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

BARRY M. GOLDWATER RANGE

2023 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 2018–2023

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:
2023 Barry M. Goldwater Range Integrated Natural Resources Management Plan Update

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

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

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Acronyms

ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AFAF	Air Force Auxiliary Field
AFB	Air Force Base
AFMAN	Air Force Manual
AGL	Above Ground Level
ALF	Auxiliary Landing Field
AML	Appropriate Management Level
AMSL	Above Mean Sea Level
ANG	Air National Guard
ARNG	Army National Guard
ARS	Arizona Revised Statutes
ASSP	Arizona Site Stewards Program
AUX	Auxiliary Airfield
AWCS	Arizona Wildlife Conservation Strategy
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department
BA	Breeding Area
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 Eccotech
CBP	(U.S.) Customs and Border Protection
CEMML	Center for Environmental Management of Military Lands
CFR	Code of Federal Regulations
CLEO	Conservation Law Enforcement Officer
CLEP-OP	Conservation Law Enforcement Program Operations Plan
DoD	Department of Defense
DOI	Department of the Interior
DZ	Drop Zone
EIS	Environmental Impact Statement
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act
ETAC	East Tactical Range
FLPMA	Federal Land Policy and Management Act of 1976
FOB	Forward Operating Base
FR	Federal Register
FTHL	Flat-tailed Horned Lizard
FW	Fighter Wing
FY	Fiscal Year
GIS	Geographic Information System
GPS	Global Positioning System
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
IPCC	Intergovernmental Panel on Climate Change
IRT	Incident Response Team
LiDAR	Light Detection and Ranging
LLNB	Lesser Long-nosed Bat
KNOZ	The F-35 Auxiliary Landing Zone is known as KNOZ
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCO	Marine Corps Order
MD	Munition Debris
MEC	Munitions and Explosives of Concern
MLWA	Military Lands Withdrawal Act of 1999
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MTR	Munitions Treatment Range
NABat	North American Bat Monitoring Program
NEPA	National Environmental Policy Act of 1969
NMRD	Non-Munitions Related Debris
NPS	National Park Service
NRM	Natural Resource Manager
NTAC	North Tactical Range
NWR	National Wildlife Refuge
OHV	Off-Highway Vehicle
PRECIP	Precipitation
PRIA	Public Rangeland Improvement Act of 1978
P.L.	Public Law
RAWS	Remote Automatic Weather Station
RCRA	Resource Conservation and Recovery Act of 1976
RFI	RCRA Facility Investigation
RMD	Range Management Department
RMO	Range Management Office
RMS	Rangewide Management Strategy
ROD	Record of Decision
SGCN	Species of Greatest Conservation Need
SR	State Route
STAC	South Tactical Range
SWMU	Solid Waste Management Unit
T&E	Threatened and Endangered
TAVE	Temperature Average
TMAX	Temperature Maximum
TMIN	Temperature Minimum
UofA	University of Arizona
UDA	Undocumented Alien
USAF	United States Air Force
U.S.	United States
U.S.C.	United States Code
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

USGS	United States Geological Survey
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 (ARNG), and Air Force Reserve Command. As the nation's third largest military installation by area, 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, Cabeza Prieta National Wildlife Refuge (NWR), Sonoran Desert National Monument, 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% of the land area and is more than twice the size of any other component.

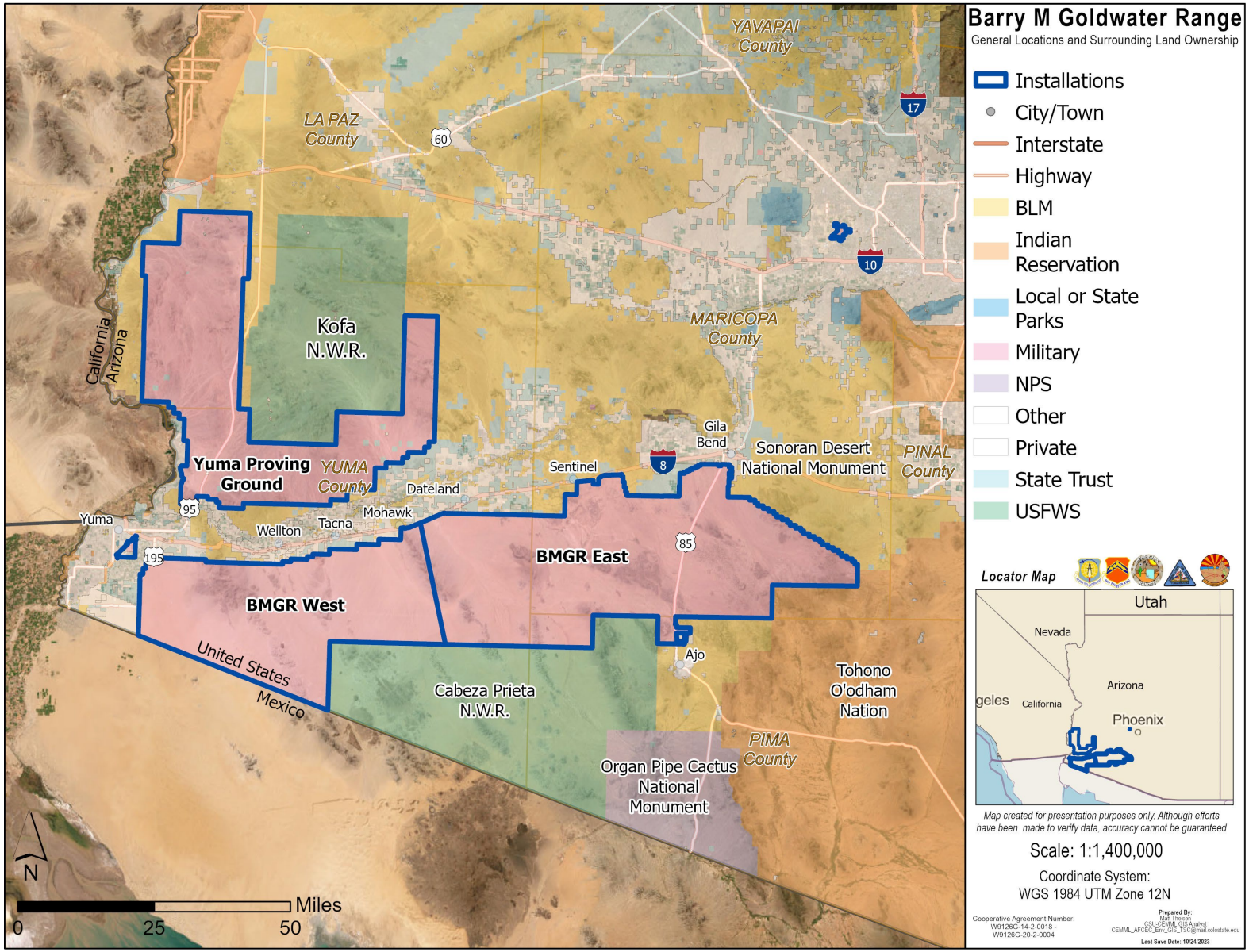


Figure 1-1. Barry M. Goldwater Range general location and surrounding land ownership.

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 (AZGFD), updated the 2018 INRMP, in accordance with the Military Lands Withdrawal Act of 1999 (MLWA) (Public Law [P.L.] 106-65), the Sikes Act Improvement Act (hereinafter 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 2023 INRMP is the third INRMP update for BMGR and is the product of a thorough review of the 2018 INRMP, in accordance with the five-year review cycle.

