



United States Department of Interior
Bureau of Land Management
Agua Fria National Monument
Phoenix District



Land Health Evaluation Cross Y Allotment



Cross Y Allotment, Agua Fria National Monument, Arizona

Table of Contents

Abstract.....	- 1 -
1.0 Information about this Evaluation	- 1 -
1.1 Purpose of this Evaluation.....	- 1 -
1.2 Allotment Information.....	- 1 -
1.3 Relationship to BLM Statutes, Regulations, and Policies.....	- 2 -
1.4 Arizona Standards and Guidelines for Grazing Administration	- 2 -
2.0 Current Livestock Grazing Management.....	- 3 -
2.1 Actual Use by Livestock	- 3 -
2.2 Rangeland Improvements.....	- 4 -
3.0 Soils, Climate, and Ecological Sites	- 4 -
3.1 Soils.....	- 4 -
3.3 Climate	- 5 -
3.4 Ecological Sites	- 6 -
4.0 Vegetation	- 9 -
4.1 Noxious/Invasive Weeds.....	- 9 -
4.2 Current Long-term Monitoring Data.....	- 9 -
4.3 Assessment, Inventory, and Monitoring (AIM) Data	- 13 -
4.4 Vegetation Utilization Data.....	- 13 -
4.5 Desired Upland Plant Community Objectives	- 14 -
5.0 Wildlife	- 17 -
5.1 Threatened & Endangered Species (T&E).....	- 18 -
5.2 Special Status Species	- 19 -
6.0 Aquatic Resources	- 20 -
6.1 Water Quality	- 20 -
6.2 Riparian Area Data.....	- 20 -
6.2 Proper Functioning Condition Assessments	- 20 -
6.3 Multiple Indicator Monitoring	- 21 -
6.4 Riparian Desired Plant Communities.....	- 24 -
7.0 Recreational Resources	- 24 -
8.0 Final Determinations.....	- 25 -
Standard 1 – Upland Sites.....	- 25 -
Standard 2 – Riparian – Wetland Site.....	- 26 -
Standard 3 – Desired Resource Conditions	- 26 -

9.0 List of Preparers - 28 -
10.0 Literature Cited - 29 -
11.0 Maps..... - 30 -
Appendix A..... - 1 -
Assessment, Inventory, and Monitoring (AIM) Data - 17 -

Abstract

Data collected in 2007 - 2009, 2012, and 2014 at various monitoring locations throughout the Cross Y Allotment show the allotment is meeting Arizona Rangeland Health Standard 2 and also portion of Standard 3. However, due to the amount of non-native invasive plant species and high amounts of bare ground and litter cover, large portions of the allotment are not meeting Standard 1, or the upland portion of standard 3. The invasion of non-native plants has proliferated due to increased wildfires that have burned portions of the allotment on several occasions during the past decade. Current livestock grazing management is not considered to be a causal factor for Standard 1 or 3 not being met because livestock have not used the degraded area of the allotment with any measurable intensity for over a decade.

1.0 Information about this Evaluation

1.1 Purpose of this Evaluation

The purpose of this evaluation is to assess whether the Cross Y Allotment is achieving or not achieving the *Arizona Standards for Rangeland Health and Guidelines for Grazing Administration*, along with appropriate BLM Phoenix District land use plan objectives (Table 1 describes the Arizona Standards for Rangeland Health). If standards and other multiple use resource objectives are not being met, or significant progress is not being made toward achieving them, this evaluation will identify the causal factors and identify recommendations for management changes to achieve standards. An interdisciplinary team evaluated all assessment and monitoring data pertaining to the evaluation area.

On July 16, 2009, the BLM, Phoenix District Office, sent notices to interested public and stakeholders of grazing allotments, including the Cross Y Allotment, where grazing permits were being considered for renewal and evaluations are being initiated or continued. The notice requested allotment specific resource data that would assist BLM in analyzing resource conditions on the allotment(s).

A Land Health Evaluation is not a decision document but a stand-alone report that records the analysis and interpretation of the available inventory and monitoring data from the allotment. This document is a draft; comments received from the permittee and/or interested publics will be considered as part of the evaluation process. Several possible actions identified in the evaluation report may produce a desirable outcome: these alternatives will be analyzed in an Environmental Assessment to find out which future management actions are most appropriate.

1.2 Allotment Information

The Cross Y Allotment (Allotment # 06013) is located in Yavapai County, east of Interstate 17 and immediately north of Black Canyon City, Arizona and is entirely within the Agua Fria National Monument. The allotment is 17,072 acres total, 16,140 acres of BLM administered lands (95%) and 932 acres of private lands (5%). The allotment is characterized by Mesa tops and is crossed by the Agua Fria River. The elevation ranges from 2,000 to 3,500 feet. There are approximately 9.5 linear miles of riparian areas along the Agua Fria River within the allotment. See Map 1 for allotment location and boundary information.

1.3 Relationship to BLM Statutes, Regulations, and Policies

The Bureau's objectives for rangeland management are to carry out the intent of the Taylor Grazing Act of 1934, as amended and supplemented, the Federal Land Policy and Management Act of 1976, and the Public Rangelands Improvement Act of 1978.

Title 43 Code of Federal Regulations (CFR) Part 4100 regulations govern grazing administration for public rangelands. Among other things, the regulations require the implementation of standards and guidelines to achieve the fundamentals of rangeland health.

1.4 Arizona Standards and Guidelines for Grazing Administration

The purpose of the Standards and Guidelines is to maintain or improve the health of the public rangelands. Standards and guidelines are intended to help the Bureau, rangeland users, and others focus on a common understanding of acceptable resource conditions and work together to achieve that vision. Standards and Guidelines were incorporated into Phoenix District land use plans in 1995.

As defined by the Arizona Resource Advisory Council, “Standards” are goals for the desired condition of the biological and physical components and characteristics of rangelands. “Guidelines” are management approaches, methods, and practices that are intended to achieve a standard. Guidelines are developed and applied consistent with the desired condition and within the site’s capability and specific public land uses, and may be adjusted over time. Arizona Standards & Guidelines are defined below in Tables 1 and 2.

Table 1. Arizona Standards for Rangeland Health.

Arizona Standards for Rangeland Health	
Standard 1	Upland Sites: Upland soils exhibit infiltration, permeability and erosion rates that are appropriate to soil type, climate and landform (ecological site).
Standard 2	Riparian-Wetland Sites: Riparian-wetland areas are in properly functioning condition.
Standard 3	Desired Resource Conditions: Productive and diverse upland and riparian-wetland plant communities of native species and are maintained
Rangeland Health Attributes	
1. Soil/Site Stability	The capacity of the site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water.
2. Hydrologic Function	The capacity of the site to capture, store and safely release water from rainfall, runoff and snowmelt, to resist reduction in this capacity and recover from disturbance.
3. Biotic Integrity	The capacity of the site to support characteristic functional and structural vegetation communities and to resist loss due to disturbance and recover following disturbance.

The Arizona Guidelines for Grazing Administration (Table 2) are a series of management practices used to ensure that grazing activities meet the Land Health Standards.

Table 2. Arizona Guidelines for Rangeland Health.

Arizona Guidelines	
Guidelines for Standard 1	1-1. Management activities will maintain or promote ground cover that will provide for infiltration, permeability, soil moisture storage, and soil stability appropriate for the ecological sites within management units. The ground cover should maintain soil organisms and plants and animals to support the hydrologic and nutrient cycles, and energy flow. Ground cover and signs of erosion are surrogate measures for hydrologic and nutrient cycles and energy flow.
	1-2. When grazing practices alone are not likely to restore areas of low infiltration or permeability, land management treatments may be designed and implemented to attain improvement.
Guidelines for Standard 2	2-1. Management practices maintain or promote sufficient vegetation to maintain, improve or restore riparian-wetland functions of energy dissipation, sediment capture, groundwater recharge and stream bank stability, thus promoting stream channel morphology (e.g., gradient, width/depth ratio, channel roughness and sinuosity) and functions appropriate to climate and landform.
	2-2. New facilities are located away from riparian-wetland areas if they conflict with achieving or maintaining riparian-wetland function. Existing facilities are used in a way that does not conflict with riparian-wetland functions or are relocated or modified when incompatible with riparian-wetland functions.
	2-3. The development of springs and seeps or other projects affecting water and associated resources shall be designed to protect ecological functions and processes.
Guidelines for Standard 3	3-1. The use and perpetuation of native species will be emphasized. However, when restoring or rehabilitating disturbed or degraded rangelands, non-intrusive, non-native plant species are appropriate for use where native species (a) are not available, (b) are not economically feasible, (c) cannot achieve ecological objectives as well as non-native species, and/or (d) cannot compete with already established non-native species.
	3-2. Conservation of Federal threatened or endangered, proposed, candidate, and other special status species is promoted by the maintenance or restoration of their habitats.
	3-3. Management practices maintain, restore, or enhance water quality in conformance with State or Federal standards.
	3-4. Intensity, season and frequency of use, and distribution of grazing use should provide for growth and reproduction of those plant species needed to reach desired plant community objectives.
	3-5. Grazing on designated ephemeral (annual and perennial) rangeland may be authorized if the following conditions are met: <ul style="list-style-type: none"> • ephemeral vegetation is present in draws, washes, and under shrubs and has grown to useable levels at the time grazing begins; • sufficient surface and subsurface soil moisture exists for continued plant growth; • serviceable waters are capable of providing for proper grazing distribution; • sufficient annual vegetation will remain on site to satisfy other resource concerns, (i.e., watershed, wildlife, wild horses and

- burros); and
- Monitoring is conducted during grazing to determine if objectives are being met.

3-6. Management practices will target those populations of noxious weeds that can be controlled or eliminated by approved methods.

3-7. Management practices to achieve desired plant communities will consider protection and conservation of known cultural resources, including historical sites, and prehistoric sites and plants of significance to Native American peoples.

2.0 Current Livestock Grazing Management

Howard Cattle Company acquired the grazing preference for the Cross Y Allotment in 1998. Permitted livestock for the Cross Y Allotment is 250 cattle on a yearlong grazing system; which is equivalent to 2790 Animal Unit Months (AUMs) per year. An allotment management plan has not been completed for the Cross Y allotment; however the allotment is broken into three main grazing units (See Map 2). These units are the Black Mesa unit, River unit, and South unit. The River unit is located in the middle portion of the allotment and runs north to south. The Agua Fria River is in this unit, composed of one large pasture. This unit is a winter use only pasture from November 1st to February 28th. The South unit is adjacent to the River unit and includes a portion of private land. Livestock are rotated into the unit in February from the River pasture. This unit is used primarily in the spring and fall. The Black Mesa unit is located in the north end of the allotment on a mesa top west of the Agua Fria River along Interstate 17. This is a summer pasture with two water storage tanks.

A wildland fire burned a large portion of the Black Mesa unit in 2005. At that time the lessee agreed to rest both the uplands and riparian area for three years. Prior to the wildfire, the current lessee typically ran a reduce number of cattle ranging from 120 cows or less. In 2009 grazing season, the lessee returned livestock to the allotment starting with 35 head of cattle (See Table 3).

2.1 Actual Use by Livestock

For the Cross Y Allotment, actual use was determined from billing statements over the last 10 years. Starting in 2003, the lessee reduced his livestock numbers due to poor climatic conditions. In 2005, a large wildfire burned most of the Black Mesa area. This was a significant portion of the allotment and a crucial part of the grazing rotation system. The lessee offered to rest his allotment for several years while the Black Mesa area recovered from the burn. Actual use shows that the permittee has only used an average of 17% of their allotted AUMs since 2003.

Table 3. Actual use by livestock from 2003 to 2014.

Year	Livestock Number	Begin Date	End Date	AUMs
2014	50	3/1/2014	2/28/2015	558
2013	50	3/1/2013	2/28/2014	558
2012	75	3/1/2012	2/28/2013	837
2011	50	3/1/2011	2/28/2012	558
2010	40	3/1/2010	2/28/2011	446
2009	35	3/1/2009	2/28/2010	391

Year	Livestock Number	Begin Date	End Date	AUMs
2008	No Use			
2007				
2006				
2005	70	3/1/2005	8/5/2005	338
	6	8/6/2005	8/30/2005	5
	64	8/31/2005	2/28/2006	356
2004	75	3/1/2004	2/28/2005	837
2003	52	3/1/2003	5/31/2003	146
	75	6/1/2003	2/28/2004	626
Average AUMs				471

2.2 Rangeland Improvements

Range Improvement Projects (fences, water developments, etc.) on the Cross Y Allotment were last inventoried in 2010. A 2014 assessment concluded that most of the range improvements in the Cross Y Allotment were in disrepair and in need of being repaired to become functional. Rangeland improvements are important for proper management livestock, but also as important sources of water for wildlife.

3.0 Soils, Climate, and Ecological Sites

3.1 Soils

A soil survey was completed in 1976 by the Natural Resources Conservation Service (NRCS) for Yavapai County, Arizona. These land resource units consists of mountainous areas interrupted by grassy mesas and dissected by deep rough canyons. The drainage pattern is well developed. Drainages are confined in narrow canyons and have little, if any, flood plain areas.

The dominant soils are the Rimrock-Graham complex (Rn) and the Rock Land, Low Rainfall (Rr). Map 2 displays the soil types of the Cross Y Allotment. Rn complex is about 60 percent Rimrock cobbly clay that has slopes of 0 to 8 percent and 30 percent Graham very stony clay loam that has slopes of 8 to 15 percent. These soils are in an intricate pattern on gently to strongly sloping basalt plains that are dissected by few deep drainage ways that have steep sides. The Graham soil is on low ridges and slightly higher lying areas, or near the edges of steep drainage ways. Included with these soils in mapping are small areas of Rimrock gravelly clay loam and Graham very stony clay loam that has slopes of 0 to 8 percent. Also included are areas of House Mountain very rocky and gravelly loam and rock outcrops in the Graham soil. Runoff is slow to medium on these soils. The hazard of erosion is slight to moderate.

Rock Land, Low Rainfall (Rr) soils consists of 50 to 90 percent rock outcrops, and the rest is shallow and very shallow soils. This soil typically occurs on mild to steep on hills, mountains, and divides that are dissected by numerous drainage ways and vertical escarpments. The rock outcrops are basalt, andesite, granite, or tuff. Annual precipitation is less than 12 inches. Runoff is medium to high. The hazard of erosion is slight. The vegetation is sparse cover of desert

shrubs and an understory that is dominantly annual grasses. Forage production is severely limited because of the rock outcrops, limited rainfall, and shallow and very shallow depth of bedrock.

3.3 Climate

The Cross Y Allotment lies in the annual precipitation zones of 10 to 13 inches and 12 to 16 inches, occurring at elevations of 2000 to 4500 feet. Summer rains that fall July through September originate on the Gulf of Mexico, and are convective, usually brief, intense thunderstorms. Cool season moisture tends to be frontal, originating in the Pacific and Gulf of California. This winter precipitation falls in widespread storms with long duration and low intensity. Snow is rare and seldom lasts more than an hour or two. May and June are the driest months of the year. Humidity is generally very low. Winter temperatures are mild, with very few days recording freezing temperatures in the morning. Average annual air temperatures range from 59 to 70 degrees Fahrenheit.

Drought is a recurrent feature of Arizona. Drought should not be confused with aridity. Drought has been defined as a period when precipitation is less than 75 percent of the average amount (Society for Range Management 1989) while aridity refers to areas of low rainfall that are a permanent feature of climate. Klages (1942) concluded that “even slight reductions from normal precipitation can cause severe reductions in plant yield in areas below 300 mm (\approx 11.81 inches) of precipitation. Two or more consecutive years of drought have far more impact on vegetation than one year of drought followed by normal or above-normal precipitation.”

The Allotment lies within the 10-13” and 12-16” precipitation zones. At key areas located at the lower level of each precipitation zone (10” and 12” respectively), the normal range of variability for these sites usually lends itself to lower perennial grass growth in a shrub-dominated ecological site. In contrast, sites located in the upper limits of the precipitation zones (particularly in the 12-16” zone) are typically capable of producing a higher perennial grass component. Slope and aspect of the site also play a factor in vegetative composition and forage production capability. Furthermore, the rainfall ratio for the Cross Y Allotment is approximately 60% winter: 40% summer precipitation. This ratio results in more precipitation being available for cool-season vegetation (shrubs and forbs) and less available moisture for warm-season vegetation such as perennial grasses.

Climate data from 2002 indicates a severe drought that year, with only 4.91 inches of rain for the year. In contrast, 2008 precipitation was slightly above average. These climatic variations could account for some of the differences found in the data between 2003 and 2008/2009. The permittee has responded to drought conditions by removing or reducing the number of livestock on the allotment during those times.

Precipitation

Precipitation data was obtained from the Western Regional Climate Center web site, (www.wrcc.dri.edu). Data collected at the Cordes climate station located approximately 7 miles northwest of the Cross Y allotment, indicate the 10 year average between 2004 and 2013 was 12.2 inches. During this same time frame, the average high temperature was 75.7 degrees F and the average low temperature was 46.9 degrees F. Yearly precipitation totals ranged from a low of 15.06 inches in 2004 to a high of 20.66 inches in 2010 (Table 4). Five of the last ten years have

been above average precipitation with five years below the average. The average precipitation by month for the period of 2004 – 2013 is shown in Table 4:

Table 4. Precipitation totals by month from 2004 to 2013.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
January	0.14	0.85	0	0.74	5.01	1.13	9.43	0	0.06	2.49
February	1.86	1.6	0	1.13	1.48	2.28	1.68	1.16	0.08	0.2
March	1.36	0.94	1.19	1.22	0	0	2.02	0.65	1.04	1.28
April	1.66	0.42	0.05	0.02	0	1.05	0.12	0.68	0.1	0.03
May	0	0	0	0	0.44	1.06	0	0.07	0	0
June	0	0.07	0.85	0	0	0	0	0	0	0
July	2.1	0.78	0.61	2.01	2.62	1.4	1.52	0.71	1.59	1.59
August	0.19	1.48	1.68	0.42	1.63	0.44	0.7	0.28	0.78	2.78
September	1.97	0.54	0.8	1.79	0.49	0.05	0.11	0.53	1.19	2.39
October	2.32	1.07	0.98	0.04	0	0.02	1.16	0.52	0.34	0.04
November	1.98	0.44	0	2.3	1.58	0	0.36	1.72	0.05	2.99
December	1.48	0	0.4	4.29	3.31	3.52	3.56	2.58	2.18	0.95
Totals	15.06	8.19	6.56	13.96	16.56	10.95	20.66	8.9	7.41	14.74

3.4 Ecological Sites

The National Range and Pasture Handbook states (NRCS 2003), “An Ecological Site is a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.” The vegetative community has an association of species that differs from other ecological sites in kind and proportion of species and annual production.

Two different Major Land Resource Areas (MLRA) are represented in this allotment:

- MLRA 38-1, The Arizona Interior Chaparral 12-16” annual precipitation
- MLRA 40-1, Sonoran Basin and Range 10-13” annual precipitation

Ecological sites have soil characteristics that have developed over time. The development of soil is dependent on parent material, climate, living organisms, topography and time. Soils with similar characteristics support and produce a distinctive kind and amount of vegetation and are grouped into the same ecological site. This information is recorded as the total pounds of production of the above ground portions of the plant community produced on one acre in a year. Total production is air-dry weight and is estimated relative to the Ecological Site Description. For more information about ESI is in the above section, or available at the Natural Resources Conservation Service’s *Major Land Resource Area (MLRA)*.

An ecological site inventory was updated in 2012 for the Agua Fria National Monument. Five ecological site types or associations of those types are located within the Cross Y Allotment boundary (see Map 3). The following descriptions outline each ecological site in detail:

Loamy Bottom 10-13” pz - This site occurs in the lower bottom drainages of the Sonoran Desert Basin. It benefits significantly from run-in moisture from adjacent areas. It can occur in all

exposures. It usually occurs as recent alluvial deposits along drainage ways and recent alluvial fans. It typically occurs between 2800 and 4800 feet in elevation with slopes less than 2%. The soils characterizing this site are deep to bedrock or other plant root restricting layers. The surface soil depth ranges from 4 to 10 inches and texture is loam, or silty clay loam. The underlying layers have permeability ranging from moderate to moderately slow, but can absorb and hold all the moisture the climate supplies. The plant community on this range site is a mixture of grasses, forbs, trees and desert shrubs. The grasses are a mixture of tall growing and mid grasses. Warm season grasses are dominant in the potential community. Key areas have been established within this ecological site to assess the proper functioning condition of the riparian areas and the Agua Fria River.

Basalt Hills 10-13” pz - This site occurs in the upper elevations of the Sonoran Desert on hill slopes, ridge tops and mesas. It typically occurs between 2200 and 4000 feet in elevation with 15 to 60 percent slopes. The site is characterized by shallow soils formed on basic igneous parent material (Basalt) with calcareous loams and extremely well developed, very dark colored, cobble and stone covers. Large areas of talus or rock slides occur intermingled with soil areas. The historic plant community is a diverse mixture of desert trees, shrubs, cacti, grasses and forbs such as: foothill palo verde, saguaro, calliandra, mormon tea, brittlebush, range ratany, bursage, bush muhly, tobosa, and annual grasses.

Volcanic Upland 12-16” pz - This site occurs in the lower elevations of the Mogollon Transition zone south of the rim in central Arizona. This site occurs in an upland position. It occurs on gently sloping pediments, basalt flows and mesa tops. These soils are shallow (10 to 20 inches deep), clayey throughout and well drained. They are formed in alluvium from basalt, andesite and related volcanic tuff and ash. The surface textures are clayloam and clay. These soils have vertic properties and crack and churn with wetting and drying. The effective rooting depth is limited due to hard bedrock at 20 inches or less. Runoff is slow on dry soils due to cracks and holes, but is high on moist soils. The erosion hazard is slight unless heavy traffic causes trailing and compaction. The historic native plant community is a mixed shrub, succulent, grass community (tobosa dominated) with a diverse flora of native annual grasses and forbs of both the winter and summer season. Periodic wildfires which burned adjacent sites with deep soils, would not carry easily through these areas with shallow soils and poor fuel continuity. In the absence of fire for longer periods shrubs and cacti can exist in the potential plant community. The interactions of drought, grazing and fire can result in loss of tobosa cover. If tobosa canopy cover is reduced to less than 5% and is patchy in distribution; it may not be able to re-colonize large areas. In these situations, annual species, both native and non-native can dominate the plant community. Non-native annuals may, over time, diminish the soil seed-bank of native annual species.

