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Land Health Evaluation Report

Badger Den Allotment

(No. 51100)



March 2021



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Acronyms and Abbreviations

ADEQ	Arizona Department of Environmental Quality
AZGFD	Arizona Game and Fish Department
AIM	Assessment, Inventory, and Monitoring
AUM	Animal Unit Month
BLM	Bureau of Land Management
BO	Biological Opinion
CYL	Cattle Yearlong
DPC	Desired Plant Community
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESD	Ecological Site Description
FAR	Functional-at risk
GIS	Geographic Information System
HCPC	Historic climax plant community
IBLA	Interior Board of Land Appeals
ID team	Interdisciplinary team
IPaC	Information for Planning and Consultation
LHE	Land Health Evaluation
LPI	Line Point Intercept
NAD	North American Datum
NEPA	National Environmental Policy Act
NF	Nonfunctional
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
PFC	Proper Functioning Condition
PL	Public land
p.z.	Precipitation zone
RHA	Rangeland Health Assessment
RMP	Resource Management Plan
ROD	Record of Decision
STM	State Transition Model
T&E	Threatened and Endangered
UA	University of Arizona
USDA	U.S. Department of Agriculture

USDI	U.S. Department of the Interior
USDM	U. S. Drought Monitor
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey Agency
UTM	Universal Transverse Mercator

1. Introduction

The Secretary of the Interior approved the Bureau of Land Management (BLM) Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (Arizona Standards and Guidelines) in April 1997. The purpose of a land health evaluation (LHE) report is to determine whether the Arizona standards for rangeland health are being achieved, or, if the standards are not being achieved, to determine if livestock are the causal factor for not achieving or making significant progress towards achieving land health standards. While livestock grazing is not currently authorized on the Badger Den Allotment (No. 51100), the allotment is designated as available for grazing through the Safford District Resource Management Plan (RMP), which incorporated the Upper Gila-San Simon Grazing Environmental Statement. Previously, the allotment was actively used until 1993 as described in the timeline below.

This LHE will determine if land health standards are being met, and the potential effects of permitting livestock grazing. This 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. The data and recommended management actions from this LHE will inform any federal action associated with the Badger Den Allotment and that federal action will be subject to the National Environmental Policy Act (NEPA) procedure. Issues identified through internal and public scoping of the NEPA process would be addressed and solutions incorporated into the permit to ensure that rangeland health standards continue to be met in areas where standards are currently being met and that livestock grazing is not a contributing factor to not meeting standards.

Present rangeland health is the result of contributing factors including, but are not limited to past land uses, land use restrictions, recreation, wildlife, rights-of-way, mining, fire, weather, and insects and disease (USDI BLM, 1997).

2. Allotment Profile and General Description

The Badger Den Allotment (No. 51100) is located in Graham County, Arizona. It is approximately 8 miles north of the town of Bowie. The BLM-administered grazing allotments that border the Badger Den Allotment include Tanque, 111 Ranch, Hackberry, Poppy Canyon, Murchison, Fan, and Willow (Appendix A, Figure 7). The Badger Den Allotment is comprised of 47,470 (96.9%) BLM-administered acres, 1,469 (3.0%) private land acres, and 61.3 (0.1%) State Trust land acres, totaling to 49,000 acres.

Elevation of the allotment is approximately 3,500 feet though the allotment ranges from 3,300 feet along the San Simon River up to 5,500 feet at Javelina Peak. The San Simon River, which usually only has water after moderate rain events, runs through the allotment. Haekel road, a paved BLM road, follows beside the San Simon River and crosses it once on the allotment. Range improvements on the allotment include dams and dikes placed on the allotment for soils stabilization and rangeland health rehabilitation, seeding projects implemented to help with vegetation reestablishment, as well as many livestock grazing facilities such as fences dividing the allotment into pastures (Appendix A, Figure 9), fencing creating livestock enclosures, cattle guards, gates, wells, pipelines, water storage and troughs, dirt tanks, corrals, developed springs and other improvements. The Badger Den Allotment has been, and continues to be, the location

for mining activities. There are active zeolite operations within Section 20 of Township 11 South, 29 East within the Badger Den Allotment boundary.

3. Grazing History

Livestock grazing is not currently authorized on the Badger Den Allotment. The allotment is designated as available for grazing through the Safford District RMP, which incorporated the Upper Gila-San Simon Grazing Environmental Statement and was actively used until 1993 as described in the timeline below. Livestock grazing was previously authorized under Section 3 of the Taylor Grazing Act for the Badger Den Allotment. Past grazing permits incorporated use on all unfenced land ownerships controlled by the permittee and were billed for use on BLM-administered land on the basis of percent public land (PL). The PL identifies the percentage of forage available on BLM-administered land, not acreage. Past permitted use has changed over the years due to adjustments in carrying capacity or land exchanges as described below.

May 1, 1981 – To incorporate the Upper Gila-San Simon Grazing Environmental Statement (USDI BLM, 1978) a decision was issued to adjust the authorized livestock use on the Badger Den Allotment from 2,796 Animal Unit Months (AUMs) or 292 cattle yearlong at 80 percent PL down to 1,395 AUMs (171 cattle/horses yearlong) at 68 percent PL over a 5-year period. The excess 1,401 AUMs which were removed were put into suspension.

October 23, 1981 - An amendment to the May 1st grazing decision was issued to incorporate a 19 head reduction that the State Land department made to the state grazing lease within the allotment. This adjusted the reduction schedule to 1,386 AUMS (152 CYL) at 76 percent PL over the 5 years. Reductions were fully implemented by March 1, 1986.

June 16, 1988 - A letter was written informing of a land exchange with the State of Arizona. As a result, the grazing permit was increased to 1,776 AUMs (152 cattle/horses yearlong) at 97 percent PL.

July 28, 1989 – A permit was signed allowing 150 cattle and 2 horses at 97 percent PL yearlong.

February 15, 1991 - A decision was issued to cancel the grazing permit and grazing preference in whole on the Badger Den Allotment due to failure to adhere to the terms and conditions of the permit. The decision to cancel the grazing permit was not made for rangeland health purposes. The decision was appealed with a petition for stay allowing the permittee to continue grazing until the appeal was resolved.

February 5, 1993 - The Interior Board of Land Appeals (IBLA) dismissed the appeal and affirmed the BLM's decision to cancel the permit. The BLM enforced the decision to cancel the permit resulting in no livestock on the allotment. There has not been an active grazing permit for the Badger Den Allotment since 1993, although the Badger Den Allotment has remained designated as available for grazing.

After cancellation of the permit and removal of livestock in 1993, there were several years of repeated willful trespass by the previous permittee with the last known case occurring in 2002. These intermittent trespass cases involved fewer livestock than were previously permitted. From 2002 to the current year of 2020 the allotment has been predominantly vacant as described below. The BLM staff continue to monitor the Badger Den Allotment to preclude prohibited acts.

In recent years, small numbers of incidental unauthorized livestock from neighboring allotments occasionally have been found on the Badger Den Allotment. When observed, livestock were not allowed to remain on the allotment and were promptly removed with repairs done to fencing as problematic areas were discovered. These incidents were documented and resolved informally through conversations with livestock owners. No resource damage has been observed or documented by incidental unauthorized livestock use on the Badger Den Allotment.

4. Wildlife Resources

This section discusses the wildlife resources in and around the Badger Den Allotment, including Federally listed threatened and endangered (T&E) species, BLM special status species, and species of economic and recreational importance. Refer to Appendix B: Wildlife and Plant Species for a complete list of species.

4.1 Threatened and Endangered Species

The grazing program for the BLM Gila District, including grazing activities within the Badger Den Allotment, was assessed pursuant to Section 7 of the Endangered Species Act (ESA) to determine whether the program would jeopardize the continued existence of an endangered or threatened species and/or their designated or proposed critical habitat. The U.S. Fish and Wildlife Service (USFWS) rendered a Biological Opinion (BO) on the Gila District Livestock Grazing Program #22410-2006-F-0414 (2012). The BO determined that no conservation measures were needed for the Badger Den Allotment due to the absence of the consulted listed species and/or designated critical habitat. Additionally, on September 29, 2020, a generated report using the USFWS Information for Planning and Conservation (IPaC) website indicated a total of five Federally listed or proposed species were known or expected to occur within the allotment: jaguar, northern Aplomado falcon, yellow-billed cuckoo, northern Mexican gartersnake, and Wright's marsh thistle (USDI USFWS N.d.; Appendix B: Wildlife and Plant Species). A report generated on February 20, 2020 from the Arizona Game and Fish Department (AZGFD) Environmental Online Review Tool (AZGFD, N.d.) indicated that an additional three Federally listed species have the potential to occur within 5 miles of the allotment boundary and/or within the allotment: ocelot, Desert Pupfish, and Gila Topminnow. The Gila Chub is not currently present within the allotment but could be present in the future due to a restored wildlife enclosure called Sands Draw, as discussed below.

The allotment lacks the basic components that define jaguar habitat based on the description provided by the USDI USFWS (2013) Federal Register Notice for designating critical habitat. The jaguar is most commonly found in warm, tropical climates that are usually associated with water. Jaguars are rarely found in extensive arid areas and generally avoid open country like grasslands and desertscrub as they prefer closed vegetative structures of nearly every tropical forest type. The ocelot is also strongly associated with dense cover or vegetation, which suggests it uses a fairly narrow range of microhabitats (USDI USFWS 2012; Emmons 1988; Horne 1998). Research has found that ocelots are most frequently observed in biotic communities associated with tropical and subtropical habitats (i.e. subtropical thornscrub, tropical deciduous forest, or tropical thornscrub) (USDI USFWS 2012). Due to the Badger Den Allotment's biotic communities consisting primarily of Chihuahuan Desertscrub and semidesert grassland, jaguars and ocelots are expected to be absent from the allotment.

The northern Aplomado falcon is one of three subspecies of the Aplomado falcon and the only subspecies recorded in the United States. Falcons require open habitats that have scattered trees for hunting, roosting, and nesting and an understory of grass and shrubs (USDI USFWS 2005). Habitat types include yucca-covered ridges in coastal prairie, riparian woodland in open grassland, palm and oak savannas, deciduous woodland, yucca-mesquite grasslands, and a variety of other open desert grassland and shrub habitats (USDI USFWS 2005). According to Truett (2002), there have been no verified sightings of Aplomado falcons in Arizona since 1940, and the northern Aplomado falcon is now considered to be extirpated from the State of Arizona. There is a very limited distribution in the U.S. in Texas and New Mexico. The species' historical range extends into southeastern Arizona; however, the species is still considered to be extirpated from Arizona with no recent records of the species. In Arizona, no documented nesting attempts have occurred since 1940 (AZGFD 2021), or since 2006 when the whole state of Arizona was included in the 10(j) area designation (50 CFR Part 17, 42298-42315). There was a reported observation in 1977 west of Rodeo, New Mexico in Cochise County, Arizona; however, sight records since 1940 are unsubstantiated, and the falcon is considered possibly extirpated in Arizona (per conversation with USFWS; AZGFD 2021). There is no designated or proposed critical habitat for this species. Based on monitoring results, the allotment lacks the riparian-woodland habitat component as well as a productive grassland understory; therefore, the northern Aplomado falcon is expected to be absent from the allotment.

Due to a general lack of perennial water and riparian habitat, the yellow-billed cuckoo, northern Mexican gartersnake, Desert Pupfish, Gila Chub and Gila Topminnow are expected to be absent from the allotment. The yellow-billed cuckoo is a riparian obligate species that utilizes cottonwood gallery forests and may use upland areas for foraging. The allotment does not contain the primary riparian habitat; however, yellow-billed cuckoos may utilize the upland areas temporarily during times of migration. The northern Mexican gartersnake is known to be found in both lotic and lentic habitats including cienegas, stock tanks, and river habitats including pools and backwaters (USDI USFWS 2014). There are no recorded observations of the northern Mexican gartersnake being present within the allotment. The Desert Pupfish and Gila Topminnow are not expected to be present within the Badger Den Allotment due to the evidence of ephemeral-to-intermittent flows along the San Simon River resulting in disconnected habitat for fish populations to exist or migrate upstream. Historically, desert pupfish and Gila Topminnow may have existed in the San Simon River when flows were more consistent and existed in the Gila River before nonnative aquatic species were established. Although neither of these species occur in the Badger Den Allotment at present, both, as well as the Gila Chub, have been approved to be introduced into the Sands Draw wildlife enclosure. The Sands Draw wildlife enclosure supports a well with artesian flow that feeds two ponds and channel habitat that is perennial. This habitat was enhanced and expanded for Desert Pupfish, Gila Topminnow, and Gila Chub to repatriate these species back into this watershed. See Section 7.2.1 for further discussion on riparian-wetland sites. Overall, due to the lack of perennial water sources and riparian habitat, the yellow-billed cuckoo, northern Mexican gartersnake, Desert Pupfish, Gila Chub and Gila Topminnow are expected to be absent from the allotment.

Additional riparian-wetland habitat, described further in Section 7.2.1 below, include the HX Detention Dam and Dripping Springs. They may provide marginal riparian habitat for all wildlife, primarily during wet periods. Visual observations of Drippings Springs showed no water at the location, however there were a few grasses growing within the catchment. The dry nature of the site does not provide the necessary moisture to support a riparian-wetland plant community. At the HX Detention Dam, water has saturated the ground creating a small riparian-wetland area behind the detention dam and has been fitted with an enclosure fence. Observations

of the HX Dam riparian-wetland habitat showed the presence of some desirable native riparian-wetland vegetation such as cottonwood trees and giant sacaton, which appeared to be in good health. Other species observed included Johnson grass and cocklebur, both invasive.

The Wright's marsh thistle is a wetland obligate plant species that occurs in wet, alkaline soils in spring seeps and marshy edges of streams and ponds between 3,450 and 7,850 feet in elevation (USDI USFWS 2010). This species currently occurs only in New Mexico as it has been extirpated from all previously known locations in Arizona. Due to the lack of perennial water and riparian-wetland habitat, the Wright's marsh thistle is expected to be absent from the allotment.

4.2 BLM Special Status Species

The BLM sensitive species that have suitable habitat present and/or are known to exist or have the potential to exist within this allotment are the bald eagle (wintering only), ferruginous hawk, golden eagle, western burrowing owl, American peregrine falcon, Arizona Botteri's sparrow, Arizona myotis, banner-tailed kangaroo rat, black-tailed prairie dog, cave myotis, greater western bonneted bat, spotted bat, pale Townsend's big-eared bat, and the desert mud turtle. A total of 12 USFWS Birds of Conservation Concern (USDI USFWS, 2008), not already addressed as BLM sensitive species or T&E species, have the potential to occur within the allotment and are included in Appendix B: Wildlife and Plant Species. The Birds of Conservation Concern 2008 list considers bird species that are nongame species, gamebirds without a hunting season, subsistence-hunted nongame birds in Alaska, and ESA candidate, proposed, and recently delisted species (USDI USFWS 2008). Data derived from the Arizona Game and Fish Department Environmental Online Review Tool (AZGFD, N.d.) was used for the migratory bird analysis.

The allotment offers an array of habitats for migratory birds, providing valuable food and cover. Migratory species of concern that have the highest potential to occur on the allotment include several raptor species (i.e. hawks, eagles, owls, falcons) and a variety of passerine species. No surveys have been conducted specifically within this allotment for this assessment to determine presence, but these species have the potential of occurring if habitat is available. Bird species utilize the grassland, open shrub, and rocky outcrop habitat for hunting prey. The black-tailed prairie dog and banner-tailed kangaroo rat utilize grasslands and open shrub habitat for burrowing and foraging. Bat species may occur on the allotment if roosting habitat is available. Generally, the composition, structure, and distribution of habitat for all classifications of sensitive species, other than the desert mud turtle, are intact and would be suitable for use if the species were present. The desert mud turtle requires riparian habitat associated with perennial flows for feeding and breeding; therefore, it is unlikely that this species would occur on this allotment due to the lack of appropriate habitat conditions.

4.3 Species of Economic and Recreational Importance

Based on the AZGFD Environmental Online Review Tool report (AZGFD, N.d.), the following species of economic and recreational importance may occur within or in proximity to the Badger Den Allotment: Gambel's and scaled quail, mule deer, band-tailed pigeon, javelina, mountain lion, and the white-winged and mourning doves. Mountain lion and javelina occur in limited numbers or only occasionally on the allotment as resources meet their needs. Mountain lions can be found in deserts, mountains, deciduous forests, lowlands, canyons, prairies and more, and could use the allotment to migrate between more suitable patches of habitat, such as rocky outcrops or areas with dense vegetation. Javelinas are typically found within desert-type ecosystems below 5,500 feet, and are often in washes, rolling hills, and other topographical features that are within or closely adjacent to a water source. Grasslands with dispersed shrub thickets, cacti and palo verde offer forage and cover habitat for mule deer, Gambel's and scaled

quail, and the white-winged and mourning dove species. The band-tailed pigeon prefers dry mountain forested habitat, which is absent from this allotment.

5. Objectives

This section provides an overview of the Safford Field Office management objectives that are associated with the Badger Den Allotment per the Safford District RMP and Environmental Impact Statement (EIS) as approved in the Partial Records of Decision (ROD) dated September 1992 and July 1994 (USDI BLM, 1991). The Safford District RMP incorporates by reference the Upper Gila-San Simon Grazing Environmental Statement (USDI BLM, 1978).

5.1 Land Use Plan Management Objectives

The Badger Den Allotment is designated as available for grazing through the Safford District RMP which incorporated the Upper Gila-San Simon Grazing Environmental Statement. At the time of the Environmental Statement, there were two allotments (5110 and 5113) in the Badger Den unit and surface management was different than it is today. The Environmental Statement designated a total of 1,598 public land AUMs available for livestock use in the unit. Subsequent land exchanges and other allotment decisions adjusted the authorized grazing use on the allotment as outlined in Section 3 Grazing History.

5.2 Allotment-Specific Objectives

The objective for the Badger Den Allotment is to meet the land health standards at key areas as established in the Arizona Standards for Rangeland Health. Specific objectives are defined for Standards 1, 2, and 3 in Section 7: Land Health Standards and Determinations, to guide the determination of whether the land health standards are being met.

6. Monitoring and Evaluation

This section provides information regarding drought monitoring, ecological sites and key areas, monitoring methodology, and monitoring results on the Badger Den Allotment. Photos of key areas can be found in Appendix C: Key Area Photos.

6.1 Drought Monitoring Evaluation

The U.S. Drought Monitor (USDM) is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Drought experts compare recent precipitation to long-term averages. They check temperatures, moisture levels in soils, water levels in streams and lakes, and watch for other indicators of drought to establish consensus for drought categories (USDM, 2020). One hundred percent of Graham County was categorized as severe drought in 2018, and moderate drought in 2019 as shown in Table 8 in Appendix A. This is significant because the majority of monitoring data collected for this evaluation was conducted during these two years.

Precipitation and temperature data from PRISM climate datasets (PRISM, 2017) were utilized by requesting data for key areas 1-10, as identified in Table 11, which are dispersed throughout the Badger Den Allotment and producing an average of the key areas. Climatic data from this source is not collected from a single station but is modeled using data collected from many stations and physiographic factors in the area.

Precipitation and temperature results are provided in Figure 8 and Table 9 in Appendix A. Average annual precipitation ranged between 5.5 inches (in 2003) and 13.6 inches (in 2000). Average annual rainfall on the allotment between 2000 and 2019 was 10 inches with most precipitation recorded in the summer months. The data show that five years between 2000 and 2019 averaged less than 8 inches of annual precipitation (2003, 2006, 2009, 2012, 2017) while five years averaged above 12 inches of precipitation (2000, 2007, 2010, 2015, 2016). Average monthly temperatures ranged between 83°F in July and 44°F in December.

6.2 Ecological Sites and Monitoring Sites

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. The ESDs are developed by the National Resources Conservation Service (NRCS) and partners to document the properties of ecological sites. These include climate, soil, geomorphology, hydrology, and vegetation information that describe the behavior of individual ecological sites. Since an ecological site might feature several plant communities that occur over time or in response to land management, these descriptions can be used to interpret ecological changes (Perez, 2017).

In grazing administration, a key area is defined as a relatively small portion of a range selected because of its location, use, or grazing value as a monitoring point for grazing use. Key areas are indicator areas that are able to reflect what is happening on a larger area as a result of on-the-ground management actions. A key area should be a representative sample of a large stratum, such as a pasture, grazing allotment, wildlife habitat area, herd management area, watershed area, etc., depending on the management objectives being addressed by the study (USDI BLM, 1996).

Riparian reaches along the San Simon River and key areas on uplands were established for evaluation of the Badger Den Allotment. Historic key areas have changed, with some no longer sampled because of access issues and/or proximity to other monitored sites. Other key areas have been recently established in 2018 (UA/AIM sites BD-6, BD-6b, and BD-10). Each AIM/UA monitoring site was considered for additional RHA monitoring. Three AIM/UA sites included no RHA because another RHA had already been completed at each ecological site. Five RHAs were conducted in the same location as UA/AIM monitoring sites (site names in parentheses), all other RHAs were conducted in areas (ecological sites) without supporting monitoring data. Table 1 below shows which RHA locations correspond with a monitoring site.

Table 1. Crosswalk for Monitoring Sites

AIM/UA Site Name	RHA Site Name
N/A	BD-1 (clay loam upland)
N/A	BD-2 (Clayey swale)
N/A	BD-3 (Limy fan)
N/A	BD-4 (Limy fan)
(BD-4) (loamy upland)	N/A
(BD-6) (sandy loam upland)	N/A
(BD-8) (loamy upland)	N/A
(BD-9in)	BD-6 (sandy loam upland)
(BD-9out)	BD-7 (sandy loam upland)
(BD-10)	BD-5 (loamy upland)

AIM/UA Site Name	RHA Site Name
(BD-6b) (AIM only)	BD-8 (sandy upland)
(Fan3) (AIM only)	BD-9 (sandy upland)
N/A	BD-10 (sandy wash)

The key areas analyzed in this assessment provide data for ecological sites on the allotment and are a representative sample of the entire grazing allotment. They are representative of the allotment's vegetation composition, soils, vegetative production, and grazing value. These key areas serve as indicators of the allotments range condition and are appropriate for indicating vegetation changes that would be tied to livestock management. Two ecological sites had either no Ecological Site Description (ESD), or the ESD was incomplete; no Rangeland Health Assessment (RHA) was completed for these ecological sites. Not all ESDs on the allotment have been fully evaluated (either no data is publicly available, or the ESD is in provision status); in such cases, currently available provisional information was used. Two other ecological sites were not evaluated due to terrain and decreased livestock suitability. Figure 10 **Error! Reference source not found.** and Table 10 in Appendix A identify the ecological sites on the Badger Den Allotment. Figure 11 identifies the location of key areas and Proper Functioning Condition (PFC) reaches.

