U.S. Department of the Interior

Bureau of Land Management

Environmental Assessment

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Big Bug Creek Allotment
Grazing Authorization Renewal

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BLM

1.0 PURPOSE AND NEED FOR ACTION

The Bureau of Land Management (BLM), Hassayampa Field Office proposes to issue a grazing lease renewal decision to provide area-specific direction and management actions for the Big Bug Creek Allotment in the southeastern portion of Yavapai County, Arizona. See Map 1 in the Land Health Evaluation (LHE) (Appendix C) for more information about where the allotment is located.

This Environmental Assessment (EA) has been prepared for compliance with the National Environmental Policy Act (NEPA). This EA tiers to the Environmental Impact Statement (EIS) for the 2010 Bradshaw Harquahala Resource Management Plan (RMP) and incorporates by reference relevant portions of the 2014 LHE for the Big Bug Creek Allotment (Appendix C).

1.1 Purpose and Need

The purpose of this action is to consider livestock grazing opportunities on public lands where consistent with management objectives, including the BLM *Arizona Standards for Rangeland Health and Guidelines for Livestock Grazing Management* (Rangeland Health Standards) (BLM 1997).

The need for this action is established by the Taylor Grazing Act, the Federal Land Policy and Management Act, Fundamentals of Rangeland Health (43 CFR 4180), and the Bradshaw Harquahala Record of Decision and Approved Resource Management Plan (RMP) (BLM 2010) to respond to an application for renewal of an expiring livestock grazing permit to graze livestock on public land. In detail, the analysis of the actions is needed because:

- The Bradshaw-Harquahala RMP identifies resource management objectives and management actions that establish guidance for managing a broad spectrum of land uses and allocations for public lands in the Hassayampa Field Office. The RMP allocated public lands within the Big Bug Creek allotment as available for domestic livestock grazing. Where consistent with the goals and objectives of the RMP and Land Health Standards, the issuance of grazing permits or leases to qualified applicants are provided for by the Taylor Grazing Act and the Federal Land Policy and Management Act.
- BLM Arizona adopted the Arizona Rangeland Health Standards (Land Health Standards) and Guidelines for Livestock Grazing Management (Arizona S&Gs) in all Land Use Plans in 1997 (Appendix A). The Land Health Standards and Guidelines for Grazing Administration were also incorporated into the RMP. Guidelines direct the selection of grazing management practices and, where appropriate, livestock facilities to promote significant progress toward, or the attainment and maintenance of, the standards. The LHE completed for the Big Bug Creek allotment determined that Standards 1 (Upland) and part of Standard 3 (Desired Resource Conditions – Upland) are being achieved, while Standards 2 (Riparian) and part of Standard 3 (Desired Resource Conditions – Riparian) are not being met.

1.2 Decision to be made

The Hassayampa Field Manager is the authorized officer responsible for the decisions regarding management of BLM administered public lands within this allotment. Based on the results of this NEPA analysis, the authorized officer will issue a determination of the significance of the environmental effects and whether an environmental impact statement (EIS) would be required. If the authorized officer determines that it is not necessary to prepare an EIS, the EA will provide information for the authorized officer to make an informed decision whether to renew, renew with modifications, or not renew the permit and if renewed, which management actions, mitigation measures, and monitoring requirements will be prescribed for the Big Bug Allotment to ensure management objectives and Arizona Standards for Rangeland Health are achieved.

1.3 Land Use Plan Conformance

Rangeland management decisions in the Bradshaw-Harquahala RMP[1] that pertain to the Proposed Action include:

Desired Future Conditions

GM-1 Rangeland conditions conform to the Land Health Standards described in *Arizona Standards for Rangeland Health and Guidelines for Grazing Administration*, which describe the desired conditions needed to encourage proper functioning of ecological processes. These standards are described in greater detail in the above section on Land Health Standards.

GM-2 Watersheds are in properly functioning condition, including their upland, riparian, and aquatic components. Soil and plant conditions support infiltration, storage, and release of water that are in balance with climate and landform.

GM-3 Ecological processes are maintained to support healthy biotic populations and communities

Land Use Allocation

GM-4 Administer 93 grazing authorizations within the grazing allotment boundaries shown on Map 13.

GM-5 Public lands without a grazing permit or lease authorization will remain unauthorized for livestock grazing.

Management Actions

GM-6 Build livestock control fences and alternative water sources where needed to meet natural resource objectives. Fence construction and maintenance will follow guidance provided in BLM's Handbook on Fencing No. 1741-1.

GM-8 Inventory and/or monitoring studies are used to determine if adjustments to permitted use levels, terms and conditions, and management practices are necessary in order to meet and/or make significant progress towards meeting the Arizona Standards for Rangeland Health and other management objectives.

[1] Management decisions applicaple to Rangeland Management (GM) are numbered and listed on pages 49-52 of the web version Bradshaw-Harquahala RMP (BLM 2010).

GM-11 Range improvements needed for proper management of the grazing program will be determined and completed, including repair and/or installation of fences, cattle guards, water developments, and vehicle routes needed to access improvement areas.

GM-14 Management practices to achieve Desired Plant Community (DPCs) will consider protecting and conserving known cultural resources, including historical sites, prehistoric sites, and plants of significance to Native American people.

GM-15 Apply management actions outlined in the Arizona Standards for Rangeland Health and Guidelines for Grazing Administration to recognize and correct potential erosion problems that could degrade other resources, with prioritized emphasis on sites that might directly affect species that have been listed as threatened, endangered, or candidate by the FWS.

Guidelines for Standard One

GM-17 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. The ground cover should maintain soil organisms, 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.

Guidelines for Standard Two

GM-19 Management practices maintain or promote sufficient vegetation to maintain, improve or restore riparian-wetland functions of energy dissipation, sediment capture, groundwater recharge, stream bank stability, thus promoting stream channel morphology (e.g. gradient, width/depth ratio, channel roughness, and sinuosity), and functions suitable to climate and landform.

Guidelines for Standard Three

GM-24 Intensity, season and frequency of use, and distribution of grazing use will be managed to provide for growth and reproduction of plant species needed to reach DPC (Desired Plant Community) objectives.

GM-27 DPC objectives will be quantified for each allotment through the rangeland monitoring and evaluation process. Ecological site descriptions available through the Natural Resources Conservation Service and other data will be used as a guide for addressing site capabilities and potentials for change over time. These DPC objectives are vegetation values that BLM is managing over the long term. Once established, DPC objectives will be updated and monitored by the use of indicators for Land Health Standard Three.

1.4 Relationship to Statutes, Regulations, or other Plans

Grazing permit/lease renewals are provided for in 43 CFR 4100. The objectives of these regulations are "....to promote healthy, sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions; to promote the orderly use, improvement and development of the public lands; to establish efficient and effective administration of grazing of public rangelands; and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands" (43 CFR 4100.0-2). 43 CFR 4100.0-2(b) also states, in part, "These objectives will be realized in a manner consistent with land use plans, multiple use, sustained yield, environmental values, economic and other objectives stated in the Taylor Grazing Act of

June 28, 1934, as amended (43 U.S.C. 315, 315a-315r); section 102 of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701) and the Public Rangelands Improvement Act of 1978 (43 U.S.C. 1901(b)(2)).”

The Proposed Action complies with 43 CFR 4100.0-8 which states, in part, “The authorized officer shall manage livestock grazing on public lands under the principle of multiple use and sustained yield, and in accordance with applicable land use plans.” The Proposed Action also complies with 43 CFR 4130.2(a) which states, in part, “Grazing permits or leases shall be issued to qualified applicants to authorize use on the public lands and other lands under the administration of the Bureau of Land Management that are designated as available for livestock grazing through land use plans”.

The Proposed Action is consistent with the Fundamentals of Rangeland Health (43 CFR 4180.1) and Rangeland Health Standards, which were developed through a collaborative process involving the Arizona Resource Advisory Council and the BLM State Standards and Guidelines team. The Secretary of the Interior approved the Standards and Guidelines in April 1997. These standards and guidelines address watersheds, ecological condition, water quality, and habitat for special status species. These resources are addressed later in this document.

In addition, the actions considered under this EA are designed to be consistent with all Federal, State, and local laws, regulations, and policies deemed relevant to the proposed undertaking, including (but not limited to) the following:

- Taylor Grazing Act of 1934
- Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.)
- Public Rangelands Improvement Act of 1978
- 43 CFR 4100 Grazing Administration - Exclusive of Alaska
- Arizona Water Quality Standards, Revised Statute Title 49, Chapter II
- Clean Water Act of 1972, as amended
- Clean Air Act of 1970, as amended
- Endangered Species Act of 1973, as amended
- Section 106 of the National Historic Preservation Act of 1966, as amended
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001-3013; 104 Stat. 3048-3058)
- National Environmental Policy Act of 1969
- Migratory Bird Treaty Act of 1917, and Executive Order 13186 – *Responsibilities of Federal Agencies to Protect Migratory Birds*

1.5 Scoping & Public Participation

Internal scoping was conducted with BLM specialists. External scoping was initiated through an informal consultation with the U.S. Fish and Wildlife Service for comments related to any special status species that may be located in the area. Public scoping was conducted via letters sent to the Consultation, Coordination, and Cooperation list.[2] Recipients were asked to comment

[2] All references in this document are on file with project record, BLM Hassayampa Field Office, 21605 North 7th

on the LHE and the Proposed Action. The scoping period was August 4 through August 18, 2014.

1.6 Issues Identified

The primary issues identified during public scoping include:

- Sheep trailing
- Water and riparian use and utilization by livestock.
- Noxious and Invasive Weeds

Please see Appendix B for a full list of individual comments and responses.

2.0 ALTERNATIVES

This chapter describes the alternatives to be analyzed in detail (Chapter 3). The interdisciplinary team (IDT) of BLM specialists developed three alternatives – Proposed Action, No Action, and No Grazing – based on the analysis and technical recommendations presented in the Big Bug Creek LHE, and to respond to scoping comments. A Reduced Grazing alternative was also considered, but eliminated from further analysis. These alternatives are designed to meet the purpose and need for action, conform to existing land use plans, and satisfy the legal and regulatory requirements for rangeland management.

2.1 Features Common to All Alternatives

The following apply to each of the three alternatives below.

Arizona Standards for Rangeland Health

All the alternatives in this assessment were intended to meet or make significant progress toward meeting the standards and following objectives, as described in the Rangeland Health Standards.

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

1. Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site).
2. Riparian-wetland areas are in properly functioning condition.
3. Productive and diverse upland and riparian-wetland plant communities of native species exist and are maintained.

Desired Plant Community Objectives

As part of the land health assessment process, DPC objectives were established for important biological resources (biological objects within the boundaries of the allotments). 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

Avenue, Phoenix, Arizona 85027.

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. Site potentials, developed from the Natural Resources Conservation Service's (NRCS) Ecological Site Descriptions,[3] determine the potential for various ecosites. A complete explanation of the DPC objectives and development process can be found in the LHE.

1. *Key Area 1 DPC Objectives (Volcanic Upland 12 inch (") to 16" Precipitation Zone (PZ)):*

- Maintain vegetation canopy cover at greater than or equal to (≥) 25 percent.
- Maintain key browse shrub species composition at ≥ 30 percent.
- Maintain key perennial grass composition at ≥ 20 percent, with ≥ 5 percent Tobosa.
- Maintain bare ground ≥ 25%.

2. *Key Area 2 DPC Objectives (Loamy Upland 12" to 16"PZ):*

- Maintain vegetation canopy cover at 30%.
- Maintain composition of palatable shrubs at > 15 %.
- Maintain key perennial grass composition at > 15 %.
- Maintain bare ground below 25 %.

Monitoring

Rangeland monitoring studies are conducted to analyze the effects of anthropogenic uses within the Big Bug Creek allotment. Section 5.0 of the Big Bug Creek LHE describes the methods used to inventory, monitor, and analyze data collected throughout the evaluation period and allotment boundary.

2.2 Alternative A - Proposed Action

Under this alternative, similar to the No Action Alternative, a grazing lease would be issued for a 10-year period to the holder of the preference for grazing privileges on the Big Bug Creek Allotment under the current terms and conditions of the permit. Grazing use would occur annually on the allotment between the dates of 01 March to 28 February. Forage utilization levels on average would be lowered to 40 percent during normal years and 30 percent average during drought years on key forage grass species. Utilization of palatable woody species would be reduced to 35%. When the 30-40% utilization "trigger" is met on any forage species (herbaceous or woody), the lessee would be responsible to make sure their cattle were moved off of the BLM portions of the allotment. The following table shows what terms and conditions would be on the new grazing lease:

Table 1. Grazing schedule under the Proposed Action

Allotment Name	Cattle Number	Begin Date	End Date	Percent Public Land	AUMs
Big Bug Creek	9	1-Mar	28-Feb	100%	108

[3] Available online at (http://esis.sc.egov.usda.gov/).

Changes from the use described above may be allowed for reasons of drought, flooding, or any other reasons acceptable to the BLM authorized officer. However, these changes must be requested in writing at least 30 days before the requested changes are proposed to occur, and be approved by the BLM authorized officer in writing.

In addition to the proposed terms and conditions, other mandatory terms and conditions would be added to the permit under the Proposed Action (Standard terms and conditions are found on Grazing Permit/Lease Form 4130-2a):

1. Supplemental feeding is limited to salt, mineral, and/or protein in block, granular, or liquid form. If used, these supplements must be placed at least one-quarter (1/4) mile from livestock water sources and known cultural sites, and one-eighth (1/8) mile away from major drainages and washes and sensitive wildlife habitat.
2. The lessee must properly complete, sign and date an Actual Grazing Use Report Form (BLM Form 4230-5) annually. The completed form(s) must be submitted to the BLM, Hassayampa Field Office(HFO) within 15 days from the last day of authorized annual grazing use (43 CFR 4130.3-2 9d)).
3. As required by the Native American Graves Protection and Repatriation Act regulations at 43 CFR 10.4, the following would be added to the permit as a term and condition: "If in connection with allotment operations under this authorization, any human remains, funerary objects, sacred objects or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act (P.L. 101-601; 104 Stat. 3048; 25 U.S.C. 3001) are discovered, the permittee shall stop operations in the immediate area of the discovery, protect the remains and objects, and immediately notify the Authorized Officer of the discovery. The permittee shall continue to protect the immediate area of the discovery until notified by the Authorized Officer that operations may resume."

2.3 Alternative B - No Action Alternative

Under this alternative, the grazing permit would be issued for a 10-year period to the holder of the preference for grazing privileges on the Big Bug Creek Allotment under the current terms and conditions of the permit. Livestock use would continue on the allotment as it has for the past 20 years. The following grazing schedule would remain in place on the allotment and would be a term and condition of the grazing permit:

Table 2. Grazing Schedule under the No Action Alternative.

Allotment Name	Cattle Number	Begin Date	End Date	Percent Public Land	AUMs
Big Bug Creek	9	1-Mar	28-Feb	100%	108

2.4 Alternative C - No Grazing Alternative

Under this alternative, livestock grazing would be eliminated from the BLM administered lands within the Big Bug Creek Allotment. The existing grazing permit would be cancelled, reducing the active AUMs from 108 to 0.

There are no range improvements or water catchments on BLM administered lands that would need to be reclaimed within the allotment.

2.5 Alternatives Considered but Removed from Detailed Analysis

Alternatives may be dismissed from detailed analysis under the following conditions (BLM 2008):

- The alternative is ineffective and would not respond to the Purpose and Need
- It's technically or economically infeasible
- It's inconsistent with the land use plan
- Implementation is remote or speculative
- It's substantially similar to another alternative that is analyzed
- It would have substantially similar effects as an alternative that is being analyzed.

2.5.1 Reduced Grazing Alternative

The IDT reviewed a "reduced grazing" alternative in response to comments received during public scoping (see Appendix B, comments 8 and 9). The purpose of the alternative was to consider whether reducing the livestock stocking rate on the allotment presented a viable means of meeting the purpose and need for this action.

Rather than select an arbitrary number or percentage of reduction, the BLM typically uses a "desired stocking rate analysis"[4] to estimate livestock carrying capacity on the allotment. A stocking rate analysis provides a non-arbitrary method to identify alternative possible stocking rates on an allotment. This analysis identifies stocking rates based on a desired utilization percent of key forage species.

Desired Stocking Rate Formula:

$$\frac{\text{(Actual Use)(Desired Utilization Percent)}}{\text{Observed Utilization Percent}} = \text{Desired Stocking Rate}$$

Desired or objective utilization levels for the allotment were calculated using 30 percent for herbaceous (grasses and forbs) or palatable shrub species established in the LHE. In 2008 thru 2013, the lessee ran the full livestock numbers authorized for the grazing year (9 cow/calf pairs from March 1 through February 28, 108 AUMs). All data were used for years that both actual use and utilization data were available (2013 and 2014). When utilization levels were recorded for more than one species, the highest use level was used. This method uses the concept of "limiting factor" which recognizes that the species used the most will determine the level of grazing use that will best manage for maintenance of the key forage species.

Estimated carrying capacity was calculated to be 540 AUMs on the BLM portion of the Big Bug Creek Allotment. This analysis used average key area utilization data (6%) and actual use numbers (total annual livestock numbers) from 2013 and 2014 to calculate the estimated carrying capacity. To generate the desired stocking rate, the actual use was multiplied by the desired utilization percent, and then divided by the observed utilization to yield desired use.

A reduced grazing alternative was not analyzed in detail because the current alternatives sufficiently illustrate the full range of expected impacts. The carrying capacity analysis demonstrates that utilization is within the desired range under current stocking rates. The IDT

[4] The desired stocking rate analysis was conducted in conformance with TR-4400-07, "Analysis, Interpretation, and Evaluation", as given in Appendix 2 of the TR.

determined that the alternative would have substantially similar effects as an alternative (Proposed Action and No Action) that is being analyzed in detail in this EA. Therefore, the alternative is removed from detailed analysis.

2.5.2 Actual Use Alternative

This alternative was proposed and considered by the interdisciplinary BLM Team. Actual use is defined as the location, duration and intensity (livestock numbers) within an allotment across the course of a grazing year. Because the lessee has been primarily running the full livestock numbers authorized for the grazing year (9 cow/calf pair from 3/1 to 2/28) since 2008 (Appendix C, Table 8 in LHE), this alternative is substantially similar to the No Action alternative, which is analyzed in detail in Chapter 4. Therefore, this alternative is removed from detailed analysis.

2.5.3 Cattle grazing only alternative

This alternative was proposed during public scoping and would prohibit sheep trailing across the allotment while still allowing cattle grazing. Sheep trailing through the Big Bug Creek allotment is solely at the discretion of the BLM authorized officer and is outside of the scope of this analysis. This alternative would have substantially similar impacts as the No Grazing Alternative and has been removed from detailed analysis.

3.0 AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

For each resource analyzed in detail, this chapter first provides a succinct description of the conditions and trends of issue-related elements of the human environment, and then analyzes and describes the potential environmental consequences, or impacts, that would occur as a result of implementing the alternatives. Resources that may exist within the project area, but would not be impacted by the alternatives, are listed in Table 3.

General Project Setting

The Big Bug Creek allotment is located in the Arizona Interior Chaparral within the Mogollon Transition area and south of the Mogollon Rim, which is characterized by steep hill slopes and ridges, rugged mountain slopes, ridge tops, and mesa sides. Slopes are from 15 percent to 70 percent. The elevation of the Allotment ranges from 3,800 feet to 4,281 feet. Big Bug Creek allotment is bisected by Big Bug Creek; however, there are no sections of Big Bug Creek that are perennial, thus current conditions/water resources are not available in sufficient volume and durations to support are riparian areas along Big Bug Creek within the allotment.

3.1 Definition of Terms

Common terms used to describe potential environmental impacts are defined as follows:

Adverse: An effect that is negative or detrimental to one or more resources (e.g. degrades its quality or integrity). In this document, the term “impact” is assumed to be adverse unless otherwise stated.

Beneficial: An effect that is positive or beneficial to one or more resources (e.g. enhances its quality or integrity)

Direct: Effects of the action that are a direct result of the action, occurring at the same time and place as the action.

Indirect: Effects of the action that are caused or enabled by the action, but occur later in time or space or through an intermediary, and are reasonably foreseeable (e.g. growth-inducing effects, "but-for" effects, etc.).

Cumulative: Direct and indirect effects of the action combined with the incremental, additive effects of other past, present, and reasonably foreseeable future actions, on a given resource.

Short-Term: An effect that occurs only for a short time relative to the temporal scope of the action.

