

BARRY M. GOLDWATER RANGE

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN



PUBLIC REPORT

October 2018



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



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

U. S. Air Force
Integrated Natural Resource Management Plan—Public Report
Barry M. Goldwater Range (BMGR)
Arizona



BARRY M. GOLDWATER RANGE

2018 REVIEW AND UPDATE OF THE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN—PUBLIC REPORT

ON

Military Use, Environmental Conditions, Resource Management Activity, and Public Access and Involvement 2012–2017

Prepared in accordance with the Update of the

Military Lands Withdrawal Act of 1999 (Public Law 106-65 § 3031(b)(5)(A))

Prepared in support of the

2018 Barry M. Goldwater Range Integrated Natural Resources Management Plan Update

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ACRONYMS

ADEQ	Arizona Department of Environmental Quality
AFAF	Air Force Auxiliary Field
AFB	Air Force Base
AGFD	Arizona Game and Fish Department
ALF	Auxiliary Landing Field
AML	Appropriate Management Level
AMSL	Above Mean Sea Level
ANG	Air National Guard
ARS	Arizona Revised Statutes
ASSP	Arizona Site Stewards Program
AUX	Auxiliary Airfield
BASH	Bird/Wildlife Aircraft Strike Hazard
BEC	Barry M. Goldwater Range Executive Council
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMGR	Barry M. Goldwater Range
BO	Biological Opinion
BP	(U.S.) Border Patrol
BSE	Bering Sea Ecoregion
CBP	(U.S.) Customs and Border Protection
CFR	Code of Federal Regulations
CLEO	Conservation Law Enforcement Officer
DGM	Digital Geophysical Mapping
DoD	Department of Defense
DOI	Department of the Interior
DZ	Drop Zone
EIS	Environmental Impact Statement
EM	Electromagnetic Survey
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
ESM	Environmental Sciences Management
ETAC	East Tactical Range
FLPMA	Federal Land Policy and Management Act of 1976
FR	Federal Register
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
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

MCAS	Marine Corps Air Station
MLWA	Military Lands Withdrawal Act of 1999
MOU	Memorandum of Understanding
MTR	Munitions Treatment Range
NEPA	National Environmental Policy Act of 1969
NM	National Monument
NPS	National Park Service
NTAC	North Tactical Range
NWR	National Wildlife Refuge
PRIA	Public Rangeland Improvement Act of 1978
P.L.	Public Law
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
SR	State Route
STAC	South Tactical Range
SWMU	Solid Waste Management Unit
UA	University of Arizona
UDA	Undocumented Alien
U.S.	United States
U.S.C.	United States Code
USGS	United States Geologic Survey
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 1971

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) use the range for training military aircrews in the tactical execution of air-to-air and air-to-ground missions. To a lesser extent, the range is 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 BMGR East, and the USMC is the primary user of and managing agency for the western portion of the range, referred to as BMGR West.

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 (56 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 authority to the Commanding Officer of Marine Corps Air Station (MCAS) Yuma.

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, and Air Force Reserve Command. As the nation's third largest military installation, 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 and into the foreseeable future.



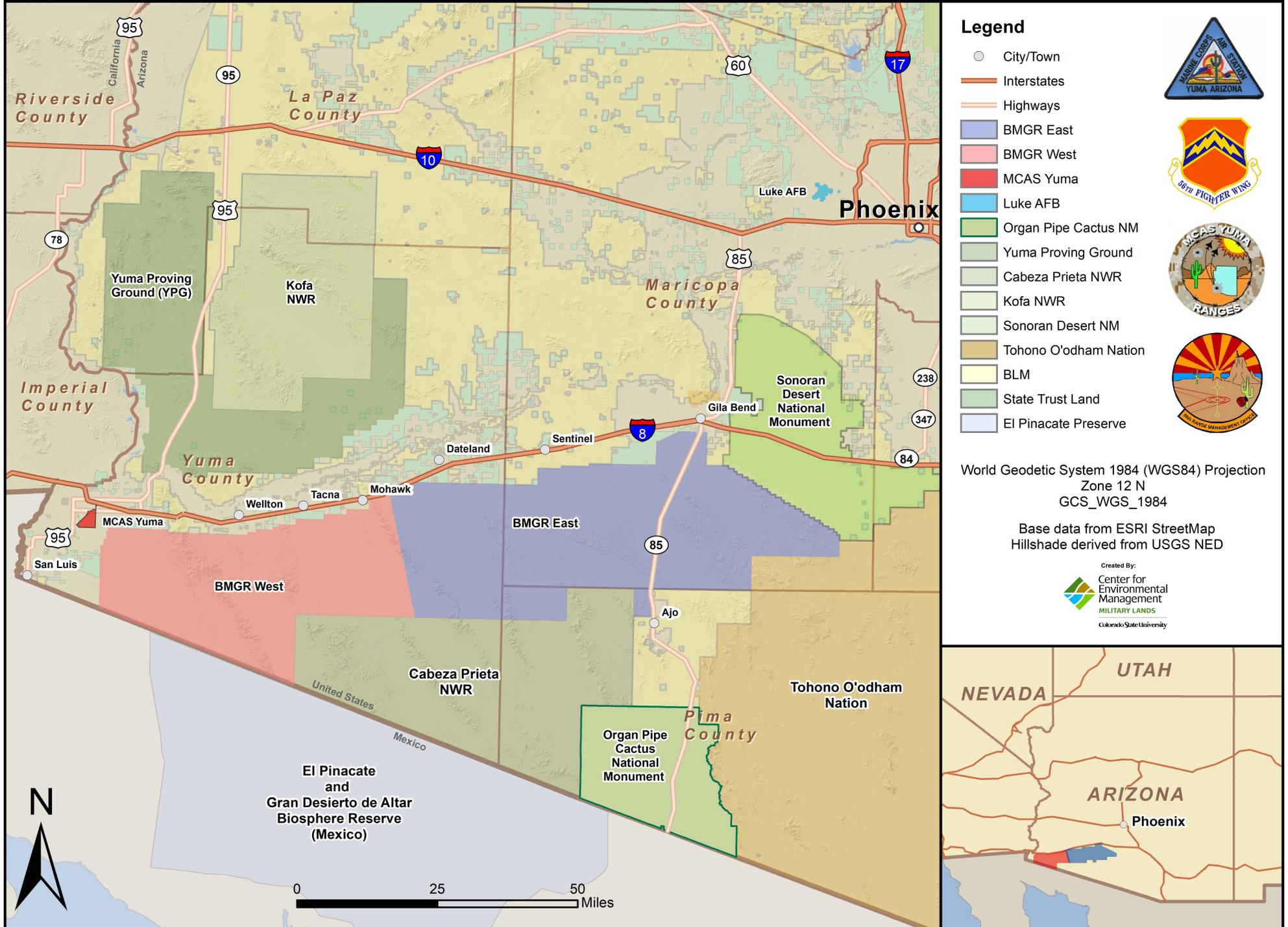
Sonoran Desert landscape.

In addition to its continuing value as an essential national defense asset, BMGR is nationally significant as a critical component in the largest remaining expanse of relatively unfragmented Sonoran Desert in the U.S. With the exception of State Route (SR) 85, the land is free of major development and is ecologically linked to 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 1.1. Within this contiguous complex, BMGR contributes almost 55 percent of the land area and is more than twice the size of any other component.

Figure 1.1: 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
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1.1 Public Report Purpose and Content

This report is part of an ongoing process to update the Integrated Natural Resources Management Plan (INRMP) for 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 of 1999 (MLWA) (Public Law [P.L.] 106-65), the Sikes Act Improvement Act (hereafter referred to as “Sikes Act”) (16 U.S. Code [U.S.C.] § 670a et seq., as amended), 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 for operation and effect on a regular basis but not less than every five years. The 2018 INRMP is the second INRMP update for BMGR and is the product of a thorough review of the 2012 INRMP, in accordance with the five-year review cycle.

In spring 2017, a notice was published in the *Federal Register*, *Yuma Sun*, *Gila Bend Sun*, *Arizona Daily Star*, *Ajo Copper News*, and *West Valley View* about two informational events to which the IEC members and all stakeholders, including natural resource agencies and the general public, were invited. The initial event in May (Table 1.1) was a presentation to kick off the 2018 update and timeline of the 2012 BMGR INRMP and to explain how the updating process works. The second event was an open house designed to illustrate (via posters) and summarize the prior five-year action plan, including any changes that had taken place at BMGR, and how the changes were likely to affect the ensuing five-year action plan developed for the 2018 INRMP.

In early 2018, a draft version of this Public Report was released to the public and to state, local, and tribal governments for review and comment. The public comment period for both the draft Public Report and the draft updated INRMP began on February 23rd when a Notice of Availability was published in the *Federal Register*, *Yuma Sun*, *Gila Bend Sun*, *Arizona Daily Star*, *Ajo Copper News*, and *West Valley View* for a 30-day comment period. The public also was invited to open-house meetings (Table 1.1) for opportunities to ask questions about and comment on both documents. To receive full consideration for preparing the Final Public Report and INRMP, comments had to be received by 25 March 2018.

Table 1.1: Public open-house meeting schedule.

Date	Time	Location
10 May 2017	5:30–7:30 pm	Cabela’s 9380 W Glendale Ave, Glendale, AZ 85305
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

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 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 proposed changes to the INRMP that may occur over the next five-year planning period (2018–2023).

Comments were received from two members of the public, including a representative from the Friends of the Sonoran Desert. Overall, the comments were positive and applauded the USAF and USMC for their efforts to be good stewards of natural and cultural resources at BMGR, particularly in the realms of wildlife conservation, invasive species monitoring and management, vegetation mapping, cultural resources protection, hazardous materials and waste management, standardization of road classifications, and public access and outreach efforts. Several comments elicited updates to three sections of the report, including a section that discusses changes in UDA vehicle (decreasing) versus foot traffic (increasing).

Comments that conveyed ongoing or emerging concerns focused on (1) avoiding reductions in wildlife habitat/corridor connectivity; (2) precluding trespass livestock, including horses and burros, from wandering onto BMGR lands; (3) researching and reducing the levels/effects of soil disturbance associated with dragging, illegal immigration, drug trafficking, and other activities; (4) a need for more wildlife waters; (5) protecting groundwater from hazardous materials and waste; (6) avoiding damage to cultural resources; and (7) providing greater public access for recreation. Most of these concerns are already being addressed on some level. To address concerns specific to UDA traffic and associated road-maintenance activity, the report sections concerned with Border Patrol activities (section 2.2.2) and UDA traffic (sections 3.1.1–3.1.2) were updated. As for increased public access, the feasibility of this is low, given the military mission of BMGR.

There was also a concern that climate change is not addressed adequately by the INRMP. In response, the climate section (3.2) was updated with details about BMGR’s regional climate monitoring program via on-site and local weather stations and coordination with DoD’s Strategic Environmental Research and Development Program, specifically its climate change research (section 3.2.1). Moreover, there is a comprehensive climate assessment currently being conducted by Colorado State University for a majority of the USAF installations. The end-products of this assessment will include climate models and management recommendations for each installation. Once those results and products are available, the INRMPs will be updated with that information.

1.2 BMGR Land Withdrawal and Reservation

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 public lands that had been administered by the BLM but which were withdrawn by Congress through the MLWA for military purposes for 25 years. The remaining 5 percent is permanently administered by the Department of Defense (DoD). The MLWA had the effect of

- withdrawing¹ the public land within the boundaries of 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 of the withdrawn public land to the Secretary of the Air Force and the Secretary of the Navy; and
- reserving² the withdrawn public land for use by the Secretaries of the Air Force and Navy as
 - (A) an armament and high-hazard testing area;
 - (B) a training facility for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support;
 - (C) a facility for testing equipment and tactics development; and
 - (D) other defense-related purposes consistent with the purposes specified in P.L. 106-65 § 3031(a)(2).

The authorization for BMGR, as provided by the MLWA, 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 updated INRMP and Public Report are vital for the application to extend the land withdrawal, jurisdiction, and reservation of BMGR (P.L. 106-65 § 3031(e)(2)(b)).

Land withdrawals and reservations for BMGR prior to the MLWA were provided by a series of executive and legislative instruments dating from 1941. The MLWA 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 in accordance with the Sikes Act and other applicable guidance. Thus, the 2007 INRMP was the first resource management plan prepared for BMGR under DoD leadership and the first to incorporate a comprehensive inventory of both the requirements and distribution of military surface use as a baseline for developing resource management goals, objectives, and practices at BMGR.

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.

1.3 INRMP Management Guidance

The 2018 INRMP is based on the foundation provided by the Sikes Act, which sets forth resource management policies and guidance for the preparation of INRMPs (Table 1.2). The Sikes Act (16 U.S.C. 670a (a)(3)) states that,

“Consistent with the use of military installations State-owned National Guard installations to ensure the preparedness of the Armed Forces, the Secretaries of the military departments shall carry out the [natural resource 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 [BMGR] to facilitate the use.”

Additional direction provided by the MLWA (Table 1.2) that is specific to 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)).

Managing and protecting cultural resources is no less a priority on military installations than managing and protecting natural resources. Typically, management guidance for cultural resources at a given installation is provided in an Integrated Cultural Resources Management Plan (ICRMP); however, the MLWA requires that INRMPs provide guidance for managing and protecting cultural resources. The 2018 BMGR INRMP provides for cultural resource protection by ensuring that natural resource management actions fully support and comply with the range’s ICRMP and incorporates (by reference) the ICRMP. Additional stipulations of the MLWA and Sikes Act are outlined in Table 1.2.

DoD Instruction 4715.03 with change 1, *Natural Resources Conservation Program* (DoD 2017), 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 also 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 2017). This goal is reflected in the Department-level land management policies of the USAF and USMC. Consequently, ecosystem-based management and protection of biological diversity is an important guiding element of the 2018 INRMP for BMGR.

Table 1.2: INRMP elements specified in the Sikes Act and MLWA of 1999.

Sikes Act
<p>To the extent appropriate and applicable, provide for the INRMP elements listed below.</p> <ul style="list-style-type: none"> • 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 BMGR
MLWA of 1999
<p>The INRMP shall include the provisions listed below.</p> <ul style="list-style-type: none"> • Develop the INRMP in consultation with affected Native American tribes and include provisions that (1) meet the trust responsibilities of the United States with respect to Native American tribes, lands, and rights reserved by treaty or federal law; (2) allow access to and ceremonial use of sacred sites to the extent consistent with the military purposes of BMGR; and (3) provide for timely consultation with affected Native American tribes. • Provide that any hunting at 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 BMGR and brush and range fires occurring outside of BMGR boundaries that result from military activities. • Provide that all gates, fences, and barriers constructed at 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 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.

BMGR is unique in that range management is shared between the USAF and the USMC. Whereas this 2018 INRMP update follows the USAF standardized template, USMC-specific policies have been incorporated and the plan adheres to Marine Corps Order 5090.2A (with changes 1–3) of the *Environmental Compliance and Protection Manual* (USMC 2013b).

1.3.2 Interagency Participation

The USAF and USMC hold the primary surface management responsibility for BMGR. The Secretary of the Interior, acting through the U.S. Fish and Wildlife Service (USFWS), and AGFD are responsible for its natural resources. Although both USFWS and AGFD have responsibilities related to the recovery of endangered and threatened species, AGFD has primary jurisdiction over resident wildlife management within BMGR.

The USAF, USMC, USFWS, and AGFD are collaborating to prepare the INRMP five-year review in accordance with the MLWA; Sikes Act; and a 2001 Cooperative Agreement for the implementation of an ecosystem-based INRMP for BMGR.

CHAPTER 2 CHANGES IN MILITARY AND NON-MILITARY USE

2.1 Military Use

The primary mission of BMGR has not changed since the 2012 INRMP and plays a more crucial role with the bed down of the F-35s at both BMGR East and West. The preeminent activity at BMGR East is advanced training for student aircrews transitioning to frontline combat aircraft. Readiness training for aircrews in operational combat is predominant at BMGR West. BMGR also serves the Navy, Air Force Reserve Command, ANG, and Army National Guard in these capacities. Other installations that regularly practice on the range include MCAS



F-35 aircrew training.

Miramar, Davis-Monthan AFB, Silverbell Army Heliport, and Arizona ANG Base at Tucson International Airport. In addition to regular users, “casual user” training deployments originating 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.

BMGR is composed of land and overlying restricted airspaces reserved for 26 military purposes (Figures 2.1–2.3). These restricted airspaces—R-2301W, R-2301E, R-2304, and R-2305—are designated by the Federal Aviation Administration to support the military training missions. The restricted-airspace dimensions remain unchanged from those that were in effect following implementation of the MLWA.

Tactical surface and aviation training has not prompted substantial or large-scale ecosystem modifications that would inhibit the range’s ability to directly support its national defense purposes. The ongoing and foreseeable military use of 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 occur regularly, 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 BMGR; and
- buffers that permit independent training events to safely take place 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 to safely support multiple and simultaneous training or other operations. 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. The training areas, features, and facilities of BMGR East are summarized in Table 2.1 and mapped in Figure 2.1.

In 2010, proposed range enhancements were evaluated in the *Final Environmental Impact Statement (EIS) for Proposed BMGR East Range Enhancements* (56th Range Management Office [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).

- Convert 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.
- Construct 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 from 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.
- Pave approximately 7 miles of an existing graded road between the main tower and Range Munitions Consolidation Points (also referred to as the Water Well) at Range 1 to eliminate dust generated by the ongoing heavy use of the existing road; decrease road maintenance requirements by providing a cost-effective, durable, and long-lasting maintenance solution; and 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.
- Develop 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 2010 EIS are designed to improve operations but do not involve construction on the range.
- Lower 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. Currently, overflights of the refuge are restricted to altitudes of 1,500 feet AGL or higher, except within approved corridors, under the terms of a 1994 MOU between the DoD and DOI. The 2010 EIS assessed proposals to lower the overflight 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.
- Authorize 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.
- Establish 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: Current military training facilities, features, and use at BMGR East.

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 floors, and altitude ceilings 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 Auxiliary Airfield (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 remain almost entirely unchanged since well before the 2012 INRMP update. The single exception was conversion of the left side of Range 3 to a helicopter gunnery range. Construction of this facility began in 2012; it has since been completed and is in use.	Changed
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 six 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

Table 2.1: Current military training facilities, features, and use at BMGR East.

Area/Activity	Description of Current Training Feature, Facility and Military Use	Status Since 2012 INRMP
Range Munitions Consolidation Points (RMCPs)	RMCPs 1, 2, 3, and 4 continue to serve as range EOD and maintenance support areas. Expended munitions, munitions scrap, and target debris that is safe for handling is cleared from the three tactical and four manned ranges and transported to the RMCPs for demilitarization and decontamination processing before being released for off-range recycling or disposal. The RMCPs are also used as staging locations for target construction, maintenance, and replacement operations. The use and configuration of these areas are unchanged since the 2012 update.	Unchanged
Explosive Ordnance Disposal (EOD) Training Range	The EOD Training Range continues to be used for instructing EOD technicians to perform safe detonations of deployed (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 BP and, occasionally, by USAF Security Police.	Changed
Gila Bend AFAF	Gila Bend AFAF continues to serve as the operational support center for 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 in a ROD for implementation; however, funds to complete these projects are not yet available. Ongoing maintenance and improvement of facilities at Gila Bend AFAF are routinely conducted.	Unchanged
Assault Landing Zones (also known as Auxiliary Airfields, or AUX)	AUX-6 and Stoval airfields are World War II era triangular airfields 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 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.	Changed
Sand and Gravel Excavation and Stockpile Areas	Excavation of sand and gravel from ten wash locations in 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

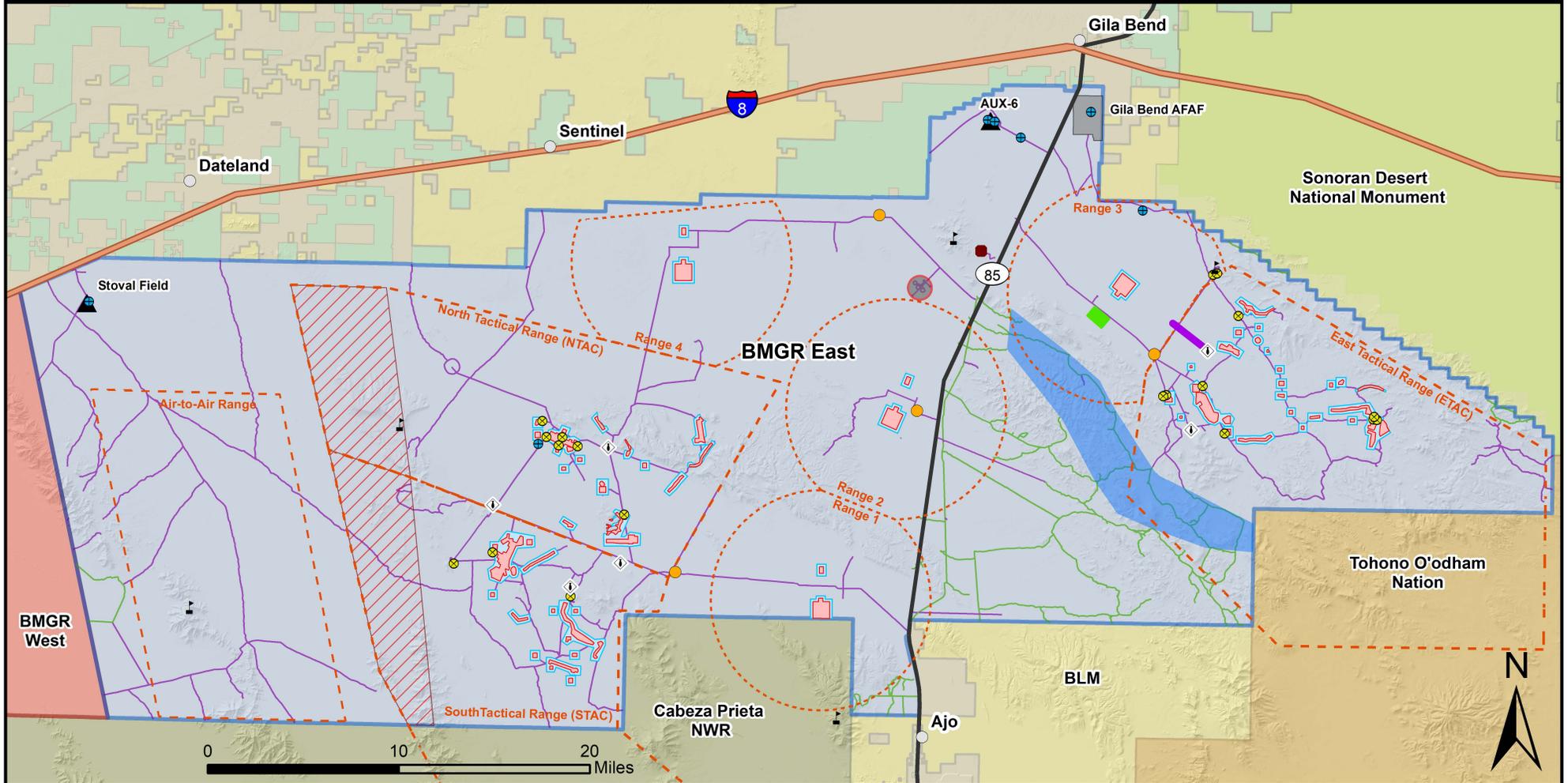
Table 2.1: Current military training facilities, features, and use at BMGR East.