Three public meetings were held to provide information to the public on the INRMP revision process and to present an opportunity for the public to ask questions (Table 1-1). The initial meeting was held to discuss the INRMP revision process, a general timeline, and to provide information on the two upcoming meetings. In April 2023, a notice was published in the *Yuma Sun*, *Gila Bend Sun*, *Arizona Daily Star*, and *Ajo Copper News* newspapers about the two remaining public meetings to which the Intergovernmental Executive Committee (IEC) members and all stakeholders, including natural resource agencies and the general public, were invited. In addition to this notice, an informative postcard with upcoming meeting information was developed and distributed to stakeholders for whom BMGR had mailing addresses. The second public meeting, in May 2023, was an open house designed to illustrate (via posters) and summarize the accomplishments made over the previous five-year action plan, planned work over the next five years, and highlights of the focal management species on the range. The final public meeting was held in August 2023 to discuss the upcoming five-year work plan for BMGR in detail, present details of this Public Report, and to answer questions from the public.

In September 2023, 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 13 September when the drafts were published on Luke AFB's website with this availability described in the Federal Register and in the *Yuma Sun*, *Gila Bend Sun*, *Arizona Daily Star*, *The Arizona Republic*, and *Ajo Copper News* newspapers for a 30-day comment period. To receive full consideration for preparing the Final Public Report and INRMP, comments had to be received by 13 October 2023.

Table 1-1. Public open-house meeting schedule.

Date	Time	Location
11 January 2023	5:30–7:30 pm	Arizona Game & Fish Department Tucson Office 555 N. Greasewood Rd., Tucson, Arizona 85745
10 May 2023	5:30–7:30 pm	Sonoran Desert Inn & Conference Center 55 Orilla Avenue, Ajo, Arizona 85321
24 August 2023	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 2018 INRMP. The purpose of the report is to provide updated information that will help reviewers understand and comment on proposed changes to the INRMP that may occur over the next five-year planning period (2024 to 2028).

There were 17 comments from three different commenters during the public review period. Comment topics included clarification requests about permitted range activities, questions on the NEPA process relating to the INRMP, and suggestions on the management of the Sonoran Desert tortoise. All of the comments were reviewed together by the 56 RMO and MCAS Yuma, which worked together to develop responses to the public comments. Table 1-2 below lists the comments and the collaborative responses from 56 RMO and MCAS Yuma. All of the comments were for the draft BMGR INRMP but changes to the INRMP stemming from the public comments were also applied to this Public Report as applicable. 56 RMO and MCAS Yuma appreciate all members of the public who reviewed the INRMP or participated in the public review process.

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
Yuma County Sheriff	In reading the document , there is very little mention of the situation with concurrent jurisdiction concerning local law enforcement and activities, it spells out that local law enforcement has to go through the permitting process. We are the responding agency for all criminal investigations, BLM, AZGF, USFWS, and military police as well as range wardens from MCAS, call our agency to respond and conduct criminal investigations from minor thefts to homicides. We are also by statute required by law to respond and conduct Search and Rescue activities in our counties. And coordinate those searches and obtain assistance from our federal and military partners in the geographic areas . During these investigations we utilize both aircraft and drones for crime scene documentation as well as search and rescue operations which assist us mitigating or causing any environmental impacts. Last year we had a number of search and rescue calls from migrants as well as processed 69 migrant death investigations, this year we have already processed 17 migrant death investigations. We coordinate these activities with MCAS yuma range control and when we asked we are told a hard no on using drones, why am I reading we can obtain a permit in this document and given a hard no from staff here?	We added additional text to the INRMP clarifying that law enforcement agencies are required to complete the Range Access and Safety Training Program but they are not required to obtain a public recreation permit to access the Range when performing their official duties. We added text to clarify that drones, along with metal detectors, remote-controlled aircraft, ultralights, and powered parachutes, are prohibited on the Range. The previous text that stated these items could be used on the Range was incorrect.
Citizen	Is there a separate NEPA document or how is this being handled under NEPA?	NEPA analysis for the original BMGR INRMP was completed in the 2006 BMGR INRMP EIS. The management activities in this 2023 INRMP Update are not expected to require natural

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
		resources management practices materially different from those described in the existing INRMP. Therefore, consistent with DoDM 4715.03, November 25, 2013 (Change 2, 08/31/2018), additional NEPA analysis is not required for this 2023 INRMP Update. Natural resources management practices/projects not discussed in detail in existing NEPA documentation to include the 2006 INRMP EIS, shall receive additional, site-specific NEPA review as appropriate before implementation.
Desert Tortoise Council	The IMRMP refers to the Sonoran desert as a population. The Sonoran desert tortoise (Gopherus morafkai) is not a population, but a fully recognized species. Please see Murphy et al. (2011) and Edwards et al. (2016). We request that the taxonomic status of the Sonoran desert tortoise be corrected throughout the INRMP.	We agree that the text should reference the Sonoran Desert tortoise as a separate species and not as a population of the desert tortoise. All references to the species as a population has been corrected in the INRMP and in this Public Report.
Desert Tortoise Council	The INRPM provides a paragraph on the Sonoran desert tortoise that suggests it is closely related to the gopher tortoise (Gopherus polyphemus). Cladistic analysis shows that G. morafkai is most closely related to the Mojave desert tortoise, G. agassizii, whereas the gopher tortoise is a distantly related species that is more closely related to the bolson tortoise in Mexico (G. flavomarginatus). The agassizii and polyphemus clades diverged more than 25 million years ago and, outside of sharing common ancestry and burrowing tendencies, have very little in common. In addition, there is a plethora of scientific literature available from Google Scholar on the Sonoran desert tortoise, as well as its closest relative, the Mojave desert tortoise. We recommend that the INRMP be revised so it provides the latest scientific information on the Sonoran	We agree that using studies on the Sonoran Desert tortoise or to closely related species is ideal. We have replaced information using studies with the gopher tortoise with information stemming from work done with the Sonoran Desert tortoise. The reference for that work is below. Lovich, J.E., R.C. Averill-Murray, M. Agha, J.R. Ennen, and M. Austin. 2017. Variation in Annual Clutch Phenology of Sonoran Desert Tortoises

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
	desert tortoise, or if not available, its closest related species, the Mojave desert tortoise on its needs to survive and persist (e.g., physiology, nutrition, population connectivity, genetics, etc.). Major threats to the tortoise are listed here. One major threat not listed is wildfire even though it is discussed later on page 129. We request that the USAF and USMC add wildfire to the list of major threats and provide information of the acres of tortoise habitat lost to wildlife in the last decade or so.	(*Gopherus morafkai*) in Central Arizona. Herpetological 73(4): 313-322.
Desert Tortoise Council	"Long-term monitoring plots are surveyed every three years for Sonoran Desert tortoises." We suggest that the INRMP include information is provided that demonstrates the survey methods used on monitoring plots are implementing appropriate scientific methodology (e.g., collecting data to determine adequate sample size, health conditions, amount of recruitment, sex ratio, etc.) that will provide meaningful data on the status and trend of the species throughout its range and the local populations that occur on the BMGR. Both status and trend analyses are necessary to determine whether the Sonoran desert tortoise is effectively being conserved or is declining (e.g., a trend toward extirpation of local populations in the foreseeable future and extinction). In addition, a summary of the tortoise data collected should be provided in the INRMP as this information will show the effectiveness of past management. It should be used as a metric to determine whether these management actions have been effective or need to be modified to provide for tortoise conservation for the long term. In addition, the Air Force should be monitoring the quality and quantity of the habitat and its connectivity in the BMGR, especially vegetation, to determine any changes that are occurring to native perennial and annual species in composition, density, abundance, cover, etc. These data are needed to effectively manage for all wildlife species on the BMGR especially species listed under the Endangered Species Act and protected under Arizona Game and Fish Code.	Our partners at AZGFD follow rigorous, well established protocols. This section is not specific to the Sonoran Desert tortoise and therefore does not need further explanation, it is a general summary of all wildlife management happening on BMGR.