Long-Term: An effect that occurs for a long time relative to the temporal scope of the action.

3.2 Analysis of Resources

Table 3. Resources and rationale for detailed analysis.

Resource	Not Present	Present, Not Affected	Present, May Be Affected	Rationale
Air Quality	X			The Clean Air Act of 1970 and subsequent amendments required the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS), which specify maximum levels for six criteria pollutants: carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM), sulfur dioxide, and lead. Livestock operations have the potential to release fugitive dust (PM) and carbon monoxide associated with cattle trailing, range improvements, and vehicle use. Yavapai County is classified by EPA as "attainment" for the purposes of NAAQS; therefore further analysis is not necessary for this assessment.
Areas of Critical Environmental Concern	X			No Areas of Critical Environmental Concern are present within the project area.
Cultural Resources		X		Cultural and heritage resources within the Hassayampa Field Office area represent evidence of more than 10,000 years of human occupation of the region. The majority of the cultural resources on public lands are archaeological sites reflecting both pre-Columbian and post-contact occupation.

Resource	Not Present	Present, Not Affected	Present, May Be Affected	Rationale
				According to Arizona BLM Handbook H-8110, *Guidelines for Identifying Cultural Resources* (BLM 1999), livestock grazing lease renewals are generally exempt from cultural resources surveys. No new ground disturbing activities have been proposed in this EA.
Energy Conservation/Energy Requirements and Conservation Potential		X		The CEQ's NEPA Guidelines Section 1502.2(e) indicates that the discussion of environmental consequences must include analysis of the ". . . [e]nergy requirements and conservation potential of various alternatives and mitigation measures." The Proposed Action would likely result in the use of motorized vehicles. While energy would be expended, the effects to energy conservation are negligible. Therefore, the topic is dismissed from further analysis.
Environmental Justice	X			EO 12898, *General Actions to Address Environmental Justice in Minority Populations and Low Income Populations* (1994), requires all Federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low income populations. The proposed action would not result in disproportionate health or environmental effects on minorities or low income populations or communities. Nothing inherent in the alternatives considered would cause any statistically significant changes to ethnic composition of the resident populations and there is no indication that there would be any adverse economic effects on any particular ethnic group or any particular income group under any alternative.
Farmlands (Prime and Unique)	X			Under the *Farmland Protection Act* of 1981, Federal agencies seek to minimize the unnecessary or irreversible conversion of farmland to nonagricultural uses. No unique or prime farmlands exist within the project area; therefore, there would be no impact on

Resource	Not Present	Present, Not Affected	Present, May Be Affected	Rationale
				this resource (BLM 2007, p. 437).
Floodplains	X			EO 11988, *Floodplain Management* (1977) and EO 11990, *Protection of Wetlands* (1977), require all Federal agencies to avoid construction within the 100-year floodplain unless no practicable alternative exists, and to minimize the destruction, degradation, or loss of wetlands. The proposed action does not result in any impacts to floodplains or wetlands.
Minerals	X			The proposed action will not likely have any impacts on minerals management within the allotment.
Native American Religious Concerns	X			EO 13007, requires Federal agencies to (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and (2) avoid adversely affecting the physical integrity of such sacred sites. No known sacred sites are present in the project area.
Non-native Invasive and Noxious Species			X	See Section 4.5 (pg. 20) for more information.
Paleontological Resources	X			There are no known significant resources in the planning areas. Management actions are designed to inventory and protect fossil sites if they are discovered in the course of normal management activities (BLM 2007, p. s-xix).
Recreation		X		Recreation opportunities within the project area are classified in the Bradshaw-Harquahala RMP. The Big Bug Creek allotment falls within the Black Canyon Special Recreation Management Area. The Black Canyon Trail Resource Management Zone runs through a section of the allotment. Continued livestock use would not affect the availability of recreational opportunities within the allotment based on current management direction.
Visual Resources		X		Under the RMP, the Big Bug Creek allotment is allocated to Visual Resource Management

Resource	Not Present	Present, Not Affected	Present, May Be Affected	Rationale
				(VRM) Classes II and III. VRM Class II objective is to retain the existing character of the landscape, with a low level of change. VRM Class III objective is to partially retain the existing character of the landscape, with a moderate level of change. None of the proposed alternatives would alter the landscape beyond the objectives of the VRM Classes.
Soil Resources			X	See Section 4.4 for more information.
Vegetation			X	See section 4.3 for more information.
Wastes (Hazardous and Solid)	X			No known hazardous or solid waste issues occur in the allotment (BLM 2007 p. 437).
Water Quality (Surface and Ground)		X		The Arizona Department of Environmental Quality has not listed any water quality issues or impaired waters within the Big Bug Allotment.
Wetlands and Riparian Areas			X	See Section 4.6 for more information.
Wild and Scenic Rivers	X			There are no river segments within the allotment that are designated, eligible, or suitable as wild, scenic, or recreational under the Wild and Scenic Rivers Act.
Wild Horses and Burros	X			There are no wild horses or burros or herd management areas associated with the project area.
Wilderness	X			No designated wilderness or wilderness study areas are present within the project area.
Wildlife and Fish, including Threatened and Endangered Species, Special Status Species, and Migratory Birds			X	See Section 4.7 for more information.

3.3 Vegetation

3.3.1 Affected Environment

Much of the information presented in this section is summarized from the Big Bug Creek LHE. The purpose of the LHE was to assess whether the Arizona Rangeland Health Standards are being achieved on the Big Bug Creek allotment and to determine if livestock are the causal factor for not achieving, or making significant progress toward achieving, land health standards.

Characteristic vegetation on the drier soils at the lower elevations are Whitethorn, soaptree yucca, fourwing saltbush, mesquite, cat-claw acacia, and ocotillo with an understory that consists of grama species, alkali sacaton, tobosagrass, curly mesquite, and bush muhly. At the intermediate elevations, Evergreen woodland savannas are typical where Mexican blue oak, white oak species, juniper species, jojoba, and turbinella oak are the dominant species and cone beardgrass, sideoates grama, blue grama, Texas bluestem, plains lovegrass, sprucetop grama, threeawns, and needlegrass characterize the understory.

Ecological Sites

Upland vegetation within the allotment encompasses seven ecological sites with corresponding ecological site descriptions. Ecological site descriptions are reports that describe the biophysical properties of ecological sites. Of the ten ecological sites within the Big Bug Creek allotment, three are dominant (Appendix C, Map 4 in the LHE):

Desired Plant Community Objectives

Two Key Areas were established on the Big Bug Creek allotment in 2008 (Figure 4). DPC objectives are provided for each key area within the allotment. DPC objectives address the desired resource conditions based on vegetation attributes, such as composition, structure, and cover that are desired within the allotment. The Key Areas are monitored and analyzed based on DPC objectives to determine whether indicators of ecological processes conform to the Rangeland Health Standards. Refer to Map 1 in the Land Health Evaluation for more information about vegetation communities within the allotment.

Findings of Land Health Evaluation

The LHE describes the data and methods used to determine whether the relevant Rangeland Health Standards are being achieved on the allotment. Studies at both key areas are consistent with Ecological Site Descriptions in soil/site stability, hydrologic function, and biotic integrity. All DPC objectives are being achieved at both Key Areas 1 and 2.

According to the LHE, Key Areas were as expected for their ecological site potential for plant species composition, cover, and frequency. Key Area species composition data shows a relatively high percentage of perennial grasses (primarily tobosa) and palatable shrubs. This is typical of the ecological sites within the Big Bug Creek allotment. The most dominant species found across the allotment, from the key area data, were tobosa grass, shrubby buckwheat, catclaw acacia, prickly pear, broom snakeweed, range ratany, purple three-awn, and desert cenaothus many of which are key forage species.

Based upon data compiled and analyzed in the Big Bug Creek LHE, the allotment is meeting Arizona Rangeland Health Standards 1 (Upland Sites) and 3 (Desired Resource Conditions) for upland plant communities.

3.3.2 Environmental Consequences

The health of upland vegetation is measured by achieving or progressing toward the relevant Land Health and DPC objectives that are derived from the NRCS Ecological Site Descriptions.

Alternative A – Proposed Action

Livestock can directly affect vegetation by reducing plant vigor and productivity, decreasing or eliminating desirable forage species, and causing loss of, or injury to, individual plants from trampling, particularly near water developments. Grazing impacts on vegetation are mitigated by timing of use, adjustment of stocking rates, limiting utilization rates, and conformance with the Rangeland Health Standards and Guidelines.

This alternative would limit forage utilization levels to 40 percent for grasses, forbs, and shrubs. This is within the range recommended for moderate grazing in semi-desert grass and shrublands (Holechek 1988). Ranges in good condition can withstand the higher use level without loss of productivity (ibid.). Most rangeland grasses and forbs can have 40 percent to 50 percent of their leaves and stems removed every year and still remain healthy and productive so that plants can photosynthesize and manufacture energy to produce more leaves, stems, and seeds. With the grazing utilization stipulations, the Proposed Action would maintain or improve upland vegetation productivity over current conditions by maintaining utilization at lower levels than is currently permitted on the allotment.

During periods of ongoing drought, the utilization objectives for upland key forage species would be reduced to no more than 30 percent average utilization (Holechek 1988). This utilization percentage during drought would compensate for decreased plant growth and would allow for residual forage for wildlife food and thermal cover. Drought conditions would be monitored using the United States Drought Monitor (http://droughtmonitor.unl.edu). Any drought conditions ranging from moderate drought (D1) to exceptional drought (D4) would require the lessee not to exceed the 30 percent average utilization on upland key forage plant species.

Based on the data compiled and analyzed for the LHE, the allotment is achieving Standards 1 and 3 for upland areas. Vegetation attributes such as vigor, and recruitment and composition of desirable forage species are appropriate for the site under current grazing management, and soils are stable.

Alternative B – No Action

Under current management, the Big Bug Creek allotment is meeting all Land Health Standards in the upland areas. Both Key Areas on the allotment are consistent with Ecological Site Descriptions in soil/site stability, hydrologic function, and biotic integrity. All DPC objectives are being achieved. Livestock grazing would continue to occur without utilization thresholds and deference to drought conditions. Grazing impacts to upland vegetation will continue to have minimal impacts on the upland plant communities on the BLM portions of the allotment as indicated in the Big Bug Creek Land Health Evaluation with a potential for greater impact than

Alternative A and Alternative C. The lessee would not be required to submit annual actual use reports.

Alternative C – No Grazing

Under this alternative, upland vegetation would have the most rest and recovery and not be impacted by livestock grazing as compared to the other alternatives. Although the allotment is meeting all applicable standards for rangeland health, plant communities would benefit from rest. Because no livestock grazing would occur, plants would remain ungrazed by livestock each year. In the short-term, grasses would see greater benefits as compared to Alternatives A and B because the lack of grazing use does not impede their ability to fix a significant amount of carbon, produce seed, and set seed. In the long-term, grasses may become "wolfy" and may not be as palatable, nutritious, or desirable to wildlife (Ganskopp and Bohnert 2004).

However, studies have demonstrated that an intermediate level of grazing may maintain greater levels of native plant diversity, while cattle removal resulted in little increase in native plant cover and reduced plant species richness relative to the moderate grazing control (Loeser et at. 2007).

The plants that would most benefit from no grazing are grass and shrub species. Current year's growth – the leaves and young stems that are important for photosynthesis – is the most digestible part of the plant and is the portion generally removed by browsing animals. The buds are especially important to protect from grazing because they are the source of new stems.

Under this alternative, upland vegetation would improve the most in short-term productivity, vigor, species composition, and formation of new stems compared to the other alternatives. Production, vigor and species composition will decrease relative to Alternative A and Alternative B over time.

3.4 Soil Resources

3.4.1 Affected Environment

Soils in the allotment range from clayey to fine loamy across the allotment. The dominant soil type within the allotment is the Cabezon Soils, which covers approximately 45 percent of the allotment. The Cabezon Soil Series consist of well-drained soils that are shallow, with depths ranging from 7 inches to 20 inches over basalt. These soils are on gently sloping to steep hills and mountains. The remainder of the allotment is loamy soil types. Soils developed on the adjacent basin fill and on the old alluvial terraces deepen to greater than 60 inches.

The fine grained soil material, mesic soil temperature regime, and ustic soil moisture regime produces a transitional plant community with strong presence of woody species and fine rooted herbs and grasses. Tobosa grass has strong associations with the clay rich volcanics and accounts for roughly half the cover in the allotment and associated monitoring (BLM 2013).

Current soil conditions are monitored at the two Key Areas on the allotment, which represent the two dominant ecosites. Current conditions are measured and compared to expected conditions for the dominant ecological sites using both abiotic and biotic indicators. Surface stability of

soils is evaluated using nine factors. The biotic indicators encompass nine factors for annual production and plant species community composition.

Table 4 displays the relative departure from the reference conditions for the two dominant ecosites on the allotment. The LHE reported no substantial departure from expected Ecological Site Description conditions (BLM 2014). Some indication of departure was found from surface erosion sign in the clayey uplands, which impacts both soil stability and plant community abundance.

Table 4. Soil Conditions on the Big Bug Creek Allotment as Reported in the Rangeland Health Evaluation

Key Area	Ecological Site	Abiotic Departure	Biotic Departure	Notes
1	Volcanic Hills 12-16" Clayey	none to slight (9)	none to slight (8), slight to mod (1)	Perennial grass greater than 50%
2	Clayey Uplands 12-16"	none to slight (5), slight to mod (3), mod (1)	none to slight (6), slight to mod (2), mod (1)	Minimal erosion sign; vegetation cover is greater than expected.

Soil conditions on the basalts and basin fill have swaths of bare soil from rocky and clay conditions. Heavy clays can inhibit plants from shrink swell that follows wetting/drying cycles. The vertic soils within the clayey upland ecosite will have particularly high shrink swell. The clays common to both ecosite soils can produce high soil moisture matric potentials given their ability to hold water tightly. Thus, plants may have a hard time accessing water due to the strong water tension by the clays as soils dry.

Soils erode from wind and water where bare soil surfaces exist. The expected range for bare soil varies widely for the ecosites with values from 5 percent to 35 percent (Table 3, NRCS 2008). Monitoring found bare soil was 14 percent in the volcanic hills site (Key Area 1) and 19 percent in the clayey uplands (Key Area 2) (BLM 2013). Erosion hazard for wind erosion is low for the basalt soils and moderate to high for the basin fill soils. The basalt soils have higher rock content that lowers wind erosion hazard.

Table 5. Existing Percent (%) Groundcover at Key Areas in the Big Bug Creek Allotment Compared to Reference Conditions for Ecosites

Key area	Ecological Site	Bare Ground (%)	Litter (%)	Gravel/Rock (%)	Vegetation (%)
1	Volcanic Upland 12”-16"	3	29	40	28
Reference		5-55	10-40	25-50	1-30
2	Loamy Uplands 12”-16"	6	17	56	21

Key area	Ecological Site	Bare Ground (%)	Litter (%)	Gravel/Rock (%)	Vegetation (%)
	Reference	5-35	15-65	35-75	15-50

Desert soils have known contributions from biological soil crusts, also called cryptogamic crusts, for soil biologic function. Soil biological crusts include a wide range of organisms that stabilize soils and enhance soil fertility (Peterson 2001, Belnap 2003). Cryptogamic crust species and morphological group composition change along environmental gradients of ecological province, small scale microtopography, and disturbance (Peterson 2001, Rivera-Aguilar et al. 2009). Biotic crusts are a minor component of the plant community on the allotment: Expected ranges for cryptogamic crust presence within the ecosites present are 2 percent or less for Volcanic Hills, and between 1 percent and 5 percent for Clayey Upland.

The project area site conditions favor flat lying filamentous cyanobacteria that dominate in fine soil textures and in early successional environments. These soil biological crusts reside in the surface layer of the soil and are difficult to identify, and are often covered by gravels (Peterson 2001). Later successional crust species include mosses and lichens that become more visible. The Ecological Site Descriptions for the project area give a range of up to 5 percent for soil biological crusts (NRCS 2006 2012). Severe soil degradation from livestock grazing can diminish soil biological crusts by decreasing soil stability (Belnap and Eldridge 2003, Jimenez Aguilar et al. 2009), but the rangeland health data do not indicate poor soil conditions (BLM 2013). The results from the LHE show that most of the project has stable soils that would suit the growth of crusts.

3.4.2 Environmental Consequences

Alternative A – Proposed Action

Soil communities rely on plant production and the litter provides soil protection. Livestock grazing directly affects soil function by removing a portion of the vegetation annual crop. Vegetation production provides soil protection as litter and supplies substrate for soil decomposers. Evidence that the level of grazing is decreasing this annual crop to the detriment of soil and plant communities was not found (BLM 2013).

The expected annual crop for volcanic and clayey ecosites ranges averages 1,225 and 815 pounds per acre respectively (NRCS 2006, 2012). Monitoring showed that forage species make up 80 percent to 85 percent weighted composition for the two Key Areas. Thus, grazing can account for a substantial part of annual production utilization.

Litter can be used as a proxy for the amount of annual production remaining for soil processes after grazing by livestock and native grazers. The LHE reported that plant litter accounted for a little over 23 percent ground cover, which falls within the expected range for both ecosites (NRCS 2008). The LHE reported no sign of departure for annual production on the basalt soils, but did report a slight to moderate reduction in annual production on the basin fill (BLM 2013).

Livestock impact soils by compacting and loosening soil from trampling and trailing in addition to selecting for forage species. The impacts depend on the duration, timing, class or kind of livestock, and intensity of grazing. Within the allotment, indications of livestock degrading soils from erosion were slight to none overall.

Indications of livestock degrading soils from erosion were slight to none overall. In this arid setting, wind and water have strong influences on redistributing soil particles. Wind will move particles from open disturbed areas and redeposit on nearby vegetation patches or even farther depending on fineness of soil particles. Water erosion from intense summer thunderstorms creates runoff that transports soil particles and deposits on run-on surfaces – typically vegetation patches.

However, the vertic, clay rich soils on the basin fill had moderate to slight indications of erosion. Some evidence of water erosion pathways were observed in addition to terracettes. This is likely due to the ongoing drought conditions the allotment has seen over the past several years. Soil aggregation had slight to moderate sign of departure at the vertic soils key area. Soil aggregation indicates the ability for soils to resist erosion (Pellant et al. 2005).

Grazing management can moderate the effects of yearlong livestock grazing. The addition of a 40 percent average utilization standard as an administrative action would be a safeguard for providing adequate annual crop. The net effect of the new measures would likely improve soil conditions over the current allotment regime.

Continued livestock management would not likely change the composition of soil biological crusts. Although rangeland monitoring did not indicate crust presence, this environment should support soil biological crusts in the bare soil interspaces

Alternative B – No Action

The current management of livestock does not indicate a declining trend in soil condition based on the monitoring data and LHE. Current soil conditions have 25 percent to 30 percent vegetation cover with a strong presence of tobosa grass. Minor shrubs and cacti have higher presence on the basin fill. Soils appear stable with erosion sign slight to none on the basalt cap and slightly elevated on the basin fill where terracettes and water flow patterning from overland flow was noted. These conditions would be expected to continue under the No Action Alternative. Impacts would be similar to Alternative A.

Alternative C – No Grazing

Removal of livestock under this alternative would increase the litter for soil processes and reduce compaction and bare soil exposure from livestock trampling and forage utilization. Soil impacts would remain highest as groundcover slowly re-establishes at grazing congregation areas. Recovery of vegetation and soils across the range would be slow and depend on the level of forage that livestock grazing previously impacted. Potentially, an increase in annual crop would boost substrate available for soil decomposers. Natural grazers that include ungulates, rabbits, rodents and insects would continue to exert grazing pressure on annual crop.

Response from no grazing may be moderate for this allotment since grass and forbs make up the majority of vegetation biomass. The expectation is that increased litter levels would reduce bare soil expanse. Existing bare soils are 14 percent to 20 percent at current grazing levels for a typical precipitation year. The expected range for these ecotypes is as low as 5 percent. The expansion of grasses would increase soil percolation rates and soil organic substrate with increased rooting and annual crop. The rate of this expansion may be slow since the current extent of grasses is high when compared to reference conditions.

Biotic crust presence may initially increase following removal of livestock from the allotment. However, because existing vegetation production would also increase, and expected ranges of crust presence are low within the ecosites present, biotic crusts would likely remain very low as a percent of existing soil cover, and may decline as vegetation cover increases.