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. Annual clearances entail removing expended ordnance and target debris on the surface within 50 feet 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 inside a 300-foot radius around each inert/practice ordnance target and inside a 500-foot radius around each live ordnance target. Every ten years, ordnance and target debris on the surface is cleared inside a 1,000-foot radius around each inert/practice and live ordnance target. No EOD clearances are conducted within the Air-to-Air subrange.	Unchanged
Air Combat Training Systems	Air Combat Training Systems 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 2.1: Current Military Use at BMGR East

Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

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

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

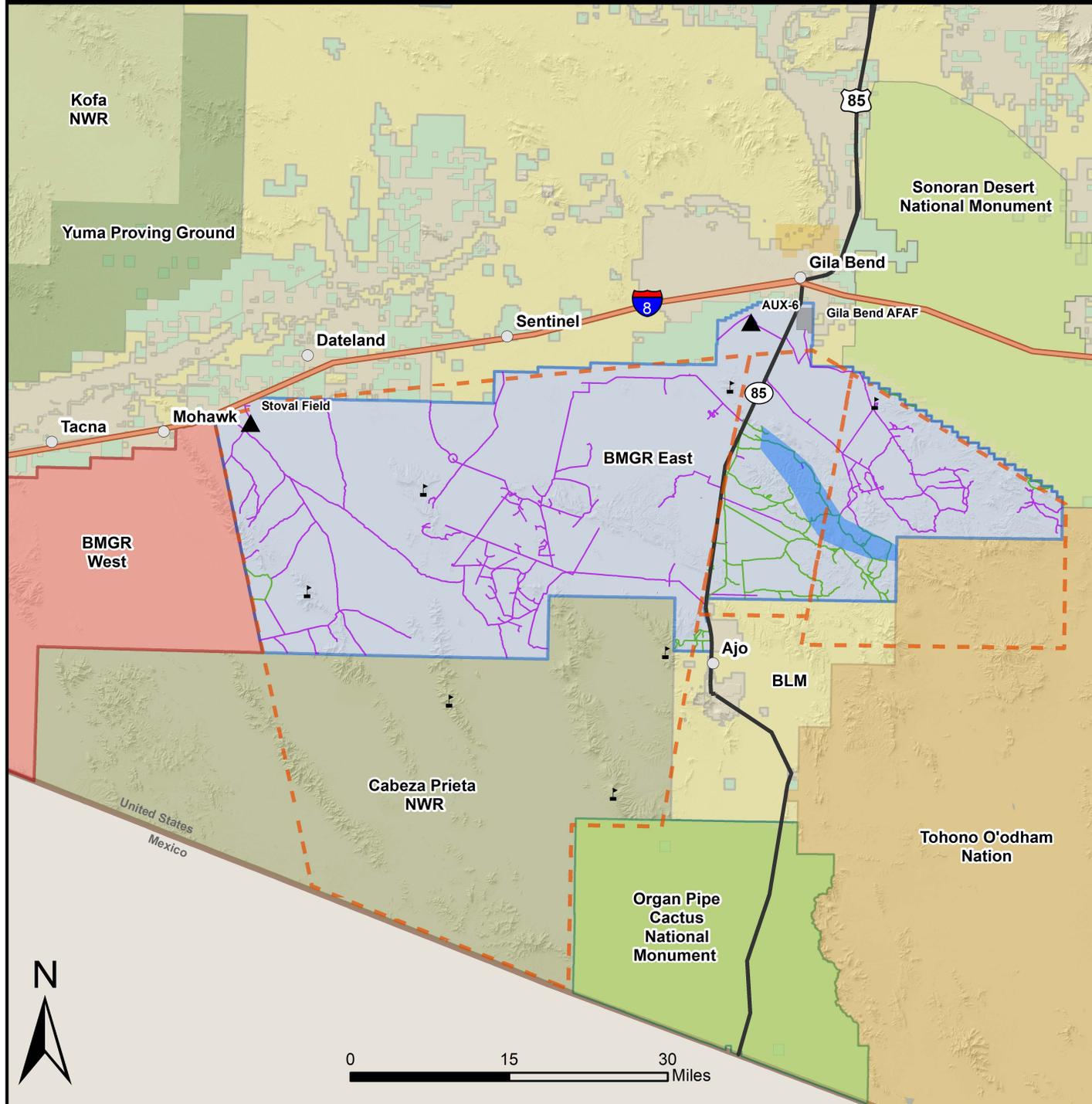
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Figure 2.2: Restricted Airspace at BMGR East

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

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2.1.2 Changes in Military Use at BMGR West

MCAS Yuma organizes its air and ground combat forces into Marine Air Ground Task Forces, which form the fundamental cornerstones of modern USMC combat doctrine. Marine Air Ground Task Forces 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. The R-2301W restricted airspace is divided into four aviation subranges, and all the other listed training facilities and features are ground-based.



An F-18 flying over the Sonoran Desert.

In 2010, the USN approved development of the Auxiliary Landing Field (ALF) complex to support Marine Corps F-35B training for the West Coast basing of the F-35B aircraft (USFWS 2010a). 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 2.3 and detailed in Table 2.2 with notations as to whether they were constructed after 2012.

Table 2.2: Current military training facilities, features, and use at BMGR West.

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	BMGR West represents 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) remain unchanged since 1960.	Unchanged
Airspace Subranges	Four airspace subranges, including 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 for helicopter operations.	Unchanged
F-35B ALF	Construction of the F-35B ALF (known as KNOZ) was completed in 2015. The ALF includes three simulated landing helicopter assault decks, flight control towers, aircraft maintenance shelter, refueling apron, and a fire and rescue shelter.	Changed
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 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

Table 2.2: Current military training facilities, features, and use at BMGR West.

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2012 INRMP
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 score weapon use. The air-to-ground weapons delivery component 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
<i>Air-Ground Training Facilities</i>		
Ground Support Areas	Thirty-three undeveloped ground support areas are used for 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
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
<i>Ground Combat Training Ranges</i>		
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: Current military training facilities, features, and use at BMGR West.

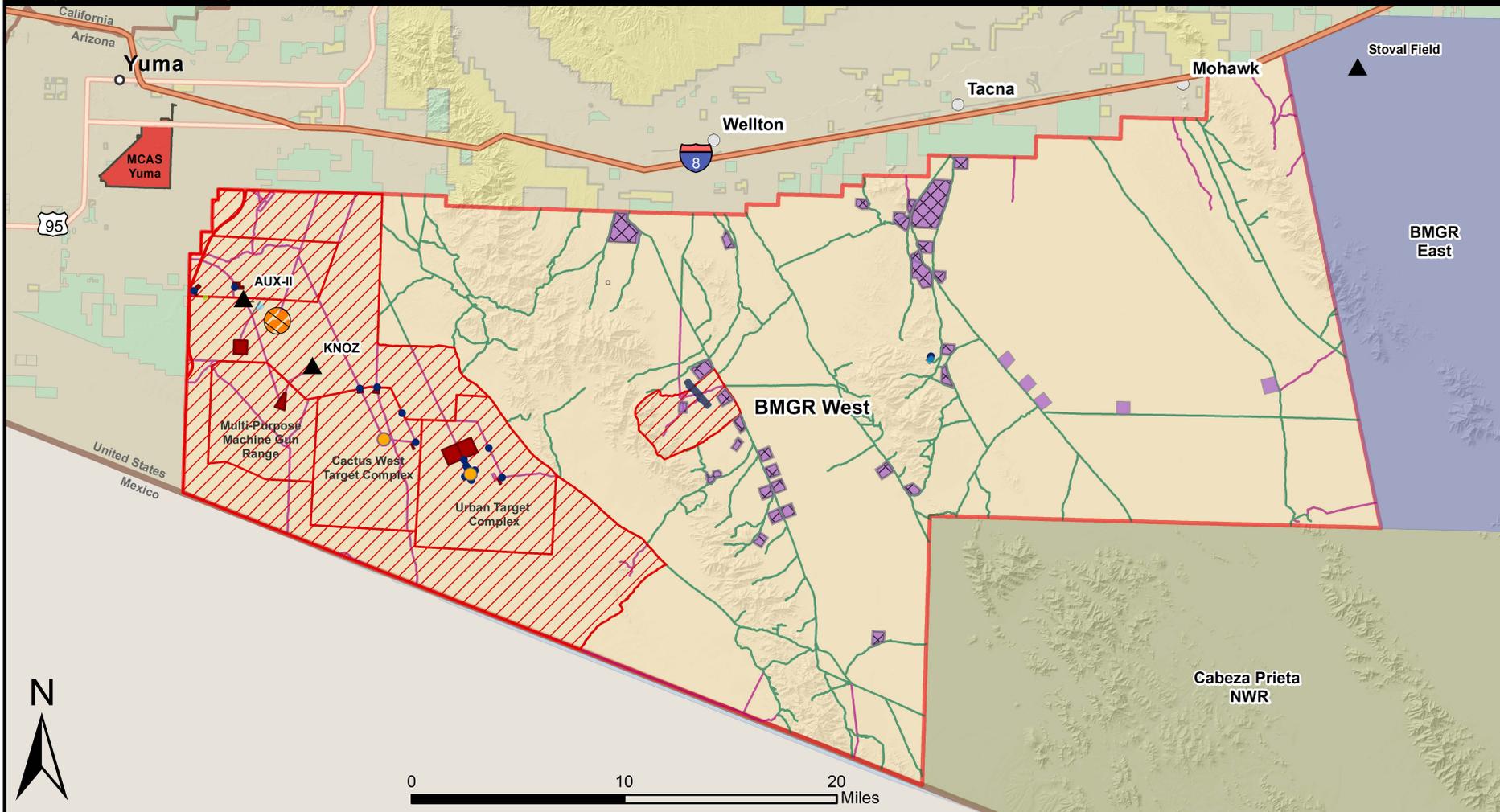
Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2012 INRMP
Convoy Security Operations Courses 1 and 2 and Murrayville (East and West)	Four Convoy Security Operations Courses are designed to train troops assigned to protect vehicle convoys in combat theaters and how to recognize, counter, and defeat threats from hostile forces. Static and pop-up targets that simulate threats are placed in ambush scenarios along the existing access roads in the vicinities of the Cactus West Target Complex, the 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 for use 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
AUX-II Field Ammunition Supply Point	The Field Ammunition Supply Point, located about 1,500 feet northwest of AUX-II, provides temporary secure storage for munitions used by ground units during field exercises, primarily during semi-annual weapons and tactics instructor courses.	Unchanged

Table 2.2: Current military training facilities, features, and use at BMGR West.

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2012 INRMP
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 2.3: Current Military Use at BMGR West
Barry M. Goldwater Range (BMGR)

2018-2023 Integrated Natural Resource Management Plan (INRMP)



Legend

- | | | | |
|-------------------|---|-------------------------------|--|
| Interstate 8 | State Trust Land | Urban Infantry Training Range | Restricted Access/Hazard Areas |
| Highways | BMGR West Military Training | Auxiliary Airfield (AUX) | BMGR West Designated Admin Use Only Road |
| City/Town | Aerial Bombing Range | Landing Zone Area | BMGR West Designated Public and Admin Use Road |
| MCAS Yuma | AUX II Bivouac Site | Impact Area | |
| BMGR East | Gas Chamber for Personal Equipment Operations | Observation Position Point | |
| BMGR West | Ground Support Area | Parachute Drop Zone | |
| Cabeza Prieta NWR | | Training Range | |
| BLM | | | |

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

Base data from ESRI StreetMap
Hillshade derived from USGS NED

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2.2 Non-Military Activities

2.2.1 Arizona Game and Fish Department

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

AGFD's primary wildlife management responsibilities were recognized in the 2007 INRMP and continue without change, as follows.

- Develop and maintain habitat assessment/evaluation, protection, management, and enhancement projects (e.g., artificial water developments and Sonoran pronghorn (*Antilocapra americana sonoriensis*) food plots).
- Conduct wildlife population surveys.
- Manage wildlife predators and endangered or other special-status species (management of federally listed endangered species is a responsibility shared with the USFWS).
- Enforce hunting regulations.
- Establish game limits for hunting, trapping, and non-game species collection.
- Issue hunting permits.
- Participate as a member on the Sonoran Pronghorn Recovery Team.
- Assist and advise the DoD in managing off-highway vehicle use in terms of habitat protection and advocating for user opportunities.



The javelina is just one of the species that may be hunted at BMGR. Photo courtesy of Arizona Game and Fish Department.

AGFD continues to make determinations on the appropriateness of and/or need to transplant wildlife into/out of BMGR. If proposed wildlife transplants would affect operations and ecosystems/management goals and objectives at BMGR, then appropriate environmental studies and regulatory compliance would be completed, as required, prior to implementing any specific proposal.

2.2.2 U.S. Border Patrol

As a result of its proximity to the U.S.–Mexico border, the entire BMGR is potentially subject to the presence of undocumented aliens (UDAs) and smuggling traffic (Figure 1.1). Therefore, the range is heavily patrolled by U.S. Customs and Border Protection (CBP) agents seeking to interdict and apprehend smugglers and illegal entrants. The CBP is also charged with installing border

infrastructure as needed to deter illegal crossings and maintain operational control of the border (Homeland Security Act of 2002 [P.L. 107-296], Illegal Immigration Reform and Immigrant Responsibility Act of 1996 [P.L. 104-208 § 102], 8 U.S.C. § 1103, and other acts). Within the CBP, the U.S. Border Patrol (BP) is the 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 BMGR East, BP coordinates with Range Management Office (RMO) Conservation Law Enforcement Officers (CLEOs) and Pima and Maricopa County Sherriff Offices. Within BMGR West, the 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 of how the existence and operations of military airports can endanger the lives of those who live and work nearby. 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 perimeter includes residential, industrial, and agricultural, including rangelands for livestock grazing and croplands. The populations of these are summarized in Table 2.3. Most of the population in proximity to BMGR resides in Yuma County. In 2007, when the housing bubble burst and triggered the 2008 recession, Yuma County, like most of the nation, experienced a decline in population growth 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). When the economy began to recover, the population growth rate exceeded the historical average, rising to an annual growth rate of about five percent from 2010–2017 (U.S. Census 2017).

The federal government has jurisdiction over approximately 80 percent of the land in Yuma County (Yuma County Department of Development Services 2012). Two of the primary uses in unincorporated portions of Yuma County are military and agriculture (40 and 47 percent, respectively) (Yuma County Department of Development Services 2012).

The community of Gila Bend lies just north of BMGR East. The Gila Bend planning area includes approximately 175,000 acres of open, relatively flat terrain. Development in the Gila Bend community is concentrated in town (Gila Bend 2017) and includes large residential lots, energy-generation facilities, agriculture, and sand- and gravel-extraction sites (Gila Bend 2017). There are no master-planned communities within the unincorporated portion of the Gila Bend planning area (Gila Bend 2017).

Table 2.3: Surrounding community populations, 2010–2017.

City	2010 U.S. Census Data	Recent Population Estimates
City of Yuma, Yuma County	93,064	96,502 ¹
Wellton, Yuma County	2,882	2,947 ²
Tacna, Yuma County	602	674 ²
Gila Bend, Maricopa County	1,922	2,069 ¹
Ajo, Pima County	3,304	3,696 ²

¹ 2017 U.S. population estimates (as of July 1, 2017) (U.S. Census Bureau 2017).

² 2016 U.S. population estimates retrieved from the 2010–2016 American Community Survey at https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

The Tohono O'odham Nation, located southeast of BMGR, encompasses approximately 2.8 million acres. The Nation is organized into 11 districts, one of which is the Hicikiwan District that abuts BMGR's southeastern-most border. As of 2016, the Hicikiwan District's population was 817 and the off-reservation population is 1,259 (Tohono O'odham Nation 2016). Tohono O'odham 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 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 the colder winter weather in more northern climates to enjoy milder Arizona winter temperatures.

CHAPTER 3 CHANGES IN LAND AND ENVIRONMENTAL CONDITIONS

3.1 Landforms, Geology, Soils, and Hydrology

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 BMGR are within the Gran Desierto dune system, which extends to the west and south and into Mexico. There are smaller sand dune systems in several other areas of BMGR, 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 within 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 above mean sea level (AMSL) in the southwest corner of BMGR West to 4,002 feet 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. Sloping masses of alluvial fill material, known as *bajadas*, fan outward from many of the mountain bases to taper more gradually than the mountains themselves to the generally flat valley floors.

Volcanic landforms are found on the range, the most notable of which 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 BMGR boundary and connects to the Colorado River northwest of the range. Surface water at BMGR is minimal. There are no perennial or intermittent streams present, and ephemeral stream flow occurs only immediately after substantial rainfall events. Surface-water drainage at BMGR flows away from the mountain ranges in numerous feeder washes that flow into larger washes, which generally flow northward to the Gila River before it meets 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 at BMGR and, during certain times of the year, so scarce that the AGFD began developing wildlife watering sites, or “wildlife waters,” in the late 1950s. These wildlife waters have included constructed catchments and modifications to many existing water resources to extend the availability of water for wildlife. Currently, more than 40 wildlife waters are maintained across BMGR through a partnership between the 56 RMO, the MCAS Yuma RMD, and the AGFD. During extreme drought, the AGFD will routinely refill these wildlife waters by hauling in tens of thousands of gallons annually by vehicle and helicopter to support wildlife. 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 except for approved military, resource management, and law enforcement purposes and it established vehicle operating rules to facilitate ground-surface recovery and natural revegetation. 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 controlling and managing 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, BMGR, and/or the Tohono O'odham Nation.

As a result of illegal cross-border foot traffic, the BP is patrolling new areas where illegal vehicles had not traveled in the past. Attempts apprehend and perform rescues of UDAs has led to a proliferation of new roads and off-road driving in these areas.



Humanitarian aid drops lead to waste being left in the desert.

Illegal cross-border foot traffic also has prompted humanitarian groups to increase their drops of food, water, clothing, and medical supplies, at areas along UDA foot trails. Nefarious groups intending to directly support illegal drug smuggling activities are doing likewise. Regardless of the intent, this practice has led to increased proliferation of unauthorized vehicle routes and a dramatic increase in the amount of litter and trash along UDA trails in remote sites.

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 on both sides of the roads and downcutting of the roadbeds to below natural grade. This affects surface runoff from precipitation events by precluding or slowing the natural flow of water in drainages that intercept the roads. In turn, this causes runoff

to pond on the upstream side of the road. The excess soil moisture there can promote the growth of thick stands of vegetation, often composed of invasive species. By the same token, water flow is effectively cut off from the natural vegetation community for some distance downstream of the road. Steep slopes and frequent vehicle traffic also promote severe incision of roads, which disconnects the lower and upper portions of intercepted watersheds and alters or disrupts the patterns of overland flow. As a result, the lower and upper watersheds have developed distinctly different vegetation covers, and woody riparian vegetation is disappearing in the lower watershed. Repeatedly dragging roads also 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 at BMGR West road, which has been widened considerably and is now diverting runoff and creating new, potentially problematic drainage channels.

Other factors contributing to soil erosion and ground disturbance include the use of off-highway vehicles, including sandrails and other recreational vehicles, and unauthorized travel off the public road system. Excessive speeds and chronic caravanning 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 surface runoff, it also reduces the soil moisture available for vegetation. In turn, plant mortality may increase, and without vegetation to slow the rate of surface runoff, hillside erosion can intensify (Brooks and Lair 2009). Soil erosion also may directly impact military training activities. For example, high wind speeds in areas of heavy soil erosion can reduce visibility and air quality during training activities. Finally, there is evidence that the air pollution from heavy traffic along roads can lead to high concentrations of heavy metals and other contaminants in soils and vegetation, which, in turn could impact the health of threatened and endangered species. For example, the desert tortoise population has declined due to an airborne virus responsible for upper respiratory and shell diseases, and there is some concern that accumulations of heavy metals in tortoise forage may be making the tortoises more susceptible to these diseases (Brooks and Lair 2009). Although qualitative observations of anthropogenic impacts to soil resources have been noted by range managers at BMGR, there have been no quantitative, data-driven studies 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 standard operating procedures listed below.

- Dragging shall take place only within the roadbed.
- No loading of drag devices with materials shall take place to increase drag weight.
- Turn-around shall take place only in designated areas.
- There shall be no increase in the size of turn-around areas.
- Drags will not be relocated until they are thoroughly cleaned of soils and/or plant parts, and seeds to preclude the spread of potentially invasive species.

- Before initiating a new drag, there will be coordination among responsible parties to ensure it is implemented responsibly.
- 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 have included

- an MOU, signed 23 April 2018, between BMGR West and Yuma Station BP for road maintenance;
- meetings between the BMGR Executive Council (BEC) and affected agencies six times per year to identify substantive issues, conflicts, or other matters for consideration regarding potential impact upon lands or resources in the BMGR region;
- developing Regional Road Network Books and global positioning system (GPS)/Adobe PDF maps to delineate roads allowed for use in support of the CBP mission;
- requiring all law enforcement agencies complete the *Range Access and Safety Training Program*;
- requiring CBP Air, Sector, and Station Chiefs attend BMGR orientations;
- allowing the CBP access to BMGR East Small Arms Range for training;
- providing the CBP access to and use of Gila Bend AFAF facilities, airfield, and all-terrain vehicle storage facilities;
- establishing airspace access agreements for CBP rotor, fixed wing and Unmanned Aircraft Systems;
- providing special operation support to facilitate BMGR East access;
- routing CBP radios through the Gila Bend Emergency Communications Center to enable direct contact between the military and the BP; and
- establishing standardized protocols at BMGR East for BP range access and road-dragging activities.

BMGR East

In an effort to determine the full scope of damage that illegal border crossings and deterrence activities are having on the landscape, the USAF began a drag roads monitoring project. The purpose of the project is to help inform management as to how they can could prevent further erosion and changes in surface hydrology.

Road elevations and conditions are measured and photo-documented, respectively, each year and then compared to document changes in elevation and other characteristics along monitored drag roads. Future assessments could include (1) comparing vegetation survey data to identify changes in vegetation composition adjacent to both drag roads and along non-drag roads and (2) conducting hydrological studies to determine how drag roads affect surface hydrology.



Measuring road elevation with a California rod and auto-level.

BMGR West

In 2014, the U.S. Geological Survey (USGS) reported on quantified disturbances to soils, vegetation, and cultural resources caused by migrant and smuggler traffic, border security, and general recreational vehicle use at 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 a geographic information system (GIS) and remote sensing to model soil erosion based on factors from the Universal Soil Loss Equation (Villarreal 2014).

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

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) mapping the range's surface with LiDAR (Light Detection And Ranging—a type of remote sensing that uses laser light to produce 3-dimensional maps of the earth's surface), and (3) manually measuring erosion on the ground (with an electronic, survey-grade theodolite total station) (Duan et al. 2017). Monitoring erosion will help resource managers prioritize erosion-prone areas and determine whether erosion is caused more by wind or precipitation runoff (Duan et al. 2017).

The mapped soil-disturbance data and erosion-vulnerability model will allow resource managers to quickly identify where off-road vehicle traffic will have the greatest negative impact on soil resources and allow them to designate critically disturbed areas and restoration sites where off-road driving would be prohibited.

In accordance with the BMGR INRMP 5-Year Action Plan for 2012–2017, the University of Arizona (UA) developed and implemented a digital soil-mapping technique specifically for characterizing the complex alluvial and eolian deposit-dominated landscape of BMGR West (Rasmussen and Regmi 2015). This project

resulted in a rangewide, highly detailed map that classifies the variability and distribution of soils across the BMGR West landscape (Rasmussen and Regmi 2015).

BMGR West staff are working with the UA to use the new soil mapping technique to derive high spatial-resolution maps of soil-landscape variability and initial segmentation of the landscape into soil-landscape map-units for the planning period covered by the 2018 INRMP. Soil maps provide natural resource managers with crucial decision-making tools that allow them to assess the potential for erosion and natural hazards. They also can be used to assess biophysical and biogeochemical functioning of the landscape (Rasmussen and Regmi 2015).

3.2 Climate

The Southwest U.S. has a hot, arid, and variable climate driven by its geographic location. Most precipitation occurs during frontal storms in mid-winter or during late-summer monsoons. Because rainfall patterns are highly irregular, however, some BMGR locations may receive little or no rain during the same year in which other areas receive average or above-average precipitation. Moreover, the Sonoran Desert is subject to frequent and sometimes prolonged droughts. Based on long-term weather patterns, the annual average amount of rainfall in the higher elevations along the easternmost portion of BMGR is nearly nine inches; however, the annual average over the entire range is less than five inches, near Yuma it is only about three inches. Some of BMGR's interior valleys may receive as less than two inches of rain per year. When the relatively stable weather patterns that drive the region's arid climate periodically break down, all or portions of the range may receive two to three times the normal amount of annual rainfall, sometimes during just one to a few storms.

Overall effects of the prevailing rainfall patterns are exacerbated by high temperatures and regional evapotranspiration potentials that greatly exceed those of all other known precipitation regimes. Summer daytime temperatures often exceed 110 degrees Fahrenheit. Annual evaporation potentials,



Observation tower housing cameras that monitor human activities and erosion.

which vary from more than 86 inches in the western portion of the range to 72 inches in the eastern portion of the range, greatly exceed typical rainfall amounts.