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
Desert Tortoise Council	"The key effort of the conservation strategy is to focus on conservation, habitat improvement, and ongoing management of the tortoise status and habitat." The INRMP lists some "key actions implemented by BMGR East to protect the tortoise…" We request that the INRMP explain why these actions are applied only to BMGR East and not the entire BMGR. In addition, the USAF and USMC imply that implementing these key actions are adequate to manage for the conservation of the tortoise on the BMGR. We request that the INRMP, supported by science, demonstrate that these key actions are effective in managing for the conservation of the tortoise on the BMGR.	The INRMP incorrectly specified that only BMGR East was implementing the actions described in the text. BMGR East and West both implement these actions and the text now states "BMGR" to reflect that.
Desert Tortoise Council	On this page the INRMP appears to mention two types of surveys for tortoises, surveys of new areas and surveys of a long-term monitoring plot. We request that the two types of surveys be described and include the scientific rationale for the past and future survey plans and the plans themselves. For example, the USAF and USMC state, "[s]urveys covered the monitoring plot in its entirety with surveyors walking parallel transects at 49 feet [sic] intervals." For the Mojave desert tortoise, the transect interval is 30 feet. Data have been collected and analyzed for tortoise detections in the Mojave Desert and the result is the maximum distance for transects is 30 feet. The Mojave Desert has perennial plants densities and topography that is more open than the Sonoran Desert. This openness means it is easier to see Mojave desert tortoises than Sonoran desert tortoises as the latter occurs in areas with more diverse topography and greater density of vegetation. Consequently, the USAF and USMC should ensure that tortoise transects are spaced at appropriate intervals to result in a high detection rate of tortoises located on or near the transects. If not already studied, this spacing of transects along with upslope and downslope biases	To provide more context and information on our monitoring efforts, this section of text now contains information on the sources for the methodology and seasonality of our monitoring/survey efforts.

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
	that help hide animals from a person's view should be investigated, and if the data indicate this is a bias, the survey method should be modified to correct this bias. As discussed in our comments above under page 117, to determine whether management actions are effectively managing for the tortoise and other species of wildlife and plants, data should be collected on local populations and rangewide, as well as on habitat requirements. Please explain in the INRMP how the past and future survey plans for the tortoise comply with the data needed to determine whether the USAF and USMC are effectively managing for the conservation of the Sonoran desert tortoise. This information is necessary to determine whether the implementation of the Candidate Conservation Agreement for the Sonoran Desert Tortoise in Arizona (USFWS et al. 2015) of which the USAF and USMC are signatories is being effectively implemented. Please ensure that the design of water catchments/artificial watering sites allows target animals access but prevents tortoises and other small animals from entering the catchments, becoming trapped, or drowning. Catchments should be monitored regularly and searched for animal remains to determine whether these catchments are inadvertently killing wildlife and the species and numbers affected. In this section of the INRMP, management goals, objectives and specific projects are identified. Please ensure that the USAF and USMC identify in this section all goals, objectives and projects that will be implemented to achieve the commitments made in the Candidate Conservation Agreement for the Sonoran Desert Tortoise in Arizona (USFWS et al. 2015). These projects should be rated as ahigh priority for implementing	

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
Desert Tortoise Council	In this section of the INRMP, management goals, objectives and specific projects are identified. Please ensure that the USAF and USMC identify in this section all goals, objectives and projects that will be implemented to achieve the commitments made in the Candidate Conservation Agreement for the Sonoran Desert Tortoise in Arizona (USFWS et al. 2015). These projects should be rated as ahigh priority for implementing	Project 1.4.1, a project to survey new and/or existing occupation sites of the Sonoran Desert tortoise, is rated as a high priority. Further, we have added additional conservation actions to the list of key action items implemented at BMGR to protect the species that are actions we implement based on the Sonoran Desert tortoise Candidate Conservation Agreement.
Desert Tortoise Council	"For native plant populations, monitor long-term vegetation monitoring plots on five-year intervals at BMGR East and continue regional collaboration to analyze and contextualize data. Initiate a similar program of vegetation monitoring on BMGR West." We request that the vegetation monitoring include both perennial and annual plant species and native and non-native species. The monitoring design that is implemented should be statistically robust and science-based. We support adding BMGR West to this Project as the project should include the entire Range. In addition, we request that an adaptive management project be added to the projects on vegetation. As an example of an adaptive management project, if a wildfire occurs on the Range, the frequency of the vegetation monitoring should increase in that area, ideally occur within a few weeks after the fire and more frequently thereafter to adequately assess the successional process and changes to the vegetation community following the wildfire. The results of this frequent monitoring would help determine when revegetation efforts should be implemented, the methods that would be used to produce the greatest success, and the native species that would be revegetated.	This project is specific to the long-term vegetation and soil monitoring plots that have been established in the last 5 years; we follow the protocol established by the Sonoran Desert Network, refer to section 2.3.2.3 in the INRMP and section 3.3.1 in the public report for exact references.

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
	A similar adaptive management project should be added for the tortoise and other special status species.	
Desert Tortoise Council	"Monitor invasive plant and animal species through annual (at minimum) patrols of range roads, known infestation sites, potential infestation areas, identifying and reporting areas of concern for treatment using the cloud app at BMGR East and West." For this Project, we support the use of technology to report and record identified areas of invasive species. We suggest that when monitoring/collecting data during surveys for native vegetation, these statistically robust survey methods also collect data on non-native species. Further, we suggest that the Project should include the removal/treatment of non-native plant species prior to the plants setting seed for that growing season to reduce the production of seeds and contribution to the seed bank to reduce the production of non-native species during the succeeding growing season.	The specifics of this project can be found in section 7.11 in the INRMP and 3.3.2 in the Public Report; we use GIS software to record locations and perform manual and chemical removal of invasives as needed throughout the range while doing our best to target species prior to seed production.
Desert Tortoise Council	Please add the Sonoran desert tortoise as a species that is adversely affected by the presence of these non-native invasive plant species.	We have added "Sonoran Desert tortoise" to this project in Chapter 8 and in Chapter 10. This project has also been updated in Table 9-1 in this report.
Desert Tortoise Council	"Survey new and/or existing sites of Sonoran Desert tortoise occupation at BMGR East and identify suitable habitat every three years to continue the 56 RMO's long history of tortoise conservation and management, support listing decisions, and prevent designation of critical habitat." We suggest this objective be expanded to clarify of reference how new sites will be selected and that the survey methods implements are statistically rigorous. In addition, we suggest the results of the surveys and analysis of the data be included in a report that is posted online and easily available to the public to access. In addition, we suggest that recurring	AZGFD is following rigorous protocol for surveys as referenced on section 7.4.2 in the INRMP and section 3.7.2 of the public report.

