United States Department of the Interior
Bureau of Land Management
Safford Field Office
Safford, AZ

FINAL

Environmental Assessment

DOI-BLM-AZ-G010-2015-0029-EA

Twin C Allotment (No. 40210) Grazing Permit Renewal and Goat Camp Well

July 2016

Editor’s Note

An Errata Sheet to the Draft Environmental Assessment and Land Health Evaluation published January 25, 2106 is available in Appendix H of this Final Environmental Assessment #DOI-BLM-AZ-G010-2015-0029-EA.

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List of Acronyms

AAC	Arizona Administrative Code
ABBA	Arizona Breeding Bird Atlas
ACEC	Area of Critical Environmental Concern
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Departments
ARS	Arizona Revised Statute
AUM	Animal Unit Month
BLM	Bureau of Land Management
BMP	Best Management Practice
BO	Biological Opinion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CYL	cattle year long
dBA	decibel, A-weighted
DPS	distinct population segment
EA	environmental assessment
EIS	environmental impact statement
FLPMA	Federal Land Policy and Management Act of 1976
gpm	gallons per minute
HMDS	Heritage Data Management System
HUC	hydrologic unit code
Hz	hertz
IPaC	Information for Planning and Conservation system
kV	kilovolt
LHE	Land Health Evaluation
MOU	Memorandum of Understanding
NDAA	National Defense Authorization Act of 2015
NEPA	National Environmental Policy Act of 1969
NRCS	National Resources Conservation Service
p.z.	precipitation zone
P.L.	Public Law
PCE	primary constituent element
RMP	Resource Management Plan
RNCA	Riparian National Conservation Area
ROD	Record of Decision
TC	Twin C [map key area identifier]
UG ES	Upper Gila-San Simon Environmental Statement
USC	United States Code
USFWS	United States Fish and Wildlife Service
VRM	Visual Resource Management

Identifying Information

Title: Twin C Allotment (No. 40210) Grazing Permit Renewal and Goat Camp Well

EA Number: DOI-BLM-AZ-G010-2015-0029-EA

Type of Project: Range Management

Name and Location of Preparing Office:
Bureau of Land Management (BLM) Safford Field Office
Safford, Arizona

General Location: Approximately 15 miles east of Safford, Arizona, and 12 miles southwest of Clifton, Arizona, within both Graham and Greenlee counties. Within sections of Township 6 South, Range 28 East, Township 6 South, Range 29 East, and Township 7 South, Range 29 East of the Gila and Salt River Base Meridian.

Applicant: Manuel and Caroline Manuz

Chapter 1 – Purpose and Need

1.1 Introduction

This environmental assessment (EA) has been prepared pursuant to the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.), Council of Environmental Quality (CEQ) NEPA regulations (40 CFR 1500-1508), Department of Interior NEPA implementing regulations (43 CFR Part 46), and BLM NEPA Handbook H-1790-1.

This EA analyzes and discloses the potential environmental effects of two proposed actions relating to the Twin C Allotment:

- Renewal of the Twin C Allotment (No. 40210) grazing permit, and
- Drilling and operating a new well on the allotment's Goat Camp Pasture, hereafter referred to as "Goat Camp Well."

This EA analyzes in detail the following:

- Proposed Action: Authorize Grazing Permit Renewal & Goat Camp Well Development
- Alternative 1: No Action
- Alternative 2: Authorize Grazing Permit Renewal Only
- Alternative 3: No Grazing

1.2 Background

Grazing Permit Renewal

On March 1, 2015, the Twin C Allotment grazing permit was issued pursuant to Section 402 of the Federal Land Policy and Management Act (FLPMA) of 1976 (43 U.S.C. 1752), as amended by Section 3023 of Public Law (P.L.) 113-291, National Defense Authorization Act (NDAA) of 2015, which provides for the following:

"The terms and conditions in a grazing permit or lease that has expired, or was terminated due to a grazing transfer, shall be continued under a new permit or lease until the date on which the Secretary concerned completes any environmental analysis and documentation for the permit or lease required under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) and other applicable laws."

Per procedural requirements for grazing permit renewal (43 CFR 4100.0-8) the BLM Safford Field Office completed an evaluation to determine whether the Twin C Allotment is meeting the standards for rangeland health as described in the Arizona Standards for Rangeland Health and Guidelines for Grazing Management (BLM, 1997a) ("Arizona Standards and Guidelines"). The Land Health Evaluation (LHE) Report for the Twin C Allotment was initially completed in July 2015, and has since been updated to include additional indicators of rangeland health conducted

in March 2016.

This LHE Report concludes that Arizona land health Standards 1 and 3 (Standard 2 is not applicable) on the Twin C Allotment are being achieved, including achievement of desired plant community (DPC) objectives and desired resource conditions.

Analyses within the Twin C Allotment LHE Report have been incorporated by reference for purposes of this EA, and may be referred to in Appendix A.

Goat Camp Well

Drilling of the proposed Goat Camp Well was initiated in 2011 but was not completed due to various administrative appeals. As a result, the partially constructed well, drilled to the depth of 150 feet, was capped with a collared pipe and welded plate pending completion of NEPA compliance. This EA (#DOI-BLM-AZ-G010-2015-0029-EA) replaces all previous EAs and assesses the proposed construction the Goat Camp Well and the proposed renewal of the Twin C Allotment grazing permit.

1.3 Purpose and Need and Decision to be Made

Grazing Permit Renewal

The purpose of this proposed action is to fully process the term grazing permit renewal (Authorization # 2701077) on the Twin C Allotment in accordance with all applicable laws, regulations, and policies and in accordance with 43 CFR 4130.2(a) of BLM Grazing Regulations which states, "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 need for the proposed action is to renew the Twin C Allotment grazing permit with terms and conditions for grazing use that would meet, or make significant progress towards meeting, the Arizona Standards and Guidelines for Rangeland Health, management objectives within the Safford District Resource Management Plan (RMP) (BLM 1991), and other pertinent multiple use objectives for the allotment.

The decision to be made is to determine whether to renew the grazing permit, and if so, the terms and conditions necessary for permit issuance to comply with the BLM's statutory obligations as outlined in 43 CFR 4130 Authorizing Grazing Use, 43 CFR 4180 Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration, and FLPMA's multiple-use mandate.

Goat Camp Well

The purpose of this proposed action is to provide an upland perennial source of water to supplement the existing upland water infrastructure of the Twin C Allotment, providing adequate water facilities for existing authorized grazing management activities.

The need for the proposed action is that the other upland sources of existing water on the

allotment – Headquarters Well [Arizona Department of Water Resources (ADWR) Well Registration No. 55-631495] and Lower Berregero Well (ADWR Well Registration No. 55-631496) – do not produce a sufficient supply of perennial water to provide for the whole system The need for the development of upland water sources was identified the Gila Box Riparian National Conservaton Area (RNCA) Management Plan.

The decision to be made is whether to authorize the development of the proposed Goat Camp Well to provide an additional perennial upland water source for the Twin C Allotment to supplement the existing water system.

1.4 Area Location and Setting

The Twin C Allotment encompasses 10,934 acres of BLM-managed land, excluding approximately 350 acres of the overlapping Gila Box Riparian National Conservation Area (RNCA) that is closed to livestock grazing. The allotment is divided into five pastures: River, Cinder Pit, Goat Camp, Lower Berregero, and Upper Berregero (Figure 1). Allotment case file records, augmented by direct field observations and project inspections conducted September 30 and October 14, 2015, document existing range improvements on the Twin C Allotment as follows (Figure 2):

- An approximate 19-mile pipeline system for livestock watering
- Three wells
    - River Well
    - Headquarters Well
    - Lower Berregero Well
- 11 storage tanks (pumped/perennial water storage)
- 12 troughs
- 16 dirt tanks (ephemeral water storage)
- Seven corrals
- One cattleguard
- Allotment boundary and pasture fences

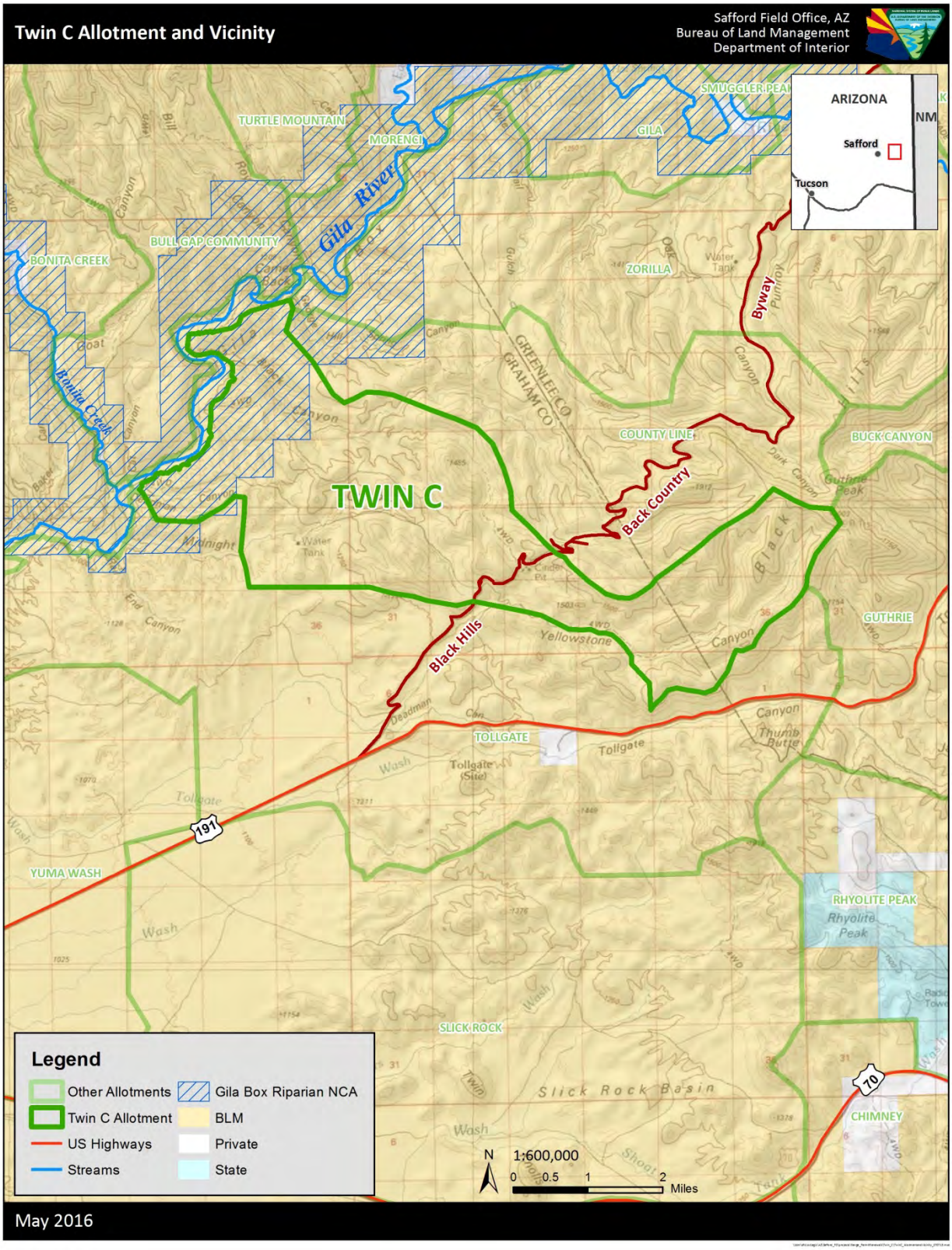


Figure 1. Twin C Allotment and Vicinity

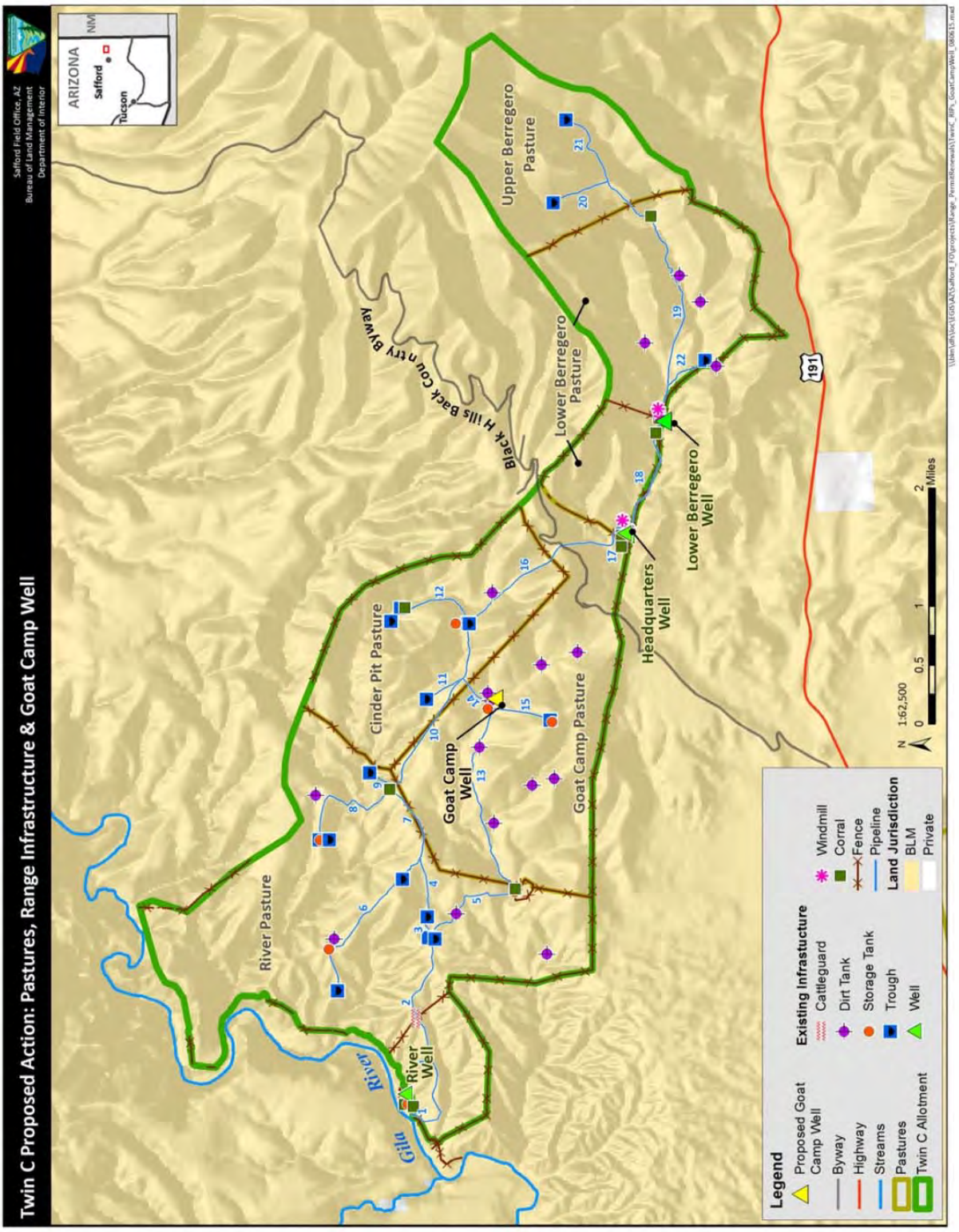


Figure 2. Twin C Allotment Pastures and Range Improvements

Existing Wells

A summary of the existing well features are provided in Table 1 below. Well registration number, date constructed, and well log capacity for each well are documented in the ADWR well registries (refer to Appendix B). Actual capacity, or current discharge rate, in gallons per minute (gpm) was measured at the source for Headquarters and Lower Berregero wells. River Well, a shallow well (40 feet) adjacent to the Gila River, is the sole perennial source of water for the allotment's three western pastures (River, Cinder Pit, and Goat Camp). This well is connected directly to the pipeline system and, thus, does not provide a readily accessible way to ascertain capacity at the source. Therefore, an alternate location was required and was measured at Goat Camp Tank due to its upland location in the vicinity of the proposed Goat Camp Well. The methodology used involved recording the average time required to fill a receptacle (refer to Appendix C).

Table 1. Twin C Allotment Well Inventory Data

Well Name, Source & Registry No.[1]	Date Constructed	Well Log Capacity (gpm)[2]	Actual Capacity (gpm)[3]	Power	Pastures Supplied
• River • Groundwater • 55-631497	1953	15	At Source=Unknown[4] Output at Goat Camp Tank = 3.7	Diesel pump	River Cinder Pit Goat Camp
• Headquarters • Groundwater • 55-631495	1945	4	1.7	Windmill, Gas generator	Lower Berregero Upper Berregero
• Lower Berregero • Groundwater • 55-631496	1961	4	2.7	Solar pump	Lower Berregero Upper Berregero

[1] ADWR well registry number.
[2] Well log capacity is the recorded pump test capacity at time of construction. Wells located within the Twin C Allotment fall outside of an ADWR Active Management Area and are not required to maintain a well's initial capacity.
[3] Verified by BLM Range Management Specialists on 9/30/2015 field visit.
[4] Permittee estimate is 15-20 gpm.

The alluvial groundwater supplied to River Well is a base water for purposes of supporting authorized livestock. The well is operated by the permittee through a cooperative agreement with the BLM. River Well is located within the riparian area of the Gila Box RNCA at the far western end of Twin C Allotment. Access to the well for operations is indirect and affected by terrain and fencing. Pumping at River Well is operated on an intermittent basis based upon need. Turning the diesel pump on and off is performed manually by the allotment permittee who runs the pump

unattended generally for a 24-hour minimum for a period of one to several days, depending on environmental factors such season of use and periods of rainfall. When in use, the River Well pump operates at a noise level of 60.5-90.5 decibels, with ambient noise levels in the area ranging from 50.1-73.7 decibels. The total amount of water produced for livestock consumption by the River Well is estimated at 908,800 gallons per year, or approximately 0.003853 cubic feet per second (cfs).

Headquarters and Lower Berregero wells operate on an intermittent basis as they rely on wind and solar energy sources, respectively. Headquarters Well operations may be supplemented by an existing gas generator.

When livestock are not in a pasture, the water supply to that pasture is turned off at the trough or storage tank so that there is less pumping in the overall system.

Pipeline System

Water pumped from the River Well travels an appreciable distance through an interconnected pipeline system (Figure 2, segments #1-15) for delivery to upland tanks and troughs located on the allotment's River, Cinder Pit, and Goat Camp pastures (i.e., "western pastures"). This serves a single herd of approximately 113 livestock (cattle) on the Twin C Allotment.

The Headquarters and Lower Berregero wells supply water to a second herd of approximately 47 livestock (39 cattle, 8 horses) on the Twin C Allotment's Lower and Upper Berregero pastures (i.e., "eastern pastures"). Lower Berregero Well supplies water to the most eastern portions of the allotment (Figure 2, segments #19-22). The allotment's western and eastern pastures are connected via a portion of the pipeline (Figure 2, segments #16-18). These segments were implemented as a redundancy feature in the event that should any of the Twin C Allotment wells fail, water could be diverted between the western and eastern pastures as a stopgap measure. To date, it has been reported by the permittee that these interconnecting pipeline segments (#16-18) have not been used.

1.5 Conformance with Land Use Plan(s)

The Proposed Action is in conformance with the Safford District Resource Management Plan (RMP) and Environmental Impact Statement (EIS) as approved by the BLM Safford Field Office in the Partial Records of Decision (ROD) dated September 1992 and July 1994. In addition, The Safford District RMP incorporates by reference previous grazing decisions implemented by the Upper Gila-San Simon Grazing Environmental Statement (UG ES) (BLM 1978) and the Eastern Arizona Grazing Environmental Impact Statement (EA EIS) (BLM 1986).

The Proposed Action complies with the following management objectives set forth by the Safford District RMP and incorporated land use plans:

> Cultural Resources (CL19) Cultural resources stipulations will be included on all grazing leases and permits. UG ES pp. 4-2.
>
> Grazing Management (GM12) The general objective of the proposed action is to permit

livestock to use the harvestable surplus of palatable vegetation–a renewable resource–and thereby produce a usable food product. The proposed livestock management program is based on the multiple-use management concept, which provides for the demands of various resource uses and minimizes the conflicts among those uses or activities. Although the various uses of the rangeland resources can be compatible, competition among uses requires constraints and mitigating measures to realize multiple-use resource management goals. The specific objectives for each grazing unit are shown in

Appendix C [of the UG ES.] UG ES pp. 1-6.

GM17 Deviation from the management system could be allowed for circumstances beyond the licensee's control, such as severe drought, but such deviations would require the District Manager's prior authorization. UG ES pp. 1-8.

GM32 Proper stocking is an essential principle of range management, which should precede or coincide with the initiation of any grazing management system. With stocking rates in balance with the proposed grazing capacities, utilization of key forage species in the key areas would average about 40 percent over a period of years. At a given stocking rate during years of high forage production (e.g. above normal rainfall) utilization in the use pasture might be as low as 20 percent. During years of low forage production utilization could be as high as 60 percent. UG ES pp. 1-9.

GM53 Construction of range improvements would be necessary to implement and operate the various types of grazing management included in the proposal. Construction of adequate water facilities, for example, would be necessary in areas designated for livestock grazing. UG ES pp. 1-25.

GM63 Well specifications are presented on pages 1-34 to 1-35 of the [Upper Gila-San Simon] Final EIS and are summarized as follows: 1) Wells would be constructed by drilling a hole 4 to 8 inches in diameter with depths of 100 to 800 feet. Each well would be cased with steel pipe and sealed with concrete to prevent cave-ins and contamination, 2) BLM will work with ranchers to keep electric pumps or windmills operating to provide water for wildlife while cattle are not in the pasture, 3) An anticipated 1/4 acre of disturbance would occur for each well. UG ES pp. 1-34.

Vegetation Management (VM03) Ecological site inventories will be combined with the desired plant community concept to develop management objectives for activity plans as they are written or revised. RMP p. 45.

VM04 Public lands will be managed to preserve and enhance the occurrences of special status species and to achieve the eventual delisting of threatened and endangered species. RMP p. 45.

Wildlife/Fisheries (WF02) District management will focus on priority species and their associated habitats to maintain or enhance population levels. Threatened and endangered, proposed, candidate, State-listed and other special status species will be managed to enhance or maintain district population levels or in accordance with established inter/intra-agency management plans. District management efforts will be directed towards the enhancement of biological diversity. RMP ROD Part I p. 6.

WF14 Manage habitat for optimum wildlife populations, based on ecological conditions, taking into consideration local, yearly climatic variations. BLM will follow

Arizona Game and Fish Department's five-year strategic plans for the various species and will assist the Department in accomplishing its goals for the various species. RMP p. 34.

Objectives from UG-ES (Black Canyon Allotment #5021, identified currently as the Twin C Allotment No. 40210):

- Increase wildlife cover by establishing 150 to 200 cottonwood trees per mile along Gila River bottom.
- In 15 years reduce the present [sole source factor] SSF from 41 to 36. Increase plant density from 10% to 20% in 15 years.
- Increase forage available to livestock from 60 [cattle year-long] CYLs to 100 CYLs in 15 years.

Further, the Safford District RMP was amended by the Decision Record for the Statewide Land Use Plan Amendment for Implementation of Arizona Standards for Rangeland Health and Guidelines for Grazing Administration EA (BLM 1997b). This decision established that grazing management which provides for plant growth and reproduction of those plant species needed to reach desired plant community objectives will be applied to all allotments under year-long grazing and that future grazing decisions would be in accordance with the Arizona Standards and Guidelines.

Gila Box RNCA Management Plan

The BLM implemented the Gila Box RNCA Management Plan (January 1998). The plan established the management objective to implement upland water development for the Twin C Allotment, a need resulting from the deferral of livestock grazing from the Gila River riparian area due to the Gila Box RNCA designation. Per the Gila Box RNCA Management Plan EA (BLM 1998) with the removal of livestock grazing from the Gila River riparian area, "There will be an increased livestock handling cost to keep livestock out of the river. The loss of the river as a water source will be offset by upland water development. And there will be an increase in maintenance cost for new fencing" (p. 54). The Decision Record for the EA defined the allotment-specific management action for Twin C, "There will be no livestock use within the riparian areas along the Gila River. An administrative decision will be issued to discontinue Gila River corridor grazing. Construction and installation of fences, cattleguards and upland water developments will be necessary" (p. 82). On the Twin C Allotment, this closed approximately 350 acres to livestock grazing. The proposed development of Goat Camp Well responds in part to the decision made in the Gila Box RNCA Management Plan to remove livestock from the Gila River riparian area and provide for the development of upland water sources.

1.6 Relationship to Other Plans, Statutes, and Regulations

Proposed actions must comply with the following laws and/or agency regulations, and be consistent with applicable federal, state and local laws, regulations, and plans to the maximum extent possible.

43 CFR Part 4100 – BLM Grazing Administration, Exclusive of Alaska

The Proposed Action relating to the grazing permit renewal is consistent with 43 CFR 4100

Grazing Administration. 43 CFR 4100.0-2 states, "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. These objectives - shall be realized in a manner that is consistent with land use plans, multiple use, sustained yield, environmental values, economic and other objectives stated in 43 CFR part 1720, subpart 1725; 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. 1740)" (43 CFR 4100.0-2).

43 CFR 4100.0-8 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 the Arizona Standards and Guidelines, 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 Arizona Standards and Guidelines in April 1997. These standards and guidelines address watersheds, ecological condition, water quality, and habitat for special status species.

In addition, the proposed action would comply with the following laws and/or agency regulations, other plans and is consistent with applicable Federal, state and local laws, regulations, and plans to the maximum extent possible:

- 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
- Endangered Species Act of 1973, as amended
- Migratory Bird Treaty Act of 1918, 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)
- Arizona Desert Wilderness Act of 1990 (P.L. 101-628)
- Arizona Water Quality Standards, Revised Statute Title 49, Chapter II
- Arizona Administrative Code (A.A.C.) R12-15-801 et seq. and Arizona Revised Statute (A.R.S.) § 45-594 and 45-595 Arizona Department of Water Resources (ADWR) well construction requirements

1.7 Scoping and Issues Identification

Issues were identified by the BLM Safford Field Office interdisciplinary team, the grazing permittee, and interested publics. The scoping process included a Consultation, Cooperation, and Coordination letter distributed to the permittee and five other individuals and organizations in May 2014. No scoping comments were received. However, the following issues were identified, incorporating in part issues raised from public comments that were submitted to the BLM in response to previous EAs for the proposed Goat Camp Well:

- How would renewal of the grazing permit affect current grazing management?
- How would continued livestock grazing affect the health of upland vegetation?
- How would continued livestock grazing affect soil erosion?
- How would continued livestock grazing affect threatened and endangered species, special status species, and migratory birds?
- Could disturbance to wildlife, including migratory birds and sensitive species occur during drilling activities of the new well?
- Could the proposed Goat Camp Well affect the aquifer and flow of the Gila River?

Notification of availability of the daft EA and a 30-day comment period was provided by letter dated January 25, 2016. The notification letter was distributed by certified mail to the permittee and seven other individuals and organizations. In addition, copies of the notification letter and draft EA were posted to the publicly-accessible BLM NEPA Register at http://bit.ly/TwinCGoatCampEA. The BLM received two letters in response indicating support for the project. No substantive comments were received.

Chapter 2 - Proposed Action and Alternatives

2.1 Proposed Action: Authorize Grazing Permit Renewal & Goat Camp Well Development

2.1.1 Permit Renewal

In accordance with 43 CFR 4130.2, and based upon the allotment LHE Report documenting that land health standards are being obtained, the Proposed Action would offer the Twin C Allotment grazing permit for a period of 10 years with the existing Mandatory Terms and Conditions (Table 2) and revisions to Other Terms and Conditions listed below, which would become effective upon acceptance of the permit.

Existing Mandatory Terms and Conditions

Table 2. Mandatory Terms and Conditions for the Twin C Allotment

Allotment	Livestock Number	Grazing Period Begin - End	% Public Land	Animal Unit Months (AUMs)
Twin C (No. 40210)	152 Cattle 8 Horses Total = 160	03/01 2/28 Year Long	100	1,824 Cattle 96 Horse Total = 1,920 AUMs

Existing Other Terms and Conditions

- In order to improve livestock distribution on the public lands, all salt blocks and/or mineral supplements shall not be placed within a 1/4 mile of any riparian area, wet meadow or watering facility (either permanent or temporary) unless stipulated through a written agreement or decision in accordance with 43 CFR 4130.3-2c.
- 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.
- As a term and condition of this permit you are required to submit a report of actual grazing use made on this allotment for the previous grazing period, March 1 to Feb. 28. Failure to submit such a report by March 1, of this year, may result in suspension or cancellation of the grazing permit.
- In accordance with Sec. 325, Title III, H.R. 2691, Department of the Interior and related agencies Appropriations Act, 2004 (P.L. 108-108), which was enacted on November 10, 2003,

this grazing permit or lease is renewed under section 402 of the Federal land Policy and Management Act of 1976, as amended (43 U.S.C. 1752), title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010 ET SEQ.), or, if applicable, section 510 of the California Desert Protection Act (16 U.S.C. 410AAA-50). In accordance with Public Law 108-108 the terms and conditions contained in the expired or transferred permit or lease shall continue in effect under the renewed permit or lease until such time as the Secretary of the Interior completes processing of this permit or lease in compliance with all applicable laws and regulations, at which time this permit or lease may be canceled, suspended, or modified, in whole or in part, to meet the requirements of such applicable laws and regulations.

Deletions from Other Terms and Conditions

- As a term and condition of this permit you are required to submit a report of actual grazing use made on this allotment for the previous grazing period, March 1 to Feb. 28. Failure to submit such a report by March 1, of this year, may result in suspension or cancellation of the grazing permit

- In accordance with Sec. 325, Title III, H.R. 2691, Department of the Interior and related agencies Appropriations Act, 2004 (P.L. 108-108), which was enacted on November 10, 2003, this grazing permit or lease is renewed under section 402 of the Federal land Policy and Management Act of 1976, as amended (43 U.S.C. 1752), title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010 ET SEQ.), or, if applicable, section 510 of the California Desert Protection Act (16 U.S.C. 410AAA-50). In accordance with Public Law 108-108 the terms and conditions contained in the expired or transferred permit or lease shall continue in effect under the renewed permit or lease until such time as the Secretary of the Interior completes processing of this permit or lease in compliance with all applicable laws and regulations, at which time this permit or lease may be canceled, suspended, or modified, in whole or in part, to meet the requirements of such applicable laws and regulations.

Additions to Other Terms and Conditions

- In accordance to the Gila Box RNCA Management Plan Final Decision (EA AZ-040-08-03) issued June 27, 2000, grazing of livestock along the riparian zone of the Gila River within the Gila Box Riparian National Conservation Area is not permitted.
- Maintenance feeding of livestock with access to public land is prohibited. Maintenance feeding shall be defined as providing livestock with feed to assist in meeting their basic caloric needs, provided at a rate of 3 lbs./day/head or more.
- This permit is subject to future modification as necessary to achieve compliance with the standards and guidelines (43 CFR 4180).
- Permittees shall maintain all range improvement projects for which they have maintenance responsibilities.
- All troughs shall be outfitted with wildlife escape structures to provide a means of escape for animals that fall in while attempting to drink or bathe.

- The Permittee shall submit a report of the actual grazing use made on this allotment, by pasture, for the previous grazing period, March 1 to February 28. Failure to submit such a

report by March 15 of the current year may result in suspension or cancellation of the grazing permit.

It should be noted that the first two stipulations listed above in the *Additions to Other Terms and Conditions* are occurring as a matter of practice, or de facto:

- Due to the physical inaccessibility of the Gila River riparian zone of the Gila Box RNCA resulting from existing fencing and terrain, livestock from the Twin C Allotment cannot, and currently are not, grazing this area.
- Maintenance feeding of livestock on the Twin C Allotment has not been known to occur.

However, the addition of these stipulations to the grazing permit is an administrative mechanism conveying requirements regarding livestock use and management on public land managed by the BLM.

2.1.2 Goat Camp Well

The Proposed Action regarding Goat Camp Well would be to authorize the livestock permittee to develop the proposed Goat Camp Well at T6S, R29E, NE ¼ of Section 30 to provide an additional perennial upland water source for livestock. The location is upland approximately three miles east of the Gila River. The proposed well would provide a perennial water supply to an adjacent storage tank, trough, and pipeline and would supplement the ephemeral water supplies (dirt tanks) in the River, Cinder Pit, and Goat Camp pastures. Specifically, Goat Camp Well would pump water directly into the existing storage tank. A separate pump would then supply water from the storage tank to pipeline segments #14 or #15, as determined by a manual valve selection. The proposed location has existing road access.

Under the Proposed Action, drilling of the Goat Camp Well (ADWR Well Registration No. 55-220387) would resume where left off in 2011. Estimated duration of construction would be two to four weeks. It is estimated that ground water would be reached between 850 to 1,000 feet below ground surface, but could be up to 1,200 feet in depth. The well "drill pad" would encompass approximately 0.10 acre and is within the footprint of an existing range improvement site that supports a storage tank and trough. A two-ton truck with a mounted drill would be sufficient to complete the drilling. All construction activities would use existing dirt roads maintained by the permittee to complete the project. Ground and vegetation disturbance at the site is preexisting due to livestock and wildlife congregating at the existing water supply as well as associated maintenance activities of the range improvements. (Refer to Figures 3-6.) Full development of the proposed well would not necessitate additional ground or vegetation disturbance.

Figure 3. Proposed Goat Camp Well looking south. T6S, R29E, NE ¼ of Section 30, Goat Camp Pasture – Twin C Allotment. 9/30/2015.

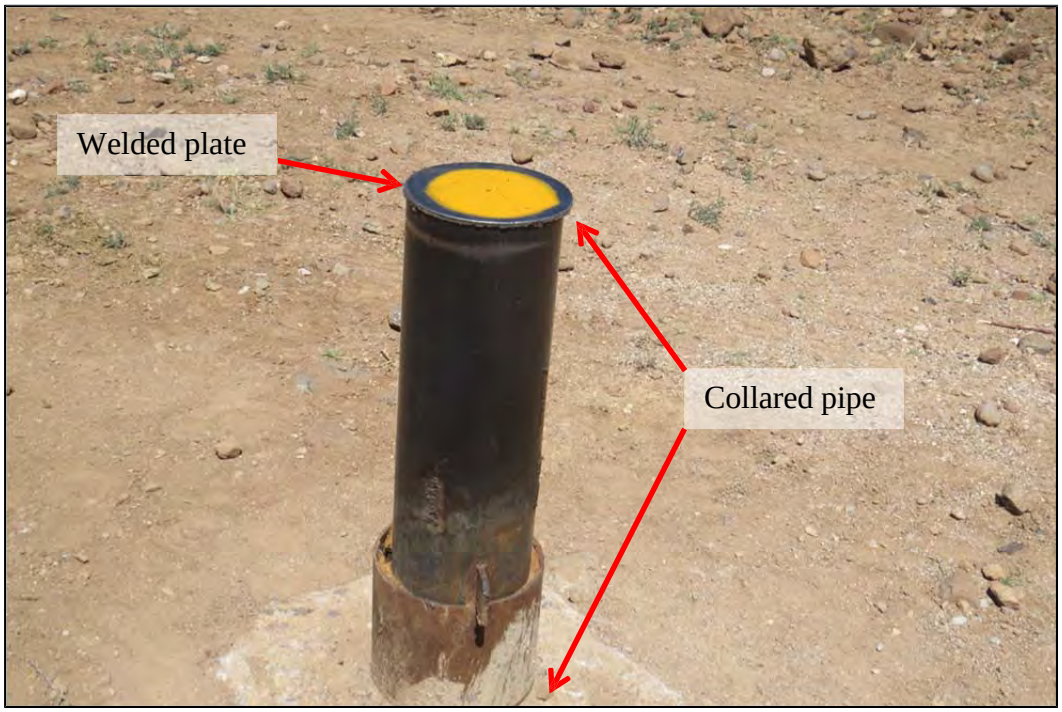


Figure 4. Proposed Goat Camp Well - capped. T6S, R29E, NE ¼ of Section 30, Goat Camp Pasture – Twin C Allotment. 9/30/2015.

Figure 5. Storage tank looking northwest. Goat Camp Pasture – Twin C Allotment. 9/30/2015.

Figure 6. Trough looking northwest. Goat Camp Pasture – Twin C Allotment. 9/30/2015.

Well construction requirements would comply with ADWR specifications per A.A.C. R12-15- 801 et seq. and A.R.S. § 45-594 and 45-595. The pump at the Goat Camp Well would be submersible and solar powered. It is estimated that the maximum pumping rate would be 20 gpm during daylight hours. The pumping schedule of the Goat Camp Well would typically alternate for 2-3 days on and two days off. Solar panels would be attached to steel framework mounted close to the ground for ease of maintenance (replacement and tilting) and to minimize potential visual impact. The framework support posts would be dug with an auger or by hand. It is expected that 8-12 panels (modules) 2x4 feet per module (less than 200 square feet total) would supply sufficient power to pump water the estimated 850 to 1,000 (maximum 1,200) feet to the surface. A small fence would enclose the panels and would consist of four-strand barbed wire, standard T-posts and support braces at each corner. This would reduce the potential damage to the solar panels caused by livestock and wildlife.

In accordance with the regulations at 43 CFR 4120.3-2(b), the BLM would enter into a cooperative range improvement agreement with the permittee to establish use and maintenance of this well. The permittee would be responsible for all maintenance of the well and solar panels, and fencing. Expected maintenance of the well and solar panels would most likely consist of pump or a solar panel replacement due to equipment failure. No annual (routine) maintenance is expected on this system.

Goat Camp Well Production

The BLM does not know, nor can it know, how much water the proposed Goat Camp Well would produce until it is drilled. As noted by BLM Hydrogeologist Paul L. Summers, "Based on the geologic formation found in this area, the most probable opportunity for a water supply at the planned site is within what are known as interflow zones, where permeability is higher due to weathering processes during periods of volcanic quiescence, or due to layers of higher permeability rock . . . It is impossible to predict the depth at which these zones occur, because they occur at several different elevations within the formation . . ." (BLM 2011). Refer to Appendix D for the Declaration of Hydrogeologist Paul L. Summers.

In relation to the permittee's estimate of River Well production of 15-20 gpm, there are essentially three possible outcomes upon drilling Goat Camp Well. The well could produce (1) greater than or equivalent to 15-20 gpm, (2) less than 15-20 gpm, or (3) no water at all. Potential outcomes for well production are addressed in the following scenarios:

Scenario #1

Goat Camp Well would produce greater than or equal to 15 - 20 gpm. Goat Camp Well in lieu of River Well would operate as the primary perennial source, augmented by ephemeral sources, for livestock watering facilities on the River, Cinder Pit, and Goat Camp pastures. The pumping schedule of the Goat Camp Well would typically alternate for 2 to 3 days on and two days off. It would operate on an intermittent basis based upon need and depending on environmental factors such season of use and periods of rainfall. The Headquarters and Lower Berregero wells would continue to supply the eastern pastures.

Water supplied by River Well is the allotment's base water, in which a cooperative range improvement agreement is in place with the permittee for authorized use. Authorization cannot be removed without an identified alternate base water source subject to a separate BLM action.

With Goat Camp Well operating at full capacity, River Well operations would decrease substantially or altogether.

Scenario #2
Goat Camp Well would produce some quantity greater than zero but less than 15-20 gpm. Goat Camp Well would operate to the extent possible as the primary source to the Goat Camp and Cinder Pit pastures while River Well would continue as the primary source of perennial water to the River Pasture. Each well would operate on an intermittent basis based upon need and depending on environmental factors such season of use and periods of rainfall. The Headquarters and Lower Berregero wells would continue to supply the eastern pastures.

Scenario #3
Goat Camp Well would produce no water. River Well would remain the only perennial water source supplying the western pastures at the existing rate of 15-20 gpm, and the Headquarters and Lower Berregero wells would continue to supply the eastern pastures. As a result, the non-producing Goat Camp Well shaft would be capped and abandoned.

In all three scenarios, the maximum annual water use is not expected to exceed the current 1.28 million gallons of annual water use, which equates to the amount currently in demand for full permitted use of livestock on the Twin C Allotment. (Refer to Appendix E for methodology.) No additional water facilities (troughs or storage tanks) would be created as a part of this Proposed Action. If additional livestock water facilities are proposed in the future, the BLM would consider the request in accordance with 43 CFR 4120.3 and be analyzed in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4371 et seq.)

2.1.3 Design Features and Best Management Practices

The following design features and best management practices (BMPs) would be included in the Proposed Action to minimize the potential impacts of Goat Camp Well development outlined in Section 2.1.2:

- Construction activities would be limited to daylight hours to minimize impacts to wildlife.
- Construction activities would be limited to periods when the soil and ground surface are not wet in order to avoid road damage, e.g. ruts.
- Well construction requirements would comply with ADWR specifications per A.A.C. R12-15-801 et seq. and A.R.S. § 45-594 and 45-595.
- In order to reduce the potential for the spread of noxious and invasive weeds from construction equipment used for implementation of the proposed action, either from contamination with weed seed and/or biomass, all vehicles would be thoroughly power washed off-site to remove all vegetative material and soil before transporting equipment to the construction site. This includes trucks, trailers and all other machinery.
- Leftover materials pose a hazard to public safety and also to wildlife. Thus, construction debris would be removed to an appropriate landfill location. This includes any unused, replaced, or discarded materials such as pipes float valves, wire, and other miscellaneous supplies. BLM staff would conduct site visits to the area to ensure adequate clean-up measures are taken.

- Any cultural (historic/prehistoric site or object) or paleontological resource (fossil remains of plants or animals) discovered during operations would immediately be reported to the authorized officer or his/her designee. All operations in the immediate area of the discovery shall be suspended until written authorization to proceed is issued. An evaluation of the discovery shall be made by a qualified archaeologist or paleontologist to determine appropriate actions to prevent the loss of significant cultural or scientifically important paleontological values;
- If in connection with this work any human remains, funerary objects, sacred objects or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act (P.L. 101-601; 104 Stat. 3048; 25 U.S.C. 3001) are discovered, operations in the immediate area of the discovery would stop, the remains and objects would be protected, and the BLM would be immediately notified. The immediate area of the discovery would be protected until notified by the Safford Field Office Manager that operations may resume.
- At no time would vehicle or equipment fluids (including motor oil and lubricants) be dumped on public lands. The BLM accepts the spill management plan complying with ADWR well drilling requirements as sufficient best management practice. In addition, in the case of a hydrocarbon spill (e.g., fuel) the BLM would be notified and spilled fluids would be excavated to a depth of 12 inches beyond contaminated material, removed from the work location and disposed of properly. If no water is developed after drilling to the maximum depth, the drill hole would be capped and abandoned according to ADWR requirements.
- Drilling waste such as drilling fluid and drill cuttings would be removed so that wastes do not pollute surface waters or cause contamination of the well.
- No water pumped to the surface at Goat Camp Well would be allowed back into the subsurface flow.

2.1.4 Monitoring

Permit Renewal

The terms and conditions of the permit, the livestock numbers, and kind would be monitored through routine compliance inspections conducted by the BLM. Other monitoring data would be collected in accordance with BLM policy and guidance.

Goat Camp Well

The BLM would conduct inspections of the well site during drilling to ensure compliance with the BMPs listed in Section 2.1.3. Periodic inspections would subsequently be conducted by BLM specialists to ensure appropriate operation and maintenance. The project area would be periodically monitored by the BLM for noxious weeds after construction while conducting routine land management activities, including long term rangeland monitoring.

2.2 Alternative 1: No Action

A No Action alternative is developed for two reasons. First, the No Action alternative represents a viable and feasible choice in the range of management alternatives. Second, because a No Action

alternative represents the continuation of current management actions, it provides a benchmark of existing impacts continued into the future against which to compare the impacts of the other proposed management alternatives.

Alternative 1 would provide for the following:

- Reauthorize the Twin C Allotment grazing permit as described in Section 2.1.1, excluding the *Deletions to Other Terms and Conditions* and *Additions to Other Terms and Conditions.* Authorized use would continue as stated on the current grazing permit and described in the LHE Report. The exception is that the term incorporating P.L.108-108 in the Other Terms and Conditions would continue to be deleted it is no longer applicable as an outcome of this NEPA process, which "completes processing of this permit […] in compliance with all applicable laws and regulations, at which time this permit […] may be canceled, suspended, or modified, in whole or in part, to meet the requirements of such applicable laws and regulations."
- Goat Camp Well would not be authorized, the existing conditions at the proposed well location would be unchanged, and the ADWR well registry vacated. Operation of the water system would continue as it is currently.

2.3 Alternative 2: Authorize Grazing Permit Only

Alternative 2 would provide for the following:

- Reauthorize the Twin C Allotment grazing permit as described in Section 2.1.1.
- Goat Camp Well would not be authorized, the existing conditions at the proposed well location would be unchanged, and the ADWR well registry vacated. Operation of the water system would continue as it is currently.

2.4 Alternative 3: No Grazing

Under Alternative 3, the following would occur:

- Permit renewal would not be authorized. The BLM would close the Twin C Allotment to livestock grazing. An amendment to the Safford District RMP and a separate grazing decision would be required. Existing range improvements would not be maintained for livestock usage, although some troughs could be maintained under the direction of the BLM for the benefit of wildlife use. At some point in the future, the BLM could reanalyze the Twin C Allotment for livestock grazing to activate the AUMs pursuant to the NEPA and land use amendment process.
- Goat Camp Well would not be authorized. As grazing would no longer be an authorized activity, this alternative would not consider authorizing development of Goat Camp Well, as the need for the proposed well would no longer exist. The existing conditions at the proposed well location would be unchanged, and the ADWR well registry vacated.

2.5 Alternatives Considered but Eliminated 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
- The alternative is technically or economically infeasible
- The alternative is inconsistent with the land use plan
- Implementation of the alternative is remote or speculative
- The alternative is substantially similar to another alternative that is analyzed
- The alternative would have substantially similar effects as an alternative that is being analyzed.

2.5.1 Alternatives Related to Grazing

Reduced Grazing Alternative

A reduction in AUMs was not considered for detailed analysis because the LHE Report concluded that the Arizona Standards for Rangeland Health were being achieved at the current permitted use level. The Proposed Action and No Grazing alternatives sufficiently illustrate a full range of expected effects since land health standards are currently being achieved. A Reduced Grazing alternative would have substantially similar effects as an alternative that is being analyzed. Therefore, the alternative is removed from detailed analysis.

2.5.2 Alternatives Related to Goat Camp Well

Water Hauling

In regards to Goat Camp Well, hauling water and construction of a detention (earthen) dam within the allotment were considered as alternatives. These options were deemed not feasible. Hauling water would require access to a nearby and reliable water source other than the Gila River, which does not currently exist. Dam construction for the retention of seasonal rainfall would be an ineffective alternative because the rainfall collected would be of insufficient quantities to provide perennial water to the uplands. Such a dam would essentially function as the existing dirt tanks, which provide ephemeral waters only to grazing livestock. Therefore, this alternative does not warrant further consideration.

Alternate Well Locations

Two other locations located at Ranch Headquarters and west of Goat Camp Pasture within the uplands of the Twin C Allotment were evaluated for the proposed well. These sites were considered but eliminated based on the professional judgment of the well driller [personal communication with Cueto Drilling Company of Clifton, Arizona] who stated that these locations were less likely to be productive. The well driller reported a situation, unrelated to this Proposed Action and not on the Twin C Allotment, whereby a well in the general vicinity of Headquarters Well was attempted. However, the geomorphology proved to be unstable and well construction unsuccessful. Further, the topography and lack of access to the area west of the proposed Goat Camp Well location would be problematic, thus posing issues of technical and economical infeasibility. Therefore, these alternative well locations do not warrant further consideration.

The proposed Goat Camp Well location possesses water-bearing formations of volcanic rock, cinder, and sandstone. In addition, the proposed location has existing road access and is near existing range improvements (e.g., pipelines, storage tank, and trough.) No additional sites

exhibiting these attributes have been identified.

Chapter 3 – Affected Environment

The Twin C Allotment is located approximately 15 miles east of Safford, Arizona, and 12 miles southwest of Clifton, Arizona, within both Graham and Greenlee counties. A portion of the allotment is within the Gila Box RNCA, and the Black Hills Back Country Byway crosses through. The allotment is within the Yuma Wash-Upper Gila River watershed (HUC 10, 1504000505) and the Safford ground water basin.

3.1 Resources and Resource Elements

The BLM is required to consider many authorities when evaluating a Federal action. Those elements of the human environment that are subject to the requirements specified in statutes, regulations, or executive orders, and must be considered in all EAs, have been considered by BLM resource specialists to determine whether they would be potentially affected by the Proposed Action. These elements are identified in Table 3, along with the rationale for the determination on potential effects. If any element was determined to be potentially impacted, it was carried forward for detailed analysis in this EA; if an element is not present or would not be affected, it was not carried forward for analysis. Table 3 also contains other resources/concerns that have been considered in this EA. As with the elements of the human environment, if these resources were determined to be potentially affected, they were carried forward for detailed analysis in this document.

Table 3. Summary Evaluation of Elements/Resources of the Human Environment

Resource	Determination*	Affected Environment (Rationale for Determination)
* NP = Not present in the area that will be impacted by the Proposed Action or alternatives. NI = Present, but not affected to a degree that would mean detailed analysis is required. PI = Present with potential for impact; analyzed in detail in the EA.		
Air Quality	NI	Air quality in the general area is good, although windblown dust can be a minor source of pollution. The allotment is within an attainment area for all National Ambient Air Quality Standards. The drilling of Goat Camp Well would result in temporary, localized deterioration of air quality because of the operation of equipment and the dust generated from well drilling. Because the amount generated would very small in relation to the natural windblown dust, would be temporary (no more than four weeks) and would cease once well drilling is complete, the BLM has determined that the impact is negligible.
Areas of Critical Environmental Concern (ACEC)	NP	The alternatives would not affect this element as ACECs are not within or adjacent to the Twin C Allotment.

Resource	Determination*	Affected Environment (Rationale for Determination)
* NP = Not present in the area that will be impacted by the Proposed Action or alternatives. NI = Present, but not affected to a degree that would mean detailed analysis is required. PI = Present with potential for impact; analyzed in detail in the EA.		
Cultural Resources	NI	*Concerning grazing permit renewal*, twenty Class III cultural resources surveys have been conducted within Twin C Allotment. In areas cattle congregation, no historic properties have been found. The Black Hills Back Country Byway that transects the allotment is the historic Highway 666 and is eligible for listing on the National Register for Historic Places. The byway has limited exposure to cattle because it is not near areas of cattle congregation and it lies between the two grazing management systems of the western and eastern pastures. One earthen dam built by the Civilian Conservation Corps circa 1936 is located on the Twin C Allotment. It was constructed to support cattle grazing and still functions as intended. Therefore, the grazing permit renewal alternatives would not affect cultural resources to a degree that would mean a detailed analysis is required.
	NP	*Concerning Goat Camp Well*, a Class III cultural resources inventory was completed in the area of the proposed Goat Camp Well. No cultural resources were identified. This resource element would not be impacted by the alternatives relating to Goat Camp Well.
Environmental Justice	NP	The closest communities are Clifton and Safford, Arizona, located 12 and 15 miles respectively from the Twin C Allotment. Therefore, the action would have no disproportionately high or adverse human health or other environmental effects on minority or low-income segments of the population. The alternatives would also have no effect on low-income or minority populations. The Goat Camp Well is outside of the Gila River Indian Community applicable impact zones.
Farmlands (Prime or Unique)	NP	There are no prime or unique farmlands within or adjacent to the allotment. Therefore, the proposed action and alternatives would not affect prime or unique farmlands.
Floodplains	NP	The Twin C Allotment is located in the uplands just outside of the Gila River and is outside of any designated floodplain. Due to topography and fencing, the allotment does not include the floodplain. There is no known flooding hazard on the allotment nor is there any expectation that the alternatives would create or alter downstream flooding hazard.
Invasive and Nonnative Species	NI	There are currently no known invasive species or noxious weeds located on the Twin C Allotment. Since there are no known invasive or nonnative species that have been established on the allotment to date, the risk of establishment is thought to be low. Measures to prevent the spread of invasive and noxious weeds have been incorporated into the BMPs. No invasive/nonnative species impacts from any alternatives are anticipated.
Lands/Realty	NI	There is a 500-kilovolt (kV) power line right-of-way that runs through the allotment. Guthrie Peak Communication Site has a number of communication towers and is located in the far northeast corner of the allotment. There would be no direct, indirect, or cumulative impacts as a result of the Proposed Action and alternatives.
Livestock Grazing	PI	Discussed in document. Livestock grazing would be impacted differently across the alternatives, and is analyzed in the following chapters.

