BARRY M. GOLDWATER RANGE

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

2018 INRMP PUBLIC REPORT

Prepared by:
Colorado State University
Center for Environmental Management of Military Lands

Prepared for:
U.S. Department of the Air Force, Luke Air Force Base
U.S. Department of the Navy, U.S. Marine Corps, Marine Corps Air Station Yuma

In cooperation with:
U.S. Department of the Interior, Fish and Wildlife Service,
Cabeza Prieta National Wildlife Refuge
and
Arizona Game and Fish Department

February 2018 Draft

BARRY M. GOLDWATER RANGE

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN – *DRAFT* PUBLIC REPORT

ON

Military Use, Environmental Conditions, Resource Management Activity, and Public Access and Involvement 2018 — 2023

Prepared in accordance with the Military Lands Withdrawal Act of 1999 (Public Law 106-65 § 3031(b)(5)(A))

Prepared in support of the:
Revision of the
2018 Barry M. Goldwater Range Integrated Natural Resources Management Plan

Prepared by:
Colorado State University
Center for Environmental Management of Military Lands

Prepared for:
U.S. Department of the Air Force, Luke Air Force Base
U.S. Department of the Navy, Marine Corps Air Station Yuma

In cooperation with:
U.S. Department of the Interior, Fish and Wildlife Service,
Cabeza Prieta National Wildlife Refuge and
Arizona Game and Fish Department

February 2018

Table of Contents

LIST OF TABLES

TABLE OF FIGURES

ACRONYMS

ACTS	Air Combat Training System
ADEQ	Arizona Department of Environmental Quality
AFAF	Air Force Auxiliary Field
AFB	Air Force Base
AFRC	Air Force Reserve Command
AGFD	Arizona Game and Fish Department
AGL	Above Ground Level
ALF	Auxiliary Landing Field
AML	Appropriate Management Level
AMSL	Above Mean Sea Level
ANG	Air National Guard
ARNG	Army National Guard
ARS	Arizona Revised Statutes
ASSP	Arizona Site Stewards Program
ATV	All-Terrain Vehicle
AUX	Auxiliary Airfield
BASH	Bird/Wildlife Aircraft Strike Hazard
BEC	BMGR Executive Council
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMGR	Barry M. Goldwater Range
BP	Border Patrol
BSE	Bering Sea Eccotech
CBP	(U.S.) Customs & Border Protection
CLEO	Conservation Law Enforcement Officer
CSOC	Convoy Security Operations Courses
DGM	Digital Geophysical Mapping
DoD	Department of Defense
DOI	Department of the Interior
DZ	Drop Zone
EA	Environmental Assessment
EIS	Environmental Impact Statement
EM	Electromagnetic Survey
EOD	Explosive Ordinance Disposal
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESM	Environmental Sciences Management
ETAC	East Tactical Range
FARP	Forward Arming and Refueling Point
FASP	Field Ammunition Supply Point
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FTHL	Flat-Tailed Horned Lizard
FW	Fighter Wing
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System

HGL	HydroGeoLogic, Inc.
HMA	Herd Management Area
HQMC	Headquarters Marine Corps
ICRMP	Integrated Cultural Resources Management Plan
IEC	Intergovernmental Executive Committee
INRMP	Integrated Natural Resources Management Plan
IPMP	Integrated Pest Management Plan
LIDAR	Light Detection and Ranging
MAGTF	Marine Air Ground Task Force
MC	Munitions Constituents
MCAS	Marine Corps Air Station
MCO	Marine Corps Order
MEC	Munitions and Explosives of Concern
MLWA	Military Lands Withdrawal Act of 1999
MOU	Memorandum of Understanding
MTR	Munitions Treatment Range
NEP	Nonessential Experimental Population
NEPA	National Environmental Policy Act of 1969
NM	National Monument
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NTAC	North Tactical Range
NWR	National Wildlife Refuge
OB	Open Burn
OD	Open Detonation
OHV	Off-Highway Vehicle
PRIA	Public Rangeland Improvement Act of 1978
RCRA	Resource Conservation and Recovery Act of 1976
RFI	RCRA Facility Investigation
RMD	Range Management Department
RMO	Range Management Office
ROD	Record of Decision
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SOP	Standard Operating Procedure
SR	State Route
STAC	South Tactical Range
SWMU	Solid Waste Management Unit
UA	University of Arizona
UDA	Undocumented Alien
USGS	United States Geologic Survey
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
USMC	United States Marine Corps
USNVC	National Vegetation Classification Standard
UTC	Urban Target Complex
WFMP	Wildland Fire Management Plan
WFRHBA	Wild Free-Roaming Horses and Burros Act of 197

CHAPTER 1 INTRODUCTION

The Barry M. Goldwater Range (BMGR) in southwestern Arizona is a United States (U.S.) military installation. The U.S. Air Force (USAF) and the U.S. Marine Corps (USMC) utilize the range to train military aircrews in the tactical execution of air-to-air and air-to-ground missions. To a lesser extent, the range is also used for other national defense purposes, most of which support or are associated with tactical air training. The USAF is the primary user of and managing agency for the eastern portion of the range, referred to as the BMGR East, and the USMC is the primary user of and managing agency for the western portion of the range, referred to as the BMGR West (Figure 1.2).

The Secretary of the Air Force, who has primary surface management responsibility for BMGR East has delegated command and control authority to the Commander of the 56th Fighter Wing (FW) at Luke Air Force Base (AFB). Similarly, the Secretary of the Navy, who has primary surface management responsibility for BMGR West has delegated local command and control to the Commanding Officer of Marine Corps Air Station (MCAS) Yuma.

The BMGR is an essential national defense training area that produces the combat-ready aircrews needed to defend the nation and its interests for the USAF, USMC, Navy, Air National Guard (ANG), Army National Guard (ARNG), and Air Force Reserve Command (AFRC). As the nation's third largest military installation, the BMGR has the training capabilities, capacities, and military air base support that provide the flexibility needed to sustain a major share of the country's aircrew training requirements now as well as into the foreseeable future.

Figure 1.1: Sonoran Desert Landscape

Parallel to its continuing value as an essential national defense asset, the BMGR is also nationally significant as a critical component in the largest remaining expanse of relatively unfragmented Sonoran Desert in the United States. With the exception of State Route (SR) 85, the land is free of major development and is ecologically linked to the Organ Pipe Cactus National Monument (NM), Cabeza Prieta National Wildlife Refuge (NWR), Sonoran Desert NM, and other lands administered by the Bureau of Land Management (BLM), as shown in Figure 1.2. Within this contiguous complex, the BMGR contributes almost 55 percent of the land area and is more than twice the size of any other component.

1.1 Public Report Purpose and Content

This report is part of an ongoing process to revise the Integrated Natural Resources Management Plan (INRMP) for the BMGR. The USAF and USMC, in partnership with the Department of the Interior (DOI) and the Arizona Game and Fish Department (AGFD), prepared an INRMP, in accordance with

the Military Lands Withdrawal Act (MLWA) of 1999 (Public Law [P.L.] 106-65), the Sikes Act Improvement Amendments (hereafter referred to as "Sikes Act" [16 U.S.C. § 670a et seq.]), the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. §§ 4321-4370h), and other applicable laws. As provided by the Sikes Act, INRMPs must be reviewed as to operation and effect on a regular basis, but no less than every five years. The 2018 INRMP is the second revision for the BMGR and is the product of a thorough review of the 2012 INRMP in accordance with the five-year review cycle.

The MLWA requires that a Public Report be issued concurrent with each review of the BMGR INRMP to facilitate participation by affected parties (P.L. 106-65 § 3031(b)(5)(A)). This report describes the changes in military use, environmental conditions, and public access opportunities that have occurred at the BMGR since implementation of the 2012 INRMP. The purpose of the report is to provide updated information that will help reviewers better understand and comment on the proposed revisions to the INRMP that have the potential to occur over the next five-year planning period 2018-2023.

This draft Public Report has been released for review and comment to the public and state, local and tribal governments. The final Public Report and the 2018 INRMP will provide a summary of the comments received and responses to those comments.

The public comment period for the draft Public Report and revised INRMP began on 20 February, 2018 with the publication of a Notice of Availability in the *Federal Register*, *Yuma Sun, Gila Bend Sun, Arizona Daily Star, Ajo Copper News, West Valley View and a 30 day comment period.* In addition, the public was invited to open-house meetings. The dates and locations are listed below (Table 1-1). To receive full consideration during the preparation of the Final Public Report and INRMP comments had to be received no later than 22 March 2018.

Table 1-1: Public Open-House Meeting Schedule

DATE	TIME	LOCATION
22 June 2017	5:30-7:30 pm	Woods Memorial Library 3455 N. First Avenue Tucson, Arizona, 85719
13 March 2018	5:30-7:30 pm	Sonoran Desert Inn & Conference Center 55 Orilla Avenue Ajo, Arizona 85321
14 March 2018	5:30-7:30 pm	Yuma Main Library 2951 S. 21st Drive Yuma, Arizona 85364

1.2 BMGR Land Withdrawal and Reservation

The BMGR encompasses approximately 1.7 million acres of federal land that is administered through the Secretaries of the Air Force and Navy. All but five percent of BMGR land, is composed of DOI public land that had been administered by the BLM but withdrawn by Congress for military purposes for 25

years through the MLWA of 1999. The remaining 5 percent is permanently administered by the Department of Defense (DoD). The MLWA of 1999 had the effect of:

- Withdrawing [1] the public land within the boundaries of the BMGR from all forms of appropriation under the general land laws, including the mining laws and the mineral leasing and geothermal leasing laws, subject to valid existing rights.
- Transferring jurisdiction over the withdrawn public land to the Secretary of the Air Force and the Secretary of the Navy
- Reserving[2] the withdrawn public land for use by the Secretaries of the Air Force and Navy for use as—

  (A) An armament and high-hazard testing area;

  (B) Training for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support;

  (C) Equipment and tactics development and testing; and

  (D) Other defense-related purposes consistent with the purposes specified in this paragraph (P.L. 106-65 § 3031(a)(2)).

The authorization for the BMGR, as provided by the MLWA of 1999, will terminate on 5 October 2024; however, the Act also authorizes the Secretaries of the Air Force and Navy to file an application to extend the land withdrawal and reservation if they determine that there will be a continuing military need for all or any portion of the range after that date. The revised INRMP and Public Report are vital components to the application to extend the land withdrawal, jurisdiction, and reservation of the BMGR (P.L. 106-65 § 3031(e)(2)(b)).

The land withdrawals and reservations for the BMGR prior to the MLWA of 1999 were provided by a series of executive and legislative instruments dating from 1941. The Act was the first instrument, however, to transfer jurisdiction over the withdrawn public land to the Secretaries of the Air Force and Navy, assign responsibility for managing the lands to the Armed Services Secretaries, and provide that an INRMP be prepared for the range in accordance with the Sikes Act and other applicable guidance. Thus, the 2007 INRMP was the first resource management plan prepared for the range under DoD leadership and the first to incorporate a comprehensive inventory of both the

[1] "Withdrawing" federal lands means to withhold them by executive or legislative action from settlement, sale, location, or entry under some or all of the general land, mining, and mineral laws in order to limit or prohibit activities normally permitted under those laws. The Defense Withdrawal Act of 1958 (P.L. 85-337) provides that an Act of Congress is required for land withdrawals for military purposes that are more than 5,000 acres in aggregate.

[2] "Reserving" federal lands means designating withdrawn areas for specified public (or governmental) purposes or programs. For example, military reservations established in areas formerly a part of the public domain consist of lands that have been withdrawn and then reserved, nearly always in the same executive or legislative action, for the purpose of military use.

requirements and distribution of military surface use as a baseline for developing resource management goals, objectives, and practices at the BMGR.

1.3 INRMP Management Guidance

The 2018 revised INRMP is based on the foundation provided by the Sikes Act which sets forth resource management policies and guidance for the preparation of INRMPs. The Sikes Act states that:

> Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out [a natural resources management program] to provide for—
>
> (A) The conservation and rehabilitation of natural resources on military installations;
>
> (B) The sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping and non-consumptive uses; and
>
> (C) Subject to safety requirements and military security, public access to [the BMGR] to facilitate the use (16 U.S.C. 670a (a)(3)).

Additional direction provided by the MLWA of 1999 that is specific to the BMGR states that the INRMP shall:

> … include provisions for proper management and protection of the natural and cultural resources of [the range], and for sustainable use by the public of such resources to the extent consistent with the military purposes [of the range]… (P.L. 106-65 § 3031(b)(3)(E)(i)).

The MLWA of 1999 also requires that the INRMP provide guidance for the management and protection of cultural resources. Cultural resource management and protection is as an important priority on military installations as is natural resources management; however, management guidance for natural and cultural resources is typically provided through separate INRMPs and Integrated Cultural Resources Management Plans (ICRMPs). Although the MLWA of 1999 provision is a departure from this norm, the 2018 INRMP provides for cultural resources protection by prescribing that natural resource management actions be fully supportive of and compliant with the range ICRMP, and the ICRMP is incorporated by reference in the INRMP. Further stipulations of the MLWA and Sikes Act are outlined in Table 1-2.

DoD Instruction 4715.03, *Natural Resources Conservation Program*, calls for INRMPs to be based, to the maximum extent practicable, on ecosystem management. The goal of ecosystem management, as established by the DoD, is to ensure that military lands support both present and future training requirements while preserving, improving, and enhancing ecosystem integrity. This approach maintains and improves the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies, human use, and the environment required for realistic training operations (DoD 2013). This goal is reflected in the Department-level land management policies of the USAF and USMC. Consequently, ecosystem management and protection of biological diversity are important guiding elements of the 2018 INRMP for the BMGR.

Table 1-2: INRMP Elements Specified in the Sikes Act and MLWA of 1999

Sikes Act
The INRMP shall, to the extent appropriate and applicable, provide for: • Wildlife management, land management, and wildlife-oriented recreation. • Wildlife habitat enhancement or modifications. • Wetland protection, enhancement, and restoration, where necessary for support of wildlife or plants. • Integration of, and consistency among, the various activities conducted under the plan. • Establishment of specific natural resources goals and objectives and time frames for proposed actions. • Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of wildlife resources. • Appropriate public access subject to requirements necessary to ensure safety and military security. • Enforcement of applicable natural resource laws (including regulations). • No net loss in the capability of military installation lands to support the military mission of the BMGR.
MLWA of 1999
The INRMP shall: • Be developed in consultation with affected Native American tribes and include provisions that address: (1) meeting the trust responsibilities of the United States with respect to Native American tribes, lands, and rights reserved by treaty or federal law; (2) allowing access to and ceremonial use of sacred sites to the extent consistent with the military purposes of the BMGR; and (3) providing for timely consultation with affected Native American tribes. • Provide that any hunting on the BMGR be conducted in accordance with the provisions of 10 U.S.C. § 2671 (the general military policy for hunting, fishing, and trapping on military reservations). • Identify current test and target impact areas and related buffer or safety zones. • Provide necessary actions to prevent, suppress, and manage brush and range fires occurring within the BMGR as well as brush and range fires occurring outside of the BMGR resulting from military activities. • Provide that all gates, fences, and barriers constructed on the BMGR are designed and erected to allow wildlife access, to the extent practicable and consistent with military security, safety, and sound wildlife management use. • Incorporate any existing management plans pertaining to the BMGR, to the extent that INRMP preparers mutually determine that incorporation of such plans into the INRMP is appropriate. • Include procedures to ensure that the periodic reviews of the plan under the Sikes Act are conducted jointly by the Secretaries of the Navy, USAF, and Interior, and that affected states, Native American tribes, and the public, are provided a meaningful opportunity to comment upon any substantial revisions to the plan that may be proposed. • Provide procedures to amend the plan as necessary.

1.3.1 INRMP Organization

The revised INRMP was organized according to the USAF standardized template intended to minimize redundant effort and reduce the time needed to update plans across the organization.

The BMGR is unique in that management of the range is shared between the USAF and USMC. While the 2018 INRMP follows the USAF standardized template USMC specific policies have been incorporated and the plan adheres to Marine Corps Order (MCO) 5090.2A with changes 1 through 3 of the *Environmental Compliance and Protection Manual* (Headquarters USMC [HQMC] 2013).

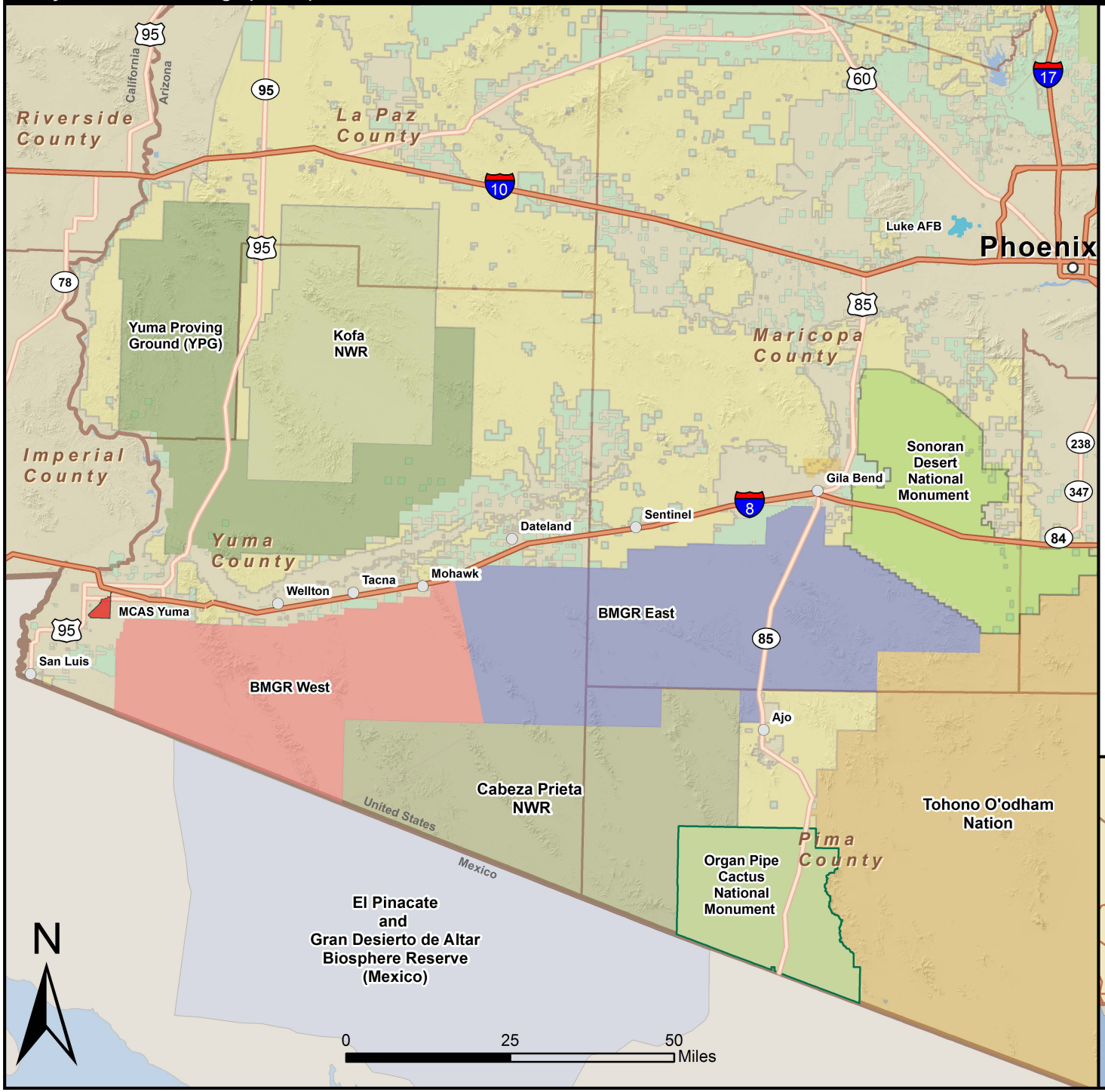
1.3.2 Interagency Participation

Although the USAF and USMC hold the primary surface management responsibility for the BMGR, the Secretary of the Interior, acting through the U.S. Fish and Wildlife Service (USFWS), and AGFD are responsible for its natural resources. The USFWS and AGFD have responsibilities related to the recovery of endangered and threatened species while AGFD has primary jurisdiction over resident wildlife management within the BMGR. The USAF, USMC, USFWS, and AGFD are jointly preparing the INRMP five-year review in accordance with the MLWA of 1999; Sikes Act; and a 2001 Cooperative Agreement for the implementation of an ecosystem-based INRMP for the BMGR.

Figure 1.2: General Location and Surrounding Land Ownership

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstates
- Highways
- BMGR East
- BMGR West
- MCAS Yuma
- Luke AFB
- Organ Pipe Cactus NM
- Yuma Proving Ground
- Cabeza Prieta NWR
- Kofa NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- BLM
- State Trust Land
- El Pinacate Preserve

World Geodetic System 1984 (WGS84) Projection
Zone 12 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

CHAPTER 2 CHANGES IN MILITARY AND NON-MILITARY USE

2.1 Military Use

Figure 2.1: F-35 Aircrew training

The primary mission of the BMGR remains unchanged from the 2012 INRMP and has become more critical with the bed down of the F-35s at both installations. The preeminent activity on the BMGR East is advanced training for student aircrews transitioning to frontline combat aircraft. Readiness training for aircrews in operational combat is predominant at the BMGR West. In addition, the BMGR serves the Navy, AFRC, ANG, and ARNG in these capacities. Other installations that regularly practice on the range include MCAS Miramar, Davis-Monthan AFB, Silverbell Army Heliport, and Arizona ANG Base at Tucson International Airport. In addition to regular users, "casual user" training deployments that originate from active duty, reserve, and ANG flying units from other areas of the U.S. and allied units from overseas, also train at the range.

The range is composed of land and overlying restricted airspace reserved for 26 military purposes (Figures 2.2, 2.3 and 2.5). The restricted airspace dimensions of the BMGR remain unchanged from those that were in effect following implementation of the MLWA of 1999. Overlying the range—R-2301W, R-2301E, R-2304, and R-2305—are designated restricted airspace by the Federal Aviation Administration to support the military training missions.

Tactical surface and aviation training has not triggered substantial or large-scale ecosystem modifications that would inhibit the range to directly support its national defense purposes. The ongoing and foreseeable military use of the BMGR depends in large part on the conservation, protection, and management of natural resources and regulating public use and safety.

Air and land space that directly support regular military training activities provide:

- The surface space needed to adequately disburse activities so that realistic training can regularly occur either as independent but simultaneous events or as large-scale, combined action events.
- The flexibility to host irregularly scheduled training or testing activities, (e.g., air-to-air missile shoots or long-range air-to-ground weapons deliveries) that require restricted air and land space configurations that cannot be accommodated by standard weapons ranges or other activity areas of the BMGR.
- Buffers that permit independent training events to safely occur simultaneously on a non-interference basis.

2.1.1 Changes in Military Use at BMGR East

The BMGR East land area is currently subdivided into eight aviation subranges in order to safely support multiple and simultaneous training or other operations. The BMGR East also includes Gila Bend Air Force Auxiliary Airfield (AFAF), Stoval Auxiliary Airfield (AUX), and Aux-6 to support training in forward area airfield operations, observation points, and other facilities. Training areas, features, and facilities on the BMGR East are shown on Figure 2.2 and summarized in Table 2-1.

In 2010, proposed range enhancements were analyzed in an Environmental Impact Statement (EIS) *Final EIS for Proposed BMGR East Range Enhancements* (56 RMO and Luke AFB 2010) and approved for implementation in a Record of Decision (ROD). Since the 2012 INRMP, the following enhancements have been completed or may occur during the five-year planning period covered by the INRMP (2018-2023):

- Conversion of Range 3 into a helicopter gunnery range to better support the specialized training needs of rotary-wing users. Construction of the range has been completed and use of the area for gunnery training has begun. Improvements to the original design are to be made as part of ongoing maintenance.
- Construction of a new taxiway and a new air traffic control tower at Gila Bend AFAF. These improvements would enhance the safety of operations, eliminate the need for waivers of certain airfield criteria, and enhance the capability of Gila Bend AFAF as a divert airfield for aircraft experiencing in-flight emergencies while operating in the BMGR East. The new control tower would meet the minimally acceptable visual surveillance or depth perception standards specified by the Unified Facilities Criteria for military airfields. This action was selected for implementation in a ROD, but funding for the project is not yet available.
- Paving of approximately 7 miles of an existing graded road between Range 1 main tower and the Range 1 Range Munitions Consolidation Points (also referred to as the Water Well) to eliminate dust generated by the ongoing heavy use of the existing road; to decrease road maintenance requirements by providing a cost-effective, durable, and long-lasting maintenance solution; and to reduce the vehicle maintenance burden resulting from disproportionate wear and tear on USAF vehicles that frequently travel on this road. Paving this road is subject to the availability of funds; expected completion date is 2020 or sooner.
- Developing a moving vehicle target in North Tactical Range (NTAC) to provide aircrews with realistic training in attacking mobile ground targets. A moving target operating on an existing road on the East Tactical Range (ETAC) has been in use (for strafing only) since 2010; however, a more robust moving target complex to support bomb and rocket employment is needed. A location on NTAC was selected in a ROD. This action has not been implemented.

The remaining "enhancements" described in the EIS do not involve construction on range, but are designed to improve operations.

- Lowering the operational floor of R-2301E restricted airspace over the Cabeza Prieta NWR to enable fixed-wing aircraft aircrews to perform realistic low-level attacks on targets located in the South Tactical Range (STAC) and realistic low-level air-to-air intercepts in the air-to-air combat tactics Range. Overflights of the refuge are currently restricted to altitudes of

1,500 feet above ground level (AGL) or above, except within approved corridors, under the terms of a 1994 Memorandum of Understanding (MOU) between DoD and DOI. The 2010 EIS assessed proposals to lower the floor to 500 feet AGL to support low-level attack and intercept training that would provide combat conditions that aircrews may encounter in real-world scenarios. Implementation of this approved action will not occur until the MOU is renegotiated.

- Authorizing additional ground-based training for combat search and rescue teams, special operation teams, USMC units, and potentially other small squads of troops that involve clandestine insertions and extractions from helicopters or vehicles, cross-country land navigation, and other activities while traveling in stealth on foot. The 2010 EIS assessed proposals to expand the opportunities for this type of training. Helicopter insertions and extractions and vehicle movements associated with this training would be restricted to existing helicopter landing zones and roads. This proposal has been implemented.
- Establishing streamlined procedures to facilitate environmental reviews and approvals for reconfiguring or otherwise updating tactical range targets on a timely basis to provide training that reflects the combat conditions that U.S. warfighters will encounter when meeting real world threats. This proposal has been implemented.

Table 2-1: BMGR East Current Military Training Facilities, Features and Use

Area/Activity	Description of Current Training Feature, Facility and Military Use	Status since 2012 INRMP
BMGR East Land Base	BMGR East represents 60 percent of the total BMGR acreage. This area is subdivided into 8 subranges (numbered and tactical ranges, and the air-to-air range—as described below) that may be scheduled separately to support multiple missions, or scheduled together for larger exercises and events.	Unchanged
Restricted Airspace	The areas defined by R-2301E, R-2304, and R-2305 lateral boundaries, altitude floor, and altitude ceiling remain unchanged since before 1960. They are not affected by the land withdrawal. R-2301E overlies most of the BMGR East land area, including Stoval AUX, two tactical ranges (NTAC and STAC), three of the four numbered ranges (1, 2, and 4), and the Air-to-Air range. The area extends from the surface to 80,000 feet above mean seal level (AMSL). R-2304 overlies ETAC, part of Area B, which is open to the public by permit, and a small portion of the Tohono O'odham Nation. R-2305 overlies Range 3 and its facilities and extends south over a portion of Area B. The vertical limits of both R-2304 and R-2305 are surface to 24,000 feet AMSL.	Unchanged
Numbered Ranges	Four numbered ranges capable of supporting Class A (scored) operations, support primary instruction in air-to-ground delivery of bombs, rockets, and gunnery (inert/training ordnance only). The airspace associated with these ranges may be scheduled concurrently with adjacent tactical ranges as needed. Facilities on and use of these subranges are almost entirely unchanged since well before the 2012 revised INRMP. The single exception is the conversion of the left side of Range 3 to a helicopter gunnery range. Construction of this facility was begun in 2012; it has since been completed and is in use.	Changed

Table 2-1: BMGR East Current Military Training Facilities, Features and Use

Area/Activity	Description of Current Training Feature, Facility and Military Use	Status since 2012 INRMP
Tactical Ranges	Three tactical ranges (NTAC, STAC, and ETAC) support aircrew training in gunnery, bomb, rocket, and missile employment. Targets simulate tactical features such as airfields, railroad yards, missile emplacements, truck convoys, urban areas, and enemy compounds. Threat simulators may be included in training scenarios to better reflect real-world conditions. Only practice ordnance may be employed on most targets; high-explosive ordnance may be used only on five targets specifically designated for this purpose. The tactical ranges continue to be used on a daily basis for ordnance delivery training. A remotely operated vehicle target operates on an existing road in ETAC and is used for strafing only.	Unchanged
Air-to-Air Range	A portion of this range may be used for air-to-air gunnery and missile firing; however, these operations are scheduled infrequently. This area is used daily for aerial combat and maneuvering training, with no ordnance expenditure.	Unchanged
EOD (Explosive Ordinance Disposal) Training Range	The EOD Training Range continues to be used for instructing EOD technicians to perform safe detonations of expended but unexploded ordnance. Detonation of high explosive charges weighing up to 2,000 pounds net explosive weight is authorized in this area.	Unchanged
Small Arms Range	Since 2012, minor improvements and repairs to the Small Arms Range have been completed. The range continues to be used almost daily for small arms training by the Border Patrol (BP), and occasionally, by USAF Security Police.	Changed

Table 2-1: BMGR East Current Military Training Facilities, Features and Use

Area/Activity	Description of Current Training Feature, Facility and Military Use	Status since 2012 INRMP
Gila Bend AFAF	Gila Bend AFAF continues to serve as the operational support center for the BMGR East. It includes an 8,500-foot runway, six helipads, and other airfield facilities, as well as offices, workshops, storage, lodging, and other spaces. No active duty personnel or aircraft are permanently based at Gila Bend AFAF. Construction of a taxiway for the runway and a new air traffic control tower were assessed in an EIS and selected for implementation in a ROD; however, funds to complete these projects are not available as of this writing. Ongoing maintenance and improvement of facilities at Gila Bend AFAF are routinely conducted.	Deferred
Assault Landing Zones (a.k.a. Aux)	AUX-6 and Stoval airfields are World War II era triangular airfields that are used for certain limited training activities. AUX-6 is regularly used for C-130 and helicopter operations by USAF, USMC, and ARNG units. Since 2012, upgrades to runway surfaces have improved the safety of these operations. Stoval airfield, on the far west side of the BMGR East, is used by USMC units, primarily during the twice-yearly weapons and tactics instructor courses. Landing zone and drop zone operations are conducted at both these locations. AUX-11 is no longer used as an airfield, but serves as a site for exercise-specific communications operations.	Unchanged
Sand and Gravel Excavation and Stockpile Areas	Excavation of sand and gravel from ten wash locations in the BMGR East and stockpiling of these materials at five sites for later on-range use is approved, but not yet implemented; a permit from Maricopa County is required. The sand and gravel may be used in target construction or road repairs as needed.	Unchanged

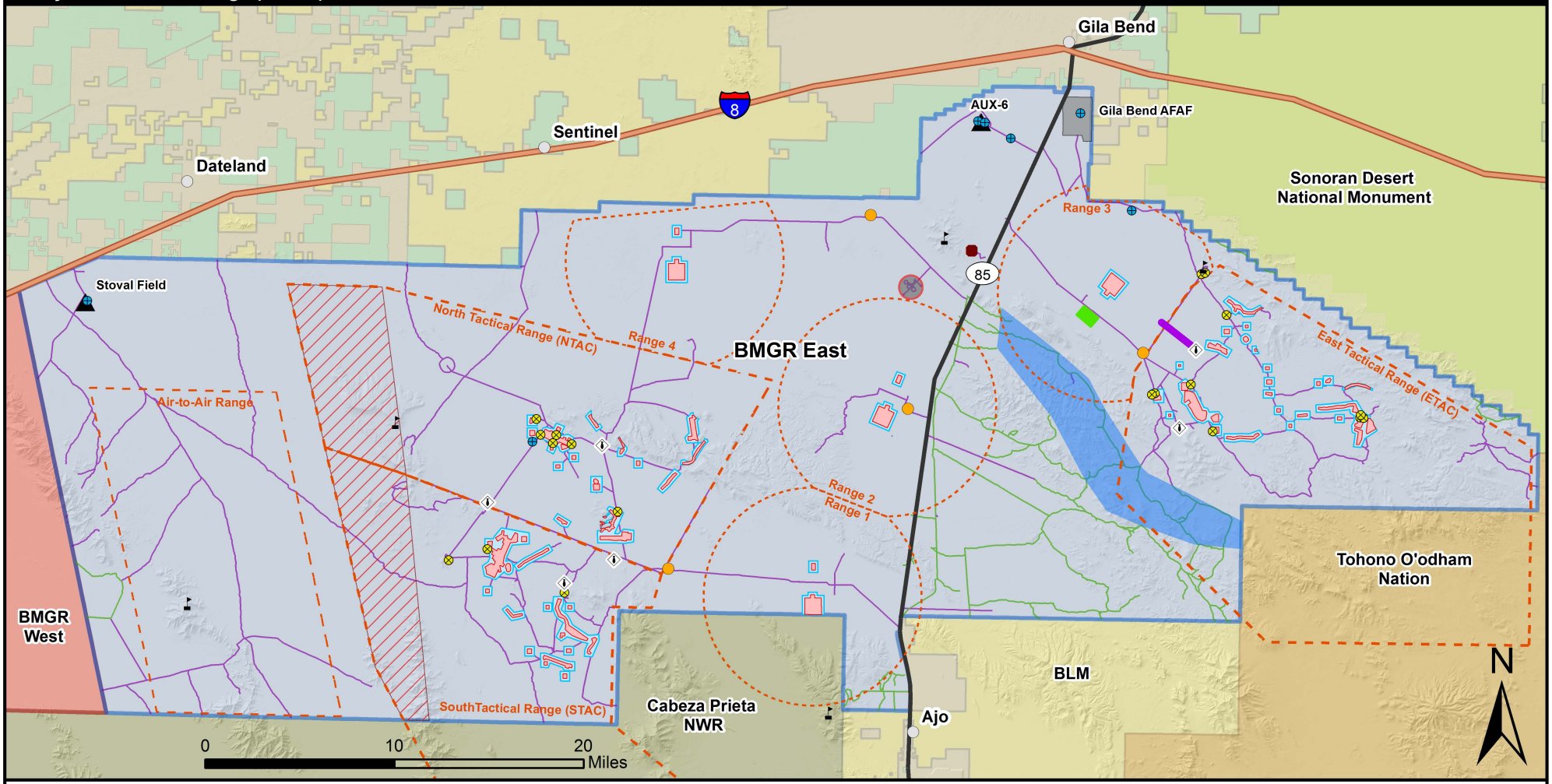
Table 2-1: BMGR East Current Military Training Facilities, Features and Use