3.2.1 Update

The Southwest became warmer and drier over the twentieth century and climate models project that this trend will continue into the twenty-first century (Overpeck et al. 2013). Droughts are projected to become more severe and winter precipitation events are projected to become more frequent and intense (Overpeck et al. 2013). Significant changes in the Southwest region's climate will impose 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, BMGR East staff began a climate monitoring program by installing a network of 12 real-time, communication-grade weather stations, data loggers, and precipitation-storage gauges. In addition to these stations, BMGR East has maintained its existing rain gauges (Fig. 3.1) and the use of data loggers to increase the number of climate-monitoring points and provide a more spatially explicit understanding of climate variables. These stations collect measurements on (Black 2015) the

- regional climate monitoring program,
- temperature,
- relative humidity,
- precipitation,
- wind speed,
- wind direction,
- solar radiation, and
- soil moisture.

The real-time weather data can be accessed by visiting <http://98.191.112.244/index.html>. This website provides easy access to real-time data needed by the Luke AFB Weather Squadron, 25th Operational Weather Squadron, Maricopa County Flood Control Department, National Oceanic and Atmospheric Administration, and regional law enforcement agencies. Access to real-time weather data informs time-sensitive resource management issues (Black 2015), including where and when to

- service emergency feed and water stations for endangered species;
- apply control measures for invasive plants; and
- check cultural resources that may have been subject to extreme erosion events.

BMGR West has five weather stations from which data can be downloaded manually. Staff are exploring options to install communication sensors on these weather stations for also reporting real-time climate data. In addition, several agencies have partnered with BMGR to gain insight into the distribution and timing of precipitation on a regional scale. The study area encompasses a large

portion of southwestern Arizona (Figure 3.1; source: Black 2015). The partnering agencies in this regional monitoring effort (Black 2015) are listed below.

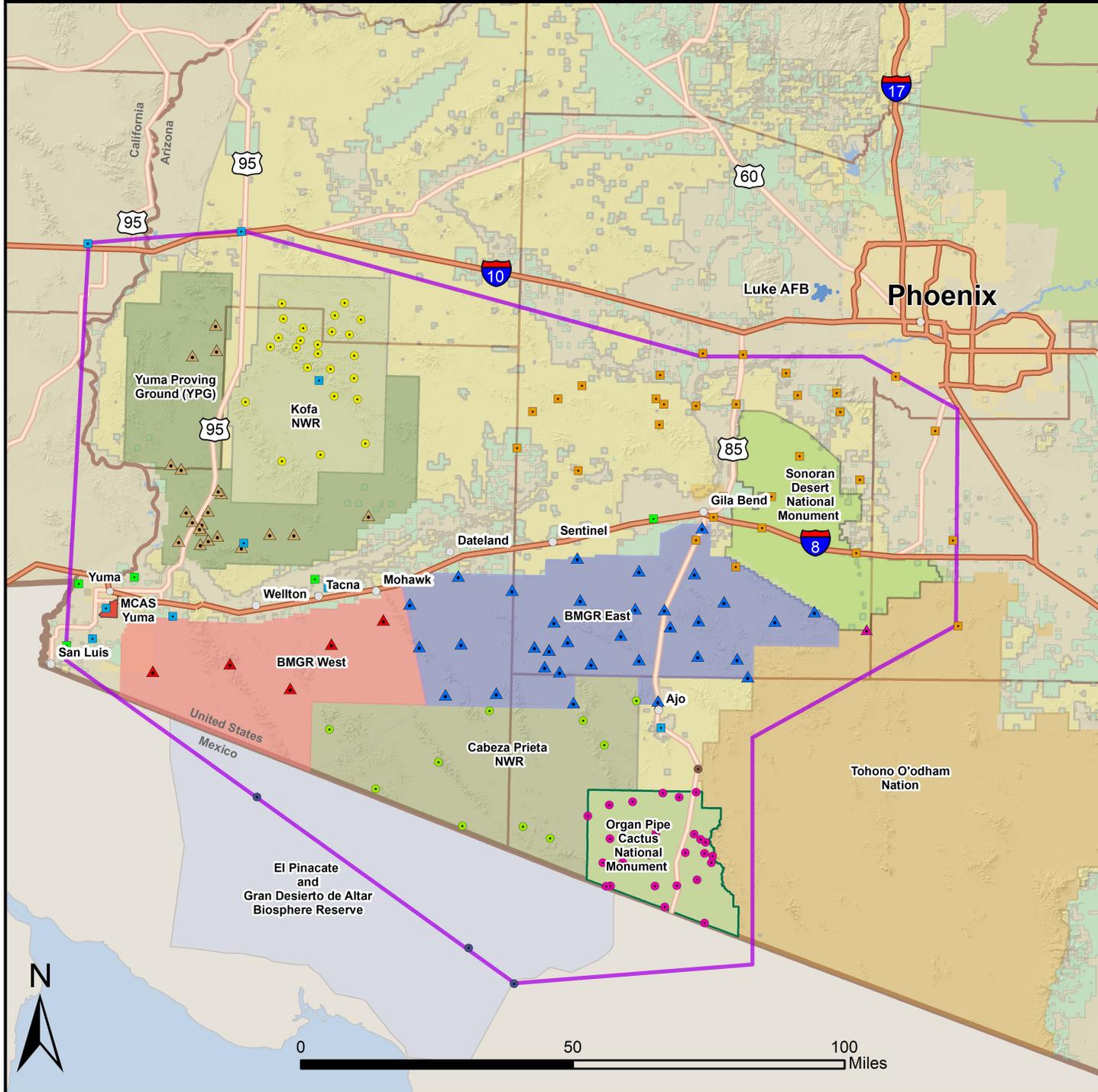
- BMGR East (USAF)
- BMGR West (USMC)
- Cabeza Prieta NWR (USFWS)
- Kofa NWR (USFWS)
- Organ Pipe Cactus NM (National Park Service [NPS])
- Sonoran Desert NM/Ajo Block (BLM)
- Yuma Proving Ground (U.S. Army)
- Flood Control District of Maricopa County

Partner agency staff aggregate the monthly precipitation data for each water year (i.e., October 1 to September 30; using a calendar year would split up the period of winter rain). Monthly precipitation values are combined with data from neighboring agencies, including data from the National Oceanic and Atmospheric Administration's Cooperative Observer Program stations throughout the region, the El Pinacate and Gran Desierto de Altar Biosphere Reserve in Mexico, and the UA Meteorological Network. Data from two rain gages at private homes in Ajo and Why are included as well (Black 2015). These aggregated datasets contain monthly precipitation values for 160 stations across the region. For locations without rain gauges, these data are used to estimate precipitation amounts on the basis of recorded amounts in surrounding areas (i.e., interpolation of weather data), 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 the region's precipitation patterns, especially during monsoon season. The current method also does not consider elevation, which can influence precipitation events.

Figure 3.1: 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

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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 BMGR. The Arizona Upland Subdivision is restricted principally to areas of the range east of SR 85 where the slopes and upper *bajadas* of the Sand Tank and Saucedá mountains provide favorable soils, elevations, and precipitation. The plant communities within the remaining portion of the range occur within the Lower Colorado River Valley Subdivision. The distribution of plant communities within both of these subdivisions is influenced by the landscape's diversity, of which widely spaced and rugged mountain ranges, broad valley plains, sand dune systems, surface drainages, and *playas* are the most important features.

3.3.1 Update

In 1981, the NPS developed a vegetation map for Organ Pipe Cactus NM using 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 the contiguous parcels of federally managed lands following the same standardized protocol through the support of the Desert Southwest Cooperative Ecosystem Studies Unit and UA. Completed areas include BMGR West, Organ Pipe Cactus NM, Cabeza Prieta NWR and BLM lands in the Ajo Block, and portions of 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 for BMGR East along its eastern "stair-step" boundary with the Sonoran Desert NM and in areas with a slope exceeding 20 percent. When the remaining portions of BMGR East are completed (in 2019), the maps will be compiled into a single map for all federal lands mapped within southwestern Arizona. This seamless map will provide a baseline for ecosystem management decisions and help land and resource managers to better understand how wildlife species are using the landscape, including their movement patterns, habitat use, and the associated vegetation.

The vegetation maps classify vegetation communities according to the U.S. National Vegetation Classification System (USNVC). The hierarchical framework of the USNVC documents community alliances and associations. An alliance represents the broadest level of classification used for vegetation mapping and is defined by a characteristic range of species compositions, habitat conditions, physiognomy, and diagnostic species—typically at least one species found in the uppermost or dominant stratum of the vegetation layer being classified (USNVC 2017). Alliances reflect regional climate, hydrologic, substrate, and disturbance regimes and trends (USNVC 2017). Associations, on the other hand, 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 (USNVC 2017). An association typically occurs on a particular landform type; for example, White Bursage-Big Galleta Grass occurs on dune landforms (Malusa and Sundt 2015). Occasionally, vegetation communities are mapped down to the sub-association level.

BMGR East

Detailed mapping (Table 3.1, Figure 3.2) was conducted by UA in multiple phases. The first phase began in 2003 with mapping of the NTAC and STAC (McLaughlin et al. 2007). Next, the ETAC Range and Area B were mapped, followed by the western San Cristobal Valley, and finally, 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 during FYs 2018 and 2019:

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

Table 3.1: Vegetation associations at BMGR East.

Vegetation Association	Total Acres	Vegetation Association	Total Acres
Wolfberry	8,074	White Bursage - Creosote	943
Creosote - Fagonia (<i>Fagonia</i> spp.) - White Bursage	5,715	Jojoba (<i>Simmondsia hinensis</i>) / Lycium Mountains	872
Saltbush (<i>Atriplex</i> spp.) - Slender Saltbush (<i>A. tenuissima</i>) - Creosote	5,393	Mesquite - Paloverde	817
Creosote / Desert Saltbush (<i>A. polycarpa</i>) / Mesquite	4,165	Honey Mesquite (<i>P. glandulosa</i>) Playa	88
Bursage spp. / Creosote / Yellow Paloverde / Ironwood	2,318	Brittlebush Terrace	71
White Bursage / Big Galleta Grass / Creosote	1,199	Barren	51

BMGR West

Vegetation mapping (Table 3.2, Figure 3.3) for BMGR West began in 2009 and was completed in 2014 (Malusa 2010, Malusa 2012, Malusa and Sundt 2015). Most of BMGR West lies within the 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, and 40 subassociations. The most detailed mapping unit often includes a reference to a particular landform, such as Creosote - White Bursage / Ocotillo on ridges.

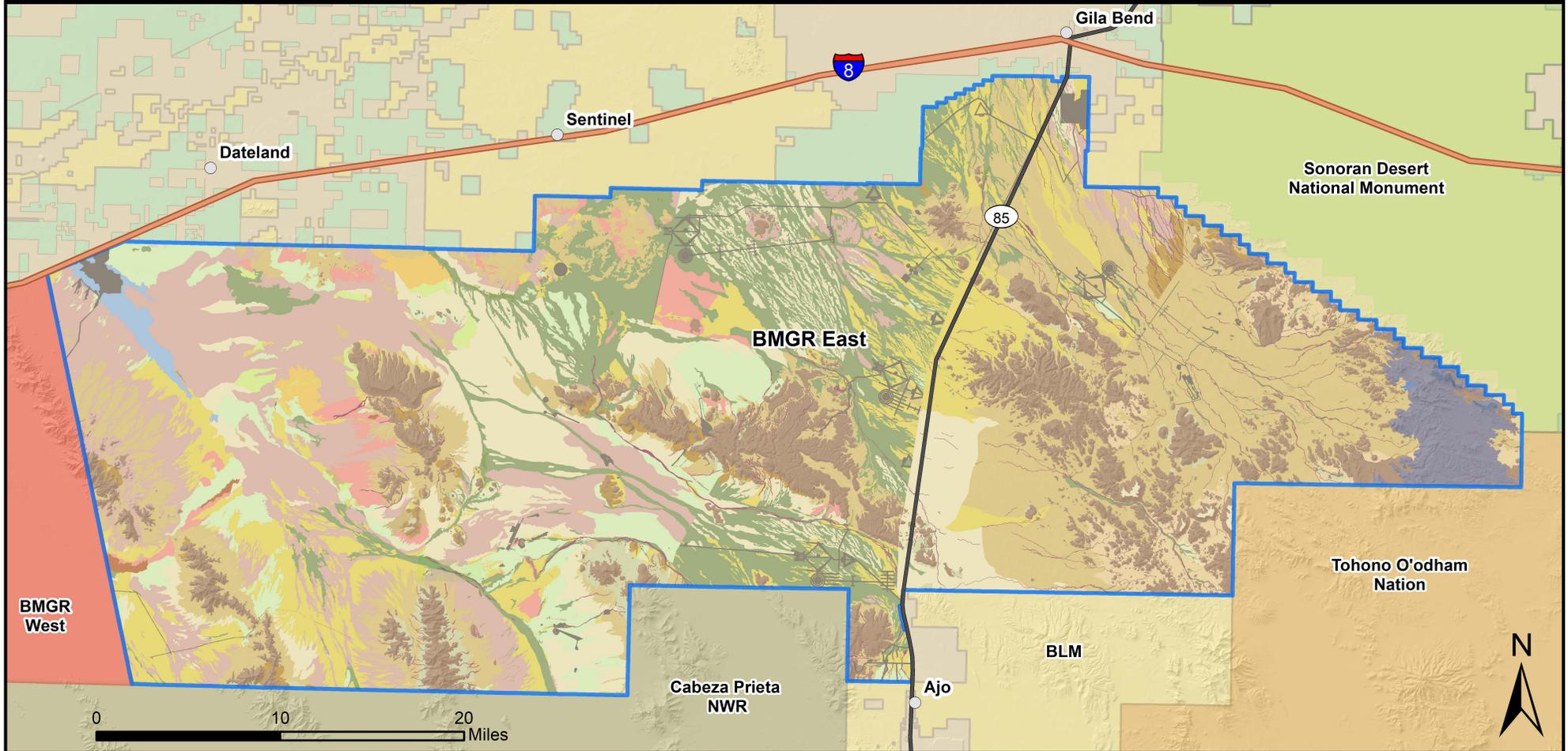
Table 3.2: Vegetation associations at BMGR West.

Vegetation Association	Total Acres	Vegetation Association	Total Acres
Creosote - White Bursage	275,715	White Bursage – Creosote / Paloverde / Ironwood	5,687
Creosote - Bursage / Paloverde - Ironwood	97,543	Disturbed	4,155
Creosote Monotype	96,401	Brittlebush - Creosote	4,075
White Bursage - Elephant Tree	49,096	White Bursage – Creosote - Teddy Bear Cholla	3,949
White Bursage - Big Galleta Brass	28,040	Mormon Tea – Agave (<i>Agave</i> spp.) / White Bursage	2,864
White Bursage - Creosote	26,403	Brittlebush – Ironwood - Blue Paloverde	2,600
Wolfberry	15,082	Arrowleaf (<i>Pleurocoronis plurisetata</i>) / Sumac (<i>Rhus</i> spp.) / Beargrass (<i>Nolina microcarpa</i>) / Mormon Tea	1,937
Creosote - Triangle Leaf Bursage	14,252	Brittlebush - White Bursage- Creosote	1,934
Creosote - White Bursage - Big Galleta Grass	13,639	Barren	911
Creosote - Fagonia - White Bursage	11,984	Lavender (<i>Hyptis emoryi</i>) - Holly Leaf Bursage (<i>A. ilicifolia</i>)	444
Creosote - White Bursage - Triangle Leaf Bursage	10,629	Blue Paloverde / Holly Leaf Bursage	263
Brittlebush - Creosote - White Bursage / Yellow Paloverde	10,073	Desert Holly (<i>A. hymenelytra</i>) - White Bursage	147
Creosote - Teddy Bear Cholla	9,867	Mesquite – Paloverde Bosque	19
Creosote Floodplain	6,256		

Figure 3.2: 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

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The remainder of BMGR West lies within the Great Basin and Intermountain Dry Shrubland and Grassland Macrogroup. This vegetation is characterized by shrubs, such as Mormon tea (*Ephedra viridis*), and is restricted to northern slopes of the higher mountains. This macrogroup comprises one alliance, two associations, and two subassociations at 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 vegetation map's sub-association classes. Figure 3.3 depicts BMGR West vegetation communities mapped at the association level. Table 3.2 lists and quantifies the broadly categorized vegetation associations that cover BMGR West (Malusa and Sundt 2015).

3.3.2 Invasive Plants

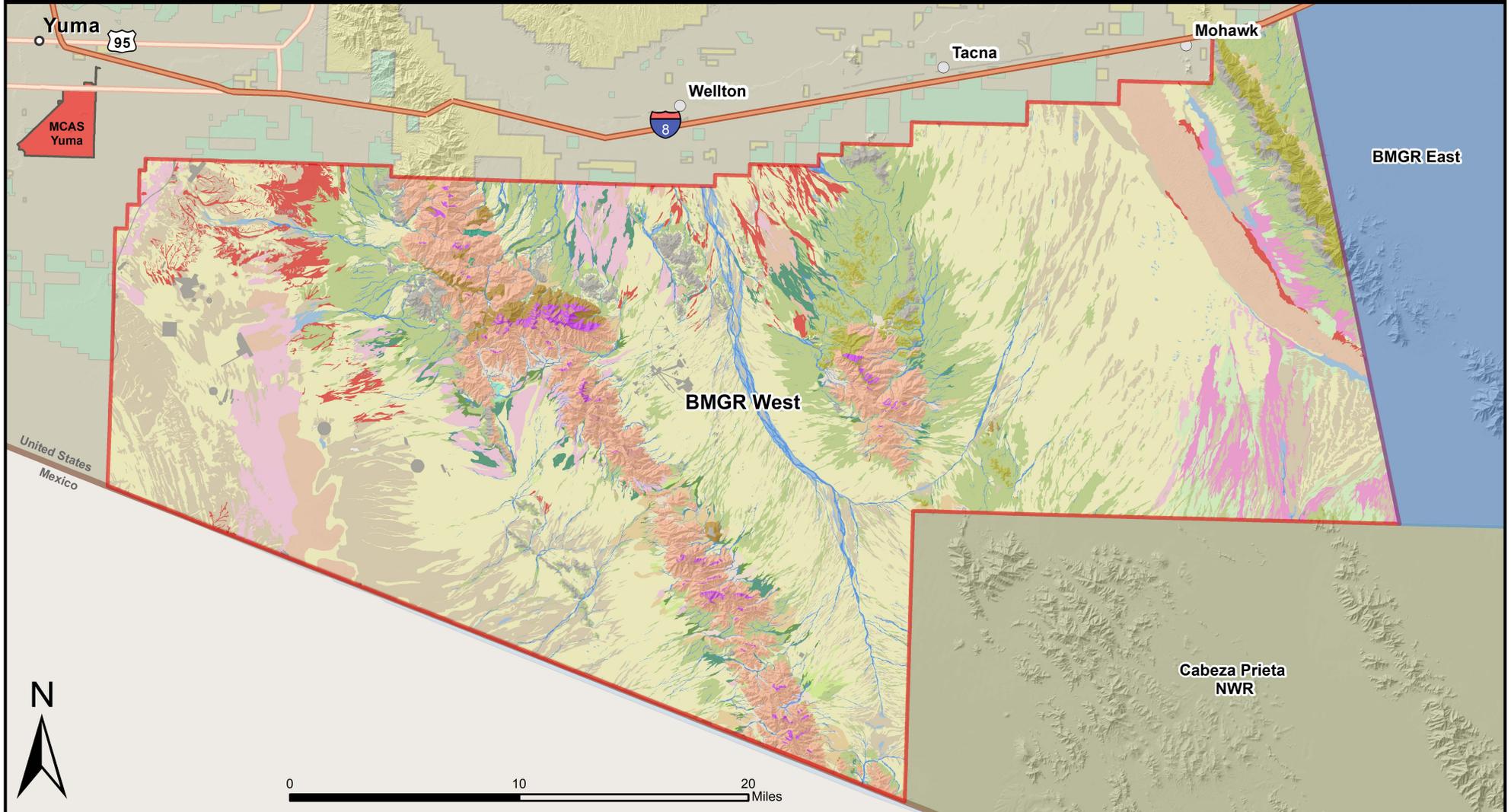
Exotic, invasive, or noxious plants are generally characterized by their ability to easily colonize disturbed areas. They have specialized dispersal mechanisms that allow them to quickly become the dominant vegetation in an area, thus altering native vegetation communities. Roads, livestock grazing,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

If left undetected, unmonitored, and unmanaged, nonnative invasive species could fundamentally alter BMGR's ecosystem structure through competition with native species. Other effects include reduced species diversity and the potential for promoting and spreading wildfires (Villarreal et al. 2011). The following species have been identified and are being actively monitored and managed through 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*) (a small population was discovered at 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 3.3: BMGR West Vegetation Community Map

Barry M. Goldwater Range (BMGR)



Legend

Interstate 8	BMGR West Vegetation Associations	17 - Creosote-Bursage/Palo Verde-Ironwood	41 - Arrowleaf/Sumac/Beargrass/Mormon Tea	81 - Wolfberry
Highways	0 - Barren	19 - Creosote-Fagonia-White Bursage	50 - Disturbed	83 - Lavender-Hollyleaf Bursage
City/Town	10 - Creosote Monotype	24 - White Bursage-Creosote-Teddy Bear Cholla	63 - Brittlebush-Creosote-White Bursage/Yellow Palo Verde	90 - Blue Palo verde/Hollyleaf Bursage
BMGR East	11 - Creosote-White Bursage	26 - White Bursage-Big Galleta Grass	67 - Brittlebush-Creosote	
BMGR West	12 - Creosote-Triangle Leaf Bursage	27 - White Bursage-Elephant Tree	68 - Brittlebush-White Bursage-Creosote	
MCAS Yuma	13 - Creosote-White Bursage-Triangle Leaf Bursage	28 - White Bursage-Creosote	69 - Brittlebush-Ironwood-Blue Palo verde	
Cabeza Prieta NWR	14 - Creosote-Teddy Bear Cholla	29 - White Bursage-Creosote/Palo Verde/Ironwood	71 - Desert Holly-White Bursage	
BLM	15 - Creosote floodplain	40 - Mormon Tea-Agave/White Bursage	80 - Mesquite-PaloVerde	
State Trust Land	16 - Creosote-White Bursage-Big Galleta Grass			

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

Base data from ESRI StreetMap
Hillshade derived from USGS NED

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3.3.2.1 Update

BMGR East

Buffelgrass, a fire-tolerant perennial, has expanded noticeably along the SR 85 corridor. The vast majority of this expansion has occurred outside of BMGR's fence line along the highway right-of-way. Buffelgrass also has 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 the buffelgrass rate of expansion along SR 85. Results from the research suggest that buffelgrass expansion is limited to draws and washes, making control efforts feasible (Whittle and Black 2014).

Four other invasive species of concern include a fire-tolerant perennial, fountain grass, and three annuals: Mediterranean grass, Sahara mustard, and colocynth. Fountain grass is found at BMGR East and West, and Mediterranean grass has become widespread throughout BMGR East. Given Sahara mustard's affinity for sandy soils, its ability to produce 750-9,000 seeds per plant, and its dispersal mechanism (once the seeds mature, the plant dies and breaks away from its stem; the seeds drop off as the wind rolls the plant across the landscape), the species continues to be the most prevalent invasive species at BMGR (U.S. Department of Agriculture 2015). Its expansion is a greater concern at BMGR West because the soils there are generally sandier. It 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. As annuals well adapted to arid climates, Mediterranean grass and Sahara mustard typically become much more abundant following wet winters. Similar to buffelgrass, Mediterranean grass and Sahara mustard are fire-tolerant and can form dense monocultures that easily promote fire. These characteristics could lead to altered fire regimes (greater frequency and intensity) if these invasive species are left unmanaged.



Buffelgrass outbreak in Area B (left), an infestation of Fountain grass (middle photo, courtesy of NPS at [Fountain Grass](#)), and Sahara mustard thriving in early spring (right).