A key attribute of an ecological site is the historic climax plant community (HCPC), or reference state. The HCPC represents the natural potential plant community found on relatively undisturbed sites. The HCPC is determined by analyzing relatively undisturbed areas of that ecological site. The HCPC or reference state, written in the reference sheet at the end of each ESD is compared with existing range condition in this document to determine current departure from reference condition.

6.3 Monitoring Methodology

The Arizona Standards for Rangeland Health were assessed for the Badger Den Allotment by a BLM Interdisciplinary (ID) Team consisting of a Hydrologist, a Natural Resource Specialist, and a Rangeland Management Specialist. Monitoring and assessments methods include RHAs, a PFC assessment, and monitoring data collected through the University of Arizona (UA) and the BLM in 2014 and 2018, and Assessment, Inventory, and Monitoring (AIM) data collected in 2019. These monitoring and assessments form the basis for the rationale of the LHE.

Standard 1 was evaluated through RHAs using the Interpreting Indicators of Rangeland Health method, as described in BLM Technical Reference 1734-6 Version 4 (2005). All Indicators associated with each Attribute were collectively considered when giving an overall rating for each Attribute at a site. The determination of Standard 1 for each site was made based on the RHA assessment and other monitoring information where available.

Standard 2 was evaluated with a PFC assessment as described in Technical Reference 1737-15 (USDI BLM 2015). The abbreviation PFC describes both the assessment method and a defined, on-the-ground condition of a riparian area. These broad-scale condition assessments use hydrology, vegetation, and erosion/deposition attributes and processes to qualitatively assess the condition of riparian areas. The determinations from the assessments include ratings of (PFC), Functional-At Risk (FAR), or Nonfunctional (NF). If the system is FAR it is then given a trend value of either upward, downward, or static.

Standard 3 was evaluated using a variety of upland study methods. Dry weight rank (which measures vegetation composition), line intercept (which measures species cover and/or composition), line-point intercept (LPI) (which collects a sample to calculate species cover and/or composition as well as ground cover), ground cover (which measures ground cover), soil stability (which measures stability of soils), and species richness (which lists plant species present), were among the monitoring methods used. These methods are described in detail in BLM Technical Reference 1734-4, “Sampling Vegetation Attributes” (USDI BLM 1996), and Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems second edition (Herrick, et al., 2018). Results from RHA and PFC assessments in Standards 1 and 2 were also considered.

6.4 Monitoring results

The following tables provide an overview of the measured percent canopy cover and/or percent composition for each vegetation cover class, as well as the measured ground cover (i.e. bare ground, gravel, rock, litter). Results for RHAs are given below in Section 7.1.1 Standard 1 Determinations. Results for PFC assessments are given below in Section 7.2.1 Standard 2 Determinations. Interpretation of monitoring results are given for monitored sites in Section 7.1.1 Standard 1 Determinations and Section 7.3.3 Standard 3 Determinations below. The UA monitoring data was collected in 2014 and 2018 on the Badger Den Allotment. In 2019, the BLM in Arizona changed monitoring methods from UA monitoring to implement the AIM strategy, which seeks to create standards in resource data collection that can be shared across jurisdictions and agencies. Monitoring results between AIM and UA vary due to several factors including monitoring method used as described below:

- The UA cover values are determined through the line intercept monitoring method. This method involves placing a line transect and calculating how much vegetation intersects the line transect. The AIM cover values are determined through the LPI method which also places line transects but in a different orientation then collects data only at certain points along the line transect.
- The UA composition values are determined through the dry weight rank method which considers annual production of perennial plants within a monitoring quadrat to determine which produces more by weight. The AIM composition values are determined through the LPI method considering all vegetative cover classes including annuals, and determines composition based off of cover values.

Although these monitoring methods use different protocols, they both provide correct results for the specific locations monitored and are approved monitoring methods. The largest variation between UA and AIM monitoring results is due to location. As described above, while UA and AIM monitoring efforts on a site occurred in the same general area, the variation in methodology resulted in different spots on the ground being analyzed. The UA’s monitoring methods are often more spread out, acquiring data from a larger area but is less consistent on specific locations monitored. The AIM method generally covers a smaller area yet is more reproducible to compare yearly results with greater accuracy. While UA and AIM monitoring results are both accurate, they are not comparable due to different collection parameters, but can both be used to infer data for a site. The UA data is used to show current condition and gives some indication of trend on the allotment. Because future BLM monitoring will continue to use the AIM strategy, the AIM data is used both to show current condition as well as to establish a baseline for future monitoring.

Table 2. Canopy Cover/Composition/Cover Class for UA Data for 2014 and 2018

Cover Class	Species	Site (BD-4) (% cover / % composition)		Site (BD-6) (% cover / % composition)	Site (BD-8) (% cover / % composition)		Site (BD-9in) ¹ (% cover / % composition)		Site (BD-9out) ² (% cover / % composition)		Site (BD-10) ³ (% cover / % composition)
		2014 ⁴	2018 ⁴	2018 ⁴	2014 ⁵	2018 ^{5,6}	2014 ⁵	2018 ⁵	2014 ⁵	2018 ⁵	2018 ⁴
Perennial Grasses	Bush muhly	-- / 1.09	-- / 0.10	--	--	--	--	--	--	--	-- / 1.45
	Fluff grass	--	--	--	--	--	--	--	--	--	-- / 3.64
	Spike dropseed	--	--	-- / 2.34	--	--	--	--	--	--	--
	Tobosagrass	-- / 37.03	-- / 30.52	--	--	--	--	--	--	--	-- / 30.55
<i>Perennial Grass Total</i>		-- / 38.12	-- / 30.62	-- / 2.34	--	--	--	--	--	--	-- / 35.64
Perennial Forbs	Broom snakeweed	--	--	-- / 24.04	--	--	--	--	--	0.12 / 0.52	-- / 3.45
	Burroweed	--	--	--	--	--	0.02 / 0.15	0.17 / 0.93	--	0.11 / 0.47	-- / 9.09
	Desert zinnia	--	--	--	--	--	--	--	--	--	-- / 1.82
	Hog potato (Indian rushpea)	-- / 1.72	-- / 12.58	--	--	--	--	--	--	--	-- / 15.45
	Silverleaf nightshade	--	--	--	--	--	--	--	--	--	-- / 8.55
<i>Perennial Forb Total</i>		-- / 1.72	-- / 12.58	-- / 24.04	--	--	0.02 / 0.15	0.17 / 0.93	--	0.23 / 0.99	-- / 38.36
Trees, Shrubs and Succulents (collectively called shrubs)	Catclaw acacia	--	--	--	4.81 / 20.04	8.04 / 30.07	0.03 / 0.22	0.22 / 1.20	--	--	--
	Christmas cholla	--	--	--	--	--	--	--	0.12 / 1.04	0.73 / 3.13	-- / 6.73
	Creosote bush	-- / 43.75	-- / 51.03	--	--	--	--	--	--	--	-- / 0.55
	Desert saltbush	--	--	-- / 4.26	--	--	--	--	--	--	--
	Desert wolfberry	-- / 2.03	-- / 1.65	--	3.03 / 12.61	2.02 / 7.55	--	--	--0.05 / 0.42	--	--
	Devil's cholla	-- / 3.91	-- / 1.03	--	--	--	--	--	--	--	-- / 5.82
	Fourwing saltbush	--	--	-- / 27.66	--	--	--	--	--	--	--

	Jumping cholla (cane cholla)	-- / 3.28	-- / 0.31	--	8.13 / 33.87	6.33 / 23.67	1.08 / 9.45	2.00 / 10.87	1.87 / 15.73	5.44 / 23.36	--
	Mormon tea	--	--	--	0.20 / 0.83	--	0.37 / 3.22	0.43 / 2.34	0.13 / 1.05	0.28 / 1.20	-- / 1.82
	Prickly pear	-- / 0.47	-- / 0.31	--	0.47 / 1.95	--	0.96 / 8.42	1.14 / 6.20	0.12 / 0.98	0.29 / 1.25	--
	Soaptree yucca	--	--	-- / 6.38	--	0.19 / 0.71	0.07 / 0.59	0.33 / 1.79	--	--	-- / 3.09
	Sotol	--	--	--	0.21 / 0.87	--	--	--	--	--	--
	Velvet mesquite	-- / 6.72	-- / 2.47	-- / 35.52	7.16 / 29.84	10.16 / 38.00	8.87 / 77.95	14.10 / 76.67	9.16 / 80.78	16.32 / 70.07	-- / 8.00
<i>Shrub Total</i>		<i>-- / 60.16</i>	<i>-- / 56.80</i>	<i>-- / 73.82</i>	<i>24.01 / 100.01</i>	<i>26.74 / 100.00</i>	<i>11.38 / 99.85</i>	<i>18.22 / 99.07</i>	<i>11.85 / 100</i>	<i>23.06 / 99.01</i>	<i>-- / 26.01</i>
Foliar Cover Total		--	--	--	23.99	26.74	11.38	18.39	11.85	23.29	--
Bare Ground		28.83	15.83	46.33	--	--	--	--	--	--	44.00
Gravel (1/8" - 3")		45.83	56.33	6.67	--	--	--	--	--	--	20.00
Rock >3"		2.00	5.83	--	--	--	--	--	--	--	0.33
Live Basal Vegetation		0.50	0.50	1.00	--	--	--	--	--	--	2.67
Litter (including live non-basal vegetation)		22.83	21.50	46.00	--	--	--	--	--	--	33.00

¹This is also IIRH site BD-6

²This is also IIRH site BD-7

³This is also IIRH site BD-5

⁴No canopy/foiar cover data, only ground cover and vegetation composition (through the Dry Weight Rank method)

⁵No ground cover data, composition calculated from the LPI method

⁶Site (BD-8) moved approximately 700 feet to the Northwest in 2018. The key area remained in the same ecological site and data collected for both 2014 and 2018 were used and compared to provide informative site characteristics.

-- Indicates species was not present or no data was collected

Table 3. Line-Point Intercept Data for AIM Collected in 2019

Cover Class	Species	Site (BD-4) (% cover / % composition)	Site (BD-6) (% cover / % composition)	Site (BD-6b) ¹ (% cover / % composition)	Site (BD-8) (% cover / % composition)	Site (BD-9in) ² (% cover / % composition)	Site (BD-9out) ³ (% cover / % composition)	Site (BD-10) ⁴ (% cover / % composition)	Site (Fan3) ⁵ (% cover / % composition)
Perennial Grasses	Bush muhly	--	--	0.70 / 5.83	--	--	--	--	--
	Tobosagrass	0.70 / 4.32	--	--	--	--	--	6.70 / 32.37	--
	Unknown perennial grass	--	--	--	--	--	--	0.70 / 3.38	--
<i>Perennial Grasses Total</i>		<i>0.70 / 4.32</i>	--	<i>0.70 / 5.83</i>	--	--	--	<i>7.40 / 35.75</i>	--
Annual Grasses	common Mediterranean grass	0.70 / 4.32	--	0.70 / 5.83	--	--	--	3.30 / 15.94	--
	needle grama	--	--	--	--	--	--	2.00 / 9.66	--
<i>Annual Grasses Total</i>		<i>0.70 / 4.32</i>	--	<i>0.70 / 5.83</i>	--	--	--	<i>5.30 / 25.60</i>	--
Perennial forbs	Broom snakeweed	--	0.70 / 1.69	--	--	--	--	2.70 / 13.04	--
	Burroweed	--	--	--	0.70 / 2.13	--	--	--	--
	Desert zinnia	0.70 / 4.32	--	--	--	--	--	--	--
<i>Perennial Forbs Total</i>		<i>0.70 / 4.32</i>	<i>0.70 / 1.69</i>	--	<i>0.70 / 2.13</i>	--	--	<i>2.70 / 13.04</i>	--
Annual/Biennial Forb	Texas stork's bill	0.70 / 4.32	--	--	--	--	--	--	--
<i>Annual /Biennial Forb Total</i>		<i>0.70 / 4.32</i>	--	--	--	--	--	--	--
Annual Forbs	Unknown annual forb	3.30 / 20.37	0.70 / 1.69	--	4.70 / 14.33	2.70 / 18.49	1.30 / 8.13	1.30 / 6.28	--
<i>Annual Forb Total</i>		<i>3.30 / 20.37</i>	<i>0.70 / 1.69</i>	--	<i>4.70 / 14.33</i>	<i>2.70 / 18.49</i>	<i>1.30 / 8.13</i>	<i>1.30 / 6.28</i>	--
Trees, shrubs, succulents (collectively called shrubs)	Catclaw acacia	--	--	--	--	1.30 / 8.9	--	--	--
	Creosote bush	8.70 / 53.70	--	7.30 / 60.83	--	--	--	1.30 / 6.28	--
	Four-wing saltbush	--	2.00 / 4.83	--	--	--	--	--	4.00 / 13.33

Cover Class	Species	Site (BD-4) (% cover / % composition)	Site (BD-6) (% cover / % composition)	Site (BD-6b) ¹ (% cover / % composition)	Site (BD-8) (% cover / % composition)	Site (BD-9in) ² (% cover / % composition)	Site (BD-9out) ³ (% cover / % composition)	Site (BD-10) ⁴ (% cover / % composition)	Site (Fan3) ⁵ (% cover / % composition)
	Devil's cholla	--	--	3.30 / 27.50	--	--	--	2.00 / 9.66	--
	Soaptree yucca	--	--	--	--	--	--	0.70 / 3.38	--
	Unknown shrub	0.70 / 4.32	--	--	--	--	--	--	--
	Velvet Mesquite	--	38.00 / 91.79	--	14.70 / 44.82	9.30 / 63.70	14.70 / 91.88	--	26.00 / 86.67
	Walkingstick cactus (cane cholla)	0.70 / 4.32	--	--	12.70 / 38.72	1.30 / 8.9	--	--	--
<i>Shrub Total</i>		<i>10.1 / 62.34</i>	<i>40.00 / 96.62</i>	<i>10.60 / 88.33</i>	<i>27.4 / 83.54</i>	<i>11.90 / 81.50</i>	<i>14.70 / 91.88</i>	<i>4.00 / 19.32</i>	<i>30.00 / 100.00</i>
Total Canopy Cover		16.20	41.40	12.00	32.80	14.60	16.00	20.70	30.00
Bare Ground		30.70	46.70	56.70	57.30	72.70	72.70	60.00	52.00
Total Litter		16.70	46.70	21.30	21.30	20.00	16.00	22.00	30.70

¹This is also IIRH site BD-8

²This is also IIRH site BD-6

³This is also IIRH site BD-7

⁴This is also IIRH site BD-5

⁵This is also IIRH site BD-9

Note: Composition calculated from the LPI cover

7. Land Health Standards and Determinations

The purpose of this LHE report is to determine whether the Arizona Standards for Rangeland Health are being achieved on the Badger Den Allotment, or, if the standards are not being achieved, to determine if livestock are the causal factor for not achieving or making significant progress towards achieving land health standards. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time (see Section 3 above). Because of this period of rest on the allotment, current land health and vegetative conditions represent what the allotment is currently capable of achieving.

Due to the predominant underutilization and/or vacancy of the allotment, current livestock grazing is not contributing toward not meeting standards. Lands not meeting standards are a result of a number of factors including but not limited to historic overgrazing prior to the establishment of the Taylor Grazing Act and soil loss that resulted from that use, extended drought broken by intense thunderstorms, railroad and road development and subsequent effects on ecological function of hydrology, channel excavation in 1883 from the Gila River up the San Simon Valley to confine flow, and environmental effects from an earthquake in 1887 (Humphreys, 2015; USDI BOR, 2000).

7.1 Standard 1 – Upland Sites

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

The RHA and supporting data from other monitoring methods determine if Standard 1 is being met for each key area. Each RHA was conducted using Technical Reference 1734-6 “Interpreting Indicators of Rangeland Health” that outlines the protocol for evaluating 17 Indicators. Each indicator is associated with one or more of three attributes (Pellant et al. 2005):

1. Soil and Site Stability – The capacity of an area to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water.
2. Hydrologic Function – The capacity of an area to capture, store, and safely release water from rainfall, run-on and snowmelt (when relevant), to resist a reduction in this capacity, and to recover this capacity when a reduction does occur.
3. Biotic Integrity – The capacity of the biotic community to support ecological processes within the normal range of variability expected for the site, to resist a loss in the capacity to support these processes, and to recover this capacity when losses do occur. The biotic community includes plants, animals, and microorganisms occurring both above and below ground.

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

- None to Slight (N-S) - Attribute has “None to Slight” departure from reference condition.
- Slight to Moderate (S-M) - Attribute has “Slight to Moderate” departure from reference condition.

- Moderate (M) -Attribute has “Moderate” departure from reference condition.
- Moderate to Extreme (M-E) - Attribute has “Moderate to Extreme” departure from reference condition.
- Extreme to Total (E-T) - Attribute has “Extreme to Total” departure from reference condition.

Many factors interact to ensure that upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform, therefore, soil and site stability, hydrologic function, and biotic integrity are considered. Indicator and attribute ratings are made relative to site potential (i.e. highly erodible soils may be rated as N-S even if soil movement is significant). Departure from reference condition may be present, however if the site is in a stable alternative state which exhibits infiltration, permeability, and erosion rates appropriate to the site, then the standard may still be met. A summary of the indicator and attribute ratings determined through the RHA assessments conducted on the Badger Den Allotment are presented in Table 4 and Table 5 below (see Appendix A, Figure 11 for locations).

Table 4. Summary of Range Health Assessment 17 Indicator Ratings

Indicator	S = Soil & Site Stability H = Hydrologic Function B = Biotic Integrity	Extreme Departure	Moderate to Extreme Departure	Moderate Departure	Slight to Moderate Departure	None to Slight Departure
1. Rills	S, H		BD-8		BD-3, BD-4	BD-1, BD-2, BD-5, BD-6, BD-7, BD-9, BD-10
2. Water-flow patterns	S, H		BD-8	BD-3, BD-4, BD-10	BD-2	BD-1, BD-5, BD-6, BD-7, BD-9
3. Pedestals and/or terracettes	S, H					All 10 sites
4. Bare ground	S, H				BD-5, BD-8, BD-10	BD-1, BD-2, BD-3, BD-4, BD-6, BD-7, BD-9
5. Gullies	S, H			BD-8	BD-1, BD-3, BD-4, BD-10	BD-2, BD-5, BD-6, BD-7, BD-9
6. Wind-scoured, blowouts, and/or deposition areas	S				BD-5	BD-1, BD-2, BD-3, BD-4, BD-6, BD-7, BD-8, BD-9, BD-10

Indicator	S = Soil & Site Stability H = Hydrologic Function B = Biotic Integrity	Extreme Departure	Moderate to Extreme Departure	Moderate Departure	Slight to Moderate Departure	None to Slight Departure
7. Litter movement	S			BD-5, BD-8	BD-9	BD-1, BD-2, BD-3, BD-4, BD-6, BD-7, BD-10
8. Soil surface resistance to erosion	S, H, B					All 10 sites
9. Soil surface loss or degradation	S, H, B					All 10 sites
10. Plant community composition and distribution relative to infiltration	H		BD-1	BD-6, BD-7, BD-10	BD-5	BD-2, BD-3, BD-4, BD-8, BD-9,
11. Compaction layer	S, H, B					All 10 sites
12. Functional / structural groups	B		BD-1, BD-6, BD-7,	BD-5, BD-10		BD-2, BD-3, BD-4, BD-8, BD-9
13. Plant mortality / decadence	B				BD-5	BD-1, BD-2, BD-3, BD-4, BD-6, BD-7, BD-8, BD-9, BD-10
14. Litter amount	H, B			BD-10	BD-3, BD-4, BD-8, BD-9	BD-1, BD-2, BD-5, BD-6, BD-7,
15. Annual production	B			BD-6, BD-7, BD-10	BD-5	BD-1, BD-2, BD-3, BD-4, BD-8, BD-9
16. Invasive plants	B			BD-6, BD-7,	BD-1, BD-2, BD-5	BD-3, BD-4, BD-8, BD-9, BD-10
17. Reproductive capability of perennial plants	B			BD-5	BD-8	BD-1, BD-2, BD-3, BD-4, BD-6, BD-7, BD-9, BD-10

Table 5. Summary of Rangeland Health Attribute Ratings

Rangeland Health Attribute	Extreme Departure	Moderate to Extreme Departure	Moderate Departure	Slight to Moderate Departure	None to Slight Departure
Soil and Site Stability (S)			BD-8	BD-3, BD-4, BD-5, BD-10	BD-1, BD-2, BD-6, BD-7, BD-9
Hydrologic Function (H)			BD-8, BD-10	BD-1, BD-3, BD-4, BD-6, BD-7	BD-2, BD-5, BD-9
Biotic Integrity (B)		BD-1	BD-5, BD-6, BD-7, BD-10	BD-8	BD-2, BD-3, BD-4, BD-9

The criteria for evaluating Standard 1 includes factors such as ground cover and signs of erosion. Ground cover consists of litter, the amount and type of vegetation, and the presence of rocky substrate. These factors are considered under the Soil and Site Stability and the Biotic Integrity Rangeland Health Attributes. Signs of erosion include the presence of flow patterns, gullies, rills, and/or plant pedestalling, and are considered in the determination for the Soil and Site Stability and Hydrologic Function Rangeland Health Attributes. The following discussions for each site describe the degree of departure for each of the three Rangeland Health Attributes based on the Indicator ratings. All indicators associated with an attribute were collectively considered when giving an overall rating for each attribute at each site. Descriptions include consideration of RHA assessments and other monitoring to determine if Standard 1 is being achieved.

7.1.1 Standard 1 Determinations

BD-1 (Clay Loam Upland 8-12” p.z.; R041XB204AZ)

Site BD-1 was evaluated through an RHA by the ID Team in October 2019. This is a newly established site with no AIM or UA monitoring data. The Soil and Site Stability Attribute was rated N-S due to the overall absence of signs of excess erosion and/or deposition and movement of soil and litter. The majority of the indicators for Soil and Site Stability were rated either in the N-S or S-M departure category (see Table 5 for attribute ratings). It was noted that some gullies were present, but they were not determined to be excessive; therefore, Indicator 5 received a S-M rating.

The Hydrologic Function Attribute was rated S-M primarily due to the degree of departure for the plant community composition and distribution, Indicator 10 received a M-E rating, all other indicators were rated primarily at N-S, with one S-M (see Table 4). The M-E rating for Indicator 10 indicates the site may be less capable of retaining precipitation and promoting infiltration than would be expected. The lack of erosive rills and gullies indicate that infiltration is still occurring due to the presence of rocky ground cover.