Clayey Upland 12-16” pz - This site occurs in the lower elevations of the Mogollon Transition zone south of the rim in central Arizona. It occurs in an upland position, on gently sloping valley fill plains, basalt flow and mesa tops. It typically occurs between 3200 and 4600 feet elevation with 0 to 8 percent slopes. This ecological site is characterized by well-drained, moderately deep to deep soils (30 to over 60 inches) with moderate to high available water capacity and a slight erosion hazard. They have formed in alluvium from basalt, andesite and related volcanic tuff and ash. The surface textures are clay and silty clay except that granular silty clay loam or heavy

clay loam are at the surface in some places. These soils have vertic properties and crack and churn with wetting and drying. The historic native plant community is a tobosa grassland with a diverse flora of native annual grasses and forbs of both cool season and warm season species. The overstory cover consists of a few shrubs and pinyon-juniper (10-15%). Broom snakeweed (*Gutierrezia sarothrae*), juniper, cacti, mullein (*Verbascum* spp.), and annuals are the most common increasers and invaders on this site. Historically, periodic wildfires occurred every 15 years; June through August, and controlled shrubs and succulents encroaching from adjacent areas of shallow soils. Low value forage plants tend to expand their range on this site with sustained winter and spring grazing. This is the most extensively found ecological site within the Cross Y Allotment.

Clay Loam Upland 12-16" pz - This site occurs at the lowest elevations of the interior chaparral zone in the Mogollon Transition area. It occurs in an upland position. It is on gentle slopes, fan terraces, ridge-tops and mesa tops. It typically occurs between 3100 and 4600 feet in elevation with 15 to 45 percent slopes. These soils are moderately deep to deep (30-60 inches) and dark colored in the surface (6-12 inches). They are clayey textured, gravelly to very gravelly and well drained. They have formed in alluvium and colluvium from a variety of parent materials. They do not exhibit vertic soil properties (cracking and churning). Soil surfaces can be covered by gravels, cobbles and/or stones. The erosion hazard is moderate to high where plant or gravel covers are inadequate. The historic native plant community is dominated by tobosa and other perennial warm season grasses with a mixture of desert shrubs, half shrubs, succulents and forbs. This includes a diverse flora of native annual grasses and forbs of both the winter and summer seasons. Periodic wildfires occurred at moderate intervals (15 to 30 years) and helped to maintain a balance between grasses and shrubs. The interactions of drought, fire and continuous livestock grazing can, over time, result in the loss of perennial grasses, half shrubs and suffrutescent forbs on this site. The lack of fire for very long periods can lead to increases in large shrubs/succulents like prickly pear, and whitethorn acacia. Trees like juniper, paloverde, mesquite and canotia can increase as well. In some situations non-native annuals can dominate the site. These species can, over time, diminish the soil seed-bank of native annual species. Non-native annuals can act to increase the fire frequency of areas of the site near roads and urban areas, where the incidence of man-made fires is high.

Volcanic Hills 12-16" pz Clayey - This site occurs in the lower elevations of the interior chaparral zone, south of the Mogollon Rim in central Arizona. This site occurs in an upland position. It occurs on rugged mountain slopes, ridge-tops and mesa sides. Elevations range from 3200 to 4600 feet. Slopes are from 15 to 70 percent. These soils are shallow (10 to 20 inches) and dark colored. They are clayey throughout (smectitic) and well drained. They have formed in residuum and slope alluvium from basalt, andesite and related volcanic tuffs and ash. The surface textures are clayloam to clay. Surfaces are well covered by dark colored; gravels, cobbles and stones. The effective rooting depth is limited by hard bedrock at 10 to 20 inches. Runoff is moderate to high on moist soils. The erosion hazard is slight due to gravel, cobble and rock covers. The historic native plant community is a diverse mixture of desert trees, shrubs, succulents, forbs and grasses. This includes a diverse flora of native annual grasses and forbs of both the winter and summer seasons. Periodic wildfires occurred at moderate intervals (15 to 30 years) and helped maintain a balance between herbs and shrubs. In the absence of fire for longer periods, shrubby species and cacti can become dominant. The interactions of drought, fire and

continuous livestock grazing can, over time, result in the loss of palatable grasses, half shrubs and suffrutescent forbs. In some situations non-native annuals can dominate the site. These species can, over time, diminish the soil seed-bank of native annual species. Non-native annuals can act to increase the fire frequency of areas of the site near roads and urban areas, where the incidence of man-made fires is high.

4.0 Vegetation

This section identifies the vegetation characteristics of the Cross Y Allotment through the use of ecological site descriptions provided by the Natural Resource Conservation Service. This section also examines current vegetation and rangeland health monitoring data.

4.1 Noxious/Invasive Weeds

Red Brome and Wild Oats have become naturalized over much of Arizona. Salt cedar, Black mustard, Spiny cocklebur, Buffelgrass, and Malta starthistle are present within the Agua National Monument and occur within the Cross Y Allotment.

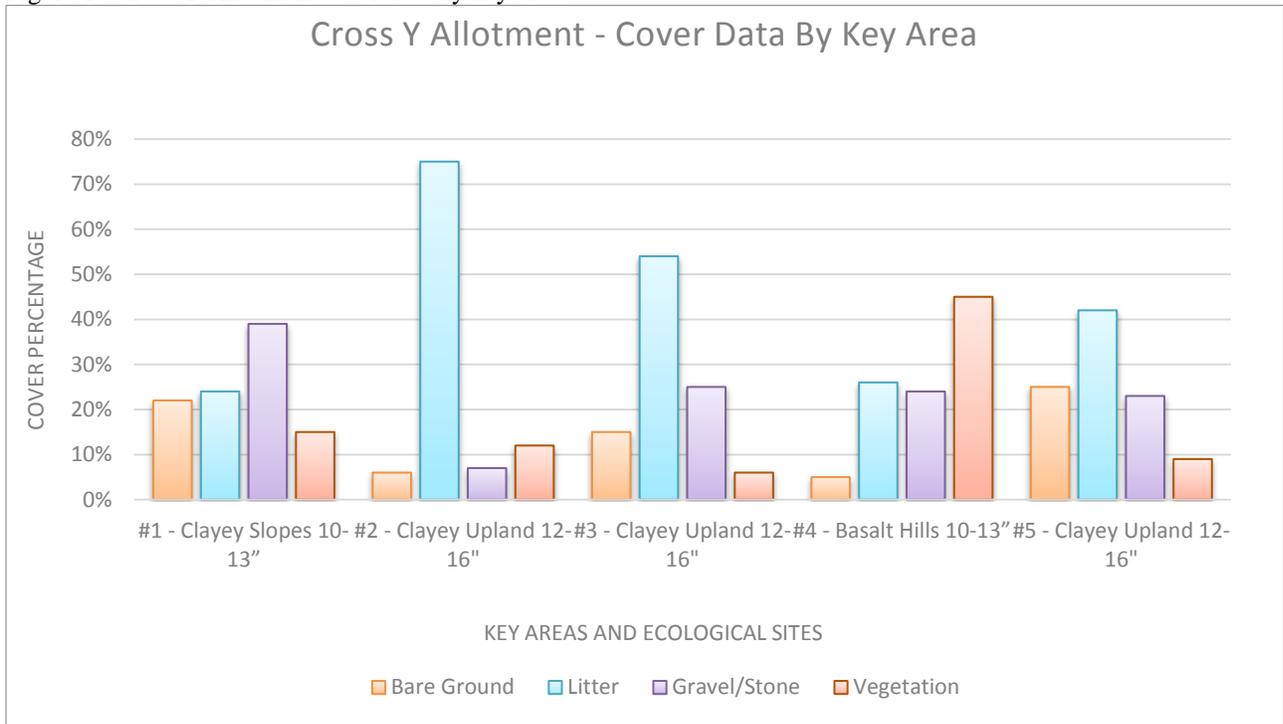
The Black Mesa area is north of Black Canyon City and south of Badger Springs exit along the east side of Interstate 17. This particular mesa has been and continues to be heavily impacted by frequent wildfire. As a result, the dominant native grasses have suffered a high mortality rate and the establishment of non-native grasses and forbs is increasing.

4.2 Current Long-term Monitoring Data

Long-term monitoring key areas were established in the Cross Y Allotment in 2007 and 2008 (Map 1). Key areas represent plant communities over similar areas in the allotment and serve as representative samples of range condition, trend, use, and production. A key area is a relatively small portion of a unit selected because of its location, use or grazing value as a monitoring point for measuring changes in vegetation and the impacts of grazing. This section summarizes the results of all Key Area (KA) data collected and analyzed. More detailed information and data for each key area are provided in Appendix A.

Cover: Cover is defined as the percentage of ground surface covered by vegetation or other coverages including rocks (gravel/stone), litter, or bare ground. Cover data is useful when evaluating soil stability and hydrologic processes on rangelands; this is because different types of coverages have influences on rain interception and infiltration and runoff rates. According to the appropriate correlated Ecological Site Descriptions for the Cross Y Allotment, ground cover for adequate soil stability and hydrologic function fall within appropriate percentages at Key Areas 1 and 4. Percentages fell outside of appropriate percentages at Key Areas 2, 3, and 5. For more detailed information about cover data please refer to Appendix A. The following figure shows the cover data at each key area:

Figure 1. Cross Y Allotment cover data by key area.



Frequency: Frequency of species occurrence data was collected at all of the Cross Y Key Areas in 2007 and 2008. Repeat frequency data was collected in 2012 at Key Areas 2, 3, and 5. Frequency shows, in percent, how many times a particular species is present along a transect line during a vegetation study. Plant frequency is a function of quadrat size and reflects both plant density and dispersion. The sensitivity of frequency data to density and dispersion make frequency a useful parameter for monitoring and documenting changes in plant communities. Frequency data shows most of the ecosystems within the Cross Y Allotment are being driven by low precipitation and the onset of drought. This is shown through the rapid decline of Blue Dicks at several key areas. The following figures represent the repeat frequency data collected for the three key areas in 2008 and 2012. For more information about frequency data refer to Appendix A.

Figure 2. Key Area 2 Frequency Data compared between 2008 and 2012.

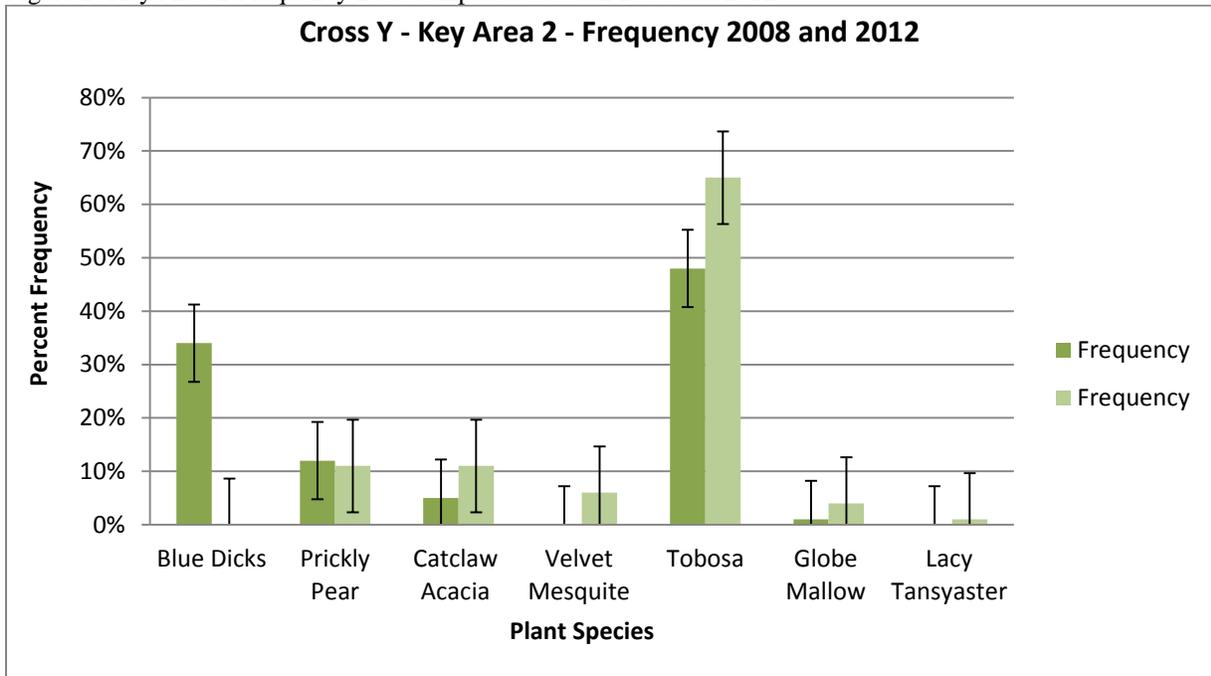


Figure 3. Key Area 3 Frequency Data compared between 2008 and 2012.

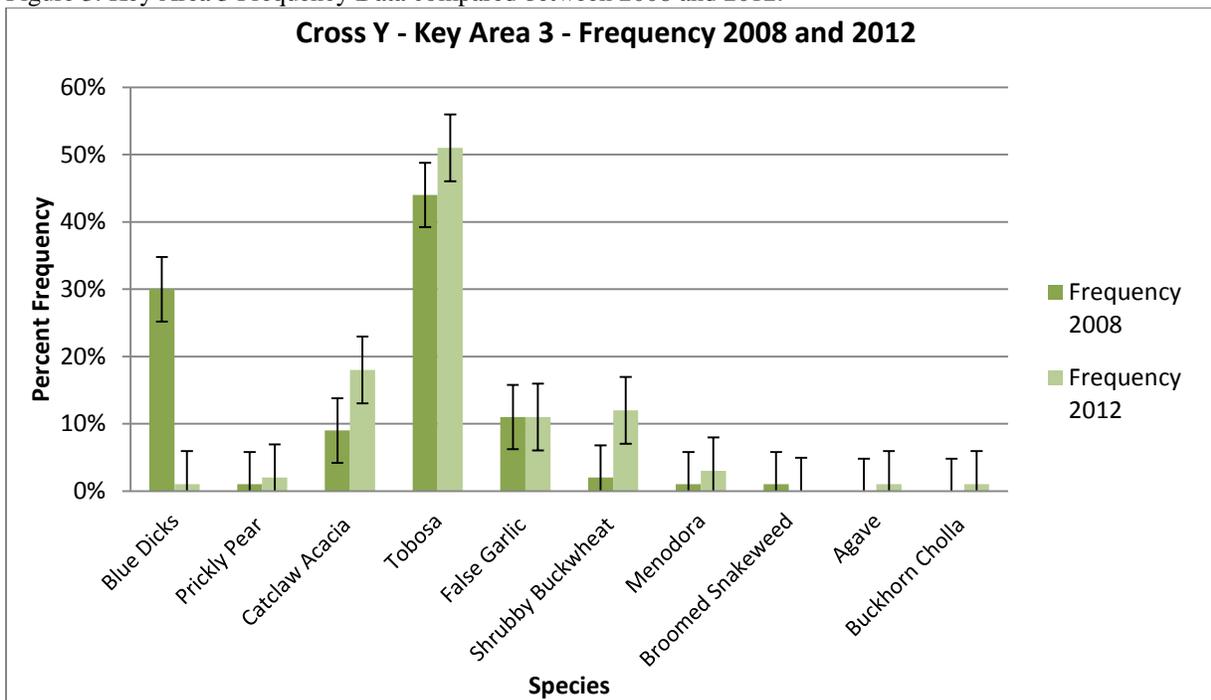
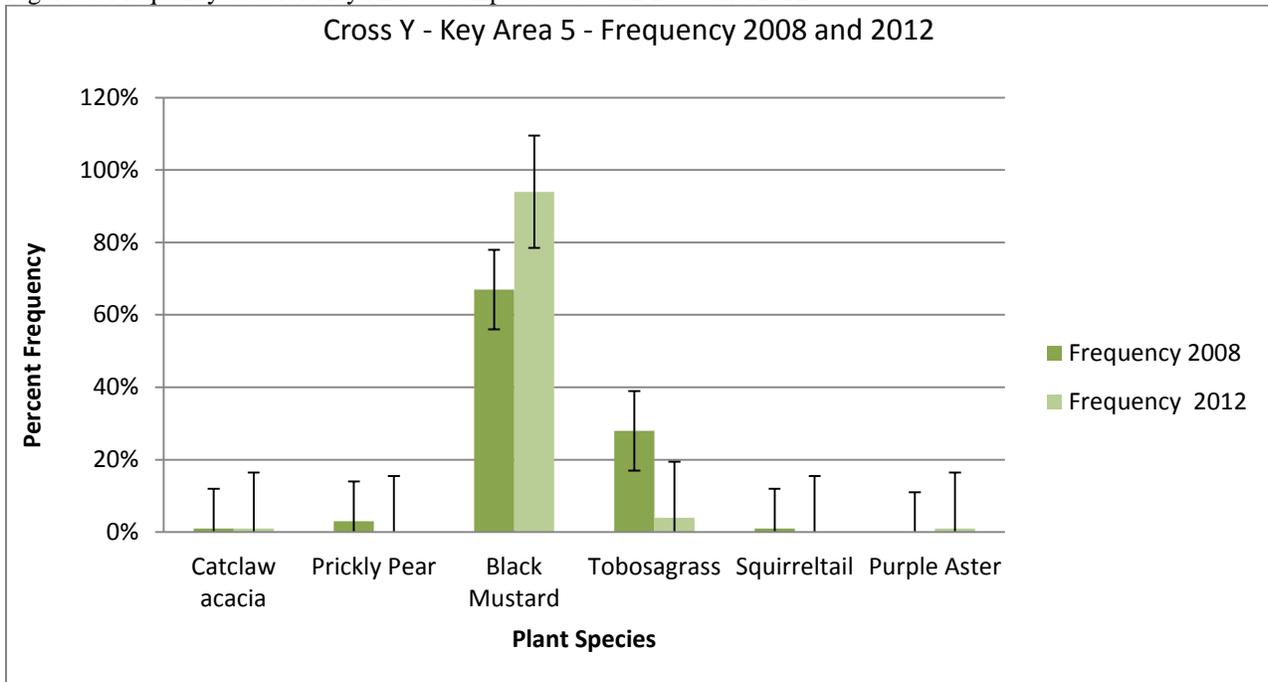


Figure 4. Frequency data for Key Area 5 compared between 2008 and 2012.



Rangeland Health: A Rangeland Health Assessment is a qualitative assessment for determining the condition of rangeland ecosystems against a reference condition that is determined ahead of time for each ecological site. Interpreting Indicators of Rangeland Health is based on 17 quickly-assessed qualitative indicators that provides a preliminary evaluation of soil/site stability, hydrologic function, and biotic integrity (at the ecological site level). The product of this assessment is not a single rating of rangeland health, rather a qualitative assessment of these three components which are referred to as attributes. More detailed information about Rangeland Health can be found in Appendix A. Table 5 illustrates the degree of departure for each of the three rangeland health attribute from PNC at Cross Y Allotment key areas 2-5:

Table 5. 2012 RHE attribute rating table illustrating departures from PNC.

Key Area	Rangeland Health Attribute	Attribute Rating – Departure from Site Capability
Volcanic Hills 1 12–16" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	None to Slight
Clayey Upland 2 12–16" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	Slight to Moderate
Clayey Upland 3 12–16" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	Slight to Moderate
Basalt Hills 4 10–13" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	None to Slight
Clayey Upland 5	Soil / Site Stability	None to Slight

Key Area	Rangeland Health Attribute	Attribute Rating – Departure from Site Capability
12–16” pz	Hydrologic Function Biotic Integrity	Slight to Moderate Moderate

Species Composition: Species composition is the percentage of various plant species relative to a total given area. The dry-weight rank method was used to determine species composition and is specifically designed to determine species composition on rangelands by providing a measure of the relative contribution of various species to the total biomass (based on dry matter content) for a site. For more information about species composition at the Cross Y Allotment please refer to Appendix A.

4.3 Assessment, Inventory, and Monitoring (AIM) Data

The BLM has begun implementing the Assessment, Inventory, and Monitoring (AIM) protocol on BLM administered lands across the country (Toevs et al. 2011). Baseline data was collected in the Cross Y Allotment in 2012 at 5 randomly selected locations that were stratified to correlate with subpopulations of plant communities found within different ecological sites. For more information about the AIM monitoring protocols and plot locations please refer to Appendix A.

4.4 Vegetation Utilization Data

Vegetation utilization examines the percentage of usable herbaceous plant material removed by ungulates from various plant communities found within the allotment (Interagency Technical Reference 1734-3). Utilization monitoring, when used with other monitoring information can be employed to 1) analyze animal distribution within allotments; 2) track and observe cause and effect relationships for observed changes in resource attributes, such as soil cover, species composition, residual cover, etc.; and 3) adjust stocking rates and/or timing of grazing to correlate with resource objectives (Interagency Technical Reference 1734-3). Utilization studies during 2012 and 2014 show utilization levels at 4% for the allotment; these levels are extremely low and fall within the “no use” utilization rating category. The following table shows utilization levels from the 2012 and 2014 grazing seasons:

Table 6. Forage utilization levels from 2012 and 2104.

Year	Key Area	Species	Utilization Level
2012	Lim-2	Tobosagrass	2.5
2012	CU-3	Tobosagrass	2.5
2012	CU-5	Tobosagrass	9
2012	CU-6	Tobosagrass	2.5
2012	CU-7	Tobosagrass	2.5
2012	CU-7	Curly-mesquite	2.5
2012	T-3	Tobosagrass	6
2012	T-3	Shrubby Buckwheat	11
2014	1	Tobosagrass	2.5
2014	1	Curly Mesquite	2.5

Year	Key Area	Species	Utilization Level
2014	2	Tobosagrass	2.5
2014	3	Tobosagrass	2.5
2014	4	Tobosagrass	6
2014	5	Tobosagrass	2.5
Average Utilization			4%

4.5 Desired Upland Plant Community Objectives

Desired Plant Community (DPC) objectives address the desired resource conditions based on vegetation attributes, such as composition, structure, and cover that are desired within the allotment. These include establishing vegetative characteristics necessary for soil protection, providing forage and habitat for both livestock and wildlife. Site potentials (soil, climate, topography) establish the natural limits on what can be produced in terms of vegetation and related resource values like forage, wildlife habitat and watershed characteristics.