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 as they 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 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, guidance for invasive species removal and control, and storage, mixing, safety, and disposal guidance for herbicides. 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. Currently, restricted-use herbicides are not approved for application at either Gila Bend AFAF or BMGR East; only pesticides containing glyphosate as the main ingredient and registered with the Environmental Protection Agency 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).

Manual removal and disposal of invasive plants is prioritized in small (less than 100 acres), environmentally sensitive areas. In areas with low-density stands of invasive weeds that are accessible by vehicle or foot, herbicide is being applied with ground-based equipment. Ground-based equipment is also being used to make targeted applications in accessible infested areas among high densities of environmentally sensitive species. Aerial applications of herbicide are restricted to areas where invasive species occur at high densities. Typically, herbicide is applied by larger aircraft, which may include a USAF C-130 outfitted for pesticide dispersal. For two years, the USAF had an Environmental Assessment in place for a Sahara mustard-control program that entailed aerial applications of herbicide at BMGR East (the Finding of No Significant Impact 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 of treatment improved the control of Sahara mustard along approximately 15 miles of roadway. In the event that aerial herbicide treatments are required in the future, NEPA documents will be prepared. The USAF also 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 for BMGR East, as detailed below, through use of the GIS Cloud app. Currently, funding is in place to begin a partnership with the 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 BMGR East CLEOs to map and monitor invasive species on the east side of the range.



Colocynthis thrives in hyper-arid desert landscapes (left), Colocynthis flower (middle), and Colocynthis fruit (right). Photos courtesy of 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 BMGR. This study combined field measurements, controlled experiments, and mathematical models to determine the environmental factors that affect Sahara mustard success and its long-term impact on other native, winter annual plants. More specifically, this study examined how spatial variation in both biotic and abiotic environments influence the population growth of Sahara mustard and its impact on native plants. It also attempted to quantify the natural dispersal range of the species to improve estimates of its expansion rate across BMGR.

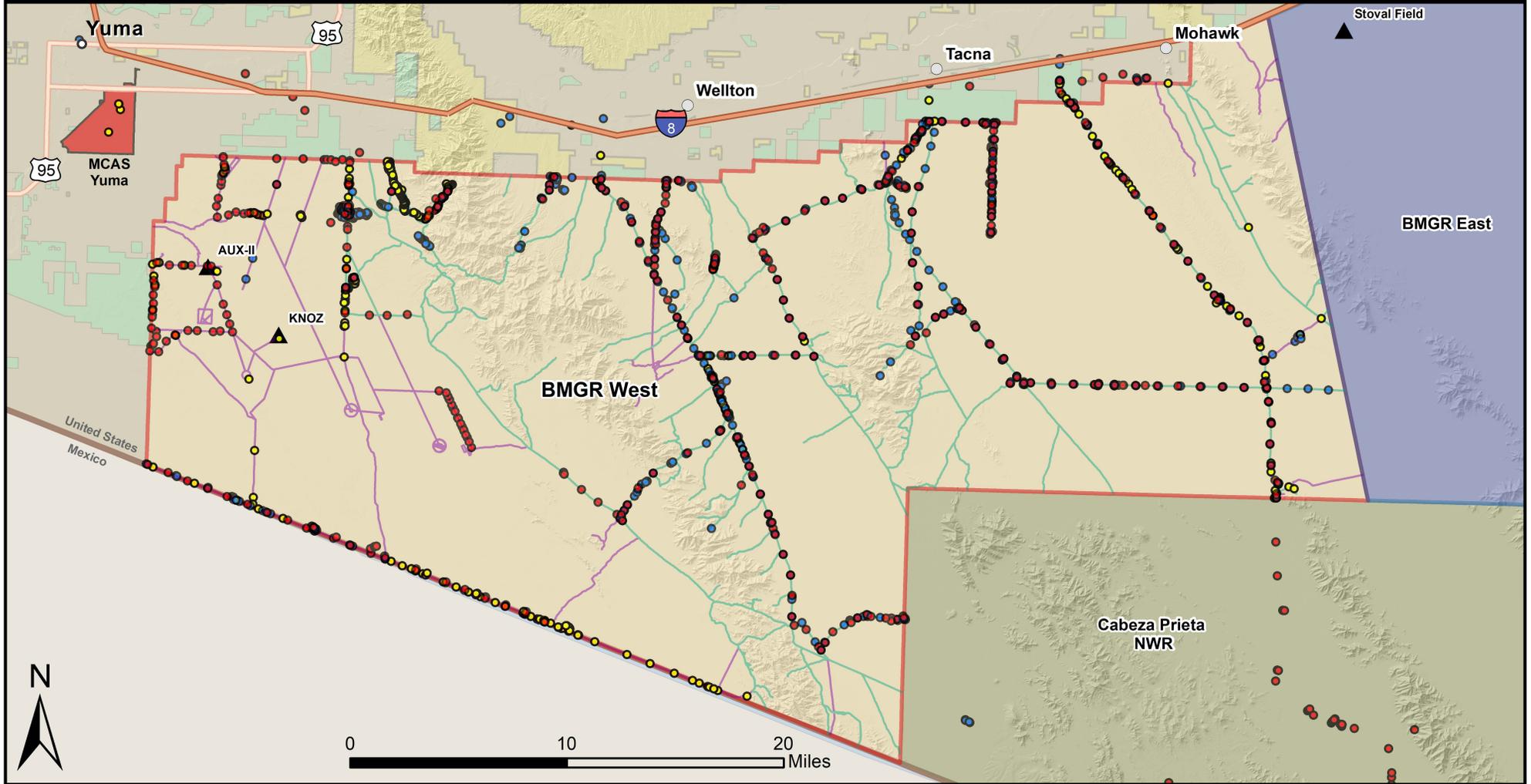
Results from this research (Li and Malusa 2014, Li 2016), have been encouraging. It has shown that Sahara mustard can be controlled effectively because it is vulnerable to adverse post-germination conditions. That is, after extended periods of winter drought, source populations of Sahara mustard on a range-wide scale are reduced to isolated areas where soils retain moisture. These persistent populations could expand again across the landscape as conditions become favorable again, but they can be successfully eliminated after drought. 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 the NPS Lake Mead Exotic Plant Management Team. It entails using cloud-based mapping with the GIS Cloud app and a smartphone to document the locations/distributions and estimated abundance of invasive species across BMGR West, which facilitates the efficient implementation of targeted follow-up control efforts (Figure 3.4). The project is designed to give resource managers a timely method for mapping and tracking the spread of invasive weeds across the range, with a particular focus on Sahara mustard and buffelgrass. The app also provides 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 quality control and interpretation of the data, conducting surveys to assess current invasion conditions, maintaining the GIS Cloud app, and prioritizing treatment areas based on real-time information on the distribution of invasive plant emergence and habitat favorability for the invasive species. UA staff also perform before and after surveys of treatment areas, 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, BMGR West CLEOs, and UA staff together collected 1,750 data points during the winter of 2016–2017, and more than 2,800 data points since the program’s inception in 2015 (Figure 3.4).

Figure 3.4: GISCloud App Invasive Species Mapping at BMGR West

Barry M. Goldwater Range (BMGR)



Legend

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

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

Base data from ESRI StreetMap
Hillshade derived from USGS NED



Upon receipt of data from the GIS Cloud app and treatment recommendations from UA staff, the NPS Lake Mead Exotic Plant Management Team determines and implements the appropriate 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 areas identified for potential 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 (e.g., surfactants), tracking areas surveyed, and tracking acres and species treated. These records are included in a final annual report that is electronically submitted to MCAS Yuma RMD within 30 days of project completion. A major benefit of this project is that MCAS Yuma personnel do not handle or apply 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. A total of 6,739 acres have been surveyed, resulting in the treatment of 11 acres (Table 3.3).

An important outcome of this program is enhanced knowledge on the occurrence and abundance of invasive plants, especially Sahara mustard. Because BMGR West and other areas are subject to invasion from populations outside of its jurisdiction, successful control of Sahara mustard requires sufficient interagency collaboration to contain invasions at BMGR East, Cabeza Prieta NWR, and other agency lands (BLM, Bureau of Reclamation, etc.). Success of the management program has prompted staff at Cabeza Prieta NWR to adopt the GIS Cloud app for monitoring and treating Sahara mustard and buffelgrass on the Refuge. CLEOs for BMGR East initiated use of the app in spring 2018, and staff with El Pinacate Preserve in Mexico have expressed interest in initiating a similar monitoring program. It will be helpful to establish an interagency program that can sufficiently standardize the use of the GIS Cloud app across agencies and coordinate treatment efforts among agencies for targeting populations that serve as sources for infestations that cross jurisdictional boundaries.

3.4

Wildland Fire Management

Wildfires greater than a few acres in size were almost unknown at 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 BMGR, was estimated to be on a 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, is very susceptible to fire and may take decades to re-establish.

Table 3.3: Invasive plant treatment efforts at BMGR West, 2015–2017.

Species	Year	Surveyed Acres ¹	Infested Acres ¹	Gross Infested Acres Treated ¹	Treated Acres ¹
Sahara mustard (<i>Brassica tournefortii</i>)	2015	1192.00	1.06	62.09	1.06
Buffelgrass (<i>Pennisetum ciliare</i>)	2015	1192.00	1.25	13.15	1.25
Salt cedar (<i>Tamarix ramosissima</i>)	2015	1192.00	0.02	0.15	0.02
Athel tamarisk (<i>Tamarix aphylla</i>)	2015	1192.00	0.00004	0.00005	0.00004
Fountain grass (<i>Pennisetum setaceum</i>)	2015	1192.00	0.0005	0.003	0.0005
Sahara mustard (<i>Brassica tournefortii</i>)	2016	3777.29	4.37	538.19	4.37
Buffelgrass (<i>Pennisetum ciliare</i>)	2016	3777.29	0.08	6.66	0.08
Salt cedar (<i>Tamarix ramosissima</i>)	2016	3777.29	0.002	0.02	0.002
Sahara mustard (<i>Brassica tournefortii</i>)	2017	1769.30	4.00	598.11	4.00
Buffelgrass (<i>Pennisetum ciliare</i>)	2017	1769.30	0.03	5.23	0.03
	Total	6739.00	11.00	1224.00	11.00

¹ Acreage Definitions (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.)

Surveyed Area—An area inspected during the course of weed management or other control activities. An area may be considered “surveyed” whether or not target weed species are found there. The surveyed area is delineated by recording GPS coordinates along the perimeter (or at perimeter points) or by digitizing the area by using landform references.

Gross Infested Area—An area defined by the general perimeter of an infestation. It contains both 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 and does not take into account percent cover of the weeds.

Net Infested Area—The area occupied by weeds within the gross infested area (i.e., it does not include spaces between individuals and populations). The “total infested area” may comprise multiple net infested areas within the gross infested area, as described by polygons, buffered points, buffered lines, or calculated from a stem count in which each individual is assigned a coverage multiplier.

Net Treated Area—Either the infested area or a subset of the infested area that received treatment. Treatment area is calculated using the same standards as infested area.

3.4.1 Update

The expansion 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 expansion of invasive species are influencing an increasing fuel loads, changing fuel characteristics, and placing some fire-intolerant native species at risk. Introduced grasses and forbs increase fuel continuity across the landscape, altering vegetation composition and leading to increasing 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 positive feedback loop. Under this scenario, increasing abundance of invasive species 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 both an altered vegetation community and an altered fire regime.

A wildfire, evidently fueled by Sahara mustard, burned approximately 500 acres of the native creosote - bursage community at BMGR West in 2008 or 2009. Post-fire field inventory showed that the mustard was the only species recovering in the area (Malusa 2010). This trend places a priority on continuous invasive species management to protect habitat quality and ecosystem function for native plants and wildlife and to ensure that there are no adverse effects on military training activities and mission readiness.

BMGR East

Since 2011, there have been 126 fires at 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. The 56 RMO tracks fire events at BMGR East by recording each incident in its fire history database.

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 in fire management. The plan will describe fire mitigation (pre-suppression and suppression) actions to be taken on both strategic and tactical bases (56 RMO 2014). The plan will serve as the guidance for wildfire response protocols. As part of the WFMP development process, the 56 RMO also signed an MOU with the BLM for fire suppression assistances at BMGR East (U.S. Bureau of Land Management and 56 FW 2017).

BMGR West

There have been very few wildfires on the west side of the range. Overall, wildfire risk at BMGR West is much lower than it is at BMGR East, due in large part to the greater scarcity of precipitation and vegetation. Even with this low risk, however, MCAS Yuma is required to develop and implement a WFMP, per Marine Corps Order 5090.2A with changes 1–3 (USMC 2013b). The WFMP will define roles and responsibilities for offices, departments, and agencies involved in wildfire mitigation and suppression actions, and it will provide guidance for firefighters, public safety officials, and the RMD to ensure that the actions do not interfere with or curtail military training activities. Once the WFMP

is complete, the MCAS Yuma RMD intends to develop an MOU with the BLM for providing fire-suppression assistance at BMGR West.

3.5 Wildlife

Existing inventories show that more than 200 bird species, more than 60 mammal species, 10 amphibian species, and more than 50 reptile species may potentially occur within the contiguous area of BMGR and Cabeza Prieta NWR. Historical information indicates that the diversity of wildlife species and habitats present in 1941 (when BMGR was established) were similar to what are found at BMGR and Cabeza Prieta NWR combine today in abundances that are relatively stable and typical for this portion of the Sonoran Desert. This may be attributed to several factors:

- the land has been set aside 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 that caused by military training;
- the ecological interconnections with two national monuments and one national wildlife refuge have remained unfragmented and undiminished;
- the primary land use for aviation training has limited on-the-ground disturbances of soils and vegetation to a relatively small and dispersed portion 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;
- BMGR is far from major metropolitan areas, which likely has minimized public visitation and the effects of prolonged intensive use; and
- Surface-drainage patterns generally isolate the range and its surrounding area hydrologically, thus protecting 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 also applies to BMGR unless otherwise pre-empted by federal law. AGFD began wildlife management activities at BMGR in the late 1950s to establish wildlife waters (see Section 3.6) and continues their upkeep today. AGFD also has involvement with many aspects of BMGR's wildlife program. For example, it continues to organize and conduct bighorn sheep and deer surveys at BMGR every three years, 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 at BMGR East and West. AGFD also performs annual surveys for the flat-tailed horned lizard (FTHL) (*Phrynosoma mcallii*), speckled rattlesnakes (*Crotalus mitchellii*), and bats at BMGR West.



AGFD conducts surveys for many species at BMGR, including flat-tailed horned lizard (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 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. . .” (U.S. Army Corps of Engineers 2015). The agreement facilitates AGFD management activities at BMGR East, which typically includes conducting wildlife surveys to determine population trends; providing recommendations based on survey data for restoring or maintaining resident species; controlling wildlife populations at appropriate, sustainable levels for protecting other BMGR resource values; and enforcing state game laws.

Collaborative efforts with AGFD and other partners include implementing actions prescribed by the Sonoran Pronghorn Recovery Plan and conducting a number of wildlife activities during the FY 2019–2023 timeframe. Surveys are set to reoccur for desert tortoise (every 5 years), birds (years 1 and 2), kit fox (*Vulpes macrotis*) (years 1 and 4), and cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) (bi-annually). Surveys for raptors and bats will occur annually.

In-house staff and partners will continue the effort to control invasive species for improving wildlife habitat and to identify and maintain important connectivity corridors for wildlife. 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 Chapter 9 (Table 9.1, *BMGR East 5-Year Work Plan: FY 2019–2023*). Sensitive species monitoring and conservation projects are discussed in detail in Section 3.7, *Protected Species*.

BMGR West

Baseline indices for small mammals, reptiles, and amphibians provide crucial information for developing and implementing appropriate management practices that comply with government regulations and requirements regarding wildlife and natural resources management. The first comprehensive inventory of amphibians, reptiles, and small mammals is underway. 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 managing wildlife species.

Wildlife surveys and habitat improvement projects planned for the next five years can be found in Chapter 9 (Table 9.2 *BMGR West 5-Year Work Plan: FY 2019–2023*). 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 water availability for their benefit. AGFD has constructed catchments at locations across BMGR to collect and store rainfall. During periods of extreme drought, AGFD will refill these water sources routinely by hauling in tens of thousands of gallons, by vehicle and helicopter, to support wildlife. These sites are also being used and affected by illegal immigration and trafficking across the range.



Camera traps capture images of UDAs using wildlife waters.

3.6.1 Update

BMGR East

Texas Tech Researchers conducting amphibian research at BMGR detected elevated levels of ammonium (NH_3) in several wildlife waters. This prompted the USGS to evaluate the water quality at a variety of different wildlife waters across 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 elements or properties and the presence of blue-green algae (cyanobacteria) and chytrid fungus (*Batrachochytrium dendrobatidis*).

Results of the water-quality analyses have varied over the four years of sampling. Ammonia concentrations at a number of sites have occasionally exceeded Arizona Department of Environmental Quality's (ADEQ) acute and/or chronic standards for aquatic life and wildlife (ADEQ 2009; USGS 2013–2016). In 2015, iron (Fe) concentrations measured at wildlife water 1148 exceeded the criterion recommended by the Environmental Protection Agency for freshwater aquatic life (USGS 2013–2016). No samples have contained blue-green algae at 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 are the modifications to natural water sources (*tinajas*) to create more reliable sources of water for wildlife (56 RMO 2009). Water has always been a crucial 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 their natural state to the extent possible. The USAF is working with the tribes and AGFD to remove modification structures at *tinajas* and has restricted further alterations to existing *tinajas*. Only construction and remodeling of existing artificial wildlife waters is permitted.

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

BMGR West

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

3.7 Protected Species

There are currently two species listed under the Endangered Species Act (ESA) known to occur at BMGR: Sonoran pronghorn (*Antilocapra americana sonoriensis*) and acuña cactus (*Echinomastus erectocentrus* var. *acunensis*). The pronghorn's survival depends on the Sonoran Desert ecosystem that is distributed across BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus NM (Section 3.7.2.1). The acuña cactus, listed in 2013 as endangered, is found primarily at BMGR East, Tohono O'odham Nation Reservations, BLM lands, Organ Pipe Cactus NM, and areas southeast of Phoenix between Cactus Forest and Kearny.

The FTHL has no federal protection, but it is listed as threatened in Mexico, a Species of Greatest Conservation Need (SGCN) in Arizona, and a Species of Concern in California. The FTHL occurs at BMGR West and is managed in accordance with the Candidate Conservation Agreement and FTHL

Rangewide Management Strategy (RMS), to which USMC and AGFD are parties. The FTHL (Section 3.7.2.4) occurs in the far western portion of BMGR West and has been the subject of considerable activity associated with 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, however, the USFWS withdrew its proposed FTHL 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 conducting research and annual occupancy and demographic surveys.

Peirson's milkvetch (*Astragalus magdalena peirsonii*), which is federally listed as threatened, is found primarily on the Algodones Dunes in California and the dunes of the Gran Desierto of northwestern Sonora, Mexico. A single specimen thought to be Peirson's milkvetch was collected from BMGR in 1996 near the range's western boundary, but later it was assigned to a different subspecies. Currently, Peirson's milkvetch is not known to exist in Arizona, although it occurs nearby in Sonora and suitable habitat exists in the Yuma Dunes at BMGR West. The species was not detected during surveys conducted in 2003 and 2004 (BMGR Task Force 2005). The only Biological Opinion (BO) that has addressed potential effects of BMGR military activities on Peirson's milkvetch dates back to 2001. In that BO, 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 there was relatively limited potential habitat at BMGR and USMC activities were expected to have only minimal effects on those habitats (BMGR Task Force 2005). Although Peirson's milkvetch has not been found during any surveys to date, if the species is found at BMGR, re-initiation or consultation with the USFWS may be warranted.

The Sonoran desert tortoise (*Gopherus morafkai*) is not a federally listed species, but it is listed as a SGCN in Arizona. BMGR staff apply conservation strategies as outlined in a Conservation Agreement for the tortoise, which is discussed in more detail in Section 3.7.2.2, *Desert Tortoise Update*.

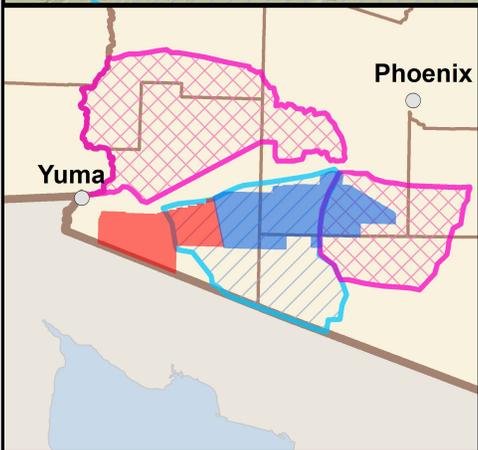
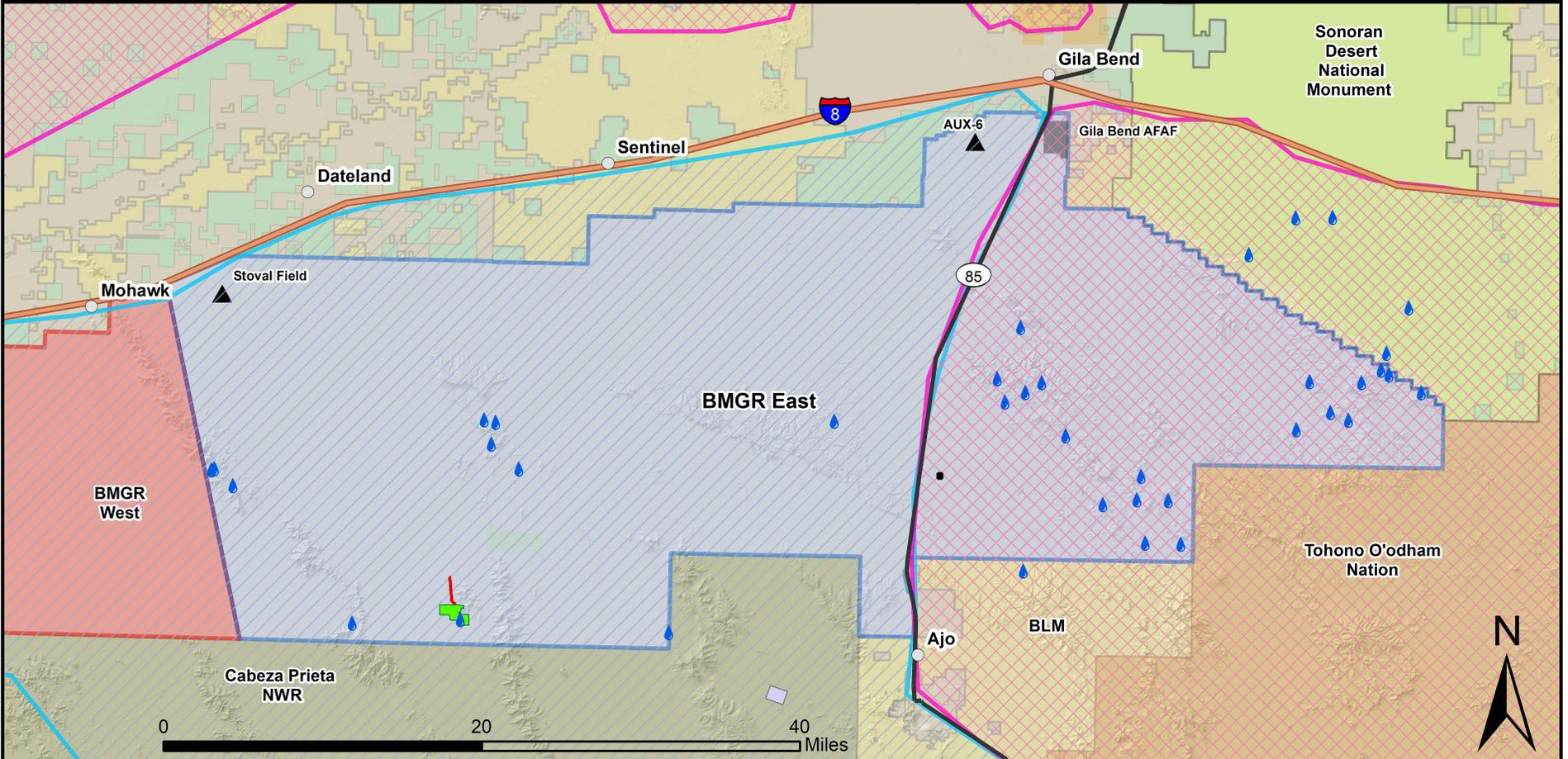
Federally threatened and endangered species that have not been documented at BMGR but have the potential to occur there are listed in Table 3.4. In addition, each species' Arizona Status and Arizona State Wildlife Action Plan (SWAP) score are listed.

