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



DRAFT

Environmental Assessment

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

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

January 2016



Table of Contents

List of Acronyms	iv
Identifying Information.....	1
Chapter 1 – Purpose and Need	2
1.1 Introduction	2
1.2 Background.....	2
1.3 Purpose and Need and Decision to be Made	3
1.4 Area Location and Setting.....	4
1.5 Conformance with Land Use Plan(s)	8
1.6 Relationship to Other Plans, Statutes, and Regulations	10
1.7 Scoping and Issues Identification	11
Chapter 2 - Proposed Action and Alternatives	12
2.1 Proposed Action: Authorize Grazing Permit Renewal & Goat Camp Well Development	12
2.1.1 Permit Renewal	12
2.1.2 Goat Camp Well	15
2.1.3 Design Features and Best Management Practices	19
2.2 Alternative 1: No Action	20
2.3 Alternative 2: Authorize Grazing Permit Only	21
2.4 Alternative 3: No Grazing & No Goat Camp Well	21
2.5 Alternatives Considered but Eliminated From Detailed Analysis	21
2.5.1 Alternatives Related to Grazing.....	22
2.5.2 Alternatives Related to Goat Camp Well.....	22
Chapter 3 – Affected Environment.....	24
3.1 Resources and Resource Elements	24
3.2 Resources Brought Forward for Analysis	28
3.2.1 Vegetation	28
Chapter 4 – Environmental Effects	39
4.1 Environmental Effects of the Proposed Action - Authorize Grazing Permit Renewal & Goat Camp Well Development	39
4.2 Environmental Consequences of Alternative 1: No Action	43
4.3 Environmental Consequences of Alternative 2: Authorize Grazing Permit Renewal Only	44
4.4 Environmental Consequences of Alternative 3: No Grazing & No Goat Camp Well.....	45
4.5 Cumulative Impacts	46

4.5.2	Cumulative Impacts of the Proposed Action	47
4.5.4	Cumulative Impacts of Alternative 2: Authorize Grazing Permit Only	50
4.5.5	Cumulative Impacts of Alternative 3: No Grazing & No Goat Camp Well	51
	Chapter 5 – Consultation and Coordination	53
	Chapter 6 – List of Preparers	54
	References	55
	Appendix A: Land Health Evaluation Report	58
	Appendix B: ADWR Well Registries	59
	Appendix C: Flow Rates Methodology of Existing Wells	71
	Appendix D: Threatened, Endangered, and Status Species	72
	Appendix E: Other Calculations (Water)	80
	Appendix F: Declaration of Hydrogeologist Paul L. Summers	82

List of Figures

Figure 1.	Twin C Allotment and Vicinity	5
Figure 2.	Twin C Allotment Pastures and Range Improvements	6
Figure 3.	Proposed Goat Camp Well looking south. T6S, R29E, NE ¼ of	16
Figure 4.	Proposed Goat Camp Well - capped. T6S, R29E, NE ¼ of Section 30,	16
Figure 5.	Storage tank looking northwest. Goat Camp Pasture – Twin C	17
Figure 6.	Trough looking northwest. Goat Camp Pasture – Twin C Allotment. 9/30/2015.....	17
Figure 7.	Key Areas and Ecological Sites on the Twin C Allotment.....	29
Figure 8.	Soil Complexes on the Twin C Allotment.....	32
Figure 9.	Monthly Precipitation Averages for BLM-maintained Spring Canyon rain gauge located approximately 2.5 miles west of the Twin C Allotment (data from 2001 to 2013).	34

List of Tables

Table 1.	Twin C Allotment Well Inventory Data	7
Table 2.	Mandatory Terms and Conditions for the Twin C Allotment.....	12
Table 3.	Three-Pasture Rotation, 1st Year	12
Table 4.	Two-Pasture Rotation, 1st Year	13
Table 5.	Three-Pasture Rotation, 2nd Year	13
Table 6.	Two-Pasture Rotation, 2nd Year	13
Table 7.	Three-Pasture Rotation, 3rd Year	13
Table 8.	Summary Evaluation of Elements/Resources of the Human Environment	24

Table 9. Twin C Ecological Site Descriptions30
Table 10. Twin C Allotment Soil Complexes.....33
Table 11. Billed/Actual Use on Twin C Allotment.....35

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
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
IPaC	Information for Planning and Conservation system
kV	kilovolt
LHE	Land Health Evaluation
NDAA	National Defense Authorization Act of 2015
NEPA	National Environmental Policy Act of 1969
NRCS	National Resources Conservation Service
p.z.	precipitation zone
PL	Public Law
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 consequences of two proposed actions relating to the Twin C Allotment:

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

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 (PL) 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 preference 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 completed in July 2015.

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 water upland 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 – 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 water to provide for the whole system.

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 10,987 acres of BLM-managed land. 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 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)
- 11 troughs
- 16 dirt tanks (ephemeral water storage)
- Seven corrals
- One cattleguard
- Allotment boundary and pasture fences

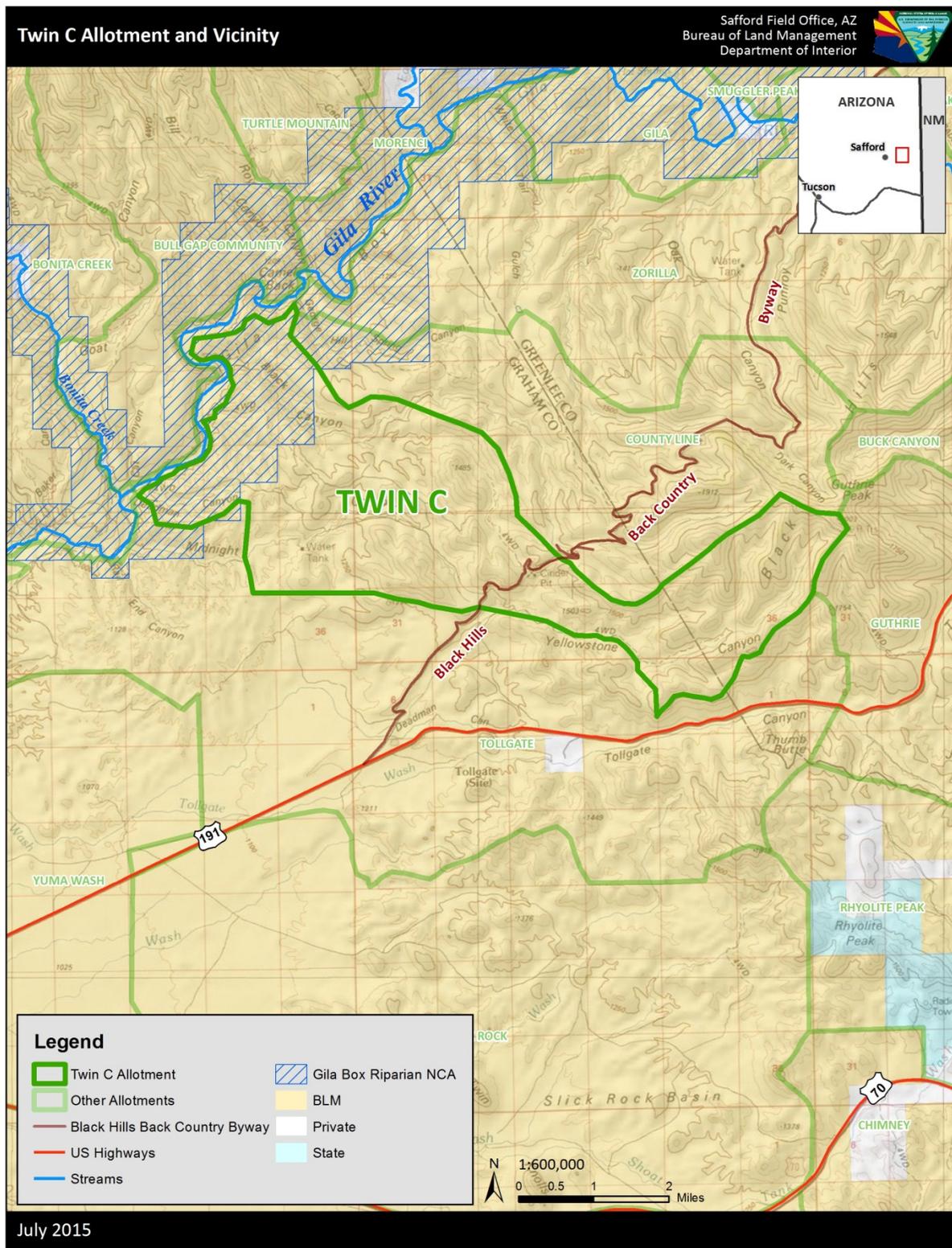


Figure 1. Twin C Allotment and Vicinity

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 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
<ul style="list-style-type: none"> • River • Groundwater • 55-631497 	1953	15	At Source=Unknown ⁴ Output at Goat Camp Tank = 3.7	Diesel pump	River Cinder Pit Goat Camp
<ul style="list-style-type: none"> • Headquarters • Groundwater • 55-631495 	1945	4	1.7	Windmill, Gas generator	Lower Berregero Upper Berregero
<ul style="list-style-type: none"> • 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 water supplied to River Well is a base water owned and controlled by the permittee. 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 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.

Pipeline System

Water pumped from the River Well travels an appreciable distance through an interconnected pipeline system (segments #1-12) 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"). The allotment's western and eastern pastures are connected via a portion of the pipeline (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 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. 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.

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.

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.

Gila Box RNCA Management Plan

In response to the establishment of the Gila Box Riparian National Conservation Area (RNCA) by the Arizona Desert Wilderness Act of 1990 (P.L. 101-628), 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). 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.

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.

Others

- 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 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?

Chapter 2 - Proposed Action and Alternatives

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

2.1.1 Permit Renewal

Existing Mandatory Terms and Conditions

In accordance with 43 CFR 4130.2, and based upon the allotment July 2015 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 listed in Table 2 below, which would become effective upon acceptance of the permit.

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

Grazing management on the Twin C Allotment 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 preference. 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 Tables 3-7 below.

Table 3. 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

Pasture	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
River												

Key: Blank = Rest, X = Grazed

Table 4. 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

Key: Blank = Rest, X = Grazed

Table 5. 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

Key: Blank = Rest, X = Grazed

Table 6. 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

Key: Blank = Rest, X = Grazed

Table 7. 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

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.
- The Permittee shall submit a report of the actual grazing use made on this allotment 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.
- 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

- 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.

It should be 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 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.

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. In addition, 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 an existing range improvement site that supports an existing 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.

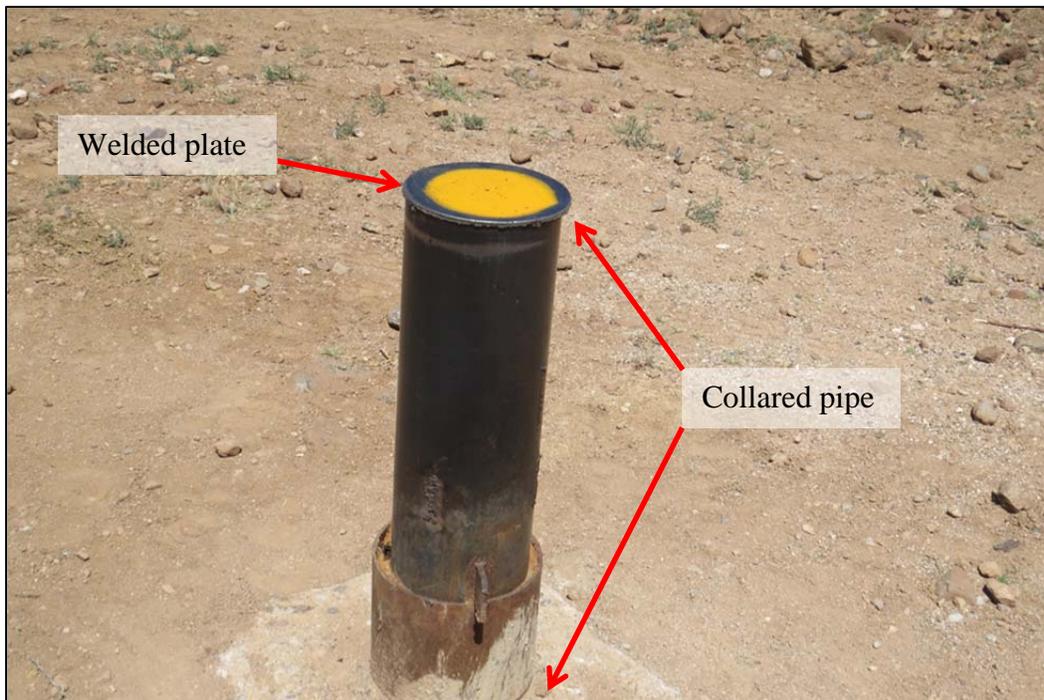


Figure 4. Proposed Goat Camp Well - capped. T6S, R29E, NE ¼ of Section 30, Goat Camp Pasture – Twin C Allotment. 9/30/2015.



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 feet to the surface. An optional 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 for use and maintenance of this well. The permittee would be responsible for all maintenance of the well and solar panels, and fencing if implemented. 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).

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 well production may be characterized 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 Headquarters and Lower Berregero wells would continue to supply the eastern pastures. Due to the permittee’s ownership of River Well and associated base water, BLM does not have direct monitoring or enforcement authority for River Well production. However, 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

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. 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 preference use of livestock on the Twin C Allotment. (Refer to Appendix E for methodology.) No additional water facilities (troughs, 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 and it would be subject to compliance with NEPA.

2.1.3 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:

- 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.

2.1.4 Monitoring

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 assessments on land health.

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 *Additions to Other Terms and Conditions*. Authorized use would continue the same as described in the LHE Report.
- 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 & No Goat Camp Well

Under Alternative 3, the following would occur:

- Permit renewal would not be authorized. The BLM would not authorize grazing on the Twin C Allotment for a ten-year term and all AUMs for active preference would be suspended and not available for livestock grazing on public lands (i.e., livestock grazing would be deferred for the ten-year permit period). 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 the end of the ten-year term, the BLM would reanalyze the Twin C Allotment for livestock grazing to activate the AUMs pursuant to the NEPA process.
- Goat Camp Well would not be authorized. Because 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 July 2015 LHE Report assessed and concluded that the Arizona Standards for Rangeland Health were being met on the Twin C Allotment. The Proposed Action and No Grazing alternatives sufficiently illustrate a full range of expected consequences 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.

Actual Use Alternative

Actual use is defined as the location, duration and intensity (livestock numbers) within an allotment across the course of a grazing year. Because the permittee has been primarily running the full livestock numbers authorized for the grazing year [160 livestock consisting of 152 cattle and 8 horses from 03/01 to 2/28] since 2006 (see Table 9 in LHE Report), this alternative is substantially similar to the No Action alternative, which is analyzed in detail in Chapter 3. Therefore, this 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-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 8, 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 8 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 8. 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)
<p>* 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.</p>		
Cultural Resources	NI NP	<p><i>Concerning grazing permit renewal</i>, 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 detailed analysis is required.</p> <p><i>Concerning Goat Camp Well</i>, 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.</p>
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	<u>Discussed in document</u> . Livestock grazing would be impacted differently across the alternatives, and is analyzed in the following chapters.

Resource	Determination*	Affected Environment (Rationale for Determination)
<p>* 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.</p>		
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 <i>payment in lieu of taxes</i> . 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	<u>Discussed in document.</u> 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 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 Animal Species	NI	The Safford Field Office implements its grazing program consistent with the Biological Opinion (BO) rendered on the Gila District Livestock Grazing Program for the Safford/Tucson Field Offices' Livestock Grazing Program, Southeastern Arizona (22410-2006-F-0414). This BO was reviewed to insure that all mitigation measures and stated in the BO are being followed. No issues were identified from this review. Since the completion of the BO, the Mexican and narrow-headed garter snakes and yellow-billed cuckoo have had proposed critical habitat listed along the Gila River, and the western population of the yellow-billed cuckoo have been listed as threatened. These additional proposed critical habitats and species were reviewed and received a determination of no effect in Appendix D.
Threatened, Endangered, or Candidate Fish Species	NP	The Safford Field Office implements its grazing program consistent with the BO rendered on the Gila District Livestock Grazing Program for the Safford/Tucson Field Offices' Livestock Grazing Program, Southeastern Arizona (22410-2006-F-0414). This BO was reviewed to insure that all mitigation measures and stated in the BO are being followed. No issues were identified from this review.

Resource	Determination*	Affected Environment (Rationale for Determination)
<p>* 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.</p>		
Vegetation	PI	<u>Discussed in document.</u> Vegetation communities would be impacted differently by across the alternatives, and are analyzed in the following chapters.
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	<u>Discussed in document.</u> 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	<u>Discussed in document.</u> 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, and wildlife and special status species.

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 clayey slopes, loamy slopes, limy slopes, and volcanic hills. Two key area monitoring sites each are located within the clayey slopes and the limy slopes. Slopes of 40% or greater occur on 34% of the allotment. (Figure 7 and Table 9).

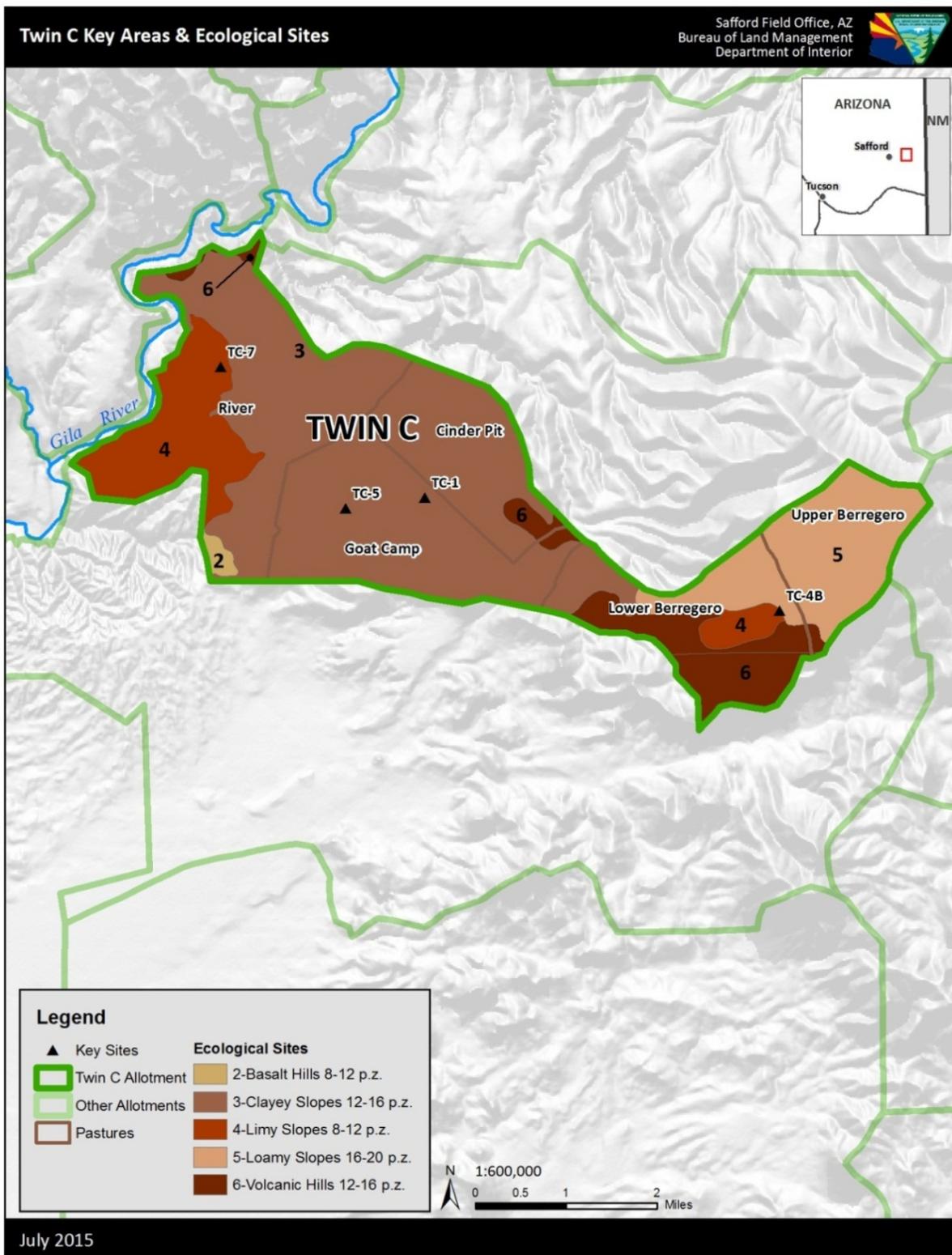


Figure 7. Key Areas and Ecological Sites on the Twin C Allotment.