Resource	Determination*	Affected Environment (Rationale for Determination)
* NP = Not present in the area that will be impacted by the Proposed Action or alternatives. NI = Present, but not affected to a degree that would mean detailed analysis is required. PI = Present with potential for impact; analyzed in detail in the EA.		
Native American Religious Concerns	NP	During consultations with American Indian Tribes who claim cultural affiliation to southern Arizona, no Native American religious concerns have been identified in relation to alternatives proposed in this EA.
Recreation	NI	Five of forty miles of the Black Hills Back Country Byway passes through the Twin C Allotment. Information kiosks are present. Gates, closed access, and picnic areas are not present. Other recreation activities are dispersed and sporadic, primarily in the form of hunting. It is unlikely that recreationists would be in the area of Goat Camp Well during drilling operations. The continuance of livestock grazing, and the operation of the solar powered pump at the proposed Goat Camp Well would not impact recreational activities.
Socioeconomic Values	NI	The mining community of Clifton is just outside the allotment boundaries. Under the Proposed Action, the permittees would continue running a livestock operation on the allotment. The permittee would continue to contribute in a small way to the economy of the local community. In addition, the county would continue to receive the allotment proportion of *payment in lieu of* taxes. In the no grazing alternative, the permittee would experience negative economic impacts. Nevertheless, the alternatives would not appreciably affect the economy or social aspect of the region.
Soils	PI	Discussed in document. Soils would be impacted differently across the alternatives, and are analyzed in the following chapters.
Threatened, Endangered, or Candidate Plant Species	NP	No threatened, endangered, or candidate plant species are known to occur on the allotment; therefore, there would be no direct, indirect, or cumulative impacts to this critical element.
Threatened, Endangered, or Candidate Wildlife Species	PI	Discussed in document. Yellow-billed cuckoo and its proposed critical habitat have the potential to be affected by the proposed action and are analyzed in the following chapters.
Threatened, Endangered, or Candidate Fish Species	PI	Discussed in document. Razorback sucker and designated critical habitat have the potential to be affected by the proposed action and are analyzed in the following chapters.
Vegetation	PI	Discussed in document. Vegetation communities would be impacted differently across the alternatives, and are analyzed in the following chapters.

Resource	Determination*	Affected Environment (Rationale for Determination)
* NP = Not present in the area that will be impacted by the Proposed Action or alternatives. NI = Present, but not affected to a degree that would mean detailed analysis is required. PI = Present with potential for impact; analyzed in detail in the EA.		
Visual Resources Management (VRM)	NI	The grazing permit alternatives would not impact VRM. The location of the proposed well is in a Class III VRM area. The objective of this class is to partially retain the existing landscape character. The level of change to the characteristic landscape should be moderate. Management activities associated with livestock grazing may attract attention, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. The Goat Camp Well site is below a ridge line and is visible only from a very small view shed. A large water storage tank currently exists at the site; the addition of a well head and ground mounted solar panels (less than 200 square feet) would not attract attention, change the character of the landscape or dominate the view.
Wastes (hazardous or solid)	NP	There are no known hazardous or solid wastes within or adjacent to the Twin C Allotment; thus, no direct, indirect, or cumulative impacts on this critical element would occur.
Water Quality and Quantity (Ground & Surface)	PI	Discussed in document. The potential impacts of continued grazing and Goat Camp Well construction on surface or subsurface water quality and quantity are analyzed in the following chapters.
Wetlands/Riparian Zones	NP	Livestock do not have access to the riparian area bordering Gila River due to unpassable terrain and fencing. There are no other wetlands or riparian zones within the Twin C Allotment; therefore, there would be no direct, indirect, or cumulative impacts to this critical element.
Wild and Scenic Rivers	NI	The segment of the Gila River bordering the Twin C has been inventoried as suitable for designation as a Wild and Scenic River segment. However, since livestock do not have access to the bordering Gila River due to unpassable terrain and fencing, no impacts are anticipated. Therefore, there would be no direct, indirect, or cumulative impacts to this critical element.
Wilderness	NP	The Twin C Allotment does not contain, nor is it adjacent to any wilderness areas or Wilderness Study Areas.
Wilderness Characteristics	NP	The Twin C Allotment project area is not located within an area containing the three wilderness characteristics of naturalness, solitude, or outstanding opportunities for primitive and unconfined recreation.
Wildlife and Special Status Species	PI	Discussed in document. Wildlife would be impacted differently across the range of alternatives. See detailed analysis in the following chapters.

3.2 Resources Brought Forward for Analysis

Potential resources to be brought forward for analysis in this EA are:

- Vegetation
- Soils
- Grazing management
- Wildlife and special status species
- Water quality and quantity

3.2.1 Vegetation

The Twin C Allotment contains varied ecological sites which correlate to types of vegetation communities expected to occur.

Ecological sites found on the Twin C Allotment are basalt hills, clayey slopes, limy slopes, loamy slopes, and volcanic hills (Figure 7). Slopes of 40% or greater occur on 34% of the allotment (Table 4).

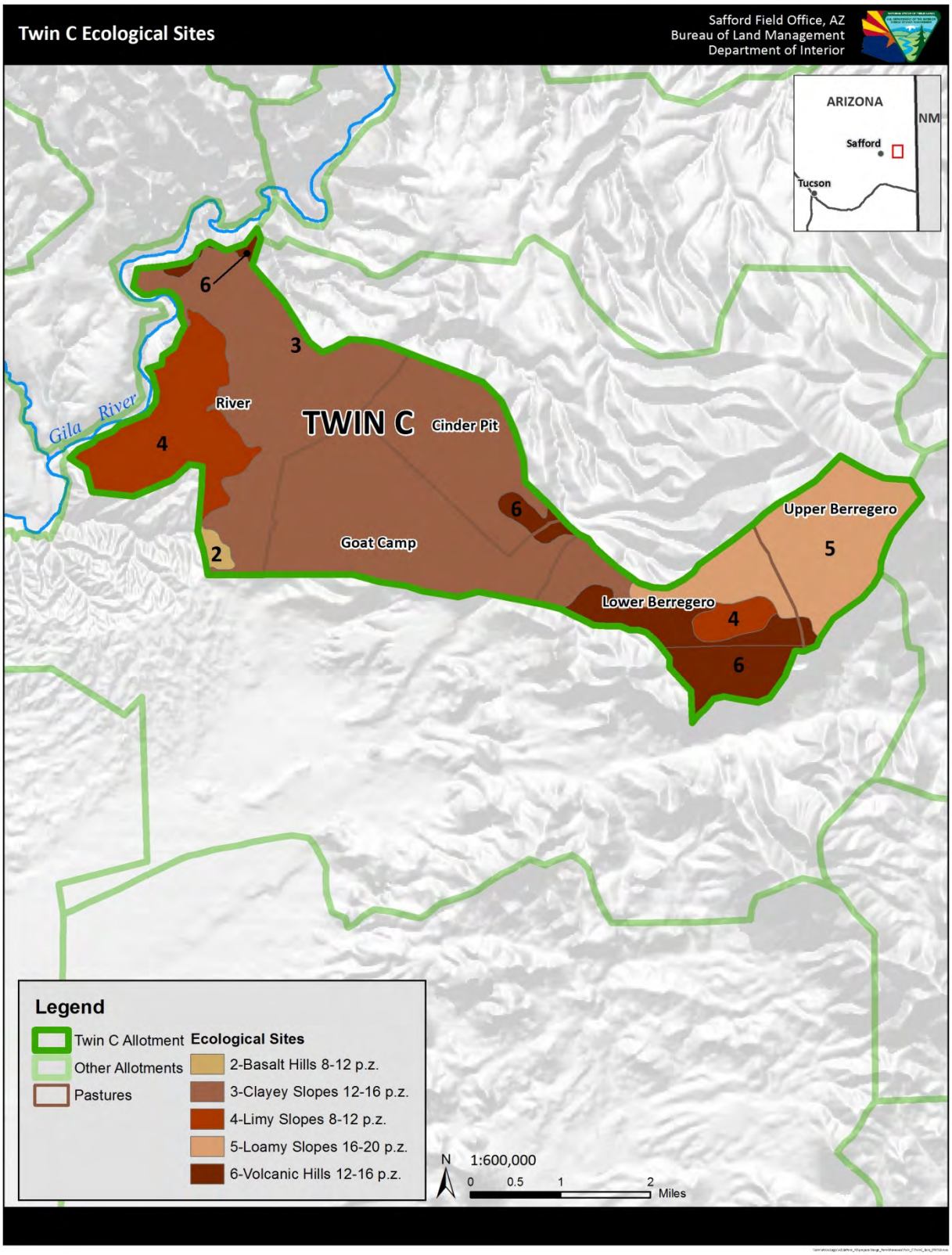


Figure 7. Ecological Sites on the Twin C Allotment.

Table 4. Twin C Ecological Site Descriptions

Map Legend #	Ecological Site	Acres	% of Twin C
2	Basalt Hills 8-12″ p.z.	225	2%
3	Clayey Slopes 12-16″ p.z.	6,509	59%
4	Limy Slopes 8-12″ p.z.	1,663	15%
5	Loamy Slopes 16-20″ p.z.	1,916	18%
6	Volcanic Hills 12-16″ p.z., loamy	628	6%

Basalt Hills 8-12" p.z. (R041XC301AZ)

Grass species found in the Basalt Hills include: cane beardgrass (*Bothriochloa barbinodis*), sideoats grama *(Bouteloua curtipendula)*, bush muhly *(Muhlenbergia porteri)*, Arizona cottontop (*Digitaria californica*), and black grama *(Bouteloua eriopoda).* Forb species found include: dwarf Indianmallow (*Abutilon parvulum*), slimleaf bursage (*Ambrosia confertiflora*), twinleaf senna (*Senna bauhinioides*), and carelessweed (*Amaranthus palmeri*). Shrubs species found include: mesquite, whitethorn *(Acacia constricta)*, catclaw acacia *(Acacia greggii)*, creosote bush (*Larrea tridentata* sp.), broom snakeweed *(Gutierrezia sarothrae)*, and pale wolfberry *(Lycium pallidum)*. Succulent species found include: cholla *(Cylindropuntia)* and prickly pear (*Opuntia* spp.*)*.

Clayey Slopes 12-16" p.z. (R041XC303AZ)

Grass species found in the Clayey Slopes include: tobosa *(Pleuraphis mutica)*, perennial three-awn *(Aristada* spp.*)*, sideoats grama (*Bouteloua curtipendula)*, bush muhly (*Muhlenbergia porteri)*, and black grama *(Bouteloua eriopoda).* Forb species found include: fanpetals *(Sida* spp.*)*, globemallow *(Sphaeralcea ambiqua)*, leatherweed *(Croton pottsii).* Shrubs species found include: mesquite, whitethorn *(Acacia constricta)*, catclaw acacia *(Acacia greggii)*, snakeweed *(Gutierrezia sarothrae)*, and pale wolfberry *(Lycium pallidum)*. Succulent species found include: cholla *(Cylindropuntia* spp.*)* and prickly pear (*Opuntia* spp.*)*.

Limy Slopes 8-12" p.z. (R041XB207AZ)

Grass species found in the Limy Slopes include: perennial three-awn *(Aristada* spp.*)*, sideoats grama (*Bouteloua curtipendula)*, bush muhly *(Muhlenbergia porteri)*, fluffgrass (*Dasyochloa pulchella*), slim tridens (*Tridens muticus*), and black grama *(Bouteloua eriopoda).* Forb species found include but not limited to: desert-holly (*Acourtia nana*), bursage (*Ambrosia* spp.), leatherweed (*Croton pottsii*), and pricklyleaf dogweed (*Thymophylla acerosa*). Shrubs species found include: whitethorn *(Acacia constricta)* and creosotebush (*Larrea tridentate*). Succulent species found include: prickly pear (*Opuntia* spp.*)*.

Loamy Slopes 16-20" p.z. (R041XA107AZ)

Grass species potentially on this site include: sideoats grama *(Bouteloua curtipendula)*, plains lovegrass *(Eragrostis intermedia)*, and cane beardgrass *(Bothriochloa barbinodis).* The aspect is

open grassland to savannah. Low forb production is expected. Shrub species potentially found on this site include: fairy duster *(Calliandra eriophylla)*, shrubby buckwheat *(Eriogonum wrightii)*, and prairie acacia *(Acacia anqustissima)*. Stands of Palmer agave *(Agave palmeri)* can occur in dense patches and are not well dispersed though areas of the site.

Volcanic Hills 12-16" p.z., loamy (R041XC323AZ)

Grass species potentially on this site include: sideoats grama (*Bouteloua curtipendula)*, among many other warm season perennial grasses. Many species of shrubs and succulents are potentially located on this site including: shrubby buckwheat *(Eriogonum wrightii)*, whitethorn *(Acacia constricta)*, catclaw acacia *(Acacia greggii)*, prickly pear *(Opuntia* spp.*)*, and cholla *(Cylindropuntia* spp.*).*

3.2.2 Soils

The soil complexes on the Twin C Allotment are varied as presented in Figure 8 and Table 5 below.

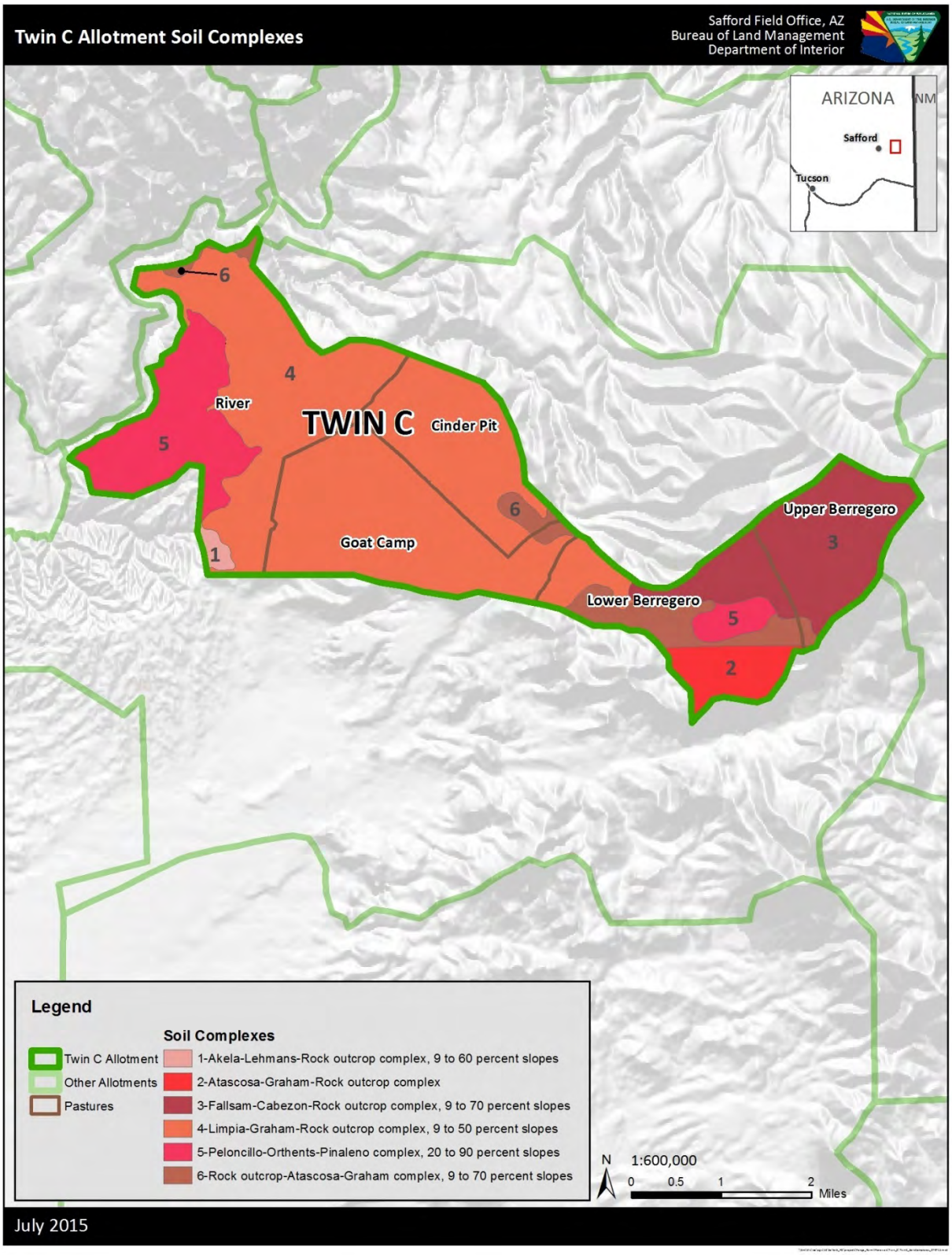


Figure 8. Soil Complexes on the Twin C Allotment

Table 5. Twin C Allotment Soil Complexes

Map Reference #	Soil Name	% of Twin C
1	Akela-Lehmans-Rock outcrop complex, 9 to 60 percent slopes	1%
2	Atascosa-Graham-Rock outcrop complex	4%
3	Fallsam-Cabezon-Rock outcrop complex, 9 to 70 percent slopes	18%
4	Limpia-Graham-Rock outcrop complex, 9 to 50 percent slopes	63%
5	Peloncillo-Orthents-Pinaleno complex, 20 to 90 percent slopes	13%
6	Rock outcrop-Atascosa-Graham complex, 9 to 70 percent slopes	1%

Akela-Lehmans-Rock outcrop complex, 9 to 60 percent slopes

This complex is found on hills, summit's, and side slopes. Akela soil comprises 40 percent of the complex, Lehmans 20 percent, and Rock outcrop 20 percent. Permeability is Low to Moderate, with Moderate to High runoff with soils being 4 to 20 inches. Erosion potential from surface disturbing activities is Moderate to High.

Atascosa-Graham-Rock outcrop complex

This complex is found on hills and ridges. Atascosa soil comprises 45 percent of the complex, Graham 20 percent, and Rock outcrop 20 percent. This complex is well-drained; medium to rapid runoff; moderate permeability. Erosion potential from surface disturbing activities ranges from moderate to extreme depending upon slope.

Fallsam-Cabezon-Rock outcrop complex, 9 to 70 percent slopes

This complex is found on hills, ridges, and saddles. Fallsam soil comprises 35 percent of the complex, Cabezon 25 percent, and Rock outcrop 25 percent. Permeability is Moderately Slow to Slow, with medium-high runoff with a depth of 60 inches. The complex is well drained. Erosion potential from surface disturbing activities is moderate.

Limpia-Graham-Rock outcrop complex, 9 to 50 percent slopes

This complex is on hills, ridges, and scarp slope. Limpia soil comprises 45 percent of the complex, Graham 20 percent, and Rock outcrop 15 percent. Runoff is high to very high. Permeability is slow, but the complex is well drained. Erosion potential from surface disturbing activities is moderate.

Peloncillo-Orthents-Pinaleno complex, 20 to 90 percent slopes

This complex is found on hills, fan remnants, and ridges. Peloncillo soil comprises 40 percent of the complex, Orthents 25 percent, and Pinaleno 15 percent. Permeability is rapid to moderately rapid, with Low to Medium runoff. The complex is excessively well to well drained with a depth of 60 inches. Erosion potential from surface disturbing activities is moderate.

Rock outcrop-Atascosa-Graham complex, 9 to 70 percent slopes

This complex is found on hills and ridges. Rock outcrop soil comprises 35 percent of the complex, Atacosa 30 percent, and Graham 20 percent. Permeability is moderate, with Medium to

High runoff with soils being 10–20 inches deep. The complex is well drained. Erosion potential from surface disturbing activities is moderate.

3.2.3 Livestock Grazing

The Twin C Allotment has remained in the same family since the 1930s. This has provided continuity and consistency in the allotment's grazing management, a characteristic lacking on many BLM allotments that experience multiple transfers.

Grazing history on the Twin C Allotment is as follows:

- Permitted use from the 1978 Upper Gila – San Simon Grazing Environmental Statement: 200 Cattle/8 Horses; 2,397 AUMs
- Permitted use per the 1986 Safford FO Grazing Permit Renewal Final Decision: 152 Cattle/8 Horses; 1,920 AUMs
- The permittee has been implementing a deferred pasture rotation system. This grazing system consists of two concurrent grazing systems on the allotment's five pastures as follows:
    - A one-herd (113 cattle), three-pasture rotation system that utilizes the western pastures (River, Cinder Pit, and Goat Camp), and
    - A one-herd (39 cattle, 8 horses), two-pasture rotation system utilizing the eastern pastures (Lower and Upper Berregero.)

  Total livestock on the Twin C Allotment will not exceed the 160 permitted for full permitted use. However, the apportionment of livestock between the two concurrent grazing systems may vary slightly from year to year.

  The annual grazing and resting periods for each system is illustrated in Table 6 below.

Table 6. Annual Grazing and Rest Periods

Three-Pasture Rotation, 1st Year												
Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Cinder Pit			X	X	X	X	X	X	X	X		
Goat Camp	X	X									X	X
River												
Two-Pasture Rotation, 1st Year												
Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Upper Berregero	X	X	X	X	X	X					X	X
Lower Berregero	X	X	X	X	X	X	X	X	X	X	X	X
Three-Pasture Rotation, 2nd Year												

Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Cinder Pit												
Goat Camp			X	X	X	X	X	X	X	X		
River	X	X									X	X
Two-Pasture Rotation, 2nd Year												
Pasture	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Upper Berregero	X	X	X	X	X	X	X	X	X	X	X	X
Lower Berregero	X	X	X	X	X	X					X	X
Three-Pasture Rotation, 3rd Year												
Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Cinder Pit	X	X									X	X
Goat Camp												
River			X	X	X	X	X	X	X	X		

Key: Blank = Rest, X = Grazed

Actual Use/Billed Use

A summary of the active permitted use billed and actual use in AUMs for the Twin C Allotment between 2004 to 2013, which includes the 2008 and 2012 monitoring years, is presented in Table 7 below. One AUM is the amount of forage necessary for the sustenance of one cow or its equivalent for a period of one month.

Table 7. Billed/Actual Use of Twin C Allotment

Grazing Fee Year	Permitted use AUMs	Actual AUMs*	% of Permitted use Used
2004	1,920	1,598	83%
2005	1,920	1,483	77%
2006	1,920	1,920	100%
2007	1,920	1,920	100%
2008	1,920	1,920	100%
2009	1,920	1,824	95%
2010	1,920	1,824	95%
2011	1,920	1,788	93%
2012	1,920	1,920	100%
2013	1,920	1,920	100%

Grazing Fee Year	Permitted use AUMs	Actual AUMs*	% of Permitted use Used
2014	1,920	1,776	92.5%
2015	1,920	1,920	100%
2016	1,920	1,920	100%

*Source: BLM Rangeland Administration System

Land Health Evaluation

Rangeland health assessments were conducted on the Twin C Allotment at four sites in November 2008, November 2013, November 2014, and May 2016 by an interdisciplinary team. Seventeen public land health indicators, as identified in the LHE Report, were used to assess attributes of soil/site stability, hydrologic function, and biotic integrity. The seventeen indicators were ranked according to their departure from the reference conditions that were developed by an interdisciplinary team using the expected historical climax conditions described in the Natural Resource Conservation Service (NRCS) ecological site description as a guideline. The worksheets are on file at the Safford Field Office. Information from long term BLM records were also incorporated when making determinations.

Please refer to Appendix A for the Twin C Allotment LHE Report detailing the rangeland health assessment.

Arizona Land Health Standard 1: Upland Sites

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

Criteria: Signs of accelerated erosion that are none to slight or slight to moderate and are appropriate for this ecological site as indicated by ground cover (litter, rock, vegetative canopy cover, etc.), and signs of erosion. This objective applies to all key areas and their corresponding ecological site. A departure of moderate or greater would not be achieving the standard. A departure of none to slight or slight to moderate is considered achieving the standard.

As disclosed in the LHE Report (Appendix A), the criteria for Standard 1 are being achieved. Standard 1 was analyzed using seven of the seventeen indicators of rangeland health ground cover and erosion conditions, as follows:

- Ground cover
  - Litter
  - Live vegetation (amount and type)
  - Rock
- Erosion:
  - Flow patterns
  - Gullies
  - Rills
- Plant pedestaling

Assessment of current soil conditions based on the above seven indicators on the Twin C Allotment is noted below. Basalt Hills 8-12" p.z. (R041XC301AZ) ecological site, located within River Pasture, was not evaluated because it represents 2% of the allotment, and thus would not be expected to yield significant data to inform a land health evaluation.

Clayey Slopes 12-16" p.z. (R041XC303AZ) Ecological Site

In 2014, there were no rills or gullies, pedestals were uncommon, and terracettes were not observed and rated none to slight. Water flow patterns were what are expected for the site and rated none to slight. Bare ground was rated none to slight. All litter size classes remained in place and measured at none to slight. Soil surface resistance to erosion was rated as none to slight as was soil surface loss. Compaction was not a factor and rated none to slight. This site was rated none to slight.

Limy Slopes 8-12" p.z. (R041XB207AZ) Ecological Site

In 2014, no rills, gullies, wind-scoured blowouts, or pedestals were observed and rated none to slight. Bare ground was rated none to slight. Water flow patterns were discontinuous and very short and rated none to slight. Amount and size of bare ground areas match that expected for the site was rated none to slight. Actual exposed soil areas are small (<2 inches in diameter) and not connected. All liter size classes remained in place. Surface soil is stabilized by rock armor and plant cover/liter. No apparent soil surface loss was observed, and compaction was not a factor. This site was rated none to slight.

Loamy Slopes 16-20" p.z. (R041XA107AZ) Ecological Site

In 2016, the site had no rills. Water flow patterns were at reference condition. No pedestals and/or terracettes were observed. Bare ground was within reference condition at 7-9%. It was noted that this site was heavily armored with rocks. No gullies were observed. Wind-scoured blowouts were not observed. Litter movement was not noticeable. The soil surface is stabilized by rock armor and the soil surface horizon intact. There was no observed soil surface loss or degradation. Compaction was not a factor and not restricting water infiltration or root penetration. This site was rated none to slight.

Volcanic Hills 12-16" p.z., loamy (R041XC323AZ) Ecological Site

In 2016, the site had no rills. Water flow patterns were at reference condition. No pedestals and/or terracettes were observed. Bare ground was rated slight to moderate with percent bare ground falling in the middle of the range 5 to 35%. It was noted that this site was heavily armored with rocks. No gullies were observed. Wind-scoured blowouts were not observed. Litter movement was not noticeable. The soil surface is stabilized by rock armor and the soil surface horizon intact. There was no observed soil surface loss or degradation. Compaction was not a factor and not restricting water infiltration or root penetration. This site was rated none to slight.

Arizona Land Health Standard 2: Riparian Wetland Sites

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

The Gila River is fenced out or inaccessible due to terrain. No other riparian wetland sites are present elsewhere on the Twin C Allotment. Therefore, Standard 2 was not evaluated.

Arizona Land Health Standard 3: Desired Resource Conditions

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

Criteria: Upland plant communities meet, or are making significant progress toward, desired plant community (DPC) objectives. DPC key area objectives are stepped down from the Safford District RMP desired resource conditions to a site-specific level to measure attainment of land use plan's desired future condition goals and multiple use objectives. The DPC objectives established for the Twin C Allotment are:

Desired Resource Conditions for Clayey Slopes 12-16" p.z. (R041XC303AZ) Ecological Site

DPC Key Area Objectives:

- Maintain vegetative community compositions: perennial grasses 23%, shrubs 15% and forbs 58%
- Maintain a minimum of perennial canopy cover for grasses at 40%, 35% for shrubs and 25% for forbs
- Maintain bare ground at less than 10%
- Maintain composition of palatable shrubs at 5 to 10%
- Maintain key perennial grass composition at 20 to 35%

Desired Resource Conditions for Limy Slopes 8-12" p.z. (R041XB207AZ) Ecological Site

DPC Key Area Objectives:

- Maintain vegetative community compositions: perennial grasses 36%, shrubs 35% and forbs 28%
- Maintain a minimum of perennial canopy cover for grasses at 40%, 35% for shrubs and 25% for forbs
- Maintain bare ground at less than 10%
- Maintain composition of palatable shrubs at 5 to 10%
- Maintain key perennial grass composition at 20 to 35%

Desired Resource Conditions for Loamy Slopes 12-16" p.z. (R041XA107AZ) Ecological Site

DPC Key Area Objectives:

- Maintain vegetative community compositions: perennial grasses 30%, shrubs 10% and forbs 5%
- Maintain a minimum of perennial canopy cover for grasses at 40%, 1 to 5% for shrubs and 1 to 5% for forbs
- Maintain bare ground between 15 to 40%
- Maintain composition of palatable shrubs at 3 to 5%

- Maintain key perennial grass composition at 20 to 35%

Desired Resource Conditions for Volcanic Hills 12-16" p.z., loamy (R041XC323AZ) Ecological Site

DPC Key Area Objectives:

- Maintain vegetative community compositions: perennial grasses 30%, shrubs 5% and forbs 3%
- Maintain a minimum of perennial canopy cover for grasses at 15 to 20%, 5 to 10% for shrubs and 5 to 10% for forbs
- Maintain bare ground at less than 35%
- Maintain composition of palatable shrubs at 3 to 5 %
- Maintain key perennial grass composition at 20 to 35 %

The criteria for Standard 3 are being met. The ecological sites were within the reference state but are not in HCPC but have transitioned into the native grass, forb, half-shrub community with succulents becoming more dominant. Productive and diverse upland plant communities of native species exist and are being maintained at levels identified in the DPC objectives.

3.2.4 Wildlife Resources/Special Status and Threatened and Endangered Species

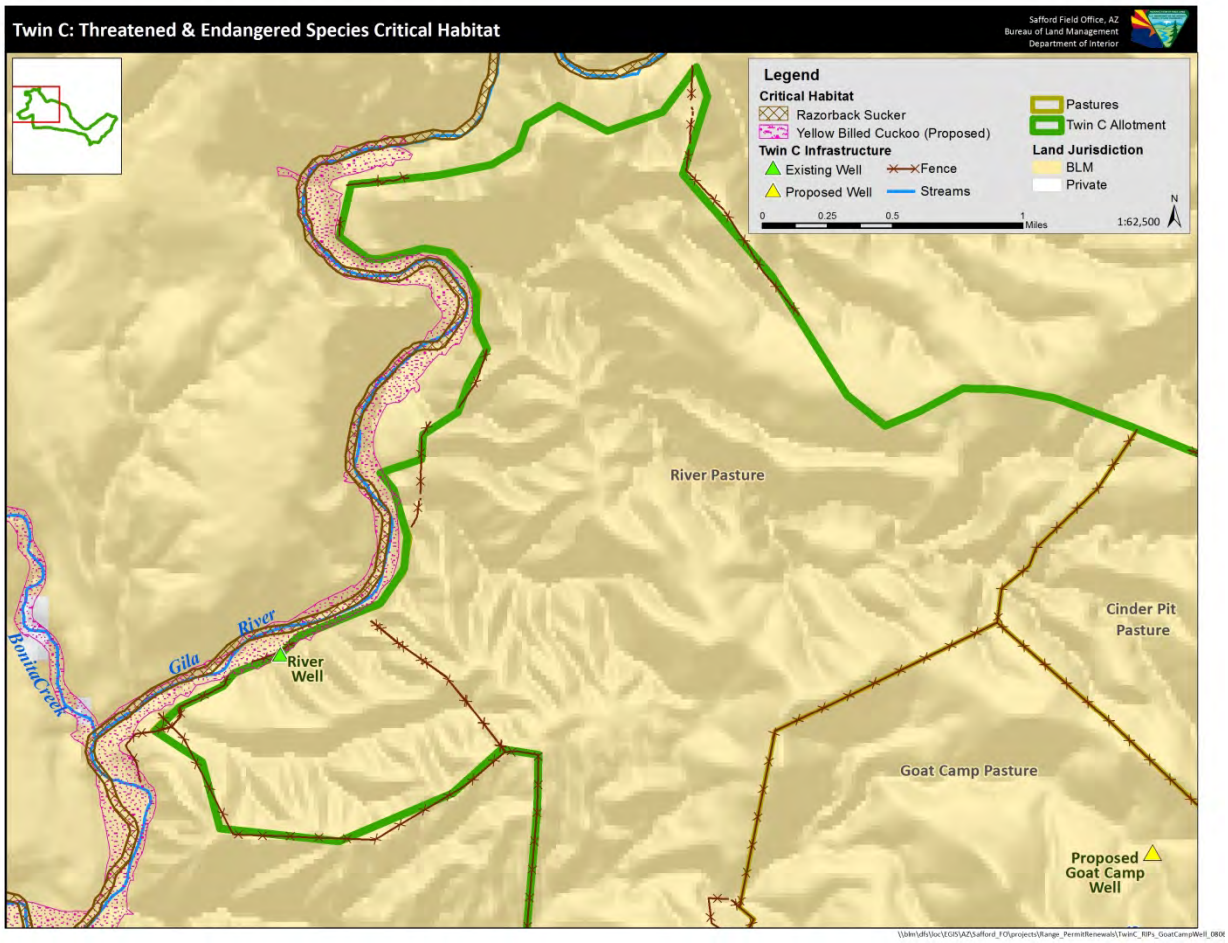
This section discusses the wildlife resources in and around the Twin C Allotment, including Threatened and Endangered Species, Birds of Conservation Concern, Special Status Species, and Game Species.

Threatened and Endangered Species

An updated query of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation system (IPaC) was completed on May 10, 2016 for the Twin C Allotment. Specific species determinations were made and are available in Appendix F of this EA.

Razorback sucker and its designated critical habitat were considered under the Gila District Livestock Grazing Program Biological Opinion (BO #22410-2006-F-0414) with concurrence from the USFWS that grazing on the Twin C Allotment was not likely to adversely affect the species or designated critical habitat. Western yellow-billed cuckoo and its proposed critical habitat were listed or proposed since the 2012 BO was finalized and occur along the Gila River, adjacent to the Twin C Allotment. To ensure compliance with the Endangered Species Act, the BLM completed informal consultation with USFWS for grazing on the Twin C Allotment and received concurrence (#02EAAZ00-2016-I-0541) from USFWS (USFWS 2016) that the proposed permit renewal and operation and maintenance of associated infrastructureare not likely to adversely affect the razorback sucker or yellow-billed cuckoo, nor their designated or proposed critical habitat (Appendix G). Figure 9 indicates these species' designated and proposed habitats in relation to the Twin C Allotment. The allotment boundary fence depicted accounts for the riparian area excluded from livestock grazing resulting from the Gila Box RNCA Management Plan.

Figure 9. Razorback Sucker Designated Critical Habitat and Yellow-billed Cuckoo Proposed Critical Habitat.



Razorback Sucker

The razorback sucker was listed as endangered on October 23, 1991 (56 FR 54957) and critical habitat was designated on March 21, 1994 (59 FR 13374). Critical habitat was designated in 15 reaches of the Colorado River, including the reach in eastern Arizona on the Gila River from the Arizona/New Mexico border to Coolidge Dam (USFWS 1994).

This fish is endemic to the Colorado River basin, occurring historically in all major rivers and stream tributaries. It still occurs in lakes Mohave, Mead, Havasu, and the upper Colorado River. Large numbers of young suckers were released into the Gila River, Bonita Creek, and Eagle Creek throughout the 1980's with no known long-term success.

The biology of this species has been studied extensively and is thoroughly reviewed by Bestgen (1990), USFWS (1993) and Minckley *et al.* (1991). Razorback suckers are long lived. Older individuals in Lake Mohave have been estimated to be over 40 years old. They grow quickly in the first five to seven years, with growth slowing or becoming nonexistent in old individuals. Both sexes are sexually mature by age four. Spawning occurs from late winter through spring

along gravelly shorelines or bays. Evidence suggests they migrated from larger rivers to smaller tributaries prior to spawning.

This species occurs in streams to large rivers with slow backwater areas where it feeds on benthic organisms, detritus, and plankton. Adults occupy a variety of habitats including eddies, back waters, flooded gravel pits, flooded bottoms, flooded mouths of tributaries, slow runs, and sandy riffles (Bestgen 1990 and Minckley *et al*. 1991). It is found in Colorado River reservoirs where adult populations persist until they die of old age. Survival of young in reservoirs is not sufficient to sustain the population (Minckley *et al*. 1991).

Spawning habitat in reservoirs consists of wave swept shores with substrates that range from silt to cobble; areas dominated by gravel are often used for spawning (Bestgen 1990 and Minckley *et al.* 1991). In riverine environments fish spawn with rising water levels and temperature in response to spring flooding. This sucker is known to migrate to specific locations to spawn over rocky runs and gravel bars (Tyus and Karp 1990) or remains in the same area (Bestgen 1990 and Minckley *et al*. 1991). In riverine environments of the upper Colorado River, this fish spawns from April to June (Bestgen 1990). Spawning would likely occur earlier on the Gila River in the Gila District due to warmer water temperatures. Spawning occurs at 9-20ºC (Bestgen 1990).

Because few young razorback suckers are produced in the wild, little is known about the habitat requirements of immature razorback suckers. However, it is known that flooding of bottomland areas that persist long enough to serve as nursery areas for razorback suckers are important to young razorbacks in riverine environments (Modde *et al*. 1996).

An important biological component of the habitat requirements of the sucker are nursery areas relatively free of predatory nonnative fish. Young suckers are known to be preyed upon by catfish and other nonnative species.

In 1981, the State of Arizona and the USFWS entered into a Memorandum of Understanding (MOU) in an attempt to recover the species to a level that would prevent the need for listing. As a result of this MOU, attempts were made to establish new wild populations of razorback suckers throughout Arizona. The Gila River and its tributaries, Bonita and Eagle Creeks, were stocked with hundreds of thousands of small suckers from 1981-1987 (Minckley *et al*. 1991).

Bonita Creek and the Gila River in or near the Gila Box RNCA were stocked with razorback sucker in July of 1985. Bonita Creek received 6,389 fish and the Gila River over 78,000 fish (Brooks 1985). The primary factor for the low success rate of survival for razorback sucker in the lower Colorado River including the Gila River basin is introduced, predatory fish (Brooks 1985, Bestgen 1990). Fish released into the Gila River were rarely recaptured following stocking. Predation rates on razorback have been found to be substantial, severely limiting survival of stocked fish in the Gila River (Brooks 1985, Bestgen 1990). The last observation of razorback sucker in Bonita Creek was made in March of 1991 by a BLM Fisheries Biologist. A large sucker was observed and photographed. The photos were shown to Dr. Minckley, Dr. Marsh and Dr. Douglas, Arizona State University faculty and all experts at identifying native Arizona fishes. They concluded, that the fish was a razorback sucker.

Bonita creek was surveyed in 1991, 1992, 1993, and 2003-2016. None of these surveys revealed the presence of razorback sucker.

In 2001, an extensive survey of the Gila Box was conducted at 12 sites along the Gila River to describe the current composition and distribution of the ichthyofauna. A total of 26,528 fish were collected. No razorback suckers were recorded.

Fish surveys have occurred at a minimum of five sites per year on the Gila River, within the Gila Box, from 2003 through 2015. One of the sites, from 2004-2008, was the Gila River at the confluence of Bonita Creek. Razorback sucker were not detected during any of these surveys.

It is extremely unlikely that any of this species stocked in the 1980's have persisted or reproduced offspring that survived in the Gila River or Bonita Creek over the last 30 years due to predation by catfish and other nonnative predatory fishes, which are abundant throughout the Gila Box RNCA.

Razorback Sucker Critical Habitat

Razorback sucker critical habitat includes the Gila River and its 100-year floodplain. The primary constituent elements (PCEs) determined necessary for survival and recovery of the razorback sucker include, but are not limited to:

PCE 1 – Water

This includes a quantity of water of sufficient quality (*i.e.*, temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage.

PCE 2 – Physical Habitat

This includes areas of the Colorado River system that are inhabited or potentially habitable by fish for use in spawning, nursery, feeding, and rearing, or corridors between these areas. In addition to river channels, these areas also include bottom lands, side channels, secondary channels, oxbows, backwaters, and other areas in the 100-year flood plain, which when inundated provide spawning, nursery, feeding and rearing habitats, or access to these habitats.

PCE 3 – Biological Environment

Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation and competition, although considered normal components of this environment, are out of balance due to introduced nonnative fish species in many areas.

Yellow-billed Cuckoo

The Western distinct population segment (DPS) of the yellow-billed cuckoo (*Coccyzus americanus*) was listed as a threatened species on October 3, 2014 (USFWS 2014a). The proposed rule designating critical habitat was published on August 15, 2014 (USFWS 2014b). The western yellow-billed cuckoo was formerly widespread and locally common in California,

Arizona, New Mexico, Oregon, and Washington and uncommon along the western front of the Rocky Mountains north to British Columbia (American Ornithologists Union 1998, Hughes 1999). The largest remaining breeding areas are in southern and central California, Arizona, New Mexico, and in northwestern Mexico (USFWS 2014a). The current breeding population is low, with estimates of approximately 350 to 495 pairs north of the Mexican border and another 330 to 530 pairs in Mexico for a total of 680 to 1,025 breeding pairs (USFWS 2014a).

Yellow-billed cuckoos may be found in a variety of vegetation types during migration, including coastal scrub, secondary growth woodland, hedgerows, humid lowland forests, and forest edges from sea level to 2,500 meters (8,125 feet) (Hughes 2015). During migration they may utilize smaller riparian patches than those in which they typically nest. This suggests that the habitat needs of the yellow-billed cuckoo during migration are not as restricted as their habitat needs when nesting and tending young.

Yellow-billed cuckoos feed on large insects and small vertebrates such as tree frogs and lizards (Hughes 1999). The yellow-billed cuckoo breeding season may be timed to coincide with outbreaks of insect species, particularly tent caterpillars (Hughes 2015, USFWS 2014a) or cicadas (Halterman 2009). Foraging typically occurs within the riparian canopy (Hughes 2015) but may occasionally forage in adjacent habitats (Laymon 1980).

Yellow-billed cuckoos breed in dense riparian woodlands comprised with cottonwood, willow, and mesquite (*Prosopis spp.*) (Laymon and Halterman 1989, Hughes 1999). Yellow-billed cuckoo may nest and forage in tamarisk, but there is usually a native riparian tree component within the occupied habitat (Gaines and Laymon 1984, Johnson *et al.* 2008).

Yellow-billed cuckoos reach their breeding range later than most other migratory breeders, often in June (Rosenberg *et al.* 1982). Nesting usually occurs between late June and late July, but can begin as early as late May and continue until late September (Hughes 1999).

The primary threat to the western yellow-billed cuckoo is loss or fragmentation of high-quality riparian habitat suitable for nesting (Corman and Wise-Gervais 2005). Habitat loss and degradation from several interrelated factors include alteration of flows in rivers and streams, encroachment into the floodplain from agricultural and other development activities, stream channelization and stabilization, diversion of surface and ground water for agricultural and municipal purposes, livestock grazing, wildfire, and establishment of nonnative vegetation, drought, and prey scarcity due to pesticides (USFWS 2014c).

Yellow-billed cuckoo vocalizations range from approximately 433-971 hertz (Hz), with a peak frequency of 676 Hz (Goodwin and Shriver 2010). Audible noise within this frequency range, in proximity to yellow-billed cuckoo, could interfere with communication. In addition to effects of frequency, decibel levels can have a range of effects from hearing damage or permanent threshold shift (>110 dBA), temporary threshold shift (93-110 dBA), masking or communication interference (60-93 dBA), to little or no expected interference at a level that would be considered similar to a quiet suburban area (50-60 dBA) (Dooling and Popper 2007). While it likely varies between species, birds have been shown to be able utilize short-term adaptations to overcome noise masking of up to 10-15 decibels by altering the spectrum,

decibels, timing, and location of calls (Dooling and Popper 2007).

No systematic surveys for yellow-billed cuckoo have been completed within the action area. However, during riparian health assessments on the Gila River and adjacent to the Twin C Allotment, yellow-billed cuckoo were detected once in 2014 and twice in 2015. These detections were single vocalizations during one day so occupancy or nesting cannot be determined.

Yellow-billed Cuckoo Proposed Critical Habitat

Proposed critical habitat for yellow-billed cuckoo near the Twin C Allotment falls within Unit 24: AZ–16 Bonita Creek; Graham County. This unit is a 6 mile-long continuous segment of the Gila River that includes a continuous segment of Bonita Creek. Approximately 101 acres, or 11 percent, of this proposed unit are privately owned with 828 acres, or 89 percent, in Federal ownership, which includes lands in the Gila Box RNCA managed by BLM. This unit has been consistently occupied by western yellow-billed cuckoos during the breeding season. The site provides a movement corridor between larger habitat patches and contains small to moderate sized patches of tamarisk, a nonnative species that reduces the habitat's value (USFWS 2014a).

The PCEs to sustain the yellow-billed cuckoos' life-history processes including breeding, foraging and dispersing are:

PCE 1 – Riparian Woodlands

Riparian woodlands with mixed willow-cottonwood vegetation, mesquite-thorn forest vegetation, or a combination of these that contain habitat for nesting and foraging in contiguous or nearly contiguous patches that are greater than 325 feet (100 m) in width and 200 acres (81 ha) or more in extent. These habitat patches contain one or more nesting groves, which are generally willow dominated, have above average canopy closure (greater than 70 percent), and have a cooler, more humid environment than the surrounding riparian and upland habitats.

PCE 2 – Adequate Prey Base

Presence of a prey base consisting of large insect fauna (for example, cicadas, caterpillars, katydids, grasshoppers, large beetles, dragonflies) and tree frogs for adults and young in breeding areas during the nesting season and in post-breeding dispersal areas.

PCE 3 – Dynamic Riverine Processes

River systems that are dynamic and provide hydrologic processes that encourage sediment movement and deposits that allow seedling germination and promote plant growth, maintenance, health, and vigor (e.g. lower gradient streams and broad floodplains, elevated subsurface groundwater table, and perennial rivers and streams). This allows habitat to regenerate at regular intervals, leading to riparian vegetation with variously aged patches from young to old. Because the species exists in disjunct breeding populations across a wide geographical and elevational range and is subject to dynamic events, the river segments described below are essential to the conservation of the western yellow-billed cuckoo, because they maintain stability of subpopulations, provide connectivity between populations and habitat, assist in gene flow, and protect against catastrophic loss. The occupied rivers and streams that are proposed for designation contain physical and biological features that are representative of the historic and

geographical distribution of the species. All river segments proposed as western yellow-billed cuckoo critical habitat are within the geographical area occupied by the species as defined by the species' DPS at the time of listing (i.e., currently) and contain the features essential to the conservation of the species. The features essential to the conservation of the species and refined primary constituent elements are present throughout the river segments selected, but the specific quality of riparian habitat for nesting, migration, and foraging will vary in condition and location over time due to plant succession and the dynamic environment in which they exist.

BLM Sensitive Species

The BLM's current list of sensitive species (BLM 2011) was reviewed along with the USFWS Birds of Conservation Concern (USFWS 2008), the Arizona Game and Fish Department Arizona (AGFD) Breeding Bird Atlas (ABBA) and Heritage Data Management System (HDMS) (AGFD 2015) for known occurrences. The results are documented in Appendix A of the attached Land Health Evaluation. Species such as lowland leopard frog, wintering bald eagle, common black-hawk, Sonoran sucker, Sonoran mud turtle and yellow warbler are all associated with the Gila River. Species such as Bell's vireo, Lucy's warbler, phainopepla, northern beardless-tyrannulet are associated with both riparian areas and densely vegetated drainages in the uplands. Canyon towhee inhabit shrub dominated upland areas while golden eagles hunt for prey across the uplands. Livestock on the Twin C Allotment are excluded from accessing the Gila River.

Game Species

Game species on the allotment include Gambel's quail, javelina, mule deer, and white-tail deer. Mountain lion, black bear, desert and Rocky Mountain bighorn sheep occur in limited numbers or only occasionally on the allotment. Shrub dominated upland areas with dispersed thickets offer the best habitat for Gambel's quail. Deer need browse and forbs, dispersed water and thickets for cover. Javelina make use of succulent vegetation such as prickly pear throughout the year with forbs tubers and browse seasonally important, dispersed water and vegetative cover complete their habitat needs. Javelina tend to be associated with available waters and dense vegetation which occur primarily on the lower slopes and valleys of the Twin C Allotment. Livestock waters allow mule deer and javelina to occupy habitats that would only otherwise be available seasonally, when precipitation events create standing water.

3.2.5 Water Quality and Quantity

The Twin C Allotment lies within the Yuma Wash-Gila River watershed (HUC 10, 1504000505) and drains northwest into the Gila River. Immediately downstream of the allotment, the Gila River from Bonita Creek to Yuma Wash (assessment unit #15040005-022) does not meet water quality standards for lead (Arizona Department of Environmental Quality, 2014). There are no public drinking water systems within the allotment and the purpose(s) of the proposed well are livestock watering and wildlife.

The Twin C Allotment lies within the Gila Valley sub basin of the Safford Basin. The sub basin encompasses approximately 1,642 square miles and is bounded by mountains to the northeast (Gila), east (Peloncillo), and southwest (Pinaleno and Santa Teresa). The sub basin is divided into two units or layers known as the younger and older alluvial fill. Ground water occurs in both units and is generally thought to function as a single aquifer system based upon the limited

amount of available information (e.g., water-level data, driller's logs and associated construction date, etc.) Ground water flows from the basin boundaries toward the axis of the valley and then northwest paralleling the Gila River.

The Gila River, which enters the valley from the east and exits to the northwest, is the primary drainage and source of recharge for the basin. Mountain-front recharge particularly along the Pinaleno Mountains can also provide a considerable amount of ground water to the sub basin as can seepage from irrigation canals and underflow from the adjacent San Simon sub basin. Annual precipitation is approximately 8-20 inches per year with most occurring over the months of July, August, and September. Annual precipitation is not a substantial source of recharge.

Water levels in the Gila Valley sub basin have experienced little change since groundwater was developed in the 1950s, with the average discharge from wells at 1,000 gpm (ADWR Securing Arizona's Water Future). The recorded discharge capacity of the three existing wells on the Twin C Allotment are 15 gpm, 4 gpm, and 4 gpm respectively and operate intermittently.

The Twin C Allotment permittee requires and utilizes approximately an estimated 3,500 gallons of water per day, or 1.28 million gallons annually, from the Gila Valley sub basin for livestock grazing and ancillary wildlife use. Refer to Appendix E for methodology. There are no seeps or springs known to occur on the allotment

Chapter 4 – Environmental Effects

This section provides a discussion of the environmental effects, or impacts, as a result of the Proposed Action and Alternatives. Effects are defined as modifications to the existing condition of the environment and/or probable future condition that would be brought about by implementation of one of the alternatives.

Impacts can be direct, indirect, or cumulative. Direct impacts are those effects that are caused by the action or alternative and occur at the same time and place, while indirect impacts are those effects that are caused by or would result from an alternative and are later in time but that are still reasonably certain to occur. Pursuant to 40 CFR 1508.7, cumulative effects are generally assessed using the environmental impacts of past, present, or reasonably foreseeable future actions within the project areas.

The impact analyses in the following sections were based on knowledge of the resources and the site, review of existing literature information provided by experts and other agencies, and professional judgment.

4.1 Environmental Effects of the Proposed Action - Authorize Grazing Permit Renewal & Goat Camp Well Development

4.1.1 Vegetation

Grazing Permit Renewal

Under the Proposed Action, direct impact to vegetation would continue to occur through livestock grazing. The proposed renewal of the grazing lease with all allotment Terms and Conditions allows grazing to continue on the Twin C Allotment in concert with the multiple use and sustainability mandates of the BLM. Standards 1 and 3 are being met for upland health and the desired plant community. Therefore, upland vegetation is able to grow, set seed, build up carbohydrate stores, build root systems, become established, and spread unrestricted when weather conditions permit.

It is anticipated that for upland areas on the Twin C Allotment the rotation grazing system will maintain or improve key forage plant composition with the various functional groups including ground cover, and maintain or improve diversity within the upland ecological sites found on the allotment due to the continuing Mandatory Terms and Conditions and the *Additions to Other Terms and Conditons*.

Goat Camp Well

There would be no direct or indirect impacts to vegetation from the full development of Goat Camp Well, as the well site is in a previously disturbed area. Further, the proposed well would not necessitate additional vegetation disturbance from present conditions.