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

Acuña Cactus

In 2013, the acuña cactus was designated as a federally 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, USFWS designated critical habitat for the acuña cactus (Table 3.4), which includes six geographically separate units totaling approximately 18,535 acres (50 CFR § 17). One unit is adjacent to the northeastern portion of BMGR East; however, lands within BMGR are exempt from critical habitat designation. There are at least three distinct clusters of acuña cactus at BMGR East (Urreiztieta 2013 and Abbate 2017), but the species has not been detected at BMGR West and is not expected to occur there.

Figure 3.5: Protected Species Management BMGR East
Barry M. Goldwater Range (BMGR)



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 10(j) Re-establishment Areas
- Endangered Sonoran Pronghorn US Range
- ▲ Auxiliary Airfield (AUX)
- Arizona G&F Wildlife Waters

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

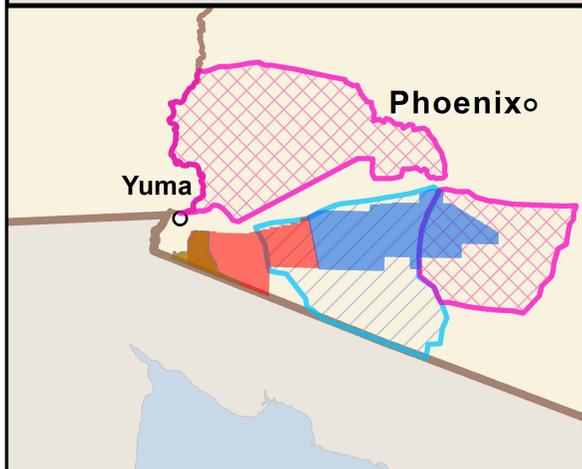
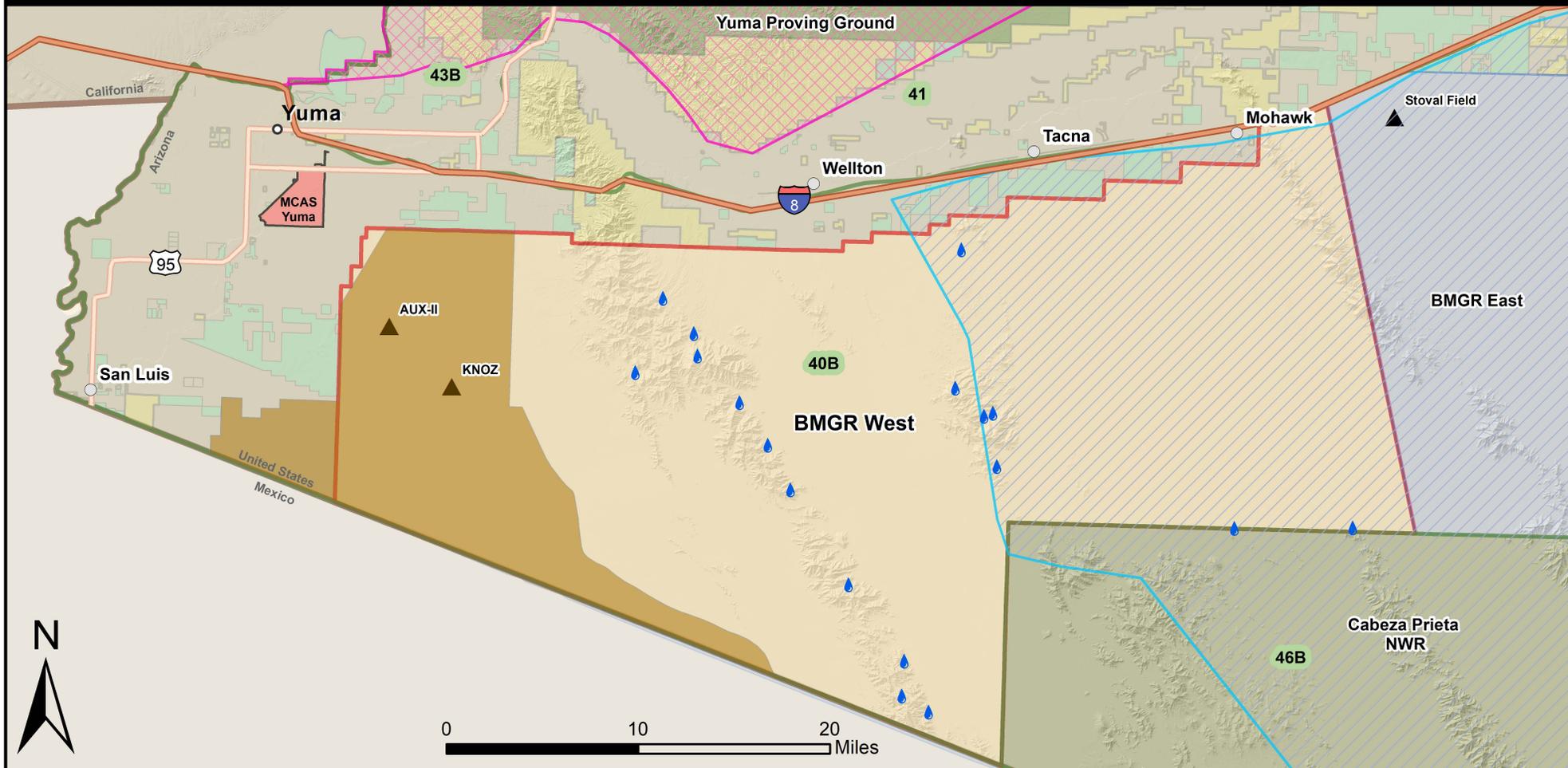
Base data from
ESRI StreetMap
Hillshade derived
from USGS NED

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



Figure 3.6: 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 10(j) Re-establishment Areas
- Endangered Sonoran Pronghorn 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 (SGCN).

Common Name (<i>Scientific Name</i>)	Federal ¹ Status	Arizona Status ² / SWAP Score ³	Species of Greatest Conservation Need	Species or Habitat			Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
Mammals⁴								
Lesser long-nosed bat (<i>Leptonycteris curasoae yerbabuena</i>)		SC/1A		✓			53 FR 38456, 30 September 1988; Petition to delist; 82FR 1665, 6 January 2017; Delisted 83FR 17093, 18 April 2018	Summer resident that roosts in caves or mines and forages in desert scrub habitats (BMGR East and West).
Spotted bat (<i>Euderma maculatum</i>)		SC/1B	✓		✓	✓		Riparian areas, rocky cliffs (BMGR West).
Southern yellow bat (<i>Lasiurus ega</i>)		SC/NR			✓	✓		In association with palm trees, may occur in vicinity (BMGR East and West).
California leaf-nosed bat (<i>Macrotus californicus</i>)		SC/1B	✓	✓				Year-round resident that roosts in caves or mines and forages in desert scrub or xeroriparian vegetation. (BMGR East and West).
Greater western mastiff bat (<i>Eumops perotis californicus</i>)		NR/1B	✓	✓				Lower and upper Sonoran desert scrub near cliffs, preferring the rugged rocky canyons with abundant crevices (BMGR East and West).
Sonoran pronghorn (<i>Antilocapra americana sonoriensis</i>)	LE	SC/1A	✓	✓			32 FR 4001, 1 March 1967	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 (BMGR East and West).
Sonoran pronghorn (<i>Antilocapra americana sonoriensis</i>)	XN			✓			76 FR 25593, 5 May 2011	New breeding pen at Kofa NWR, relocation of some species from existing breeding pen at Cabeza Prieta NWR to BMGR East.
Canyon Mouse (<i>Peromyscus crinitus</i>)		NR/1C		✓				Rocky habitats or gravel sites adjacent to rocky areas (BMGR West).
Kit fox (<i>Vulpes macrotis</i>)		NR/1B		✓				In valleys and on sandy plains in the Southwestern deserts (BMGR East and West).
Little pocket mouse (<i>Perognathus longimembris</i>)		NR/1B		✓				Found in various types of desert scrub habitats (greasewood, rabbitbrush, creosote bush, cactus, mesquite, paloverde, etc.) (BMGR West).
Crawford's desert shrew (<i>Notiosorex crawfordi</i>)		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 (<i>Ovis canadensis mexicana</i>)		NR/NA	✓	✓				Desert mountain ledges and grassy basins (BMGR East and West).
Arizona wood rat (<i>Neotoma devia</i>) (on the list provided by MCAS Yuma, but not on the AZ SGCN 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).
Birds⁵								
Southwestern willow flycatcher (<i>Empidonax traillii extimus</i>)	LE	SC/1A	✓			✓	60 FR 10693, 27 February 1995; Designation of critical habitat: 78 FR 343, 3 January 2013	Well-developed riparian areas with cottonwood, willow, or tamarisk are not present.

Table 3.4: Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN).

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				Present	Potential	Not Expected		
Yuma clapper rail (<i>Rallus longirostris yumanensis</i>)	LE	SC/1A	✓			✓	32 FR 4001, 11 March 1967	Marsh habitat not found at BMGR.
Bald eagle (<i>Haliaeetus leucocephalus</i>)	BGEPA	SC/1A	✓			✓	Proposed for delisting: 64 FR 36453, 6 July 1999; Delisted: 72 FR 37346, 9 July 2007	Aquatic habitat not found at BMGR.
Golden eagle (<i>Aquila chrysaetos canadensis</i>)	BGEPA	NA/1A		✓				Cliffs or in large trees that afford an unobstructed view (BMGR East).
Sprague's pipit (<i>Anthus spragueii</i>)		SC/1A	✓		✓			Winters in grassy fields along lower Colorado River from north of Yuma to Parker (may be expected occasionally at BMGR West).
Cactus ferruginous pygmy-owl (<i>Glaucidium brasilianum cactorum</i>)		SC/1A	✓		✓			Xeroriparian areas (BMGR East and West).
Peregrine falcon (<i>Falco peregrinus anatum</i>)		SC/1A	✓		✓			Isolated cliffs; winter migrant (BMGR East and West).
Ferruginous hawk (<i>Buteo regalis</i>)		SC/1B	✓	✓				Arid to semiarid regions, as well as grasslands and agricultural areas (BMGR East).
Belted kingfisher (<i>Ceryle alcyon</i>)		SC/NA	✓		✓			Found near water (fresh or salt); rare transient at BMGR.
Crested caracara (<i>Caracara cheriway</i>)		SC/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 (<i>Egretta thula</i>)		SC/NA	✓		✓			Marshes, lakes, ponds, lagoons, mangroves, and shallow coastal habitats; may appear during seasonal migration (BMGR East and West).
Tropical kingbird (<i>Tyrannus melancholicus</i>)		SC/NA	✓		✓			Situations with scattered trees, savanna, open woodland, forest edge, plantations, residential areas and agricultural lands.
Desert Purple Martin (<i>Progne subis Hesperia</i>)		NR/1B	✓	✓				Desert Southwest in saguaro cacti cavities (BMGR East).
Gila woodpecker (<i>Melanerpes uropygialis</i>)		NR/1B		✓				All desert habitats, nesting in saguaro cacti (BMGR East and West).
Gilded flicker (<i>Colaptes chrysoides</i>)		NR/1B		✓				All desert habitats, nesting in saguaro cacti (BMGR East and West).
Le Conte's Thrasher (<i>Toxostoma lecontei</i>)		NR/1B	✓	✓				Open desert scrub, alkali desert scrub, and desert succulent scrub (BMGR East and West).
Mountain plover (<i>Charadrius montanus</i>)		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 at BMGR East, and surveys in 2011 and early 2012 identified the plover in Maricopa County (Gila Bend AFAF), and Yuma County.
Bendire's thrasher (<i>Toxostoma bendirei</i>)		NR/1C		✓				Relatively open desert grassland, shrubland or woodland with scattered shrubs or trees (BMGR East and West).

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				Present	Potential	Not Expected		
Black-tailed gnatcatcher (<i>Polioptila melanura</i>)		NR/1C		✓				Desert brush, dry washes, and mesquite <i>bosques</i> (BMGR East and West).
Brown-crested flycatcher (<i>Myiarchus tyrannulus</i>)		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 (<i>Phalaenoptilus nuttallii</i>)		NR/1C		✓				In all Sonoran Desert habitats, but most common on sparsely vegetated <i>bajadas</i> (BMGR East and West).
Costa's hummingbird (<i>Calypte costae</i>)		NR/1C		✓				Desert and semi-desert, arid brushy foothills, chaparral; in migration and winter also in adjacent mountains and in open meadows and gardens (BMGR East and West).
Elf owl (<i>Micrathene whitneyi</i>)		NR/1C		✓				Deserts, dry shrublands, riparian woodlands, and open pine-oak forests (BMGR East and West).
Gray vireo (<i>Vireo vicinior</i>)		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 (<i>Icterus cucullatus</i>)		NR/1C		✓				Favors groups of palms for nesting. (BMGR East).
Lucy's warbler (<i>Vermivora luciae</i>)		NR/1C			✓			Mesquite <i>bosques</i> and edges of riparian woods in desert zones (BMGR East and West).
Phainopepla (<i>Phainopepla nitens</i>)		NR/1C		✓				Scrub habitats, with desert mistletoe present for foraging (BMGR East and West).
Prairie falcon (<i>Falco mexicanus</i>)		NR/1C		✓				Canyons, open country, grasslands, and deserts (BMGR East and West).
Scott's Oriole (<i>Icterus parisorum</i>)		NR/1C		✓				Yucca gardens on desert grassland prairies, but they have been found wherever yucca is growing, even on the hillsides of mountain canyons (BMGR East and West).
Varied bunting (<i>Passerina versicolor</i>)		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 (<i>Megascops kennicottii</i>)		NR/1C		✓				Southern populations inhabit lowland riparian forests, oak-filled arroyos, desert saguaro and cardón cacti stands, Joshua tree and mesquite groves, and open pine and pinyon-juniper forests (BMGR East and West).
White-throated swift (<i>Aeronautes saxatalis</i>)		NR/1C		✓				Rocky cliffs and canyons, typically found nesting in arid regions, but near major rivers (BMGR East and West).
Pyrrhuloxia (<i>Cardinalis sinuatus</i>)		NR/NA		✓				Desert scrub and mesquite thickets (BMGR East).
Reptiles								
Colorado Desert fringe-toed lizard (<i>Uma notata</i>)		NR/NA1		✓				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 (BMGR East and West).

Table 3.4: Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN).

Common Name (<i>Scientific Name</i>)	Federal ¹ Status	Arizona Status ² / SWAP Score ³	Species of Greatest Conservation Need	Species or Habitat			Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
Yuman Desert fringe-toed lizard (<i>Uma rufopunctata</i>)		SC/NR	✓	✓			Listed as Candidate: 80 FR 56423, 18 September 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 (BMGR East and West).
Flat-tailed horned lizard (<i>Phrynosoma mcallii</i>)		SC/1A	✓	✓			Withdrawal of proposal to list: 76 FR 14210, 15 March 2011	Creosote flats, sand dunes, and mud hills in southeastern California, southwestern Arizona, and northwestern Mexico (BMGR West).
Desert rosy boa (<i>Lichanura trivirgata gracia</i>)	SC	NR/NA	✓	✓				Rocky areas in desert ranges, especially in canyons with permanent or intermittent streams (BMGR West).
Mexican rosy boa (<i>Lichanura trivirgata trivirgata</i>)	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) (<i>Gopherus morafkai</i>)		SC/1A	✓	✓				Sonoran desertscrub and semidesert grassland, prefers rocky slopes and <i>bajadas</i> (BMGR East).
Desert night lizard (<i>Xantusia vigilis</i>)		SC 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 (<i>Urosaurus graciosus</i>)		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).
Amphibians								
Western (or Great Plains) narrow-mouthed toad (<i>Gastrophryne olivacea</i>)		SC/1C	✓		✓			Moist crevices or burrows, near ephemeral water sources (BMGR East and West).
Plants								
Acuña cactus (<i>Echinomastus erectocentrus</i> var. <i>acunensis</i>)	LE	HS		✓			81 FR 14058, 16 March 2016; Designation of critical habitat: 81 FR 55265, 18 August 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 at BMGR East (Urreiztieta 2013, Abbate 2017); the species has not been detected at BMGR West, nor is it expected to occur.
Peirson's milkvetch (<i>Astragalus magdalenae</i> var. <i>peirsonii</i>)	LT				✓		63 FR 53596, 6 October 1998; Designation of critical habitat: 64 FR 47329, 4 August 2004; Petition to remove from listing—not warranted: 73 FR 41007, 17 July 2008	Slopes of mobile sand dunes in the Sonoran desert scrub plant community. No confirmed occurrences, but the Yuma Dunes at BMGR West represent potential habitat.
Sand food (<i>Pholisma sonorae</i>)		HS		✓				Drifting sand below 500 ft. elevation in creosote bush scrub (Yuma Dunes in the extreme southwestern portion of BMGR West).

¹ **Federal Status:** BGEPA=Bald and Golden Eagle Protection Act; LE=Endangered, LT=Threatened, SC=Species of Concern (U.S. Fish and Wildlife Service); MBTA=Migratory Bird Treaty Act (50 CFR 10.13); NL=Not listed, S=Sensitive species (Bureau of Land Management and/or U.S. Forest Service); XN=Experimental non-essential population.

² **Arizona Status:** **LE**=Listed endangered, **HS**=Highly Safeguarded, **SC**=Species of Concern, **NA**=Not Applicable, **NR**=Not Rated.

³ **Arizona State Wildlife Action plan (SWAP) score (species' vulnerability):** **1A**=Scored 1 for vulnerability in at least one of eight vulnerability categories and matches at least one of the following: federally listed as E, T, or Candidate species; specifically covered under a signed conservation agreement or a signed conservation agreement with assurance; recently delisted federally and requires post-delisting monitoring;; closed-season species (i.e., no take permitted), as identified in Arizona Game and Fish; **1B**=Scored 1 for vulnerability, but matches none of the criteria listed under 1A; **1C**=Unknown status species.

⁴ The Yuma puma has been omitted from the table; it had been listed as a wildlife species of concern, but genetic research completed after the list of wildlife species of concern was created showed that the subspecies ranking was incorrect.

⁵ A list of migratory birds protected by the Migratory Bird Treaty Act of 1918 can be found at 50 CFR 10.13.

Bald and Golden Eagles

On 6 December 2016, USFWS issued a Final Rule (50 CFR Parts 13 and 22) revising the permit regulations for incidental take of eagles and eagle nests to enhance regulation clarity and improve compliance while continuing eagle protection. Revisions affected 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 (USFWS 2015), but it still has SGCN status with AGFD. In 2015, a Candidate Conservation Agreement was developed as a collaborative and cooperative effort between land and resource management agencies, including BMGR's managing agencies (USAF and USMC). The conservation strategy focuses on conservation, habitat improvement, and ongoing management of the Sonoran desert tortoise and its habitat.

Lesser long-nosed bat

The lesser long-nosed bat (see Section 3.7.2.3) is known to forage at BMGR and a roost was discovered in 2016 at ETAC. The species, however, was recently removed from the Federal list of Threatened and Endangered species (USFWS 2018). In compliance with USFWS policies and guidelines related to post-delisting management and monitoring, the USFWS, AGFD, and 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. Although the area of pronghorn distribution has become smaller over the years, the methods and geographic study areas used to estimate the pronghorn population also have varied over time. In 1992, AGFD initiated regular biennial aerial surveys of the Sonoran pronghorn population. Based on these surveys, the U.S. population was estimated to peak at 282 animals in 1994, and the population low was estimated at 21 to 33 animals in 2002 following a severe drought.

The pronghorn's current range includes portions of BMGR East (Figure 3.5) and West (Figure 3.6). 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 AGFD, the recovery team consists of representatives from Luke AFB, MCAS Yuma, USFWS, Organ Pipe Cactus NM, BLM (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 the Phoenix and Los Angeles Zoos, 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, but currently this position is empty and no other representative has filled this role. An invitation has been extended for a representative to participate on the recovery team.



Sonoran pronghorn temporarily stay in a captive breeding pen.

Concerted efforts by the USAF, USMC, AGFD, USFWS, and other members of the recovery team, and their implementation of numerous recovery actions, have led to improved status of Sonoran pronghorn. Key recovery actions have included (1) initiating the semi-captive breeding program at Cabeza Prieta NWR (2003) and later at Kofa NWR (2011), (2) relocating some pronghorn from the breeding pen at Cabeza Prieta NWR to a third population in Area B of BMGR East, and (3) designating 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 USFWS can apply to a population of a threatened or endangered species prior to reestablishing it in an unoccupied portion of its former range.

If successful, these and other actions of the recovery plan will eventually lead to down-listing and then delisting of the species. However, increasing numbers of pronghorn at BMGR have the potential to constrain the range's mission. The USFWS continues to work with the military to reduce mission constraints and minimize risks to pronghorn from military operations. For example, the USFWS issued a non-jeopardy BO in 2010 that allowed reduced target-closure distances, as described below. Additionally, USFWS has provided feed and water near the range boundaries (east, west, and south) to lure pronghorn away from actively used targets.

To reduce potential impacts to pronghorn due to military exercises (e.g., ordnance delivery) at BMGR East, daily pronghorn monitoring occurs at NTAC, STAC, and Range 1 when EOD operations or weapons employment is expected. 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 BO, if a pronghorn is sighted within 3.1 miles 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 2010b). Additionally, no ordnance deliveries of any kind (including inert ordnance) would be authorized within 1.9 miles of a pronghorn location on the tactical range where it was found 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 miles of the target and no ordnance of any type will be released if the pronghorn is within 0.6 mile of a target. If a vehicle is within 1.5 miles of a pronghorn, vehicle speed must be reduced to 15 mph.

Additionally, several pronghorn waters, irrigated forage plots and supplemental feed stations have been established to help pronghorn 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 federal list of threatened and endangered species. Specific recovery goal objectives include those listed below.

- Ensure multiple viable populations of Sonoran pronghorn range-wide.
- Ensure that adequate quantity, quality, and connectivity of Sonoran pronghorn habitat for supporting their 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 USFWS in coordination with the Recovery Team as new information becomes available.

Sonoran pronghorn recovery efforts are a great success story for endangered species management. Although captive-bred populations fluctuate every year with fawn recruitment and translocations of pronghorn, the biennial population survey last conducted by AGFD in December 2016 yielded an estimate of 228 wild pronghorn at Cabeza Prieta NWR. As of Fall 2017, informal surveys have yielded estimates of about 70 individuals in the Kofa NWR population (personal communication with Christa Weise, USFWS, December 2017) and 40 individuals in the Area B (or Saucedo) population.

AGFD distributes a monthly Sonoran pronghorn update, which summarizes the captive breeding program, wild pronghorn numbers, water projects, forage enhancements, and related projects. The updates cover the entire U.S. pronghorn distribution, but certain aspects of the updates pertain specifically to 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 BMGR's managing agencies (USAF and USMC). The key effort of the conservation strategy is to focus on conservation, improvement, and ongoing management of the Sonoran desert tortoise's status and habitat. Some of the key action plans implemented by BMGR East 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 project where desert tortoise occupancy is most likely to occur (Grandmaison 2012). This knowledge, coupled with maps of training sites/activities, will allow range managers to identify specific locations where training activities and potential tortoise habitat overlap and take appropriate measures to ensure the tortoise's continued existence without impinging on the military's mission (Grandmaison 2012). The model also serves as a valuable tool for prioritizing new areas to survey, including the Growler and Crater Mountains, which the model indicated have relatively high probabilities of tortoise occupancy (Grandmaison 2012). The BMGR East 5-Year Work Plan includes surveys of new areas (focused by model results) and/or re-surveying known occupied and suitable habitat every five years.