Area/Activity	Description of Current Training Feature, Facility and Military Use	Status since 2012 INRMP
EOD Clearance	EOD clearances occur annually, every two years, and every 10 years. Expended ordnance and target debris on the surface is cleared each year to 50 feet on either side of roads and target access ways and in the vicinity of targets to maintain safe work areas for maintenance, reconstruction, or replacement of targets. Every two years, ordnance and target debris on the surface is cleared to a radius of 300 feet from each inert/practice ordnance target and to a radius of 500 feet from each live ordnance target. Every ten years, ordnance and target debris on the surface is cleared to a radius of 1,000 feet from each inert/practice and live ordnance target. No EOD clearances are conducted within the Air-to-Air subrange.	Unchanged
Air Combat Training Systems (ACTS)	ACTS provide a variety of technologically advanced equipment and support capabilities, including the Range Operations Coordination Center (Snakeye), Air Combat Maneuvering Instrumentation, scoring and feedback systems, and simulated ground-to-air threats. Electronic equipment is continually upgraded; some remote equipment locations, both on and off range, are no longer needed.	Unchanged

Figure 2.2: Current Military Use at BMGR East

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstate 8
- State Route 85
- BMGR East
- BMGR West
- Gila Bend AFAF
- Cabeza Prieta NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- BLM
- State Trust Land
- Air Combat Maneuvering System
- Air Force Small Arms Range
- Range Munitions Consolidation Point (RMCP)
- Parachute Drop Zone
- Auxiliary Airfield (AUX)
- Helicopter Landing Zone
- Moving Vehicle Target
- Smokey SAMs Launch Site
- EOD Training Range
- Numbered Range Boundary (air)
- Tactical Range Boundary (air)
- Helicopter Gunnery Range
- Moving Vehicle Target
- EOD 2-Year Clearance Area
- EOD 10-Year Clearance Area
- Hazard Area - Access is only granted when range is closed. Valid permit reguired.
- Hazard Area - NTAC and STAC

BMGR East Roads

- Road for Administrative (Government) Use Only
- Road Open for Public and Administrative Use

World Geodetic System 1984
(WGS84) Projection
Zone 12 N
GCS_WGS_1984

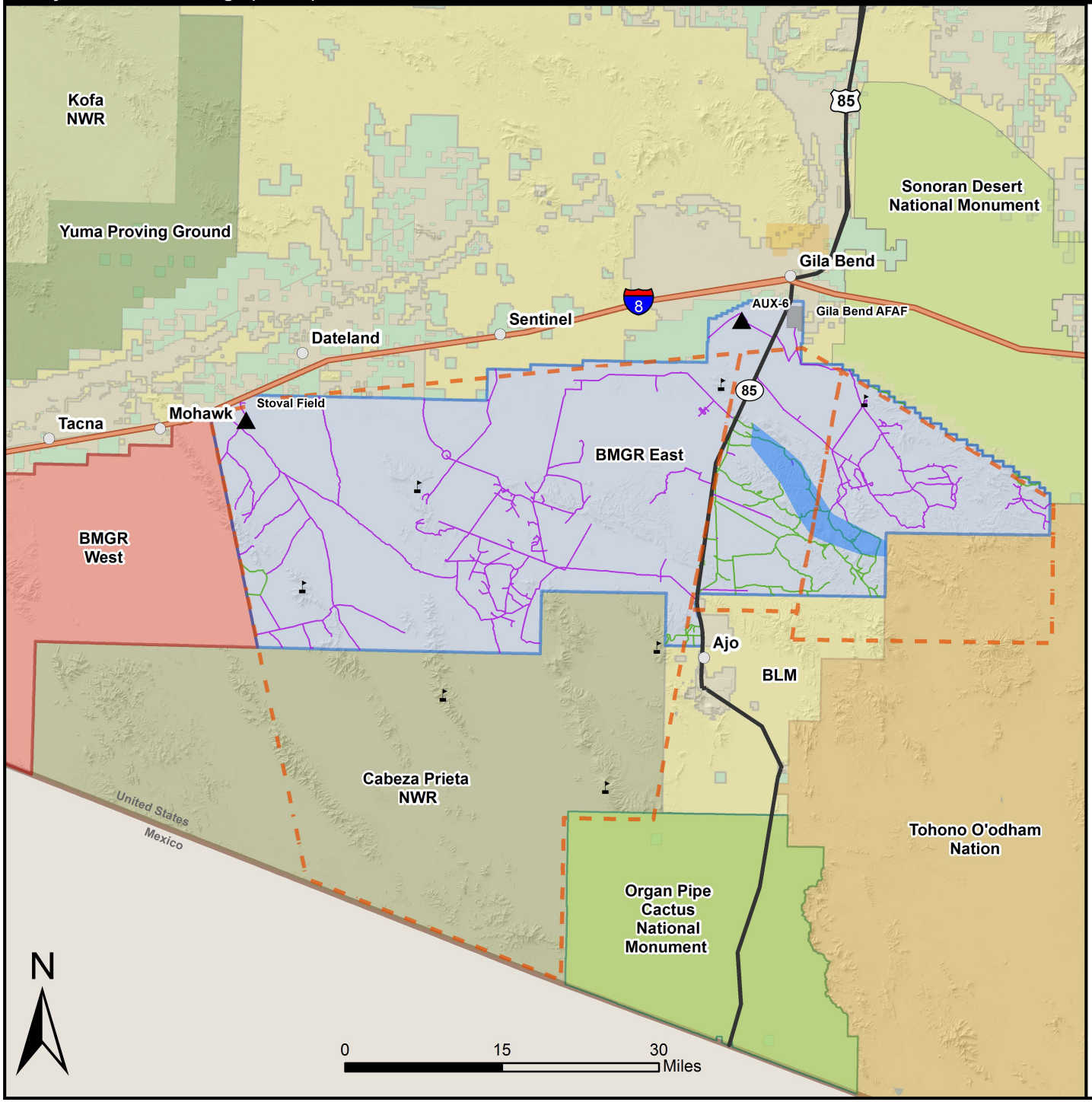
Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

Figure 2.3: Restricted Airspace at BMGR East

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstate 8
- State Route 85
- BMGR East
- BMGR West
- Gila Bend AFAF
- Yuma Proving Ground
- Cabeza Prieta NWR
- Kofa NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- Organ Pipe Cactus NM
- BLM
- State Trust Land
- Air Combat Maneuvering System
- Auxiliary Airfield (AUX)
- Restricted Airspace
- Hazard Area - Access is only granted when range is closed. Valid permit required.

BMGR East Roads

- Road for Administrative (Government) Use Only
- Road Open for Public and Administrative Use

World Geodetic System 1984
(WGS84) Projection
Zone 12 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

2.1.2 Changes in Military Use at BMGR West

The MCAS Yuma organizes its air and ground combat forces into Marine Air Ground Task Forces (MAGTFs), which form the fundamental cornerstones of modern USMC combat doctrine. MAGTFs are scalable and tailored for specific missions (e.g., humanitarian assistance, emergency response, peacekeeping, specific regional threat, and major war abroad) that integrate air and ground assets to accomplish the assigned mission. With the exceptions of the R-2301W restricted airspace being divided into four aviation subranges, all of the listed training facilities and features are ground-based.

Figure 2.4: F-18 flying over the Sonoran Desert.

The Navy approved development of the Auxiliary Landing Field (ALF) complex to support Marine Corps F-35B training in 2010 for the West Coast basing of the F-35B aircraft (USFS 2010). Construction was completed in 2015. The F-35 will replace the AV-8B aircraft in USMC squadrons based at MCAS Yuma. The current military features, facilities, and uses are shown in Figure 2.5 and detailed in Table 2-2 with notations as to whether they were constructed after 2012.

Table 2-2: BMGR West Current Military Training Facilities, Features and Use

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2012 INRMP
Surface Area and Airspace		
BMGR West Surface Area	The BMGR West consists of approximately 40 percent of the total BMGR acreage. Boundary and land withdrawal areas are as established by the MLWA of 1999.	Unchanged
Restricted Airspace	R-2301W lateral boundaries, altitude floor (ground surface), and altitude ceiling (80,000 ft. AMSL) are unchanged since 1960.	Unchanged
Airspace Subranges	Four airspace subranges – TACTS-Hi, TACTS-Low, Cactus West, and AUX-II, are allocated to one or more subranges or are aggregated into larger units as needed to support training.	Unchanged
Aviation Training Ranges and Facilities		
AUX-II	AUX-II provides an assault landing zone airstrip for training aircrews of C-130 aircraft to operate in and out of a primitive landing zone in a forward area. AUX-II also continues to be used as a staging area or forward arming and refueling point (FARP) for helicopter operations.	Unchanged
F-35B ALF	Construction of the F-35B ALF, otherwise known as KNOZ, was completed in 2015. The ALF includes three simulated landing helicopter assault decks, flight control towers, aircraft maintenance shelter, refueling apron, fire and rescue shelter.	Changed

Table 2-2: BMGR West Current Military Training Facilities, Features and Use

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2012 INRMP
Cactus West Target Complex	Cactus West Target Complex includes 1) a bull's-eye target, located inside a 1,500-foot radius bladed circle, and 2) two berm and panel targets for strafing practice. Ordnance deliveries are restricted to inert and practice munitions. As described later in this table, the Cactus West Target receives impacts from the Convoy Security Operations Course (CSOC) 2 Range and as a Live Ordnance and Drop Tank Jettison Area.	Unchanged
Urban Target Complex (UTC)	The UTC provides a simulated urban setting with streets, 240 buildings, multiple targets, and vehicles for training aircrews in precision air-to-ground attack in densely developed and populated areas. The UTC Range is located inside the fenced area. The complex also has a moving land target, which consists of a remotely controlled vehicle that pulls a target sled on an oval track.	Unchanged
Instrumentation	A portion of the TACTS Range is instrumented to support air-to-air and air-to-ground combat training. The electronic architecture is composed of 27 fixed-position and 17 mobile-positions that can track, record, and replay the simultaneous actions of 36 aircraft and scoring weapon use. The air-to-ground weapons delivery component of is supported by 112 individual passive tactical target sites situated in 11 complexes that simulate airfield installations, power stations, fuel storage facilities, buildings, railway facilities, anti-aircraft missile and gun positions, and military vehicles. No munitions are fired or otherwise released on this electronically scored range.	Unchanged
Air-Ground Training Facilities		
Ground Support Areas	Thirty-three undeveloped ground support areas allow units to participate in off-road training exercises. Most ground troop deployments are coordinated with aviation training exercises to enhance the realism of air-ground training evolution for both elements.	Unchanged

Table 2-2: BMGR West Current Military Training Facilities, Features and Use

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2012 INRMP
Parachute Drop Zones (DZ)	Twenty-one parachute tactical DZs are currently designated. The AUX-II DZ is located within a previously disturbed, inactive bull's-eye bombing target. The DZ immediately to the East of Aux-II is the only DZ approved for parachute cargo drops, which require retrieval by an off-road combat fork lift. The other 10 DZs are located within ground support areas to minimize off-road driving for retrievals.	Unchanged
Ground Combat Training Ranges		
Rifle and Pistol Ranges	The Rifle and Pistol Ranges are used to train and qualify personnel in the use of small arms.	Unchanged
Small Arms Live-Fire Maneuver Range (Range 2)	The Small Arms Live-Fire Maneuver Range is located in an unused sand and gravel borrow pit and serves as a close combat maneuvering range for training small teams or individuals in the tactical use of infantry small arms.	Unchanged
Multi-Purpose Machine Gun Range (Panel Stager)	The Multi-Purpose Machine Gun Range is located at the inactive air-to-ground bombing target at Panel Stager Range 2. Ground-to-ground machine gun fire of .50 caliber and smaller is directed from guns mounted on vehicles traveling on existing access roads at target sets located in the retired bombing impact area.	Unchanged

Table 2-2: BMGR West Current Military Training Facilities, Features and Use

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2012 INRMP
Convoy Security Operations Courses (CSOC 1 and 2) and Murrayville (East and West)	Four CSOCs are designed to train troops assigned to protect vehicle convoys in combat theaters, how to recognize, counter, and defeat threats from hostile forces. Static and pop-up targets that simulate threats are located in ambush scenarios along the access roads and run-in line. These are located along the existing access roads in the vicinities of the Cactus West Target Complex, UTC and along the run-in line to the UTC. Ground-to-ground machine gun fire of .50 caliber and smaller may be directed from guns mounted on vehicles or run-in-line at target sets designed to simulate ambush attacks by hostile forces. The direction of fire from the access roads in the vicinity of the Cactus West complex is generally to the south such that the Cactus West target impact area is affected. The direction of fire from the run-in-line is generally at target sets to the east or west such that the existing target impact areas at the UTC also serve as an impact area.	Unchanged
Combat Village	Combat Village simulates a small building complex adjacent to a railroad. This facility is used as an electronically scored target and for training small units in infantry tactics involving reconnaissance, assaults, or defense. Only blank small arms munitions and a special effects small arms marking system, are authorized at this infantry tactics training site.	Unchanged
Hazard Areas	Five hazard areas, four to the west and one to the east of the Gila and Tinajas Altas mountains, support use of small arms and/or aircraft lasers in training operations. Surface entry to hazard areas is closed to nonparticipating personnel when hazardous activities are scheduled.	Unchanged
Support Areas		
Cannon Air Defense Complex	The Cannon Air Defense Complex provides administrative, maintenance, and training areas for a Marine Air Control Squadron. The complex is a permanent built-up facility of about 192 acres.	Unchanged

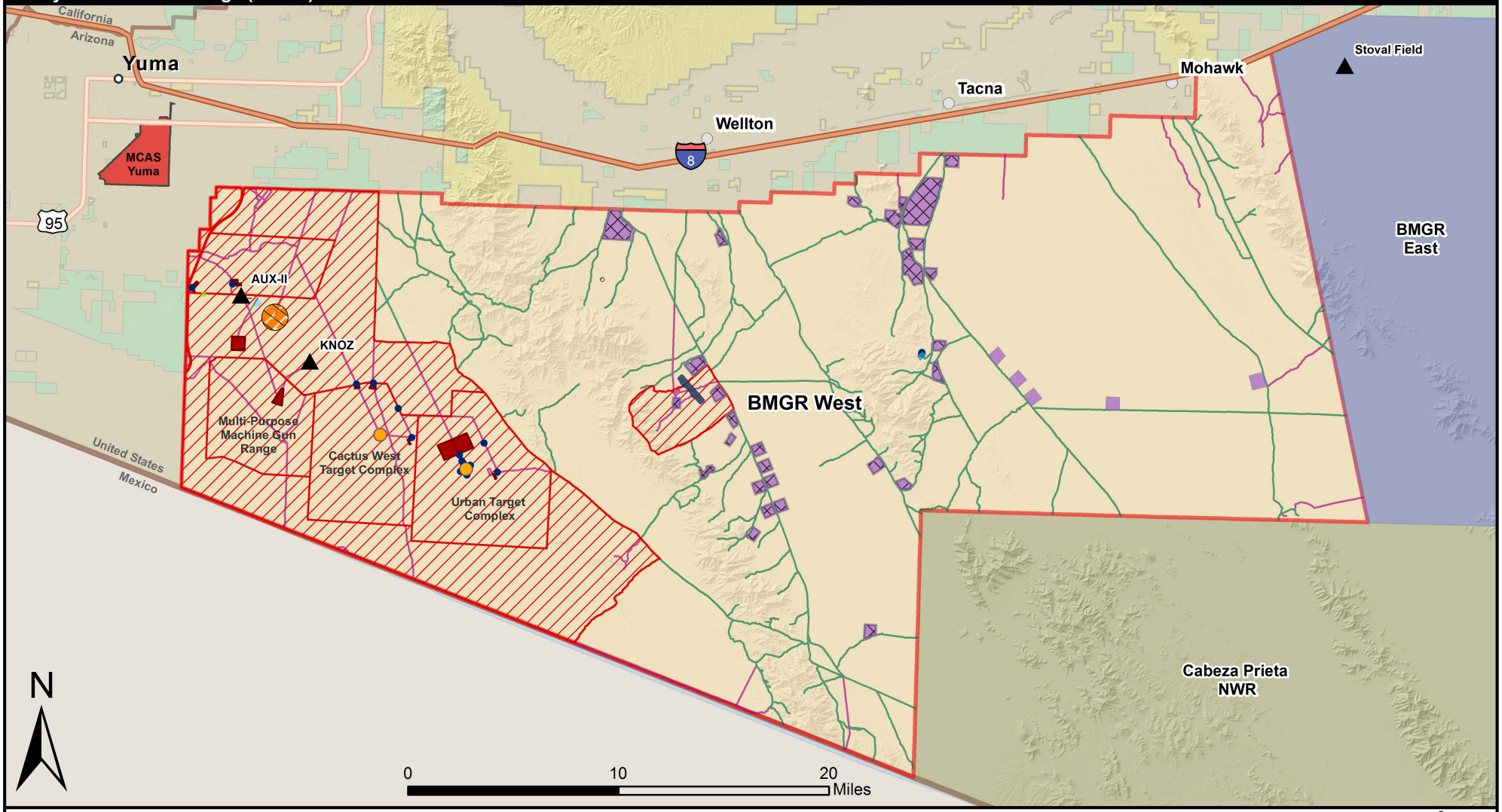
Table 2-2: BMGR West Current Military Training Facilities, Features and Use

Range Feature or Facility	**Description of Current Training Feature, Facility and Military Use**	**Status Since 2012 INRMP**
AUX-II Field Ammunition Supply Point (FASP)	The FASP provides temporary secure storage for munitions used by ground units during field exercises, primarily during semi-annual weapons and tactics instructor courses. The FASP is located about 1,500 feet northwest of AUX-II.	Unchanged
Munitions Treatment Range (MTR)	The MTR is used to train personnel in the use of demolition explosives and unexploded ordnance.	Unchanged
Live Ordnance and Drop Tank Jettison Area	The Cactus West Target bull's-eye is used as a Live Ordnance and Drop Tank Jettison Area for aircraft experiencing difficulties that warrant a precautionary jettisoning of external stores prior to recovery at MCAS Yuma. Panel Stager Range 2 is presently used as the impact area for the Multi-Purpose Machine Gun Range.	Unchanged

Figure 2.5: Current Military Use at BMGR West

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- Interstate 8
- Highways
- City/Town
- MCAS Yuma
- BMGR East
- BMGR West
- Cabeza Prieta NWR
- BLM
- State Trust Land

BMGR West Military Training Areas

- Aerial Bombing Range
- AUX II Bivouac Site
- Gas Chamber for Personal Equipment Operations
- Ground Support Area
- Urban Infantry Training Range
- Auxiliary Airfield (AUX)
- Landing Zone Area
- Impact Area
- Observation Position Point
- Parachute Drop Zone
- Training Range
- Restricted Access/Hazard Areas
- BMGR West Designated Admin Use Only Road
- BMGR West Designated Public and Admin Use Road

World Geodetic System 1984 (WGS84) Projection
Zone 11 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

2.2 Non-Military Activities

2.2.1 Arizona Game and Fish Department

The state of Arizona has primary jurisdiction over wildlife management within the BMGR, except where pre-empted by federal law. Nothing in the MLWA of 1999 or Sikes Act either diminishes or expands the jurisdiction of the state with respect to wildlife management.

The primary wildlife management responsibilities of AGFD were recognized in the 2007 INRMP and continue without change to include:

- Developing and maintaining habitat assessment/evaluation, protection, management, and enhancement projects (e.g., artificial water developments and Sonoran pronghorn (*Antilocapra americana sonoriensis*) food plots).
- Conducting wildlife population surveys.
- Managing wildlife predators and endangered species or special status species (management of federally listed endangered species is a responsibility shared with the USFWS).
- Enforcing hunting regulations.
- Establishing game limits for hunting, trapping, and non-game species collection.
- Issuing hunting permits.

Figure 2.6: Javelina is just one species open to hunting on the BMGR (AGFD).

- Participating as a member on the Sonoran Pronghorn Recovery Team.
- Assisting and advising the DoD to manage OHV use in terms of habitat protection and advocating for user opportunities.

AGFD continues to make determinations on the appropriateness and need to transplant wildlife into or out of the BMGR. Should wildlife transplants affecting the BMGR be proposed, appropriate environmental studies and regulatory compliance would be completed, as required, prior to implementing any specific proposal.

2.2.2 U.S. Border Patrol

The entire range is potentially subject to the presence of undocumented aliens (UDAs) and smuggling traffic because of its proximity to the international border (Figure 1.2). Because of this, the range is heavily patrolled by U.S. Customs & Border Protection (CBP) agents seeking to interdict and apprehend smugglers and illegal entrants. CBP is also charged with installing border infrastructure as needed to deter illegal crossings, and maintaining operational control of the border (Homeland Security Act of 2002, P.L. 107-296, codified at 6 U.S. C. §§ 101 et seq., Section 102 of the Illegal

Immigration Reform and Immigrant Responsibility Act of 1996, P.L. 104-208, as amended, 8 U.S.C. § 1103 and other acts). Within CBP, the U.S. Border Patrol (BP) is delegated authority for "detecting and preventing the entry of terrorists, weapons of mass destruction, and unauthorized aliens into the country, and to interdict drug smugglers and other criminals between official points of entry." Within the BMGR East, BP coordinates with Range Management Office (RMO) Conservation Law Enforcement Officers (CLEOs) and Pima and Maricopa County Sherriff Offices. Within the BMGR West, BP coordinates with Range Management Department (RMD) CLEOs and the Yuma County Sheriff's Office and Yuma County Search and Rescue.

2.3 Surrounding Communities

The state of Arizona recognizes the importance of military aviation to its economy. The state is also aware how land uses in the vicinity of military airports, can endanger lives. To promote public safety, the state has adopted legislation to restrict land use in the vicinity of military airports. Pursuant to Arizona Revised Statutes (ARS) § 28-8481 and Attorney General Opinion No. I08-003, no new residential development shall occur within a High Noise or Accident Potential Zone unless the terms and conditions of a development plan were met prior to December 31, 2004 (Yuma County Department of Development Services 2012).

Existing land use along the BMGR's perimeter includes communities, industry, range land for livestock grazing, and agricultural uses. The population of these communities (from U.S. Census Population Estimates 2016; American Community Survey 5-Year Estimates 2011-2015) are summarized in Table 2-3.

Table 2-3: Surrounding Community Population 2010-2015

CITY	2010 U.S. CENSUS DATA	RECENT POPULATION ESTIMATES
City of Yuma, Yuma County	93,064	94,906[1]
Wellton, Yuma County	2,882	2,968[1]
Tacna, Yuma County	602	706[2]
Gila Bend, Maricopa County	1,922	2,071[1]
Ajo, Pima County	3,304	3,886[2]

Source:
[1] 2016 U.S. Census Population Estimates (as of July 1, 2016)
[2] 2016 U.S. Population estimates unavailable. Population estimates retrieved from the 2011-2015 American Community Survey 5-Year Estimates
https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml

The majority of the population near the BMGR resides in Yuma County. In 2007, when the housing bubble burst (triggered by the excess subprime debt and an oversupply of housing across the nation), causing a recession, Yuma County, like most of the nation, experienced a decline in population and construction activity (Yuma County Department of Development Services 2012). Before the recession, historical growth rates for Yuma County had been both robust and predictable, with an average growth rate of 3.84 percent between 1980 and 2000 (Yuma County Department of Development

Services 2012). Since the economic recovery began in 2009, the rate of Yuma County population growth increased at a rate that exceeded the historical average. According to U.S. Census data, the population growth rate reached 5 percent for the 2010-2016 period (U.S. Census 2016).

The federal government owns approximately 80 percent of the land in Yuma County (Yuma County Department of Development Services 2012). Military activities and agriculture are two of the primary uses of the unincorporated portions of Yuma County. About 40 percent of the land is used for military uses and 47 percent of nonmilitary land is used for agriculture (Yuma County Department of Development Services 2012).

The community of Gila Bend lies just north of the BMGR East. The Gila Bend planning area includes approximately 175,000 acres of vacant, relatively flat terrain. Existing land use in Gila Bend is concentrated in town (Gila Bend 2017). Scattered land use includes large lot residential use, energy generation facilities, agriculture, and sand and gravel extraction sites (Gila Bend 2017). No master planned communities are located within the unincorporated portion of the planning area (Gila Bend 2017).

The Tohono O'odham Nation encompasses approximately 2.8 million acres and is located southeast of the BMGR. The Nation is organized into 11 districts, with Hickiwan District abutting the BMGR's most southeastern border. Hickiwan District's population is 817, while the off-reservation population is 1,259 (Tohono O'odham Nation 2016). Land use includes ranching, livestock grazing, and seasonal cattle camps.

The town of Ajo, in Pima County, is a small community located just south of the BMGR East. Ajo is a former copper-mining hub. Its population has grown due to an increase in US border control efforts and other government workers moving to the area. As with many other Arizona communities, Ajo population changes seasonally due to people leaving colder weather, to enjoy warmer temperatures.

CHAPTER 3 CHANGES IN LAND AND ENVIRONMENTAL CONDITIONS

3.1 Landforms, Geology, Soils, and Hydrology

The BMGR is located in the Basin and Range Physiographic Province of Arizona, which is distinguished by broad alluvial valleys separated by steep, discontinuous mountain ranges that run northwest to southeast. The westernmost valley plains of the BMGR are within the Gran Desierto dune system, which extends both to the west and south and into Mexico. Smaller sand dune systems have also formed in several other range locations, with the most expansive being Mohawk Sand Dunes in the central portion of the range. The alluvial valleys are deep bedrock basins filled with silt, clay, sand, and gravel deposits. These deposits can be more than 10,000 feet deep.

There are 15 named mountain ranges in BMGR, representing two physiographic types: sierras and mesas. The Mohawk Range, west of the San Cristobal Valley, is made up of rugged sierras that have characteristic towering jagged profiles. The Aguila Mountains, east of the San Cristobal Valley, are mesas that have flat tops and steep cliffs. Elevations range from 185 feet AMSL at the southwest corner of BMGR West to 4,002 feet above AMSL at the eastern edge of BMGR East atop the Sand Tank Mountains. The mountain ranges are formed from igneous, metamorphic, and sedimentary rock types. Along many of the mountain bases, sloping masses of alluvial fill material, known as bajadas, extend outward like fans to taper more gradually than the mountains themselves into the generally flat valley floors.

Volcanic landforms are found on some parts of the range; the most notable is the Sentinel Plain Volcanic Field. A second volcanic landscape, the Crater Range, consists of eroded basalt-andesite lava flows with cliff-like escarpments and ridge-forming dikes. Isolated pillars mark the location of volcanic conduits. There is evidence of extensive sheet-like lava flows in some parts of the range. These flows formed irregular plains with rough basalt surfaces. Portions of the largest such lava flow in southern Arizona extend into the northern part of the range south of the community of Sentinel. The BMGR region is in a tectonically stable area with few earthquakes and few active faults.

Principal rivers in the region include the Gila and Colorado Rivers. The Gila River runs east to west just north of the BMGR boundary and connects to the Colorado River northwest of the range. Surface water at the BMGR is very limited. There are no perennial or intermittent streams present, and ephemeral stream flow occurs only in immediate response to sizeable rainfall events. Surface water drainage of the range flows outward from the mountain ranges and, for most of the area, ultimately northward by numerous feeder washes into the larger washes that flow to the Gila River, then turns west into the Colorado River.

Natural flooding events are highly variable in frequency and intensity and can have a large effect on natural community composition, structure, and function. Some storms cause flash flooding in the smaller mountain drainages and short-term flooding in the larger valley washes and floodplains. Rainwater collects in natural rock catchments (also known as tanks or *tinajas*), human-modified natural catchments, or artificially constructed tanks where the water may remain for weeks or months without recharge until it eventually evaporates or is consumed by wildlife or people.

Surface water availability is extremely limited on the BMGR during certain times of the year so much so that the AGFD began developing wildlife waters in the late 1950s. The AGFD has constructed catchments and modified many existing water resources to extend the availability of water for wildlife. Currently, over 40 wildlife water sites are maintained across the range through a partnership between the 56 RMO, MCAS Yuma RMD, and the AGFD. During periods of extreme drought, the AGFD will routinely refill these water sources by hauling tens of thousands of gallons annually, both by vehicle and through the use of helicopters, to support wildlife species. A detailed discussion on wildlife water management can be found in Section 3.6 *Wildlife Waters*

3.1.1 Environmental Impacts from Recreation, Illegal Border Traffic and Deterrence Efforts

Ground disturbance is one of the key factors influencing soil stability, surface drainage and erosion. The majority of disturbance is created by off-road driving and the proliferation of new vehicle routes. To reduce impacts, a designated road system was established in 2007 which closed the range to off-road driving to all users, except for approved military, resource management, and law enforcement purposes and established vehicle operating rules to facilitate natural revegetation and recovery of ground surfaces. The current status of the designated road system is discussed in detail in Chapter 6 *Changes in the BMGR Road System*.

The BMGR road system has provided an important tool for the control and management of roads and vehicle use, but the proliferation of new unauthorized vehicle routes has continued. This problem has been compounded by vehicle traffic associated with UDAs and illegal drug smugglers crossing the international border from Mexico and traveling cross-country through the Organ Pipe Cactus NM, Cabeza Prieta NWR, the BMGR, and/or the Tohono O'odham Nation.

Figure 3.1: Humanitarian aid drops result in waste being left in the desert.

While the completion of the border barrier fence has reduced illegal cross-border vehicle traffic it has led to an increase in illegal cross-border foot traffic. In response, BP has expanded its patrolling into new areas where illegal vehicles historically did not travel. Attempts to make apprehensions and perform UDA rescues has resulted in a proliferation of new roads and off-road driving in these new areas.

Cross-border illegal foot traffic has also caused an upsurge in humanitarian aid drops. Food, water, clothing, and medical supplies are dropped at areas along UDA foot trails by humanitarian groups as well as more nefarious groups intending to directly support illegal drug smuggling activities. Regardless of the intent of the groups, this practice has led to increased proliferation of unauthorized vehicle routes into remote aid drop sites as well as a dramatic increase in the amount of litter and trash along the UDA trails.

Due to increased illegal foot traffic, BP agents have expanded the use of drag roads as they monitor the area. Dragging these roads repeatedly over time has contributed to the formation of berms which has been shown to affect surface water flows following precipitation events. Some of the road beds have receded below natural grade and have created a berm on either side that restricts the flow of water from natural cross road drainages. As a result, the runoff causes ponding on the upstream side of the road. As a result, thick stands of vegetation, often times composed of invasive species, can develop in response to the increased soil moisture. Additionally, since water flow is effectively cut off, the natural vegetation community declines for some distance along the drier downstream side of the road.

Because of steep slopes and frequent motorized vehicle use, many road surfaces are severely incised. Incised roads disconnect the lower and upper portions of the watershed and disrupt overland flow. At present, the lower and upper watersheds have distinct vegetation covers, but woody riparian vegetation types are disappearing in the lower watershed.

Additionally, repeatedly dragging roads tends to widen the road surface, increasing the area of disturbance associated with roads across the landscape. Evidence of this has been observed along AUX-II on the BMGR West road which has been widened considerably; diverting runoff and creating new, potentially problematic drainage channels.

Additional factors contributing to soil erosion and ground disturbance stem from the use of OHVs, sand rails, other recreational vehicles, and unauthorized travel off the public road system. Excessive speeds and caravanning continually over the same routes further contribute to road degradation.

Soil compaction, erosion, and damage to native vegetation resulting from off-road driving not only modifies the distribution and pattern of overland flow during rain events, but also reduces available soil moisture for vegetation further promoting erosion by reducing soil cohesion (Brooks and Lair 2009). In addition, soil erosion may directly impact military training activities; instances of high wind speeds in areas where heavy soil erosion has occurred can reduce visibility during training activities as well decrease air quality.

Soil erosion and poor air quality may also negatively affect the health of threatened and endangered species. For example, the population of the desert tortoise has declined due to an airborne virus responsible for an upper respiratory tract disease. While qualitative observations of anthropogenic impacts to soil resources have been noted by range management, there has been no quantitative, data-driven study documenting human and natural impacts to range soil resources, hydrology, overland flow, and air quality.

3.1.1.1 Update

To reduce changes in surface drainage and soil erosion from road dragging activities the USAF, USMC, and BP have developed the following standard operating procedures (SOPs):

- Dragging shall take place only within the roadbed.
- No loading of drag devices with materials to increase drag weight.
- Turn-around in designated areas only.

- No increase in turn-around area size.
- Drags will not be relocated until they are thoroughly cleaned to remove potential invasive species and/or seeds.
- Coordination of desired drag before initiating a new one.
- BP Wellton and Ajo Stations have adopted supplemental protocols intended to reduce the negative impacts of dragging operations on cultural and natural resources.

Additional efforts between the USAF, USMC and BP to reduce the negative impacts from other sources include:

- Barry M. Goldwater Range Executive Council (BEC) meetings between affected agencies are held six times a year to identify substantive issues, conflicts, or other matters for consideration regarding potential impact upon lands or resources in the BMGR region.
- Regional Road Network Books and Global Positioning System (GPS)/Adobe PDF maps have been created to delineate roads allowed for use in support of the CBP mission.
- All law enforcement agencies are required to complete the *Range Access and Safety Training Program.*
- CBP Air, Sector and Station Chiefs are required to attend the BMGR orientations.
- BMGR East Small Arms Range can be accessed by CBP for training.
- CBP has access to and use of Gila Bend AFAF facilities, airfield, and all-terrain vehicle (ATV) storage facilities.
- Airspace access agreements for CBP rotor, fixed wing and Unmanned Aircraft Systems.
- Special operation support is provided to facilitate the BMGR East access.
- CBP radios are routed through the Gila Bend Emergency Coordinate Center to enable direct contact between the military and BP.
- BMGR East has standardized protocols for BP range access and road-dragging activities.

BMGR East

In an effort to determine the full scope of damage that illegal border crossing and deterrence is having on the landscape, the USAF began a drag roads monitoring project. The purpose of the project is to inform management of techniques that will prevent increases in erosion and changes to surface hydrology.

Figure 3.2: Road elevation measurements being taken using California rod and auto-level.

Road elevation measurements and photo documentation of road conditions are

recorded annually and compared to document elevation and visual changes to monitored drag roads. Future analysis could consist of vegetation surveys to compare the vegetation composition adjacent to drag roads and non-drag roads and hydrological studies to determine how drag roads affect surface hydrology (56 RMO n.d.).

BMGR West

A 2014 U.S. Geological Survey (USGS) report quantified the disturbances to soils, vegetation, and cultural resources caused by migrant and smuggling traffic, border security, and general recreational vehicle use on the BMGR West. In this study, the USGS developed an erosion vulnerability model to identify areas prone to soil erosion from these activities by 1) mapping vehicle disturbances, 2) measuring soil compaction, and 3) using Geographic Information System (GIS) and remote sensing to model soil erosion based on factors from the Universal Soil Loss Equation (Villarreal 2014).