4.1.2 Soils

Grazing Permit Renewal

Twin C Allotment is dominated by Limpia-Graham-Rock outcrop complex, 9 to 50 percent slopes (63%) with Fallsam-Cabezon-Rock outcrop complex, 9 to 70 percent slopes (18%) and Peloncillo-Orthents-Pinaleno complex, 20 to 90 percent slopes (13%). All the soil complexes possess moderate erosion potential from surface disturbing activities. Livestock trails and congregation areas can cause soil compaction, but these areas are small and isolated relative to the allotment's 10,934 acres. The concurrent two and three pasture rotation systems currently utilized on the Twin C Allotment lessen the potential impact. In the four most recent Land Health Assessments, soil erosion related attributes were rated from moderate (2012) to none to slight (2013, 2014, and 2016). These monitoring studies have indicated that grazing at the full permitted use using the current grazing management systems is sustainable for soils and soil sustainability. Impacts to soils from the Proposed Action would include soil compaction and increased potential for erosion in some isolated areas where livestock congregate (such as watering facilities.) However, with continued proper management using the pasture rotation systems, impacts would not be significant.

Goat Camp Well

There would be less than significant direct impacts to soils from the drilling of Goat Camp Well. The well site is located in a preexisting disturbed area and is in the same location of the previously aborted well drilling. Soil impacts would be limited to disturbance caused by the drilling truck operations, well pipe assembly and installation, clearing of the area where the solar panels will be installed, and construction of the fence around the solar panels. Such activities would not be expected to cause soil erosion. There would be no direct or indirect impact to soils from any of three Goat Camp Well production scenarios discussed in Section 2.1.2 regarding the pumping of the well.

4.1.3 Livestock Grazing

Grazing Permit

The proposed action would affect the livestock grazing permittee on the Twin C Allotment by renewing the term grazing permit. The proposed action would maintain the current level of livestock authorized for the permittee for an additional ten years. This would result in a continued viable ranching operation for the livestock operator and provide some degree of stability for the permittee's livestock operation. Permit renewal would also meet the purpose and need for action identified in Chapter 1 of this EA – to provide for livestock grazing opportunities on public lands where consistent with meeting management objectives, including the Arizona Standards for Rangeland Health and Guidelines for Livestock Grazing Management and the Safford RMP and to respond to applications to fully process and renew permits to graze livestock on public land.

With implementation of the Proposed Action, there would be no changes in livestock grazing on the Twin C Allotment from current authorized management. All Mandatory Terms and Conditions would remain the same as the previous ten years and the permit would be re-issued for another ten years. The *Deletions to Other Terms and Conditions* and *Additions to Other*

Terms and Conditions as described in Section 2.1.1 would be implemented, which would administratively convey requirements regarding livestock use and management on public land managed by the BLM. The livestock utilization at key areas on the allotment is at or below light use (21-40%). This indicates current water placement and livestock distribution is supporting current livestock use levels. The most recent land health assessments (2012, 2013, 2014, and 2016) documented in the Twin C Allotment LHE Report determined that the allotment is obtaining Standards 1 and 3 of the Arizona Standards for Rangeland Health, under the terms and conditions of the renewed grazing permit. Per the Arizona Standards for Rangeland Health, the Twin C Allotment would continue to be monitored to ensure management objectives and Rangeland Health Standards continue to be achieved.

Goat Camp Well

The three well production scenarios listed in Section 2.1.2, irrespective of well source, would not impact grazing management on the Twin C Allotment differently in terms of AUMs, number of watering facilities (troughs, storage tanks), the total amount of water pumped, or livestock distribution. The existing livestock watering facilities would be supplied at the existing levels. If the Goat Camp Well is productive, the BLM would be the registered well owner and would enter into a cooperative range improvement agreement that specifies the permittee's responsibility for use and maintenance.

4.1.4 Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species

Grazing Permit

Threatened and Endangered Species

Razorback Sucker and Designated Critical Habitat

Watershed effects from livestock management within the watershed of the Gila River will continue to occur from livestock management upslope of the river (e.g., destruction of crypto biotic crusts, increased soil erosion, sedimentation, and increased runoff). These effects are negligible due to management to meet the upland health standards. The River Well pump extracts up to an estimated 908,800 gallons of water per year or approximately 0.003853 cubic feet per second (cfs). BLM, in concurrence with USFWS, has determined that the effect of this amount of water pumping from the alluvial groundwater adjacent to the Gila River will be insignificant to razorback sucker and its designated critical habitat.

Yellow-billed Cuckoo and Proposed Critical Habitat

Operation of the River Well would continue to cause occasional short-term disturbance to yellow-billed cuckoo, which may be foraging among the nearby mesquite trees, due to human disturbance while attending to the well's pump and noise produced during intermittent operations. This affect is fleeting and insignificant. Additionally, the River Well pump extracts up to an estimated 908,800 gallons of water per year, or approximately 0.003853 cubic feet per second (cfs). This amount of water pumped form the alluvial groundwater adjacent to the Gila River will not appreciably affect yellow-billed cuckoo critical habitat, as determined by the BLM with concurrence by USFWS.

Grazing of the uplands adjacent to the Gila River may alter and reduce prey availability for

foraging yellow-billed cuckoo in the uplands. The areas where influences on insect populations would be highest from grazing are in areas where livestock grazing is the highest within one mile of the Gila River. Given that the majority of yellow-billed cuckoo foraging is expected to occur along the riparian area and mesquite bosques of the Gila Box RNCA where grazing is excluded and that the allotment is meeting upland health standards for the ecological sites, BLM has determined in concurrence with USFWS that the effects of grazing on the Twin C Allotment on food availability would be insignificant.

BLM Sensitive Species

The BLM's current list of sensitive species (BLM 2011) was reviewed along with the USFWS Birds of Conservation Concern (USFWS 2008), the Arizona Game and Fish Department Arizona (AGFD) Breeding Bird Atlas (ABBA) and Heritage Data Management System (HDMS) (AGFD 2015) for known occurrences (Appendix F). Species such as lowland leopard frog, bald eagle, common black-hawk, Sonoran sucker, Sonoran mud turtle and yellow warbler are all associated with the Gila River. Species such as Bell's vireo, Lucy's warbler, phainopepla, northern beardless-tyrannulet are associated with both riparian areas and densely vegetated drainages in the uplands. Canyon towhee inhabit shrub dominated upland areas while golden eagles hunt for prey across the uplands. Livestock on the Twin C Allotment are excluded from accessing the Gila River and the associated riparian corridor. Livestock use and operations are not anticipated to affect golden eagle nesting or foraging due to the distance of infrastructure from potential nest sites and effects of grazing will not impact the ability of golden eagles to hunt over the upland areas. Bald eagles do not breed along the Gila River adjacent to the Twin C allotment and would primarily forage along the river and in nearby lakes and ponds. Livestock grazing on the Twin C Allotment will not interfere with bald eagle foraging. Current vegetation conditions and prey availability are not expected to change with continued livestock use. Therefore, the continuation of livestock use on the Twin C Allotment would not impact BLM sensitive species or USFWS Birds of Conservation Concern beyond current levels.

Game Species

Under the Proposed Action, the Permittee would retain maintenance responsibilities for the range improvements that provide water for game species. There would be no anticipated change in wildlife habitat (water, forage, and cover) from current conditions and therefore no change in wildlife species from current conditions.

Goat Camp Well

Threatened and Endangered Species

Razorback Sucker and Designated Critical Habitat

Drilling of the Goat Camp Well would have no direct or indirect effect to razorback sucker or their critical habitat. If Goat Camp Well produced 15-20 gallons per minute it would likely reduce the water drawn for livestock from the River Well. This could potentially reduce the amount of water removed from the alluvial groundwater adjacent to the Gila River by up to 908,800 gallons per year, or approximately 0.003853 cubic feet per second (cfs). This reduction would be insignificant or immeasurable for effects to razorback sucker and their critical habitat, as determined by the BLM with concurrence by USFWS.

Yellow-billed Cuckoo and Proposed Critical Habitat

Drilling of the Goat Camp Well would have no direct or indirect effect to yellow-billed cuckoo or their proposed critical habitat. If Goat Camp Well produced 15-20 gallons per minute it would likely reduce the water drawn for livestock from the River Well, the number of visits to turn the well on and off, and the time the pump was run. This would be a small benefit to yellow-billed cuckoo due to the reduced human and mechanical noise disturbances. If the Goat Camp Well produces less than 15 gallons per minute, the benefits to yellow-billed cuckoo would be reduced proportionally to the amount of water needed from the River Well to support livestock operations on the Twin C Allotment.

BLM Sensitive Species

The current list of BLM sensitive species (BLM 2011) was reviewed along with the USFWS Birds of Conservation Concern (USFWS 2008), the Arizona Game and Fish Department Arizona (AGFD) Breeding Bird Atlas (ABBA) and Heritage Data Management System (HDMS) (AGFD 2015) for known occurrences (Appendix F). Species such as lowland leopard frog, bald eagle, common black-hawk, Sonoran sucker, Sonoran mud turtle and yellow warbler are all associated with the Gila River. Species such as Bell's vireo, Lucy's warbler, phainopepla, northern beardless-tyrannulet are associated with both riparian areas and densely vegetated drainages in the uplands. Canyon towhee inhabit shrub dominated upland areas while golden eagles hunt for prey across the uplands. Livestock on the Twin C Allotment are excluded from accessing the Gila River and riparian area. Continued grazing would not result in significant effects.

Golden and bald eagles are associated with the Gila River and river canyon walls three miles away and the Black Hills located four miles away from the proposed well site. Both species are wide ranging and could fly over the project site during operations. Well drilling and pump installation will be over a short period of time and will not impact these species as it will not disturb nests or alter prey availability. Migratory birds of numerous species are common throughout the area. There are no habitat features at the proposed well site that would concentrate nesting or roosting. Completion of the Goat Camp Well would not directly impact individuals, habitat or nests. A few individual birds in close vicinity to the project site would be displaced and others would avoid the area during drilling activities. This impact is temporary, since it is expected to occur for a maximum of four weeks. This impact is lessened since drilling operations would only occur during daylight hours. Birds, as noted for wildlife in general, would not have access to water at the site during short term drilling operations. Therefore, potential impacts would be less than significant.

Game Species

There would be temporary direct impacts to wildlife from the noise and human activity associated with the drilling action. Wildlife would be displaced from and avoid the project site for up to four weeks. This impact would be lessened due to the fact that drilling activities would be limited to daylight hours.

The effect on game species habitat would be minimal and short term. The ground disturbance would be at the small temporary drill pad (approximately 0.10 acre), which has been previously disturbed. The impact to wildlife and their habitat would be negligible. The drill pad area would be expected to recover in the short term (less than 10 years). Therefore, potential impacts to

game species from the drilling of Goat Camp Well would be less than significant.

4.1.5 Water Quality and Quantity

Grazing Permit

There would be no impact from the Proposed Action of renewing the grazing permit on water quality. Livestock have no physical access to the Gila River and associated riparian area due to fencing and terrain, and the Twin C Allotment is void any known seeps or springs. Administratively, livestock grazing within the riparian area of the Gila Box RNCA is deferred. However, the *Additions to Other Terms and Conditions* would formally convey this requirement. As such, livestock would not have an opportunity to introduce contaminants or sediments to the Gila River. Therefore, water quality would be unaffected by grazing on the Twin C Allotment.

Under the Proposed Action, no changes to the Mandatory Terms and Conditions are proposed. Additional livestock watering locations are not proposed.Therefore, demands on water quantity would be unchanged.

Goat Camp Well

There is no expectation that the construction and operation of the proposed Goat Camp Well would alter either surface or subsurface water quality.

The potential impact of Goat Camp Well on underground hydrology and connectivity to the Gila River has been assessed by BLM Hydrogeologist Paul L. Summers, who summarized in a Declaration (Appendix D), that "the proposed well being drilled for the Twin C range allotment located about 3 miles east of the Gila River will not have an impact on flow in the Gila River for several reasons" (BLM 2011):

- The planned maximum pumping rate of the well (20 gallons per minute) is not sufficient to create a cone of depression large enough to extend out three miles to intercept flow in the river.
- Due to geological conditions, it is likely that the well would be completed above the level of the river in the volcanic rocks [as anticipated], in which case there would not be a hydraulic connection to the river.
- The intermittent pumping schedule would allow the aquifer to recover, limiting the growth of the cone of depression in the aquifer, which means the cone of depression would not extend to the Gila River.
- Short pumping durations and low pumping rates do not produce a far reaching cone of depression.
- Even if the well is completed at or near the level of the river, the pumping rate would not be sufficient to impact the river, because the cone of depression would not extend to the river.

If the proposed Goat Camp Well is able to produce greater than or equal to 15-20 gallons per minute, then it would become the primary perennial water source for the allotment's River,

Cinder Pit, and Goat Camp pastures. Use of River Well would be significantly reduced or eliminated, thus allowing for the approximate 908,800 gallons per year of alluvial groundwater adjacent to the Gila River to remain. Quantity of water supplied in total to the Twin C Allotment would remain the same; therefore, there would not be any impacts to water levels of the Gila Valley sub basin.

If the Goat Camp Well is productive but producing less than 15-20 gallons per minute, then it would supplement River Well production. Some amount of water would be returned to the alluvial groundwater supply adjacent to the Gila River. However, the quantity of water supplied to the Twin C Allotment would remain the same. Therefore, there would not be any impacts to water levels of the Gila Valley sub basin.

If the Goat Camp Well produces no water, then the permittee will continue to utilize the River Well as the source for the existing water facilities. However, the quantity of water supplied to the Twin C Allotment in total would remain the same. Therefore, there would not be any impacts to water levels of the Gila Valley sub basin.

Irrespective of the production capacity, Goat Camp Well development would not increase the amount of water to be used for the allotment's existing water infrastructure as there would be no changes to grazing management practices nor any additional livestock watering locations implemented.

4.1.6 Monitoring

Grazing Permit

BLM resource specialists would continue to periodically monitor and complete compliance inspections on the allotment over the 10-year term of the grazing permit to ensure that the fundamentals or conditions of rangeland health are being achieved, in accordance with 43 CFR 4180. If monitoring and/or inspections indicate that desired resource conditions are not being achieved, and current livestock grazing practices are causing non-attainment of land health standards and other multiple use objectives, the permitted use and/or grazing practice for the allotment would be modified in consultation and coordination with all stakeholders and interested publics.

4.2 Environmental Effects of Alternative 1: No Action

4.2.1 Vegetation

The No Action alternative would impact vegetation as would authorizing the permit renewal as described in Section 4.1.1. Drilling of the Goat Camp Well would not be authorized. The River Well would continue to be utilized as the primary perennial water source for the allotment's western pastures' watering facilities. Neither abandoning the incomplete Goat Camp Well nor continued use of River Well would result in any direct or indirect effects to vegetation.

4.2.2 Soils

The No Action alternative would impact soils as described in Section 4.1.2 for the authorization

of the grazing permit renewal. Drilling of the Goat Camp Well would not be authorized. The River Well would continue to be utilized as the primary perennial water source for the allotment's western pastures' watering facilities. Neither abandoning the incomplete Goat Camp Well nor continued use of River Well would result in any direct or indirect effects to soils.

4.2.3 Livestock Grazing

The No Action alternative would impact livestock grazing as described in Section 4.1.3 for the authorization of the grazing permit renewal. However, both the *Deletions from Other Terms and Conditions* and *Additions to Other Terms and Conditions* would not be implemented. The exception is that the term incorporating P.L.108-108 in the Other Terms and Conditions would continue to be deleted it is no longer applicable as an outcome of this NEPA process, which "completes processing of this permit […] in compliance with all applicable laws and regulations, at which time this permit […] may be canceled, suspended, or modified, in whole or in part, to meet the requirements of such applicable laws and regulations."Therefore, the administrative requirements identified in Section 2.1.1 regarding livestock use and management on public land managed by the BLM would not be formally conveyed. Drilling of Goat Camp Well would not be authorized. River Well would continue to be utilized as the primary perennial water source for livestock on the the allotment's western pastures. Current livestock management on the Twin C Allotment would continue.

4.2.4 Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species

The No Action alternative would impact wildlife as described in Section 4.1.4 for the authorization of the grazing permit renewal. Drilling of the Goat Camp Well would not be authorized.

Threatened and Endangered Species

Razorback Sucker and Designated Critical Habitat

The No Action alternative would have the same effect on razorback sucker and their designated critical habitat as described in Section 4.1.4 for the authorization of the grazing permit renewal.

Yellow-billed Cuckoo and Proposed Critical Habitat

The No Action alternative would have the same effect on yellow-billed cuckoo and their proposed critical habitat as described in Section 4.1.4 for the authorization of the grazing permit renewal.

BLM Sensitive Species

The No Action alternative would have the same effect on BLM sensitive species as described in Section 4.1.4. for the authorization of the grazing permit renewal. Installation of wildlife escape ramps on livestock waters within the *Additions to Other Terms and Conditions* would not be implemented. BLM would be responsible for the installation and maintenance of wildlife escape ramps in order to comply with requirements of multiple use management per FLPMA.

Game Species

The No Action alternative would have the same effect on game species and their habitat as described in Section 4.1.4 for the authorization of the grazing permit renewal.

4.2.5 Water Quality and Quantity

The No Action alternative would impact livestock grazing as described in Section 4.1.5 for the authorization of the grazing permit renewal. Drilling of Goat Camp Well would not be authorized. The River Well would continue to be utilized as the primary perennial water source for the allotment's western pastures' watering facilities. Neither abandoning the incomplete Goat Camp Well nor continued use of River Well would result in any direct or indirect effects to water quality or quantity.

4.3 Environmental Effects of Alternative 2: Authorize Grazing Permit Renewal Only

4.3.1 Vegetation

Alternative 2 would impact vegetation as would authorizing the permit renewal as described in Section 4.1.1. Drilling of the Goat Camp Well would not be authorized. River Well would continue to be utilized as the primary perennial water source for the allotment's western pastures' watering facilities. Neither abandoning the incomplete Goat Camp Well nor continuing use of River Well would result in any direct or indirect effects to vegetation.

4.3.2 Soils

Alternative 2 would impact soils as described in Section 4.1.2 for the authorization of the grazing permit renewal. Drilling of the Goat Camp Well would not be authorized. River Well would continue to be utilized as the primary perennial water source for the allotment's western pastures' watering facilities. Neither abandoning the incomplete Goat Camp Well nor continuing use of River Well would result in any direct or indirect effects to soils.

4.3.3 Livestock Grazing

Alternative 2 would impact livestock grazing as described in Section 4.1.3 for the authorization of the grazing permit renewal. Drilling of Goat Camp Well would not be authorized. River Well would continue to be utilized as the primary perennial water source for the allotment's western pastures' livestock and current livestock management on the Twin C Allotment would continue.

4.3.4 Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species

Threatened and Endangered Species

Razorback Sucker and Designated Critical Habitat

Alternative 2 would have the same effect on razorback sucker and their designated critical habitat as described in Section 4.1.4 for the authorization of the grazing permit renewal.

Yellow-billed Cuckoo and Proposed Critical Habitat

Alternative 2 would have the same effect on yellow-billed cuckoo and their proposed critical

habitat as described in Section 4.1.4 for the authorization of the grazing permit renewal.

BLM Sensitive Species

Alternative 2 would have the same effect on BLM sensitive species as described in Section 4.1.4 for the authorization of the grazing permit renewal. Installation and maintenance of wildlife escape ramps would be conveyed to the permittee through the terms and conditions of the permit.

Game Species

Alternative 2 would have the same effect on game species and their habitat as described in Section 4.1.4 for the authorization of the grazing permit renewal.

4.3.5 Water Quality and Quantity

Alternative 2 would impact water quality and quantity as described in Section 4.1.5 for the authorization of the grazing permit renewal. Drilling of Goat Camp Well would not be authorized. River Well would continue to be utilized as the primary perennial water source for the allotment's western pastures' watering facilities. Neither abandoning the incomplete Goat Camp Well nor continuing use of River Well would result in any direct or indirect effects to water quality or quantity.

4.4 Environmental Effects of Alternative 3: No Grazing

4.4.1 Vegetation

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. Grasses would see greater benefits as compared to Alternatives 1 and 2 because the lack of grazing use does not impede their ability to fix a significant amount of carbon, produce seed, and set seed.

However, 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).

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 terms of productivity, vigor, species composition, and formation of new stems compared to the other alternatives.

4.4.2 Soils

Alternative 3 would remove grazing from the Twin C Allotment. Goat Camp Well would not be developed. Decreased erosion potential from increased vegetation densities would be expected to occur as the result of discontinued grazing. This would be anticipated to be especially so in the small and isolated areas of livestock trails and congregation areas around water troughs and stock tanks.

4.4.3 Livestock Grazing

This alternative would drastically affect the permittee by not authorizing livestock grazing on the Twin C Allotment. The inability to graze on the allotment would disrupt the stability of the permittee's livestock operation. To continue operating, the permittee would be required to seek alternate arrangements for their livestock, such as leasing private pastures, state land leases, or obtaining a substitute federal grazing permit.

This alternative would not meet the purpose and need for action identified in Chapter 1 of this EA – to provide for livestock grazing opportunities on public lands where consistent with meeting management objectives, including the Arizona Standards for Rangeland Health and Guidelines for Livestock Grazing Management and the Safford District RMP, and to respond to applications to fully process and renew permits to graze livestock on public land. (See Section 4.2 for a discussion on the vegetative condition on the allotment, including the Arizona Standards for Rangeland Health and Guidelines for Livestock Grazing Management.)

Existing range improvements would not be maintained for livestock usage, although some troughs could be maintained by the BLM for the benefit of wildlife use. As maintenance of range improvements would cease to occur, the deterioration of fences bordering neighboring allotments could result in periodic livestock grazing trespassing over the ten-year term. Further, fencing that currently separates the allotment from the riparian corridor of the Gila Box RNCA could deteriorate. Thus, potential livestock trespassing from neighboring allotments into Gila River and riparian area could result.

4.4.4 Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species

Threatened and Endangered Species

Razorback Sucker and Designated Critical Habitat

Vegetation would gradually revert to a more intact grassland community typical in an ungrazed condition. These communities would include increased standing vegetation and ground cover than what exists in the current grazed condition. The Twin C Allotment would see reduced soil erosion and sediment runoff. However, watershed effects from livestock management occurring on other allotments within the watershed of the Gila River would continue (e.g., destruction of cryptobiotic crusts, increased soil erosion, sedimentation, increased runoff). These effects are negligible due to management to meet the upland health standards. The River Well pump, which extracts up to an estimated 908,800 gallons per year of alluvial groundwater would no longer be used. The effect of this amount of water remaining within the Gila Valley sub basin system will be insignificant to razorback sucker and its designated critical habitat.

Yellow-billed Cuckoo and Proposed Critical Habitat

Operation of the River Well would cease the and the occasional short-term disturbance to yellow-billed cuckoo, which may be foraging among the nearby mesquite trees, due to someone driving to the pump and turning it on and off intermittently would cease. The River Well Pump noise and its potential but minor effects to yellow-billed cuckoo would be eliminated. The estimated 908,800 gallons per year of alluvial groundwater, extracted by the River Well pump would remain within the Gila Valley sub basin system. The effect would be insignificant to yellow-billed cuckoo and its proposed critical habitat.

Grazing in the uplands, adjacent to the Gila River, would cease and prey availability for foraging yellow-billed cuckoo in the uplands would be increased. Given that the majority of yellow-billed cuckoo foraging is expected to occur along the riparian area and mesquite bosques within the Gila Box RNCA where grazing is excluded, the removal of livestock grazing on the Twin C Allotment on food availability for yellow-billed cuckoo is anticipated to be insignificant.

BLM Sensitive Species

Three BLM sensitive species are known to occur in the general vicinity of the proposed project: peregrine falcon (*Falco peregrinus*), golden eagle (*Aquila chrysaetos*), and bald eagle (*Haliaeetus leucocephalus*). These species would not be appreciably affected by the removal of livestock grazing from the Twin C Allotment.

Vegetation would gradually revert to a more intact grassland community typical in an ungrazed condition. These communities would include increased standing vegetation and ground cover than what exists in the current grazed condition. This could support greater numbers of ground-nesting birds, and favor reptiles, amphibians, and small mammals dependent on grassland habitats (Mendelson and Jenning 1992; Bock et al. 1984).

Goat Camp Well would not be completed; therefore there would be no direct impacts to BLM sensitive species or their habitat from drilling the well since there would be no noise and human activity associated with the drilling action, so no temporary direct impacts to BLM sensitive species would occur.

Game Species

Removal of livestock grazing would eliminate potential competition for forage availability for wildlife. Waters would no longer be maintained by the permittee and BLM would have to evaluate whether to maintain them for wildlife, or not. If livestock waters were decommissioned or failed due to lack of maintenance, mule deer distribution would shift in relationship to available waters. Generally, most large mammals require drinking water within approximately three miles. If some troughs would be maintained by the BLM for the benefit of wildlife use, a shift in distribution would be minimized or avoided altogether.

Goat Camp Well would not be completed; therefore there would be no direct impacts to BLM games species or their habitat from drilling the well since there would be no noise and human activity associated with the drilling action, so no temporary direct impacts to game species would occur.

4.4.5 Water Quality and Quantity

With Alternative 3 there would be no use of any wells as a source for livestock water on the Twin C Allotment as livestock grazing would not be an authorized use per an amendment to the Safford District RMP. As such, an estimated annual 1.28 million gallons of water withdrawn from all three Twin C Allotment wells would return to the Gila Valley sub basin. This would have a negligible impact on the area's water quantity. If some troughs were to be maintained by the BLM for the benefit of wildlife use, a minimal quantity of water would still continue to draw from any of the existing wells. However, this would not result in any appreciable effect on water quantity.

4.5 Cumulative Effects

CEQ NEPA regulations define a cumulative impact as, "The impact on the environment which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions." Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

The life of the Proposed Action (authorization of the permit renewal and Goat Camp Well development) would be a period of ten years, which corresponds to the term of the permit renewal. The useful life of the well could extend past this term. This time frame is considered to be most appropriate for considering the incremental effect of actions in the foreseeable future. Many of the past and present actions are expected to persist through this time frame, though the relative intensity of these actions could vary.

The following resource elements would have no cumulative impacts from the Proposed Action or alternatives as they are not found within or adjacent to the Twin C Allotment: Air Quality, ACEC's, Floodplains, Wastes, Cultural Resources, Native American Religious Concerns, Prime Farmland, VRM, Wild and Scenic Rivers, Wilderness Characteristics, Wilderness, Recreation, Socioeconomics, and Threatened, Endangered and Special Status fish or plants.

4.5.1 Past, Present and Reasonably Foreseeable Future Activities

Livestock grazing has been administered within the Twin C Allotment area for over a hundred years and is currently authorized in accordance with the Safford District RMP and grazing permit terms and conditions. Three wells (River, Headquarters, and Lower Berregero) have been drilled and utilized within the Twin C Allotment within approximately the past eighty years, and 70 wells have been drilled in neighboring allotments for many different uses. The wells on the Twin C Allotment were installed within range improvement areas to develop water sources for livestock and wildlife. Aside from the proposed Goat Camp Well, no further well development is anticipated within the allotment at this time. Future activities include the installation of a muffler on the River Well pump as a maintenance action of an existing range improvement. Installation of the muffler would reduce the current noise levels of the diesel pump (60.5-90.5 decibels) by approximately 17 decibels to prevent masking of yellow-billed cuckoo communications within the direct vicinity of the well. The decibel reduction would yield noise levels similar to the natural or ambient noise levels of 55-73.7 decibels. Therefore, continued operation of the River Well pump will not have a significant effect on yellow-billed cuckoo. Other range

improvements, including potential water sources and vegetation treatments, are in the planning stages for other BLM grazing allotments in the watershed including Johnny Creek, Bonita Creek, Zorilla, Turtle Mountain, and Slick Rock. Cattle grazing on BLM allotments would continue.

Additionally, one transmission line bisects the Twin C Allotment from north to south. The Guthrie Peak communication site is located in the far northeast corner of the allotment. Maintenance, including vegetation clearing of intruding brush, occurs immediately surrounding the transmission line and communications site as needed. The Black Hills Backcountry Byway traverses through the Twin C Allotment for five of its forty miles. Road maintenance activities occur regularly, as needed. The allotment is open to recreational activities such as small and big game hunting, hiking, picnicking, birding, horseback riding, primitive camping, and off-highway vehicle driving. Hunting, hiking, birding, and other outdoor activities would likely increase as urban areas become increasingly crowded and rural communities grow.

4.5.2 Cumulative Effects of the Proposed Action

Vegetation

The Proposed Action renews the grazing permit with the same AUMs, pasture rotation system, and watering facilities from the previous ten years, as well as authorizes the development of Goat Camp Well. Grazing management under the Mandatory Terms and Conditions would continue, and the *Deletions to Other Terms and Conditions* and *Additions to Other Terms and Conditions* as described in section 2.1.1 would be implemented. Further, monitoring studies have indicated that the Twin C Allotment is meeting the Arizona Standards for Rangeland Health with grazing at the full permitted use and pasture rotation system. It is expected that the vegetation communities on the Twin C Allotment will continue to be within DPC reference conditions and in a healthy state. With Goat Camp Well, no direct or indirect effects to vegetation are expected due to project location within a previously disturbed area; thus, cumulative effects would not be anticipated. Vegetation treatments for rangeland health and the maintenance of transmission and telecommunication site would occur.

Soils

The Proposed Action (1) renews the grazing permit with the same AUMs, pasture rotation system, and watering facilities from the previous ten years, and (2) authorizes development of Goat Camp Well. Grazing management under the Mandatory Terms and Conditions would continue, and the *Deletions to Other Terms and Conditions* and *Additions to Other Terms and Conditions* as described in Section 2.1.1 would be implemented. Monitoring studies indicate that grazing at the full permitted use and current pasture rotation would allow soils to maintain their current healthy state that is within their reference condition. It is expected that the soils on the Twin C Allotment will continue to be stable. There will be no additional cumulative impacts to soils with the construction of the Goat Camp Well than what was already discussed in Section 4.1.2. Other activities within the allotment and watershed, such as use of upland roads, may contribute slightly to erosion.

Livestock Grazing

The Proposed Action regarding the permit renewal would carry forward the previous ten years of

grazing management per the current Mandatory Terms and Conditions, with the *Deletions to Other Terms and Conditions* and *Additions to Other Terms and Conditions* as described in Section 2.1.1. Livestock grazing at the permitted use AUMs and pasture rotation system are allowing for the resources on the Twin C Allotment to be maintained at a stable state as indicated by the LHE Report. This indicates current water placement and livestock distribution is providing for sufficient livestock utilization. The addition of Goat Camp Well would not result in an impact to grazing management. No other current or reasonably foreseeable activities are expected to impact livestock grazing.

Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species

Because the vegetation communities are not expected to be directly or indirectly changed by the Proposed Action, the quality of wildlife habitat on the Twin C Allotment would continue to support existing wildlife species, including mule deer and javelina. Wildlife, including razor back sucker and yellow-billed cuckoo and their habitats, may be affected by drought, climate change, and other activities occurring within and adjacent to the project area including various dispersed recreational activities. Population growth in nearby communities such as Safford and Morenci could increase the level of off-highway vehicle use in the vicinity of the project area, resulting in increased disturbance to wildlife, particularly ground dwelling species with low mobility and disturbance-related displacement of migratory birds and other avian species. Drought reduces the cover available for small animals including ground nesting birds as well as increased competition for food, such as seeds, which are less abundant during drought and consumed by livestock. Drilling of the Goat Camp Well will cause short term disturbance and possibly displacement of nearby wildlife that are not acclimated to human activities due to the relative remoteness of the site. Livestock grazing levels are carried out at a level (per the Safford District RMP) to ensure that vegetation is maintained for wildlife forage and cover. It is therefore anticipated that the renewal of the grazing permit and the drilling of Goat Camp Well would not result in significant cumulative impacts to wildlife resources when added to other past, present, and reasonably foreseeable activities in the project area.

Water Quality and Quantity

The Proposed Action's permit renewal would not result in anticipated effects to water quality because grazing is excluded from the Gila River and riparian corridor. Water quantity would remain unchanged.

Water quality and quantity impacts are not anticipated with the authorization of Goat Camp Well development. There is likely no hydraulic connection between the proposed Goat Camp Well and the Gila River. It is anticipated that water use would remain at current levels independent of the well source (e.g., the existing River Well and/or proposed Goat Camp Well). In addition, the amount of water used per year relative to Gila Valley sub basin water levels is negligible and would not result in a significant cumulative effect. There would not be any impacts to water levels of the Gila Valley sub basin. The aforementioned (Section 4.5.1) water developments from would be expected to be of the same scale and intensity of the proposed Goat Camp Well; thus the impact on the Gila Valley sub basin water levels would be insignificant.

4.5.3 Cumulative Impacts of Alternative 1: No Action

Vegetation

Under the No Action alternative, cumulative impacts on vegetation pertaining to permit renewal would be the same as described in Section 4.5.2.

Soils

Under the No Action alternative, cumulative impacts on soils pertaining to permit renewal would be the same as described in Section 4.5.2.

Livestock Grazing

The No Action alternative would only issue the permit renewal and would carry forward the previous ten years of management per the Mandatory Terms and Conditions. Livestock grazing at the permitted AUMs and pasture rotation system are allowing for the resources on the Twin C Allotment to be maintained at a stable state as indicated by achievement of Land Health Standards in the LHE Report. No other current or reasonably foreseeable activities are expected to impact livestock grazing.

Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species

Because the vegetation communities are not expected to be changed from current conditions by the continuation of grazing on the Twin C Allotment, the allotment would continue to support existing wildlife species, including mule deer and javelina. Wildlife may be affected by drought, climate change, and other activities occurring within and adjacent to the project area including various dispersed recreational activities. Population growth in nearby communities (such as Safford and Morenci) could increase the level of off-highway vehicle use in the vicinity of the project area, resulting in increased disturbance to wildlife, particularly ground dwelling species with low mobility and disturbance-related displacement of migratory birds and other avian species. Drought reduce the cover available for small animals including ground nesting birds as well as increased competition for food, such as seeds, which are less abundant during drought and consumed by livestock. Livestock grazing levels are done at a level to ensure that maintains wildlife forage and cover. It is therefore anticipated that the renewal of the grazing permit would not result in significant cumulative impacts to wildlife resources when added to other past, present, and reasonably foreseeable activities in the project.

Water Quality and Quantity

Under the No Action alternative, the drilling of Goat Camp Well would not be authorized and the River Well would remain the primary perennial water source for the allotment's western pastures (River, Cinder Pit, and Goat Camp). Grazing at current livestock levels would not alter the water demand. The Twin C Allotment is within the Yuma Wash-Upper Gila River watershed (HUC 10, 1504000505). The amount of water used per year on the Twin C Allotment relative to the Gila Valley sub basin water levels is negligible and would not contribute to a significant cumulative effect. There would not be any impacts to water levels of the Gila Valley sub basin.

4.5.4 Cumulative Impacts of Alternative 2: Authorize Grazing Permit Only

Vegetation

The cumulative impacts of vegetation from Alternative 2 would be the same as described in Section 4.5.1.

Soils

The cumulative impacts of soils from Alternative 2 would be the same as described in Section 4.5.1.

Livestock Grazing

Alternative 2 would authorize the permit renewal only, and would carry forward the previous ten years of grazing management. Livestock grazing at the permitted AUMs and pasture rotation system are allowing for the resources on the Twin C Allotment to be maintained at a stable state as indicated by the LHE Report. This indicates current water placement and livestock distribution is providing for sufficient livestock utilization. No other current or reasonably foreseeable activities are expected to impact livestock grazing.

Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species

Because the vegetation communities are not expected to be changed from current conditions by the continuation of grazing on the Twin C Allotment, the allotment would continue to support existing wildlife species, including mule deer and javelina. Wildlife may be affected by drought, climate change, and other activities occurring within and adjacent to the project area including various dispersed recreational activities. Population growth in nearby communities, such as Safford and Morenci, could increase the level of off-highway vehicle use in the vicinity of the project area, resulting in increased disturbance to wildlife, particularly ground dwelling species with low mobility and disturbance-related displacement of migratory birds and other avian species. Drought reduces the cover available for small animals including ground nesting birds as well as increased competition for food, such as seeds, which are less abundant during drought and consumed by livestock. Livestock grazing levels are done at a level to ensure that wildlife forage and cover are maintained. It is therefore anticipated that the renewal of the grazing permit would not result in significant cumulative impacts to wildlife resources when added to other past, present, and reasonably foreseeable activities in the project

Water Quality and Quantity

In Alternative 2, the drilling of Goat Camp Well would not be authorized and the River Well would remain the primary perennial water source for the three upper pastures (River, Cinder Pit, and Goat Camp). The Twin C Allotment is within the Yuma Wash-Upper Gila River watershed (HUC 10, 1504000505). The amount of water used per year on the Twin C Allotment relative to the Gila Valley sub basin water levels is negligible and would not contribute to a significant cumulative effect. There would not be any impacts to water levels of the Gila Valley sub basin.

4.5.5 Cumulative Impacts of Alternative 3: No Grazing

Vegetation

Under Alterative 3, minor changes in vegetation would be expected over the long term. Removal of livestock, in itself, would not noticeably change some of the vegetation communities. Many would remain shrub dominated. Herbaceous vegetation cover and diversity could change to a small extent over the long term. Increased standing vegetative matter would result in increased cover for some species. No other current or foreseeable activities are anticipated on the allotment or the watershed that would affect vegetation.

Herbaceous vegetation within the Twin C Allotment would remain within its natural range of variation in composition, structure, function, and fuel loading. Utilization of the vegetation communities by wildlife would continue. Both prescribed fire and fire for resource benefit (i.e., naturally occurring ignition) activities can occur in areas that are authorized for grazing management. Alternative 3 would allow the continued use of these fire treatments without having to coordinate grazing rotation/rest periods to allow for adequate herbaceous cover to carry fire. The increased herbaceous cover would allow for the use of fire to meet resource objectives of maintaining the vegetation community within its natural range of variation.

Soils

Under the Alternative 3, minor beneficial changes in soils would likely occur as a result of increased vegetation cover. This allows for more precipitation infiltration and less potential erosion. Any cattle congregation areas would slowly recover. No other current or foreseeable activities are anticipated on the allotment or the watershed that would affect soils.

Livestock Grazing

Alternative 3 would result in the removal of livestock grazing on the Twin C Allotment. Existing range improvements would not be maintained for livestock usage, although some troughs could be maintained by the BLM for the benefit of wildlife use. The permittee would experience negative economic impacts if other lands for grazing could not be obtained and required their grazing operations to cease. However, the sale of the livestock from the Twin C Allotment would not be significant in terms of the overall number of livestock grazing in the area. It is anticipated that the Alternative 3 would not result in significant cumulative impacts to livestock grazing when added to other past, present, and reasonably foreseeable activities in the project area.

Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species

Under Alternative 3, a loss or reduction of livestock waters would result in altered habitat uses, change in distribution, and possibly population numbers. The BLM would evaluate whether to maintain any livestock waters for the benefit of wildlife. Ground cover and vegetative cover would be expected to increase with the removal of livestock grazing. Insects and seed heads, food items for many species of birds, would increase in availability.

Wildlife may be affected by other activities occurring within and adjacent to the project area including various dispersed recreational activities. Off-highway vehicle use in the vicinity of the project area could increase with population growth in nearby communities, resulting in increased disturbance to wildlife, particularly ground dwelling species with low mobility and disturbance-

related displacement of migratory birds and other avian species. It is therefore anticipated that the no action alternative would not result in significant cumulative impacts to wildlife resources when added to other past, present, and reasonably foreseeable activities in the project area.

Water Quality and Quantity

In Alternative 3, the drilling of Goat Camp Well would not be necessary without the authorization of the grazing permit for the Twin C Allotment. In addition, River, Headquarters, and Lower Berregero wells would not draw water as there would be no livestock to support. Therefore, up to 1.28 million gallons of water annually would be returned to the Gila Valley sub basin. This would provide a negligible but positive impact on the Gila Valley sub basin's water quantity.

Chapter 5 – Consultation and Coordination

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Appendix A: Land Health Evaluation Report

United States Department of the Interior

Bureau of Land Management

Safford Field Office

Safford, AZ

Land Health Evaluation Report

Twin C Allotment (No. 40210)

For Grazing Permit Renewal DOI-BLM-G010-2015-0029-EA

July 2016

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List of Acronyms

ACEC	Area of Critical Environmental Concern
APE	Area of Potential Effect
AUM	Animal Unit Month
BLM	Bureau of Land Management
BO	Biological Opinion
CFR	Code of Federal Regulations
DEM	digital elevation model
DPC	desired plant community
DRC	desired resource condition
DWR	dry weight rank
EA	environmental assessment
EIS	environmental impact statement
ESD	Ecological Site Description
FO	Field Office
GIS	geographic information system
GPS	geographic positioning system
HCPC	historical climax plant communities
HMDS	Heritage Data Management System
Hwy	Highway
IPaC	Information for Planning and Conservation system
LHE	Land Health Evaluation
LUP	land use plan
MLRA	Major Land Resource Area
NAD	North American Datum
NAGPRA	National American Graves Protection and Repatriation Act
NEPA	National Environment Policy Act
NHPA	National Historic Preservation Act
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
OHV	off-road highway vehicle
p.z.	precipitation zone
PL	Public Law
RAS	Rangeland Administration System
RAWS	remote automatic weather station

RMP	Resource Management Plan
RNCA	Riparian National Conservation Area
SHPO	State Historic Preservation Office
T&E	threatened and endangered
TC	Twin C [key area identifier]
TCP	Traditional Cultural Property
TEAMS	[USFS] Talent, Expertise, Agility, Mobility, and Simplicity Enterprise Unit
UA	University of Arizona
USC	United States Code
USDA	US Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UTM	Universal Transverse Mercator

1 Introduction

The purpose of this land health evaluation (LHE) report is to determine whether the Arizona Standards for Rangeland Health are being achieved on the Twin C Allotment, or if the standards are not being achieved, to determine if livestock are the causal factor for not achieving or making significant progress towards achieving land health standards. This evaluation is not a decision document but a stand-alone report that clearly records the analysis and interpretation of the available inventory and monitoring data.

The Secretary of the Interior approved Bureau of Land Management (BLM) Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (Standards and Guidelines) in April 1997. The Decision Record, signed by the Arizona BLM State Director (April 1997) provides for full implementation of the Standards and Guidelines in Arizona BLM land use plans (LUPs). Standards and guidelines are implemented by the BLM through terms and conditions of grazing permits, leases, and other authorizations, grazing-related portions of activity plans (including Allotment Management Plans), and through range improvement-related activities.

Land health standards are measurable and attainable goals for the desired condition of the biological resources and physical components/characteristics of desert ecosystems found within the allotment.

The LHE Report ascertains:

1. If standards are being achieved, not achieved, and if significant progress is being made towards achievement of the land health.
2. Where it is ascertained that land health standards are not being achieved, determine whether livestock grazing is a significant factor causing that non-achievement.

This report covers an evaluation period of twelve years (2004-2016). This is a standard evaluation period that provides the BLM the ability to collect an adequate amount of information related to grazing use and environmental factors pertaining to the permit renewal process.

1.1 Consultation, Cooperation and Coordination

A letter to interested publics informing that the Twin C Allotment was being considered for permit renewal was distributed May 2014. Coordination with the Twin C Allotment permittee has been on-going. Data on special status species was obtained from the US Fish and Wildlife Service (USFWS) and the Arizona Game and Fish Department (AGFD).

1.2 Definition of Arizona Standards for Rangeland Health and Guidelines for Grazing Administration

Arizona Standards for Rangeland Health are expressions of levels of physical and biological condition or degree of function required for healthy, sustainable rangelands and defines minimum resource conditions that must be achieved and maintained. Determination of rangeland health is based upon conformance with these standards.

Guidelines consider type and level of grazing use. Guidelines for grazing management are types of methods and practices determined to be appropriate to ensure the standards can be met or that significant progress can be made toward meeting the standard. Guidelines are tools that help managers and permittee's achieve standards. Guidelines are specific to livestock grazing.

Guidelines are best management practices such as grazing systems which could be used to achieve rangeland health standards.

Although the process of developing standards and guidelines applies to grazing administration, present rangeland health is the result of the interaction of many factors in addition to grazing livestock. Other contributing factors may include, but are not limited to, past land uses, land use restrictions, recreation, wildlife, rights-of-way, wild horses and burros, mining, fire, weather, and insects and disease (Arizona Standards and Guidelines, 1997).

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

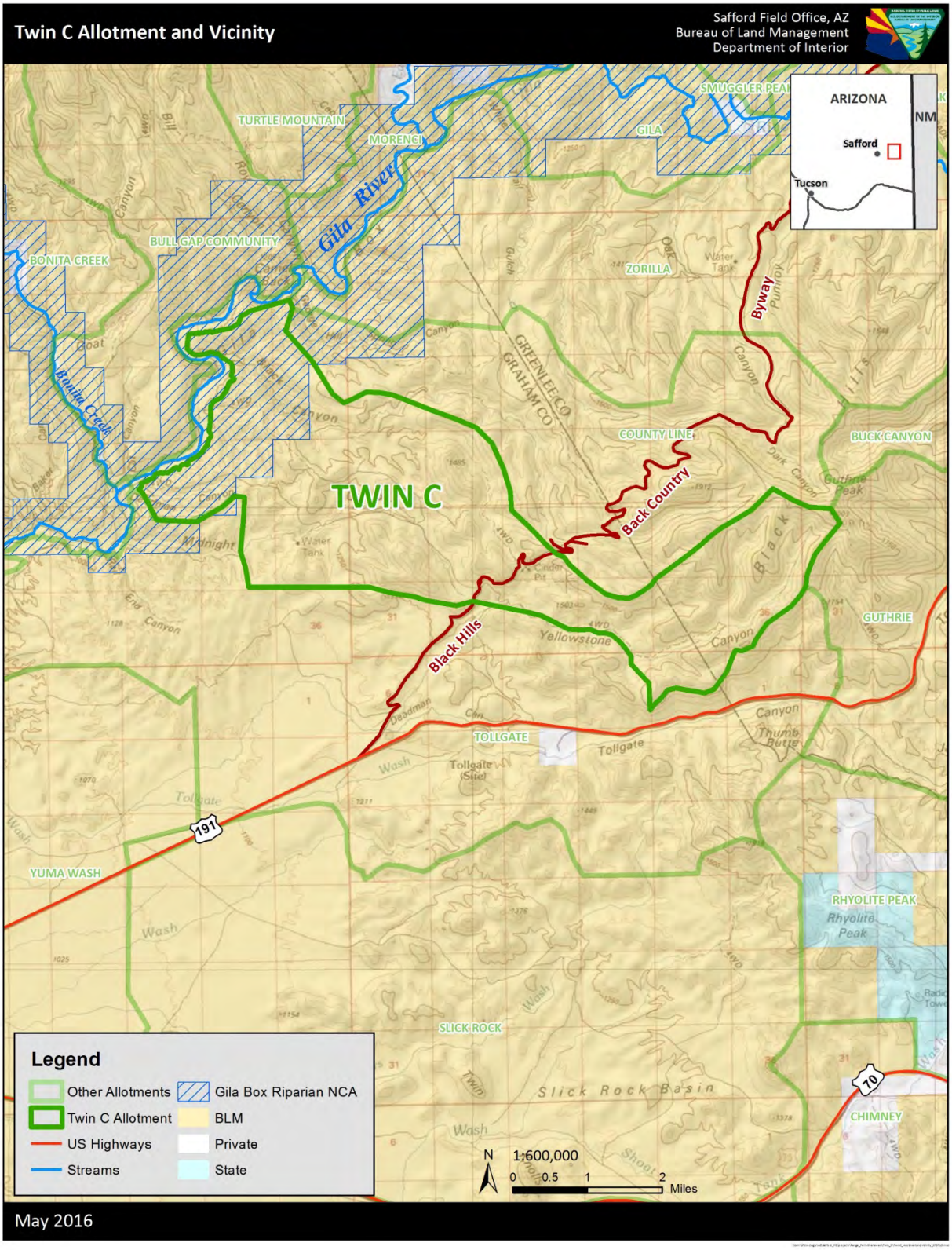
2 Allotment Profile and General Description of Evaluation Area

2.1 Location

The Twin C Allotment No. 40210 is located approximately 15 miles east of Safford, Arizona and approximately 12 miles south of Clifton, Arizona and extends across both Graham and Greenlee counties (Figure 1). The allotment is bounded by the Gila River to the west, the BLM County Line Allotment to the north and Highway 191 to the south. The Black Hills Back Country Byway passes through the allotment. Elevation ranges from 3,400 feet at the Gila River to 6,500 feet south of Guthrie Peak. Geologically, the Twin C Allotment is composed of Tau (upper andesite flows) and Qca (colluvial and alluvial deposits, undivided, Holocene and Pleistocene).

The western portion of the Twin C Allotment falls within the Gila Box Riparian National Conservation Area (RNCA). However, approximately 350 acres of the Twin C Allotment located directly adjacent to the Gila River (riparian corridor) was removed from grazing activity as a result of the Gila Box RNCA designation established by the BLM (EA # AZ-040-08-03 decision dated June 27, 2000). This portion of the allotment is unavailable to grazing for the life of the Gila Box RNCA plan. Due to the small amount of acreage removed from grazing relative to the overall allotment area, no change was made to the permitted Animal Unit Months (AUM) for the Twin C Allotment as a result of the Gila Box RNCA designation.

Figure 1. Vicinity Map



2.2 Physical Description

A physical description of the Twin C Allotment follows.

2.2.1 Surface Land Ownership

The Twin C Allotment is 10,934 acres and is entirely comprised of BLM lands.

2.2.2 Precipitation

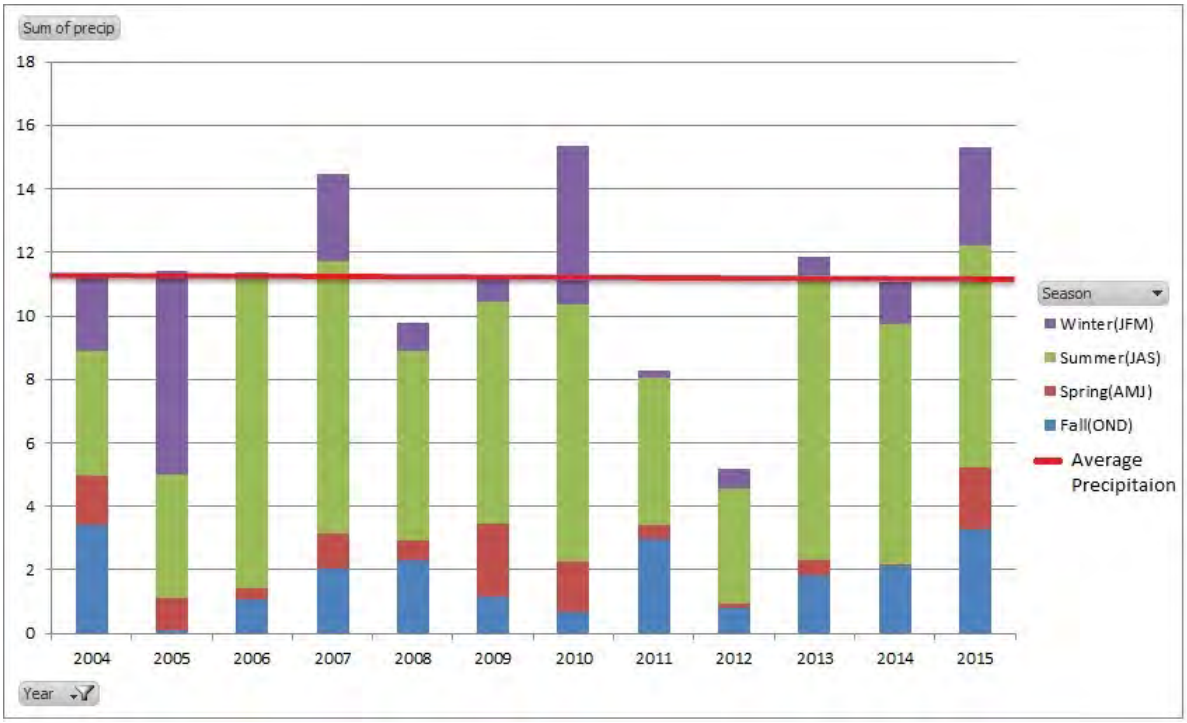
Precipitation data for the Twin C Allotment and vicinity is provided by the Guthrie remote automatic weather station (RAWS). The Guthrie weather station (coordinates 657742 E, 3639912 Nis located in the very northeast corner of the Twin C Allotment. Data measured between 2008 and 2012 indicate that precipitation patterns on the allotment are typically bimodal (Table 1). Summer rainfall typically comes in the form of heavy localized convectional thunderstorms while winter moisture results from general frontal storms. Average annual precipitation for the majority of the Twin C Allotment ranges from 8-20 inches with higher elevations receiving 16-20 inches. During the evaluation period of 2008 to 2015 as depicted in Figure 2, the average precipitation was 11.38 inches. This shows that 4 out of the 12 years were below average but only one year was well below the expected for this area.