3.7.2.3 Lesser Long-Nosed Bat Update

The lesser long-nosed bat has been removed from the federal list of threatened and endangered species (USFWS 2018). The post-delisting monitoring plan includes monitoring roost occupancy and potential threats and assessing the phenology and distribution of lesser long-nosed bat forage resources to better understand forage availability for the bats.

To provide data in support of the lesser long-nosed bat post-delisting monitoring plan, the following activities may be implemented, as appropriate, on BMGR lands, as time and funding allow.

1. USFWS and AGFD will be notified of any additional roost sites in which lesser long-nosed bats are found, either through the ongoing, large-scale bat monitoring study (Mixan et al. 2016) or through other monitoring actions.
2. The roost currently occupied by lesser long-nosed bats will be monitored regularly and the data will be provided to USFWS and AGFD. Research is encouraged to determine the occupancy and use patterns of this roost by lesser long-nosed bats.
3. To better understand habitat occupancy and use patterns by lesser long-nosed bats, one or more study sites may be established for monitoring forage phenology and tracking forage resources over time. Protocols developed for the U.S. National Phenology Network's ongoing program of monitoring plant phenology across the U.S. would be used for this effort. The results will be added to the National Phenology Network database

3.7.2.4 Flat-Tailed Horned Lizard Update

BMGR West researchers conducted extensive fieldwork on the FTHL from 2011 to 2014 (Goode and Parker 2015). The purpose of the study was to address two main issues identified by USFWS and raised in the BO: (1) potential impacts of jet noise on the hearing and behavior of FTHLs, and (2) potential effects of increased vehicle traffic on roads in the vicinity of the new KNOZ (USFWS 2010a). In 2012, 499 FTHLs were removed from the KNOZ footprint. Twenty of the FTHLs were sent to the San Diego Zoo for a captive breeding program, and the remaining individuals were translocated to mark-recapture plots or immediately moved over the exclusion fencing.



Flat-tailed horned lizard captured at BMGR West.

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 similar except in the season immediately after translocation, during which translocated FTHLs had significantly larger home ranges. The survival rate of translocated FTHLs was lower than those which were not translocated, but the difference was not statistically significant. Reproductive behavior was witnessed in both translocated and non-translocated individuals.

More than 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 numbers of avian predators were significantly greater along roads that paralleled powerlines than they were along roads within out powerlines nearby. 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 to determine the population size, survival rate, recruitment, and population growth of FTHLs (Grimsley and Leavitt 2015). Approximately 88 percent of the management area falls within 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 at BMGR West and the other on the Bureau of Reclamation's parcel. In 2011, AGFD randomly selected 75 smaller (about 328 X 656 feet) occupancy plots, a subsample of which is surveyed annually.

Between 2008 and 2014, AGFD captured 624 individual FTHLs within the two long-term, demography study plots (Grimsley and Leavitt 2015). Of the 624 captures, 316 were juveniles and 308 were adults (Grimsley and Leavitt 2015). The number of juveniles captured over the seven-year study period varied widely.

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

3.7.2.5 Acuña Cactus Update

BMGR East has developed an Inventory and Monitoring Plan for the acuña cactus (56 RMO 2007), using the same protocols implemented for monitoring the cactus at Organ Pipe Cactus, NM. This protocol is designed to assess population dynamics of the acuña cactus by measuring the growth, mortality, recruitment, and reproductive status of the populations at BMGR East. The existing protocol for monitoring the cactus entails surveying once every five years, beginning in mid-March and continuing once per week until the flower blooming period ends. Because the species' federal status recently changed to endangered, 56 RMO will conduct annual monitoring.

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

In addition to conducting the annual surveys, other measures will be taken to minimize potential disturbances to the 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 at BMGR, thus eliminating these threats to the 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 the rugged terrain and hilltop locations where the cactus occurs provides default protection from disturbance.

USAF has agreed to continue protecting acuña cactus habitat by precluding new impacts, such as establishing new military targets and off-road vehicle use within the critical habitat area; avoiding disturbance of vegetation and pollinators within 2,952 feet of known or newly discovered acuña cactus plants; and continuing to monitor and control invasive plant species. Detailed vegetation mapping will be completed by FY 2019 for 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 conservation efforts to establish new populations of acuña cactus at BMGR and other areas as appropriate.

Although a recent study indicated that the acuña cactus population at BMGR East has increased by roughly 3 percent, the recommendations listed below should be followed to ensure its ongoing increase (Abbate 2017).

- Continue to monitor acuña cactus populations and measure morphological characteristics of individuals from new populations.
- Focus monitoring efforts on ridges, hillsides, and gentle slopes where the cacti are most likely to occur.
- Consider fencing off areas where cactus populations are most vulnerable to being crushed or uprooted by animal movements and grazing.
- Initiate seed collection and captive-propagation trials.
- Use wildlife game cameras to document predation, potential unknown threats, and seed-dispersal mechanisms.
- Limit future research teams to two individuals to restrict damage to small acuña cacti, which are vulnerable to crushing and uprooting.

3.7.3 Bats

To better understand bat fauna specifically at BMGR East, a large-scale monitoring study was conducted using a combination of roost, capture (mist netting), and acoustic surveys (Mixan et al. 2016). By assessing bat diversity and habitat-use patterns, land managers will be better informed for identifying and addressing any potential declines in bat populations or their ranges and to mitigate and reverse those declines. A total of 17 species were identified in the survey (Table 3.5), including the recently delisted 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 to 2014, a study was conducted to identify and avoid potential conflicts between bats and the military mission at BMGR East and West and the nearby Yuma Proving Ground (Piorkowski et al. 2014). New data were collected and combined with data from previous studies to locate potential bat roost sites. It was determined that there is relatively little area across 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 crucial 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.

BMGR staff are committed to continually monitoring bat populations and 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 and re-analyzing old [bat] call logs with new call-detection software. The re-analysis will assess the accuracy of the original call-detection results and determine whether any additional species may be present at certain roost locations (i.e., lesser long-nosed bats). Other planned monitoring activities include continued mist-net trapping and guano sampling and analysis. All data and results from these monitoring activities will be shared with partners at USFWS and AGFD.

Table 3.5: Bat species detected at BMGR.

Common Name	Scientific Name
Big brown bat	<i>Eptesicus fuscus</i>
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>
California leaf-nosed bat	<i>Macrotus californicus</i>
California myotis	<i>Myotis californicus</i>
Canyon bat	<i>Parastrellus hesperus</i>
Cave myotis	<i>Myotis velifer</i>
Greater mastiff bat	<i>Eumops perotis</i>
Hoary bat	<i>Lasiurus cinereus</i>
Lesser long-nosed bat	<i>Leptonycteris curasoae yerbabuena</i>
Little brown myotis	<i>Myotis lucifugus occultus</i>
Silver-haired bat	<i>Lasionycteris noctivgans</i>
Long-eared myotis	<i>Myotis evotis</i>
Pallid bat	<i>Antrozous pallidus</i>
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>
Western red bat	<i>Lasiurus blossevillii</i>
Western small-footed myotis	<i>Myotis ciliolabrum</i>
Yuma myotis	<i>Myotis yumanensis</i>

3.7.4 Migratory Birds and Eagles

3.7.4.1 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA) (50 CFR 10.13) 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), which -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 significant adverse effects on populations of protected species (USFWS 2007).

Executive Order 13186 directs agencies to take certain actions to further strengthen migratory bird conservation under the conventions of the MBTA, the Bald and Golden Eagle Protection Act (BGEPA)

(16 U.S.C. § 668 et seq.), and other pertinent statutes. It requires the establishment of MOUs between the USFWS and other federal agencies. Accordingly, DoD and USFWS signed an MOU in 2006 to promote the conservation of migratory birds (DoD and USFWS 2006). This MOU, which was updated and re-signed in 2014 (DoD and USFWS 2014), describes specific actions that should be taken by DoD to advance migratory bird conservation, avoid or minimize the take of migratory birds, and ensure that DoD operations (other than military readiness activities) are consistent with the MBTA.

From 2012 to 2014, AGFD conducted a breeding bird survey, and most of the bird species detected at BMGR fall under MBTA protection. MCAS Yuma and Luke AFB subsequently prepared a check list of bird species that may be sighted at BMGR. Because the list is extensive, it is not included in this document but is provided to visitors if requested.

3.7.4.2 Eagles

Since the 1990s when the bald eagle was listed under the ESA, pilots of military aircraft flown or managed by the 56 FW observe a 1-nautical-mile lateral separation around bald eagle breeding areas during the breeding season (December 1–July 15), in accordance with measures described in a 1994 biological opinion. Luke AFB also has been a committee member of the Southwestern Bald Eagle Management Committee since at least the 1990s and, in 2007, the 56 FW became an MOU signatory to the Conservation Assessment and Strategy for the Bald Eagle in Arizona.



Pair of golden eagles using a wildlife water at BMGR West.

After the bald eagle was delisted on 28 June 2007 and the 1994 biological opinion was no longer in effect, eagles nonetheless remained protected by the MBTA and the BGEPA. In 2013, the 56 RMO, with technical assistance from USFWS and AGFD, implemented two changes to the avoidance buffers around bald eagle breeding areas. First, the avoidance buffer during the breeding season was changed from 1-nautical-mile of lateral separation to 2,000 feet of lateral and vertical separation. Second, the breeding season is now observed from December 1 to June 30, in accordance with a 2006 Conservation Assessment, which was

renewed in 2014. Because the bald eagle breeding window has been found recently at specific locations to extend past June 30 (especially at higher elevations where nesting is initiated later in the spring), further evaluation and information may warrant consideration in altering this window for specific nesting sites.

Less is known about the avoidance measures needed for golden eagles that may be affected by military training activities. This lack of knowledge and updates to the BGEPA have increased the need for golden eagle nest monitoring in the southwestern desert region. In 2011, the Southwestern Golden Eagle Management Committee was formed and the 56 FW became a participant on that committee.

Beginning in 2006, AGFD began to investigate breeding golden eagle statewide distribution and status, which led to an improved understanding and the current ongoing monitoring effort (McCarty et al. 2017). In 2006, AGFD surveyed 85 previously known breeding areas (BAs), finding 14 were occupied by golden eagles (McCarty et al. 2017). From 2011 to 2014, the Department conducted statewide aerial occupancy and nest survey efforts for cliff-nesting golden eagles (McCarty et al. 2017). Building upon these survey results, the AGFD began assessing productivity at a subsample of known BAs in 2015 and 2016 (McCarty et al. 2017). After the 2017 season, there were 275 known golden eagle BAs, 46 historic BAs, and 474 potential BAs outside of Native American lands in Arizona.

The DOD also contracted with AGFD to design and implement a three-year study (2013–2015) evaluating possible impacts to golden eagles from airborne military training activities and compliance with BGEPA. The study has three primary objectives: (1) identify and survey the potential distribution of golden eagle breeding areas across military lands, (2) create a landscape-scale model to predict the likelihood of potential golden eagle nesting habitat, and (3) collect golden eagle demographic information and provide management recommendations that will permit BMGR and other southwestern military installations to maintain their training regimes while also complying with the BGEPA (Piorkowski et al. 2015).

The following actions were recommended for implementation.

- Continue monitoring known, potential, and historic golden eagle nests on military installations.
- Coordinate with local, state, and regional authorities on current golden eagle distribution and status to inform current and future military activities for compliance with BGEPA.
- Develop avoidance buffers around known golden eagle nests during the breeding season, specifically those that were occupied within the last five years.
- Avoid disturbance around potential and historic golden eagle nests during the early (pre-incubation, incubation, and nests with nestlings <4 weeks of age) breeding season. Potential nest sites are described as those that provide suitable nest-site structure but where no golden eagles have been previously observed. Historic nests are sites that were used by golden eagles in the past, but have had no occupancy for the most recent decade. Normal military training activities can resume in the area once all potential or historic nests have been deemed unoccupied for a given breeding season.
- Avoid heavy ground and aerial disturbance during the early breeding season within habitat predicted by the habitat model as having a high likelihood of being potential golden eagle nesting habitat. By using precise modeling, reducing 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 the modeled estimates.

There is a current effort underway (via contract between USAF and the Colorado State University's Center for Environmental Management of Military Lands) to compile and standardize all historical locations of eagle nests and associated data for a subset of Air Force installations in the western U.S., including Luke AFB and BMGR. All nest locations recorded on installations after project completion should be shared with the AGFD. Likewise, periodically BMGR and Luke AFB will request all eagle

nest data recorded by AGFD within the military operating area. The project products will include recommendations for compliance with BGEPA, including monitoring eagle populations, behaviors, and productivity; mitigating disturbance; and assessing the risks associated with overhead utility infrastructure. Meanwhile, the 56 FW observes the same buffer parameters for golden eagle nests as it does for bald eagle nests (territories occupied within the most recent decade): 2,000 feet of lateral and vertical separation from December 1 to June 30. As new information about sensitive areas is acquired, it will be provided to the 56 RMO Airspace Manager, who updates the GIS layers with the new data, displays all the sensitive species areas on maps, and shares the maps with trainees so that these sensitive areas may be avoided during crucial times and/or seasons.

3.7.4.3 Update

BMGR East

Environmental management guidelines, as identified in the BASH Reduction Plan for Gila Bend AFAF (56 FW 2013), include controlling vegetation (e.g., maintaining vegetation height between 7 and 14 inches, 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 of habitat components that attract them (e.g., install devices that exclude birds from potential perches, nesting sites, and roosting sites; control insects and rodents). Priority BASH management actions under this plan include vigilant monitoring and reporting of potential bird strike hazards, managing the environment at and surrounding the Gila Bend AFAF, removing carrion along SR 85 to reduce the number of large avian scavengers (e.g., turkey vultures), and conducting bird/wildlife harassment and depredation as required. A private contractor is currently conducting daily threat monitoring at Gila Bend AFAF and BMGR East near Ranges 1 and 2. Status reports issued on a monthly basis summarize, in part, the numbers of BASH strikes/month, BASH threat days/month, and surveys conducted/month; the 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, LLC, and Chiulista Services, Inc. 2012–2016). A summary of the annual BASH management data results for 2012–2016 are provided in Tables 3.6 and 3.7.

BASH concerns are greatest when aircraft fly at low altitudes (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, which is a data-driven, remote sensing system to alert pilots 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 the 56 FW OPLAN 91-2 (56 FW 2013), and it focuses on reducing the BASH threat at the Gila Bend AFAF and at the Range 1 and 2 lead-in-lines.

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 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 [*Sylvilagus* spp.] and coyotes [*Canis latrans*]) at Gila Bend AFAF is authorized by a permit issued annually by AGFD to the 56 RMO/Environmental Sciences Management and applies only to Gila Bend AFAF.

Primary avian species surveyed under this project include, but are not limited to, turkey vulture (*Cathartes aura*), common raven (*Corvus corax*), raptor species (e.g., red-tailed hawk [*Buteo jamaicensis*], prairie falcon [*Falco mexicanus*], golden eagle, American kestrel [*Falco sparverius*], etc.), dove species (mourning and white-winged doves, Eurasian collared-dove [*Streptopelia decaocto*]), and horned lark (*Eremophila alpestris*). Round-tailed ground squirrel (*Xerospermophilus tereticaudus*) surveys also are conducted at Gila Bend AFAF, as the species represents one of the main food sources for raptors species. Data are provided in the Annual BASH Summary Report for BMGR East (Tunista Services, LLC, and Chiulista Services, Inc. 2012–2016) (Tables 3.6 and 3.7). 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 3.6: Summary of annual BASH management actions (2012–2016) at Gila Bend AFAF and BMGR East.

Year	BASH Threat Days			BASH Strike	Carrion Removed	Frequency	
	Low	Moderate	Severe			Harassment	Depredation
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 BMGR East (Tunista Services, LLC, and Chiulista Services, Inc. 2012–2016).

Table 3.7: Annual BASH survey results for Gila Bend AFAF and BMGR East, 2012–2016.

Species	Year	Gila Bend AFAF			Gila Bend AFAF Perimeter			SR 85 (Range 1 and 2)			Gila Bend AFAF Oxidation Pond		
		Total individuals	Times observed	No. surveys	Total individuals	Times observed	No. surveys	Total individuals	Times observed	No. surveys	Total individuals	Times observed	No. Surveys
Avian spp.	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 spp.	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 spp.	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 spp.	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 spp.	2016	8,640	254	254	3,152	147	147	1,949	107	107	5,540	131	131
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 BMGR West (MCAS Yuma Station Order 3750.1C). The BASH program is governed by the MCAS Yuma BASH Working Group, which 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 the representatives listed below.

- 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 that properly trained personnel are available for required BASH management actions. The Conservation Office serves as liaison between MCAS Yuma and 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 strike incidents are sent to the Smithsonian Institute for official review, identification, and cataloging.

3.8 BMGR East Trespass Livestock

Since the early 1970s, feral horses and burros (*Equus* spp.) have been protected by the federal government under 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 as amended (FLPMA) (BLM 2001) and the Public Rangeland Improvement Act of 1978 (PRIA) (P.L. 95–514). These feral animals are descendants of escaped livestock, and although they are not technically “wild,” the term “wild free-roaming” provides them special protection under the WFRHBA. On a national scale, the management of feral horses and burros has fallen to the BLM or the U.S. Forest Service (USFS) when these animals are found within a designated Wild Horse and Burro Herd Management Area (HMA) (Figure 3.7). 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 the minimum and maximum population levels 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 evaluation of rangeland habitat conditions, including the collection of data on each area’s vegetation and soil resources. The AML, along with any update to it, is set for each HMA in an open, public process during field planning efforts.



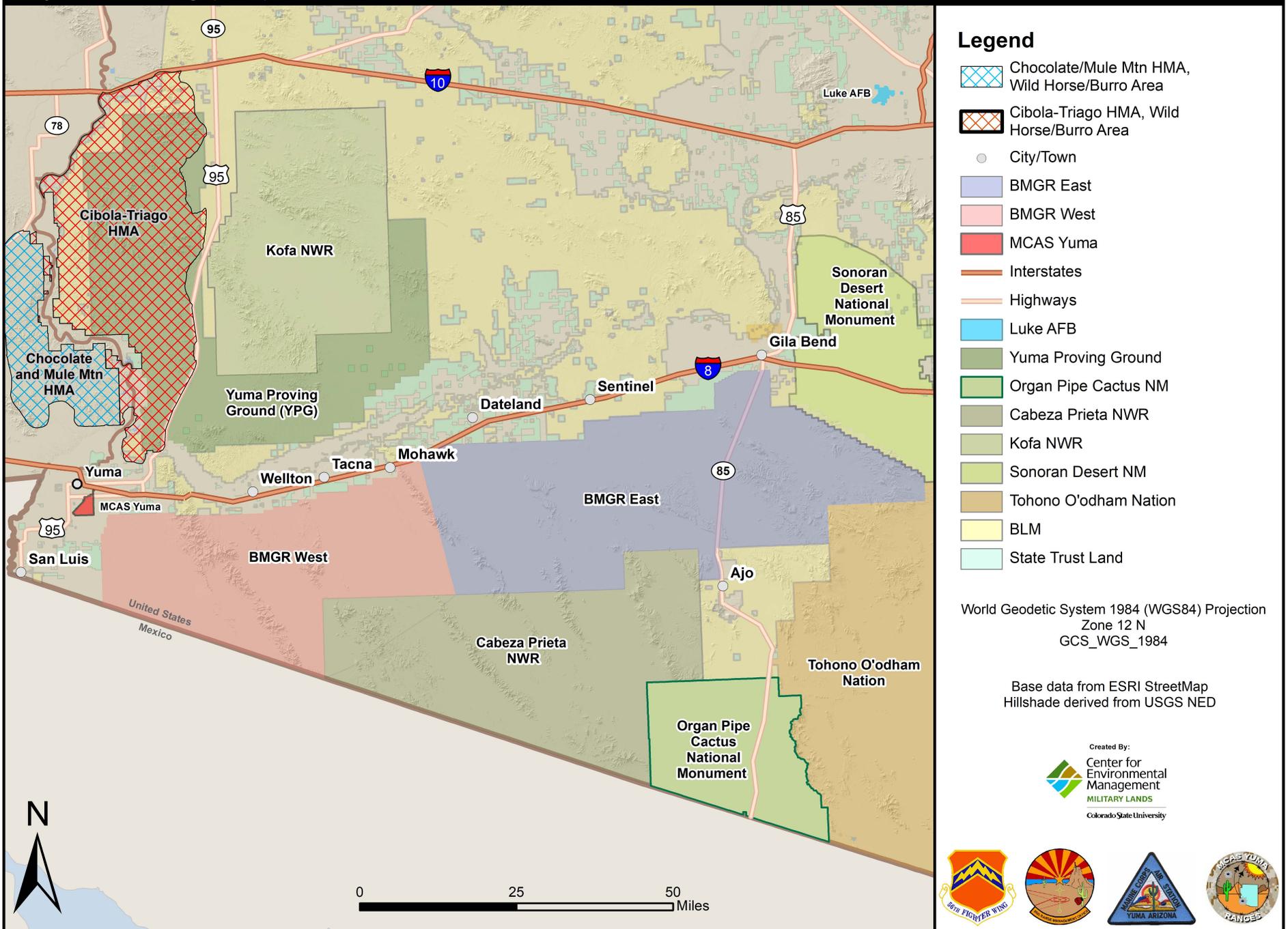
Trespass burros at BMGR are not protected under WFRHBA.

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 trespass livestock often defaults to the local land management agency as well as the state. BMGR does not contain a designated Wild Horse and Burro HMA; the HMA closest to BMGR is the Cibola-Trigo HMA, located 8 miles north of BMGR West or 40 miles west of BMGR East along the Colorado River. Management of trespass horses and burros at BMGR has fallen to the 56 RMO and MCAS Yuma RMD staff at BMGR East and West, respectively. The 2007 and 2012 INRMPs (USAF 2007; USAF, Luke AFB, U.S. Department of the Navy, and MCAS Yuma 2013) and the annual INRMP reviews (2013–2017), have reiterated that trespass livestock, specifically cattle (*Bos taurus*), burros, and horses are a problem. Given BMGR East’s proximity to adjacent grazing allotments, impacts to natural resources from trespass livestock are typically greater at BMGR East. Issues and impacts related to trespass livestock observed or with the potential to occur at BMGR include, but are not limited to,

- 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; and
- increased public safety risk from livestock/vehicle collisions with potential to impact all range users, including public recreators; BP; 56 RMO and MCAS Yuma RMD staff and support personal, other range managers, and contractors; and 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; and
 - increased wildfire risk if trespass animals aid in the dispersal of fire-adapted weed species.

Figure 3.7: Wild Horse and Burro HMA
Barry M. Goldwater Range (BMGR)



3.8.1 Update

The 56 RMO and MCAS Yuma RMD staff wish to develop policies, programs and methods to use in managing trespass livestock, including horses and burros. 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 Resource-Specific Goal RS4.5 from "Remove privately owned animals from the BMGR" to "Monitor and control trespass animals and livestock at BMGR, and assess and mitigate their impacts."

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

Although the development of this management plan will be a priority over the next five years, there are management strategies that BMGR staff can initiate now, under this INRMP, to reduce negative impacts from trespass livestock.

- **Work 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), the Arizona Department of Agriculture (AZDA), and AGFD to ensure coordinated management of trespass livestock. BMGR staff will continue to participate in the Interagency Feral Livestock Committee.
- **Fencing**—BMGR staff recognize that Arizona is a fence-out state and that BMGR does not fall within an Arizona no-fence district. Although fencing BMGR's entire boundary is not feasible, certain corridors can be effectively fenced off to help preclude trespass livestock. BMGR staff will prioritize efforts to work with staff from adjacent BLM lands and BLM grazing permittees to install new fencing in strategic areas and 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 will be continually monitored to identify additional access corridors onto the range that need fencing.
- **Trespass Livestock Removal and Management**—Trespass livestock will be prioritized for removal from BMGR lands following all applicable state and federal laws. BMGR staff will work with ranchers and stakeholders to push privately owned, BLM-permittee livestock found on 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 Arizona Revised Statutes 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.



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 AZDA stating that all applicable state, federal, and DoD rules were followed allowing AZDA to produce a Form 1 letter (after the livestock inspection) that will authorize USAF ownership of the animals. Becoming USAF property, as determined by the State of Arizona, these animals will be sold at public auction. To initiate this new trespass livestock removal policy, 56 RMO staff are currently pursuing viable procurement methods that may be used, whereby a contractor would be selected to perform duties under an awarded contract.