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
	surveys for the tortoise occur in BMGR West in suitable habitat for the species be conducted. We note this is the only project in the INRMP for the tortoise. We found no project that would be implemented if the survey results for the tortoise showed a downward trend. Using monitoring data to identify a management issue and change management to improve the status of a species, aka adaptive management, should be a project that is added to the INRMP for the tortoise and other special status species, rather than waiting 5 or more years for the next INRMP to add it. We request that the USAF and USMC add this adaptive management project, as we believe existing data from some tortoise monitoring plots show a decline in tortoise densities/numbers on the Range. Absent this commitment and direction in the INRMP to change management as needed, the USAF and USMC would implement one project that only monitors the tortoise (or other species), potentially documenting their decline until they were extirpated from some of the Range.	
Desert Tortoise Council	"Opportunistically assess and annually document the trespass livestock population at BMGR East and use results to develop a plan to remove trespass livestock and prevent further incursions, as needed." We recommend the USAF and USMC use their pilots or drones to routinely assess and document trespass livestock. The use of pilots or drones would accomplish two projects, training time for the pilots and drone users and collection of needed data to effectively implement this part of the INRMP. The data collected from these flights could then be entered into a data base to track their locations and used to implement Project 1.5.4, annually fund a contract to monitor and control trespass of animals and livestock.	The USAF is working to complete an 18 mile long fence on the southern boundary of BMGRE to prevent trespass livestock damages. We added a sentence about this to the INRMP.

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
Desert Tortoise Council	"The BMGR's natural resource management has been mostly limited to actions taken for the benefit of protected or special status species (e.g., Sonoran pronghorn, acuña cactus, and FTHL)." Please add that the Sonoran desert tortoise is a special status species. As such ensure that the action in the INRMP reflect those needed to benefit this species.	This list of species is not an exhaustive list, however, we have added the Sonoran Desert tortoise to this list.
Desert Tortoise Council	The Council disagrees with some of the designations for projects. We strongly recommend that Project 1.2.3 be designated as a high priority for reasons provided early in this letter.	Definitions of High, Medium, and Low priority projects are outlined on page 193 of INRMP. MCAS Yuma does not rank projects by priority.
Desert Tortoise Council	We appreciate this opportunity to provide the above comments and trust they will help protect tortoises during any resulting authorized activities. Herein, we reiterate that the Desert Tortoise Council wants to be identified as an Affected Interest for this and all other projects funded, authorized, or carried out by the USAF or USMC that may affect desert tortoises, and that any subsequent environmental documentation for this INRMP is provided to us at the contact information listed above. Additionally, we ask that you respond in an email that you have received this comment letter so we can be sure our concerns have been registered with the appropriate personnel and office for this INRMP.	We will utilize the insight gained to improve future communication strategies.
Desert Tortoise Council	The Council learned of the availability of the INRMP from a third party. On 8/14/2023, the Council sent an email to the proponent asking when comments on the INRMP were due. We received no response. The Council sent a second email shortly after 8/27/2023 asking that the Council be added to the Affected Interest list and be sent a copy of the INRMP (or a link to the document). The Council was informed the comment period would end on 10/13/2023, but did not receive a copy of the document or a link to it. The Council had difficulty locating the INRMP online. We did not find this information in the Federal Register Notice of July 20, 2023 which was a	We will utilize the insight gained to improve future communication strategies.

Table 1-2. Comments received from the public

Commenter	Comment	BMGR's Response
	"Notice of Intent to Prepare an Update to the 2018 Integrated Natural Resources Management Plan and Public Report (INRMP) for the Barry M. Goldwater Range" and a request for input. After several attempts to search for the document on the Internet, we found it. Although the Council has years of experience in finding government documents available for public review and comment, we had difficulty finding this INRMP. Because of our difficulty in locating the INRMP online, we wonder how many of the general public, who wanted to provide comments during the public comment period, were unable to, Stil other may have been discouraged from providing comments because of the difficulty in locating the document online and their unfamiliarity with searching several locations online for government documents. We recommend that, in the future, Department of Defense installations should be transparent in providing information on the public comment periods for INRMPs and should facilitate easy accessibility of these documents to the public. CEMML NOTE- we provided our email communications with Mr. LaRue as a pdf along with the other comments we received.	

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 5% 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% is permanently administered by the Department of Defense (DoD). The MLWA had the following effects:

- withdrawing[1] 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
- reserving[2] 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).

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 to transfer jurisdiction over the withdrawn public land to the Secretaries of the Air Force and Navy, to assign responsibility for managing the lands to the Armed Services Secretaries, and to provide that an INRMP be prepared in accordance with the Sikes Act and other applicable guidance. Thus, the 2007 INRMP (USAF 2007) 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.

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

[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.

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)). In 2017, to continue the statutory authorization for BMGR, the Secretaries of the Air Force and Navy provided notice of the continuing military need for BMGR after the 2024 deadline. Accordingly, the Secretaries of the Air Force and Navy submitted an Application for Withdrawal Extension to the Secretary of the Interior in 2018. A Legislative Environmental Impact Statement (LEIS) was developed for BMGR in 2021 that outlines proposed actions and alternatives, a description of the affected environment, environmental consequences, and cumulative effects. This LEIS was developed to aid the United States Congress in making a decision on extending the land withdrawal. While the extension of the land withdrawal is anticipated, a decision to allow the current withdrawal to expire would require military use of the land surface to cease after 4 October 2024.

1.3 INRMP Management Guidance

The 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 and 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 use of natural and nature-based features to maintain or improve military installation resilience;
>
> (C) the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping and non-consumptive uses; and
>
> (D) subject to safety requirements and military security, public access to [BMGR] to facilitate the use."

Additional direction provided by the MLWA (Table 1-3) 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 § 3031I(3)(E)(i)).

Managing and protecting cultural resources is a priority on military installations alongside 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 as well. The 2023 BMGR INRMP provides for cultural resource protection by ensuring that natural resource management actions fully support and comply with the range's ICRMPs and incorporates (by reference) the ICRMPs. Additional stipulations of the MLWA and Sikes Act are outlined in Table 1-3.

DoD Instruction 4715.03, *Natural Resources Conservation Program*, calls for INRMPs to be based, to the maximum extent practicable, on ecosystem management. The goal of ecosystem management, as established by the DoD, is to ensure that military lands support both present and future training requirements while 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. 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 are important guiding elements of the 2023 INRMP for BMGR.

Table 1-3. Integrated natural resources plan elements specified in the Sikes Act and Military Lands Withdrawal Act of 1999.

Sikes Act
To the extent appropriate and applicable, provide for the INRMP elements listed below. • 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
Military Lands Withdrawal Act of 1999
The INRMP shall include the provisions listed below. • 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 along the 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. Although this 2023 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 2013*b*).

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 AZGFD are responsible for its natural resources. Although both USFWS and AZGFD have responsibilities related to the recovery of endangered and threatened species, AZGFD has primary jurisdiction over resident wildlife management within BMGR.

The USAF, USMC, USFWS, BLM, and AZGFD are collaborating to prepare the INRMP five-year review in accordance with the MLWA and Sikes Act.

Barry M. Goldwater Range East staff collaborate with Arizona Game and Fish Department staff to monitor bighorn sheep.