The study identified highly disturbed areas vulnerable to soil compaction and detected approximately 6,077 miles of unauthorized off-road tracks. Major disturbance hotspots occur along the U.S.-Mexico border road (Villarreal 2014). Considerable disturbance was also detected along the southern end of El Camino del Diablo Este and areas around Tractor Road and Military Drag (Villarreal 2014). The highest number of repeated disturbances occurred in the southern part of the hazard area, which is off-limits to OHV uses year-round (Villarreal 2014).

Figure 3.3: Observation tower house cameras that monitor human activity and erosion.

In June 2015, BMGR West staff began to monitor erosion across the range using three field methods: (1) deployment of a three-dimensional camera, (2) ground-based light detection and ranging (LIDAR), and (3) manually measuring erosion using an electronic, survey grade theodolite total station (Duan et al. 2017). Monitoring erosion will help resource managers prioritize erosion-prone areas and identify whether wind or rainfall runoff erosion is dominant (Duan et al. 2017).

The soil disturbance mapping data and erosion potential models will allow resource managers to quickly identify where off-road vehicle traffic will have the greatest negative impact on soil resources and allow for the designation of critically disturbed areas and restoration sites where off-road driving would be prohibited.

Additionally, and in accordance with the BMGR INRMP 5-Year Action Plan: 2012-2017, University of Arizona (UA) developed and implemented a digital soil mapping technique specifically for characterizing the complex alluvial and eolian deposit dominated landscape of the BMGR West (Rasmussen and Regmi 2015). This project resulted in a range-wide, digitally assessed, high spatial resolution soil-landscape classification map depicting soil landscape variability and distribution (Rasmussen and Regmi 2015).

resolution soil-landscape classification map depicting soil landscape variability and distribution (Rasmussen and Regmi 2015).

BMGR West staff is working with UA to complete a range-wide soil map, incorporating the newly developed soil mapping technique, within the planning period covered by the 2018 INRMP. Soil maps serve as decision-making tools for natural resources managers, allowing them to assess the potential for erosion and natural hazards. They also help determine the biophysical and biogeochemical functioning of the landscape (Rasmussen and Regmi 2015).

3.2 Climate

The Southwest region of the U.S. is characterized by a hot and arid variable climate that is strongly influenced by its geographic location. Most precipitation occurs during mid-winter and is a result of frontal types of storms or a late summer monsoon. Due to the irregularity of rainfall patterns, some range locations may receive little or no rain during the same year in which other areas receive average or above-average precipitation.

Average annual rainfall in the higher elevations along the easternmost portion of the BMGR may approach 9 inches. Average rainfall over the entire range, however, is less than 5 inches per year. Rainfall near Yuma typically averages no more than 3 inches annually. These averages are based on long-term weather patterns.

The Sonoran Desert is subject to frequent and sometimes prolonged droughts. Some of the BMGR's interior valleys can receive as less than 2 inches of rain per year. When the stable weather patterns that enforce the aridity of the BMGR region periodically break down, all or portions of the range may receive two to three times the normal annual rainfall, sometimes in only one or a few storms.

The overall effects of the prevailing low rainfall patterns are exacerbated by high temperatures and regional evaporation transpiration potentials that greatly exceed all known rainfall regimes. Summer daytime temperatures often are in excess of 110 degrees Fahrenheit. Annual evaporation potentials, which vary from greater than 86 inches in the western part of the range to about 72 inches in the eastern, greatly exceed the available precipitation.

3.2.1 Update

The Southwest has become warmer and drier over the past century, and projections indicate this trend will continue into the twenty-first century (Overpeck et al. 2013). Droughts will become more severe and precipitation extremes in winter are expected to become more frequent and more intense (Overpeck et al. 2013). Significant changes in climate in this region will have broad impacts on ecosystems and consequences for biodiversity (Bagne and Finch 2012).

3.2.1.1 Regional Climate Monitoring Program

In the fall of 2011, the BMGR East began a climate monitoring program by installing a network of 12 communication-grade weather stations (Campbell Scientific), manual download data loggers, and manual-read precipitation storage gauges. In addition to real-time stations, the BMGR East has maintained existing rain gauges and manual-download data loggers to increase the number of climate-

monitoring points and provide a more spatially explicit understanding of climate variables. These stations transmit data in real time and collect measurements on the following climatic variables (Black 2015):

- Temperature
- Relative humidity
- Precipitation
- Wind speed
- Wind direction
- Solar radiation
- Soil moisture

Real-time weather data can be accessed by visiting http://98.191.112.244/index.html .

The website provides real time visibility to the Luke AFB Weather Squadron, 25th Operational Weather Squadron, Maricopa County Flood Control Department, National Oceanic and Atmospheric Administration (NOAA), and regional law enforcement agencies. Access to real-time weather data informs time-sensitive resource management issues including (Black 2015):

- Locations for and servicing of emergency feed and water stations for endangered species.
- Timing and control measures for invasive plants.
- Identifying areas where cultural resources may have been subject to extreme erosion events.

The BMGR West has five manual-download weather stations and is exploring options to install communication sensors on the weather stations to also report climate data in real-time. In addition, several agencies have partnered with the BMGR to gain insight into the spatial and temporal distribution of precipitation on a regional scale. The study area encompasses a large portion of southwest Arizona (Figure 3.4). The following partnering agencies participate in this regional monitoring effort (Black 2015):

- BMGR East (USAF)
- BMGR West (USMC)
- Cabeza Prieta NWR (USFWS)
- Kofa National Wildlife Refuge (NWR) (USFWS)
- Organ Pipe Cactus NM (National Park Service (NPS))
- Sonoran Desert NM / Ajo Block (BLM)
- Yuma Proving Ground (U.S. Army)
- Flood Control District of Maricopa County

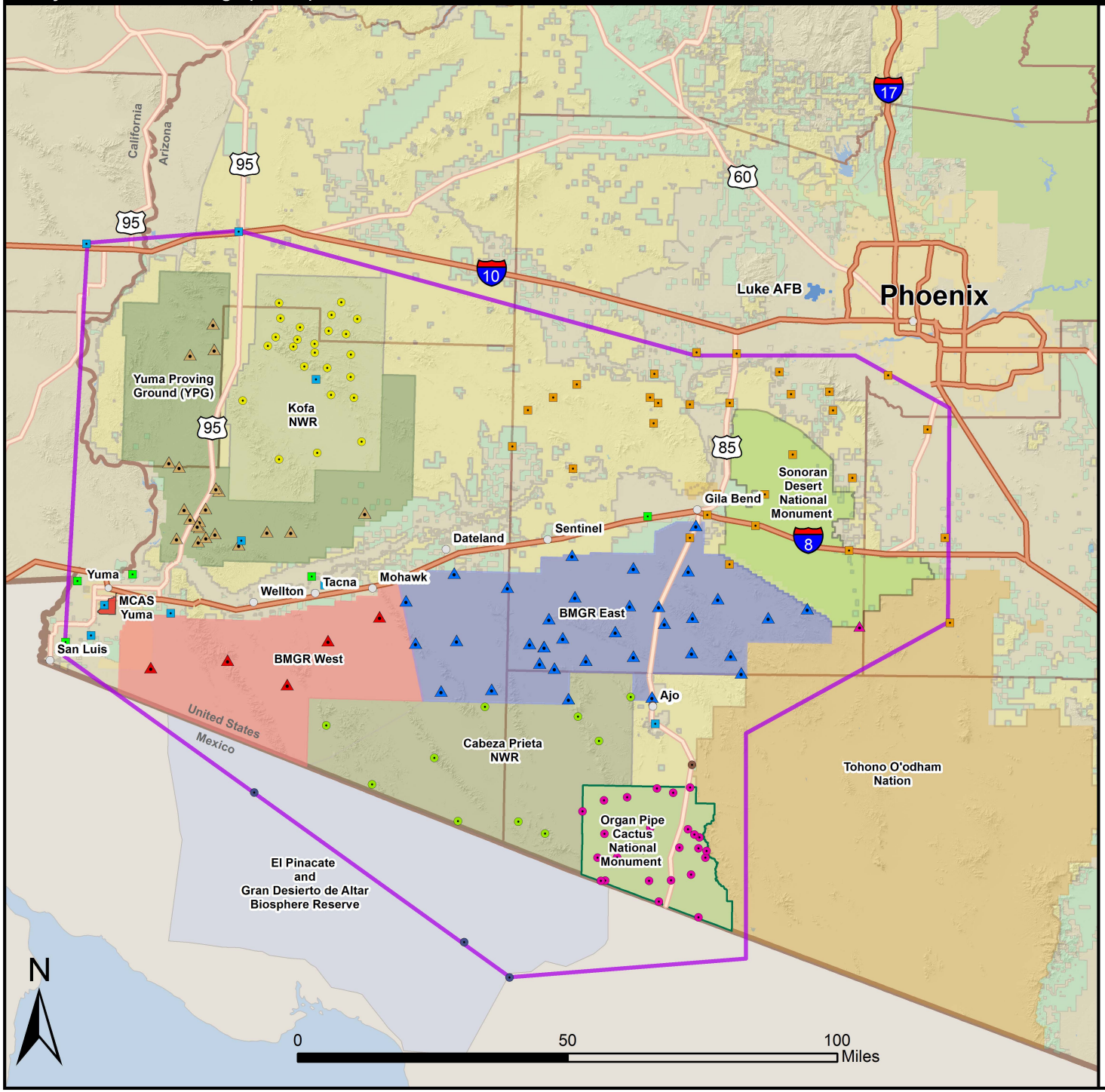
Partnering agency staff aggregate monthly precipitation data. They use an Oct. 1 to Sept. 30, water year as opposed to a calendar year, Jan. 1 to Dec. 31, to avoid splitting up the winter rain. Monthly precipitation values are combined with the data from neighboring agencies that includes NOAA

Cooperative Observer Program stations throughout the region, the El Pinacate and Gran Desierto de Altar Biosphere Reserve in Mexico, UA Meteorological Network, as well as two rain gages at private homes in Ajo and Why (Black 2015). Aggregated datasets contain monthly precipitation totals for 160 stations across the region. Interpolation is used to estimate precipitation at locations without gages, based on measurements from weather stations. But this method has its limits. The current interpolation method can potentially exaggerate the spatial extent of precipitation events due to the highly variable nature of precipitation in the region, especially during the monsoon season. The current method also does not consider elevation, which can be influential in precipitation events.

Figure 3.4: Regional Weather Stations

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstates
- Highways
- Luke AFB
- MCAS Yuma
- BMGR East
- BMGR West
- Yuma Proving Ground
- Organ Pipe Cactus NM
- Cabeza Prieta NWR
- Kofa NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- BLM
- State Trust Land
- El Pinacate Biosphere Preserve

Manager (# of Stations)

- AZMET (5)
- BLM (1)
- BMGR East (35)
- BMGR West (5)
- NOAA COOP (9)
- Cabeza (10)
- Kofa NWR (24)
- Maricopa County FCD (30)
- ORPI (26)
- El Pinacate (3)
- Private (2)
- YPG (21)
- Weather Station Study Area

World Geodetic System 1984 (WGS84) Projection
Zone 12 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

3.3 Vegetation and Invasive Plants

Nearly 290 species of plants characteristic of the Arizona Upland and Lower Colorado River Valley subdivisions of the Sonoran Desert are reported to occur at the BMGR. The Arizona Upland Subdivision is restricted principally to the portions of the range east of SR 85 where the slopes and upper bajadas of the Sand Tank and Sauceda mountains provide favorable soils and elevations, and adequate precipitation. The plant communities within the remaining portion of the range are within the Lower Colorado River Valley Subdivision. The distribution of plant communities within both of these subdivisions is influenced by the diverse landscape of the range, in which the series of widely spaced rugged mountain ranges, broad valley plains, sand dune systems, surface water drainages, and playas are the most important features.

3.3.1 Update

In 1981, the NPS developed a vegetation map for the Organ Pipe Cactus NM following the protocol developed by P.L. Warren and others from the UA (Malusa and Sundt 2015). Since this time, an effort has been underway to map all connecting federal land management entities following the same standardized protocol through the support of the Desert Southwest Cooperative Ecosystem Studies Unit and UA. Completed areas include the BMGR West, Organ Pipe Cactus NM, Cabeza Prieta NWR and BLM lands in the Ajo Block, and portions of the BMGR East (Malusa 2003; McLaughlin et al. 2007; Osmer et al. 2009; Malusa 2010; Shepherd 2011; Whitbeck 2013; Malusa and Sundt 2015; Weston and Fehmi 2016). Mapping continues on the BMGR East along its eastern 'stair-step' boundary with the Sonoran Desert NM as well as on areas with greater than a 20 percent slope. When the remaining portions of the BMGR East are completed (in 2019), one cohesive map will be produced for all mapped federal lands within southwestern Arizona. This seamless map will provide a baseline for ecosystem management decisions and be a useful tool for land and resource managers to better understand how wildlife are utilizing the landscape, their movement patterns, habitat use, and associated vegetation.

The vegetation maps classify vegetation communities following the U.S. National Vegetation Classification System (USNVC). The hierarchical framework of the USNVC documents community alliances and associations. Alliance is the broadest level of classification used for vegetation mapping and is defined by a characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically where at least one is found in the uppermost or dominant stratum of the vegetation layer (USNVC 2017). Alliances reflect regional climate, hydrologic, substrate, and disturbance regimes and trends (USNVC 2017). Associations represent the finest scale at which communities are mapped and are based on the characteristic range of species composition, diagnostic species occurrence, habitat conditions, physiognomy, and local climatic, hydrologic, and disturbance regimes and trends (Jennings et al. 2006; USNVC 2017). Occasionally, vegetation communities are mapped down to the sub-association level whereas an association typically occurs with a particular landform, such as with White Bursage-Big Galleta Grass on Dunes (Malusa and Sundt 2015).

BMGR East

Detailed mapping was conducted by UA in five phases (Figure 3.5). The first phase began in 2003 with the mapping of the NTAC and STAC (McLaughlin et al. 2007). Next the ETAC Range and Area B were mapped, then the western San Cristobal Valley, and then the eastern San Cristobal Valley, Aguila Mountains, and Sentinel Plain (Osmer et al. 2009; Shepherd 2011; Whitbeck 2013; Weston and Fehmi 2016). To complete the remaining portions of the comprehensive vegetation association mapping effort, the following areas are scheduled to be mapped over the course of two fiscal years (FY), FY 18 and FY 19. Remaining areas to be mapped include:

- Approximately 11,000 acres along the 'stair-step' boundary between the easternmost portion of the range and the Sonoran Desert NM.
- Approximately 90,000 acres identified as having a slope greater than 20 percent. These areas were deemed less suitable for Sonoran pronghorn and were not mapped in order to reduce costs. As of February 2018, the remaining areas to be mapped are accounted for within the Brittlebush (*Encelia farinose*) - Creosote - White Bursage / Yellow Paloverde association.

Table 3-1: BMGR East Vegetation Associations

VEGETATION ASSOCIATION	TOTAL ACRES
Creosote / Paloverde - Ironwood	221,645
Creosote - Triangle Leaf Bursage	148,356
Creosote Floodplain	135,891
Creosote - White Bursage - Triangle Leaf Bursage	114,980
Creosote Monotype	110,577
Brittlebush (*Encelia farinose*) - Creosote - White Bursage / Yellow Paloverde (90,000 acres un-surveyed)	135,513
Creosote - White Bursage	55,264
>20% Slopes or Mountains	29,943
Bursage / Creosote – Wolfberry (*Lycium* spp.) / Paloverde	23,529
Mountain Uplands	20,522
Creosote - White Bursage - Big Galleta Grass	19,459
Disturbed	14,647
White Bursage - Creosote - Teddy Bear Cholla (*Cylindropuntia bigelovii*)	11,846
Creosote - Teddy Bear Cholla	9,905

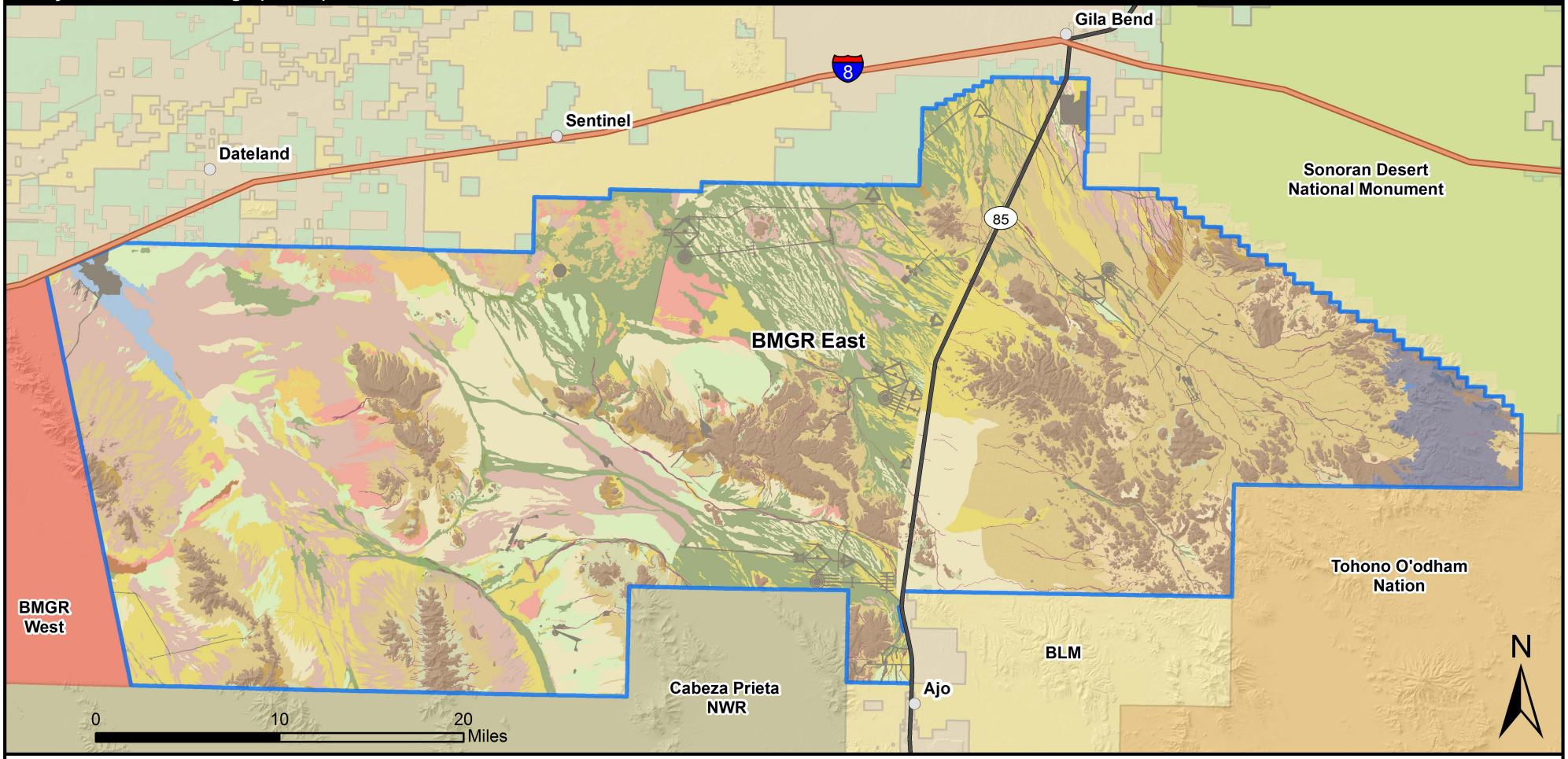
Table 3-1: BMGR East Vegetation Associations

VEGETATION ASSOCIATION	TOTAL ACRES
Wolfberry	8,074
Creosote - Fagonia (*Fagonia* spp.) - White Bursage	5,715
Saltbush (*Atriplex* spp.) - Slender Saltbush (*A. tenuissima*) - Creosote	5,393
Creosote / Desert Saltbush (*A. polycarpa*) / Mesquite	4,165
Bursage spp. / Creosote / Yellow Paloverde / Ironwood	2,318
White Bursage / Big Galleta Grass / Creosote	1,199
White Bursage - Creosote	943
Jojoba (*Simmondsia chinensis*) / Lycium Mountains	872
Mesquite - Paloverde	817
Honey Mesquite (*P. glandulosa*) *Playa*	88
Brittlebush Terrace	71
Barren	51

Figure 3.5: BMGR East Vegetation Community Map

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstate 8
- State Route 85
- BMGR East
- BMGR West
- Cabeza Prieta NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- BLM
- State Trust Land

BMGR East Vegetation Associations

- 0 - Barren
- 10 - Creosote Monotype
- 11 - Creosote - White Bursage
- 12 - Creosote - Triangle Leaf Bursage
- 13 - Creosote - White Bursage - Triangle Leaf Bursage
- 14 - Creosote - Teddy Bear Cholla
- 15 - Creosote Floodplain
- 16 - Creosote - White Bursage - Big Galleta Grass
- 17 - Creosote / Palo Verde - Ironwood
- 18 - Creosote / Desert Saltbush / Mesquite
- 19 - Creosote - Fagonia - White Bursage
- 21 - Bursage / Creosote - Wolfberry / Palo Verde
- 24 - White Bursage - Creosote - Teddy Bear Cholla
- 25 – Bursage spp. / Creosote / Yellow Palo Verde / Ironwood
- 26 - White Bursage / Big Galleta Grass / Creosote
- 28 - White Bursage - Creosote
- 30 - Jojoba / Lycium Mountains
- 31 - Mountain Uplands
- 50 - Disturbed
- 60 - Brittlebush Terrace
- 63 - Brittlebush - Creosote - White Bursage / Yellow Palo Verde
- 70 - Saltbush - Slender Saltbush - Creosote
- 80 - Mesquite - Palo Verde
- 81 - Wolfberry
- 82 - Honey Mesquite Playa

World Geodetic System
1984 (WGS84) Projection
Zone 12N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

BMGR West

Vegetation mapping efforts began in 2009 and were completed in 2014 (Malusa 2010; Malusa 2012; Malusa and Sundt 2015) (Figure 3.6). The majority of the BMGR West is part of Mojave-Sonoran Semi-Desert Scrub macrogroup, which covers most of the Mojave and Sonoran deserts in the Southwestern U.S. Within this macrogroup, there are six alliances including creosote, bursage, saltbush, brittlebush, watercourse, and blue paloverde. Within these alliances are 23 associations, such as Creosote – Teddy Bear Cholla. Finally, within these associations are 40 subassociations, the most detailed mapping unit, which often includes a reference to a particular landform, such as Creosote - White Bursage / Ocotillo on ridges.

The remainder of the BMGR West falls under the Great Basin and Intermountain Dry Shrubland and Grassland Macrogroup. This vegetation is characterized by shrubs like Mormon tea (*Ephedra viridis*), and is restricted to the north slopes of the higher mountains. Within this macrogroup there is one alliance, two associations, and two subassociations on the BMGR West (Malusa and Sundt 2015). The 2015 report *Vegetation Mapping of the Barry M. Goldwater Range West, Marine Corps Air Station-Yuma, Arizona* (Malusa and Sundt 2015) provides a detailed description of the sub-association vegetation map classes. Figure 3.6 depicts the BMGR West vegetation communities mapped at the association level. Table 3-2 lists and quantifies the broadly categorized vegetation associations that cover the BMGR West (Malusa and Sundt 2015):

Table 3-2: BMGR West Vegetation Associations

VEGETATION ASSOCIATION	TOTAL ACRES
Creosote - White Bursage	275,715
Creosote - Bursage / Paloverde - Ironwood	97,543
Creosote Monotype	96,401
White Bursage - Elephant Tree	49,096
White Bursage - Big Galleta Brass	28,040
White Bursage - Creosote	26,403
Wolfberry	15,082
Creosote - Triangle Leaf Bursage	14,252
Creosote - White Bursage - Big Galleta Grass	13,639
Creosote - Fagonia - White Bursage	11,984
Creosote - White Bursage - Triangle Leaf Bursage	10,629
Brittlebush - Creosote - White Bursage / Yellow Paloverde	10,073

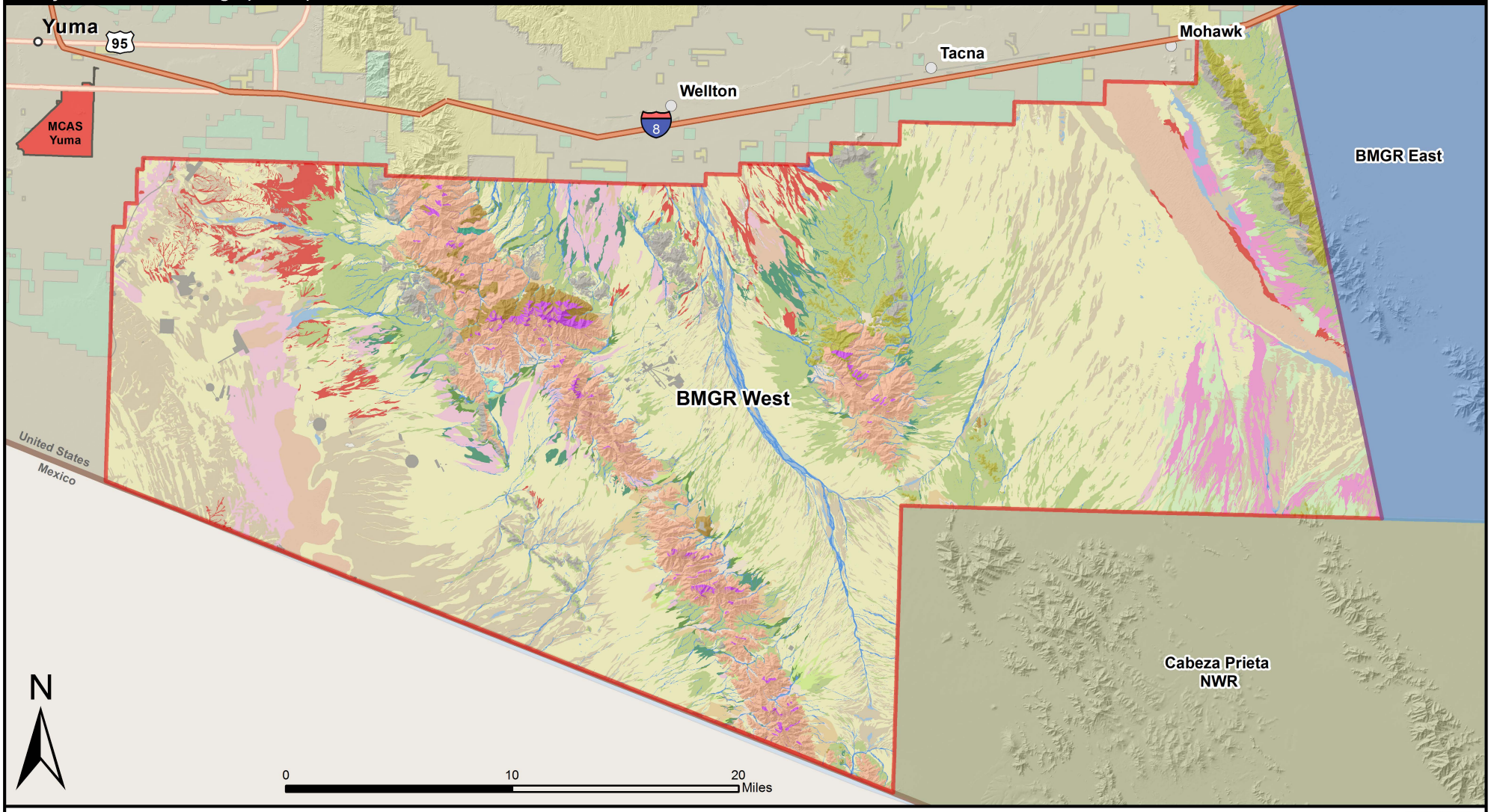
Table 3-2: BMGR West Vegetation Associations

VEGETATION ASSOCIATION	TOTAL ACRES
Creosote - Teddy Bear Cholla	9,867
Creosote Floodplain	6,256
White Bursage – Creosote / Paloverde / Ironwood	5,687
Disturbed	4,155
Brittlebush - Creosote	4,075
White Bursage – Creosote - Teddy Bear Cholla	3,949
Mormon Tea – Agave (*Agave* spp.) / White Bursage	2,864
Brittlbush – Ironwood - Blue Paloverde	2,600
Arrowleaf (*Pleurocoronis pluriseta*) / Sumac (*Rhus* spp.) / Beargrass (*Nolina microcarpa)* / Mormon Tea	1,937
Brittlebush - White Bursage-Creosote	1,934
Barren	911
Lavender (*Hyptis emoryi*) - Holly Leaf Bursage (*A. ilicifolia*)	444
Blue Paloverde / Holly Leaf Bursage	263
Desert Holly (*A. hymenelytra*) - White Bursage	147
Mesquite – Paloverde Bosque	19

Figure 3.6: BMGR West Vegetation Community Map

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- Interstate 8
- Highways
- City/Town
- BMGR East
- BMGR West
- MCAS Yuma
- Cabeza Prieta NWR
- BLM
- State Trust Land

BMGR West Vegetation Associations

- 0 - Barren
- 10 - Creosote Monotype
- 11 - Creosote-White Bursage
- 12 - Creosote-Triangle Leaf Bursage
- 13 - Creosote-White Bursage-Triangle Leaf Bursage
- 14 - Creosote-Teddy Bear Cholla
- 15 - Creosote floodplain
- 16 - Creosote-White Bursage-Big Galleta Grass
- 17 - Creosote-Bursage/Palo Verde-Ironwood
- 19 - Creosote-Fagonia-White Bursage
- 24 - White Bursage-Creosote-Teddy Bear Cholla
- 26 - White Bursage-Big Galleta Grass
- 27 - White Bursage-Elephant Tree
- 28 - White Bursage-Creosote
- 29 - White Bursage-Creosote/Palo Verde/Ironwood
- 40 - Mormon Tea-Agave/White Bursage
- 41 - Arrowleaf/Sumac/Beargrass/Mormon Tea
- 50 - Disturbed
- 63 - Brittlebush-Creosote-White Bursage/Yellow Palo Verde
- 67 - Brittlebush-Creosote
- 68 - Brittlebush-White Bursage-Creosote
- 69 - Brittlebush-Ironwood-Blue Palo verde
- 71 - Desert Holly-White Bursage
- 80 - Mesquite-PaloVerde
- 81 - Wolfberry
- 83 - Lavender-Hollyleaf Bursage
- 90 - Blue Palo verde/Hollyleaf Bursage

World Geodetic System
1984 (WGS84) Projection
Zone 11N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

3.3.2 Invasive Plants

Exotic, invasive, or noxious plants are characterized by their ability to easily colonize disturbed areas. They have specialized dispersal mechanisms that allow them to quickly become the dominant vegetation in an area. Invasive plants generally have the potential to impact native vegetation communities. Roads, livestock grazing and people, serve as the primary vectors for invasive species on the BMGR.

If left undetected, unmonitored, and unmanaged, nonnative invasive species could fundamentally alter the BMGR's ecosystem structure through competition with native species. Other effects include a reduction of species diversity, and enhancing the spread of wildfires (Villarreal et al. 2011).The following species have been identified and are being actively monitored and managed by physical removal and disposal and/or chemical methods.

- Sahara mustard (*Brassica tournefortii*)
- Buffelgrass (*Pennisetum ciliare*, Syn. *Cenchrus ciliaris*)
- Fountain Grass (*Pennisetum setaceum*)
- Mediterranean grass (*Schismus arabicus* and *S. barbatus*)
- Colocynth (*Citrullus colocynthis*) (small population discovered on the BMGR East in 2017)
- Lehmann lovegrass (*Eragrostis lehmanniana*)
- Salt cedar (*Tamarix ramosissima*)
- Athel tamarisk (*Tamarix aphylla*)
- Russian thistle (*Salsola tragus*)
- Red brome (*Bromus rubens*)

Figure 3.7: Buffelgrass outbreak in Area B.

Figure 3.8: Fountain grass infestation. (NPS 2016).

Figure 3.9: Sahara mustard thriving in early spring.

3.3.2.1 Update

BMGR East

There has been an observable expansion of buffelgrass along the SR 85 corridor, with the vast majority of this expansion occurring outside of the BMGR fence line along the highway right-of-way. Buffelgrass has also been reported in the STAC, areas within the San Cristobal Valley, and within portions of Area B, south of the Crater Mountains, where it appears to be extending up from the highway along several small drainages. Staff from the 56 RMO have conducted a multiyear study examining and mapping buffelgrass rate of spread along SR 85. Results from the research suggest that buffelgrass expansion is limited to draws and washes, making control efforts feasible (Whittle and Black 2015).

Two other invasive species of concern include Mediterranean grass (*Schismus* spp.) and Sahara mustard. Mediterranean grass is widespread throughout the range and is most common on fine grained soils. Sahara mustard is most common west of SR 85 and has become well established along many of the NTAC and STAC roadways and within several of the target areas. Both Mediterranean grass and Sahara mustard are annual weeds that appear to be largely weather dependent and are much more abundant following wet winters.

A small population of colocynth, or desert gourd, was recently found adjacent to the Range 1 access road in close proximity to an active archeological excavation. It is believed that colocynth seeds were potentially brought in on excavation equipment being used for the archeological operation. All identified plants and fruits were pulled and disposed of, although there was evidence of broken and partially eaten fruit, indicating seed dispersal may have occurred. The surrounding area is now being monitored by 56 RMO staff to attempt to limit the spread of this invasive species.

Luke AFB has developed and implemented an Integrated Pest Management Plan (IPMP) that includes guidance and protocols for invasive species removal and management for both the Gila Bend AFAF and the BMGR East (Luke AFB IPMP 2015). This plan outlines the budgeting mechanisms, applicator certification requirements, reporting and recordkeeping requirements, health and safety guidelines, regulatory compliance, herbicide storage, mixing, safety, and disposal guidance, and guidance for invasive species removal and control. Methods for control include a combination of physical and mechanical removal as well as the application of herbicide through both foliar spot spraying and aerial application. Restricted-use herbicides are not currently approved for application at either Gila Bend AFAF or the BMGR East and only Environmental Protection Agency (EPA)-registered pesticides containing glyphosate as the primary active ingredient, are currently being applied. In general, regardless of the manner in which the herbicides are applied, herbicides will be used in a "judicious and prudent manner using products that quickly degrade and have little risk of contaminating water or affecting wildlife" (Luke AFB IPMP 2015).

Physical removal and disposal of invasive plants by hand, is prioritized in small (<100 acres), environmentally sensitive areas. Application of herbicide by ground equipment is being utilized in areas with low density stands of invasive weeds that are accessible by vehicles and foot. Ground-based equipment is also being used to make targeted applications in accessible infested areas with high densities of environmentally sensitive species. Aerial application of herbicide is restricted to

high density invasive species areas. It is typically applied by larger aircraft, which may include an USAF C-130 outfitted for pesticide dispersal. The USAF had an Environmental Assessment (EA) in place for a Sahara mustard control program using aerial herbicide application for two years at the BMGR East (Finding of No Significant Impact [FONSI]) was signed on 19 July 2012). The purpose of this program was to reduce wildfire risk and improve range quality for wildlife and native vegetation communities on approximately 7,800 acres that had high densities of Sahara mustard and few other environmentally sensitive plant species. This program resulted in improved control of Sahara mustard along approximately 15 linear miles of roadways. In the event that aerial herbicide treatments are required in the future, NEPA documents will be prepared. Additionally, the USAF will be required to re-enter consultation with the USFWS prior to conducting any future aerial treatments within Sonoran pronghorn habitat.