Desired Plant Community objectives also address the multiple uses and requirements of the Taylor Grazing Act, Federal Land Policy and Management Act, Endangered Species Act, and appropriate laws, regulations, and policies. They incorporate desired attributes from both the Arizona Standards for Rangeland Health and the Agua Fria National Monument Resource Management Plans objectives into quantifiable vegetation objectives and wildlife habitat requirements on a site-specific level for the allotment. They were developed from the vegetation potentials from the NRCS Ecological Site Guide to determine the potential for the site.

Specifically, DPC objectives aim to maintain or increase vegetative cover and key perennial grass and browse species at compositions that are appropriate for each ecological site. These objectives only apply where the potential exists and are based on near normal year's precipitation. Fluctuations in species composition may occur from year to year depending on abnormal precipitation or other climatic factors. DPC objectives and corresponding rationale for each Cross Y Ecological Sites are as follows:

Desired Plant Community Objectives – Clayey Upland 12-16” PZ:

1. Increase composition of native grasses to 70% of the plant community by 2025.
2. In areas where Tobosa is decreasing (Key Area 5), increase Tobosa composition to a minimum of 20% of the plant community by 2025.
3. In areas where Tobosa is not decreasing, maintain Tobosa composition at 40% or higher.
4. Maintain or reduce Catclaw acacia or other native increaser shrubs to less than 5% of the composition of the plant community.
5. Reduce composition of non-native annual grasses and forbs to less than 5% of the plant community.

Rationale: The potential natural plant community of a Clayey Upland 12-16” p.z. ecological site is a Tobosa grassland with diverse amounts of native annual grasses and forbs. This ecological site has evolved with periodic wildfire typically occurring once every 15-30 years; June through

August. These wildfires controlled shrubs and succulents from encroaching from adjacent areas where soils are much shallower. In the absence of fire for long periods of time, shrubs and cacti can become dominant and can outcompete native herbaceous species. The interactions of drought, grazing, and fire can result in loss of tobosa cover. If tobosa canopy cover is reduced to less than 5% and is patchy in distribution; it may not be able to re-colonize large areas. Keeping Tobosa composition at levels above 5% is extremely important for various wildlife species and provides hiding cover for pronghorns when taller than 8-15 inches (Yoakum 2006, AZGFD 2011). Annual species, both native and non-native can dominate the plant community in this ecological site. Non-native annuals can diminish the soil seed-bank of native annual species, completely changing the dynamics of the ecosystem.

Desired Plant Community Objectives – Volcanic Hills 12-16” PZ:

6. Maintain perennial grasses, subshrubs and forbs at ≥ 60 -80% of the plant community composition.
7. Maintain tobosa and curly mesquite composition at greater than $\geq 40\%$. 12-16 pz ESD predicts $\sim 50\%$ between two species, 10-13 pz predicts 20%,. Predicts 50%. Clayey soils expect more grasses and herbaceous. Precip more on the MLRA 40 side.
8. Maintain composition of large shrubs, succulents and trees at 10-20% of plant community. Maintain bare ground below 20%. Provide soil stability, adequate hydrologic infiltration rates, prevent invasive

Rationale: The potential natural plant community of a Volcanic Hills 12-16” p.z. ecological site is a diverse mixture of desert trees, shrubs, succulents, forbs, and grasses. This ecological site has evolved with periodic wildfire typically occurring once every 15-30 years; June through August. These wildfires controlled shrubs and succulents from encroaching from adjacent areas where soils are much shallower. In the absence of fire for long periods of time, shrubs and cacti can become dominant and can outcompete native herbaceous species. The interactions of drought, grazing, and fire can result in loss of tobosa cover. If tobosa canopy cover is reduced to less than 5% and is patchy in distribution; it may not be able to re-colonize large areas. Keeping Tobosa composition at levels above 5% is extremely important for various wildlife species. Annual species, both native and non-native can dominate the plant community in this ecological site. Non-native annuals can diminish the soil seed-bank of native annual species, completely changing the dynamics of the ecosystem.

Key area 1, representative of the volcanic hills 12-16”p.z., falls within an area mapped as category 2 desert tortoise habitat. Habitat requirements for the desert tortoise are met within this area and the species is expected to occur in the area. Plant community objectives ensure adequate and diverse plant community is available for forage needs and fall within the ecological site potential. Other species such as deer will also benefit by a divers composition of trees, shrubs, succulents, forges and grasses (Krausman 1997, Heffelfinger et al. 2006).

Desired Plant Community Objectives – Basalt Hill 10-13” PZ:

1. Increase total native grass and forb composition to 15% by 2025 for Desert Tortoises that reside within this area of the allotment.

2. Reduce Velvet mesquite composition to 10% by 2025.
3. Maintain tree, shrub, and succulent (cacti) composition at less than 80% and greater than 50% of the plant community.
4. Maintain palatable browse species at more than 40% composition of the plant community.

Rationale: Maintain a diverse native plant community of desert trees, shrubs, cacti, grasses and forbs. Natural incidences of fire in this MLRA are very low and fires are much more common from man-made ignitions. Palo verde and saguaro can be severely impacted and may take long periods of time (30-50 years) to recover to pre-fire composition. This plant community is highly susceptible to invasion by non-native species such as wild oats or red brome. Maintaining the native plant community is very important in reducing the niche often occupied by invasive non-native grasses.

Key area 4, representative of the basalt hills 10-13”p.z., falls within an area mapped as category 2 desert tortoise habitat. Habitat requirements for the desert tortoise are met within this area and desert tortoises are expected to occur in the area. Plant community objectives ensure adequate and diverse plant community is available for forage needs and fall within the ecological site potential. It is expected shrubs and trees will dominate this ecological site but slight reduction in shrub/tree cover will open niches for perennial grasses which are expected to comprise a greater composition of the plant community. Other species such as deer will also benefit by a divers composition of trees, shrubs, succulents, forges and grasses (Krausman 1997, Heffelfinger et al. 2006).

Desired Plant Community Objectives – Clay Loam Upland 12-16” PZ:

1. Increase Tobosa grass canopy cover to 15% by 2025.
2. Reduce Catclaw acacia cover to 5% by 2025.
3. Increase half shrubs cover to 10% by 2025.

Rationale: The historic native plant community is a tobosa grassland with diverse flora of native annual grasses and forbs of both the winter and summer season. Control shrubs and succulents encroaching from adjacent areas of shallow soils. Periodic wildfire occurred every 15-30 years; June through August, and controlled shrubs and succulents encroaching from adjacent areas of shallow soils. In the absence of fire for long periods shrubs and cacti can become dominant. The interactions of drought, grazing and fire can result in loss of tobosa cover. If tobosa canopy cover is reduced to less than 5% and is patchy in distribution; it may not be able to re-colonize large areas. Annual species, both native and non-native can dominate the plant community. Non-native annuals can diminish the soil seed-back of native annual species.

The randomly selected monitoring plot for this ecological site was located in close proximity (300 feet) of a water facility. Consequently, it is expected that perennial grass composition will be lower than predicted in the ecological site description. A DPC objective to increase tobosa cover at this site will ensure the persistence tobosa on the site. Although not directly related to composition, a reduction of catclaw cover to 5% will increase the potential for native grasses to increase in composition along with half shrubs which will improve mule deer habitat (Krausman 1997, Heffelfinger et al. 2006).

Desired Plant Community Objectives – Volcanic Upland 12-16” PZ:

1. Increase Tobosa grass canopy cover to 15% by 2025.
2. Decrease invasive annual plant cover to 5% by 2025.
3. Increase half shrubs cover to 10% by 2025.
4. Maintain native herbaceous plant cover at current levels (>70%).

Rationale: The historic native plant community is a tobosa grassland with diverse flora of native annual grasses and forbs of both the winter and summer season. Control shrubs and succulents encroaching from adjacent areas of shallow soils. Periodic wildfire occurred every 15-30 years; June through August, and controlled shrubs and succulents encroaching from adjacent areas of shallow soils. In the absence of fire for long periods shrubs and cacti can become dominant. The interactions of drought, grazing and fire can result in loss of tobosa cover. If tobosa canopy cover is reduced to less than 5% and is patchy in distribution; it may not be able to re-colonize large areas. Annual species, both native and non-native can dominate the plant community. Non-native annuals can diminish the soil seed-bank of native annual species.

The maintenance of native herbaceous plant cover at >70% will serve to meet hiding and thermal cover needs of many wildlife species such as mule deer, Gambel’s quail, and javelina and many other upland bird species, small mammals and reptiles. An increase of tobosa to 15% will increase perennial ground cover and reduce cover provided by annuals which is more dependent upon precipitation patterns. An increase of half shrub cover will serve to improve the amount of cover and forage which will benefit mule deer (Heffelfinger et al. 2006).

5.0 Wildlife

The Cross Y Allotment is located within the Arizona Game and Fish Department management unit 21. Big game species that inhabit the allotment area include, but are not limited to: mule deer (*Odocoileus hemionus*), white-tailed deer (*Odocoileus virginianus*), pronghorn (*Antilocapra americana*), javelina (*Pecari tajacu*), mountain lion (*Puma concolor*), and black bear (*Ursus americanus*). These species are likely to utilize all habitats in and around the allotment, either year round or seasonally. Riparian areas provide cover and travel corridors. Big game populations have been generally down for the last decade.

Small game and fur-bearing species inhabiting the area include black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus auduboni*), skunks (*Mephitis* spp.), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*) and raccoon (*Procyon lotor*).

Other wildlife species present on the allotment include various migratory birds, bats, small mammals, reptiles, amphibians and native fish. To date, 197 bird species have been documented in the Agua Fria National Monument, many of which likely occur within the Cross Y allotment. Examples of wildlife present include yellow warbler (*Dendroica petchia*), summer tanager (*Piranga rubra*), hoary bat (*Lasiurus cinereus*), pocket mice (*Perognathus* spp.), rattlesnakes (*Crotalus* spp), black-necked garter snake (*Thamnophis cyrtopsis*) and canyon treefrog (*Hyla arenicolor*).

Four exotic species are important to note in this allotment: fathead minnow (*Pimephales promelas*), green sunfish (*Lepomis cyanellus*), crayfish, and bullfrog (*Rana catesbeiana*). The

crayfish is known for modifying vegetation in a stream, and the bullfrog can be a considerable predator on small fish, leopard frogs, and garter snakes. Green sunfish are significant predators of native fishes. The fathead minnow is not known to impact native fishes directly, but may compete for food sources. The fathead minnow is commonly found in all types of slow waters; it is tolerant of high temperatures, turbid water, low oxygen levels, and high saline levels.

5.1 Threatened & Endangered Species (T&E)

The Cross Y allotment is contains habitat for, and populations of, many species listed as endangered or proposed as threatened. Critical habitat has been designated for one species within the allotment and proposed for another. Other endangered species occupy portions of the allotment but critical habitat has not been designated. Threatened and endangered species expected to occur within the allotment include many fish species, one bird species and one snake.

The upper portion of Lousy Canyon is occupied by 3 endangered fish, Gila topminnow (*Poeciliopsis occidentalis occidentalis*), desert pupfish (*Cyprinodon macularius*) and Gila chub (*Gila intermedia*) and contains designated critical habitat for the chub. All 3 species were translocated to this site cooperatively by the BLM, U.S. Fish and Wildlife Service and the Arizona Game and Fish Department. All 3 species were also stocked into a tributary of Larry Creek on the Horseshoe Ranch, upstream of the Cross Y Allotment. Critical habitat in Lousy Canyon is a series of riffles and pools at the bottom of a deep canyon, inaccessible to livestock.

Livestock grazing impacts to the endangered fish in Lousy Canyon were analyzed in Biological Opinion (BO) 2-21-99-F-031 (The reintroduction of Gila topminnow and desert pupfish into three tributaries of the Agua Fria River), BO 02-21-03-F-0409-R1 (The existing Phoenix Field Office planning decisions and associated activities on the Gila chub in the Agua Fria National Monument), and, most recently, BO 22410-05-F-0785 (The effects of the Agua Fria National Monument and Bradshaw-Harquahala Resource Management Plan on Federally-listed species). These BO's concluded that livestock grazing would not affect the endangered fish in Lousy Canyon because the area is inaccessible to livestock and the fish would not survive if they wash downstream into the Agua Fria River due to the presence of predaceous non-native fish.

The Northern Mexican gartersnake (*Thamnophis eques megalops*) is listed as a threatened species and protected under the Endangered Species Act (79 FR 38677). Critical habitat has been proposed within portions of the Agua Fria River located within Cross Y allotment. The Mexican gartersnake is associated with permanent water sources with riparian vegetation. Food sources include fish, frogs, and earthworms. The last record of a single Mexican garter snake in the Agua Fria River was over 10 years ago. The Arizona Game and Fish Department considers the species extirpated from the Agua Fria River watershed based on recent survey efforts (Brennan and Holycross 2006). The FWS proposed rule states that the Mexican gartersnake proposed critical habitat is considered as being with the geographical area currently occupied by the species. The areas are proposed under sections 3(5)(A)(i) of the Act because they are essential for conservation for the northern Mexican gartersnake.

The western yellow-billed cuckoo (*Coccyzus americanus*) is a proposed to be listed as threatened under the Endangered Species Act. A riparian dependent species, the yellow-billed cuckoo has

been documented as breeding in Agua Fria River within two miles of the Cross Y allotment. Surveys within the allotment have not occurred because the riparian habitat only marginally meets the habitat requirements for the species. Critical habitat has not been proposed for portions of the Agua Fria River within the Cross Y allotment; however, isolated patches of adequate riparian habitat exists within the allotment which likely support breeding populations of the yellow-billed cuckoo.

5.2 Special Status Species

Many special status species occur within the Cross Y allotment. The diverse habitats within the allotment support special status fish, migratory birds, reptiles and amphibians. Many species depend upon riparian corridors of the Agua Fria River but others are found in the Saguaro desert uplands that occur on canyon walls within the allotment.

Bald eagles and golden eagles are expected to be found within the allotment. Golden eagles (*Aquila chrysaetos*) have been documented breeding within the allotment as recently as 2014. Bald eagles may be occasionally observed in the Agua Fria National Monument but are considered transient. The closest known bald eagle breeding area is located at the northeastern end of Lake Pleasant, approximately 10 miles downstream of the Cross Y Allotment. Both species are protected under the Bald and Golden Eagle Protection Act.

The gilded flicker (*Colaptes chrysoides*), a BLM sensitive bird species occurs in the upland Sonoran desert scrublands. These species create nest cavities in saguaro cacti upon which many other species inhabit. Gilded flicker habitat is restricted to the canyons of the Cross Y allotment.

The Sonoran desert tortoise (*Gopherus agassizii*) is a candidate species. This species occupies Arizona upland Sonoran desert scrub areas within the Agua Fria River canyon and the south-facing slopes between Black Mesa and Black Canyon City. Within the Cross Y Allotment, approximately 4,850 acres have been classified as Category II and approximately 750 acres classified as Category III tortoise habitat. Desert tortoises are herbivorous, foraging on grasses and forbs. The typical diet consists of 30% annual forbs, 18% perennial forbs, 27% grasses, 23% woody plants, and 1% prickly pear fruit (Van Devender et. al 2002) They are active in the spring and then again in the late summer and early fall. When not active, tortoises retreat underground in shelter sites excavated under or between large rocks, in caliche caves along washes or in natural cavities.

The lowland leopard frog (*Rana yavapaiensis*) and Sonoran mud turtle (*Kinosternon sonoriense sonoriense*) are BLM sensitive herpetological species that have been documented within the allotment. Both species are riparian obligate species and are expected to occur in areas of perennial water.

Multiple native fish occur within the allotment and are considered as BLM-sensitive. The longfin dace (*Agosia chrysogaster*) and the desert sucker (*Catostomus clarki*) both occur within the Agua Fria River. The longfin dace inhabits shallow streams with sand and rock substrate, moderate flow, with deeper water near cover; it can tolerate high water temperatures and low oxygen levels. The desert sucker is found in medium to high gradient rivers and creeks, usually

with rocky bottoms; fish tend to move from pools to feed in riffles at night. They are intolerant to low oxygen levels.

6.0 Aquatic Resources

6.1 Water Quality

None of the streams within the Cross Y Allotment area are listed on the 303(d) list which summarizes streams that have had Total Mean Daily Loads (TMDL's) developed for them. Section 303(d) of the CWA requires states to identify waters that do not meet applicable water quality standards after the application of certain technology-based controls. These water bodies are defined as "water quality limited" and a "Total Maximum Daily Load", or TMDL, may be developed for that water body. A TMDL defines the degree of pollution control needed to maintain compliance with water quality standards and it defines the amount of pollutant input that can occur and still have the water body fully supporting its designated beneficial uses. Based on current information, there are no other concerns regarding water or water quality that require attention from the BLM .

6.2 Riparian Area Data

There are three riparian areas on the Cross Y Allotment, Larry Creek, Lousy Canyon, and the Agua Fria River. Proper functioning condition (PFC) was assessed on all of these riparian areas according to BLM Technical Reference 1737-9 Process for Assessing Proper Functioning Condition (USDI 1993a), and BLM Technical Reference 1737-15 A user guide to assessing proper functioning condition and the supporting science for lotic areas (USDI 1998). The Agua Fria River was further assessed for grazing impacts to riparian vegetation and bank stability according to BLM Technical Reference 1737-23 Multiple Indicator Monitoring of Stream Channels and Streamside Vegetation (MIM) (USDI 2011). Larry Creek and Lousy Canyon were not assessed using the MIM protocol since these riparian areas are excluded from grazing by steep cliff-bound terrain. Cross sections were also installed at the MIM site according to BLM Technical Reference 1737-8 Greenline Riparian-Wetland Monitoring (USDI 1993b).

6.2 Proper Functioning Condition Assessments

Larry Creek

Proper Functioning Condition (PFC) was assessed at Larry Creek on 5-25-10. Dominant over-story vegetation in the riparian area included Fremont cottonwood (*Populus fremontii*), Gooding's willow (*Salix gooddingii*), net leaf hackberry (*Celtis reticulata*) and Arizona sycamore (*Platanus wrightii*). Dominant understory vegetation included spikerush (*Eleocharis palustris*), cattail (*Typha latifolia*), and dense stands of common reed (*Phragmites australis*). Much of Larry Creek is intermittent or interrupted perennial, but where there appeared to be good soil moisture riparian vegetation exhibited high vigor and had adequate vegetative cover to protect soils and dissipate energy during flood events. Cover in the form of large rocks and boulders were also present to protect banks and dissipate energy from flood events. Cattle are excluded from the riparian areas of Larry Creek by steep terrain, so no disturbance from cattle grazing was present. **Larry Creek was rated as proper functioning condition.**

Lousy Canyon

PFC was assessed at Lousy Creek on 6-10-11. Dominant over-story vegetation in the riparian area included velvet ash (*Fraxinus velutina*), Fremont cottonwood (*Populus fremontii*), Gooding's willow (*Salix gooddingii*), and Arizona sycamore (*Platanus wrightii*). Dominant understory vegetation included three square sedge (*Schoenoplectus pungens*), cattail (*Typha latifolia*), and dense stands of common reed (*Phragmites australis*). Much of Lousy Canyon is perennial with dense riparian vegetation proving good soil protection. Large rocks, boulders, and vegetation provide adequate cover and structure to dissipate energy during flood events. Cattle are excluded from all but the lowest portion of Lousy Creek near the confluence with the Agua Fria River by steep terrain. No disturbance from cattle grazing was observed. **Lousy Canyon was rated as proper functioning condition.**

Agua Fria River

The Agua Fria flows through 7.3 miles of BLM administered land on the Cross Y allotment. PFC was assessed on 3-4-11 and 3-11-11. The Agua Fria River is divided up into four riparian segments 6013-1H, 6013-1I, 6013-1J, and 6013-1K. The upper segment (6013-1K) is narrow and canyon-bound with most of the banks covered with rocks, boulders, or steep cliff faces. Riparian vegetation is sparse in this segment, but Gooding's willow, Fremont cottonwood, velvet ash, three square sedge, spikerush, cattail, and common reed was present in wider areas of the canyon. Evidence of frequent, high intensity floods was observed in this segment. Cattle grazing in this riparian segment is highly unlikely due to terrain. **Segment 6013-1K was rated as proper functioning condition.** Riparian segment 6013-1J also had sparse riparian vegetative cover. Many willows were laid over and a debris line was present approximately 10 meters above base flow, presumably from the 2010 flood event. The valley bottom was wider in this reach. Much of the banks were covered with large rock and boulders. Cattle have access to this reach. Riparian obligate species in this reach includes Gooding's willow, Fremont cottonwood, seep willow, three square sedge, spikerush, and cattails. **Riparian segment 6013-1J was rated as proper functioning condition.** Riparian segments 6013-1H and 6013-1I had more riparian vegetation present. Recent extreme flooding was evident from laid over and uprooted trees but there was a high density of riparian obligate woody seedlings on the banks in many areas (Gooding's willow, seep willow, and cottonwood). Three square sedge, spikerush, cattail, and common reed were locally abundant in places. Cattle have access to these two segments. **Both 6013-1H and 6013-1I were rated as proper functioning condition.**

6.3 Multiple Indicator Monitoring

A representative Designated Monitoring Area (DMA) was selected in riparian segment 6013-1I to install a Multiple Indicator Monitoring (MIM) plot. This reach was chosen due to the presence of sensitive resources that are important to maintaining bank stability and because it has open access to cattle during the grazing season. Sensitive resources include native riparian obligate plant species and stream banks with well-developed soil layer. The dominant herbaceous greenline plant species was three square sedge (SCPU10) which comprised 46.2% of the greenline. Other herbaceous species included spikerush (ELPA3), cattail (TYLA) and Bermuda grass (CYDA). The dominant woody species found along the greenline was Gooding's

willow (SAGO) which composed 30.2% of the greenline plant composition. Other woody species found on the greenline were seep willow (BASA4) and salt cedar (TARA). The average stubble height of the three square sedge was 79.29 cm, which reflects the un-grazed condition of the herbaceous vegetation (Table 2). No evidence of browsing of riparian woody plant species was observed. The woody species use was rated at 10% (Table 2), the lowest woody use category in the MIM protocol. No bank alteration due to cattle hoof action was observed (Table 3). There was also no evidence of fractured, slumping, sloughing or steep eroding banks (Table 3).

Table 7. Plant species composition along the greenline.

Species Plant Code	Greenline Composition
Seep Willow	0.8%
Spikerush	0.1%
Velvet Ash	0.0%
Deergrass	0.1%
RK	7.4%
Goodings Willow	30.2%
Cattail	0.2%
Three square sedge	46.2%
Bermudagrass	13.1%
Velvet Ash	0.0%

Table 8. Stubble height of key riparian herbaceous species and woody species use along the greenline.