Table 9. Twin C Ecological Site Descriptions

Map Legend #	Key Area	Ecological Site	Acres	% of Twin C
2		Basalt Hills 8-12 p.z.	225	2%
3	TC-1, TC-5	Clayey Slopes 12-16 p.z.	6,509	59%
4	TC-4B, TC-7	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.	628	6%

Basalt Hills 8-12” p.z.

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*), broom snakeweed (*Gutierrezia sarothrae*), and pale wolfberry (*Lycium pallidum*). Succulent species found include: cholla (*Cylindropuntia*) and prickly pear (*Opuntia*). In an average year, the site is expected to produce 850 pounds per acre per year in a normal year, 395 pounds per acre in an unfavorable year, and 1325 pounds per acre in an exceptional year.

Clayey Slopes 12-16” p.z.

Grass species found in the Clayey Slopes include: tobosa (*Pleuraphis mutica*), perennial three-awn (*Aristida*), sideoats grama (*Bouteloua curtipendula*), bush muhly *Muhlenbergia porteri*, and black grama (*Bouteloua eriopoda*). Forb species found include: fanpetals (*Sida*), globemallow (*Sphaeralcea ambigua*), 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*) and prickly pear (*Opuntia*). In an average year, the site is expected to produce 922 pounds per acre per year, 810 pounds per acre in an unfavorable year, and 1035 pounds per acre in an exceptional year.

Loamy Slopes 16-20” p.z.

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: mesquite (*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. In an average year, the site is expected to produce 1520 pounds per acre per year, and 763 pounds per acre per unfavorable year, and 2350 pounds per acre in an exceptional year.

Limy Slopes 8-12" p.z.

Grass species found in the Limy Slopes include: perennial three-awn (*Aristida*), 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*), 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*). In an average year, the site is expected to produce 340 pounds per acre per year, 125 pounds per acre in an unfavorable year, and 695 pounds per acre in an exceptional year.

Volcanic Hills 12-16" p.z.

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*), and cholla (*Cylindropuntia*). In an average year, the site is expected to produce 860 pounds per acre per year, and 430 pounds per acre per unfavorable year, and 1360 pounds per acre in an exceptional year.

3.2.2 Soils

The soil complexes on the Twin C Allotment are varied as presented in Figure 8 and Table 10 below.

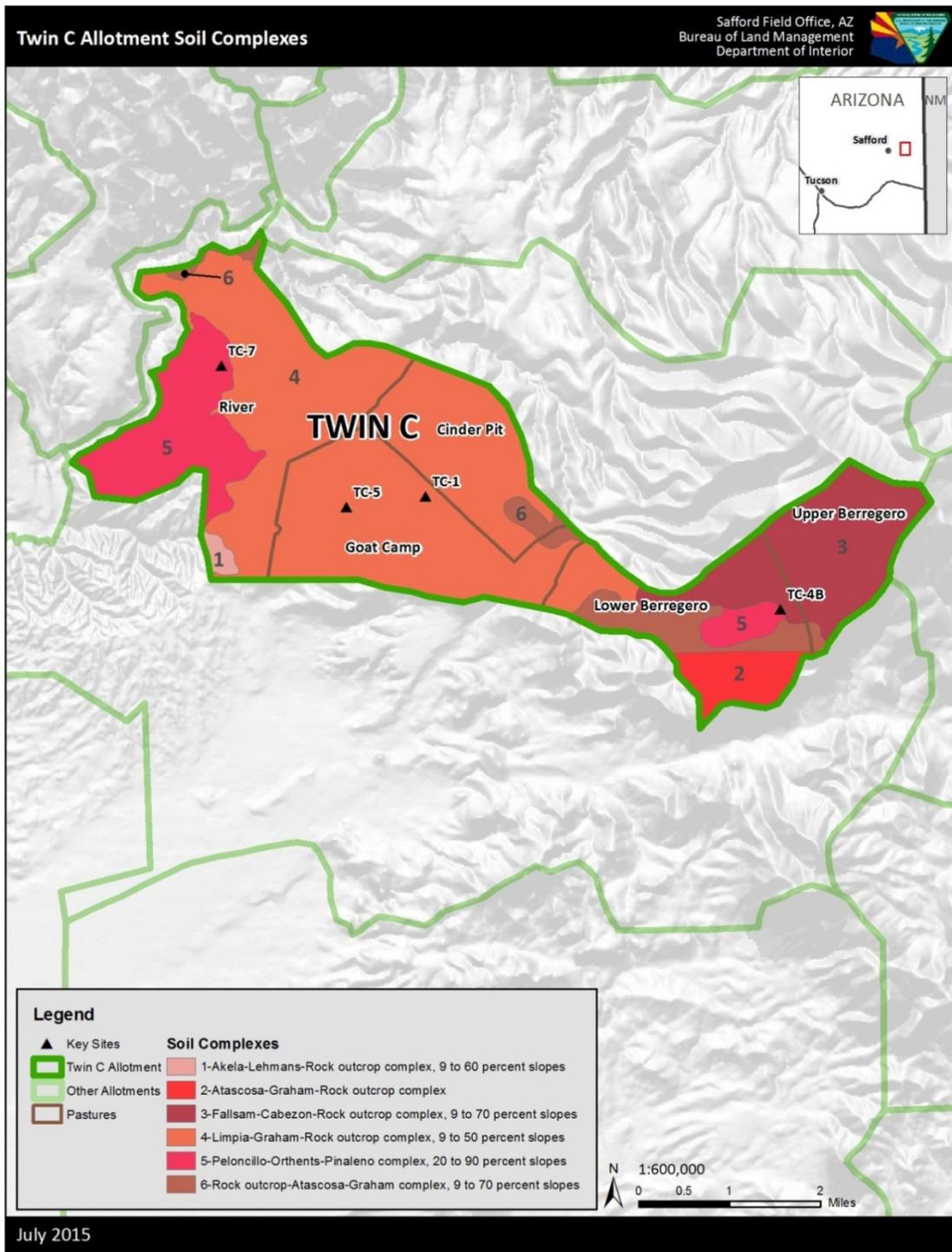


Figure 8. Soil Complexes on the Twin C Allotment

Table 10. 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.

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.

Precipitation

Precipitation ranges from 8 to 20 inches per year with a majority falling in mid to late summer and early fall (Figure 9). An Allotment Management Plan was established in 1982 and revisited in January of 1987. The *Santa Rita* grazing system utilized on the Twin C Allotment is a one-herd, three-pasture (River, Cinder Pit, and Goat Camp pastures), three-year rest-rotation system. This system was designed for mid-to-late summer rainfall and forage production patterns that typically occur in the hot semi-desert grasslands in southeastern Arizona.

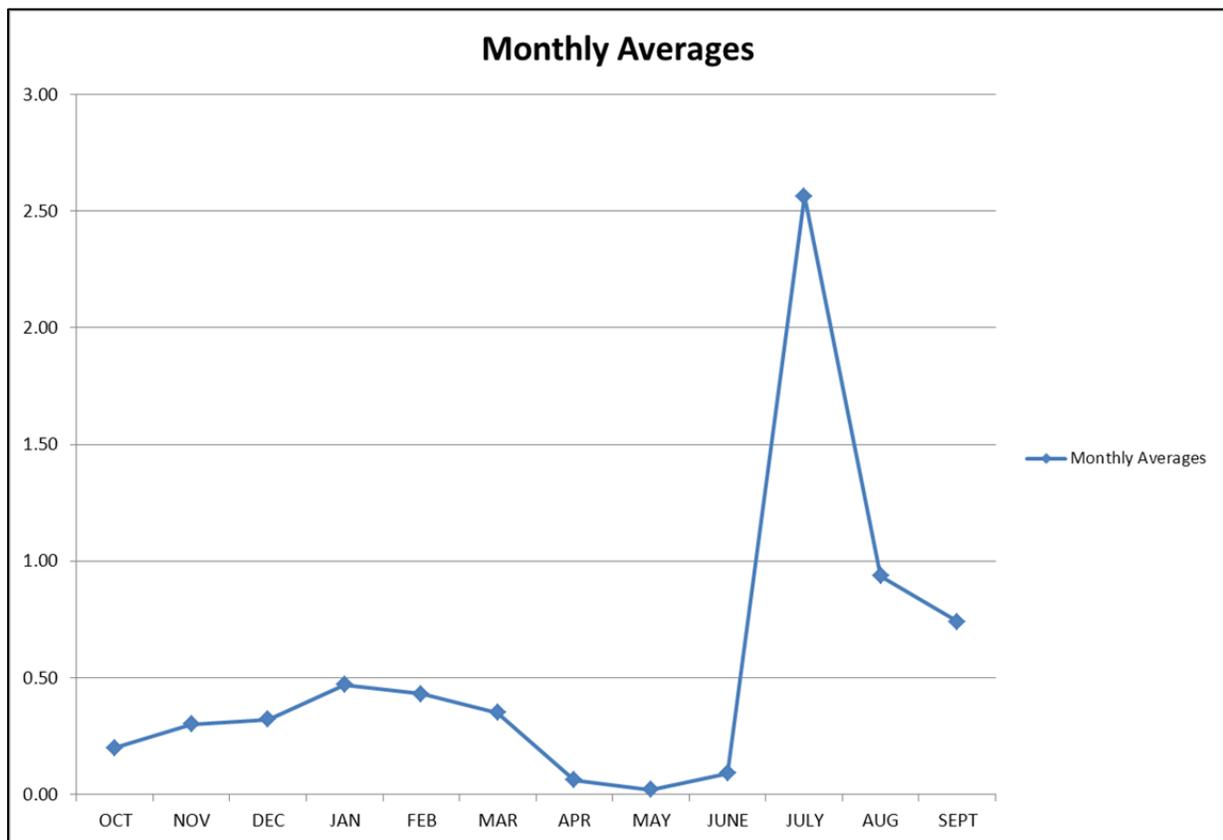


Figure 9. Monthly Precipitation Averages for BLM-maintained Spring Canyon rain gauge located approximately 2.5 miles west of the Twin C Allotment (data from 2001 to 2013).

Actual Use/Billed Use

A summary of the preference 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 11 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 11. Billed/Actual Use of Twin C Allotment

Grazing Fee Year	Preference AUMs	Actual AUMs*	% of Preference 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%

*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, and November 2014 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 slight to light or light 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 non to slight or slight to moderate is considered achieving the Standard.

As disclosed in the July 2015 LHE Report, the criteria for Standard 1 are being met and current grazing is in conformance with the guidelines for livestock grazing management. 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.

- *Clayey Slopes*
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 measured at TC-1 at 11.5% and rated none to slight. All litter size classes remained in place and measured at 14.5%. 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.
- *Limy Slopes*
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.

Arizona Land Health Standard 2: Riparian Wetland Sites

The Gila River is fenced out or inaccessible due to terrain and no springs 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:

- Maintain vegetative canopy cover at 20 to 30%
- Maintain vegetative ground cover at 7 to 10%
- Maintain composition of palatable shrubs at 12 to 14%
- Maintain perennial grass composition at 15 to 20%

The criteria for Standard 3 are being met. The ecological sites were within the reference state or historic climax plant community of the state and transition model. Productive and diverse upland plant communities of native species exist and are being maintained.

3.2.4 Wildlife, Including Migratory Birds and Sensitive Species

The Twin C Allotment is comprised of diverse geological forms, elevations, slopes, and vegetation types, resulting in a diversity of wildlife species from large mammals such as, mule deer, javelina, and numerous species of small mammals, herpetofauna, and birds.

The BLM's current list of sensitive species (BLM, 2011) was reviewed, as was the USFWS Birds of Conservation Concern (USFWS, 2008) to determine potential species occurrences. Additionally, the Arizona Game and Fish Department Arizona (AGFD) Breeding Bird Atlas (ABBA) and Heritage Data Management System (HDMS) (AGFD, 2015) were queried to determine known occurrences. The results are documented in Appendix D. Species such as lowland leopard frog, bald eagle, common black-hawk, Sonora 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.

Mule Deer

Deer feed primarily on browse and forbs. Forbs are highly preferred and in spring and summer can comprise 20% to 40% of the annual diet; whereas browse can constitute between 40% to 70% of the diet in fall and winter. Mule deer are selective feeders and would choose the most succulent and nutritious shoots and grasses on which to feed. Diet largely depends on the ecoregion in which they live (Heffelfinger, *et al.*, 2006), in more productive habitats, such as woodland areas, a greater variety of food would be eaten than in desert areas.

Grazing at light to moderate levels has little impact on mule deer since browse and forbs constitute 90% of their diet with grass important only in early spring. Cattle consume primarily grass, with forbs and browse as secondary, but seasonally important components. Overgrazing results in livestock consuming more browse, which exacerbates the level and intensity of competition with mule deer. To reduce this impact, livestock should not be allowed to browse more than 50% of the annual leaders growth (by weight), which equates to approximately 50% of the leaders browsed (Holechek and Galt, 2000).

Twin C Allotment provides good habitat for mule deer. The slopes provide year-round habitat, with the lower areas important for seasonal forage and for movement.

Javelina

Like mule deer, javelina use variety of different habitat types throughout Arizona. Javelina are opportunistic feeders and require a diverse plant community comprised of flowers, fruits, nuts, grasses, forbs, shrubs, vines, succulents, and trees for survival. Prickly pear cactus comprises a major portion of their diet. A diverse and intact plant community not only provides forage, but needed shelter and cover. Sonoran desert scrub and desert grassland habitat are two of the most important biotic communities in Arizona for javelina and comprise approximately 67% of their

range. Javelina does not inhabit pure grasslands, but grasslands that have been invaded by shrubs and cacti. Riparian forests are also important and are used quite frequently by javelina as sources of water, food, and cover (Day, 1985).

Javelina tend to be associated with available waters and dense vegetation. They are primarily found around the lower slopes of the Twin C Allotment.

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 stock 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 8-9 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 is 1,000 gpm (ADWR, undated).

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.

Chapter 4 – Environmental Effects

This section provides a discussion of the environmental effects (or impacts) as a result of the Proposed Action and Alternatives. Impacts 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 effects 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

Rangeland health assessments conducted in 2012, 2013, and 2014 demonstrate that the Twin C Allotment is within reference condition for the two primary ecological sites making up 74% of the allotment (Clayey Slopes and Limy Slopes). In the past ten years, the permittee's actual use was between 77% and 100% of preference AUMs. The Proposed Action would retain the same terms and conditions as the previous ten years with the same number of preference AUMs of 1,920, with the *Additions to Other Terms and Conditions* describe in section 2.1.1. Monitoring studies have indicated that grazing at the full preference of 1,920 AUMs is sustainable for the amount of production that is found on the allotment. The Proposed Action would allow the allotment to maintain the current AUMs, as well as continue to meet the standards for rangeland health.

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 ground or vegetation disturbance.

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 10,987 acres. The concurrent two and three pasture rotation systems currently utilized on the Twin C Allotment lessen the potential impact. In the three most recent Land Health Assessments, soil erosion related attributes were rated from moderate (2012) to none to slight (2013 and 2014). These monitoring studies have indicated that grazing at the full preference 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 be minor.

Goat Camp Well

There would be minor direct and indirect impact to soils from the drilling of Goat Camp Well, as 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 optional 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

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. *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 is at or below light use (21-40%) with most of the acreage in the allotment expected to be used below moderate levels (41-60%). This indicates current water placement and livestock distribution is providing for sufficient livestock utilization. The most recent land health assessments (2012, 2013, and 2014) and the Twin C Allotment LHE Report determined that the allotment is meeting 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 will continue to be monitored.

Goat Camp Well

None of the three well production scenarios (section 2.1.2) would impact grazing management any differently in terms of AUMs, number of watering facilities (troughs, storage tanks), the total amount of water pumped, or livestock distribution – it is only a choice of water source to supply the existing water facilities at the existing levels. If the Goat Camp Well does produce water, 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, Including Migratory Birds and Sensitive Species

Grazing Permit

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

Livestock on the Twin C Allotment are excluded from accessing the Gila River and the associated riparian corridor. 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. Continued livestock use on the Twin C allotment will not impact BLM sensitive species or USFWS Birds of Conservation Concern.

Goat Camp Well

The effect on habitat would be minimal and short term. The only ground disturbance would be at the small temporary drill pad (approximately 0.10 acre), which has been previously disturbed. In addition, since the habitat is very common and widespread, 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).

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.

Migratory birds of numerous species are common throughout the area. There are no habitat features at the site that would concentrate nesting or roosting. The Proposed Action 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. Birds, as noted for wildlife in general, would not have access to water at the site during drilling operations. This impact is lessened since drilling operations would only occur during daylight hours.

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*). All are associated with the Gila River and canyon walls three miles away. Historic golden eagle nests occur on ledges and rock faces along the ridge of the Black Hills four miles away. All three species are wide ranging and could fly over the project site during operations. There is no expectation that the Proposed Action would impact these three species.

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 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 and therefore water quality would be unaffected by grazing on the Twin C Allotment.

Development of Goat Camp Well 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 as Goat Camp Well would supply existing troughs.

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 F), 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 909,000 gallons per year of water adjacent to the Gila River to remain in or near the river channel (refer to Appendix E). 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 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 Gila River sub-surface flow. 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.

4.2 Environmental Consequences 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. The exception would be that the *Additions to Other Terms and Conditions* would not be implemented. 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. The 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.

4.2.4 Wildlife, Including Migratory Birds and Sensitive 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. 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 wildlife.

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 Consequences 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, Including Migratory Birds and Sensitive Species

Alternative 2 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. 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 wildlife.

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 Consequences of Alternative 3: No Grazing & No Goat Camp Well

4.4.1 Vegetation

Alternative 3 would defer livestock grazing on the Twin C Allotment for a period of 10 years, and Goat Camp Well would not be drilled. 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.

4.4.2 Soils

Alternative 3 would remove grazing from the Twin C Allotment and Goat Camp Well would not be drilled. Increased vegetation densities and decreased erosion potential would be expected to occur as the result of removing grazing, and 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

Alternative 3 would defer livestock grazing on the Twin C Allotment for a period of 10 years. 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 range improvements maintenance would not occur, the deterioration of fences bordering neighboring allotments could result in periodic livestock grazing trespassing over the ten-year term. Alternative 3 would also have a negative economic impact on the permittee. The permittee might choose to seek grazing permits on nearby private or state lands, which would likely be more expensive. Or the permittee might sell the herd, which would result in short-term economic benefits but would be a one-time source of income rather than sustaining the livelihood that the permittee has worked towards since 1996.

4.4.4 Wildlife, Including Migratory Birds and Sensitive Species

Vegetation under Alternative 3 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 Jennings, 1992; Bock et al., 1984).

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 impacts to wildlife or their habitat. Since no drilling would occur, there would be no noise and human activity associated with the drilling action, so no temporary direct impacts to wildlife 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 for a deferral period of ten years. During this time, the 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 Impacts

CEQ NEPA regulations defines 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 for the allotment. Two other wells 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 two wells on the Twin C Allotment were installed within range improvement areas to develop water sources for livestock and wildlife. No further well development is anticipated within the allotment at this time. Other range improvements, including potential water sources and vegetation treatments, are in the planning stages in other BLM grazing allotments in the watershed including Johnny Creek, Bonita Creek, Zorilla, Turtle Mountain, and Slick Rock. Cattle grazing 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 Impacts 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 *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 preference 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 *Additions to Other Terms and Conditions* as described in section 2.1.1 would be implemented. Monitoring studies indicate that grazing at the full preference 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 *Additions to Other Terms and Conditions* as described in section 2.1.1. Livestock grazing at the preference 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, Including Migratory Birds and Sensitive 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 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 in combination with grazing 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, impacts from these activities would be moderated by the open and remote nature of the region. 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 preference 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. No other current or reasonably foreseeable activities are expected to impact livestock grazing.