3.5 Invasive and Noxious Species

3.5.1 Affected Environment

Even though none was documented during the recent vegetation monitoring on the allotment, red brome (Bromus rubens) has been observed on the Big Bug Creek allotment during allotment visits by BLM staff. A non-native, invasive plant, red brome is an annual bunchgrass that is frequent to abundant across Arizona and is naturalized across the Western U.S. Red brome is not highly competitive with established perennials, especially native grasses (Halvorson and Guertin 2003, USDA 2012). The plant has a short growing season and low palatability.

Red brome can alter the fire regime in native desert plant communities by increasing fuel loads and shortening the fire return interval (Simonin 2001). This increased fire activity can adversely affect native species. The presence of red brome is variable depending upon the amount and seasonal distribution of rainfall, becoming more widespread after winters with moderate to high rainfalls. However, the abundance of red brome in the project area is limited due to low precipitation. During dry seasons, red brome is typically only found in shaded areas, and not in the interspace areas between vegetation. This patchiness does not support continuous fuel loading to carry wildfire.

Monitoring results at Key Areas 1 and 2 do not indicate a problem with the presence of invasive plant species. For Key Area 1, monitoring found that departure from the Ecological Site Description for invasive species was “slight to moderate” and “moderate” for Key Area 2 (Appendix C, Table 19 and Table 23 in LHE). These departures are likely due to increased amounts of bare ground and decreased native vegetation composition due to ongoing drought conditions at the time that the data was collected. It isn’t believed that non-native plant species are outcompeting native plant species on the allotment. The Hassayampa FO is not managing for red brome.

3.5.2 Environmental Consequences

Alternative A – Proposed Action

Red brome cannot be eradicated from desert ecosystems. However, its spread can be minimized and possibly controlled through appropriate methods including livestock management practices that maintain desired native plant communities and the presence of ground litter.

Proper grazing management to maintain the desired plant communities for the ecological site, as proposed in this alternative, will aid in suppression of red brome and other undesirable plant species (USFS 2012). Studies have demonstrated that an intermediate level of cattle grazing may maintain greater levels of native plant diversity, while cattle removal resulted in little increase in native plant cover and reduced plant species richness relative to the moderate grazing control (Loeser et al. 2007). Establishing and maintaining competitive grasses can minimize the invasion and spread of rangeland weeds (Sheley 1995).

The Proposed Action is designed to maintain or improve conditions favorable to meeting DPC objectives and Rangeland Health Standards. The LHE reported that Key Areas were as expected for their ecological site for plant species composition, cover, and frequency, and that ground litter was within expected surface cover range for the ecological sites. Species composition data showed a relatively high percentage of perennial grasses and palatable shrubs: the presence of herbaceous and perennial plants is recommended to help control invasive plants like red brome (USDA 2012).

As stated above, red brome in abundance can alter the fire regime in desert plant communities. However, the spread and distribution of red brome would remain dependent on annual precipitation. Maintaining DPC objectives would provide conditions under which native plant species would continue to outcompete red brome.

The Big Bug Creek allotment currently is meeting the upland standards. As the BLM continues to monitor utilization of upland key forage species over time to ensure average utilization of key herbaceous forage species does not exceed an average of 40 percent, which is light to moderate use, it is expected that renewing the grazing permit with the suggested terms and conditions would not contribute to spread of non-native, invasive plants.

Alternative B – No Action

Under the No Action alternative, the season of use and livestock numbers would be unchanged from the present. As such, present conditions in terms of soil litter and vegetation composition and cover would remain unchanged. Because the current management of livestock does not indicate a declining trend in expected ecological site conditions based on the monitoring data and rangeland health evaluation, a change in the presence or distribution of invasive, non-native species is not expected.

Alternative C – No Grazing

Red brome is present on the Big Bug Creek allotment. As stated above, red brome has become naturalized across the West, and its presence is frequent to abundant throughout Arizona. Removal of grazing by domestic livestock would not automatically lead to disappearance of invasive plant species (Young and Clements 2007), and would not be expected to affect the presence or distribution of red brome within the allotment.

Although livestock grazing is observed to be one of the disturbance types that influence the invasive potential of the species (USGS 2003), red brome can be found across both disturbed and undisturbed landscapes (USDA 2012). While the No Grazing alternative may provide benefits by removing cattle and sheep and, therefore, one form of disturbance to soils and vegetative cover

within the allotment, this alone would not be expected to affect the presence of red brome in the allotment. Further, there is no indication that the spread and distribution of the invasive species can be controlled or eradicated outside of active management.

Competition by crowding has been shown to reduce the reproductive success of red brome (Halvorson 2003). Under the No Grazing alternative, upland vegetation would improve the most in productivity, vigor, species composition, and formation of new stems compared to the other alternatives (see Upland Vegetation section above). The expected effect would be a minor reduction in the presence of red brome across the allotment.

3.6 Wetlands and Riparian Areas

3.6.1 Affected Environment

The Big Bug Creek LHE had information on climate, precipitation, range improvements, and riparian resources within the allotment. This section is an extension of the information presented in the LHE. The LHE found that Standard 2 and the riparian portion of Standard 3 are not being met.

The Big Bug allotment encompasses approximately 4.1 miles of riparian habitat. The BLM manages approximately 1500 feet of the 4.1 miles of riparian habitat within the allotment, which equates to about 7%. Arizona State Land Department administers 0.7 miles, or about 17%, and the remaining 79% is privately owned. Big Bug Creek is intermittent to dry, but does support some limited numbers of mature Arizona ash (*Fraxinus velutina*), cottonwood (*Populous fremontii*), and seep willow (*Baccharis salicifolia*). The distribution of riparian obligate woody species is patchy with very little canopy continuity. Facultative wetland trees and shrubs are the dominant overstory vegetation. There is no evidence of riparian obligate forbs (ex. sedges, rushes, etc.) or woody species recruitment. These current conditions are likely a result of a lack of water which is due to drought and ground water pumping from neighboring housing subdivisions and gravel mining operations.

Stream Flow Regime

There are no sections of Big Bug Creek within the allotment that exhibit perennial stream flow. Potential for perennial stream flow is generated mostly by high elevation areas where cool temperatures promote a snowpack (WRCC 2013) and/or there is sufficient precipitation, particularly during cooler seasons, to briefly overcome effects of evaporation and evapotranspiration. In arid environments, streams typically lose flow downstream in the lower precipitation and elevation zones as found in the Big Bug Creek Allotment.

The Big Bug LHE (Appendix C) notes that average precipitation between 2001 and 2014 was 12.95 inches, with only trace levels of snow. Yearly precipitation totals ranged from a low of 8.07 inches in 2006 to a high of 20.12 inches in 2004 (Appendix C - LHE Table 2, Appendix A). Seven out of fourteen years have had above average precipitation and six have been below average.

Mean annual minimum temperature is a rough measure that helps determine areas of potential significant or pre-dominate snow precipitation, which is a key factor in total stream yield and perennial or seasonal flow. Mean annual air temperatures range from 59 to 70 ($\bar{x}$ = 65 F) degrees Fahrenheit. Freezing temperatures are common from October through April, typically at night,

and into the morning. Daytime temperatures in the summer are generally in the high 90 degree range. Winter temperatures are mild, with very few days recording freezing temperatures in the morning (esis.sc.egov.usda.gov).

Precipitation and potential evaporation based on monthly temperature were compared for Cordes weather station 3 miles east of the allotment. The Cordes weather station is about 3,700 feet elevation which is similar to elevations found in the allotment. Using an equation for potential evaporation following Turc (1963), as suggested by Dyer (2010), and normal for mean monthly temperature (64 F), the Cordes area typically experiences 33.6 inches of evaporation. This means that the allotment receives 2.5 times more evaporation potential than it receives in total precipitation.

Soil moisture content in the allotment would be quite low, and runoff contribution, excepting very intense rainfall events, correspondingly low. Given that the headwaters of Big Bug Creek are less than 4,500 feet in elevation and average precipitation 18 inches or less on average, this analysis demonstrates that it is unlikely Big Bug Creek would sustain flow beyond short term (days) response to rainfall events.

Stream flow is also influenced by the water table, underground water flow, and underground water storage aquifers (USGS 2014). Recent residential developments in the area have put a significant amount of stress on the water table and aquifers that may contribute to the water that feeds Big Bug Creek. Residents in Spring Valley, which is found in the middle of the allotment, have reported significant losses in well water production due to the new housing developments that are directly north of the allotment within close proximity to Big Bug Creek (UAFWM 2014).

Riparian Characteristics

Aerial images of the Big Bug Creek show a wide shallow channel with an alluvial substrate, mostly sands to cobble and absent of riparian or shading vegetation. There is occasional bifurcation around now vegetated island forms indicating that large movement of sediment is possible. Cobbled riffle forms are present on a frequency related to flow volumes adequate to transport average substrate size. Pool forms are notably absent. Multiple Indicator Monitoring (MIM) data shows that riparian plant species are present within the riparian area, but are not prevalent.

Proper functioning condition assessments of Big Bug Creek adjacent to the Big Bug Creek Allotment, discussed in detail in the LHE, determined a nonfunctional rating and an unsatisfactory rating since 1992. Factors attributing to the rating were livestock use, road effects, lack of adequate water to support riparian vegetation and ground water pumping. Lack of water in adequate volume and duration to support riparian vegetation recruitment is almost entirely outside of the control of BLM due to the scale and lack of management decision space.

Water Developments

There are two water catchments on the BLM administered portions of the allotment. Most of the water catchments/developments that provide water to livestock and wildlife are located on the state and privately owned portions of the allotment.

Hydrologic Function

Hydrologic function and soil stability at both Key Areas on the allotment were found to have slight to moderate deviation from the desired Ecological Site Description conditions. This is likely due to the ongoing drought conditions the allotment was experiencing at the time the rangeland health assessment was conducted. Hydrologic function is described (in the context of LHE) as the capacity of a site to capture, store, and safely release water from rainfall and snowmelt.

3.6.2 Environmental Consequences

Alternative A – Proposed Action

Without long-term monitoring or observations, issues about perennial flow in Big Bug Creek cannot be fully answered; however, it is probable that the site does not have capacity for reliable flow through the summer months based on the known environmental conditions and requirements for perennial flow in the project area (see Affected Environment above).

The existing surface flow regime in Big Bug Creek is expected to remain unchanged from the long-term under prevailing demands, and will remain dependent upon upper catchment precipitation.

While water developments do affect surface water availability, upper catchment areas in the project area do not contain snowpack, and therefore are too low in elevation to provide reliable perennial flow to Big Bug Creek, at least in early summer months. Conditions of flow in the long-term are expected to remain the same, dictated largely by year-to-year precipitation totals and strength of monsoon rains.

Given that livestock numbers would remain the same there would be no change to runoff response. Upland hydrologic function is determined suitable compared to the ecological site description.

Alternative B – No Action

Under this alternative there would be no short term change in the present conditions including number of permitted livestock. Mineral supplements would not have specified distance from water sources or major drainages to alleviate grazing pressure on vegetation. No improvements in vegetation condition in the vicinity of major drainages and water sources would be expected.

Hydrologic function of the uplands and therefore the vast majority of the allotment area are determined to achieve standards. No change would be expected in this condition.

The flow regime of Big Bug Creek is determined not perennial, and dictated largely by upper catchment precipitation. Normal maintenance of functional surface flow impoundments and groundwater pumping equipment is expected to continue, therefore having no additional effects to surface flow or hydrologic functions.

Alternative C – No Grazing

Under this alternative the allotment would be closed to grazing for ten years. Because it has been determined that upland vegetation and hydrologic function is achieving standards for the eco-

sites of the allotments, there may not be an overt change in runoff response. Vegetation recovery would result in at least an increase in precipitation interception, by both canopy and basal vegetation, so that runoff yield, particularly from the high intensity monsoon rains would lessen if by an immeasurable amount.

Flow regime for Big Bug Creek would remain largely unchanged because the low elevation of its catchment prevents perennial flow. This condition would not be ameliorated by no grazing, and in fact for reasons provided above, vegetation regrowth under the No Grazing scenario could potentially reduce stream flow yield, even if again by a very small margin.

3.7 Wildlife Resources

Wildlife species and wildlife habitat that may occur on the Big Bug Creek allotment are described below. Source material used to inform this assessment includes Arizona Game and Fish Department (AZGFD), the U.S. Fish and Wildlife Service (FWS) Arizona Listed Species (FWS 2013), and information on file with the Hassayampa Field Office, such as the Bradshaw-Harquahala RMP. The BLM Phoenix District sensitive species list (USDI 2010) was reviewed and cross-referenced by county with the AZGFD Heritage Data Management System to narrow the list to potential sensitive species that occur within the allotment (Table 4).

No federally listed threatened, endangered, or candidate species occupy habitat or occur within this allotment.

3.7.1 Affected Environment

Both cattle and wildlife utilize herbaceous vegetation. Various wildlife species (e.g., mule deer, some migratory birds) depend on forbs and shrubs for forage and concealment. Insectivore species such as bats or some migratory birds are indirectly dependent on herbaceous vegetation to support their insect population diet or to provide a substrate for nesting, roosting, or concealment. Larger predator species are indirectly dependent on herbaceous vegetation to provide forage and cover for prey species such as small mammals and birds. The presence and movement of livestock between areas can result in the direct disturbance or displacement of individual wildlife species from areas providing cover and forage.

Although livestock grazing can provide competition for foraging and may reduce cover available for wildlife species, all DPC objectives are being achieved in key areas within the allotment. Ecological processes, including vegetation canopy, palatable shrub competition, and key perennial grass competition, are within the normal range of variability for the sites.

Across all ecological sites, vegetative species composition and structure provides cover and forage to support a diverse wildlife community. Abundant trees and shrubs are available to provide forage, cover, and nesting opportunity for many bird species as well as cover and palatable browse for mule deer, javelina, and other game species. The mix of trees/shrubs/cactus and grasses/forbs present on the allotment provides 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 species groups.

Wildlife species that occur within Big Bug Creek allotment are typical and representative of the vegetative communities present in the area. Small game and fur-bearing species present 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, and amphibians such as the black-chinned sparrow, grey vireo (*Vireo vicinior*), blue-grey gnatcatcher (*Polioptila caerulea*) lark sparrow (*Chondestes grammacus*), eastern meadowlark (*Sturnella magna*), western pipistrelle (*Parastrellus hesperus*) hoary bat (*Lasiurus cinereus*), pocket mice (*Perognathus* spp.), rattlesnakes (*Crotalus* spp), and bull snake (*Pituophis melanoleucus*).

The Big Bug Creek allotment is located within the AZGFD management unit 20A. Mule deer (*Odocoileus hemionus*), javelina (*Pecari tajacu),* mountain lion (*Puma concolor*), and black bear (Ursus americanus) are some of the big game species that utilize the allotment. These species are likely to utilize all habitats in and around the allotment, either year round or seasonally. Mule deer rely heavily on browse and forbs, which make up the majority of their diet (greater than 90%). Grasses and succulents were generally less than 5 percent of mule deer diet (Krausman et al. 1997, Heffelfinger et al. 2006). Unit 20A also contains a small and transient population of elk. It is currently managed to maintain a limited number of elk below the carrying capacity of the unit to minimize conflicts on private land.

Pronghorn (*Antilocapra americana*) historically occupied the area but are likely extirpated due to habitat fragmentation resulting from Interstate 17 and Highway 69 as well as urban sprawl within the Prescott Valley area.

Although Big Bug Creek bisects the allotment, the reach in the allotment is ephemeral and lacks adequate riparian vegetation. The drainages do provide relatively dense cover for travel corridors. The allotment includes water development range improvements, which provide important watering areas for both cattle and wildlife in this arid region.

Table 4 shows the BLM Phoenix District sensitive species that may occur on the allotment. The sensitive species list has been narrowed by filtering with the AZGFD's Heritage Data Management System database.

Table 6. Bureau of Land Management Phoenix District Sensitive Species List (USDI 2010), Including Species Names, Unique Habitats, and Presence of Suitable Habitats that May Occur within the Big Bug Creek Allotment

BLM Sensitive Species	Phoenix District Presence	Unique Habitat	Suitable Habitat within Analysis Area
Amphibians			
Lowland leopard frog (*Lithobates yavapaiensis*)	v	Wetlands	No permanent wetlands within allotment but species may persist in some areas, such as near water developments
Birds			

BLM Sensitive Species	Phoenix District Presence	Unique Habitat	Suitable Habitat within Analysis Area
American peregrine falcon (*Falco peregrinus anatum*) (FWS delisted)	v	Cliffs	Yes, potential transitory and foraging habitat but no known nesting areas
Bald eagle (*Haliaeetus leucocephalus*) (FWS delisted)	v	Riparian; Undisturbed foraging/nesting areas	Yes, potential transitory habitat but no known nesting areas
Golden eagle (*Aquila chrysaetos*)	v	Varied habitats; Significant cliffs, large undeveloped areas	Yes, potential transitory habitat but no known nesting areas
Mammals			
Arizona myotis (*Myotis occultus*)	h	Caves, mines	Yes, potential transitory and foraging habitat
California leaf-nosed bat (*Macrotus californicus*)	v	Caves, mines	Yes, potential transitory and foraging habitat
Cave myotis (*Myotis velifer*)	v	Caves, mines	Yes, potential transitory and foraging habitat
Townsend's big-eared bat (*Corynorhinus* (equal*Plecotus*) *townsendii*)	v	Caves, mines	Yes, potential transitory and foraging habitat
Acronymns used in this table: **v** – known to occur; **h** – probable occurrence			

Table 7 lists sensitive species potentially found within the Big Bug Creek allotment that have status across multiple agencies with wildlife management responsibilities. No Federally listed threatened or endangered species occupy habitat or occur within this allotment.[5]

[5] U. S. Fish and Wildlife Arizona Listed Species (as of November 30, 2014)

Table 7. Names of Sensitive Species with Status Across Multiple Management Agencies.

Name	Common Name	FWS	USFS	BLM	State
Anaxyrus microscaphus	Arizona Toad	SC	S		
Aquila chrysaetos	Golden Eagle	BGA		S	
Cicindela oregona maricopa	Maricopa Tiger Beetle	SC			
Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC	S	S	
Rana yavapaiensis	Lowland Leopard Frog	SC	S	S	WSC
Acronymns used in this table: **SC** – Species of Concern; **S** – Sensitive; **BGA** – Bald and Golden Eagle Protection Act; **WSC** – Wildlife of Special Concern					

Migratory Birds

All migratory birds are protected under the 1918 Migratory Bird Treaty Act (16 USC 703), which prohibits the taking of any migratory birds, their parts, nests, or eggs unless specifically permitted by regulation. Additional protection is provided by the Neotropical Migratory Bird Conservation Act of 2000 (16 USC Chapter 80). Executive Order 13186 requires the BLM and other federal agencies to work with the FWS to provide protection for migratory birds, primarily in the form of habitat protection to avoid migratory pattern disruption. Birds found within the allotment are typical of arid desert grassland habitat such as rufous-winged sparrow, chipping sparrow, and western scrub-jay.

In 2008 the FWS released a report titled “Birds of Conservation Concern” in which they listed species of concern by Bird Conservation Regions (BCR) (USFWS 2008). That report helps focus conservation efforts on the species that need it. Big Bug Creek lies within BCR 34 (Sierra Madre Occidental).

3.7.2 Environmental Consequences

Alternative A – Proposed Action

As wildlife forage species such as palatable shrubs and perennial grasses are currently within the normal range of variability, it is expected the continued managed livestock grazing in this alternative would maintain this trend for wildlife species. Utilization limits on key forage species will ensure adequate abundance and recruitment of vegetation needed to support the various species occurring within the allotment. Utilization limits would provide sufficient seed production for seed-eating species and residual forage for insects, providing important prey for bats, insectivorous migratory birds, and prey base for predators such as the golden eagles and coyote. Livestock grazing could result in the destruction or disturbance of some ground bird nests during migratory breeding season.

Alternative B – No Action

There would be minimal difference in effects to key wildlife forage species compared to the Proposed Action as it would be expected that DPC objectives would continue to be met. General livestock grazing disturbance and displacement effects would be slightly greater under the No Action scenario as mineral placement restrictions would not be implemented. Utilization levels would not be set which may result in a reduction of forage and cover for wildlife species over time.

Alternative C – No Grazing

In the absence of livestock grazing, competition for wildlife forage vegetation would be reduced, providing more forage for wildlife and insect populations. The absence of livestock grazing could result in cover canopy increasing over time, benefiting cover-dependent species. Livestock disturbance/displacement effects would not occur, benefiting ground-nesting migratory birds and other wildlife individuals. Overall, Alternative C would be expected to have a beneficial effect on wildlife individuals, but it is not likely to have a measurable effect on wildlife populations within the project area.