Stubble Height				Woody Use
	Average SH for all key species (inches)	Dom key species for SH	Avg Height of dominant key species	Woody Species Use - all woody species (%)
80.00	76.4	Three square sedge	79.29	10.0%
n=	54	51		11
95% conf Int¹	7.8		8	
95% CI²	0.96			5%

¹ 95% CI: 95% confidence interval based upon standard deviation from sample data

² 95% CI: 95% confidence interval on observer variation see table F7 in the Appendix

Table 9. Streambank alteration, stability and cover.

	Streambank Alteration (%)	Streambank stability(%)	Streambank cover (%)
	0%	100%	100%
n=	2	80	80

	Streambank Alteration (%)	Streambank stability(%)	Streambank cover (%)
95% conf Int¹		*	*
95% CI²	6%	5%	5%

¹95% CI: 95% confidence interval based upon standard deviation from sample data

²95% CI: the 95% confidence interval on observer variation see table F7 in the Appendix

Table 10. Age class of woody species along the greenline.

Key Species	Seedlings	Young	Mature
Seep Willow	47	4	8
Velvet Ash	0	1	0
Gooding's Willow	36	4	3
Salt Cedar	2	2	1

Riparian cross-section transects

Cross-section belt transects were done to assess woody species age class distribution across a wider extent of the riparian area. Seven belt transects were surveyed perpendicular to the stream as described in BLM Tech Reference 1737-8 (Tables 11 and 12). The most abundant woody species encountered in the transects was the native shrub seep willow (BASA4). The most abundant tree species was the non-native invasive salt cedar (TARA). Gooding's willow was the most abundant native riparian obligate tree species. The age class distribution of native riparian obligate trees was split fairly evenly between seedlings, young and mature (Table 6).

Table 11. Woody species composition and age class based on cross-section belt transects.

All Woody Species			
Species	Seedling	Young	Mature
Gooding's Willow	18	14	15
Woodland Strawberry	2	3	0
Seep Willow	79	38	2
Velvet Ash	1	4	0
Salt Cedar	15	40	1

Table 12. Native riparian obligate tree species composition and age class based on cross-section belt transects.

Native Riparian Obligate Trees			
	Seedling	Young	Mature
Gooding's Willow	18	14	15
Velvet Ash	2	3	0
Total	20	17	15

Native Riparian Obligate Trees			
	Seedling	Young	Mature
Percent composition	38%	33%	29%

6.4 Riparian Desired Plant Communities

Desired Plant Community for Larry Creek riparian: Overstory dominated by native riparian obligate trees including Fremont cottonwood (*Populus fremontii*), Gooding’s willow (*Salix gooddingii*), net leaf hackberry (*Celtis reticulata*) and Arizona sycamore (*Platanus wrightii*). Multiple age-classes of riparian trees are present to provide recruitment for maintenance and recovery. The age class distribution should be >15 percent seedlings, > 15 percent young, and >15 percent mature (age class according to BLM Tech Reference 1737-23). Herbaceous riparian streambank vegetation dominated by three square (*Schoenoplectus pungens*), spikerush (*Eleocharis palustris*), cattail (*Typha latifolia*), and common reed (*Phragmites australis*).

Desired Plant Community for Lousy Canyon: Overstory dominated by native riparian obligate trees including Fremont cottonwood (*Populus fremontii*), Gooding’s willow (*Salix gooddingii*), velvet ash (*Fraxinus velutina*) and Arizona sycamore (*Platanus wrightii*). The age class distribution should be >15 percent seedlings, > 15 percent young, and >15 percent mature (age class according to BLM Tech Reference 1737-23). Herbaceous riparian streambank vegetation dominated by three square sedge (*Schoenoplectus pungens*), cattail (*Typha latifolia*), and common reed (*Phragmites australis*).

Desired Plant Community for the Agua Fria River: In areas that are less prone to scouring and where there is sufficient soil development and soil moisture the Desired Plant Community consists of herbaceous riparian streambank vegetation dominated by three square sedge (*Schoenoplectus pungens*), and spikerush (*Eleocharis* spp.). The riparian overstory is dominated by native riparian obligate tree species including Gooding’s willow (*Salix gooddingii*), velvet ash (*Fraxinus velutina*), and Fremont cottonwood (*Populus fremontii*). The age class distribution should be >15 percent seedlings, > 15 percent young, and >15 percent mature (age class according to BLM Tech Reference 1737-23).

7.0 Recreational Resources

There are no developed recreation sites on the allotment and little to no public access by vehicle. Hunting, hiking, camping and exploration of cultural sites appear to be the primary recreational uses in the area.

The Agua Fria National Monument/ Phoenix North Public Lands Visitor Study was completed in 2002. The information in that report concludes that the visitors of the area strongly value the resource for its capacity to experience a unique, natural setting and escape the stresses of everyday life. The visitors express a clear preference for maintaining the natural, relatively undeveloped character of the environment. The national monument visitor survey, in general, tends to show a less pronounced history of use in the area, nearly one-third have visited the monument for the first time, and nearly half had fewer than six visits at any time.

In general, on the Agua Fria National Monument, hunting, camping (for the purpose of hunting) and use of off-highway vehicles are the primary recreational uses of the area. There is an increasing interest in hiking and walking, nature study, visiting historical and cultural sites, dispersed camping, and wildlife and bird watching.

Off-highway vehicle (OHV) use is restricted by the lack of public access and topography on the allotment. Some access through the private property onto the allotment has been allowed for OHV use, hunting, hiking and exploration and study of cultural sites. The land use plan for the Agua Fria National monument addresses vehicle route designations. It limits vehicles to designated routes and prohibits cross-country motorized travel, except in the case of emergency or for approved administrative purposes.

8.0 Final Determinations

Standard 1 – Upland Sites

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

Based on the analyses and supporting documentation referenced herein, resource conditions do not meet Standard 1. Current livestock grazing and recreation management are not considered to be a causal factor this standard not being met.

Rationale: Data collected at monitoring locations throughout the allotment show the Clayey Slopes, Basalt Hills, and Limy Upland ecological sites within the lower elevations and southern portions of the allotment to be in acceptable ecological condition. These areas have adequate ground cover for water infiltration, permeability, and soil stability.

However, nearly one third of the allotment, the Clayey Upland ecological site located in the Black Mesa use area, is infested with several different non-native invasive plant species including wild oats and black mustard. These areas are also high in bare ground and litter content which can lead to inadequate infiltration and permeability rates, as well as soil surface loss or degradation. Data collected from these areas between 2008 and 2012 (Appendix A, Key Area 5) shows invasive species in these areas to be nearly a monoculture that are directly outcompeting native grasses and forbs. Other data analyzed by the BLM (Appendix A, Key Area 3, AIM Plot CU-5 and CU-6) shows that several areas found on the Black Mesa portion of allotment are highly susceptible to invasion by the non-natives due to high amounts of litter and bare ground, and low composition of native plants to compete for resources. Please refer to Map 6 for more information about which area of the allotment is at risk.

Impacts from historical livestock grazing, encompassed with a short fire return interval is having the largest impact on the Clayey Upland area of the allotment. Livestock grazing on the Cross Y Allotment is minimal and has not occurred with any notable intensity on the Black Mesa area for nearly a decade. Therefore it is the belief of the BLM that current livestock grazing has not accelerated decreases in Tobosagrass or the invasion of the non-natives through increased

disturbance. Recreational activities are also negligible in these areas and have not likely had any significant impacts on infiltration, permeability, and erosion rates.

Standard 2 – Riparian – Wetland Site

Riparian-wetland areas are in proper functioning condition.

Based on the analyses and supporting documentation referenced herein, resource conditions meet standard 2.

Rationale: Larry Creek and Lousy Canyon riparian areas are rugged, remote areas with no livestock grazing and very little human disturbance. Where perennial water exists, riparian obligate vegetation is dense and vigorous and shows resiliency to recent high-energy flood flows. Riparian vegetation along the Agua Fria River is sparser and patchily distributed than along Larry Creek and Lousy Canyon. Many portions of the Agua Fria have steep, rocky banks with little soil formation on the stream banks. The narrow, canyon-bound physiography of the stream likely concentrates the energy of flood events. There is evidence of flood flows approximately 10 meters above base flow. These factors likely contribute to the low density of riparian vegetation present along much of the Agua Fria River on the Cross Y allotment. In areas that are less prone to scouring riparian obligate vegetation is well established, growing in dense belts along the stream banks. All of the Proper Functioning Condition (PFC) assessments for the Cross Y Allotment found all of the reaches of riparian areas to be in Proper Functioning Condition.

Standard 3 – Desired Resource Conditions

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

A. Upland Sites

Based on the analyses and supporting documentation referenced herein, resource conditions do not meet standard 3. Current livestock grazing and recreation management are not considered to be a causal factor this standard not being met.

Rationale: Vegetation Monitoring data from Key Areas and AIM plots correlated to ecological sites shows the Basalt Hills, Limy Uplands, and Clayey Slopes of the allotment fall within acceptable ranges for native species existence and maintenance. These areas are in overall good ecological condition and should be maintained in their current condition. However, data also shows the Clayey Upland 12-16” ecological site, found on the Black Mesa portion of the allotment, to have low amounts of native plant biodiversity and vegetation cover. These areas are dominated by non-native plants like wild oats, black mustard, and red brome. Data (Appendix A, Key Area 5) also shows species composition of Tobosa is extremely low at these areas and is in danger of being eradicated out of the ecosystem by non-natives. Data from AIM Plot CU-3, 5, and 6 shows the Black Mesa area of the allotment is at high risk of being further invaded by non-native plants (Map 6).

B. Riparian Areas

Based on the analyses and supporting documentation referenced herein, resource conditions meet standard 3.

Rationale: Riparian areas within the Cross Y Allotment are in overall good condition and are considered to be properly functioning. Desired Plant Community objectives for species composition are nearly being met at all of the PFC and Multiple Indicator Monitoring (MIM) locations.

Wildlife Habitat Assessment

Across all of the Clayey Slopes, Basalt Hills, and Limy Upland ecological sites, and within the riparian areas of the allotment, vegetation composition and structure provide suitable cover and forage to support a diverse wildlife community, including sensitive birds and fish and the Sonoran Desert Tortoise (Map 5). Grazing use in these areas has been minimal as indicated by current utilization data. The mix of trees/shrubs/cactus and grasses/forbs present on these areas of the allotment provide a diversity of habitats suitable for a variety of wildlife species from reptiles and small mammals to various birds, and game species as well as predators that depend on these various habitat types.

The Clayey Upland areas of the allotment also provide habitat for various types of wildlife. These areas are extremely important fawning areas for Pronghorn Antelope (Map 5). Unfortunately, Pronghorn Antelope recruitment on the Black Mesa area will continue to decline as a result of the frequent fires and invasion of non-native species unless management actions are taken to mitigate the effects of the frequent fires and invasions.

Land Health Technical Recommendations:

Based on the data compiled and analyzed for this Land Health Evaluation, the Cross Y Allotment is achieving Standard 2 and a portion of Standard 3 of the Arizona Standards for Rangeland Health. Observed apparent trend across the Loamy Bottom, Basalt Hills, and Limy Upland ecological sites in the allotment shows these areas are in stable condition. Vegetation attributes such as vigor, recruitment, and composition are appropriate for these sites. The Clayey upland areas of the allotment that are not meeting Rangeland Health Standards are in need of improvement. The BLM provides the following recommendations that will likely help maintain the areas that are in stable ecological condition and to work as a catalyst to restore the areas of the allotment that are in need of improvement.

1. Continue implementing a grazing rotation that provides growing season rest (March 1 to October 31) in all riparian areas, annually. This measure has maintained riparian proper functioning condition and providing habitat for yellow-billed cuckoo and native fishes.
2. Implement yearly average utilization (depending on yearly precipitation totals) goals for key forage grass species to insure adequate ground cover to protect watershed function and provide adequate wildlife forage and cover.

3. Close the Black Mesa portion of the allotment to season long grazing. Implement a grazing system for the area that provides for prescriptive grazing practices only.
4. Repair all range improvements to become functioning. Repairing range improvements will also help provide much needed water for wildlife in some areas of the allotment.
5. Implement test plots on the Clayey Upland areas of the allotment to test various methods of vegetation management to significantly reduce or eradicate the black mustard, wild oats, and red brome found on that portion of the allotment. Results from the test plots could be used to make future rangeland management restoration decisions on the Black Mesa area.
6. Avoid placement of salt and nutritional supplements within ¼-mile of any riparian area to avoid livestock concentration in sensitive wildlife habitat. Avoid placement of salt and nutritional supplements within 1/8-mile of any known cultural sites.

9.0 List of Preparers

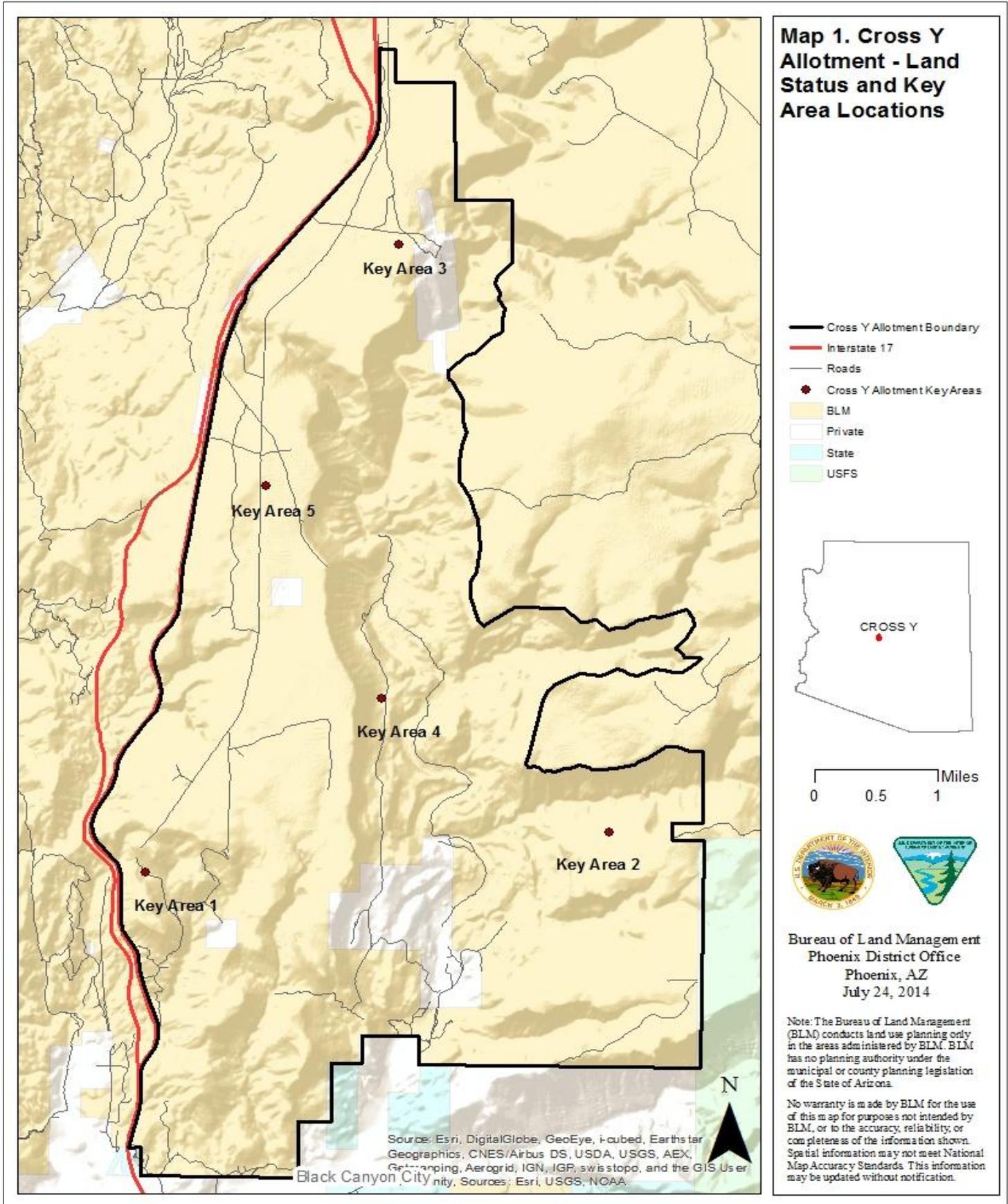
Casey Addy	Natural Resource Specialist, Agua Fria National Monument/Hassayampa Field Office
Amanda James	Monument Manager/Assistant Field Manager, Agua Fria National Monument/Hassayampa Field Office
Paul Sitzmann	Wildlife Biologist, Agua Fria National Monument/Hassayampa Field Office

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11.0 Maps



Map 1. Cross Y Allotment - Land Status and Key Area Locations

- Cross Y Allotment Boundary
- Interstate 17
- Roads
- Cross Y Allotment Key Areas
- BLM
- Private
- State
- USFS



0 0.5 1 Miles



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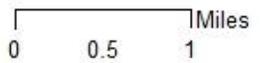
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Map 2. Cross Y Allotment - Use Areas

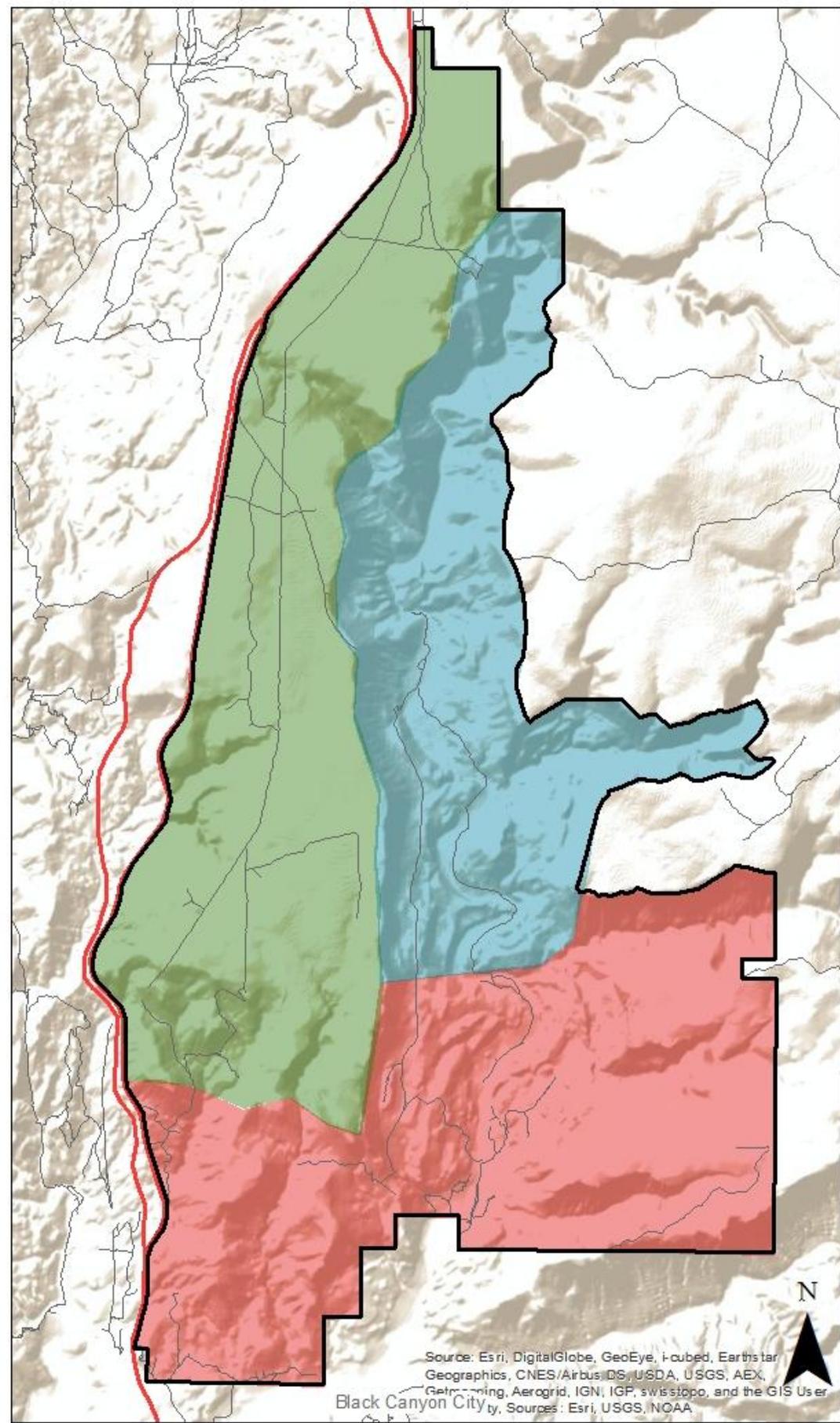
-  Cross Y Allotment Boundary
-  Roads
-  Black Mesa Unit
-  River Unit
-  South Unit
-  Interstate 17



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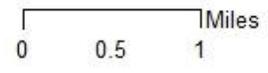


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Black Canyon City, Sources: Esri, USGS, NOAA



Map 3. Cross Y Allotment - Ecological Sites

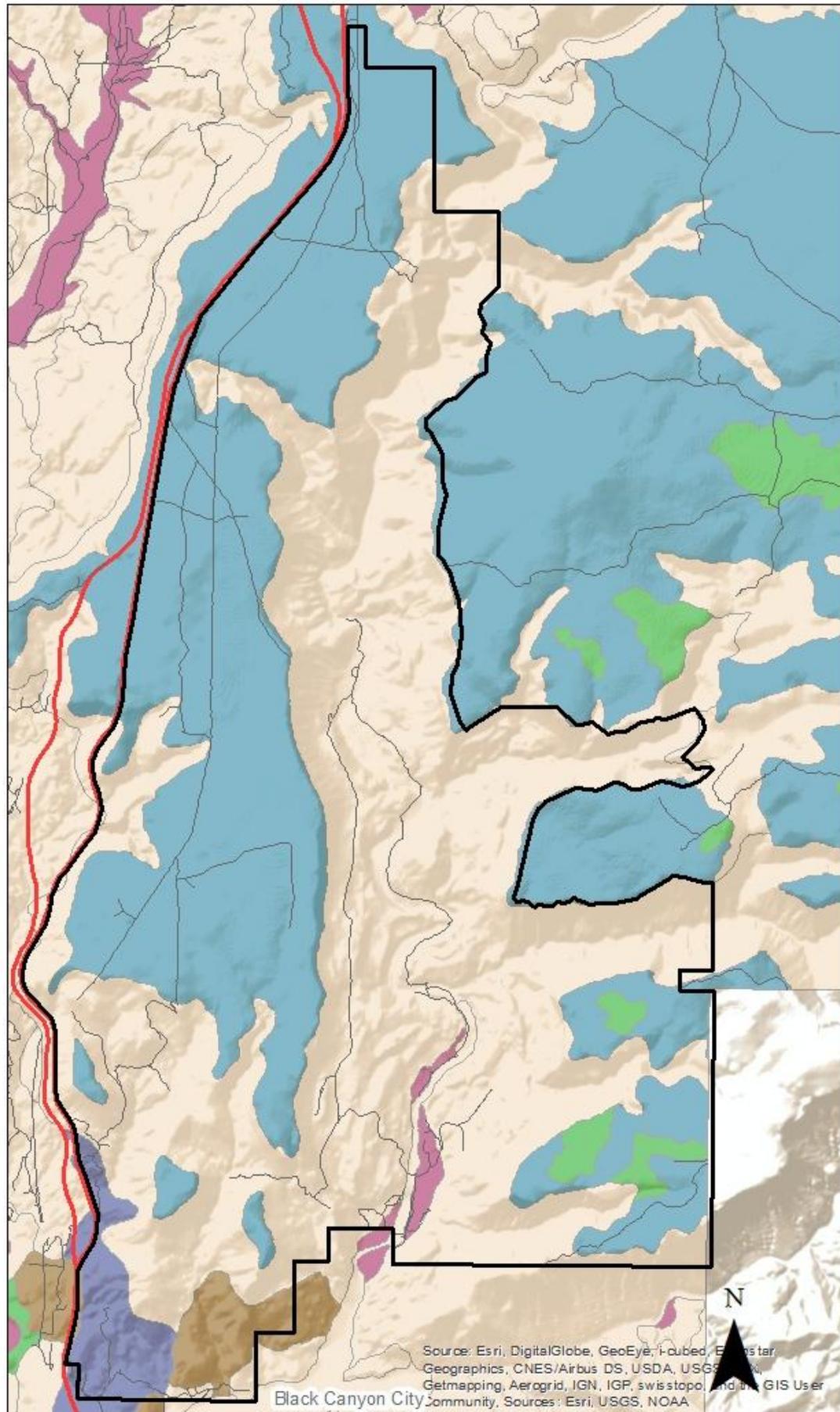
-  Cross Y Allotment Boundary
-  Interstate 17
-  Rock Land
-  Basalt Hills 10-12" p.z.
-  Clay Loam Upland 12-16" p.z.
-  Clayey Upland 12-16" p.z.
-  Limy Upland 10-12" p.z.
-  Loamy Bottom 10-12" p.z.
-  Meadow 12-16" p.z.
-  Volcanic Hills 12-16" p.z. Clayey
-  Volcanic Upland 12-16" p.z.