Wildlife, Including Migratory Birds and Sensitive 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 in combination with grazing 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. 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-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 preference 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, Including Migratory Birds and Sensitive 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 in combination with grazing 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. 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-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 & No Goat Camp Well

Vegetation

Under Alternative 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 deferral of livestock grazing on the Twin C Allotment for a period of 10 years. 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. While 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, Including Migratory Birds and Sensitive Species

Under Alternative 3, loss or reduction of livestock waters would result in altered habitat uses, change in distribution, and possibly population numbers. The BLM would have to evaluate if any livestock waters would be maintained for wildlife. Ground cover and vegetative cover would be expected to increase with the removal of livestock grazing. Loss of ground cover from grazing is exacerbated during times of drought and may result in increased predation on small mammals, certain bird species, such as quail and song birds, and reptiles. Loss of seedheads from grass and forbs from livestock grazing may create food shortages for many rangeland birds. Insects, another food items for many species of birds are also lower in grazed areas.

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. However, impacts from these activities would be moderated by the open and remote nature of the region. 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 renewed authorization of grazing on 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, 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

Arizona Game & Fish Department

USFWS, Arizona Ecological Services

Manuel and Carolyn and Manuz, Twin C Allotment permittee

Raymond Cueto, Cueto Drilling Company, Clifton, Arizona

Chapter 6 – List of Preparers

BLM Safford Field Office

Jason Martin, Rangeland Management Specialist
Dan McGrew, Archaeologist,
Jeff Conn, Natural Resources Specialist
Todd Murdock, Recreation Planner
Heidi Blasius, Fisheries Biologist
Larry Thrasher, Geologist
Roberta Lopez, Realty Specialist
Dan Quintana, Fuels Program Specialist
Sharisse Fisher, Geographic Information Specialist
Vanessa Stepanek, Geographic Information Specialist
Amelia Underwood, Assistant Field Manager,
Amy Corathers, Planning and Environmental Specialist

BLM National Operations Center

Senior Hydrogeologist, Paul L. Summers

References

- Arizona Department of Environmental Quality. 2014. Arizona's 2012/14 Impaired Waters. Available online at <http://www.azdeq.gov/environ/water/assessment/>. Accessed December 16, 2015.
- Arizona Department of Water Resources. Undated. Securing Arizona' water future: Safford Basin. Available online at http://www.azwater.gov/azdwr/StatewidePlanning/RuralPrograms/OutsideAMAs_PDFs_for_web/Southeastern_Arizona_Planning_Area/Safford_Basin.pdf. Accessed December 30, 2015.
- _____. Well Registry. Available online at <https://gisweb.azwater.gov/WellRegistry/>. Accessed December 16, 2015.
- Arizona Game and Fish Department. HabiMap™. Available online at <http://www.habimap.org/habimap>. Accessed 07/30/2015.
- Bock, C.E., J.H. Bock, W.R. Kenney and V. M. Hawthorne. 1984. Responses of birds, rodents, and vegetation to livestock enclosure in a Semidesert Grassland site. *Journal of Range Management*. 37:239-242.
- Day, G. I. 1985. Javelina: research and management in Arizona. Arizona Game and Fish Department.
- Heffelfinger, J. 2006. Deer of the Southwest: A Complete Guide to the Natural History, Biology, and Management of Southwestern Mule Deer and White-Tailed Deer. Texas A&M University Press.
- Holecheck, J.L. and D.G. Galt. 2000. Grazing Intensity Guidelines. *Rangelands*. 22:11-14.
- Mendelson III, J. R., & Jennings, W. B. 1992. Shifts in the relative abundance of snakes in a desert grassland. *Journal of Herpetology*, 38-45.
- Rasby, Dr. Rick. July 18, 2012. How much water do cows drink per day? University of Nebraska – Lincoln. Lincoln, NE. Available online at <http://beef.unl.edu/>.
- Summers, Paul L. October 31, 2011. Hydrogeologist declaration. Bureau of Land Management, National Operations Center, Denver, CO.
- United States Department of Agriculture, Natural Resources Conservation Service. Ecological Site Description, Site name: Clayey Slopes 12-16" pz. Site Description authored by Dan Robinett, Larry Ellicott, and Steve Barker. Available online at <https://esis.sc.egov.usda.gov>. Accessed 08/26/2013.

- _____. Ecological Site Description, Site name: Limy Slopes 8-12” pz. Site description authored by Dan Robinett *et al.* Available online at <https://esis.sc.egov.usda.gov>. Accessed 08/26/2013.
- _____. Ecological Site Description, Site name: Volcanic Hills 12-16” pz. Site description authored by Dan Robinett *et al.* Available online at <https://esis.sc.egov.usda.gov>. Accessed 08/26/2013.
- United States Department of Interior, Bureau of Land Management. 1978. Upper Gila-San Simon Grazing Environmental Statement. Arizona State Office, Phoenix.
- _____. 1991. Safford District Resource Management Plan and Environmental Impact Statement. Safford Field Office, Safford, Arizona.
- _____. 1992. Partial Record of Decision for the Approval of the Safford District Resource Management Plan I. Arizona State Office, Phoenix.
- _____. 1997a. Arizona Standards for Rangeland Health and Guidelines for Grazing Administration. Department of Interior, Washington, DC.
- _____. 1997b. Proposed Plan Amendment of Land Use Plans in Arizona for Implementation of Arizona Standards for Rangeland Health and Guidelines for Grazing Administration, Finding of No Significant Impact, and Decision Record. Arizona State Office, Phoenix, Arizona.
- _____. 1998. Gila Box National Resource Conservation Area Management Plan, Environmental Assessment, Finding of No Significant Impact and Decision Record. Safford Field Office, Safford, Arizona.
- _____. 2008. BLM National Environmental Policy Act Handbook. H-1790-1. Washington, DC.
- _____. 2011. Declaration of Hydrogeologist Paul Summers. National Operations Center, Denver, CO. October 31, 2011.
- _____. Arizona State Director Instruction Memorandum No. AZ-2011-005 to All Field Offices. Subject: Updated Bureau of Land Management (BLM) Sensitive Species List for Arizona. 29 December 2010.
- U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp.
- _____. Information for Planning and Conservation (IPaC). Available online at <http://ecos.fws.gov/ipac>. Accessed 07/30/2015.

U.S. Geological Survey. National Water Information System: Web Interface. Available online at <http://waterdata.usgs.gov/az/nwis/>. Accessed 12/14/2015.

_____. National Water Information System: Web Interface. Available online at http://waterdata.usgs.gov/az/nwis/uv?site_no=09448500. Accessed 12/17/2014.

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 2015



Twin C Allotment Land Health Evaluation

Table of Contents

List of Acronyms.....	i
1 Introduction	1
1.1 Consultation, Cooperation and Coordination	1
1.2 Definition of Arizona Standards for Rangeland Health and Guidelines for Grazing Administration.....	1
2 Allotment Profile and General Description of Evaluation Area.....	3
2.1 Location.....	3
2.2 Physical Description	5
2.2.1 Surface Land Ownership.....	5
2.2.2 Precipitation	5
2.2.3 Temperatures.....	7
2.2.4 Soils.....	7
2.2.5 Watershed	9
2.2.6 Pastures and Range Improvements.....	9
2.3 Biological Resources.....	10
2.3.1 Major Land Resource Areas	10
2.3.2 Ecological Sites within the Twin C Allotment.....	11
2.3.3 Wildlife Resources/Special Status and Threatened and Endangered Species.....	19
2.4 Special Management Areas.....	20
2.5 Recreation Resources	20
2.6 Cultural Resources.....	20
3 Grazing Management	21
3.1 Grazing History.....	21
3.2 Mandatory Terms and Conditions for Permitted Use.....	21
4 Objectives	23
4.1 Land Use Plan Management Objectives.....	23
4.2 Allotment-Specific Objectives	24
4.3 Key Area Objectives.....	24
5 Plant List	27
6 Rangeland Inventory and Monitoring Methodology.....	28
6.1 Ground Cover Protocol.....	28
6.1.1 Pace Frequency	28
6.1.2 Fetch.....	29

6.1.3 Dry Weight Rank (DWR)..... 29

6.2 Indicators of Rangeland Health 29

7 Management Evaluation and Summary of Studies Data..... 31

7.1 Actual Use..... 31

7.2 Key Area Analysis..... 31

7.3 Land Health Evaluation..... 32

7.3.1 TC-1 and TC-5 (Clayey Slopes 12-16" p.z. R041XB303AZ)..... 32

7.3.2 TC-4B and TC-7 (Limy Slopes 8-12" p.z. R041XB207AZ)..... 34

7.4 Frequency/Cover, Composition, and Structure Data 35

7.5 Utilization 36

8 Conclusions 38

9 Recommended Management Actions 39

10 List of Preparers..... 40

11 Draft Determination 41

References 42

Appendix A: Threatened, Endangered, and Sensitive Species..... 44

Appendix B: UA Monitoring Data 2008..... 52

Appendix C: UA Monitoring Data 2012..... 60

Appendix D: USFS TEAMS Monitoring Data 2014..... 68

Appendix E: Twin C Allotment Utilization Information 2013..... 77

List of Figures

Figure 1. Vicinity Map 4

Figure 2. Average Seasonal Precipitation from Guthrie RAWS..... 6

Figure 3. Soil Complexes on Twin C Allotment 8

Figure 4. Twin C Allotment Pastures and Existing Range Improvements 10

Figure 5. Key Areas and Ecological Sites on the Twin C Allotment.....12

Figure 6. State-and-Transition Model for Clayey Slopes 12-16" p.z. 14

Figure 7. Key Areas (TC-1) Clayey Slopes 12-16" p.z. Slope and armor characteristics are noted, 2008. 15

Figure 8. Key Area (TC-5) Clayey Slopes 12-16" p.z. Landscape view, 2008. 15

Figure 9. State-and-Transition Model for Limy Slopes 8-12" p.z. 17

Figure 10. Key Area Monitoring (TC-7) and LHE Site. Slope and rock armor characteristics noted, 2008.18

Figure 11. Key Area Monitoring (TC-7) and LHE Site. Landscape view looking westward toward Gila River, 2008. 18

Figure 12. Key Area Monitoring (TC-7) and LHE Site. Rock armor characteristics noted, 2008. 19

List of Tables

Table 1. Quarterly Precipitation (inches) from Guthrie Remote Automatic Weather Station (RAWS)..... 5

Table 2. Temperatures in Degrees Fahrenheit 7

Table 3. Soil Composition in Percentages on Twin C Allotment 7

Table 4. Ecological Sites Located with Twin C Allotment..... 11

Table 5. Mandatory Terms and Conditions in Twin C Permit 21

Table 6. Key Vegetative Species Located on the Twin C Allotment¹ 26

Table 7. Key Plant Species 27

Table 8. Actual Use on Twin C Allotment..... 31

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

Twin C Allotment Land Health Evaluation

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 is 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.

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.

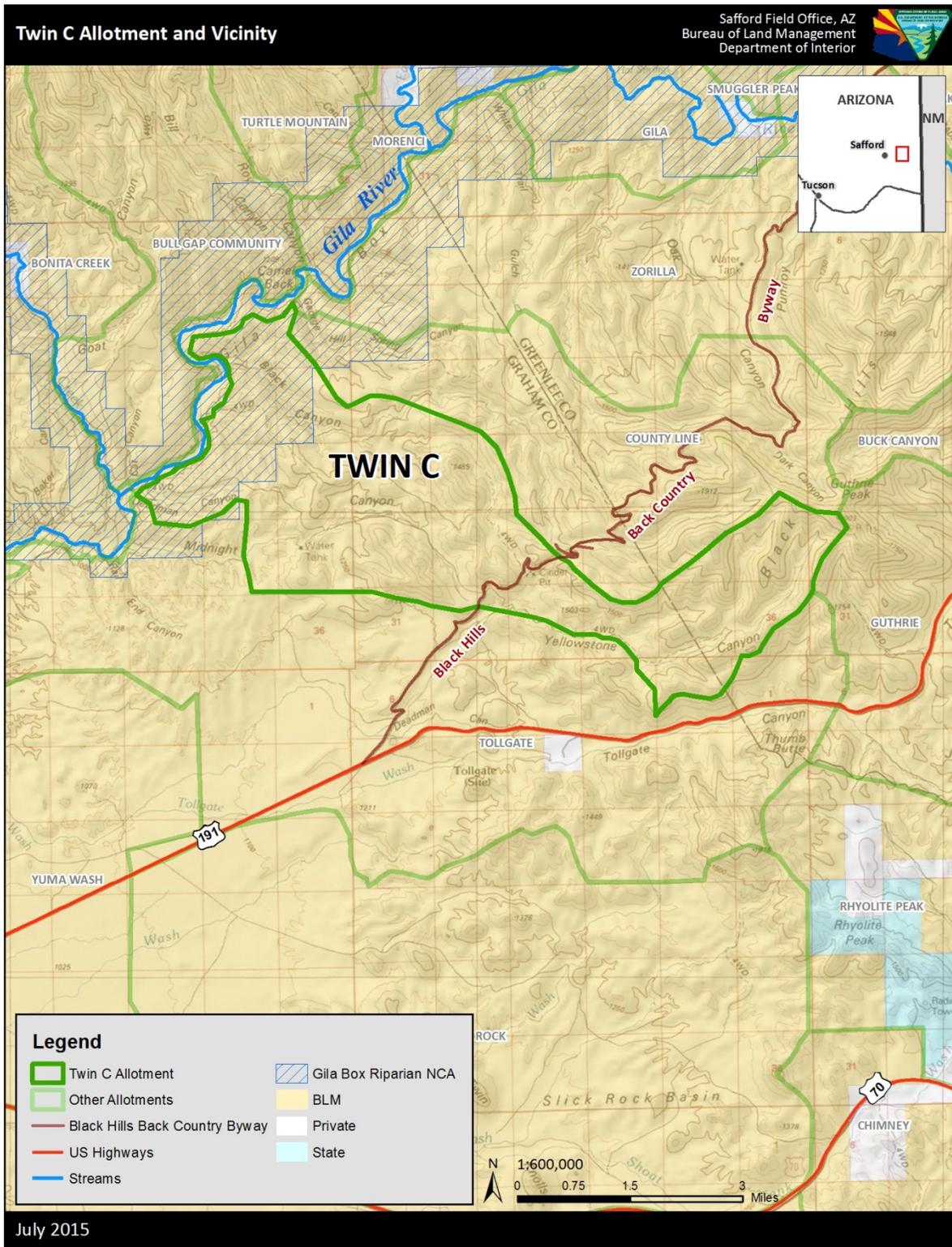
2 Allotment Profile and General Description of Evaluation Area

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 10,987 acres and is entirely comprised of BLM lands.

2.2.2 Precipitation

Precipitation patterns are typically bimodal (Table 1). Summer rainfall is 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 8-12 inches with higher elevations receiving 12-20 inches (Figure 2). As indicated, dry or drought conditions have occurred more frequently since 2001 as compared to years prior.

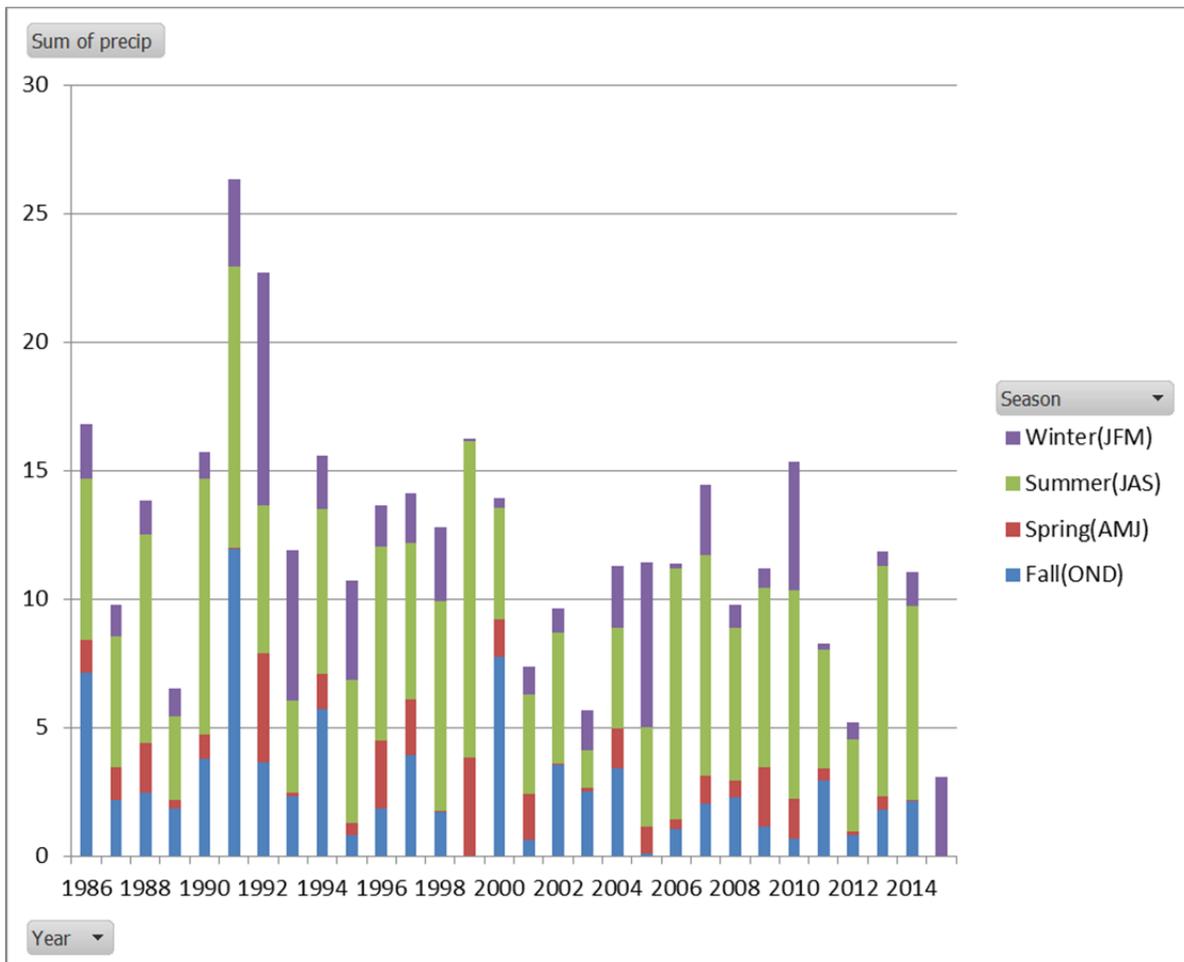
Table 1. Quarterly Precipitation (inches) from Guthrie Remote Automatic Weather Station (RAWS)

Year	Quarter				Total
	Fall (Oct – Dec)	Spring (Apr – Jun)	Summer (Jul - Sep)	Winter (Jan – Mar)	
1986	7.15	1.27	6.27	2.1	16.79
1987	2.2	1.28	5.08	1.2	9.76
1988	2.45	1.96	8.09	1.36	13.86
1989	1.84	0.36	3.26	1.08	6.54
1990	3.79	0.96	9.95	1.02	15.72
1991	11.94	0.04	10.98	3.37	26.33
1992	3.66	4.24	5.77	9.05	22.72
1993	2.34	0.11	3.59	5.87	11.91
1994	5.72	1.36	6.45	2.04	15.57
1995	0.83	0.48	5.55	3.85	10.71
1996	1.85	2.64	7.55	1.63	13.67
1997	3.93	2.16	6.09	1.96	14.14
1998	1.7	0.08	8.12	2.88	12.78
1999	0	3.83	12.33	0.08	16.24
2000	7.73	1.5	4.34	0.36	13.93
2001	0.61	1.8	3.86	1.11	7.38
2002	3.57	0.03	5.11	0.92	9.63
2003	2.5	0.17	1.44	1.55	5.66
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

Year	Quarter				Total
	Fall (Oct – Dec)	Spring (Apr – Jun)	Summer (Jul - Sep)	Winter (Jan – Mar)	
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	n/a	n/a	n/a	3.1	3.1

Source: Western Regional Climate Center; Reno, Nevada,

Figure 2. Average Seasonal Precipitation from Guthrie RAWS



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 2008 and 2015.