4.0 CUMULATIVE ACTIONS

The CEQ defines cumulative effects (also known as cumulative impacts) as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what (federal or non-federal) agency or person undertakes such actions" (40 CFR 1508.7).

The intensity, or severity, of the cumulative effects considers the magnitude, geographic extent, duration, and frequency of the effects. The magnitude of the effect reflects the relative size or amount of the effect; the geographic extent considers how widespread the effect may be; and the duration and frequency refer to whether the effect is a one-time, intermittent, or chronic event.

If there is no net effect to a particular resource from an action, then there is no potential for cumulative effects. In addition, if effects that do not overlap in time and/or space, they do not contribute to cumulative effects. The temporal frame for analysis of cumulative effects is 10 years, which is the time period for the grazing lease. The spatial scale is the 2,196-acre Big Bug Creek allotment.

The past, present, and reasonably foreseeable future actions considered in the cumulative effects analysis are summarized below.

A wide variety of land uses and activities are possible on the Big Bug Creek allotment, including travel, recreation, mineral development, grazing, and others. Specific actions that are occurring, or are likely to occur in the reasonably foreseeable and contribute to cumulative effects include:

Livestock Grazing

The Big Bug Creek allotment has been an active livestock grazing allotment and portion of a historic sheep trailing driveway for decades. Livestock grazing has occurred in some form in the allotment area for over a century. The environmental effects of past grazing practices are reflected in the current description of the affected environment for the allotment. If left unchanged (No Action), current grazing practices are not expected to contribute toward any downward trends in resource conditions on the allotment. Reissuing the 10-year grazing lease under either the No Action or Proposed Action alternatives likewise is not anticipated to contribute additional adverse impacts to allotment resource conditions as described in Chapter 3. Under the No Grazing scenario, improvement in resource conditions are expected to be mild over the long-term as soil and vegetative conditions slowly recover from long-term livestock grazing on the allotment.

Recreation

The Big Bug Creek allotment is open to both motorized and non-motorized recreation opportunities. Motorized travel by the lessee and public is limited to existing routes within the allotment. Recreation use throughout the area includes a range of activities from dispersed and informal recreation to organized, BLM-permitted group uses. Typical recreation in the area consists primarily of more primitive activities such as hiking, wildlife viewing, horseback riding, camping, backpacking, and hunting. Target shooting and illegal dumping does occasionally occur within the allotment.

A portion of the Black Canyon recreation trail is located within the allotment. A trailhead for the trail is located within the allotment near Big Bug Creek. Use of the trail is fairly high, but shouldn't be impacted by the limited presence of cattle. A management plan for the Black Canyon trail has been proposed and is currently being drafted by the BLM. This plan will address potential future uses of the trail.

Recreation uses can impact soils and vegetation, and at high use levels may impact wildlife by causing displacement. Recreationists that use the Black Canyon trail primarily cause impacts to soils and vegetation along the trail corridor. In addition, the growing populations in Maricopa and surrounding Arizona counties are expected to increase pressures on public lands for recreational uses. However, recreational uses, even if they increase, would not result in substantive additional impacts to resources within the allotment, and Rangeland Health Standards would continue to be met. Overall, the Proposed Action is not expected to contribute additional cumulative effects.

Developments and Projects

No new or proposed developments or projects were identified within the project area. A number of existing rights-of-way (ROWs) including roads, mining claims, pipelines, and public utilities, intersect portions of the Big Bug Creek allotment. Owners/operators are authorized to access ROWs for routine maintenance and repair. Minor disturbances or impacts to resources may occur due to vehicle access and maintenance activities, such as brush clearing, within the ROWs. These past and continuing actions associated with ROWs are not expected to contribute additional incremental impacts beyond those described in Chapter 3 of this environmental assessment.

5.0 CONSULTATION

The BLM conducts scoping to solicit internal and external input on the potential issues, impacts, and alternatives that may be addressed in an EIS or EA. The BLM conducted scoping on this EA concurrently with taking comments on the 2014 Big Bug Creek LHE. External scoping was conducted via letter sent to the Consultation, Coordination, and Cooperation list. Recipients were asked to comment on the draft LHE as well as the Proposed Action presented in this EA. The scoping period ran from August 4 through August 18, 2014. Two external scoping comment letters were received from the Arizona Game and Fish Department and Western Watersheds Project. Scoping comments are summarized in Appendix B.

The BLM Hassayampa Field Office also informally consulted with the U.S. Fish and Wildlife Service (USFWS) about impacts the proposed action may have on Threatened and Endangered (T&E) Species found within the allotment. The USFWS agreed that the proposed action would not likely have any impacts on any T&E species found within or close proximity to the allotment.

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This list presents the individuals from the BLM who contributed to the technical content of this EA. Some of the individuals below prepared or reviewed specific sections, or provided input to the content and production of this document.

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ACRONYMS

AUM	Animal Unit Months
AZGFD	State of Arizona Game and Fish Department
BCR	Bird Conservation Region
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations

DPC	Desired Plant Community
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
FO	Field Office
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information Systems
IDT	Interdisciplinary Planning Team
LHE	Land Health Evaluation
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NRCS	National Resource Conservation Service
PM	Particulate Matter
RMP	Resource Management Plan
USC	United States Code
VRM	Visual Resource Management

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APPENDIX A. ARIZONA'S STANDARDS FOR RANGELAND HEALTH AND GUIDELINES FOR GRAZING ADMINISTRATION

INTRODUCTION

The Department of the Interior's final rule for Grazing Administration, issued on February 22, 1995, and effective August 21, 1995, requires that Bureau of Land Management (BLM) State Directors develop State or regional standards and guidelines for grazing administration in consultation with BLM Resource Advisory Councils (RAC), other agencies and the public. The final rule provides that fallback standards and guidelines be implemented, if State standards and guidelines are not developed by February 12, 1997. Arizona Standards and Guidelines and the final rule apply to grazing administration on public lands as indicated by the following quotation from the Federal Register, Volume 60, Number 35, page 9955.

"The fundamentals of rangeland health, guiding principles for standards and the fallback standards address ecological components that are affected by all uses of public rangelands, not just livestock grazing. However, the scope of this final rule, and therefore the fundamentals of rangeland health of §4180.1, and the standards and guidelines to be made effective under §4180.2, are limited to grazing administration."

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

With the commitment of BLM to ecosystem and interdisciplinary resource management, the standards for rangeland health as developed in this current process will be incorporated into management goals and objectives. The standards and guidelines for rangeland health for grazing administration, however, are not the only considerations in resolving resource issues.

The following quotations from the Federal Register, Vol. 60, No. 35, page 9956, February 22, 1995, describe the purpose of standards and guidelines and their implementation:

"The guiding principles for standards and guidelines require that State or regional standards and guidelines address the basic components of healthy rangelands. The Department believes that by implementing grazing-related actions that are consistent with the fundamentals of §4180.1 and the guiding principles of §4180.2, the long-term health of public rangelands can be ensured.

"Standards and guidelines will be implemented through terms and conditions of grazing permits, leases, and other authorizations, grazing-related portions of activity plans (including Allotment Management Plans), and through range improvement-related activities.

"The Department anticipates that in most cases the standards and guidelines themselves will not be terms and conditions of various authorizations but that the terms and conditions will reflect the standards and guidelines.

"The Department intends that assessments and corrective actions will be undertaken in priority order as determined by BLM.

"The Department will use a variety of data including monitoring records, assessments, and knowledge of the locale to assist in making the "significant progress" determination. It is

anticipated that in many cases it will take numerous grazing seasons to determine direction and magnitude of trend. However, actions will be taken to establish significant progress toward conformance as soon as sufficient data are available to make informed changes in grazing practices."

FUNDAMENTALS AND DEFINITION OF RANGELAND HEALTH

The Grazing Administration Regulations, at §4180.1 (43 Code of Federal Regulation [CFR] 4180.1), Federal Register Vol. 60, No. 35, pg. 9970, direct that the authorized officer ensures that the following conditions of rangeland health exist:

(a) Watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage, and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity, and timing and duration of flow.

(b) Ecological processes, including the hydrologic cycle, nutrient cycle, and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.

(c) Water quality complies with State water quality standards and achieves, or is making significant progress toward achieving, established BLM management objectives such as meeting wildlife needs.

(d) Habitats are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered species, Federal Proposed, Category 1 and 2 Federal candidate and other special status species.

These fundamentals focus on sustaining productivity of a rangeland rather than its uses. Emphasizing the physical and biological functioning of ecosystems to determine rangeland health is consistent with the definition of rangeland health as proposed by the Committee on Rangeland Classification, Board of Agriculture, National Research Council (Rangeland Health, 1994, pg. 4 and 5). This Committee defined Rangeland Health ". . .as the degree to which the integrity of the soil and the ecological processes of rangeland ecosystems are sustained." This committee emphasized ". . .the degree of integrity of the soil and ecological processes that are most important in sustaining the capacity of rangelands to satisfy values and produce commodities." The Committee also recommended that "The determination of whether a rangeland is healthy, at risk, or unhealthy should be based on the evaluation of three criteria: degree of soil stability and watershed function, integrity of nutrient cycles and energy flow, and presence of functioning mechanisms" (Rangeland Health, 1994, pg. 97-98).

Standards describe conditions necessary to encourage proper functioning of ecological processes on specific ecological sites. An ecological site is the logical and practical ecosystem unit upon which to base an interpretation of rangeland health. Ecological site is defined as:

". . . a kind of land with specific physical characteristics which differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its response to management" (Journal of Range Management, 48:279, 1995). Ecological sites result from the interaction of climate, soils, and landform (slope, topographic position). The importance of this concept is that the "health" of different kinds of rangeland must be judged by standards specific

to the potential of the ecological site. Acceptable erosion rates, water quality, productivity of plants and animals, and other features are different on each ecological site.

Since there is wide variation of ecological sites in Arizona, standards and guidelines covering these sites must be general. To make standards and guidelines too specific would reduce the ability of BLM and interested publics to select specific objectives, monitoring strategies, and grazing permit terms and conditions appropriate to specific land forms.

Ecological sites have the potential to support several different plant communities. Existing communities are the result of the combination of historical and recent uses and natural events. Management actions may be used to modify plant communities on a site. The desired plant community for a site is defined as follows: "Of the several plant communities that may occupy a site, the one that has been identified through a management plan to best meet the plan's objectives for the site. It must protect the site as a minimum." (Journal of Range Management, 48:279, 1995.)

Fundamentals (a) and (b) define physical and biological components of rangeland health and are consistent with the definition of rangeland health as defined by the Committee on Rangeland Classification, Board on Agriculture, National Research Council, as discussed in the paragraph above. These fundamentals provide the basis for sustainable rangelands.

Fundamentals (c) and (d) emphasize compliance with existing laws and regulation and, therefore, define social and political components of rangeland health. Compliance with Fundamentals (c) and (d) is accomplished by managing to attain a specific plant community and associated wildlife species present on ecological sites. These desired plant communities are determined in the BLM planning process, or, where the desired plant community is not identified, a community may be selected that will meet the conditions of Fundamentals (a) and (b) and also adhere to laws and regulations. Arizona Standard 3 is written to comply with Fundamentals (c) and (d) and provide a logical combination of Standards and Guidelines for planning and management purposes.

STANDARD AND GUIDELINE DEFINITIONS

Standards are goals for the desired condition of the biological and physical components and characteristics of rangelands. Standards:

(1) are measurable and attainable; and

(2) comply with various Federal and State statutes, policies, and directives applicable to BLM Rangelands.

Guidelines are management approaches, methods, and practices that are intended to achieve a standard. Guidelines:

(1) typically identify and prescribe methods of influencing or controlling specific public land uses;

(2) are developed and applied consistent with the desired condition and within site capability; and

(3) may be adjusted over time.

IMPLEMENTING STANDARDS AND GUIDELINES

The authorized officer will review existing permitted livestock use, allotment management plans, or other activity plans which identify terms and conditions for management on public land. Existing management practices and levels of use on grazing allotments will be reviewed and evaluated on a priority basis to determine if they meet, or are making significant progress toward meeting, the standards and are in conformance with the guidelines. The review will be interdisciplinary and conducted under existing rules which provide for cooperation, coordination, and consultation with affected individuals, federal, state, and local agencies, tribal governments, private landowners, and interested publics.

This review will use a variety of data, including monitoring records, assessments, and knowledge of the locale to assist in making the significant progress determination. Significance will be determined on a case by case basis, considering site potential, site condition, weather and financial commitment. It is anticipated there will be cases where numerous years will be needed to determine direction and magnitude of trend.

Upon completion of review, the authorized officer shall take appropriate action as soon as practicable but no later than the start of the next grazing year upon determining that the existing grazing management practices or level of use on public land are significant factors contributing to failure to achieve the standards and conform with the guidelines that are made effective under 43 CFR 4180.2. Appropriate action means implementing actions that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with guidelines.

Livestock grazing will continue where significant progress toward meeting standards is being made. Additional activities and practices would not be needed on such allotments. Where new activities or practices are required to assure significant progress toward meeting standards, livestock grazing use can continue contingent upon determinations from monitoring data that the implemented actions are effective in making significant progress toward meeting the standards. In some cases, additional action may be needed as determined by monitoring data over time.

New plans will incorporate an interdisciplinary team approach (Arizona BLM Interdisciplinary Resource Management Handbook, April 1995). The terms and conditions for permitted grazing in these areas will be developed to comply with the goals and objectives of these plans which will be consistent with the standards and guidelines.

ARIZONA STANDARDS AND GUIDELINES

Arizona Standards and Guidelines (S&G) for grazing administration have been developed through a collaborative process involving the Bureau of Land Management State S&G Team and the Arizona Resource Advisory Council. Together, through meetings, conference calls, correspondence, and Open Houses with the public, the BLM State Team and RAC prepared Standards and Guidelines to address the minimum requirements outlined in the grazing regulations. The Standards and Guidelines, criteria for meeting Standards, and indicators are an integrated document that conforms to the fundamentals of rangeland health and the requirements of the regulations when taken as a whole.

Upland sites, riparian-wetland areas, and desired resource conditions are each addressed by a standard and associated guidelines.

Standard 1: Upland Sites

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

Criteria for meeting Standard 1:

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

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

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

As indicated by such factors as:

Ground Cover

- litter
- live vegetation, amount and type (e.g., grass, shrubs, trees, etc.)
- rock

Signs of erosion

- flow pattern
- gullies
- rills
- plant pedestaling

Exceptions and exemptions (where applicable):

- None

Guidelines:

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.

Standard 2: Riparian-Wetland Sites

Riparian-wetland areas are in properly functioning condition.

Criteria for meeting Standard 2:

Stream channel morphology and functions are appropriate for proper functioning condition for existing climate, landform, and channel reach characteristics. Riparian-wetland areas are functioning properly when adequate vegetation, land form, or large woody debris is present to dissipate stream energy associated with high water flows.

Riparian-wetland functioning condition assessments are based on examination of hydrologic, vegetative, soil and erosion-deposition factors. BLM has developed a standard checklist to address these factors and make functional assessments. Riparian-wetland areas are functioning properly as indicated by the results of the application of the appropriate checklist.

The checklist for riparian areas is in Technical Reference 1737-9 "Process for Assessing Proper Functioning Condition." The checklist for wetlands is in Technical Reference 1737-11 "Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas."

As indicated by such factors as:

- Gradient
- Width/depth ratio
- Channel roughness and sinuosity of stream channel
- Bank stabilization
- Reduced erosion
- Captured sediment
- Ground-water recharge
- Dissipation of energy by vegetation

Exceptions and exemptions (where applicable):

- Dirt tanks, wells, and other water facilities constructed or placed at a location for the purpose of providing water for livestock and/or wildlife and which have not been determined through local planning efforts to provide for riparian or wetland habitat are exempt.
- Water impoundments permitted for construction, mining, or other similar activities are exempt.

Guidelines:

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.

Standard 3: Desired Resource Conditions

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

Criteria for meeting Standard 3:

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

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

As indicated by such factors as:

- Composition
- Structure
- Distribution

Exceptions and exemptions (where applicable):

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

Guidelines:

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:

- 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 which 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.

APPENDIX B. COMMENTS RECEIVED DURING SCOPING

Comment No.	Commenter	Comment	BLM Response
1	Tina Mozelewski, AZGFD	The Department notes that the conclusions of standard achievement are described differently in three different locations within the LHE. The abstract on page 3 describes "Standard One is achieved ... Standard Two is not achieved ... Standard Three is not achieved." In the conclusions section on page 19, achievement is summarized as "upland areas meet both Standard 1 and Standard 3. The riparian area within the allotment is not achieving Standard 2." Finally, the technical recommendations section on page 23 describes the Big Bug Creek Allotment as "achieving Standard 1 and Standard 3 of the Arizona Standards for Rangeland Health in upland sites but -is not meeting Standard 2 in riparian areas or Standard 3 in riparian sites." The Department feels that this inconsistency in the conclusions of standard achievement is confusing and should be corrected.	Please refer to sections 1.0 and 4.1 of the Land Health Evaluation and Appendix A of the EA for more information about the Arizona Standards and Guidelines for Rangeland Health. Standard 3 has two parts; desired resource conditions for both upland and riparian ecosystems within the allotment. The riparian portion of standard 3 is not meeting desired resource conditions. However, the upland portion of standard 3 is meeting desired resource conditions.
2	Greta Anderson, Western Watersheds Project	The conditions of Big Bug creek and the reasons for its failure to meet Riparian Functioning Condition standards is attributed to the dewatering of the creek from groundwater pumping, *e.g.* LHE at 7, 19. However, the LHE does not provide any information about the groundwater pumping that may be	Please refer to section 2.3.6 in the LHE and section 3.6.1 and 3.6.2 of the EA for more information about groundwater pumping. No groundwater is pumped on BLM lands for livestock use.

Comment No.	Commenter	Comment	BLM Response
		incidental to livestock use of the allotment such as a well for stock water developments. The maps in the LHE also do not include information about range developments or infrastructure and the source of water for the livestock should be disclosed and the hydrologic impacts of this concurrent water withdrawal should be assessed.	
3	Greta Anderson, Western Watersheds Project	It appears as though livestock were having an adverse impact on the allotment prior to the surface water declines (LHE at 19) and based on the description of where sheep "are watered" at the Big Bug Creek trailhead (LHE at 10) it appears this is still a livestock concentration area. Please explain where the water comes from for these sheep each year, and please analyze the impact of this use on whatever emergent riparian species or woody seedlings may be present in the area where the sheep are watered and trailed in the spring.	There is no indication that livestock are having any negative impacts on the allotment. Data used in the LHE that showed degradation was from the Mayer allotment, which is adjacent to the Big Bug Allotment. Please refer to section 3.3 in the LHE for more information about sheep watering locations.
4	Greta Anderson, Western Watersheds Project	The narrative description of sheep use of the Big Bug allotment is inconsistent with the authorizations of actual use. The LHE states (p. 10) that the sheep are watered and then trail through the allotment for one or two days. But the AUM and recent actual use reveal that the sheep spend more time on the allotment most years. LHE at 18. For example, in 2011, 2000 sheep spent four days on the allotment (5 sheep per AUM), and this is not accounting for lambs. Please provide a more thorough explanation of actual use in the	Sheep trailing use of the Big Bug Creek allotment is outside the scope of this analysis.

Comment No.	Commenter	Comment	BLM Response
		forthcoming EA.	
5	Greta Anderson, Western Watersheds Project	The LHE doesn't include meaningful utilization data or any information about when it was gathered. The conclusions sections for the key areas report utilization levels (LHE at 22-23) but these summaries aren't correlated to the actual use or season of use by sheep in any way. Please include this information in the forthcoming EA.	Livestock utilization levels from 2013 and 2014 are shown in section 6.2.4 of the LHE (pg. 16). Utilization is also discussed in the EA on pages 7, 9, 16, 17, 21, 23, and 31.
6	Greta Anderson, Western Watersheds Project	An analysis of the sheep and cattle impacts on the spread and persistence of red brome and wild oats on the allotment should be included in the EA. LHE at 7. An analysis of risk should also be provided, since these sheep are traveling across multiple public lands and the risk of them carrying seeds in their coats or intestines is high. An analysis of the non-native species on contingent public lands is warranted.	Please refer to section 3.5 of the EA for more information about noxious/invasive plants in relation to livestock grazing.
7	Greta Anderson, Western Watersheds Project	There is a significant list of threatened and endangered species found within five miles of the Big Bug allotment. LHE at 33. Many of these species likely occurred or could occur on the Big Bug allotment if the watercourses of the allotment were restored or ephemeral waters were not removed by livestock grazing. Please use the forthcoming EA to analyze how grazing impacts the potential habitat for these aquatic and riparian species and how, in the absence of grazing under a No Grazing alternative, the habitat	Please refer to section 3.7 in the EA for more information.