The Biotic Integrity Attribute was rated M-E due to the significant departures from the reference state regarding functional and structural groups present (Indicator 12). Functional composition and diversity have a large impact on ecosystem processes, and are the principal factors that inform plant productivity, nitrogen cycling, and light penetration (Tilman et al. 1997). The ESD for this site indicates that perennial grasses, such as tobosagrass, should be the dominant cover type, followed by the dominant shrubs, annual forbs and annual grasses, and the lowest amount of cover should consist of succulents and perennial forbs. The ID Team observed that shrub species were the dominant cover type, followed by succulents, annual grasses, and then perennial

grasses, which resulted in the M-E departure rating for Indicator 12 (Table 4). Regarding invasive plants, Indicator 16 allows for the consideration of both invasive (i.e. nonnative) and noxious weed species, as well as native species that are not considered desirable at their present amount based on the ESD Reference Sheet. Throughout this site the ID Team observed devil’s cholla, as well as localized populations of Lehmann’s lovegrass near the roadways resulting in the S-M departure rating. Indicators 8, 11, 13, 14, 15, and 17 were all rated N-S.

The Clay Loam Upland ecological site on the Badger Den Allotment has transitioned from the “Reference State” to the “Shrubs & Tobosa State” as shown in the ESD’s State and Transition Model (STM) (Figure 1) below. The model illustrates that the restoration pathway, R2A, includes managed grazing and woody species control as needed. Management actions may be considered for the control of shrubs and succulents. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time. This period of rest has not transitioned the landscape back into HCPC and the ESD STM model prescribes managed grazing as a practice in transitioning back to HCPC; therefore, grazing is an appropriate management action for the site, and future authorized grazing would not be expected to further degrade the site.

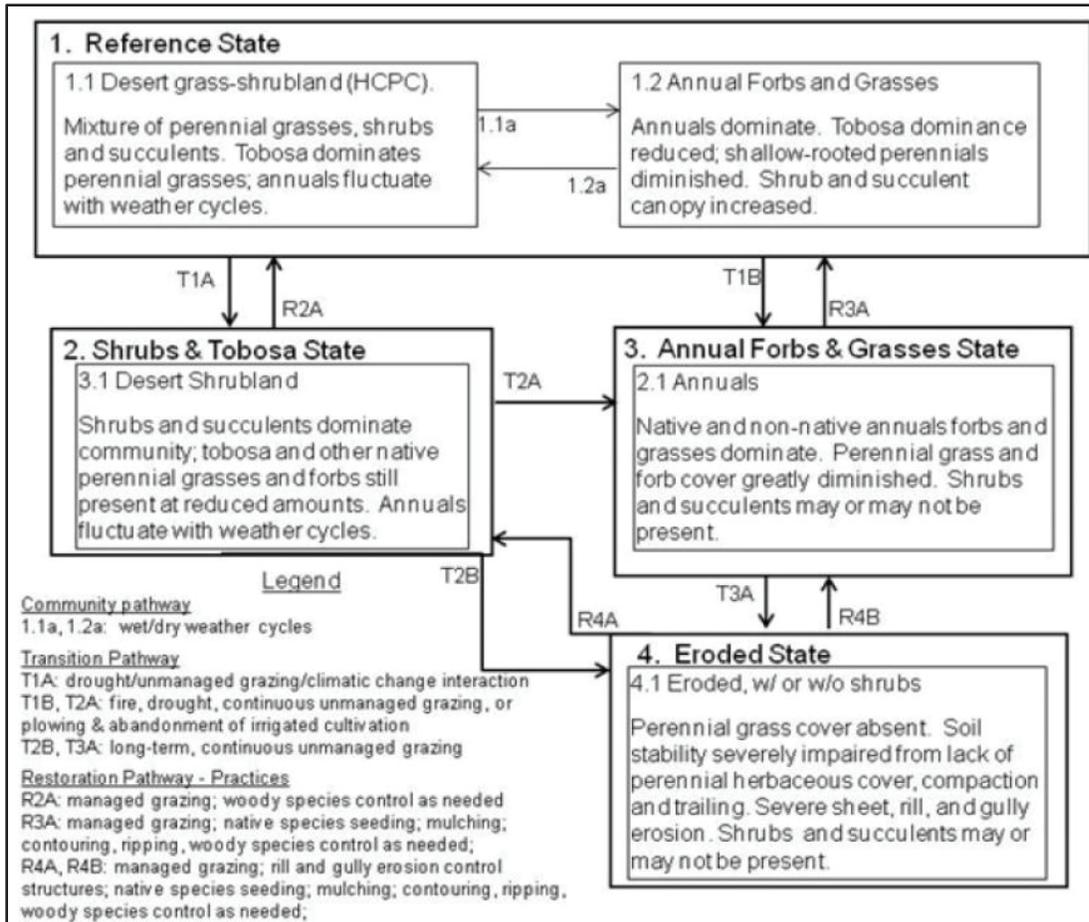


Figure 1. STM for Clay Loam Upland 8-12” p.z.

Although the desired dominant functional and structural groups have transitioned away from reference condition, the soils are exhibiting infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform. Because of this, site BD-1 was found to be meeting Standard 1.

BD-2 (Clayey Swale 8-12" p.z.; R041XB202AZ)

Site BD-2 was evaluated through an RHA by the ID Team in January 2020. This is a newly established site with no AIM or UA monitoring data. The Soil and Site Stability Attribute was rated N-S due to the overall absence of signs of excess erosion and/or deposition and movement of soil and litter. The majority of the indicators for Soil and Site Stability were rated either in the N-S or S-M departure category (see Table 5 for attribute ratings). It was noted that some water flow patterns were present, and were being influenced by a nearby road and fenceline; therefore, Indicator 2 received a S-M rating.

The Hydrologic Function Attribute was rated N-S suggesting that the site's soil surface erosion or degradation, absence of a compaction layer, amount of litter and litter movement, and absence of excessive erosional features are appropriate to the site. The ID Team observed that the plant community composition and distribution (Indicator 10) was meeting the expected conditions, as described in the ESD, which supports appropriate infiltration rates for the site. Water flow patterns (Indicator 2), as described above for the Soil and Site Stability Attribute, also affects the rating for Hydrologic Function but was not considered to be causing a significant impact to this attribute.

The Biotic Integrity Attribute was rated N-S suggesting that the site's productivity and the plant functional and structural groups were meeting the expected conditions as described in the ESD. The majority of the indicators were rated N-S except for Indicator 16 (Invasive Plants). Regarding invasive plants, Indicator 16 allows for the consideration of both invasive (i.e. nonnative) and noxious weed species, as well as native species that are not considered desirable at their present amount based on the ESD Reference Sheet. It was noted by the ID Team that mesquite and creosote were present but in a greater amount than the ESD indicated, which resulted in the indicator being rated S-M. Overall, the plant communities at this site were observed to have the appropriate dominant and sub-dominant functional and structural groups, and there was evidence that their reproductive capabilities were meeting the expected conditions for the site and, therefore, the estimated annual production was within the appropriate range for an average year.

The Clayey Swale ecological site on the Badger Den Allotment is in the "Mesquite, Natives" site as shown in the STM model below (Figure 2). Restoration pathway "1b" includes herbicide or mechanical control methods for mesquite as well as proper grazing or no grazing. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time. This period of rest has not transitioned the landscape back into HCPC and the ESD STM model prescribes managed grazing as a practice in transitioning back to HCPC; therefore, grazing is an appropriate management action for the site, and future authorized grazing would not be expected to further degrade the site. Overall, although few indicators showed S-M departure from reference condition, attribute ratings showed N-S departure from reference condition and the soils are exhibiting infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform. Because of this, site BD-2 was found to be meeting Standard 1.

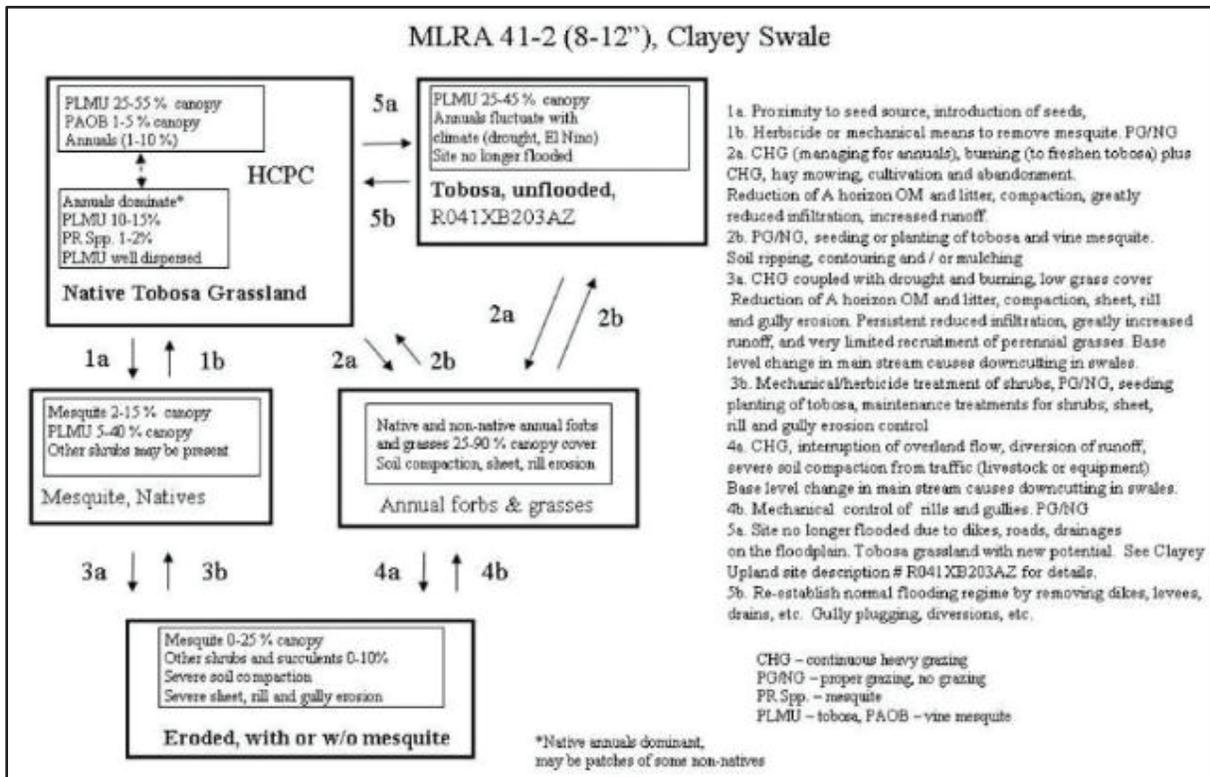


Figure 2. STM for Clayey Swale 8-12" p.z.

BD-3 (Limy Fan 8-12" p.z.; R041XB206AZ)

Site BD-3 was evaluated through an RHA by the ID Team in January 2020. This is a newly established site with no AIM or UA monitoring data. The Soil and Site Stability Attribute was rated S-M due to the presence of water flow patterns and erosion features. The majority of the indicators for Soil and Site Stability were rated either in the N-S or S-M departure category (see Table 5 for attribute ratings). The number of rills, gullies and erosion associated with gullies present were expected to be zero; however, due to the presence and extent of some of these features, Indicators 1 and 5 were rated at a S-M departure (Table 4). Water-flow patterns were expected to occupy 30-40 percent of the surface area and be poorly defined, but the ID Team observed well-defined patterns that were common throughout and connected to one another; therefore, Indicator 2 was rated at a M departure (Table 4). Indicators appeared to be influenced by the presence of the road and/or railroad close by.

The Hydrologic Function Attribute was rated S-M due to the presence of erosional features including rills, gullies and well-defined water-flow patterns discussed above; as well as the presence of litter (Indicator 14) in the interspaces greater than indicated by the ESD reference sheet. According to the ESD’s reference state conditions, litter is expected to be absent from water-flow patterns and bare areas; however, the ID Team observed litter in those areas and determined that this indicator had a S-M departure from the described reference state. Litter presence will assist with water infiltration and help stabilize soils and is therefore considered a beneficial departure. Soil surface resistance to erosion (Indicator 8) and soil surface structure (Indicator 9) were rated N-S, and there was no evidence of a compaction layer (Indicator 11). The reference sheet indicates that both shrub and soil texture allow infiltration and limit run-off

(Indicator 10). The ID Team observed that the plant community composition and distribution supported appropriate infiltration rates for the site.

The Biotic Integrity Attribute was rated N-S suggesting that the site’s productivity and the plant functional and structural groups were meeting the expected conditions as described in the ESD. The majority of the indicators were rated N-S except for Indicator 14 (litter amount), which was described above. Regarding invasive plants, Indicator 16 allows for the consideration of both invasive (i.e. nonnative) and noxious weed species, as well as native species that are not considered desirable at their present amount based on the ESD Reference Sheet. It was noted by the ID Team that London rocket, a non-native mustard, was present but it was not common throughout the site and was not dominating the vegetation; therefore, this indicator was rated N-S (Table 4). Overall, the plant communities at this site were observed to have the appropriate dominant and sub-dominant functional and structural groups, and there was evidence that their reproductive capabilities were meeting the expected conditions for the site and, therefore, the estimated annual production was within the appropriate range for an average year.

Site BD-3 in the Limy Fan ecological site on the Badger Den Allotment is in HCPC as shown in the STM model below (Figure 3). Although water flow patterns showed M departure, other indicators led to a S-M attribute rating for Hydrologic Function. The other attribute ratings were determined to be N-S departure from reference condition. Although water flow patterns, rills and gullies were present, the amount of litter, plant community function, and soils surfaces show that the soils are exhibiting infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform. Overall, site BD-3 was found to be meeting Standard 1.

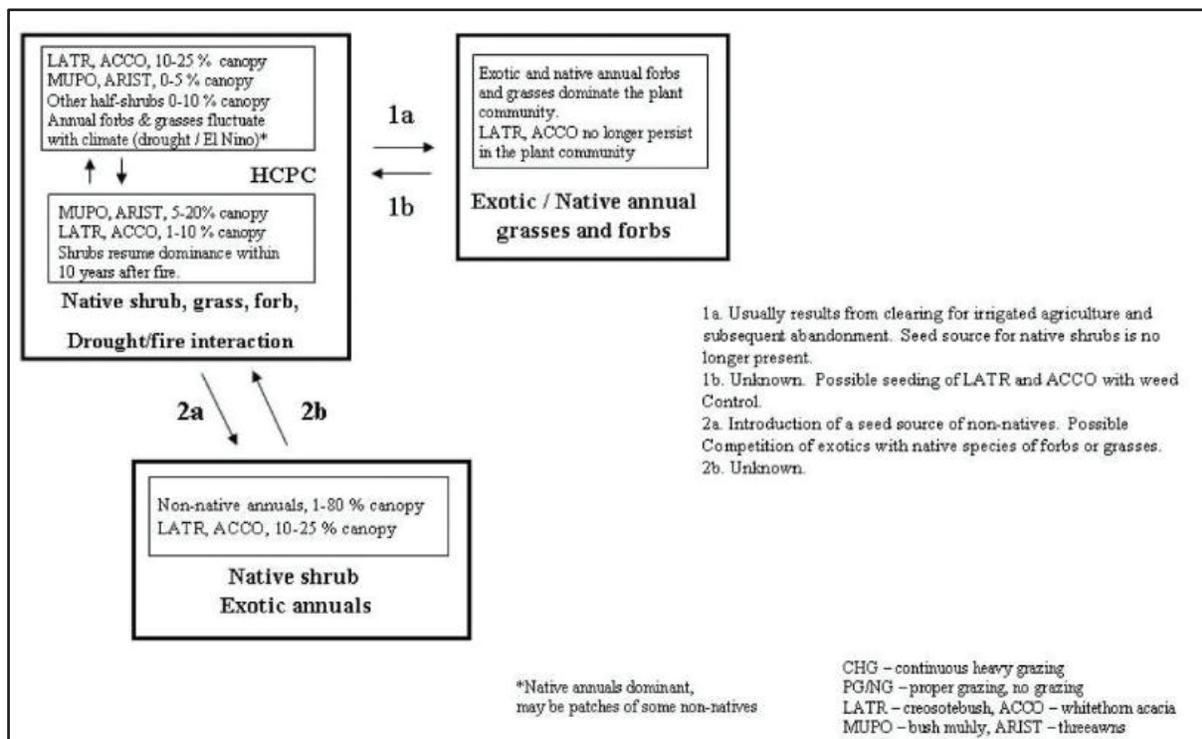


Figure 3. STM for Limy Fan 8-12" p.z.

BD-4 (Limy Fan 8-12” p.z.; R041XB206AZ)

Site BD-4 was evaluated through an RHA by the ID Team in September 2019. This is a newly established site with no AIM or UA monitoring data. The Soil and Site Stability Attribute was rated S-M due to the presence of well-defined rills and excess litter movement (Table 4). The majority of the indicators for Soil and Site Stability were rated N-S but two indicators were rated M (Indicators 1 and 7, Table 4). It was noted that the rills (Indicator 1) were large shallow, and well-defined through the evidence that they were channeling water-flows. The ESD indicates that there should be no rills present at this site; therefore, due to the presence and extent of the observed rills, Indicator 1 was rated at M departure (Table 4). The ESD indicates that fine and coarse litter size classes should only be moving short distances (1-2 feet) in open spaces due to water movement and may concentrate in dams. Under large shrubs, all litter size classes are expected to stay in place. The observed litter movement was greater than 2-3 feet from the rooted vegetation, which indicates a M departure from the reference state.

The Hydrologic Function Attribute was rated S-M due to the presence and extent of the rills, as described above. All indicators associated with this attribute were rated N-S except for Indicator 1 (Table 4), which was described above. There were no signs suggesting excessive soil surface erosion or degradation was occurring, and there was no evidence of a compaction layer. A bottle cap test was done to test the soil stability, and the results matched up with the ESD (1-2 in the open spaces and 2-4 under canopy). The plant community composition and distribution were found to be appropriate for the site to provide effective and adequate infiltration for the site, resulting in Indicator 10 being rated at N-S. The ID Team observed an appropriate amount of litter (Indicator 14) in the understories and did not observe litter in the bare areas or water-flow patterns. These observations matched with the ESD reference state condition, so this indicator was rated at N-S.

The Biotic Integrity Attribute was rated N-S due to the site’s productivity and the plant functional and structural groups meeting expected conditions as described in the ESD. All of the indicators that influence the Biotic Integrity Attribute were rated N-S (Table 5). Overall, the plant communities at this site were observed to have the appropriate dominant (large shrubs) and sub-dominant (annual grasses, annual forbs, perennial grasses, and succulents) functional and structural groups, and their reproductive capabilities (Indicator 17) were meeting the expected conditions for the site. The estimated annual production (Indicator 15) was also estimated to be within the appropriate range for an average year.

Site BD-4 in the Limy Fan ecological site on the Badger Den Allotment is in HCPC as shown in the STM model above (Figure 3). Although water flow patterns showed M departure, other indicators led to a S-M attribute rating for Hydrologic Function. The other attribute ratings were determined to be N-S departure from reference condition. Although rills and gullies were present, the amount of litter, plant community function, and soils surfaces show that the soils are exhibiting infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform. Because of this, overall, site BD-4 was found to be meeting Standard 1.

BD-5 (Loamy Upland 8-12” p.z.; R041XB210AZ)

The RHA site BD-5 was evaluated by the ID Team in September 2019. This site also had monitoring completed in 2018 by the UA, and in 2019 by an AIM crew. An overview of the monitoring data is in Table 2 and Table 3 in Section 6. In the RHA evaluation, the Soil and Site Stability Attribute was rated S-M due to signs of deposition and movement of soil and litter. Indicator 4 showed more bare ground than the reference state resulting in a S-M rating. The reference sheet showed no deposition under shrubs (Indicator 6), but the ID Team noted

sediments were being deposited resulting in S-M rating. Also, the reference sheet showed coarse litter staying in place (Indicator 7) but the ID Team saw coarse litter moving over 2 feet resulting in a rating of M. Other Soil and Site Stability indicators were as described in reference condition including 1, 2, 3, 5, 8, 9, and 11 (Table 4).

The Hydrologic Function Attribute was rated N-S. Two indicators rated S-M including bare ground (Indicator 4) and the degree of departure for the plant community composition and distribution (Indicator 10). Indicator 4 showed more bare ground than expected. The UA and AIM monitoring (BD-10) resulted in 44 percent and 60 percent respectively. Both values are higher than the 23 percent shown on the reference sheet for the reference site monitoring, but the ESD also shows a wide range of 5-70 percent bare ground acceptable for this Loamy Upland site. Monitoring results for bare ground at the site fall within the acceptable range. The S-M rating for Indicator 10 was due to fewer perennial grasses and more shrubs and succulents. This indicates that the site may be less capable of retaining precipitation and promoting infiltration than would be expected.

The Biotic Integrity Attribute was rated M due to an observed shift in the plant community composition and distribution (Indicator 12) and reproductive capability (Indicator 17). Other indicators rated S-M include plant mortality, annual production, and the presence of invasive plants; Indicators 13, 15 and 16, respectively (Table 4). Functional composition and diversity have a large impact on ecosystem processes, and are the principal factors that inform plant productivity, nitrogen cycling, and light penetration (Tilman et al. 1997). The ESD for this site indicates that perennial grasses should be the dominant cover type followed by shrubs then forbs. The RHA noted that shrubs dominated the site, resulting in M for Indicator 12 (Table 4). The RHA noted that plants were showing mortality or decadence above reference condition, production appeared to be reduced, due in part to the observed shift in plant composition resulting in S-M departure for Indicators 13 and 15. Reproduction capability seemed moderately affected due to drought (Indicator 17).

Regarding invasive plants, Indicator 16 allows for the consideration of both invasive (i.e. nonnative) and noxious weed species, as well as native species that are not considered desirable at their present amount based on the ESD Reference Sheet. The ID Team observed creosote encroachment (invasive to the site) resulting in a S-M rating for Indicator 16.

The UA and AIM monitoring at site BD-5 (UA/AIM plot BD-10) in the Loamy Upland ecological site indicate that the site is in the HCPC “Native Grass/shrub-land” state. The ESD’s STM (Figure 4) illustrates that the site is in natural fluctuation with fire/drought interaction. The RHA rated Indicator 12 as M because the ID Team had observed more shrubs than grasses, however the UA/AIM monitoring at the site recorded more grasses than shrubs (Table 2 and Table 3). Shrub encroachment will be evaluated through future monitoring. The absence of rills and gullies, and the result of other indicators at the site indicate that overall, the soils are exhibiting infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform. Because of this, overall, site BD-5 was found to be meeting Standard 1.