The 56 RMO is initiating a similar invasive species mapping and treatment project as the BMGR West, detailed below, using the GIS Cloud app. Currently, funding is in place to begin a partnership with UA to maintain and manage the GIS Cloud app data and to purchase one smartphone with an annual data plan. This device will be used by the BMGR East CLEOs to map and monitor invasive species on the east side of the range. Additionally, an MOU is being developed with the NPS Lake Mead Exotic Plant Management Team to serve in a similar capacity as it does for the BMGR West program, discussed below.

Figure 3.10: Colocynth thrives in hyper-arid desert landscapes. (Qatar Natural History Group)

Figure 3.11: Colocynth flower. (Qatar Natural History Group)

Figure 3.12: Colocynth fruit. (Qatar Natural History Group)

BMGR West

The MCAS Yuma RMD, in cooperation with the 56 RMO, partnered with researchers from UA to characterize and model Sahara mustard invasion throughout the BMGR. This study combined field measurements, controlled experiments, and mathematical modeling to determine environmental factors that affect Sahara mustard success and long-term impact on other native winter annual plants. More specifically, this study examined how spatial variation in both biotic and abiotic environments affected the population growth of Sahara mustard as well as its impact on native plants. It also attempted to quantify the natural dispersal range of the invasive species in order to better estimate the rate of spread across the BMGR.

Results from this research (Li and Malusa 2014; Li 2016), have been encouraging, showing that Sahara mustard can be effectively controlled because it is vulnerable to adverse post-germination

conditions due to its ephemeral seed bank. On a range-wide scale, after extended periods of winter droughts, Sahara mustards source populations are reduced to isolated areas where soils retain moisture. These populations will expand again across the landscape as conditions return to favorable. Successful elimination of persisting local populations after droughts, can effectively reduce its presence over the range. The knowledge gained from this study has provided strong scientific insight for managing Sahara mustard, and led to the development of a management program adopted by the MCAS Yuma RMD to reduce the presence of this species over time.

This management program involves a continuing partnership with MCAS Yuma RMD, UA, and NPS Lake Mead Exotic Plant Management Team. This project employs cloud-based mapping to document invasive species presence across the BMGR West allowing for targeted follow-up control efforts to be implemented in the most efficient manner possible (Figure 3.13). The project is designed to give the resource managers a timely method for mapping and tracking the spread of invasive weeds across the range, with particular focus on Sahara mustard and buffelgrass. This effort uses cloud-based mapping using the GIS Cloud app and smartphones to gather data on invasive species distribution and abundance. The app records the location of sighting along with dropdown menus to identify the species and estimate abundance. In addition, there are options to record photos, audio, and take specific notes for each point. Once completed, these points are automatically uploaded to an online map making the data immediately available to UA staff and the Lake Mead Exotic Plant Management Team. CLEOs from MCAS Yuma are typically the first to discover new invasive species populations and provide key survey data for the project.

As their part of this partnership, UA staff are tasked with data quality control, interpretation, and surveys to assess current invasion conditions, maintaining the GIS Cloud app, and prioritizing treatment areas based on real-time distribution of invasive plant emergence and habitat favorability of the invasive species. UA staff also perform before/after surveys of treatment areas and generate reports detailing the success or failure of each treatment effort and analyzing the results of the generated distribution models. Due in part to the simplicity and effectiveness of the GIS Cloud app, MCAS Yuma RMD staff, the BMGR West CLEOs, and UA staff together collected 1750 data points during the winter of 2016-2017, and over 2,800 data points since the program's inception in 2015 (Figure 3.13).

Upon receipt of data from the GIS Cloud app and treatment recommendations from UA staff, NPS Lake Mead Exotic Plant Management Team determines and implements the appropriate weed control treatment for each area. Treatment options include foliar spot spraying, cut stump treatments, and manual removal. All herbicide mixture and application practices follow NPS protocols and regulations. In addition, the NPS team purchases, stores, and delivers herbicides to project sites and observes all herbicide label requirements and guidance for each of the planned treatment options. The NPS team also completes and maintains the required MCAS Yuma Pesticide Application Records and submits them after each herbicide application project is completed.

Other contributions from the NPS Team include gathering, updating, and providing GIS information on potential areas identified for treatment during the following year as well as maintaining accurate records of project activities (using GPS/GIS technology), tracking the amount of herbicide and other chemicals used (i.e., surfactants), tracking areas surveyed, tracking acres and species treated, and

compiling their work into a final annual report that is electronically submitted to MCAS Yuma RMD within 30 days of project completion. One major benefit of this project is that MCAS Yuma personnel never have to handle or apply any herbicides. Since the GIS Cloud app monitoring and treatment program began in 2015, the NPS team has actively treated five invasive species including Sahara mustard, buffelgrass, salt cedar, Athel tamarisk, and fountain grass. Accumulatively, 6,739 acres have been surveyed resulting in the treatment of 11 acres (Table 3-3).

An important outcome of this program is the extensive knowledge of the occurrence and abundance of invasive plants, especially Sahara mustard. Yet, BMGR West is subject to invasion from the species' source populations outside of its jurisdiction. Successful control of Sahara mustard requires sufficient interagency collaborations to contain invasive populations on the BMGR East, Cabeza Prieta NWR, and other agency land (BLM, Bureau of Reclamation, etc.). The success of the management program has prompted staff at the Cabeza Prieta NWR to adopt the GIS Cloud app to monitor and treat Sahara mustard and buffelgrass on the Refuge. CLEOs for the BMGR East will initiate the use of the app in spring 2018. In addition, staff from the El Pinacate Preserve in Mexico have expressed interest in initiating a similar monitoring program. It is desirable to establish an interagency program that can sufficiently standardize the use of the GIS Cloud app across agencies and coordinate treatment efforts among agencies to target populations that are sources for infestations that cross jurisdiction boundaries.

Table 3-3: BMGR West Invasive Plant Treatment Efforts 2015-2017

Species	Year	Surveyed Acres	Infested Acres	Gross Infested Acres Treated	Treated Acres
Sahara mustard *(Brassica tournefortii)*	2015	1192.00	1.06	62.09	1.06
Buffelgrass *(Pennisetum ciliare)*	2015	1192.00	1.25	13.15	1.25
Salt cedar *(Tamarix ramosissima)*	2015	1192.00	0.02	0.15	0.02
Athel tamarisk *(Tamarix aphylla)*	2015	1192.00	0.00004	0.00005	0.00004
Fountain grass *(Pennisetum setaceum)*	2015	1192.00	0.0005	0.003	0.0005
Sahara mustard *(Brassica tournefortii)*	2016	3777.29	4.37	538.19	4.37
Buffelgrass *(Pennisetum ciliare)*	2016	3777.29	0.08	6.66	0.08
Salt cedar *(Tamarix ramosissima)*	2016	3777.29	0.002	0.02	0.002
Sahara mustard *(Brassica tournefortii)*	2017	1769.30	4.00	598.11	4.00
Buffelgrass *(Pennisetum ciliare)*	2017	1769.30	0.03	5.23	0.03
	Total	***6739 acres***	***11 acres***	***1224 acres***	***11 acres***

Acreage Definitions:

Surveyed Area: Any area covered during the course of weed management / control activities. An area may be considered "surveyed" regardless of the presence / absence of target weed species. Surveyed area is obtained by GPSing the perimeter, GPSing perimeter points or digitized on screen using landform references.

Gross Infested Area: The gross infested area is defined as the general perimeter of the infestation. Gross infested areas contain the target species and the spaces between populations or individuals. A gross infested area is calculated by adding up the total acreage of all mapped weed infestations, without taking into account percent cover.

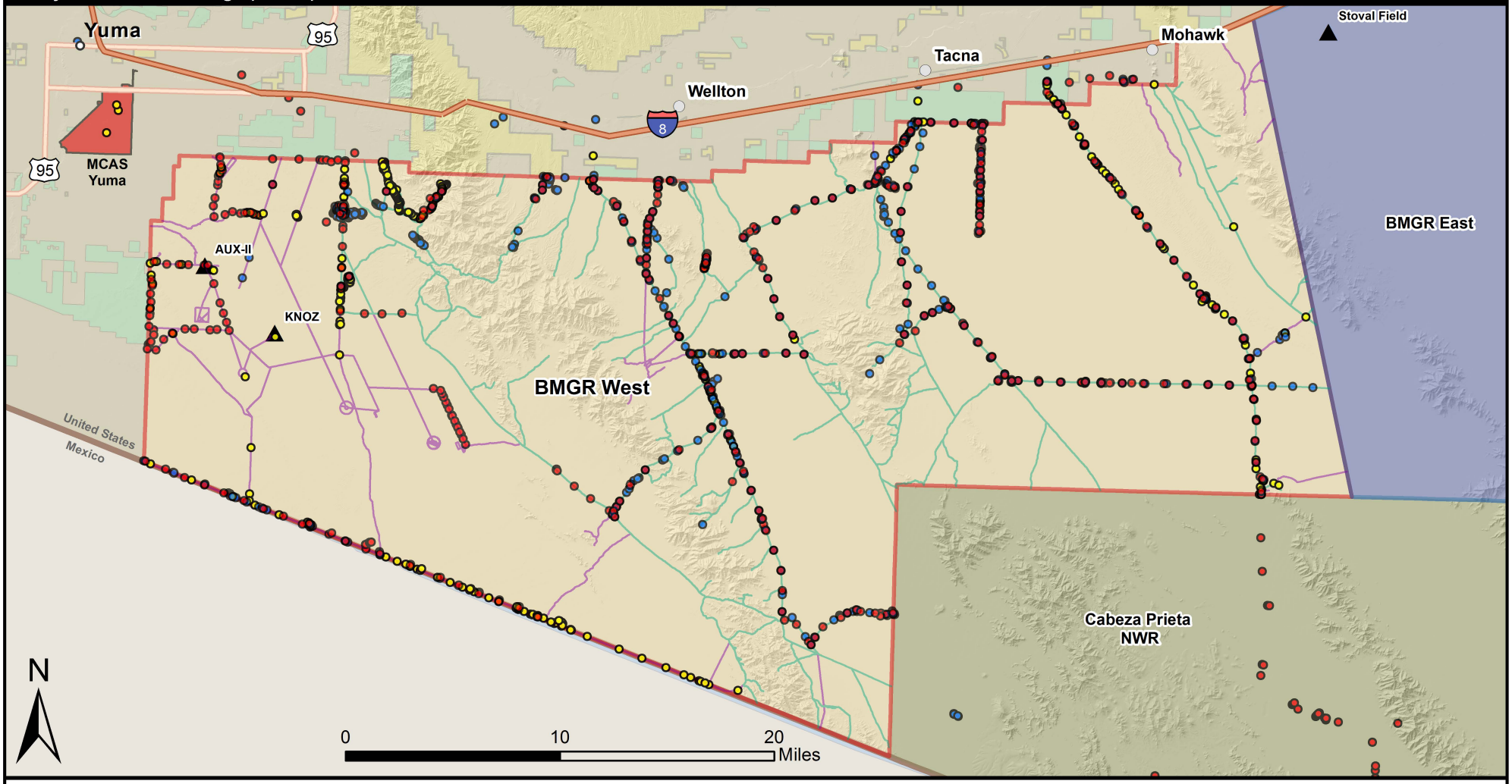
Net Infested Area: Actual area occupied by weed species within the gross infested area, which does not contain the spaces between individuals and populations. The total infest area (with the gross infested area) may be comprised of multiple infested areas, described by polygons, buffered points, buffered lines, or be calculated as the result of a stem count in which each individual is assigned a coverage multiplier.

Net Treated Area: Treated area is either the infested area or subset of an infested area which has received treatment action. Treatment area is calculated using the same standards as infested area.

** All of these terms apply to single species measurements. When there is more than one weed species in an area, the above measurements need to be applied to each species (population) individually.*

Figure 3.13: GISCloud App Invasive Species Mapping at BMGR West

Barry M. Goldwater Range (BMGR)



Legend

- City/Town
- Interstate 85
- Highways
- MCAS Yuma
- BMGR East
- BMGR West
- Cabeza Prieta NWR
- BLM
- State Trust Land
- BMGR Designated Admin Use Only Road
- BMGR Designated Public and Admin Use Road
- Auxiliary Airfield (AUX)
- GISCloud Weed Survey 2016-2017
- GISCloud Weed Survey 2015-2016
- GISCloud Weed Survey 2014-2015

World Geodetic System 1984 (WGS84) Projection
Zone 11 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

3.4 Wildland Fire Management

Wildfires greater than a few acres in size were almost unknown at the BMGR until the early 2000s. Low densities of native Sonoran Desert vegetation typically did not provide sufficient fuel to carry fires over large areas. The natural fire regime for portions of the Sonoran Desert, including the BMGR, was calculated to be on an estimated 295-year cycle (Schmid and Rogers 1988). Sonoran Desert vegetation is typically not fire-dependent, and large fires within these vegetation communities have the potential to significantly alter vegetation composition at the ecosystem or landscape level. Desert vegetation such as saguaro cactus, organ pipe cactus (*Stenocereus thurberi*), blue paloverde, ocotillo, and creosote bush are very susceptible to fire and may take decades to re-establish.

3.4.1 Update

The spread of non-native, invasive plants has altered the natural fire regime in some areas. Historically, bare space between shrubs and trees limited the extent that fires could spread in the Sonoran Desert. Now, changes in climate, human activities, and the resulting spread of invasive species are influencing an increasing fuel load, changing fuel characteristics, and places some fire-intolerant native species in danger. Introduced grasses and forbs increase fuel continuity across the landscape, altering vegetation composition and resulting in an increase of fire size, frequency, and intensity (Geiger and McPherson 2005). This, coupled with the fact that many invasive species tend to be the first species to recover post-fire, typically increasing in both density and coverage, leads to a particularly concerning positive feedback loop. Under this scenario, increases in invasive species abundance lead to increased fire activity, which in turn favors increased abundance for those same invasive species and subsequently more frequent and larger fires. The end result of this potential scenario is an altered fire regime.

A wildfire, evidently fueled by Sahara mustard, burned approximately 500 acres of native creosote-bursage community at the BMGR West in 2008 or 2009. Post-fire field inventory showed that the mustard was the only species recovering in the area (Malusa 2010), indicating that the fire regime may be changing over time. This trend places a priority on continuing invasive species management so as to protect the quality of the range for native plants and wildlife and to ensure no impact to the military training activities and readiness mission.

BMGR East

Since 2011, there have been 126 fires at the BMGR East ranging in size from a few square yards to several hundred acres. These fires are reported to and investigated by, the 56 RMO Wildland Fire Program Manager. An account of each incident is documented and stored in the 56 RMO BMGR East Fire History Spreadsheet.

The 56 RMO is working to develop the first-ever Wildland Fire Management Plan (WFMP) for the area. The plan will define roles and responsibilities and provide guidance for the offices, departments, and agencies involved and will describe fire pre-suppression and suppression actions to be taken on a strategic as well as, a tactical basis (56 RMO 2014). The document will serve as the guiding plan for wildfire response protocols moving forward. As part of this WFMP development

process, the 56 RMO also signed an MOU with the BLM for fire suppression assistances on BMGR East (BLM and 56FW 2017).

BMGR West

Wildfire risk at the BMGR West is much less than at the BMGR East, given the difference in precipitation patterns and the resulting increase in the area of bare ground and scarcity of vegetation. Subsequently, there have been very few wildfires on the west side of the range. Even with this reduced risk, MCAS Yuma is required to develop and implement a WFMP per MCO 5090.2A w/ changes 1-3 (HQMC 2013). The WFMP will define roles and responsibilities for offices, departments, and agencies involved in wildfire pre-suppression and suppression activities as well as provide guidance for firefighters, public safety officials and the RMD to maximize military training operations prior to and during a wildland fire event. Once the WFMP is complete, the MCAS Yuma RMD intends to develop a MOU with the BLM for fire suppression assistance on the BMGR West.

3.5 Wildlife

Existing inventories show that over 200 bird species, more than 60 species of mammals, 10 amphibian species, and over 50 reptile species may potentially occur, within the combined BMGR and the adjacent Cabeza Prieta NWR. Available evidence indicates that the diversity of wildlife species and habitats present in 1941 when the BMGR was established continue to be found within the range today in abundances that are relatively stable and typical for this portion of the Sonoran Desert. This may be attributed to several factors including:

- The land is withdrawn for military use, which has excluded or limited other land uses—such as livestock grazing, farming, mining, and intensive off-road vehicle recreation—that potentially would have altered physical and biological systems to a greater extent than has military training
- Ecological interconnections with two national monuments and one national wildlife refuge have remained unfragmented and undiminished
- The primary use of the land, aviation training, has limited on-ground disturbances of soils and vegetation to a relatively small and dispersed proportion of the range
- Restrictions and limits on public access and use have left many portions of the range free of disturbances from intensive and concentrated recreation activities
- The BMGR is far from major metropolitan areas, which has likely minimized public visitation and the effects of prolonged intensive use
- Surface drainage patterns generally isolate the range and its surrounding area hydrologically, which have protected it from upstream water-borne pollutants, sedimentation, and watershed modification

AGFD has management authority for the state's wildlife, which is held in trust for the citizens of the State of Arizona. This authority applies to the BMGR unless otherwise pre-empted by federal law. AGFD began wildlife management activities on the BMGR with the establishment of water sources (Section 3.6) in the late 1950s and continue with their upkeep today. AGFD is also involved in many aspects of the BMGR's wildlife program. AGFD continues to organize and conduct bighorn sheep and deer surveys on the BMGR at three year-intervals, annual call-counts of mourning (*Zenaida macroura*) and white-winged doves (*Z. asiatica*) at Range 3 and ETAC and Le Conte's thrasher (*Toxostoma lecontei*) surveys within both the BMGR East and West. AGFD also performs annual surveys for the Flat-Tailed Horned Lizard (FTHL, *Phrynosoma mcallii*), speckled rattlesnakes (*Crotalus mitchellii*), and bats on the BMGR West.

Figure 3.14: AGFD conducts surveys for many species on the BMGR including FTHL (left), Le Conte's thrasher (middle), and bighorn sheep (right).

3.5.1 Update

BMGR East

In August 2015, the U.S. Army Corps of Engineers (USACE) Omaha District and AGFD entered into a five-year cooperative agreement to "collect, analyze, and apply environmental and cultural resource data and implement land rehabilitation and maintenance for optimal management of lands under control of the DoD" (USACE 2015). The agreement facilitates AGFD management activities on the BMGR East, which typically include conducting wildlife surveys to determine population trends, providing recommendations based on survey data for restoring or maintaining resident species, controlling wildlife populations at appropriate sustained levels for protection of other BMGR resources' values, and enforcing state game laws.

Collaborative efforts with AGFD, and other partners, include the implementation of actions within the Sonoran Pronghorn Recovery Plan and conducting a number of wildlife activities during the FY 2018-2024 timeframe. Reoccurring surveys will occur for the following species: desert tortoise (every 5 years); bird surveys (years 1 and 2), kit fox (years 1 and 4); and cactus ferruginous pygmy owl (bi-annually). Surveys for raptors and bats will occur annually.

In-house staff and partners will continue the ongoing effort to control invasive species to improve wildlife habitat and identify and maintain important wildlife connectivity corridors. Additional habitat enhancements and restoration activities will be undertaken as needed.

A complete list of wildlife surveys and habitat improvement projects planned for the next five years can be found in Table 9-1 *BMGR East 5-Year Work Plan: FY 2018-2024.* Sensitive species monitoring and conservation projects are discussed in detail in Section 3.7 *Protected Species*.

BMGR West

Determining baseline indices for small mammals, reptiles, and amphibians is critical in determining management practices in order to comply with government regulations and requirements regarding wildlife and natural resource management. The first comprehensive inventory of amphibians, reptiles, and small mammals is currently being conducted. This project will last for three years and accomplish three objectives: (1) create maps indicating species distribution, (2) identify an efficient, repeatable monitoring methodology, and (3) determine recommendations for monitoring and management of wildlife species.

Wildlife surveys and habitat improvement projects planned for the next five years can be found in Table 9-2 *BMGR West 5-Year Work Plan: FY 2018-2024.* Sensitive species monitoring and habitat enhancement projects are discussed in detail in Section 3.7 *Protected Species*.

3.6 Wildlife Waters

Playas, *tinajas*, and other natural water resources are important to migratory birds and other wildlife. Many of these resources were modified to extend the availability of water for their benefit. AGFD has constructed catchments at locations across the range to collect and store rainfall. During periods of extreme drought, AGFD will routinely refill these water sources by hauling tens of thousands of gallons annually, both by vehicle and helicopters, to support wildlife species. These sites are also being used and affected by illegal immigration and trafficking across the range.

Figure 3.15: Camera traps capture wildlife waters being utilized by UDAs.

3.6.1 Update

BMGR East

Researchers from Texas Tech conducting amphibian research on the BMGR, detected elevated levels of ammonium (NH_3) at several wildlife waters sites. This prompted the USGS to evaluate the water quality at a variety of different wildlife waters across the BMGR, including natural and modified *tinajas*, and artificial water catchments. Sampling began in 2013 and has continued each year since (USGS 2013 – 2016). The water is tested for a variety of chemical parameters as well as blue-green algae (cyanobacteria), and chytrid fungus (*Batrachochytrium dendrobatidis*).

The results of the water quality analysis have varied over the 4 years of sampling. Ammonia concentrations at a number of sites have occasionally exceeded both the Arizona Department of Environmental Quality (ADEQ) acute and/or chronic aquatic life and wildlife standards (ADEQ 2009; USGS 2013-2016). In 2015, the iron (Fe) concentrated at wildlife water 1148 exceeded the EPA-recommended freshwater aquatic life criteria (USGS 2016). No samples have revealed blue-green algae concentrations above the detection limits for microcystin, cylindrospermopsin, and saxitoxin. Several wildlife waters tested positive for chytrid fungus in 2013, 2014, and 2016 (USGS 2013; 2016). The majority of the positive samples were "below detection limit", meaning the concentration of chytrid fungus present was below the detection threshold of 10 copies/uL (USGS 2013-2016).

A concern among tribal cultural experts and archaeologists is the modification of natural water sources, *tinajas*, to create more reliable wildlife waters (56 RMO 2009). Water has always been a critical resource to desert dwellers and travelers and archaeological evidence is often concentrated around natural water resources. Modifications and ongoing maintenance could result in damage or destruction to these traditionally significant resources.

The tribes would like to have the enhancements and modifications removed and the *tinajas* restored to as natural state as possible. The USAF is working with the tribes and AGFD to remove the structures and has prohibited any alterations of existing structures on *tinajas.* Only construction and remodeling of existing artificial wildlife waters is permitted.

Over the next five-year planning period the BMGR East will continue a holistic review based on previous studies and relevant literature to evaluate the benefits and adverse effects of wildlife waters, continue water quality monitoring, develop recommendations for management and support AGFD annual maintenance of all existing water developments and redevelopment as required.

BMGR West

The BMGR West will continue to work with AGFD to monitor and maintain existing wildlife waters network over the next five-year period covered by this INRMP.

3.7 Protected Species

There are currently three species listed under the Endangered Species Act (ESA) known to occur on the BMGR. They are the Sonoran pronghorn (*Antilocapra americana sonoriensis*), lesser long-nosed bat (*Leptonycteris curasoae*), and acuña cactus (*Echinomastus erectocentrus* var. *acunensis*). The

pronghorn (Section 3.7.2.1) is dependent on the Sonoran Desert ecosystem of the BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus NM for its continued survival. The lesser long-nosed bat (Section 3.7.2.3) is known to forage on the BMGR and in 2016 a roost was discovered on ETAC. The lesser long-nosed bat is currently proposed for delisting from the Threatened and Endangered species list. The acuña cactus has been recently (2013) awarded endangered status and is found mainly on the BMGR East, Tohono O'odham Nation Reservations, BLM, Organ Pipe Cactus NM, and southeast of Phoenix (between Cactus Forest and Kearny).

The FTHL has no federal protection, but is listed as threatened in Mexico and is a species of special concern in Arizona and a species of concern in California. The FTHL occurs in BMGR West and is managed in accordance with the Candidate Conservation Agreement and FTHL Rangewide Management Strategy (RMS) to which the USMC and AGFD are parties. The FTHL (Section 3.7.2.4) occurs at the far western portion of the BMGR West and has been the subject of considerable activity within the ESA and federal courts. Much of the FTHL's historic habitat (possibly as much as 50 percent) in the U.S. has been lost due to agricultural and residential development. In 2011, the USFWS withdrew its proposed listing based in part on protections offered by the 2003 RMS (FTHL Interagency Coordinating Committee). As a Signatory Agency, MCAS Yuma has incorporated RMS measures into the INRMP, including participating as an FTHL Interagency Coordinating Committee member and conducting annual occupancy and demographic surveys, and research.

Peirson's milkvetch (*Astragalus magdalenae peirsonii*) is listed as threatened. The plant is primarily found on the Algodones Dunes in California and the dunes of the Gran Desierto of northwestern Sonora, Mexico. On the BMGR, a single specimen was thought to be collected in 1996 near the range's western boundary. However, the specimen was subsequently assigned to a different subspecies. Peirson's milkvetch is not currently known to exist in Arizona, although it occurs nearby in Sonora and suitable habitat exists in the Yuma Dunes at the BMGR West. Surveys during 2003 and 2004 failed to find the species (BMGR Task Force 2005). The only Biological Opinion (BO) addressing effects of the BMGR military activities on Peirson's milkvetch was in 2001. In this Opinion, the USFWS found that the actions proposed were not likely to jeopardize the continued existence of Peirson's milkvetch. The rationale for this conclusion was that relatively limited potential habitat existed on the BMGR and USMC activities were expected to only minimally affect those habitats (BMGR Task Force 2005). The species has not been found during any surveys to date; however, in accordance with the 2001 BO, if the species is found at the BMGR, re-initiation or consultation with the USFWS may be warranted.

The Sonoran desert tortoise (*Gopherus morafkai)* is not a federally listed species, but is an Arizona Species of Greatest Conservation Need (SGCN). The BMGR applies conservation strategies as outlined in the Conservation Agreement which is discussed in more detail in Section 3.7.2.2 *Desert Tortoise Update*.

Federally threatened and endangered species that have not been documented at the BMGR, but have the potential to occur are listed in Table 3-4. In addition, Arizona Status and Arizona's State Wildlife Action Plan (SWAP) score are listed.

3.7.1 Changes in the Protection Status of Species since the 2012 INRMP

Acuña Cactus

In 2013, the acuña cactus was designated federal status as an endangered species. It is also protected by the Arizona Native Plant Law and is designated as a highly safeguarded native plant. On 19 September, 2016 the USFWS designated critical habitat for the acuña cactus. The critical habitat includes six geographically separate units totaling approximately 18,535 acres (50 C.F.R. § 17). One unit is adjacent to the northeastern portion of the BMGR East; however, lands within the BMGR are exempt from critical habitat designation. At least three distinct clusters of an acuña cactus exist in the BMGR East (Urreiztieta 2013 and Abbate 2017). The plant has not been detected in the BMGR West, nor is it expected to occur.

Bald and Golden Eagle

On 6 December, 2016, the USFWS issued a Final Rule (50 CFR Parts 13 and 22) revising the regulations for permits for incidental take of eagles and take of eagle nests to enhance clarity to the regulations and improve compliance while maintaining protection for eagles. Revisions include permit issuance and duration, definitions, compensatory mitigation standards, criteria for eagle nest removal permits, permit application requirements and fees (50 CFR Parts 13 and 22).

Desert Tortoise

On 5 October 2015, the Sonoran population of the Sonoran desert tortoise was removed from the ESA candidate list (Federal Register 2015), but retains SGCN status as designated by the State of Arizona. In 2015, a Candidate Conservation Agreement was developed as a collaborative and cooperative effort between land and resource management agencies, including the BMGR managing agencies (USAF and USMC). The key effort of the conservation strategy is to focus on conservation, habitat improvement, and ongoing management of the Sonoran desert tortoise status and habitat.

Lesser long-nosed bat

The lesser long-nosed bat was proposed for delisting by the USFWS in January 2017. In compliance with the regulations of implementing the ESA, as well as USFWS policies and guidelines related to post-delisting management and monitoring, the USFWS, the AGFD, and the New Mexico Department of Fish and Game have developed a post-delisting monitoring plan. The purpose of this plan is to ensure that the lesser long-nosed bat population remains secure from the risk of extinction following delisting.

3.7.2 Federally Listed Threatened and Endangered Species

3.7.2.1 Sonoran Pronghorn Update

The Sonoran pronghorn has been listed as a federally endangered species since 1967. Data from 1925 through 1991 indicate that relatively low numbers (approximately 50 to 150 animals) of pronghorn have been present in southwestern Arizona. The area of pronghorn distribution has become smaller over the years. However, the methods and geographic study areas used to estimate the pronghorn population have also varied over time. In 1992, AGFD initiated regular biennial aerial surveys of the

Sonoran pronghorn population. Based on these surveys, the peak for the U.S. population was estimated at 282 animals in 1994, and the population low was estimated at 21 to 33 animals in 2002 after a severe drought.

The pronghorn's current range includes portions of the BMGR East (Figure 3.18) and the BMGR West (Figure 3.19). The USAF and USMC actively participate in and financially support the Sonoran Pronghorn Recovery Plan and the actions of the Sonoran Pronghorn Recovery Team. Led by the AGFD, the recovery team consists of representatives from the Luke AFB, MCAS Yuma, USFWS, NPS (from Organ Pipe Cactus NM, BLM (from the Lower Sonoran Field Office), UA, Commission for Ecology and Sustainable Development of the State of Sonora (Mexico), National Commission for Protected Natural Areas (Mexico), veterinary staff and representatives from Phoenix Zoo and Los Angeles Zoo, and a representative from the U.S. Department of Homeland Security (Atkinson 2012). In the past, the wildlife biologist for the Tohono O'odham Nation represented the Nation on the recovery team. Currently, this position is empty and no representative has fulfilled this role. An invitation has been extended for a representative to participate on the recovery team.

Figure 3.16: Sonoran pronghorn temporarily stay in a captive breeding pen.

Concerted efforts of the USAF, U.S. Navy, AGFD, FWS, and other members of the recovery team have resulted in improved status of Sonoran pronghorn through the implementation of numerous recovery actions. Key recovery actions included the initiation of the semi-captive breeding programs at the Cabeza Prieta NWR (2003) and later at Kofa NWR (2011), relocation of some pronghorn from the breeding pen at Cabeza Prieta NWR to a third population in Area B on the BMGR East, and the designation of the Kofa NWR and Area B populations as experimental populations as allowed by Section 10(j) of the ESA. An experimental population is a special designation that the USFWS can apply to a population of a threatened or endangered species prior to reestablishing it in an unoccupied portion of its former range.

These and other actions of the recovery plan, if successful, will ultimately lead to down listing and delisting of the species. However, the increased numbers of animals on the range has the potential to constrain the mission. The USFWS continues to work with the military to reduce mission constraints and minimize risks to pronghorn from military operations. For example, in 2010, the USFWS issued a non-jeopardy biological opinion that allowed for reduced target closure distances, described below. Additionally, the USFWS has provided feed and water near the range boundaries (east, west, and south) in an attempt to lure pronghorn away from actively used targets.

On the BMGR East, daily monitoring of target areas occurs on NTAC, STAC and Range 1 when explosive ordinance disposal (EOD) operations or weapons employment is expected to reduce potential impacts to pronghorn due to military exercises (e.g., ordnance delivery). Monitoring is

conducted by qualified biologists and includes visual observations from vantage points with the aid of binoculars and spotting scopes, as well as telemetry surveillance to locate pronghorn.

Following suggestions in the 2010 biological opinion, if a pronghorn is sighted within a 3.1 mile radius of high explosive ordnance targets, on either NTAC or STAC, then the training mission will be canceled or diverted to a different tactical range (USFWS 2010). Additionally, no ordnance deliveries of any kind (e.g., inert ordnance) would be authorized within a 1.9 mile radius of the pronghorn location on the tactical ranges for the remainder of the day. On Manned Range 1, strafe activities will be suspended for the day if a pronghorn is located within 1.9 mile radius of target and no ordnance of any type will be released if the pronghorn is within 0.6 miles of a target. If a vehicle is within a 1.5 mile radius from a pronghorn then a reduced speed is required (15 mph).

Additionally, several pronghorn waters, irrigated forage plots and supplemental feed stations have been established to help the pronghorn populations survive the dry Southwest summers. The goal is to conserve and protect the Sonoran pronghorn and its habitat so that its long-term survival is secured, and it can be removed from the list of threatened and endangered species. Specific recovery goal objectives include:

- Ensure multiple viable populations of Sonoran pronghorn range wide.
- Ensure that there is adequate quantity, quality, and connectivity of Sonoran pronghorn habitat to support populations.
- Minimize and mitigate the effects of human disturbance on Sonoran pronghorn.
- Identify and address priority monitoring needs.
- Identify and conduct priority research.
- Maintain existing partnerships and develop new partnerships to support Sonoran pronghorn recovery.
- Secure adequate funding to implement recovery actions for Sonoran pronghorn.
- Practice adaptive management in which recovery is monitored and recovery tasks are revised by the USFWS in coordination with the Recovery Team as new information becomes available.

The Sonoran pronghorn recovery efforts are a great success story for endangered species management. While breeding pen populations fluctuate every year due to fawn recruitment and pronghorn relocation, biennial population surveys last conducted by AGFD in December of 2016 estimated 228 wild pronghorn at Cabeza Prieta NWR. As of Fall 2017, informal surveys have resulted in estimates of about 70 individuals in the Kofa population (personal communication with Christa Weise, USFWS, December 2017) and 40 individuals in Area B (or Sauceda) populations.

AGFD distributes a monthly Sonoran pronghorn update, which summarizes the captive breeding program, wild pronghorn numbers, water projects, forage enhancements, and related projects. The AGFD pronghorn update covers the entire U.S. pronghorn distribution, and certain aspects of the monthly update pertain to the BMGR.

3.7.2.2 Desert Tortoise Update

In 2015, a Candidate Conservation Agreement was developed as a collaborative and cooperative effort between land and resource management agencies, including the BMGR managing agencies (USAF and USMC). The key effort of the conservation strategy is to focus on conservation, habitat improvement, and ongoing management of the Sonoran desert tortoise status and habitat. Some of the key action plans implemented by the BMGR East in order to protect the tortoise are listed below.

- Public access is only allowed by permit in certain areas and visitors (recreational users) are required to watch a safety video that includes natural resource conservation practices.
- All recreational vehicular travel is restricted to designated roads.
- Off-road travel by official vehicles is highly restricted with extreme exceptions including clearance of unexploded ordnances for example.
- Designated speed limits are established for all roads.
- Develop a Fire Management Plan to reduce the potential for wildland fires which are detrimental to Sonoran desert tortoise habitat.
- BMGR East follows an invasive weed monitoring and eradication program, with the aim of protecting native desert habitat.
- Livestock and livestock grazing leases are not permitted and trespass livestock are being prioritized for removal.
- Mining leases and any associated activities are not permitted on post.