Comment No.	Commenter	Comment	BLM Response
		could perhaps be restored and reclaimed for wildlife use.	
8	Greta Anderson, Western Watersheds Project	The technical recommendations include considering the impacts of drought on the resource conditions and, if persistent, implement additional monitoring and/or reduce livestock numbers. LHE at 25. All climate forecasts predict a southwest that is hotter and drier, and drought conditions are widely considered to be the new normal. That should lead the BLM to implement additional monitoring and reduce livestock numbers under the preferred alternative **now**. Waiting for things to get worse risks the resilience of the ecosystem, and the evidence of existing adverse impacts on Big Bug Creek should not be ignored. *See* Beschta, et al. 2012, "Adapting to Climate Change on Western Public Lands: Addressing the Ecological Effects of Domestic, Wild, and Feral Ungulates," *Environmental Management*.	Monitoring data was collected under drought conditions and was conducted in accordance with BLM Technical References. Please refer to section 2.2 for more information about livestock grazing utilization during drought. The proposed alternative utilization level (30-40%) is very conservative and will likely help with adaptation to changing climatic conditions within the Big Bug Creek Allotment. Adverse impacts to the riparian systems on the Big Bug allotment are discussed in section 3.6 in the NEPA analysis. Monitoring data for the Big Bug Creek system shows a gradual reduction in the water table coinciding with industrial activities and development in the area. These impacts are outside of BLM control. Due to the lack of surface water and riparian dependent vegetation along this riparian reach, livestock use is limited and was not identified as a causal factor for the non-functional ecological processes.
9	Greta Anderson, Western Watersheds Project	Because of the resource conditions and evidence on long-term impairment on the BLM portion of the Big Bug allotment, a reasonable range of alternatives would include a No Grazing alternative, a Reduce Grazing alternative, and an alternative that removes the sheep trailing permit on the allotment. The sheep use is obviously high intensity and there is no clear monitoring (at least in the LHE) that tracks this impact. High intensity short-duration	This EA analyzes a "No Grazing alternative" as suggested. A "cattle only" (no sheep trailing) and a "Reduced Grazing" alternative have been dismissed because the impacts would be substantially similar to the "No Grazing alternative" and "Proposed Alternative." Sheep trailing is outside the scope of this analysis because it occurs under a different grazing authorization.

Comment No.	Commenter	Comment	BLM Response
		grazing systems, contrary to popular wishful thinking, have adverse impacts on the desert landscape and thorough consideration should be given to those impacts in the forthcoming NEPA analysis.	

APPENDIX C. FINAL LAND HEALTH EVALUATION

United States Department of the Interior
Bureau of Land Management
Hassayampa Field Office
Phoenix District Office

Big Bug Creek Allotment (#06143)

Land Health Evaluation

Table of Contents

Abstract

This Rangeland Health Evaluation is a stand-alone report designed to ascertain compliance with the Arizona Standards for Rangeland Health on the Big Bug Creek Allotment, identify causal factors if standards are not being met, and provide technical recommendations to improve land health conditions if needed. This report concludes:

- Standard One is achieved on this allotment.
- Standard Two is not achieved on this allotment. The causal factor for this is driven by a lack of water in duration and frequency to support proper functioning riparian conditions.
- Standard Three is not achieved on this allotment. Adequate water in both frequency and duration is not present to support riparian vegetation recruitment within Big Bug Creek located within the Big Bug Allotment.

Technical recommendations will serve to improve resource conditions within the allotment. However, the failure to meet standard 2, are dependent upon issues outside the control of the BLM.

1.0 Introduction

The purpose of this land health evaluation is to assess whether the *Arizona Standards for Rangeland Health* (1997) are being achieved on the Big Bug Creek grazing allotment and to determine if livestock, or other land use activities, are the causal factor for not achieving, or making significant progress towards achieving, land health standards. An evaluation is not a decision document, but a standalone report that clearly records the analysis and interpretation of the available inventory and monitoring data. As part of the land health assessment process Desired Plant Community (DPC) objectives were established for the Biological Resources (biological objects within the boundaries of the allotment). The DPC objectives will assure that soil condition and ecosystem function described in Standards 1, 2 and 3 are met where achievable under management actions taken by the Bureau of Land Management (BLM).

Land Health Standards are measurable and attainable goals for the desired condition of the biological resources and physical components/characteristics of the ecosystems found within the boundaries of this grazing allotment. To be attainable, goals for desired resource conditions must be under the management control of the BLM.

This evaluation seeks to ascertain if land health standards are being achieved or not achieved, and, in cases of not achieved, if significant progress is being made towards achievement of land health. Where land health standards are not achieved, this assessment will identify the causal factors and identify recommendations for management changes to achieve land health standards under the authorities of the Bureau of Land Management.

This document is draft; comments received from the lessee and/or interested publics will 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 a forthcoming Environmental Assessment to evaluate the effects of implementing the various actions.

2.0 Big Bug Creek Allotment Profile

2.1 Allotment Location

The Big Bug Creek allotment is located in Yavapai County, west of Interstate 17 just northwest of Cordes Junction, Arizona (Map 1). The town of Spring Valley is encompassed within the Big Bug Creek Allotment (Map 2). Arizona Highway 69 and Big Bug Creek bisects the allotment. The allotment is located within the Bradshaw-Harquahala planning area of the BLM Hassayampa Field Office (HFO).

2.2 Physical Description

2.2.1 Allotment Acreage

Big Bug Creek Allotment acreages respective to land status are given below (Table 1). The total acres within the allotment are 4749 which is dominated in ownership by the State Lands Department. BLM manages 16 % of the Big Bug Creek Allotment.

Table 1. Land Status by ownership for the Big Bug Creek Allotment for the 2014 land health evaluation. Yavapai County, AZ USA.

Land Status	Acres	Percent of total
Bureau of Land Management	747	16
State Trust Lands	2919	61
Yavapai County Lands	81	2
Private	1002	21

2.2.2 Climate

Average annual air temperatures range from 59 to 70 degrees Fahrenheit. Freezing temperatures are common from October through April, typically at night, and into the morning. Daytime temperatures in the summer are generally in the high 90 degree range. Winter temperatures are mild, with very few days recording freezing temperatures in the morning (esis.sc.egov.usda.gov).

2.2.3 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 5 miles south of the Big Bug Creek allotment. Average precipitation between 2001 and 2014 was 12.95 inches, with only trace levels of snow. Yearly precipitation totals ranged from a low of 8.07 inches in 2006 to a high of 20.12 inches in 2004 (Table 2 in Appendix A). Seven of the fourteen years have been above average precipitation and six have been below average.

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 north Pacific. This winter precipitation ranges from a trace to 10 inches, and falls in widespread storms with long duration and low intensity. Snow is rare and seldom lasts

more than a day, except on north aspects. May and June are the driest months of the year. Humidity is generally very low.

2.2.4 Soils

A soil survey was completed in 1976 by the Natural Resources Conservation Service (NRCS) for Yavapai County, AZ. The land resource units within the survey consist 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 typical soil series in the allotment consist of well-drained soils that are very deep (typically more than 80" to restrictive layer) over alluvium. These soils are Balon gravely; clay loam which occur on gently sloping alluvial fans (Map 3).

2.3 Biological Resources

2.3.1 Major Land Resource Area

The Big Bug Creek falls within the Major Land Resource Area (MLRA) 38, the Mogollon transition. MRLAs describe, on a large-landscape scale, the physiography, geology, climate, water, soils, biological resources and general land use (USDA 1981)).

2.3.2 Ecological Sites

An ecological site is defined as 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 and respond to management in BLM TR 1734-7 (Habich 2001). It is the product of all the environmental factors responsible for its development, and it has a set of key characteristics (soils, hydrology, and vegetation) that are included in the ecological site description. Development of the soils, hydrology, and vegetation are all interrelated. Each is influenced by the other and influences the development of the others. Ecological sites are named and classified based on soil parent material or soil texture and precipitation. There are 11 ecological sites within the Big Bug Creek Allotment (Map 4) but only six within lands administered by the BLM. See Table 2 for acreages of each respective ecological site.

Table 2. Acres and percentages of ecological sites found within the Big Bug Creek Allotment administered by the Bureau of Land Management Yavapai County, AZ USA.

Ecological Sites – Only BLM Administered	Acres	Percent
Clayey Slopes 12-16" p.z.	22	3
Basalt Upland 14-18" p.z.	78	10
Granitic Hills 12-16" p.z.	66	9
Volcanic Hills 12-16" p.z. Clayey	121	16
Volcanic Upland 12-16" p.z.	154	21
Loamy Upland 12-16" p.z.	306	41
Total	**747**	**100**

The two most dominant ecological sites within the Big Bug Creek allotment administered by the BLM are Loamy Upland 12-16" p.z. and Volcanic Upland 12 16" p.z. which accounts for 62% of these areas or 460 acres. Both are described in detail below.

Loamy Upland 12-16" pz (BgD)-An ecological site description for this soil and precipitation zone has not been completed at the time of this evaluation. An ESD has been created for the ecological site Clay Loamy Upland 12-16" and basic landforms and soil characteristics are expected to be similar. This site occurs on hill slopes, and mountains. It typically occurs has 1 to 45 percent slopes. These are deep soils (~60 in to bedrock) which have formed in loamy alluvium of mixed origin. Soil surfaces are well protected by gravel and rocks. The historic plant community on this site is a mixed community of juniper overstory with a mid/short-grasses (cool and warm season), forbs, and shrub understory. Increased or continuous grazing can cause lower forage value grasses and forbs to replace and decrease some of the cool season grasses. Likely species to invade and increase if this ecological site deteriorates are blue yucca, broom snakeweed, annual forbs, prickly pear, hedgehog and blue grama.

On the Big Bug Creek Allotment this site is most often situated adjacent to ecological associations containing the Volcanic Hills and Clayey Slopes and Upland types. Due to similar geology, the rocky nature of the soils in this type as well as the similar climate and vegetation characteristics, this ecological site was evaluated in conjunction with the adjacent ecological sites.

Volcanic Upland 12-16" pz (VsC)- This site occurs in steep slopes and ridges. It can occur in north, south, and east exposures. It typically occurs between 3,100 and 4,600 feet elevation with 15 to 45 percent slopes. The soils characterizing this site are very deep formed in mixed alluvium. The historic plant community on this site is dominated by tobosa and other perennial warm season grasses with a mixture of desert shrubs, half shrubs, succulents and forbs. Increased or continuous grazing can cause the loss of palatable grasses, half shrubs and woody forbs. The interactions of drought and/or fire can additionally, over time, result in the deterioration of the ecological site. The natural fire interval for this ecological site is a moderate interval (15-30 years) which helps to maintain the balance between the grasses and shrubs. A lack of natural fire could cause an increase in large shrubs and/or succulents like prickly pear and whitethorn acacia, as well as a possible increase in trees like juniper, mesquite, and canotia. 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.

2.3.4 Vegetation

The Big Bug Creek Allotment is within the lowest elevations of the Natural Resource Conservation Service's (NRCS) Major Land Resource Area (MLRA) 38-1, Mogollon Transition with 12-16" annual precipitation. Characteristic vegetation on the drier soils at the lower elevations are mesquite, cat-claw acacia, and wait-a-minute bush with an understory that consists

of grasses such as grama spp., tobosa grass, and curly mesquite; shrubs like snakeweed, shrubby buckwheat, twinberry, globe mallow, and a diverse assemblage of annual forbs and grasses. Typically shallow soils and/or north facing slopes support a higher ratio of shrubs to grass whereas deeper soils and slopes with a southern exposer support a larger grass component.

2.3.5 Noxious/Invasive Weeds

Red Brome and Wild Oats have become naturalized over much of Arizona and occur within the Big Bug Creek Allotment. Salt cedar is also present in Big Bug creek but in low densities.

2.3.6 Riparian-Wetland Resources

Federal policy and BLM Manual 1737 defines wetlands as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and which, under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USDI, 1992). Riparian-Wetland areas include marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.

The Big Bug allotment encompasses approximately 4.1 miles of riparian habitat. The BLM manages approximately 1500 feet of the 4.1 miles of riparian habitat within the allotment which equates to about 7%. Arizona State Land Department administers 0.7 miles or about 17% and the remaining 79% is privately owned. Big Bug Creek is intermittent to dry but does supports some limited numbers of mature Arizona Ash (*Fraxinus velutina*), Cottonwood (*Populous fremontii*), and seep willow (*Baccharis salicifolia*). The distribution of riparian obligate woody species is patchy with very little canopy continuity. Facultative wetland trees and shrubs are the dominant overstory vegetation. There is no evidence of riparian obligate forbs (ex. sedges, rushes, etc.) or woody species recruitment. These current conditions are likely a result of a lack of water which is potentially due to drought and ground water pumping. It was noted that construction activities related to the construction of the Cordes Junction interchange by ADOT removed over 1,000,000 gallons of water within close proximity to the Big Bug Creek Allotment. The result of this action permanently dried up a spring that was perennial on the base property for Big Bug Creek Allotment.

2.3.7 Wildlife Resources

The Big Bug Creek Allotment is located within the Arizona Game and Fish Department management unit 20A. 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. Pronghorn (*Antilocapra americana*) historically occupied the southern portions of the allotment but are extirpated due to habitat fragmentation resulting from Interstate 17 and Highway 69.

Other wildlife species present on the allotment include various migratory birds, bats, small mammals, reptiles, and amphibians. Fish species may temporally inhabit portions of Big Bug Creek but are limited by water availability. 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 common species 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*).

2.3.8 Threatened & Endangered Species (T&E)

No Threatened and Endangered Species occupy the Big Bug Creek Allotment.

2.3.9 Special Status Species and Migratory Birds

No Federally listed Special Status Species occur within the Big Bug Creek Allotment. Special Status species that may occur or have been documented within five miles of the allotment are in Table 4 of Appendix A. Many migratory birds are expected to occur at times within the Big Bug Creek Allotment. This includes raptor species such as the golden eagle (Aquila chrysaetos), waterfowl, passerine and other orders of birds. Waterfowl may temporally use pooled water and stock tanks during migrations. State sensitive aquatic species such as longfin dace (*Agosia chrysogaster*), desert sucker (*Catostomus clarki*), lowland leopard frogs(*Rana yavapaiensis*), and Sonoran mud turtles (*Kinosternon sonoriense*) have been known to historically occur in Big Bug Creek, they are no longer present due to a lack of surface flows.

2.4 Recreational Resources

There are both motorized and non-motorized recreation resources that occur within the allotment. The Black Canyon National Historic Trail passes through a portion of the Allotment. It is a non-motorized that is used by hikers, bicyclist, and equestrian users. The Big Bug Creek Trailhead for the Black Canyon National Historic Trail is located within the allotment south of Highway 69 adjacent to Big Bug Creek. Off-highway vehicle (OHV) use is restricted by the lack of public access and topography on the allotment.

2.5 Locatable Minerals

The mining claim history of the BLM land in Big Bug Creek Allotment centered within Big Bug Creek began in 1979. Several notice level operations occurred between1985-1988. Mining activity consisted of placer type operations which occurred in the steam bed. It has been noted on field forms that small scale mining activities in Big Bug Creek have occurred as recently as 2013.

3.0 Grazing Management

3.1 Grazing History

Livestock are authorized within the Big Bug Allotment. Billing records for cattle go back to 1965 and indicate 49 years of continued use. Sheep trailing occurs within the allotment for typically two or three days each year between April 1 and May 15. However, this use is

authorized under a different grazing lease. Historically, the Big Bug Creek Allotment and surrounding area was part of the Stock Driveway No. 56, also known as the Black Canyon Trails Area, was federally established in 1919 but use of the route dates back to the 1600s (Nellans 2014). Stock Driveway No. 56 and others were revoked in 1982 under 43 CFR Public Land Order 6330 (1982). Billing records for sheep use have indicated authorized use since 1960.

3.2 Cattle Authorization

The current cattle operator acquired the Big Bug Creek Allotment in 1996. The permitted livestock for this allotment is 9 cattle yearlong which equates to 108 animal unit months (AUMs). An allotment management plan has not been completed for the Big Bug Creek allotment. There is one pasture on the allotment. Although cattle are typically not rotated within the allotment, they are well distributed throughout the allotment by livestock waters. There is no specified grazing system for the allotment. Typically, the permittee runs 9 cattle yearlong in the allotment. No water range improvements occur and are permitted on lands managed by the BLM. Terms and conditions are listed below.

Mandatory Terms and Conditions of the Current Authorization #0202744

Authorized Use:	
Lessee	Hamernick
Percent Public Land	100%
Grazing Preference	108 Animal Unit Months (AUMs)
Season of Use	Yearlong
Range Classification	Perennial
Management Category	Custodial
Kind and class of livestock use	Cattle

3.3 Sheep Trailing

Sheep trailing occurs within the Big Bug Creek Allotment. Actual use of sheep trailing activities within the Big Bug Creek allotment during the past 10 years ranged between 13 and 52 AUMs. Sheep are watered at the Big Bug Creek recreation trailhead located immediately south of highway 69. The water is supplied from a well associated with an active mining claim in the area. The livestock operator has permission to use this water source. Typical trailing activities occur between 2 and 3 days. Authorization for sheep trailing occurs on a yearly basis and is not tied to the livestock grazing authorization for the Big Bug Creek Allotment.

4.0 Planning and Environmental Document Objectives

4.1 Resource Management Plan Objectives

The Taylor Grazing Act of 1934 provides for two types of authorized use: (1) A *grazing permit*, which is a document authorizing use of the public lands within an established grazing district, and are administered in accordance with Section 3 of the Taylor Grazing Act; and (2) a *grazing lease*, which is a document authorizing use of the public lands outside an established grazing district, and are administered in accordance with Section 15 of the Taylor Grazing Act.

The BLM is responsible for establishing the appropriate levels and management strategies for livestock grazing in this allotment. Grazing permits issued must be in compliance with the multiple use and sustained yield concepts of Federal Land Policy and Management Act FLPMA and the Fundamentals of Rangeland Health (43 CFR 4180), and be in accordance with the Guidelines for Grazing Administration while continuing to achieve Arizona Standards for Rangeland Health.

On April 28, 1997, the Secretary of Interior approved the implementation of the *Arizona Standards for Rangeland Health and Guidelines for Grazing Administration* for all Land Use Plans in Arizona. 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 1997 and into the *Bradshaw-Harquahala RMP* in 2010.

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 S&Gs are defined as the following:

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 Site
Riparian-wetland areas are in proper functioning condition.

Standard 3 - Desired Resource Conditions
Productive and diverse upland and riparian-wetland communities of native species exist and are maintained.

4.2 Key Area and Riparian Objectives:

Specific key area objectives step down from the Desired Future Condition objectives found in the Bradshaw-Harquahala RMP (2010). These Key Area specific objectives are designed to assess Public Land conformance to the Arizona Standards for Rangeland Health on the Big Bug Creek Allotment.

There are two active key areas on the Big Bug Creek Allotment and one PFC assessment segment (Map 4) that collectively assess the three Arizona Land Health Standards (Table 5). A multiple indicator monitoring (MIM) plot is located immediately upstream of the allotment (Map 4) and additional PFC assessments have been conducted immediately upstream of the Big Bug

Creek and data on these areas are also included to determine land health standards. These data are included in this land health evaluation due to the proximity, similarity in resources, appearance, use and value as legacy data.

Table 4. Monitoring areas within the Big Bug Creek Allotment collected between 2009 and 2013. Table includes ecological site and land health standards assessed.

Study Site Name	Ecological Site/Area	Standards Assessed
KA 1	Upland - Volcanic Upland 12"-16" PZ	Standard 1, Standard 3
KA 2	Upland - Loamy Upland 12" – 16" PZ	Standard 1, Standard 3
BB-MIM	Riparian	Standard 2, Standard 3
6011-45B (PFC)	Riparian	Standard 2, Standard 3
6011-45C (PFC)	Riparian	Standard 2, Standard 3

Desired Plant Community (DPC) objectives were developed for each key area within the Complex by an interdisciplinary team of BLM resource specialists and biologists. These objectives are designed to maintain or improve the biotic integrity of the Public Lands, provide for wildlife habitat, and provide for usable forage as limited by the potential of the ecological site. Objectives, and the rationale for each objective, are given below.