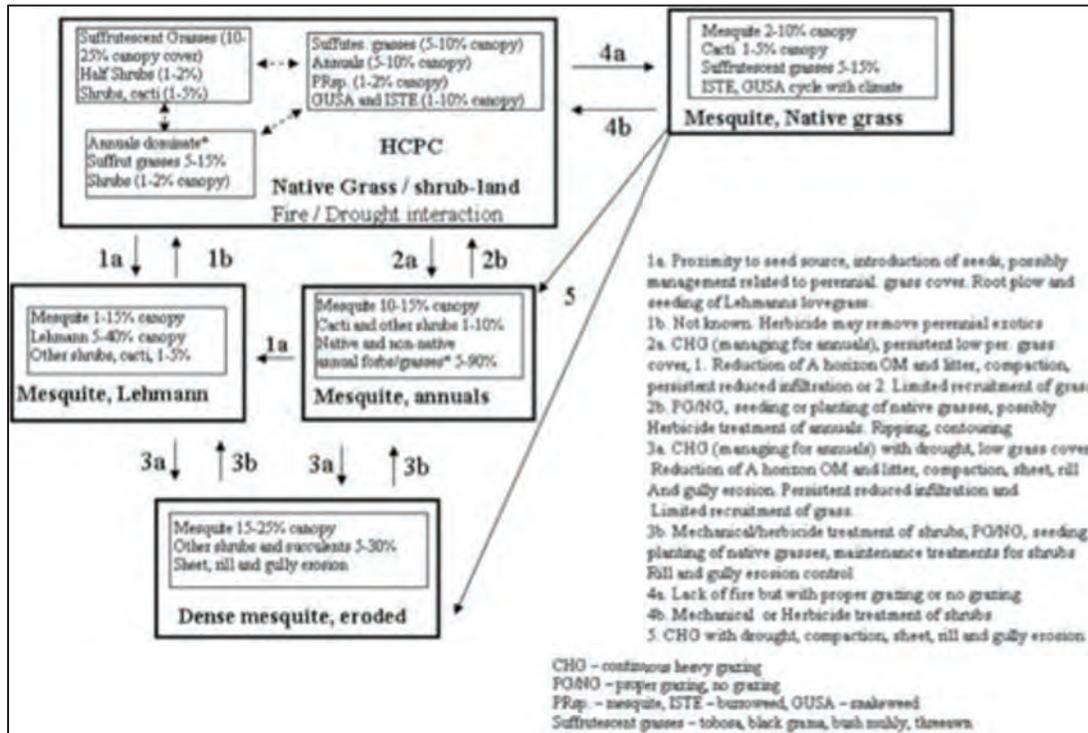


Figure 4. STM for Loamy Upland 8-12" p.z.

BD-6 and BD-7 (Sandy Loam Upland 8-12" p.z.; R041XB215AZ)

Sites BD-6 and BD-7 were evaluated by the ID Team in September 2019. Both key areas are in the same area, one inside and the other outside a livestock enclosure. Because of site similarities, both sites were evaluated through the same RHA, and both sites were rated the same for all indicators. These sites also had monitoring completed in 2014 and 2018 by the UA, and in 2019 by an AIM crew at sites (BD-9in) and (BD-9out). A breakdown of the monitoring data is in Table 2 and Table 3 in Section 6.4 above.

In the RHA evaluation, the Soil and Site Stability Attribute was rated N-S due to the overall absence of signs of excess erosion and/or deposition and movement of soil and litter. All of the indicators for the Soil and Site Stability Attribute were rated in the N-S departure category (Table 4). The ESD states that the percent of bare ground should range from 10-80 percent. The AIM data collected in 2019 determined that the amount of bare ground was measured at 72.70 percent, which is within the range for this reference state (Table 3). It was noted that one concentrated gully was present, but this was determined to be caused by the presence of the railroad track crossing.

The Hydrologic Function Attribute was rated S-M primarily due to the degree of departure for the plant community composition and distribution (Indicator 10) that was rated M. All other hydrologic indicators were rated primarily at N-S (Table 4). The M rating for Indicator 10 indicates the site may be less capable of retaining precipitation and promoting infiltration than would be expected due to the absence of a dominant perennial grass cover and higher than expected cover of succulents. Both the UA and AIM data measured the tree/shrub/succulent percent cover as ranging from 4.52 to 23.06 percent (Table 2 and Table 3), as compared to the ESD that indicates this site should have a range of 1-5 percent sub-shrub, 5-7 percent tree, and 1-

2 percent succulent cover. The percentage of bare ground and presence of rocky substrate indicate that infiltration may still be able to occur during overland water flows by slowing those flows down to allow the water to remain on-site longer.

The Biotic Integrity Attribute was rated M due to the significant departures from the reference state regarding the plant community composition and distribution, the annual production, and the presence of invasive plants; Indicators 12, 15 and 16, respectively (Table 4). Functional composition and diversity have a large impact on ecosystem processes, and are the principal factors that inform plant productivity, nitrogen cycling, and light penetration (Tilman et al. 1997). The ESD for this site indicates that perennial grasses, such as black grama or bush muhly, should be the dominant cover type, followed by annual grasses, then dominant trees followed by half shrubs, succulents and dominant shrubs (i.e. fourwing saltbush and catclaw acacia), and the lowest amount of cover should consist of forbs and miscellaneous shrubs. The ID Team observed that shrub and succulent species were the dominant cover type and few perennial grasses were noted, which resulted in the M-E departure rating for Indicator 12 (Table 4). The UA and AIM data both also measured trees/shrubs/succulents as being the dominant cover class at both monitoring sites (BD-9in and BD-9out).

The annual production for this site is expected to be 217 pounds per acre in a below average year. The ID Team's ocular estimate of moderately reduced productivity resulted in Indicator 15 being rated M (Table 4).

Regarding invasive plants, Indicator 16 allows for the consideration of both invasive (i.e. nonnative) and noxious weed species, as well as native species that are not considered desirable at their present amount based on the ESD Reference Sheet. The ID Team observed devil's cholla to be encroaching on the site. The ESD notes for this indicator that the mesquite canopy cover should be less than 5 percent. The UA and AIM data both measured velvet mesquite at both sites (BD-9in and BD-9out) within a range of 9 to 16 percent cover.

Reference to the STM for this ecological site (Figure 5) shows that the site has transitioned from HCPC "Native grass/shrub-land" state to the "Mesquite, annuals" state. The STM describes in transition "2b" that to transition back to HCPC would require proper grazing or no grazing, seeding or planting of native grasses, and possibly treatment of annuals, ripping, or contouring. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time. This period of rest has not transitioned this site back to HCPC; other methods would be required for such a transition to occur. Additionally, other issues such as the nearby railroad may be strongly influencing the site and have a stronger continued future effect on ecological function than potential livestock grazing. Intensive management methods for site rehabilitation may be considered. The mesquite, annuals phase is a stable state but could transition toward the dense mesquite, eroded state if factors listed in transition 3a occur such as if continuous heavy grazing with drought occur on the site. Livestock grazing alone, if managed properly, would not continue to degrade the site, or prevent it from meeting standards.

The desirable dominant functional and structural groups were absent at the site, Indicator 10 indicates the site may be less capable of retaining precipitation and promoting infiltration than would be expected, however, all other Soil and Site Stability, and Hydrologic Indicators showed N-S departure from reference condition, and the lack of erosive rills and gullies indicate that

infiltration is still occurring due to sandy soils and rocky ground cover. Overall, despite the shift in ecological state, upland soils exhibited infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform at BD-6 and BD-7 and these sites are therefore meeting Standard 1.

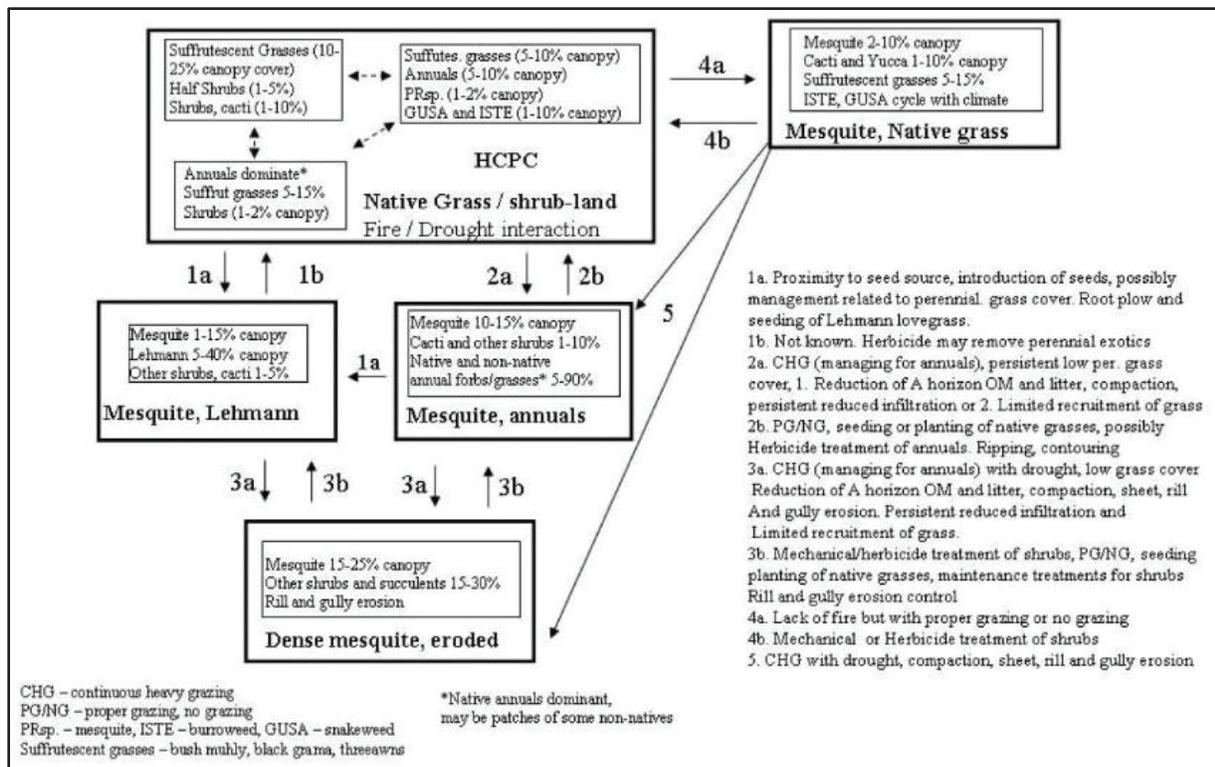


Figure 5. STM for Sandy Loam Upland 8-12" p.z.

BD-8 (Sandy Upland 8-12" p.z.; R041XB214AZ)

Site BD-8 was evaluated by the ID Team in October 2019. This site also had monitoring completed in 2019 by an AIM crew at site (BD-6b). A breakdown of the data can be found above in Section 6.4, Table 3. In the RHA evaluation, the Soil and Site Stability Attribute was rated M due to the extent of the rills and water-flow patterns, the presence of a large gully, and the absence of litter in the interspaces. The ID Team observed several rills at the site and the ESD indicates that there should be none; therefore, the indicator was rated a M-E (Table 4). The water-flow patterns were observed to be a dominating feature throughout the site despite the ESD indicating that they should occupy less than 10 percent of the surface area; therefore, this indicator was also rated a M-E (Table 4). A large gully was observed at the site, which resulted in Indicator 5 being rated M since the ESD indicates that there should be no gullies present at the site. The percent bare ground was estimated to be less than the described reference state of 70-75 percent, and AIM data supported this observation by measuring bare ground at 56.70 percent. The ESD also indicates that the bare areas should be approximately 10-20 feet in diameter and generally not connected; however, the ID Team observed that the majority of the bare ground was connected due to the extensive water-flow patterns; therefore, this indicator was rated S-M. The litter movement had also departed from its reference state due to the extent of the surface water-flow events as indicated by the water-flow patterns. It is expected that the fine and coarse litter size classes would only move short distances (2-6 feet) from wind in the open spaces;

however, the ID Team did not observe any litter in those areas due to the overland flows moving the litter off-site; therefore, this indicator was rated M. The soil surface resistance to erosion and loss or degradation were found to be within the described reference state, and both Indicators (8 and 9) were rated N-S, as well as Indicator 11 (Compaction layer) due to the absence of a compaction layer. Pedestals were observed at the site and were less than 12 inches tall, which is within the expected range for this site's reference state.

The Hydrologic Function Attribute was rated M primarily due to many of the same indicators as discussed for the Soil and Site Stability Attribute: Indicators 1, 2, 4, and 5. Indicator 14 (Litter amount) was also rated S-M due to the lack of an adequate amount of litter, likely a result of the extensive water-flow patterns. The ESD indicates that the average percent litter cover for this site should be 25 percent. The AIM monitoring measured litter cover to be approximately 21.30 percent. The remaining indicators associated with this attribute (3, 8, 9, 10 and 11) were all rated N-S (Table 4).

The Biotic Integrity Attribute was rated S-M due to the concerns regarding the amount of litter, as discussed above for the Hydrologic Function Attribute, and the lack of evidence suggesting the perennial plants are capable of reproducing at a sustainable level. The majority of the indicators were rated N-S. The ESD indicating that plant mortality is strongly affected by weather patterns, and this was seen in saltbush species which appeared decadent, therefore plant mortality/decadence (Indicator 13) was rated N-S. The ESD indicates that the reproductive capabilities for this site should not be impaired; however, the ID Team observed that the saltbush species were decadent and did not appear to be reproducing, therefore the indicator for reproductive capability (Indicator 17) was rated S-M. No compaction layer was observed, and the soil was determined to match the ESD description regarding color, stability, and texture (Indicators 8 and 9). The plant functional and structural groups (Indicator 12) were expected to be dominated by large shrubs (i.e. honey mesquite), followed by smaller shrubs (i.e. desert and fourwing saltbush), perennial grasses, succulents, and lastly annual forbs and grasses. This indicator was supported by the AIM data, which showed that shrubs made up 88.33 percent of the total plant species composition for their monitoring location. The level of annual production was estimated to be within the expected range for a below-average year as provided by the ESD, which is 360 pounds per acre. No invasive species were noted at the site.

The Soil and Site Stability and Hydrologic Function attributes were considered moderately departed from the reference condition. Biotic Integrity was rated N-S. Many rills were present and water-flow patterns dominated the site. There was a large amount of exposed sand (bare ground), which were often connected due to extensive water flow patterns, and a large gully was present at the site. Litter amounts were low, and the reproductive capability of perennial plants was being impacted. This Sandy Upland ecological site naturally experiences large areas of bare ground. Vegetation, litter and rock contribute little to water infiltration for the site, which instead relies heavily on sandy soils for infiltration to occur. Despite this, erosion has still occurred, and whether the site is recovering, remaining static, or continuing to degrade is unclear at this time due to the limited amount of monitoring that has occurred up to this point. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time. Because of this period of rest, the current land health represents what the allotment is capable of achieving without management actions being implemented such as vegetation or soil treatments. The RHA ratings for this ecological site show a transition from the HCPC to a different, less desirable state. The STM for this Sandy Upland site is still in development, however, as with other similar ecological sites within the Badger Den Allotment, properly managed livestock grazing is expected to be a tool in transitioning back to

HCPC, although other more intensive action managements would likely be needed as well. Because of assessed conditions and reasons described above, site BD-8 is not exhibiting infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform. This is attributed to reasons discussed under Section 7 above including historic overgrazing, extended drought, railroad and road development, and other factors. This site is therefore not meeting Standard 1.

BD-9 (Sandy Upland 8-12" p.z.; R041XB214AZ)

Site BD-9 was evaluated by the ID Team in October 2019. This site also had monitoring completed in 2019 by an AIM crew at site (Fan3). A breakdown of the data can be found above in Section 6.4, Table 3. In the RHA evaluation, the Soil and Site Stability Attribute was rated N-S due to the majority of the indicators being rated N-S (Table 4). The ID Team did not observe any erosional features due to wind or water that was greater than the ESD described for the reference state. Water-flow patterns were observed at the site but were found to be infrequent and not well-connected. Mesquite plants had symmetrical mounds of deposition all around their bases, which the ESD indicated to be an expected feature for the site. The percent bare ground (Indicator 4) was rated N-S due to observation that the gravel and rock present were armoring the soil. The AIM data measured bare ground at 52.00 percent, which is below the expected range as indicated in the ESD (70-75 percent). No compaction layer was observed, and the soil was determined to match the ESD description regarding color, stability and texture (Indicators 8 and 9). Indicator 7 (litter movement) was rated S-M due to the large and fine litter material moving more than 2-6 feet in the open spaces, but under the shrubs the litter was staying in place.

The Hydrologic Function Attribute was rated N-S primarily due to the majority of the indicators being rated N-S (Table 4). Many of these indicators were described above for the Soil and Site Stability Attribute (Indicators 1-5, 8, 9, and 11). Indicator 14 (Litter amount) was rated S-M due to there being more litter located within the observed water-flow patterns than the ESD described. There should be no litter in the water-flow patterns or bare areas. The AIM data collected estimated the litter cover to be 30.70 percent. The ESD does not provide an expected range for the amount of litter, but due to the observed movement of the litter present, this indicator was considered to be departed from the reference state.

The Biotic Integrity Attribute was rated N-S due to the majority of the indicators for this attribute being rated N-S (Table 5). Many of these indicators were described above for the Soil and Site Stability Attribute (Indicators 8, 9 and 11). Indicator 14 was the only one that received a departed rating, for reasons described above for the Hydrologic Function Attribute. There was a low amount of plant decadence (Indicator 13) observed and the reproductive capabilities of perennial plants (Indicator 17) did not appear to be impaired. While Russian thistle was observed in the roadway it had not spread out of that disturbed corridor, Indicator 16 (Invasive plants) was rated N-S. The plant functional and structural groups (Indicator 12) were expected to be dominated by large shrubs (i.e. honey mesquite), followed by smaller shrubs (i.e. desert and fourwing saltbush), perennial grasses, succulents, and lastly annual forbs and grasses. The AIM data supports shrubs being dominant on the site showing 100 percent plant composition through the monitoring. While no grasses or forbs were detected during this monitoring effort, the ESD supports the presence of fewer grasses, succulents, and forbs on the site. The level of annual production (Indicator 15) was estimated to be within the expected range for a below-average year as provided by the ESD, which is 360 pounds per acre.

All three attributes were rated N-S. Litter movement was the only indicator departed from reference condition and the departure was adding more litter to flow patterns than expected

which is beneficial to the site in stabilizing soils and assisting in infiltration. This Sandy Upland ecological site naturally experiences large areas of bare ground. Vegetation, litter and rock contribute little to water infiltration for the site, which instead relies heavily on sandy soils for water infiltration. The STM for this Sandy Upland site is still in development, therefore a determination cannot be made if the site is in HCPC but because all attributes were rated N-S the site is functioning. Site BD-9 is exhibiting infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform and is therefore meeting Standard 1.

BD-10 (Sandy Wash 8-12” p.z.; R041XB213AZ)

Site BD-10 was evaluated through an RHA by the ID Team in January 2020. This is a newly established site with no AIM or UA monitoring data. The Soil and Site Stability Attribute was rated S-M due to the presence of well-defined water-flow patterns, the presence of gullies, and the amount of bare ground observed in comparison to the ESD reference state conditions. The majority of the indicators for Soil and Site Stability were rated in the N-S but two indicators were rated S-M (Indicators 4 and 5) and one indicator was rated M (Indicator 2, Table 4). It was noted that the water-flow patterns (Indicator 2) were deeper than the expected 6-12 inches, as indicated in the ESD. The ID Team observed them to be approximately 2-3 feet deep, which resulted in the indicator being rated a M departure. The amount of bare ground was observed to be greater than expected for the site, which is 41 percent, this indicator was rated a S-M departure. The ID Team noted that there appeared to be fewer annuals than expected as well as less litter. There were gullies observed by the ID Team, but it was noted that the banks were vegetated, which helps hold soil in place. The ESD indicates that no gullies should be present at the site; therefore, this indicator was rated a S-M departure.

The Hydrologic Function Attribute was rated M due to the extent of gullies and water-flow patterns, as described above, as well as the lack of litter, and the lack of a dominant grass plant community. Of the 10 indicators associated with this attribute only five were rated N-S (Table 4). Two of the indicators were rated a S-M, and three of the indicators were rated a M. Indicators 2, 4 and 5 were described above for the Soil and Site Stability Attribute. Indicator 10 (Plant community composition and distribution) was observed to have more shrubs and fewer grasses than expected based on the ESD. Trees and large shrubs are expected to be well distributed across the site with a 20-30 percent canopy cover, while perennial grasses are expected to be scattered across the site with a 10-12 percent canopy cover. Perennial grasses benefit the site by slowing and/or reducing the energy of surface run-off and by promoting infiltration. Due to the lack of appropriate perennial grass cover paired with the observed erosional features, this indicator was rated M. Indicator 14 (litter amount) was observed to be approximately 20 percent of the ground cover, whereas the ESD indicates the litter amount should be an average of 50 percent. The amount of bare ground and the reduced amount of grass cover paired with the extent of the water-flow patterns and gullies suggests that available litter is being removed from the site at a greater amount than expected; therefore, this indicator was rated M.

The Biotic Integrity Attribute was rated M due to the overall absence of perennial grasses and tree species, lack of an adequate amount of litter, and the less-than-expected level of production for a below-average year. Of the nine indicators associated with this attribute, six were rated N-S; however, due to the important influences the remaining three indicators (12, 14 and 15) have on a site’s biotic integrity, this attribute was considered to be departed from the reference state. The plant communities observed at this site were found to have a dominant shrub community, followed by perennial grasses and no trees. The ESD indicates that the site should be dominated by grasses and trees, with riverwash shrubs and miscellaneous shrubs in the sub-dominant group; therefore, this indicator was rated M. The low litter amount was described above for the

Hydrologic Function Attribute. The annual production was estimated to be about 500-600 pounds, and while the ID Team noted that the area has been experiencing drought conditions in recent years this level of production was still below the expected amount for a below-average year

This Sandy Wash ecological site has transitioned from the reference state to the eroded state. The current plant community was observed to be predominantly shrubs with some grasses. The STM (Figure 6) illustrates that the restoration pathway includes proper grazing, maintenance treatment of shrubs, and planting of native grasses. Mechanical repairs of eroded areas and reestablishment of the flooding regime of the bottoms if possible. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time, still this site has not transitioned back to HCPC. Other methods described above would be required. Proper grazing is described in the STM as a part of transitioning back to HCPC and would not further degrade the site.