In 2012, a landscape-level habitat model was developed to identify locations where desert tortoise occupancy is most likely to occur (Grandmaison 2012). This knowledge, coupled with training maps, will allow range managers to identify specific locations where training and habitat overlap and take appropriate measures to reduce conflict to ensure their continued existence and cohabitation with the military mission (Grandmaison 2012). The model also serves as a valuable tool for prioritizing new areas to survey, with the Growler and Crater mountains identified as having a relatively high probability of tortoise occupancy (Grandmaison 2012). The BMGR East 5-Year Work Plan includes surveying new areas and/or re-surveying known occupied and suitable habitat every five years, focused by model results.

3.7.2.3 Lesser Long-Nosed Bat Update

The lesser long-nosed bat post-delisting monitoring plan includes monitoring continued roost occupancy, threats monitoring, and an assessment of forage availability through phenology and distribution of lesser long-nosed bat forage resources.

To provide data that will complement the lesser long-nosed bat post-delisting monitoring plan, the following activities may be implemented, as appropriate, on lands within the BMGR, as time and funding allow:

1. The USFWS and AGFD will be notified of any additional roost sites determined to be occupied by lesser long-nosed bats either through the ongoing large-scale bat monitoring study (Mixan et al. 2016) or through other monitoring actions.

2. The currently occupied lesser long-nosed bat roost will be regularly monitored and the data provided to the USFWS and AGFD. Research is encouraged to determine the occupancy and use patterns of this roost by lesser long-nosed bats.

3. In an effort to better understand occupancy and use patterns by the lesser long-nosed bat, a forage phenology monitoring site(s) may be established to track forage resources over time. This effort will follow protocols consistent with the U.S. National Phenology Network's ongoing program to monitoring plant phenology across the United States. The results will be added to the National Phenology Network system. Conducting forage phenology monitoring at the BMGR is dependent on time and funding availability.

3.7.2.4 Flat-Tailed Horned Lizard Update

Figure 3.17: FTHL captured on the BMGR West.

BMGR West researchers conducted extensive fieldwork on the FTHL from 2011-2014 (Goode and Parker 2015). The purpose of the study was to address two main issues identified by the USFWS and raised in the BO: (1) potential impacts of jet noise on hearing and behavior of the FTHL, and (2) potential effects of increased vehicle traffic on roads in the vicinity of the new KNOZ (USFWS 2010). In 2012, a total of 499 FTHLs were removed from the KNOZ footprint. Twenty FTHLs were sent to the San Diego Zoo for a captive breeding program, and the remaining individuals were translocated to either mark-recapture plots or immediately moved over the exclusion fencing. During the course of the field work, 353 FTHLs were radio tracked 7,561 times. It was determined that home range characteristics and movement patterns of non-translocated and translocated lizards were alike, only differing in the fact that translocated FTHLs had significantly larger home ranges in the season immediately following translocation. While the survival rate of translocated FTHLs was lower than those which were not, the difference was not statistically significant. Reproductive behavior was witnessed in both translocated and non-translocated individuals.

Over 22,000 miles were driven on paved roads at BMGR while surveying for FTHLs. During that period, 412 live and 150 dead FTHLs were observed on the roadways. It was noted that avian predators were significantly higher along roads with power poles. Traffic from the KNOZ construction did not appear to have an effect on road mortality of FTHLs.

With funding provided by USMC and the Bureau of Reclamation, AGFD conducts annual surveys, within the Yuma Desert Management Area with the objectives of determining the population size, survival rate, recruitment, and population growth (Grimsley and Leavitt 2015). Approximately 88 percent of the management area is located within the BMGR West and the remainder is owned by the Bureau of Reclamation (Grimsley and Leavitt 2015). In 2008, AGFD established two 22-acre long-term demography study plots, one within the BMGR West and the other on the Bureau of Reclamation

parcel. In 2011, AGFD randomly selected 75 smaller (~ 328 ft. by 656 ft.) occupancy plots of which a subsample is surveyed annually.

Between 2008-2014, AGFD has captured 624 individual FTHLs within the two demography long-term plots (Grimsley and Leavitt 2015). Of the 624 captures, 316 were juvenile and 308 were adults (Grimsley and Leavitt 2015). There was a high variability in the number of juveniles captured over the seven-year study period.

Between 2011-2014, occupancy surveys detected FTHLs during 43 of 82 (52.4 percent) surveys and 21 of 29 plots (72 percent) (Grimsley and Leavitt 2015). Of the individuals captured 21 were male and 22 female (Grimsley and Leavitt 2015).

3.7.2.5 Acuña Cactus Update

The BMGR East has developed an Inventory and Monitoring Plan for the acuña cactus (56 RMO 2007), utilizing the same protocols implemented at Organ Pipe Cactus NM, for monitoring of. This protocol is designed to assess population dynamics of the acuña cactus by measuring growth, mortality, recruitment, and reproductive status of populations that occur on the BMGR East. The existing protocol for monitoring the cactus provides for surveying once every five years beginning in mid-March, and continuing once per week for the remainder of the flowering phenology. Due to the recent change in federal status of the acuña cactus, 56 RMO will conduct monitoring every year.

Data on the locations of individual plants will be used to further define the habitat conditions most suitable to the specie. They include drained knolls and gravel ridges between major washes and on hilltops in granite substrates. Models of areas with suitable habitat will be used to help identify areas to survey and monitor. Data from the monitoring will be compiled into reports on an annual basis and analyzed to determine trends for the species, which may lead to implementation of adaptive management actions, such as road closures or fire suppression activities (56 RMO 2007). The reports will be shared with the AGFD's Heritage Data Management System, and it is anticipated that there will be annual meetings of all natural resource management agencies to discuss species trends. Wildlife biologists at the 56 RMO have been communicating with the USFWS to identify possible additional survey locations within the BMGR East.

In addition to conducting annual surveys of habitat, other measures will be taken to minimize the potential for disturbance of acuña cactus and its habitat. These actions include controlling invasive species, implementing a fire management plan, developing procedures to control trespass livestock, monitoring illegal immigration, contraband trafficking, and border-related law enforcement, as well as continuing informal coordination with law enforcement authorities.

Mining and agriculture are prohibited within the BMGR, thus eliminating these threats to acuña cactus. Most of the area designated as critical habitat is not authorized for recreational use, although unauthorized trespass may occur with illegal immigration and contraband trafficking. It is believed that acuña cactus and its habitat is being protected from disturbance by the rugged terrain and hilltop locations where it occurs.

The USAF has agreed to continue its protection of acuña cactus habitat. USAF will prevent new impacts, such as the establishment of new military targets and off-road vehicle use within the critical

habitat area; avoid disturbance of vegetation and pollinators within 2,952 feet of known or newly discovered acuña cactus plants; and continue to monitor and control invasive plant species. Detailed vegetation mapping will be completed by FY 2019 for the BMGR East, and these data might contribute to more precise acuña cactus habitat modeling efforts. When new resources become available, the USAF may aid or enable ex situ conservation efforts to establish new populations of acuña cactus on the BMGR and other areas as appropriate.

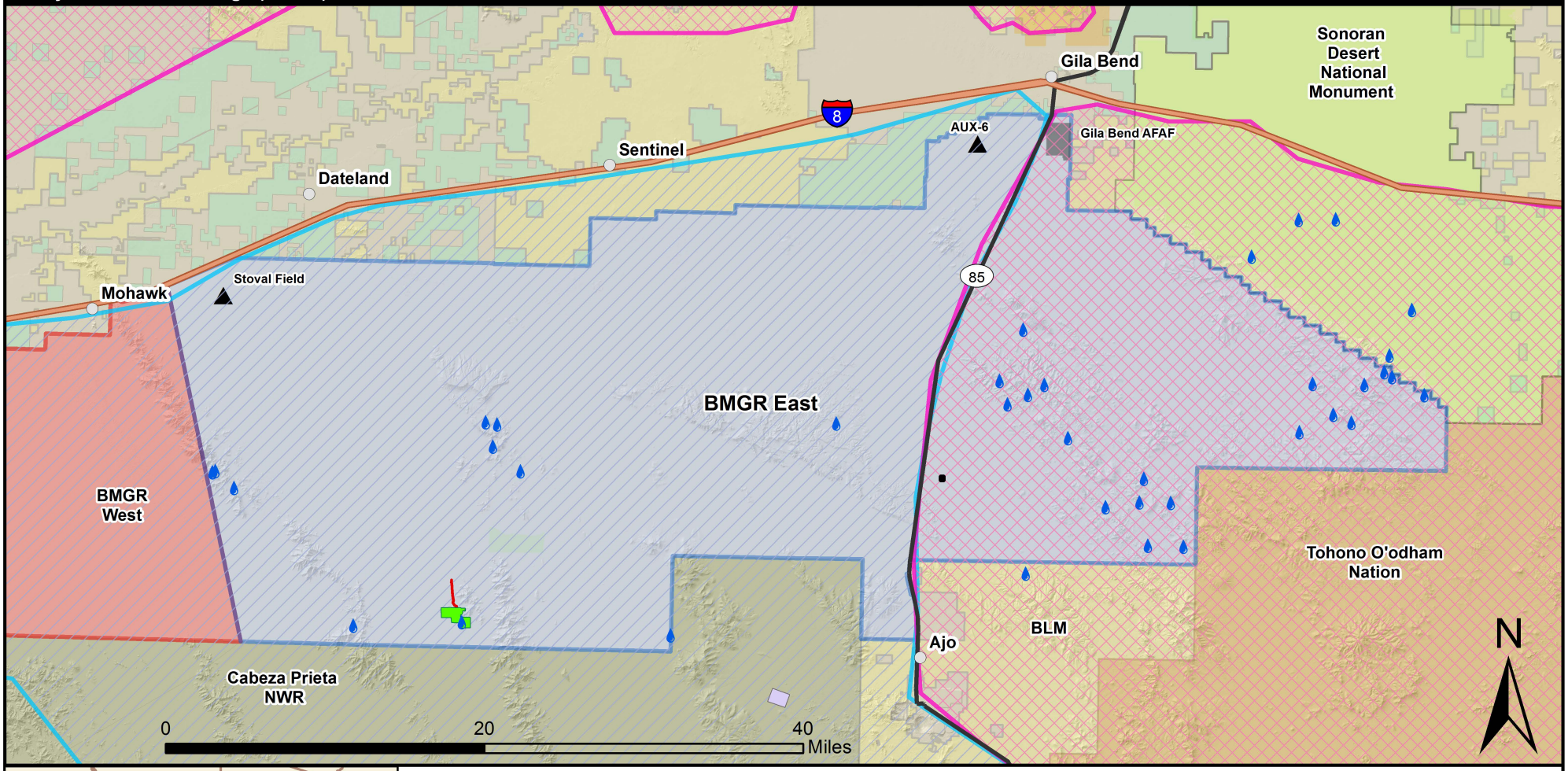
While a recent study has shown that the acuña cactus population on the BMGR East has increased by roughly 3 percent, there are still a number of recommendations that should be followed to ensure its numbers continue to rise (Abbate 2017):

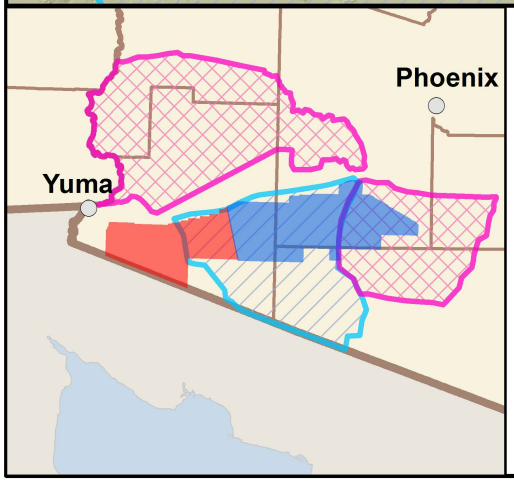
- Continue to monitor acuña cactus populations and morphological measurements for individuals within new populations.
- Monitoring efforts will focus on ridges, hillsides and gentle slopes where the cacti are most likely to be located.
- Fencing of off areas where cactus populations are most vulnerable to being crushed or uprooted due to animal movement and grazing, should be considered.
- Initiate seed collection and captive propagation trials.
- Use wildlife game cameras to document predation, potential unknown threats and seed dispersal mechanisms.
- Future research teams should be limited to two individuals to restrict damage to small acuña cacti, which are vulnerable to crushing and uprooting.

Figure 3.18: Protected Species Management BMGR East

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)





Legend

- City/Town
- Interstate 8
- State Route 85
- BMGR East
- BMGR West
- Gila Bend AFAF
- Cabeza Prieta NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- BLM
- State Trust Land
- Sonoran Pronghorn Semi-Captive Breeding Enclosure at Cabeza Prieta NWR
- Sonoran Pronghorn Granite Mtn Forage Plot Current
- Sonoran Pronghorn Granite Mtn Forage Plot Future Expansion
- Sonoran Pronghorn Area B Recovery Pen
- Sonoran Pronghorn 10J Reintroduction Area
- Sonoran Pronghorn Designated US Range
- Auxiliary Airfield (AUX)
- Arizona G&F Wildlife Waters

World Geodetic System 1984 (WGS84) Projection
Zone 12 N
GCS_WGS_1984

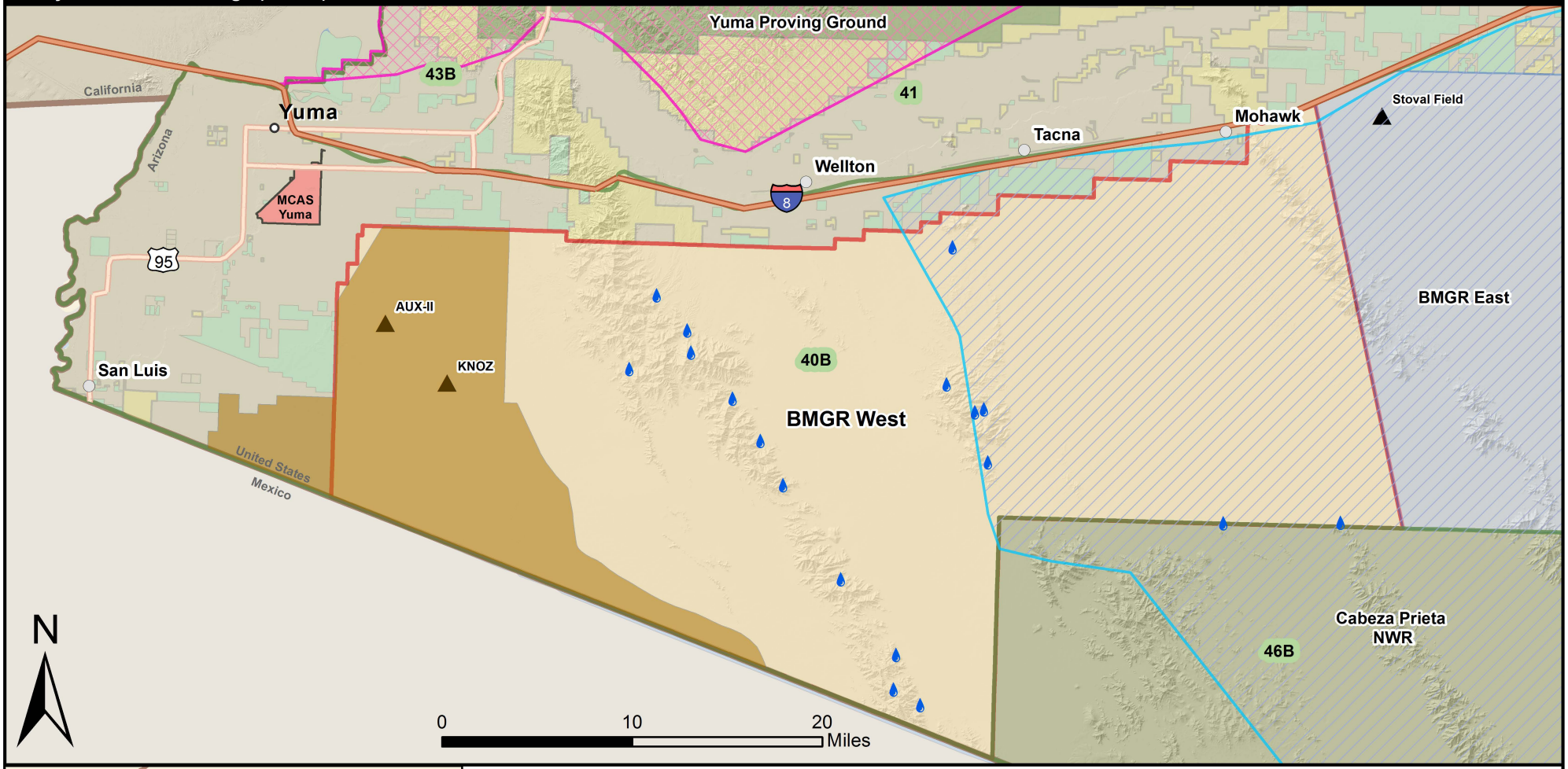
Base data from ESRI StreetMap Hillshade derived from USGS NED

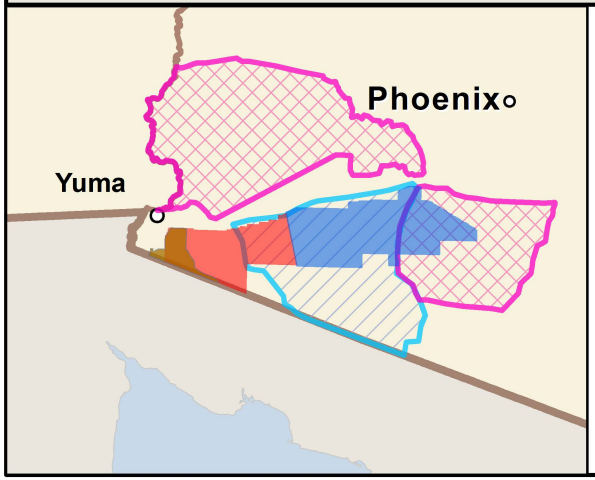
Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

Figure 3.19: Protected Species Management BMGR West

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)





Legend

- City/Town
- Interstates
- Highways
- MCAS Yuma
- BMGR East
- BMGR West
- Yuma Proving Ground
- Cabeza Prieta NWR
- BLM
- State Trust Land
- Flat-Tail Horned Lizard Habitat Area
- Sonoran Pronghorn 10J Reintroduction Area
- Sonoran Pronghorn Designated US Range
- Arizona G&F Game Managements Units
- Auxiliary Airfield (AUX)
- Arizona G&F Wildlife Waters

World Geodetic System
1984 (WGS84) Projection
Zone 11 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	Federal[1] Status	Arizona[2] Status/ SWAP Score	Species of Greatest Conservation Need	Species or Habitat			Federal Register Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
Mammals								
Lesser long-nosed bat (*Leptonycteris curasoae yerbabuena)*	E	WC/1B		✓			53 FR 38456 dated 9-30-88 Petition to remove 82FR 1665 dated 1-6-2017	Summer resident that roosts in caves or mines and forages in desert scrub habitats.
Spotted bat *(Euderma maculatum)*		WC/1B	✓		✓	✓		Riparian areas, rocky cliffs (BMGR West)
Southern yellow bat *(Lasiurus ega)*		WC/NR			✓	✓		In association with palm trees, may occur in vicinity.

[1] **Federal**
E=Endangered
T=Threatened
C=Candidate
Ca= Conservation Agreement with the USFWS
BGEPA=Bald and Golden Eagle Protection Act.
SC=Species of Concern
Nep=Nonessential experimental population

[2] **Arizona Status/Swap Score**
WC=Wildlife Species of Concern in Arizona
HS=Highly safeguarded
NR=Not rated
NA=Not applicable
Within The Arizona Status/Swap Score: Arizona Score Of Vulnerability Criteria:
1A=Scored —"1" For vulnerability in at least one of nine vulnerable categories, or is a T, C species, or is covered under a signed Conservation Agreement, or protected under the BGEPA, or requires Post-Delisting Monitoring, or Is Petitioned For Listing
1B=Scored —"1" For Vulnerability, but match none of the listing criteria under 1A.

1C=Unknown status species.

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
California leaf-nosed bat *(Macrotus californicus)*		WC/NA	✓	✓				Year-round resident that roosts in caves or mines and forages in desert scrub or xeroriparian vegetation.
Greater western mastiff bat *(Eumops perotis californicus)*		NR/1B	✓	✓				Lower and upper Sonoran desert scrub near cliffs, preferring the rugged rocky canyons with abundant crevices.
Sonoran pronghorn *(Antilocapra americana sonoriensis)*	E	WC/1A	✓				32 FR 4001 dated 3-11-67	Southwestern Arizona: vegetation includes big galleta grass, six week three-awn, six weeks grama, creosote bush, bursage, and saltbush. BMGR West and East, east of the Gila and Tinajas Altas mountains.
	NEP				✓		76 FR 25593 dated 5-5-11	New breeding pen at Kofa NWR, relocation of some species from existing breeding pen at Cabeza Prieta NWR to BMGR East.
Canyon Mouse *(Peromyscus crinitus)*		NR/1C		✓				Rocky habitats or gravel sites adjacent to rocky areas. (BMGR West)
Kit fox *(Vulpes macrotis)*		NR/1C		✓				In valleys and on sandy plains in the Southwestern deserts.

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
Little pocket mouse (*Perognathus longimembris*)		NR/1C		✓				Found in various types of desert scrub habitats (greasewood, rabbitbrush, creosote bush, cactus, mesquite, paloverde, etc.). (BMGR West)
Crawford's desert shrew *(Notiosorex crawfordi)*		NR/NA		✓				Not restricted to any particular vegetation type, so long as there is sufficient cover. They are often found in packrat houses, or under dead agaves, old logs, or other debris. (BMGR West)
Desert bighorn sheep (*Ovis canadensis mexicana)*		NR/NA	✓	✓				Desert mountain ledges and grassy basins
Arizona wood rat (*Neotoma devia)* (on the list provided by MCAS Yuma, but not on the SGCN state list)				✓				Low desert or rocky slopes; sagebrush scrub or areas with scattered cactus, yucca, and other low vegetation. When inactive, occupies elaborate den built of debris among cacti, rocks, etc. Found only in extreme western Arizona. (BMGR West)

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
Birds								
Southwestern willow flycatcher (*Empidonax traillii extimus)*	E	WC/1A	✓			✓	60 FR 10693 dated 2-27-95 Designation of critical habitat: 78 FR 343 dated 1-3-2013	Well-developed riparian areas with cottonwood, willow, or tamarisk are not present.
Yuma clapper rail (*Rallus longirostris yumanensis)*	E	WC/1A	✓			✓	32 FR 4001 dated 3-11-67	Marsh habitat not found on the BMGR.
Bald eagle (*Haliaeetus leucocephalus)*	BGEPA	WC/1A	✓			✓	Proposed for delisting: 64 FR 36453 dated 7-6-99 Delisting: 72 FR 37346 dated 7-9-07	Aquatic habitat not found on the BMGR.
Golden eagle (*Aquila chrysaetos canadensis*)	BGEPA	NA/1A		✓				Cliffs or in large trees that afford an unobstructed view. (BMGR East)
Sprague's pipit *(Anthus spragueii)*		WC/1A	✓		✓			Winters in grassy fields along lower Colorado River from north of Yuma to Parker. (May be expected occasionally at BMGR West)

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
Cactus ferruginous pygmy-owl (CFPO) (*Glaucidium brasilianum cactorum)*		WC/1A	✓		✓			Xeroriparian areas
Peregrine falcon (*Falco peregrinus anatum)*		WC/1A	✓		✓			Isolated cliffs; winter migrant
Ferruginous hawk *(Buteo regalis)*		WC/1B	✓	✓				Arid to semiarid regions, as well as grasslands and agricultural areas. (BMGR East)
Belted kingfisher *(Ceryle alcyon)*		WC/NA	✓		✓			Found near water (fresh or salt). Rare transient at BMGR.
Crested caracara *(Caracara cheriway)*		WC/NA	✓		✓			Semi-desert, in both arid and moist habitats, but is more common in the former. Observed in Sonoran Desert NM near BMGR East.
Snowy egret *(Egretta thula)*		WC/NA	✓		✓			Marshes, lakes, ponds, lagoons, mangroves, and shallow coastal habitats. May appear during seasonal migration.
Tropical kingbird (*Tyrannus melancholicus)*		WC/NA	✓		✓			Situations with scattered trees, savanna, open woodland, forest edge, plantations, residential areas and agricultural lands.

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
Desert Purple Martin *(Progne subis Hesperia)*		NR/1B	✓	✓				Desert Southwest in saguaro cacti cavities. (BMGR East)
Gila woodpecker *(Melanerpes uropygialis)*		NR/1B		✓				All desert habitats, nesting in saguaro cacti.
Gilded flicker *(Colaptes chrysoides)*		NR/1B		✓				All desert habitats, nesting in saguaro cacti.
Le Conte's Thrasher *(Toxostoma lecontei)*		NR/1B	✓	✓				Open desert scrub, alkali desert scrub, and desert succulent scrub.
Mountain plover *(Charadrius montanus)*		NR/1B	✓	✓				Xeric or disturbed uplands; short vegetation, bare ground, and a flat topography. Not on the AGFD Heritage Data Management System for Maricopa, Pima, and Yuma counties. However, known to occur on BMGR East, and surveys in 2011 and early 2012 identified the plover in Maricopa County (Gila Bend AFAF), and Yuma County.
Bendire's thrasher *(Toxostoma bendirei)*		NR/1C		✓				Relatively open desert grassland, shrubland or woodland with scattered shrubs or trees,

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
Black-tailed gnatcatcher (*Polioptila melanura)*		NR/1C		✓				Desert brush, dry washes, and mesquite bosques.
Brown-crested flycatcher *(Myiarchus tyrannulus)*		NR/1C			✓			Found in association with saguaros; also frequents river groves and other areas where trees are large enough to provide sites for cavity nesting. (BMGR East)
Common poorwill *(Phalaenoptilus nuttallii)*		NR/1C		✓				In all Sonoran Desert habitats, but most common on sparsely vegetated *bajadas.*
Costa's hummingbird *(Calypte costae)*		NR/1C		✓				Desert and semi-desert, arid brushy foothills, chaparral; in migration and winter also in adjacent mountains and in open meadows and gardens.
Elf owl *(Micrathene whitneyi)*		NR/1C		✓				Deserts, dry shrublands, riparian woodlands, and open pine-oak forests.
Gray vireo *(Vireo vicinior)*		NR/1C		✓				Non-breeding winter resident found in desert and arid scrub, semi-open areas with scattered scrub and semi-open arid brushland. (BMGR West)
Hooded oriole *(Icterus cucullatus)*		NR/1C		✓				Favors groups of palms for nesting. (BMGR East)

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
Lucy's warbler *(Vermivora luciae)*		NR/1C			✓			Mesquite bosques and edges of riparian woods in desert zones.
Phainopepla *(Phainopepla nitens)*		NR/1C		✓				Scrub habitats, with desert mistletoe present for foraging.
Prairie falcon *(Falco mexicanus)*		NR/1C		✓				Canyons, open country, grasslands, and deserts.
Scott's Oriole *(Icterus parisorum)*		NR/1C		✓				Yucca gardens on desert grassland prairies, but they have been found wherever yucca is growing, even on the hillsides of mountain canyons.
Varied bunting *(Passerina versicolor)*		NR/1C		✓				Streamside thickets, brush mostly in areas of dense thorny brush, often with an upper story of scattered trees. (BMGR East)
Western screech-owl *(Megascops kennicottii)*		NR/1C		✓				Southern populations inhabit lowland riparian forests, oak-filled arroyos, desert saguaro and cardon cacti stands, Joshua tree and mesquite groves, and open pine and pinyon-juniper forests.

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
White-throated swift *(Aeronautes saxatalis)*		NR/1C		✓				Rocky cliffs and canyons, typically found nesting in arid regions, but near major rivers.
Pyrrhuloxia *(Cardinalis sinuatus)*		NR/NA		✓				Desert scrub and mesquite thickets. (BMGR East)
Reptiles								
Colorado Desert fringe-toed lizard (*Uma notata*)	C	NR/NA1		✓			Listed as Candidate: 81 FR 1368 dated 1-12-2016	Restricted to sparsely vegetated windblown sand dunes and sandy flats; it requires fine, loose sand for burrowing; vegetation is usually scant, consisting of creosote bush or other scrubby growth.
Yuman Desert fringe-toed lizard *(Uma rufopunctata)*	C	WC/NR	✓	✓			Listed as Candidate: 80 FR 56423 dated 9-18-2015	Restricted to sparsely vegetated windblown sand dunes and sandy flats; it requires fine, loose sand for burrowing; vegetation is usually scant, consisting of creosote bush or other scrubby growth.
Flat-tailed horned lizard (*Phrynosoma mcallii*)	CA	WC/1A	✓	✓			Withdrawal of proposal to list 76 FR 14210 dated 3-15-11	Creosote flats, sand dunes, and mud hills in southeastern California, southwestern Arizona, and northwestern Mexico. (BMGR West)

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
Desert rosy boa (*Lichanura trivirgata gracia*)	SC	NR/NA	✓	✓				Rocky areas in desert ranges, especially in canyons with permanent or intermittent streams. (BMGR West)
Mexican rosy boa (*Lichanura trivirgata trivirgata*)	SC	NR/NA	✓	✓				On or near rocky mountains or hillsides in desert ranges, where they inhabit the granite rock outcroppings that absorb the sun's rays providing heat and cover. (BMGR West)
Desert Tortoise (Sonoran population) (*Gopherus morafkai)*		WC/1A	✓	✓				Sonoran desertscrub and semidesert grassland, prefers rocky slopes and *bajadas*. (BMGR East)
Desert night lizard (*Xantusia vigilis*)		WC in Mohave County only / NA		✓				Arid and semiarid, among fallen leaves and trunks of yuccas, agaves, cacti, and other large plants, also in crevices of rock outcroppings and under logs and bark of foothill pines; it ranges locally into pinyon-juniper, sagebrush-blackbrush, and chaparral-oak. (BMGR West)
Long tailed brush lizard *(Urosaurus graciosus)*		NR/NA		✓				The Lower Colorado River Sonoran Desert scrub community and can be a common sight in creosote bush- lined desert flats with sandy soil and along tree lined drainages. (BMGR West)

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	**Federal[1] Status**	**Arizona[2] Status/ SWAP Score**	**Species of Greatest Conservation Need**	**Species or Habitat**			**Federal Register Reference**	**Habitat or Potential Habitat at BMGR**
				Present	**Potential**	**Not Expected**		
Amphibians								
Western (or Great Plains) narrow-mouthed toad (*Gastrophryne olivacea)*		WC/1C	✓		✓			Moist crevices or burrows, near ephemeral water sources (BMGR West and East)
Plants								
Acuña cactus (*Echinomastus erectocentrus* var. *acunensis)*	E	HS		✓			81 FR 14058 dated 3-16-2016; critical habitat 81 FR 55265 dated 8-18-2017	The Arizona Upland Subdivision of the Sonoran Desert scrub biotic community, tending to be located at the western, warmer, drier perimeter of the Subdivision within the Paloverde Saguaro Association At least three distinct clusters of an acuña cactus exist in the BMGR East (Urreiztieta 2013 and Abbate 2017). The plant has not been detected in the BMGR West, nor is it expected to occur.

Table 3-4: Threatened and Endangered Species and Species of Greatest Conservation Need

Common Name *(Scientific Name)*	Federal[1] Status	Arizona[2] Status/ SWAP Score	Species of Greatest Conservation Need	Species or Habitat			Federal Register Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
Peirson's milkvetch (*Astragalus magdalenae* var. *peirsonii)*	T				✓		63 FR 53596-53615 dated 10-6-98; critical habitat 64 FR 47329-47351 dated 8-4-04, Petition to remove from listing not warranted; 73 FR 41007, dated 7-17-08	Slopes of mobile sand dunes in the Sonoran desert scrub plant community. No confirmed occurrences but Yuma Dunes in the BMGR West are potential habitat.
Sand food *(Pholisma sonorae)*		HS		✓				Drifting sand below 500 ft. elevation in creosote bush scrub (Yuma Dunes in the extreme southwestern portion of the BMGR West).

* A list of migratory birds protected by the Migratory Bird Treaty Act can be found at 50 CFR 10.13.

Order of Presentation and List of Acronyms:

Federal
E=Endangered
T=Threatened
C=Candidate
CA=Species managed under Conservation Agreement with the USFWS
BGEPA=Species protected by provisions in the Bald and Golden Eagle Protection Act.
SC=Species of Concern
NEP=Nonessential Experimental Population

Arizona Status/SWAP Score
WC=Wildlife Species of Concern in Arizona – WC species are the same as those in Threatened Native Wildlife in Arizona (1988)

HS=Highly Safeguarded
NR=Not Rated
NA=Not Applicable

Within the Arizona Status/SWAP Score: Arizona score of vulnerability criteria:
1A=Scored —"1" for vulnerability in at least one of nine vulnerable categories, or is a T, C species, or is covered under a signed conservation agreement, or protected under the BGEPA, or requires post-delisting monitoring, or is petitioned for listing
1B=Scored —"1" for vulnerability, but match none of the listing criteria under 1A.
1C=Unknown status species.

Sources: USFWS, AGFD, 56 RMO, MCAS Yuma RMD and NatureServe

3.7.3 Bats

In order to detect roost site locations and avoid potential conflicts between bats and the mission, several large-scale bat monitoring studies have occurred or are being implemented using a combination of survey methods. Those methods include, but are not limited to, acoustic monitoring, mist net traps, roost assessments and guano sampling.

To better understand bat fauna on the BMGR East, a large-scale monitoring study was implemented using a combination of survey methods including roost, capture, and acoustic surveys (Mixan et al. 2016). By assessing bat diversity and habitat use patterns, land managers will be better able to identify and address any potential population and range declines in bat species and act to mitigate or reverse those declines. A total of 17 species were identified in the survey (Table 3-5) including one endangered species, the lesser long-nosed bat, and four species of concern; the cave myotis (*Myotis velifer*), California leaf-nosed bat (*Macrotus californicus*), greater mastiff bat (*Eumops perotis*), and Townsend's big-eared bat (*Corynorhinus townsendii*).

From 2012-2014 a study was implemented to identify and avoid potential conflicts with bats and the military mission on the BMGR East, West, and nearby Yuma Proving Ground (Piorkowski et al. 2014). New data was collected and combined with previous studies, to determine potential bat roosts sites. It was determined that there is relatively little area across the BMGR where bats can rest, hibernate, and rear young. The loss of traditional roosts, such as caves, has meant that abandoned mines have become an increasingly critical habitat feature for roosting bats. This could create potential conflicts as many of these abandoned mines exist in areas open for public recreation and possibly present a safety hazard. There are a number of methods, such as bat gates, that could prevent people from entering these areas while still allowing free passage for roosting bats.