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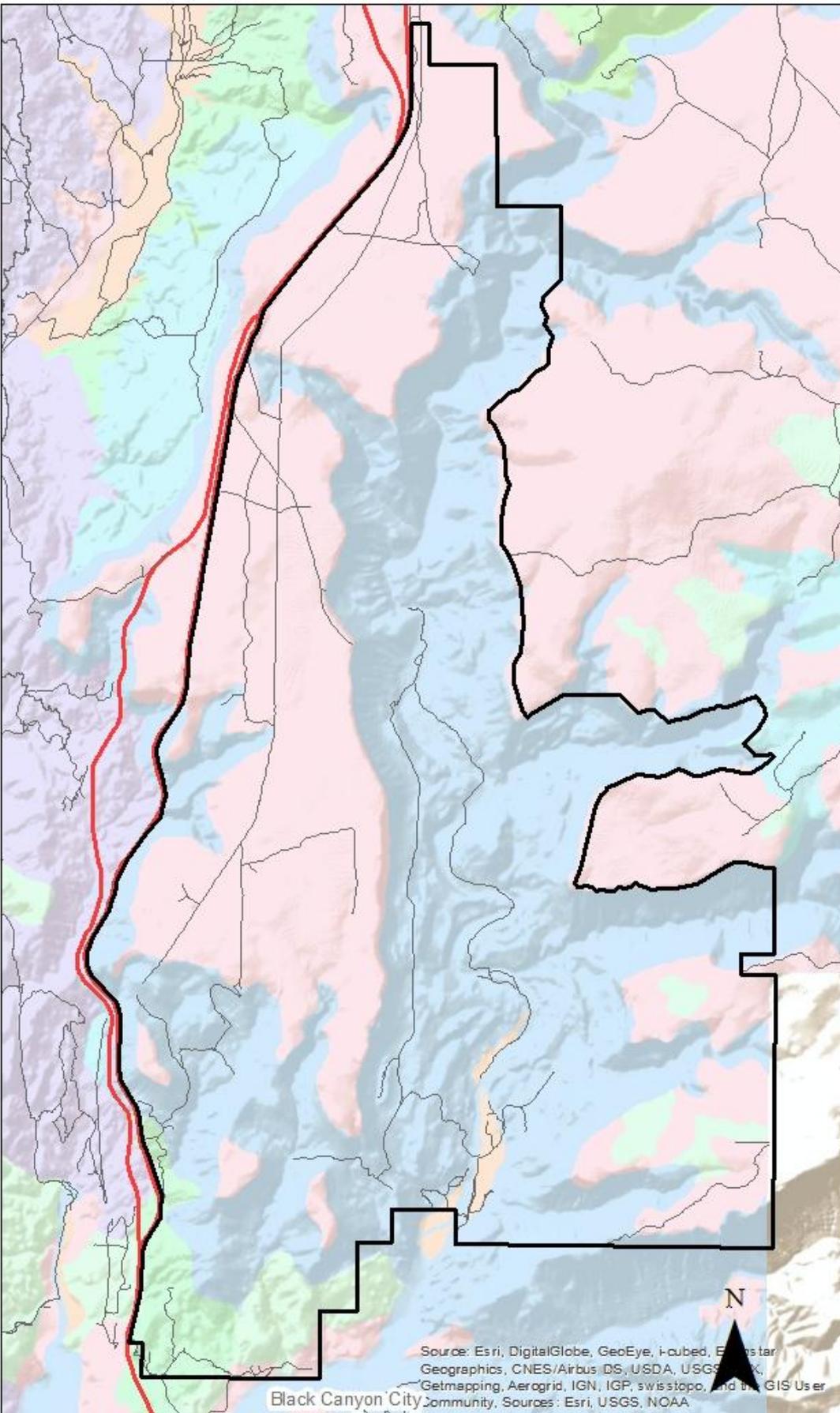


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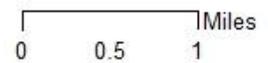
Black Canyon City Community



Map 4. Cross Y Allotment - Soils



- Cross Y Allotment Boundary
 - Interstate 17
 - Roads
- Soils**
- Soil Type**
- Rock Land
 - ashy-skeletal over fragmental or ordery
 - ordery
 - clayey
 - clayey over fine-silty
 - clayey over fragmental
 - clayey over loamy
 - clayey-skeletal
 - coarse-loamy
 - coarse-loamy over sandy or sandy-skeletal
 - coarse-silty
 - fine
 - fine-loamy
 - fine-loamy over fragmental
 - fine-loamy over sandy or sandy-skeletal
 - fine-silty
 - loamy
 - loamy-skeletal
 - not used
 - sandy
 - sandy-skeletal



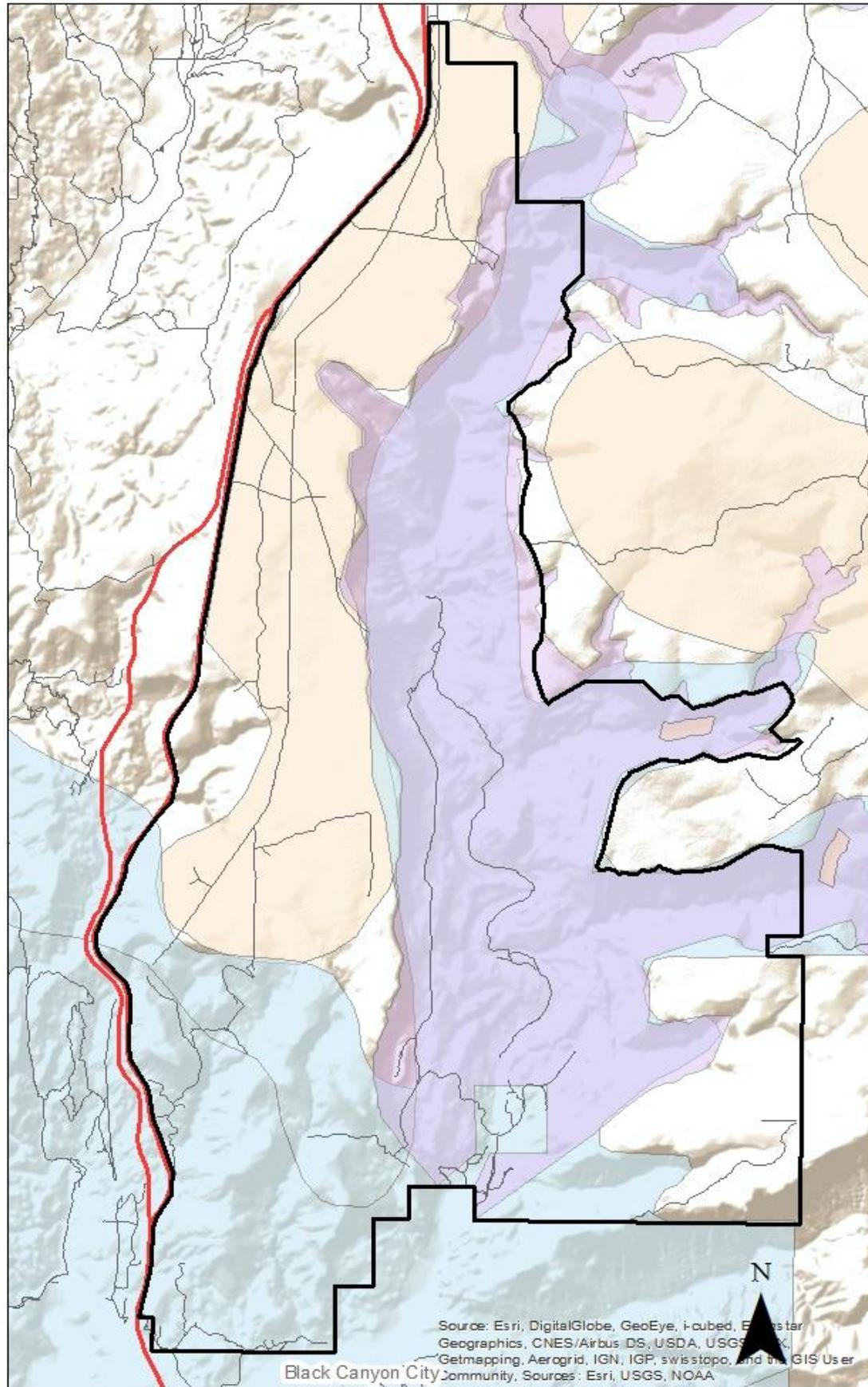
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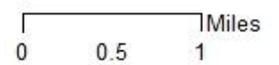
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Map 5. Cross Y Allotment - Wildlife Habitat



- Cross Y Allotment Boundary
- Interstate 17
- Gila Chub Habitat
- Important Bird Area
- Desert Tortoise Habitat
- Pronghorn Antelope Fawning Habitat



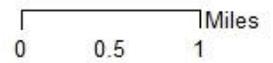
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Map 6. Cross Y Allotment - At Risk Areas

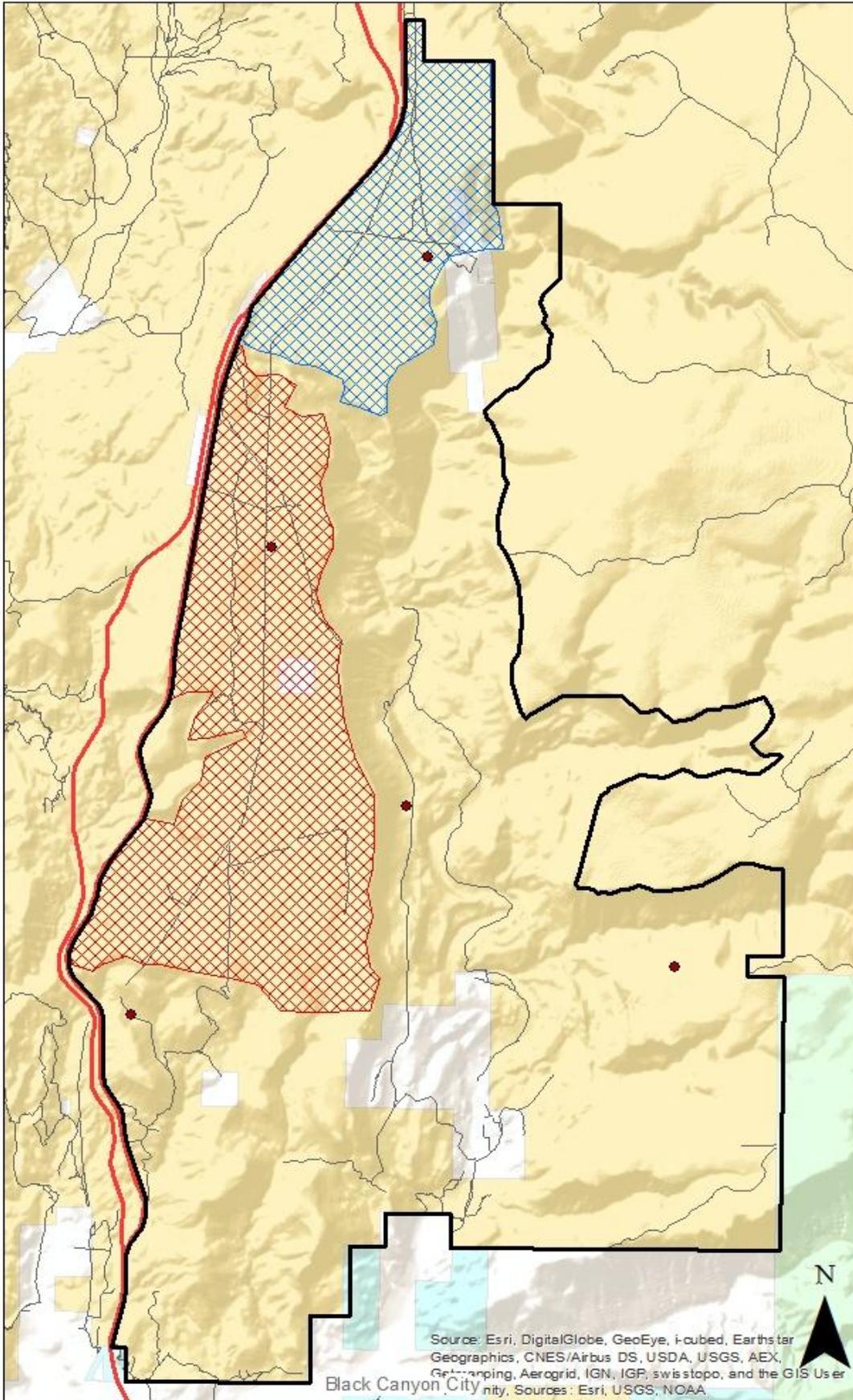
-  Cross Y Allotment Boundary
-  Interstate 17
-  At Risk Area
-  Slightly At Risk Area



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APPENDIX A

Key Area Data

Between 2007 and 2009, five key areas were established on the Cross Y allotment. These key areas were monitored using various methods and analyzed to determine whether indicators of ecological processes conform to the Arizona standards for rangeland health (Section 1.3). Refer to Map 1 for locations of the key areas found within the Cross Y Allotment.

Key Area 1

Ecological Site Name: Volcanic Hills 12-16” pz Clayey

Ecological Site ID: R038XA117AZ – Mogollon transition

Production: 1225 lbs/ac (670 lbs/ac to 2000 lbs/ac)

Dominant Vegetation: Foothills palo verde/ false mesquite - jojoba/ tobosa – curly mesquite

Location: Township 9 North, Range 2 East, Section 15

Key Area 1 was established in 2007. At that time, dry weight rank estimates, point cover, and frequency data was collected. This ecological site is unique and is found in a Volcanic Hills ecological site. This area has a variety of different ecological sites including clayey upland and basalt hills ecological sites. This key area location was selected because of its potential access for livestock.

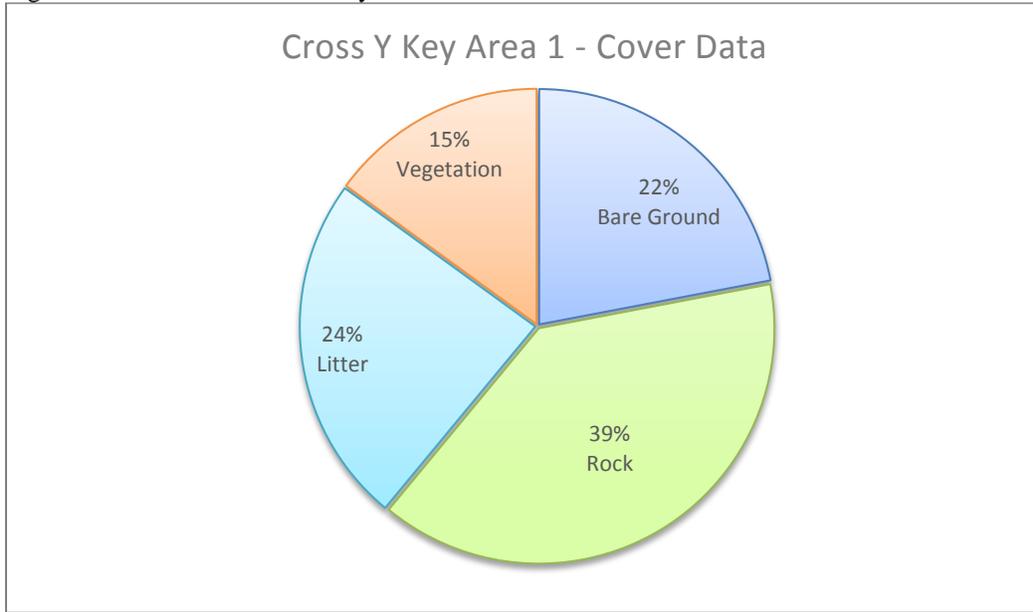
Photo 1. Key Area 1, Volcanic Hills 12-16” p.z.



Cover Data:

The surface cover ranges for a Volcanic Hills 12-16” precipitation zone for each attribute are: bare ground 5 – 50%, litter 15 – 75%, rock 1 – 75%, and vegetation 15 - 20%. Cover data collected at Key Area 1 (Figure 1) indicates ground cover is appropriate for the ecological site and is meeting the desired plant community objects.

Figure 1. 2008 Cover data for Key Area 1.



Species Composition:

The Dry Weight Rank method was used to comprise species composition for this Key Area. This Key Area shows good composition of Tobosa and Curly Mesquite, which are the dominant perennial grasses found in this type of ecological site. There was also good composition of shrubby species. Generally when precipitation is low, perennial forb composition is very low on this type of ecological site. The total succulent composition is higher than desired at 15% of the plant community.

Table 1. Species composition for Key Area 1.

Volcanic Hills 12-16” p.z.	
Species	Composition %
Perennial Forbs	
Globemallow	T
Shrubs	
Catclaw Acacia	1
Fairy Duster	T
Range Ratany	6
Broomed Snakeweed	1
Skunk Bush	1
Jojoba	8
Succulents	
Cholla	5

Volcanic Hills 12-16” p.z.	
Species	Composition %
Prickly Pear	10
Trees	
Palo Verde	4
Perennial Grasses	
Tobosa	39
Three Awn	T
Curly Mesquite	24

Frequency Data:

Frequency measurements were conducted at Cross Y Key Area 1 (Table 2) in 2007. Frequency measures the percentage of times a certain species was present within a study area. Species richness provides the number of plant species present along within the study area. Range ratany, prickly pear, jojoba, palo verde, tobosa, and curly mesquite occurred frequently, all of which are valuable species to wildlife and ecological processes.

Table 2. Frequency data for Key Area 2.

Clayey Slopes 1 10-13”	2007 Frequency
Globe Mallow	2%
Fairy Duster	1%
Catclaw Acacia	1%
Broomed Snakeweed	1%
Skunk Bush	1%
Range Ratany	8%
Prickly Pear	9%
Cholla	5%
Jojoba	8%
Palo Verde	4%
Tobosa	38%
Curly Mesquite	22%
Species Richness	12 species

Key Area 1		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Volcanic Hills 12-16” p.z Clayey	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	None to Slight

Key Area 2

Ecological Site Name: Clayey Upland 12"-16" PZ

Ecological Site ID: R038XA102AZ – Arizona Interior Chaparral

Production: 1325 lbs/ac (580 lbs/ac to 2100 lbs/ac)

Dominant Vegetation: tobosa grass – vine mesquite

Location: Township 9 North, Range 3 East, Section 20

Key Area 2 was established in 2008. At that time, dry weight rank estimates, ground point cover, species frequency, and a Rangeland Health Assessment worksheet was completed. The majority of the Cross Y Allotment that is usable by livestock is within the clayey upland 12 -16" p.z. ecological site. Two key areas were established in this ecological site. Key area 2 was established in an older pasture that was used more in the past. The current lessee is not using this pasture at this time. The windmill needs maintenance work before it can be used again.

Photo 2. Key area 2, Clayey Upland 12-13" p.z.



Cover Data:

Surface cover ranges for a Clayey Upland 12- 16" precipitation zone for each attribute are: bare ground 15 - 25%, litter 25 - 45%, rock 0 -25%, and vegetation 35 - 60%. The vegetation cover at key area increased in 2012 from 12% to 13%. The amount of litter decreased from 75% in 2008 to 51% in 2012. The amount of bare ground increased in 2012 to 22% from 6% in 2008. Grazing in this area has been relatively minimal. Therefore, these fluctuations in cover are likely driven by ongoing drought conditions and low precipitation in 2012, compared to 2008 when precipitation was above average.

Figure 2. 2008 Key Area 2 cover data.