Table 2. Temperatures in Degrees Fahrenheit

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.*

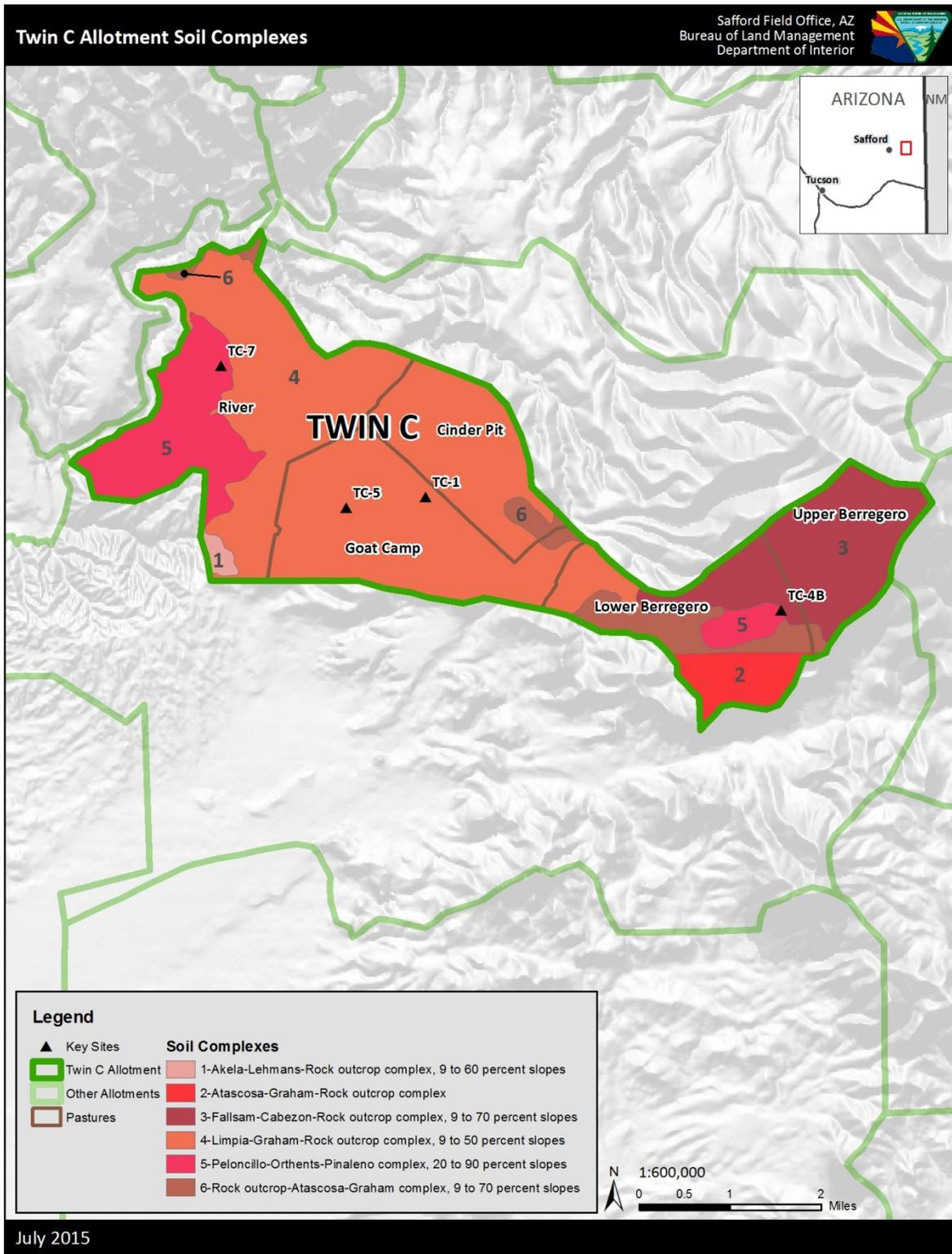
2.2.4 Soils

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-Cabazon-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%

Figure 3. Soil Complexes on Twin C Allotment



2.2.5 Watershed

The Twin C Allotment lies within the Upper Gila River Watershed. The Upper Gila Watershed is defined by the Gila River drainage area, from the New Mexico border to Coolidge Dam (San Carlos Reservoir). Land ownership 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 open range grazing and recreation, with a minor amount of forestry in the national forests. A major mining facility is located in the Clifton-Morenci area along the San Francisco River. Five wilderness areas and the Gila Box Riparian National Conservation Area are located in the watershed and have restricted uses. (ADEQ)

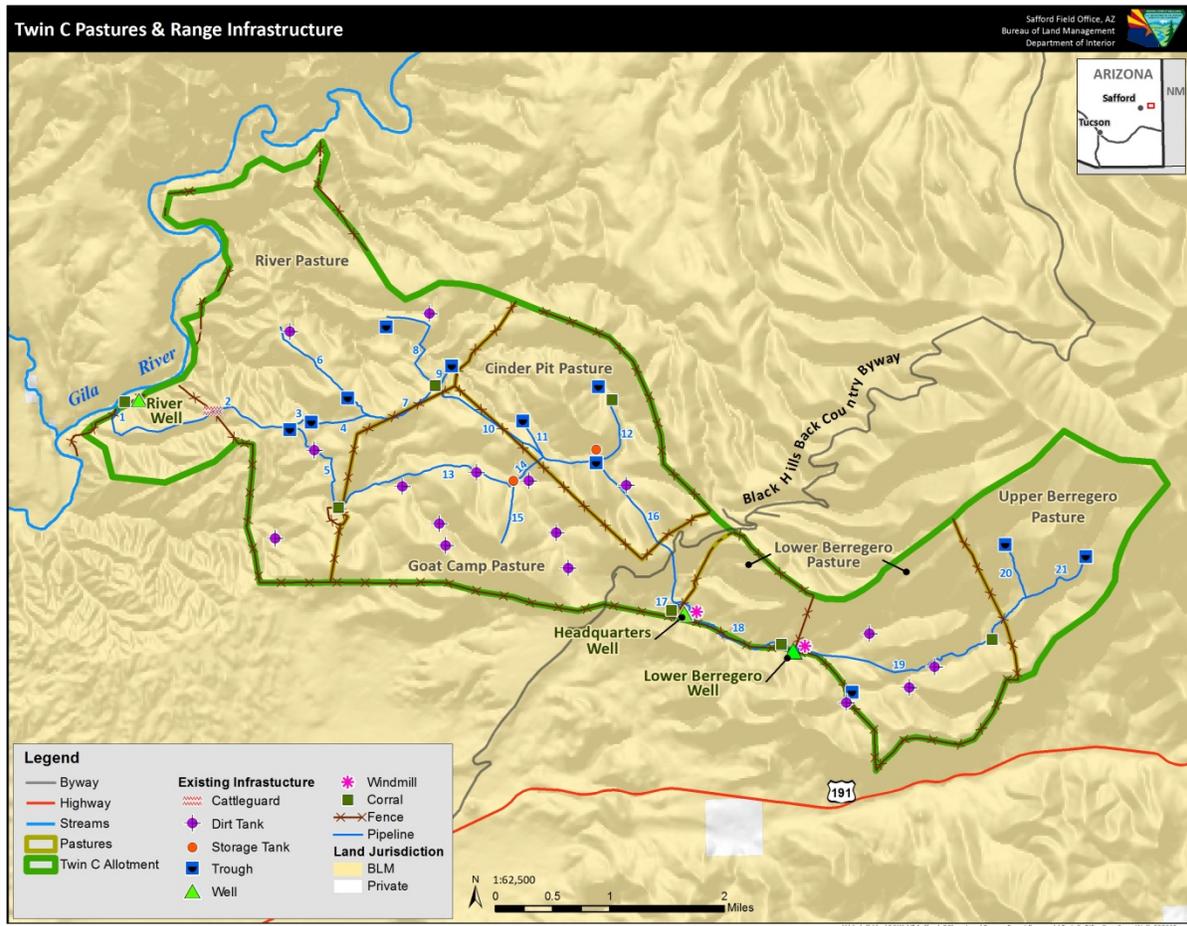
2.2.6 Pastures and Range Improvements

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 on 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.

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). An 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”). Higher elevations occur in the eastern portion of the Twin C Allotment resulting in more precipitation (12- 20”).

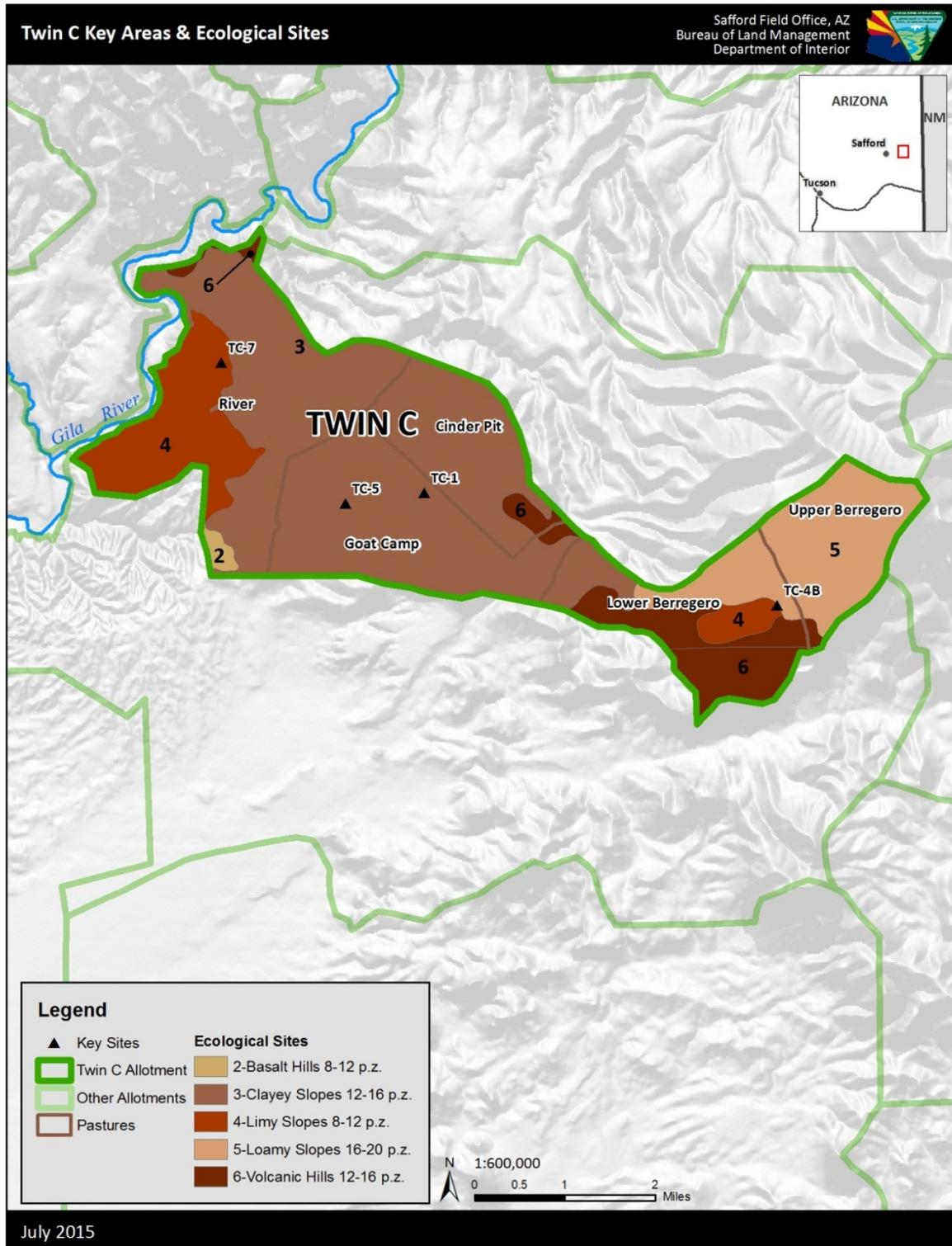
2.3.2 Ecological Sites within the Twin C Allotment

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. Key areas make up a relatively small portion of an allotment, they are selected because they are representative of an ecological site (vegetation and soils) and the amount of livestock use or grazing value within an allotment. Key areas are used as a monitoring point for grazing use and vegetation monitoring. 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 with Twin C Allotment

Figure 5 Map Legend Reference #	Key Area and GPS Coordinates (UTM 12 S; NAD 27)	Ecological Site	Percent Area of Twin C
2		Basalt Hills 8-12 p.z.	2%
3	TC-1 (0648954,3639942); TC-5 (0647549, 3639751)	Clayey Slopes 12-16 p.z.	59%
4	TC-4B (0655246, 3637934) TC-7 (0645333, 3642263)	Limy Slopes 8-12 p.z.	15%
5		Loamy Slopes 16-20 p.z.	18%
6		Volcanic Hills 12-16 p.z.	6%

Figure 5. Key Areas and 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 that make up the characteristics of Ecological sites which classify rangeland types.

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

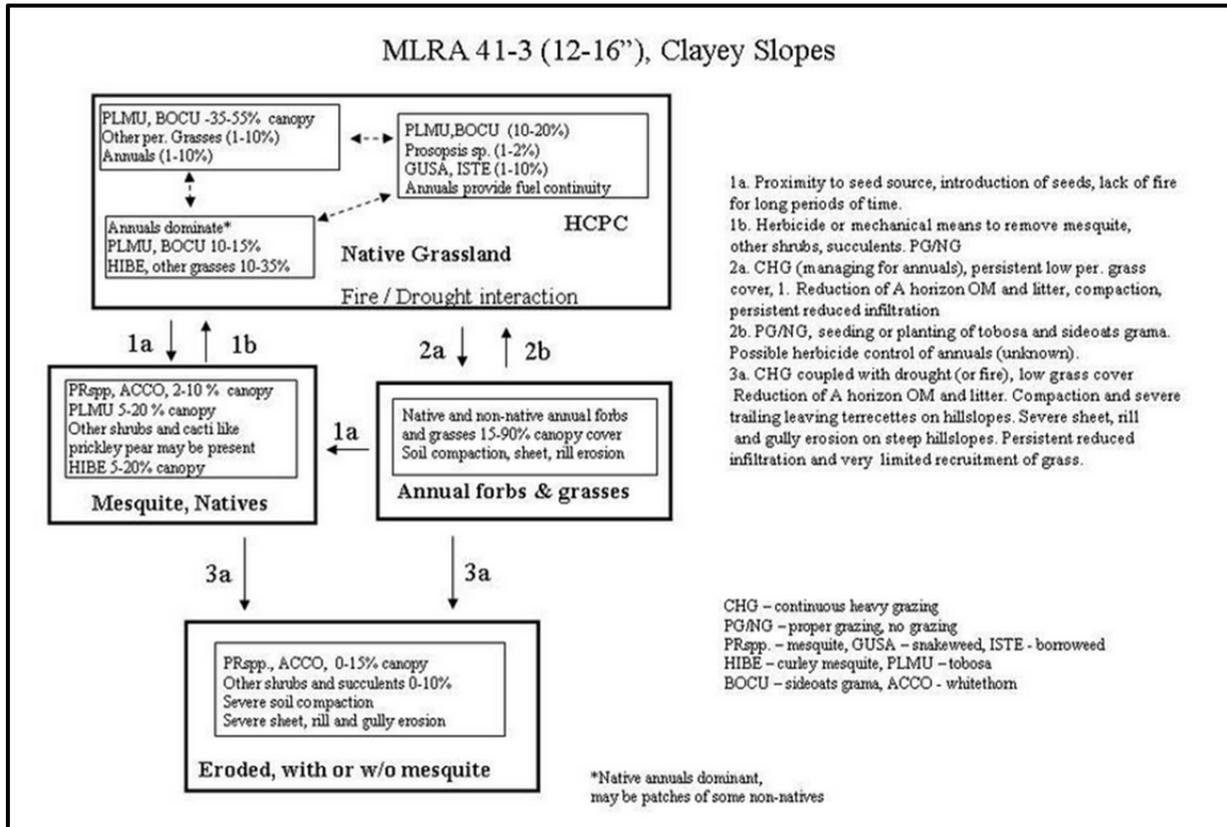
This ecological site occurs in the middle elevations of the Madrean Basin and Range province in Southeastern Arizona. It occurs on hill-slopes and ridge-tops. Slope aspect is site differentiating at elevations near land resource area boundaries. Precipitation in this common resource area ranges from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

The HCPC on this ecological site is dominated by warm season perennial grasses. Shrubs and perennial forbs are well represented on the site (Figure 6). 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 site. The aspect is shrub-dotted grassland.

Grass species found in the Clayey Slopes include: tobosa (*Pleuraphis mutica*), perennial three-awn (*Aristida*), sideoats grama (*Bouteloua curtipendula*), bush muhly *Muhlenbergia porteri*, and black grama (*Bouteloua eriopoda*). Forb species found include: fanpetals (*Sida*), globemallow (*Sphaeralcea ambigua*), 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*) and prickly pear (*Opuntia*). In an average year, the site is expected to produce 922 pounds per acre per year, 810 pounds per acre in an unfavorable year, and 1,035 pounds per acre in an exceptional year.

The Clayey Slopes 12-16" ecological sites on the Twin C Allotment are no longer in the Native Grassland state (see Figure 6), however they have not fully transitioned into the Mesquite, Natives state. According to the monitoring data (see Table 10) 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. 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 7 and 8 show the key sites that were evaluated.

Figure 5. State-and-Transition Model for Clayey Slopes 12-16" p.z.



Source: NRCS ESIS, June 2015.

Figure 6. Key Areas (TC-1) Clayey Slopes 12-16" p.z. Slope and armor characteristics are noted, 2008.



Figure 7. Key Area (TC-5) Clayey Slopes 12-16" p.z. Landscape view, 2008.



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

This 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. More than half falls during July through September in brief, but often heavy, thunderstorms. The rest of the moisture comes as light rain or snow that falls slowly for a day or more, but rarely lasts more than a day. May and June are normally the driest months. Humidity is generally very low. Temperatures are mild throughout most of the year. Freezing temperatures are common at night December through February; brief 0° F may be observed some nights. During June, July and August some days may exceed 100° F. In years of average or greater winter precipitation, annual grasses and forbs occur abundantly in the interspaces.