Table 1. Quarterly Precipitation (inches) from Guthrie RAWS in Inches

Year	Quarter				Total (inches)
	Fall (Oct – Dec)	Spring (Apr – Jun)	Summer (Jul - Sep)	Winter (Jan – Mar)	
2004	3.43	1.52	3.94	2.41	11.3
2005	0.09	1.04	3.89	6.41	11.43
2006	1.06	0.35	9.8	0.16	11.37
2007	2.06	1.08	8.58	2.73	14.45
2008	2.29	0.66	5.93	0.92	9.8
2009	1.16	2.32	6.98	0.72	11.18
2010	0.68	1.57	8.1	4.99	15.34
2011	2.96	0.45	4.64	0.24	8.29
2012	0.82	0.14	3.6	0.63	5.19
2013	1.83	0.49	8.95	0.57	11.84
2014	2.15	0.04	7.56	1.3	11.05
2015	3.3	1.92	7.00	3.1	15.32
Annual average					**11.3805**

Source: Western Regional Climate Center, Reno, Nevada.

Figure 2. Average Seasonal Precipitation on Twin C Allotment



Source: *ibid.*

2.1.3 Temperatures

The following table shows the minimum, maximum, and average temperature recorded in Clifton, Arizona in the vicinity of the Twin C Allotment between 2004 and 2015.

Table 2. Temperatures in Degrees Fahrenheit on Twin C Allotment

Month	Minimum	Maximum	Average
January	13°F	76°F	47°F
February	19°F	83°F	52°F
March	26°F	88°F	57°F
April	34°F	95°F	66°F
May	43°F	109°F	76°F
June	53°F	110°F	85°F
July	64°F	110°F	87°F
August	62°F	108°F	84°F
September	51°F	103°F	79°F
October	28°F	96°F	68°F
November	16°F	101°F	58°F
December	19°F	73°F	45°F

Source: *ibid.*

2.2.4 Soils

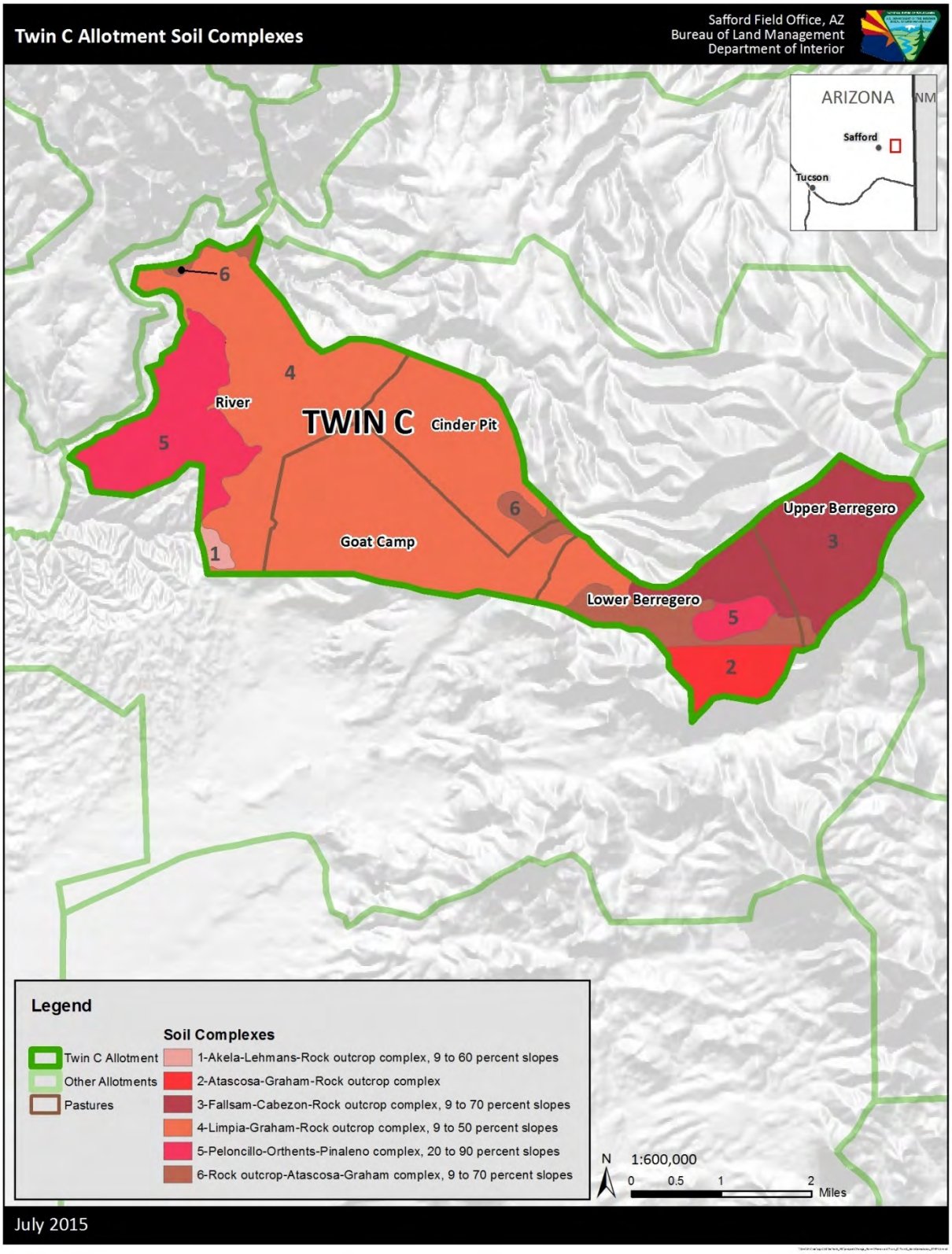
The soil composition on the Twin C Allotment is varied as presented in Table 3 and Figure 3 below.

Table 3. Soil Composition in Percentages on Twin C Allotment

Figure 3 Map Legend Reference #	Soil Name	% Area
1	Akela-Lehmans-Rock outcrop complex, 9 to 60 percent slopes	1%
2	Atascosa-Graham-Rock outcrop complex	4%
3	Fallsam-Cabezon-Rock outcrop complex, 9 to 70 percent slopes	18%
4	Limpia-Graham-Rock outcrop complex, 9 to 50 percent slopes	63%
5	Peloncillo-Orthents-Pinaleno complex, 20 to 90 percent slopes	13%
6	Rock outcrop-Atascosa-Graham complex, 9 to 70 percent slopes	1%

Source: websoilsurvey.nrcs.usda.gov/app/

Figure 3. Soil Complexes on Twin C Allotment



2.2.5 Watershed

The Twin C Allotment lies within the Yuma Wash-Upper Gila River watershed (HUC 10, 1504000505). The Yuma Wash-Upper Gila River watershed is defined by the Gila River drainage area, from just northeast of the San Francisco River south along the Gila River to just west of Tidwell Wash (ADEQ). Land ownership within this watershed is approximately 47% federal, 28% tribal, 15% state, and 10% private. Agriculture is a primary land use in the Safford area. Outside of this area, land use is primarily utilized for recreation in addition to agriculture. A major mining facility is located in the Clifton-Morenci area along the San Francisco River. The Gila Box Riparian National Conservation Area is located in the watershed and has restricted uses.

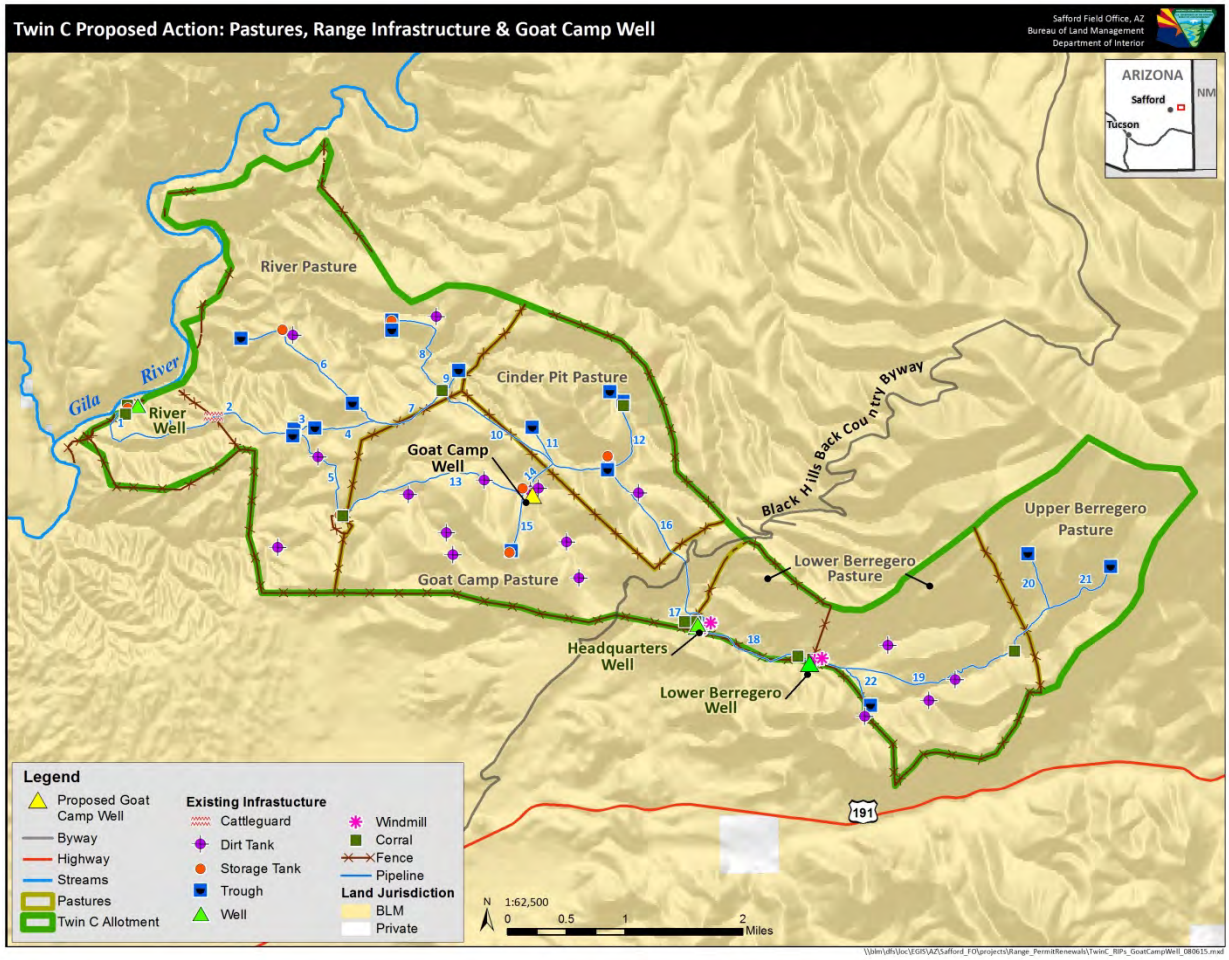
2.2.6 Pastures and Range Improvements

The Twin C Allotment consists of five pastures with allotment boundary fences and cross fencing:

1. River Pasture
2. Cinder Pit Pasture
3. Goat Camp Pasture
4. Lower Berregero
5. Upper Berregero

Each pasture has at least two watering troughs and at least one storage tank. Water for livestock grazing on the River, Cinder Pit, and Goat Camp pastures is pumped from the River Well adjacent to the Gila River. Water for the Lower and Upper Berregero pastures is provided from the Headquarters and the Lower Berregero wells. When livestock are not in a pasture the water supply to that pasture is turned off at the trough or storage tank so that there is less pumping in the overall system. There are several dirt tanks within the Twin C Allotment that are dependent upon annual rainfall. There are no other sources of water on the allotment. Refer to Figure 4 for the allotment's pastures and grazing infrastructure.

Figure 4. Twin C Allotment Pastures and Existing Range Improvements



2.3 Biological Resources

This section discusses the biological resources within the Twin C Allotment.

2.3.1 Major Land Resource Areas

The Twin C Allotment lies near the boundary between the Mogollon Transition (Major Land Resource Area [MLRA 38]) and the Southeastern Arizona Basin and Range Resource Area (MLRA 41). A MLRA is a broad geographic area that is characterized by a particular pattern of soils, climate, water resources, vegetation, and land use. Each MLRA, in which rangeland and forestland occur, is further divided into ecological sites. The Southeastern Arizona Basin and Range Resource Area (sometimes referred to as the Madrean Basin and Range) can be further divided into sub-resource areas:

- 41-1 Mexican Oak-Pine Forest and Oak Savannah
- 41-2 Chihuahuan-Sonoran Desert Shrub
- 41-3 Chihuahuan-Sonoran Semidesert Grasslands

The Twin C Allotment lies primarily in the Chihuahuan-Sonoran Desert Shrub resource area of MLRA 41-2 [8-12" precipitation zone (p.z.)]. Higher elevations occur in the eastern portion of the Twin C Allotment resulting in more precipitation (12- 20").

2.3.2 Ecological Sites within the Twin C Allotment

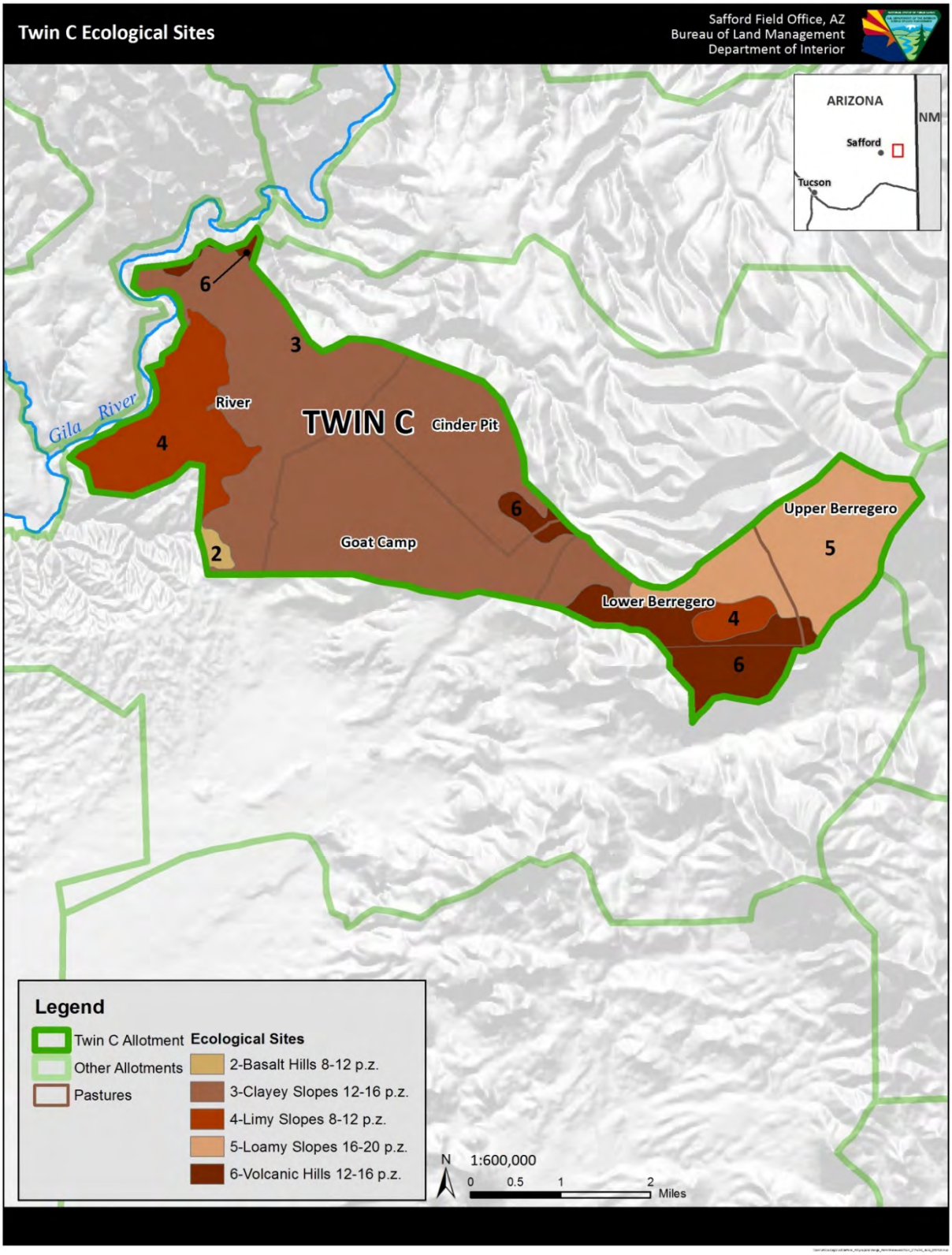
Ecological sites provide a consistent framework for classifying and describing rangeland soils and vegetation thereby delineating land units that share similar capabilities to respond to management activities or disturbance. A summary of the ecological sites present within the Twin C Allotment is provided in Table 4 and Figure 5 below.

Table 4. Ecological Sites Located within Twin C Allotment

Figure 5 Map Legend Reference #	Ecological Site	% Area
2	Basalt Hills 8-12" p.z. (R041XC301AZ)	2%
3	Clayey Slopes 12-16" p.z. (R041XB303AZ)	59%
4	Limy Slopes 8-12" p.z. (R041XB207AZ)	15%
5	Loamy Slopes 16-20" p.z. (R041XA107AZ)	18%
6	Volcanic Hills 12-16" p.z. loamy (R041XC323AZ)	6%

Source: 2006 MRLA Geographic Database, National Resources Conservation Service (NRCS).

Figure 5. Ecological Sites on the Twin C Allotment



The ecological site descriptions (ESD) are developed by the National Resources Conservation Service (NRCS). The ESDs with established key areas on the Twin C Allotment are provided in summary below. Detailed NRCS ESD reports for each ESD are stored and accessed within the Ecological Site Information System (ESIS) available online at https://esis.sc.egov.usda.gov/Welcome/pgReportLocation.aspx?type=ESD.

Historic climax plant community (HCPC), or reference state, is the characteristic plant community that has developed on the site according to the following factors: soils, topography, and climate. These collective factors form the basis of ecological sites which classify rangeland types.

2.3.2.1 Basalt Hills 8-12" p.z. (R041XC301AZ)

This ecological site occurs in the middle elevations of the Madrean Basin and Range province in Southeastern Arizona. It occurs on hill-slopes and ridge-tops. Slope aspect is site differentiating at elevations near land resource area boundaries. Precipitation in this common resource area ranges from 12-16 inches yearly with elevations from 3,600 to 5,000 feet. Soils are shallow.

The HCPC on this ecological site is dominated by warm season perennial grasses and shrubs. The major perennial grasses are well dispersed throughout the plant community. Shrubs are concentrated at the edge of outcrops and along talus slides. The aspect is shrub-dotted grassland.

Grass species found in the Basalt Hills include: black grama (*Bouteloua eriopoda*), sideoats grama (*Bouteloua curtipendula*), cane beardgrass (*Bothriochloa barbinodis*), Arizona cottontop (*Digitaria californica*), and bush muhly (*Muhlenbergia porteri*). Forb species found include: dwarf indian mallow (*Abutilon parvulum*), Arizona snakecotton (*Froelichia arizonica*), brownplume wirelettuce (*Stephanomeria pauciflora*), euphorbia (*Euphorbia* spp.), and American vetch (*Vicia americana*). Shrubs species found include: Whitethorn acaia (*Acacia constricta*), fourwing saltbush (*Atriplex canescens*), orance Indianmallow (*Abutilon incanum*), desert broom (*Baccharis sarothroides*), and desert agave (*Agave deserti*).

2.3.2.2 Clayey Slopes 12-16" p.z. (R041XB303AZ)

This ecological site occurs in the middle elevations of the Madrean Basin and Range province in Southeastern Arizona. It occurs on hill-slopes and ridge-tops. Slope aspect is site differentiating at elevations near land resource area boundaries. Precipitation in this common resource area ranges from 12-16 inches yearly with elevations from 3,600 to 5,000 feet. Soils are moderately deep to deep.

The HCPC on this ecological site is dominated by warm season perennial grasses. Shrubs and perennial forbs are well represented on the site. The major perennial grasses, except tobosa and vine mesquite, are well dispersed throughout the plant community. These two species occur in patches of various sizes that may not be well dispersed over larger areas of the ecological site. The aspect is shrub-dotted grassland.

Grass species found in the Clayey Slopes include: tobosa *(Pleuraphis mutica),* perennial three-awn *(Aristida* spp.*),* sideoats grama (*Bouteloua curtipendula),* bush muhly *(Muhlenbergia porteri),* and black grama *(Bouteloua eriopoda).* Forb species found include: fanpetals *(Sida* spp.*),* globemallow *(Sphaeralcea ambiqua),* leatherweed *(Croton pottsii).* Shrubs species found include: mesquite, whitethorn *(Acacia constricta),* ocotillo (*Fouquieria splendens*), catclaw acacia *(Acacia greggii),* snakeweed *(Gutierrezia sarothrae),* and pale wolfberry *(Lycium*

pallidum). Succulent species found include: cholla *(Cylindropuntia* spp.*)* and prickly pear (*Opuntia* spp.*).*

2.3.2.3 Limy Slopes 8-12" p.z. (R041XB207AZ)

This ecological site occurs in the lowest elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on fan terraces, hill-slopes and ridge-tops. It occurs in the Gila and San Pedro river valleys. Precipitation ranges from 8-12 inches annually, with elevations ranging from 2600 to 4000 feet. Soils are moderately deep to deep.

The HCPC is dominated by creosote bush and whitethorn acacia. Annual grasses and forbs are an important part of the plant community in wet seasons. Perennial grasses are important only on north aspects. Cryptogams are common on this site, often colonizing areas with low covers of gravel and rock.

Grass species found in the Limy Slopes include: perennial three-awn *(Aristida* spp.*),* sideoats grama (*Bouteloua curtipendula),* bush muhly *(Muhlenbergia porteri),* fluffgrass (*Dasyochloa pulchella*), slim tridens (*Tridens muticus*), and black grama *(Bouteloua eriopoda).* Forb species found include but not limited to: desert-holly (*Acourtia nana*), bursage (*Ambrosia* spp.), leatherweed (*Croton pottsii*), and pricklyleaf dogweed (*Thymophylla acerosa*). Shrubs species found include: whitethorn *(Acacia constricta)* and creosotebush (*Larrea tridentata*). Succulent species found include: prickly pear (*Opuntia* spp.*).*

2.3.2.4 Volcanic Hills 12-16" p.z., loamy (R041XC323AZ)

This ecological site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on hill-slopes and ridge-tops. Slope aspect is site differing at elevations near the boundaries of major land resource areas. Precipitation ranges from 12-16 inches annually, with elevations ranging from 3500 to 5500 feet. Soils are shallow.

The plant community historically found on this site is dominated by warm season perennial grasses. Many species of shrubs and succulents are well represented on the site. Larger shrubs are concentrated at the edges of rock outcrops and in canyon bottoms. All the major grass species are well dispersed throughout the plant community. The aspect is shrub dotted grassland.

Grass species found in the Volcanic Hills include but not limited to: cane beardgrass (*Bothriochloa barbinodis*), sideoats grama (*Bouteloua curtipendula*), plains lovegrass (*Eragrostis intermedia*), hairy grama (*Bouteloua hirsuta*), and purple grama *(Bouteloua radicosa*). Forb species found include but not limited to: Lousiana sagewort (*Artemisia ludoyiciana*), slender janusia (*Janusia gracilis*), red and yellow deervetch (*Lotus rigidus*), and perennial rockcress (*Arabis perennans*). Shrubs species found include: false mesquite (*Calliandra eriophylla*), shrubby buckwheat (*Eriogonum wrightii*), and range ratany (*Krameria erecta*). Succulent species found include: prickly pear (*Opuntia* spp.*)* and banana yucca (*Yucca baccata*).

2.3.2.5 Loamy Slopes 16-20 p.z. (R041XA107AZ)

This site occurs in the middle elevations of the Madrean Basin and Range province in southeastern Arizona. It occurs on fan terraces, hill-slopes, ridges, and saddles. Slope aspect is

site differing at elevations near the boundaries of major land resource areas. Precipitation ranges from 16-20 inches annually, with slopes ranging from 4,500 to 5,500 feet. Soils are deep.

The HCPC on this site is dominated by warm season perennial mid-grasses. The major grass species are well dispersed throughout the plant community. Stands of Palmer agave occur in dense patches and are not well dispersed through areas of the site. Several species of low shrubs, cacti and other succulents, and forbs are well represented in this plant community. The aspect is open grassland to savannah. North slopes will often have an open canopy of oaks and/or juniper. South slopes will be agave dotted grassland.

Grass species found in the Loamy Slopes include but not limited to: cane beardgrass (*Bothriochloa barbinodis*), sideoats grama (*Bouteloua curtipendula*), plains lovegrass (*Eragrostis intermedia*), hairy grama (*Bouteloua hirsuta*), and curley mesquite (*Hilaria belangeri).* Forb species found include but not limited to: Lousiana sagewort (*Artemisia ludoyiciana*), Cooley's bundleflower (*Desmanthus cooleyi*), and trailing fleabane (*Erigeron flagellaris*). Shrubs species found include: false mesquite (*Calliandra eriophylla*), shrubby buckwheat (*Eriogonum wrightii*), and prairie acacia (*Acacia angustissima*). Succulent species found include: Palmer agave (*Agave palmeri*) and sacahuista (*Nolina microcarpa*).

2.3.3 Wildlife Resources/Special Status and Threatened and Endangered Species

This section discusses the wildlife resources in and around the Twin C Allotment, including Threatened and Endangered Species, Birds of Conservation Concern, Special Status Species, and Game Species. Refer to Appendix A for a list of species.

2.3.3.1 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation system (IPaC) was completed on May 10, 2016 for the Twin C Allotment. Specific species determinations were made and are in Appendix A. Threatened and endangered species which may be affected by proposed actions on the Twin C Allotment are the razorback sucker and designated critical habitat and Western yellow-billed cuckoo and its proposed critical habitat. Razorback sucker and its designated critical habitat were considered under the Gila District Livestock Grazing Program Biological Opinion (BO #22410-2006-F-0414) with concurrence from the USFWS that grazing on the Twin C Allotment was not likely to adversely affect the species or designated critical habitat. Western yellow-billed cuckoo and its proposed critical habitat were listed or proposed since the 2012 BO was finalized. To ensure compliance with the Endangered Species Act, the BLM completed informal consultation with USFWS for grazing on the Twin C Allotment and received concurrence (#02EAAZ00-2016-I-0541) from USFWS (USFWS 2016).

2.3.3.2 BLM Sensitive Species

The BLM current list of sensitive species (Instruction Memorandum No. AZ-2011-005) was reviewed, as was the USFWS Birds of Conservation Concern 2008 to determine potential species occurrences. These were cross-checked with the Arizona Game and Fish Department, Arizona Breeding Bird Atlas (ABBA) and Heritage Data Management System (HDMS) to determine known occurrences. The results are documented in Appendix A. Species such as lowland leopard frog, bald eagle, common black-hawk, Sonoran sucker, Sonoran mud turtle and yellow

warbler are all associated with the Gila River. Species such as Bell's vireo, Lucy's warbler, phainopepla, northern beardless-tyrannulet are associated with both riparian areas and densely vegetated drainages in the uplands. Canyon towhee inhabit shrub dominated upland areas while golden eagles hunt for prey across the uplands. Livestock on the Twin C Allotment are excluded from accessing the Gila River. Livestock use is not considered to impact the ability of golden eagle to hunt over upland areas. This is not expected to change with continued livestock use.

2.3.3.1 Game Species

Game species on the allotment include Gambel's quail, javelina, mule deer, and white-tail deer. Mountain Lion, black bear and Rocky Mountain bighorn occur in limited numbers or only occasionally on the allotment. Shrub dominated upland areas with dispersed thickets offer the best habitat for quail. Mule deer need browse and forbs, dispersed water and thickets for cover. Javelina make use of succulent vegetation such as prickly pear throughout the year with forbs tubers and browse seasonally important, dispersed water and vegetative cover complete their habitat needs. Livestock waters allow mule deer and javelina to occupy habitats that would only otherwise be available seasonally, when precipitation events create standing water.

2.4 Special Management Areas

The original boundary of the Twin C Allotment stretched to the Gila River. Since the enactment of the Arizona Desert Wilderness Act of 1990 and the subsequent Gila Box RNCA designation, all Twin C livestock are excluded from grazing within the Gila River riparian area.

2.5 Recreation Resources

Dispersed recreation primarily involves small and big game hunting, target shooting, and off-highway vehicle (OHV) operation. In addition, the Black Hills Back Country Byway traverses the Twin C Allotment for a distance of five miles. Adjacent to the allotment is the county-managed Black Hills Rockhound area.

2.6 Cultural Resources

Guidelines 3-7 in the Arizona Standards and Guidelines provides that, "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."

A Class III cultural resources survey was completed on November 21, 2008 by Safford Field Office Archaeologist Daniel L. McGrew (Project No. AZ-410-09-024). This survey was to note the presence of archaeological sites, Traditional Cultural Properties, and Sacred Sites.

Known cultural resources within the Twin C Allotment include 12 historic or archaeological sites, consisting mainly of rocks, lithics, or pottery, the Black Hills Back Country Highway (eligible for listing in the National Register of Historic Places), and an earthen dam constructed by the Civilian Conservation Corps.

3 Grazing Management

This section discusses the grazing history, permitted use, and terms and conditions existing of the current permit.

3.1 Grazing History

Grazing history on the Twin C Allotment is as follows:

- Permitted use from the 1978 Upper Gila – San Simon Grazing Environmental Statement:

  200 Cattle/8 Horses; 2,397 AUMs

- Permitted use per the 1986 Safford FO Grazing Permit Final Decision:

  152 Cattle/8 Horses; 1,920 AUMs

- The permittee has been implementing a deferred pasture rotation system based. This grazing system consists of two concurrent grazing systems on the allotment's five pastures as follows:

  1. A one-herd (113 cattle), three-pasture rotation system that utilizes the western pastures (River, Cinder Pit, and Goat Camp), and
  2. A one-herd (39 cattle, 8 horses), two-pasture rotation system utilizing the eastern pastures (Lower and Upper Berregero.)

  Total livestock on the Twin C Allotment will not exceed the 160 permitted for full permitted use. However, the apportionment of livestock between the two concurrent grazing systems may vary slightly from year to year.

  The annual grazing and resting periods for each system is illustrated in Table 5 below.

Table 5. Annual Grazing and Rest Periods

Three-Pasture Rotation, 1st Year												
Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Cinder Pit			X	X	X	X	X	X	X	X		
Goat Camp	X	X									X	X
River												
Two-Pasture Rotation, 1st Year												
Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Upper Berregero	X	X	X	X	X	X					X	X
Lower Berregero	X	X	X	X	X	X	X	X	X	X	X	X

Three-Pasture Rotation, 2nd Year												
Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Cinder Pit												
Goat Camp			X	X	X	X	X	X	X	X		
River	X	X									X	X
Two-Pasture Rotation, 2nd Year												
Pasture	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Upper Berregero	X	X	X	X	X	X	X	X	X	X	X	X
Lower Berregero	X	X	X	X	X	X					X	X
Three-Pasture Rotation, 3rd Year												
Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Cinder Pit	X	X									X	X
Goat Camp												
River			X	X	X	X	X	X	X	X		

Key: Blank = Rest, X = Grazed

3.2 Mandatory Terms and Conditions for Permitted Use

Grazing use on the Twin C Allotment is in accordance with the terms and conditions of the term permit. A summary of the current permitted use for the allotment is provided in Table 6.

Table 6. Mandatory Terms and Conditions in Twin C Permit

Allotment Name/ Number	Livestock Number/Kind	Grazing Period Begin End	% Public Land	Active Use (AUM)
Twin C (No. 40210)	152 Cattle 8 Horses	3/1 2/28 Yearlong	100	1,824 Cattle 96 Horses

Source: Current Grazing Permit

Existing Other Terms and Conditions:

- In order to improve livestock distribution on the public lands, all salt blocks and/or mineral supplements shall not be placed within a 1/4 mile of any riparian area, wet meadow or watering facility (either permanent or temporary) unless stipulated through a written agreement or decision in accordance with 43 CFR 4130.3-2c.

- 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.
- As a term and condition of this permit you are required to submit a report of actual grazing use made on this allotment for the previous grazing period, March 1 to Feb. 28. Failure to submit such a report by March 1, of this year, may result in suspension or cancellation of the grazing permit.
- In accordance with Sec. 325, Title III, H.R. 2691, Department of the Interior and related agencies Appropriations Act, 2004 (P.L. 108-108), which was enacted on November 10, 2003, this grazing permit or lease is renewed under section 402 of the Federal land Policy and Management Act of 1976, as amended (43 U.S.C. 1752), title III of the Bankhead-Jones Farm Tenant Act (7 U.S.C. 1010 ET SEQ.), or, if applicable, section 510 of the California Desert Protection Act (16 U.S.C. 410AAA-50). In accordance with Public Law 108-108 the terms and conditions contained in the expired or transferred permit or lease shall continue in effect under the renewed permit or lease until such time as the Secretary of the Interior completes processing of this permit or lease in compliance with all applicable laws and regulations, at which time this permit or lease may be canceled, suspended, or modified, in whole or in part, to meet the requirements of such applicable laws and regulations.

4 Objectives

This section is an overview of the Safford FO management objectives that are associated with the allotment per the Safford District RMP, and developed through the Arizona Standards and Guidelines.

4.1 Land Use Plan Management Objectives

The 1991 Safford District RMP, which adopted most of the 1978 Upper Gila-San Simon Grazing Environmental Statement (UG-ES) decisions and resource condition objectives related to grazing, provide for the following management objectives applicable to the Twin C Allotment:

- Grazing Management (GM12) The general objective of the proposed action is to permit livestock to use the harvestable surplus of palatable vegetation–a renewable resource–and thereby produce a usable food product. The proposed livestock management program is based on the multiple-use management concept, which provides for the demands of various resource uses and minimizes the conflicts among those uses or activities. Although the various uses of the rangeland resources can be compatible, competition among uses requires constraints and mitigating measures to realize multiple-use resource management goals. (UG-ES p. 1-6)
- GM32 Proper stocking is an essential principle of range management, which should precede or coincide with the initiation of any grazing management system. With stocking rates in balance with the proposed grazing capacities, utilization of key forage species in the key areas would average about 40 percent over a period of years. At a given stocking rate during years of high forage production (e.g. above normal rainfall) utilization in the use pasture might be as low as 20 percent. During years of low forage production utilization could be as high as 60 percent. (UG-ES p. 1-9)
- GM53 Construction of range improvements would be necessary to implement and operate the various types of grazing management included in the proposal. Construction of adequate water facilities, for example, would be necessary in areas designated for livestock grazing. (UG-ES p. 1-25)
- Vegetation Management (VM03) Ecological Site Inventories will be combined with the desired plant community concept to develop management objectives for activity plans as they are written or revised. (RMP p. 45)
- VM04 Public lands will be managed to preserve and enhance the occurrences of special status species and to achieve the eventual delisting of threatened and endangered species. (RMP p. 45)
- Wildlife/Fisheries (WF02) District management will focus on priority species and their associated habitats to maintain or enhance population levels. Threatened and endangered, proposed, candidate, State-listed and other special status species will be managed to enhance or maintain district population levels or in accordance with established inter/intra-agency management plans. District management efforts will be directed towards the enhancement of biological diversity. (UG-ES ROD Part I page 6)

- WF14 Manage habitat for optimum wildlife populations, based on ecological conditions, taking into consideration local, yearly climatic variations. BLM will follow Arizona Game and Fish Department's five-year strategic plans for the various species and will assist the Department in accomplishing its goals for the various species. (RMP p. 34)
- Objectives from UG-ES (Black Canyon Allotment #5021, identified currently as the Twin C Allotment No. 40210):
  - Increase wildlife cover by establishing 150 to 200 cottonwood trees per mile along Gila River bottom.
  - In 15 years reduce the present [soil surface factor] SSF from 41 to 36. Increase plant density from 10% to 20% in 15 years.
  - Increase forage available to livestock from 60 [cattle year-long] CYLs to 100 CYLs in 15 years.

4.2 Allotment-Specific Objectives

The Twin C Allotment is subject to the following resource condition objectives as established in the Arizona Standards for Rangeland Health:

Standard 1 - Upland Sites

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

Standard 2 - Riparian-Wetland 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.

4.3 Key Area Objectives

In grazing administration, key areas are indicator sites used to reflect trends in rangeland health on a larger scale as a result of on-the-ground management actions. A key area is a relatively small portion of a range selected because of its location, use or grazing value as a monitoring point for grazing use. It is assumed that key areas, when properly selected, reflect the overall acceptability of current management over the range and serve as an indicative sample of range conditions, trend or degree of use.

Key areas are representative of the grazing use occurring on the allotment. A key area should be a representative sample of a large stratum, such as a pasture, grazing allotment, wildlife habitat area, herd management area, or watershed area depending on the management objectives being addressed by the study. Key areas are located in a single ecological site to measure ecosystem dynamics.

Key species are generally an important component of a plant community as they serve as

indicators of change and may or may not be forage species. Refer to Table 7 and Figure 6 for key areas on the Twin C Allotment. Addressed in this LHE Report are the results from the key area monitoring by University of Arizona (UA) and BLM in 2008 and 2012, U.S. Forest Service (USFS) in 2014. Monitoring data for ecological sites without established key areas was collected by the BLM in March 2016.

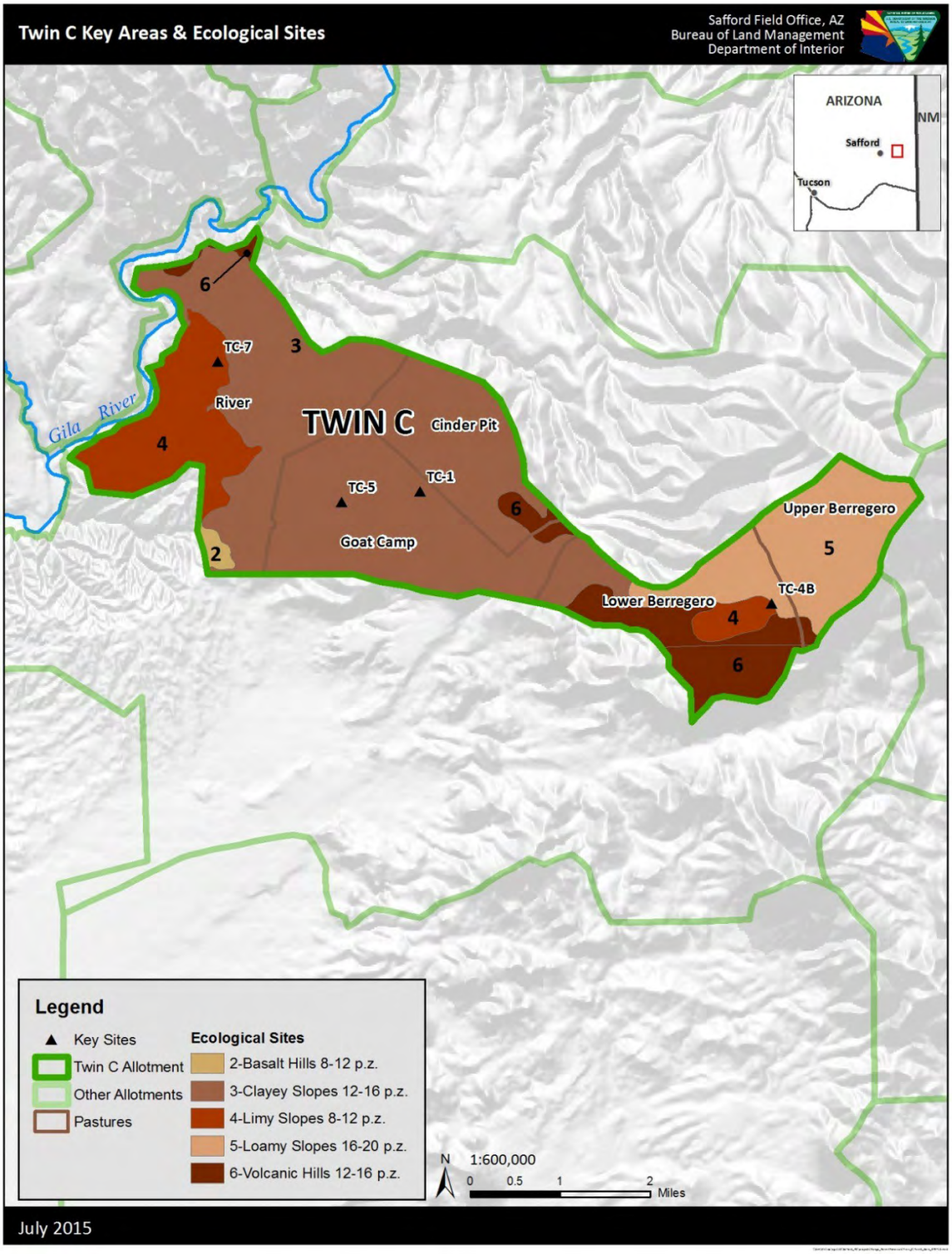
Basalt Hills 8-12" p.z. (R041XC301AZ) ecological site was not evaluated because it makes up 2% of the allotment and the River Pasture, and thus would not be expected to yield significant data to inform the land health evaluation.

Table 7. Key Vegetative Species Located on the Twin C Allotment[1]

Key Site	Ecological Site	Key Species	Ecological Site ID	GPS Coordinates (NAD83 CONUS)
TC-1 TC-5	Clayey Slopes 12-16"	*Erogrostis intermedia Bouteloua Rothrockii Acacia constricta Plearuaphis mutica Muhlenbergia porteri Calliandra eriophylla*	R041XB303AZ	12S UTM 0648955 3639943 12S UTM 0647549 3639751
TC-4B TC-7	Limy Slopes 8-12"	*Bouteloua curtipendula Pleuraphis mutica Panicum obtusum Erogrostis intermedia Eriogonum wrightii Prosopis velutina*	R041XB207AZ	12S UTM 0655246 3637934 12S UTM 0645333 3642263
n/a[2]	Volcanic Hills 12-16" p.z., loamy	*Bothriochloa barbinodis Bouteloua curtipendula Bouteloua hirsuta Calliandra eriophylla Eriogonum wrightii*)	R041XC323AZ	
n/a[2]	Loamy Slopes 16-20" p.z	*Bothriochloa barbinodis Bouteloua curtipendula Eragrostis intermedia Hilaria belangeri Calliandra eriophylla Eriogonum wrightii Nolina microcarpa*	R041XA107AZ	

[1] UA Monitoring Data 2008 and 2012 (Appendices B and C) and USFS TEAMS Enterprise Unit Monitoring Data 2014 (Appendix D).
[2] [Key sites not previously established]

Figure 6. Twin C Key Areas and Ecological Sites.



Standard 1 - Upland Sites

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

Signs of accelerated erosion that are none to slight or slight to moderate and are appropriate for this ecological site as indicated by ground cover (litter, rock, vegetative (canopy) cover, etc. and signs of erosion. This objective applies to all key areas and their corresponding ecological site. A departure of moderate or greater would not be achieving the standard. A departure of none to slight or slight to moderate is considered achieving the Standard.

Standard 2 - Riparian-Wetland Site

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

Standard 2 **is not applicable** because no Riparian-Wetland sites exist within the Twin C Allotment due to the deferral of livestock grazing within the Gila River riparian area established by the Gila Box Management Plan.

Standard 3 - Desired Resource Conditions

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

The criterion of meeting desired resource conditions is achievement or conditions leading to Desired Plant Community (DPC). DPC key area objectives are stepped down from the Safford District RMP desired resource conditions to a site-specific level to measure attainment of LUP desired future condition goals and multiple use objectives. The DPC objectives are specific to each ecological site within the Allotment. The current state of the plant community found at each key area was analyzed along with information from NRCS Ecological Site Descriptions (ESDs) and reference sheets, to estimate the potential or capability of the site to produce different kinds and amounts of vegetation, so that the DPC objectives are realistic in terms of what is possible to achieve.

Desired Resource Conditions for River and Lower Berregero Pastures: Limy Slopes 8-12" p.z. Ecological Site

DPC Key Area Objectives:

- Maintain vegetative community compositions: Perennial Grasses 36%, Shrubs 35% and Forbs 28%
- Maintain a minimum of perennial canopy cover for grasses at 40%, 35% for shrubs and 25% for forbs 30%.
- Maintain bare ground at less than 10%
- Maintain composition of palatable shrubs at 5 to 10 %
- Maintain key perennial grass composition at 20 to 35%

Rationale:

The recommended levels of total canopy cover for grasses, shrubs, and forbs will provide sufficient cover for wildlife species (mule deer, quail and non-game etc.) and prevent accelerated erosion of the site. In addition, maintaining canopy cover levels for grasses and mid-level shrubs will provide important nesting and escape cover for quail. Maintaining composition of palatable shrub species and key perennial grass species will also provide forage for wildlife and livestock (refer to Section 5for a comprehensive list of vegetative species specific to the Twin C Allotment.)

Desired Resource Conditions for Goat Camp and Cinder Pit Pastures: Clayey Slopes 12-16 p.z. Ecological Site

DPC Key Area Objectives:

- Maintain vegetative community compositions: perennial grasses 23%, shrubs 15% and forbs 58%
- Maintain a minimum of perennial canopy cover for grasses at 40%, 35% for shrubs and 25% for forbs.
- Maintain bare ground at less than 10%
- Maintain composition of palatable shrubs at 5 to 10 %
- Maintain key perennial grass composition at 20 to 35%

Rationale:

The recommended canopy cover levels for grasses, shrubs, and forbs will provide sufficient cover for wildlife species (mule deer, quail and non-game, etc.) and prevent accelerated erosion of the site. In addition, maintaining canopy cover levels for grasses and mid-level shrubs will provide important nesting and escape cover for quail. Maintaining composition of palatable shrub species and key perennial grass species will also provide forage for wildlife and livestock (refer to Section 5 for a comprehensive list of vegetative species specific to the allotment).

Desired Resource Conditions for Upper Berregero Pasture: Loamy Slopes 16-20" p.z. Ecological Site

DPC Key Area Objectives:

- Maintain vegetative community compositions: perennial grasses 25-35%, shrubs 15% and forbs 10-15%
- Maintain a minimum of perennial canopy cover for grasses at 35%, 15% for shrubs and 20% for forbs.
- Maintain bare ground at less than 40%
- Maintain composition of palatable shrubs at 5 to 10 %
- Maintain key perennial grass composition at 30 to 40%

Rationale:

The recommended canopy cover levels for grasses, shrubs, and forbs will provide sufficient cover for wildlife species (mule deer, quail and non-game, etc.) and prevent accelerated erosion of the site. In addition, maintaining canopy cover levels for grasses and mid-level shrubs will provide important nesting and escape cover for quail. Maintaining composition of palatable shrub species and key perennial grass species will also provide forage for wildlife and livestock (refer to Section 5 for a list of vegetative species specific to the allotment.)

Desired Resource Conditions for Lower Berregero Pasture: Volcanic Hills 12-16" p.z., loamy Ecological Site

DPC Key Area Objectives:

- Maintain vegetative community compositions: perennial grasses 23%, shrubs 15% and forbs 58%
- Maintain a minimum of perennial canopy cover for grasses at 20%, 10% for shrubs and 10% for forbs
- Maintain bare ground at less than 35%
- Maintain composition of palatable shrubs at 5 to 15 %
- Maintain key perennial grass composition at 20 to 35%

Rationale:

The recommended canopy cover levels for grasses, shrubs, and forbs will provide sufficient cover for wildlife species (mule deer, quail and non-game, etc.) and prevent accelerated erosion of the site. In addition, maintaining canopy cover levels for grasses and mid-level shrubs will provide important nesting and escape cover for quail. Maintaining composition of palatable shrub species and key perennial grass species will also provide forage for wildlife and livestock (refer to Section 5 for a comprehensive list of vegetative species specific to the Twin C Allotment.)

5 Plant List

Table 8 presents a list of plant species within the dominant ecological sites located on the Twin C Allotment. These plant species provide key forage and cover for wildlife species and livestock.

Table 8. Key Plant Species

Common Name	Scientific Name
slimleaf bursage	*Ambrosia confertiflora*
Parish threeawn	*Aristida purpurea var. parishii*
Astralagus	*Astragalus*
cane beardgrass	*Bothriochloa barbinodis*
sixweeks grama	*Bouteloua barbata*
sideoats grama	*Bouteloua curtipendula*
false mesquite	*Calliandra eriophylla*
bluedicks	*Dichelostemma capitatum*
rough jointfir	*Ephedra fasciculate*
shrubby buckwheat	*Eriogonum wrightii*
fishhook barrel cactus	*Ferocactus wislizeni*
curly mesquite	*Hilaria belangeri*
hogpotato	*Hoffmannseggia glauca*
range ratany	*Krameria erecta*
Lycium	*Lycium*
rough menodora	*Menodora scabra*
bush muhly	*Muhlenbergia porter*
Engelmann pricklypear	*Opuntia engelmannii*
staghorn cholla	*Opuntia versicolor(syn)*
Indianwheat	*Plantago ovate*
Tobosa	*Pleuraphis mutica*
western honey mesquite	*Prosopis glandulosa var. torreyana*
velvet mesquite	*Prosopis velutina*
desert globemallow	*Sphaeralcea ambigua*
soaptree yucca	*Yucca elata*
desert zinnia	*Zinnia acerosa*

6 Rangeland Inventory and Monitoring Methodology

Inventory and monitoring data were collected in 2008, 2012, and 2014. See Appendices C-E for this data.

6.1 Ground Cover Protocol

Ground cover is the amount of surface area comprised of bare ground, perennial plant bases, litter, gravel or rocks. Ground cover data is recorded through each soil protection category and expressed as a percentage of total hits, reflecting the amount of litter, vegetative root bases, gravel and rocks available to intercept raindrop impact before reaching the soil and of bare ground exposed to climatic elements. Cover data were collected with each quadrat placement. A single point from the quadrat was consistently the focal point for cover category classification.

Ground cover parameters established prior to data collection are as follows:

1. One ground cover hit is recorded per quadrat placement. The total number of ground cover hits equals the total number of quadrat placements.
2. Litter is dead plant material directly covering the ground, dead perennial vegetative bases, or animal material. If a small stem or piece of litter is not considered large enough to intercept raindrop impact, the hit is the ground covering below it.
3. Bare ground is soil with particles up to 1/4"; gravel are particles 1/4"-3" in size; rocks are $\geq$3".
4. Annual grasses and annual forbs are considered litter cover when in contact with the ground and large enough to intercept raindrop impact.

6.2 Pace Frequency

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

A 40 x 40 cm. (0.16 m^2) quadrat is used for pace frequency applied as follows:

1. Species present within the bounds of the sample quadrat are recorded with a single tally.
2. If no species are present, no frequency data are recorded.
3. Perennial or annual grasses and forbs must be rooted within the quadrat to be counted.
4. A grass or forb plant base present under the quadrat frame is considered "in."
5. Annual plants, grasses and forbs, are counted whether green or dried.

6. Tree/shrub canopy and basal hits are recorded separately. Over time, these parameters can indicate changes in tree/shrub size (canopy) or plant numbers (basal).
7. A canopy hit is any part of the tree or shrub that overhangs the quadrat (enters an imaginary vertical projection of the plot frame).
8. Quadrat placements are placed at one-pace intervals (2-steps), patterned in transects (straight lines) and are run parallel to each other, generally contouring slope, within the area of one ecological site (vegetation and soil type).