4.2.1 Standard 1 - Upland Sites

Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate, and landform (ecological site) (Bradshaw-Harquahala RMP decision LH-1, 2010).

Soil erosion on the key area is appropriate to the ecological site on which it is located. Factors indicating conformance to Standard 1 include ground cover, litter, vegetative foliar cover, flow patterns, rills, and plant pedestalling in accordance to developed NRCS Ecological Site Guides and/or Reference Sheets. Deviations that are "slight" or "slight to moderate" from the appropriate site guide or reference are considered meeting the Standard. Departures of Moderate or greater will not meet the Standard except in cases where the departure is documented as showing an improvement of land health over what is expected on a reference site.

4.2.2 Standard 2 – Riparian-Wetland Sites

Objective: Riparian-wetland areas are in properly functioning condition (PFC) (Bradshaw-Harquahala RMP decision LH-2, 2010).

Riparian-wetland sites are considered in proper functioning condition when the stream channel morphology and functions are appropriate for the existing climate, landform, and channel reach characteristics. Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate the stream energy of high-water flows. Key indicators in assessing the criteria for meeting standard to are gradient, width/depth ratio,

channel roughness and sinuosity of the stream channel, bank stabilization, reduced erosion, captured sediment, ground water recharge, and dissipation of energy by vegetation.

4.2.3 Standard 3 – Upland and Riparian-Wetland Plant Communities

Objective: Productive, diverse upland and riparian-wetland plant communities of native species exist and are maintained (Bradshaw-Harquahala RMP decision LH-3, 2010).

Standard 3 is met if upland and riparian-wetland plant communities meet DPC objectives. Plant community objectives are determined with consideration for all multiple uses. Objectives also address native species and the requirements of the Taylor Grazing Act (TGA), Federal Land Policy and Management Act (FLPMA): Endangered Species Act (ESA); Clean Water Act (CWA); and suitable laws, regulations and policies.

Foliar cover and bare ground cover class objectives in upland sites will provide thermal and hiding cover for wildlife species and will prevent accelerated erosion on the sites. Adequate vegetation and woody debris stability of riparian-wetland areas provide additional bank stabilization capabilities in addition to natural bank armament along with meeting the food, water, cover and space needs of many wildlife species. Recommended palatable shrub and grass compositions and riparian obligate vegetation will provide for adequate wildlife forage on the site for species such as mule deer, quail, and other non-game wildlife species.

4.3 Key Area Desired Plant Community and Riparian Objectives

4.3.1 Key Area 1 DPC Objectives (Volcanic Upland 12-16 "PZ)

1. *Maintain vegetation canopy cover at ≥ 25%*
2. *Maintain palatable shrub species composition at ≥ 30%*
3. *Maintain perennial grass composition ≥ 20% with ≥ 5% comprising of tobosa*
4. *Maintain bare ground ≥ 25%*

Rationale:
Based on the ecological site potential for the volcanic upland 12-16" p.z. ecological site description (R038XA115AZ), The expected soils surface cover based on basal cover is: grass 2-5%, forb 0-1%, shrub/vine 1-2%, tree 0-1%, biotic crust 1-5%, rock 31-75%, and bare ground between 5-55%. The expected range of vegetative canopy cover is between 30-109% but high rock fragments within the key area reduce the expected vegetation canopy.

Maintaining the vegetative canopy cover above 25% is slightly below the predicted from the ESD but is expected due to the high amount of rock at the site. The maintenance of appropriate vegetative canopy cover levels will prevent accelerated erosion of the site and provide adequate cover and browse for wildlife such as mule deer. Additionally, Tobosa canopy cover less than 5% may lead to an inability for tobosa to recolonize an area.

Composition of shrubs, by weight, is expected to range between 24-37% which includes both non palatable and palatable shrubs. Adequate composition of overall shrub production and

palatable shrubs will provide for hiding and thermal cover for wildlife such as mule deer and also provide for sufficient browse (Heffelfinger 2006).

The Bare ground cover level is based upon the expected range as identified in the Volcanic Upland 12-16" p.z. ESD. Current amounts of bare ground are low and litter and rock/gravel are expected to contribute to large percentages of the ground cover. Bare ground greater than 25% may indicate structural functional groups are outside of what is expected (ex. Greater shrub/woody species cover than expected).

4.3.2 Key Area 2 DPC Objectives (Loamy Upland 12-16"PZ)

1. *Maintain vegetation canopy cover at 30%*
2. *Maintain composition of palatable shrubs at 15%*
3. *Maintain perennial grass composition at >15% with a tobosa composition at > 5%*
4. *Maintain bare ground below 25%*

Rationale:
NRCS has not developed and ESD for the Loamy Upland 12-16" p.z.. The Loamy Upland 10-13" p.z. (R040XA114AZ) was used to develop DPCs objects. These DPS objectives were also cross referenced with the existing Range Site Guidelines (1982) for Loamy Upland 12-16" p.z. (038XA109AZ) to ensure appropriate DPC objectives were developed. Expected surface cover ranges for a Loam Upland 10- 13" p.z. for each attribute are: bare ground 25-75%, litter 10-70%, rock 1-65%, and basal cover of perennial vegetation 1-11%. The expected canopy cover is 11-84% for all vegetation classes.

Maintaining the vegetative canopy at the 30% or greater within the expected range as per the reference sheet R040XA114AZ. Adequate canopy cover will serve wildlife and livestock needs on the site while maintaining land health standards. Maintaining appropriate vegetative canopy cover levels will prevent accelerated soil erosion of the site.

Composition of shrubs is expected to range between 16% and 26% in the 1982 Range Site Guidelines and is expected to be 28% ±1% in the Loamy Upland 10-13" p.z.. Palatable shrubs are expected to consist between 10-20% of total production as identified in the Range Site Guidelines (1982). Adequate composition of overall shrub production and palatable shrubs will provide for hiding and thermal cover for wildlife such as mule deer and also provide for sufficient browse (Heffelfinger 2006).

As identified in the Loamy Upland 10-13", perennial grass is expected to range between 18% and 27%. It is expected that the north facing aspect will have a reduced amount of relative grass production and be at or slightly below the expected range. When tobosa is less than 5% of composition, it may not be able to recolonize an area.

Bare ground levels are expected to be at or below the low end what is expected in the loamy upland 10-13" p.z. ESD due to higher precipitation which likely results in increased vegetative production. Perennial grass composition is expected to be at the low expected range of due to the northern aspect where Key Area 2 is located.

4.3.3 Riparian Objectives

1. Maintain woody species age class of >15% seedlings, > 15% mid-size (young), > 15% large size (mature).
2. Riparian obligate or facultative riparian woody species consist of >50% of the composition.
3. Riparian obligate or facultative riparian herbaceous species consist of >50% of the foliar cover.

Rationale:
DPC woody species size/age class objectives are outlined in the Bradshaw-Harquahala ROD/RMP 2010. Many of the riparian objectives are dependent upon sufficient surface flows, both in volume and duration, to support riparian obligate vegetation which currently does not exist. Consequently, both obligate and facultative woody species are expected to contribute to the percent composition of species on the greenline. A composition of 50% or greater of facultative and riparian obligate woody and herbaceous species will ensure riparian characteristics are maintained given the current site potential.

5.0 Inventory and Monitoring Methods

This section describes the methods and protocols used to inventory, monitor, and analyze the data collected throughout the evaluation period and allotment boundary. Rangeland monitoring studies were conducted to monitor the effects of livestock use within the allotment.

5.1 Upland Monitoring

Monitoring protocols used at the upland Key Areas on the allotment include a variety of study methods. Compliance with Standard 1 is completed using the Interpreting Indicators of Rangeland Health study method, as described in BLM Technical Reference 1734-6 Version 4 (Pellant 2005). This study method is supplemented with quantitative data collected in the methods described below.

Compliance with Standard Three is completed using a variety of upland study methods. Primarily, Dry Weight Rank, Point Cover, and Pace Frequency are used for vegetative monitoring. These methods are described in detail in BLM Technical Reference 1734-4, "Sampling Vegetation Attributes" (Pellant 2005) For these methods, a 40X40 centimeter quadrat was used, with a single point located along the rear edge of the frame for point cover data.

Utilization data was collected at each Key Area using the Key Species method. Utilization shows how much plant material (by percent) is consumed by ungulates during a specific growing season. The utilization method is described in BLM Technical Reference 1734-3, "Utilization Studies and Residual Measurements."

5.2 Riparian Monitoring Methods

Riparian monitoring was carried out using BLM Technical Reference 1737-23 Multiple Indicator Monitoring (MIM) of Stream Channels and Streamside Vegetation and BLM Technical Reference 1737-11 Process for Assessing Proper Functioning Condition (PFC).

The MIM protocol is a quantitative assessment designed for monitoring stream banks, stream channels, and streamside riparian vegetation. The MIM protocol integrates annual grazing use and long-term trend indicators allowing for evaluation of livestock grazing management.

The Proper Functioning Condition (PFC) assessment is a qualitative assessment that determines the on-the-ground condition of a riparian area; termed PFC, the protocol is used to assess how well the physical processes are functioning. The protocol is a consistent approach for considering hydrology, vegetation, and erosion/deposition (soils) attributes and processes to assess the condition of riparian-wetland areas. When in a proper functioning state, a riparian area will exhibit resiliency that will allow a riparian-wetland area to hold together during high-flow events with a high degree of reliability. High resiliency allows an area to maintain or produce desired values, such as fish habitat, neotropical bird habitat, or forage, over time. Riparian-wetland areas that are not functioning properly may not sustain these values.

6.0 Management Evaluation: Summary of Data

Actual use, precipitation data, and key area study methods, multiple indicator monitoring and proper functioning condition assessments were used to assess the rangeland health of the allotment. Data collected was analyzed, synthesized and explained to determine whether current management practices are meeting or progressing toward attainment of the standards and guidelines established by the Arizona Standards. The evaluation period took place in 2008 to 2014 (Table 6).

Table 5. A list of monitoring methods and dates completed on the Big Bug Creek Allotment.

Monitoring Method	Date Completed
Point Cover	2009
Utilization	2013, 2014
Dry Weight Rank	2009
Composition	2009
Pace Frequency	2009
Rangeland Health Assessment	2009, 2010, 2014
Monitoring Photos	2009, 2014
Multiple Indicator Monitoring	2010
Proper Functioning Condition Assessment	2012

6.1 Actual Use

Actual use means where, how many, what kind or class of livestock, and how long livestock graze on an allotment, or on a portion or pasture of an allotment. For the Big Bug Creek Allotment, actual use was determined from billing statements charged to the permittee each year. Table 6 refers to cattle actual use within allotment #06143.

Table 6. Past 10 years of Actual use for allotment #06143 in the Big Bug Creek Allotment between 2003 and 2013

Grazing Season 03/01-02/28	Livestock Numbers	% Public Land	AUMs
2003	9 Cattle	100%	108
2004	9 Cattle	100%	108
2005	9 Cattle	100%	108
2006	9 Cattle	100%	108
2007	9 Cattle	100%	108
2008	9 Cattle	100%	108
2009	9 Cattle	100%	108
2010	9 Cattle	100%	108
2011	9 Cattle	100%	108
2012	9 Cattle	100%	108
2013	9 Cattle	100%	108

6.2 Data Summary

6.2.1 Proper Functioning Condition Assessment Summary

Proper functioning condition assessments have been conducted within the Big Bug Creek Drainage since 1992. Most PFC studies were conducted in the adjoining allotment which contains PFC segment 6011-45C. One PFC segment assessment was conducted on segment 6011-45B which falls within the Big Bug Creek Allotment.

All PFC assessments, both within the Big Bug Creek Allotment and the adjoining allotment determined either an "Unsatisfactory "or a "Non-Functional" rating. This rating is the lowest rating possible in the assessment. Assessment year, rating and rational area summarized below:

Table 7. PFC Assessment summary for Big Bug Creek.

Year	Rating	Rational
*1992	Unsatisfactory	Heavy cattle use, bank alteration
*1998	Not Functional	Road affects, Down cutting and channelization, groundwater pumping
*2010	Not Functional	Down cutting and channelization, Dry seasonally. Lack of seedling recruitment
2013 NF	Not Functional	Lack of water, ground water pumping. Lack of seedling recruitment

* Indicates assessments conducted in the Mayer Allotment which adjoins the Big Bug Creek Allotment upstream.

6.2.2 Multiple Indicator Monitoring Summary

A representative Designated Monitoring Area (DMA) was selected in the Big Bug Creek drainage next to the Big Bug Creek Allotment by an interdisciplinary team. This is due in part to the presence of riparian vegetation within the area in adequate size to conduct the MIM protocol. Summarized data are discussed in this assessment due to the proximity to the Big Bug Creek

Allotment. It is likely that if sufficient water in both volume and duration persist within the Big Bug Creek Allotment, riparian vegetation from the adjoining allotment will serve as a seed/vegetative source for recolonization.

Three key riparian attributes were assessed with the MIM protocol at BB-MIM. Bank stability, green line vegetation and woody vegetation attributes were recorded. These indicators are used to determine if riparian objectives in the RMP are met.

Stream bank stability is determined qualitatively by observing whether the stream banks are depositional or erosional; whether they are covered or uncovered; and whether any type of instability is occurring (i.e. fracturing, slumping, sloughing, or eroding). For the bank to be considered covered, the stream bank must be covered by at least either 50% foliar cover of perennial vegetation, 50% cover of cobbles 15cm or greater, 50% cover of anchored large woody debris 10 cm diameter or greater, or 50% cover of a combination of the three. Bank stability data collected at BB-MIM determined that 81% of the reach is covered, and 52% of the reach is considered stable (Figure 3 in Appendix A). This indicates that much of the stream bank is vulnerable to erosion.

The greenline is a linear grouping of live perennial vascular plants, embedded rock, or anchored wood above the waterline on or near the water's edge. Species composition (Figure 4), which includes both the perennial vegetation rooted within the frame as well as the mature overstory hanging over the plot, primarily comprised of Seep Willow (*Baccharis salicifolia*) and Bermuda grass (*Cynodon dactylon*) (Table 9 in Appendix A). Stubble height of the Bermuda grass was documented to be at 18.33 inches which indicates little use. Many upland species were documented growing on the greenline and no riparian obligate tree species were recorded. Facultative riparian species such as the velvet ash were present. This indicated a general lack of sufficient water to support the riparian habitat.

Woody riparian plants provide shade and habitat diversity and are important for the stability of stream banks. Woody species use is a MIM indicator of grazing utilization on woody species along stream banks. Big Bug Creek has had no visible utilization of its woody species along the riparian areas, thus a Woody Species Use Classification Midpoint of 10; class of Slight (0-20%)- Browse plants appear to have little or no use; was given to each woody species within the plots. Stream banks were dominated by mature seep willow and desert broom plants. Other portions of the MIM protocol were not conducted. These included residual pool depth and poll frequency and substrate analyses. Data on these attributes were not collected due to the lack of surface water within the plot.

6.2.4 Utilization Studies

Utilization studies were conducted within the Big Bug Creek Allotment in 2013 and 2014 at Key areas 1 and 2. Results from the utilization studies show utilization percentages to be fairly minimal with average utilization for both years at 6%. These totals account for both wildlife and livestock use of grasses and shrubs. The following table outlines utilization by plant species:

Table 8. Utilization studies for the Big Bug Creek Allotment from 2013 and 2014.

Year	Plant Species	Key Area	Utilization %
2013	Sideoats grama (BOCU)	BB-02	2.5
2013	Curly mesquite (HIBE)	BB-02	2.5
2013	Sideoats grama (BOCU)	BB-01	2.5
2013	Purple three-awn (ARPU9)	BB-01	2.5
2013	Bastardsage (ERWR)*	BB-01	4
2013	Littleleaf ratany (KRER)*	BB-01	2.5
2013	Littleleaf ratany (KRER)*	BB-02	12
2013	Bastardsage (ERWR)*	BB-02	18
2014	Littleleaf ratany (KRER)*	BB-02	2.5
2014	Tobosa grass (PLMU)	BB-01	9
2014	Purple three-awn (ARPU9)	BB-01	2.5
2014	Shrubby buckwheat (ERIOG)	BB-02	9

*Palatable Shrubs

7.0 Conclusions

Based upon the data compiled and analyzed for this Land Health Evaluation, Upland areas meet both Standard 1 and Standard 3. The riparian area within the allotment is not achieving Standard 2 (Table 10). Rational for these conclusions are explained in detail at each respective key area and monitoring area in subsequent sub-chapters of this chapter.

Table 9. Summary of land health objectives at locations monitored for the Big Bug Creek Allotment.

	Standard 1	Standard 2	Standard 3
KA-1	Achieved	N/A	Achieved
KA-2	Achieved	N/A	Achieved
BB-MIM	N/A	Not Achieved	Achieved
PFC 6011-45B	N/A	Not Achieved	Not Achieved

Utilization data is used to determine if livestock are a potential causal factor for non-achievement of Standards. Based on Holechek (1988), livestock utilization levels in this precipitation zone should be between 30-40% for moderate use without producing deleterious effects to the ecological site. Based on the Southwestern Mule Deer Habitat Guidelines (Heffelfinger2006), browse utilization in this precipitation zone should be limited to 35% to prevent deleterious effects to deer habitat.

Grass composition results are based on the sum composition percent for all grass species occurring on the study area. Palatable shrub composition results are based on the sum composition percent for all palatable browse species as listed, by animal species, in Appendix A, Section 3, “Big Bug Creek Plant List.” Vegetative foliar cover and bare ground cover class results are based on point cover data.

7.1 Key Area and Monitoring Conclusions for Standard 1 and Standard 3

Key Area 1
Standard 1: Achieved
Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform (ecological site).

Rationale:
Standard 1 objectives were met at key area 1 because it was determined that upland soils exhibited infiltration, permeability, and erosion rates that area appropriate to the soil type, climate and landform as described in the volcanic upland 12-16" p.z. (R038XA115AZ). Rangeland health assessments conducted in 2010 determined a "none to slight" departure from the site capability. A "slight to moderate" departure in site stability and hydrologic function and a "moderate" departure from site potential was concluded in 2014 (Table 13 in Appendix A). Adequate vegetative canopy cover, and soil-related indicators such as flow patterns, bare ground, soil and litter movement, and soil compactions, that are appropriate for KA-1 and the larger area it represents. However, even given the slight to moderate and moderate rating, the site was stable, functioning and biologically intact.

Standard 3: Achieved

1. *Maintain vegetation canopy cover at ≥ 25%* **Achieved**
2. *Maintain palatable shrub species composition at ≥ 30%.* **Not Achieved**
3. *Maintain perennial grass composition ≥ 20% with ≥ 5% comprising of tobosa* **Achieved**
4. *Maintain bare ground ≥ 25%* **Achieved**

Rationale:
Canopy cover at KA-1 is 28% (Figure 1) which is 1% less than what is expected in the relevant ESD. However, it is expected that canopy cover is near the lower end of the expected ESD range due to precipitation levels in the area being at or below average. Bare ground was found to be 3% which is below the ESD but not outside of what is expected given the high percentage of litter and gravel at the site.

Palatable shrub species composition was found to be 14% which is below the expected site potential. Key perennial grass species composition was 34% which is above the DPC objective. Tobosa was also found to occur in adequate numbers to persistence in KA-1. The site appears to be in the mixed shrub grasslands state which is appropriate for the site potential of volcanic upland 12-16" p.z..

Key Area 2
Standard 1: Achieved
Objective: Upland soils exhibit infiltration, permeability, and erosion rates that are appropriate to soil type, climate and landform (ecological site).

Standard 1 objectives were met at key area 2 because it was determined that upland soils exhibited infiltration, permeability, and erosion rates that area appropriate to the soil type, climate and landform. Rangeland health assessments conducted in 2010 determined a "none to slight" departure from the site capability. The latest rangeland health assessment (Table 13 in Appendix A) determined a "none to slight" for site stability and hydrologic function along with a "slight to moderate" deviation

for biotic integrity given the site potential for the loamy upland 10-13" p.z. ecological site description when cross referenced with the rangeland sight guidelines for the loamy upland 12-16" p.z. (038XA109AZ) (1982). Adequate vegetative cover, soil armament, and biotic community was present to maintain the site. Key area 2 was found to be stable, functioning and biologically intact. The site appears to fall within the shrub dominated historic natural plant community as expected given the northern aspect.