CHAPTER: 2 CHANGES IN MILITARY AND NON-MILITARY USE

2.1 Military Use

F-35 during training.

The primary mission of BMGR has not changed since the 2018 INRMP, although it plays a more crucial role with the bed down of 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, Air National Guard, and Army National Guard in these capacities. Other installations that regularly practice on the range include MCAS Miramar, Davis-Monthan AFB, Silverbell Army Heliport, and Morris 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 (Figure 2-1, Figure 2-2, Figure 2-3, Figure 2-4). 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 on regulating public use and safety.

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

- the surface space needed to adequately disperse 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 2018 INRMP, the following enhancements have been completed or may occur during the five-year planning period covered by the 2023 INRMP (2024 to 2028):

- 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 air traffic control tower, buildings for base operations, and fire department buildings 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.
- Complete improvements to the Range 1 Road to mitigate flooding and erosion issues using the selected Erosion Mitigation Alternative (CEMML 2022*a*) of constructing a concrete, at-grade crossing and enlarging existing drainage patterns to direct flows toward Tenmile Wash.

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 above ground level (AGL) or higher, except within approved corridors, under the terms of a 1994 Memorandum of Understanding (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 Barry M. Goldwater Range East.

Area/Activity	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
BMGR East Land Base	BMGR East represents 60% of the total BMGR acreage. This area is subdivided into eight 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, two tactical ranges (North Tactical Range [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 East Tactical Range (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 (USAF et al. 2013) 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.	Unchanged
Tactical Ranges	Three tactical ranges (NTAC, STAC, and ETAC) support aircrew training in gunnery, bomb, rocket, and missile deployment. 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 daily for ordnance delivery training.	Unchanged

Table 2-1. Current military training facilities, features, and use at Barry M. Goldwater Range East.

Area/Activity	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
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
Range Munitions Consolidation Points (RMCPs)	RMCPs 1, 2, 3, and 4 continue to serve as range Explosive Ordnance Disposal (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 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 CBP and, occasionally, by USAF Security Police.	Unchanged
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. The conditions of existing runways are poor, resulting in USAF limitations for training in the areas. 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 of these locations. AUX-11 is no longer used as an airfield, but the area immediately south serves as a site for exercise-specific communication operations.	Unchanged

Table 2-1. Current military training facilities, features, and use at Barry M. Goldwater Range East.

Area/Activity	**Description of Current Training Feature, Facility and Military Use**	**Status Since 2018 INRMP**
Sand and Gravel Excavation and Stockpile Areas	Excavation of sand and gravel from 10 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. As of 2023, no sites are being used.	Unchanged
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 10 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 (Snake-eye), 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

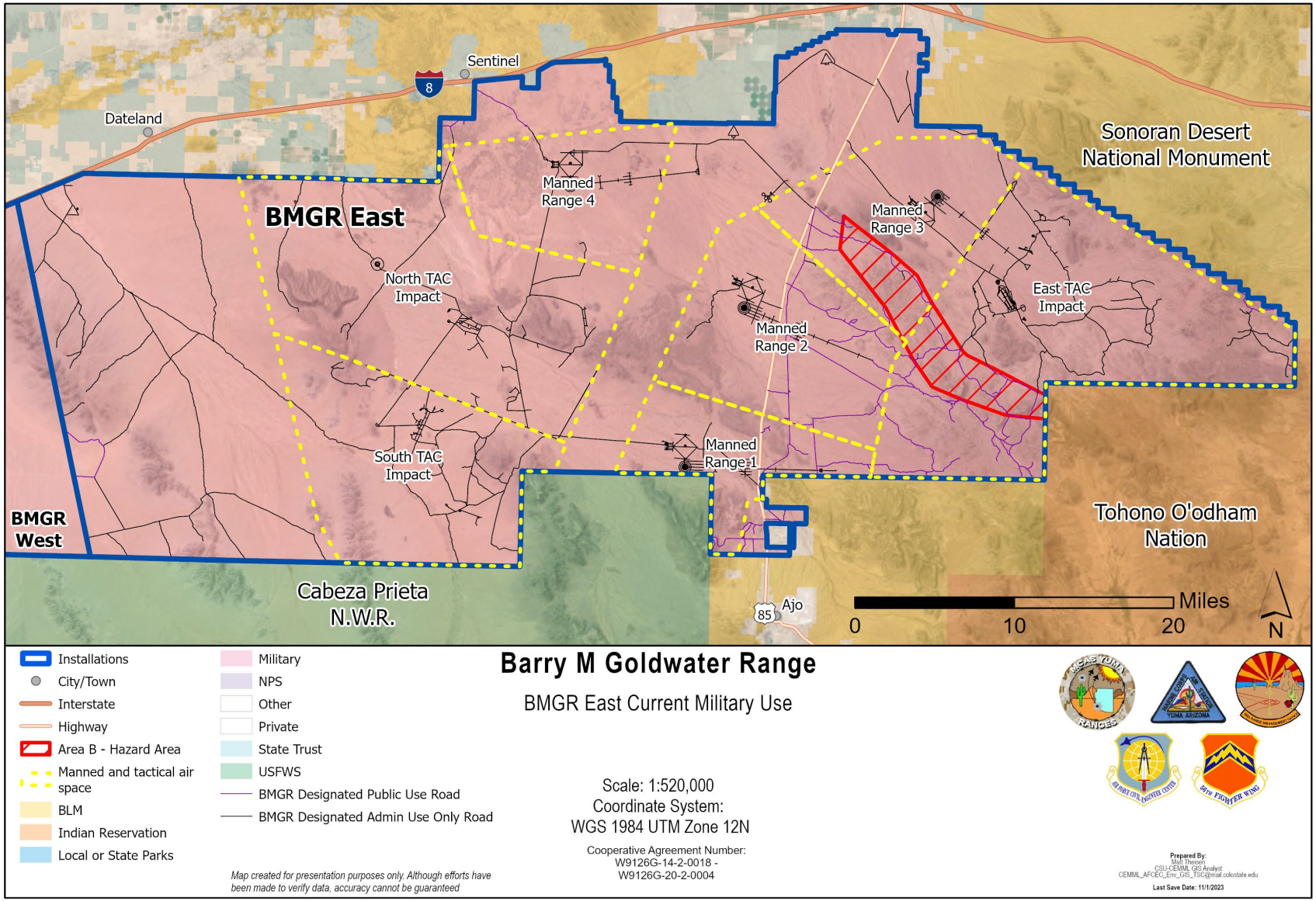


Figure 2-1. Current military use at Barry M. Goldwater Range East.