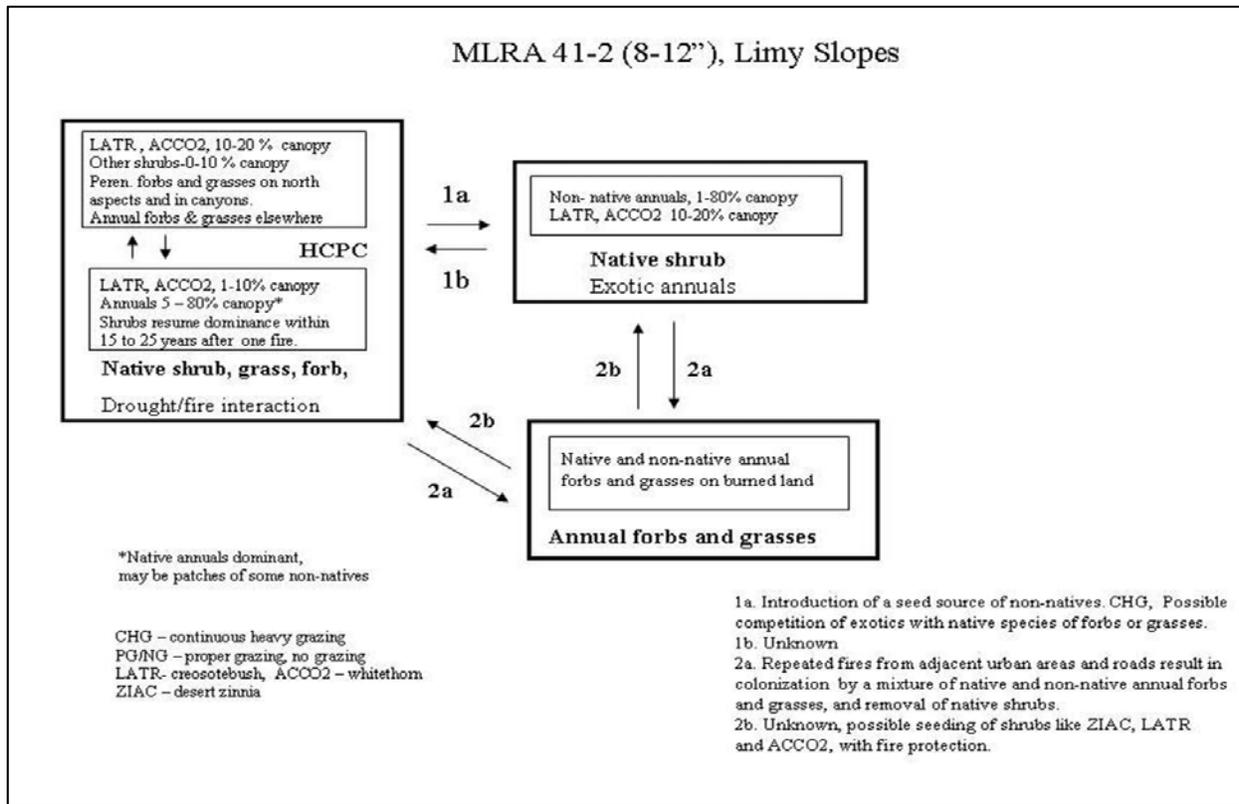
The plant communities found on an ecological site are naturally variable. Composition and production will vary with yearly conditions, location, aspect and the natural variability of the soils. The HCPC represents the natural potential plant community found on relict or relatively undisturbed areas of this site. Other plant communities described here represent plant communities that are known to occur when the site is disturbed by factors such as fire, grazing and drought.

The historic native state includes the native plant communities that occur on the site, including the HCPC. This state includes other plant communities that naturally occupy the site following fire, drought, flooding, herbivores and other natural disturbances. The HCPC represents the natural climax community that eventually reoccupies the site with proper management and a return to near normal conditions and/or equilibrium (Figure 9). Once the site crosses a threshold caused by continuous heavy grazing, drought/fire resulting in the site becoming dominated by annual grasses and forbs (State 2 or 3) it may be physically, biologically, or economically impractical to reverse through future management practices.

Grass species found in the Limy Slopes include: perennial three-awn (*Aristida*), 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*), 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*). In an average year, the site is expected to produce 340 pounds per acre per year in a normal year, 125 pounds per acre in an unfavorable year, and 695 pounds per acre in an exceptional year.

The Limy Slopes 8-12” ecological sites on the Twin C Allotment are not in HCPC they are in the transition from HCPC to Native shrub, grass, forb (see Figure 9). According to the monitoring data (see Table 11) canopy cover for shrubs/vines is within expected values but native grass and forbs canopy cover is higher than the expected range. Species composition is higher in forbs and shrubs/vine species but is within typical range for grasses/grasslike. Figures 10-12 show the key sites that were evaluated.

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



Source: NRCS ESIS, June 2015.

Figure 9. Key Area Monitoring (TC-7) and LHE Site. Slope and rock armor characteristics noted, 2008.



Figure 10. Key Area Monitoring (TC-7) and LHE Site. Landscape view looking westward toward Gila River, 2008.



Figure 11. Key Area Monitoring (TC-7) and LHE Site. Rock armor characteristics noted, 2008.



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, Special Status Species, and Game Species. Refer to Appendix A for a list of species.

2.3.3.1 Threatened and Endangered Species

A search of the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Conservation system (IPaC) was completed on July 30, 2015 for the allotment. Specific species determinations were made and are in Appendix A. Threatened and endangered species considered in the evaluation of the Twin C allotment are: razorback sucker and designated critical habitat which was considered under the Gila District Livestock Grazing Program Biological Opinion (BO #22410-2006-F-0414); yellow-billed cuckoo and its proposed critical habitat, and proposed critical habitat for narrow-headed and Mexican garter snakes, which have critical habitat proposed since the 2012 BO was finalized. Species were evaluated and received a determination of no effect in Appendix A due to their distance from the allotment and livestock on the Twin C Allotment have been excluded from accessing the Gila River for over 15 years since implementation of the Gila Box RNCA.

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.

2.2.3.1 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 Renewal Final Decision
152 Cattle/8 Horses; 1,920 AUMs

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 5.

Table 5. Mandatory Terms and Conditions in Twin C Permit

Allotment Name/ Number	Livestock Number/Kind	Grazing Period		% Public Land	Active Use (AUM)
		Begin	End		
Twin C (No. 40210)	152 Cattle 8 Horses	3/1	2/28 Yearlong	100	1824 Cattle 96 Horses

Source: Rangeland Administration System (RAS)

Other Terms and Conditions:

- In order to improve livestock distribution on the public lands, all salt blocks and/or mineral supplements will not be placed within a ¼ 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 4130.3-2 C.
- 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 (PL 101-601; 104 Stat. 3048; USC 3001) are discovered, the permittee/lessee shall stop operations in the immediately area of the discovery, protect the remains and objects, and immediately notify the authorized officer of the discovery until notified by the authorized officer that operations may resume.
- The Permittee shall submit a report of the actual grazing use made on this allotment 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.

- 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.

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)

4.2 Allotment-Specific Objectives

The Twin C Allotment is subject to the following 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).

Under proper functioning conditions, rates of soil loss and infiltration are consistent with the potential of the 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. 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 5 and Figure 4 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 and U.S. Forest Service (USFS) in 2014.

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 slight to light or light 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 non to slight or slight to moderate is considered achieving the Standard.

Standard 2 - Riparian-Wetland Site

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 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 current state of the plant community found at each key area was analyzed along with information from the NRCS 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 TC-4B (Lower Berregero Pasture): 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.
- 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 (See list of key species) and key perennial grass species at will also provide forage for wildlife and livestock.

Desired Resource Conditions for TC-7 (River Pasture): Limy Slopes 8-12 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 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 5 for a list of vegetative species specific to the allotment).

Table 6. Key Vegetative Species Located on the Twin C Allotment¹

Site	Ecological Site	Key Species	Ecological Site ID	GPS Coordinates (NAD83 CONUS)
TC-1	Clayey Slopes 12-16" (45%) Volcanic Hills 12-16" (20%)	<i>Erogrostis intermedia</i> ; <i>Bouteloua Rothrockii</i>	R041XB303AZ R041XB323AZ	12S UTM 0648955 3639943
TC-4B	Limy Slopes 8-12" (40%) Limy Upland 8-12" (15%)	<i>Bouteloua curtipendula</i> ; <i>Pleuraphis mutica</i>	R041XB207AZ R041XB208AZ	12S UTM 0655246 3637934
TC-5	Clayey Slopes 12-16" (45%) Volcanic Hills 12-16" (20%)	<i>Pleauraphis mutica</i> ; <i>Muhlenbergia porteri</i>	R041XB303AZ R041XB323AZ	12S UTM 0647549 3639751
TC-7	Limy Slopes 8-12" (40%) Limy Upland 8-12" (15%)	<i>Panicum obtusum</i> ; <i>Erogrostis intermedia</i>	R041XB207AZ R041XB208AZ	12S UTM 0645333 3642263

¹ UA Monitoring Data 2008 and 2012 (Appendices B and C) and USFS TEAMS Enterprise Unit Monitoring Data 2014 (Appendix D).

5 Plant List

The following is 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 7. Key Plant Species

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

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:

- One ground cover hit is recorded per quadrat placement. The total number of ground cover hits equals the total number of quadrat placements.
- 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.
- Bare ground is soil with particles up to 1/4"; gravel are particles 1/4"-3" in size; rocks are ≥ 3 ".
- Annual grasses and annual forbs are considered litter cover when in contact with the ground and large enough to intercept raindrop impact.

6.1.1 Pace Frequency

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

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

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

- 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).
- A canopy hit is any part of the tree or shrub that overhangs the quadrat (enters an imaginary vertical projection of the plot frame).
- 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).

6.1.2 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.

6.1.3 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.

6.2 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 Soil/Site Stability (S), Hydrologic (H) and Biotic Integrity (B). The following are the 17 indicators that are evaluated during an assessment and the attribute(s) they measure:

- Rills: S, H
- Water Flow Patterns: S, H
- Pedestals and/or Terracettes: S, H
- Bare Ground: S,H

Twin C Allotment Land Health Evaluation

- Gullies: S, H
- Wind-Scoured, Blowout, and/or Depositional Areas: S
- Litter Movement: S
- Soil Surface Resistance to Erosion: S, H, B
- Soil Surface Loss or Degradation: S, H, B
- Plant Community Composition and Distribution Relative to Infiltration and Runoff: H
- Compaction Layer: S, H, B
- Functional/Structural Groups: B
- Plant Mortality/Decadence: B
- Litter Amount: H, B
- Annual Production: B
- Invasive Plants: B
- Reproductive Capability of Perennial Plants: B

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 the Table 9. As indicated, full preference AUMs have been implemented on the allotment in recent years.

Table 8. 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%

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

7.2 Key Area Analysis

The five steps for determining rangeland health as outlined in the manual are:

- Step 1. Identify the Evaluation Area; Determine the Soil and Ecological Site
- Step 2. Obtain or Develop the Reference Sheet and the Corresponding Evaluation Matrix
- Step 3. Collect Supplementary Information
- Step 4. Rate the 17 Indicators on the Evaluation Sheet
- Step 5. Determine the Functional Status of the Three Rangeland Health Attributes:
 1. Soil and site stability (S)
 2. Hydrologic function (H)
 3. Biotic integrity (B)

7.3 Land Health Evaluation

A discussion of the rangeland health attributes – soil and site stability, hydrologic function, and biotic integrity – evaluated at the Twin C Allotment evaluation areas follows.

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

The reference condition indicates:

- There should be no presence of rills;
- Less than 10% cover of water flow patterns; pedestals are uncommon;
- The soil material is generally not conducive to forming continuous stands of plants that promote terracettes;
- Bare ground 0-5%;
- No gullies or erosion should be present;
- No wind scoured blowouts should be present;
- All litter should be staying in place;
- Soil surface resistance to erosion 1-3 canopy interspaces, 4-6 under plant canopies;
- Canopy 20-40%, basal 5%, litter 45-55%, gravel 30%.
- 45-55% of canopy cover is perennial grasses, 5% perennial forbs, 30% shrubs, 10% subshrubs, cover is well dispersed;
- Perennial grass > annual grasses and forbs > subshrubs = shrubs > succulents = perennial forbs; and
- Species not expected include: turpentine bush, jojoba, whitethorn, mesquite, prickly pear, cane cholla, and ocotillo. These species 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 6) 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 6 & 7). 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 measured at TC-1 at 11.5% and rated none to slight. All litter size classes remained in place and measured at 14.5%. 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, has 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 (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. Invasive plants was rated slight to moderate due to reduced perennial grasses and abundance of prickly pear.

7.3.2 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 slight to non-existent. 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 litter 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 Ecological Site Description. 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 (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) > perennial grass > misc. shrubs > succulents > misc. perennial grasses = annuals = 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.

7.4 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. Native perennial grass species frequency, 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).

Table 10. Plant Type Presence at Key Areas TC-1 and TC-5

TC-1 and TC-5 (Clayey Slopes 12-16" p.z. R041XB303AZ)		
Plant Type	Expected	Actual (Average of 2008 and 2012 Data at each Key Area)
COMPOSITION		
Forbs	5 – 15 %	15%
Grass/Grasslike	9 – 22%	34%
Shrub/Vine	10-13%	15%
CANOPY COVER		
Forbs	1 – 5%	40%
Grass/Grasslike	1 – 10%	43%
Shrub/Vine	1-5%	27%

Table 11. Plant Type Presence at Key Areas TC-4B and TC-7

TC-4B and TC-7 (Limy Slopes 8-12" p.z., R041XB207AZ)		
Plant Type	Expected	Actual (Average of 2008 and 2012 Data at each Key Area)
COMPOSITION		
Forbs	1 - 16%	28%
Grass/Grasslike	1-31 %	36%
Shrub/Vine	10 - 13%	35%
CANOPY COVER		
Forbs	1 - 5%	36%
Grass/Grasslike	1 - 10%	41%
Shrub/Vine	1 - 35%	36%

7.5 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 below. (Utilization forms and blank form in Appendix E)

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.

8 Conclusions

Standard 1: Upland Sites

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

Conclusion: Standard 1 is being achieved at all Key Areas.

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

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

Conclusion: Standard 2 is not applicable.

Standard 3: Desired Resource Conditions

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

- Maintain vegetative canopy cover at 20 to 30%
- Maintain vegetative ground cover at 7 to 10%
- Maintain composition of palatable shrubs at 12 to 14%
- Maintain perennial grass composition at 15 to 20%

Conclusion: Standard 3 is being achieved at all Key Areas.

Rationale:

Data from the key areas indicate that these sites are achieving the objectives for canopy cover, palatable shrubs, perennial grasses and ground cover. Utilization data at key area indicates light to moderate use on perennial grasses and light use on key palatable shrub species. 75% the allotment appeared to have slight to light use.

Precipitation data during evaluation period indicate that dry or drought conditions covered 7 out of 10 years.

9 Recommended Management Actions

Based on the conclusions of above, the following management actions are recommended:

- Continue with the current Mandatory Terms and Conditions to authorize 1,920 AUMs for livestock (cattle and horses).
- Continue with the current Other Terms and Conditions.
 - In order to improve livestock distribution on the public lands, all salt blocks and/or mineral supplements will not be placed within a ¼ 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 NAGPRA (PL 101-601; 104 STAT. 3048; USC 3001) are discovered, the permittee/lessee shall stop operations in the immediately area of the discovery, protect the remains and objects, and immediately notify the authorized officer of the discovery until notified by the authorized officer that operations may resume.
 - The Permittee shall submit a report of the actual grazing use made on this allotment 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.
 - 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.
- The following Other Terms and Conditions should be included as a stipulation to the grazing permit:
 - In accordance to the Gila Box 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.

10 List of Preparers

BLM Staff

Jason S. Martin, Rangeland Management Specialist
Todd Murdock, Recreation/Wilderness Specialist
Vanessa Stepanek, GIS Specialist
Sharisse Fisher, GIS Specialist
Dan McGrew, Archaeologist
Jeff Conn, Natural Resource Specialist
Amelia Underwood, Assistant Field Office Manager
Amy Corathers, Planning & Environmental Specialist

2014 BLM LHE Interdisciplinary Team

Jason Martin, Rangeland Management Specialist
Tim Goodman, Wildlife Biologist/T&E
Dave Arthun, Rangeland Management Specialist

2013 USFS TEAMS Enterprise Unit

Rick Baxter, Wildlife Biologist/T&E
Troy Grooms, Rangeland Management Specialist

Other Field Participants

Scott Stratton, USDA-NRCS, Rangeland Management Specialist
Andrew Brischke, UA, Research Specialist

11 Draft Determination

Implement the grazing and other management actions identified in **Section 9.0 Recommended Management Actions**.

Authorized Officer Concurrence:

- I concur with the conclusions 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

Date

References

- Arizona Department of Environmental Quality. Available online at <https://www.azdeq.gov/environ/water/assessment/download/ugw.pdf>
- Arizona Game and Fish Department. HabiMap™. Available online at <http://www.habimap.org/habimap>. Accessed 07/30/2015.
- Evans, R. A., and R.M. Love. 1957. The step-point method of sampling. A practical tool in range research. *J. Range Manage.* 10:208-212.
- Galt, L., F. Molinar, J. Navarro, J. Joseph, and J. Holechek. 2000. Grazing capacity and stocking rate. *Rangelands* 22: 7-11.
- Herrick, J.E., J. Van Zee, K.M. Havstad, L.M. Burkett, and W.G. Whitford. 2005. Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems. Vol II: *Design, supplementary methods and interpretation*.
- Holechek, J.L. 1988. An approach for setting the stocking rate. *Rangelands* 10:10-14.
- Holechek, J.L., R.D. Pieper and C. H. Herbal. 2001. *Range Management Principles and Practices*. Prentice Hall, New Jersey. 587p.
- McReynolds, K., A. Phipps, and W. Renken. 2006. *Southeastern Arizona Monitoring and Inventory Program: Methods and Ground Rules*. UA.
- Milchunas, D.G., W.K. Lauenroth, P.L. Chapman, and M.K. Kazempour. 1989. Effects of grazing, topography, and precipitation on the structure of semiarid grassland. *Vegetation* 80:11-23,
- Pellant. M., P. Shaver, D.A. Pyke, and J.E. Herrick. 2005. Interpreting indicators of rangeland health, version 4. Technical Reference 1734-6. Denver, CO, USA: U.S. Department of the Interior, BLM, National Science and Technology Center. 122p.
- Society for Range Management. 1989. *A glossary of terms used in range management*. 3rd ed. Society for Range Management, Denver, CO.
- Sprinkle, J.E., Rob Grumbles, and Art Meen. 2002. *Nutritional characteristics of Arizona browse*. UA Cooperative Extension Publication No. AZ127315pp.
- U.S. Department of Agriculture, Natural Resources Conservation Service. 2006. Available online at <http://esis.sc.egov.usda.gov/ESDReport/fsReport.aspx?id=R041XB210AZ&rptLevel>.
- _____. 1997. *National range and pasture handbook*. Washington, D.C.

U.S. Department of Interior, BLM. 1996. *Sampling Vegetation Attributes*.

_____. 1991. *Safford District RMP. Environmental Impact Statement (Final)*.

_____. 2005. *Interpreting indicators of rangeland health. Technical Reference 1734-6, Version 4*. Service Center, Denver, Colorado.

U.S. Fish and Wildlife Service. Information for Planning and Conservation (IPaC). Available online at <http://ecos.fws.gov/ipac>. Accessed 07/30/2015.

Appendix A: Threatened, Endangered, and Sensitive Species

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Federally-listed Species					
* Desert pupfish, <i>Cyprinodon macularius</i>	Endangered				Desert pupfish 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. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
Gila chub, <i>Gila intermedia</i>	Endangered	Identified			Gila chub occur in close proximity to the allotment 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, <i>Poeciliopsis occidentalis</i>	Endangered				Gila topminnow 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. No grazing actions associated with the Twin C allotment will impact the species. No effect.
Headwater chub, <i>Gila nigra</i>	Candidate				Considered a BLM sensitive species, but does not currently occur in the upper Gila River watershed.
* Lesser long-nosed bat, <i>Leptonycteris curasoae yerbabuena</i>	Endangered	Identified			There are no known lesser long-nosed bat roosts on the Twin C Allotment; it is also outside of the foraging range of the bat. No effect.
* Loach minnow, <i>Tiaroga cobitis</i>	Endangered	Identified			Desert pupfish 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. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
* Loach minnow critical habitat	Designated	Identified			Loach minnow critical habitat is designated along Bonita Creek on the opposite side of the Gila River from the allotment. There will be no impacts to critical habitat.
* Mexican gray wolf, <i>Canis lupus baileyi</i>	Experimental population, non-essential	Identified			Currently the experimental population of Mexican gray wolf is limited to USFS lands over ten miles away. No effect.
Narrow-headed garter snake, <i>Thamnophis rufipunctatus</i>	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.

Twin C Allotment Land Health Evaluation

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Northern Mexican garter snake, <i>Thamnophis eques megalops</i>	Threatened	Identified			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	Identified			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, <i>Gila robusta</i>	Candidate				Roundtail chub is considered a BLM sensitive species. It is not currently known to occur in the Gila River adjacent to the Twin C allotment but does occur in Eagle Creek within 5 miles of the allotment.
* Razorback sucker, <i>Xyrauchen texanus</i>	Endangered	Identified			Razorback suckers are considered to occupy the Gila river at population levels so low as to not be detectable. Livestock on the Twin C Allotment are excluded from the River. There is no effect on Razorback suckers from livestock grazing on the Twin C Allotment.
* Razorback sucker critical habitat	Designated	Identified			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 use on the Twin C Allotment has no effect on critical habitat.
* Southwestern willow flycatcher, <i>Empidonax traillii extimus</i>	Endangered	Identified			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 limiting 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.
* Spikedace <i>Meda fulgida</i>	Endangered	Identified			Spikedace 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. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
* Spikedace critical habitat	Designated	Identified			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.