The BMGR is committed to continually monitoring bat populations as well as evaluating and protecting important bat roost sites. Monitoring techniques that will be employed over the next 5-years, as time and funding allow, include continuing acoustic monitoring at known roost sites as well are re-analyzing old call logs using new call detection software. The purpose of re-analyzing old call logs through improved call detection software is to determine if the original call detection results were correct, and to see if any additional species may be present at certain roost locations (i.e., lesser long-nosed bats). Other monitoring objectives that are planned to be conducted include continued mist net trapping and guano sampling and analysis. All data and results from these monitoring activities will be shared with partners at the USFWS and AGFD.

Table 3-5: Bat Species Detected on the BMGR

Common Name	Scientific Name	Endangered Species Act (ESA) Status
Big Brown Bat	*Eptesicus fuscus*	-
Brazilian Free-Tailed Bat	*Tadarida brasiliensis*	-
California Leaf-Nosed Bat	*Macrotus californicus*	Species of Concern
California Myotis	*Myotis californicus*	-
Canyon Bat	*Parastrellus hesperus*	-
Cave Myotis	*Myotis velifer*	Species of Concern

Table 3-5: Bat Species Detected on the BMGR

Common Name	Scientific Name	Endangered Species Act (ESA) Status
Greater Mastiff Bat	*Eumops perotis*	Species of Concern
Hoary Bat	*Lasiurus cinereus*	-
Lesser Long-Nosed Bat	*Leptonycteris yerbabuenae*	Endangered (petitioned to be delisted)
Little Brown Myotis	*Myotis lucifigus occultus*	-
Silver-Haired Bat	*Lasionycteris noctivgans*	-
Long-Eared Myotis	*Myotis evotis*	-
Pallid Bat	*Antrozous pallidus*	-
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Species of Concern
Western Red Bat	*Lasiurus blossevillii*	-
Western Small-Footed Myotis	*Myotis cliolabrum*	-
Yuma Myotis	*Myotis yumanensis*	-

3.7.4 Migratory Birds and Eagles

3.7.4.1 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA), is a federal statute that implements four treaties between the nations of the U.S. and Canada, Mexico, Japan, and Russia on the conservation and protection of migratory birds. More than 800 species of birds are protected by the MBTA (CFR 10.13). The MTBA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulation. In 2003, the National Defense Authorization Act directed the Secretary of the Interior to exempt the Armed Forces from incidental take rules during military readiness activities authorized by the Secretary of Defense. Effective 30 March, 2007, the USFWS issued a Final Rule authorizing the take of migratory birds from military readiness activities provided such activities do not have a significant adverse effect on the population (72 FR 8931).

Executive Order 13186 directs agencies to take certain actions to further strengthen migratory bird conservation under the conventions under the MBTA, the Bald and Golden Eagle Protection Act (BGEPA), and other pertinent statutes. It requires the establishment of MOUs between the USFWS and other federal agencies. Accordingly, DoD and USFWS implemented an MOU in 2010 to promote the conservation of migratory birds (DoD and USFWS 2006). This MOU describes specific actions that should be taken by DoD to advance migratory bird conservation; avoid or minimize the take of migratory birds; and ensure DoD operations, other than military readiness activities, are consistent with the MBTA.

From 2012-2014, AGFD completed a breeding bird survey. Most species of birds found at the BMGR are provided MBTA protection. MCAS Yuma and Luke AFB have prepared a Bird Check List that is provided to visitors if requested. The list identifies species that may be sighted at the BMGR; the species list is extensive and is not repeated in this document.

3.7.4.2 Eagles

In 2006, AGFD published the *Conservation Assessment and Strategy for the Bald Eagle in Arizona* and entered into a MOU with Luke AFB, USFWS, and numerous other parties for the conservation of the bald eagle in the state (Driscoll et al. 2006). In order to comply with the BGEPA as well as the MOU, Luke AFB adheres to avoidance buffers of 2000 vertical and lateral feet around bald eagle breeding areas from 1 December to 30 June.

Figure 3.20: Pair of golden eagles utilizing a wildlife water on the BMGR West.

With the declaration of take permits, golden eagle nest monitoring has become a critical component of management in the Southwest desert. AGFD designed a three-year study (2013-2015) to evaluate the impact of airborne military training activities on golden eagles. Military training routes throughout the state (with the exclusion of tribal lands) were analyzed with three primary objectives: (1) to identify and survey potential distribution of golden eagle breeding areas across military lands, (2) to create a landscape-scale model to predict likelihood of potential golden eagle nesting habitat, and (3) to collect golden eagle demographic information and provide management recommendations that will permit BMGR and other Southwestern military installations to maintain their training regiments while also complying with the BGEPA. After two consecutive years of survey and monitoring, AFGD determined that there was no evidence of additional golden eagle take under the airspace used during military training activities and that these activities did not appear to adversely affect breeding golden eagles (Piorkowski et al. 2015).

The following management recommendations were made by AGFD (Piorkowski et al. 2015):

1. Continue monitoring known and suspected golden eagle nests on military installations.
2. Coordinate with local, state and regional authorities on current golden eagle distribution and status to ensure current and future military activities are in compliance with the BGEPA.
3. Develop avoidance zones around known golden eagle nests during the breeding season, specifically those that were occupied within the last five years.
4. Avoid disturbance around suspected golden eagle nesting activity during the early breeding season. Nest sites described as "suspected" have the opportunity to provide suitable structure to a nesting golden eagle even if no golden eagle has been identified using it in any particular year. In effect, unoccupied does not mean non-use of a suspected golden eagle nest. Normal military training activities can resume in the area once all "suspected" nests have been determined as unoccupied for that breeding season.
5. Avoid heavy ground and aerial disturbance during the early breeding season within modeled habitat that has a high likelihood of potential golden eagle nesting habitat. By using these

precise models, reduction of heavy disturbance activities in areas of high likelihood may reduce or eliminate incidental take even if surveys to document nesting golden eagles have not been completed in those areas. Future model validation should allow quantification of thresholds associated with high likelihood habitat in these modeled estimates.

The BMGR East, in coordination with AGFD, has developed plans to continue supporting bald eagle nest watch programs, golden eagle surveys, raptor surveys, and to assess the potential for raptor electrocution over the next five-year planning period (Table 9-1).

3.7.5 Bird /Aircraft Strike Hazards

The BMGR lies within the Pacific Flyway, which, at this location, is a minor flyway for waterfowl and a major flyway for raptors and small songbirds. Bird/Wildlife Strike Hazard (BASH) reduction plans are developed for DoD military installations where elevated hazards exist and can be controlled and mitigated, as is the case at the BMGR East and West.

3.7.5.1 Update

BMGR East

BASH concerns are greatest when aircraft fly at low altitude (at both takeoff and landing), rather than during in-flight operations. A BASH Reduction Plan is in place for Gila Bend AFAF, where there is a runway. In accordance with this plan, the USAF uses the Avian Hazard Advisory System (AHAS), which is a data-driven, remote sensing system to alert aircraft for the presence of birds in the airspace. The AHAS system evaluates weather and radar data and provides real-time alerts to aviators when concentrations of large birds are in the airspace. Also, as part of the prevention program, AHAS provides pilots and flight schedulers with a near real-time tool when selecting flight routes. The plan is based on Luke AFB's BASH Reduction Plan and 56 FW OPLAN 91-2 (2013), and focuses on reducing the BASH threat at the Gila Bend AFAF and at the Range 1 and 2 lead-in-lines.

Environmental management guidelines, as identified in the BASH Reduction Plan for Gila Bend AFAF, include controlling vegetation (e.g., maintaining vegetation height between 7"-14", removing dead vegetation, and perches), controlling water (e.g., modifying ditches, eliminating standing water), controlling waste (e.g., collect and dispose of waste rapidly), and controlling birds through chemical and physical alterations (e.g., bird-proof structures, control insects and rodents). Priority BASH management actions under this plan include vigilant threat monitoring and reporting, management of the environment both at and surrounding the Gila Bend AFAF, carrion removal along SR 85 to reduce the number of large avian scavengers (e.g., turkey vultures), and bird/wildlife harassment and depredation as required. A private contractor is currently conducting daily threat monitoring at Gila Bend AFAF and the BMGR East near Range 1 and 2. Status reports are issued on a monthly basis. These reports summarize, in part, the number of BASH strikes/month, number of BASH threat days/month, number of surveys conducted/month, average number of birds by size, max and mean animal counts/month by species, total carrion removed/month and location of disposal, and other environmental information (e.g., wastewater pond depth). In addition to monthly reporting, the contractor is also providing annual BASH reports that summarize and analyze all monthly data and provides trend data to the 56 RMO (Tunista Services and Chiulista Services 2012-2016). A summary

of the annual BASH management data results for 2012 to 2016 is provided in Table 3-6 and Table 3-7.

Table 3-6: Summary of Annual BASH Management Actions (2012 to 2016) at the Gila Bend AFAF and the BMGR East

Year	BASH Threat Days			BASH	Carrion	Times Wildlife	
	Low	Moderate	Severe	Strike	Removed	Harassed	Depredated
2012	247	0	0	1	149	5	0
2013	249	1	1	2	192	6	0
2014	269	6	0	1	273	8	0
2015	269	4	0	2	396	1	0
2016	250	3	0	1	200	16	0
Total	***1,284***	***14***	***1***	***7***	***1,210***	***36***	***0***

Source: The Annual BASH Summary Reports for the BMGR East (Tunista Services and Chiulista Services 2012-2016).

Bird harassment and depredation at Gila Bend AFAF is authorized by the USFWS through a permit issued annually to the 56 FW, which applies to both Luke AFB and Gila Bend AFAF (USFWS Permit 2017). A log of BASH harassment and depredation events at Gila Bend AFAF is being retained and updated by the 56 RMO and includes all incidents dating back to 2006. Mammal depredation (e.g., rabbits and coyotes) at Gila Bend AFAF is authorized by a permit issued annually by AGFD to the 56 RMO/Environmental Sciences Management (ESM) and applies only to Gila Bend AFAF.

Primary avian species surveyed under this project include, but are not limited to, turkey vultures (*Cathartes aura*), common ravens (*Corvus corax*), raptors species (e.g., red-tailed hawks (*Buteo jamaicensis*), prairie falcons, golden eagles, American kestrel (*Falco sparverius*), etc.), doves (mourning doves, white-winged doves, Eurasian collared-doves), and horned larks (*Eremophila alpestris*). Round-tailed ground squirrels are also surveyed at Gila Bend AFAF as they represent one of the main food sources for raptors species. Data are provided in the Annual BASH Summary Report for the BMGR East (Tunista Services and Chiulista Services 2012-2016) Species included in the "other" category include species such as the lark bunting (*Calamospiza melanocorys*), greater roadrunner (*Geococcyx californianus*), green-winged teal (*Anas crecca*), long-billed curlew (*Numenius americanus*), black-tailed jackrabbit (*Lepus californicus*), coyote, and kit fox.

Table 3-7: Annual BASH Survey Results for Gila Bend AFAF and the BMGR East

Species	Year	Gila Bend AFAF			Gila Bend AFAF Perimeter			SR 85 (Range 1 and 2)			Gila Bend AFAF Oxidation Pond		
		Total Individuals	Times Observed	# of Surveys	Total Individuals	Times Observed	# of Surveys	Total Individuals	Times Observed	# of Surveys	Total Individuals	Times Observed	# of Surveys
Avian sp.	2012	9,440	247	247	1,213	72	72	968	113	113	4,581	74	74
Ground Squirrel	2012	384	127	247	0	0	72	0	0	113	0	0	74
Other	2012	658	136	247	2,652	71	72	540	98	113	1,978	74	74
Total		***10,482***		***247***	***3,865***		***72***	***1,508***		***113***	***6,559***		***74***
Avian sp.	2013	13,408	251	251	2,678	108	108	1,409	138	138	5,888	107	107
Ground Squirrel	2013	124	58	251	0	0	108	0	0	138	0	0	107
Other	2013	1,525	178	251	3,236	108	108	383	117	138	3,130	106	107
Total		***15,057***		***251***	***5,914***		***108***	***1,792***		***138***	***9,018***		***107***
Avian sp.	2014	17,251	251	251	3,668	113	113	1,891	148	148	7,097	87	87
Ground Squirrel	2014	200	79	251	0	0	113	0	0	148	0	0	87
Other	2014	1,759	248	251	3,835	113	113	825	134	148	3,809	87	87
Total		***19,210***		***251***	***7,503***		***113***	***2,716***		***148***	***10,906***		***87***
Avian sp.	2015	15,598	250	250	2,295	88	88	2,381	173	173	4,270	81	81
Ground Squirrel	2015	164	93	250	0	0	88	0	0	173	0	0	81
Other	2015	893	34	250	3,560	88	88	364	95	173	2,804	81	81
Total		***16,655***		***250***	***5,855***		***88***	***2,745***		***173***	***7,074***		***81***
Avian sp.	2016	8,640	254	254	3,152	147	147	1,949	107	107	5,540	131	131

Table 3-7: Annual BASH Survey Results for Gila Bend AFAF and the BMGR East

Species	Year	Gila Bend AFAF			Gila Bend AFAF Perimeter			SR 85 (Range 1 and 2)			Gila Bend AFAF Oxidation Pond		
		Total Individuals	Times Observed	# of Surveys	Total Individuals	Times Observed	# of Surveys	Total Individuals	Times Observed	# of Surveys	Total Individuals	Times Observed	# of Surveys
Ground Squirrel	2016	300	122	254	0	0	147	0	0	107	0	0	131
Other	2016	1,011	150	254	3,271	147	147	407	102	107	3,423	81	131
Total		***9,951***		***254***	***6,423***		***147***	***2,356***		***107***	***8,963***		***131***
All Years Total		***71,355***		***1,253***	***29,560***		***528***	***11,117***		***679***	***42,520***		***480***

BMGR West

A BASH Reduction Plan has been developed and implemented for the BMGR West (StatO 3750.1C 2014). The BASH program is governed by the MCAS Yuma BASH Working Group. The working group meets quarterly to assess the status of the BASH Reduction Program and provides recommendations and guidance for improving program delivery. These meetings are held in conjunction with the Commanding Officer's Safety Council meetings and are coordinated by the MCAS Yuma Installation Aviation Safety Officer. The BASH Working Group includes:

- Commanding Officer (Chairperson)
- Airfield Operations Officer
- Air Traffic Control Facility Officer
- Range Director
- Aviation Safety Officer
- Natural Resources Specialist
- Pest Management Officer
- Tenant Unit Representatives including:
    - Marine Aircraft Group 13
    - Marine Aviation Weapons and Tactics Squadron 1
    - Marine Fighter Training Squadron 401

The MCAS Yuma BASH Reduction Plan outlines the management requirements and coordination procedures for all BASH Working Group personnel and staff. The MCAS Yuma Conservation Manager maintains all required dispersal and depredation permits, including USFWS MBTA depredation and harassment permits; maintains harassment and depredation equipment; retains BASH records and ensures properly trained personnel are available for required BASH management actions. The Conservation Office serves as liaison between MCAS Yuma and the USFWS, U.S. Department of Agriculture Animal and Plant Health Inspection Service, AGFD, and the Audubon Society. It monitors migratory, seasonal, and local bird activities. All remains from BASH strikes incidents are sent to the Smithsonian Institute for official review, identification and cataloging.

3.8 BMGR East Trespass Livestock, Horses, and Burros

Since the early 1970s, feral horses and burros (*Equus* spp.) have received protections by the federal government under the provisions of the Wild Free-Roaming Horses and Burros Act of 1971 (WFRHBA) (16 U.S.C. §§ 1331-1340) as amended by the Federal Land Policy and Management Act of 1976 (FLPMA) and the Public Rangeland Improvement Act of 1978 (PRIA). While not technically "wild," these animals are descendants of escaped livestock. The term "wild free-roaming" provides special protections to these animals under the WFRHBA. On a national scale, the management of feral horses and burros has fallen to the BLM or U.S. Forest Service (USFS) when these animals are found within a designated Wild Horse and Burro Herd Management Area (HMA) (Figure 3.22). HMAs were designated in PRIA and represent areas where wild horses and burros were documented at the time of the passage of the WFRHBA. Each HMA has an associated management plan that provides specific herd management goals and objectives and determines what each HMA's carrying capacity or "Appropriate Management Level (AML)" should be. The HMA management plan also determines what the minimum and maximum population levels are for wild horses and burros to allow for population growth over a four to five-year period. Each HMA's AML is determined through a rigorous, multi-year analysis and an evaluation of rangeland habitat conditions including data on each area's vegetation and soil resources. The AML, along with any update to the AML, is set for each HMA in an open, public process during field planning efforts.

Figure 3.21: Trespass Burros on the BMGR are not protected under WFRHBA.

While stringent management guidelines are required under federal law for animals found within an HMA, animals found outside of an HMA are not provided the same protections and are often considered to be "estrays" or unauthorized livestock in trespass. The management of these estray animals often defaults to the local land management agency as well as the state. The BMGR does not contain a designated Wild Horse and Burro HMA. The closest HMA to the BMGR is the Cibola-Trigo HMA, located 8 miles north of the BMGR West or 40 miles west of the BMGR East along the Colorado River. Management of trespass horses and burros on the BMGR has fallen to the 56 RMO and MCAS Yuma RMD staff at the BMGR East and West, respectively. The 2007 and 2012 INRMPs, as well as the annual INRMP reviews (2013-2017), have repeatedly expressed that trespass livestock, specifically cattle (*Bos taurus*), burros, and horses are a problem. Impacts to natural resources from these animals are typically greater on the BMGR East given its proximity to adjacent grazing allotments. Issues and impacts related to trespass livestock, horses, and burros that have either been observed or have the potential to occur at the BMGR include, but are not limited to, the following:

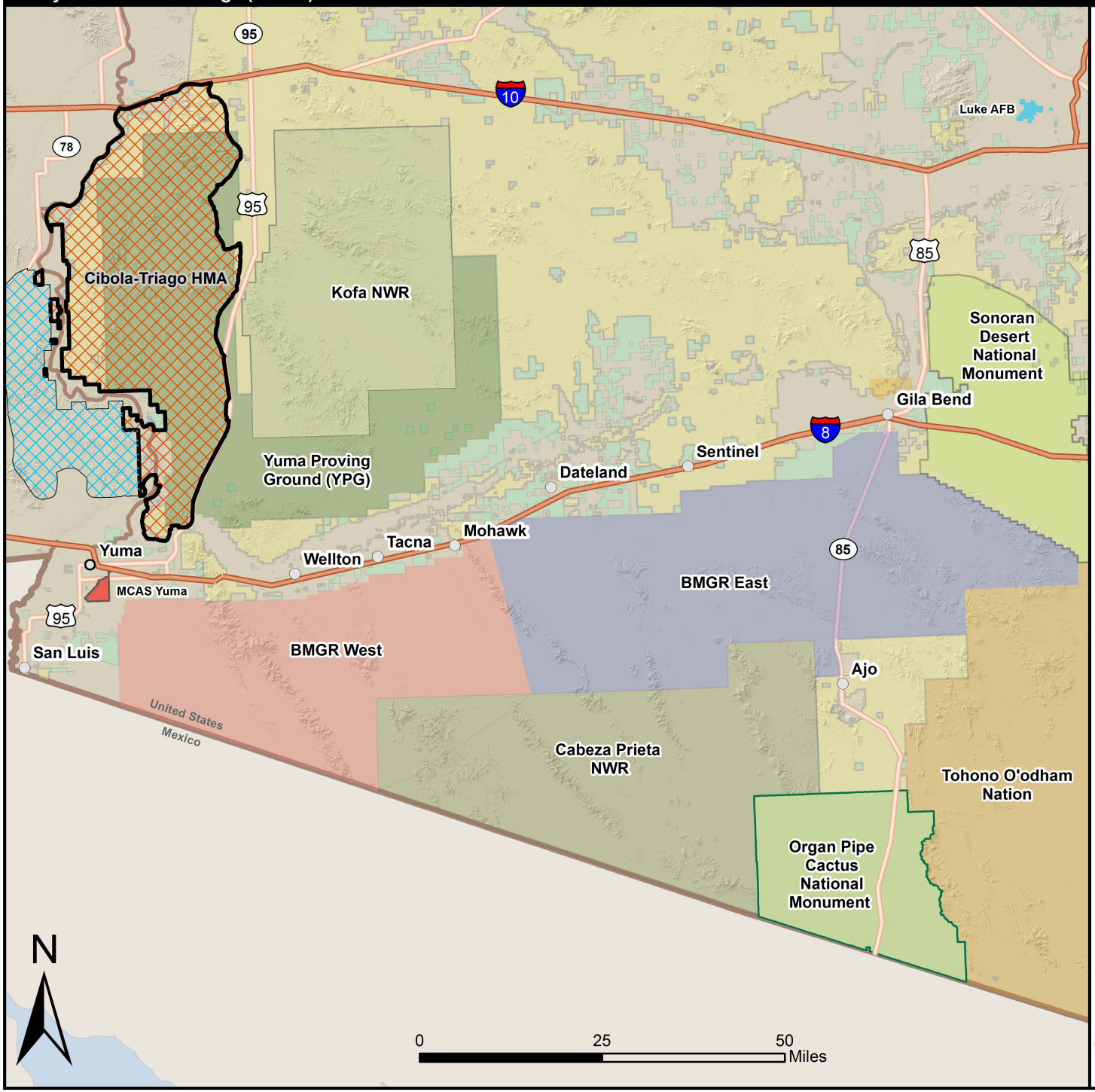
- Extensive destruction and degradation of sensitive plant species and Sonoran Desert native plant communities.

- Increased competition with native protected/endangered wildlife species for available forage and water resources (i.e., Sonoran pronghorn).
- Potential for disease transmission to native wildlife species.
- Increased soil degradation and erosion potential.
- Surface water depletion and destruction of environmentally sensitive/culturally significant water resources.
- Potential water quality impacts associated with fecal contamination and increased erosion and sedimentation.
- Destruction and trampling of cultural resource sites.
- Invasive plant species seed dispersal.
- Increased public safety risk from livestock/vehicle collisions with potential to impact all range users including:
    - Public recreationalists
    - BP
    - 56 RMO and MCAS Yuma RMD staff and support personal, other range managers, and contractors
    - Military personnel
- Potential direct negative impacts to the military training mission include but are not limited to:
    - Delays, interruptions, and cessation of live-fire training missions if animals are on range.
    - Increased risk of vehicle collisions during ground-based training efforts.
    - Increased wildfire risk if trespass animals aid in the dispersal of fire-adapted weed species.

Figure 3.22: Trespass Livestock and Wild Horse and Burro HMA

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstates
- Highways
- BMGR East
- BMGR West
- MCAS Yuma
- Luke AFB
- Yuma Proving Ground
- Organ Pipe Cactus NM
- Cabeza Prieta NWR
- Kofa NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- BLM
- State Trust Land
- Cibola-Triago HMA, Burro Only Area
- Cibola-Triago HMA, Wild Horse/Burro Area

World Geodetic System 1984 (WGS84) Projection
Zone 12 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

3.8.1 Update

BMGR does not contain a designated Wild Horse and Burro HMA. Protections provided under applicable federal law (i.e., WFRHBA, FLPMA, PRIA) do not extend to trespass horses and burros on the Goldwater Range. However, the 56 RMO and MCAS Yuma RMD staff wish to develop policies, programs and methods to use in the management of these trespass horses and burros and livestock. Consequently, 56 RMO and MCAS Yuma RMD staff and agency partners at the AGFD and USFWS were prompted during the 2016 INRMP Annual Review process, to revise the Resource-Specific Goal RS4.5 from: "Remove privately owned animals from the BMGR" to: "Monitor and control trespass animals and livestock at the BMGR, and assess and mitigate their impacts."

Based on this revised Resource-Specific Goal, the 56 RMO staff at the BMGR East are planning to develop a Trespass Livestock, Horse, and Burro Management Plan that addresses all aspects of management and monitoring of these animals and defines the roles and responsibilities for all parties. This plan will ensure humane treatment of all animals while reducing impacts to natural and cultural resources as well as to the military training and readiness mission. This plan will provide policies, programs, and methods to ensure the INRMP goal of monitoring and controlling trespass animals and livestock is met.

While the development of this management plan will be a priority over the next five years, there are management actions that the BMGR staff can initiate now, under this INRMP, in recognition of the need to reduce negative impacts from trespass livestock, horses, and burros. These include the following strategies:

Working with Surrounding Land Management Agencies

The 56 RMO and MCAS Yuma RMD staff will work cooperatively with surrounding land management agencies and individuals (BLM, USFWS, BLM grazing permittees, Tohono O'odham Nation) as well as the Arizona Department of Agriculture (AZDA) and the AGFD, to ensure coordinated management of trespass livestock, horses, and burros. Staff from the BMGR will continue to participate in the Interagency Feral Livestock Committee.

Fencing

The BMGR staff recognize that Arizona is a fence-out state and that the BMGR does not reside in an Arizona no-fence district. While it is unfeasible to fence the entire boundary of the BMGR, certain corridors can be effectively fenced off to reduce trespass livestock, horses, and burros. The BMGR staff will prioritize efforts to work with adjacent BLM staff and BLM grazing permittees to install new fencing in strategic areas as well as monitor existing fencing. In addition to installing new fencing, the existing fence infrastructure will be, maintained and improved, as needed. The presence of trespass livestock, horses, and burros will be continually monitored to identify additional access corridors onto the range that need fencing infrastructure installed.

Trespass Livestock Removal and Management

Trespass livestock will be prioritized for removal from the BMGR lands following all applicable state and federal laws. The BMGR staff will work with ranchers and stakeholders to push privately-owned,

BLM permittee livestock that are found on the BMGR lands back into the BLM-managed areas. All other privately-owned livestock will be rounded up and held for property recovery procedures to occur, as determined by ARS 3-1402 and 43 CFR Subpart 4150. AZDA will complete brand inspections on all trespass livestock, and the 56 RMO will post notifications to allow owners an opportunity to recover trespass livestock.

Figure 3.23: Trespass livestock cause extensive damage to sensitive plant species and Sonoran Desert native plant communities.

For non-branded stray livestock that are not claimed during the established recovery notification period, as outlined in ARS 3-1402, the 56 RMO will provide a letter to the AZDA stating all applicable state, federal and DoD rules were followed allowing the AZDA to produce a Form 1 letter (after the livestock inspection) that that will authorize USAF ownership of the animals. These animals, becoming USAF property as determined by the State of Arizona, will be sold at public auction. To initiate this new trespass livestock removal policy, staff at the 56 RMO are currently pursuing viable procurement methods that may be used wherein a contractor would be selected to perform duties under an awarded contract. The contract could include but would not be limited to: actively riding the range at the BMGR East, monitoring the presence of trespass livestock, inspecting and repairing fencing, and removing trespass livestock as necessary utilizing established protocols and or procedures as set forth under law and or an issued Statement of Work. 56 RMO would also explore the possibility of having the contractor monitor for invasive weeds as well as observing and reporting on any other known or potential impact to natural and cultural resources on the BMGR East.

CHAPTER 4 CHANGES IN CULTURAL RESOURCES

The USAF and USMC are responsible for protecting and managing the cultural resources within the BMGR in accordance with a suite of federal laws and regulations. Federal law protects cultural resources that satisfy government criteria for being listed on the National Register of Historic Places. The USAF and USMC, in consultation with tribes and other interested parties, work with the Arizona State Historic Preservation Office (SHPO) in Phoenix, Arizona to determine which resources are eligible for listing. Activities that provide protection for cultural resources on the BMGR indirectly support the military mission by preventing or minimizing conflicts between military operations and resource protection goals.

4.1.1 Update

BMGR East

The most recent ICRMP for the BMGR East was implemented in 2009. An update to the ICRMP is currently in progress and is expected to be finalized in 2018. A key component of the plan is the integration of natural and cultural resource concerns through the successful implementation of the ICRMP and INRMP as required by MLWA. These efforts have been identified as a series of action items in the Management Action Plan, some of which are high priorities for the five years covered by the ICRMP and include:

1. Complete surveys and Section 106 reviews as needed to support range improvements and sustain the training mission.
2. Sustain the training mission by including actions proposed in the Comprehensive Range Plan and the EIS for range enhancements and alternatives.
3. Carry out the actions required under the programmatic agreement for INRMP implementation and complete cultural resource inventories and Section 106 review of INRMP-related actions not covered by the programmatic agreements.
4. Synthesize cultural resource data, evaluate the historic significance of recorded resources, and make determinations of eligibility for inclusion on the National Register of Historic Places.

Archaeological surveys have been conducted in both military use zones and public access areas. Public recreation, and the associated effects, are potential threats to cultural resources. To determine the extent of the threat, the programmatic agreement for implementation of the 2007 INRMP required the prioritization of surveys along roads and adjacent areas likely to be affected by public access (56 RMO 2009). Surveys conducted along public access roads in Area B have identified at least 39 resources eligible for inclusion on the National Register of Historic Places (Tagg and Blake 2012). Per the agreement, the USAF developed strategies to protect these resources from public use activities such as vehicle based camping, campfires, theft, and vandalism. Strategies include regular monitoring of known resources, permit enforcement, and increased recreational supervision.

The majority of the projects are related to military actions that require surveys of large contiguous areas. The 56 RMO is committed to systematic surveys of areas affected by ongoing training activities and as of 2015, 199,391 acres of the BMGR East have been surveyed. Surveys and projects that have been initiated since the 2012 INRMP include:

- Completed 2012-Intensive archaeological survey of 1,003 acres on Range 1.
- Completed 2013-Archaeological survey and condition assessment of the GPS site (AZ Z:5:55 [ASM]).
- Completed 2014-Stoval Airfield resurvey and archaeological testing of six sites.
- Completed 2014-Intensive archaeological survey of 155 acres for the Sierra del Diablo forage plot realignment in the Southern San Cristobal Valley.
- Completed 2014-Intensive archaeological survey of a 1.6-mile segment of Range 1 road and AZ Z:5:68(ASM).
- Completed 2016-Gila Bend AFAF archaeological data recovery at five sites and one isolate within the Airfield Flight Line Clear Zone.

The Arizona Site Stewards Program (ASSP) is a key component of site monitoring efforts on the BMGR East. The ASSP trains and uses volunteers to monitor sensitive or threatened sites on public lands throughout the state. Currently over 800 trained volunteers monitor the condition of historic, prehistoric, and paleontological sites. Their efforts constitute a crucial supplement to the limited staff resources of most federal and state agencies. Site Steward training involves both classroom instruction and fieldwork covering antiquity laws, crime-scene management, site and feature identification, and map reading.

Figure 4.1: Rock art located on the BMGR East.

The ASSP is led by and sponsored by SHPO, the Governor's Archaeology Advisory Commission, and public land managers throughout Arizona, including the 56 RMO. The 56 RMO cultural resource manager serves as the Agency Coordinator for ASSP activities on the BMGR East, identifying and prioritizing sites to be monitored and preparing handbooks to be used for this purpose by Site Stewards. A volunteer Regional Coordinator monitors the activities of Site Stewards working on the BMGR East.

BMGR West

The MCAS Yuma and 56 RMO cultural resources programs for the BMGR West and East, respectively, produced a three-volume ICRMP in 2009. The ICRMP provides guidance for managing cultural resources on the entire BMGR in accordance with the National Historic Preservation Act and other

applicable laws and regulations. Volume 1 addresses the background and management issues germane to both the BMGR West and the BMGR East—the physical setting, resource laws, culture history, and other landscape-scale elements. Volume 2 specifically addresses the BMGR East and, as mentioned above, is superseded by a 2017 ICRMP. Volume 3 specifically addresses the BMGR West.

In 2011, the then MCAS Yuma Cultural Resources Manager considered the writing of the BMGR West portion of the most recent ICRMP to be complete. The final draft of the ICRMP, however, was never presented to the Commander for signature and thus, was never executed. MCAS Yuma awarded a contract in August 2017 to have the 2011 ICRMP rewritten in order to correct deficiencies and update the management strategy. Completion of the new BMGR West ICRMP is anticipated in September 2019 and, among other changes, it will include Standard Operating Procedures and an assessment of current data gaps.

Approximately 137,000 acres (20 percent) of the roughly 694,000 acres of the western portion of the BMGR West has been systematically surveyed. These surveys have resulted in the recording of approximately 350 sites. Survey reports completed since 2012 include the following:

- Completed 2013- Cultural Resources Survey for a Renewable Energy Project for Marine Corps Air Station Yuma
- Completed 2013- Archaeological Survey Report of Negative Findings for the Laser Spot Video Recording System on the Barry M. Goldwater Range West
- Completed 2014- Archaeological Survey Report of Negative Findings for the Range One Expansion on the Barry M. Goldwater Range West
- Completed 2015- Archaeological Survey of 21,941 Acres on the Barry M. Goldwater Range West, Marine Corps Air Station, Yuma, Arizona
- Completed 2015- Archaeological Survey Report of Negative Findings for a Proposed Earthquake Early Warning Sensor on the Barry M. Goldwater Range West
- Completed 2016- An Archaeological Survey of 6,289 Acres on the Barry M. Goldwater Range West, Yuma County, Arizona
- Completed 2016- Archaeological Survey of 26,172 Acres on the Barry M. Goldwater Range West, Marine Corps Air Station Yuma, Arizona

The MCAS Yuma cultural resources program, in accordance with Section 110 of the National Historic Preservation Act, requests funding each year in order to complete the survey of the BMGR West. As with the BMGR East, this goal will not be realized for several years simply due to the magnitude and cost of the task. The ICRMP, now underway, will detail the Marine Corps' short and long-term plans for compliance with Section 110.

CHAPTER 5 CHANGES TO OUTDOOR RECREATION AND PUBLIC ACCESS

The BMGR offers a variety of public recreation activities as well as access to natural areas. Approximately 38 percent of the BMGR is open to the public. Activities include camping, hiking, hunting, and target shooting.

5.1 Update

Range permits allow entry to both the BMGR East and West public areas, Cabeza Prieta NWR, and the Sonoran Desert NM. Range access permits are available online or can be obtained from the 56 RMO/Public Affairs office, MCAS Yuma Pass and Identification office, Cabeza Prieta NWR, and the BLM Phoenix Field office. All visitors are required to sign a hold-harmless form, and watch a range safety video. Two permits are required; one in personal possession at all times and the other displayed on the vehicle's dash. Prior to entering the range, recreational users must call the phone number listed on the back of the permit to hear warning information for specific travel areas. Individuals under the age of 18 must be accompanied by an adult at all times. Any person entering the range without a valid permit may be fined and/or barred from the BMGR.

BMGR East is also planning to provide permits online via the iSportsman program (https://isportsman.net). The program allows visitors to register and print a permit, sign a digital hold harmless form, watch the range safety video, and check in and out of an area via smartphone app or a phone call. Additionally, the 56 RMO can develop a custom report that all users must fill out detailing what area of the range they will be visiting, the duration of the visit, type of activities being performed, and any other information that will assist the 56 RMO perform its natural and cultural resource management mission. Depending on the success of this program, the MCAS Yuma RMD is interested in using the iSportsman program on the BMGR West.