The Soil and Site Stability attribute was rated as S-M and Hydrologic Function and Biotic Integrity were rated M. Gullies were present and water flow patterns were deep, and the vegetation community had shifted affecting hydrologic function. Whether the site is recovering, remaining static, or continuing to degrade is unclear at this time due to the establishment of this monitoring site in 2020 and the limited amount of monitoring that has occurred up to this point. Because of this period of rest from livestock grazing, the current land health represents what the allotment is capable of achieving without management actions being implemented such as vegetation or soil treatments. Because of assessed conditions and reasons described above, site BD-10 is not exhibiting infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform. Because livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time, this is attributed to reasons discussed under Section 7 above including historic overgrazing, extended drought, railroad and road development, and other factors. This site is therefore not meeting Standard 1.

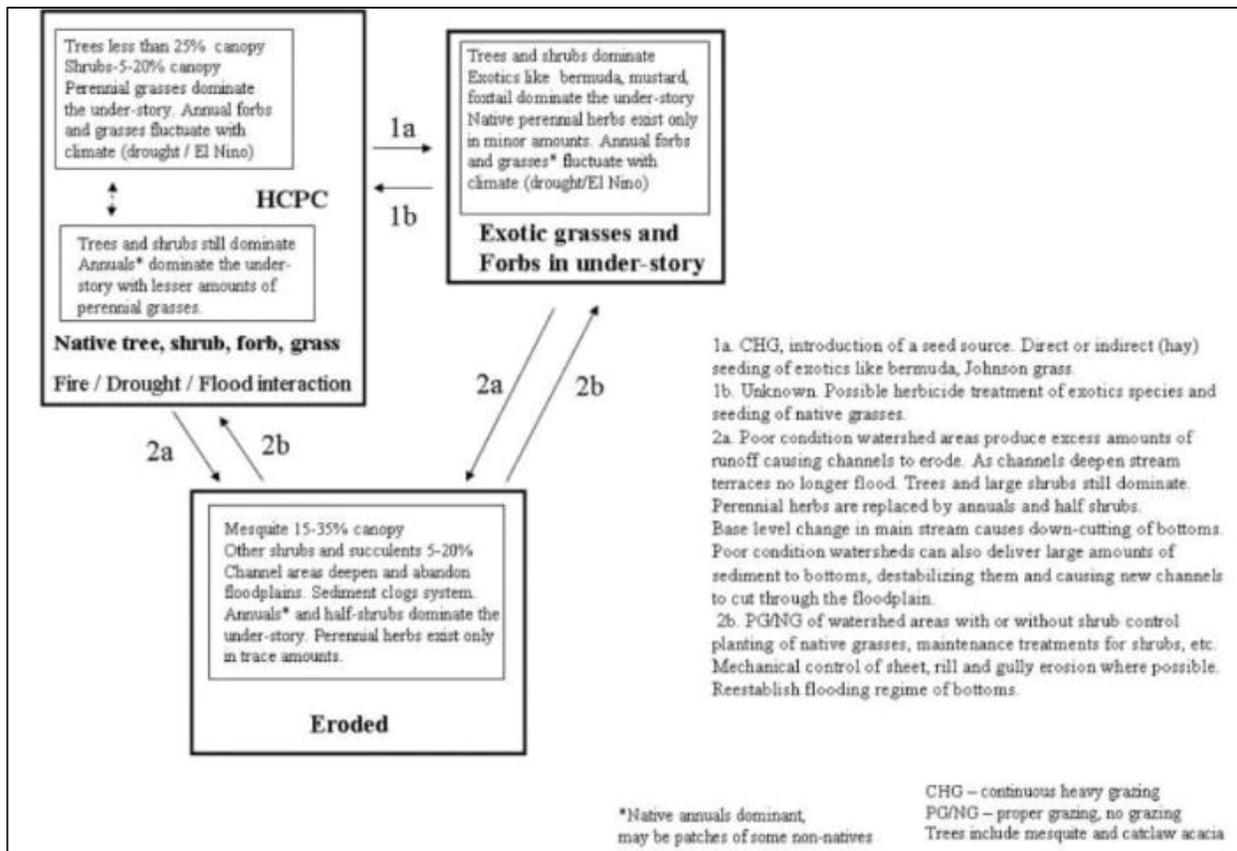


Figure 6. STM for Sandy Wash 8-12" p.z.

Summary

Standard 1 was evaluated at the 10 RHA sites and described above. Overall, the majority of the RHA sites are currently meeting Standard 1 (Table 6).

Table 6. Overview of the RHA Site Determinations for Standard 1

Site Name	ESD	Determination
BD-1	Clay Loam Upland	Meeting
BD-2	Clayey Swale	Meeting
BD-3	Limy Fan	Meeting
BD-4	Limy Fan	Meeting
BD-5	Loamy Upland	Meeting
BD-6 and BD-7	Sandy Loam Upland	Meeting
BD-8	Sandy Upland	Not Meeting
BD-9	Sandy Upland	Meeting
BD-10	Sandy Wash	Not Meeting

The Sandy Upland ecological site had both RHA sites BD-8 and BD-9. Site BD-8 is not meeting Standard 1 while site BD-9 is meeting the standard.

The Sandy Wash ecological site had RHA site BD-10 and soils at the site did not show infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform and therefore is not meeting Standard 1.

The shifted conditions of RHA sites BD-8 and BD-10 is attributed to reasons discussed under Section 7 above including historic overgrazing, extended drought, railroad and road development, and other factors. Because livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time, current land health represents what the allotment is capable of achieving without management actions being implemented such as vegetation or soil treatments. Management actions may be considered for these treatments, whether meeting Standard 1 or not, however, often these sites are stable alternative states and considered an appropriate site condition. For sites that have not naturally transitioned back into HCPC, established ESD STM models allow for proper grazing in transitioning back to HCPC; therefore, proper grazing is an appropriate management action, and would not further degrade the landscape. Overall, the majority of the upland ecological site soils showed infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform.

7.2 Standard 2 – Riparian-Wetland Sites

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

The PFC assessment determines if Standard 2 is being met for each riparian reach by looking at how well the physical attributes can hold up against moderately high flow events (i.e. 5-, 10-, or 25-year flows). The lotic PFC protocol addresses the physical functioning of perennial or intermittent lotic riparian systems, such as rivers or streams. This protocol is not intended for use on ephemeral systems, which do not support the vegetation, riparian functions, and values that are dependent on extended periods of streamflow and availability of free water in the soil. This assessment considers hydrologic, vegetative, and erosion/deposition attributes and processes to assess the condition of riparian areas at a point in time. Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris are present to dissipate stream energy associated with high water flows (USDI BLM, 1997). A checklist is used to determine the overall health of the riparian-wetland system (USDI BLM, 2015). That information is then used by the ID Team to place the riparian-wetland reach into one of three rating categories: Proper Functioning Condition (PFC), Functional-At Risk (FAR), or Nonfunctional (NF). If the system is FAR it is then given a trend value of either upward, downward, or static. A system rated as NF is not given a trend value because these reaches are severely degraded and incapable of functioning properly under current conditions. It is also determined what factors might be preventing the system from achieving PFC and if these factors are out of the control of the land manager. “The minimum acceptable management goal for a riparian area is at least PFC because any rating below PFC indicates a condition that is not suitable” (USDI BLM, 2015).

The United States Geological Survey Agency (USGS) has identified the stretch of the San Simon River on the Badger Den Allotment to be intermittent. Although, there have been other agencies, such as the Arizona Department of Environmental Quality (ADEQ), that have referred to it as being an ephemeral system (ADEQ, 2004). Due to these contradictions, PFC was performed to verify and/or dismiss the presence of riparian-wetland habitat on the allotment. There are 9.24 miles of the San Simon River within the Badger Den Allotment. Three reaches were analyzed through the PFC assessment and a rating for each reach is listed in Table 7 below (see Figure 11, in Appendix A for locations).

Table 7. Summary of Proper Functioning Condition (PFC) Ratings

Reach	Reach Length (Miles)	PFC Rating	PFC Trend	Meeting Standard 2 (Y/N)
Reach 1	1.76	N/A	N/A	N/A
Reach 2	2.66	FAR	Static	No
Reach 3	4.82	FAR	Static	No

7.2.1 Standard 2 Determinations

Reach 1

This reach starts at the southern end of the allotment boundary and ends at the confluence with Sands Draw (ephemeral; see in Appendix A). This reach ends at the confluence because downstream the sinuosity begins to increase which helps to dissipate the energy of flows; there is also a contribution to water supply from that confluence. Increased sinuosity and a greater water supply change the way the system functions (i.e., water infiltration, vegetation, dissipating energy of high flows); the total distance of Reach 1 is 1.76 miles. This reach was assessed on February 25, 2020, by an ID Team made up of BLM specialists in the fields of range, natural resources, and hydrology. The ID Team determined that this reach functions as an ephemeral system due to man-made dams and dikes preventing adequate surface flow to support riparian-wetland vegetation. Further, PFC is not designed to evaluate ephemeral systems and Reach 1 is considered ephemeral and contains no riparian-wetland habitat. Therefore, Reach 1 is not applicable for Standard 2.

Reach 2

This reach begins at the confluence of Sands Draw which contributes much of the surface flow into the system and the sinuosity increases from the previous reach. Reach 2 ends 2.66 miles down-stream where the channel sinuosity decreases resulting in reduced energy dissipation and a change in system functionality (see Figure 11 in Appendix A). Due to the water supply from Sand Draw, this reach functions like as an intermittent stream unlike Reach 1 which is upstream of that confluence. This reach was assessed on February 25, 2020, by an ID Team made up of BLM specialists in the fields of range, natural resources, and hydrology. More stabilizing vegetation was present at this site than at Reach 1, but desirable native wetland obligate species were lacking. A dense covering of Bermuda grass with sporadic patches of alakali sacaton helped to stabilize banks during high water flow. Woody species such as salt cedar and mesquite were heavily concentrated on the banks of this reach and two mature seep willows were seen during the PFC assessment; no willow recruitment was noted. Other desired woody species (i.e., other willows and cottonwoods) were not present due to general lack of moisture, infrequent flooding of banks, competition with other species present, or other factors. Fallen woody material was also absent in the channel; this material could reduce the velocity of surface flow and promote infiltration. The increased sinuosity of this reach helps to dissipate the energy of flows, which keeps the channel from eroding.

The San Simon Crossing along Haekel road was recently re-constructed with three box culverts. The need to add the culverts came as aggrading of the San Simon channel frequently deposited high volumes of sand and silt making the road impassable (Natural Channel Design, Inc, 2018).

Haekel road is paved with asphalt, the dirt shoulders add sediment to the system and will continue to do so with water running off the road and into the channel. The ID Team determined the riparian-wetland health to be FAR with a static trend. Although there have not been previous PFC assessments done on this reach a trend was determined based on current conditions. There were no signs of active erosion (i.e. slumping and/or knickpoints) in the channel, but there were signs of aggradation especially near the San Simon crossing. Although the channel appeared to be laterally and horizontally stable, the system is missing key riparian species. Manmade structures upstream of the Badger Den Allotment have reduced surface flows. As a result, Reach 1 functions as an ephemeral system, which affects the capabilities of Reach 2 meeting PFC. Overall, Reach 2 is not meeting Standard 2 due to the lack of riparian obligate species and woody material being absent in the channel. If there were obligate species and more desirable woody species (i.e., willows and cottonwoods) this would increase the bank stability and the woody debris in the channel would help to dissipate energy better. Both help with infiltration which would promote the recruitment of the woody and obligate species.

Reach 3

This reach was separated from the previous reach as the sinuosity decreases and sheet erosion on the northeast bank display large areas of bare ground. This reach ends 4.82 miles downstream at the northern boundary of the Badger Den Allotment (see Figure 11 in Appendix A). Reach 3 also gets much of its surface flow from Sands Draw, and functions similarly to Reach 2 as an intermittent stream. This reach was assessed on February 25, 2020, by an ID Team made up of BLM specialists in the fields of range, natural resources, and hydrology. This reach has similar issues as Reach 2, such as lacking riparian obligate and desired native woody species, as well as a lack of fallen woody material in the channel to slow flow and dissipate energy. Large areas of bare ground on the northeast side of channel within Reach 3, could contribute more sediment loading into the channel from overland flow. The channel of this reach is deeper, so the floodplain is not inundated as often, resulting in a smaller floodplain.

Woody species include fewer salt cedar and more mesquite which provide a more adequate source for woody material than along Reach 2. There were signs of woody material in the channel but was not consistent throughout the reach. A few seep willows were seen, but no willow recruitment was noted. Other desired woody species (i.e. other willows and cottonwoods) were not present due to general lack of moisture, infrequent flooding of banks, competition with other species present, or other factors. The ID Team determined the riparian-wetland health to be FAR with a static trend. Although there have not been previous PFC assessments done on this reach a trend was determined based on current conditions. There were no signs of active erosion (i.e. slumping) in the channel and it appears to be laterally and horizontally stable, but the system is missing key riparian species.

Manmade structures upstream of the Badger Den Allotment have reduced surface flows. As a result Reach 1 functions as an ephemeral system, which affects the capabilities of Reach 3 meeting PFC. Overall, Reach 3 is not meeting Standard 2 due to the lack of riparian obligate and desired woody species, woody material is lacking in the channel, and the floodplain is not inundated frequently. If there were riparian obligate species and more desirable woody species (i.e. willows and cottonwoods) this would increase the bank stability and allow the channel to dissipate energy better. With the decrease in sinuosity, the channel needs something (i.e. an increase in fallen woody debris) to dissipate the energy from high flows, or else it will continue to carve the channel deeper.

Additional Riparian-Wetland Habitat

Additional riparian-wetland habitat includes HX Detention Dam, Sands Draw Detention Dam, a canal, and Dripping Springs. These areas are exempt for Standard 2, are not applicable to the PFC assessment, or are otherwise excluded from livestock grazing and are therefore not included in the Standard 2 assessment as described below.

The HX Detention Dam was constructed in 1956 across Gold Gulch, an ephemeral wash, to reduce sediment transport and repair eroding channels within the watershed. As a result from the reduced velocity of the surface flow, water has saturated the ground creating a small riparian area behind the detention dam. Observations of the HX Dam riparian-wetland habitat showed the presence of desirable native riparian-wetland vegetation including cottonwood trees and giant sacaton, which appear to be in good health. Other species observed include Johnson grass and cocklebur (both invasive). A four-strand wire fence was then put up around this anthropogenic riparian area to create a livestock enclosure. Previous grazing permits prescribed through terms and conditions that the enclosure was not available for livestock grazing, in order to protect and maintain the watershed and wildlife resources behind the dam. Since this area was excluded from grazing and other activities, such as off-road vehicle use, it was not evaluated for riparian-wetland habitat in Standard 2.

One of the resources used to identify possible riparian-wetland habitats was a Geospatial Information System (GIS) layer put out by the USFWS using aerial imagery and the USGS National Hydrography Dataset (NHD) (USGS NHD, N.d.) to create polygons of approximate location and type of wetland habitats in the United States and its Territories. According to that GIS layer, there is a freshwater emergent wetland in sections 10, 15, 21, and 22 of Township 11 South, Range 28 East. This is located down channel of the HX Detention Dam in the Gold Gulch ephemeral wash. After site visits by the ID Team while performing the 17 indicators assessment, it was determined that this is a low-lying area and during large precipitation events water can collect here and saturate the soil. Since this is an ephemeral system PFC could not be performed, therefore it was not evaluated for riparian-wetland habitat in Standard 2.

The Sands Draw Detention Dam was built in 1972 at the boundary of the Whitlock Wash-Hospital Flat Watershed, which is fed by several ephemeral washes. The dam was constructed to reduce sediment transport and repair eroding channels within the watershed. Like HX Detention Dam, this has created a small wetland area behind the dam and has been fenced to exclude livestock in order to protect and maintain the watershed and wildlife resources behind the dam. Within this enclosure there are anthropogenic ponds fed by a well for wildlife use only. Removal of salt cedar (invasive noxious weed) has been conducted there as well as re-contouring the aquatic and riparian habitat, followed by the seeding and planting of native vegetation. This area is not available for authorized grazing and other activities such as off-road vehicle use. It was not evaluated for riparian-wetland habitat in Standard 2.

The USGS has identified in their NHD a perennial reach in Section 1 of Township 11 South, Range 28 East. After further investigation through aerial imagery and range improvement files, this is a canal constructed to supply water to a stock pond. The canal was replaced by a pipeline in the 1970's. Under the exceptions and exemptions for Standard 2, water facilities constructed for the purpose of providing water for livestock or wildlife are exempt (USDI BLM, 1997). Therefore, this area was not evaluated for riparian-wetland habitat in Standard 2.

Dripping Spring is located in Section 9 of Township 10 South, Range 29 East. In 1969, construction for a small detention dam to collect surface flow from Dripping Spring was

completed to provide a water source for livestock and wildlife away from the spring source. Visual observation of Drippings Springs showed no water at the location, there were a few grasses growing within the catchment, but the dry nature of the site did not provide the moisture to support a riparian-wetland plant community. The area around Dripping Springs was fitted with an enclosure fence. Under the exceptions and exemptions for Standard 2, water facilities constructed for the purpose of providing water for livestock or wildlife are exempt (USDI BLM, 1997). Therefore, this area was not evaluated for riparian-wetland habitat in Standard 2.

Summary

Standard 2 was evaluated at all three reaches using the PFC assessment and is described above. Overall, Reach 1 was determined to be an ephemeral system and not applicable to Standard 2; Reaches 2 and 3 were determined to not be meeting Standard 2 (Table 7).

Both reaches were lacking desirable riparian obligate species and preferred woody vegetation (i.e., willows and/or cottonwoods), which would help to increase bank stabilization, add woody debris to the channel, and promote water infiltration. With these reaches classified as intermittent, the expected vegetation is not going to be the same as that of a perennial reach especially in the arid southwest. Overall water availability is the limiting factor between perennial and intermittent reaches for vegetation. Elevation can have a significant effect on riparian vegetation as a function of the changes in temperature and precipitation. Landscapes at lower elevations, like the San Simon Valley, tend to have sparse vegetation along the stream banks and minimal vegetation in the stream channel (The University of Arizona, 2007). For Reach 2 and 3 to move into PFC there should be an increase in the alkaline sacaton instead of a few sporadic patches, and more willow individuals. A lack of precipitation could inhibit the growth of these species, keeping Reach 2 and 3 from achieving PFC.

The channel depth in Reach 3 was deep and had a narrow floodplain, indicating that during high flows, water seldom reached the floodplain. The San Simon watershed began to produce high sediment yields in the early 1900s. Early causes for the high amount of erosion included ditch constructions which drained excess water off fields in the San Simon Valley, the freight wagon trail to Bowie and San Simon, excessive cattle in the watershed, and severe droughts during those early years of 1903-1905 and 1914-1915 (USDI BOR, 2000). Since that time, livestock use has been reduced on public lands through management under the Taylor Grazing Act and detention dams have been constructed to reduce sediment transport (i.e., HX and Sands Draw Detention Dams). Research conducted regarding sediment transport in the San Simon indicates that the watershed is recovering with the help of the structures, and the deeply cut channel of the San Simon River is aggrading (USDI BOR, 2000).

Because livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time, current livestock grazing is not a contributing factor in not meeting Standard 2. Livestock grazing is an appropriate use of the San Simon River when managed properly to allow for continued bank stability, channel aggradation, and recruitment or establishment of desirable riparian/wetland species. Current riparian health represents what the allotment is capable of achieving without management actions being implemented such as vegetation or soil treatments.

7.3 Standard 3 – Desired Resource Conditions

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

Standard 3 is determined by evaluating whether desired plant community (DPC) objectives are being supported and provided with consideration for all multiple uses: rangeland health, State water quality standards, and habitat for endangered, threatened, and sensitive species. Standards 1 and 2 help to inform whether the desired plant communities are being supported or have the ability to function as desired.

The DPC objectives are criteria established to evaluate a site's capability of achieving desired resource conditions. The BLM ID Team established DPC objectives based on ESDs and reference sheets for ecological sites across the Badger Den Allotment. These DPC objectives are based on HCPC. Although alternative states described in STMs were not included in DPC establishment, they should be considered on a site by site basis when determining if Standard 3 is being met.

The Clay Loam Upland, Limy Fan, Loamy Upland, and Sandy Upland ecological sites comprise 80 percent of the Badger Den Allotment. Two sets of DPC objectives for the allotment were established using these ecological sites based on their similarities, and are described in Sections 7.3.1 and 7.3.2. Other RHA and UA/AIM monitoring areas such as (BD-6)¹, BD-2, BD-6 (BD-9out), BD-7 (BD-9in), and BD-10 were not used while establishing DPC objectives due to their minor land percentage, however sensitive areas such as riparian wetland habitat is still considered for Standard 3.

The following DPC objectives are established to ensure current conditions on the allotment are maintained or improved. Meeting these DPC objectives will provide soil stability from canopy cover and litter cover that reduce raindrop impacts to soils and impede overland flow, allowing infiltration of moisture and development of soil structure. Plant roots hold soils together, provide organic matter to soils, and assist with water infiltration and soil moisture retention. The DPC objectives provide a diverse plant community that will allow for natural ecological functions and provide habitat features, such as increased sources for shelter, cover and foraging, for the wildlife species described above in Section 4. These DPC objectives will ensure rangeland health and will ensure State water quality standards are met.

7.3.1 Sandy Upland and Limy Fan sites DPC Objective

The Sandy Upland and Limy Fan sites DPC objective was established using Limy Fan and Sandy Upland ESDs. The Limy Fan and Sandy Upland ecological sites on the Badger Den Allotment occur at similar elevations (2,600-4,000 feet), are in the same precipitation zone (8-12 inch), have similar soil textures (sandy loam to loamy sand), and similar soil depth (60 inch), additionally, ESD reference conditions show relatively high percentages for bare soils (greater than 50 percent expected), and HCPC plant communities are both dominated by large shrubs with few perennial grasses.

The ESD reference sheet for Limy Fan lists perennial grass cover at 0-5 percent, forb cover at 0-15 percent, and shrubs at 25-30 percent. The Sandy Upland ESD characterized the site's functional structural groups as dominated by large shrubs and sub-dominated by smaller shrubs

¹ Site names with parentheses are UA/AIM monitoring sites and those without are RHA sites, refer to Table 1 in section 6.4.

followed by perennial grasses, sub-shrubs, and succulents. The reference sheet does not establish percent canopy cover, but it can be inferred as 25-30 percent because of the allowed 70-75 percent bare ground. This maximum 25-30 percent canopy cover would allow for perennial grasses and forbs but would be dominated by shrubs at an estimated 15-30 percent. Neither of these ecological sites' plant composition contribute significantly to runoff and infiltration, instead sandy soils are identified as the main contributor to water penetration.