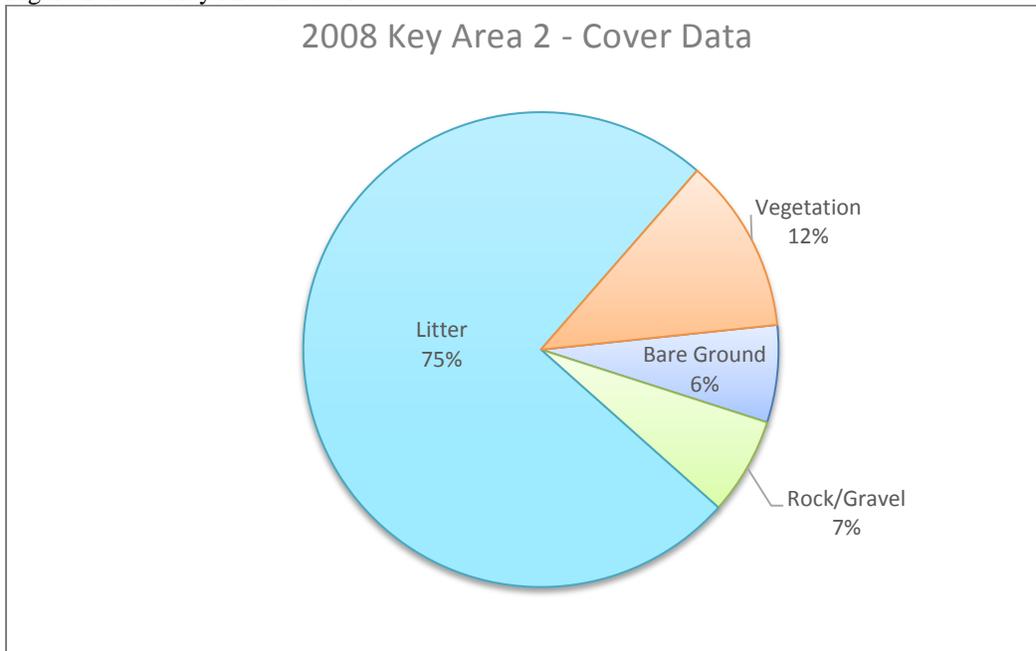
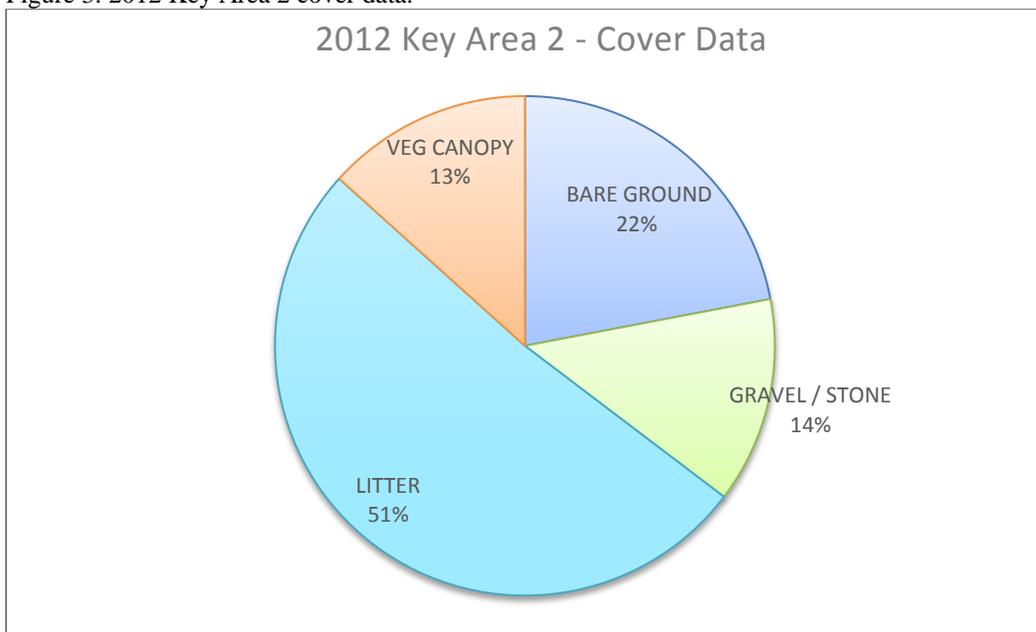


Figure 3. 2012 Key Area 2 cover data.



Species Composition:

The Dry Weight Rank method was used to comprise species composition for this Key Area. In both 2008 and 2012 Tobosa was the dominant (and only) perennial grass. The total composition for Tobosa at key area 2 was 66% in 2012. The total succulent composition is higher than desired at 10% in 2012. As expected during an ongoing drought, Forb composition was low at this site. Refer to Table 3 for the species composition amounts found at Key Area 2.

Table 3. Species composition for Key Area 2.

Clayey Upland 12-16" p.z.		
Species	Composition % 2008	Composition % 2012
Perennial Forbs		
Globe Mallow	1	4
Blue Dicks	33	0
Lacy Tansyaster	0	1
Shrubs		
Catclaw Acacia	5	10
Velvet Mesquite	0	6
Succulents		
Prickly Pear	15	10
Perennial Grasses		
Tobosa	47	66
Annuals		
Annual Forbs	0	0
Annual Grasses	0	0

Frequency Data:

Frequency measurements were conducted at Cross Y Key Area 2 in 2008 and 2012. Frequency measures the percentage a certain species was present in the study area. As shown in the table below, the only significant difference was a decrease in Blue Dicks. This fluctuation is likely due to ongoing drought and low precipitation in 2012, compared to 2008 when precipitation was well above average (Table 4).

Table 4. Frequency data for Key Area 2 between 2008 and 2012.

Clayey Upland 2 12-16"	Frequency 2008	Frequency 2012
Blue Dicks	34%	0%
Prickly Pear	12%	11%
Catclaw Acacia	5%	11%
Velvet Mesquite	0%	6%
Tobosa	48%	65%
Globe Mallow	1%	4%
Lacy Tansyaster	0%	1%
Buckhorn Cholla	1%	0%
Species Richness	6 species	6 species

Rangeland Health Attribute Rating

Attributes are placed into one of five categories depending on the degree of departure from the ecological site description or reference area. Below is a summary of the three attributes relative to the distribution of indicator ratings from the Rangeland Health Evaluation Summary Worksheet, completed for Key Area 2. Biotic integrity was rated slight to moderate because

Tobosa cover is below the 40 -50% range and an abundance of annual forbs and grasses dominating the site.

Table 5. Rangeland health attributes rating for Key Area 2.

Key Area 2		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Clayey Upland 2 12-16" pz	Soil / Site Stability	None to slight
	Hydrologic Function	None to slight
	Biotic Integrity	Slight to moderate

Key Area 3

Ecological Site Name: Clayey Upland 12"-16" PZ

Ecological Site ID: R038XA102AZ – Arizona Interior Chaparral

Production: 1325 lbs/ac (580 lbs/ac to 2100 lbs/ac)

Dominant Vegetation: tobosagrass – vine mesquite

Location: Township 10 North, Range 2 East, Section 36

Key Area 3 was established in 2008. At that time, dry weight rank estimates, ground point cover, species frequency, and a Rangeland Health Assessment worksheet was completed. Key Area 3 was the second of two studies established in a Clayey Upland 12 -16" p.z. This study area is very similar to Key Area 2. The lessee rotates his cattle into this pasture in June for the summer season.

Photograph 3. Cross Y Allotment key area 3, Clayey Upland 12-16" p.z.



Cover Data:

Surface cover ranges for a Clayey Upland 12- 16” precipitation zone for each attribute are: bare ground 15 - 25%, litter 25 - 45%, rock 0 -25%, and vegetation 35 - 60%. The vegetation cover at key area 3 was 6%. The litter cover was 54% and consisted of mostly annual grasses and forbs. Bare ground cover was 15%, which is appropriate for this ecological site. Rock and gravel cover for Key Area 3 is higher than Key Area 2. Forage productively remains high; soil processes exhibit infiltration, permability, and soil stability appropriate for the site and condition.

Figure 4. 2008 cover data for Key Area 3.

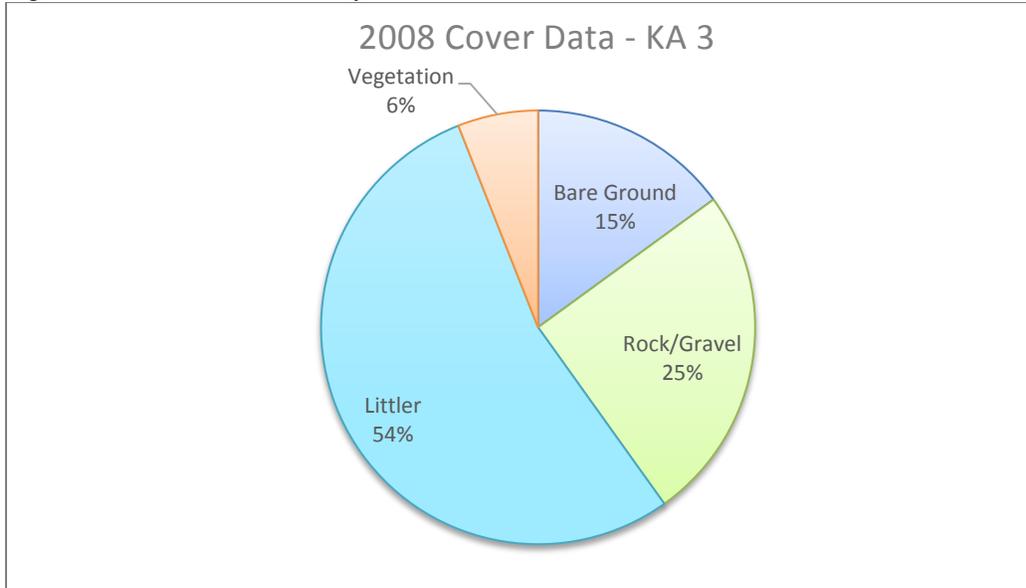
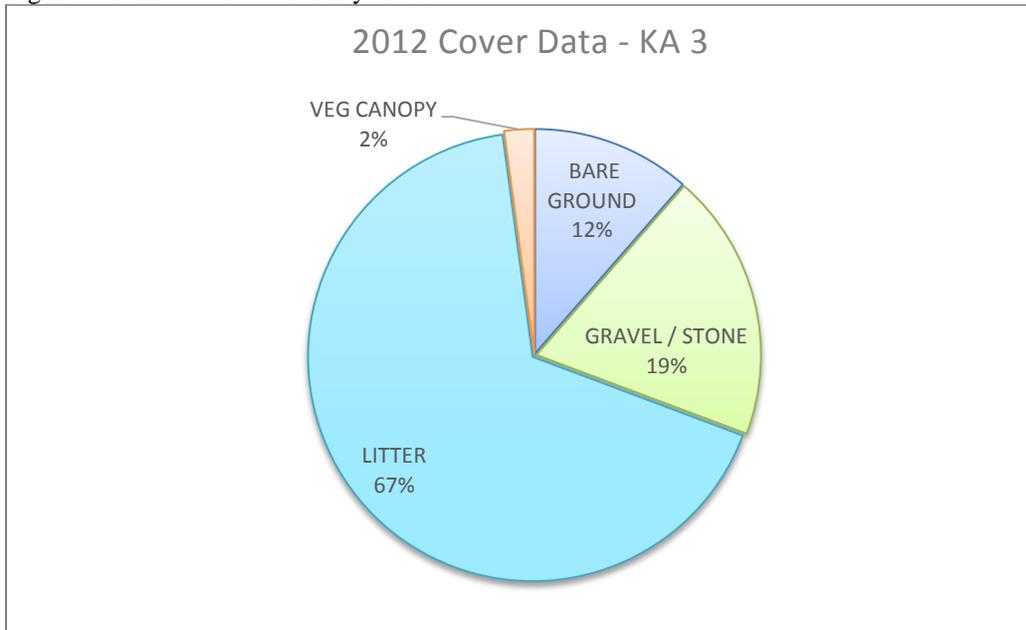


Figure 5. 2012 Cover data for key area 3.



Species Composition:

Table 5 is a comparison to the Clayey Upland 12 -16" PZ Ecological Site Description for relative vegetation production and species composition at Cross Y Key Area 3; this monitoring study was also conducted in 2008. Tobosa is the dominant perennial grass on a Clayey Slopes site. The total composition for Tobosa at key area 2 was 37%.

Table 5. Species composition for Clayey Upland 3.

Clayey Upland 12-16" p.z.		
Species	Composition % 2008	Composition % 2012
Perennial Forbs		
Blue Dicks	37	0
False Garlic	8	11
Menodora	1	3
Globemallow	0	2
Shrubs		
Catclaw Acacia	7	17
Broomed Snakeweed	T	0
Shrubby Buckwheat	1	12
Succulents		
Prickly Pear	1	3
Agave	0	1
Perennial Grasses		
Tobosa	46	52
Annuals		
Annual Grasses	0	0
Annual Forbs	0	0

Frequency Data:

Frequency measurements were conducted at Cross Y Key Area 3 in 2008 and 2012. Frequency measures the percentage of times a certain species was present in a study area. Species richness provides the number of individual species present during a study. As noted in table 6 below, most species in the plant community show no difference between the two years sampled, however two species (Blue Dicks and Tobosa) did show notable decreases. As we saw at other key areas, these fluctuations are likely due to ongoing drought conditions in 2012, compared to above average conditions in 2008.

Table 6. Key Area 3 frequency data between 2008 and 2012.

Clayey Upland 3 12-16"	Frequency 2008	Frequency 2012
Blue Dicks	30%	1%
Prickly Pear	1%	2%
Catclaw Acacia	9%	18%
Tobosa	44%	36%
False Garlic	12%	11%

Clayey Upland 3 12-16"	Frequency 2008	Frequency 2012
Shrubby Buckwheat	2%	12%
Menodora	1%	3%
Broomed Snakeweed	1%	0%
Globemallow	0%	2%
Agave	0%	1%
Buckhorn Cholla	0%	1%
Species Richness	8 species	11 species

Rangeland Health Attribute Rating

Attributes are placed into one of five categories depending on the degree of departure from the ecological site description or reference area. Below is a summary of the three attributes relative to the distribution of indicator ratings from the Rangeland Health Evaluation Summary Worksheet, completed for Key Area 3. All attributes were rated slight to moderate because of the low vegetation cover, an abundance of annual grasses and forbs, and some evidence of wind erosion and pedestalling.

Table 7. Rangeland health attributes rating for Key Area 3.

Key Area 3		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Clayey Upland 3 12-16" pz	Soil / Site Stability	Slight to moderate
	Hydrologic Function	Slight to moderate
	Biotic Integrity	Slight to moderate

Key Area 4

Ecological Site Name: Basalt Hills 10"-13" PZ

Ecological Site ID: R040XA101AZ – Sonoran Basin and Range

Production: 775 lbs/ac (206 lbs/ac to 2100 lbs/ac)

Dominant Vegetation: Foothills Palo verde-saguaro/ white brittlebush-ocotillo/ tobosa-bush muhly

Location: Township 9 North, Range 2 East, Section 1

Key Area 4 was established in 2008. Dry weight rank estimates, ground point cover, species frequency, and a Rangeland Health Assessment worksheet were completed. Key Area 4 is located on an upland terrace within a riparian pasture. The Ecological site is a Basalt Hills 10 – 13" p.z. This ecological site is a considerable portion of the Cross Y allotment but due to the steep terrain and lack of upland water only small portions of it is grazed. The location of this key area was selected because of its accessibility to livestock.

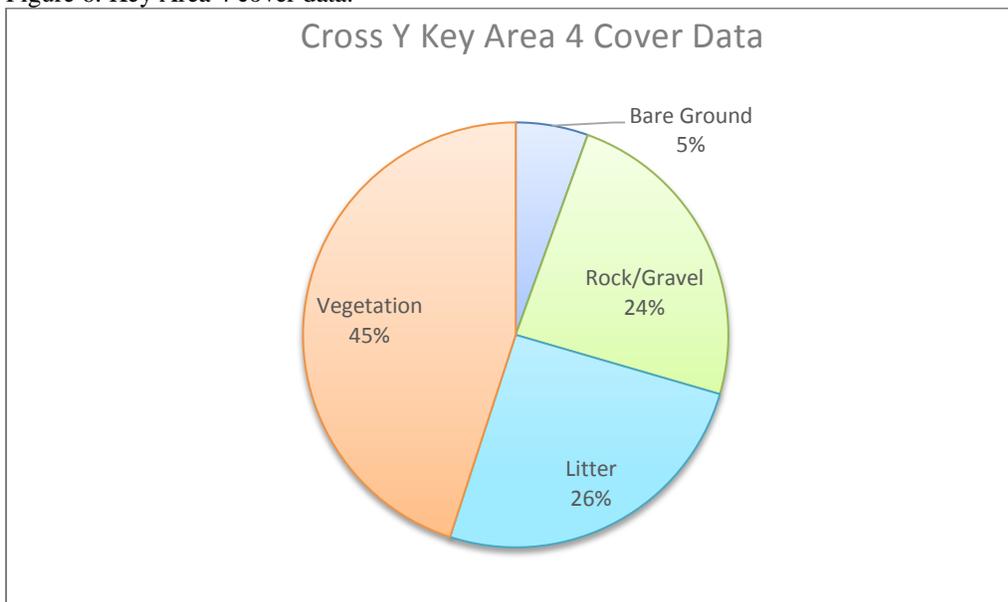
Photo 4. Cross Y Allotment Key Area 4.



Cover Data:

Surface cover ranges for a Basalt Hills 10- 13” precipitation zone for each attribute are: bare ground 5 - 35%, litter 5 - 50%, rock 20 -60%, and vegetation 15 - 20%. Cover data collected at Key Area 4 (Figure XX). The vegetation cover at key area 4 was very high 45% due to a high percent composition of mesquite and creosote. All other ground cover percentages were in appropriate ranges for a Basalt Hills site.

Figure 6. Key Area 4 cover data.



Species Composition:

Table 8 is a comparison to the Basalt Hills 10 -13” p.z. Ecological Site Description for relative vegetation production and species composition at Cross Y Key Area 4; this monitoring study was conducted in 2008. This plant community has a diverse mixture of desert trees, shrubs, cacti, grasses and forbs. Creosote composition was 19%, higher than expected. Within the allotment there are limy upland inclusions that are most likely influencing the percent composition of creosote for this key area. Mesquite composition was 24%, which was also high for the site. Basalt Hills ecological sites are typically dominated by Palo Verde. Perennial grass species was 1% of the total composition for the key area. Considering the amount of rainfall in the area the potential for higher production of perennial grass species is desired.

Table 8. Species composition for Basalt Hills, Key Area 4.

Basalt Hill 10-13"	
Species	Composition %
Perennial forbs	
Canyon ragweed ambrosia	1
Unknown forb	T
Goldenaster	10
Shrubs	
Whitestem paper flower	3
Triangleleaf goldeneye	11
Mormon tea	T
Catclaw acacia	4
Gray brittlebush	2
Green brittlebush	1
Creosote	25
Wolfberry	2
Succulents	
Teddybear cholla	2
Buckhorn cholla	3
Pencil cholla	1
Prickly pear	1
Trees	
Palo verde	2
Velvet mesquite	31
Perennial grasses	
Sand dropseed	T
Purple three awn	T
Big galleta	1
Annuals	
Annual forbs	0
Annual grasses	0

Frequency Data:

Frequency measurements were conducted at Cross Y Key Area 4 in 2008. Frequency measures the percentage of times on a transect that a certain species was present. Species richness

provides the number of plant species present along a transect. The amount of species at Key Area 4 is fairly high.

Table 9. 2008 frequency data for Key Area 4.

Key Area 4 - Basalt Hills 10-13”	Frequency
Canyon Ragweed Ambrosia	<1%
Unknown forb	<1%
Goldenaster	6%
Whitestem paper flower	2%
Triangleleaf goldeneye	10%
Mormon tea	<1%
Catclaw acacia	4%
Gray brittlebush	2%
Green brittlebush	3%
Creosote	25%
Wolfberry	3%
Teddybear cholla	2%
Buckhorn cholla	3%
Pencil cholla	<1%
Prickly pear	1%
Palo verde	2%
Velvet mesquite	31%
Sand dropseed	<1%
Purple three awn	<1%
Big galleta	1%
Species Richness	20 species

Rangeland Health Attribute Rating

Attributes are placed into one of five categories depending on the degree of departure from the ecological site description or reference area. Below is a summary of the three attributes relative to the distribution of indicator ratings from the Rangeland Health Evaluation Summary Worksheet, completed for Key Area 4. All of the attributes were rated as none to slight from the reference state.

Table 10. Rangeland health attribute rating for Key Area 4.

Key Area 4		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Basalt Hills 4 10-13” pz	Soil / Site Stability	None to slight
	Hydrologic Function	None to slight
	Biotic Integrity	None to slight

Key Area 5

Ecological Site Name: Clayey Upland 12"-16" PZ

Ecological Site ID: R038XA102AZ – Arizona Interior Chaparral

Production: 1325 lbs/ac (580 lbs/ac to 2100 lbs/ac)

Dominant Vegetation: tobosagrass – vine mesquite

Location: Township 10 North, Range 2 East, Section 36

Key Area 5 was established in 2008. At that time, dry weight rank estimates, ground point cover, species frequency, and a Rangeland Health Assessment worksheet was completed. Key Area 5 was the second of two studies established in a Clayey Upland 12 -16" p.z. Ecologically, this study area is very similar to Key Area 3.

Photo 5. Cross Y Allotment Key Area 5 (taken in 2014).



Cover Data:

Surface cover ranges for a Clayey Upland 12- 16" precipitation zone for each attribute are: bare ground 15 - 25%, litter 25 - 45%, rock 0 -25%, and vegetation 35 - 60%. Cover data collected at Key Area 3 (Figure XX) also indicates this area is transitioning from a tobosa grassland to an annual forbs and grasses state. The vegetation cover at key area 3 was 6%. The litter cover was 54% and consisted of mostly annual grasses and forbs. Bare ground cover was 15%, which is appropriate for this ecological site. Rock and gravel cover for Key Area 3 is higher than Key Area 2. Forage productively remains high; soil processes exhibit infiltration, permability, and soil stability appropriate for the site and condition.

Figure 7. 2008 cover data for Key Area 5.