Individuals interested in conducting scientific research on the BMGR are required to obtain permission from the 56 RMO or the MCAS Yuma RMD. In addition, for the collection of wildlife specimens, a Scientific Collection Permit application is also required to be approved by the AGFD.

The following activities are prohibited or require the applicant to pass a background check to obtain a Special Use Permit.

- Use of drones/UAVs (prohibited)
- Parties with 10 or more vehicles
- Discharge of firearms before sunrise or after sunset
- Discharge of fully automatic firearms
- Extended camping
- Scientific studies of any type
- Collecting wildlife specimens (requires additional approval by AGFD)

All public recreational users are expected to comply with range rules. Cross-country and off-road travel is strictly prohibited and all vehicles are required to remain on designated roads. On the Cabeza Prieta NWR, vehicles are restricted to the Camino del Diablo and Christmas Pass Roads. In general, roads should be considered closed unless designated open by an official carsonite post marker on the BMGR East or a lettered/numbered 4X4 wooden intersection marker on the BMGR West. Disturbance or removal of cultural resources/artifacts (e.g., pottery, chipped stone, ground stone, shell, beads, glass bottles, ceramics, cans, metal, lumber, pictographs, and arrowheads) is strictly prohibited.

Figure 5.1: Unimproved public access road.

In the past, visitor gates on the BMGR East have been augmented with counters and cameras, and this may be re-implemented in the future. Cameras can capture images of who is using the range and for what purpose. The practice of leaving food, water, clothes, and medical supplies along UDA foot trails has led to increased litter and trash, which the military is responsible for cleaning up. If identified, such groups will be escorted off the range, have their permits revoked and may face investigation and prosecution from BMGR East and West CLEOs and CBP.

BMGR East

Approximately 13 percent of the BMGR East is open for public recreation (Figure 5.2). Visitors to the BMGR East must abide by these range-specific rules:

- *Rock hounding* - Prospecting, removal, or disturbance of sand, gravel, rocks, minerals, and fossils is strictly prohibited.
- *Hazard Areas* –For safety reasons, the 56 RMO has established "Hazard Areas" that are off-limits to permit holders when the range is open. This restriction affects access to the northernmost portions of Area B.
- *Hunting* – Hunting at the BMGR East is restricted to the public access areas. Public access areas east of SR 85 (i.e., Area B, area near the eastern range boundary in ETAC) fall under the AGFD hunting Unit 40A (AGFD 2017). Species available to hunt within this area include bighorn sheep, javelina, deer, dove, and quail. Available bighorn sheep permits have varied over the last 10 years due to population fluctuations. Between 2008 and 2013, no bighorn sheep permits were available due to population decline. Only one permit was available in 2014. Another slight increase in population since 2015 have resulted in two permits being available each year for 2015, 2016, and 2017. The number of bighorn sheep permits is determined by the AGFD population survey results. Public access areas west of SR 85 on BMGR East (i.e., area near Ajo) fall under the same AGFD hunting unit as BMGR West, 40B (described below).

BMGR West

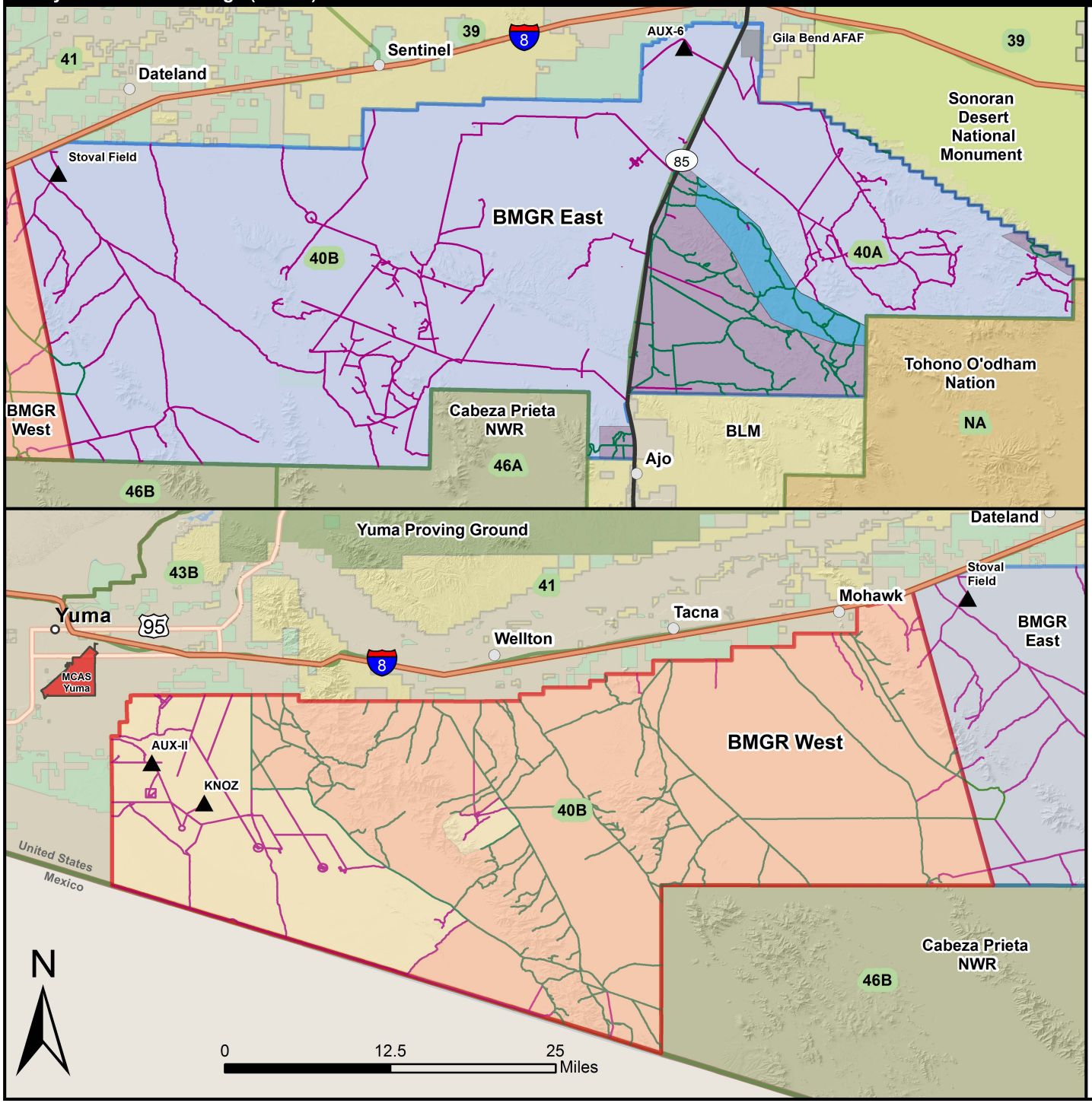
Approximately 76 percent of the BMGR West is open for public recreation (Figure 5.2). Visitors to the BMGR West must abide by these range-specific rules:

- *Rock hounding* – Surface rock collection is allowed in most of the BMGR West public recreation areas. Collection is limited to 25 pounds of surface rock per day and 250 pounds per year. The use of metal detectors is strictly prohibited.
- *Hunting* - Hunting within the publicly accessible portions of the BMGR West falls under the AGFD hunting Unit 40B (AGFD 2017). Species available to hunt within this unit include bighorn sheep, javelina, deer, dove, and quail along with waterfowl and pheasant, although the presence of waterfowl and pheasants is extremely unlikely. As with BMGR East, available bighorn sheep permits has varied over the last 10 years due to fluctuations in population. Currently, 8 bighorn sheep permits are available annually with four tags being issued for the Gila Mountains, two tags for the Tinajas Mountains, and two tags issued for the Copper and Mohawk Mountains. The available number of bighorn sheep permits is assessed annually and is determined by the AGFD population survey results.

Figure 5.2: BMGR Public Recreation

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstate 8
- Highways
- Auxiliary Airfield (AUX)
- BMGR West
- BMGR East
- Gila Bend AFAF
- Yuma Proving Ground
- Cabeza Prieta NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- MCAS Yuma
- BLM
- State Trust Land
- Arizona G&F Game Managements Units
- Hazard Area - Access is only granted when range is closed. Valid permit required.
- BMGR East Public Access
- BMGR West Public Access
- BMGR Designated Admin Use Only Road
- BMGR Designated Public and Admin Use Road

World Geodetic System 1984 (WGS84) Projection
Zone 11 and 12 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

5.2 Conservation Law Enforcement

Law enforcement on the range is defined within the Sikes Act, 16 U.S.C. § 670; Assimilative Crimes Act, 18 U.S.C. § 13; Uniformed Code of Military Justice, 10 U.S.C. § 807B; and other applicable laws and regulations. The Sikes Act mandates that each military department shall ensure sufficient numbers of professionally trained CLEOs are available and assigned responsibility to perform tasks to implement INRMPs. Enforcement of natural resources laws is an integral part of a Natural Resources Program and shall be coordinated under the direction of the Natural Resources Manager (CFR 32, Title, 32 National Defense 2000). Because the ICRMP is incorporated by reference in the INRMP, the USAF and USMC also must enforce laws and regulations that protect cultural resources.

In addition to enforcement activities, CLEOs are the eyes and ears of the range. CLEOs assist with conservation activities such as wildlife surveys, habitat restoration, water projects, formulating hunting objectives, monitoring protected species, and resolving nuisance and human/wildlife conflicts. CLEOs patrol and/or conduct surveillance where there is a potential for poaching or cultural resource vandalism. CLEOs also play an integral role in slowing the spread of invasive species. CLEOs spend a majority of the time patrolling the range and may be the first to identify such species. They assist NRMs by using the GIS Cloud app to record the GPS coordinates and capture images of invasive species to allow prompt management actions.

Integral to resource protection is public education and outreach. Education is a key element in preventative law enforcement. Successful conservation law enforcement is enhanced by the knowledge gained in contributing to natural and cultural resources program support.

BMGR East

The 56 RMO has entered into a contractual agreement with AGFD to employ two Department Wildlife Managers as CLEOs for the BMGR East. These activities are authorized under ARS Title 17-201A, 211E, 231B.7, and 310; and are consistent with provisions of the Sikes Act (16 USC 670a) and the MLWA. One CLEO began service in Oct 2017 and the other will begin service in the fall of 2018. The CLEOs are tasked with enforcing federal and state laws and AGFD Commission rules governing natural resources, cultural resources, OHV/ATV use, trespass, and property damage as necessary. The CLEOs have authority to conduct investigations and issue citations, serve warrants, make arrests, coordinate case prosecution with County Attorneys and the Staff Judge Advocate (56 FW JA), and provide testimony in court. The CLEOs will support the military and conservation goals through implementation of the INRMP and ICRMP, as requested/directed by the 56 RMO.

BMGR West

MCAS Yuma employs four full-time Range Wardens, or CLEOs, to investigate, apprehend, and/or detain individuals suspected of committing offenses of the criminal laws and regulations of the U.S. that relate to MCAS Yuma, the BMGR, and the Chocolate Mountain Aerial Gunnery Range, with an emphasis on protecting natural resources. CLEOs are uniformed law enforcement officers with fully delegated law enforcement authority, including authority as USFWS Deputy Game Wardens, allowing them to enforce federal wildlife statutes (MCAS Yuma SOP 2013).

CHAPTER 6 CHANGES IN THE BMGR ROAD SYSTEM

The 2007 INRMP included an inventory of all roads and their classification within the following three categories:

- roads open for administrative (i.e., government) and public use
- roads open for administrative use only
- roads closed to public use

The designated road system and public access opportunities are mostly unchanged. However, continued surveys and monitoring of the road system have prompted Luke AFB and MCAS Yuma to propose changing the road classifications and adding roads to support military training, resource management, and BP law enforcement purposes. The current status of the BMGR road system and public access opportunities at BMGR West and BMGR East are addressed in the following sections.

6.1 UPDATE

BMGR East

The 2018 road system includes maintained roads through active target complexes, but does not include all of the vehicle routes that are used within the complexes to construct and maintain individual targets or that are used for EOD clearance activities. The surface areas within target complexes affected by construction, maintenance, and EOD clearance vehicles are located in open areas that are already heavily disturbed by bombing and strafing. Vehicle operations to conduct construction, maintenance, and EOD clearance work, contribute to the ground disturbance. This method of accounting for the roads contributes to some of the differences in the total miles of administrative use roads between 2012 and 2018. As indicated above and as provided by the 2012 INRMP, the USAF may occasionally need to reuse a closed road when it is the only means of accessing a specific location for conducting certain activities, such as conducting a Native American group visit to a remote cultural resource site or transporting equipment to an isolated location. The closed road would be used for that occasion, but would not be otherwise mapped, marked, or signed for other government agency use, as is done with roads classified for regular administrative use. The road would remain classified as closed and would be treated as closed for all routine government uses. When the need to reuse a closed road is identified, the USAF would evaluate the proposed use for compliance with environmental laws (for example, to verify that no species newly listed as either threatened or endangered, or proposed for listing, under the ESA are likely to occur in the area). Closed roads that have been reclassified as recovered former roads would require careful assessment of the potential

Figure 6.1: Example of a road closure sign.

effects of the proposed reuse on their recovered status before new use of these former routes could be approved.

As indicated in Table 6-1, the active road system, as recorded in 2018, includes a total of 744 miles of roads, of which 170 miles are designated as available to provide public access (Figure 6.2). Because extensive areas continue to be used on a regular basis for military activities, general public access continues to be limited. Public access to Management Unit 6 (which includes what is known as Area B) is subject to temporary closures as needed for military purposes. Areas currently open to the public also may be closed to protect vulnerable natural or cultural resources from damage.

Table 6-1: BMGR East Designated Road System in 2012 and 2018

ROAD CATEGORY	2012	2018
Miles of roads classified for administrative use only inside military hazard/security areas that are restricted from general public access	570	555
Miles of roads classified for administrative or public use inside military hazard/security areas	5	6
Miles of roads classified for administrative use only outside of restricted military hazard/security areas	11	13
Miles of roads classified for public use outside of restricted military hazard/security areas but subject to temporary closure for military purposes	170	170
Total Miles of Road	***756***	***744***

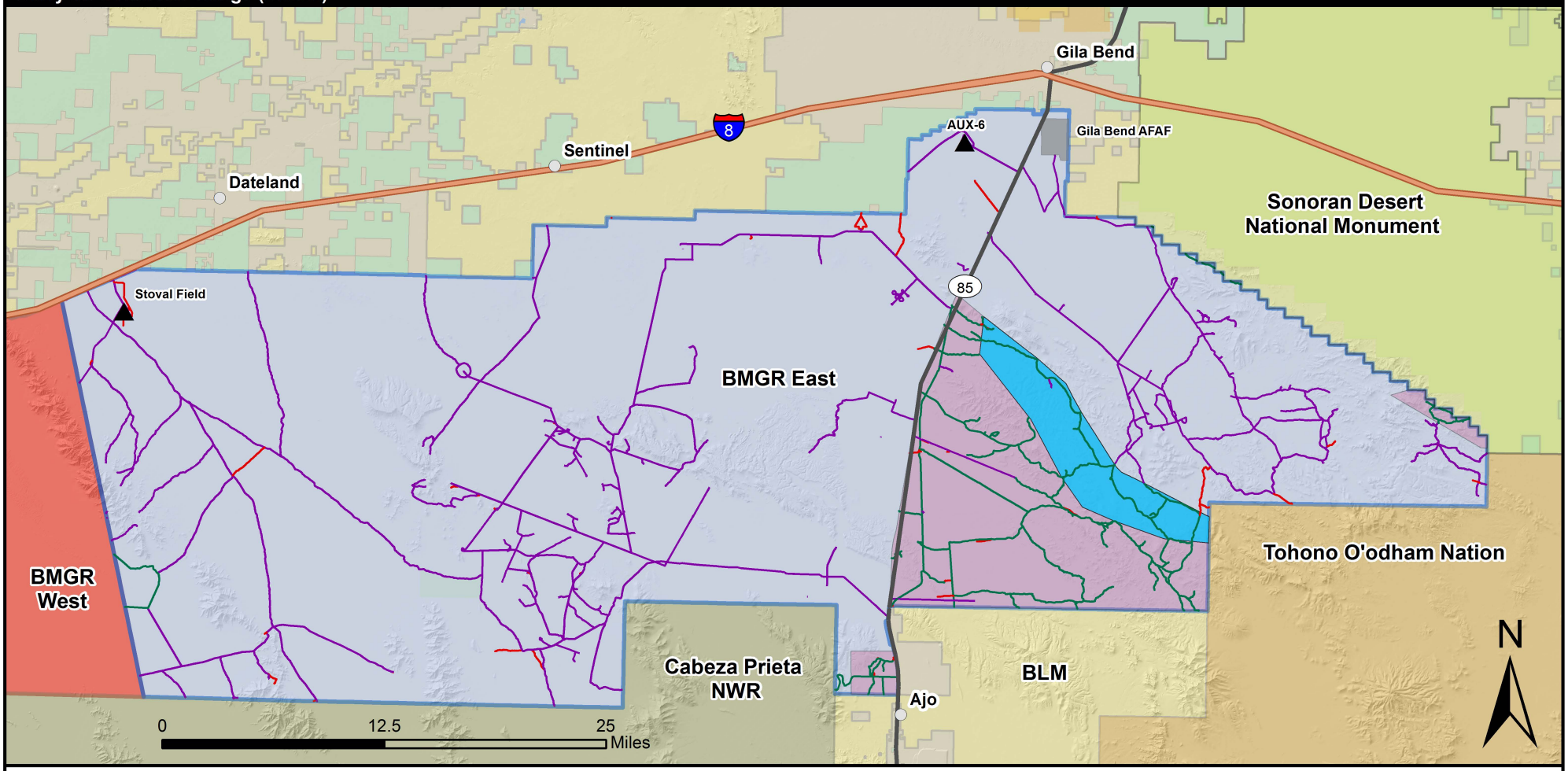
As outlined in Table 6-1, additional surveys and monitoring of roads have led to the following changes in miles of roads:

- Roads open for administrative use only inside hazard/security areas has increased by 15 miles. The difference in mileage of administrative use only roads is from the addition of road intersection at the 567 segment and the closure of road at Daniels arroyo, the San Cristobal cheater road, the Cougar Canyon extension road, and the Granite Mountain access road.
- Miles of roads classified for public use inside military hazard/security areas has increased by 1 mile, from 5 to 6. This increase is due to a more accurate measurement of the roadways.
- Miles of roads classified for administrative use only outside of hazard/security areas has increased from 11 to 13 miles. The increase is due to the addition of new roads.

Figure 6.2: BMGR East Travel Management

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstate 8
- State Route 85
- BMGR East
- BMGR West
- Gila Bend AFAF
- Cabeza Prieta NWR
- Sonoran Desert NM
- Tohono O'odham Nation
- BLM
- State Trust Land
- Hazard Area - Access is only granted when range is closed. Valid permit required.
- BMGR East Public Access

BMGR East Desginated Road System

- Road for Administrative (Government) Use Only
- Road Closed
- Road Open for Public and Administrative Use
- Auxiliary Airfield (AUX)

World Geodetic System 1984
(WGS84) Projection
Zone 12 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

BMGR West

The designated road system continues to function as documented in the 2012 INRMP, with a few minor exceptions. The 2012 INRMP reported three road designations: miles of administrative use only roads inside military hazard/security areas, miles of administrative use only roads outside of military hazard/security areas, and miles of roads classified for administrative or public use outside of restricted military hazard/security areas. For 2018, the road designation system was simplified to include only two categories: miles of roads classified for administrative use only and miles of roads classified for public use. Additionally, the difference in miles of administrative use only roads is due to more accurate surveys of the roads. No new roads have been added during the 2012-2018 timeframe.

The area available for general public access continues to include about 75 percent of the BMGR West. All or portions of the public use area continue to be subject to occasional temporary closures to support military activities that present safety hazards and/or have security requirements. The active road system is 636 miles of active roads and includes 427 miles of public access roads (Table 6-2 and Figure 6.3).

Table 6-2: BMGR West Designated Road System in 2012 and 2018

ROAD CATEGORY	2012	2018
Miles of roads classified for administrative use only	195	209
Miles of roads classified for public and administrative use	427	427
Total Miles of Road	***622***	***636***

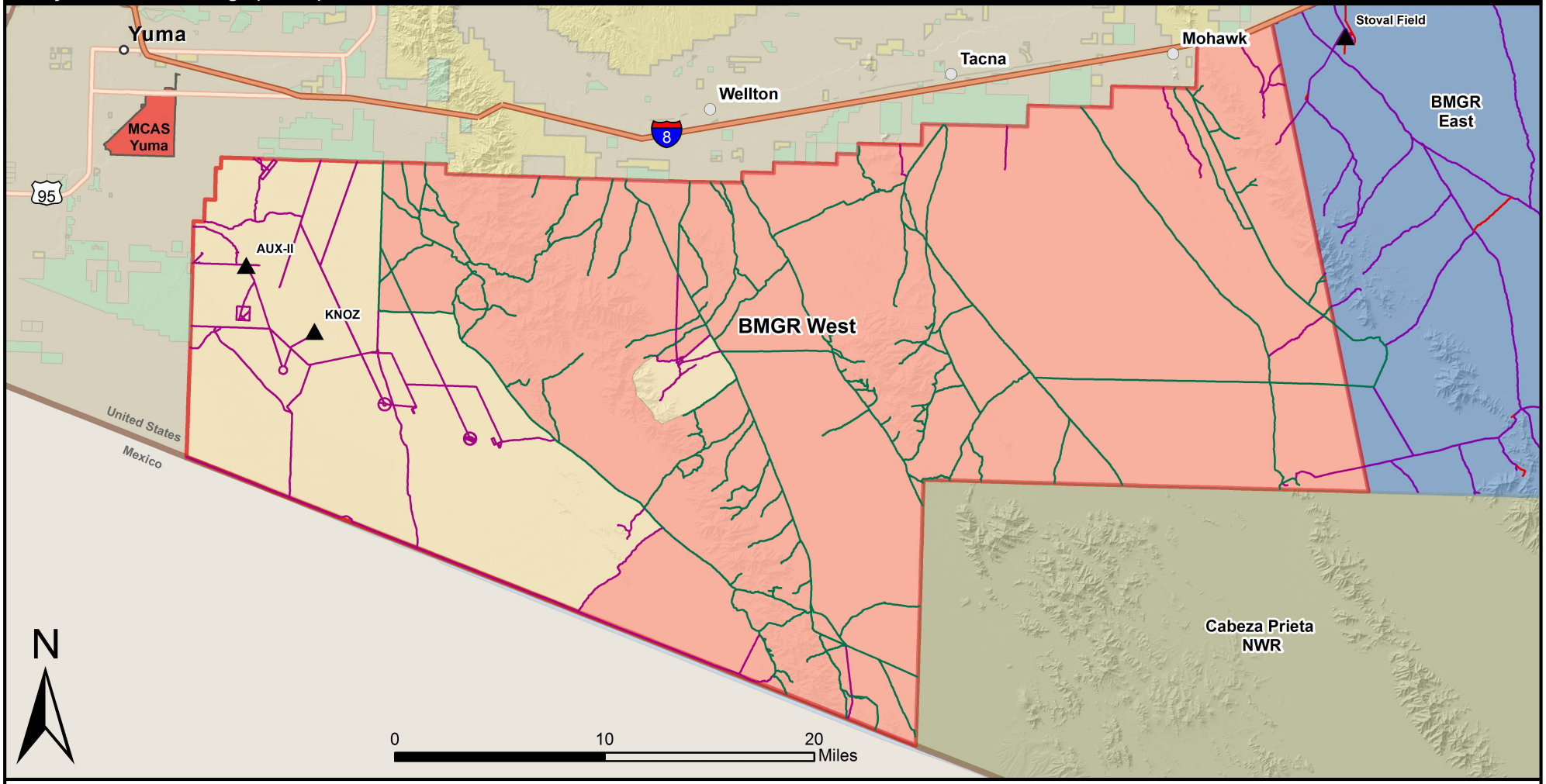
As outlined in Table 6-2, additional surveys and monitoring of roads have led to the following changes in miles of roads:

- Miles of roads of roads classified for administrative use only has changed from 195 miles to 209 miles. The change in road mileage is due to more accurate road surveys.

Figure 6.3: BMGR West Travel Management

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- City/Town
- Interstate 8
- Highways
- BMGR West
- BMGR East
- MCAS Yuma
- Cabeza Prieta NWR
- BLM
- State Trust Land
- BMGR West Public Access
- Auxiliary Airfield

BMGR West Designated Road System

- Road for Administrative (Government) Use Only
- Road for Public and Administrative Use

World Geodetic System 1984
(WGS84) Projection
Zone 11 N
GCS_WGS_1984

Base data from ESRI StreetMap
Hillshade derived from USGS NED

Created By:
Center for Environmental Management
MILITARY LANDS
Colorado State University

CHAPTER 7 SUMMARY OF ENVIRONMENTAL REMEDIATION ACTIVITIES

Chapter 7 offers a brief overview of the handling and treatment of hazardous materials and solid waste at the BMGR and a summary of the associated mitigation measures that are routinely employed. This is followed by an update of out-of-routine remediation actions that have occurred since the 2012 INRMP report.

7.1 Hazardous Materials

Hazardous materials are substances with strong chemical and/or physical properties, which may pose a substantial threat to human health and the environment. Hazardous materials used support the military mission includes petroleum, oils, and lubricants such as fuel, hydraulic fluids, and similar substances. To a lesser extent, target maintenance activities also require hazardous materials (for example, paint).

Latex paints are used in dispersed locations throughout the BMGR for construction and repair of simulated targets. Petroleum and lubricants are used to power and maintain vehicles and portable generators in the target ranges and ground support areas throughout the BMGR during troop deployment and range maintenance and clearance activities. Temporary containment aprons made of high-density sheeting and sandbags are placed beneath parked vehicles, supply drums, temporary aboveground storage tanks, fuel tankers, vehicles being fueled, and other equipment that may leak fuels or lubricants. When soiled, the aprons are placed in secure containers, transported off-range, and handled/treated/disposed of as solid waste in accordance with applicable rules and regulations.

Recreational users also use petroleum and lubricants to power their vehicles and other motorized equipment. The amount used is unknown.

7.2 Hazardous and Solid Wastes

Hazardous wastes are products or by-products of hazardous materials. In order to be classified as hazardous, the substances must either appear on a series of lists compiled by the U.S. Environmental Protection Agency or have the characteristics of being flammable, corrosive, reactive, or toxic.

The potential areas for both hazardous and non-hazardous waste generation are near to where they are used. Military aircraft mishaps or the downing of an aircraft, will also generate hazardous waste. The protocol for responding to an aircraft mishap involves multiple considerations for handling and disposing of these substances. Materials and waste management at the mishap site also includes an estimate of the environmental damage to the site as compared to the derived benefits from the removal operation or site mitigation measures.

At the Gila Bend AFAF, low concentrations of hazardous wastes may be processed in the wastewater treatment lagoons and septic systems. These sites are monitored in accordance with applicable regulations to ensure that undue amounts of hazardous wastes are not released into the environment.

Solid waste includes garbage; refuse; sludge (from a wastewater treatment plant, water supply treatment plant, or air pollution control facility); and other discarded material. Solid waste is generated as a result of activities associated with all training activities. Routine military waste management is accomplished by means of wastewater treatment lagoons at the Gila Bend AFAF, septic systems at other established support facilities, and the regular removal of all other hazardous and solid wastes from the BMGR for recycling or disposal in approved off-range landfills. During military troop deployment exercises, all solid waste is collected, contained, transported off range, and disposed of in accordance with all applicable rules and regulations.

Each training range is closed annually for maintenance. During the closures, EOD personnel render any unexploded and partially exploded ordnance inert and nonhazardous, and remove the remaining residue to a central collection point to be processed for recycling. A small amount of debris, mainly wood targets and sea-land container liners are either ground in place as mulch or removed for disposal in a sanitary landfill off the BMGR.

Figure 7.1: During annual range maintenance unexploded ordnance will be rendered inert and nonhazardous and processed for recycling.

The management of non-military waste relies on the recreation user code of conduct, communicated via the permit program. However, some occurrences of solid waste littering by recreational visitors, individuals illegally entering the U.S. from Mexico, and illegal dumping have been identified. Although no specific area has been identified as a central location for illegal dumping, solid waste has been spotted in areas along the borders of the BMGR as well as along I-8 and SR 85. Solid waste dumping has also been observed scattered in designated recreational use areas of the range.

7.3 Update

BMGR East

Since the 2012 report Weston Solutions completed investigation and remediation activities at several former munitions treatment and disposal areas at AUX-6 on the BMGR East in three phases;

- Phase I: 12-19 November 2015
- Phase II: 11 January – 12 February 2016
- Phase III: 2 January — 30 March 2017

All fieldwork has been completed. The final report is due early 2018.

The two Solid Waste Management Units (SWMUs) included in the Resource Conservation and Recovery Act of 1976 (RCRA) Facilities Investigation (RFI) are located at AUX-6, Sub Area 1, on the BMGR. The runways at AUX-6 are configured in an equilateral triangle and were used for aircraft operations starting in the 1940s. When aircraft operations ceased at AUX-6, it was used for

training and munitions disposal. Ammunition disposal actions associated with AUX-6 were likely active until the early 1970s when EOD operations were relocated to the MTR located south of the Range 4 access road. Currently, AUX-6 is used for joint tactical training operations that do not involve live munitions, and munitions disposal operations are currently not conducted. The area is suitable for these purposes because of its proximity to the Gila Bend AFAF and existing cleared level areas for vehicle access and maneuvering. Three subareas have been designated at SWMU 2:

- SWMU 2-1 is the site of the former underground munitions- burning furnace, associated fuel tank, and pipeline. It is located within the infield portion of AUX-6 formed by the three runways.
- SWMU 2-2 is a discrete area located in the southeast portion of AUX-6 and was reportedly used for thermal treatment of munitions including pyrotechnics, cartridge- actuated devices, and 20mm ammunition.
- SWMU 2-3, also known as the Northwest Open Burn (OB)/Open Detonation (OD) Area, is located in the northwest portion of AUX-6 near the northernmost apex of the triangle formed by the three runways and was the site of OB/OD of various munitions items.

Historical activities at SWMU 2-1 consisted mainly of thermal treatment of munitions in a furnace mounted on a concrete slab. Fuel was provided to the furnace via underground piping to a separate fuel tank. The thermal treatment of munitions consisted of lighting the furnace until an operating temperature was achieved that was sufficient to burn off energetic components of munitions items. The munitions were supplied to the furnace from a feeder pipe. Munitions residue was removed from the furnace after it had been shut down and allowed to cool.

Treatment of munitions at SWMU 2-3 consisted mainly of burning in a trench with combustible dunnage (wooden boxes, pallets, scrap lumber, etc.) and application of an accelerant such as diesel fuel. Munitions items were placed on the dunnage and either functioned or were consumed. Explosive kick-out from functioning munitions may have been scattered around the burn pits. At the conclusion of burning, pits were either backfilled or remained open for reuse. Open detonation of munition items consisted of placing a block of donor high explosive on each item followed by detonation. The most commonly used donor charge was C-4 plastic explosive, a plastic explosive consisting of a mixture of chlorotrimethylene-trinitramine and a plasticizer.

The SWMUs at AUX-6 are subject to the closure requirements of 40 CFR 264 Subpart G. A RCRA Hazardous Waste Management Area Post-Closure Permit has been obtained by Luke AFB from ADEQ for Unit 8 of the MTR in June 2006. A condition of the Post-Closure Permit required completion of a RFI to determine if munitions constituents (MC) releases require additional corrective measures to formally close SWMUs 2-1 and 2-3.

Previous RCRA activities have identified the majority of munitions hazards and removed some of the munitions debris. An initial investigation conducted by Bering Sea Eccotech (BSE) confirmed subsurface indications of previous munitions burning and detonation at AUX-6, including munitions and explosives of concern (MEC), munitions debris, miscellaneous metal scrap, and hydrocarbon impacts in soil. Subsequently, BSE removed extensive deposits of buried munitions debris and transported them off site. The scope of BSEs activities consisted of brush removal, surface clearing,

and digging exploratory trenches in locations based on surface debris and known or suspected areas of concern. In addition, soil samples were collected at both SWMUs; however, a summary of analytical results or laboratory reports were not included in the report issued by BSE.

A visual site inspection conducted by Zapata Engineering in 2007 identified and gathered historical information on explosive releases at AUX-6. The inspection confirmed the presence of MEC consisting of 20mm fuses and projectiles; aircraft actuators and rocket motor propellant, and munitions debris consisting of 20mm casings, projectiles and fragments; small arms; bomb fragments; smoke grenades; 2.75- and 5-inch rockets and rocket motor components; cartridge actuator components, and illumination flares. A subsequent geophysical investigation was completed at SWMU 2-1 and 2-3 by Zapata Engineering in May 2009. The investigation covered a radial pattern of individual transient electromagnetic (EM) survey lines at SWMU 2-1 and 2-3. In addition, contiguous lane mapping was completed generally centered over the suspected furnace location at SWMU 2-1, with an EM survey to map soil conductivity in the vicinity of the former furnace pad. The investigation covered only approximately ¼ acre of the area delineated as SWMU 2-1. The EM survey lines at SWMU 2-3 were generally concentrated at the southeast portion of the SWMU, with several lines oriented along or near suspected burial trenches.

In May 2012, HydroGeoLogic, Inc. (HGL) conducted a digital geophysical mapping (DGM) investigation of 4 acres at SWMU 2-1 and 20 acres at SWMU 2-3. The results from that investigation indicated the presence of potential burial pits and subsurface metal sources at both SWMUs. A total of 128 anomalies and 8 potential burial pits were identified at SWMU 2-1 and 2,129 anomalies with 19 potential burial pits at SWMU 2-3, based upon the 2012 DGM investigations. The eight polygons are multiple anomalies within proximity to each other and are potential burial pits (HGL 2012).

RFI of SWMU 2-1 and 2-3 were presented in RFI Reports prepared by HGL. Two separate RFI Plan Objectives were developed by HGL for SWMU 2-1 and 2-3. The proposed actions in the RFI Plan Objectives, based upon accumulated investigation data, included the following:

- Conduct DGM of recommended additional grids.
- Reacquisition of anomalies identified during DGM surveys.
- Intrusive investigation of individual anomalies and potential burial pits.
- Soil sampling and analyses to determine if MC was present.
- Comparison of analytical results to applicable or relevant and appropriate regulatory limits.
- Preparation and submittal of an RFI Report summarizing MEC/MC investigation results with recommendations for further actions if necessary.

BMGR West

No accidental spills have been reported at the BMGR West between the 2012 report and present (February 2018). Any point source pollution, such as painting targets and burning wooden target debris, is remediated in accordance with best management practices and stipulations in the permits from either ADEQ or Yuma County.