6.3 Fetch

Fetch is the distance from the nearest perennial plant base within 360 degrees of the quadrat's ground cover point. Fetch, reported with descriptive statistics, relates to plant distribution and watershed characteristics. Perennial plant cover can reduce soil erosion by creating an obstruction, slowing the rate of overland flow. A shorter distance between perennial plant bases lessens the opportunity for flowing water to acquire the necessary energy to remove soil and litter from a site. Overtime, fetch data can be used to assess changes in the spatial distribution and connectivity of vegetation patches plus document trends in the fragmentation of plant cover for rangeland health evaluation. One-hundred distances were measured in conjunction with pace frequency as baseline data for future monitoring.

6.4 Dry Weight Rank (DWR)

Dry weight rank estimates plant composition on a dry weight production basis. This data collection was made using a 40cm x 40cm plot frame and 100 placements. The three perennial species within a vertical projection of quadrats placed repeatedly (100 times) comprising the most annual biomass production on a dry weight basis are ranked (1st, 2nd, and 3rd most biomass). Multiple ranks are given when less than 3 species are present. For example, if species A and species B are the two species present, ranks of 1 and 3, 1 and 2, or 2 and 3 are given to species A; if only species B is present, it receives a tally for each rank. No tally was recorded at quadrat placements void of perennial species.

6.5 Indicators of Rangeland Health

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

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

The following are the 17 indicators that are evaluated during an assessment and the attribute(s) they measure:

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

The three attributes of rangeland health (soil/site stability, hydrologic function, and biotic integrity) are evaluated and assigned rating categories for each of the 17 attributes. (Refer to Technical Reference 1734-6; Appendix 4: Evaluation Matrix.)

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

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

6.6 Utilization

Utilization refers to the percentage of current forage removed by grazing animals or the amount of residual vegetation left after grazing. Utilization for each key area on the Twin C Allotment is presented in *Section 7.5 Utilization Data Assessment*. Table 9 below presents the descriptions of utilization ranging from no use to severe use.

Table 9. Range Utilization Ratings for Key Forage Plants

Rating	Description
No Use (0%)	The rangeland shows no evidence of use by grazing animals.
Slight use (1-20%)	The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.
Light (21 - 40%)	The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed at 60 to 80% of the number of current seedstalks of key herbaceous plants remains intact. Most young plants of the key species are undamaged. Little or no one of low value plants. There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 21 to 40% of the available leader growth of the key browse plants has been removed.
Moderate (41 - 60%)	The rangeland appears entirely covered as uniformly as natural features and facilities will allow. 15 to 25% of the number of current seedstalks of key herbaceous species remain intact. No more than 10% of the number of low value herbaceous forage plants are utilized. Browse plants appear rather uniformly utilized and 41 to 60% of the available leader growth of key browse plants has been removed.
Heavy (61 - 80%)	The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with more than 10% of the number of low value herbaceous forage plants have been utilized. The preferred browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on key browse plants. Approximately 61 to 80% of the available leader growth of the key browse plants has been removed.
Severe (81-100%)	The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction of current seedstalks of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of preferred grasses are grazed to the soil surface. There is no evidence of terinal buds and 81 to 100% of available leader growth of the browse plants have been utilized. Hedging is readily apparent and the browse plants are more frequently broken.

7 Management Evaluation and Summary of Studies Data

The following information is the evaluation and summary of the rangeland health assessments utilizing the inventory and monitoring protocols that have taken place on the Twin C Allotment since 2008.

7.1 Actual Use

Actual use that has occurred on the Twin C Allotment is provided in Table 10. As indicated, full permitted use AUMs have been implemented on the allotment in recent years.

Table 10. Actual Use on Twin C Allotment

Grazing Fee Year	Permitted AUMs	Actual AUMs[1]	% Used
2004	1920	1598	83%
2005	1920	1483	77%
2006	1920	1920	100%
2007	1920	1920	100%
2008	1920	1920	100%
2009	1920	1824	95%
2010	1920	1824	95%
2011	1920	1788	93%
2012	1920	1920	100%
2013	1920	1920	100%
2014	1920	1920	100%
2015	1920	1920	100%
2016	1920	1920	100%

[1]Based on Actual Grazing Use Report (4130-5), RAS billing statements.

7.2 Rangeland Health Assessments

The upland health of several key areas was evaluated using the Rangeland Health Evaluation Site documentation worksheet. A discussion of the rangeland health attributes – soil and site stability, hydrologic function, and biotic integrity – evaluated on the Twin C Allotment evaluation areas follows.

7.2.1 TC-1 and TC-5 (Clayey Slopes 12-16" p.z. R041XB303AZ)

The reference condition indicates there should be no presence of rills; water flow patterns are less than 10% of the area and discontinuous; pedestals and terracettes do not occur; no gullies or erosion should be present; no wind scoured blowouts should be present; all litter classes should be staying in place; soil resistance to erosion is 1-3 in the interspaces and 4-6 under plant canopy; cover values are: basal 5%, litter 45-55%, gravel 30%; bare ground 20 to 30%; and grass and shrub canopy 20-40%. Perennial grass should dominate

this site with annual grass and forbs being greater than subshrubs and shrubs which should be greater than succulents and perennial forbs. Species not expected to occur on this site include: turpentine bush, jojoba, whitethorn, mesquite, prickly pear, cane cholla, and ocotillo and may increase to undesirable levels in absence of natural fires.

Rangeland Health Attribute 1: Soil and Site Stability

In 2008, the sites had few rills, with some showing signs of being active and rated moderate. Water flow patterns were nearly at reference condition with some flow lengths connected but erosion minor and rated moderate. Some pedestals were in flow paths and rated moderate. Bare ground was 9% at TC-1 and 17% at TC-5. It was noted that this site was heavily armored with rocks at 47.5% at TC-1 and 40.5% at TC-5. Bare ground was infrequent and rarely connected and rated slight to moderate. Gullies were uncommon and no erosion was associated with the gullies and rated slight to moderate. Wind-scoured blowouts were infrequent and few although some deposition was noted. This indicator was rated slight to moderate. Litter was 36% at TC-1 and 30% at TC-5. What litter was being displaced was small size classes and rated slight to moderate. The soil surface is stabilized by rock armor (Figure 8) and the soil surface horizon intact and was rated none to slight. Soil surface loss or degradation was rated slight to moderate as there appeared to be a slight loss throughout the site (Figures 8 and 9). Compaction was not a factor and not restricting water infiltration or root penetration and rated none to slight (UA 2008).

In 2013, there were no rills/gullies present at the site, pedestals and/or terracettes were slight to non-existent. Wind-scouring and litter movement were none to slight. The ground is naturally heavily armored by rock. Foliar cover collected at TC-1 was 73% with 5% basal cover of perennial and annual native grasses, and TC-5 was 59% with 4% basal cover. Total litter at TC-1 was measured at 34% with bare ground measuring 0% and TC-5 was measured at 47% with bare ground measuring 3%. Soil surface at TC-1 was measured at 11% soil with 84% rock/rock fragments and TC-5 with 75% rock and rock fragments. Soil loss or degradation was not occurring (USFS TEAMS 2013).

In 2014, there were no rills or gullies, pedestals were uncommon, and terracettes were not observed and rated none to slight. Water flow patterns were what are expected for the site and rated none to slight. Bare ground was rated none to slight. All litter size classes remained in place and measured at none to slight. Soil surface resistance to erosion was rated as none to slight as was soil surface loss. Compaction was not a factor and rated none to slight.

Rangeland Health Attribute 2: Hydrologic Function

In 2008, portions of the site were in the moderate category as perennial grass cover was reduced. Infiltration is slightly affected by minor changes in plant community composition and/or distribution. Plant cover changes have only a minor effect on infiltration. Shrubs and forbs (basal and canopy) provided the structure and cover lacking from perennial grasses. In addition, litter and the rock armor nature of the site limited runoff. Plant distribution was also well dispersed throughout the site. This indicator was rated slight to moderate. Litter was relative to site potential and weather and rated slight to moderate (UA 2008).

In 2013, perennial native grasses were very effective at holding soil cover due to their basal area

and their fine fibrous root systems. These grasses contribute organic matter directly into the soil and help build stable soil aggregates. In addition the plant and litter cover provide protection against wind erosion, and it increases infiltration and decrease runoff. This site was rated none to slight. (USFS TEAMS 2013).

In 2014, perennial grasses, specifically tobosa, have decreased while black grama, vine mesquite and perennial forbs have increased. The shrub component remains constant and dominant. The plant community is providing cover and litter for effective infiltration and reduced runoff. This indicator was rated none to slight. Litter cover was 15% at TC-1 and 23% at TC-5 and was rated none to slight (UA 2012).

Rangeland Health Attribute 3: Biotic Integrity

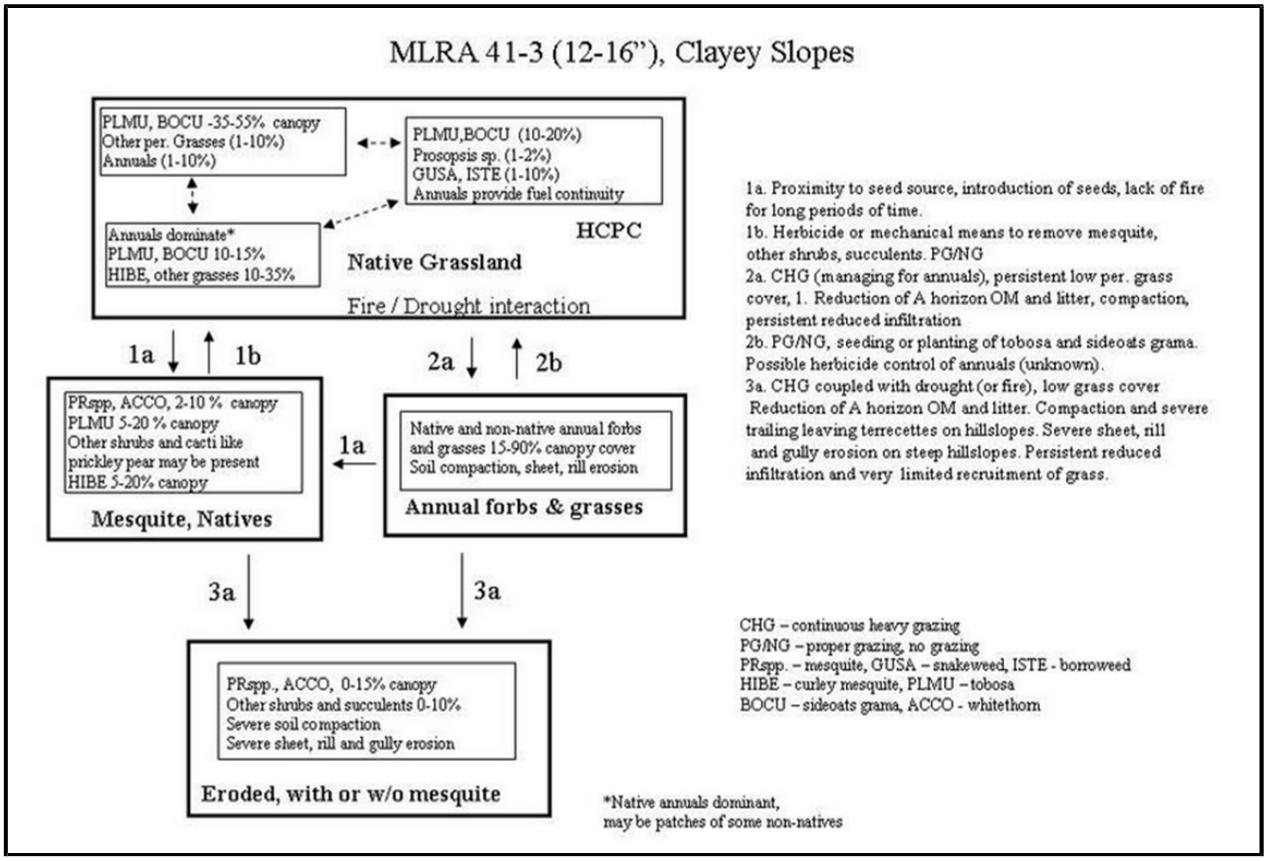
In 2008, the functional/structural groups indicator was assigned to the slight to moderate category with some votes for *moderate* due to reduced perennial grasses and abundance of prickly pear. It was; however, not enough reduction in grass composition and subsequent increase in shrubs to "transition" out of the "reference state". UA 2008 data found tobosa, bush muhly, sideoats and black grama present at TC-1 and TC-5. Plant mortality and decadence matched that expected for the site and was rated none to slight. Annual production was estimated at 60-80% of potential and rated slight to moderate. Invasive plants were moderate and scattered throughout the site. Despite recent droughts, perennial shrubs and grasses appeared healthy and rated none to slight.

In 2013, the site exhibited biotic integrity, and in a productive and sustainable condition and rated none to slight. In general the composition, structure and distributions of plant communities are present as described within the ESDs throughout a majority of the allotment. The current vegetative composition of both perennial and annual native species within the allotment is appropriate for the range site. (USFS TEAMS 2013).

In 2014, native shrub composition matches what is expected for the site and was assigned none to slight. Plant mortality matches that which is expected for the site despite below average winter precipitation and rated none to slight. The annual production exceeded 80% of potential production for the site based on recent weather and the past two monsoon seasons and rated none to slight. The presence of invasive plants was rated slight to moderate due to reduced perennial grasses and abundance of prickly pear.

The Clayey Slopes 12-16"p.z. ecological sites on the Twin C Allotment are no longer in the Native Grassland state (see Figure 7); however, they have not fully transitioned into the Mesquite, Natives state. According to the monitoring data, there is a higher canopy cover of shrubs/vines than HCPC but native grass and other canopy cover is still within the expected range of HCPC (Table 14). Native perennial grasses, such as sideoats grama, tobosa, and threeawns, still dominate the site and species composition is higher in grass/grasslike species and forbs, such as globemallow and leatherweed, but is within typical range for shrubs, such as acacia, wolfberry, and prickly pear. Figures 8 and 9 show the Clayey Slopes 12-16" p.z. from established key area locations.

Figure 7. State-and-Transition Model for Clayey Slopes 12-16" p.z.



Source: NRCS ESIS, June 2015.

Figure 8. Key Areas (TC-1). Clayey Slopes 12-16" p.z. Slope and armor characteristics are noted, 2008.

Figure 9. Key Area (TC-5). Clayey Slopes 12-16" p.z. Landscape view, 2008.

7.2.2 TC-4B and TC-7 (Limy Slopes 8-12" p.z. R041XB207AZ)

The reference condition indicates there should be no presence of rills; water flow patterns are 30-40% of the area and discontinuous; terracettes do not occur and pedestals occur on creosote bush 2-3 inches high; no gullies or erosion should be present; no wind scoured blowouts should be present; some fine litter classes can move short distances; basal 0-6%, litter 3-35%, gravel 15-50%; bare ground 5-50%; and shrubs are evenly distributed across the site.

Rangeland Health Attribute 1: Soil and Site Stability

In 2008, only site TC-7 was observed. No rills, gullies, wind-scoured blowouts, or pedestals were observed and rated none to slight. Water flow patterns were discontinuous and very short and rated none to slight. Bare ground was measured at 6.5% and rated none to slight. Coarse woody litter remained under shrub canopies and all other litter size classes remained in place and was rated none to slight. The soil surface is stabilized by rock armor and the horizon appeared intact and matched what is expected for the site and rated none to slight. No apparent soil loss or degradation was observed, nor was compaction and both were rated none to slight (UA 2008).

In 2013, there were no rills, gullies present at the sites, pedestals and/or terracettes were none to slight. Wind-scouring and litter movement were none to slight. Bare ground at TC-4B was only 3% and TC-7 was 0%. The soil surface is stabilized by rock armor and the horizon appeared intact and matched what is expected for the site and rated none to slight. No apparent soil loss or degradation was observed, nor was compaction and both were rated none to slight (USFS TEAMS 2013).

In 2014, only TC-7 was observed. No rills, gullies, wind-scoured blowouts, or pedestals were observed and rated none to slight. Water flow patterns were discontinuous and very short and rated none to slight. Amount and size of bare ground areas match that expected for the site was rated none to slight. Actual exposed soil areas are small (<2 inches in diameter) and not connected. All liter size classes remained in place. Surface soil is stabilized by rock armor and plant cover/liter. No apparent soil surface loss was observed, and compaction was not a factor.

Rangeland Health Attribute 2: Hydrologic Function

In 2008, only TC-7 was observed. Plant community is stable with adequate canopy and basal cover that is well distributed. Litter cover was 36.5% at TC-7, higher than the ecological site guide, but litter amount can fluctuate significantly throughout the year and was still rated none to slight.

In 2013, sites TC-4B and TC-7 were observed. Vegetative cover was adequate to ensure soil stabilization and appropriate for permeability rates within the ecological system. Litter cover at TC-4B was 55% and 38% at TC-7, higher than the ecological site guide but was still rated none to slight (USFS TEAMS 2013).

In 2014, only TC-7 was observed. The plant community is stable with adequate canopy and basal cover dispersed throughout the site and rated none to slight. Litter cover was 36.5%, exceeding guidelines but rated none to slight.

Rangeland Health Attribute 3: Biotic Integrity

In 2008, only TC-7 was observed. Plant community composition and structural functional groups match what is expected for the site. Shrubs should approximate 13% canopy cover and dominant the Functional/Structural Groups followed by perennial grasses, half shrubs, succulents, miscellaneous grasses and forbs. Shrubs were well dispersed and robust. There was a mix of native shrub species with creosote, acacia, mesquite and wolfberry. The number of species in each group closely matches what is expected for the site. This indicator was rated none to slight. Plant mortality and decadence match that expected for the site. There was little indication of plant mortality particularly with shrubs. This indicator was rated none to slight. Annual production was estimated at 60-80% of potential per the ESD. Invasive plants were not noted at this site and dominant shrubs were within HCPC. This indicator was rated none to slight.

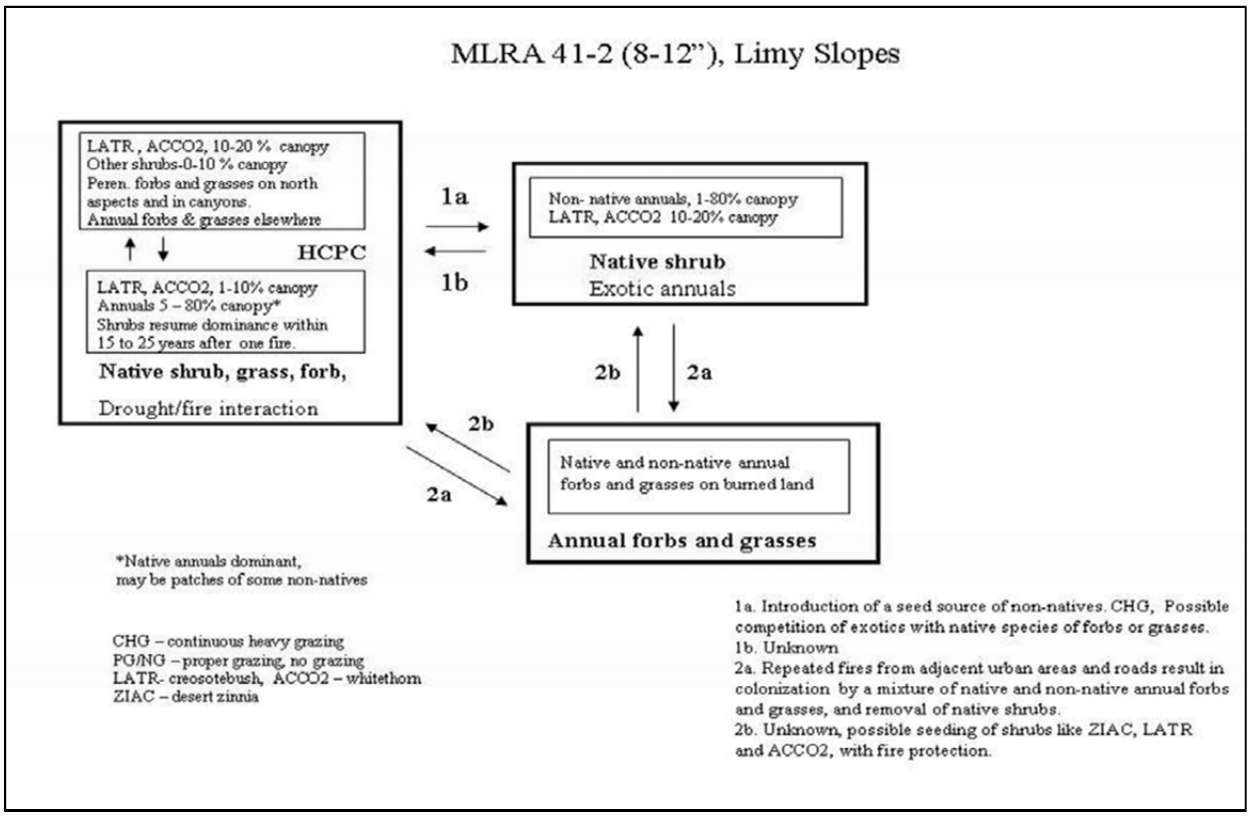
In 2013, TC-4B and TC-7 were observed. The sites exhibited biotic integrity, and in a productive and sustainable condition and rated none to slight. In general the composition, structure and distributions of plant communities are present as described within the ESDs throughout a majority of the allotment. The current vegetative composition of both perennial and annual native species within the allotment is appropriate for the range site. (USFS TEAMS 2013).

In 2014, only TC-7 was observed. Creosote and whitethorn acacia are the primary native shrubs within the HCPC. Dominant shrubs (creosote) are in greater amounts than perennial grasses that are in greater amounts than misc. shrubs that are in greater amounts than succulents that are in greater amounts than miscellaneous perennial grasses that are in equal amounts to annuals and perennial forbs, which matches the number of species in each group. This indicator was rated none to slight. Little mortality/decadence was observed.

Annual production estimates exceeded 80% of potential production for the site. The invasive species indicator was rated none to slight because the dominant shrubs are within the HCPC. Perennial shrubs and grasses appeared healthy.

The Limy Slopes 8-12” p.z. ecological sites on the Twin C Allotment are not in HCPC they are in the transition from HCPC to native shrub, grass, forb (Figure 10). According to the monitoring data, canopy cover for shrubs/vines is within expected values but native grass and forbs canopy cover is higher than the expected range (Table 15). Species composition is higher in forbs and shrubs/vine species but is within typical range for grasses/grasslike. Figures 11-13 show the key sites that were evaluated.

Figure 10. State-and-Transition Model for Limy Slopes 8-12" p.z.



Source: NRCS ESIS, June 2015.

Figure 11. Key Area Monitoring (TC-7) and LHE Site. Limy Slopes 8-12" p.z. Slope and rock armor characteristics noted 2008.

Figure 12. Key Area Monitoring (TC-7) and LHE Site. Limy Slopes 8-12" p.z. Landscape view looking westward toward Gila River, 2008.

Figure 13. Key Area Monitoring (TC-7) and LHE Site. Limy Slopes 8-12"p.z. Rock armor characteristics noted 2008.

7.2.3 Loamy Slopes 16-20" p.z. (R041XA107AZ)

The reference condition indicates there should be no presence of rills; water flow patterns are very short, indistinguishable among high cobble/gravel/vegetation cover; pedestals are less than one inch in height, occasionally observed on short grasses; terracettes common, 3-5 feet apart with one inch elevation difference; 3-6% bare ground evenly distributed among gravel/rock cover, non-vegetated areas are scarce; no gullies present on this site; no wind scoured areas; fine litter movement should be less than a foot, course litter stays in place; soil slake values are between 5 and 6 and no difference between canopy and interspaces; cover classes are as follows: basal cover 15-20% and canopy cover is 50-70% for grasses and 5-10% for shrubs; no compaction layer on this site; warm season mid-grasses are the dominant species on this site; perennial grasses will show increased decadence since last disturbance; percent litter cover is 55%; expected annual production is 1520 pounds per acre per year; invasive species on this site consist of Lehmann's lovegrass, Boer lovegrass, yellow bluestem, and velvet mesquite; plant reproductive capability should not be impaired.

Rangeland Health Attribute 1: Soil and Site Stability

In 2016, the site had no rills. Water flow patterns were at reference condition. No pedestals and/or terracettes were observed. Bare ground was within reference condition at 7-9%. It was noted that this site was heavily armored with rocks. No gullies were observed. Wind-scoured blowouts were not observed. Litter movement was not noticeable. The soil surface is stabilized by rock armor and the soil surface horizon intact. There was no observed soil surface loss or degradation. Compaction was not a factor and not restricting water infiltration or root

penetration. Soil and site stability were rated none to slight.

Rangeland Health Attribute 2: Hydrologic Function

In 2016, all hydrologic functions were rated none to slight. Perennial grasses were in abundance especially cane beardgrass and sideoats grama. Amount of litter was also observed to be within the DPC of 20 to 50%. The plant community is providing cover and litter for effective infiltration and reduced runoff.

Rangeland Health Attribute 3: Biotic Integrity

In 2016, the functional/structural group's indicator was assigned to the none to slight category. Plant mortality and decadence matched that expected for the site and was rated none to slight. Annual production was estimated at DPC and rated none to slight. Invasive plants were rated slight to moderate with Lehmans lovegrass being scattered throughout the site. Perennial shrubs and grasses appeared healthy and rated none to slight.

The Loamy Slopes 16-20" ecological site on the Twin C Allotment is within the HCPC. (See Figure 14). According to the land health evaluation the only concern across all attributes was the presence of Lehamans lovegrass. Figure 15 shows this ecological site from the top of Guthrie Peak.

Figure 14. State-and-Transition Model for Loamy Slopes 16-20" p.z.

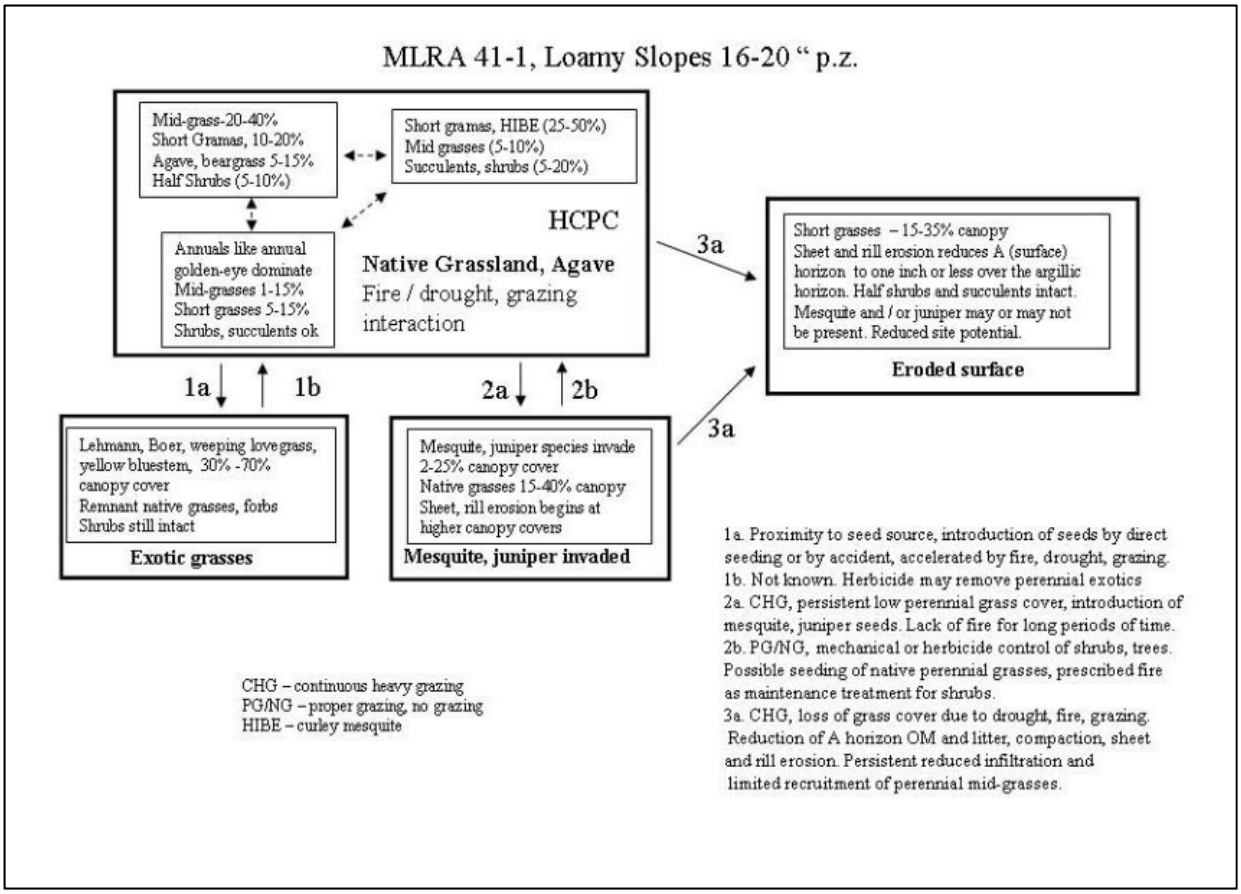


Figure 15. LHE Site near Guthrie Peak, Loamy Slopes 16-20" p.z.

7.2.4 Volcanic Hills 12-16" p.z., loamy (R041XC323AZ)

The reference condition indicates there should be no presence of rills; water flow patterns are uncommon, pedestals and terracettes are uncommon; 0-5% bare ground; no gullies present on this site; no wind scoured areas; all litter size classes should be staying in place; expected soil slake values are 1-3 in interspaces and 4-6 under plant canopy; cover classes are as follows: basal cover 5% and canopy cover is 45-55% for perennial grasses, 30% for shrubs, 5% for forbs, and 10% for subshrubs; no compaction layer on this site; perennial grasses are the dominant species on this site; perennial grasses will show increased decadence since last disturbance; percent litter cover is 45-55%; expected annual production is 1000 pounds per acre per year; invasive species on this site consist of turpentine bush, jojoba, whitethorn, mesquite, prickly pear, cane cholla, ocotillo, red brome and wild oats.

Rangeland Health Attribute 1: Soil and Site Stability

In 2016, the site had no rills. Water flow patterns were at reference condition. No pedestals and/or terracettes were observed. Bare ground was rated slight to moderate with percent bare ground falling in the middle of the range 5 to 35%. It was noted that this site was heavily armored with rocks. No gullies were observed. Wind-scoured blowouts were not observed. Litter movement was not noticeable. The soil surface is stabilized by rock armor and the soil surface horizon intact. There was no observed soil surface loss or degradation. Compaction was not a factor and not restricting water infiltration or root penetration. Soil and site stability was rated none to slight.

Rangeland Health Attribute 2: Hydrologic Function

In 2016, all hydrologic functions were rated slight to moderate except for plant community

composition and distribution which was rated moderate. This was rated moderate because of an increase in prickly pear. Amount of litter was also observed to be slightly less than DPC, of 20 to 50% and rated moderate to extreme.

Rangeland Health Attribute 3: Biotic Integrity

In 2016, the site was rated slight to moderate. Functional/structural group indicator was assigned to the moderate to extreme due to the increase in prickly pear. Plant mortality and decadence matched that expected for the site and was rated none to slight. Annual production was estimated at DPC and rated none to slight although much of the production was from prickly pear and perennial grasses were not measured. Invasive plants were rated slight to moderate with Lehmans lovegrass and prickly pear driving this rating. Perennial shrubs and grasses appeared healthy and rated none to slight for annual production and reproductive capability of perennial plants.

The Volcanic Hills 12-16"p.z., loamy ecological site on the Twin C Allotment is not in HCPC, it is in the transition from HCPC to Shrub Increase (see Figure 16). However instead of mimosa, mesquite, and juniper this site shows an increase in prickly pear. Native grasses were within desired DPC range and normal composition. Figure 17 shows this ecological site.

Figure 16. State-and-Transition Model for Volcanic Hills 12-16" p.z., loamy

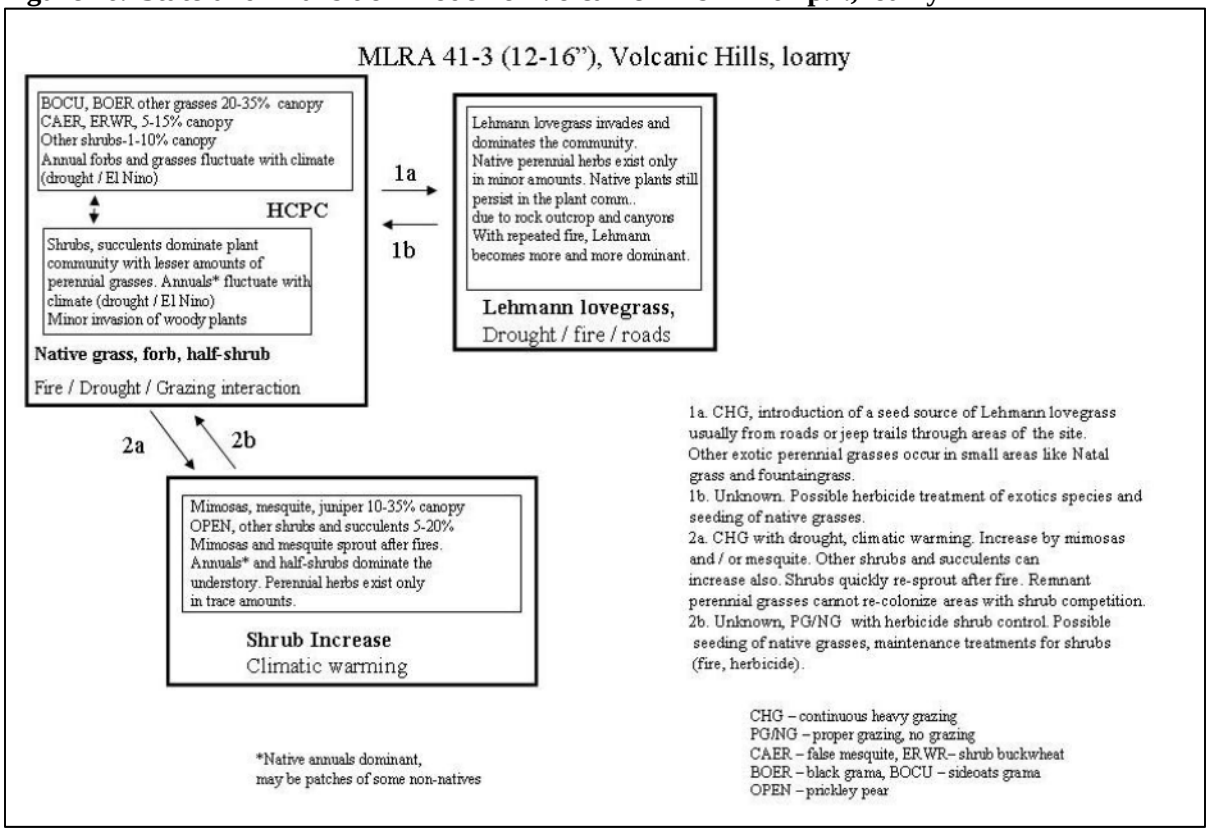


Figure 17. LHE Site. Volcanic Hills 12-16" p.z., loamy

7.3 Frequency/Cover, Composition, and Structure Data

The UA (2012) determined the range trend was *static* for all four key areas on the Twin C Allotment (TC-1, TC-4B, TC-5 and TC-7). These results are consistent with the conclusions reached by the BLM Interdisciplinary Teams in 2008, 2013 and 2014. Plant communities, as described by the *State-and-Transition Model* for the Ecological Sites considered, generally fall within the HCPC. Frequency of native perennial grass species (e.g., black grama and bush muhly) have increased from 2008 to 2012, while shrub and succulents frequencies have decreased between 2008 and 2012 (UA 2008 and 2012 monitoring data, Appendices C and D).

7.4 Utilization Data Assessment

TC-1 and TC-5 (Clayey Slopes 12-16” p.z., R041XB303AZ)

TC-1: Utilization measured at the key area in 2013, was 3% on plains lovegrass (*Eragrostis intermedia*) and 0% on Rothrock’s grama (*Bouteloua rothrockii*). Utilization in 2015 at the key area was 6% on plains lovegrass and 3.3% on Rothrock’s grama. Both of these represent light use.

TC-5: Utilization measured in 2013 was 6% on tobosa (*Pleuraphis mutica*), and 3% on bush muhly (*Muhlenbergia porteri*). Utilization measured in 2015 was 14.3% on tobosa, and 16.3% on bush muhly. This represents light use.

TC-4B and TC-7 (Limy Slopes 8-12" p.z., R041XB207AZ)

TC-4B: Utilization measured in 2013 was 18% on sideoats gramma (*Bouteloua curtipendula*) and 11% on tobosa (*Pleuraphis mutica*). Utilization measured in 2015 was 23% on sideoats grama, and 32% on tobosa. This represents light use.

TC-7: Utilization measured at the key area in 2013 was 5% on vine mesquite (*Panicum obtusum*) and 9% on plains lovegrass (*Eragrostis intermedia*). Utilization measured in 2015 at the key area was 14% on vine mesquite and 9% on plains lovegrass. This represents light use.

In summary, livestock utilization at key areas on the allotment is at or below the 21-40% light use rating. This indicates current water placement and livestock distribution is supporting current livestock use levels.

8 Determinations of Land Health Standards

Standard 1: Upland Sites

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

Determination:

☒ Meeting the Standard

☐ Not Meeting the Standard; Making Significant Progress Toward Standard

☐ Not Meeting the Standard; Not Making Significant Progress Toward Standard

☐ Standard Does Not Apply

Rationale:

Signs of accelerated erosion are minimal and are appropriate for the site as indicated by ground cover, litter, rock, and vegetative (canopy) cover. The findings are based upon the preponderance of evidence of all indicators used to determine attainment of Land Health Standard 1.

The results of the upland health assessment indicate a none to slight departure from the ecological site descriptions.

Standard 2: **Riparian-Wetland Sites**

Determination:

☐ Meeting the Standard

☐ Not Meeting the Standard; Making Significant Progress Toward Standard

☐ Not Meeting the Standard; Not Making Significant Progress Toward Standard

☒ Standard Does Not Apply

Rationale:

There are no riparian areas on the Twin C Allotment; therefore, Standard 2 was not evaluated.

Standard 3: **Desired Resource Conditions on the Twin C Allotment.**

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

Maintain DPC Key Area Objectives and Ecological Site Objectives as described in *Section 7.2 Rangeland Health Assessments*.

Determination:

☒ Meeting the Standard

☐ Not Meeting the Standard; Making Significant Progress Toward Standard

☐ Not Meeting the Standard; Not Making Significant Progress Toward Standard

☐ Standard Does Not Apply

Rationale:

Based on monitoring data and this evaluation, current livestock grazing is allowing the Twin C Allotment to maintain and achieve the DPC objectives identified for continued land health and wildlife habitat. The rangeland health evaluation indicates that soil/site stability, hydrologic, and biotic integrity are meeting the standards for this site. Data from the allotment's key areas and land health evaluations indicate that these sites are achieving the objectives for canopy cover, palatable shrubs, perennial grasses and ground cover. The shrub and forb composition and density is sufficient to provide forage and shelter for wildlife species. Utilization data at the key areas indicate light to moderate use on perennial grasses. The allotment appeared to have slight to light utilization (21-40%) based on observations done in 2013 and 2015.

9 Recommended Management Actions

Based on the determinations of in *Section 8 Determinations of Land Health Standards,* the following management actions are recommended:

1. Continue with the current Mandatory Terms and Conditions to authorize 1,920 AUMs for livestock (cattle and horses).
2. Continue with these current Other Terms and Conditions:
    - In order to improve livestock distribution on the public lands, all salt blocks and/or mineral supplements shall not be placed within a 1/4 mile of any riparian area, wet meadow or watering facility (either permanent or temporary) unless stipulated through a written agreement or decision in accordance with 43 CFR 4130.3-2c.
    - 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.
3. The following Other Terms and Conditions should be included as a stipulation to the grazing permit:
    - In accordance to the Gila Box RNCA Management Plan Final Decision (EA AZ-040-08-03) issued June 27, 2000, grazing of livestock along the riparian zone of the Gila River within the Gila Box Riparian National Conservation Area is not permitted.
    - Maintenance feeding of livestock with access to public land is prohibited. Maintenance feeding shall be defined as providing livestock with feed to assist in meeting their basic caloric needs, provided at a rate of 3 lbs./day/head or more.
    - This permit is subject to future modification as necessary to achieve compliance with the standards and guidelines (43 CFR 4180).
    - Permittees shall maintain all range projects for which they have maintenance responsibilities.
    - All troughs shall be outfitted with wildlife escape structures to provide a means of escape for animals that fall in while attempting to drink or bathe.
    - The Permittee shall submit a report of the actual grazing use made on this allotment, by pasture, for the previous grazing period, March 1 to February 28. Failure to submit such a report by March 15 of the current year may result in suspension or cancellation of the grazing permit.
4. Pursue establishment of new key areas for monitoring in all ecological sites not currently represented and reevaluate existing key areas.

5. Monitoring requirements will continue to be prescribed for the Twin C Allotment to ensure management objectives and Rangeland Health Standards continue to be achieved.
6. As a maintenance action, install a muffler on the River Well pump to reduce the current noise levels (60.5-90.5 decibels), which may mask Yellow-Billed Cuckoo communications in some areas within the vicinity of the well, to levels similar to the natural or ambient noise levels of 55-73.7 decibels.

10 List of Preparers

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Andrew Brischke, UA, Research Specialist

11 Authorized Officer Concurrence

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

X I concur with the determinations and recommendations as written.

___ I do not concur.

___ I concur, but with the following modifications:

Scott C. Cooke
Field Office Manager
Safford BLM Field Office

7/29/16
Date

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Appendix A: Threatened, Endangered, and Sensitive Species

Federally-Listed, Proposed, or Candidate Species and Proposed or Designated Critical Habitat		
Species	**Federal**	**Comments**
* Desert pupfish, *Cyprinodon macularius*	Endangered	Desert pupfish have been reintroduced into Bonita Creek on the opposite side of the Gila River from the allotment. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
Gila chub, *Gila intermedia*	Endangered	Gila chub occur in Bonita Creek, on the opposite side of the Gila River from the allotment. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
* Gila topminnow, *Poeciliopsis occidentalis occidentalis*	Endangered	Gila topminnows occur in close proximity to the allotment. They have been reintroduced into Bonita Creek on the opposite side of the Gila River from the allotment. Livestock management on the Twin C Allotment will not affect the species.
Headwater chub, *Gila nigra*	Proposed Threatened	Headwater chub does not currently occur in the upper Gila River watershed. No effect.
* Lesser long- nosed bat, *Leptonycteris curasoae yerbabuenae*	Endangered	There are no known lesser long-nosed bat roosts on the Twin C Allotment; it is also outside of the known foraging range of the bat. No effect.
* Loach minnow, *Tiaroga cobitis*	Endangered	Loach minnow have been reintroduced into upper Bonita Creek on the opposite side of the Gila River from the allotment. Livestock management on the Twin C Allotment will not affect the species.
* Loach minnow critical habitat	Designated	Loach minnow critical habitat is designated along Bonita Creek on the opposite side of the Gila River from the allotment. There will be no effect to critical habitat.
* Mexican gray wolf, *Canis lupus baileyi*	Experimental population, non-essential	Currently the experimental population of Mexican gray wolf is limited to USFS lands over ten miles away. No effect.
Narrow-headed garter snake, *Thamnophis rufipunctatus*	Threatened	The narrow-headed garter snake is a riparian obligate species with the nearest known location over ten miles away in Eagle Creek. No effect.
Narrow-headed garter snake critical habitat	Proposed	The closest point of proposed critical habitat to the Twin C Allotment is 3.8 miles upstream from the allotment at the confluence of Eagle Creek and the Gila River. Livestock management on the Twin C Allotment will have no effect on the proposed critical habitat.
Northern Mexican garter snake, *Thamnophis eques megalops*	Threatened	The northern Mexican garter snake is considered extirpated from the upper Gila River watershed. There will be no effect to the species.
Northern Mexican garter snake, critical habitat	Proposed	The closest point of proposed critical habitat to the Twin C allotment is 6.6 miles upstream, at the confluence of the San Francisco and Gila rivers. Livestock management on the Twin C Allotment will have no effect on the proposed critical habitat.
Roundtail chub, *Gila robusta*	Proposed Threatened	Roundtail chub occur in Eagle Creek within five miles of the allotment, but is not currently known to occur in the Gila River adjacent to the Twin C Allotment. No effect.

Federally-Listed, Proposed, or Candidate Species and Proposed or Designated Critical Habitat		
Species	**Federal**	**Comments**
* Razorback sucker, *Xyrauchen texanus*	Endangered	Razorback suckers are considered to occupy the Gila river at population levels so low as to not be detectable, possibly extirpated. Livestock on the Twin C Allotment are excluded from the River. Livestock grazing on the Twin C Allotment could contribute to sediment runoff into the Gila River, however based on the LHE soil and site stability was rated as none to slight. River Well removes water from the Gila River alluvium. BLM, with concurrence with USFWS, has determined that these activities may affect, but are not likely to adversely affect razorback suckers if present.
* Razorback sucker critical habitat	Designated	Critical habitat for razorback sucker is designated within the 100 year floodplain of the Gila River. Livestock on the Twin C Allotment are excluded from the 100 year floodplain. . Livestock grazing on the Twin C Allotment could contribute to sediment runoff into the Gila River, however based on the LHE soil and site stability was rated as none to slight. River Well removes water from the Gila River alluvium. BLM, with USFWS concurrence, has determined that these activities may affect, but are not likely to adversely affect razorback sucker critical habitat.
* Southwestern willow flycatcher, *Empidonax traillii extimus*	Endangered	Willow flycatchers have not been documented in the portion of the Gila River adjacent to the Twin C Allotment. Due to the narrowness of the canyon limited vegetation patch size, this portion of the river is not considered suitable habitat for willow flycatchers. In addition, Twin C livestock are excluded from the riparian area of the Gila River corridor. Livestock grazing on the Twin C Allotment has no effect on willow flycatchers. No effect.
* Spikedace *Meda fulgida*	Endangered	Spikedace have been reintroduced into upper Bonita Creek, on the opposite side of the Gila River from the allotment. No grazing actions associated with the Twin C Allotment will impact the species. No effect
* Spikedace critical habitat	Designated	Critical habitat for spikedace has been designated for Bonita Creek on the opposite side of the Gila River from the Twin C Allotment. Livestock grazing on the Twin C Allotment does not impact spikedace critical habitat. No effect.
Woundfin, *Plagopterus argentissimus*	Experimental population, non-essential	Woundfin is currently considered extirpated from the upper Gila River basin. The Gila River was designated as experimental-nonessential in 1985, but there has been no reintroduction attempts nor or there any planned. No effect.
Yellow-billed Cuckoo, western population *Coccyzus americanus*	Threatened	Yellow-billed cuckoo are known to occur along the Gila River adjacent to the Twin C Allotment and have been documented during opportunistic surveys in 2013 and 2014. Riparian habitat along this reach of the Gila River is discontinuous with patch sizes of <50 acres. Livestock are excluded from the river floodplain. River Well is located within the floodplain, out of the riparian habitat, approximately 200 meters from potential habitat. Riparian woodlands and dynamic riverine processes are not likely to be adversely affected by the operation of the River Well and grazing on the allotment's uplands is not likely to adversely affect prey availability. BLM determined, with concurrence from the USFWS, that yellow-billed proposed critical habitat would not be adversely affected.

Federally-Listed, Proposed, or Candidate Species and Proposed or Designated Critical Habitat		
Species	**Federal**	**Comments**
Yellow-billed Cuckoo critical habitat	Proposed	Critical habitat is proposed along the Gila River for yellow-billed cuckoo. Livestock are excluded from proposed critical habitat by fencing and topographic features which make these areas inaccessible to livestock. River Well is located within proposed critical habitat, out of the riparian habitat. River Well is not likely to adversely affect riverine process, and subsequently proposed critical habitat due to the relatively small quantity of water removed from the system. BLM determined, with concurrence from the USFWS, that yellow-billed proposed critical habitat would not be adversely affected.

BLM Sensitive Species	
Amphibians	
Lowland Leopard Frog, *Lithobates yavapaiensis*	Lowland leopard frogs occur along the Gila River. Livestock are excluded from the river and riparian area; therefore, there will be no impacts from livestock on lowland leopard frogs from livestock use of the Twin C Allotment.
Birds	
American Peregrine Falcon, *Falco peregrinus anatum*	There are no known peregrine eryies in the area and species occurrences in the area have not been documented on the Arizona Game and Fish Department HDMS data base. Cliff faces along the Gila River provide suitable habitat and birds could occasionally hunt over the area. There are no known impacts from livestock grazing on this species.
Bald Eagle (wintering), *Haliaeetus leucocephalus*	Wintering bald eagles occur along the Gila River. Roost trees and the ability to forage along the river are important to the species. Livestock from the Twin C Allotment are excluded from the river and riparian area and therefore do not impact the species or the habitat.
Golden Eagle, *Aquila chrysaetos*	Golden eagle nests occur in close proximity to the Twin C Allotment along the Black Hills on rock outcrops and cliff faces. Whether these nest have been recently occupied is unknown. Golden eagles fly and hunt over the upland areas of the allotment. There are no known impacts of livestock on golden eagles.
Western Burrowing Owl, *Athene cunicularia*	Although identified as a possibly occurring in the area by the IPaC search. There are no know occurrences and the soil and terrain are no conducive to the species occurrence. There are no impacts to the species form livestock grazing on the Twin C Allotment.
Fish	
Desert Sucker, *Pantosteus clarkii*	Desert suckers occur in the tributaries to the Gila River but have limited occurrence in the Gila River proper, due to nonnative fish predation and competition. There is no perennial water flow in the drainages on the Twin C Allotment and the Gila River is excluded from livestock use. There are no impacts from livestock on the species.
Longfin Dace, *Agosia chrysogaster*	Longfin dace occur in the tributaries to the Gila River but have limited occurrence in the Gila River proper due to predation and competition from nonnative fish. There is no perennial water flow in the drainages on the Twin C Allotment and the Gila River is excluded from livestock use. There are no impacts from livestock on the species.
Sonora Sucker, *Catostomus insignis*	Sonoran suckers occur in the tributaries to the Gila River but have limited occurrence in the Gila River proper due to predation and competition from nonnative fish. There is no perennial water flow in the drainages on the Twin C Allotment and the Gila River is excluded from livestock use. There are no impacts from livestock on the species.

BLM Sensitive Species	
Speckled Dace, *Rhinichthys osculus*	Speckled dace occur in the tributaries to the Gila River but have limited occurrence in the Gila River proper due to predation and competition from nonnative fish. There is no perennial water flow in the drainages on the Twin C Allotment and the Gila River is excluded from livestock use. There are no impacts from livestock on the species.
Invertebrates	
Hydrobiid Spring Snails, All species in the genus	Hydrobiid spring snails occur in the Gila River as well as the springs and tributaries associated with the river. There are no springs or perennial flows in drainages on the Twin C Allotment. Livestock are excluded from the Gila River. There are no impacts from livestock grazing on the Twin C Allotment on this genus of snails.
Succineid Snails, All species in the family	Succineid snails occur in the Gila River as well as the springs and tributaries associated with the river. There are no springs or perennial flows in drainages on the Twin C Allotment. Livestock are excluded from the Gila River. There are no impacts from livestock grazing on this Family of snails.
Reptiles	
Arizona Striped Whiptail, *Aspidoscelis arizonae*	Identified in the HDMS data base as occurring in the area, but the location is outside of the species' accepted range and not in appropriate habitat, this location is in error.
Sonora Mud Turtle, *Kinosternon sonoriense*	Although not specifically identified as occurring on or near the allotment Sonoran mud turtle are known to occur throughout the Gila River drainage in and near water. Livestock are excluded for the Gila River and riparian area. Livestock on the Twin C Allotment will not impact Sonoran mud turtles.
Plants	
Clifton Rock Daisy, *Perityle ambrosiifolia*	Clifton rock daisy is known to occur near the Twin C Allotment. Its occurrence is limited to canyon walls of Gila River conglomerate. Livestock are excluded from the Gila River in the areas where the species is found. There will be no impact from livestock on this species.