Contracted tasks could include, but would not be limited to, actively riding the range at BMGR East, monitoring the presence of trespass livestock, inspecting and repairing fencing, and removing trespass livestock as necessary by using established protocols and or procedures as set forth under the law and or an issued Statement of Work. The 56 RMO also would explore the possibility of having the contractor monitor invasive weeds and report on any other known or potential impact to natural and cultural resources at BMGR East.

CHAPTER 4 CHANGES IN CULTURAL RESOURCES

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

4.1 Update

BMGR East

The most recent ICRMP for BMGR East was implemented in 2009. An update to the ICRMP is 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 the 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 the actions as follows.

- Complete surveys and Section 106 reviews as needed to support range improvements and sustain the training mission.
- Sustain the training mission by including actions proposed in the Comprehensive Range Plan and the EIS for range enhancements and alternatives.
- 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.
- 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 its 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 negative impacts of public use, such as vehicle-based camping, campfires, theft, and vandalism. Strategies include regular monitoring of known resources, permit enforcement, and increased 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, surveys have been completed on 199,391 acres of BMGR East. Surveys and projects that have been initiated since the 2012 INRMP are listed below.

- Completed in 2012—Intensive archaeological survey of 1,003 acres on Manned Range 1
- Completed in 2012—Petroglyph recording: Lookout Mountain, Area B
- Completed in 2012–2013—Archaeological survey and condition assessment of the GPS site (AZ Z:5:55 [Arizona State Museum])
- Completed in 2012–2013—Stoval Supplemental Project: Resurvey 50 acres and archeological testing of six sites
- Completed in 2013—Pathways to Preservation: Archaeological Research Design and Management Strategy for the Barry M. Goldwater Range East
- Completed in 2013—Petroglyph recording, Black Tank, Range 2
- Completed in 2014—Intensive archaeological survey of 155 acres for the Sierra del Diablo pronghorn forage plot pipeline realignment in the Southern San Cristobal Valley
- Completed in 2014—Emergency archaeological survey, rerecording, and remapping of AZ Z:5:68 (Arizona State Museum)
- Completed in 2014—Hand excavation testing to determine presence of subsurface archaeological site
- Completed in 2015—Mechanical excavation to determine content and extent of AZ Z:5:68 (ASM)
- Completed in 2015—Draft and final Historic Properties Treatment Plan for data recovery
- Completed in 2015—Archaeological data recovery at five sites within the runway clear zone, Gila Bend Air force Auxiliary Field (AFAF)
- Completed in 2015—Intensive archaeological survey of 500 acres in Rankin Valley
- Completed in 2015—Intensive archaeological survey of 154 miles (6,209 acres) and 2,831 acres of interstitial space: recording of 106 sites
- Completed in 2017—Intensive archaeological survey of 1,500 acres of Rankin Valley
- Completed in 2017—Data recovery within the APE of AZ Z:5:68 (ASM), Range 1 Road Emergency
- Completed in 2017—Native American Graves Protection and Repatriation Act reburial on the Tohono O’odham Nation
- Completed in 2016—Vanderpot, Rein, et. al., Gila Bend Air Force Auxiliary Field: Archaeological Data Recovery at Five Sites and One Isolate within the Airfield Flight-Line Clear Zone, Barry M. Goldwater Range East, Arizona. Cultural Resource Studies in the Western Papagueria 30, Barry M. Goldwater Range East Cultural Resource Management Program, Luke AFB, Arizona

- In-house projects
 - Intensive archaeological surveys for remodeling artificial wildlife waters, placement of weather stations, pronghorn forage plots and waters, removal of contaminated soil, wildcat roads, and extensions to existing roads
 - Site condition assessments of sites on all three tactical ranges



Rock art located at BMGR East.

The Arizona Site Stewards Program (ASSP) is a key component of site monitoring efforts at 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.

The ASSP is led and sponsored by Arizona State Historic Preservation Office, 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 and identifies and prioritizes sites to be monitored and prepares handbooks to be used for this purpose by Site Stewards. A volunteer Regional Coordinator monitors the activities of Site Stewards working at BMGR East.

BMGR West

MCAS Yuma and 56 RMO cultural resources programs for BMGR West and East, respectively, produced a three-volume ICRMP in 2009. The ICRMP provides guidance for managing cultural resources throughout 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 BMGR West and East, including the physical setting, resource laws, culture, history, and other landscape-scale elements. Volume 2 specifically addresses BMGR East and, as mentioned above, is superseded by a 2017 ICRMP. Volume 3 specifically addresses BMGR West.

In 2011, the MCAS Yuma Cultural Resources Manager considered 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; thus, it was never executed. MCAS Yuma awarded a contract in August 2017 to have the 2011 ICRMP rewritten 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 BMGR West has been surveyed systematically. These surveys have resulted in the recording of approximately 350 sites. Survey reports completed since 2012 include those listed below.

- Completed in 2013—Cultural resources survey for a renewable energy project for MCAS Yuma
- Completed in 2013—Archaeological Survey Report of Negative Findings for the Laser Spot Video Recording System at Barry M. Goldwater Range West
- Completed in 2014—Archaeological Survey Report of Negative Findings for the Range One Expansion on the Barry M. Goldwater Range West
- Completed in 2015—An archaeological survey of 21,941 acres at Barry M. Goldwater Range West, Marine Corps Air Station, Arizona
- Completed in 2015—Archaeological Survey Report of Negative Findings for a Proposed Earthquake Early Warning Sensor on the Barry M. Goldwater Range West
- Completed in 2016—Archaeological survey of 6,289 acres on the Barry M. Goldwater Range West, Yuma County, Arizona
- Completed in 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 to complete the survey of BMGR West. As with 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

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

5.1 Update

Range permits allow entry to 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 for keeping 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 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 may use the program to create a custom report that all users must fill out to detail which 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 in performing 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 at BMGR West.

Individuals interested in conducting scientific research at BMGR are required to obtain permission from the 56 RMO or the MCAS Yuma RMD. For collecting wildlife specimens, a Scientific Collection Permit application is also required and must be approved by 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 of the range are expected to comply with range rules. Cross-country and off-road travel is strictly prohibited—all vehicles are required to remain on designated roads. At Cabeza Prieta NWR, vehicles are restricted to the Camino del Diablo and Christmas Pass Roads. In general, roads are to be considered closed unless designated open by an official carsonite marker post (at BMGR East) or a 4-foot wide by 4-foot high, lettered/numbered, wooden intersection marker (at 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.



Unimproved public access road.

In the past, visitor gates at BMGR East have been augmented with counters and cameras. They may be reinstalled 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, people conducting such activity 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 BMGR East is open for public recreation (Figure 5.1). Visitors to BMGR East must abide by the range-specific rules listed below.

- *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 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 AGFD hunting Unit 40A (AGFD 2017a). Species that may be hunted within this area include bighorn sheep (*Ovis canadensis*), javelina (*Tayassu tajacu*), deer, dove, and quail. The number of hunting permits made available are determined by population surveys and vary as game species’ populations fluctuate. Between 2008 and 2013, no bighorn sheep permits were available as a result of the species’ population decline, and only one permit was available in 2014. For the next three years, another slight increase in the population resulted in two permits being made available each year. Public access areas west of SR 85 at BMGR East (i.e., area near Ajo) fall under the same AGFD hunting unit as BMGR West, 40B (described below).

BMGR West

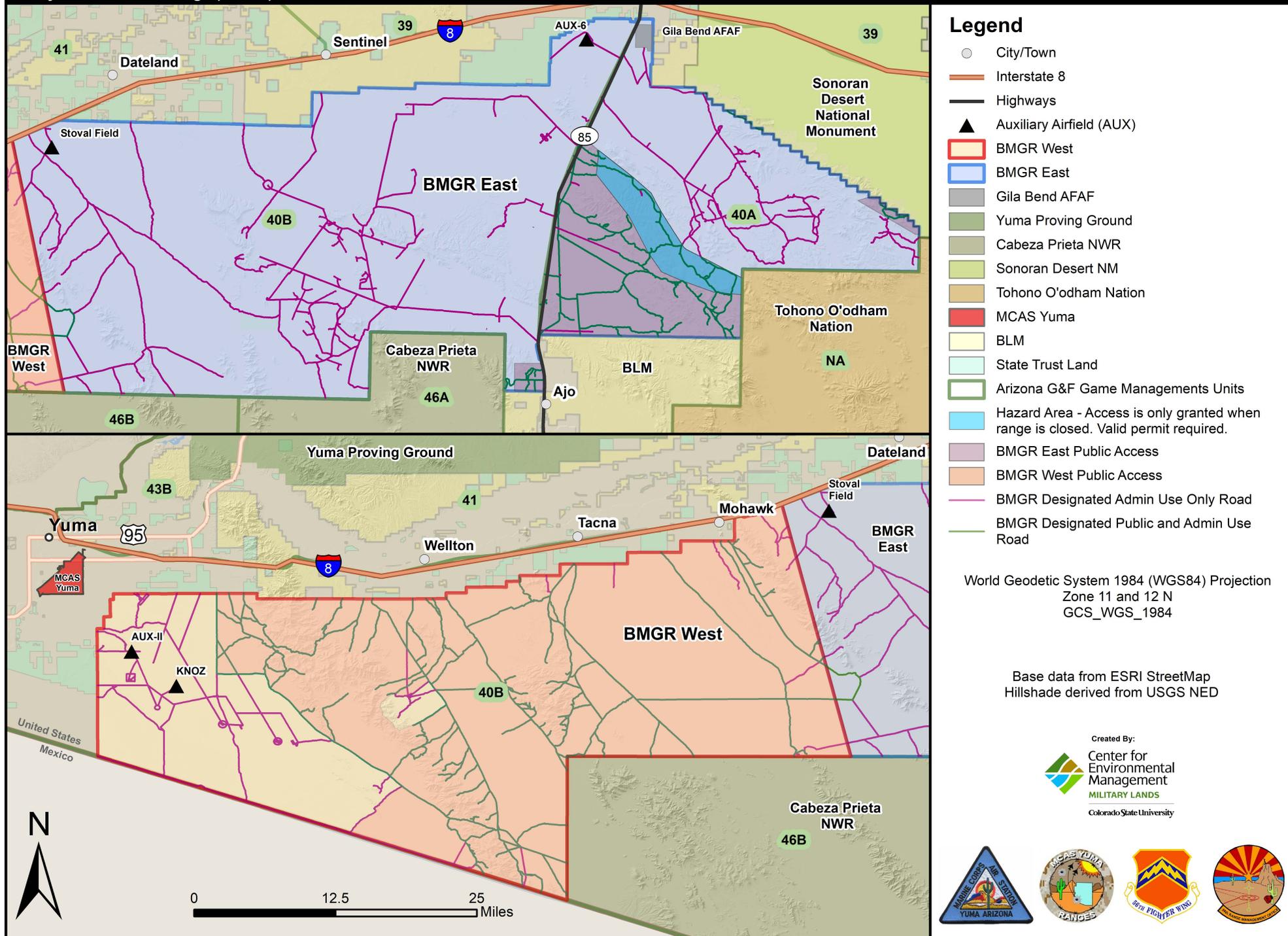
Approximately 76 percent of BMGR West is open for public recreation (Figure 5.1). Visitors to BMGR West must abide by the range-specific rules listed below.

- *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 BMGR West falls under AGFD hunting Unit 40B (AGFD 2017a). Species that may be hunted in this unit include bighorn sheep, javelina, deer, dove, and quail along with waterfowl and ring-necked pheasant (*Phasianus colchicus*), although the presence of waterfowl and pheasants is extremely unlikely. As it has been at BMGR East, the number of bighorn sheep permits made available has varied over the last 10 years due to the species' population fluctuations. 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 number of bighorn sheep permits to make available is assessed annually and determined by AGFD population survey results.

Figure 5.1: 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

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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 that sufficient numbers of professionally trained CLEOs are available and assigned the responsibility of performing tasks to implement INRMPs. Enforcement of natural resource laws is an integral part of a Natural Resources Program and shall be coordinated under the direction of the Natural Resources Manager (32 CFR, National Defense). 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. They 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 vandalism to cultural resources. Because they spend a majority of their time patrolling the range, they may be the first people to observe the presence of invasive species. They assist NRMs by using the GIS Cloud app to record the GPS coordinates and capture images of invasive species, which helps to ensure that management actions to control invasive species are prompt. Overall, CLEOs play a crucial role in slowing the range expansion of invasive species.

Integral to resource protection is public education and outreach. A successful conservation law enforcement program is integrated within and contributes to the natural and cultural resources programs they are protecting. This integration keeps the CLEO informed about the resources program goals and objectives and improves the CLEOs ability to protect resources, enforce policies, and relay important information to the public. Indeed, education is a key element in preventative law enforcement.

BMGR East

The 56 RMO has entered into a contractual agreement with AGFD to employ two Department Wildlife Managers as CLEOs for BMGR East. These actions are authorized under ARS Title 17 (Articles 201A, 211E, 231B.7, and 310); and are consistent with provisions of the Sikes Act (16 U.S.C. § 670a et seq.) and 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, off-highway/all-terrain vehicle 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 Judge Advocate), 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 against U.S. criminal laws and regulations that relate to MCAS Yuma, 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 (USMC 2013a).

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 for supporting 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 this chapter.

6.1 UPDATE

BMGR East

The 2018 road system includes maintained roads that go through active target complexes, but it does not include all of the vehicle routes used within the complexes to construct and maintain individual targets or those used for EOD-clearance activities. Vehicle operations to conduct construction, maintenance, and EOD-clearance contribute to the ground disturbance, but the surface areas within



Example of a road closure sign.

target complexes affected by construction, maintenance, and EOD-clearance vehicles are located in open areas already heavily disturbed by bombing and strafing. 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). For closed roads that have been reclassified as recovered former

roads, careful assessment of how the proposed reuse would affect their recovered status would be required before new use of these former routes could be approved.

The active road system, as recorded in 2018, includes a total of 744 miles of road, 170 miles of which are classified as providing public access (Table 6.1, Figure 6.1). 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: Designated road system in 2012 and 2018 at BMGR East.

Road Category	2012	2018
Miles of road classified as administrative-use-only inside military hazard/security areas that are restricted from general public access	570	555
Miles of road classified as administrative or public use inside military hazard/ security areas	5	6
Miles of road classified as administrative-use-only outside of restricted military hazard/security areas	11	13
Miles of road classified as 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

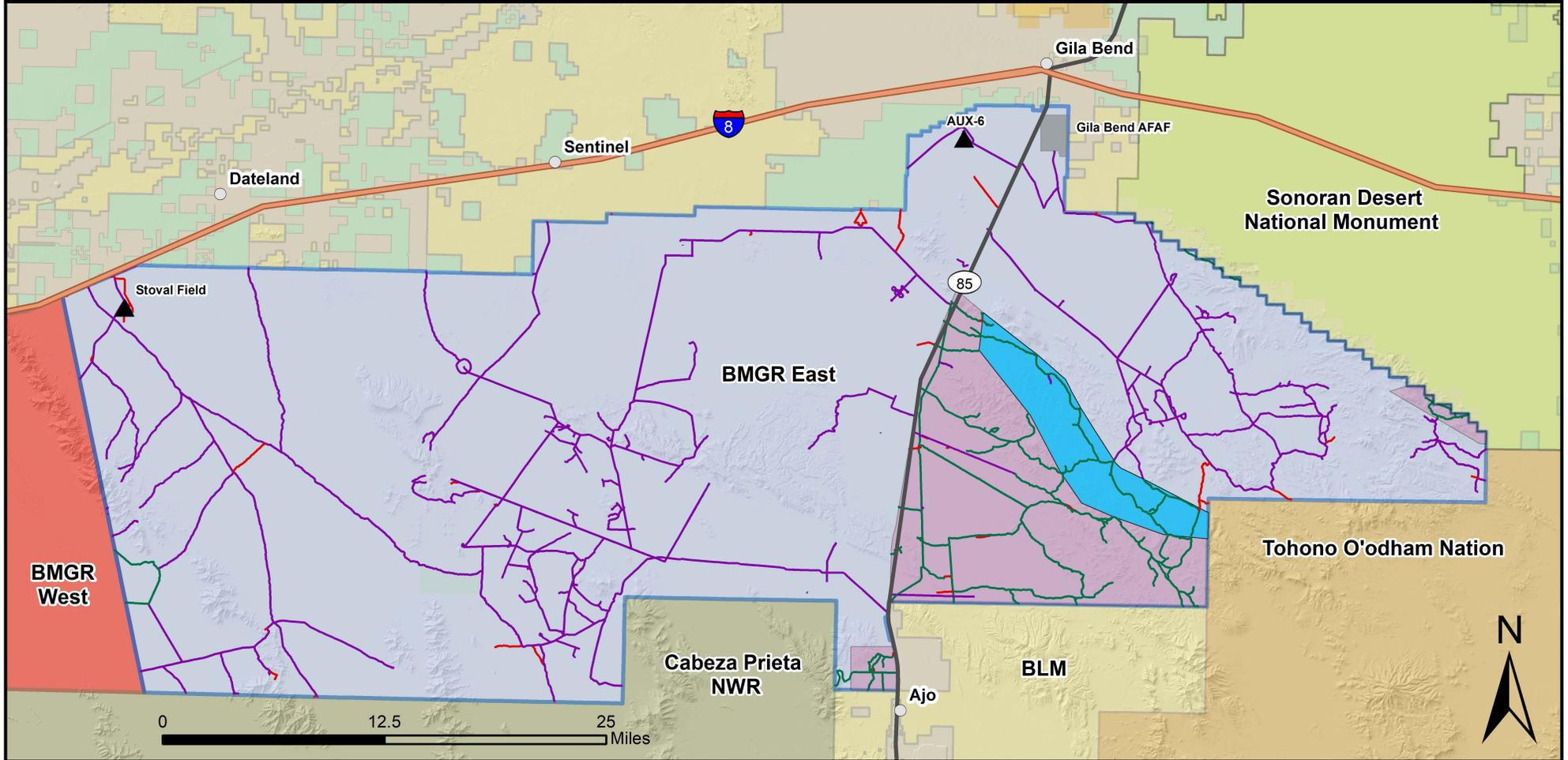
As outlined in Table 6.1, additional road surveys and monitoring have led to the changes in miles of road, as follows.

- Miles of road open for administrative-use-only inside hazard/security areas increased by 15 miles. The difference resulted 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 road classified for public use inside military hazard/security areas increased by 1 mile. The difference resulted from a more accurate measurement of the roadways.
- Miles of road classified for administrative-use-only outside of hazard/security areas increased by 2 miles. The difference resulted from adding new roads.

Figure 6.1: 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 Designated 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

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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 road inside military hazard/security areas, miles of administrative-use-only road outside of military hazard/security areas, and miles of road 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 road classified for administrative-use-only and miles of road classified for public use. The difference in miles of administrative-use-only road 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 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 represents 636 miles of active road and includes 427 miles of public access road (Table 6.2 and Figure 6.2).

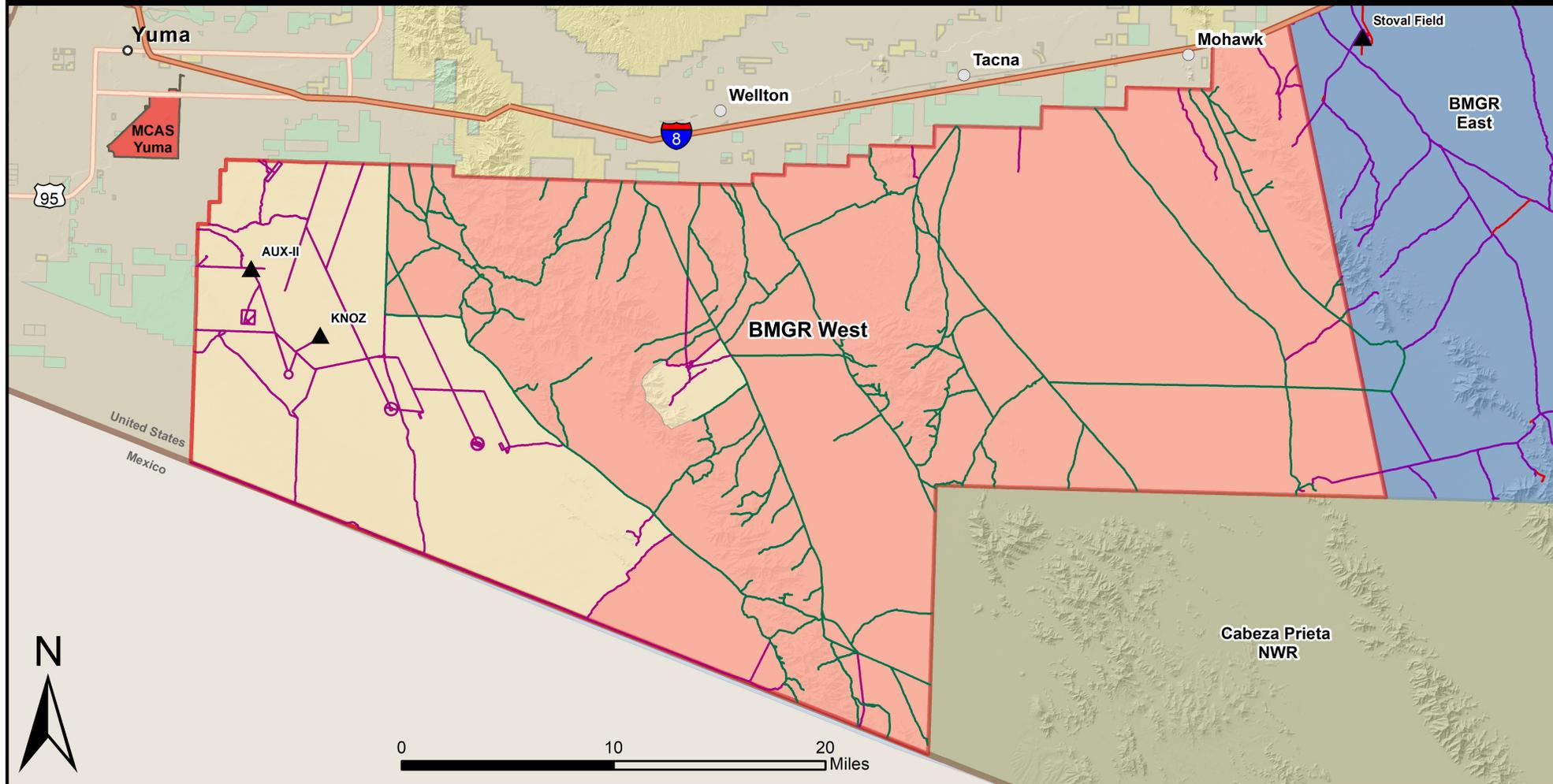
Table 6.2: Designated road system in 2012 and 2018 at BMGR West.

Road Category	2012	2018
Miles of road classified as administrative-use-only	195	209
Miles of road classified as public and administrative use	427	427
Total Miles of Road	622	636

As outlined in Table 6.2, additional road surveys and monitoring have led to the changes in miles of road as follows.

- Miles of road classified for administrative-use-only increased by 14 miles. The difference resulted from more accurate road surveys.

Figure 6.2: BMGR West Travel Management
Barry M. Goldwater Range (BMGR)



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 (AUX)

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

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CHAPTER 7 SUMMARY OF ENVIRONMENTAL REMEDIATION ACTIVITIES

Chapter 7 offers a brief overview of how hazardous materials and solid waste are handled and treated at BMGR and a summary of the associated mitigation measures that are used routinely. This is followed by an update on the non-routine remediation actions that have occurred since the 2012 INRMP.

7.1 Hazardous Materials

Hazardous materials are substances with strong chemical and/or physical properties that may pose a substantial threat to human health and the environment. Hazardous materials used in support of the military mission include petroleum, oils, and lubricants, such as fuels, hydraulic fluids, and similar substances. To a lesser extent, target-maintenance activities also require hazardous materials (e.g., paint).

Latex paints are used in dispersed locations throughout 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 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 above-ground 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. Such materials are classified as hazardous if the substances 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.