These reference sheet estimates for perennial grasses, forbs, and shrubs list acceptable low to high ranges for each of the plant types. The low to high values listed above were used to establish the following DPC objective. The DPC objective for the upland plant community on Sandy Upland and Limy Fan sites is to maintain an average cover of:

- 0-5 percent perennial grasses
- 0-15 percent forbs
- 15-30 percent shrubs

By meeting the DPC objective, the site would be capable of providing habitat conditions for the passerine species and several species of economic and recreational importance, as described in Section 4, by increasing the available shrub cover for shelter and protection as well as providing greater opportunities for foraging.

7.3.2 Clay Loam and Loamy Upland sites DPC Objectives

The Loamy Upland type sites DPC objective was established using Clay Loam Upland and Loamy Upland ESDs. The Clay Loam Upland and Loamy Upland ecological sites on the Badger Den Allotment occur at similar elevations (2,600-4,000 feet), are in the same precipitation zone (8-12 inch), have similar soil textures (gravelly loam), and similar soil depth (50-60 inch), both with high gravel content. The ESD reference conditions show variable percentages for bare soils (both ranging from 5 percent to 70 percent, or greater), and HCPC plant communities are both dominated by perennial grasses with fewer shrubs.

The ESD reference sheet for Clay Loam Upland lists perennial grass cover exhibiting patch-distribution at 27-37 percent, shrubs at 1-5 percent, and succulents at 1-5 percent. The ESD canopy structure lists grasses at 7-32 percent (including annuals), forbs at 2-42 percent (including annuals), and shrubs at 4-25 percent.

The Loamy Upland STM shows cover percentages for HCPC and includes suffrutescent grasses (tobosa, black grama, bush muhly, and threeawn) at 5-25 percent, this does not include cover of less-dominant non-suffrutescent grasses. The ESD Canopy Structure shows grass cover at 11-37 percent, which includes annual grasses, shrubs at 8-25 percent, and forbs at 2-42 percent (including annuals).

These ESDs and corresponding reference sheet estimates for grasses, forbs, and shrubs list acceptable low to high ranges for each of the plant types. The low to high values listed above were used to establish the following DPC objective. The DPC objective for the plant community on Clay Loam and Loamy Upland sites is to achieve or maintain cover of:

- 5-37 percent grasses
- 2-42 percent forbs
- 4-25 percent shrubs

By meeting the DPC objective, the site would be capable of providing habitat conditions for the passerine species, black-tailed prairie dog, banner-tailed kangaroo rat, and several species of economic and recreational importance, as described in Section 4, by increasing the available grass cover that is utilized for foraging opportunities as well as cover and protection for nests and burrows.

7.3.3 Standard 3 Determinations

Upland Plant Communities

Monitoring and assessments done at Sandy Upland and Limy Fan sites included sites BD-3, BD-4, BD-8 (BD 6b), and BD-9 (Fan3). The RHA results for BD-3, BD-4, BD-8, and BD-9 are given in Section 7.1 above. Specific monitoring data results for UA/AIM plots (BD-6b) and (Fan3) are given in Table 2 and Table 3 above. The Standard 3 determination for Sandy Upland and Limy Fan sites is given below.

Sandy Upland and Limy Fan sites

Both RHA sites, BD-3 and BD-4 on the Limy Fan ecological site show that Functional Structural Groups (Indicator 12) and Annual Production (Indicator 15) were rated as N-S departure indicating that the sites are both as productive and as diverse as the reference condition or the HCPC. Reproductive Capability (Indicator 17) also showed N-S departure at both sites indicating that plant communities of native species are being maintained at these sites. These are newly established sites with no AIM or UA monitoring data.

Site BD-8 (BD-6b) on the Sandy Upland ecological site showed that the Functional Structural Groups (Indicator 12) and Annual Production (Indicator 15) were rated as N-S departure indicating that the site is both as productive and as diverse as the reference condition or the HCPC. Reproductive Capability (Indicator 17) showed S-M departure indicating that maintenance of plant communities of native species is struggling at the site potentially due to drought. The AIM monitoring at this location (BD-6b) showed that perennial grass cover and forb cover were 0.7 percent, which were within the allowable DPC range, however shrub cover was lower than expected for the site totaling 10.6 percent.

Site BD-9 (Fan3) on the Sandy Upland Ecological site showed that Functional Structural Groups (Indicator 12) and Annual Production (Indicator 15) were rated as N-S departure indicating that the site is both as productive and as diverse as the reference condition or the HCPC. Reproductive Capability (Indicator 17) showed N-S departure indicating that plant communities of native species are being maintained at this site. Monitoring at this location (Fan3) showed no perennial grass or forb cover. These low percentages are within the allowable DPC range for this type of site. With the absence of grasses and forbs, shrub cover is expected to be high, monitoring data show high shrub cover within the acceptable range at 30 percent.

Summary

Sites BD-3 and BD-4 in the Limy Fan ecological site show that productive and diverse upland plant communities of native species exist and are maintained. Site BD-8 (BD-6b) and BD-9 (Fan3) in the Sandy Upland ecological site show few grasses and forbs, which is acceptable, but BD-8 (BD-6b) also showed a low percentage of shrubs and signs of unstable soils. Site BD-9 (Fan3) in the same ecological site met DPC objectives, the poor condition of BD-8 (BD-6b) is attributed to reasons discussed under Section 7 above including historic overgrazing, extended drought, railroad and road development, and other factors. Because livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly

underutilized and/or vacant since that time, current land health represents what these portions of the allotment is capable of achieving without management actions being implemented such as vegetation or soil treatments. These future management actions may be considered in the future. The STM for this Sandy Upland site is still in development and methods for bringing the ecological site back into reference condition are being considered. Properly managed livestock grazing is not expected to further degrade these sites or prevent them from meeting standards. Because of assessed conditions and reasons described above, Sandy Upland and Limy Fan sites are considered meeting Standard 3.

Clay Loam and Loamy Upland sites

Monitoring and assessments done at Clay Loam and Loamy Upland sites include BD-1, (BD-4), BD-5 (BD-10), and (BD-8). The RHA results are given in Section 7.1.1 above. Specific monitoring data results for UA/AIM plots (BD-4), (BD-8), and (BD-10) are given in Section 6.2 above and in Appendix A, Table 8 and Table 9. Standard 3 determination for Clay Loam and Loamy Upland sites is given below.

Site BD-1 in the Clay Loam Upland ecological site showed that Functional Structural Groups (Indicator 12) was rated as M-E departure showing shrubs and succulents as major contributors to the plant community instead of grasses. The site had transitioned from HCPC to an alternative stable state referenced in the STM (Figure 1) as “Shrubs & Tobosa State”. Although the upland plant community is not the HCPC, it is in a stable alternative state and other Biotic Integrity Indicators showed that the site supported a healthy and productive plant community with the exception of excessive devil’s cholla (native) and minor amounts of Lehmann lovegrass which can be invasive to the site. The STM restoration pathway (R2A) includes managed grazing and woody species control as needed. Management actions may be considered for the control of shrubs and succulents. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time. The site has not naturally transitioned back to HCPC. The ESD STM model prescribes managed grazing as a practice in transitioning back to HCPC; therefore, grazing is an appropriate management action for the site, and future authorized grazing would not be expected to further degrade the site. No other monitoring was conducted at BD-1.

Site BD-5 (BD-10) in the Loamy Upland ecological site showed through the RHA that Standard 1 was being met, indicating that infiltration, permeability, and erosion rates are considered appropriate for the site. Functional Structural Groups (Indicator 12) was rated as M departure showing fewer grasses and more shrubs than reference condition. Additionally, Indicators 13, 15, and 17 showed departures indicating that the plant community was less productive, showed some plant mortality, and had difficulty reproducing due to drought. Although this upland plant community is showing signs of hardship, the STM shown in Figure 4, shows that the site is in natural fluctuation with fire/drought interaction within HCPC. Both UA and AIM monitoring encountered many species on the site which was dominated by tobosagrass. The AIM Monitoring showed canopy cover at 7.4 percent perennial grasses, 2.7 percent perennial forbs, and 4 percent shrubs. These monitoring values are all within the acceptable range of cover to meet the DPC objective.

Site (BD-4) AIM monitoring on the Loamy Upland ecological site showed canopy cover for grasses at 1.4 percent (half of which was perennial), forbs at 4.7 percent, and shrubs at 10.1 percent. Forbs and shrubs meet the DPC objectives described above, but grass cover was lower than the acceptable range. As discussed in Section 6.4, monitoring methods between AIM and UA differed. Results from UA monitoring include composition data but not cover data.

Composition data from UA showed that tobosagrass was 37 percent of the composition in 2014 and 31 percent of the composition in 2018. This is a much higher percent composition than AIM data in 2019 which showed tobosagrass as 4.3 percent of the vegetative composition. Grass cover could be low in the AIM data due to the patch-distribution of perennial grasses described in the ESD. If the AIM plot line transects do not correlate with the location of grass patches, then monitoring results will show low perennial grass cover. Consequently, perennial grasses were not encountered as much in the more compact AIM monitoring plot as in the UA monitoring due to monitoring style differences. The UA monitoring shows that there are adequate grasses at the site, but the AIM plot line transects encountered a low percentage of those grasses. Because AIM monitoring will continue to be collected along line transects in the same location as in 2019, future monitoring is likely to continue showing low perennial grass cover even though the UA monitoring shows that there are adequate grasses at the site.

Site (BD-8) AIM monitoring on the Loamy Upland ecological site showed canopy cover for grasses at 0 percent, forbs at 5.4 percent, and shrubs at 27.4 percent. Forb cover was within the DPC objective range, grass cover was below the acceptable range and shrub cover was above the acceptable range. Grass cover could be low due to the patch-distribution of the perennial grasses described in the ESD but UA monitoring at the site also showed no perennial grass cover. The AIM monitoring included 14.7 percent mesquite and a high percentage of cholla (12.7 percent). The UA monitoring did not include such a high cover of mesquite (7 percent in 2014 and 10 percent in 2018). The STM model shows that the site has transitioned to the “Mesquite, annuals” state (Figure 4). The route back to HCPC according to the STM model transition “2b” includes treatment of shrubs coupled with proper grazing, seeding, and erosion control with potential use of ripping and contouring. These management actions could be considered in the future. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time. The site has not transitioned back to HCPC on its own. The ESD STM allows for proper grazing in transitioning back to HCPC, therefore grazing is an appropriate management action and would not further degrade the landscape.

Summary

The RHA site BD-1 on the Clay Loam Upland ecological site showed that productive and diverse upland plant communities of native species exist and are maintained. For the Loamy Upland ecological site monitoring data from three areas was considered, UA/AIM site (BD-8) showed low grass cover and high shrub cover. Site (BD-4) AIM monitoring results showed low grass cover while UA data showed adequate grasses to meet DPC objectives. Site BD-5 (BD-10) in the same ecological site also met DPC objectives. The poor condition of UA/AIM site (BD-8) which had transitioned to an alternate state is attributed to reasons discussed above under Section 7 including historic overgrazing, extended drought, railroad and road development, and other factors. Because livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time, current land health represents what these portions of the allotment is capable of achieving without management actions being implemented such as vegetation or soil treatments.

Management actions may be considered for the control of shrubs and succulents; however, often these sites are stable alternative states considered appropriate site condition. For all Clay Loam and Loamy Upland sites that have not naturally transitioned back into HCPC, the ESD STM models allow for proper grazing in transitioning back to HCPC, therefore, proper grazing is an appropriate management action, and would not further degrade the landscape. Because of assessed conditions and reasons described above, and the majority of Clay Loam and Loamy

Upland sites are meeting DPC objectives, overall, these ecological sites are considered meeting Standard 3.

Riparian-Wetland Plant Communities

The PFC assessments protocol was used to determine if productive and diverse riparian-wetland plant communities of native species exist and are maintained along the San Simon River. There are 9.24 miles of the San Simon River on the Badger Den Allotment. Reaches 2 and 3 (7.48 miles), are associated with riparian-wetland sites due to their intermittent flow. The primary water source for this reach comes from Sands Draw. Reach 1 (1.76 miles), was determined to be functioning as an ephemeral system and is not considered a riparian-wetland area due to man-made dikes and dams that are preventing adequate surface flow. As described in Section 7.2.1, Reaches 2 and 3 were not meeting PFC due to lack of riparian obligate species, and were rated as FAR with a static trend.

No permit for livestock grazing has been issued within the Badger Den Allotment along the San Simon River since the last permit was canceled in 1993 and the allotment has been predominantly underutilized and/or vacant since that time. Riparian-wetland plant community health along the San Simon River may have improved during that time but intermittent Reaches 2 and 3 are not at PFC and are therefore not meeting Standard 3. Grazing use could be an important factor in riparian-wetland plant community health moving forward, and proper grazing management strategies should be considered such as exclusion of livestock from the detention dams and deferment of livestock from sensitive riparian areas during critical growing periods to assist with production and maintenance of riparian-wetland plant communities.

7.4 Land Health Standards Determinations Summary for the Badger Den Allotment

Arizona Standards for Rangeland Health are being achieved on the Badger Den Allotment for Standards 1 and 3. Riparian-Wetland Sites are not meeting Standard 2. Livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized or vacant since that time (see Section 3: Grazing History). Because of this period of rest on the allotment, current land health and vegetative conditions represent what the allotment is currently capable of achieving.

Due to the vacancy of the allotment, current livestock grazing is not contributing toward not meeting standards. Lands not meeting standards are a result of a number of factors including but not limited to historic overgrazing prior to the establishment of the Taylor Grazing Act and soil loss that resulted from that use, extended drought broken by intense thunderstorms, railroad and road development and subsequent effects on ecological function of hydrology, channel excavation in 1883 from the Gila River up the San Simon Valley to confine flow, and environmental effects from an earthquake in 1887 (Humphreys, 2015; USDI BOR, 2000).

Properly managed livestock grazing has been considered in this evaluation as an acceptable use of uplands. Where upland ecological sites have transitioned to alternative stable states, managed grazing is identified as a practice in transitioning back to HCPC if desired. Grazing use could be an important factor in riparian-wetland plant community health moving forward, and proper grazing management strategies should be considered such as deferment of livestock from sensitive riparian areas during critical growing periods to assist with production and maintenance of riparian-wetland plant communities.

7.4.1 Standard 1 – Meeting

The majority of the individual RHA sites are currently meeting Standard 1 (Table 6). Because livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time, the shifted conditions of RHA sites BD-8 and BD-10 is attributed to reasons discussed under Section 7 above including historic overgrazing, extended drought, railroad and road development, and other factors, but is not attributed to current livestock grazing. Overall, the majority of the upland ecological site soils showed infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform; therefore, the Badger Den Allotment is meeting Standard 1.

7.4.2 Standard 2 – Not Meeting

There are 9.24 miles of the San Simon River on the Badger Den Allotment. Of the 9.24 miles of the San Simon River, 7.48 miles (Reaches 2 and 3) were evaluated for PFC. Reach 1 (1.76 miles) was determined to be functioning as an ephemeral system and is not applicable to Standard 2. Reaches 2 and 3 were rated as FAR, which does not meet Standard 2. Factors that have contributed to existing riparian-wetland condition are described in Section 7 and subsection 7.2 above, which include historic overgrazing, extended drought, channelization of the San Simon River, upstream dam and dike development, railroad and road development, and other factors. Because livestock grazing has not been permitted on the allotment since 1993 and the allotment has been predominantly underutilized and/or vacant since that time, current livestock grazing is not a contributing factor in not meeting Standard 2. Livestock grazing is an appropriate use of the San Simon River when managed properly to allow for continued bank stability, channel aggradation, and recruitment or establishment of desirable riparian-wetland species. Overall, the Badger Den Allotment is not meeting Standard 2.

Additional riparian-wetland areas on the allotment such as HX Detention Dam, Gold Gulch ephemeral wash, Sands Draw Detention Dam, and Dripping Spring did not meet criteria to be analyzed for Standard 2, or were excluded from livestock grazing, and were therefore not evaluated.

7.4.3 Standard 3 – Meeting

Sites BD-3 and BD-4 in the Limy Fan ecological site show that productive and diverse upland plant communities of native species exist and are maintained. Site BD-8 (BD-6b) in the Sandy Upland ecological site showed a low percentage of shrubs and signs of unstable soils; Site BD-9 (Fan3) in the same ecological site met DPC objectives. The Clay Loam Upland ecological site showed that productive and diverse upland plant communities of native species exist and are maintained. The AIM data for Loamy Upland ecological site showed poor condition at two sites ((BD-4) and (BD-8)). Site (BD-4) was attributed to placement of the AIM plot as UA data showed it met DPC objectives. Site (BD-8) had transitioned to an alternate state. Sites that have shifted ecological state have an altered site condition and are therefore not meeting DPC objectives. This is attributed to reasons discussed under Section 7 above including historic overgrazing, extended drought, railroad and road development, and other factors, but is not attributed to current livestock grazing. However, the majority of these sites were found to be meeting DPC objectives and were capable of maintaining a productive and diverse native plant community. The overall determination (Section 7.3.3) was that both the Sand Upland and Limy Fan sites and the Clay Loam and Loamy Upland sites are currently meeting DPC objectives.

The PFC assessments showed a lack of a desirable riparian obligate plants along the San Simon River and were determined to not be meeting DPC objectives.

Standard 3 considers both upland and riparian-wetland plant communities. Upland plant communities, which comprise the majority of the allotment, are meeting Standard 3. The San Simon River is a relatively small portion of the overall allotment and does not exhibit much of a riparian plant community. The portions of the San Simon River that are within the Badger Den Allotment are categorized by the USGS as intermittent, while PFC assessments showed that Reach 1 was categorized as ephemeral. Intermittent and ephemeral systems are limited on water availability, with water often occurring seasonally as a result of precipitation events. This lack of water availability is the limiting factor for riparian vegetation potential on the San Simon River. The overall determination for the Badger Den Allotment is that Standard 3 is being met.

8. Recommended Management Actions

Based on the determinations in *Section 7 Land Health Standards and Determinations*, the following management actions are recommended:

1. Range Health Assessments noted roads and railroads as being contributing factors to the departure from reference conditions. In beneficial areas work could be considered to divert collected waters from roadways and onto upland sites through use of rolling berms and other diversion structures.
2. Livestock grazing should be analyzed through proper NEPA protocol for proposed permit issuance. Consideration should be given to deferment of livestock from sensitive riparian areas during critical growing periods to assist with production and maintenance of riparian-wetland plant communities.

9. Authorized Officer Concurrence

I have reviewed the determinations presented in *Section 7 Land Health Standards and Determinations* and the *Recommended Management Actions* identified in *Section 8*.

- I concur with the determinations and recommendations as written.
- I do not concur.
- I concur, but with the following modifications.

SCOTT COOKE Digitally signed by SCOTT COOKE
Date: 2021.03.08 15:57:33 -07'00'

Scott C. Cooke
Field Manager

3/8/21

Date

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Appendix A: Figures and Tables

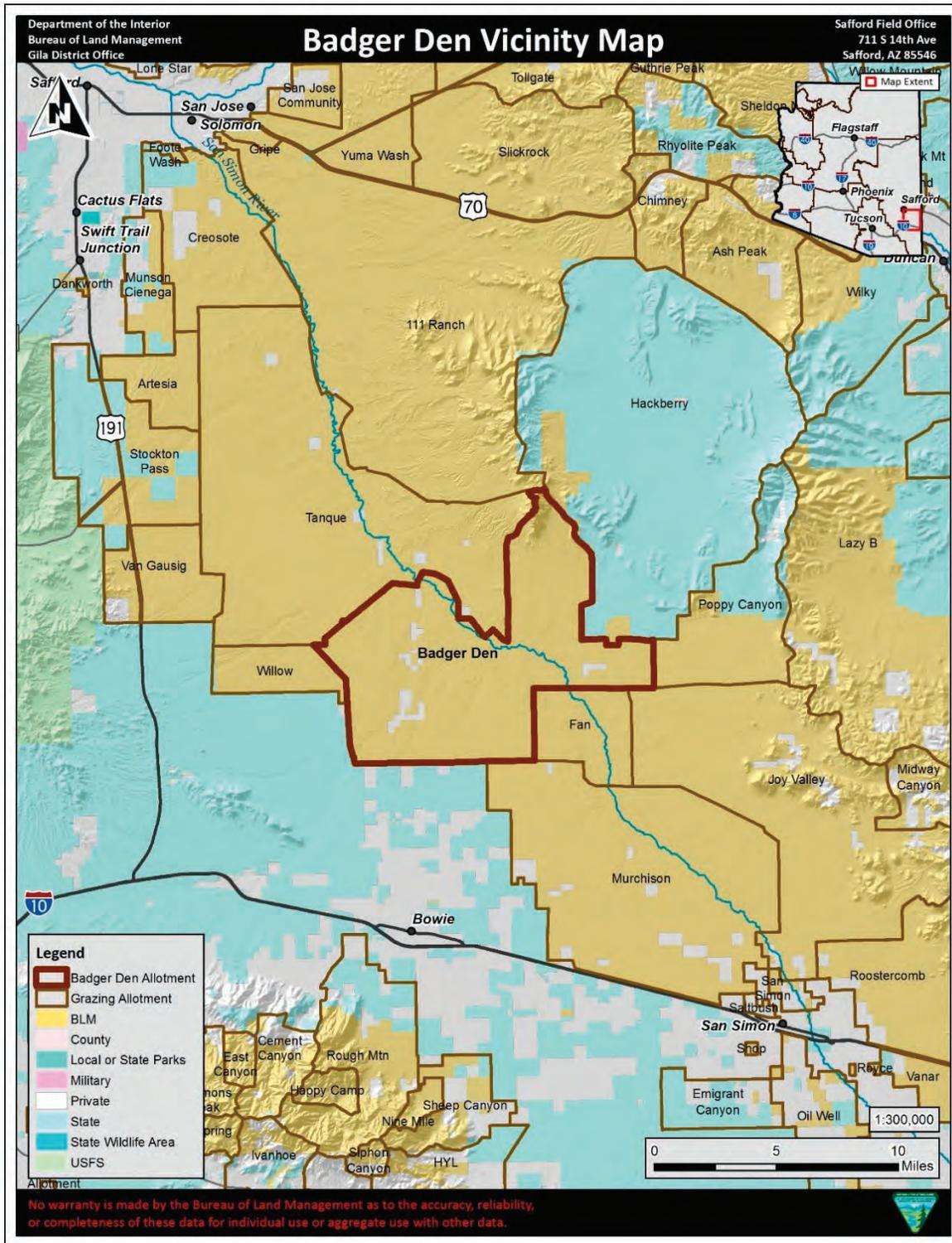


Figure 7. Location and Surface Management of Badger Den Allotment

Table 8. Drought Percent of Graham County

Week	No Drought (%)	Abnormal Drought (%)	Moderate Drought (%)	Severe Drought (%)	Extreme Drought (%)	Exceptional Drought (%)
2/18/2020	96.67	3.33	0	0	0	0
1/28/2020	100	0	0	0	0	0
12/31/2019	100	0	0	0	0	0
11/26/2019	0	100	65.96	0	0	0
10/29/2019	0	100	99.99	2.06	0	0
9/24/2019	0	100	100	1.18	0	0
8/27/2019	95.1	4.9	0	0	0	0
7/30/2019	100	0	0	0	0	0
6/25/2019	100	0	0	0	0	0
5/28/2019	100	0	0	0	0	0
4/30/2019	100	0	0	0	0	0
3/26/2019	99.9	0.1	0	0	0	0
2/26/2019	40.34	59.66	0	0	0	0
1/29/2019	0.42	99.58	45.79	0	0	0
12/25/2018	0	100	100	41.93	0	0
11/27/2018	0	100	100	42.26	0	0
10/30/2018	0	100	100	42.26	0	0
9/25/2018	0	100	100	67.32	17.23	0
8/28/2018	0	100	100	87.09	17.3	0
7/31/2018	0	100	100	87.09	23.67	0
6/26/2018	0	100	100	100	52.43	0