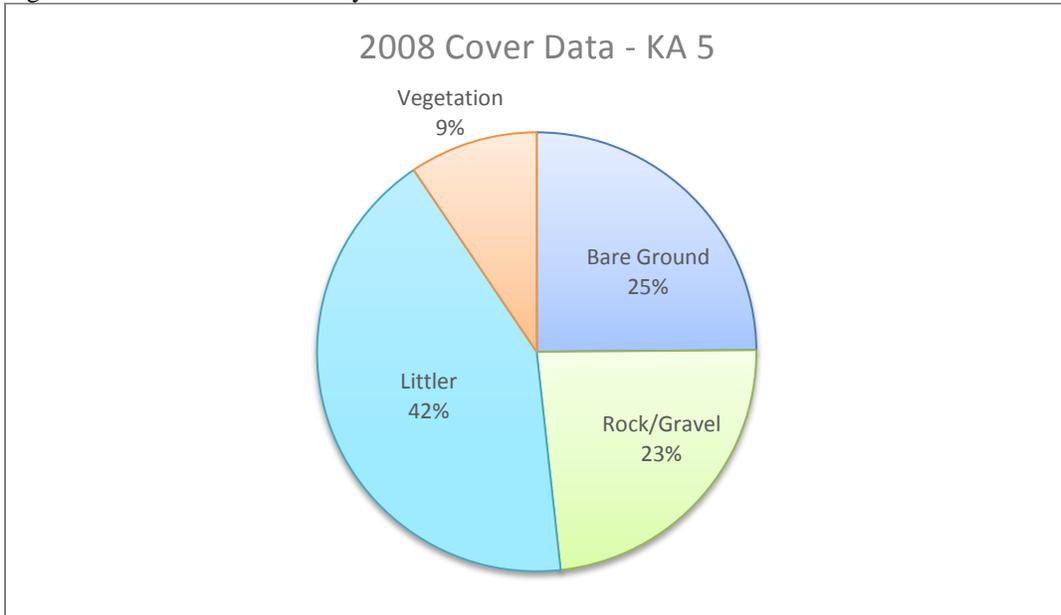
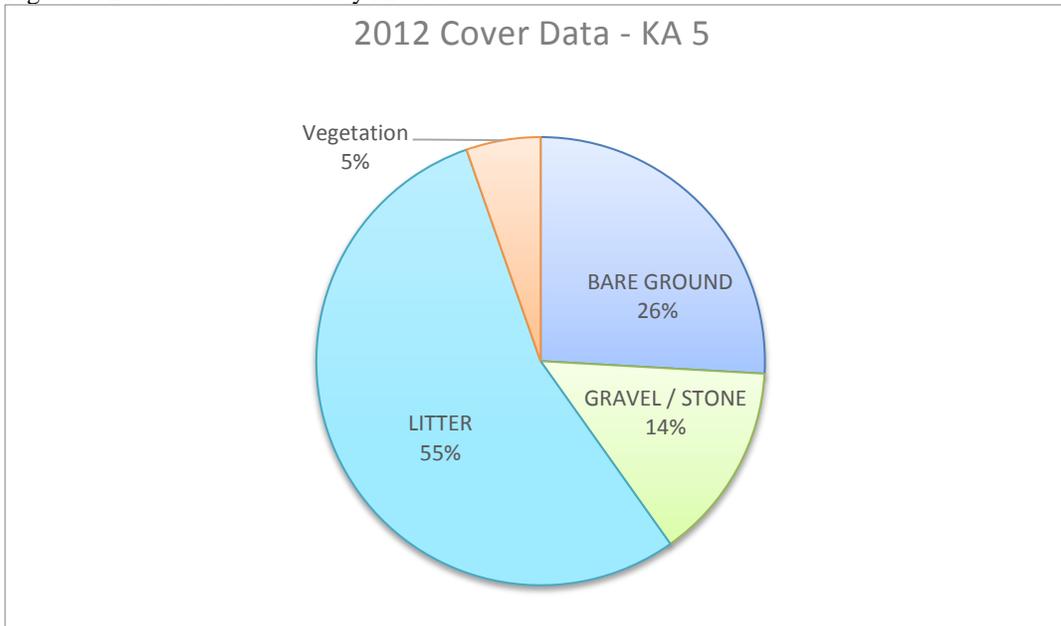


Figure 8. 2012 cover data for Key Area 5.



Species Composition:

Table 11 is a comparison to the Clayey Upland 12 -16" PZ Ecological Site Description for relative vegetation production and species composition at Cross Y Key Area 3; this monitoring study was also conducted in 2008. Tobosa is the dominant perennial grass on a Clayey Slopes site. The total composition for Tobosa at key area 2 was 37%.

Table 11. Key Area 5 percent composition by weight in 2008 and 2012 compared to percentage allowed in ecological site description.

Species	% Composition 2008	% Composition 2012
Shrubs		
Catclaw Acacia	1	1
Black Mustard	65	95
Succulents		
Prickly Pear	2	0
Perennial Forbs		
Purple Aster	0	1
Perennial Grasses		
Tobosa	31	3
Squirreltail	1	0
Annuals		
Annual Grasses	0	0
Annual Forbs	0	0

Frequency Data:

Frequency measurements were conducted at Cross Y Key Area 4 in 2008 and 2012. Frequency measures the percentage of times a certain species was present within a given transect. Species richness provides the number of plant species present in a given transect.

Table 12. Frequency of occurrence during 2008 and 2012, ANOVA statistical significance results.

Clayey Upland 5 12-16"	Frequency 2008	Frequency 2012
Catclaw acacia	3%	1%
Prickly Pear	1%	0%
Black Mustard	65%	93%
Tobosagrass	30%	4%
Squirreltail	1%	1%
Purple Aster	0%	1%
Species Richness	5 species	6 species

Rangeland Health Attribute Rating:

Attributes are placed into one of five categories depending on the degree of departure from the ecological site description or reference area. Below is a summary of the three attributes relative to the distribution of indicator ratings from the Rangeland Health Evaluation Summary Worksheet, completed for Key Area 4.

Table 13. Key Area 5 Rangeland Health attribute rating.

Key Area 5		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability

Key Area 5		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Clayey Upland 12-16" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	Moderate

Assessment, Inventory, and Monitoring (AIM) Data

The Bureau of Land Management’s Assessment, Inventory and Monitoring (AIM) strategy was developed in 2011 to allow land managers to gather data in a consistent and efficient manner, to be used at the field office, regional, and national levels. Baseline data was collected at the Cross Y Allotment in 2012 and will be used in the future to monitor the status, condition, trend, amount, location, and spatial pattern of resources on public lands within the Cross Y Allotment. Data presented in this evaluation will be used to make generalizations about plant communities found within various ecological sites in the allotment.

In the immediate future, BLM will use information derived from AIM Monitoring to make necessary management adjustments to meet resource objectives described at project, activity plan, resource management plan, and/or national program levels. Reporting at multiple scales will inform the BLM (and partners) on the effectiveness of management actions, opportunities for adaptive management, refinement of conceptual models, and evaluating the monitoring program itself. Adaptive changes will be subject to environmental analysis, land use planning, and public involvement, as appropriate (Toevs et al. 2011).

Figure 9. Canopy gap cover for each AIM Plot.

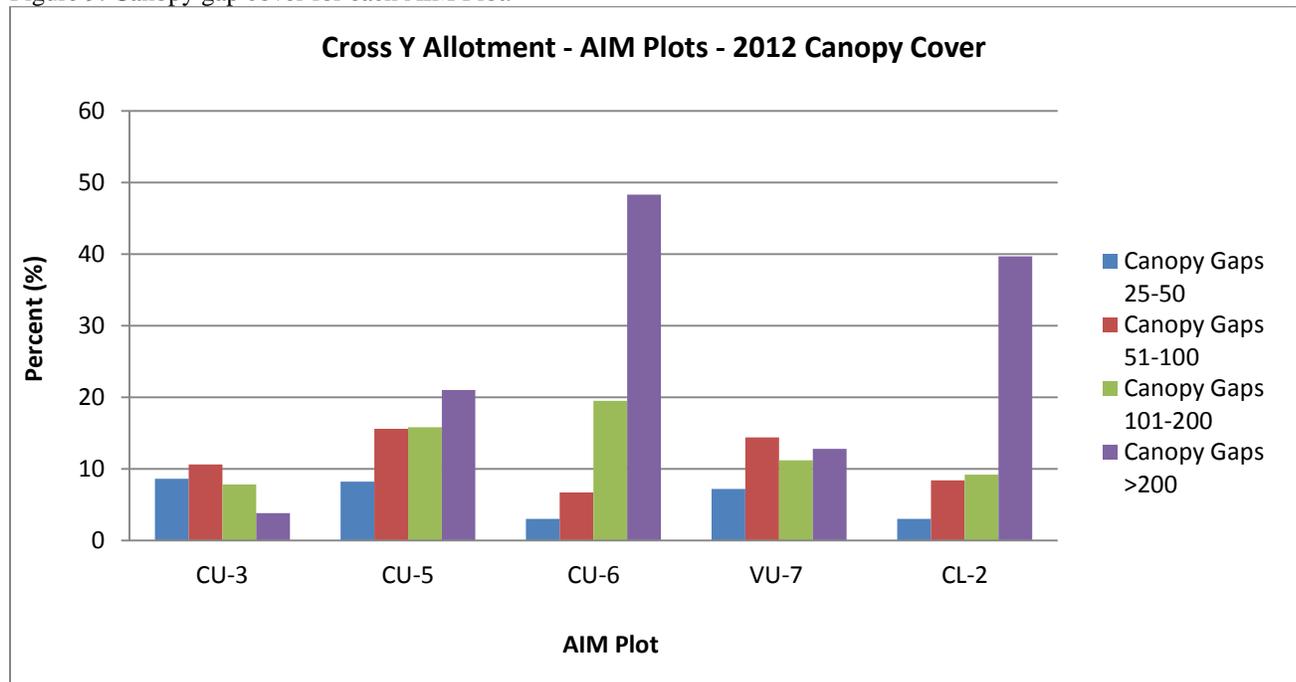
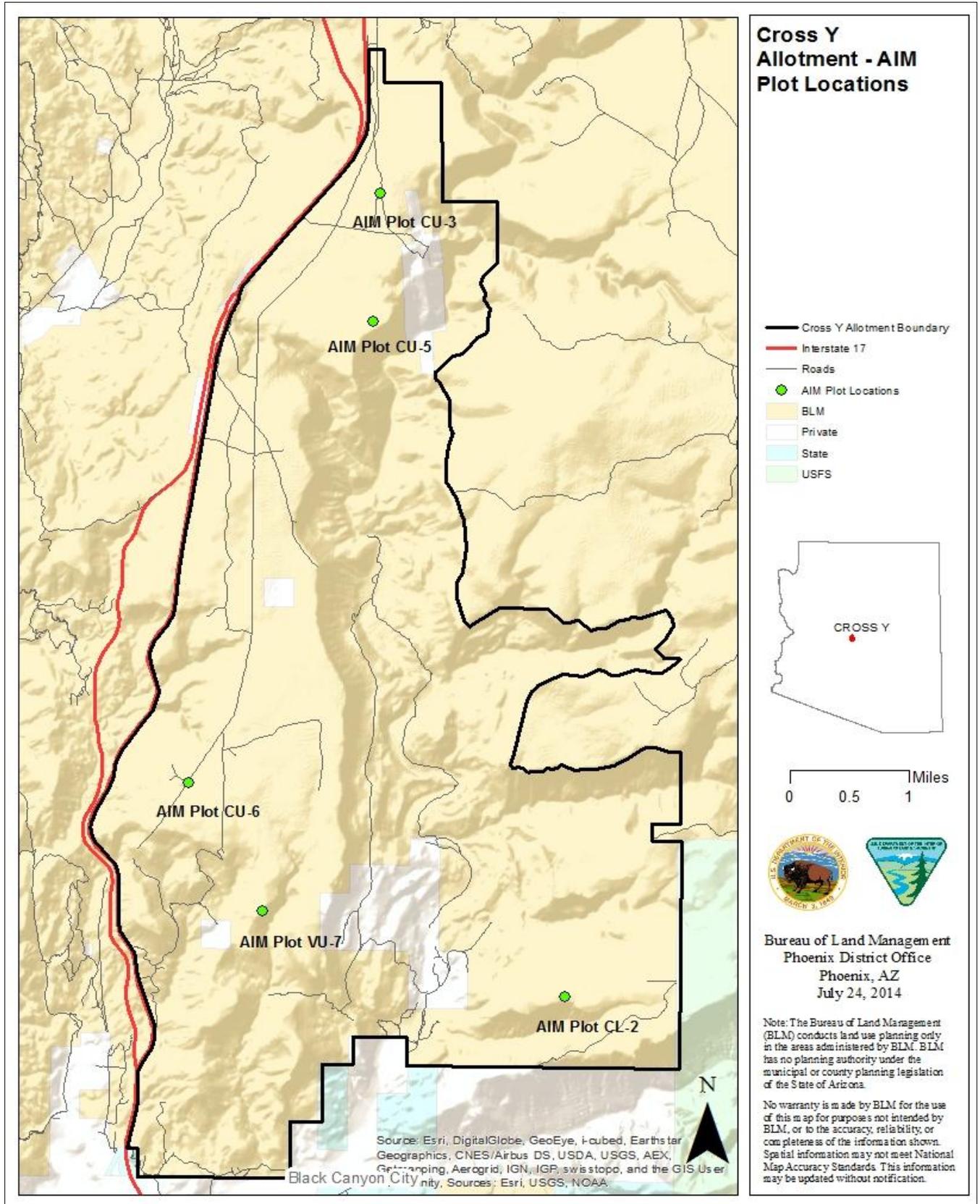


Figure 10. Map show AIM Plot locations and corresponding ecological sites within the allotment.



AIM Study Plot CU-3

Ecological Site Name: Clayey Upland 12"-16" PZ

Ecological Site ID: R038XA102AZ – Arizona Interior Chaparral

Production: 1325 lbs/ac (580 lbs/ac to 2100 lbs/ac)

Dominant Vegetation: tobosagrass – vine mesquite

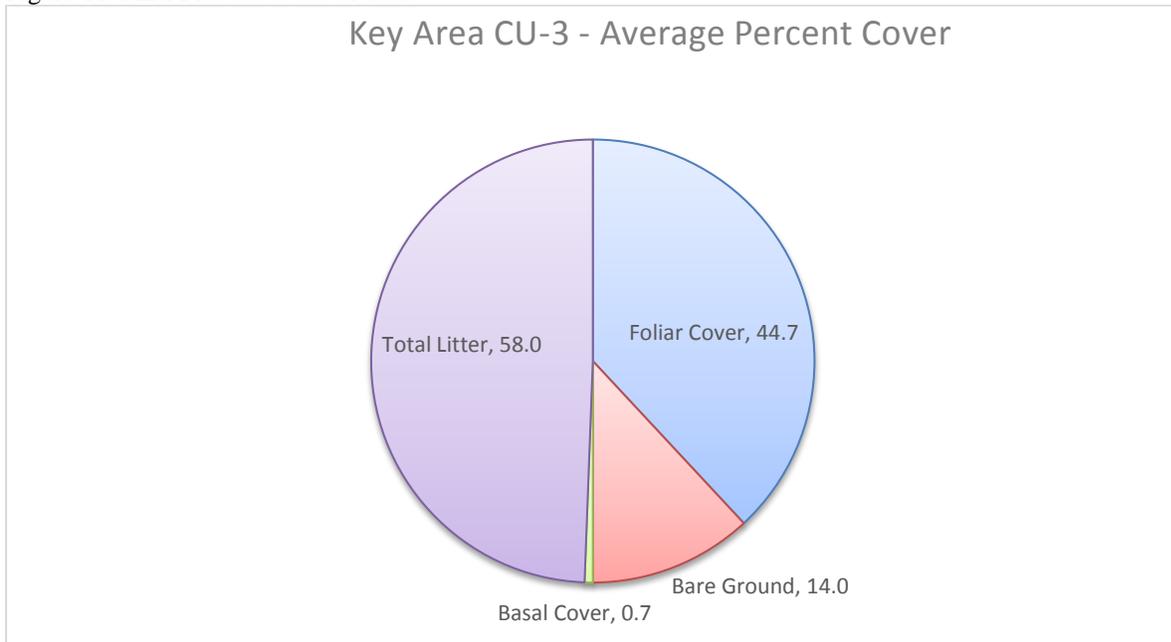
AIM Plot CU-3 is located at the northern end of the Black Mesa use area. This plot is found in a Clayey Upland 12-15" precipitation zone.

Photo 6. AIM study plot CU-3, Clayey Upland 12-16" p.z., Interstate 17 in background.



Surface cover ranges for ecological site Clayey Upland 12- 16" precipitation zone for each attribute are: bare ground 15 - 25%, litter 25 - 45%, rock 0 -25%, and vegetation 35 - 60%. AIM cover data at study plot CU-3 (Figure 10) shows high amounts of litter at 58% and vegetation foliar cover at 45%. The cover data also shows low amounts of bare ground at 14%. Litter at CU-3 is higher than what is expected at the Clayey Upland 12-16" p.z. ecological site at 58%. The amount of basal cover at study plot CU-3 is low and is expected to be much higher.

Figure 11. AIM Plot CU-3 Cover data.



AIM data collected at CU-3 shows mucronate sprangletop with the highest annual vegetative foliar cover at 21% of the sample area. Little barley was next at 9% annual foliar cover. Tobosagrass was minimal at this study plot at 3% annual foliar cover. Two forbs, little hogweed (7%) and head sandmat (8%) made up 15% of the annual foliar cover. Catclaw acacia was minimal at 1% annual foliar cover. These annual vegetative cover averages are consistent with the Clayey Upland 12”- 16” p.z. ecological site. However, the amount of Tobosagrass should be much higher.

Figure 12. Foliar cover for each vegetation species at AIM plot CU-3.

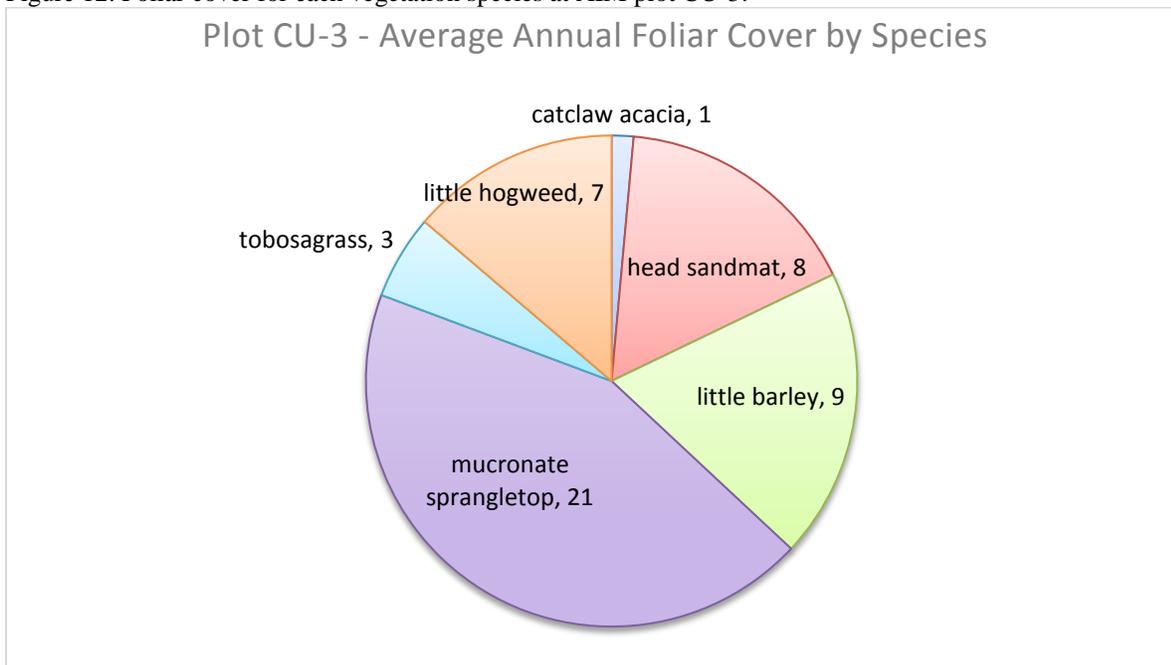


Table 13. Rangeland Health attribute rating.

AIM Plot CU-3		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Clayey Upland 12-16" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	Slight to Moderate
	Biotic Integrity	Slight to Moderate

AIM Study Plot CU-5

Ecological Site Name: Clayey Upland 12"-16" PZ

Ecological Site ID: R038XA102AZ – Arizona Interior Chaparral

Production: 1325 lbs/ac (580 lbs/ac to 2100 lbs/ac)

Dominant Vegetation: Tobosagrass – vine mesquite

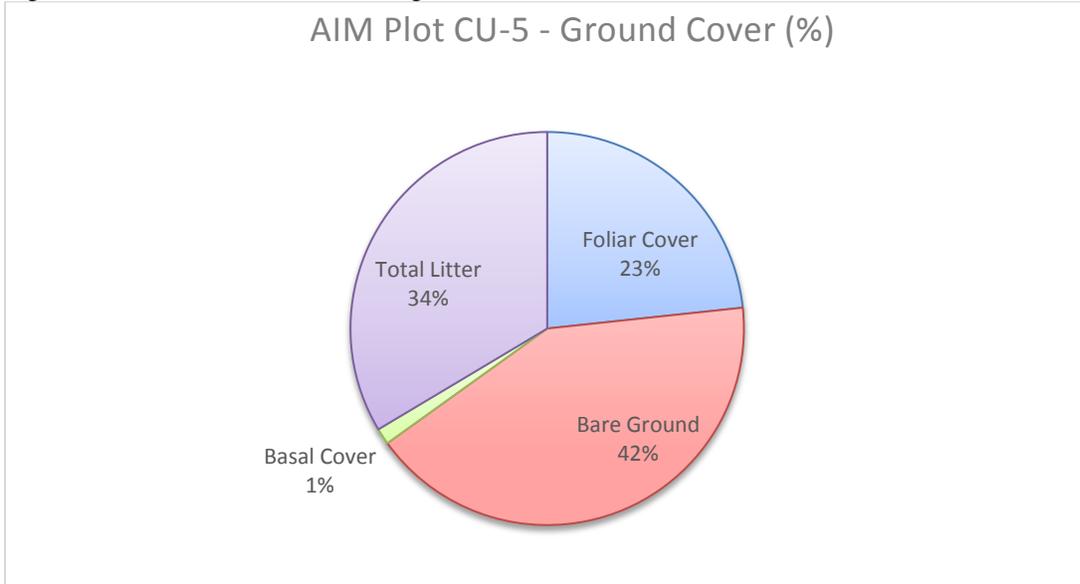
AIM study plot CU-5 was established in 2012. The area around this site has recently burned by fires in 2005 and 2014. This site is within close proximity to key area 3 and possesses many of the same ecological attributes.