Standard 3: Achieved
*Objectives***:**

1. *Maintain vegetation canopy cover at 30%* **Not Achieved**
2. *Maintain composition of palatable shrubs at >15%* **Achieved**
3. *Maintain perennial grass composition at >15% with a tobosa composition at > 5%* **Achieved**
4. *Maintain bare ground below 25%* **Achieved**

Rationale:
Cover data collected at Key Area 2 (Figure 2) fall within expected ranges for most of the respective cover classes except for vegetation canopy. The vegetation canopy cover at key area 2 was 21% which is below expected. Bare ground cover is below what is expected in the loamy upland 10-13" p.z. ESD but is likely under represented due to slightly high gravel/stone and litter cover percentages.

Palatable browse species accounted for 35% of the plant community. Perennial grass composition was found to be 45% which was dominated by purple three-awn. Tobosa was present but lower than the DPC objective (Table 12 in Appendix A).

Utilization study conducted in 2014 concluded that use on purple three-awn grass was 8% and 2.5% for side oats grama. The use of shrubby buckwheat and range ratany were 15.5% and 2.5% respectively. The low levels of utilization of both perennial grasses and highly preferred browse species indicate that current livestock use is very light which is not likely reducing the ability for perennial grasses or palatable shrubs to reproduce.

7.2 Riparian Area Monitoring Conclusions for Standard 2

Riparian – Wetland Sites
Standard 2: Not Achieved
Objective - Riparian-wetland areas are in proper functioning condition.

Rationale:
Proper functioning condition assessments of the Big Bug Creek (6011-45B) and adjoining PFC segment (6011-45C), which is in the allotment upstream of Big Bug Creek allotment, determined a nonfunctional rating for Big Bug Creek. The critical components for maintaining proper functioning condition of riparian areas: hydrology, vegetation and erosion/deposition, are lacking within the Big Bug Creek allotment. The PFC segment upstream of the Big Bug Creek Allotment (6011-45C) was wetter than the segment found within the Big Bug Creek Allotment; thus, it supported more riparian obligate vegetation.

Most apparent is the lack of surface water to support ecological processes needed to maintain riparian vigor. Dewatering of the system, likely due to ground water pumping and drought, will continue to limit surface flows of water in Big Bug Creek. Riparian resources within Big Bug Creek will continue to be impaired due to regional decreases in surface water. The root cause of the nonfunctional rating, dewatering of Big Bug Creek, is out of the management control of the Bureau of Land Management due to the scale and lack of management decision space.

Riparian Wetland Sites

Standard 3: Not Achieved

1. Maintain woody species age class of >15% seedlings, > 15% mid-size (young), > 15% large size (mature). **Achieved**

2. Riparian obligate or facultative riparian woody species consist of >50% of the composition. Hydrophilic woody plants 57% composition **Achieved**

3. Riparian obligate or facultative riparian herbaceous species consist of >50% of the foliar cover. Hydrophilic herbaceous forbs consist of 10%, Hydrophilic Herbaceous 0% **Not Achieved**

Rationale:

The portion of Big Bug Creek within the Big Bug allotment does not meet the MIM monitoring plot location requirements due to a lack of defined greenline. Additionally, the area is within active mining claims and adjacent to a recreation trailhead. The MIM monitoring plot, immediately upstream of Big Bug Creek allotment was established to represent the general conditions of the reach. Woody species age class distribution within the MIM plot was 24% seedling, 22% mid-size (young), and 63% large size class (mature) (Table 5). Riparian obligate and facultative riparian woody species consisted of 57% of the plant composition which were dominated by seep willow. MIM results indicated the area was at the potential natural plant community. However, the herbaceous cover only consisted of 10% of hydrophilic forbs and 20% of Bermuda grass which is a facultative upland species.

Although the MIM plot is at the potential natural plant community; conditions within Big Bug Creek, located within the Big Bug Creek Allotment are generally dryer. Consequently, the area does not support as vigorous riparian plant community. If adequate water in both frequency and duration were present, conditions within the Big Bug Creek Allotment will likely be similar to the MIM plot immediately upstream.

8.0 Technical Recommendations

Big Bug Creek Allotment is achieving Standard 1 and Standard 3 of the Arizona Standards for Rangeland Health in upland sites but is not meeting Standard 2 in riparian areas or Standard 3 in riparian sites. The causal factor for the failure to meet Standard 2 and Standard 3 in the riparian area is outside the management control of the Bureau of Land Management. Riparian vegetative community recruitment is not possible without adequate water in both time and duration to support recruitment. Nonetheless, actions should be implemented to improve resource conditions within the Big Bug Creek Allotment. Specific technical recommendations to improve upland conditions are outlined below.

In order to address the key areas in which the DPC objective were not met, it is recommended that the following actions be implemented unless stipulated through a written agreement or decision in accordance with 43 CFR 4130.3-2 (c) to improve resource conditions:

1. Place salt and nutritional supplements ¼-mile away from livestock waters, Big Bug Creek and of any drainages area to improve livestock distribution and avoid livestock concentration in sensitive wildlife habitat.

2. Require actual grazing use data within 15 days of end of grazing season.

It is also recommended that the following technical recommendations be adapted as non-binding recommendations.

3. 1. Consider impacts of ongoing drought to resource conditions, if persist, implement additional monitoring and/or reduce livestock numbers to ensure maintenance of the biotic community, hydrologic functions and site stability of the ecosystem.

4. 2. Implementing range improvement facilities to allow for a grazing rotation split between north and south of Highway 69 to improve livestock management abilities.

5. Monitor conditions at Big Bug Creek. If water resources in Big Bug Creek are in adequate supply and duration to allow the recruitment of riparian obligate species, implement a winter season use on Big Bug Creek. This action will serve to meet the RMP plant community objectives which consists of stream banks dominated (>50%) by native riparian herbaceous plant species; and, to ensure recruitment and retention of native riparian obligate tree species, the desired age class distribution is >15% seedling, >15% young, and >15% mature trees.

Consultation:

1. Staff Review

Name	**Title**
Casey Addy	Natural Resource Specialist
James Holden	Rangeland Management Specialist
Amanda James	Hassayampa Field Office Assistant Manager/ Agua Fria National Monument Manager
Paul Sitzmann	Wildlife Biologist (LHE project lead)

2. Helen and David Hamernick — Lessee

2. Other agencies/interested parties:
Arizona Game & Fish Department
U.S. Fish and Wildlife Service
Western Watershed Project

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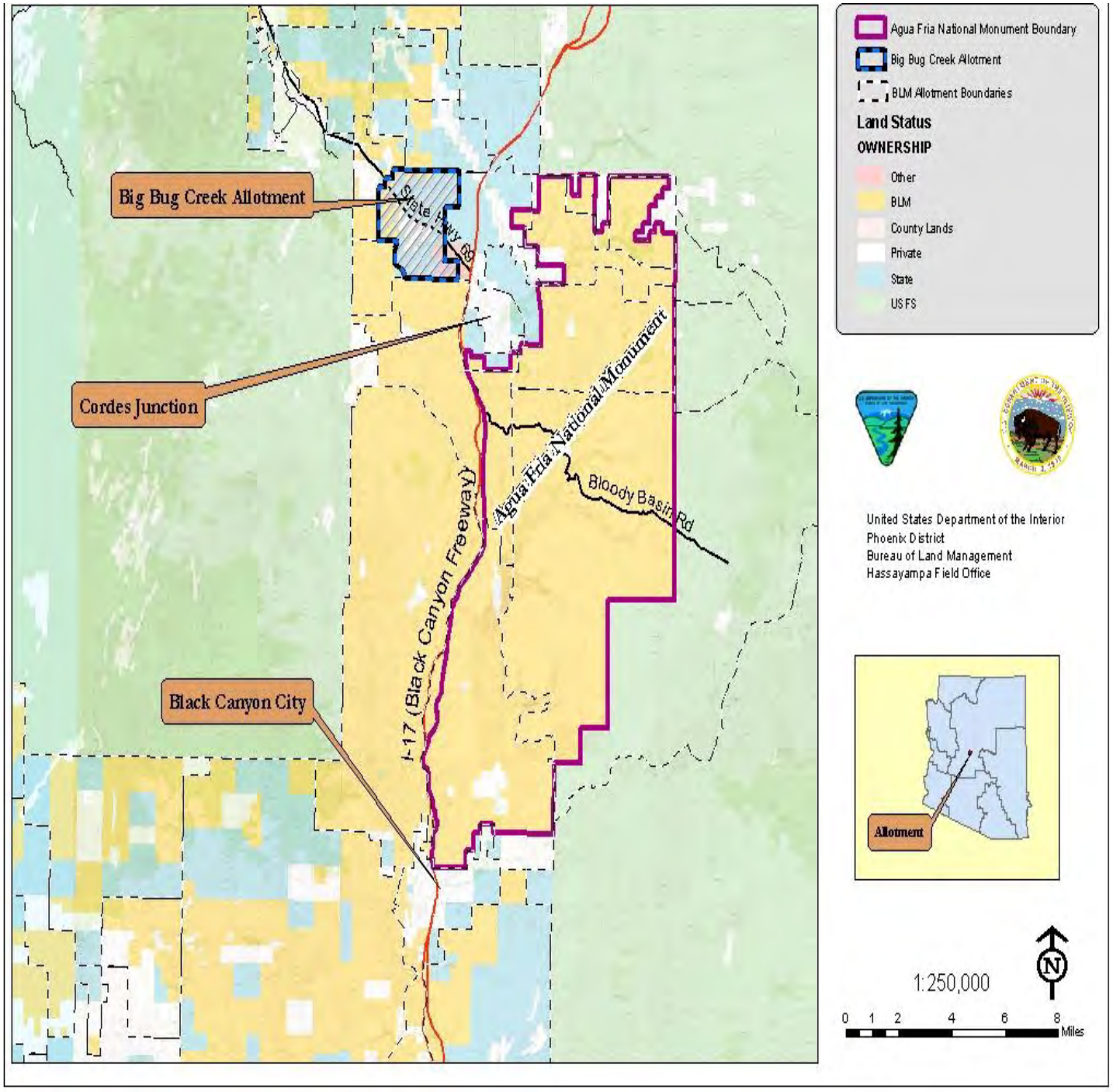
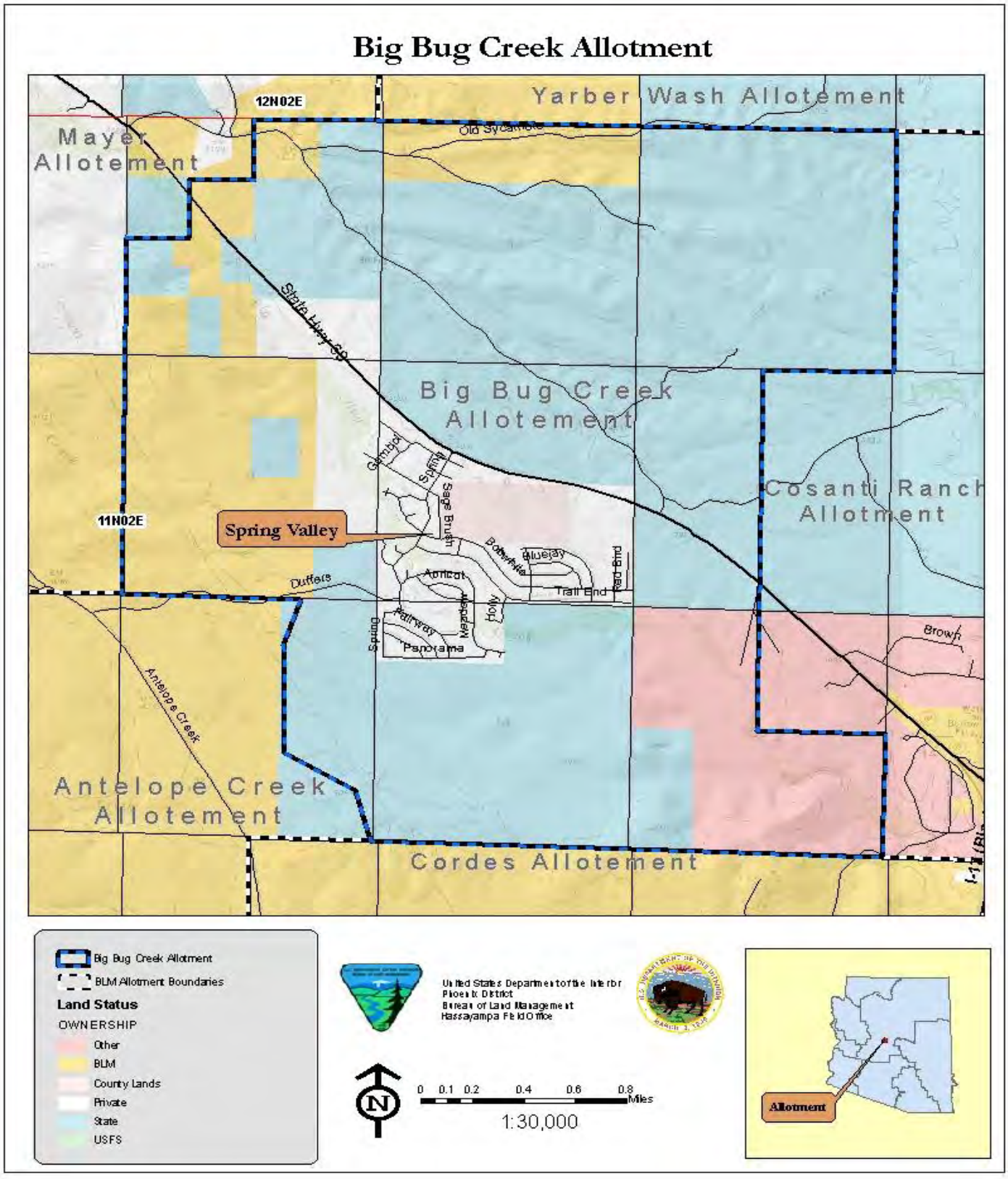
APPENDIX A

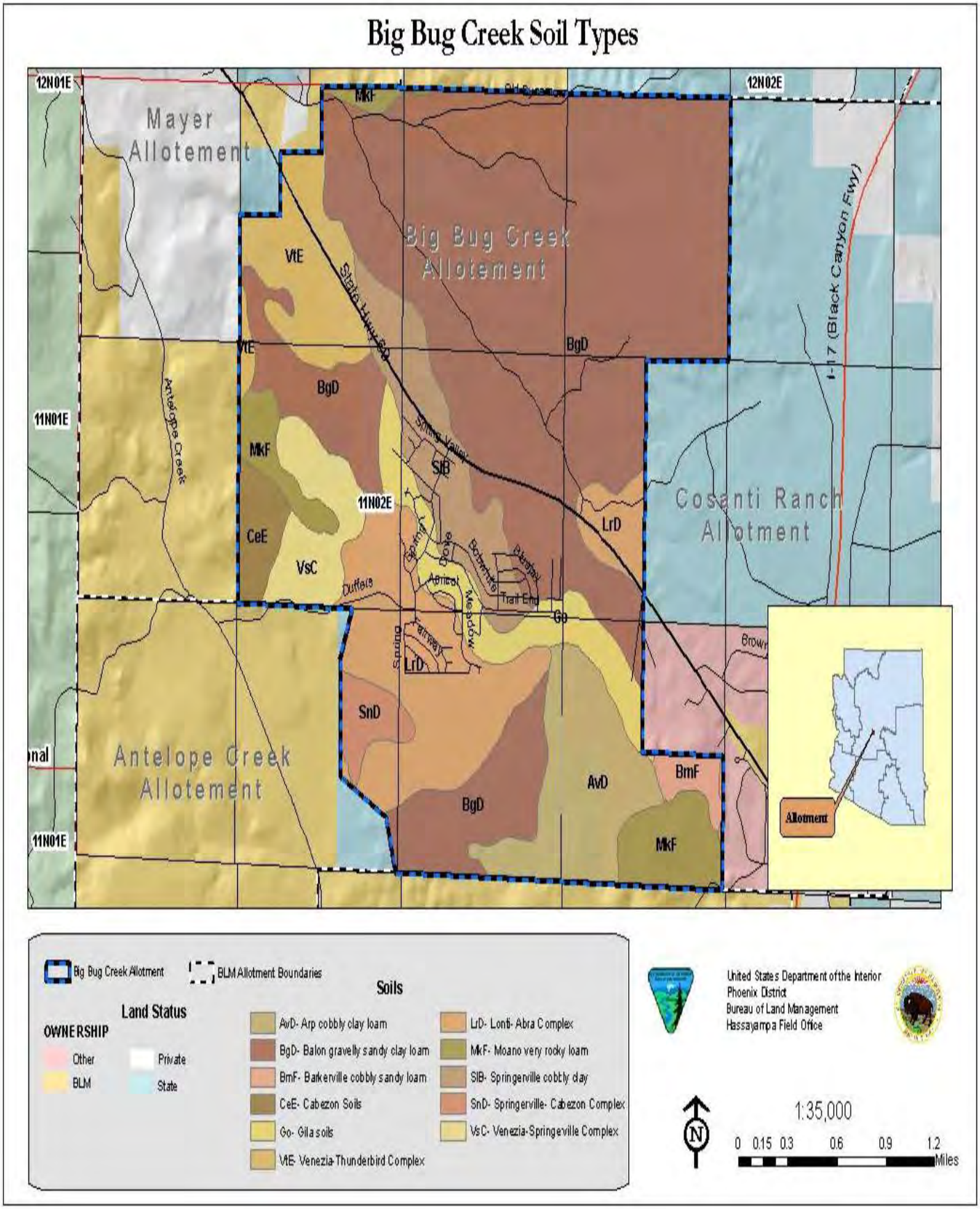
Map 1. Map of the Big Bug Allotment and surrounding area for the 2014 land health evaluation.



Map 2. Close up map of the Big Bug Allotment for the 2014 land health evaluation.



Map 3. Soil Types of the Big Bug Creek Allotment for the 2014 land health evaluation.



Map 4: Locations of Big Bug Creek Allotment key areas, PFC Segments, MIM plot and ecological sites within and next to the Big Bug Creek Allotment used for the 2014 Land Health Evaluation, Yavapai County, AZ USA.