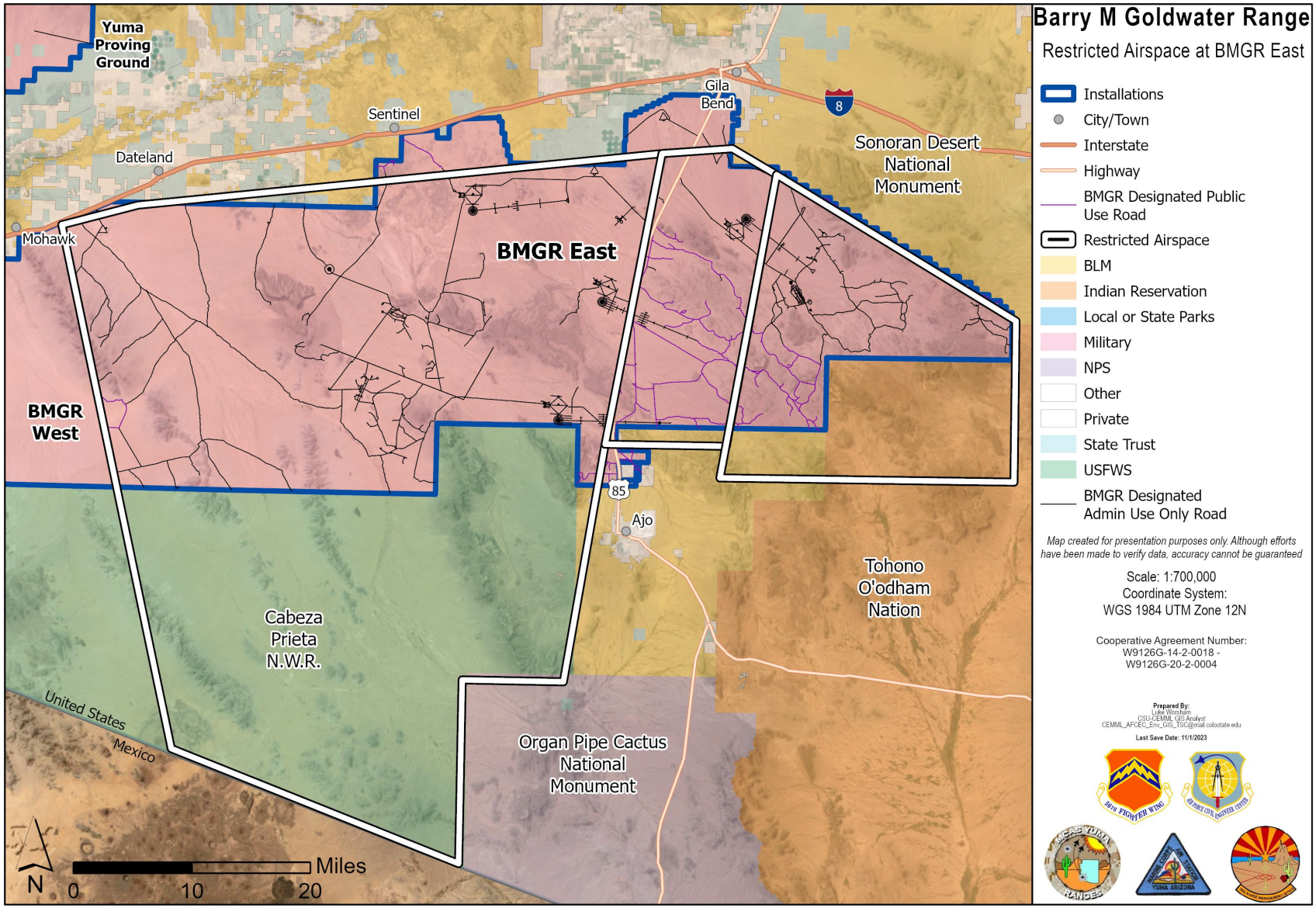


Figure 2-2. Restricted airspaces that overlie Barry M. Goldwater Range East.

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.

Multi-aircraft training at BMGR.

In 2010, the U.S. Navy 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 2010*a*). Construction was completed in 2015. The F-35 replaced the AV-8B aircraft in USMC squadrons based at MCAS Yuma. The current military features, facilities, and uses on BMGR West are shown in Table 2-2 and Figure 2-3.

Table 2-2. Current military training facilities, features, and use at Barry M. Goldwater Range West.

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
Surface Area and Airspace		
BMGR West Surface Area	BMGR West represents approximately 40% 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 feet 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. A Forward Operating Base (FOB) was added in 2021, maximizing its training potential. The entire FOB is located within the existing footprint of the AUX-II facility.	Changed
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.	Unchanged
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

Table 2-2. Current military training facilities, features, and use at Barry M. Goldwater Range West.

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
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. Nine unimproved LZs were added around the perimeter of the UTC to facilitate landing of MV-22s.	Changed
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-position targets 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
Assault Landing Zone (ALZ) Hawkeye	A 3,800-foot × 100-foot expeditious, unimproved tactical strip was constructed immediately south of Military Drag Road in 2020. The assault zone is used to train aircrews to conduct landing and takeoff combat operations in an austere environment.	Addition
Air-Ground Training Facilities		
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-two 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 forklift. The other 10 DZs are located within ground support areas to minimize off-road driving for retrievals.	Unchanged

Table 2-2. Current military training facilities, features, and use at Barry M. Goldwater Range West.

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
Ground Combat Training Ranges		
Rifle and Pistol Ranges	The Rifle and Pistol Ranges are used to train and qualify personnel in the use of small arms.	Unchanged
Range 1 Complex	The Range 1 Complex consists of two separate training ranges. Range 1 is an unknown distance automated live fire range for small arms weaponry. Range 2 is adjacent to Range 1 and is located in an unused sand and gravel borrow pit. It serves as a close combat maneuvering range in order to train Marines in proper small arms patrol techniques.	Unchanged
Range 5	Range 5 is located adjacent to Panel Stager (south and east) and supports military demolition training.	Addition
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
Deuce Village	Deuce Village is located within Ground Support Area (GSA) Site 56 and serves as an aviation Military Operational Urban Training (MOUT) facility. It is a non–live fire training facility used to facilitate integrated training of both air and ground components.	Addition
Convoy Security Operations Courses 1 and 2 and Murrayville (East and West)	These facilities have been decommissioned and are no longer in use.	Inactive
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

Table 2-2. Current military training facilities, features, and use at Barry M. Goldwater Range West.

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
Hazard Areas	Hazard Areas 2, 3, and 4 were extended south to within approximately 1 mile of the US/Mexico border to facilitate extended Weapon Danger Zone footprints.	Changed
CS Chamber	The CS Chamber (a chamber with a controlled concentration of tear gas) is used for training Marines to recognize, take protective measures, and complete mission requirements in a chemical, biological, radiological, or nuclear environment. It is located southeast of the pistol/rifle range.	Addition
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
Munitions Treatment Range (MTR)	The MTR is designed for emergency response of demilitarized and/or unserviceable, outdated, or obsolete munitions. Additionally, energetic materials found in emergency response are also treated.	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