Twin C Allotment Land Health Evaluation

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Woundfin, <i>Plagopterus argentissimus</i>	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.
Yellow-billed Cuckoo, western population <i>Coccyzus americanus</i>	Proposed Endangered	Identified	Confirmed	Known to occur	Yellow-billed cuckoo are known to occur along the Gila River - livestock are excluded from the river therefore will have no effect on the species. River Well is located out of the riparian habitat, operation and maintenance of the well will not affect yellow billed cuckoo.
Yellow-billed Cuckoo critical Habitat	Proposed	Identified			Critical habitat is proposed along the Gila River for yellow-billed cuckoo. Livestock are excluded from the river therefore livestock will have no effect on the proposed critical habitat. River Well is located out of the riparian habitat.
* Species analyzed in the Gila District Livestock Grazing Program BO #22410-2006-F-0414					
BLM Sensitive Species					
Amphibians					
Lowland Leopard Frog, <i>Lithobates yavapaiensis</i>				Known to occur	Lowland leopard frogs occur along the Gila River. Livestock are excluded from the river, there will be no impacts from livestock on lowland leopard frogs from livestock use of the Twin C Allotment.
Birds					
American Peregrine Falcon, <i>Falco peregrinus anatum</i>					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), <i>Haliaeetus leucocephalus</i>			Possible	Known to occur	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 therefore do not impact the species or the habitat.
Golden Eagle, <i>Aquila chrysaetos</i>			Possible	Known to occur	Golden eagle nests occur in close proximity to the allotment along the Black Hills on rock outcrops and cliff faces. Weather 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.

Twin C Allotment Land Health Evaluation

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Western Burrowing Owl, <i>Athene cunicularia</i>		Identified			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, <i>Pantosteus clarkii</i>				Known to occur	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, <i>Agosia chrysogaster</i>				Known to occur	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, <i>Catostomus insignis</i>				Known to occur	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, <i>Rhinichthys osculus</i>					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.

Twin C Allotment Land Health Evaluation

Species	Federal Status	IPaC	ABBA	HDMS	Comments
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, <i>Aspidoscelis arizonae</i>				Known to occur	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, <i>Kinosternon sonoriense</i>					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. Livestock on the Twin C Allotment will not impact Sonoran mud turtles.
Plants					
Clifton Rock Daisy, <i>Perityle ambrosiifolia</i>					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		Identified	Possible	Known to occur	See discussion under BLM Sensitive Species.
Common Black-Hawk			Confirmed	Known to occur	Common black hawk are known to occur and nest along the Gila River. Livestock are excluded from the river. Livestock on the Twin C Allotment will not impact this species.
Peregrine Falcon					See discussion under BLM Sensitive Species.
Yellow-billed Cuckoo			Confirmed	Known to occur	See discussion under federally listed species.
Elf Owl			Probable		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		Identified			Elegant trogons are only known to occur in Arizona next to the border with Mexico. The IPaC search miss identified this species as occurring in or near the Twin C Allotment.

Twin C Allotment Land Health Evaluation

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Northern Beardless-Tyrannulet		Identified			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. 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		Identified	Confirmed		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. 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		Identified			Gray vireos are typically found in open pinyon/juniper and chaparral habitats. The Twin C Allotment does not contain suitable habitat for the species.
Phainopepla			Confirmed		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 impacts to the species.
Lucy's Warbler		Identified	Confirmed		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 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 (<i>sonorana</i> ssp.)		Identified			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 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		Identified			Black-throated gray warblers inhabit open woodland areas. The Twin C Allotment does not provide habitat for this species.

Twin C Allotment Land Health Evaluation

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Grace's Warbler		Identified			Grace's warbler Black-throated gray warblers inhabit open woodland areas. The Twin C allotment does not provide habitat for this species. Inhabit open pine forests. The Twin C allotment does not contain habitat for this species.
Red-faced Warbler		Identified			Red-faces warblers inhabit high elevation forest. The Twin C Allotment does not contain habitat for this species.
Canyon Towhee		Identified	Probable		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		Identified			Black-chinned sparrow occurs in dense shrub areas above 4000 feet in elevation. The Twin C Allotment does not provide habitat for this species.
Chestnut-collared Longspur		Identified			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 provide good browse, escape cover and well distributed water to a 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.
Javalina					The Twin C Allotment provide a large amount of well distributed succulent forage that javalina prefer as well as escape cover and well distributed water to a support a good javalina population. Livestock waters are well distributed water and are utilized by javalina. 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 javalina. Livestock on the Twin C Allotment do not negatively impact javalina.

Twin C Allotment Land Health Evaluation

Species	Federal Status	IPaC	ABBA	HDMS	Comments
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	3.0
	Canopy 13.5
Turpentine bush	0.5
	Canopy 1.5
Snakeweed	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	-
	Canopy 7.5
Prickly pear	-
	Canopy 1.0
Snakeweed	1.5
	Canopy 2.5
Wolfberry	-
	Canopy 1.5
Palo Verde	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		

Twin C Allotment Land Health Evaluation

% 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		

Twin C Allotment Land Health Evaluation

% 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	
Dasyliion wheeleri	DAWH2				3	3	1.50	1	1		9	0.9	
Dasyliion 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	LYP A	3	3	1		7	3.50	5	6	6	53	5.3	
Lycium pallidum-canopy	LYP A	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	DIC A8			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		

Twin C Allotment Land Health Evaluation

% 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						
Dasyliion wheeleri-canopy	DAWH2		1			1	0.50						
Dasyliion 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	LYP A		1		1	2	1.00	3	3	5	32	3.2	
Lycium pallidum-canopy	LYP A	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	

Twin C Allotment Land Health Evaluation

% 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	LYP A				1	1	0.50	1			7	0.69	
Lycium pallidum-canopy	LYP A	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	BORC2		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	CRTO0	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

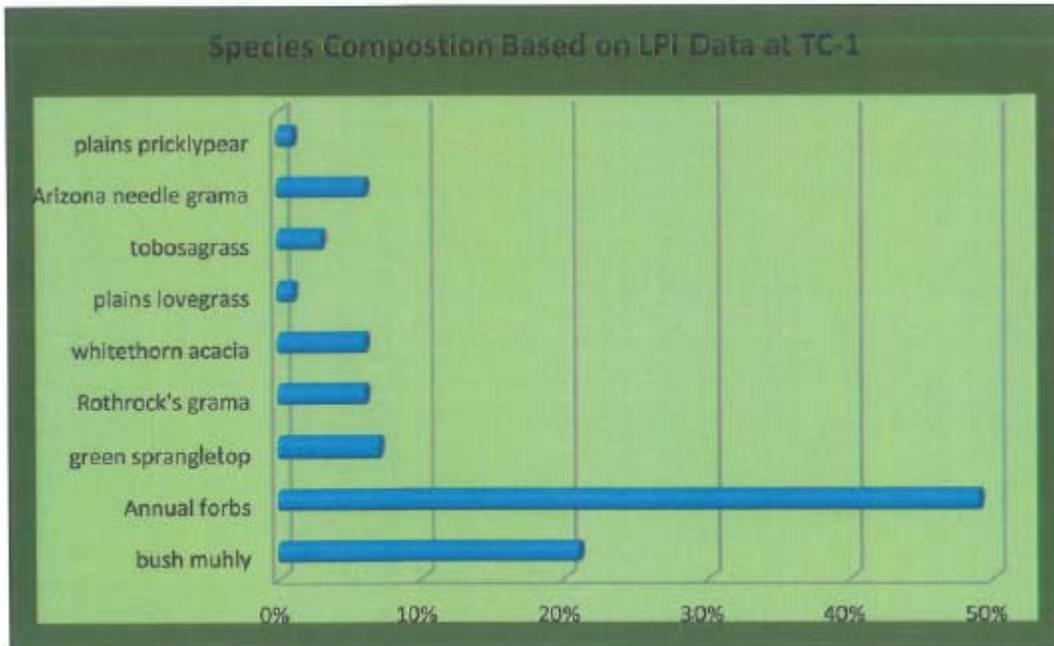
TC-1

	Basal Cover				Non-Vascular Plants	Biological Crust	Litter	Surface Fragments > 1/4" & <= 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	<i>Bouteloua aristidoides</i>	6%
	<i>Bouteloua rothrockii</i>	6%
	<i>Eragrostis intermedia</i>	1%
	<i>Leptochloa dubia</i>	7%
	<i>Muhlenbergia porter</i>	21%
	<i>Opuntia</i>	1%
	<i>Pleuraphis mutica</i>	3%
	<i>Acacia constricta</i>	6%
Cover/Litter/Bare Ground		
Basal Cover		5%
Foliar Cover		73.3%
Bare Ground		0%

Twin C Allotment Land Health Evaluation

<i>State in Transition of Mesquite Native Site as described by the ESD</i>	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



Twin C Allotment Land Health Evaluation

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

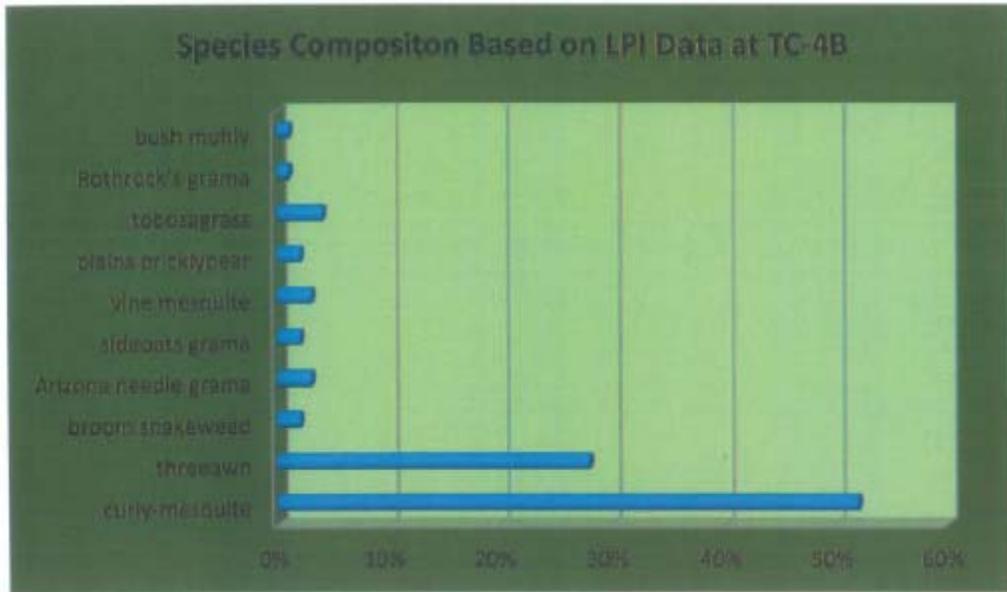
Dominant (D) roughly 40-100% composition, **Sub-dominant (S)** roughly 10-40% composition, **Minor Composition (M)** roughly 2-5% composition, or **Trace (T)** roughly <2% composition.

TC-4B and 5

	Basal Cover				Non-Vascular Plants	Biological Crust	Litter	Surface Fragments	Surface Fragments	Bedrock	Water	Bare Ground
	Grass/	Forb	Shrub/	Tree				> ¼" & <= 3"	> 3"			
	Grasslike		Vine					3"	> 3"			
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	<i>Aristida</i>	25%
Range site: R041XC323AZ	<i>Bouteloua arisidoides</i>	3%
	<i>Bouteloua curtipendula</i>	2%
	<i>Bouteloua rothrockii</i>	1%
	<i>Gutierrezia sarothrae</i>	2%
	<i>Hilaria belangeri</i>	46%
	<i>Muhlenbergia porteri</i>	1%
	<i>Opuntia polyacantha</i>	2%
	<i>Panicum obtusum</i>	3%
	<i>Pleuraphis mutica</i>	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

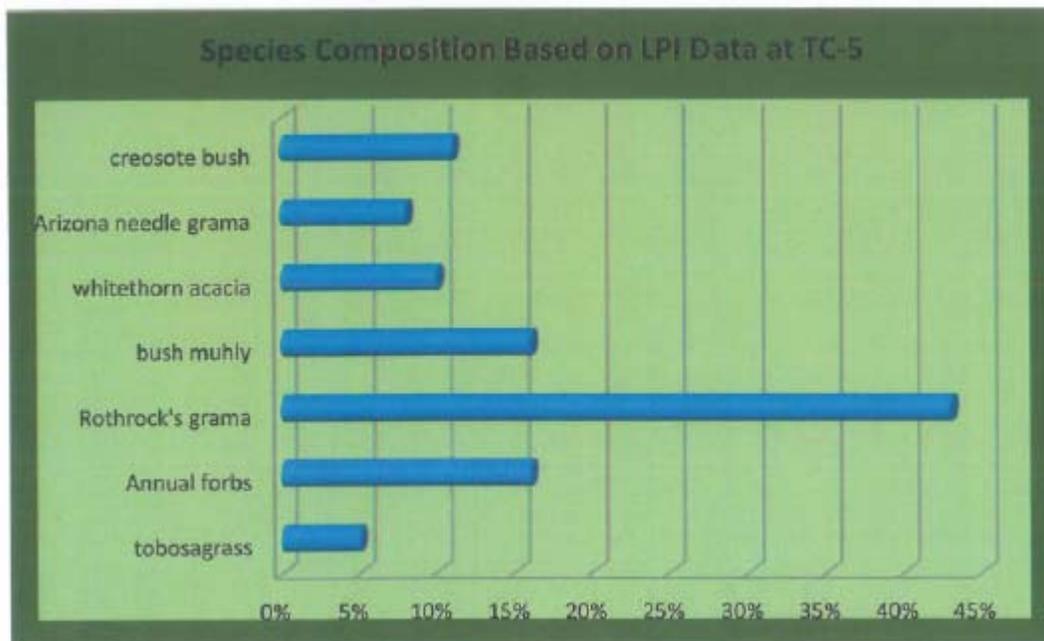
Dominant (D) roughly 40-100% composition, Sub-dominant (S) roughly 10-40% composition, Minor Composition (M) roughly 2-5% composition, or Trace (T) roughly <2% composition.

Twin C Allotment Land Health Evaluation

Key area information		Species	Line point intercept canopy cover at TC-5
Trend Plot 5 Twin C Ranch Community Allotment		<i>Annual forbs</i>	12%
Range site: R041XC323AZ		<i>Acacia constricta</i>	6%
		<i>Larrea tridentata</i>	7%
Percent litter cover measured 2013: 47%		<i>Atriplex sp.</i>	3%
tolerable bare ground: 5-35%		<i>Bouteloua aristidoides</i>	5%
Percent bare ground measured 2013: 3%		<i>Bouteloua rothrocki</i>	27%
		<i>Muhlenbergia porteri</i>	12%
		<i>Pleuraphis nutica</i>	4%
Cover/Litter/Bare Ground			
Foliar Cover	59.4%		
Basal Cover	4%		
Bare Ground	3%		

<i>State in Transition of Native grass, forb, half shrub Site as described by the ESD</i>	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%



Twin C Allotment Land Health Evaluation

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

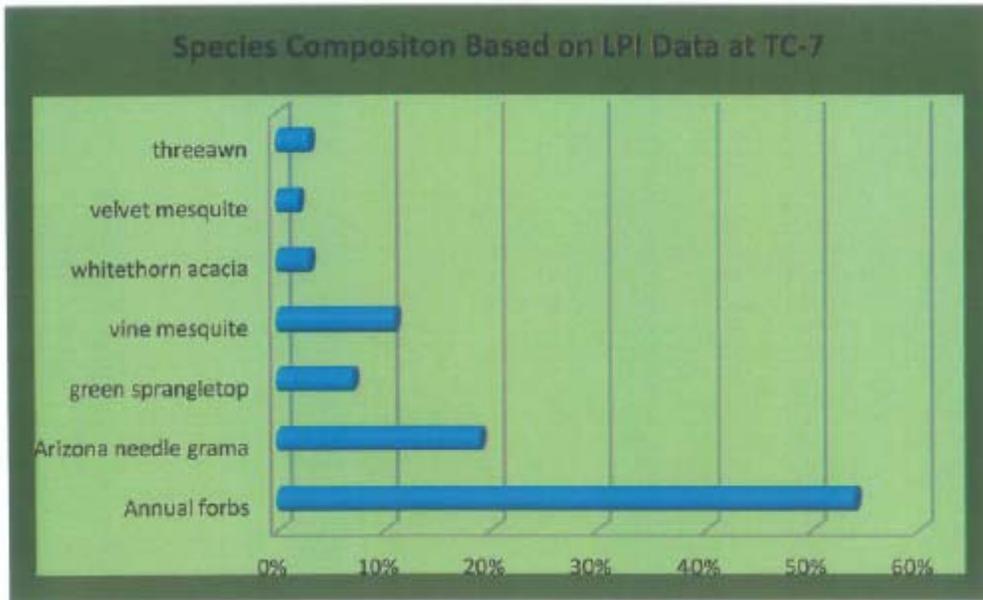
Dominant (D) roughly 40-100% composition, **Sub-dominant (S)** roughly 10-40% composition, **Minor Composition (M)** roughly 2-5% composition, or **Trace (T)** roughly <2% composition.

TC-7

	<u>Grass/</u> <u>Grasslike</u>	<u>Forb</u>	<u>Shrub/</u> <u>Vine</u>	<u>Tree</u>	<u>Vascular</u> <u>Plants</u>	<u>Crust</u>		<u>Fragments</u> <u>> ¼" & <=</u> <u>3"</u>	<u>Fragments</u> <u>> 3"</u>			<u>Ground</u>
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		<i>Acacia constricta</i>	3%
Range site: R041XB207AZ		<i>Aristida</i>	3%
		<i>Bouteloua arisidoides</i>	19%
		<i>Leptochloa dubia</i>	7%
		<i>Panicum obtusum</i>	11%
		<i>Prosopis velutina</i>	2%
		<i>Annual forbs</i>	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	ANNUAL FORBS
M	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.

Appendix E: Twin C Allotment Utilization Information 2013

Twin C Allotment Land Health Evaluation

		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 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 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 terminal 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.									

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Range Utilization
Key Forage Plant Method

1. District Safford	2. Date 11/16/83	3. Observer Grooms		
4. Allotment TUNA-C	5. Pasture	6. Operator		
7. Key Vegetation		8. Range Type		
9. Period of Use		10. Typical Uses		
11. Grazing Management System				
12. Transcor Livestock Keyframe No.				
14. Use Key Forage Plant Characteristics	15. Key Species BOCW	16. Key Species PLMU3	17. Key Species	18. Key Species
	Frequency (I)	III * (I)	Frequency (II)	III * (II)
19. Use of Key Forage Plant Characteristics	0	0	0	
20. Use of Key Forage Plant Characteristics	10	40	50	
21. Use of Key Forage Plant Characteristics	30	90	60	
22. Use of Key Forage Plant Characteristics	50	50		
23. Use of Key Forage Plant Characteristics	70			
24. Use of Key Forage Plant Characteristics	90			
Total		180	110	
Average Utilization = 20%	18%	11%		

REMARKS (Use back sheet)
* Made for the frequency of use of the plant in the field (I = 100% of the plant in the field, II = 25% of the plant in the field, III = 50% of the plant in the field, IV = 75% of the plant in the field, V = 100% of the plant in the field)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Range Utilization
Key Forage Plant Method

1. District TWINS C	2. Date 11/14/13	3. Observer Grooms / Boster																																																																																
4. Allotment TWINS C	5. District	6. Elevation																																																																																
7. Key Vegetation		8. Location KMA Twin C #5																																																																																
9. Range Type		10. Type(s) Class																																																																																
11. Period of Use		12. Grazing Management System																																																																																
13. Previous Recorded Reference No.																																																																																		
14. The Range Condition Form Grade	14.1. Total	14.2. Key Species																																																																																
		<table border="1"> <thead> <tr> <th colspan="2">Key Species Tobosa</th> <th colspan="2">Key Species Mix Po 2</th> <th colspan="2">Key Species</th> <th colspan="2">Key Species</th> </tr> <tr> <th>I (grows)</th> <th>II (0, 1)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td><input checked="" type="checkbox"/></td> <td>0</td> <td><input checked="" type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td></td> <td>60</td> <td></td> <td>30</td> <td></td> <td></td> <td></td> </tr> <tr> <td>50</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>70</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>90</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>THIN</td> <td></td> <td>60</td> <td></td> <td>30</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Percent Total = 20%</td> <td></td> <td>6%</td> <td></td> <td>3%</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Key Species Tobosa		Key Species Mix Po 2		Key Species		Key Species		I (grows)	II (0, 1)	0	<input checked="" type="checkbox"/>	0	<input checked="" type="checkbox"/>					10								30		60		30				50								70								90								THIN		60		30				Percent Total = 20%		6%		3%									
Key Species Tobosa		Key Species Mix Po 2		Key Species		Key Species																																																																												
I (grows)	II (0, 1)	I (grows)	II (0, 1)	I (grows)	II (0, 1)	I (grows)	II (0, 1)																																																																											
0	<input checked="" type="checkbox"/>	0	<input checked="" type="checkbox"/>																																																																															
10																																																																																		
30		60		30																																																																														
50																																																																																		
70																																																																																		
90																																																																																		
THIN		60		30																																																																														
Percent Total = 20%		6%		3%																																																																														

* Grade I = the top 10% of plants of above grade or a more suitable soil or better soil area.
* Grade II = the next lowest 10% of plants of a more suitable soil or a less suitable soil area.