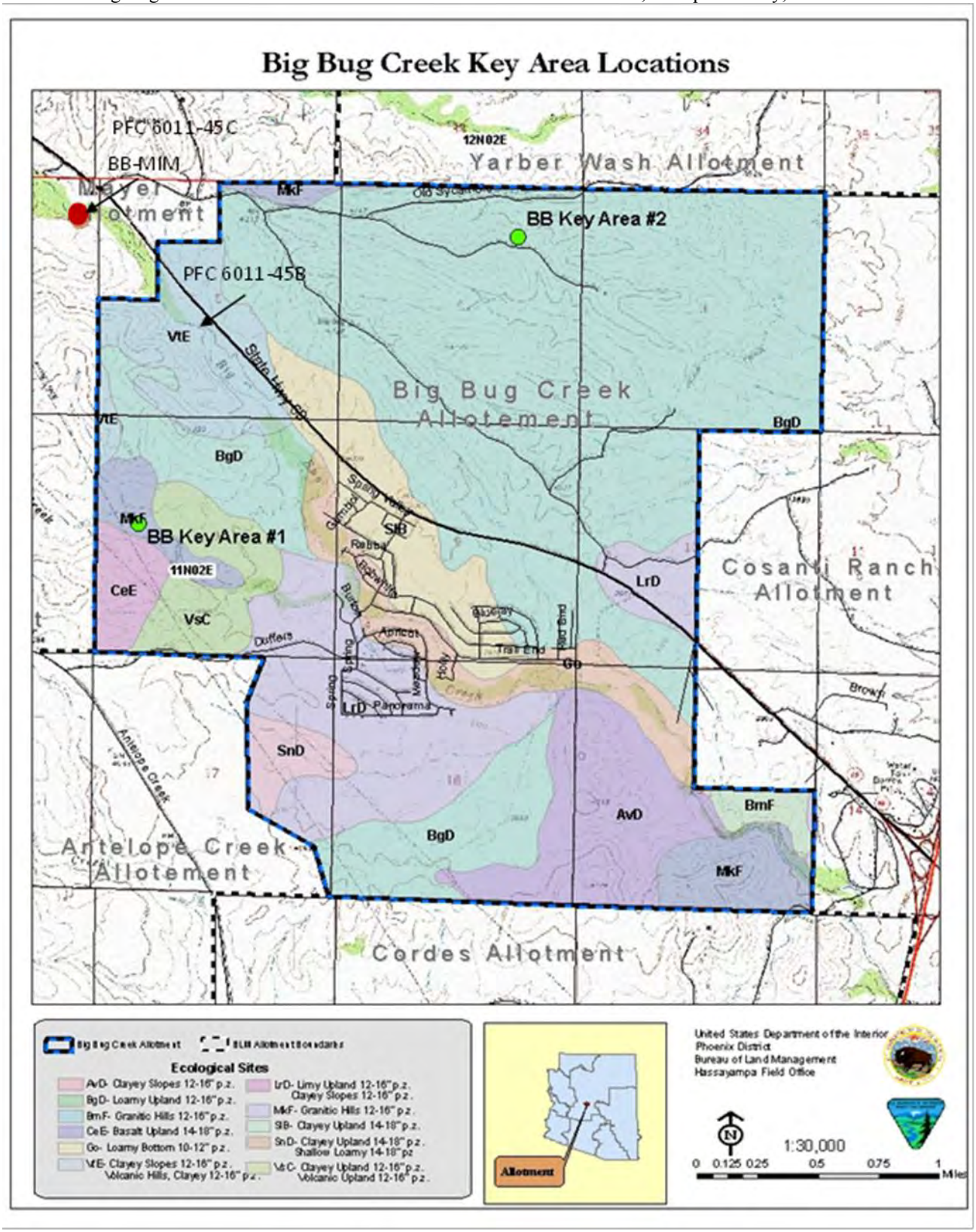


Table 1. The average precipitation by month for the period of 2004-2014 is shown below at the based in Cordes, AZ USA.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
2001	3.1	2.57	1.19	0.64	0.45	0.67	2.07	2.3	0.46	1	0.28	0.56	15.29
2002	0.12	0	0.08	0.28	0	0	1.12	0T	4.58	0.9	0.73	0.3	8.11
2003	0.85	5.67	0.89	0.1	0T	0	0.26	9	0.67	0T	2.4	0.37	13.85
2004	0.11	1.94	0.51	1.93	0	0	2.38	0.53	2.49	2.49	3.42	4.32	20.12
2005	4.59	6.14	1.5	0.7	0	0.18	2.78	2.42	0.07	1.04	0.15	0	19.57
2006	0T	0	1.34	0.2	0.03	0.32	2.26	2	0.86	0.76	0	0.3	8.07
2007	0.79	0.97	1.11	0.1	0T	0	2.65	0.66	0.73	0.12	0.95	3.31	11.39
2008	3	0.84	0T	0	0.8	0T	2.61	1.87	1.3	0	1.7	2.87	14.99
2009	0.46	1.35	0.06	0.84	1.18	0.04	2.34	0.37	0.12	0.01	0.05	2.16	8.98
2010	6.73	2.05	1.88	0.08	0	0T	3.51	2.03	0.05	NR	0.32	2.11	18.76
2011	NR	NR	NR	NR	NR	0	1.36	.59X	.96X	1.09X	.52X	3.43	7.95
2012	0.08	0.22	1.17	0.39	0X	0	5.01	2.4	1.06	0.26	0.12	1.58	12.29
2013	1.49	0.31X	1.59	0T	0T	0X	3.19	3.45X	2.12	0.15	2.88	0.76	15.94
2014	0.05	0	1.24t	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Monthly AVG.	1.64	1.70	0.97	0.44	0.21	0.10	2.35	2.10	1.14	0.61	1.02	1.51	12.95

NR: Data not reported. T: Trace of precipitation. The precipitation data value equals zero. X: Monthly means or totals based on incomplete time series.

Table 2. A table of threatened and endangered species and special status species found within and within 5 miles of the Big Bug Creek Allotment Yavapai County, AZ USA.

Name	Common Name	FWS	BLM	State
Agosia chrysogaster chrysogaster	Gila Longfin Dace	SC	S	
Anaxyrus microscaphus	Arizona Toad	SC		
Aquila chrysaetos	Golden Eagle	BGA	S	
Bat Colony				
Catostomus clarkii	Desert Sucker	SC	S	
Cicindela oregona maricopa	Maricopa Tiger Beatle	SC		
Coccyzus americanus	Yellow-billed Cuckoo	PT		WSC
Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC	S	
Gopherus morafkai	Sonoran Desert Tortoise	C*		WSC
Poeciliopsis occidentalis occidentalis	Gila Topminnow	LE		WSC
Rana yavapaiensis	Lowland Leopard Frog	SC	S	WSC
Rhinichthys osculus	Speckled Dace	SC	S	
Thamnophis eques megalops	Northern Mexican Gartersnake	PT		WSC

SC: Species of Concern. BGA: Bald and Golden Protection Act. PT: Proposed Threatened. C: Candidate. LE: Listed Endangered. S: Sensitive. WSC: Wildlife Species of Concern

Figure 1 Cover data at KA-1, Volcanic Upland 12-16 p.z., collected in 2010 at the Big Bug Creek Allotment, Yavapai County, AZ USA.

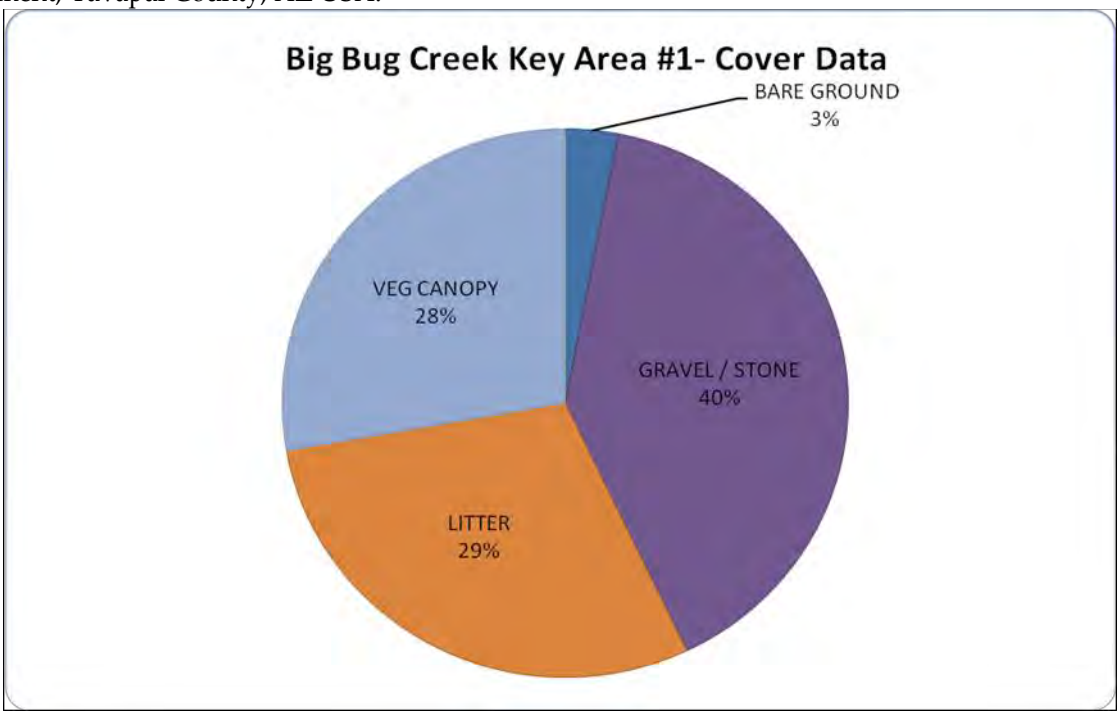


Table 3. Frequency Data in KA-1 Volcanic Upland 12-16" p.z., collected in 2010 at the Big Bug Creek Allotment, Yavapai County, AZ USA.

Species	Symbol	Frequency	% Composition
Wait-a-Bit/Catclaw Mimosa	ACGR	26%	24%
Tobosa	PLMU	15%	24%
Catclaw Acacia	MIBI	9%	6%
Purple 3-Awn	ARPU	8%	7%
*Shrubby Buckwheat	ERWR	7%	5%
Broom Snakeweed	GUSA	7%	3%
*Range Ratany	KRER	5%	5%
Spidergrass	ARTE	3%	2%
*Wirelettuce	STPA	2%	1%
Ephorbia spp.	EUPHO	2%	2%
*Globe Mallow	SPAM	1%	1%
Fluffgrass	DAPU	1%	1%
*Ayenia spp.	AYENI	1%	1%
*Ditaxis spp.	DITAX	1%	1%
Species Richness		**14 species**	

* Palatable Shrub Species

Figure 2. Cover Data at KA-2, Loamy Upland 12-16 p.z., collected in 2010 at the Big Bug Creek Allotment, Yavapai County, AZ USA.

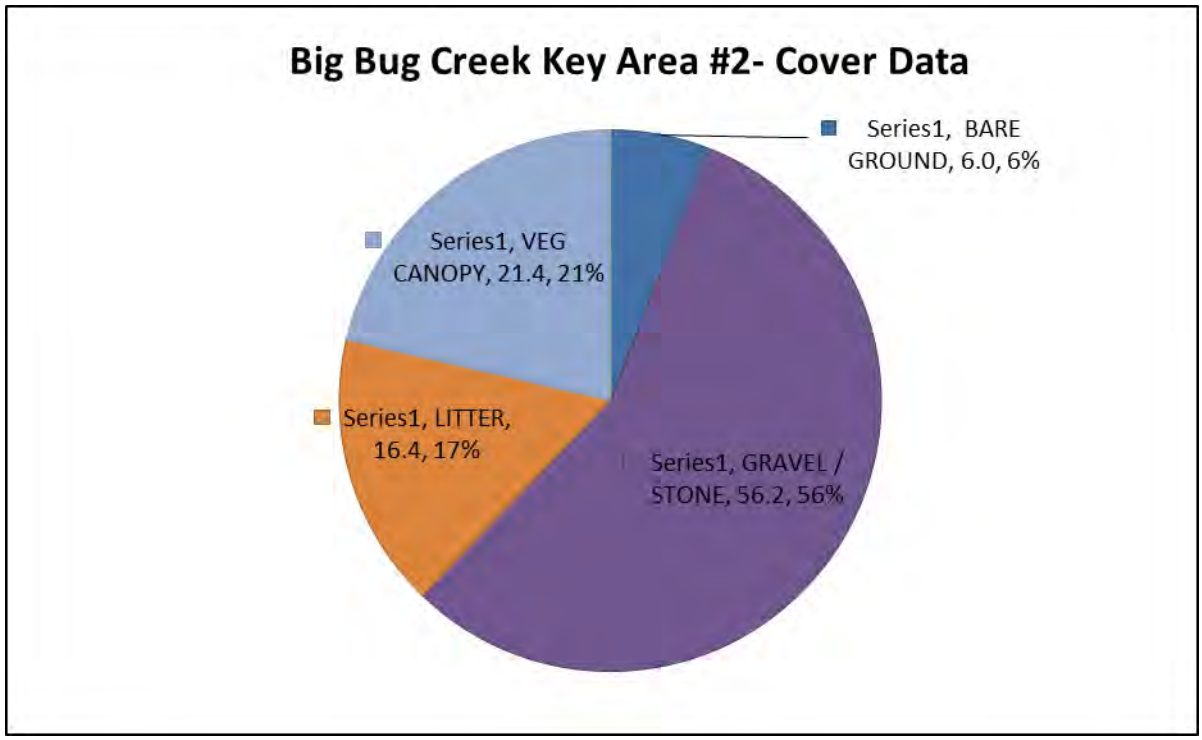


Table 4. Frequency Data at KA-2, Loamy Upland 12-16 p.z., collected at the Big Bug Creek Allotment in 2010, Yavapai County, AZ USA.

Species	Symbol	Frequency	% Composition
Purple 3-Awn	ARPU	30%	30%
*Desert Ceanothus	CEGR	18%	9%
Broom Snakeweed	GUSA	17%	7%
*Range Ratany	KRER	17%	11%
*Rough Menodora	MESC	17%	8%
*Shrubby Buckwheat	ERWR	10%	7%
Wait-a-Bit Mimosa	MIBI	9%	5%
Sideoats Grama	BOCU	6%	3%
Catclaw Acacia	ACGR	3%	2%
Black Grama	BOER	3%	1%
Curly Mesquite	HIBE	2%	1%
Tobosa	PLMU	1%	Trace
Bottlebrush Squirreltail	ELEL	1%	Trace
*Wirelettuce	STPA	1%	Trace
Fluffgrass	DAPU	1%	Trace
Spidergrass	ARTE	1%	Trace
Species Richness		**16 species**	

*** Palatable Shrub Species.**

Table 5. Key area Range Land Health Assessment monitoring results in 2010 and 2014 for the Big Bug Creek Allotment, Yavapai County, AZ USA.

Key Area	Rangeland Health Attribute	2010 Attribute Rating-Departure From Site Capability	2014 Attribute Rating-Departure From Site Capability
KA 1-Volcanic Upland 12-16″	Soil / Site Stability	None to slight	Slight to moderate
	Hydrologic Function	None to slight	Slight to moderate
	Biotic Integrity	None to slight	Moderate
KA 2-Loamy Upland 12-16″ pz	Soil / Site Stability	None to slight	None to Slight
	Hydrologic Function	None to slight	None to Slight
	Biotic Integrity	None to slight	Slight to Moderate

Figure 3. Bank Stability at Multiple Indicators Monitoring Plot in Big Bug Creek Yavapai County, AZ USA.

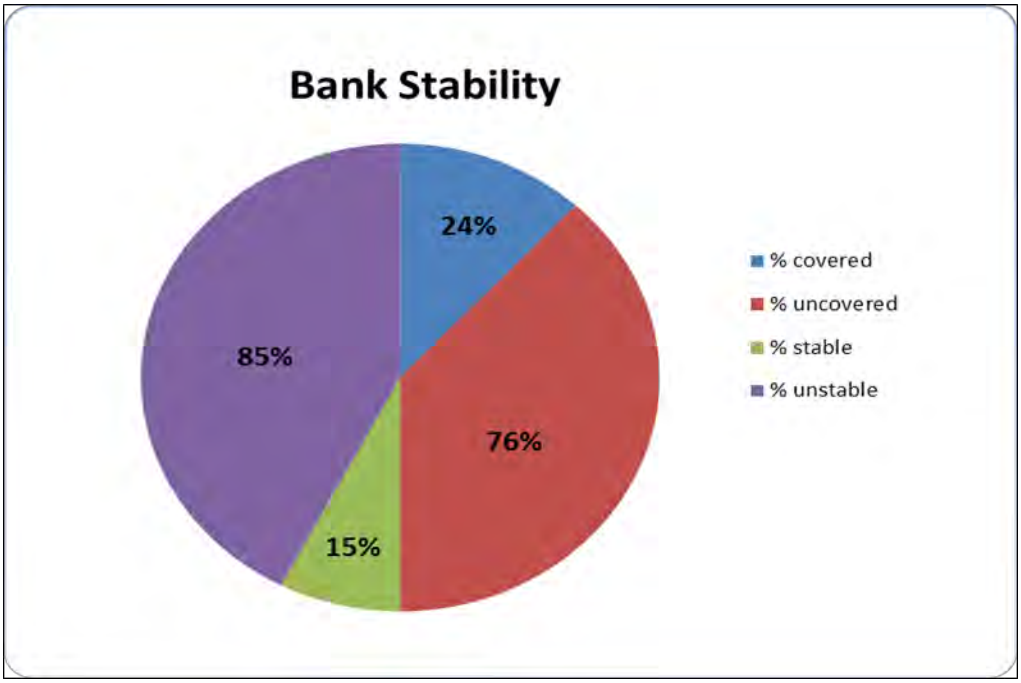


Figure 4. Woody Species Age Class of the Big Bug Creek MIM plot collected in 2010 Yavapai County, AZ USA.

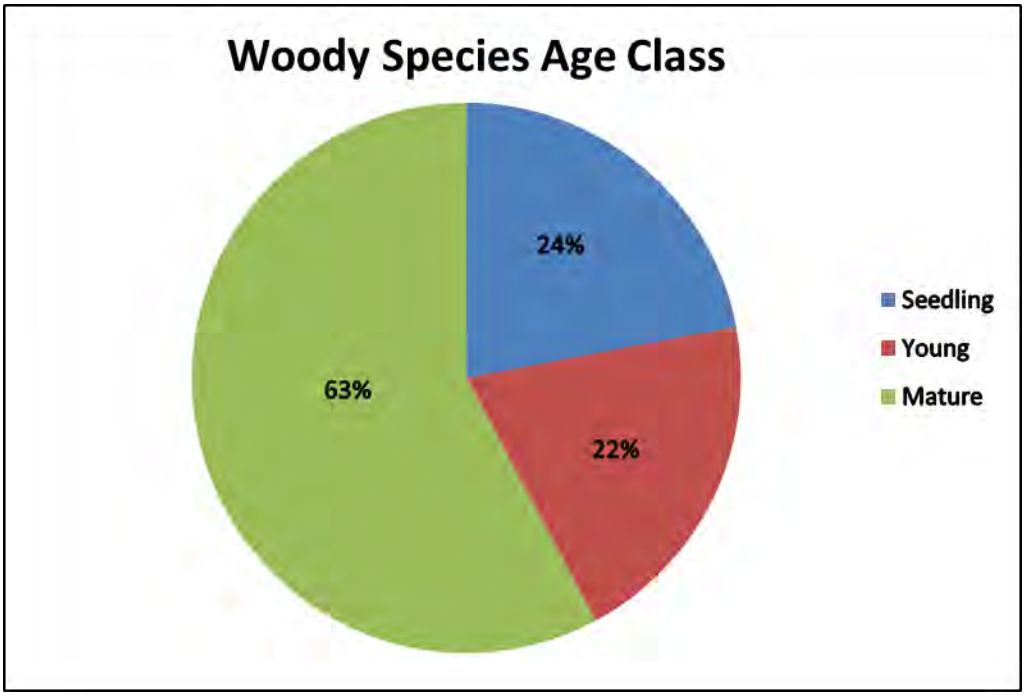


Figure 5. Plant composition of the greenline collected in Big Bug Creek in 2010 Yavapai County, AZ USA.

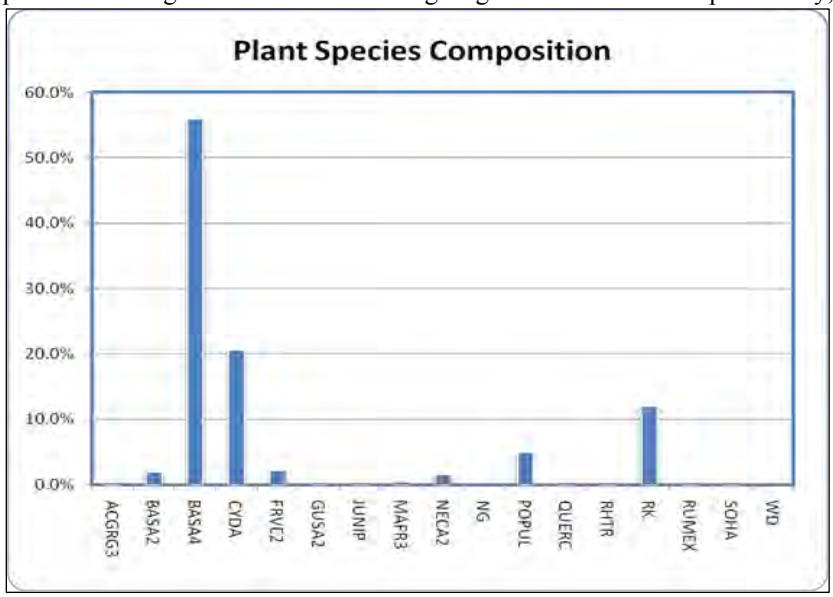


Table 6. Greenline species composition at multiple indicator monitoring area BB-MIM in Big Bug Creek Yavapai County, AZ USA in 2010.

Species	Symbol	Composition (%)
Seep Willow	BASA4	56%
Bermudagrass	CYDA	21%
Velvet Ash	FRVE2	2%
Cottonwood spp.	POPUL	5%
Catnip	NECA2	2%
Desert Broom	BASA2	2%
Freemont's Barberry	MAFR3	T
Catclaw Acacia	ACGRG3	T
Broom Snakeweed	GUSA2	T
Juniper spp.	JUNIP	T
Oak Spp.	QUERC	T
Skunk Sumac	RHTR	T
Doc Spp.	RUMEX	T
Johnson grass	SOHA	T
Wood (anchored)	WD	T
Rock (embedded >=15 cm)	RK	12%
'No Greenline'	NG	T
	Total Composition	**100%**