Photo 7. AIM study plot CU-5, Clayey Upland 12-16" p.z.



Clayey Upland 12- 16” precipitation zone for each attribute are: bare ground 15 - 25%, litter 25 - 45%, rock 0 -25%, and vegetation 35 - 60%. AIM cover data at study plot CU-5 (Figure 12) shows litter at 33% and vegetation foliar cover at 23%. The cover data also shows high amounts of bare ground at 41%. Litter at CU-5 is consistent with what is expected at the Clayey Upland 12-16” p.z. ecological site. The amount of basal cover at study plot CU-5 is low and is expected to be much higher.

Figure 13. AIM Plot CU-5 Percent Vegetative Cover/Litter.



Mucronate sprangletop had the highest annual foliar cover at 9%. Tobosagrass was the second highest annual foliar cover at 7%. Head sandmat, little barley, weakleaf bur ragweed, and field anoda all made up small percentages of the annual foliar cover. Catclaw acacia made up 1% of the annual foliar cover at this study location.

Figure 14. AIM plot CU-5 percent foliar cover by each species.

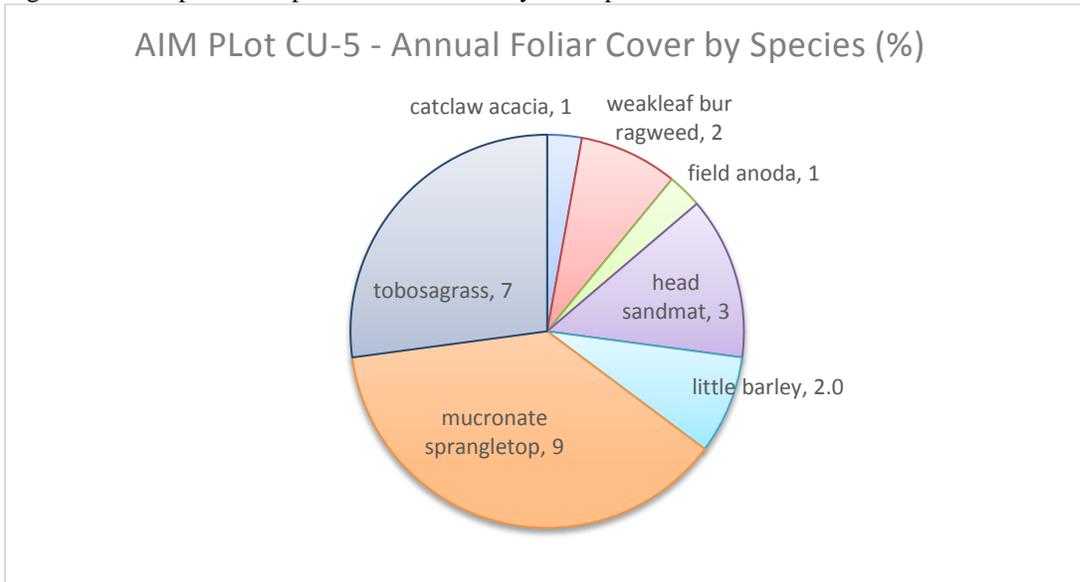


Table 14. AIM Plot CU-5, Rangeland Health attribute rating.

AIM Plot CU-5		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Clayey Upland 12-16" pz	Soil / Site Stability	Slight to Moderate
	Hydrologic Function	Slight to Moderate
	Biotic Integrity	Moderate

AIM Study Plot CU-6

Ecological Site Name: Clayey Upland 12"-16" PZ

Ecological Site ID: R038XA102AZ – Arizona Interior Chaparral

Production: 1325 lbs/ac (580 lbs/ac to 2100 lbs/ac)

Dominant Vegetation: tobosagrass – vine mesquite

AIM study plot CU-6 was established in 2012. Ecologically, this site is similar to CU-3 and CU-5.

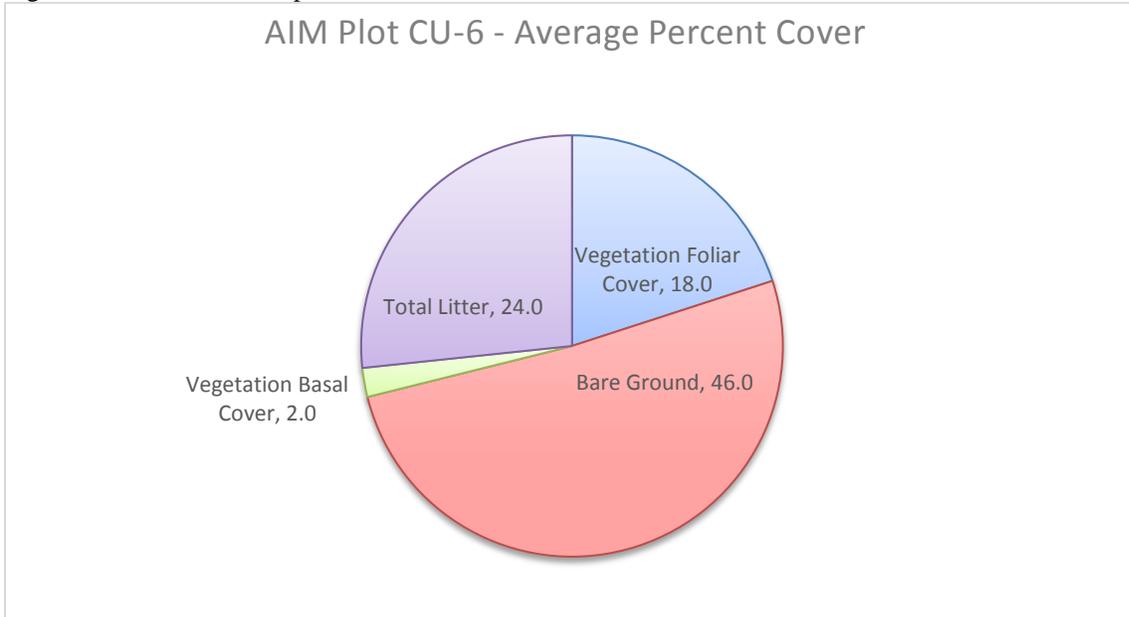
Photo8. AIM Plot CU-6, Clay Loam Upland 12-16" p.z.



Surface cover ranges for ecological site Clayey Upland 12- 16" precipitation zone for each attribute are: bare ground 15 - 25%, litter 25 - 45%, rock 0 -25%, and vegetation 35 - 60%. AIM cover data at study plot CU-3 (Figure 15) shows high amounts of litter at 58% and vegetation

foliar cover at 45%. The cover data also shows high amounts of bare ground at 46%. Litter at CU-3 is higher than what is expected at the Clayey Upland 12-16” p.z. ecological site. The amount of basal cover at study plot CU-3 is low and is expected to be much higher.

Figure 15. AIM Plot CU-6 percent cover.



Tobosagrass had the highest annual foliar cover at 7%, followed by mucronate sprangletop at 5%. Several forbs species were also detected, these species have low cover values. No annual species were detected; however biodiversity is low at this key area.

Figure 16. AIM Plot CU-6 percent annual foliar cover by each species.

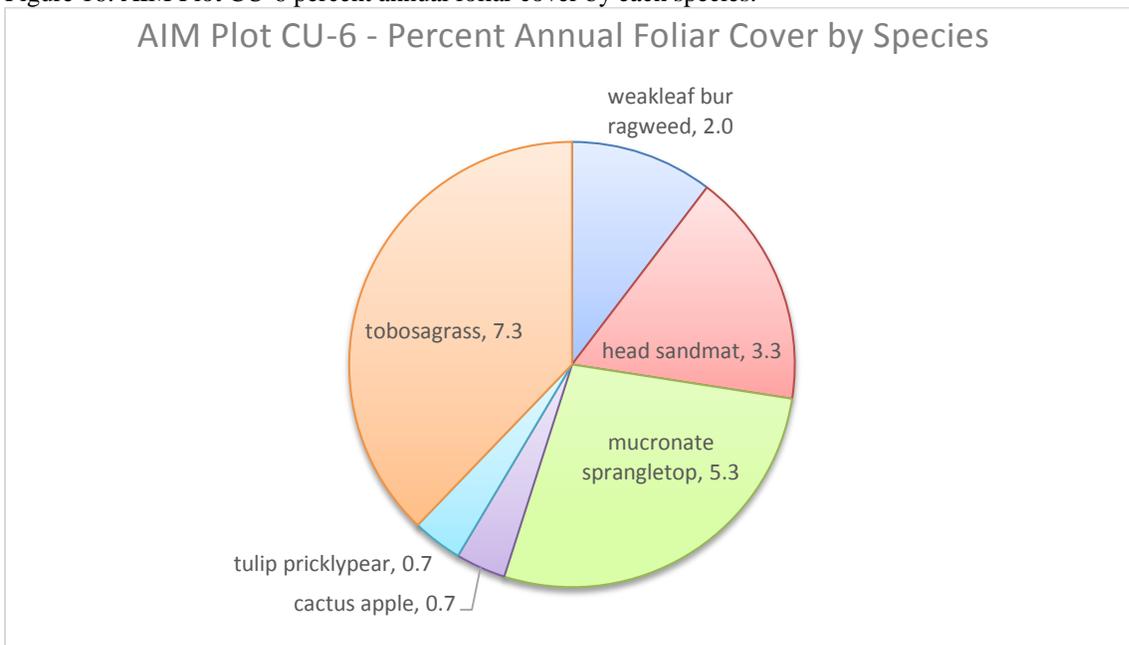


Table 15. AIM Plot CU-6 Rangeland Health attribute rating.

AIM Plot CU-6		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Clay Loam Upland 12-16" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	Slight to Moderate

AIM Study Plot VU-7

Ecological Site Name: Volcanic Upland 12"-16" PZ

Ecological Site ID: R038XA115AZ – Mogollon transition

Production: 1325 lbs/ac (272 lbs/ac to 1335 lbs/ac)

Dominant Vegetation: Walking stick cactus, Tobosagrass – vine mesquite

AIM plot VU-7 was established in 2012 at the southern end of the Black Mesa use area. This area is found in a Volcanic Upland 12-16" p.z. ecological site. Annual foliar cover collected at this study plot shows biodiversity is much higher than other AIM plots found within close proximity at Clayey Upland ecological sites.

Photo 9. AIM Plot VU-7, Volcanic Upland 12-16" p.z.



Surface cover ranges for a Volcanic Upland 12- 16” precipitation zone for each attribute are: bare ground 15 - 25%, litter 25 - 45%, rock 0 -25%, and vegetation 35 - 60%. Figure 17 shows cover data at VU-7 to be at 41% litter, 47% Foliar cover, and 9% bare ground. These averages are acceptable for this ecological site.

Figure 17. AIM Plot VU-7 percent ground cover.

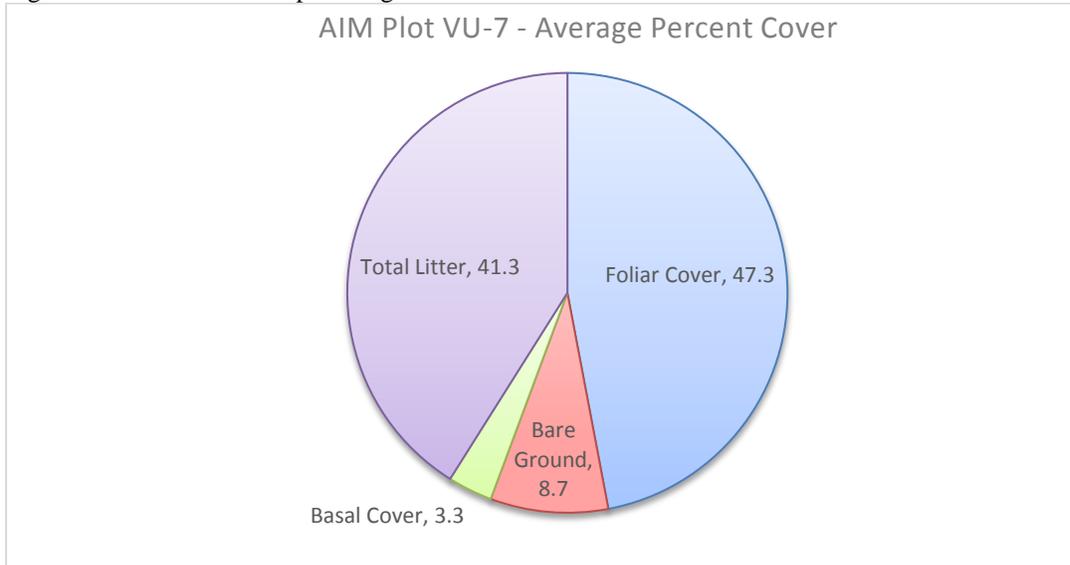


Figure 18 shows wild oats had the highest annual foliar cover at 28%, followed by mucronate sprangletop at 15%, followed by Tobosagrass at 14%. There were a high amount of shrubs, succulents, and forbs detected at this study area showing high amounts of biodiversity.

Figure 18. AIM Plot VU-7 percent foliar cover by each species.

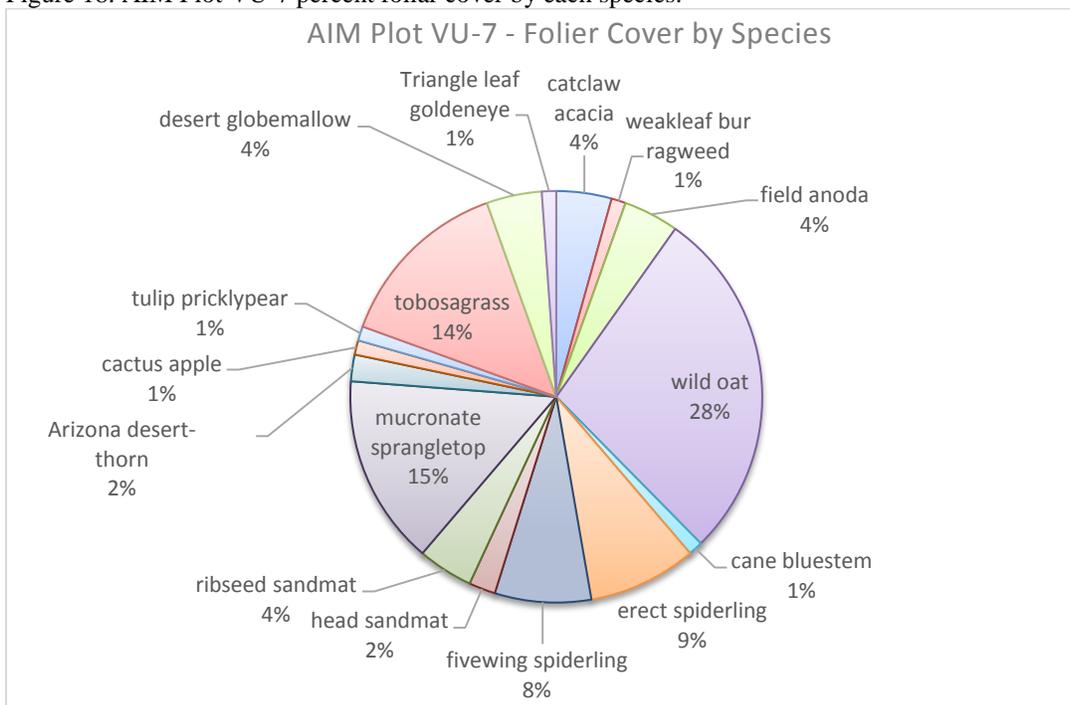


Table 16. AIM Plot VU-7 Rangeland Health attribute rating.

AIM Plot VU-7		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Volcanic Upland 12-16" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	None to Slight

Cross Y Allotment – AIM Plot CL-2

Ecological Site Name: Clay Loam Upland 12-16" PZ

Ecological Site ID: R038XA103AZ – Mogollon transition

Production: 905 lbs/ac (392 lbs/ac to 1555 lbs/ac)

Dominant Vegetation: Engelmann pricklypear – False mesquite/Tobosa – Curly Mesquite

Location: Township 10 North, Range 2 East, Section 36

AIM Plot CL-2 was established in 2012 on a Clay Loam Upland 12-16" p.z. This Key area is in the southern portion of the allotment and is the only key area found in a Limy Upland ecological site.

Photo 10. AIM Plot CL-2, Clay Loam Upland 12-16" p.z.



Surface cover ranges for a Clay Loam Upland 12-16" precipitation zone for each attribute are: bare ground 5 - 45%, litter 5 - 45%, rock 20 -85%, and vegetation 25 - 60%. Figure 19 shows

that AIM Plot Lim-2 fall within acceptable ranges for ground cover according the Limy Upland ecological site.

Figure 19. AIM Plot CL-2 percent ground cover.

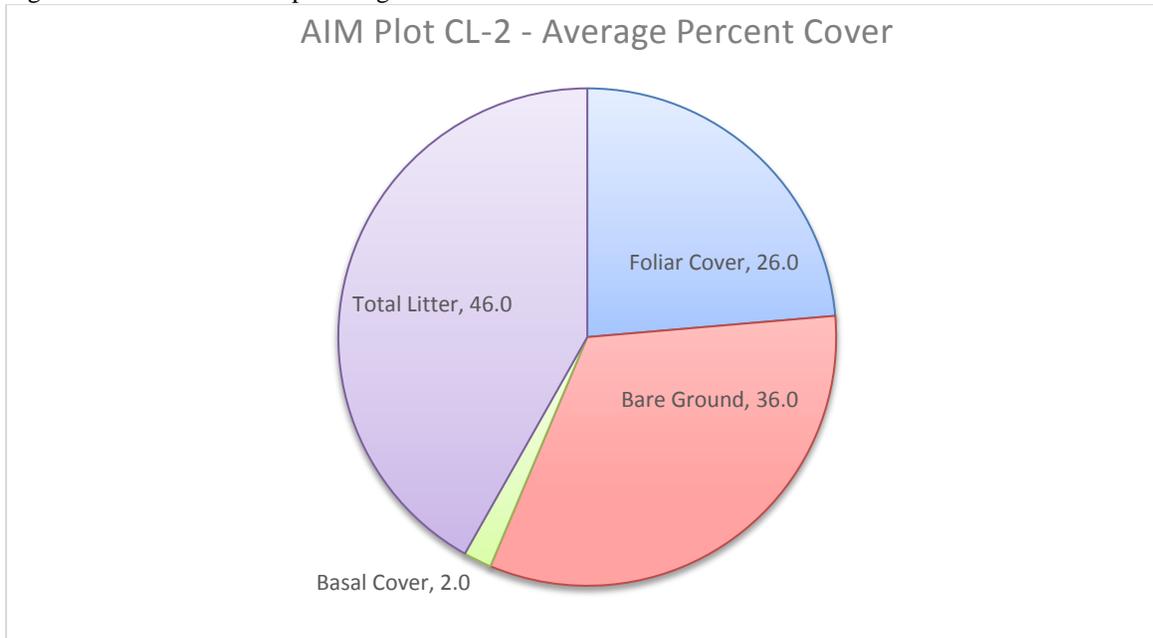


Figure 20 shows average annual foliar cover by species. Catclaw had the highest cover percentage at 7%, desert globemallow was next at 5%. The annual foliar cover shows this study plot has high biodiversity of shrubs, sub-shrubs, succulents, forbs, and grasses.

Figure 20. AIM Plot CL-2 average percent annual foliar cover.

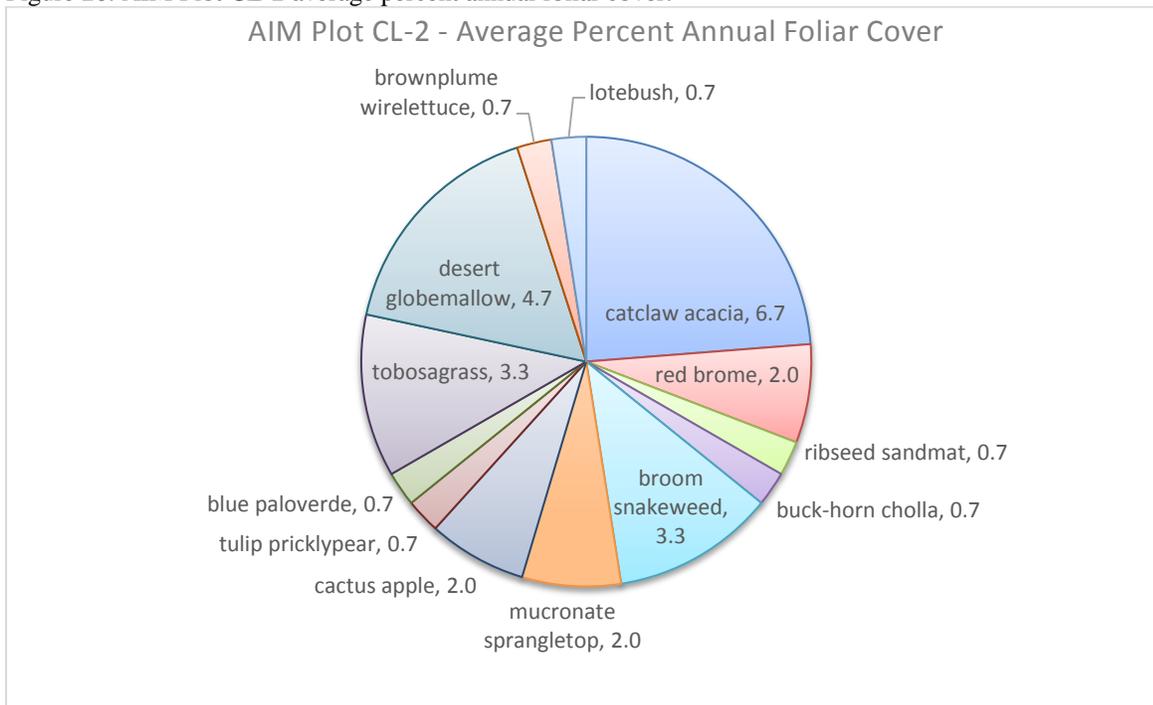


Table 17. AIM Plot Lim-2 Rangeland Health attribute rating.

AIM Plot CL-2		
Ecological Site	Rangeland Health Attribute	Attribute Rating - Departure from Site Capability
Clay Loam Upland 12-16" pz	Soil / Site Stability	None to Slight
	Hydrologic Function	None to Slight
	Biotic Integrity	None to Slight