U. S. Fish and Wildlife Service, Birds of Conservation Concern 2008	
Bald Eagle	See discussion under BLM Sensitive Species. No effect.
Common Black-Hawk	Common black hawk are known to occur and nest along the Gila River. Livestock are excluded from the Gila River and riparian area. Livestock on the Twin C Allotment will not impact this species.
Peregrine Falcon	See discussion under BLM Sensitive Species.
Yellow-billed Cuckoo	See discussion under federally listed species.
Elf Owl	Elf owls probably occur and nest along the Gila River. Livestock are excluded from the Gila River. Livestock on the Twin C Allotment will not impact the species.
Elegant Trogon	The nearest documented citing of elegant trogons are in Aravaipa Canyon, over 50 miles away from the Twin C Allotment. The IPaC search misidentified this species as occurring in or near the Twin C Allotment.
Northern Beardless-Tyrannulet	Northern beardless tyrannulets are primarily associated with riparian areas, but are known to occur in dense vegetation in drier drainages. The species is known to occur along the Gila River and could occur in vegetation thickets in drainages on the allotment. Livestock are excluded from the Gila River and riparian area. Livestock use of the Twin C Allotment does not impact the mesquite and other shrub/small tree thickets on the allotment. There will be no impact to the species.

U. S. Fish and Wildlife Service, Birds of Conservation Concern 2008	
Bell's Vireo	Bell's vireo are primarily associated with riparian areas, but are known to occur in dense vegetation in drier drainages. The species is known to occur along the Gila River and could occur in vegetation thickets in drainages on the allotment. Livestock are excluded from the Gila River and riparian area. Livestock use of the Twin C Allotment does not impact the mesquite and other shrub/small tree thickets on the allotment. There will be no impact to the species.
Gray Vireo	Gray vireos are typically found in open pinyon/juniper and chaparral habitats. The Twin C Allotment does not contain suitable habitat for the species. There will be no impact to the species.
Phainopepla	Phainopepla are strongly associated with mesquite. Livestock grazing on the Twin C Allotment does not impact the established mesquite on the allotment. There will be no impact to the species.
Lucy's Warbler	Lucy's warblers are associated with riparian areas and intermittently flood areas containing mesquite. They are known to occur and nest along the Gila River. The Gila River and riparian area is excluded from grazing and livestock grazing does not impact establish mesquite areas on the allotment. There will be no impact from livestock grazing on Lucy's warbler.
Yellow Warbler (*sonorana* ssp.)	Yellow warblers are found in cottonwood willow dominated riparian areas. They are known to occur along the Gila River, but the search of the ABBA data base did not show any documented location on or near the allotment. The Gila River and riparian area is excluded from livestock use. There will be no impacts to the species from livestock grazing on the Twin C Allotment.
Black-throated Gray Warbler	Black-throated gray warblers inhabit open woodland areas. The Twin C Allotment does not provide habitat for this species. There will be no impact to the species.
Grace's Warbler	Grace's warbler inhabit pine forests. The Twin C A llotment does not contain habitat for this species. There will be no impact to the species.
Red-faced Warbler	Red-faces warblers inhabit high elevation forest. The Twin C Allotment does not contain habitat for this species. There will be no impact to the species.
Canyon Towhee	Canyon towhee inhabits dense desert scrub areas in uplands and along drainages. The Twin C Allotment provides suitable habitat for this species. Livestock grazing on the allotment does not impact areas of dense scrub. There is no impact from grazing on this species on the Twin C Allotment.
Black-chinned Sparrow	Black-chinned sparrow occurs in dense shrub areas above 4000 feet in elevation. The Twin C Allotment does not provide habitat for this species. There will be no impact to the species.
Chestnut-collared Longspur	Chestnut-collared longspur migrate through the area. At most Individuals may rest for short periods of time on the allotment. There is no impact to this species from livestock grazing.

Big Game Species	
Mule Deer	The Twin C Allotment provides good browse, escape cover and well distributed water to support a mule deer population in the area. Livestock waters are the bases for the well-distributed water and have a positive impact on deer. Livestock are not consuming enough browse on the allotment to result in forage competition and cattle do not impact the dense vegetation patches that provide escape cover for mule deer. Livestock on the Twin C Allotment do not negatively impact mule deer.
Javelina	The Twin C Allotment provide a large amount of well distributed succulent forage that javelina prefer as well as escape cover and well distributed water to a support a good javelina population. Livestock waters are well distributed water and are utilized by javelina. Livestock are not consuming enough of the succulent forage on the allotment to result in forage competition and cattle do not impact the dense vegetation patches that provide escape cover for javelina. Livestock on the Twin C Allotment do not negatively impact javelina.

Rocky Mountain and Desert Bighorn	Rocky Mountain bighorn sheep have been expanding downstream through the Gila River drainage. Although primarily on the west side of the river some are now occurring and starting to occupy the east side. The best bighorn sheep habitat is the steep rocky terrain of the canyon walls along the river. These areas on the Twin C Allotment are either excluded from livestock use or are too steep and rough for livestock use. There is no impact from livestock on bighorn sheep.
Mountain Lion	On the Twin C Allotment mountain lions occur in the steep rocky canyon walls of the Gila river and amongst the rock outcroppings and broken terrain of the black hills. Livestock do not negatively impact mountain lion habitat.
Black Bear	Black bears occur along the Gila River and occasionally pass through the upland areas of the allotment. Livestock do not negatively impact black bear habitat.

Appendix B: UA Monitoring Data 2008

TC-1

Percent Ground Cover

	%
Bare ground	9.0
Gravel	5.5
Rock	47.5
Litter	36.0
Vegetative base	2.0

Fetch statistics

Average	
(inches)	9.67
Standard Error	0.92
Variance	80.39
Median	8
Mode	8
Range	0 – 52
Count	96

Percent frequency

		%
Perennial grasses		
Tobosa		39
Perennial three-awn		1
Bush muhly		2
Sideoats grama		2.5
Black grama		1
Perennial forbs		
Sida		28.0
Globemallow		13.5
Croton		12.0
Trees and shrubs		
Creosote	Base	-
	Canopy	0.5
Mesquite	Base	2.5
	Canopy	4.5
Prickly pear	Base	2.0
	Canopy	2.0
Snakeweed	Base	1.0

TC-1		
	Canopy	-
Ocotillo	Base	0.5
	Canopy	1.0
Catclaw acacia	Base	0.5
	Canopy	2.0
Whitethorn	Base	0.5
	Canopy	1.5
Barrel cactus	Base	1.5
	Canopy	-
Wolfberry	Base	-
	Canopy	1.5
Sotol	Base	0.5
	Canopy	-
Hedgehog cactus	Base	-
	Canopy	1
Annual forbs		17.0
Annual grasses		5.5

Percent composition	
	%
Perennial grasses	
Tobosa	35
Perennial three-awn	1
Bush muhly	2
Sideoats grama	2
Black grama	T
Perennial forbs	
Sida	22
Globemallow	7
Croton	14
Trees and shrubs	
Mesquite	7
Prickly pear	1
Snakeweed	1
Ocotillo	1
Catclaw acacia	2
Whitethorn	4
Barrel cactus	1
Sotol	1

TC-4B

Percent Ground Cover

	%
Bare ground	18.0
Gravel	19.5
Rock	19.5
Litter	32.5
Vegetative base	10.5

Fetch statistics

Average	
(inches)	9.09
Standard Error	0.94
Variance	89.29
Median	6
Mode	0
Range	0 – 45
Count	100

Percent frequency

		%
Perennial grasses		
Tobosa		38
Sideoats grama		2
Bush muhly		5
Fluffgrass		3.5
Cane beardgrass		0.5
Panic		0.5
Black grama		4
Perennial three-awn		0.5
Perennial forbs		
Globemallow		1.5
Trees and shrubs		
Whitethorn acacia	Base	3.0
	Canopy	13.5
Turpentine bush	Base	0.5
	Canopy	1.5
Snakeweed	Base	0.5

TC-4B

	Canopy	1.0
Prickly pear	Base	4.0
	Canopy	4.0
Wolfberry	Base	3.5
	Canopy	3.0
Mesquite	Base	-
	Canopy	2.5
Catclaw acacia	Base	-
	Canopy	1.0
Juniper	Base	-
	Canopy	0.5
Sotol	Base	0.5
	Canopy	5.5
Annual forbs		17.0
Annual grasses		16.5

Percent composition

	%
Perennial grasses	
Tobosa	47
Sideoats grama	4
Bush muhly	1
Fluffgrass	2
Cane beardgrass	T
Panic	1
Black grama	T
Perennial forbs	
Globemallow	3
Trees and shrubs	
Whitethorn acacia	12
Turpentine bush	3
Snakeweed	1
Prickly pear	8
Wolfberry	11
Mesquite	5
Catclaw acacia	2
Juniper	1

TC-5

Percent Ground Cover

	%
Bare ground	17.0
Gravel	10.5
Rock	40.5
Litter	30.0
Vegetative base	2.0

Fetch statistics

Average (inches)	
Standard Error	
Variance Median	
Mode Range	
Count	

Percent frequency

		%
Perennial grasses		
Tobosa		15.5
Perennial three-awn		7.5
Sideoats grama		1.5
Black grama		2
Perennial forbs		
Unknown #1		3.5
Sida		2.5
Globemallow		15.0
Trees and shrubs		
Ocotillo	Base	-
	Canopy	7.5
Prickly pear	Base	-
	Canopy	1.0
Snakeweed	Base	1.5
	Canopy	2.5
Wolfberry	Base	-
	Canopy	1.5
Palo Verde	Base	1.5

TC-5		
	Canopy	1.5
Catclaw acacia	Base	1
	Canopy	7.5
Mesquite	Base	-
	Canopy	2.0
Pin Cushion Cactus	Base	-
	Canopy	1.0
Sotol	Base	-
	Canopy	0.5
Annual forbs		90.0
Annual grasses		70.5

Percent composition	
	%
Perennial grasses	
Tobosa	27
Perennial three-awn	8
Sideoats grama	1
Black grama	1
Perennial forbs	
Four o' clock	5
Sida	5
Globemallow	18
Trees and shrubs	
Ocotillo	9
Prickly pear	1
Snakeweed	5
Wolfberry	2
Palo Verde	4
Catclaw acacia	8
Mesquite	3
Pin Cushion Cactus	2

TC-7

Percent Ground Cover

	%
Bare ground	6.5
Gravel	24.5
Rock	30.0
Litter	36.5
Vegetative base	2.5

Fetch statistics

Average	
(inches)	10.54
Standard Error	0.7
Variance	46.68
Median	10
Mode	3
Range	0 – 30
Count	95

Percent frequency

		%
Perennial grasses		
Tobosa		5
Perennial three-awn		0.5
Lehmann lovegrass		2.5
Bush muhly		0.5
Perennial forbs		
Sida		4.0
Croton		36.5
Trees and shrubs		
Palo Verde	Base	1.0
	Canopy	9.5
Cholla	Base	-
	Canopy	1.0
Barrel cactus	Base	0.5
	Canopy	-
Mesquite	Base	2.0
	Canopy	5.5

TC-7		
Ocotillo	Base	-
	Canopy	2.0
Unknown #1	Base	2.5
	Canopy	6.0
Catclaw acacia	Base	0.5
	Canopy	1.5
Brickellia	Base	18.5
	Canopy	19.0
Prickly pear	Base	1
	Canopy	4.5
Wolfberry	Base	1
	Canopy	1
Hedgehog cactus	Base	1
	Canopy	-
Annual forbs		1.5
Annual grasses		0.5

Percent composition	
	%
Perennial grasses	
Tobosa	2
Perennial three-awn	T
Lehmann lovegrass	1
Bush muhly	1
Perennial forbs	
Sida	3
Croton	40
Trees and shrubs	
Palo Verde	7
Cholla	1
Mesquite	5
Four o'clock	6
Brickellia	25
Prickly pear	6
Wolfberry	1
Hedgehog cactus	1

Appendix C: UA Monitoring Data 2012

TC-1

% Ground Cover						
Species	Transect (#Hits)					% Cover*
	1	2	3	4	Total	
Bare Ground	21	21	12	15	69	11.50
Gravel (1/4" - 3")	19	13	30	27	89	14.83
Litter	20	23	14	30	87	14.50
Rock > 3"	89	92	91	76	348	58.00
Live Basal Veg.	1	1	3	2	7	1.17

Fetch			
n	101	Minimum	0
Maximum	20	Median**	4.33
Mean	4.49	SE	1.25
Asymmetry	1.64		

% Frequency							40x40 cm	DWR Wt. Composition				Sample Size = 100
Species		Transect (#Hits)					% Freq*	Rank (#Hits)			Wtd. Sum	% Comp.*
		1	2	3	4	Total		1	2	3		
Woody Species												
Acacia constricta	ACCO2	1	1		2	4	2.00	2	2	4	22	2.2
Acacia constricta-canopy	ACCO2		4	2	3	9	4.50					
Acacia greggii	ACGR	1	1		1	3	1.50	2	3	4	24	2.4
Acacia greggii-canopy	ACGR	2	3	3	4	12	6.00					
Fouquieria splendens-canopy	FOSP2	1				1	0.50					
Fouquieria splendens	FOSP2							1			7	0.7
Gutierrezia sarothrae	GUSA2				1	1	0.50					
Larrea tridentata-canopy	LATR2			1		1	0.50					
Lycium pallidum	LYPA	1				1	0.50	1	1	2	11	1.1
Lycium pallidum-canopy	LYPA	1				1	0.50					
Opuntia	OPUNT				1	1	0.50	4	3	1	35	3.5
Opuntia-canopy	OPUNT	4			2	6	3.00					
Parthenium incanum	PAIN2	9	4	5	11	29	14.50	6	9	7	67	6.7
Prosopis velutina Woo.-canopy	PRVE			3		3	1.50					
Grasses - Perennial												
Aristida	ARIST		1			1	0.50	1			7	0.7
Bouteloua curtipendula	BOCU	1	1		1	3	1.50	2	2	2	20	2
Bouteloua eriopoda	BOER4	2		2	1	5	2.50	2	2		18	1.8
Bouteloua rothrockii	BORO2	1				1	0.50		1	1	3	0.3
Muhlenbergia porteri	MUPO2	2			1	3	1.50	2	1		16	1.6
Panicum obtusum	PAOB		6	6	3	15	7.50	1	5	5	22	2.2
Pappophorum vaginatum	PAVA2	1		3	2	6	3.00	1	1		9	0.9
Pleuraphis mutica	PLMU3	9	11	7		27	13.50	22	15	7	191	19.1
Tridens muticus	TRMU	1		1	2	4	2.00	1			7	0.7
Forbs - Perennial/Biennial												
Perennial forb(s)	PPFF	37	36	43	30	146	73.00	48	49	55	489	48.9
Solanum elaeagnifolium	SOEL				1	1	0.50					
Sphaeralcea	SPHAE		1			1	0.50			1	1	0.1
Annuals												
Annual forb(s)	AAFF	11	14	12	9	46	23.00					
Annual grass(es)	AAGG	6	3		2	11	5.50					
Unclassified												
Croton	CROTO	9	5	9	9	32	16.00	4	6	11	51	5.1
Euphorbia	EUPHO			1		1	0.50					

TC-4B

% Ground Cover						
Species	Transect (#Hits)					% Cover*
	1	2	3	4	Total	
Bare Ground	11	5	19	7	42	7.00
Gravel (1/4" - 3")	41	41	39	45	166	27.67
Litter	55	56	49	58	218	36.33
Rock > 3"	38	48	40	38	164	27.33
Live Basal Veg.	5		3	2	10	1.67

Fetch			
n	100	Minimum	0
Maximum	30	Median**	5.00
Mean	6.26	SE	0.04
Asymmetry	4.38		

% Frequency							40x40 cm	DWR Wt. Composition				Sample Size = 100
Species		Transect (#Hits)					% Freq*	Rank (#Hits)			Wtd. Sum	% Comp.*
		1	2	3	4	Total		1	2	3		
Woody Species												
Acacia constricta	ACCO2	1	1	4		6	3.00	7	10	14	83	8.3
Acacia constricta-canopy	ACCO2	9	9	15	5	38	19.00					
Acacia greggii-canopy	ACGR	3	1			4	2.00					
Acacia greggii	ACGR							1	3	3	16	1.6
Dasylirion wheeleri	DAWH2				3	3	1.50	1	1		9	0.9
Dasylirion wheeleri-canopy	DAWH2	1	1	2	1	5	2.50					
Ericameria laricifolia	ERLA12	1		1	2	4	2.00	1	1		9	0.9
Ericameria laricifolia-canopy	ERLA12			1		1	0.50					
Fouquieria splendens-canopy	FOSP2			2		2	1.00					
Gutierrezia sarothrae	GUSA2	1		1		2	1.00	1		1	8	0.8
Gutierrezia sarothrae-canopy	GUSA2		1	1		2	1.00					
Lycium pallidum	LYPA	3	3	1		7	3.50	5	6	6	53	5.3
Lycium pallidum-canopy	LYPA	6	2	5	4	17	8.50					
Opuntia	OPUNT		1			1	0.50	6	4	5	55	5.5
Opuntia-canopy	OPUNT	2	7	5	2	16	8.00					
Parthenium incanum	PAIN2	2	3	5	1	11	5.50	4	6	6	46	4.6
Parthenium incanum-canopy	PAIN2	2				2	1.00					
Grasses - Perennial												
Aristida	ARIST				2	2	1.00					
Bouteloua curtipendula	BOCU	1				1	0.50	1	1		9	0.9
Bouteloua eriopoda	BOER4	11	14	10	12	47	23.50	19	17	6	173	17.3
Digitaria californica	DICA8			1		1	0.50					
Muhlenbergia porteri	MUPO2	8	9	3	3	23	11.50	10	11	5	97	9.7
Pleuraphis mutica	PLMU3	15	21	12	15	63	31.50	35	27	25	324	32.4
Sporobolus cryptandrus	SPCR			1		1	0.50					
Tridens muticus	TRMU	2				2	1.00	2			14	1.4
Tridens pulchellus	TRPU10	1		1	2	4	2.00	1			7	0.7
Forbs - Perennial/Biennial												
Perennial forb(s)	PPFF	17	12	15	17	61	30.50	5	10	24	79	7.9
Annuals												
Annual forb(s)	AAFF	19	21	13	15	68	34.00					
Annual grass(es)	AAGG	2		1	2	5	2.50					
Unclassified												
Boerhavia	BOERH2	3	4	6	2	15	7.50		2	5	9	0.9
Unknown 1	UNKN1	1				1	0.50	1	1		9	0.9

TC-5

% Ground Cover						
Species	Transect (#Hits)					% Cover*
	1	2	3	4	Total	
Bare Ground	15	6	11	6	38	6.33
Gravel (1/4" - 3")	39	56	32	40	167	27.83
Litter	32	33	33	37	135	22.50
Rock > 3"	63	54	73	66	256	42.67
Live Basal Veg.	1	1	1	1	4	0.67

Fetch			
n	100	Minimum	0
Maximum	44	Median**	5.25
Mean	8.03	SE	0.53
Asymmetry	10.32		

% Frequency							40x40 cm	DWR Wt. Composition				Sample Size = 100
Species		Transect (#Hits)					% Freq*	Rank (#Hits)			Wtd. Sum	% Comp.*
		1	2	3	4	Total		1	2	3		
Woody Species												
Acacia constricta	ACCO2	1				1	0.50			1	1	0.1
Acacia greggii-canopy	ACGR	5	4	1	3	13	6.50					
Acacia greggii	ACGR							2	5	8	32	3.2
Aloysia wrightii-canopy	ALWR				1	1	0.50					
Cercidium floridum-canopy	CEFL6			1	1	2	1.00					
Dasylirion wheeleri-canopy	DAWH2		1			1	0.50					
Dasylirion wheeleri	DAWH2							1	1		9	0.9
Fouquieria splendens	FOSP2		1		1	2	1.00	6	7	8	64	6.4
Fouquieria splendens-canopy	FOSP2	8	4	4	7	23	11.50					
Gutierrezia sarothrae	GUSA2	1	1			2	1.00	1	2	2	13	1.3
Gutierrezia sarothrae-canopy	GUSA2				2	2	1.00					
Lycium pallidum	LYPA		1		1	2	1.00	3	3	5	32	3.2
Lycium pallidum-canopy	LYPA	4		3		7	3.50					
Opuntia-canopy	OPUNT	1	1	2		4	2.00					
Opuntia	OPUNT							2	2		18	1.8
Parthenium incanum	PAIN2		1	2		3	1.50		1		2	0.2
Prosopis velutina Woo.-canopy	PRVE				2	2	1.00					
Grasses - Perennial												
Aristida	ARIST	2		1	2	5	2.50	2	2	2	20	2
Bouteloua eriopoda	BOER4		1		1	2	1.00	1	1		9	0.9
Bouteloua rothrockii	BORO2	3	1		1	5	2.50	3	3	3	30	3
Muhlenbergia porteri	MUPO2	1	1		1	3	1.50	2	2		18	1.8
Panicum obtusum	PAOB		1			1	0.50	1			7	0.7
Pappophorum vaginatum	PAVA2	4	8	1	2	15	7.50	10	6	6	88	8.8
Pleuraphis mutica	PLMU3	10	5	8	9	32	16.00	15	12	1	130	13
Forbs - Perennial/Biennial												
Perennial forb(s)	PPFF	21	33	28	28	110	55.00	49	51	59	504	50.4
Sphaeralcea	SPHAE	1	2			3	1.50	1	1	3	12	1.2
Annuals												
Annual forb(s)	AAFF	24	19	20	23	86	43.00					
Annual grass(es)	AAGG	6	7	9	8	30	15.00					
Unclassified												
Boerhavia	BOERH2		2	1		3	1.50	1	1	2	11	1.1

TC-7

% Ground Cover						
Species	Transect (#Hits)					% Cover*
	1	2	3	4	Total	
Bare Ground	7	9	9	10	35	5.83
Gravel (1/4" - 3")	58	50	59	39	206	34.33
Litter	40	43	43	42	168	28.00
Rock > 3"	43	47	37	57	184	30.67
Live Basal Veg.	2	1	2	2	7	1.17

Fetch			
Asymmetry	4	Average	7
Count	100	Maximum	34
Median	6	SE	

% Frequency							40x40 cm	DWR Wt. Composition				Sample Size = 1
Species		Transect (#Hits)					% Freq*	Rank (#Hits)			Wtd. Sum	% Comp.*
		1	2	3	4	Total		1	2	3		
Woody Species												
Acacia greggii-canopy	ACGR	2	2		2	6	3.00					
Acacia greggii	ACGR								2	4	8	0.78
Brickellia	BRICK	4	5	7	3	19	9.50	8	4	5	69	6.76
Brickellia-canopy	BRICK		1	1	1	3	1.50					
Cercidium floridum	CEFL6	1		1		2	1.00	2	1	1	17	1.67
Cercidium floridum-canopy	CEFL6	1	1		1	3	1.50					
Fouquieria splendens-canopy	FOSP2		1	1	1	3	1.50					
Lycium pallidum	LYPA				1	1	0.50	1			7	0.69
Lycium pallidum-canopy	LYPA	1		5		6	3.00					
Opuntia	OPUNT		1	1		2	1.00	4	3	2	36	3.53
Opuntia-canopy	OPUNT	2	1		3	6	3.00					
Opuntia fulgida	OPFU				1	1	0.50					
Opuntia fulgida-canopy	OPFU				2	2	1.00					
Prosopis velutina Woot.	PRVE	1				1	0.50	4	4	6	42	4.12
Prosopis velutina Woo.-canopy	PRVE	4	3	5	2	14	7.00					
Grasses - Perennial												
Aristida	ARIST	2				2	1.00	2	1	1	17	1.67
Bouteloua rothrockii	BORO2		1			1	0.50		1	1	3	0.29
Muhlenbergia porteri	MUPO2		1	2		3	1.50	1		1	8	0.78
Panicum obtusum	PAOB	8	8	17	13	46	23.00	9	14	10	101	9.9
Pleuraphis mutica	PLMU3		6	6	5	17	8.50	12	10	9	113	11.08
Forbs - Perennial/Biennial												
Perennial forb(s)	PPFF			1		1	0.50					
Annuals												
Annual forb(s)	AAFF	31	24	17	18	90	45.00					
Annual grass(es)	AAGG	13	20	15	8	56	28.00					
Unclassified												
Boerhavia	BOERH2	3		1	1	5	2.50	2	2	1	19	1.86
Croton	CROTO	34	29	30	25	118	59.00	56	59	60	570	55.88
Ferocactus	FEROC		1			1	0.50	1	1	1	10	0.98

Appendix D: USFS TEAMS Monitoring Data 2014

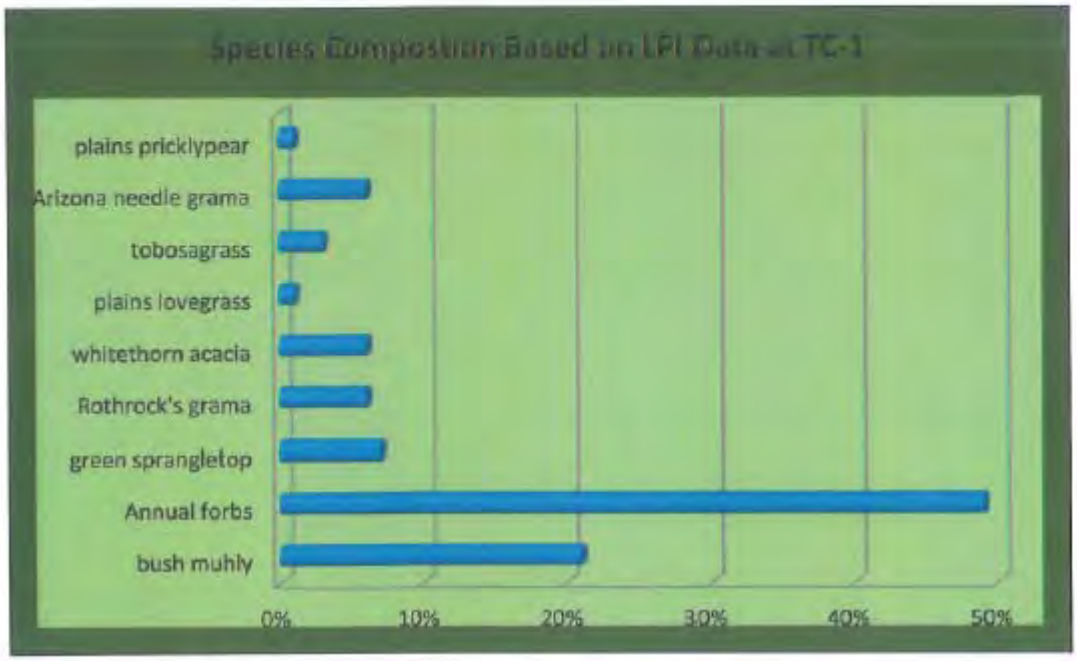
TC-1

	Basal Cover				Non-Vascular Plants	Biological Crust	Litter	Surface Fragments > ¼" & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
	Grass/ Grasslike	Forb	Shrub/ Vine	Tree								
ESD	6 to 15	0 to 1	0 to 1	0 to 0	0 to 1	0 to 5	20 to 40	10 to 45	0 to 8	0 to 0	0 to 0	20 to 30
TC-1	5	0	0	0	1	0	33.7	84.2	Not separated	0	0	0

Key area information	Species	Line point intercept canopy cover at TC-1
Trend Plot 1 *Twin C Ranch Allotment*	*Annual Forbs*	49%
Range site: R041XC303AZ	*Bouteloua aristidoides*	6%
	Bouteloua rothrockii	6%
	Eragrostis intermedia	1%
	Leptochloa dubia	7%
	Muhlenbergia porter	21%
	Opuntia	1%
	Pleuraphis mutica	3%
	Acacia constricta	6%

Cover/Litter/Bare Ground	
Basal Cover	5%
Foliar Cover	73.3%
Bare Ground	0%

State in Transition of Mesquite Native Site as described by the ESD	LPI Data
PR sp and ACCO2 – 2-10% Canopy cover	ACCO2 -6% Canopy cover
PLUM3 – 5 to 25% Canopy cover	PLUM3 – 3% Canopy cover
Other shrubs and cacti like may be present	OPPO – 1% Canopy cover
HIBE 5-25% Canopy cover	HIBE not present



Ranking	Species List for Functional/Structural Groups at TC-1
D	ERIN
D	MUPO2
S	BORO2
S	BOARA2
M	ARIST
S	ACCO2
S	OPPO
M	YUCCA
M	FOSP2
S	PLMU3
S	ANNUAL FORBS
T	CYAC8

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

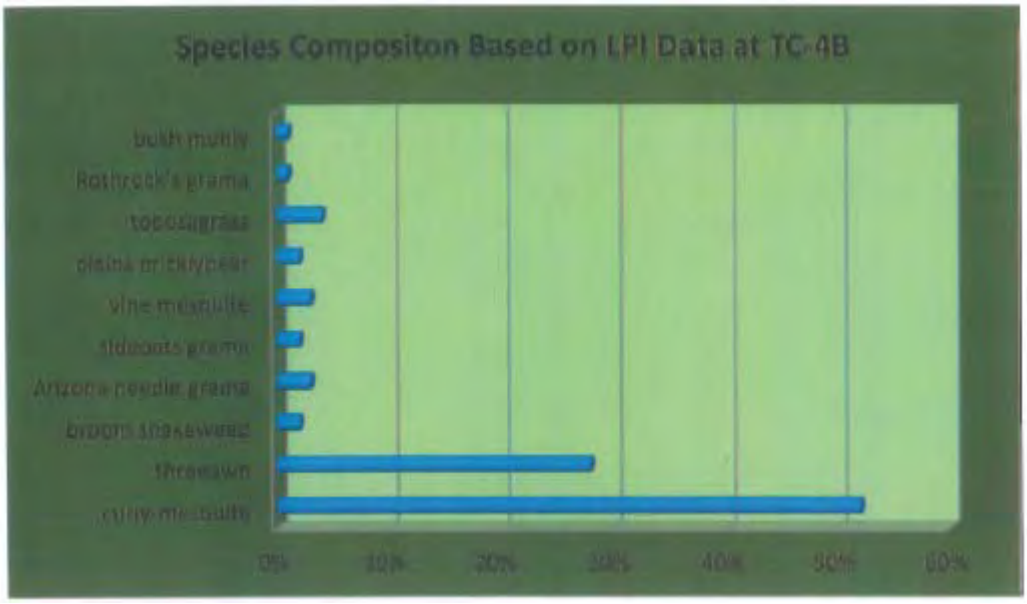
TC-4B and 5

	Basal Cover				Non-Vascular Plants	Biological Crust	Litter	Surface Fragments > ¼" & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
	Grass/ Grasslike	Forb	Shrub/ Vine	Tree								
ESD	3 to 8	0 to 1	1 to 3	0 to 0	0 to 1	0 to 1	20 to 50	25 to 50	1 to 12	1 to 15	0 to 0	5 to 35
TC-4B	13	0	0	0	2	0	55	56	Not separated	0	0 to 0	3
TC-5	3	0	1	0	0	0	46.5	75.2	Not separated	0	0 to 0	3

Key area information	Species	Line point intercept canopy cover at TC-4B
Trend Plot 4B *Twin C Ranch Community Allotment*	*Aristida*	25%
Range site: R041XC323AZ	*Bouteloua aristidoides*	3%
	Bouteloua curtipendula	2%
	Bouteloua rothrockii	1%
	Gutierrezia sarothrae	2%
	Hilaria belangeri	46%
	Muhlenbergia porteri	1%
	Opuntia polyacantha	2%
	Panicum obtusum	3%
	Pleuraphis mutica	4%

Cover/Litter/Bare Ground	
Foliar Cover	76%
Basal Cover	13%
Bare Ground	3%

State in Transition of HCPC Site as described by the ESD	LPI Data
BOCU, BOER other grasses 20-35% Canopy Cover	BOCU -2% Canopy cover HIBE – 46% MUPO2 – 1% PAOB – 3% PLMU3 – 4%
CAER, ERWR 5-15% Canopy Cover	Not present in transect but present in area
Other Shrubs 1-10% Canopy Cover	Not present in transect but present in area



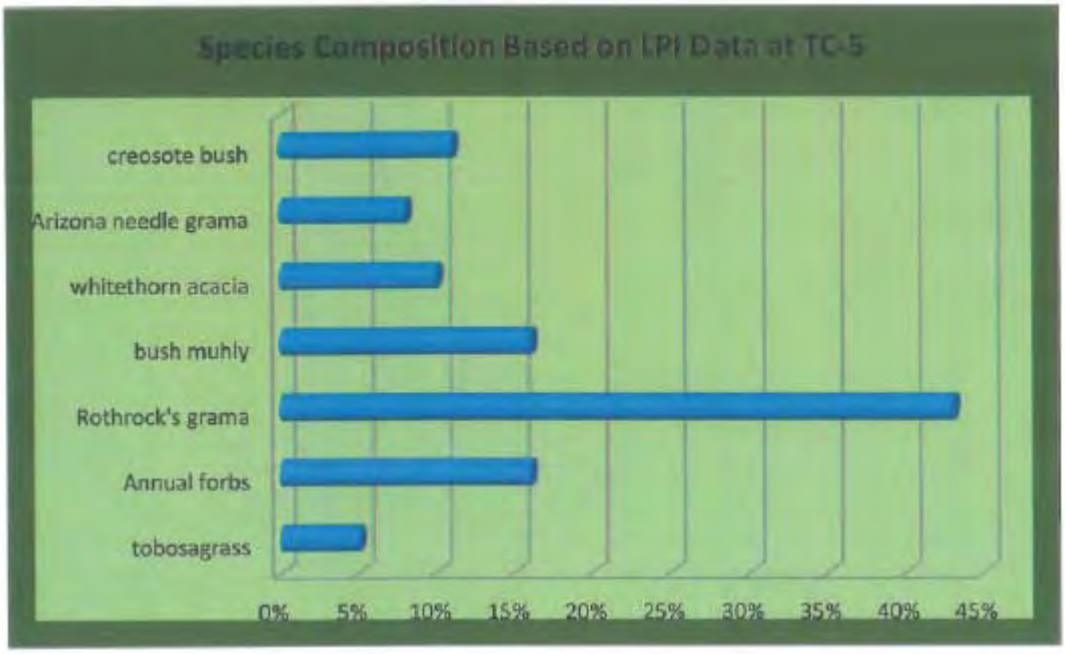
Ranking	Species List for Functional/Structural Groups at TC-4B
D	ARISTIDA
S	BOCU
S	HIBE
S	OPPO
M	PAOB
M	DICA8
M	NOLIN
M	BOARA2
M	GUSA2
M	JUMO
M	YUCCA
M	MUPO2

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

Key area information	Species	Line point intercept canopy cover at TC-5
Trend Plot 5 *Twin C Ranch Community Allotment*	*Annual forbs*	12%
Range site: R041XC323AZ	*Acacia constricta*	6%
	Larrea tridentata	7%
Percent litter cover measured 2013: 47%	*Atriplex sp.*	3%
tolerable bare ground: 5-35%	*Bouteloua aristidoides*	5%
Percent bare ground measured 2013: 3%	*Bouteloua rothrockii*	27%
	Muhlenbergia porteri	12%
	Pleuraphis mutica	4%

Cover/Litter/Bare Ground	
Foliar Cover	59.4%
Basal Cover	4%
Bare Ground	3%

State in Transition of Native grass, forb, half shrub Site as described by the ESD	LPI Data
Shrubs, succulents dominate plant community with lesser amounts of perennial grasses. Annuals fluctuate with climate (drought/El Nino).	MUPO2 – 12% Canopy cover PLMU3 – 4%
	ACCO2 – 6% LATR2 – 7%
	Annual forbs – 12%
	BOARA2 – 5% BORO2 – 27%



Ranking	Species List for Functional/Structural Groups at TC-5
M	PLMU3
M	SEAR7
S	ANNUAL FORBS
D	BORO2
M	Aristida sp.
M	BOARA2
S	OPPO
S	FOSP2
T	PAMI5
M	MUPO2
T	YUCCA
M	ACGR
T	FEROC

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

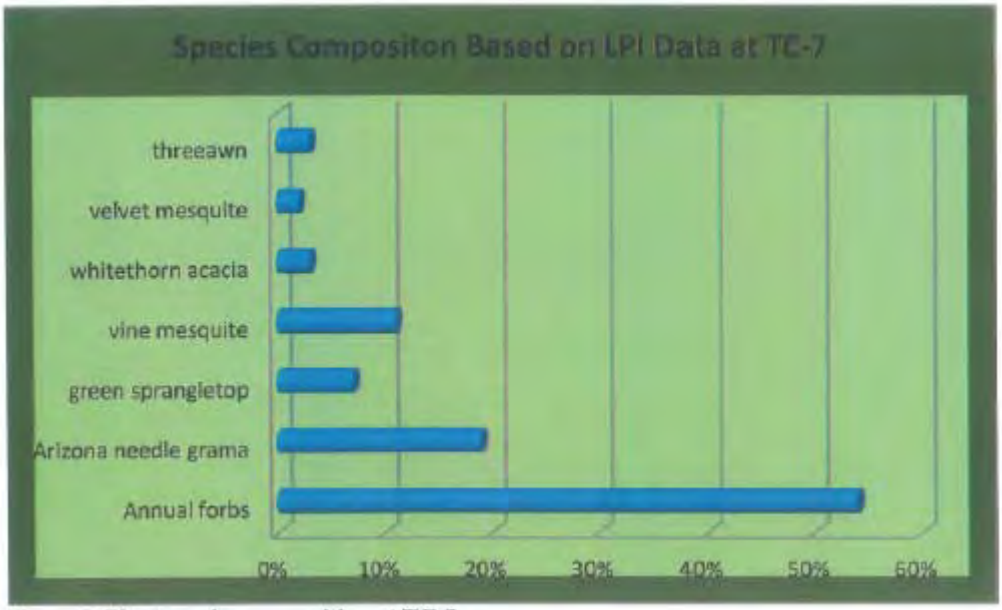
TC-7

	Grass/ Grasslike	Forb	Shrub/ Vine	Tree	Vascular Plants	Crust		Fragments > ¼" & <= 3"	Fragments > 3"			Ground
ESD	0 to 2	0 to 2	1 to 2			1 to 10	3 to 35	15 to 50	1 to 15	0 to 0	0 to 0	5 to 50
TC-7	4	0	0	0	0	0	38	90	Not Separated	0 to 0	0 to 0	0

Key area information	Species	Line point intercept canopy cover at TC-7
Trend Plot 7 *Twin C Ranch Community Allotment*	*Acacia constricta*	3%
Range site R041XB207AZ	*Aristida*	3%
	Bouteloua aristidoides	19%
	Leptochloa dubia	7%
	Panicum obtusum	11%
	Prosopis velutina	2%
	Annual forbs	53%

Cover/Litter/Bare Ground	
Foliar Cover	81%
Basal Cover	4%
Bare Ground	0%

State in Transition of HCPC Site as described by the ESD	LPI Data
LATR, ACCO2 10-20% Canopy Cover	ACCO2 – 3%
Other Shrubs 0-10% Canopy Cover	PRVE – 2%
Peren.forbs and grasses on north aspects and bottoms.	LEDU -7% Canopy cover PAOB – 11%



Ranking	Species List for Functional/Structural Groups at TC-7
M	PRVE
D	PLMU3
S	ERIN
M	OPPO
M	GUSA2
M	PLMU3
S	BORO2
S	BOARA2
M	PAOB
S	FOSP2
M	CHOLLA
M	ACCO2
S	ANNNUAL FORBS
M	FEROC

Dominant (D) roughly 40-100% composition, Sub-dominant (S) roughly 10-40% composition, Minor Composition (M) roughly 1-5% composition, or Trace (T) roughly <2% composition.

Appendix E: Twin C Allotment Utilization Information 2013 and 2015

Range Utilization Method
Key Forage Plant Method

1. District	2. Date	3. Observer	
4. Allotment	5. Pasture	6. Operator	7. Location
8. Key Vegetation	9. Range Type	10. Type(s) of Users	
11. Period of Use	12. Grazing Management System		
13. Transect Location/Key Area No.			

14. The Rating of Current Years Growth	Mid Point (x)	Key Species		Key Species		Key Species		Key Species	
		Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)
No Use (0%): The rangeland shows no evidence of use by grazing animals.	0								
Slight use (1-20%): The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.	10								
Light (21 - 40%): The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed an 60 to 80% of the number of current seedstalks of key herbaceous plants remains intact. Most young plants of the key species are undamaged. Little or no one of low value plants. There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 21 to 40% of the available leader growth of the key browse plants has been removed.	30								
Moderate (41 - 60%): The rangeland appears entirely covered as uniformly as natural features and facilities will allow. 15 to 25% of the number of current seedstalks of key herbaceous species remain intact. No more than 10% of the number of low value herbaceous forage plants are utilized. Browse plants appear rather uniformly utilized and 41 to 60% of the available leader growth of key browse plants has been removed.	50								
Heavy (61 - 80%): The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with more than 10% of the number of low value herbaceous forage plants have been utilized. The preferred browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on key browse plants. Approximately 61 to 80% of the available leader growth of the key browse plants has been removed.	70								
Severe (81-100%): The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction of current seedstalks of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of preferred grasses are grazed to the soil surface. There is no evidence of terinal buds and 81 to 100% of available leader growth of the browse plants have been utilized. Hedging is readily apparent and the browse plants are more frequently broken.	90								
Total									
Average Utilization = $\sum fx / \sum f$									
Remarks (Use back of sheet)									

Where f = the frequency or number of observations within each class interval (f column)
x = the class interval midpoint (x column), and $\sum$ the summation symbol.

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Range Utilization
Key Forage Plant Method

1. District	2. Date: 11/16/13	3. Observer: Grooms	
4. Allotment: Twin C	5. Pasture	6. Operator	7. Location: Twin C - 1 KMA
8. Key Vegetation	9. Range Type: Clayey Slopes 12.1C	10. Type(s) Users	
11. Period of Use	12. Grazing Management System		
13. Transect Location/ Key area No.: TC-1			

14. Use Rating of Current Years Growth	Mid Point (x)	Key Species: ERFW		Key Species: BO RD 2		Key Species		Key Species	
		Frequency (f)	f(f) * (x)	Frequency (f)	f(f) * (x)	Frequency (f)	f(f) * (x)	Frequency (f)	f(f) * (x)
No Use (0-5%): The rangeland shows no evidence of use by grazing animals.	0	1	0	X	0				
Slight Use (1-20%): The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.	10		30						
Light (21-40%): The rangeland may be topped, clumped, or grazed in patches. The low value herbaceous plants are ungrazed and 60 to 80% of the number of current seedstalks of key herbaceous plants remains intact. Most young plants of the key species are undamaged. Little or no use of low value plants. There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 21 to 40% of the available leader growth of the key browse plants has been removed.	30								
Moderate (41 to 60%): The rangeland appears entirely covered as uniformly as natural features and facilities will allow. 15 to 20% of the number of current seedstalks of key herbaceous species remain intact. No more than 10% of the number of low value herbaceous forage plants are utilized. Browse plants appear rather uniformly utilized and 41 to 60% of the available leader growth of key browse plants has been removed.	50								
Heavy (61 to 80%): The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with more than 10% of the number of low value herbaceous forage plants have been utilized. The preferred browse plants are badged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on key browse plants. Approximately 61 to 80% of the available leader growth of the key browse plants has been removed.	70								
Severe (81-100%): The rangeland has a mown appearance and there are indications of repeated coverage. There is no evidence of reproduction of current seedstalks of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of preferred grasses are grazed to the soil surface. There is no evidence of terminal buds and 81 to 100% of available leader growth on the key browse plants has been removed. Some, and often much, of the 2nd and 3rd year's growth of the browse plants have been utilized. Hedging is readily apparent, and the browse plants are more frequently broken.	90								
Total			30		Ø				
Average Utilization = Σ(x)/Σ(f)			3 %						

REMARKS (Use back of sheet)

*Where f = the frequency or number of observations within each class interval (f column), x = the class interval midpoint (x column), and Σ = the summation symbol.

IV 4400-12

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Range Utilization
Key Forage Plant Method

1. District: Safford	2. Date: 11/16/13	3. Observer: Grooms	
4. Allotment: Twin-C	5. Pasture	6. Operator	7. Location: TC-4B
8. Key Vegetation	9. Range Type	10. Type(s) Users	
11. Period of Use	12. Grazing Management System		
13. Transect Location/ Key area No.			

14. The Rating of Current Years Growth	Mid Point (a)	Key Species: BOCU		Key Species: PLMU3		Key Species		Key Species	
		Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)
No Use (0-5%): The rangeland shows no evidence of use by grazing animals.	0	• •	0	• •	0				
Slight Use (1-10%): The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedlings and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.	10	• • • •	40	• • • •	50				
Light (11-40%): The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ingested and 60 to 80% of the number of current seedlings of key herbaceous plants remains intact. Most young plants of the key species are undamaged. Little or no use of low value plants. There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 21 to 40% of the available leader growth of the key browse plants has been removed.	30	• • •	90	• •	60				
Moderate (41 to 60%): The rangeland appears entirely covered as uniformly as natural features and facilities will allow. 15 to 25% of the number of current seedlings of key herbaceous species remain intact. No more than 10% of the number of low value herbaceous forage plants are utilized. Browse plants appear rather uniformly utilized and 41 to 60% of the available leader growth of key browse plants has been removed.	50	•	50						
Heavy (61 to 80%): The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with more than 10% of the number of low value herbaceous forage plants have been utilized. The preferred browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on key browse plants. Approximately 61 to 80% of the available leader growth of the key browse plants has been removed.	70								
Severe (81-100%): The rangeland has a severe appearance and there are indications of repeated coverage. There is no evidence of reproduction of current seedlings of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of preferred grasses are grazed to the soil surface. There is no evidence of terminal buds and 81 to 100% of available leader growth on the key browse plants has been removed. Some, and often much, of the 2nd and 3rd year's growth of the browse plants have been utilized. Hedging is readily apparent, and the browse plants are more frequently broken.	90								
Total			180		110				
Average Utilization = Σ(f*a)/Σf		18%		11%					

REMARKS: (Use back of sheet)

*Where f = the frequency or number of observations within each class observed (if relevant), a = the class interval midpoint (in whole), and Σ = the summation symbol.

NV 4400-12

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Range Utilization
Key Forage Plant Method

1. District: Tucson	2. Date: 11/16/13	3. Observer: Grimms / Baxter	
4. Allotment: Twin C	5. Pasture	6. Operator	7. Location: KMA Twin C #5
8. Key Vegetation	9. Range Type	10. Type(s) Users	
11. Period of Use	12. Grazing Management System		
13. Transect Location/ Key Area No.			

14. Use Rating of Current Years Growth	Mid Point (x)	Key Species: Tobosa		Key Species: Muhly		Key Species		Key Species	
		Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)
No Use (0-5%): The rangeland shows no evidence of use by grazing animals.	0	X	*0	X	*0				
Slight Use (1-20%): The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedlings and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.	10								
Light (21-40%): The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60 to 80% of the number of current seedlings of key herbaceous plants remains intact. Most young plants of the key species are undamaged. Little or no use of low value plants. There is obvious evidence of leader use. The available leaders appear to be topped or browsed in patches and 21 to 40% of the available leader growth of the key browse plants has been removed.	30		60		30				
Moderate (41 to 60%): The rangeland appears entirely covered or uniformly as natural features and facilities will allow. 15 to 25% of the number of current seedlings of key herbaceous species remain intact. No more than 10% of the number of low value herbaceous forage plants are utilized. Browse plants appear rather uniformly utilized and 41 to 60% of the available leader growth of key browse plants has been removed.	50								
Heavy (61 to 80%): The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with more than 10% of the number of low value herbaceous forage plants have been utilized. The preferred browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on key browse plants. Approximately 61 to 80% of the available leader growth of the key browse plants has been removed.	70								
Severe (81-100%): The rangeland has a mown appearance and there are indentions of repeated coverage. There is no evidence of reproduction of current seedlings of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining edible of preferred grasses are grazed to the soil surface. There is no evidence of terminal buds and 81 to 100% of available leader growth on the key browse plants has been removed. Some, and often much, of the 2nd and 3rd year's growth of the browse plants have been utilized. Hedging is readily apparent, and the browse plants are more frequently broken.	90								
Total			60		30				
Average Utilization = $\sum fx / \sum f$			6%		3%				

REMARKS (Use back of sheet)

*Where f = the frequency or number of observations within each class interval if unknown, x = the class interval midpoint (x unknown), and $\sum$ = the summation symbol.

NV 4429-12

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Range Utilization
Key Forage Plant Method

1. District	2. Date 11/16/13	3. Observer Grooms	
4. Allotment Twin C	5. Pasture	6. Operator	7. Location TC-7
8. Key Vegetation	9. Range Type	10. Type(s) Users	
11. Period of Use	12. Grazing Management System		
13. Transect Location/ Key area No.			

14. Use Range of Current Years Growth	Mid Point (x)	Key Species POA6		Key Species ERIN		Key Species		Key Species	
		Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)	Frequency (f)	(f) * (x)
No Use (0-5%): The rangeland shows no evidence of use by grazing animals.	0	1	0	3	0				
Slight Use (1-20%): The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants of key herbaceous species are fully disturbed. The available leaders of key browse plants are little disturbed.	10	2	20	3	30				
Light (21-40%): The rangeland may be topped, skimmed, or grazed in patches. The low value herbaceous plants are ungrazed and 60 to 80% of the number of current seedstalks of key herbaceous plants remain intact. Most young plants of the key species are undamaged. Little or no use of low value plants. There is obvious evidence of leader use. The available leaders appear cropped or browsed in patches and 21 to 40% of the available leader growth of the key browse plants has been removed.	30	1	30	2	60				
Moderate (41 to 60%): The rangeland appears entirely covered as uniformly as natural features and facilities will allow. 15 to 25% of the number of current seedstalks of key herbaceous species remain intact. No more than 10% of the number of low value herbaceous forage plants are utilized. Browse plants appear rather uniformly utilized and 41 to 60% of the available leader growth of key browse plants has been removed.	50								
Heavy (61 to 80%): The rangeland has the appearance of complete search. Key herbaceous species are almost completely utilized with more than 10% of the number of low value herbaceous forage plants have been utilized. The preferred browse plants are hedged and some plant clumps may be slightly broken. Nearly all available leaders are used and few terminal buds remain on key browse plants. Approximately 61 to 80% of the available leader growth of the key browse plants has been removed.	70								
Severe (81-100%): The rangeland has a severe appearance and there are indications of repeated coverage. There is no evidence of reproduction of current seedstalks of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of preferred grasses are grazed to the soil surface. There is no evidence of terminal buds and 81 to 100% of available leader growth on the key browse plants has been removed. Some, and often much, of the 2nd and 3rd year's growth of the browse plants have been utilized. Hedging is readily apparent, and the browse plants are more frequently broken.	90								
Total			50		90				
Average Utilization = $\sum fx / \sum f$		5 %		9 %					

REMARKS (Use back of sheet)

*Where f = the frequency or number of observations within each class interval (if column), x = the class interval midpoint to evaluate, and $\sum$ = the summation symbol.

NV 4400-12

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Range Utilization
Key Forage Plant Method

1. District: TUCSON	2. Date: 3/11/15	3. Observer: MARTIN, J	
4. Allotment: TWIN C	5. Pasture	6. Operator	7. Location: TC-1 KMA
8. Key Vegetation	9. Range Type	10. Type(s) Users	
11. Period of Use	12. Grazing Management System		
13. Transect Location/ Key area No.			

14. Use Rating of Current Year's Growth	Mid Point (a)	Key Species ERIN Frequency (f)	(f) * (a)	Key Species BOER Frequency (f)	(f) * (a)	Key Species Frequency (f)	(f) * (a)	Key Species Frequency (f)	(f) * (a)
No Use (0-5%): The rangeland shows no evidence of use by grazing animals.	0	⊠ ∷	∅	⊠ ⊠	∅				
Slight Use (6-20%): The rangeland has the appearance of very light grazing. The key herbaceous forage plants may be topped or slightly used. Current seedstalks and young plants of key herbaceous species are little disturbed. The available leaders of key browse plants are little disturbed.	10	⊠ ∷	14∅	⊠	1∅∅				
Light (21-40%): [illegible]	30	• •	6∅						
Moderate (41 to 60%): [illegible]	50								
Heavy (61 to 80%): [illegible]	70								
Severe (81-100%): [illegible]	90								
Total		3∅	2∅∅	3∅	1∅∅				
Average Utilization = Σ(f*a)/Σf		6%		3.3%					

REMARKS (Use back of sheet)

*Where f = the frequency or number of observations within each class interval (f column), a = the class interval midpoint (a column), and Σ = the summation symbol.

[illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Range Utilization
Key Forage Plant Method

1. District: TUCSON | 2. Date: 3/11/15 | 3. Observer: MARTIN, J

4. Allotment: TWIN C | 5. Pasture: | 6. Operator: | 7. Location: TC-4B

8. Key Vegetation: | 9. Range Type: | 10. Type(s) Users:

11. Period of Use: | 12. Grazing Management System:

13. Transect Location/ Key area No.

14. The Rating of Use [illegible]	Mid Point (x)	Key Species BOCU Frequency (f)	BOCU (f) * (x)	Key Species PLMU Frequency (f)	PLMU (f) * (x)
No Use (0-5%): The rangeland shows no evidence of use by grazing animals.	0	[illegible]	Ø	[illegible]	Ø
Slight Use (1-20%): The rangeland has the appearance of very light grazing. [illegible]	10	[illegible]	7Ø	[illegible]	7Ø
Light (21-40%): [illegible]	30	[illegible]	24Ø	[illegible]	18Ø
Moderate (41 to 60%): The rangeland appears [illegible]	50	[illegible]	25Ø	[illegible]	5ØØ
Heavy (61 to 80%): The rangeland has the appearance of complete search. [illegible]	70	[illegible]	14Ø	[illegible]	21Ø
Severe [illegible]: [illegible]	90				
Total		3Ø	7ØØ	3Ø	96Ø
Average Utilization = Σfx/Σf			23.3%		32%

REMARKS (Use back of sheet)

[illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Range Utilization
Key Forage Plant Method

1. District: TUCSON	2. Date: 3/11/15	3. Observer: Martin, J	
4. Allotment: TWIN C	5. Pasture	6. Operator	7. Location: KMA TWIN C #5
8. Key Vegetation	9. Range Type	10. Type(s) Users	
11. Period of Use	12. Grazing Management System		
13. Transect Location/ Key area No.			

14. Use Rating of Current Year Growth	Mid Point (c)	Key Species PLMU		Key Species MUPO		Key Species		Key Species	
		Frequency (f)	(f) * (c)	Frequency (f)	(f) * (c)	Frequency (f)	(f) * (c)	Frequency (f)	(f) * (c)
No Use (0-5%): [illegible]	0	⊠ :	Ø	⊠	Ø				
Slight Use (1-20%): [illegible]	10	[:	5Ø	⊠ ·	11Ø				
Light (21-40%): [illegible]	30	⊠ ·	33Ø	⌈ .	18Ø				
Moderate (41 to 60%): [illegible]	50	. .	5Ø	::	2ØØ				
Heavy (61 to 80%): [illegible]	70								
Severe (81-100%): [illegible]	90								
Total		30	430	30	490				
Average Utilization = Σ(f)(c) / Σf		14.3		16.3					

REMARKS (Use back of sheet)

*Where f = the frequency or number of observations within each class interval of utilization, c = the class interval midpoint in utilization and Σ = the summation symbol.

NV-4400-11

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Range Utilization
Key Forage Plant Method

1. District: TUCSON	2. Date: 3/11/15	3. Observer: MARTIN, J
4. Allotment: TWIN C	5. Pasture:	6. Operator: / 7. Location: TC-7
8. Key Vegetation:	9. Range Type:	10. Type(s) Users:
11. Period of Use:	12. Grazing Management System:	
13. Transect Location/ Key area No.:		

14. [illegible]	Mid Point (x)	Key Species PADG Frequency (f)	(f)*(x)	Key Species ERIN Frequency (f)	(f)*(x)	Key Species Frequency (f)	(f)*(x)	Key Species Frequency (f)	(f)*(x)
No Use (0-5%): [illegible]	0	[tally marks]	Ø	[tally marks]	Ø				
Slight (6-20%): [illegible]	10	[tally marks]	8Ø	[tally marks]	12Ø				
Light (21-40%): [illegible]	30	[tally marks]	3ØØ	[tally marks]	15Ø				
Moderate (41 to 60%): [illegible]	50		5Ø						
Heavy (61 to 80%): [illegible]	70								
Severe (81-100%): [illegible]	90								
Total		3Ø	43Ø	3Ø	27Ø				
Average Utilization = Σfx/Σf		14%		11					

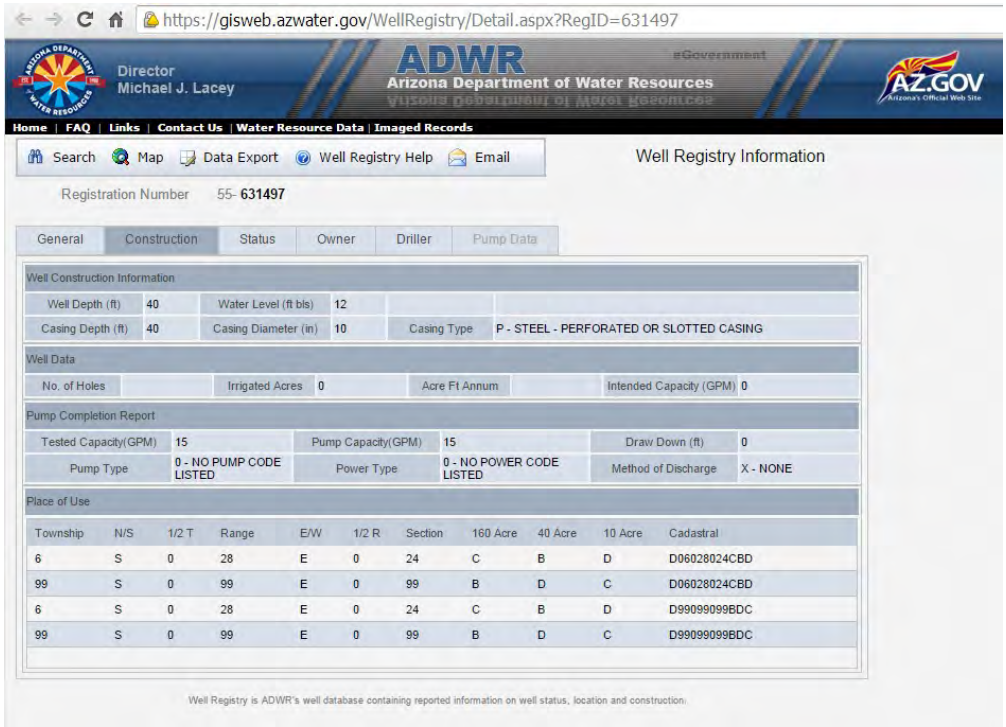
REMARKS (Use back of sheet)

*Where f = the frequency or number of observations within each class interval (if ordinal), x is the class interval midpoint (in percent), and Σ = the summation symbol.

[illegible]

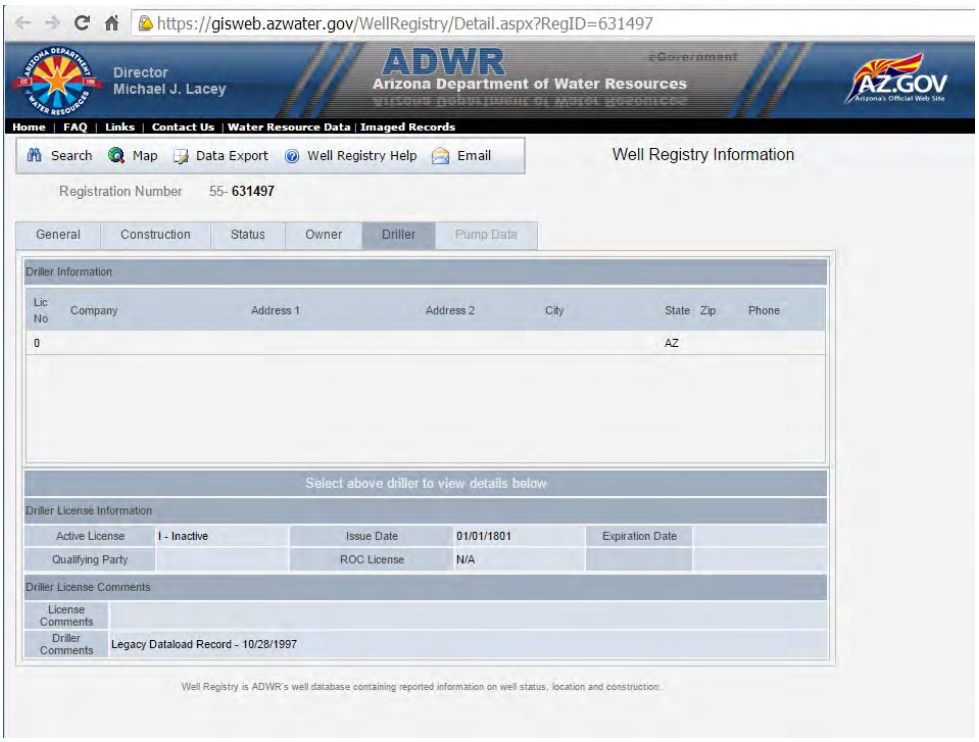
Appendix B: ADWR Well Registries

River Well



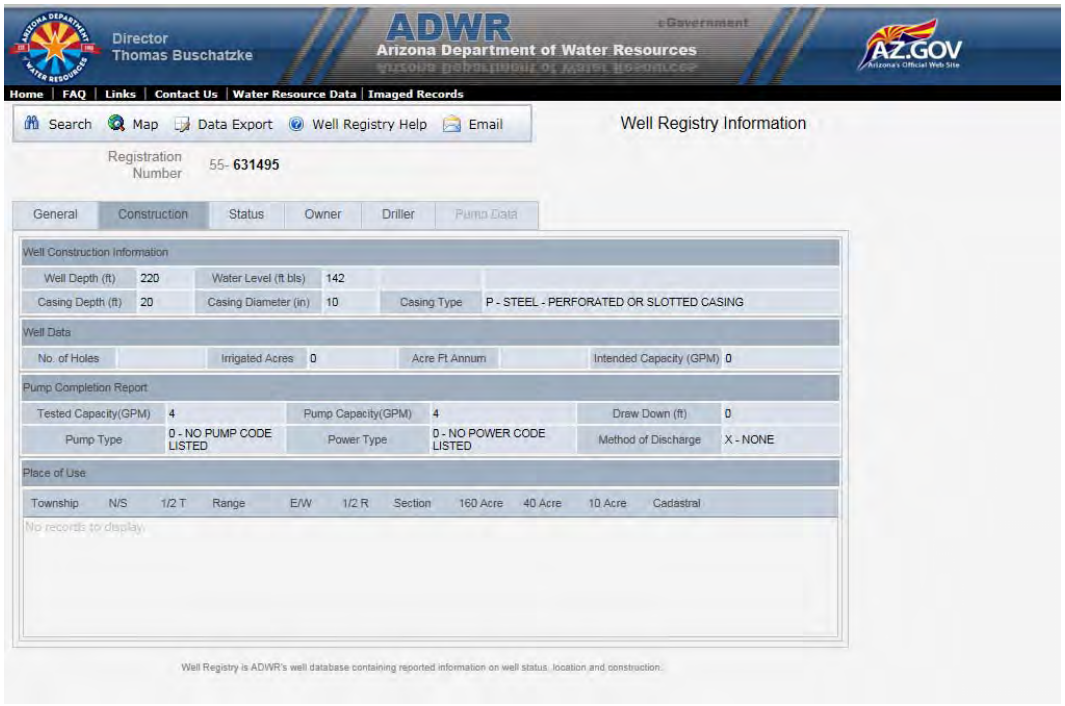
River Well - continued

River Well - continued

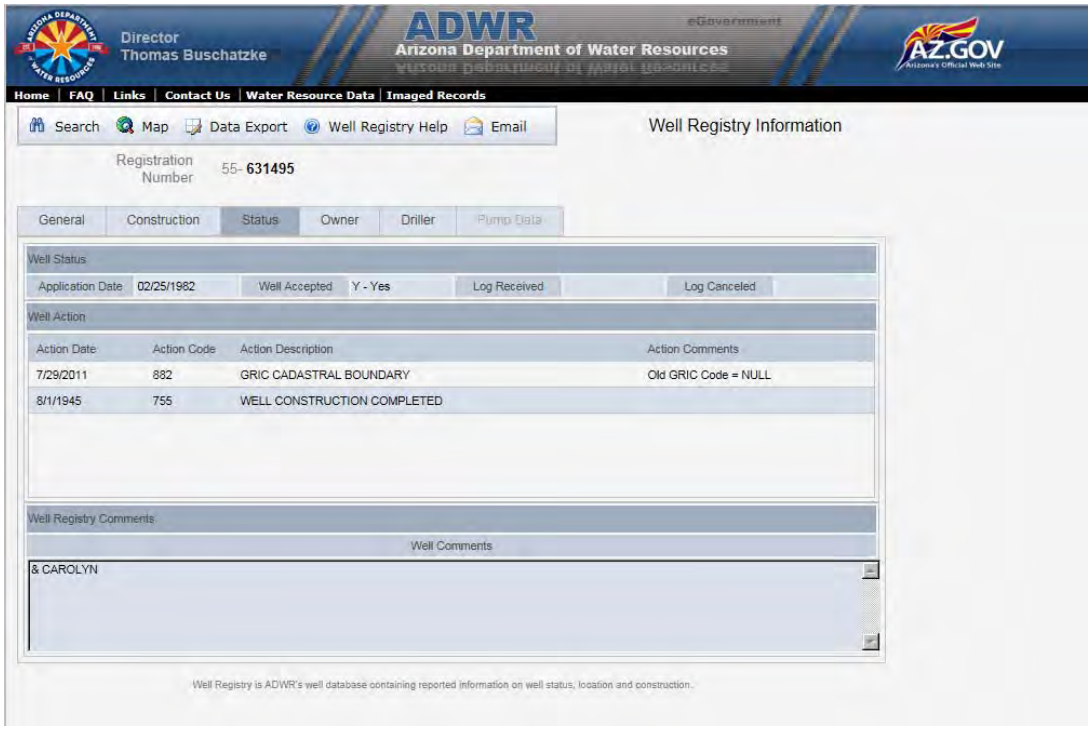


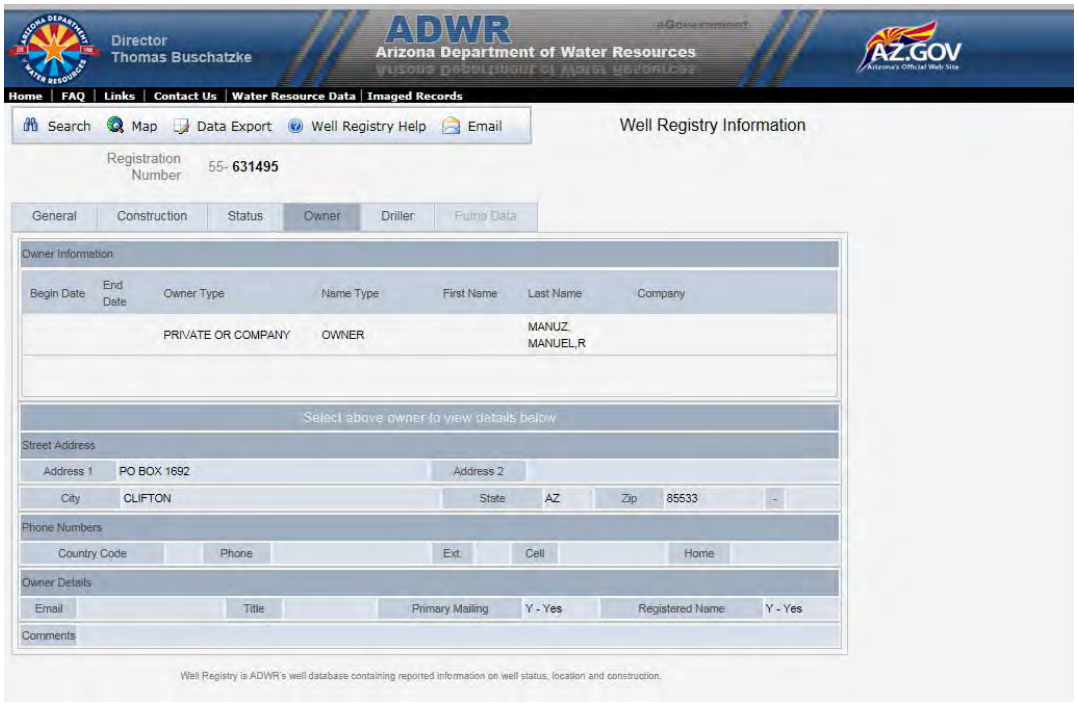
https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=631497

Headquarters Well



Headquarters Well - continued

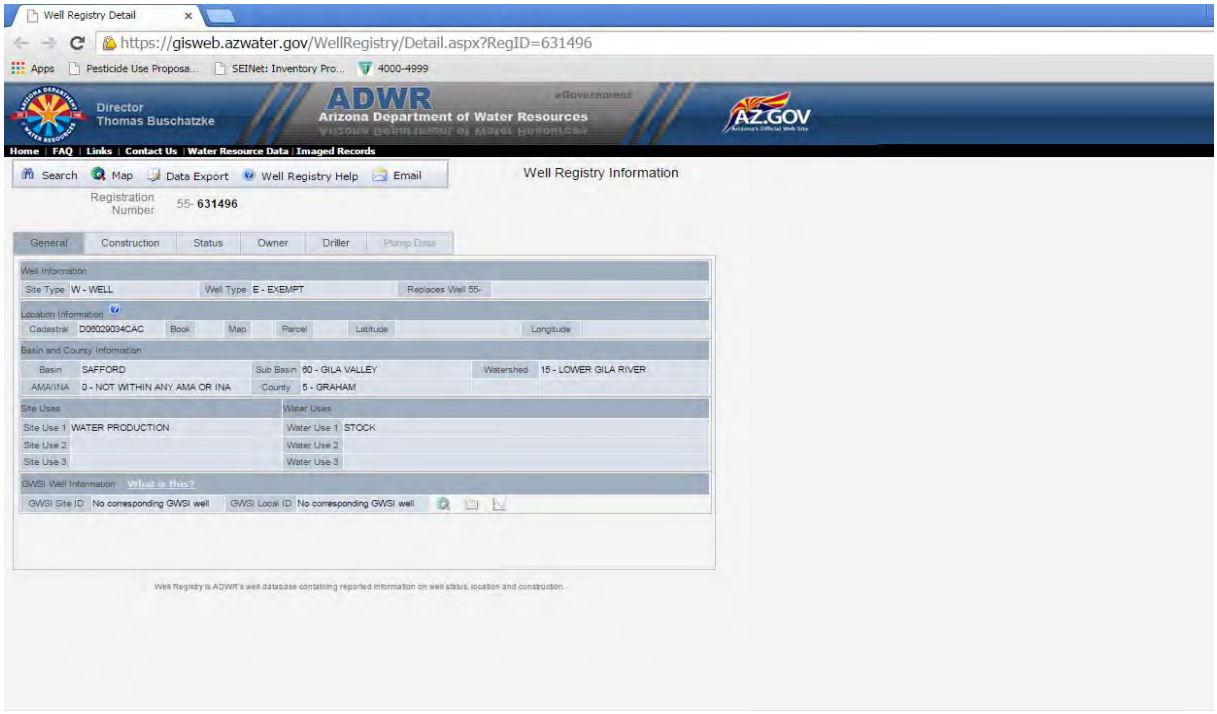


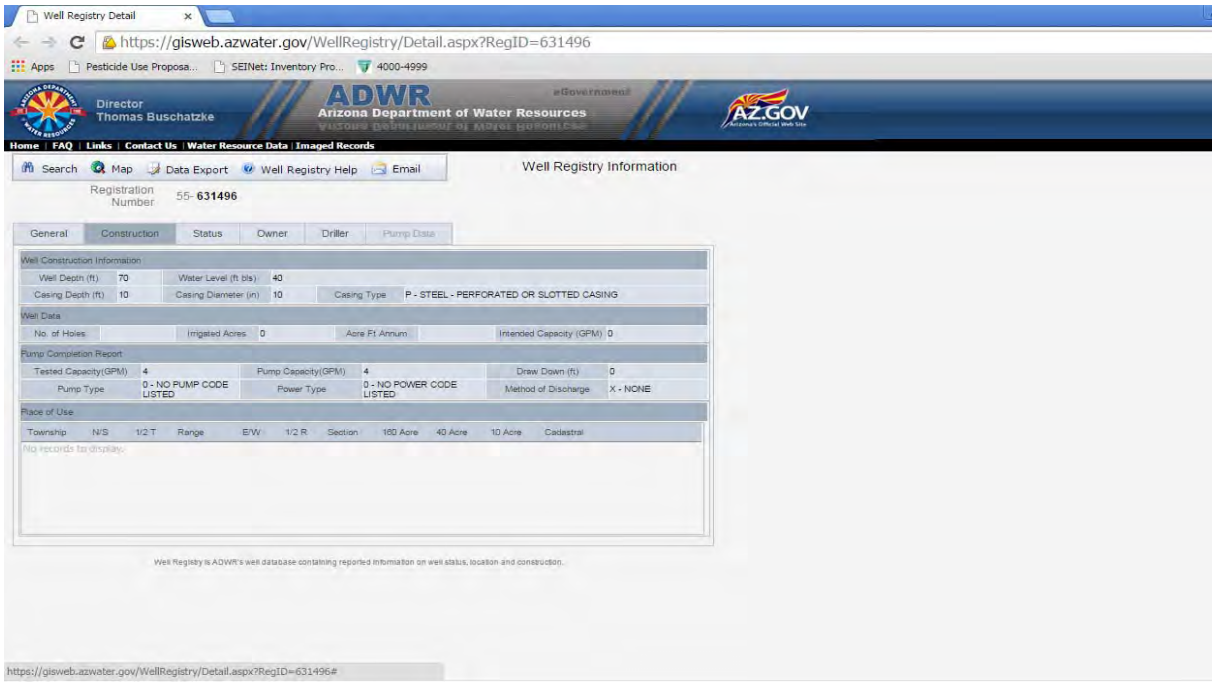


Headquarters Well - continued

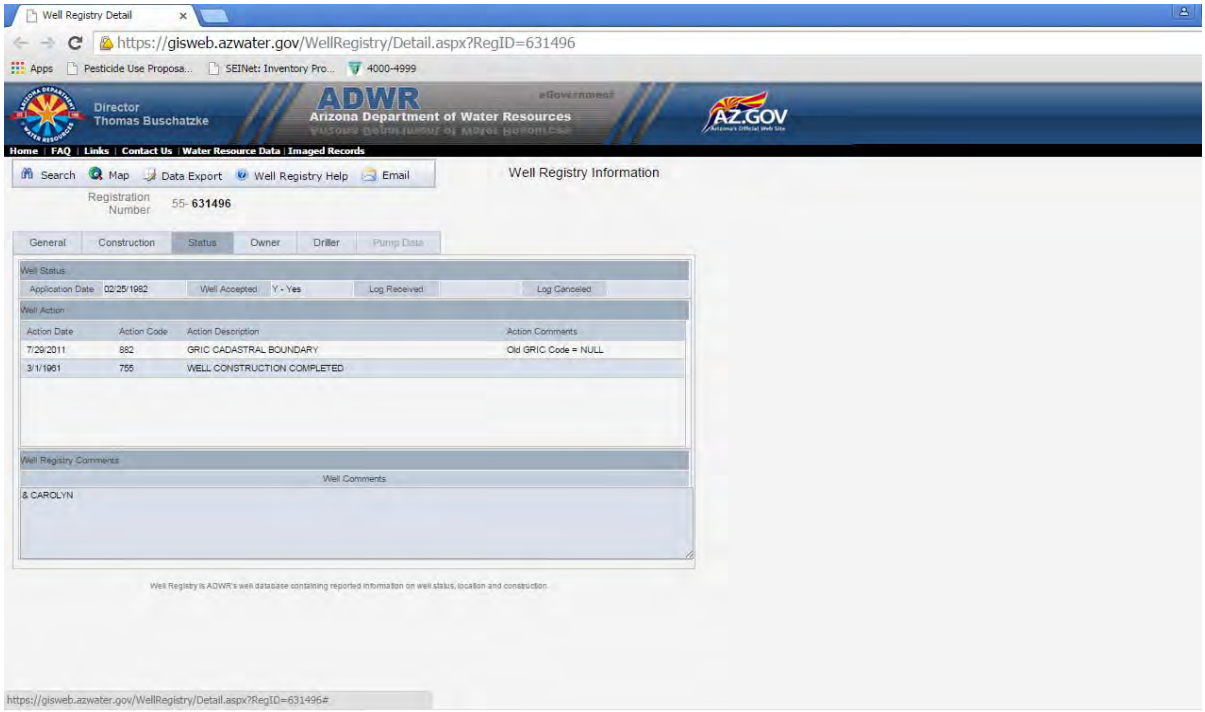
https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=631495

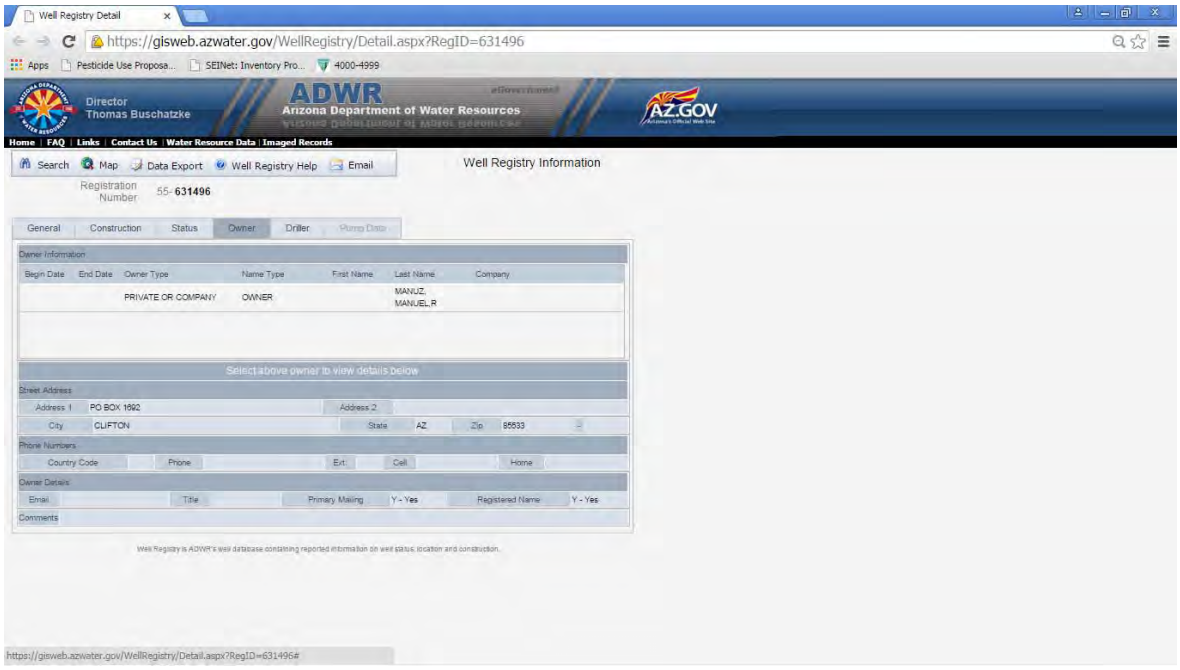
Lower Berregero Well



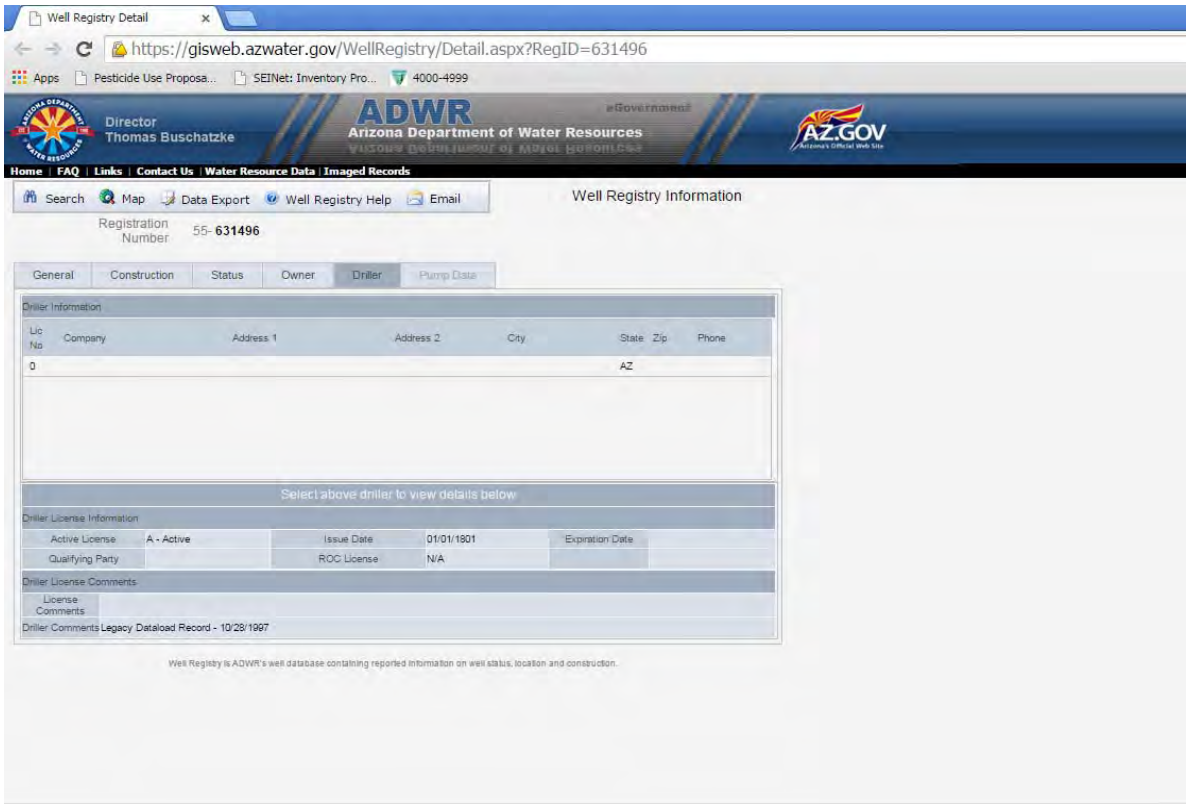


Lower Berregero Well - continued



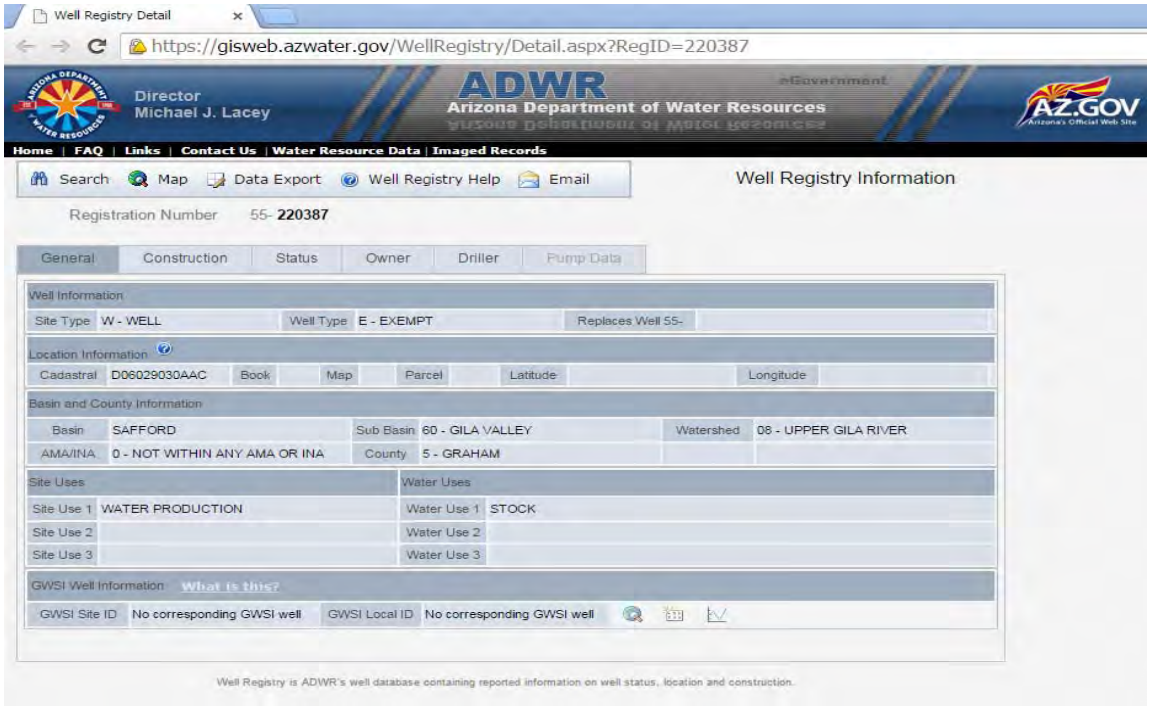


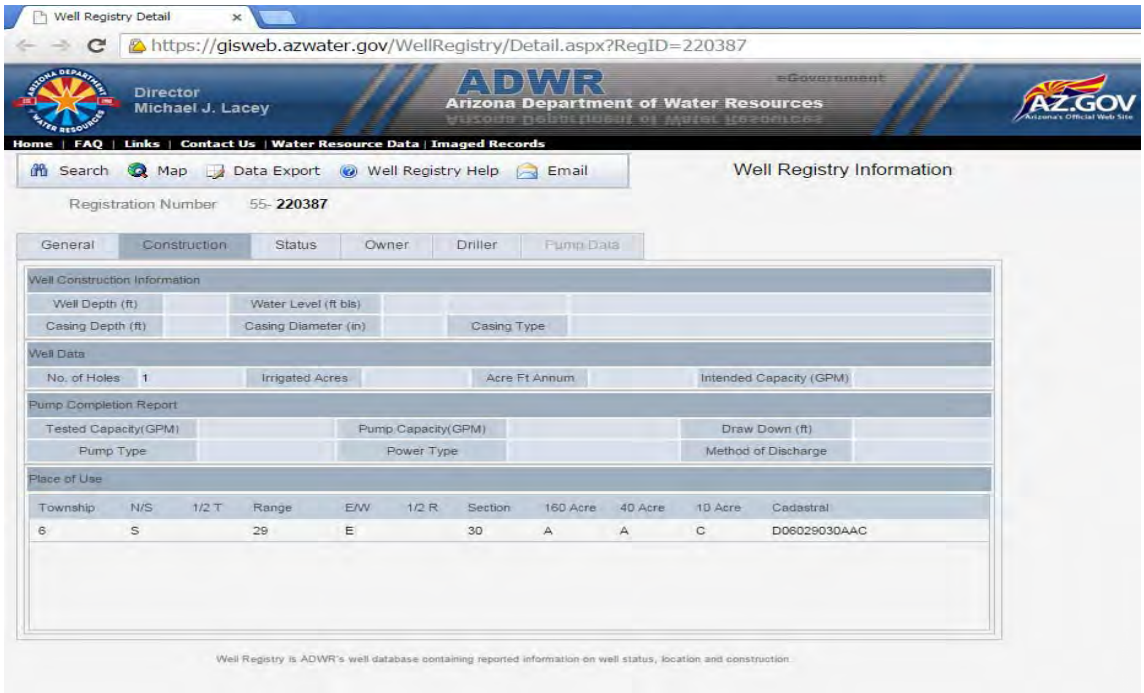
Lower Berregero Well - continued



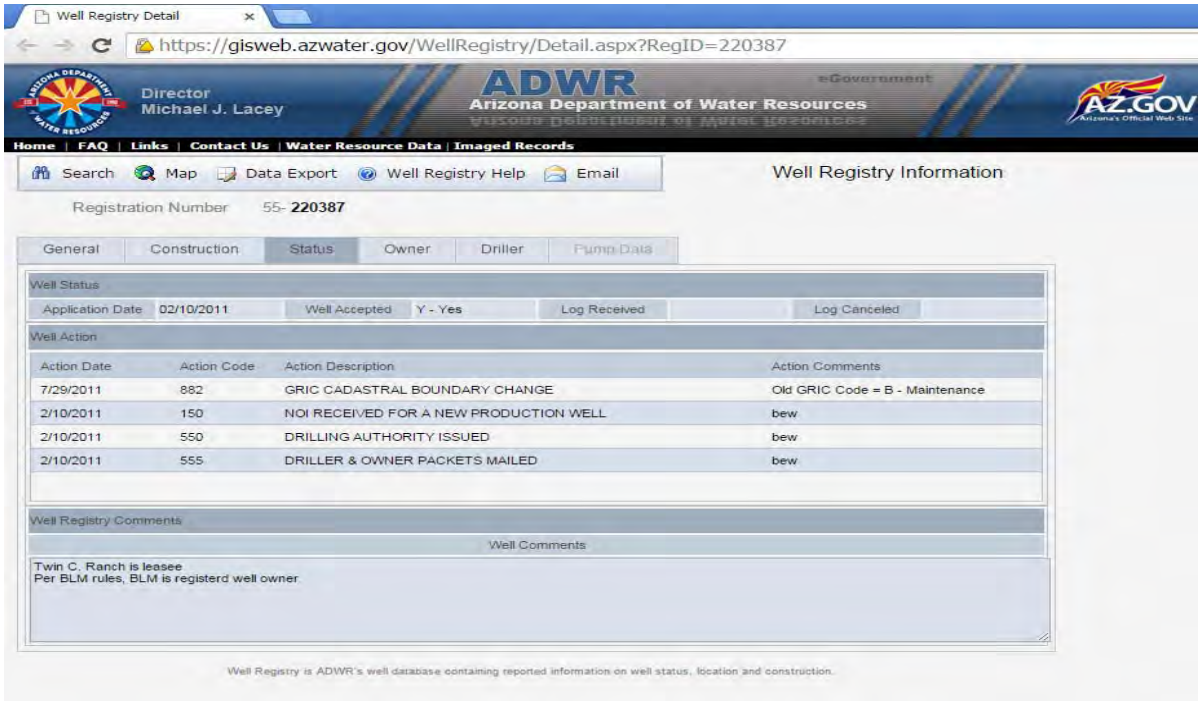
https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=631496

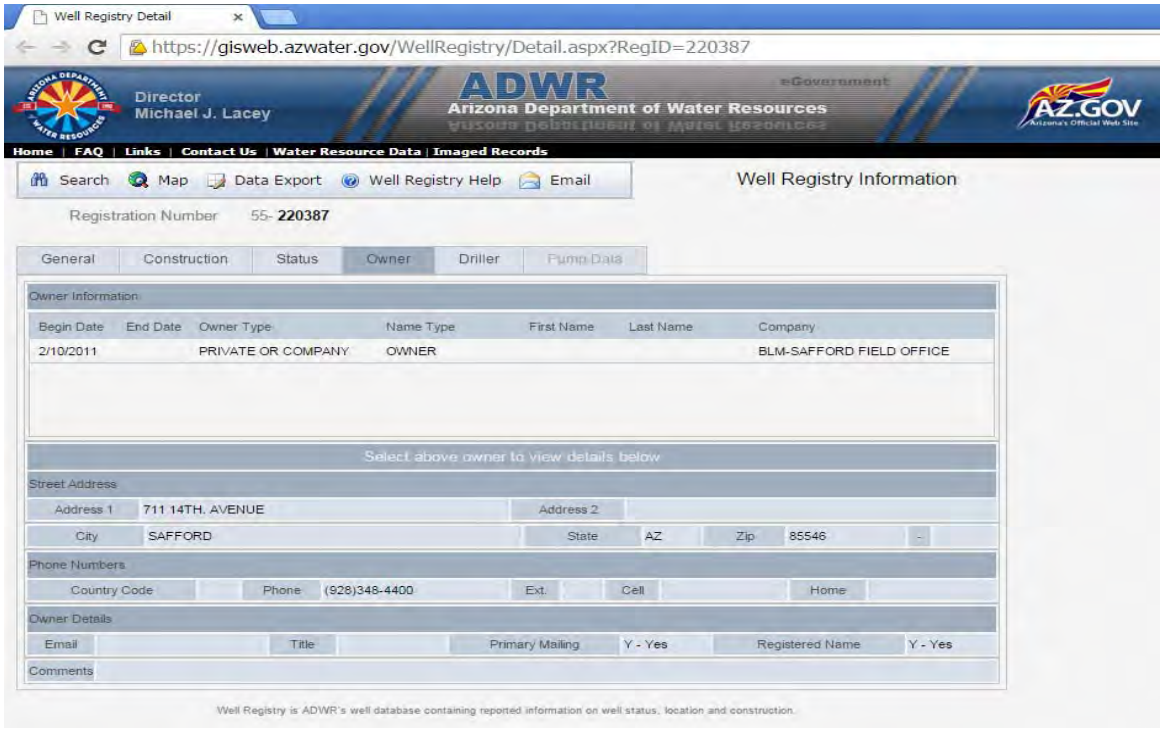
Proposed Goat Camp Well



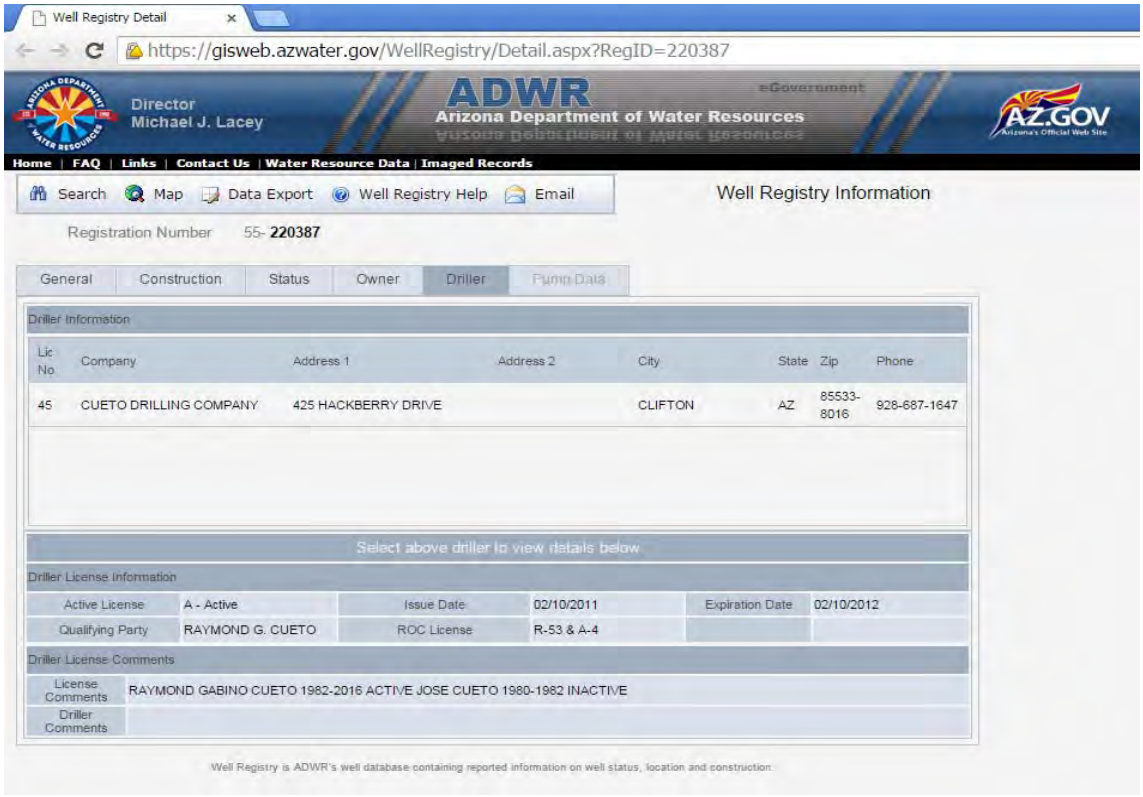


Proposed Goat Camp Well - continued





Proposed Goat Camp Well - continued



https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=631496 – Accessed 12/16/2014 16:52

Appendix C: Flow Rates Methodology of Existing Wells

On September 30 and October 14, 2015, Range Management Specialists Jason Martin and Rebecca Dees from the BLM Safford Field Office inspected the Twin C Allotment to:

1. Verify well locations.
2. Measure current discharge rates of each existing well.
3. Verify other presence and locations of existing range improvements.

How to determine gallons per minute (gpm):

1. Use a receptacle with a known volume and a watch or clock with a second hand.
2. Count how many seconds it takes to fill the receptacle with the water leaving the pump.
3. Divide the volume of the receptacle by the number of seconds it took to fill the receptacle, and then multiply by 60 (seconds). This provides the number of gallons of water per minute (gpm) flowing through the pump.

RESULTS

Well	Receptacle Size	Test #1 (seconds)	Test #2 (seconds)	Test #3 (seconds)	Average Time (sec)	Average gpm
River	1.5-gallon	24.5	24.2	23.8	24.16667	3.724138
Headquarters Well	1.5-gallon	62	59	42	54.33333	1.656442
Lower Berregero Well	0.93-gallon	19	20	22	20.33333	2.744262

At Lower Berregero Well. 9/30/2015.

Appendix D: Declaration of Hydrogeologist Paul L. Summers

Declaration of Paul L. Summers

State of Colorado)
) ss.
County of Jefferson)

I, Paul L. Summers, state as follows:

1. My name is Paul L. Summers. I am currently employed by the United States Bureau of Land Management, Department of Interior, National Operations Center, Building 50, Federal Center, Lakewood, CO, 80225.
2. I have been employed by BLM for 42 years, and have served as the bureau's national ground water specialist for the last 33 years. I hold a Bachelor of Science degree in Geology from Utah State University, and have completed two year post graduate coursework, majoring in geology, with a minor in water resources engineering. I have conducted ground water assessments for the BLM throughout the western United States.
3. My experience includes hydrogeologic site evaluations for drilling water supply wells for stock watering and campgrounds. I have also conducted ground water assessments for mining operations on Public Land, including underground gold mines, open-pit gold mines and coal mine operations. I have also conducted several investigations on surface water/ground water interactions in several states, including Arizona.
4. This evaluation of the potential impacts to the Gila River from pumping of a proposed well for the Twin C Allotment (Goat Camp Well) was done as a supporting document for BLM in the appeal by Western Watersheds Project, involving the drilling of the proposed well on the Twin C Allotment, Graham County, Arizona.

Atch 2

5. This evaluation is similar to more than 100 well site evaluations for water supply I have made in different geologic environments across the western United States. These evaluations require the interpretation of geologic maps, and consideration of ground water movement in the geologic environment as influenced by regional or local ground water flow patterns. For this evaluation, I used two geologic maps prepared by the U.S. Geological Survey that cover the drill site. These maps provide information on rock type and structural geology (faults) in the area of the planned well. From this information, I am able to make interpretations on ground water flow directions and the likelihood of a well producing water if drilled into various geologic formations.
6. The new well is located in T. 6 S., R. 29 E. NE ¼ of Sec. 30, about 3 miles east of the Gila Box River, and is planned to be drilled to a depth of up to 1200 ft. according to the Notice of Intent to Drill (NOI) filed by BLM for this well. Based on the geologic formation found in this area, the most probable opportunity for obtaining a water supply at the planned site is within what are known as interflow zones, where permeability is higher due to weathering processes during periods of volcanic quiescence, or due to layers of higher permeability rock, such as scoria or in ash-fall tuffs. It is impossible to predict the depth at which these zones occur, because they occur at several different elevations within the formation. Water moves most freely in these interflow zones and scoria layers.
7. For stream flow in the Gila River to be impacted by pumping a nearby well, there would need to be a permeable zone in the volcanic rocks that directly discharges into the canyon of the Gila River, and the river would have to be dependent on ground water discharge from this unit for sustaining flow. Additionally, the pumping rate in that zone would have to be quite

significant, much greater than the planned 20 gpm for a stock well located 3 miles away from the river.

8. Another factor in establishing the unlikely impact to the Gila Box River, is that the well will not be pumped 24/7. The planned water delivery method is to install a solar pump, and pump as required to maintain water in stock watering troughs on the allotment. The pumping schedule of the existing well at this allotment is to pump for 2-3 days and then shut the pump off for two days. This pumping schedule would likely be continued with the new well.. The result is that the cone of depression from pumping the well won't extend out 3 miles to intersect the river. Consequently, pumping would not draw water from the Gila River.
9. It is highly unlikely that drilling to 1200 feet would be necessary to obtain the quantity of water required for a stock well (20 gpm), because the quantity of water required can most likely be obtained at a shallower depth, within the interflow zones as described above, or in fractures in the volcanic rocks. But if the well is drilled to 1200 feet, the planned pumping rate will not result in an impact to the Gila River.
10. In summary, the proposed well being drilled for the Twin C range allotment located about 3 miles east of the Gila River will not have an impact on flow in the Gila River for several reasons:

a. The planned pumping rate of the well (20 gallons per minute) won't create a cone of depression that will extend out 3 miles to intercept flow in the river.

b. Due to geologic conditions, it is likely that the well will be completed above the level of the river in the volcanic rocks, in which case there would not be a hydraulic connection to the river.

c. The intermittent pumping schedule will allow the aquifer to recover, limiting the growth of the cone of depression in the aquifer, which means the cone of depression will not extend out to the river.

d. Short pumping durations and low pumping rates do not produce a far reaching cone of depression.

e. Even if the well is completed at or near the level of the river, the pumping rate is not sufficient to impact the river, because the cone of depression will not extend to the river.

REFERENCES:

Drewes, H., Houser, B.G., Hedlund, D.C., Richter, D.H., Thorman, C.H., and T.L. Finell, 1985, Geologic Map of the Silver City 1 degree by 2 degree Quadrangle, New Mexico and Arizona: USGS Map I-1310-C, 1:250,000.

Richer, D.H., and V.A. Lawrence, 1981, Geologic Map of the Gila-San Francisco Wilderness Study Area, Graham and Greenlee Counties, Arizona: USGS map MF-1315-A, 1:62,500.

I declare under penalty of perjury that the foregoing is true and correct.

10/31/11
Date

Paul L. Summers
Senior Hydrogeologist
Bureau of Land Management
National Operations Center

Appendix E: Other Calculations (Water)

Assumptions and Calculations

How Much Water Does a Cow Drink per Day?

Daily water intake for livestock varies depending on weight and ambient temperature, but in the desert Southwest, it is estimated that cows drink on average 20 gallons of water per day.

Assumptions

- Average weight of livestock is 1,000 lbs., based on BLM billing estimates.
- Typically, a 1,000-lb. cow will drink 1 gallon of water per 100 lbs. of body weight; thus, a 1,000-lb. cow will drink 10 gallons of water on an average day.
- Accounting for climatic conditions particular to the desert Southwest which experiences temperatures in the 90's to 100's Fahrenheit during the warmest months (May-October), a cow can average 30 gallons per day of water intake. Therefore, an annual average that a cow will drink in the desert Southwest is an estimated 20 gallons per day:

  [10 gal./day * 6 mos. (November-April)] x [30 gal./day * 6 mos. (May-October)] / 12 mos.

  = 20 gal./day water per cow

  Reference: Rasby, Dr. Rick, Professor of Animal Science, University of Nebraska - Lincoln, Lincoln, NE. How much water do cows drink per day? July18, 2012. http://beef.unl.edu/

Estimated Annual and Daily Water Usage on Twin C Allotment

160 head of livestock * 20 gallons/day * 365 days * 1.1 to account for anticipated wildlife use = 1.28 million gallons/year, or an average of 3,500 gallons/day

Estimated Annual and Daily Water Usage on Twin C Allotment per Pasture Rotation System

Pasture Rotation System	Livestock[1] Number	Percentage	Annual Water Usage (Gallons)	Daily Water Usage (Gallons)
Western Pastures (Supplied by River Well from alluvial groundwater)	113	71%	908,800	2,485
Easter Pastures (Supplied by Headquarters and Lower Berregero wells from groundwater)	47	29%	371,200	1,015
Twin C Allotment	160	100%	1,280,000	3,500

[1]Total livestock on the Twin C Allotment will not exceed the 160 permitted; the apportionment of livestock between the two concurrent grazing systems may vary slightly from year to year.

Daily Water Discharge for Gila River*

* Based on Daily Discharge, cubic feet per second – statistics based on 92 years of record for USGS Site 09448500 (http://waterdata.usgs.gov/az/nwis/uv?site_no=09448500, accessed 12/17/2014).