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 TWINC		5. Pasture		6. Operator		7. Location TC-1 KMA			
8. Key Vegetation			9. Range Type		10. Type(s) User				
11. Period of Use			12. Grazing Management System						
13. Traversed Location/ Key area No.									
14. The bearing of 1 versus 2 years growth									
	Mid Point (%)	Key Species ERIN		Key Species BOED		Key Species		Key Species	
		Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)
<i>Mid 11/15-16%:</i> The respondent shows no evidence of use by grazing animals.	0	☒ ::	∅	☒ ☒	∅				
<i>Mid 16-20%:</i> The respondent has the appearance of very light grazing. The key herbaceous forage plants may be grazed or slightly used. Current seedheads and young plants of key herbaceous species are little damaged. The available leaders of key browse plants are little damaged.	10	☒ ::	14∅	☒	1∅∅				
<i>Mid 21-25%:</i> The respondent may be grazed, utilized, or grazed to pasture. The low value herbaceous plants are grazed and 60 to 80% of the number of current seedheads of key herbaceous plants remains intact. Some young plants of key species are undamaged. Little or no use of low value plants. There is obvious evidence of leader use. The available leaders appear grazed or browsed in patches and 25 to 40% of the available leader growth of the key browse plants has been removed.	30	..	6∅						
<i>Mid 26-30%:</i> The respondent appears severely overgrazed to vulnerability to natural fire and conditions will allow 15 to 25% of the number of current seedheads of key herbaceous species remain intact. The more than 10% of the number of low value herbaceous forage plants are utilized. Current plants appear rather uniformly utilized and 40 to 60% of the available leader growth of key browse plants has been removed.	50								
<i>Mid 31-35%:</i> The respondent has the appearance of complete overgraze. Key herbaceous species are almost completely utilized with more than 10% of the number of low value herbaceous forage plants have been utilized. The produced browse plants are lodged and some plants change may be slightly to stem. Nearly all available leaders are used and low horizontal leader exists on key browse plants. Approximately 60 to 80% of the available leader growth of the key browse plants has been removed.	70								
<i>Mid 36-40%:</i> The respondent has a severe appearance and there are indications of severe overgraze. There is no evidence of reproduction of current seedheads of key herbaceous species. Key herbaceous forage species are completely utilized. The remaining stubble of produced grasses are grazed to the soil surface. There is no evidence of current leader and 50 to 100% of available leader growth on the key browse plants has been removed. Some, and often in oak, of the 1 st and 2 nd year's growth of the browse plants have been utilized. Indicators in readily apparent, and the browse plants are more frequently broken.	90								
Total		3∅	2∅∅	3∅	1∅∅				
Average Utilization = $\Sigma f/D$			60%		3.3%				
REMARKS (the back of sheet)									

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

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) Used			
11. Period of Use		12. Grazing Management System					
13. Traversed Location/ Key area No.							
14. Use Rating or (Leave) Year (check)							
	Use Date (Y-M-D)	Key Species PAOG	Key Species FRIN	Key Species		Key Species	
		Frequency (f)	IS * (s)	Frequency (f)	IS * (s)	Frequency (f)	IS * (s)
	<i>Use Date (Y-M-D): The respondent shows no evidence of use by grazing animals.</i>	0	☒ · φ	☒ · φ	φ		
	<i>Use Date (Y-M-D): The respondent has the appearance of very light grazing. The key herbaceous forage plants may be sparse or slightly used. Certain seedlings and young plants of key herbaceous species are being observed. The available number of key browse plants are still observed.</i>	10	□ 8φ	☒ · φ	12φ		
	<i>Use Date (Y-M-D): The respondent may be sprayed, mowed, or grazed lightly. The key herbaceous plants are in good and 80 to 90% of the number of current seedlings of key herbaceous species remain intact. More 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 number of key browse plants are observed and 11 to 40% of the available leader growth of the key browse plants has been removed.</i>	30	☒ 30φ	· φ	15φ		
	<i>Use Date (Y-M-D): The respondent appears uniformly covered in uniform or normal biomass and seedlings will show. 11 to 25% of the number of current seedlings of key herbaceous species remain intact. More than 20% of the number of low value herbaceous forage plants are utilized. Browse plants appear either uniformly utilized and 41 to 60% of the available leader growth of key browse plants has been removed.</i>	50	· 5φ				
	<i>Use Date (Y-M-D): The respondent has the appearance of complete sward. Key herbaceous species are almost completely utilized with more than 50% of the number of low value herbaceous forage plants have been utilized. The residual browse plants are lodged and some plants display may be slightly to show. Nearly all available leaders are used and low residual biomass on key browse plants. Approximately 61 to 80% of the available leader growth of the key browse plants has been removed.</i>	70					
	<i>Use Date (Y-M-D): The respondent has a sparse appearance and there are indications of repeated grazing. 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 remaining stubble and 81 to 100% of available leader growth on the key browse plants has been removed. Some, and often most, of the 1st and 2nd year's growth of the browse plants have been utilized. Grazing is readily apparent, and the browse plants are more frequently broken.</i>	90					
Total			3φ 43φ	3φ 27φ			
Average Utilization = Σ(f)/Σ			14%	9%			
REMARKS (the back of sheet)							

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

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. Purpose		6. Operator		7. Location TC-4B				
8. Key Vegetation		9. Range Type		10. Type(s) Used						
11. Period of Use		12. Grazing Management System								
13. Tract(s) Location/ Key area No.										
14. The Rating of Current Year Growth										
	Plot Point (ft)	Key Species BOCU		Key Species FLMU		Key Species		Key Species		
		Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)	Frequency (f)	(f) * (a)	
<i>No Use (0-5%):</i> The rangeland shows no evidence of use by grazing animals.		0	□	∅	∵	∅				
<i>Slight Use (5-25%):</i> The rangeland has the appearance of very light grazing. The key forage plants appear to be topped or slightly used. Current condition and young plants of key forage species are little disturbed. The available leaders of key forage plants are little disturbed.		10	□	7∅	□	7∅				
<i>Moderate Use (25-50%):</i> The rangeland may be topped, trampled, or grazed. The key forage plants are on ground and 60 to 80% of the number of current condition of key forage plants remains intact. Many young plants of the key species are undisturbed. Little or no use of low value plants. There is obvious evidence of leader use. The available leaders appear reduced or trampled on pasture and 50 to 60% of the available leader growth of the key forage plants has been removed.		30	□	24∅	□	18∅				
<i>Moderate Use (50-75%):</i> The rangeland appears heavily covered in trampled or grazed areas and trampling will allow 50 to 75% of the number of current condition of key forage species remains intact. No more than 10% of the number of low value forage plants are undisturbed. However plants appear rather sparsely and 40 to 60% of the available leader growth of key forage plants has been removed.		50	□	25∅	□	54∅				
<i>Heavy Use (75-90%):</i> The rangeland has the appearance of complete wear. Key forage species are almost completely trampled and more than 50% of the number of low value forage plants have been trampled. The preferred forage plants are trampled and some plants of value may be slightly trampled. Many available leaders are used and few available leaders on key forage plants. Approximately 60 to 80% of the available leader growth of the key forage plants has been removed.		70	□	14∅	□	21∅				
<i>Very Heavy Use (90-100%):</i> The rangeland has a severe appearance and no evidence of rangeland recovery. There is no evidence of reproduction of current condition of key forage species. Key forage plants appear to be completely trampled. The remaining number of available plants are grazed to the soil surface. The available leader growth of the key forage plants has been removed. There is no evidence of the 1 st and 2 nd year's growth of the forage plants have been trampled. Trampling is readily apparent, and the forage plants are more frequently trampled.		90	□		□					
Total			3∅	70∅	3∅	96∅				
Average Utilization = D/D			23.3 %		32 %					
REMARKS (the back of sheet)										

f = the frequency or number of observations within each class interval of estimate.
a = the class interval midpoint (in inches), and Σ = the summation symbol.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Range Utilization
Key Forage Plant Method

1. Observer JACSON		2. Date 3/11/15		3. Observer MARTIN, J					
4. Allotment TWIN C		5. Parcel		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. Treatment Location/ Key area No.									
14. Use Rating of Current Year's Growth									
	Use Point (%)	Key Species PLMU		Key Species MUPO		Key Species		Key Species	
		Frequency (#)	(# * (%))	Frequency (#)	(# * (%))	Frequency (#)	(# * (%))	Frequency (#)	(# * (%))
Use 10-20%: The rangeland shows no evidence of use by grazing animals.	0	☒	∅	☒	∅				
Use 20-30%: The rangeland has the appearance of very light grazing. The key forage plants appear to be slightly used. Current seedlings and young plants of key forage species are little damaged. The available leaders of key forage plants are little damaged.	10	1	5∅	☒	11∅				
Use 30-40%: The rangeland may be topped, grazed, or grazed in places. The low value forage plants are grazed and 60 to 80% of the number of current seedlings of key forage species 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 grazed or browsed in places and 25 to 40% of the available leader growth of the key forage plants has been removed.	30	☒	33∅	∟	18∅				
Use 40-50%: The rangeland appears heavily grazed or severely grazed and forage will show 15 to 25% of the number of current seedlings of key forage species remains intact. The more than 25% of the number of low value forage plants are grazed. However plants appear rather uniformly grazed and 40 to 60% of the available leader growth of key forage plants has been removed.	50	.	5∅	∴	2∅∅				
Use 60-70%: The rangeland has the appearance of complete use. Key forage species are almost completely grazed with more than 10% of the number of low value forage plants have been grazed. The produced forage plants are lodged and other plant stems may be slightly in place. Many all available leaders are used and few terminal buds remain on key forage plants. Approximately 60 to 80% of the available leader growth of the key forage plants has been removed.	70								
Use 80-90%: The rangeland has a more appearance and there are indications of repeated grazing. There is no evidence of reproduction of current seedlings of key forage species. Key forage species are completely grazed. The remaining stubble of produced grasses are grazed to the soil surface. There is no evidence of terminal buds and 80 to 100% of available leader growth on the key forage plants has been removed. Some, and often in 2 nd and 3 rd year's growth of the forage plants have been grazed. Hedging is readily apparent, and the forage plants are very frequently broken.	90								
Total		30	430	30	490				
Average Utilization = ΣU/D			14.3		16.3				
REMARKS (the back of sheet)									

*have 1 = the frequency or number of observations within each class interval of estimate.
Σ = the summation symbol.

Appendix B: ADWR Well Registries

River Well

← → ↻ 🏠 <https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=631497>



Director
Michael J. Lacey

ADWR
Arizona Department of Water Resources

eGovernment
AZ.GOV
Arizona's Official Web Site

Home | [FAQ](#) | [Links](#) | [Contact Us](#) | [Water Resource Data](#) | [Imaged Records](#)

🔍 Search 🗺 Map 📄 Data Export 📞 Well Registry Help ✉ Email

Well Registry Information

Registration Number 55- 631497

General Construction Status Owner Driller Pump Data

Well Information

Site Type W - WELL Well Type E - EXEMPT Replaces Well 55-

Location Information

Cadastral D06028022ACC Book Map Parcel Latitude Longitude

Basin and County Information

Basin	SAFFORD	Sub Basin	60 - GILA VALLEY	Watershed	15 - LOWER GILA RIVER
AMAINA	0 - NOT WITHIN ANY AMA OR INA	County	5 - GRAHAM		

Site Uses

Site Use 1	WATER PRODUCTION	Water Use 1	STOCK
Site Use 2		Water Use 2	
Site Use 3		Water Use 3	

GWSI Well Information [What is this?](#)

GWSI Site ID	No corresponding GWSI well	GWSI Local ID	No corresponding GWSI well
--------------	----------------------------	---------------	----------------------------

Well Registry is ADWR's well database containing reported information on well status, location and construction.

← → ↻ 🏠 <https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=631497>



Director
Michael J. Lacey

ADWR
Arizona Department of Water Resources

eGovernment
AZ.GOV
Arizona's Official Web Site

Home | [FAQ](#) | [Links](#) | [Contact Us](#) | [Water Resource Data](#) | [Imaged Records](#)

🔍 Search 🗺 Map 📄 Data Export 📞 Well Registry Help ✉ Email

Well Registry Information

Registration Number 55- 631497

General Construction Status Owner Driller Pump Data

Well Construction Information

Well Depth (ft)	40	Water Level (ft bbs)	12
Casing Depth (ft)	40	Casing Diameter (in)	10
		Casing Type	P - STEEL - PERFORATED OR SLOTTED CASING

Well Data

No. of Holes		Irrigated Acres	0	Acre Ft Annum		Intended Capacity (GPM)	0
--------------	--	-----------------	---	---------------	--	-------------------------	---

Pump Completion Report

Tested Capacity(GPM)	15	Pump Capacity(GPM)	15	Draw Down (ft)	0
Pump Type	0 - NO PUMP CODE LISTED	Power Type	0 - NO POWER CODE LISTED	Method of Discharge	X - NONE

Place of Use

Township	N/S	1/2 T	Range	E/W	1/2 R	Section	160 Acre	40 Acre	10 Acre	Cadastral
6	S	0	28	E	0	24	C	B	D	D06028024CBD
99	S	0	99	E	0	99	B	D	C	D06028024CBD
6	S	0	28	E	0	24	C	B	D	D99099099BDC
99	S	0	99	E	0	99	B	D	C	D99099099BDC

Well Registry is ADWR's well database containing reported information on well status, location and construction.

River Well - continued

← → ↻ 🏠 <https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=631497>



Director
Michael J. Lacey

ADWR
Arizona Department of Water Resources

Arizona Department of Water Resources

eGovernment



Home | **FAQ** | Links | Contact Us | Water Resource Data | Imaged Records

🔍 Search 🗺 Map 📄 Data Export 🛠 Well Registry Help 📧 Email

Well Registry Information

Registration Number 55- 631497

General
Construction
Status
Owner
Driller
Pump Data

Well Status					
Application Date	02/25/1982	Well Accepted	Y - Yes	Log Received	Log Canceled

Well Action			
Action Date	Action Code	Action Description	Action Comments
7/29/2011	882	GRIC CADASTRAL BOUNDARY CHANGE	Old GRIC Code = NULL
7/1/1953	755	WELL CONSTRUCTION COMPLETED	

Well Registry Comments

Well Comments

& CAROLYN

Well Registry is ADWR's well database containing reported information on well status, location and construction.

← → ↻ 🏠 <https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=631497>



Director
Thomas Buschatzke

ADWR
Arizona Department of Water Resources

Arizona Department of Water Resources

eGovernment



Home | **FAQ** | Links | Contact Us | Water Resource Data | Imaged Records

🔍 Search 🗺 Map 📄 Data Export 🛠 Well Registry Help 📧 Email

Well Registry Information

Registration Number 55- 631497

General
Construction
Status
Owner
Driller
Pump Data

Owner Information						
Begin Date	End Date	Owner Type	Name Type	First Name	Last Name	Company
		PRIVATE OR COMPANY	OWNER	MANUZ,	MANUEL,R	

Select above owner to view details below

Street Address						
Address 1	PO BOX 1682			Address 2		
City	CLIFTON	State	AZ	Zip	85533	-

Phone Numbers					
Country Code	Phone	Ext.	Cell	Home	

Owner Details					
Email	Title	Primary Mailing	Y - Yes	Registered Name	Y - Yes

Comments

Well Registry is ADWR's well database containing reported information on well status, location and construction.

River Well - continued

The screenshot shows the ADWR Well Registry Detail page for registration number 55-631497. The page header includes the ADWR logo, the Arizona Department of Water Resources name, and the Arizona Department of Water Resources logo. The page title is "Well Registry Information". The registration number is 55-631497. The page has tabs for General, Construction, Status, Owner, Driller, and Pump Data. The Driller tab is selected, showing a table of driller information with columns for Lic No, Company, Address 1, Address 2, City, State, Zip, and Phone. The table contains one row with values 0, , , , , AZ, and . Below the table is a section for Driller License Information with a table containing columns for Active License, Issue Date, and Expiration Date. The Active License is I - Inactive, Issue Date is 01/01/1801, and Expiration Date is . Below this is a section for Driller License Comments with a table containing columns for License Comments and Driller Comments. The Driller Comments are Legacy Dataload Record - 10/28/1997. At the bottom of the page, there is a small text block: "Well Registry is ADWR's well database containing reported information on well status, location and construction."

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

Headquarters Well

Arizona Department of Water Resources | Director Thomas Buschatzke | eGovernment | AZ.GOV

Home | **FAQ** | Links | Contact Us | Water Resource Data | Imaged Records

Search | Map | Data Export | Well Registry Help | Email

Well Registry Information

Registration Number: 55-631495

General | Construction | Status | Owner | Driller | Pump Data

Well Information			
Site Type	W - WELL	Well Type	E - EXEMPT
Replaces Well		55-	
Location Information			
Cadastral	D06029033BDC	Book	Map
Parcel	Latitude	Longitude	
Basin and County Information			
Basin	SAFFORD	Sub Basin	60 - GILA VALLEY
Watershed	15 - LOWER GILA RIVER		
AMA/INA	0 - NOT WITHIN ANY AMA OR INA		County
5 - GRAHAM			
Site Uses		Water Uses	
Site Use 1	WATER PRODUCTION	Water Use 1	DOMESTIC
Site Use 2		Water Use 2	STOCK
Site Use 3		Water Use 3	
GWSI Well Information What is this?			
GWSI Site ID	325208109230501	GWSI Local ID	D-06-29 33BDC

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Arizona Department of Water Resources | Director Thomas Buschatzke | eGovernment | AZ.GOV

Home | **FAQ** | Links | Contact Us | Water Resource Data | Imaged Records

Search | Map | Data Export | Well Registry Help | Email

Well Registry Information

Registration Number: 55-631495

General | Construction | Status | Owner | Driller | Pump Data

Well Construction Information			
Well Depth (ft)	220	Water Level (ft bls)	142
Casing Depth (ft)	20	Casing Diameter (in)	10
Casing Type	P - STEEL - PERFORATED OR SLOTTED CASING		
Well Data			
No. of Holes	Irrigated Acres	0	Acre Ft Annum
Intended Capacity (GPM)		0	
Pump Completion Report			
Tested Capacity(GPM)	4	Pump Capacity(GPM)	4
Draw Down (ft)	0		
Pump Type	0 - NO PUMP CODE LISTED	Power Type	0 - NO POWER CODE LISTED
Method of Discharge		X - NONE	
Place of Use			
Township	N/S	1/2 T	Range
E/W	1/2 R	Section	160 Acre
40 Acre	10 Acre	Cadastral	

No records to display.