5/29/2018	0	100	100	100	52.8	0
4/24/2018	0	100	100	99.42	25.89	0
3/27/2018	0	100	100	95.03	16.69	0
2/27/2018	0	100	100	95.54	5.76	0
1/30/2018	0	100	100	83.02	5.76	0
12/26/2017	0	100	100	0	0	0
11/28/2017	0	100	100	0	0	0
10/31/2017	0	100	48.98	0	0	0
9/26/2017	63.21	36.79	0	0	0	0
8/29/2017	100	0	0	0	0	0
7/25/2017	15.39	84.61	18.81	0	0	0
6/27/2017	0	100	49 .2	0	0	0

Source: U. S. Drought Monitor (USDM, 2020)

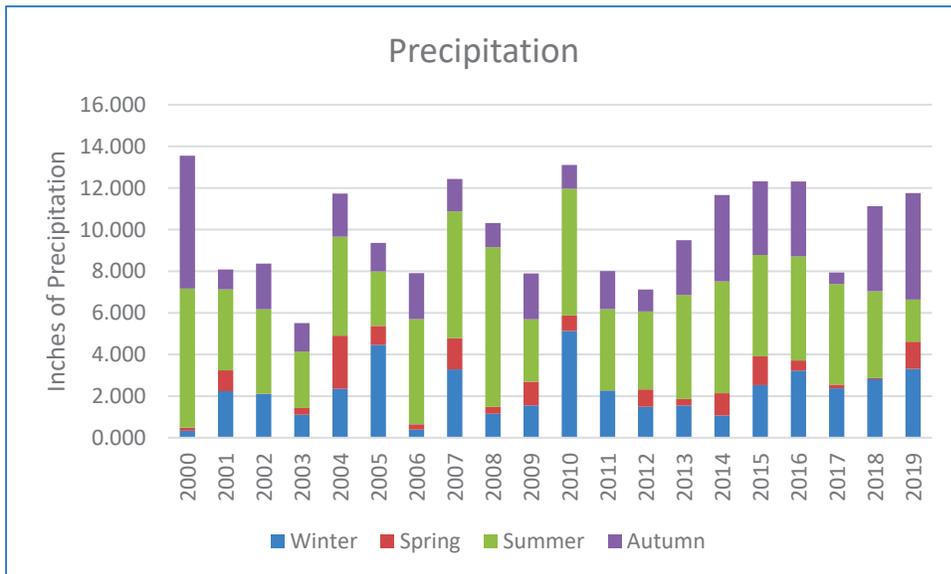


Figure 8. Annual Precipitation on the Badger Den Allotment

Table 9. Average Monthly Temperature on the Badger Den Allotment

Month	Average Temperature (°F)
January	46
February	49
March	55
April	63
May	72
June	80
July	83
August	81
September	76
October	65
November	54
December	44

Table 10. Ecological Site Classification on the Badger Den Allotment

Ecological Site	ESD ID	Allotment Acres	Allotment percentage (%)
Limy Fan 8-12" precipitation zone (p.z.)	R041XB206AZ	17576.8	35.9
Sandy Upland 8-12" p.z.	R041XB214AZ	9263.8	18.9
Clay Loam Upland 8-12" p.z.	R041XB204AZ	7225.8	14.7
Loamy Upland 8-12" p.z.	R041XB210AZ	5201.3	10.6
Sandy Wash 8-12" p.z.	R041XB213AZ	3065.4	6.3
Sandy Loam Upland 8-12" p.z.	R041XB215AZ	2485.1	5.1
No Data	No Data	1715.9	3.5
Volcanic Hills 12-16" p.z. Loamy	R041XC323AZ	932.8	1.9
Saline Upland 8-12" p.z.	R041XB212AZ	741.4	1.5
Clayey Swale 8-12" p.z.	R041XB202AZ	415.0	0.9
Basalt Hills 12-16" p.z.	R041XC301AZ	322.0	0.7
Water	No Data	54.7	0.1
Total		49000	100.0

Source: Natural Resource Conservation Service (NRCS, 2015)

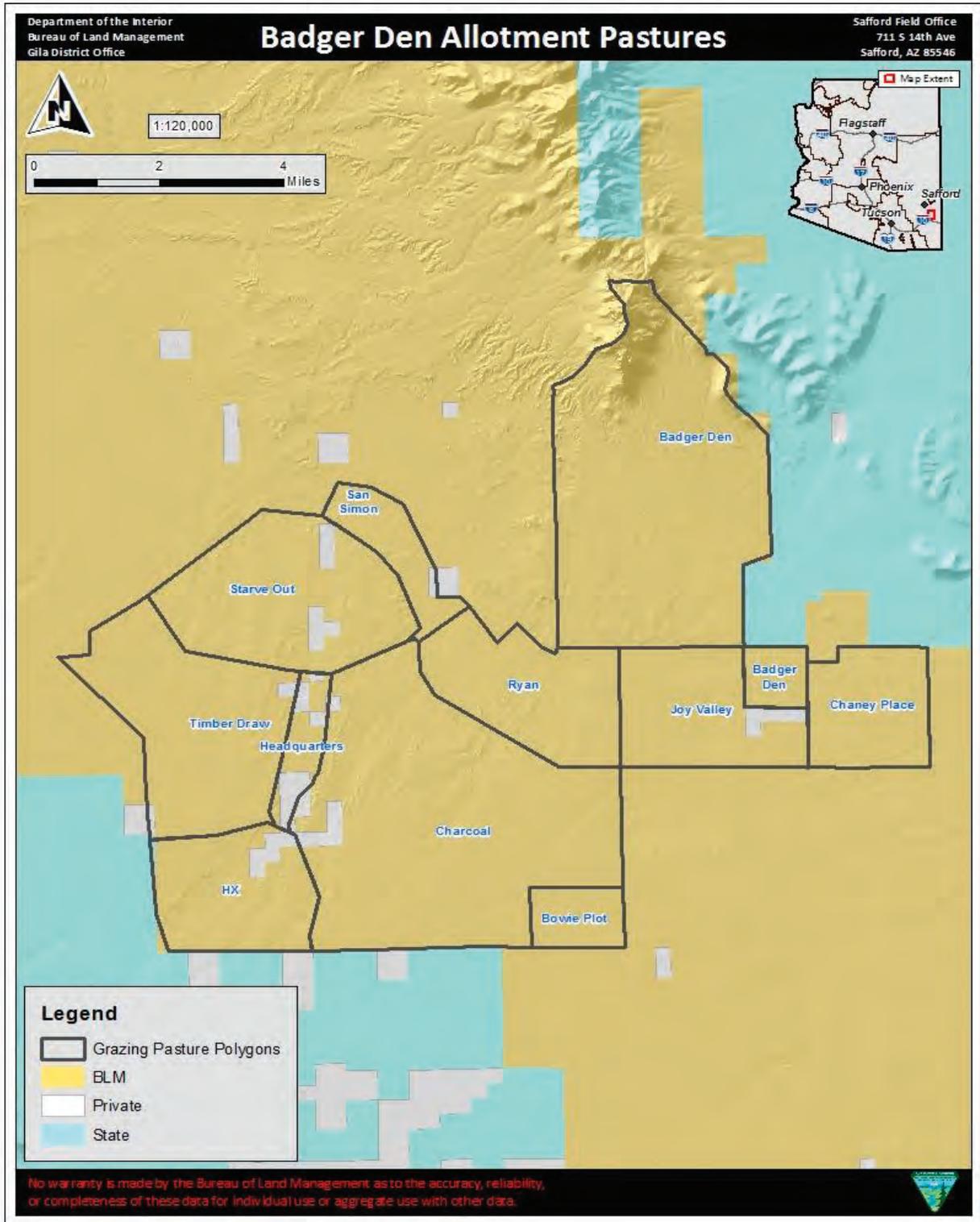


Figure 9. Badger Den Allotment Pastures

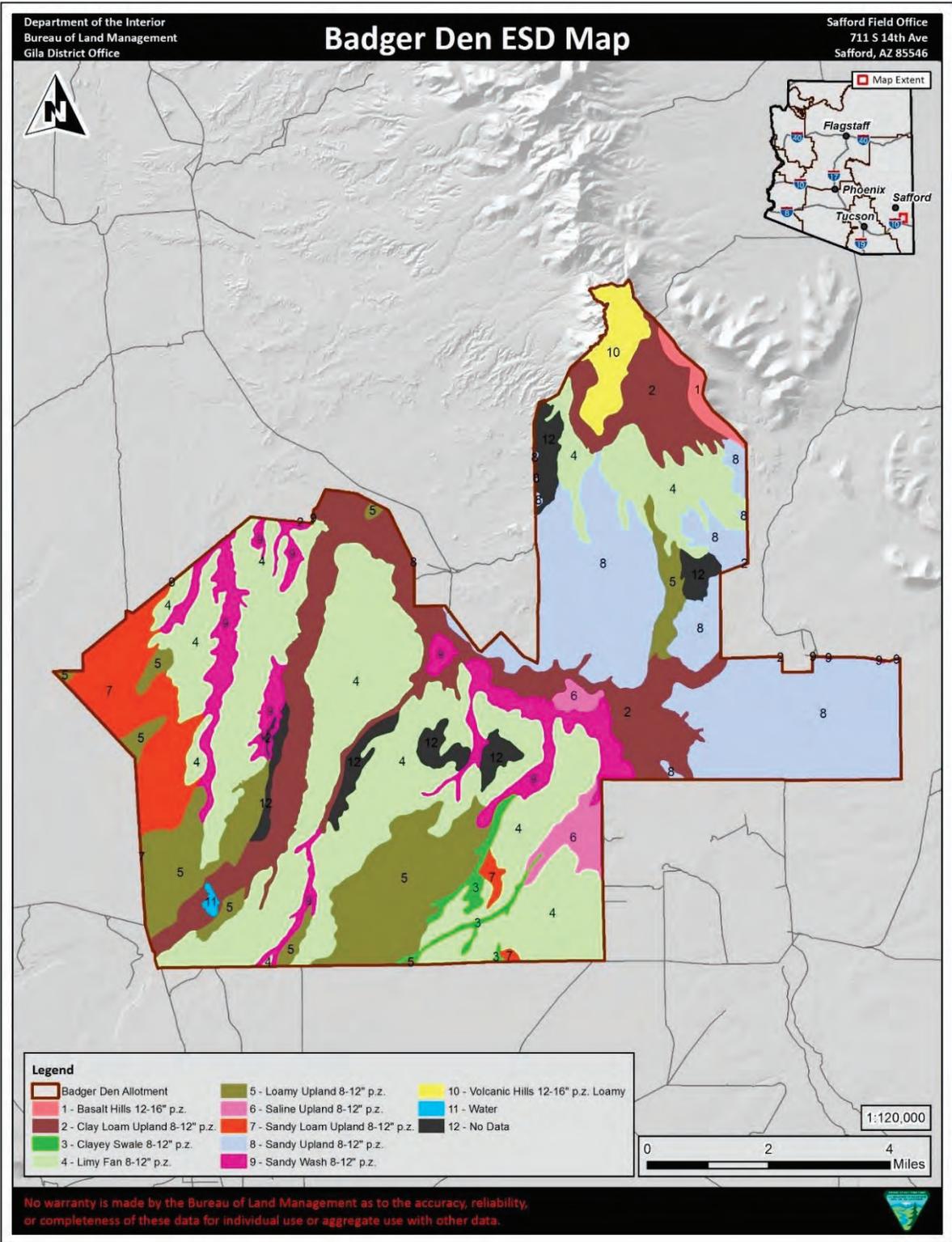


Figure 10. Ecological Sites Within the Badger Den Allotment

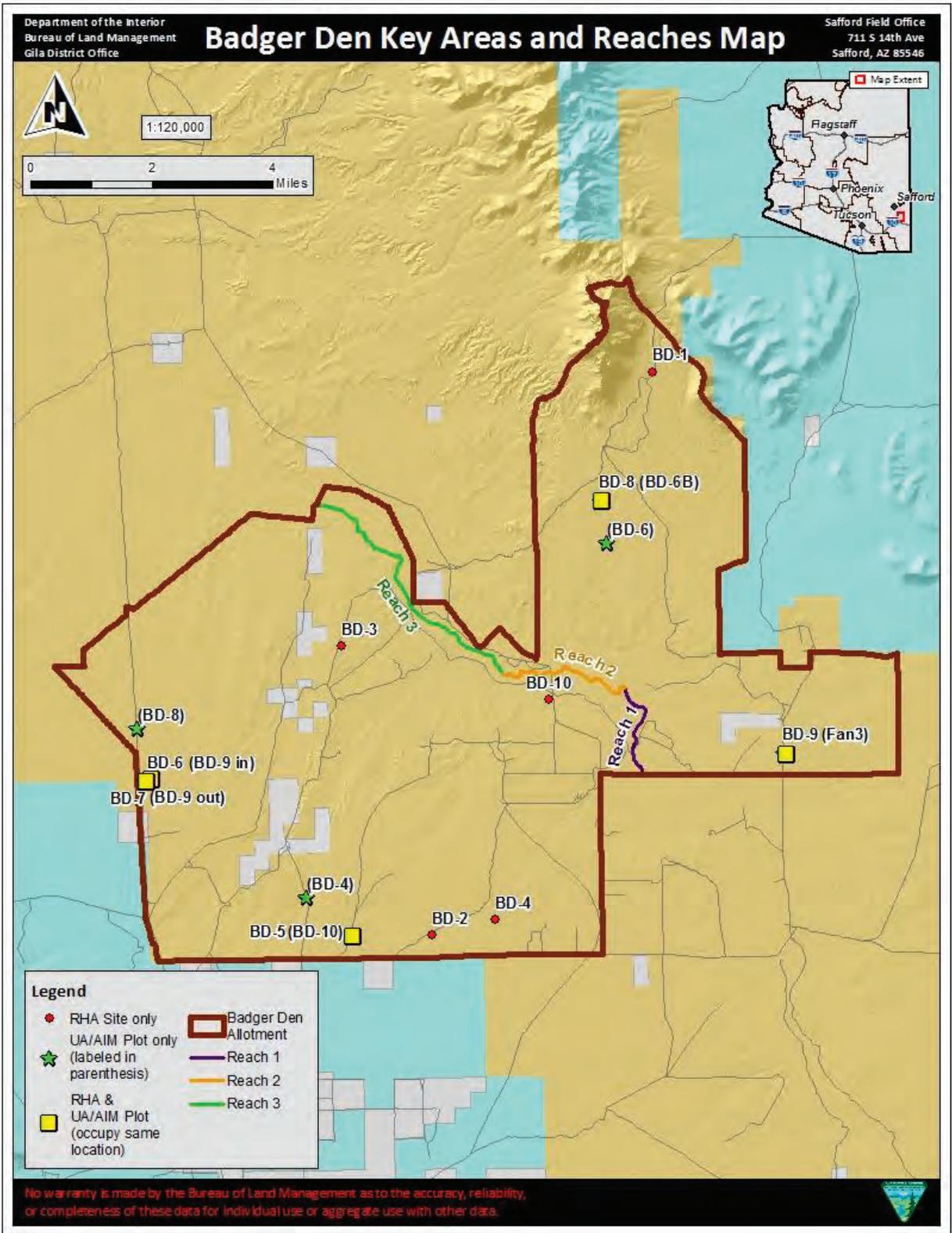


Figure 11. Upland Key Areas and PFC Reaches

Table 11. Location of the Badger Den Allotment Key Areas and PFC Reaches

Key Area or Reach**	Ecological Site Name	Ecological Site ID	Coordinates (Easting)*	Coordinates (Northing)*
BD-1	Clay Loam Upland 8-12" p.z.	R041XB204AZ	651899	3604485
BD-2	Clayey Swale 8-12" p.z.	R041XB202AZ	646010	3589429
BD-3	Limy Fan 8-12" p.z.	R041XB206AZ	643622	3597153
BD-4	Limy Fan 8-12" p.z.	R041XB206AZ	647692	3589850
(BD-4)	Loamy Upland 8-12" p.z.	R041XB210AZ	642751	3590452
BD-5 (BD-10)	Loamy Upland 8-12" p.z.	R041XB210AZ	643870	3589415
BD-6 (BD-9out)	Sandy Loam Upland 8-12" p.z.	R041XB215AZ	638439	3593609
(BD-6)	Sandy Loam Upland 8-12" p.z.	R041XB215AZ	650688	3599939
BD-7 (BD-9in)	Sandy Loam Upland 8-12" p.z.	R041XB215AZ	638413	3593580
BD-8 (BD-6b)	Sandy Upland 8-12" p.z.	R041XB214AZ	650472	3601103
(BD-8)***	Loamy Upland 8-12" p.z.	R041XB210AZ	638164	3594963
BD-9 (Fan3)	Sandy Upland 8-12" p.z.	R041XB214AZ	655380	3594362
BD-10	Sandy Wash 8-12" p.z.	R041XB213AZ	649144	3595733
PFC Reach 1 (Start)	Clay Loam Upland 8-12" p.z.	R041XB204AZ	651619	3593750
PFC Reach 1 / Reach 2	Clay Loam Upland 8-12" p.z.	R041XB204AZ	651166	3596047
PFC Reach 2 / Reach 3	Clay Loam Upland 8-12" p.z.	R041XB204AZ	647859	3596469
PFC Reach 3 (End)	Clay Loam Upland 8-12" p.z.	R041XB204AZ	642879	3600911

*Projected Coordinate System: NAD 1983 Universal Transverse Mercator (UTM) Zone 12N

** UA and AIM monitoring sites in parenthesis

*** Site (BD-8) moved approximately 700 feet to the Northwest in 2018. The key area remained in the same ecological site and data collected for both 2014 and 2018 were used and compared to provide informative site characteristics.

Appendix B: Wildlife and Plant Species

Threatened & Endangered Species				
Common Name	Scientific Name	Critical Habitat	Status	Comments
Desert pupfish ¹	<i>Cyprinodon macularius</i>	Designated	Endangered	The allotment is not within the designated critical habitat. Perennial water is absent from the San Simon River within the allotment to support populations. Perennial water is located within the Sands Draw wildlife enclosure. The BLM has completed both NEPA and ESA compliance to translocate Desert Pupfish, Gila Topminnow, and Gila Chub into this habitat.
Gila chub	<i>Gila intermedia</i>	Designated	Endangered	The allotment is not within the designated critical habitat. Perennial water is absent from the San Simon River within the allotment to support populations. Perennial water is located within the Sands Draw wildlife enclosure. The BLM has completed both NEPA and ESA compliance to translocate Desert Pupfish, Gila Topminnow, and Gila Chub into this habitat.
Gila topminnow ¹	<i>Poeciliopsis occidentalis occidentalis</i>	No designation	Endangered	No record of species occurring within allotment boundary. Perennial water is absent from the San Simon River within the allotment to support populations. Perennial water is located within the Sands Draw wildlife enclosure. The BLM has completed both NEPA and ESA compliance to translocate Desert Pupfish, Gila Topminnow, and Gila Chub into this habitat.
Jaguar ²	<i>Panthera onca</i>	Designated	Endangered	The allotment is not within the designated critical habitat. USFWS issued a letter of concurrence (USDI USFWS 2012) for the determination of “may affect, not likely to adversely affect” regarding the Gila District Grazing Program’s actions. Conservation measures will continue to be followed and implemented.
Northern Aplomado falcon ²	<i>Falco femoralis septentrionalis</i>	No designation	Experimental Population, Non-Essential	No record of the species occurring within allotment boundary. Habitat consists of open grassland with scattered trees, low ground

Threatened & Endangered Species				
Common Name	Scientific Name	Critical Habitat	Status	Comments
				<p>cover, and elevations from 3,500 to 9,000 feet. Very limited distribution in the U.S. in Texas and New Mexico. The species' historical range extends into southeastern Arizona; however, the species is still considered to be extirpated from Arizona with no recent records of the species. In Arizona, no documented nesting attempts have occurred since 1940 (AZGFD 2021), or since 2006 when the whole state of Arizona was included in the 10(j) area designation (50 CFR Part 17, 42298-42315). There is no designated or proposed critical habitat for this species.</p> <p>Reported observation in 1977 west of Rodeo, New Mexico in Cochise County, Arizona. Sight records since 1940 are unsubstantiated, and the falcon is considered possibly extirpated in Arizona (per conversation with USFWS; AZGFD 2021).</p>
Northern Mexican gartersnake ²	<i>Thamnophis eques megalops</i>	Proposed	Threatened	The allotment is not within the proposed critical habitat. The allotment lacks suitable riparian plant communities to support this species.
Ocelot ¹	<i>Leopardus pardalis</i>	No designation	Endangered	No record of species occurring within allotment boundary. USFWS issued a letter of concurrence (USDI USFWS 2012) for the determination of "may affect, not likely to adversely affect" regarding the Gila District Grazing Program's actions. Conservation measures will continue to be followed and implemented.
Wright's Marsh thistle ²	<i>Cirsium wrightii</i>	N/A	Candidate	No record of species occurring within allotment boundary. The allotment lacks suitable habitat to support this species.
Western Yellow-billed cuckoo ²	<i>Coccyzus americanus</i>	Proposed	Threatened	The allotment is not within the proposed critical habitat. The allotment lacks suitable riparian plant communities to support this species.

¹Source: AZGFD Report, retrieved February 20, 2020 (AZGFD N.d.)

²Source: USFWS Report, retrieved September 29, 2020 (USDI USFWS N.d.)