Mean Gila River daily discharge = 322 cubic feet per second 1 Cubic foot = 7.48052 gallons

322 * 7.48 = 2,408 gallons/sec * 60 = 144,513 gallons/min * 60 = 8,670,816 gallons/hour * 24 = 208,099,000 gallons/day

Appendix F: Threatened, Endangered, and Sensitive Species

Federally-Listed, Proposed, or Candidate Species and Proposed or Designated Critical Habitat		
Species	**Federal**	**Comments**
* Desert pupfish, *Cyprinodon macularius*	Endangered	Desert pupfish have been reintroduced into Bonita Creek on the opposite side of the Gila River from the allotment. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
Gila chub, *Gila intermedia*	Endangered	Gila chub occur in Bonita Creek, on the opposite side of the Gila River from the allotment. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
* Gila topminnow, *Poeciliopsis occidentalis occidentalis*	Endangered	Gila topminnows occur in close proximity to the allotment. They have been reintroduced into Bonita Creek on the opposite side of the Gila River from the allotment. Livestock grazing management on the Twin C Allotment will not affect the species.
Headwater chub, *Gila nigra*	Proposed Threatened	Headwater chub does not currently occur in the upper Gila River watershed. No effect.
* Lesser long- nosed bat, *Leptonycteris curasoae yerbabuenae*	Endangered	There are no known lesser long-nosed bat roosts on the Twin C Allotment; it is also outside of the known foraging range of the bat. No effect.
* Loach minnow, *Tiaroga cobitis*	Endangered	Loach minnow have been reintroduced into upper Bonita Creek on the opposite side of the Gila River from the allotment. Livestock grazing management on the Twin C Allotment will not affect the species.
* Loach minnow critical habitat	Designated	Loach minnow critical habitat is designated along Bonita Creek on the opposite side of the Gila River from the allotment. There will be no effect to critical habitat.
* Mexican gray wolf, *Canis lupus baileyi*	Experimental population, non-essential	Currently the experimental population of Mexican gray wolf is limited to US Forest Service lands over ten miles away. No effect.
Narrow-headed garter snake, *Thamnophis rufipunctatus*	Threatened	The narrow-headed garter snake is a riparian obligate species with the nearest known location over ten miles away in Eagle Creek. No effect.
Narrow-headed garter snake critical habitat	Proposed	The closest point of proposed critical habitat to the Twin C Allotment is 3.8 miles upstream from the allotment at the confluence of Eagle Creek and the Gila River. Livestock management on the Twin C Allotment will have no effect on the proposed critical habitat.
Northern Mexican garter snake, *Thamnophis eques megalops*	Threatened	The northern Mexican garter snake is considered extirpated from the upper Gila River watershed. There will be no effect to the species.
Northern Mexican garter snake, critical habitat	Proposed	The closest point of proposed critical habitat to the Twin C allotment is 6.6 miles upstream, at the confluence of the San Francisco and Gila rivers. Livestock management on the Twin C Allotment will have no effect on the proposed critical habitat.

Federally-Listed, Proposed, or Candidate Species and Proposed or Designated Critical Habitat		
Species	**Federal**	**Comments**
Roundtail chub, *Gila robusta*	Proposed Threatened	Roundtail chub occur in Eagle Creek within five miles of the allotment, but is not currently known to occur in the Gila River adjacent to the Twin C Allotment. No effect.
* Razorback sucker, *Xyrauchen texanus*	Endangered	Razorback suckers are considered to occupy the Gila river at population levels so low as to not be detectable, possibly extirpated. Livestock on the Twin C Allotment are excluded from the River. Livestock grazing on the Twin C Allotment could contribute to sediment runoff into the Gila River, however based on the LHE soil and site stability was rated as none to slight. River Well removes water from the Gila River alluvium. BLM, with concurrence with USFWS, has determined that these activities may affect, but are not likely to adversely affect razorback suckers if present.
* Razorback sucker critical habitat	Designated	Critical habitat for razorback sucker is designated within the 100 year floodplain of the Gila River. Livestock on the Twin C Allotment are excluded from the 100 year floodplain. . Livestock grazing on the Twin C Allotment could contribute to sediment runoff into the Gila River, however based on the LHE soil and site stability was rated as none to slight. River Well removes water from the Gila River alluvium. BLM, with USFWS concurrence, has determined that these activities may affect, but are not likely to adversely affect razorback sucker critical habitat.
* Southwestern willow flycatcher, *Empidonax traillii extimus*	Endangered	Willow flycatchers have not been documented in the portion of the Gila River adjacent to the Twin C Allotment. Due to the narrowness of the canyon limited vegetation patch size, this portion of the river is not considered suitable habitat for willow flycatchers. In addition, Twin C livestock are excluded from the riparian area of the Gila River corridor. Livestock grazing on the Twin C Allotment has no effect on willow flycatchers. No effect.
* Spikedace *Meda fulgida*	Endangered	Spikedace have been reintroduced into upper Bonita Creek, on the opposite side of the Gila River from the allotment. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
* Spikedace critical habitat	Designated	Critical habitat for spikedace has been designated for Bonita Creek on the opposite side of the Gila River from the Twin C Allotment. Livestock grazing on the Twin C Allotment does not impact spikedace critical habitat. No effect.
Woundfin, *Plagopterus argentissimus*	Experimental population, non-essential	Woundfin is currently considered extirpated from the upper Gila River basin. The Gila River was designated as experimental-nonessential in 1985, but there has been no reintroduction attempts nor or there any planned. No effect.
Yellow-billed Cuckoo, western population *Coccyzus americanus*	Threatened	Yellow-billed cuckoo are known to occur along the Gila River adjacent to the Twin C Allotment and have been documented during opportunistic surveys in 2013 and 2014. Riparian habitat along this reach of the Gila River is discontinuous with patch sizes of <50 acres. Livestock are excluded from the river floodplain. River Well is located within the floodplain, out of the riparian habitat, approximately 200 meters from potential habitat. Riparian woodlands and dynamic riverine processes are not likely to be adversely affected by the operation of the River Well and grazing on the allotment's uplands is not likely to adversely affect prey availability. BLM determined, with concurrence from the USFWS, that yellow-billed proposed critical habitat would not be adversely affected.

Federally-Listed, Proposed, or Candidate Species and Proposed or Designated Critical Habitat		
Species	**Federal**	**Comments**
Yellow-billed Cuckoo critical habitat	Proposed	Critical habitat is proposed along the Gila River for yellow-billed cuckoo. Livestock are excluded from proposed critical habitat by fencing and topographic features which make these areas inaccessible to livestock. River Well is located within proposed critical habitat, out of the riparian habitat. River Well is not likely to adversely affect riverine process, and subsequently proposed critical habitat due to the relatively small quantity of water removed from the system. BLM determined, with concurrence from the USFWS, that yellow-billed proposed critical habitat would not be adversely affected.

BLM Sensitive Species	
Amphibians	
Lowland Leopard Frog, *Lithobates yavapaiensis*	Lowland leopard frogs occur along the Gila River. Livestock are excluded from the river and riparian area; therefore, there will be no impacts from livestock on lowland leopard frogs from livestock use of the Twin C Allotment.
Birds	
American Peregrine Falcon, *Falco peregrinus anatum*	There are no known peregrine eryies in the area and species occurrences in the area have not been documented on the Arizona Game and Fish Department HDMS data base. Cliff faces along the Gila River provide suitable habitat and birds could occasionally hunt over the area. There are no known impacts from livestock grazing on this species.
Bald Eagle (wintering), *Haliaeetus leucocephalus*	Wintering bald eagles occur along the Gila River. Roost trees and the ability to forage along the river are important to the species. Livestock from the Twin C Allotment are excluded from the river and riparian area and therefore do not impact the species or the habitat.
Golden Eagle, *Aquila chrysaetos*	Golden eagle nests occur in close proximity to the Twin C Allotment along the Black Hills on rock outcrops and cliff faces. Whether these nest have been recently occupied is unknown. Golden eagles fly and hunt over the upland areas of the allotment. There are no known impacts of livestock on golden eagles.
Western Burrowing Owl, *Athene cunicularia*	Although identified as a possibly occurring in the area by the IPaC search. There are no know occurrences and the soil and terrain are no conducive to the species occurrence. There are no impacts to the species form livestock grazing on the Twin C Allotment.
Fish	
Desert Sucker, *Pantosteus clarkii*	Desert suckers occur in the tributaries to the Gila River but have limited occurrence in the Gila River proper, due to nonnative fish predation and competition. There is no perennial water flow in the drainages on the Twin C Allotment and the Gila River is excluded from livestock use. There are no impacts from livestock on the species.
Longfin Dace, *Agosia chrysogaster*	Longfin dace occur in the tributaries to the Gila River but have limited occurrence in the Gila River proper due to predation and competition from nonnative fish. There is no perennial water flow in the drainages on the Twin C Allotment and the Gila River is excluded from livestock use. There are no impacts from livestock on the species.

BLM Sensitive Species	
Sonora Sucker, *Catostomus insignis*	Sonoran suckers occur in the tributaries to the Gila River but have limited occurrence in the Gila River proper due to predation and competition from nonnative fish. There is no perennial water flow in the drainages on the Twin C Allotment and the Gila River is excluded from livestock use. There are no impacts from livestock on the species.
Speckled Dace, *Rhinichthys osculus*	Speckled dace occur in the tributaries to the Gila River but have limited occurrence in the Gila River proper due to predation and competition from nonnative fish. There is no perennial water flow in the drainages on the Twin C Allotment and the Gila River is excluded from livestock use. There are no impacts from livestock on the species.
Invertebrates	
Hydrobiid Spring Snails, All species in the genus	Hydrobiid spring snails occur in the Gila River as well as the springs and tributaries associated with the river. There are no springs or perennial flows in drainages on the Twin C Allotment. Livestock are excluded from the Gila River. There are no impacts from livestock grazing on the Twin C Allotment on this genus of snails.
Succineid Snails, All species in the family	Succineid snails occur in the Gila River as well as the springs and tributaries associated with the river. There are no springs or perennial flows in drainages on the Twin C Allotment. Livestock are excluded from the Gila River. There are no impacts from livestock grazing on this Family of snails.
Reptiles	
Arizona Striped Whiptail, *Aspidoscelis arizonae*	Identified in the HDMS data base as occurring in the area, but the location is outside of the species' accepted range and not in appropriate habitat, this location is in error.
Sonora Mud Turtle, *Kinosternon sonoriense*	Although not specifically identified as occurring on or near the allotment Sonoran mud turtle are known to occur throughout the Gila River drainage in and near water. Livestock are excluded for the Gila River and riparian area. Livestock on the Twin C Allotment will not impact Sonoran mud turtles.
Plants	
Clifton Rock Daisy, *Perityle ambrosiifolia*	Clifton rock daisy is known to occur near the Twin C Allotment. Its occurrence is limited to canyon walls of Gila River conglomerate. Livestock are excluded from the Gila River in the areas where the species is found. There will be no impact from livestock on this species.

U. S. Fish and Wildlife Service, Birds of Conservation Concern 2008	
Bald Eagle	See discussion under BLM Sensitive Species. No effect.
Common Black-Hawk	Common black hawk are known to occur and nest along the Gila River. Livestock are excluded from the Gila River and riparian area. Livestock on the Twin C Allotment will not impact this species.
Peregrine Falcon	See discussion under BLM Sensitive Species.
Yellow-billed Cuckoo	See discussion under federally listed species.
Elf Owl	Elf owls probably occur and nest along the Gila River. Livestock are excluded from the Gila River. Livestock on the Twin C Allotment will not impact the species.
Elegant Trogon	The nearest documented citing of elegant trogons are in Aravaipa Canyon, over 50 miles away from the Twin C Allotment.) The IPaC search misidentified this species as occurring in or near the Twin C Allotment.

U. S. Fish and Wildlife Service, Birds of Conservation Concern 2008	
Northern Beardless-Tyrannulet	Northern beardless tyrannulets are primarily associated with riparian areas, but are known to occur in dense vegetation in drier drainages. The species is known to occur along the Gila River and could occur in vegetation thickets in drainages on the allotment. Livestock are excluded from the Gila River and riparian area. Livestock use of the Twin C Allotment does not impact the mesquite and other shrub/small tree thickets on the allotment. There will be no impact to the species.
Bell's Vireo	Bell's vireo are primarily associated with riparian areas, but are known to occur in dense vegetation in drier drainages. The species is known to occur along the Gila River and could occur in vegetation thickets in drainages on the allotment. Livestock are excluded from the Gila River and riparian area. Livestock use of the Twin C Allotment does not impact the mesquite and other shrub/small tree thickets on the allotment. There will be no impact to the species.
Gray Vireo	Gray vireos are typically found in open pinyon/juniper and chaparral habitats. The Twin C Allotment does not contain suitable habitat for the species. There will be no impact to the species.
Phainopepla	Phainopepla are strongly associated with mesquite. Livestock grazing on the Twin C Allotment does not impact the established mesquite on the allotment. There will be no impact to the species.
Lucy's Warbler	Lucy's warblers are associated with riparian areas and intermittently flood areas containing mesquite. They are known to occur and nest along the Gila River. The Gila River and riparian area is excluded from grazing and livestock grazing does not impact establish mesquite areas on the allotment. There will be no impact from livestock grazing on Lucy's warbler.
Yellow Warbler (*sonorana* ssp.)	Yellow warblers are found in cottonwood willow dominated riparian areas. They are known to occur along the Gila River, but the search of the ABBA data base did not show any documented location on or near the allotment. The Gila River and riparian area is excluded from livestock use. There will be no impacts to the species from livestock grazing on the Twin C Allotment.
Black-throated Gray Warbler	Black-throated gray warblers inhabit open woodland areas. The Twin C Allotment does not provide habitat for this species. There will be no impact to the species.
Grace's Warbler	Grace's warbler inhabit open pine forests. The Twin C A llotment does not contain habitat for this species. There will be no impact to the species.
Red-faced Warbler	Red-faces warblers inhabit high elevation forest. The Twin C Allotment does not contain habitat for this species. There will be no impact to the species.
Canyon Towhee	Canyon towhee inhabits dense desert scrub areas in uplands and along drainages. The Twin C Allotment provides suitable habitat for this species. Livestock grazing on the allotment does not impact areas of dense scrub. There is no impact from grazing on this species on the Twin C Allotment.
Black-chinned Sparrow	Black-chinned sparrow occurs in dense shrub areas above 4000 feet in elevation. The Twin C Allotment does not provide habitat for this species. There will be no impact to the species.
Chestnut-collared Longspur	Chestnut-collared longspur migrate through the area. At most Individuals may rest for short periods of time on the allotment. There is no impact to this species from livestock grazing.

Big Game Species	
Mule Deer	The Twin C Allotment provides good browse, escape cover and well distributed water to support a mule deer population in the area. Livestock waters are the bases for the well-distributed water and have a positive impact on deer. Livestock are not consuming enough browse on the allotment to result in forage competition and cattle do not impact the dense vegetation patches that provide escape cover for mule deer. Livestock on the Twin C Allotment do not negatively impact mule deer.

Big Game Species	
Javelina	The Twin C Allotment provide a large amount of well distributed succulent forage that javelina prefer as well as escape cover and well distributed water to a support a good javelina population. Livestock waters are well distributed water and are utilized by javelina. Livestock are not consuming enough of the succulent forage on the allotment to result in forage competition and cattle do not impact the dense vegetation patches that provide escape cover for javelina. Livestock on the Twin C Allotment do not negatively impact javelina.
Rocky Mountain and Desert Bighorn	Rocky Mountain bighorn sheep have been expanding downstream through the Gila River drainage. Although primarily on the west side of the river some are now occurring and starting to occupy the east side. The best bighorn sheep habitat is the steep rocky terrain of the canyon walls along the river. These areas on the Twin C Allotment are either excluded from livestock use or are too steep and rough for livestock use. There is no impact from livestock on bighorn sheep.
Mountain Lion	On the Twin C Allotment mountain lions occur in the steep rocky canyon walls of the Gila river and amongst the rock outcroppings and broken terrain of the black hills. Livestock do not negatively impact mountain lion habitat.
Black Bear	Black bears occur along the Gila River and occasionally pass through the upland areas of the allotment. Livestock do not negatively impact black bear habitat.

Appendix G: USFWS Concurrence

United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Office
9828 North 31st Avenue, C#3
Phoenix, Arizona 85051
Telephone: (602) 242-0210 Fax: (602) 242-2513

In Reply Refer to:
AESO/SE
02EAAZ00-2016-I-0541

July 14, 2016

Memorandum

To: Field Office Manager, Safford Field Office, Bureau of Land Management, Safford, Arizona (Attention: Scott Cooke)

From: Field Supervisor

Subject: Review and Conference on the Proposed Twin C Grazing Permit Renewal and Development of the Goat Camp Well in Graham and Greenlee Counties, Arizona

We are in receipt of your request for informal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544 *et seq.*), as amended (Act) on the proposed Twin C Grazing Permit renewal, including the installation of a muffler or sound reduction system on River Well, and development of the Goat Camp Well, in Graham and Greenlee Counties, Arizona (proposed action). Your request was dated June 7, 2016, and was received by us on the same date.

We have reviewed the *Biological Evaluation for the Twin C Grazing Permit Renewal and Goat Camp Well* (BE) transmitted with your June 7, 2016, memorandum and concur with your determination that the proposed action may affect, but is not likely to adversely affect, the endangered razorback sucker (*Xyrauchen texanus*) (and its critical habitat), or the threatened yellow-billed cuckoo (*Coccyzus americanus*) (and, in conference, its proposed critical habitat). A brief description of the proposed action appears below, and is followed by our rationale for concurrence.

Description of the Proposed Action

The proposed action is to authorize: (1) the renewal of the Twin C grazing permit; (2) the installation of a muffler or noise reduction system on the River Well pump; and (3) the development of Goat Camp Well. The Twin C allotment's existing range improvements and environmental setting are described in detail in the BE; this information is incorporated herein via reference. A brief description appears below.

Grazing Permit

The Proposed Action includes the continuation of the grazing permit's Existing Other Terms and Conditions and incorporation of Additional Other Terms and Conditions.

Existing Other Terms and Conditions

- In order to improve livestock distribution on the public lands, salt blocks and/or mineral supplements shall not be placed within a 1/4 mile of any riparian area, wet meadow or watering facility (either permanent or temporary) unless stipulated through a written agreement or decision in accordance with 43 CFR 4130.3-2c.
- 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.
    - This permit is subject to future modification as necessary to achieve compliance with the standards and guidelines (43 CFR 4180).
    - Permittees shall maintain all range projects for which they have maintenance responsibilities.
    - All troughs shall be outfitted with wildlife escape structures to provide a means of escape for animals that fall in while attempting to drink or bathe.

Additions to Other Terms and Conditions[1]

- In accordance to the Gila Box RNCA Management Plan Final Decision (EA AZ-040-08-03) issued June 27, 2000, grazing of livestock along the riparian zone of the Gila River within the Gila Box Riparian National Conservation Area is not permitted.
- Maintenance feeding of livestock with access to public land is prohibited. Maintenance feeding shall be defined as providing livestock with feed to assist in meeting their basic caloric needs, provided at a rate of 3 lbs./day/head or more.
- The Permittee shall submit a report of the actual grazing use made on this allotment by pasture, for the previous grazing period, March 1 to February 28. Failure to submit such a report by March 15 of the current year may result in suspension or cancellation of the grazing permit.

You have noted that the stipulations listed in the *Additions to Other Terms and Conditions* above are occurring as a matter of practice, or *de facto*. That is, due to the physical inaccessibility of the

1 Please note that three Additions to Other Terms and Conditions were omitted from this document because they already appeared in the list of Existing Other Terms and Conditions.

Gila River riparian zone of the Gila Box RNCA due to existing fencing and terrain, livestock from the Twin C Allotment cannot, and currently are not, grazing this area.

Further, maintenance feeding of livestock on the Twin C Allotment has not been known to occur. However, the addition of these two stipulations to the grazing permit is an administrative mechanism conveying requirements regarding livestock use and management on public land managed by the BLM.

Goat Camp Well

The Proposed Goat Camp Well would authorize the livestock permittee to develop the proposed Goat Camp Well at T6S, R29E, NE ¼ of Section 30 (Figure 1.) to provide an additional perennial upland water source for livestock. The location is upland approximately three miles east of the Gila River. The proposed well would provide perennial water supply to an adjacent storage tank, trough, and pipeline and would supplement the ephemeral water supplies (dirt tanks) in the River, Cinder Pit, and Goat Camp pastures. In addition, the proposed location has existing road access.

Under the proposed action, drilling of the Goat Camp Well (Arizona Department of Water Resources Well Registration No. 55-220387) would resume where left off in 2011. Estimated duration of construction would be two to four weeks. It is estimated that ground water would be reached between 850 to 1,000 feet below ground surface, but could be up to 1,200 feet in depth. The well "drill pad" would encompass approximately 0.10 acre and is within the footprint existing range improvement site that supports a tank and trough. A two-ton truck with a mounted drill would be sufficient to complete the drilling. All construction activities would use existing dirt roads maintained by the permittee to complete the project. Full development of the proposed well would not necessitate additional ground or vegetation disturbance beyond what has already been done (Figure 1).

Well construction requirements would comply with ADWR specifications per A.A.C. R12-15-801 et seq. and A.R.S. § 45-594 and 45-595. The pump at the Goat Camp Well would be submersible and solar powered. It is estimated that the maximum pumping rate would be 20 gpm during daylight hours. The pumping schedule of the Goat Camp Well would typically alternate for 2-3 days on and two days off. Solar panels would be attached to steel framework mounted close to the ground for ease of maintenance (replacement and tilting) and to minimize potential visual impact. The framework support posts would be dug with an auger or by hand. It is expected that 8-12 panels (modules) 2x4 feet per module (less than 200 square feet total) would supply sufficient power to pump water the estimated 850 to 1,000 feet to the surface. A small fence would enclose the panels and would consist of four-strand barbed wire, standard T- posts and support braces at each corner. This would reduce the potential damage to the solar panels that could be caused by livestock and wildlife.
In accordance with the regulations at 43 CFR 4120.3-2(b), the BLM would enter into a cooperative range improvement agreement with the permittee to specify use and maintenance of this well. The permittee would be responsible for all maintenance of the well and solar panels, and fencing. Expected maintenance of the well and solar panels would most likely consist of pump or a solar panel replacement due to equipment failure. No annual (routine) maintenance is expected on this system.

Goat Camp Well Production

The BLM does not know, nor can it know, how much water the proposed Goat Camp Well would produce in gallons per minute (gpm) until it is drilled. As noted by BLM Hydrogeologist Paul L. Summers and quoted in the BE, "Based on the geologic formation found in this area, the most probable opportunity for a water supply at the planned site is within what are known as interflow zones, where permeability is higher due to weathering processes during periods of volcanic quiescence, or due to layers of higher permeability rock . . . It is impossible to predict the depth at which these zones occur, because they occur at several different elevations within the formation . . ." (BLM, 2011). In relation to the permittee's estimate of River Well production of 15 - 20 gpm, there are essentially three possible outcomes upon drilling Goat Camp Well. The well could produce (1) greater than or equivalent to 15-20 gpm, (2) less than 15-20 gpm, or (3) no water at all. Potential outcomes for well production are addressed in the following scenarios:

Scenario 1

Goat Camp Well would produce greater than or equal to 15 - 20 gpm. Subsequent operation of Goat Camp Well in lieu of River Well would operate as the primary perennial source, augmented by ephemeral sources, for livestock watering facilities on the River, Cinder Pit, and Goat Camp pastures. The Headquarters and Lower Berregero wells would continue to supply the eastern pastures.
Water supplied by River Well is the allotment's base water, in which a cooperative range improvement agreement is in place with the permittee for authorized use. Authorization cannot be removed without an identified alternate base water source subject to a separate BLM action. It is presumed that there would be disincentive for the permittee to continue River Well operations due to the inefficiency of attending to the River Well based on its location relative to the upland range infrastructure.

Scenario 2

Under the second scenario, Goat Camp Well would produce some quantity greater than zero but less than the desired 15-20 gpm. Goat Camp Well would operate to the extent possible as the primary source to the Goat Camp and Cinder Pit pastures while River Well would continue as the primary source of perennial water to the River Pasture. The Headquarters and Lower Berregero wells would continue to supply the eastern pastures.

Scenario 3

Goat Camp Well would produce no water under the third potential scenario. Should this occur, the River Well would remain the only perennial water source supplying the western pastures at the existing rate of 15-20 gpm, and the Headquarters and Lower Berregero wells would continue to supply the eastern pastures. As a result, the non-producing Goat Camp Well shaft would be capped and abandoned.

In all three scenarios, the maximum annual water use is not expected to exceed the current 1.28 million gallons (3.93 acre feet) of annual water use, which equates to the amount currently in demand for full permitted use of livestock on the Twin C Allotment. (Refer to Land Health Evaluation Appendix E in the BE for methodology.) No additional water facilities (troughs, storage tanks) would be created as a part of this Proposed Action.

River Well

The River Well will be outfitted with a muffler or noise reduction system to reduce the pump noise from the current 60.5-90.5 decibels to within the natural ambient noise level of 50.1-73.7 decibels, or a reduction of a minimum of 17 decibels.

Design Features and Best Management Practices

The following design features or best management practices (BMPs) would be included in the Proposed Action to minimize the potential impacts of Goat Camp Well development outlined in section 2.1.2 of the BE:

- Construction activities would be limited to daylight hours to minimize impacts to wildlife.
- Construction activities would be limited to periods when the soil and ground surface are not wet in order to avoid road damage, e.g. ruts.
- Well construction requirements would comply with ADWR specifications per A.A.C. R12-15-801 et seq. and A.R.S. § 45-594 and 45-595.
- In order to reduce the potential for the spread of noxious and invasive weeds from construction equipment used for implementation of the proposed action, either from contamination with weed seed and/or biomass, all vehicles would be thoroughly power washed off-site to remove all vegetative material and soil before transporting equipment to the construction site. This includes trucks, trailers and all other machinery.
- Leftover materials pose a hazard to public safety and also to wildlife. Thus, construction debris would be removed to an appropriate landfill location. This includes any unused, replaced, or discarded materials such as pipes float valves, wire, and other miscellaneous supplies. BLM staff would conduct site visits to the area to ensure adequate clean-up measures are taken.
- Any cultural (historic/prehistoric site or object) or paleontological resource (fossil remains of plants or animals) discovered during operations would immediately be reported to the authorized officer or his/her designee. All operations in the immediate area of the discovery shall be suspended until written authorization to proceed is issued. An evaluation of the discovery shall be made by a qualified archaeologist or paleontologist to determine appropriate actions to prevent the loss of significant cultural or scientifically important paleontological values;
- If in connection with this work any human remains, funerary objects, sacred objects or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act (P.L. 101-601; 104 Stat. 3048; 25 U.S.C. 3001) are discovered, operations in the immediate area of the discovery would stop, the remains and objects would be protected, and the BLM would be immediately notified. The immediate area of the discovery

would be protected until notified by the Safford Field Office Manager that operations may resume.

- At no time would vehicle or equipment fluids (including motor oil and lubricants) be dumped on public lands. The BLM accepts the spill management plan complying with ADWR well drilling requirements as sufficient best management practice. In addition, in the case of a hydrocarbon spill (e.g., fuel) the BLM would be notified and spilled fluids would be excavated to a depth of 12 inches beyond contaminated material, removed from the work location and disposed of properly. If no water is developed after drilling to the maximum depth, the drill hole would be capped and abandoned according to ADWR requirements.
- Drilling waste such as drilling fluid and drill cuttings would be removed so that wastes do not pollute surface waters or cause contamination of the well.
- No water pumped to the surface at Goat Camp Well would be allowed back into the subsurface flow. Likewise, no water pumped to the surface would be allowed to flow into surface water.

Background on the Species and Effects of the Proposed Action

The proposed action involves uncertainty with respect to the success of the new Goat Camp Well (see Scenarios 1 -3, above). Scenario 1, in which the Goat camp Well proves capable of yielding sufficient water for livestock management purposes, thus creating an incentive to discontinue operations at the River Well, would be likely to result in an appreciably minimized potential for effects to the Gila River. Scenario 3, in which Goat Camp Well fails to produce water, would result in continued use of the River Well which, in turn, has a relatively greater potential for effects to the Gila River. Scenario 2 represents an intermediate outcome with respect to yield in the Goat Camp and River wells. We cannot know *a priori* that any scenario will be realized, so our analysis will thus focus on the greatest potential effects, which are those that would result from Scenario 3. Scenarios 1 and 2 would have lesser effects and thus, those potential outcomes would remain within the scope of analysis for Scenario 3.

Razorback Sucker and Critical Habitat

The Status of the Species and Environmental Baseline for the razorback sucker that appear in the September 26, 1997, *Programmatic Biological Opinion for the Safford and Tucson Field Offices' Livestock Grazing Program, Southeastern Arizona* (1997 PBO, pages 160-166) (File Number 2-21-96-F-160) and the May 21, 2012, *Biological Opinion on the Gila District Livestock Grazing Program* (2012 BO, pages 38-39 and 66-67, respectively) (File Number 22410-2006-F-0414) are incorporated herein via reference.

In brief, the Gila River is within the known range of the razorback sucker. The species has not, however, been detected during annual surveys of the Gila River, which suggests they are in such low numbers that they are undetectable. Razorback sucker critical habitat within the action area includes the Gila River and its 100-year floodplain. The primary constituent elements (PCEs) determined necessary for survival and recovery of the razorback sucker include, but are not limited to:

1. Water - This includes a quantity of water of sufficient quality (i.e., temperature, dissolved oxygen, lack of contaminants, nutrients, turbidity, etc.) that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage.
2. Physical Habitat - This includes areas of the Colorado River system that are inhabited or potentially habitable by fish for use in spawning, nursery, feeding, and rearing, or corridors between these areas. In addition to river channels, these areas also include bottom lands, side channels, secondary channels, oxbows, backwaters, and other areas in the 100- year flood plain, which when inundated provide spawning, nursery, feeding and rearing habitats, or access to these habitats.
3. Biological Environment - Food supply, predation, and competition are important elements of the biological environment and are considered components of this constituent element. Food supply is a function of nutrient supply, productivity, and availability to each life stage of the species. Predation and competition, although considered normal components of this environment, are out of balance due to introduced nonnative fish species in many areas.

We concur with your determination that the proposed action may affect, but is not likely to adversely affect the razorback sucker or its critical habitat. Direct effects of the proposed action are discountable in that they are unlikely to occur (no portion of the proposed action will occur within the active channel of the Gila River) and insignificant (unlikely to reach the scale where take occurs) for several reasons, including the following.

1. Pumping from the existing River Well is unlikely to result in measurable effects to discharges in the Gila River. The BA states that the River Well extracts an estimated 908,800 gallons, or 0.003853 cubic feet per second (cfs) year round, of water per year from the Gila River alluvium. The mean annual discharge of the Gila River is 322 cfs. Thus the water extracted from River Well which might otherwise be available to contribute to flows (assuming groundwater-surface water connection) represents 0.0012 percent of the water available in the Gila River. We conducted an additional analysis, taking into consideration the 101 cfs mean *monthly* discharge for June for the period of record (1910 to 2016) at the U.S. Geological Survey's stream gage at the head of the Safford Valley. June is the low-flow month at which point the river would be most vulnerable to pumping related effects. Given this more conservative analysis, and assuming the River Well's pumping rate remains a static 0.003853 cubic feet per second year round, we determined that the well may capture 0.0038 percent of the water available in the Gila River during June. Regardless of the use of mean annual or monthly statistics, the effects of removing this amount of water are indiscernible from baseline conditions, difficult to measure, and are thus discountable (unlikely to occur) and insignificant (will not reach the scale where take could occur). These near-immeasurable levels of effects are also not likely to adversely affect the water-related Primary Constituent Element as described above.

2. Watershed effects from livestock management within the watershed of the Gila River will continue to occur from livestock management upslope of the river (e.g., destruction of cryptobiotic crusts, increased soil erosion, sedimentation, and increased runoff). These effects are not anticipated to be measurable on current razorback sucker habitat because the BLM will minimize these effects by managing allotments to meet the upland health standards. Any effects would not be measurable themselves, but may be additive to the

already altered condition and continuing cumulative actions. We also incorporate by reference the detailed discussion of these effects as they pertain to native fishes that appear in the 1997 PBO (pages 106-176) and the 2012 BO (pages 27-39).

3. Effects to the razorback critical habitat PCEs, including cumulative effects, are the same as described in the 1997 PBO (pages 168-171) and 2012 BO (page 87); the respective analyses are incorporated herein via reference. While these effects are likely occurring because of current livestock management, we do not anticipate that the currently-proposed action will measurably increase the level of effects noted in the 1997 PBO and 2012 BO; the effects are additive to an already-deteriorated environmental baseline and the effects of cumulative actions. The BLM will continue manage all BLM lands in allotments to meet the Standards, including implementing actions to minimize livestock use in critical habitat, so any effects should be minimized, and, potentially, improved, over time.

Yellow-billed Cuckoo

The yellow-billed cuckoo was listed as a threatened species on October 3, 2014 (79 FR 59992) (USFWS 2014b). Critical habitat for the yellow-billed cuckoo was proposed on August 15, 2014 (79 FR 48548) (USFWS 2014a). Proposed critical habitat encompasses 546,335 acres across the western United States. A revised proposed rule that may include additional proposed critical habitat is under development. The contents of these documents are incorporated herein by reference.

In brief, the USFWS has proposed to designate approximately 546,335 acres of critical habitat in Arizona, California, Colorado, Idaho, Nevada, New Mexico, Texas, Utah, and Wyoming (FWS 2014a). We note that the following PCEs in the proposed critical habitat rule are undergoing review and may be adjusted to better characterize Arizona habitat conditions in a future revised proposed rule:

1. Riparian woodlands (willow-cottonwood, mesquite thornforest, or a combination of these) in contiguous or nearly contiguous patches of at least 200 acres in extent and at least 325 feet wide, with at least one nesting grove (often willow dominated with average canopy closure of more than 70 percent), and a cooler, more humid environment than surrounding areas;

2. Adequate prey base, including a large insect fauna (e.g., cicadas, caterpillars, katydids, grasshoppers, large beetles, and dragonflies) and treefrogs in breeding areas and postbreeding dispersal areas; and

3. Dynamic riverine processes, especially including river system having hydrologic processes that promote regular habitat regeneration (sediment movement, seedling germination, plant vigor and growth), which leads to patches of old and new riparian vegetation.

The aforementioned rulemaking efforts post-date both the 1997 PBO and 2012 BO; there is therefore no prior Safford Field Office or Gila District consultation text to incorporate via reference. The yellow-billed cuckoo's Status of the Species and its proposed critical habitat, however, are described in detail in our April 28, 2016, *Amended Final Reinitiated Biological and Conference Opinion for the Rosemont Copper Mine, Pima County, Arizona* (File Number 22410-

2009-F-0389R1) (Rosemont BCO, pages 224-229), and are incorporated herein via reference. The status of the yellow-billed cuckoo in the action area - the Environmental Baseline - is described below.

The reach of the Gila River along the Twin C allotment was assessed by BLM staff in 2014 and 2015 and found to be in proper functioning condition, with a relatively young Fremont cottonwood (*Populus fremontii*) and Goodding's willow (*Salix gooddingii*) gallery with intermixed tamarisk (*Tamarix* spp.) and velvet mesquite (*Prosopis velutina*). No systematic surveys for yellow-billed cuckoo have been completed within the action area. However, during the aforementioned 2014-2015 performance of riparian health assessments, yellow-billed cuckoos were detected once in 2014 and twice in 2015 (see page 12 in the BE). These detections were single vocalizations during one day so occupancy or nesting cannot be definitively determined, but we feel it is likely that yellow-billed cuckoos occur and breed in the area.

Proposed critical habitat for yellow-billed cuckoo near the Twin C allotment falls within Unit 24: AZ–16 Bonita Creek; Graham County. This unit is a 6 mile-long continuous segment of the Gila River that includes a continuous segment of Bonita Creek. Approximately 101 acres, or 11 percent, of this proposed unit are privately owned with 828 acre, or 89 percent, in Federal ownership, which includes lands in the Gila Box Riparian National Conservation Area managed by BLM. This Unit has been consistently occupied by western yellow-billed cuckoos during the breeding season. The site provides a movement corridor between larger habitat patches and contains small to moderate sized patches of tamarisk, a nonnative species that reduces the habitat's value (USFWS 2014b, page 48563).

1. As analyzed above, the continued pumping of groundwater from the existing River Well under Scenario 3 is unlikely to result in measurable effects to discharges in the Gila River. Riparian evapotranspiration, which, like stream flows, is also a discharge of groundwater, is similarly unlikely to be measurably affected. This near-immeasurable level of level of effect is also not likely to adversely affect the water-related PCEs (1 and 3) as described above.

2. The fitting of mufflers and/or other noise reduction equipment to the River Well's pump will minimize the potential for noise disturbance to yellow-billed cuckoos.

3. Watershed effects from livestock management within the watershed of the Gila River will continue to occur from livestock management upslope of the river (e.g., destruction of cryptobiotic crusts, increased soil erosion, sedimentation, and increased runoff). These effects are not anticipated to be measurable to either the yellow-billed cuckoo or its proposed critical habitat associated with the Twin C Allotment because the BLM will minimize these effects by managing allotments to meet the upland health standards. Any effects would not be measurable themselves, but may be additive to the already altered condition and continuing cumulative actions. Again, prior consultations have not addressed yellow-billed cuckoos specifically, but we incorporate by reference the detailed discussion of these effects as they pertain to southwestern willow flycatcher (*Empidonax traillii extimus*) that appear in the 1997 PBO (pages 196-208) and the 2012 BO (pages 72-75).

4. Our 1997 and 2012 BOs were formal consultation on southwestern willow flycatcher (likely to adversely affect the species and critical habitat) but were found not likely to jeopardize the former or adversely modify or destroy the latter. Our concurrence that the proposed action is not likely to adversely affect the yellow-billed cuckoo is limited to the Twin C Allotment, and does not apply to Gila District allotments at the program scale analyzed in the 1997 and 2012 BOs.

This concludes informal consultation for the proposed action and further serves as a conference report for the proposed critical habitat for the yellow-billed cuckoo. No further section 7 consultation is required for this project at this time. Should project plans change, or if information on the distribution or abundance of listed species or critical habitat becomes available, our determinations may need to be reconsidered. We note, in particular, there will be a future revision to yellow-billed cuckoo proposed critical habitat followed by the eventual publication of a final critical habitat rule. These future actions may influence the analyses contained in this memorandum of concurrence.

In all future correspondence on this project, please refer to consultation number 02EAAZ00-2016-I-0541. Should you require further assistance or if you have any questions, please contact Jason Douglas at (520) 670-6150 (x226) or Jean Calhoun at (x223).

for Steven L. Spangle

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Appendix H: Errata Sheet to the Draft Environmental Assessment and Land Health Evaluation

The Draft Twin C Allotment (No. 40210) Grazing Permit Renewal and Goat Camp Well Environmental Assessment (EA) (DOI-BLM-AZ-G010-2015-0029-EA) was made available for public review during a 30-day comment period from January 25 through February 25, 2016. Notification of the Draft EA, which incorporates by reference the associated Land Health Evaluation (LHE) Report, was distributed via certified email to seven individuals and organizations and posted to a BLM website. Two comment letters were received. Public comments did not result in any corrections or edits within the EA.

Since the publication of the Draft EA/LHE, additional field data was collected and informal consultation with USFWS occurred. The BLM has chosen to incorporate this information along with other corrections and revisions into the Final EA/LHE in the interest of clarity of information. Revisions contained therein did not result in any substantive modifications that would affect the proposed action, alternatives, findings, or decisions. This Errata Sheet documents these changes.

Environmental Assessment		
Page	**Section**	**Subject**
2	1.1 Introduction	Included summary of alternatives analyzed in detail in Chapter 2.
2	1.2 Background	Added that LHE updated for new indicators of rangeland health conducted in March 2016.
4	1.4 Area Locaton and Setting	Acreage of Twin C Allotment revised.
4	1.4 Area Locaton and Setting	Refined allotment area form 10,987 to 10,934, a net difference of 53 acres. The 53 acres is within the Gila Box NRCA and encompasses 45-60% slopes, which is not conducive to grazing livestock. No effect on proposed action or environmental analysis.
4	1.4 Area Locaton and Setting	Revised 11 troughs to 12 troughs
5	Figure 1	Refined allotment boundary along Gila River. Net difference of 53 acres.
6	Figure 2	Refined allotment boundary along Gila River; Improve display of range improvements.
7	Existing Wells	Clarified depth of shallow well is 40 feet
7	Existing Wells	Spelled out acronym "RNCA" - Riparian National Conservation Area
7	Existing Wells	Clarified that River Well is (1) supplied by alluvial ground water, and (2) is the permittee's base water (43 CFR 4100.0-5 defined as "(2) water that is suitable for consumption by livestock and is available and accessible, to the authorized livestock when the public lands are used for livestock grazing).
7	1.4Area Location and Setting; Existing Wells	Provided noise level data of River Wel diesel pump when operating.

Page	Section	Subject
8	Existing Wells	Provided annual River Well production of 908,800 from Appenix E: Other Calculations (Water), and provided equivalent volume in cubic feet per second (cfs).
8	Existing Wells	Clarified that Headquarters and Lower Berregero wells operate on an intermittent basis as they rely on wind and solar energy sources, respectively. Headquarters Well operations may be supplemented by an existing gas generator.
8	Existing Wells	Clarified that when livestock are not in a pasture the water supply to that pasture is turned off at the trough or storage tank so that there is less pumping in the overall system.
8	Pipeline System	Included information on pipeline segments #19-22.
9	1.5 Conformance with Land Use Plans	Added additonal supporting management objective from the Upper Gila-San Simon (UG-SS) Environmental Statement, which the Safford District RMP incorporated by reference.
9-10	1.5 Conformance with Land Use Plans	Moved discussion of Gila Box RNCA Management Plan from Section 1.6 Relationship to Other Plans, Statutes, and Regulations to Secton 1.5 Conformance with Land Use Plans.
12	1.7 Scoping and Issues Identification	Update to include Draft EA notification, circulation, and response information.
13	2.1.1. Permit Renewal	Move discussion on current grazing management from Existing Mandatory Terms and Conditions to Chapter 3, 3.2.3 Livestock Grazing. Current grazing management has not been formalized as an Existing Mandatory Terms and Conditions.
14	2.1.1. Permit Renewal	Added *Deletions from Other Terms and Conditions* for clarity.
14	2.1.1. Permit Renewal; *Deletions frm Other Terms and Conditions*	Incorporated missing language "shall continue in effect under the renewed permit or lease until" into P.L. 108-108 reference in Exisiting Other Terms and Conditons and Deletions from Other Terms and Conditions.
14	2.1.1. Permit Renewal	In Additions to Other Terms and Conditions, specified "by pasture" for reporting of actual grazing use.
15	2.1.2 Goat Camp Well	Included approximate maximum drill depth of 1,200 feet for clarification.
15	2.1.2 Goat Camp Well	For clarity, added statement “A separate pump would then supply water from the storage tank to pipeline segments #14 or #15, as determined by a manual valve selection.”
18	2.1.2 Goat Camp Well	Removed "optional" regarding a fence enclosing the proposed well's solar panels.
18	2.1.2 Goat Camp Well	Included a brief discussion in Scenario #1 concerning base water revised for accuracy for context and clarity.
18	2.1.2 Goat Camp Well	Scenario #1 expanded to include River Well pumping operations and clarify information on base water adminstration.
20	2.1.4 Monitoring	Provided information for monitoring relating specifically to the grazing permit renewal.
20	2.1.4 Monitoring	Revised "including assessments on land health" to read "including long term rangeland monitoring" for clarity.
20	2.4 Alternative 3: No Grazing	Revised section header to "Alternative 3: No Grazing" from "Alternative 3: No Grazing & No Goat Camp Well" for conciseness.
21	2.2 Alternative 1: No Action	Revised 1st bullet to incorporate *Deletions to Other Terms and Condition* and the excepton to *Deletions to Other Terms and Conditions.*

Page	Section	Subject
21	2.4 Alternative 3: No Grazing	Revised 1st bullet to clarify the terms and process for the No Grazing Alternative. AUMs would be suspended indefinitely, not deferred for a finite period of 10 years as previously stated, and would result in a land use plan amendment.
22	2.5.1 Alternatives Related to Grazing	Removed "July 2015" in reference to the LHE Report, as the report has been updated (available in Appendix A of the EA).
26	3.1 Resources and Resource Elements	Table 8 revised for current status of Threatened, Endangered or Candidate Wildife Species relating to the Western yellow-billed cuckoo, razorback sucker, and their habitats.
28	3.2 Resources Brought Forward for Analysis	Added bullet point “Water quality and quantity”. Erroneously was not previously listed in this section; however, the resource was discussed and analyzed in subsequent sections of the EA.
28	3.2.1 Vegetation	Removed references to key monitoring areas as they are not within the appropriate context of the Affected Environment chapter. Key monitoring areas are relevant to land health assessments and are discussed in detail in the LHE Report (Appendix A of the EA).
29, 30	3.2.1 Vegetation	Figure 7 and Table 4 were edited to remove references to “key sites,” as they are extraneous to the affected environment section of the EA. Key sites are addressed in the monitoring section(s) of the LHE.
30, 31, 36, 37	Ecological Sites	Included identifying text "loamy" in the "Volcanic Hills 12-16” p.z., loamy" in Table 4 and in text.
30-31	3.2.1 Vegetation	Ecological Site Descriptions' production data as published by the NRCS have been removed. The BLM does not utilize the data as a metric in its assessments relating to land health standards on grazing allotments. Therefore, the production data is extraneous information.
33	3.2.2 Soils	Erosion potential added to description *Atascosa-Graham-Rock outcrop complex* to be consistent with data provide amongst soil complexes.
34	3.2.3 Livestock Grazing	Removed precipiation discussion not within appropriate context in the EA; see LHE Report for precipitation information.
34	3.2.3 Livestock Grazing	Current grazing management description relocated from Chapter 2 Proposed Action, Section 2.1.1.
35	3.2.3 Livestock Grazing	Table 7 Billed/Acutal Use of Twin C Allotment was updated to include 2014, 2015, and 2016 data.
35	3.2.3 Livestock Grazing; Land Health Evaluation	Revised to include reference to the May 2016 rangeland health assessment.
37	3.2.3 Livestock Grazing; Land Health Evaluation	Added discussion for Ecological Site Descriptions *Loamy Slopes 16-20”p.z.* and *Volcanic Hills 12-16” p.z.* Added disclosure statement that *Basalt Hill 8-12” p.z.* was not analyzed because it represents 2% of the allotment, and thus would not be expected to yield significant data to inform a land health evaluation.
38-39	3.2.3 Livestock Grazing; Land Health Evaluation	In Arizona Land Health Standard 3: Desired Resource Conditions, expanded discussion to address each of the following ecological sites: *Clayey Slopes 12-16” p.z., Limy Slopes 8-12” p.z., Loamy Slopes 12-16” p.z.,* and *Volcanic Hills 12-16” p.z.*
39-45	3.2.4 Threatened and Endangered Species	Provided robust discussion of Threatened and Endangered species in the area as a result of informal consultation with USFWS, and receipt of concurrence (#02EAAZ00-2016-I-0541) for razorback sucker, yellow-billed cuckoo, and their habitats.
40	3.2.4 Threatened and Endangered Species	Added Figure 9 Razorback Sucker Designated Critical Habitat and Yellow-billed Cuckoo Proposed Critical Habitat.

Page	Section	Subject
45	3.2.4 Game Species	Corrected reference of "wildlife" to "game species" for consistency between section header and text.
46	3.2.5 Water Quality and Quantity	Included discharge of capacities of the existing wells for informational purposes.
47	4.1.1 Vegetation; Grazing Permit Renewal	Revised discussion for consistency with the July 2016 LHE.
48	4.1.2 Soils; Grazing Permit Renewal	Revised discussion for consistency with the July 2016 LHE.
48	4.1.2 Soils	Removed "optional" in regards to fence construction around solar panels.
49	4.1.4 Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species	Revised discussion for consistency with results of informal consultation with USFWS, and receipt of concurrence (#02EAAZ00-2016-I-0541) for razorback sucker, yellow-billed cuckoo, and their habitats.
43	4.1.5 Water Quality and Quantity	Revised to clarify water source of River Well is alluvial groundwater.
59	4.5.4 Cumulative Effects	Revised section header to more precisely identify content. From "Wildlife, Including Migratory Birds and Sensitive Species" to "Wildlife: Threatened, Endangered, BLM Sensitive, and Game Species"
EA E-1		Correction to table "Estimated Annual and Daily Water Usage on Twin C Allotment per Pasture Rotation System" to accurately note River Well supply as alluvial groundwater, not Gila River [i.e., surface flow].
EA F-1	Appendix F	List of threatened, endangered, and sensitive species updated to correspond with USFWS informal consultation.
EA G-1	Appendix G	Added Appendix G – USFWS concurrence letter.
EA H-1	Appendix H	Added Appendix H – Errata Sheet.
Land Health Evaluation		
Page	**Section**	**Subject**
LHE-5	2.2.1 Surface Land Ownership	Refined allotment area form 10,987 to 10,934, a net difference of 53 acres. The 53 acres is within the Gila Box NRCA and encompasses 45-60% slopes, which is not conducive to grazing livestock. No effect on proposed action or environmental analysis.
LHE-9	2.2.5 Watershed	Corrected information on watershed; previously incorrectly identified as the Upper Gila River Watershed
LHE-11	2.3.2 Ecological Sites within the Twin C Allotment	Removed references to key monitoring areas as they are not within the appropriate context of the Allotment Profile and General Description of Evaluation Area chapter. Key monitoring areas are relevant to land health assessments and are discussed in detail in the Section 7 of the LHE Report.
LHE-11	2.3.2 Ecological Sites within the Twin C Allotment	Included identifying text "loamy" in the "Volcanic Hills 12-16" p.z., loamy" in Table 4 and in text.
LHE-13	2.3.2.1 Basalt Hills 8-12" p.z. (R041XC301AZ	Added discussion on ecological site *Basalt Hills 8-12" p.z.*
LHE-15	2.3.3 Wildlife Resources/Special Status and Threatened and Endangered Species	Added information concerning informal consultation with USFWS and concurrence (#02EAAZ00-2016-I-0541).
LHE-17	3.1 Grazing History	Incorporated grazing management system information.

Page	Section	Subject
LHE-19	4.1 Land Use Plan Management Objectives	Cited applicable objectives from the Upper Gila Environmental Statement (UG-ES).
LHE-22	4.3 Key Area Objectives	Added discussion for Ecological Site Descriptions Loamy Slopes 16-20"p.z. and Volcanic Hills 12-16" p.z. Added disclosure statement that Basalt Hill 8-12" p.z. was not analyzed because it represents 2% of the allotment, and thus would not be expected to yield significant data to inform a land health evaluation.
LHE-31	6.6 Utilization	Added Table 9. Range Utilization Ratings for Key Forage Plants.
LHE-32	7.1 Actual Use	Added 2016 data to Table 10. Actual Use on Twin C.
LHE-47	8 Determinations of Land Health Standards	Revised section title from "Conclusions." Reformatted page for clarity.
LHE-47	8 Determinations of Land Health Standards	Expanded discussion of Rationale for Standard #3.
LHE-49	9 Recommended Management Actions	Include in item #3 Other Terms and Conditions the additional stipulations: o This permit is subject to future modification as necessary to achieve compliance with the standards and guidelines (43 CFR 4180). o Permittees shall maintain all range projects for which they have maintenance responsibilities. o All troughs shall be outfitted with wildlife escape structures to provide a means of escape for animals that fall in while attempting to drink or bathe. o The Permittee shall submit a report of the actual grazing use made on this allotment, by pasture, for the previous grazing period, March 1 to February 28. Failure to submit such a report by March 15 of the current year may result in suspension or cancellation of the grazing permit.
LHE-50	9 Recommended Management Actions	Add item #4 Pursue establishment of new key areas for monitoring in all ecological sites not currently represented and reevaluate existing key areas.
LHE-50	9 Recommended Management Actions	Add item #5 Monitoring requirements will continue to be prescribed for the Twin C Allotment to ensure management objectives and Rangeland Health Standards continue to be achieved.
LHE-50	9 Recommended Management Actions	Add item #6 As a maintenance action, install a muffler on the River Well pump to reduce the current noise levels (60.5-90.5 decibels), which may mask Yellow-Billed Cuckoo communications in some areas within the vicinity of the well, to levels similar to the natural or ambient noise levels of 55-73.7 decibels.
LHE-51	10 List of Preparers	Included 2016 BLM LHE Interdisciplinary Team.
LHE-11	11 Authorized Officer Concurrence	Signed and dated.
LHE A-1	Appendix A	List of threatened, endangered, and sensitive species updated to correspond with USFWS informal consultation.