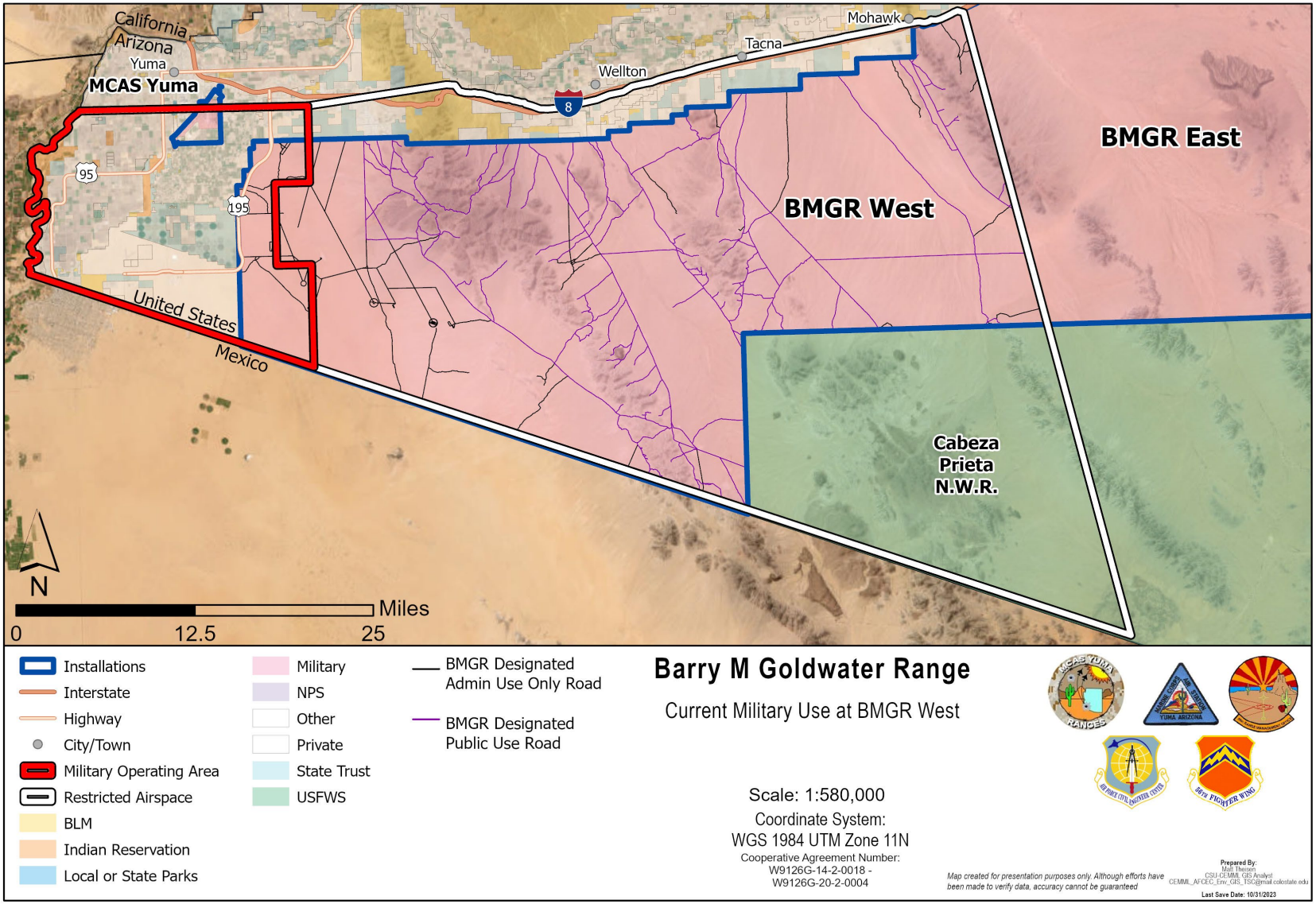


Figure 2-3. Current military use at the Barry M. Goldwater Range West.

2.2 Non-Military Activities

2.2.1 Arizona Game and Fish Department

The AZGFD 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. In addition, AZGFD is the responsible state agency for providing safe opportunities for all forms of responsible outdoor recreation, including hunting, fishing, trapping, shooting, wildlife watching, off-highway vehicle (OHV) use, and dispersed camping.

The javelina (Tayassu tajacu) is one of the big game species that may be hunted at BMGR. Photo courtesy of Arizona Game and Fish Department.

AZGFD'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 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.
- Assist and advise the DoD in managing OHVs use in terms of habitat protection and advocating for user opportunities.

AZGFD 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. Customs and Border Protection

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, CBP coordinates with Range Management Office (RMO) Conservation Law Enforcement Officers (CLEOs) and Pima and Maricopa County Sheriff Offices. Within BMGR West, the CBP 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 impact 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 31 December 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 the largest adjacent communities in these areas are summarized in Table 2-3. Most of the population in proximity to BMGR resides in Yuma County. During 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% between 1980 and 2000 (Yuma County Department of Development Services 2012). Since 2010, the county population has slowly grown from 195,751 individuals in 2010 to 203,881 in 2020 (U.S. Census Bureau 2020).

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

The community of Gila Bend lies just north of BMGR East. Its population is estimated to be 1,892 and it is the site of a 280-megawatt solar-generating station (Gila Bend 2017). The Gila Bend planning area includes approximately 175,000 acres of undeveloped, relatively flat terrain. Existing land use in Gila Bend is concentrated in town; scattered land uses include large lot residential, energy generation, agriculture, and sand and gravel extraction. No master-planned communities are located within the unincorporated portion of the planning area (Gila Bend 2017).

Table 2-3. Surrounding community populations 2010–2020.

City	2010 U.S. Census Data[a]	2020 U.S. Census Data[b]
City of Yuma, Yuma County	93,064	95,548
Wellton, Yuma County	2,882	2,375
Tacna, Yuma County	602	425
Gila Bend, Maricopa County	1,922	1,892
Ajo, Pima County	3,304	3,039

[a] 2010 U.S. Census population estimates (U.S. Census Bureau 2010).

[b] 2020 U.S. Census population estimates (U.S. Census Bureau 2020).

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 U.S. border control efforts and other government workers moving to the area. As with many other Arizona communities, Ajo's population changes seasonally due to people leaving the colder winter weather in more northern climates to enjoy milder Arizona winter temperatures.

Community of Ajo, Arizona

The Tohono O'odham Nation, located southeast of BMGR, encompasses approximately 2.8 million acres. The Nation is organized into 11 districts (Tohono O'odham Nation 2016), one of which is the Hickiwan District that abuts BMGR's southeastern-most border. The estimate of enrolled members of the Tohono O'odham Nation is 33,648 individuals with 13,055 living on the Nation. Tohono O'odham land use includes ranching, livestock grazing, and seasonal cattle camps.

In 2010, the 56 FW and Tohono O'odham Nation signed an MOU to create a framework for consultation on DoD activities at BMGR East. The MOU formalizes the consultation process but recognizes that the consultation process, in connection with the INRMP and ICRMP, is not included in its purview. In 2023, this MOU was renewed for an additional five-year period.

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 southeast to northwest. 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.

Sonoran Desert landscape near Ryan's Canyon in Area B on BMGR East during a super bloom event in March 2023.

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 southern portion of the Aguila Mountains, which are east of the San Cristobal valley, consist of sierra-type mountains while the northern portion consists of flat-topped mesas with steep cliffs. Elevations range from 185 feet 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. Soils in the region are calcareous and well drained with limited water holding capacity. They have an aridic soil moisture regime and a hyperthermic soil temperature regime.

Principal rivers in the region include the Gila and the Colorado. The Gila River runs east to west just north of the BMGR boundary and connects to the Colorado River northwest of the range. Surface water at 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 and is itself the primary limiting factor for both natural and cultural resources on the range. During certain times of the year, surface water was so scarce that the AZGFD began developing wildlife watering sites, or "wildlife waters," at BMGR 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 AZGFD. During extreme drought, the AZGFD will routinely refill these wildlife waters by hauling in tens of thousands of gallons of water annually by vehicle and helicopter to support wildlife. A detailed discussion on wildlife water management can be found in Section 3.6, *Wildlife Waters*.

3.2 Climate

The Southwest has a hot and arid variable climate that is strongly influenced by its geographic location and the predominance of differing circulation patterns including the El Niño-Southern Oscillation, the Pacific North American Pattern, and the Pacific Decadal Oscillation. 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 9 inches, while near Yuma on BMGR West it is only about 3 inches. The annual average over the entire range is less than 5 inches. Some of BMGR's interior valleys may receive less than 2 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 in a short period of time.