BLM Special Status Species	
Species	Comments
Birds	
American peregrine falcon <i>Falco peregrinus anatum</i>	This species breeds in open landscapes with cliffs for nest sites. During migration and winter periods, you can find the species in nearly any open habitat, but with a greater likelihood along or near large bodies of water and mudflats. The allotment is within their year-round habitat range. Low potential to occur on the allotment due to limited habitat suitability.
Arizona Botteri's sparrow <i>Peucaea botterii arizonae</i>	This is a subspecies of the Botteri's sparrow (<i>Peucaea botterii</i>), which is unlikely to occur in Arizona due to their year-round range primarily occurring in Mexico. This subspecies is found in grassland and coastal prairie areas and prefers tall grasses for nesting. Low potential to occur on the allotment due to limited habitat suitability.
Bald eagle <i>Haliaeetus leucocephalus</i>	Typically nest in forested areas adjacent to large bodies of water. They prefer to perch on tall, mature coniferous or deciduous trees that provide a wide view of their surroundings. The allotment is within their nonbreeding habitat range. Low potential to occur on the allotment due to limited habitat suitability.
Ferruginous hawk <i>Buteo regalis</i>	They breed in grasslands, sagebrush country, saltbush-greasewood shrublands, and edges of pinyon-juniper forests at low to moderate elevations. They winter in grasslands or deserts with abundant rabbits, gophers, or prairie dogs. The allotment is within their winter habitat range. Low potential to occur on the allotment due to limited habitat suitability.
Golden eagle <i>Aquila chrysaetos</i>	They live in open and semi open country with native vegetation. They're found mainly in mountainous areas, canyonlands, rimrock terrain, and riverside cliffs and bluffs. They nest on cliffs and steep escarpments in grassland, chaparral, shrubland, forest, and other vegetated areas. The allotment is within their year-round habitat range. Low potential to occur on the allotment due to limited habitat suitability.
Western burrowing owl <i>Athene cunicularia hypugaea</i>	They live in open, treeless areas with low, sparse vegetation, usually on gently sloping terrains. They can be found in grasslands, deserts, and steppe environments as well as pastures and agricultural fields. They are often associated with high densities of burrowing mammals (i.e. prairie dogs and ground squirrels). Allotment is within their year-round habitat range. Low potential to occur on the allotment due to limited habitat suitability.
Mammals	
Arizona myotis <i>Myotis occultus</i>	Arizona myotis occurs in ponderosa pine and oak-pine woodlands near water. The allotment lacks the necessary habitat; therefore, this species will not be impacted.
Banner-tailed kangaroo rat <i>Dipodomys spectabilis</i>	This species lives in open Desertscrub, creosote bush flats, open grasslands and sandy places. It favors a sparse covering of grasses, interspersed with a few mesquite trees and cacti. The allotment provides potentially suitable habitat for this species; therefore, this species may be impacted if present on the allotment.
Black-tailed prairie dog <i>Cynomys ludovicianus</i>	Today, the black-tailed prairie dog is considered to be absent from the state of Arizona due to predation, extermination by landowners, and the loss of native grasslands; therefore, there would be no impact to this species.

Cave myotis <i>Myotis velifer</i>	This species forms colonies in caves, mines, buildings, and sometimes under bridges. They are aerial insectivores feeding on a variety of insects, primarily from three orders: Lepidoptera, Coleoptera, and Hymenoptera. The allotment lacks the necessary habitat; therefore, this species will not be impacted.
Greater western bonneted bat <i>Eumops perotis californicus</i>	This species roosts in cliff-face crevices and feeds high above the ground. They are rarely seen and only approach the ground at a few select drinking sites. They are only found in close proximity to perennial bodies of water. The allotment lacks the necessary habitat; therefore, this species will not be impacted.
Pale Townsend's big-eared bat <i>Corynorhinus townsendii pallascens</i>	This species occurs in pine forests and arid desert scrub, always near caves or other roosting sites. The allotment lacks the necessary habitat; therefore, this species will not be impacted.
Spotted bat <i>Euderma maculatum</i>	Spotted bats inhabit desert scrub and open forests and are always associated with a water source such as a spring, river, creek or lake. The allotment lacks the necessary habitat; therefore, this species will not be impacted.
Amphibians & Reptiles	
Desert mud turtle <i>Kinosternon sonoriense sonoriense</i>	The desert mud turtle is a subspecies of the Sonoran mud turtle (<i>Kinosternon sonoriense</i>). This species is usually found in spring, creeks, ponds, and intermittent streams. They typically inhabit oak-to-pinyon-juniper woodlands or pine-fir forests but may occasionally be found in desert and grassland areas. The allotment lacks the necessary riparian habitat to support this species; therefore, this species will not be impacted.

Source: AZGFD Report, retrieved February 20, 2020 (AZGFD N.d.)

Migratory Birds and Birds of Conservation Concern	
Species	Comments
American peregrine falcon <i>Falco peregrinus anatum</i>	Addressed as a BLM special status species above.
Bald eagle <i>Haliaeetus leucocephalus</i>	Addressed as a BLM special status species above.
Bell's vireo <i>Vireo bellii</i>	Found in dense shrubby or scrubby habitat, including brushy fields, early successional growth, riverine scrub, coastal chaparral, scrub oak, mottes (isolated patches) of shrubs and trees in prairies, saltcedar stands, and mesquite bosques. Especially in arid regions, Bell's Vireos are found along streams or in dry arroyos and gulches. Even when large trees such as cottonwoods and willows are present, the vireos tend to stay more in the low vegetation. They avoid open desert scrub, grasslands, and cultivated areas. Low potential to occur on the allotment.
Bendire's thrasher <i>Toxostoma bendirei</i>	Found in desert habitats including arid grasslands, shrublands, agricultural habitats. Use more open areas with shorter vegetation. Moderate potential to occur on the allotment.
Black-chinned sparrow <i>Spizella atrogularis</i>	Black-chinned sparrows are locally common in dry brushlands and chaparral from near sea level to 8,000 feet. They associate with sagebrush, rabbitbrush, ceanothus, and other chaparral species. They typically breed on rocky hillsides and winter downslope in desert scrub. Moderate potential to occur on the allotment.
Canyon towhee <i>Melozone fusca</i>	Lives in desert grasslands and rocky and shrubby areas, often along arroyos, mesquite thickets along streams, and suburban settlements. They also occur at higher elevations, particularly in Mexico, where you may find them in desert grasslands, pinyon-juniper woods, and pine-oak forests. Low potential to occur on the allotment.

Chestnut-collared longspur <i>Calcarius ornatus</i>	Found in shortgrass prairies, rangelands, and desert grasslands. Wintering habitat exists in the eastern part of Arizona. Low-to-moderate potential to occur on the allotment in winter.
Common black hawk <i>Buteogallus anthracinus</i>	Typically found in woodlands near water where it hunts; shows an affinity for cottonwood trees at the northern end of its range. Low potential to occur on the allotment.
Ferruginous hawk <i>Buteo regalis</i>	Addressed as a BLM special status species above.
Golden eagle <i>Aquila chrysaetos</i>	Addressed as a BLM special status species above.
Gray's vireo <i>Vireo vicinior</i>	Found in pinyon-pine/juniper, mesquite scrub, oak scrub, and chaparral habitats. Hot, arid habitats usually have dense brush from near the ground to 6 feet high. Low potential to occur on the allotment.
Lark bunting <i>Calamospiza melanocorys</i>	Species is endemic to the grasslands and shrubsteppe of North America—they occur nowhere else. When breeding, they are most likely to be found in large areas of native grassland vegetation, especially wheatgrass, blue grama grass, needle-and-thread grass, and big sagebrush. Lark Buntings live among many species of prairie vegetation, including red triple-awn grass, four-winged saltbush, cottonthorn hornbush, and green-plumed rabbitbrush, all plants in which the birds may nest. They avoid bare ground when nesting, preferring shortgrass and taller habitats. They usually nest at the base of a small shrub or cactus, so pure grassland is usually not suitable for breeding habitat. Heavily grazed shortgrass habitats, prairie dog towns, and recently burned fields are not generally used. Allotment is within the species' nonbreeding and migration habitat range. Low-to-moderate potential to occur on the allotment.
Lucy's warbler <i>Leiothlypis luciae</i>	Most common in dense mesquite woodlands (i.e. bosques) of the southwestern United States, where they can reach up to 5 pairs per acre. These woodlands are most prevalent near streambeds. Lucy's Warblers also breed (in lower densities) in stands of non-native tamarisk. Other common plants of such desert habitats include acacias, hackberries, and elderberries. In drier areas of scrub and grassland, they sometimes nest in stands of willows, arrowweed, paloverde, and ironwood. They also occupy riparian cottonwood-mesquite forests and, at higher elevations, transitional woodlands with ash, walnut, sycamore, and oak. They normally occur below about 3,000 feet elevation, but some inhabit open woodlands of sycamore, alder, and oak up to 5,800 feet in central Arizona. Allotment is within the species' breeding habitat range. Low-to-moderate potential to occur on the allotment.
Phainopepla <i>Phainopepla nitens</i>	Found mostly in desert washes that have mesquite, acacia, palo verde, smoke tree, and ironwood. They nest in these same desert trees and feed heavily on berries of the desert mistletoe, a parasitic plant of these trees. Low potential to occur on the allotment.
Rufous-winged sparrow <i>Peucaea carpalis</i>	Found in thorn scrub and arid grasslands. This species is uncommon and sparsely distributed across its range. The allotment occurs within the very northern end of their year-round habitat range. Low potential to occur on the allotment.
Sprague's pipit <i>Anthus spragueii</i>	Most nesting territories have scattered shrubs and relatively little bare ground. Key grass species in their nesting habitats include blue grama, junegrass, fescues, and various species of wheatgrass (crested, slender, northern, western), along with foxtail barley, Canby blue, speargrasses, salt grass, plains muhly, and threadleaf sedge. They do not nest in cropland and are uncommon or absent in non-native grasslands. On wintering grounds in Mexico and border areas of the southern U.S., they use both native and non-native grasslands with limited shrub cover, including some shortgrass

	environments, even occasionally athletic fields and heavily grazed pastures. Allotment is on the fringe of their wintering habitat. Low potential to occur on the allotment.
Western burrowing owl <i>Athene cunicularia hypugaea</i>	Addressed as a BLM special status species above.
Western yellow-billed cuckoo <i>Coccyzus americanus</i>	Addressed as a T&E species in table above.

Sources: AZGFD Report, retrieved February 20, 2020 (AZGFD N.d.); USFWS Birds of Conservation Concern 2008 (USFWS 2008).

Species of Economic and Recreational Importance	
Common Name	Scientific Name
Band-tailed pigeon	<i>Patagioenas fasciata</i>
Gambel's quail	<i>Callipepla squamata</i>
Javelina	<i>Pecari tajacu</i>
Mule deer	<i>Odocoileus hemionus</i>
Mountain lion	<i>Puma concolor</i>
Mourning dove	<i>Zenaida macroura</i>
White-winged dove	<i>Zenaida asiatica</i>
Scaled quail	<i>Callipepla squamata</i>

Source: AZGFD Report, retrieved February 20, 2020 (AZGFD N.d.)

General Wildlife^A	
Common Name	Scientific Name
Birds	
American Bittern	<i>Botaurus lentiginosus</i>
Arizona Bells' vireo	<i>Vireo bellii arizonae</i>
Black-chinned sparrow	<i>Spizella atrogularis</i>
Brewer's sparrow	<i>Spizella breweri</i>
Broad-billed Hummingbird	<i>Cynanthus latirostris</i>
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>
Common black hawk	<i>Buteogallus anthracinus</i>
Common nighthawk	<i>Chordeiles minor</i>
Costa's hummingbird	<i>Calypte costae</i>
Dusky-capped flycatcher	<i>Myiarchus tuberculifer</i>
Eastern meadowlark	<i>Sturnella magna</i>
Elf owl	<i>Micrathene whitneyi</i>
Gila woodpecker	<i>Melanerpes uropygialis</i>
Gray flycatcher	<i>Empidonax wrightii</i>
Juniper titmouse	<i>Baeolophus ridgwayi</i>
Lincoln's sparrow	<i>Melospiza lincolnii</i>
Lucy's warbler	<i>Oreothlypis luciae</i>
Mountain pygmy-owl	<i>Glaucidium gnoma gnoma</i>
Pacific wren	<i>Troglodytes pacificus</i>
Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>
Sage thrasher	<i>Oreoscoptes montanus</i>
Savannah sparrow	<i>Passerculus sandwichensis</i>
Sprague's Pipit	<i>Anthus spragueii</i>
Sulphur-bellied flycatcher	<i>Myiodynastes luteiventris</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Western Grasshopper sparrow	<i>Ammodramus savannarum perpallidus</i>
Whiskered screech-owl	<i>Megascops trichopsis</i>
Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>
Wood duck	<i>Aix sponsa</i>
Yellow warbler	<i>Setophaga petechia</i>
Mammals	
Antelope jackrabbit	<i>Lepus alleni</i>
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>
Harris' antelope squirrel	<i>Ammospermophilus harrisi</i>
Kit fox	<i>Vulpes macrotis</i>
Lesser long-nosed bat	<i>Leptonycteris yerbabuena</i>
Mexican desert bighorn sheep	<i>Ovis canadensis mexicana</i>
Mexican vole	<i>Microtus mexicanus</i>
Northern rock deer mouse	<i>Peromyscus nasutus</i>
Pocketed free-tailed bat	<i>Nyctinomops femorosaccus</i>
Western red bat	<i>Lasiurus blossevillii</i>
Western yellow bat	<i>Lasiurus xanthinus</i>
Yuma myotis	<i>Myotis yumanensis</i>
Amphibians & Reptiles	
Arizona mud turtle	<i>Kinosternon arizonense</i>
Gila monster	<i>Heloderma suspectum</i>
Gila spotted whiptail	<i>Aspidoscelis flagellicauda</i>
Hooded nightsnake	<i>Hypsiglena sp. nov.</i>

General Wildlife ^A	
Common Name	Scientific Name
Regal horned lizard	<i>Phrynosoma solare</i>
Sonoran coralsnake	<i>Micruroides euryxanthus</i>
Sonoran Desert toad	<i>Incilius alvarius</i>
Ornate box turtle	<i>Terrapene ornata</i>
Yellow mud turtle	<i>Kinosternon flavescens</i>

Source: AZGFD Report, retrieved February 20, 2020 (AZGFD N.d.); IDT field visits

^A General wildlife provided by AZGFD is based on Predicted Range Models for within 5 miles of the allotment boundary. It does not guarantee the presence or absence of the species.

General Plant Species Observed by ID Team					
Common Name	Scientific Name	Code	Plant Life Cycle	Status	Key Area(s) Observed
Alkali sacaton	<i>Sporobolus airoides</i>	SPAI	PG	Native	PFC Reaches 1 and 2
Bermuda grass	<i>Cynodon dactylon</i>	CYDA	PG	Non-native	PFC Reaches 1 and 2
Big sacaton	<i>Sporobolus wrightii</i>	SPWR2	PG	Native	Sandy Wash, PFC Reaches 2 and 3
Broom snakeweed	<i>Gutierrezia sarothrae</i>	GUSA2	PF	Native	Limy Fan, Clayey Swale, Sandy Wash
Burroweed	<i>Isocoma tenuisecta</i>	ISTE2	PF	Native	Limy Fan, PFC Reach 1
bush muhly	<i>Muhlenbergia porteri</i>	MUPO2	PG	Native	Limy Fan, Clayey Swale, Sandy Wash
Catclaw acacia	<i>Acacia greggii</i>	ACGR	P-S/T	Native	Limy Fan, Clayey Swale
Creosote bush	<i>Larrea tridentate</i>	LATR2	PS	Native	Sandy Wash, Limy Fan, PFC Reach 3
Crucifixion thorn	<i>Castela emoryi</i>	CAEM4	P-S/T	Native	Clayey Swale
Curly dock	<i>Rumex crispus</i>	RUCR	PF	Non-native	PFC Reach 1 and 3,
Desert wolfberry	<i>Lycium macrodon</i>	LYMA	PS	Native	Sandy Wash
Devil's cholla	<i>Grusonia kunzei</i>	GRKU	PS	Native	Limy Fan
Fourwing saltbush	<i>Atriplex canescens</i>	ATCA2	PS	Native	Sandy Wash, PFC Reach 2 and 3
Graythorn (lotebush)	<i>Ziziphus obtusifolia</i>	ZIOB	P-S/T	Native	Sandy Wash
Mesa dropseed	<i>Sporobolus flexuosus</i>	SPFL2	PG	Native	Limy Fan
Prickly lettuce	<i>Lactuca serriola</i>	LASE	ABF	Non-native	Clayey Swale
Prickly Russian thistle	<i>Salsola tragus</i>	SATR12	AF	Non-native	PFC Reach 3
Rough cocklebur	<i>Xanthium strumarium</i>	XAST	AF	Native	PFC Reach 2 and 3
Saltcedar	<i>Tamarix ramosissima</i>	TARA	P-S/T	AZ Noxious Weed	PFC Reach 1, 2 and 3
Seepwillow (mule-fat)	<i>Baccharis salicifolia</i>	BASA4	PS	Native	PFC Reach 2 and 3

General Plant Species Observed by ID Team					
Common Name	Scientific Name	Code	Plant Life Cycle	Status	Key Area(s) Observed
Silverleaf nightshade	<i>Solanum elaeagnifolium</i>	SOEL	PF	Native	Clayey Swale
Soaptree yucca	<i>Yucca elata</i>	YUEL	P-S/T	Native	Limy Fan, Clayey Swale
Tobosagrass	<i>Pleuraphis mutica</i>	PLUM3	PG	Native	Clayey Swale
Threeawn	<i>Aristida ssp.</i>	ARIST	PG	Native	Limy Fan
Velvet mesquite	<i>Prosopis velutina</i>	PRVE	P-S/T	Native	PFC Reaches 1, 2 and 3
Walkingstick cactus (Cane cholla)	<i>Cylindropuntia spinosior</i>	CYSP8	PS	Native	Limy Fan, Clayey Swale
Western honey mesquite	<i>Prosopis glandulosa</i>	PRGLT	P-S/T	Native	Limy Fan, Clayey Swale
Western tansymustard	<i>Descurainia pinnata</i>	DEPI	ABP-F	Native	Limy Fan, Clayey Swale, Sandy Wash, PFC Reaches 1, 2 and 3
Whitethorn acacia	<i>Vachellia constricta</i>	VACO9	P-S/T	Native	Limy Fan, Clayey Swale, Sandy Wash

PG = Perennial Grass, PS = Perennial Shrub, PF = Perennial Forb, AF = Annual Forb, ABF = Annual/Biennial Forb, ABP-F = Annual/Biennial/Perennial Forb, P-S/T = Perennial Shrub/Tree
Source: USDA NRCS 2019

Appendix C: Key Area Photos



Figure 12. AIM Site BD-4, 2019



Figure 13. AIM Site BD-6, 2019



Figure 14. AIM site BD-6b, 2019



Figure 15. AIM Site BD-8, 2019

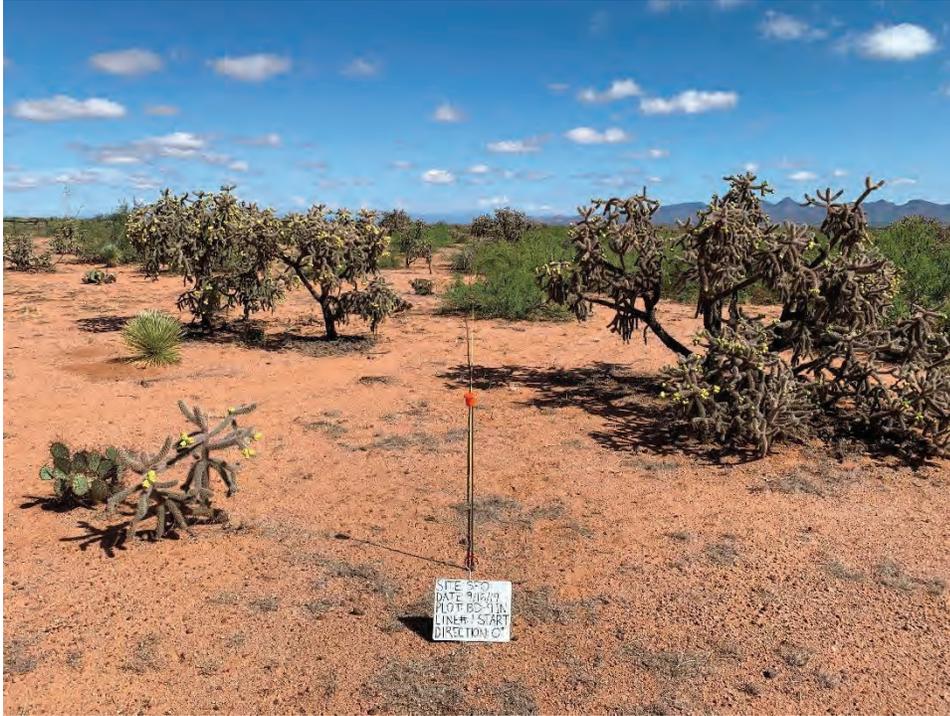


Figure 16. AIM Site BD-9in, 2019



Figure 17. AIM Site BD-9out, 2019



Figure 18. AIM Site BD-10, 2019



Figure 19. AIM Site Fan3, 2019



Figure 20. UA Site BD-4, 2014



Figure 21. UA Site BD-4, 2018



Figure 22. UA Site BD-6, 2018



Figure 23. UA Site BD-6b, 2018



Figure 24. UA Site BD-8, 2014



Figure 25. UA Site BD-8, 2018 (changed location)



Figure 26. UA Site BD-9in, 2014



Figure 27. UA Site BD-9in, 2018



Figure 28. UA Site BD-9out, 2014



Figure 29. UA Site BD-9out, 2018



Figure 30. UA Site BD-10, 2018

Appendix D: Interested Public

Arizona Cattle Growers
1811 S Alma School Rd #255
Mesa, AZ 85210

Arizona Game and Fish Department
WMHB – Project Evaluation Program
5000 West Carefree Highway
Phoenix, AZ 85086-5000

Arizona Game and Fish Department
Region V – Tucson
555 N. Greasewood Rd.
Tucson, AZ 85745

Arizona State Land Department
c/o Ronnie Tsosie
1616 West Adams
Phoenix, AZ 85007

Larry Humphrey
P. O. Box 894
Pima, AZ 85543

Levi Klump
P.O. Box 111 (726 Horse Camp Dr.)
Animas, NM 88020

Natural Resource Conservation Service
267 North 8th Avenue
Safford, AZ 85546-2690

Western Watersheds Project
c/o Cyndi Tuell & Greta Anderson
738 North 5th Avenue, Suite 206
Tucson, AZ 85705

William K. Brandau
P.O. Box 127
Solomon, AZ 85551-0127