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Headquarters Well - continued

Director Thomas Buschatzke
ADWR Arizona Department of Water Resources
 eGovernment
 AZ.GOV Arizona's Official Web Site

Home | FAQ | Links | Contact Us | Water Resource Data | Imaged Records

Search | Map | Data Export | Well Registry Help | Email

Well Registry Information

Registration Number 55-631495

General | Construction | **Status** | Owner | Driller | Pump Data

Well Status

Application Date	02/25/1982	Well Accepted	Y - Yes	Log Received	Log Canceled
------------------	------------	---------------	---------	--------------	--------------

Well Action

Action Date	Action Code	Action Description	Action Comments
7/29/2011	882	GRIC CADASTRAL BOUNDARY	Old GRIC Code = NULL
8/1/1945	755	WELL CONSTRUCTION COMPLETED	

Well Registry Comments

Well Comments

& CAROLYN

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Director Thomas Buschatzke
ADWR Arizona Department of Water Resources
 eGovernment
 AZ.GOV Arizona's Official Web Site

Home | FAQ | Links | Contact Us | Water Resource Data | Imaged Records

Search | Map | Data Export | Well Registry Help | Email

Well Registry Information

Registration Number 55-631495

General | Construction | Status | **Owner** | Driller | Pump Data

Owner Information

Begin Date	End Date	Owner Type	Name Type	First Name	Last Name	Company
		PRIVATE OR COMPANY	OWNER	MANUZ	MANUEL,R	

Select above owner to view details below

Street Address

Address 1	PO BOX 1692	Address 2	
City	CLIFTON	State	AZ
Zip	85533		-

Phone Numbers

Country Code	Phone	Ext.	Cell	Home
--------------	-------	------	------	------

Owner Details

Email	Title	Primary Mailing	Y - Yes	Registered Name	Y - Yes
-------	-------	-----------------	---------	-----------------	---------

Comments

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Headquarters Well - continued

The screenshot displays the ADWR Well Registry Information page. At the top, there is a navigation bar with the ADWR logo, Director Thomas Buschatzke's name, and the Arizona Department of Water Resources logo. Below the navigation bar are search and utility icons. The main content area shows the registration number 55-631495 and a set of tabs for different data views: General, Construction, Status, Owner, Driller, and Pump Data. The 'Driller' tab is selected, showing a table of driller information with one entry. Below this is a section for Driller License Information with a table showing license details. At the bottom, there is a section for Driller License Comments with a table containing one comment.

Registration Number: 55-631495

Well Registry Information

General Construction Status Owner **Driller** Pump Data

Driller Information							
Lic No	Company	Address 1	Address 2	City	State	Zip	Phone
0					AZ		

Select above driller to view details below

Driller License Information			
Active License	A - Active	Issue Date	01/01/1801
Qualifying Party		ROC License	N/A
Expiration Date			

Driller License Comments	
License Comments	
Driller Comments	Legacy Dataload Record - 10/28/1997

Well Registry is ADWR's well database containing reported information on well status, location and construction.

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

Lower Berregero Well

Well Registry Detail

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

Director Thomas Buschatzke

ADWR Arizona Department of Water Resources

Well Registry Information

Registration Number 55-631496

General Construction Status Owner Driller Pump Data

Well Information

Site Type: W - WELL Well Type: E - EXEMPT Replaces Well: 65-

Location Information

Cadastral: D0002034CAC Book: Map: Parcel: Latitude: Longitude:

Basin and County Information

Basin: SAFFORD Sub Basin: 00 - GILA VALLEY Watershed: 15 - LOWER GILA RIVER

AMAINA: 0 - NOT WITHIN ANY AMA OR INA Country: 5 - GRAHAM

Site Uses

Site Use 1: WATER PRODUCTION Water Use 1: STOCK

Site Use 2: Water Use 2

Site Use 3: Water Use 3

GWSI Well Information

GWSI Site ID: No corresponding GWSI well GWSI Local ID: No corresponding GWSI well

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Well Registry Detail

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

Director Thomas Buschatzke

ADWR Arizona Department of Water Resources

Well Registry Information

Registration Number 55-631496

General Construction Status Owner Driller Pump Data

Well Construction Information

Well Depth (ft): 70 Water Level (ft b/s): 40

Casing Depth (ft): 10 Casing Diameter (in): 10 Casing Type: P - STEEL - PERFORATED OR SLOTTED CASING

Well Data

No. of Holes: Irrigated Acres: 0 Acre Ft Annuum: Intended Capacity (GPM): 0

Pump Completion Report

Tested Capacity (GPM): 4 Pump Capacity (GPM): 4 Draw Down (ft): 0

Pump Type: 0 - NO PUMP CODE LISTED Power Type: 0 - NO POWER CODE LISTED Method of Discharge: X - NONE

Place of Use

Township: N/S 1/2 T Range: E/W 1/2 R Section: 160 Acre 40 Acre 10 Acre Cadastral

No records to display.

Well Registry is ADWR's well database containing reported information on well status, location and construction.

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

Lower Berregero Well - continued

Well Registry Detail

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

Director Thomas Buschatzke

ADWR Arizona Department of Water Resources

Well Registry Information

Registration Number 55-631496

Well Status
Application Date: 02/25/1982
Well Accepted: Y - Yes
Log Received: []
Log Canceled: []

Action Date	Action Code	Action Description	Action Comments
7/29/2011	882	GRIC CADASTRAL BOUNDARY	Old GRIC Code = NULL
3/1/1981	755	WELL CONSTRUCTION COMPLETED	

Well Registry Comments

& CAROLYN

Well Registry is ADWR's well database containing reported information on well status, location and construction.

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

Well Registry Detail

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

Director Thomas Buschatzke

ADWR Arizona Department of Water Resources

Well Registry Information

Registration Number 55-631496

Owner Information						
Begin Date	End Date	Owner Type	Name Type	First Name	Last Name	Company
		PRIVATE OR COMPANY	OWNER	MANUZ	MANUEL R	

Select above owner to view details below

Street Address

Address 1: PO BOX 1902

Address 2:

City: CLIFTON

State: AZ

Zip: 85533

Phone Numbers

Country Code: []

Phone: []

Ext.: []

Cell: []

Home: []

Owner Details

Email: []

Title: []

Primary Mailing: Y - Yes

Registered Name: Y - Yes

Comments

Well Registry is ADWR's well database containing reported information on well status, location and construction.

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

Lower Berregero Well - continued

The screenshot displays the 'Well Registry Detail' page for registration number 55-631496. The page header includes the ADWR logo and the name of the Director, Thomas Buschatzke. Navigation links include Home, FAQ, Links, Contact Us, Water Resource Data, and Imaged Records. A search bar and utility icons (Map, Data Export, Well Registry Help, Email) are present. The main content area features a tabbed interface with 'Driller' selected. Below the tabs is a table for Driller Information with columns for Lic No, Company, Address 1, Address 2, City, State, Zip, and Phone. A single entry is shown with '0' in the Lic No column and 'AZ' in the State column. Below this table is a section for Driller License Information with a table containing Active License (A - Active), Issue Date (01/01/1901), and Expiration Date. A Driller License Comments section contains the text 'Driller Comments Legacy Dataload Record - 10/28/1997'. A footer note states: 'Well Registry is ADWR's well database containing reported information on well status, location and construction.'

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

Proposed Goat Camp Well

Well Registry Detail x
 https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=220387

Arizona Department of Water Resources
 Director Michael J. Lacey
 eGovernment
 ADWR Arizona Department of Water Resources
 AZ.GOV Arizona's Official Web Site

Home | FAQ | Links | Contact Us | Water Resource Data | Imaged Records

Search | Map | Data Export | Well Registry Help | Email

Well Registry Information

Registration Number 55-220387

General | Construction | Status | Owner | Driller | Pump Data

Well Information

Site Type	W - WELL	Well Type	E - EXEMPT	Replaces Well 55-
-----------	----------	-----------	------------	-------------------

Location Information

Cadastral	D06029030AAC	Book	Map	Parcel	Latitude	Longitude
-----------	--------------	------	-----	--------	----------	-----------

Basin and County Information

Basin	SAFFORD	Sub Basin	60 - GILA VALLEY	Watershed	08 - UPPER GILA RIVER
AMA/INA	0 - NOT WITHIN ANY AMA OR INA	County	5 - GRAHAM		

Site Uses

Site Use 1	WATER PRODUCTION	Water Use 1	STOCK
Site Use 2		Water Use 2	
Site Use 3		Water Use 3	

GWSI Well Information [What is this?](#)

GWSI Site ID	No corresponding GWSI well	GWSI Local ID	No corresponding GWSI well
--------------	----------------------------	---------------	----------------------------

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Well Registry Detail x
 https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=220387

Arizona Department of Water Resources
 Director Michael J. Lacey
 eGovernment
 ADWR Arizona Department of Water Resources
 AZ.GOV Arizona's Official Web Site

Home | FAQ | Links | Contact Us | Water Resource Data | Imaged Records

Search | Map | Data Export | Well Registry Help | Email

Well Registry Information

Registration Number 55-220387

General | Construction | Status | Owner | Driller | Pump Data

Well Construction Information

Well Depth (ft)		Water Level (ft bls)	
Casing Depth (ft)		Casing Diameter (in)	
		Casing Type	

Well Data

No. of Holes	1	Irrigated Acres		Acre Ft Annum		Intended Capacity (GPM)	
--------------	---	-----------------	--	---------------	--	-------------------------	--

Pump Completion Report

Tested Capacity (GPM)		Pump Capacity (GPM)		Draw Down (ft)	
Pump Type		Power Type		Method of Discharge	

Place of Use

Township	N/S	1/2 T	Range	E/W	1/2 R	Section	160 Acre	40 Acre	10 Acre	Cadastral
6	S		29	E		30	A	A	C	D06029030AAC

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Proposed Goat Camp Well - continued

Well Registry Detail

https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=220387

Arizona Department of Water Resources
 Director Michael J. Lacey
 eGovernment
 ADWR Arizona Department of Water Resources
 AZ.GOV Arizona's Official Web Site

Home | FAQ | Links | Contact Us | Water Resource Data | Imaged Records

Search | Map | Data Export | Well Registry Help | Email

Well Registry Information

Registration Number 55-220387

General | Construction | **Status** | Owner | Driller | Pump Data

Well Status

Application Date	02/10/2011	Well Accepted	Y - Yes	Log Received		Log Canceled	
------------------	------------	---------------	---------	--------------	--	--------------	--

Well Action

Action Date	Action Code	Action Description	Action Comments
7/29/2011	882	GRIC CADASTRAL BOUNDARY CHANGE	Old GRIC Code = B - Maintenance
2/10/2011	150	NOI RECEIVED FOR A NEW PRODUCTION WELL	bew
2/10/2011	550	DRILLING AUTHORITY ISSUED	bew
2/10/2011	555	DRILLER & OWNER PACKETS MAILED	bew

Well Registry Comments

Well Comments

Twin C. Ranch is leasee
 Per BLM rules, BLM is registered well owner

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Well Registry Detail

https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=220387

Arizona Department of Water Resources
 Director Michael J. Lacey
 eGovernment
 ADWR Arizona Department of Water Resources
 AZ.GOV Arizona's Official Web Site

Home | FAQ | Links | Contact Us | Water Resource Data | Imaged Records

Search | Map | Data Export | Well Registry Help | Email

Well Registry Information

Registration Number 55-220387

General | Construction | Status | **Owner** | Driller | Pump Data

Owner Information

Begin Date	End Date	Owner Type	Name Type	First Name	Last Name	Company
2/10/2011		PRIVATE OR COMPANY	OWNER			BLM-SAFFORD FIELD OFFICE

Select above owner to view details below

Street Address

Address 1	711 14TH. AVENUE	Address 2	
City	SAFFORD	State	AZ
Zip	85546		

Phone Numbers

Country Code	Phone	(928)348-4400	Ext.	Cell	Home
--------------	-------	---------------	------	------	------

Owner Details

Email	Title	Primary Mailing	Y - Yes	Registered Name	Y - Yes
-------	-------	-----------------	---------	-----------------	---------

Comments

Well Registry is ADWR's well database containing reported information on well status, location and construction.

Proposed Goat Camp Well - continued

Well Registry Detail x
<https://gisweb.azwater.gov/WellRegistry/Detail.aspx?RegID=220387>

Arizona Department of Water Resources
 Director Michael J. Lacey
 ADWR Arizona Department of Water Resources
 eGovernment
 AZ.GOV Arizona's Official Web Site

Home | FAQ | Links | Contact Us | Water Resource Data | Imaged Records

Search Map Data Export Well Registry Help Email

Well Registry Information

Registration Number 55-220387

General Construction Status Owner Driller Pump Data

Driller Information

Lic No	Company	Address 1	Address 2	City	State	Zip	Phone
45	CUETO DRILLING COMPANY	425 HACKBERRY DRIVE		CLIFTON	AZ	85533-8016	928-687-1647

Select above driller to view details below

Driller License Information

Active License	A - Active	Issue Date	02/10/2011	Expiration Date	02/10/2012
Qualifying Party	RAYMOND G. CUETO	ROC License	R-53 & A-4		

Driller License Comments

License Comments	RAYMOND GABINO CUETO 1982-2016 ACTIVE JOSE CUETO 1980-1982 INACTIVE
Driller Comments	

Well Registry is ADWR's well database containing reported information on well status, location and construction.

<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: Threatened, Endangered, and Special Status Species

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Federally-listed Species					
* Desert pupfish, <i>Cyprinodon macularius</i>	Endangered				Desert pupfish 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. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
Gila chub, <i>Gila intermedia</i>	Endangered	Identified			Gila chub occur in close proximity to the allotment 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, <i>Poeciliopsis occidentalis</i>	Endangered				Gila topminnow 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. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
Headwater chub, <i>Gila nigra</i>	Candidate				Considered a BLM sensitive species, but does not currently occur in the upper Gila River watershed.
* Lesser long-nosed bat, <i>Leptonycteris curasoae yerbabuenae</i>	Endangered	Identified			There are no known lesser long-nosed bat roosts on the Twin C Allotment; it is also outside of the foraging range of the bat. No effect.
* Loach minnow, <i>Tiaroga cobitis</i>	Endangered	Identified			Desert pupfish 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. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
* Loach minnow critical habitat	Designated	Identified			Loach minnow critical habitat is designated along Bonita Creek on the opposite side of the Gila River from the allotment. There will be no impacts to critical habitat.
* Mexican gray wolf, <i>Canis lupus baileyi</i>	Experimental population, non-essential	Identified			Currently the experimental population of Mexican gray wolf is limited to USFS lands over ten miles away. No effect.
Narrow-headed garter snake, <i>Thamnophis rufipunctatus</i>	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.

Species	Federal Status	IPaC	ABBA	HDMS	Comments
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 Twin C 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, <i>Thamnophis eques megalops</i>	Threatened	Identified			The northern Mexican garter snake is considered extirpated from the upper Gila River watershed. There will be no effect to the species.
Northern Mexican gartersnake, critical habitat	Proposed	Identified			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, <i>Gila robusta</i>	Candidate				Roundtail chub is considered a BLM sensitive species. It is not currently known to occur in the Gila River adjacent to the Twin C Allotment but does occur in Eagle Creek within 5 miles of the allotment.
* Razorback sucker, <i>Xyrauchen texanus</i>	Endangered	Identified			Razorback suckers are considered to occupy the Gila river at population levels so low as to not be detectable. Livestock on the Twin C Allotment are excluded from the River. There is no effect on Razorback suckers from livestock grazing on the Twin C Allotment.
* Razorback sucker critical habitat	Designated	Identified			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 use on the Twin C Allotment has no effect on critical habitat.
* Southwestern willow flycatcher, <i>Empidonax traillii extimus</i>	Endangered	Identified			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 limiting 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.
* Spikedace <i>Meda fulgida</i>	Endangered	Identified			Spikedace 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. No grazing actions associated with the Twin C Allotment will impact the species. No effect.
* Spikedace critical habitat	Designated	Identified			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

Species	Federal Status	IPaC	ABBA	HDMS	Comments
					not impact spikedace critical habitat.
Woundfin, <i>Plagopterus argentissimus</i>	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.
Yellow-billed Cuckoo, western population <i>Coccyzus americanus</i>	Proposed Endangered	Identified	Confirmed	Known to occur	Yellow-billed cuckoo are known to occur along the Gila River. Livestock are excluded from the river; therefore, will have no effect on the species. River Well is located out of the riparian habitat, operation and maintenance of the well will not affect yellow billed cuckoo.
Yellow-billed Cuckoo critical habitat	Proposed	Identified			Critical habitat is proposed along the Gila River for yellow-billed cuckoo. Livestock are excluded from the river therefore livestock will have no effect on the proposed critical habitat. River Well is located out of the riparian habitat.
* Species analyzed in the Gila District Livestock Grazing Program BO #22410-2006-F-0414					
BLM Sensitive Species					
Amphibians					
Lowland Leopard Frog, <i>Lithobates yavapaiensis</i>				Known to occur	Lowland leopard frogs occur along the Gila River. Livestock are excluded from the river, there will be no impacts from livestock on lowland leopard frogs from livestock use of the Twin C Allotment.
Birds					
American Peregrine Falcon, <i>Falco peregrinus anatum</i>					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), <i>Haliaeetus leucocephalus</i>			Possible	Known to occur	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 therefore do not impact the species or the habitat.

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Golden Eagle, <i>Aquila chrysaetos</i>			Possible	Known to occur	Golden eagle nests occur in close proximity to the 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, <i>Athene cunicularia</i>		Identified			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, <i>Catostomus Pantosteus clarkii</i>				Known to occur	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, <i>Agosia chrysogaster</i>				Known to occur	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, <i>Catostomus insignis</i>				Known to occur	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, <i>Rhinichthys osculus</i>					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.

Species	Federal Status	IPaC	ABBA	HDMS	Comments
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, <i>Aspidoscelis arizonae</i>				Known to occur	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, <i>Kinosternon sonoriense</i>					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. Livestock on the Twin C Allotment will not impact Sonoran mud turtles.
Plants					
Clifton Rock Daisy, <i>Perityle ambrosiifolia</i>					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		Identified	Possible	Known to occur	See discussion under BLM Sensitive Species.
Common Black-Hawk			Confirmed	Known to occur	Common black hawk are known to occur and nest along the Gila River. Livestock are excluded from the river. Livestock on the Twin C Allotment will not impact this species.
Peregrine Falcon					See discussion under BLM Sensitive Species.
Yellow-billed Cuckoo			Confirmed	Known to occur	See discussion under federally listed species.
Elf Owl			Probable		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.

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Elegant Trogon		Identified			Elegant trogons are only known to occur in Arizona next to the border with Mexico. The IPaC search miss identified this species as occurring in or near the Twin C Allotment.
Northern Beardless-Tyrannulet		Identified			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. 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		Identified	Confirmed		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. 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		Identified			Gray vireos are typically found in open pinyon/juniper and chaparral habitats. The Twin C Allotment does not contain suitable habitat for the species.
Phainopepla			Confirmed		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 impacts to the species.
Lucy's Warbler		Identified	Confirmed		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 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 (<i>sonorana</i> ssp.)		Identified			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 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		Identified			Black-throated gray warblers inhabit open woodland areas. The Twin C Allotment does not provide habitat for this species.

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Grace's Warbler		Identified			Grace's warbler Black-throated gray warblers inhabit open woodland areas. The Twin C Allotment does not provide habitat for this species. Inhabit open pine forests. The Twin C Allotment does not contain habitat for this species.
Red-faced Warbler		Identified			Red-faces warblers inhabit high elevation forest. The Twin C Allotment does not contain habitat for this species.
Canyon Towhee		Identified	Probable		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		Identified			Black-chinned sparrow occurs in dense shrub areas above 4000 feet in elevation. The Twin C Allotment does not provide habitat for this species.
Chestnut-collared Longspur		Identified			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 provide 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 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.

Species	Federal Status	IPaC	ABBA	HDMS	Comments
Rocky Mountain 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 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 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:

$$[10 \text{ gal./day} * 6 \text{ mos. (November-April)}] \times [30 \text{ gal./day} * 6 \text{ mos. (May-October)}] / 12 \text{ mos.} \\ = \underline{20 \text{ gal./day}} \text{ water per cow}$$

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 Gila River)	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

¹Total 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: 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.

RECEIVED
BUREAU OF LAND MANAGEMENT

NOV 01 2011

SAFFORD FIELD OFFICE
SAFFORD, AZ 85546

1

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