CHAPTER 8 SUMMARY OF PUBLIC OUTREACH PROGRAMS

As the primary users and managers of the BMGR East and the BMGR West, respectively, the USAF and the USMC have been delegated several responsibilities. One of these is maintaining a range management balance that ensures long-term use of the facility as a premier military training location while ensuring long-term management and protection of natural and cultural resources. In that capacity, the services routinely provide forums for public outreach and opportunities for the public to learn about and provide input on various actions proposed for the BMGR. The following is an overview of the various public involvement programs and opportunities. Focus areas for public involvement programs include:

- Tours
- Indian Nations briefs
- Published articles
- Speaking events
- Media coordination
- Special projects and events
- Miscellaneous requests and participation in events

The USAF and USMC continue to participate in the BEC that was established in February 2001. The executive board is composed of representatives of agencies that have vested interests in BMGR lands. The BEC is chaired by the Director of the 56 RMO, and includes representatives from MCAS Yuma, BLM, USFWS, AGFD, CBP, and directors for the adjacent Sonoran Desert NM, Organ Pipe Cactus NM, and Cabeza Prieta NWR. The BEC meets six times each year to discuss and develop solutions for regional problems.

Additionally, in December 2011, provisions of the MLWA 1999 required that the Secretaries of the Navy, Air Force, and Interior establish an Intergovernmental Executive Committee (IEC) to provide a forum solely for the purpose of exchanging views, information, and advice relating to the management of the natural and cultural resources within the BMGR. The IEC membership includes those agencies and Native American tribes that may have a direct responsibility for, potential impact upon, or direct interest in the lands or resources of the BMGR. IEC meetings are open to the public and provide non-IEC participants with opportunities to present opinions regarding the BMGR management policies and procedures to the IEC for discussion and possible action recommendations.

BMGR East

Public outreach efforts by the USAF provide input on the development of information and infrastructure improvements to facilitate public recreational activities at BMGR East, including:

- Updated public visitation maps and rules for public education and recreation use.
- An informational video for visitors that addresses safety and environmental awareness.

- Installation of signs, gates, and fences to support road infrastructure and public access.

The USAF conducts public meetings on various issues that are announced via its website, newsletters, mailings, newspaper advertisements or legal notices. Annual reports concerning the public involvement programs for the BMGR East can be found at (URL:http://www.luke.af.mil/) .

56 RMO staff will continue to offer public involvement opportunities and provide outreach to the public. Public participation has increased from the previous years for all of the activities listed above. Ongoing exercises and operations continue to generate media interest both at Gila Bend AFAF and the BMGR. Requests for speakers, briefings, appearances, and tours continue to grow, along with requests for participation in town, county, and state meetings to coordinate efforts and share information.

BMGR West

Public outreach efforts by the USMC have included the development of information and infrastructure improvements to facilitate public recreational activities at the BMGR West, including:

- A species checklist is available for birding enthusiasts.
- The installation of signs, gates, and fences to support road infrastructure and public access.
- Tours of various features of the BMGR West resources such as the Fortuna Mine, are offered.
- Meetings are held with local non-governmental groups such as the Yuma Valley Rod and Gun Club to issue recreation access permits.
- Visits are made to local recreational vehicle (RV) parks to educate seasonal visitors on BMGR West recreational program.

The CLEOs are primarily responsible for MCAS Yuma's public outreach efforts since they patrol the range seven days a week. In addition, visitors are provided with a brochure that includes a detailed map of road classification (i.e., public, closed, administrative access) and list of approved and prohibited recreational activities (e.g., rules for camping, off-road vehicle travel, rock hounding, hunting). Guided range tours (e.g., mine tours) can be scheduled through the RMD staff. Finally, the RMD supports public outreach by supporting research opportunities and publication of findings in peer reviewed journals and their participation in science conferences and symposiums.

CHAPTER 9 PROPOSED IMPLEMENTATION SCHEDULE FOR FISCAL YEARS 2018-2024

There have been no changes in the 17 management elements outlined in the 2012 INRMP. In planning for the next five years, Luke AFB and MCAS Yuma have each developed a preliminary list of proposed action steps for FY 2018-2024. These action steps were identified by considering data acquired through inventory and monitoring activities, changes that have occurred in the past five years, emerging management issues, and input from USFWS, AGFD, and adjacent land management agencies. While not every management element requires action in each five-year plan, each is considered. These resource management elements are referenced by number in the first column of Tables 9-1 and 9-2.

1. Resource Inventory and Monitoring
2. Special Natural/Interest Areas
3. Motorized Access and Non-roaded Area Management
4. Camping and Visitor Stay Limits
5. Recreation Services and Use Supervision
6. Rock hounding
7. Wood Cutting, Gathering, and Firewood Use, and Collection of Native Plants
8. Hunting
9. Recreational (Target) Shooting
10. Utility/Transportation Corridors
11. General Vegetation, Wildlife, Wildlife Habitat, and Wildlife Waters
12. Special Status Species
13. Soil and Water Resources
14. Air Resources
15. Visual Resources
16. Wildfire Management
17. Perimeter Land Use, Encroachment, and Regional Planning

Before any action is taken range managers will consider public input and any additional partner agency feedback received on this draft Public Report. The proposed implementation plan, as shown in Table 9-1 and Table 9-2, list the actions proposed by Luke AFB for the BMGR East and MCAS Yuma for the BMGR West, respectively.

Table 9-1: BMGR East 5-Year Action Plan FY 2018-2024

INRMP BMGR East 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Resource Management											
1, 11	Monitor and control invasive species	Annual	$50,000	Annual	In-house/ Interagency /University	Ongoing monitoring occurs while driving range roads, control measures performed when necessary and appropriate	$50,000	$50,000	$50,000	$50,000	$50,000
1	Monitor vegetation plots in several plant communities	Annual	$60,000	Annual	In-house/ Contractors/ Interagency	Each plot is assessed at 5-year intervals	$10,000	$10,000	$10,000	$10,000	$10,000
1	Desert tortoise surveys	1 & 5	$50,000	Every 5 years	AGFD	Survey new areas and or re-survey known occupied and suitable habitat identified during previous surveys	$50.000				$50,000
1	Raptor management surveys and monitoring	Annual	$15,000	Annual	In-house/ AGFD	Support bald eagle nest watch, golden eagle surveys, raptor surveys, assess potential for powerline electrocution, etc.	$15,000	$15,000	$15,000	$15,000	$15,000
1	Bird surveys	1 & 2	$35,000	Varies	In-house/ AGFD	New protocol by Arizona Bird Conservation Initiative; survey 3 consecutive years, pause 5 to 10 years, repeat			$35,000	$35,000	$35,000
1	Support AGFD surveys for game ungulates	Varies	$-	Varies by species	AGFD	Support and participate in surveys performed by AGFD					
1	Support AGFD surveys for gamebirds	Annual	$-	Annual	AGFD	Support and participate in surveys performed by AGFD					

[1] INRMP Resource Management Element addressed
[2] Fulfill requirement of Resource Management Element
[3]Year of funding and completion of action
[4] Estimate of required funding amount to complete project
[5] How often action will occur
[6] Responsible parties for completing the action
*May require further NEPA review and/or Section 106 consultation

Table 9-1: BMGR East 5-Year Action Plan FY 2018-2024

INRMP BMGR East 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1	Collaborate with AGFD to identify and maintain important wildlife connectivity corridors	Annual	$-	Annual	AGFD	Collaborate with AGFD to identify and maintain important wildlife connectivity corridors					
1	Kit fox population monitoring	1 & 4	$5,000	Every 3 years	In-house	Continuation of population monitoring using scent stations	$5,000			$5,000	
1	Bat surveys; evaluate, monitor and protect important bat roosts	Annual	$50,000	Annual	In-house / AGFD	Various survey techniques: acoustic monitoring, mist net traps, roost assessments, guano sampling, etc.	$25,000	$25,000	$25,000	$25,000	$25,000
1	Cactus Ferruginous Pygmy owl (CFPO) survey (low priority)	1, 3, & 5	$5,000	Every 2 years	In-house	Low priority: no CFPO detected on BMGR East during repeated surveys over past 20 years; marginal habitat	$3,000		$3,000		$3,000
1	Weather stations and rain gauges	Annual	$19,000	Annual	In-house	Operate 12 existing remote-access stations, plus 15 rain gauges at specific study locations	$19,000	$19,000	$19,000	$19,000	$19,000
1	Monitor use of wildlife waters	Annual	$15,000	Annual	In-house/ AGFD	Continuation of program using wildlife cameras to record usage during summer months; evaluate resulting thousands of photographs to build database of species, abundance, location, etc.	$15,000	$15,000	$15,000	$15,000	$15,000
1	Medium and low priority actions as resources allow	Annual	$10,000	Varies	TBD	Some lower-priority actions may be completed based on adaptive management concerns or availability of resources	$10,000	$10,000	$10,000	$10,000	$10,000
1	Vegetation mapping	3 & 5	$25,000	Annual	In-house/Interagency /University	Continuation of vegetation mapping project being performed by UA; uses standardized method in use by regional land managers			$25,000		$25,000
1	Acuña Cactus Monitoring	Annual	$50,000	Annual	In-house/ AGFD/ Contractor	Continuation of Acuna Cactus monitoring, distribution surveys, habitat modeling, etc.	$50,000	$50,000	$50,000	$50,000	$50,000

Table 9-1: BMGR East 5-Year Action Plan FY 2018-2024

INRMP BMGR East 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1	Support special studies to address specific management issues, such as invasive, species of concern, climate change, etc.	Annual	Varies	Annual	In-house/Interagency /University	Supports research proposals developed by universities, AGFD, USGS, or others that address various issues of concern	$19,000	$27,000	$34,000	$37,000	$19,000
1	Implement cultural resource survey and monitoring requirements for INRMP-related actions	2 - 5	$150,000	Annual	In-house/Contractors	Continue surveys along roadways and nearby potential cultural sites in Area B, including recording of camp sites; use resulting information to assess potential adverse effects from INRMP-related activities including motorized access and public use.		$150,000		$150,000	
2	Identify and evaluate other possible Special Natural /Interest Areas	3	$20,000	One-time	In-house	Bender Spring and Paradise Well are candidate areas, also contemplating a nature trail in Crater Range			$20,000		
11	Habitat restoration*	As needed	$25,000	Annual	In-house	Active and passive restoration of degraded areas	$25,000	$25,000	$25,000	$25,000	$25,000
11	Evaluate benefits and adverse effects of wildlife waters	Annual	$35,000	Annual	In-house/Interagency /University	Perform a holistic review based on previous studies on the BMGR and relevant literature, continue water quality monitoring and develop recommendations for management	$35,000	$35,000	$35,000	$35,000	$35,000
11	Develop and implement procedures to control trespass livestock	Annual	$55,000	Varies	In-house	Address burgeoning trespass livestock population.	$5,000	$5,000	$5,000	$5,000	$5,000
11	Allow for the maintenance and repair of existing water developments*	As needed	TBD	Reoccurs as needed	AGFD	Support AGFD annual maintenance of all waters and redevelopment as required					

Table 9-1: BMGR East 5-Year Action Plan FY 2018-2024

INRMP BMGR East 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
12	Participate and implement actions per the Sonoran Pronghorn Recovery Plan	Annual	$220,000	Recurring actions	Interagency	Pronghorn recovery actions as stipulated in the Biological Opinion, recovery plan, or as determined by the interagency Recovery Team	$220,000	$220,000	$220,000	$220,000	$220,000
13	Evaluate erosion conditions of range roads; repair or temporarily restrict use*	Annual	$-	Annual	In-house/ Contractor	Annual driving inspection of the most heavily-used range roads; secondary and tertiary roads driven at least every 3 years. Continue drag road monitoring at 10 sites.					
13	Evaluate erosion problems in specific areas, develop recommendation plans for repair	3	$150,000	One-time	Interagency/University /Contractor	Road maintenance practices in many areas are non-sustainable.			$150,000		
13	Monitor water table levels	Annual	$-	Annual	In-house	Performed by range operations contractor					
14	Control excessive fugitive dust at permitted construction sites and recreation activity	As-required	$-	TBD	In-house	Performed by range operations contractor as part of recurring maintenance work					
16	Complete and implement fire management plan	Annual	$-	One-time	In-house	Assess fire risk, implement campfire restrictions as appropriate; maintain firefighting agreement with BLM					

Table 9-1: BMGR East 5-Year Action Plan FY 2018-2024

INRMP BMGR East 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Motorized Access											
3	Close selected roads to public access where an agency mission or resource protection issues conflict with public use	As-required	TBD	As-required	In-house	Access restrictions may be imposed due to evolving weapons safety footprints, protection of natural or cultural resources, law enforcement concerns or other management actions					
Public Use											
4	Assess benefits and effects of establishing designated camping areas and implement a decision based on the findings	Year 5	$-	One-time	In-house	Incomplete information available to make an assessment; existing camp sites are being recorded as part of cultural resources surveys along road corridors.					
5	Revise public visitation maps and rules for public education and recreation use; would inform the public about road restrictions and	Annual	$3,000	Annual	In-house/USMC	Annual revisions based on results of area monitoring and clarifications of rules printed on the map reverse.	$3,000	$3,000	$3,000	$3,000	$3,000
5	Public outreach	Annual	$5,000	Annual	In-house	Supports public awareness projects to educate base personnel / public about BMGR cultural resources, natural resources, historical preservation, and conservation activities.	$5,000	$5,000	$5,000	$5,000	$5,000
5	Public Use Area Access Program	Annual	$7,000	Annual	Contractor	Continue using iSportsman for the BMGR East public use area access. Compile recreation use statistics, analyze patterns, Identify heavily used areas. Monitor those areas to identify any resource concerns. Use vehicle traffic counters to quantify intensity of use at general and specific areas.	$7,000	$7,000	$7,000	$7,000	$7,000

Table 9-1: BMGR East 5-Year Action Plan FY 2018-2024

INRMP BMGR East 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
5	Law Enforcement patrol	Annual	$-	Annual	AGFD	First CLEO started October 2017. Second officer scheduled to arrive November of FY 19. Both CLEO's shall patrol the BMGR East and assist with resource protection.					
5	Install signs, gates, and fences to support road infrastructure and public access	Annual	$5,000	Reoccurs as needed	In-house	Install and maintain signage at range entry points, along perimeters, and at all road intersections.	$5,000	$5,000	$5,000	$5,000	$5,000
7	Monitor native wood supplies in high-use areas; restrict wood collection if resource conditions dictate	Year 1	$-	Recurs every 5 years	In-house	Use completed cultural resources surveys in Area B to identify high-use areas; assess in Year 1					
Manage Realty Property											
10	Cooperate with Arizona Department of Transportation (ADOT), BLM, BP, and utility companies regarding proposed actions within existing	Ongoing	$-	As required	ADOT/ BLM,/BP	Continuation of dialogue and partnership with proponent and supporting action agencies					
10	Coordinate with CE Real Property for maintenance of utilities by responsible agencies in the State Route 85 easement.	Ongoing	$-	As required	In-house	Activities within the right-of-way include operation and maintenance of overhead power lines, buried fiber optic lines, and a Border Patrol checkpoint					

Table 9-1: BMGR East 5-Year Action Plan FY 2018-2024

INRMP BMGR East 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Perimeter Land Use											
17	Participate in local and regional planning and monitoring land use patterns	As required	$-	As required	In-house/ Interagency	Participate in development or review of environmental assessments or impact statements, resource management plans; serve as DoD clearinghouse for energy development proposals in Arizona					
17	Monitor illegal immigration, trafficking, and border-related law enforcement to anticipate how BMGR resources may be affected	Ongoing	$-	Annual	In-house/Interagency	Continuation of informal coordination with law enforcement authorities and anecdotal evidence of border-related impacts					
						FUNDING TOTALS BY YEAR ($)	***576,000***	***676,000***	***766,000***	***726,000***	***631,000***

[1] Fulfill requirement of Resource Management Element
[2] Year of funding and completion of action
[3] Estimate of required funding amount to complete project
[4] Frequency of action
[5] Responsible parties for completing the action
*May require further NEPA review and/or Section 106 consultation

Table 9-2: BMGR West 5-Year Action Plan FY 2018-2024

INRMP BMGR West 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Resource Management											
1, 12,	FTHL occupancy surveys	Annual	Varies	Annual	In-house/Interagency	Support AGFD in conducting demographic and occupancy surveys as outlined in the Rangewide Management Plan developed by the FTHL Interagency Coordinating Committee	$76,500	$78,030	$79,591	$81,182	$82,806
1	Identify and monitor vegetation plots in several plant communities	TBD	Varies	Annual	In-house	Each plot will be assessed at 5-year intervals					
1, 11	Monitor and control invasive plant species	Annual	Varies	Annual	In-house/Interagency	Annual monitoring and control of invasive plant species is on-going	$42,148	$43,458	$44,419	$45,307	$46,203
1	Reptile, small mammal, and amphibian surveys and monitoring	2018	Varies	Every 5 years	In-house/Interagency	1) Establish a repeatable baseline monitoring methodology that will capture the diversity of small mammals, reptiles, and amphibians; 2) develop potential distribution maps captured wildlife, and; 3) provide recommendations to monitoring efforts and natural resource stewardship	$200,000				
1	General Bird Surveys	TBD	Varies	Every 5 years	In-house/Interagency	New protocol under development					
1	Surveys for game ungulates	TBD	Varies	Varies by Species	In-house/Interagency	Support and participate in surveys performed by AGFD					

[1] INRMP Resource Management Element addressed
[2] Fulfill requirement of Resource Management Element
[3] Year of funding and completion of action
[4] Estimate of required funding amount to complete project
[5] How often action will occur
[6] Responsible parties for completing the action
*May require further NEPA review and/or Section 106 consultation

Table 9-2: BMGR West 5-Year Action Plan FY 2018-2024

INRMP BMGR West 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1	Bat surveys	Annual	In-kind	Annual	In-house/Interagency	Assist AGFD in conducting bat surveys on the BMGR-West					
1	Maintain important wildlife connectivity corridors on the BMGR West	Annual	Varies	Varies	In-house/Interagency	Collaborate with AGFD and partner agencies to identify and maintain important wildlife connectivity corridors on the BMGR West					
1	Installation and maintenance of weather stations and rain gauges	TBD	Varies	Varies	In-house	Upgrade existing weather stations to wireless communication with Luke AFB	$30,000				
1	Medium and low priority actions as resources allow	Annual	Varies	Varies	TBD	Some lower-priority actions may be completed based on adaptive management concerns or availability of resources					
1	Support special studies to address specific management issues, such as invasive, species of concern, climate change, etc.	Annual	Varies	Annual	In-house/Interagency	Supports research proposals developed by universities, AGFD, USGS, or others that address various issues of concern					
2	Identify and evaluate other possible Special Natural / Interest Areas	Varies	Varies	As needed	In-house	No special interest areas have been proposed since the 2007 INRMP					
1, 12	Participate and implement actions per the Sonoran Pronghorn Recovery Plan	Annual	Varies	Annual	In-house/Interagency	Support Sonoran pronghorn recovery actions as stipulated in the Biological Opinion, Recovery Plan, or as determined by the interagency Recovery Team	$93,050	$94,817	$96,618	$98,453	$100,323
13	Examine available engineering management practice that can mitigate erosion	Varies	Varies	One-time	In-house/Interagency	Evaluate possible engineering strategies and designs to prioritize areas most erosion mitigation efforts.					
11	Partner w/Border Patrol to identify and implement habitat restoration	Varies	Varies	Annual	In-house/Interagency	Collaborate with local Border Patrol offices to implement maintenance and repair best management practices as outlined in CBP's 2012 EA (Department of Homeland Security 2012) https://nemo.cbp.gov/sbi/az_timr_final_ea.pdf					

Table 9-2: BMGR West 5-Year Action Plan FY 2018-2024

INRMP BMGR West 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
16	Complete and subsequently implement fire management plan	One-time	Varies	One-time	In-house/Interagency	Contract has been awarded and the fire plan is scheduled for completion in 2018.	$15,682				
1	Range wide soil map	Years 1,2,3	Varies	One-time	In-house /Interagency	Soil map is being developed	$150,000				
1	Aerial imagery for range and base	Year 3	Varies	As needed	In-house/Interagency	Imagery will be collected via piloted and/or autonomous aircraft and/or satellites			$125,000		
1	Characterization of Anthropogenic Impacts	Year 3	Varies	As-needed	In-house/Interagency	Use the best imagery, soil, precipitation, and vegetation data available to map recent disturbances that will considerably improve the series of erosion models (USGS 2014)					
1	Construct adaptive management strategies for maintaining acceptable limits of change.	TBD	Varies	As Needed	In-house/Interagency	Consider existing baseline survey data and regional concerns to determine the need for the implementing of adaptive management strategies					
14	Control excessive fugitive dust at permitted construction sites and recreation activity areas	As-required	Varies	As-required	In-house	Control fugitive dust as required through NEPA					
1	Allow maintenance and development of existing water sources supporting wildlife	As Needed	In-kind	As Needed	Interagency	Continue to work w/AGFD to monitor and maintain existing network					
1, 11, 13,14 ,15	Conduct habitat restoration efforts for damaged areas	As Needed	Varies	As Needed	In-house	Continue active and passive restoration of degraded areas.					
1, 11	Support AGFD installation of up to a total of six high priority wildlife waters on the BMGR	As Needed	In-kind	As Needed	In-house/Interagency	Determine as needed and available funding					

Table 9-2: BMGR West 5-Year Action Plan FY 2018-2024

INRMP BMGR West 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1-17	Maintain an adequately trained staff to accomplish conservation goals and objectives	As Needed	TBD	As Needed	In-house	Ensure that sufficient numbers of professionally and adequately trained natural resources management personnel and conservation law enforcement personnel are available and assigned responsibility to manage their installations' natural resources	$20,400	$20,808	$21,224	$21,684	$22,081
Motorized Access											
1, 5, 6, 7, 8, 9, 11	Develop a plan for determining the limits-of-acceptable change for recreational, natural and cultural resources.	TBD	Varies	As Needed	In-house/Interagency	Use baseline survey data to determine the degree of change and develop a plan appropriate to the findings					
3	Close selected roads to public access where an agency mission or resource protection issues conflict with public use	TBD	Varies	As Needed	In-house /Interagency	Determine as needed and available funding					
3	Evaluate site-specific proposals for assess the need and potential impacts of approving additional roads for agency purposes	As Needed	TBD	As Needed	In-house	Determine as needed					
3, 5	Install signs, gates, and fences to support road infrastructure and public access	As Needed	TBD	As Needed	In-house	Install signs as needed to identify restricted areas, range boundaries, range entry points, along perimeters, road intersections, and ground support areas					
Public Use											
4, 5	Maintain the recreational use database to determine public use, roads and compliance in support of natural resource management actions	Annual	Varies	Annual	In-house	Permits office maintains records of range permits issued monthly					

Table 9-2: BMGR West 5-Year Action Plan FY 2018-2024

INRMP BMGR West 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
4	Assess benefits and effects of establishing designated camping areas for adaptive management of public use areas	TBD	Varies	As Needed	In-house	Continue to collect information from visitor passes and CLEO records / observations / corrective actions to determine the possible impacts created form public use.					
5	Revise and maintain visitor map	TBD	Varies	As Needed	In-house	A surplus of 2008 the BMGR West informational brochure/maps are available through the permitting office or Range Management Department that outline public use rules and open/closed areas. Publication of a revised map will be completed when existing sources are liquidated	$3,000	$3,000	$3,000	$3,000	$3,000
5	Retain a minimum of four full-time CLEO positions	Annual	TBD	Annual	In-house	Four full-time Conservation Law Enforcement Officers have been filled					
5	Public outreach	Annual	Varies	Annual	In-house	Support public awareness efforts to educate MCAS Yuma employees and the Public concerning natural and cultural resources, historic preservation, and conservation activities					
5	Compile recreation use statistics; analyze patterns, identify heavily used areas to identify resource concern areas	Annual	TBD	Annual	In-house	This is on-going and closely monitored					
8	Evaluate the effects of non-game species collection on wildlife, habitat, and other resources. Limit or restrict collection activities within the authority of state law	Annual	In-kind	Annual	In-house/Interagency						

Table 9-2: BMGR West 5-Year Action Plan FY 2018-2024

INRMP BMGR West 5-Year Work Plan: FY 2018-2024											
Element[1]	**Action Step[2]**	**Fiscal Year[3]**	**Funding[4]**	**Frequency[5]**	**Partners[6]**	**Comments**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Manage Realty Property											
10, 17	Cooperate with ADOT, BP, and utility companies regarding proposed actions within existing utility / transportation corridors	As Needed	Varies	As Needed	Interagency	Continue an open dialogue with partnering agencies at BEC and IEC meetings. The RMD works in cooperation with the BEC, ICC, MOG, Pronghorn recovery Team, and local, state, and federal governments to revise and improve management actions and policies.					
Perimeter Land Use											
17	Monitor illegal immigration, trafficking, and border-related law enforcement to anticipate how BMGR resources may be affected	As Needed	Varies	As Needed	In-house/Interagency	Continue coordinating with law enforcement authorities and sharing of anecdotal evidence of border-related impacts.					
						BUDGET TOTALS BY YEAR ($)	***630,780***	***240,113***	***369,852***	***249,626***	***254,413***

[1] INRMP Resource Management Element addressed
[2] Fulfill requirement of Resource Management Element
[3] Year of funding and completion of action
[4] Estimate of required funding amount to complete project
[5] Frequency of action
[6] Responsible parties for completing the action
*May require further NEPA review and/or Section 106 consultation

REFERENCES

56th Range Management Office, Luke Air Force Base, and Air Education and Training Command. 2009. Barry M. Goldwater Range Integrated Cultural Resources Management Plan.

56th Fighter Wing, Range Management Office. 2010. Final EIS for Proposed Barry M. Goldwater Range East Range Enhancements.

56th Range Management Office. 2017. Barry M. Goldwater Range East Comprehensive Range Plan.

Arizona Game and Fish Department/Hunting. 2017. https://www.azgfd.com/Hunting/Units/

Arizona Game and Fish Department. 2017. Inside AGFD. https://www.azgfd.com/Agency/Overview/

Arizona-Sonora Desert Mueseum. 2017. Sonoran Desert Region. https://www.desertmuseum.org/desert/sonora.php

Bagne, K.E., and D.M. Finch. 2012 Vulnerability of species to climate change in the Southwest: threatened endangered, and at-risk species at the Barry M. Goldwater Range, Arizona Gen. Tech. Rep. RMRS-GTR-284. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 139 p.

Barry M. Goldwater Range (BMGR) Task Force. 2005. Barry M. Goldwater Range: Military Training and Protection of Endangered Species, A Report of the Congressionally Appointed Task Force. 7 March.

Black, C. 2015. Climate Monitoring Data: A Toll to Inform Land Management on the Barry M. Goldwater Range East and the Wider Region. Duan, Jennifer G., Yu, Chunshui., Potueck, Michael., Zhou, Kang. 2017. Watershed Erosion and Sedimentation Assessment of BMGR West, Annual Progress Report.

Damery-Weston, J. 2016. Buffelgrass expansion rate and dispersal type on recently invaded Barry M. Goldwater Range of southwestern Arizona. M.S. Thesis, University of Arizona, Tucson, Arizona. 23 pp.

Driscoll, James T., Jacobson, K.V., Beatty, G., Canaca, J.S., and Koloszar, J.G. 2006. Conservation assessment and strategy for the bald eagle in Arizona. Nongame and Endangered Wildlife Program Technical Report 173. Arizona Game and Fish Department, Phoenix, Arizona.

Duan, J. Chunshui, Y. Potueck, M. Kang, Z. 2017. Watershed Erosion and Sedimentation Assessment of BMGR West Annual Progress Report. University of Arizona.

Gila Bend. 2017. General Plan 2026 Developing a Brighter Future. http://www.gilabendaz.org/DocumentCenter/View/462

Goode, M. and Parker, M. R. 2015. Evaluation of Potential Impacts of the Joint Strike fighter Program on the Flat-Tailed Horned Lizard at MCAS-Yuma, Barry M. Goldwater Range. School of Natural Resources & Environment – University of Arizona.

Grimsley, A. A. and D. J. Leavitt. 2015. Flat-tailed Horned Lizard (Phrynosoma mcallii) Demographic and Occupancy Monitoring within the Yuma Desert Management Area: 2014 Progress Report. Arizona Game and Fish Department, Wildlife Contracts Branch, Phoenix, Arizona. Hammer, R. 1996. Fountain grass: turn off the spigot! Newsletter of the Florida Exotic Pest Plant Council. 6:1.

Li, M. and J. Malusa. 2014. Characterizing and modeling Sahara Mustard on the Barry M. Goldwater Range, Arizona. Final Report Submitted May, 2014 to Marine Corps Air Station, Yuma, Arizona. University of Arizona: Cooperative Agreement W9126G-11-0065.

Li, M. 2016. Biodiversity in a dynamic world: how environmental variability influences coexistence between introduced and native species. Dissertation, University of Arizona, Tucson, Arizona. 180 pp.

Luke Air Force Base. 2015. Luke AFB Pest Management, Integrated Pest Management Plan. Luke AFB, Arizona.

Malusa, J. 2010. Vegetation Mapping at the Barry M. Goldwater Range, Marine Corps Air Station, Arizona. Phase 2: Mohawk Valley. School of Natural Resources, University of Arizona: Cooperative Agreement DACA87-05-H-0018, Modification P00012.

Malusa, J. 2012. Vegetation Mapping at the Barry M. Goldwater Range, Marine Corps Air Station, Arizona. Phase 3: Copper Mountains, Baker Peaks, Wellton Hills, and Northern Lechuguilla Valley. Annual report submitted to MCAS, Yuma, in compliance with Cooperative Agreement DACA87-05-H-0018, Modification P00012.

Malusa, J., and P. Sundt. 2015. Vegetation Mapping at the Barry M. Goldwater Range West, Marine Corps Air Station – Yuma, Arizona. School of Natural Resources, University of Arizona: Cooperative Agreement DACA87-05-H-0018.

McLaughlin, S.P, S.E. Marsh, and S.E. Drake 2007. Mapping of Sonoran Pronghorn Habitat on the Air Force Portion of the Barry M. Goldwater Range, Arizona. Report submitted to the 56 RMO/ESM, United States Air Force.

Mixan, R., Diamond, J., and Gwinn, R. N. 2016. An Evaluation of Spatial and Temporal Bat Habitat Use Patterns at the Barry M. Goldwater Range East in southwestern Arizona.

Osmer, E, J.S. Fehmi, and P. Guertin. 2009. Vegetation mapping of Sonoran Desert communities on the Barry M. Goldwater Range – East (BMGR-East), Arizona. Report submitted to the 56 RMO/ESM, United States Air Force. Cooperative Agreement DACA 87-05-H-0018, Task Agreement No. 1.

Overpeck, J., G. Garfin, A. Jardine, D. E. Busch, D. Cayan, M. Dettinger, E. Fleishman, A. Gershunov, G. MacDonald, K. T. Redmond, W. R. Travis, and B. Udall. 2013. Summary for Decision Makers. An Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment, edited by G. Garfin, A. Jardine, R. Merideth, M. Black, and S. Leroy.

Piorkowski, M. D., Sturla, D. P., Diamond, J. M. and Ingraldi, M. F. 2015. Status and Distribution Modeling of Golden Eagles on Southwestern Military Installations and Overflight Areas: Assessing "Take" for this Sensitive Species at Risk – Year 2. Installation Partners of Department of Defense Legacy Program Project #13-631

Ranussen, C., Regmi, N. 2015. Predictive Soil Mapping on Barry M. Goldwater Range-West. USACE Cooperative Agreement # W9126G-14-2-0032 Final Report. The University of Arizona, Department of Soil Water and Environmental Science.

Shepherd, A.S. 2011. Mapping of Sonoran Desert Vegetation Communities and Spatial Distribution Differences of *Larrea tridentata* Seed Density in Relation to *Ambrosia dumosa* and *Ambrosia deltoidea*, San Cristobal Valley, Arizona. M.S. Thesis, University of Arizona, Tucson, Arizona.

Tagg, M.D., Blake, K.L.2012. Area B Roads Intensive Archaeological Survey of 62.5 Milwes (2,516 Acres) in the Sauceda Mountains, Barry M. Goldwater Range East, Arizona. Statistical Research Inc.

Tohono O'odham Nation. 2016. Districts. http://www.tonation-nsn.gov/districts/

United States Department of Defense and U.S. Fish and Wildlife Service. 2006. Memorandum of Understanding between the U.S. Department of Defense and the U.S. Fish and Wildlife Service to Promote the Conservation of Migratory Birds. July. Retrieved 13 April 2012 from U.S. Fish and Wildlife. http://www.fws.gov/migratorybirds/Partnerships/DoDMOUfinalSignature.pdf

United States Fish & Wildlife Service. 2010. Biological Opinion, West Coast Basing and Operations of the F-35B Joint Strike Fighter and Reinitiation of Formal Section 7 Consultation on Ongoing Activities at the Barry M. Goldwater Range by the Marine Corps Air Station–Yuma, Yuma and Maricopa Counties, Arizona, AESO/SE 22410-1995-F-0114-R006. 17 September. 2010.

United States Fish & Wildlife Service. 2010a. U.S. Fish and Wildlife Service, Region 2, Final Environmental Assessment for the Reestablishment of Sonoran Pronghorn.

United States Geologic Survey. 2013-2016. Barry M. Goldwater Range East Annual Water Quality Report. USGS Arizona Water Science Center, Tucson, Arizona.

United States Marine Corps. 2004. Preparing, Revising and Implementing Integrated Natural Resources Management Plans on Marine Corps Installations. http://www.marines.mil/Portals/59/Publications/USMC%20SAIA%20Guidance%202004.pdf?ver=2012-10-11-163505-090

United States Marine Corps. 2013. Marine Corps Air Station Yuma. Station Order 3710.6J MCAS Yuma Range and Training Areas Standard Operating Procedures.

Urreiztieta, L.F. 2013. Barry M. Goldwater Range – East acuña cactus 2012/2013 survey report: Final. Harris Environmental Group, Inc. Tucson, Arizona, USA.

Villarreal, Miguel L. 2014. Evaluation of Anthropogenic Impacts on the Barry M. Goldwater Range-West. United States Geological Survey. Cooperative Ecosystem Studies Unit agreement W9126G-11-1-0045.

Villarreal, M.L., C. van Riper, III, R.E. Lovich, R.L. Palmer, T. Nauman, S.E. Studd, S. Drake, and A.S. Rosenberg. 2011. An Inventory and Monitoring Plan for a Sonoran Desert Ecosystem: Barry M. Goldwater Range-West. Open-File Report 2011-1232. U.S. Department of the Interior and U.S. Geological Society.

Weston, J., and J. Fehmi, 2016. Mapping of Sonoran Desert vegetation communities on the Barry M. Goldwater Range – East. Report submitted to the 56 RMO/ESM, United States Air Force in partial completion of Agreement W9126G-11-2-0058, Task Nos. 3, 4, and 5.

Whitbeck, D.C. 2013. Mapping of Sonoran Desert vegetation communities of San Cristobal Valley and Southern Sentinel Plains, Barry M. Goldwater Range and variables influencing route proliferation in the Barry M. Goldwater Range's San Cristobal Valley. M.S. Thesis. University of Arizona, Tucson, Arizona. 102 pp.

Yuma County. 2012. Yuma County 2020 Comprehensive Plan with Amendments through 17 January, 2017. http://www.yumacountyaz.gov/government/development-services/laws-guidelines/2020-comprehensive-plan