Potential generation of hazardous waste typically occurs near locations where the substances are used. Military aircraft mishaps or the downing of an aircraft also will 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 AFAP, 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 refuse, sludge (from a wastewater treatment plant, water supply treatment plant, or air pollution-control facility), and other discarded material. Activities associated with all training generate solid waste. Routine waste management for BMGR is accomplished in 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 for recycling or disposal in approved off-range landfills. During troop-deployment exercises, all solid waste is collected, contained, transported off range, and disposed of in accordance with all applicable rules and regulations.

Each year, all training ranges are closed for maintenance. During the closures, EOD personnel render any unexploded and partially exploded ordnance inert and nonhazardous, and then 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, is either ground (in place) to mulch or removed for disposal in a sanitary landfill off BMGR.



During annual range maintenance, unexploded ordnance is rendered inert and nonhazardous and then processed for recycling.

Management of non-military waste relies on the recreation user code of conduct, communicated via the permit program. However, some occurrences of 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 BMGR's borders, I-8, and SR 85. Scattered solid waste also has been observed in designated recreational-use areas of the range.

7.2.1 Update

BMGR East

Since the 2012 report, contractor Weston Solutions completed investigation and remediation activities at several former munitions treatment and disposal areas at AUX-6 in three phases, as follows.

- 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 in early 2018.

The two Solid Waste Management Units (SWMUs) included in a Facilities Investigation under the Resource Conservation and Recovery Act of 1976 (RCRA) (P.L. 94-580) are located at AUX-6, Sub Area 1. 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 likely were 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 is not used for munitions-disposal operations. Three subareas have been designated at SWMU 2, as described below.

- SWMU 2-1 is the site of the former underground munitions- burning furnace and its 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/Open Detonation 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 open burn and detonation 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.

At SWMU 2-3, munitions treatment mainly consisted 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 they either exploded 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 (*Protection of Environment, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Closure and Post-Closure*). In June 2006, Luke AFB obtained an RCRA Hazardous Waste Management Area Post-Closure Permit from ADEQ for Unit 8 of the MTR. A condition of the Post-Closure Permit required completion of the RCRA Facilities Investigation (RFI) to determine whether munitions constituent releases require additional corrective measures to formally close SWMUs 2-1 and 2-3.

As a result of previous RCRA activities, the majority of munitions hazards have been identified and some of the munitions debris has been removed. 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, 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 BSE activities consisted of brush removal, surface clearing, and digging exploratory trenches located on the basis of 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.

Zapata Engineering conducted a visual site inspection in 2007, during which they identified and gathered historical information on explosive releases at AUX-6. The inspection confirmed the presence of munitions and explosives of concern, including 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. In May 2009, Zapata Engineering subsequently conducted a geophysical investigation at SWMU 2-1 and 2-3. The investigation approach entailed surveying a series of individual transient electromagnetic (EM) lines in a radial pattern at SWMU 2-1 and 2-3. In addition, contiguous lane mapping—generally centered over the suspected furnace location at SWMU 2-1—was completed with an EM survey to map soil conductivity in the vicinity of the former furnace pad. The investigation covered approximately one quarter of an acre in the area delineated as SWMU 2-1. Generally, the EM survey lines at SWMU 2-3 were 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. Based upon the 2012 DGM investigations, 128 anomalies and 8 potential burial pits were identified at SWMU 2-1 and 2,129 anomalies with 19 potential burial pits were identified at SWMU 2-3.

HGL prepared and presented the RFIs for SWMU 2-1 and 2-3 and then developed two separate RFI Plan Objectives for SWMU 2-1 and 2-3. Based on the accumulated investigation data, the RFI Plan Objectives included the actions listed below.

- Conduct DGM of recommended additional grids.
- Resurvey anomalies identified during DGM surveys.
- Conduct an intrusive investigation of individual anomalies and potential burial pits.
- Conduct additional soil sampling and analyses to determine whether munitions constituents are present.
- Compare analytical results to applicable or relevant and appropriate regulatory limits.

- Prepare and submit an RFI Report summarizing results of the munitions/explosives of concern and munitions constituents investigation, with recommendations for further actions if necessary.

BMGR West

No accidental spills were reported at BMGR West between publication of the 2012 Public Report that was created with the 2012 INRMP and February 2018. Any point-source pollution, such as that from 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 BMGR East and West, respectively, the USAF and USMC have been charged with several responsibilities. One of these is to balance range management in such a way that it ensures long-term use of the facility as a premier military training location while also ensuring long-term management and protection of natural and cultural resources. In that capacity, the USAF and USMC routinely provide forums for public outreach and opportunities for the public to learn about and provide input on various actions proposed for BMGR. This chapter 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, and
- miscellaneous requests and participation in events.

The USAF and USMC continue to participate in the BEC established in February 2001. The executive board is composed of agency representatives that have vested interests in BMGR lands. The BEC is chaired by the 56 RMO Director 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.

In December 2011, provisions of the MLWA 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 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 BMGR. IEC meetings are open to the public and provide non-IEC participants with opportunities to present opinions regarding BMGR's 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. The improvements include

- updated public visitation maps and rules for public education and recreation use;

- an informational video for visitors that addresses safety and environmental awareness; and
- the installation of signs, gates, and fences to support road infrastructure and public access.

The USAF conducts public meetings on various issues and announces them via its Website, newsletters, mailings, newspaper advertisements, or legal notices. Annual reports concerning the public involvement programs for BMGR East can be found at (<http://www.luke.af.mil/>).

56 RMO staff will continue to offer public involvement opportunities and provide public outreach. Public participation has increased from participation levels of previous years for all of the activities listed above, and the ongoing exercises and operations at Gila Bend AFAF and BMGR continue to generate media interest. 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

The USMC's public outreach efforts have included developing information and infrastructure improvements to facilitate public recreational activities at BMGR West. The improvements include

- a species checklist for birding enthusiasts;
- the installation of signs, gates, and fences to support road infrastructure and public access;
- tours of various BMGR West features or resources, such as the Fortuna Mine;
- meetings held with local non-governmental groups, such as the Yuma Valley Rod and Gun Club, to issue recreation access permits; and
- visits to local recreational vehicle (RV) parks to educate seasonal visitors about BMGR West's recreational program.

Because the CLEOs patrol the range seven days a week, they are primarily responsible for MCAS Yuma's public outreach efforts. Visitors are provided with a brochure that includes a detailed road-classification map (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, and hunting). Guided range tours (e.g., mine tours) can be scheduled through the RMD staff. Finally, the RMD enhances public outreach by supporting research opportunities, the publication of research findings in peer reviewed journals, and both RMD and researcher participation in science conferences and symposiums.

CHAPTER 9 PROPOSED IMPLEMENTATION SCHEDULE FOR FISCAL YEARS 2019–2023

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 2019–2023. 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

The proposed implementation plan, as shown in Tables 9.1 and 9.2, list the actions proposed by Luke AFB for BMGR East and by MCAS Yuma for BMGR West, respectively.

Table 9.1: BMGR East 5-Year Action Plan, FY 2019–2023.

Element ¹	Action Step ²	Fiscal Year ³	Funding ⁴	Frequency ⁵	Partners ⁶	Comments	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
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	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 at 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 the 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 Acuña 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 2019–2023.

Element ¹	Action Step ²	Fiscal Year ³	Funding ⁴	Frequency ⁵	Partners ⁶	Comments	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
1	Support special studies to address specific management issues, such as invasive species, 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 ⁷	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 at 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 ⁷	As needed	TBD	Reoccurs as needed	AGFD	Support AGFD annual maintenance of all waters and redevelopment as required.					
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 ⁷	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 areas	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.					
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.					

Table 9.1: BMGR East 5-Year Action Plan, FY 2019–2023.

Element ¹	Action Step ²	Fiscal Year ³	Funding ⁴	Frequency ⁵	Partners ⁶	Comments	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
5	Revise public visitation maps and rules for public education and recreation use; would inform the public about road restrictions and resource sensitivities	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 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
5	Law enforcement patrol	Annual	\$-	Annual	AGFD	First CLEO started October 2017. Second officer scheduled to arrive November of FY 2019. Both CLEOs shall patrol 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	\$-	Recurr 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 utility/transportation corridors	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 BP checkpoint.					
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 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 Parties responsible for completing the action.
⁷ May require further NEPA review and/or Section 106 consultation.

Table 9.2: BMGR West 5-Year Action Plan FY 2019–2023.

Element ¹	Action Step ²	Fiscal Year ³	Funding ⁴	Frequency ⁵	Partners ⁶	Comments	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
Resource Management											
1, 12	Flat-tailed Horned Lizard (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	Bat surveys	Annual	In-kind	Annual	In-house, Interagency	Assist AGFD in conducting bat surveys at BMGR West.					
1	Maintain important wildlife connectivity corridors at BMGR West	Annual	Varies	Varies	In-house, Interagency	Collaborate with AGFD and partner agencies to identify and maintain important wildlife connectivity corridors at 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 and 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 BO, 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 with BP to identify and implement habitat restoration	Varies	Varies	Annual	In-house, Interagency	Collaborate with local BP offices to implement best management practices for maintenance and repair, and as outlined in CBP's 2012 Environmental Assessment (U.S. Department of Homeland Security 2012).					
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	Rangewide 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 provide considerable improvements to the series of erosion models (USGS 2014).					

Table 9.2: BMGR West 5-Year Action Plan FY 2019–2023.

Element ¹	Action Step ²	Fiscal Year ³	Funding ⁴	Frequency ⁵	Partners ⁶	Comments	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
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 implementing adaptive management strategies.					
14	Control excessive fugitive dust at permitted construction sites and recreation activity areas	As required	Varies	As needed	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 with AGFD to monitor and maintain existing network.					
1, 11, 13, 14, 15	Conduct habitat restoration efforts in 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 at BMGR	As needed	In-kind	As needed	In-house, Interagency	Determine as needed and funding is available.					
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 funding is available.					
3	Evaluate site-specific proposals for assessing 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.					
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, and corrective actions to determine the possible impacts created by public use.					
5	Revise and maintain visitor map	TBD	Varies	As needed	In-house	A surplus of the 2008 BMGR West informational brochure/map is available through the permitting office or Range Management Department; the brochure outlines public-use rules and open/closed areas. Publication of a revised map will be completed when existing sources are gone.	\$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 about 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.					

Table 9.2: BMGR West 5-Year Action Plan FY 2019–2023.

Element ¹	Action Step ²	Fiscal Year ³	Funding ⁴	Frequency ⁵	Partners ⁶	Comments	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
8	Evaluate the effects of nongame-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	Determine as needed and funding is available.					
Manage Realty Property											
10, 17	Cooperate with ADOT, BP, and utility companies regarding proposed actions within existing utility and 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.					
FUNDING 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.

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**APPENDIX: BMGR EAST AND WEST INRMP MANAGEMENT
ELEMENTS AND STATUS OF 2012–2017 ACTION PLAN ITEMS**

Table A-1: Action items, listed by management element number and title, proposed for BMGR East in the 2012–2017 INRMP, and action item status/progress as of early 2018.

Element	Action Plan Item	Status	Progress by 2018
Resource Inventory and Monitoring			
1.1 (11)	Monitor and control invasive species	Ongoing	Initiated cleaning of drags to prevent spread of invasive species, mapping of invasive species, and physical and chemical removal of invasive species.
1.2	Monitor 92 vegetation plots in several plant communities	Ongoing	Plots have been checked at five-year intervals and will continue to be checked on the same schedule.
1.3	Desert tortoise surveys	Ongoing	Develop landscape-level habitat model to determine likelihood of desert tortoise presence (Grandmaison 2012).
1.4	Raptor management surveys and monitoring	Ongoing	AGFD 2013–2015 study to evaluate airborne military activities on golden eagles, breeding bird survey (2012–2014), avian species survey conducted by Tunista Service and Chiulista Services 2012–2016 for the Annual BASH Summary Report.
1.5	Bird surveys	Ongoing	Breeding bird survey (2012–2014), avian species survey conducted by Tunista Service and Chiulista Services 2012–2016 for the Annual BASH Summary Report, total of 1253 bird surveys from 2012–2016.
1.6	Support AGFD surveys for game ungulates	Ongoing	Annual deer surveys; bighorn sheep surveys (2014, 2017).
1.7	Support AGFD surveys for gamebirds	Ongoing	Game bird surveys conducted on an annual basis.
1.8	Collaborate with AGFD to identify and maintain important wildlife connectivity corridors at BMGR East	Ongoing	Desert tortoise research identified wash systems as important movement corridors.
1.9	Kit fox population monitoring	Ongoing	Completed kit fox population monitoring using scent stations (2013, 2016).
1.10	Bat surveys; evaluate, monitor and protect important bat roosts	Ongoing	Bat monitoring study (Mixan et al. 2016), 2012–2014 study (Piorkowski et al.) to determine potential conflict with bats and military mission.
1.11	CFPO survey (low priority)	Ongoing	Repeated surveys spanning the past 20 years at BMGR East.
1.12	Weather stations and rain gauges	Ongoing	BMGR East implemented network of communication grade weather systems in 2011; BMGR West uses manual-download weather stations.
1.13	Monitor use of wildlife waters	Ongoing	Wildlife cameras used to record species that use wildlife waters (2008–2012).
1.14	Medium and low priority actions as resources allow	Not initiated	
1.15	Vegetation mapping	Ongoing	BMGR West completed vegetation mapping in 2014 (Malusa and Sundt 2015), BMGR East initiated mapping in 2003 and plans to complete mapping by FY 2019.
1.16	Support special studies to address specific management issues, such as invasives, species of concern, climate change, etc.	Ongoing	Continuing Research of Impacts associated with Drag Roads.
1.17	Implement cultural resource survey and monitoring requirements for INRMP-related actions	Ongoing	Completed cultural resources survey for a renewable energy project for MCAS Yuma in 2013 and a number of archeological surveys at BMGR West from 2013–2016.
Special Natural/Interest Areas			
2.1	Identify and evaluate other possible Special Natural/Interest Areas	Not initiated	Project to be initiated in 2021.

Table A-1: Action items, listed by management element number and title, proposed for BMGR East in the 2012–2017 INRMP, and action item status/progress as of early 2018.

Element	Action Plan Item	Status	Progress by 2018
Motorized Access and Non-Roaded Area Management			
3.1	Close selected roads to public access where an agency mission or resource protection issues conflict with public use	Ongoing	Access restrictions have been imposed in the past due to security, safety, cultural or environmental reasons and will continue to be imposed as required.
Camping and Visitor Stay Limits			
4.1	Assess benefits and effects of establishing designated camping areas and implement a decision based on findings	Initiated, incomplete	Documented known camping areas to detect changes by repeat photography.
Recreation Services and Use Supervision			
5.1	Revise public visitation maps and rules for public education and recreation use to inform the public about road restrictions and resource sensitivities	Ongoing	Annual process that has been conducted for a number of years will continue as restrictions change.
5.2	Public outreach	Ongoing	Public awareness projects have been used to educate base personnel and the public about activities at BMGR.
5.3	Hire law enforcement officers to be retained and dedicated to BMGR East; interim measure consists of contract security guards with detention authority	Initiated, incomplete	One CLEO started in October 2017 and a second will begin in FY 2019.
5.4	Install signs, gates, and fences to support road infrastructure and public access	Ongoing	Ongoing annual process which will continue to update signage as public access and road infrastructure changes.
5.5	Compile recreation-use statistics; analyze patterns, identify heavily used areas and monitor those areas to identify resource concerns	Initiated, incomplete	Deployed traffic counters at gate entry areas; new iSportsman application will aid in recreation use statistics.
Wood cutting, Gathering, and Firewood Use, and Collection of Native Plants			
7.1	Monitor native wood supplies in high-use areas; restrict wood collection if resource conditions dictate	Ongoing	Documented known camping areas to detect changes by repeat photography.
Utility/Transportations Corridors			
10.1	Cooperate with ADOT, BLM, US Border patrol, and utility companies regarding proposed actions within existing utility/transportation corridors	Ongoing	Cooperate with partners on all utility/transportation corridors.
10.2	Coordinate with CE Real Property to restrict future utility and transportation corridors to the existing State Route 85 and railroad rights of way	Ongoing	Coordinate to ensure proper procedures are implemented.
General Vegetation, Wildlife, Wildlife Habitat, and Wildlife Waters			
11.1	Habitat restoration ¹	Ongoing	Initiated cleaning of drags to prevent spread of invasive species, mapping of invasive species, and physical and chemical removal of invasive species.
11.2	Evaluate benefits and adverse effects of wildlife waters	Ongoing	Implement as needed and based on priority level and type of threat.
11.3	Develop and implement procedures to control trespass livestock	Ongoing	Water quality tested by USGS (2013–2016), camera trapping program (2008–2012).
11.4	Allow for the maintenance and repair of existing water developments ¹	Ongoing	Fences have been established around the BMGR perimeter.

Table A-1: Action items, listed by management element number and title, proposed for BMGR East in the 2012–2017 INRMP, and action item status/progress as of early 2018.

Element	Action Plan Item	Status	Progress by 2018
Special Status Species			
12.1	Participate and implement actions per the Sonoran Pronghorn Recovery Plan	Ongoing	Established semi-captive breeding program at the Cabeza Prieta NWR (2003) and at Kofa NWR (2011); established a second population within historical range at BMGR East, monitoring program established on ranges when EOD operations or weapon use is expected.
Soil and Water Resources			
13.1	Evaluate erosion conditions of range roads; repair or temporarily restrict use ¹	Ongoing	USGS developed erosion vulnerability model from vehicle use at BMGR West (2014), implemented 3D cameras to monitor erosion across range.
13.2	Evaluate erosion problems in specific areas, develop plans for repair	Ongoing	Installed hay bales and straw waddles to reduce erosion.
13.3	Monitor water table levels	Ongoing	Annual Gila Bend contractor requirement.
Air Resources			
14.1	Control excessive fugitive dust at permitted construction sites and recreation activity areas	Ongoing	All county air quality regulations are followed.
Wildfire Management			
16.1	Complete and subsequently implement fire management plan	Initiated, incomplete	56 RMO to complete Wildland Fire Management Plan in 2018.
Perimeter Land Use, Encroachment, and Regional Planning			
17.1	Participate in local and regional planning and monitoring land use patterns	Ongoing	2018 Public Report provides opportunity for public input, public allowed to participate in development or review of environmental assessments or impact statements.
17.2	Monitor illegal immigration, trafficking, and border-related law enforcement to anticipate how the BMGR resources may be affected	Ongoing	BEC meetings held six times a year regarding illegal traffic and patrol impacts on natural resources in the BMGR region; law enforcement required to complete the Range Access and Safety Training Program.

¹ May require further NEPA review and/or Section 106 consultation.

Table A-2: Action items, listed by management element number and title, proposed for BMGR West in the 2012–2017 INRMP, and action item status/progress as of early 2018.

Element	Action Plan Item	Status	Progress by 2018
Resource Inventory and Monitoring			
1.2	FTHL JSF Impact Study	Completed	This action is complete.
1.4	Complete rangewide vegetation map	Completed	This action is complete.
1.5	Identify and monitor vegetation plots in several plant communities	Ongoing	Collaborating with NPS to control invasive species.
1.6	Reptile, small mammal, and amphibian surveys and monitoring	Ongoing	(1) Establish a repeatable baseline monitoring methodology that will capture the diversity of small mammals, reptiles, and amphibians; (2) develop potential distribution maps, and; (3) provide recommendations for monitoring efforts and natural resource stewardship (will continue through FY 2018 and 2019).
1.7	General bird surveys	Not initiated	New protocol under development.
1.8	Bat surveys	Ongoing	Assist AGFD in conducting bat surveys.
1.9	Collaborate with AGFD to identify and maintain important wildlife connectivity corridors	Not initiated	Collaborate with AGFD and partner agencies to identify and maintain important wildlife connectivity corridors.
1.10	Installation and maintenance of weather stations and rain gauges	Ongoing	Upgrade existing weather stations to wireless communication with Luke AFB.
1.12	Support special studies to address specific management issues, such as invasives, species of concern, climate change, etc.	Ongoing	This is an ongoing action.
1.13	Implement cultural resource survey and monitoring requirements for INRMP-related actions	Ongoing	Cultural resource surveys and monitoring will continue.
1.14	Develop and implement systems to monitor the effectiveness of compliance actions	Ongoing	This is an ongoing action.
1.15 (1, 5, 7, 8, 11)	Develop a plan for determining the limits-of-acceptable change for recreational, natural and cultural resources	Not initiated	Use baseline survey data to determine the degree of change and develop a plan appropriate to the findings.
1.16	Construct adaptive management strategies for maintaining acceptable limits of change	Not initiated	Consider existing baseline survey data and regional concerns to determine the need for implementing adaptive management strategies.
1.2	Annual FTHL occupancy surveys	Ongoing	These surveys will continue.
Motorized Access and Non-Roaded Area Management			
3.1	Temporarily close selected roads to public access where an agency mission or resource protection issues conflict with public use	Ongoing	This action is ongoing and will occur as needed.
3.2	Evaluate site-specific proposals for future need and impacts of developing additional roads for agency purposes ¹	Ongoing	At this time there are no plans for the development of additional roads for agency use.
3.3	Implement site-specific planning for two bypass roads that would reroute vehicle traffic around the northwest corner of the Cabeza Prieta NWR	Completed	This action is complete.
Camping and Visitor Stay Limits			
4.1	Assess benefits and effects of establishing designated camping areas and implement a decision based on the findings	Ongoing	Continue to collect information from visitor passes and CLEO records, observations, and corrective actions to determine the possible impacts created by public use.

Table A-2: Action items, listed by management element number and title, proposed for BMGR West in the 2012–2017 INRMP, and action item status/progress as of early 2018.

Element	Action Plan Item	Status	Progress by 2018
Recreation Services and Use Supervision			
5.1	Revise visitor map	Ongoing	This action is scheduled during the next five years.
5.2	Public outreach	Ongoing	Support public awareness efforts to educate MCAS Yuma employees and the public concerning natural and cultural resources, historic preservation, and conservation activities.
5.3	Install signs, gates and fences to support road infrastructure and public access	Ongoing	Install signs as needed to identify restricted areas, range boundaries, range entry points, perimeters, road intersections, and ground-support areas.
5.4	Compile recreation-use statistics, analyze patterns, identify heavily used areas; monitor those areas to identify and resource concerns	Ongoing	This is on-going and closely monitored.
Utility/Transportation Corridors			
10.1	Cooperate with ADOT, U.S. Border Patrol, and utility companies regarding proposed actions within existing utility/transportation corridors	Ongoing	Continue an open dialogue with partnering agencies at BEC and IEC meetings. The RMD works in cooperation with the BEC, IEC, MOG, Pronghorn recovery Team, and local, state, and federal governments to revise and improve management actions and policies.
General Vegetation, Wildlife, Wildlife Habitat, and Wildlife Waters			
11.1	Allow maintenance and development of existing water sources supporting wildlife	Ongoing	Continue to work with AGFD to monitor and maintain existing network of wildlife waters.
11.2	Partner with U.S. Border Patrol to identify and implement the habitat restoration	Ongoing	Collaborate with local BP offices to implement best management practices for maintenance and repair as outlined in CBP's 2012 Environmental Assessment (Department of Homeland Security et al. 2012).
11.3	Support AGFD installation of up to a total of six high-priority wildlife waters ¹	Ongoing	Determine as needed and funding is available.
Special Status Species			
12.1	Participate and implement actions per the Sonoran Pronghorn Recovery Plan	Ongoing	Support Sonoran pronghorn recovery actions as stipulated in the BO, Recovery Plan, or as determined by the interagency Recovery Team.
Soil and Water Resources			
13.1	Comprehensive erosion assessment to prioritize the sites with severe erosion, and examine available engineering management practice that can mitigate erosion	Ongoing	This is on-going and closely monitored.
Wildfire Management			
16.1	Complete and subsequently implement fire management plan	Ongoing	BMGR West Fire Management plan will be completed in FY 2018.
Perimeter Land Use, Encroachment, and Regional Planning			
17.2	Monitor illegal immigration, trafficking, and border-related law enforcement to anticipate how BMGR resources may be affected	Ongoing	Continue coordinating with law enforcement authorities and sharing of anecdotal evidence of border-related impacts.

¹ May require further NEPA review and/or Section 106 consultation.