Overall drought 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 °F. Annual evaporation potentials, 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.

The Southwest became warmer and drier over the 20th century and climate models project that this trend will continue into the 21st 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 Regional Climate Monitoring Program

Beginning in 2008, BMGR East began a climate monitoring program by installing eight manual download temperature and precipitation monitors. In the fall of 2011, this climate monitoring program was expanded by installing a network of 12 real-time, communication-grade weather stations, data loggers, and precipitation-storage gauges (Figure 3-1). In addition to these stations, BMGR East has maintained its existing rain gauges and the use of data loggers to increase the number of climate-monitoring points and provide a more spatially explicit understanding of climate variables (Black, personal communication, 2023). These stations collect measurements on the following weather parameters:

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

The real-time weather data can be accessed by visiting the Western Regional Climate Center website at https://wrcc.dri.edu/bmgr/. This publicly available 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, regional law enforcement agencies, and national scale climate monitoring program. Weekly and monthly summary reports for all these stations are also provided via email by the WRCC. Access to real-time weather data informs time-sensitive resource management issues, 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 (Figure 3-1). BMGR West is currently working to acquire five Remote Automatic Weather Stations (RAWS) through the BLM. Acquisition and deployment are anticipated to be completed by Fiscal Year (FY)23. Once established, the RAWS network will provide a continuous dataset of hourly, locally sourced weather parameters for day-to-day land management decisions and may help to explain observed variation in species and resource trends. Further accumulation of data over time will provide

additional opportunities for analyses of how weather patterns and, ultimately, climate change may be affecting the landscape and species interactions.

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). The partnering agencies in this regional monitoring effort are listed below:

- BMGR East (USAF)
- BMGR West (USMC)
- Cabeza Prieta NWR (USFWS)
- Kofa NWR (USFWS)
- Organ Pipe Cactus National Monument (National Park Service [NPS])
- Sonoran Desert National Monument/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., 1 October to 30 September; 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 University of Arizona (UofA) Meteorological Network. Data from two rain gauges at private homes in Ajo and Why are included as well (Black, personal communication, 2023). 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.

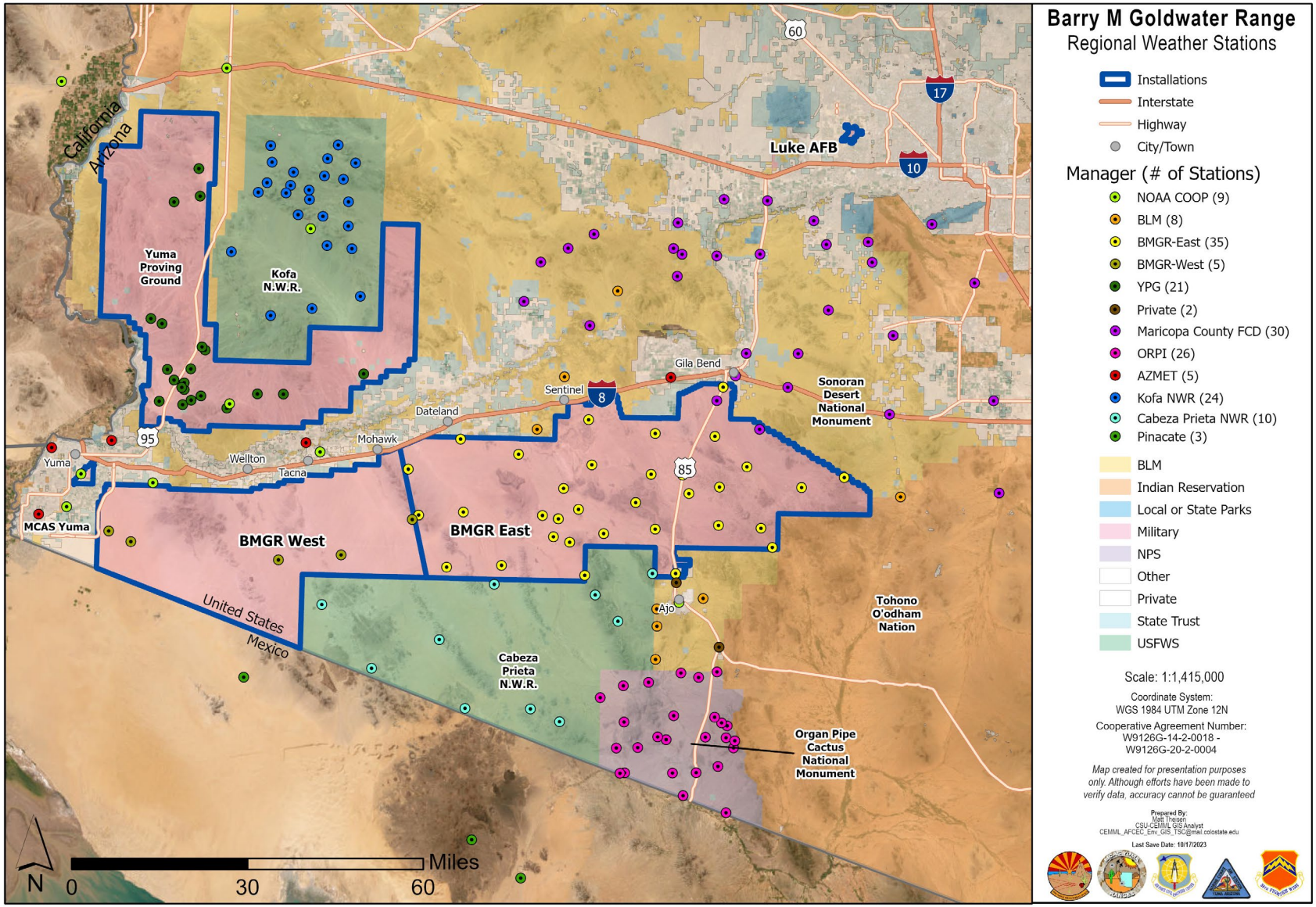


Figure 3-1. Regional weather station locations at Barry M. Goldwater Range.

3.2.2 Update

DoD, USAF, and USMC natural resources management guidance highlight the need for and importance of assessing potential impacts of climate change on natural resources on installations. Colorado State University, Center for Environmental Management of Military Lands (CEMML) conducted climate change projections for BMGR using the best science available (CEMML 2019). Climate projections for BMGR East and West were based on two future carbon emission scenarios: moderate and high emissions. The projections were based on climate model simulations developed by the Intergovernmental Panel on Climate Change (IPCC) and US National Center for Atmospheric Research and are centered around the years 2030 and 2050. These projections were compared to a reference point that was based on historical daily climate data from 1980 to 2009.

BMGR East

For the 2030 projections, both emissions scenarios project a similar increase in annual average temperature (TAVE) of between 2.1 °F and 2.5 °F over the historical average (Table 3-1). The two scenarios predict greater warming by 2050, with the moderate emission scenario projecting warming of 3.2 °F and the high emission scenario expressing a greater warming of 4.6 °F.

Annual average precipitation (PRECIP) varies between scenarios and over time due to variability in ocean–atmosphere dynamics. For 2030, the moderate emission scenario projects a large increase in PRECIP of 50%, while the high emission scenario projects an increase of 35%. For 2050, the moderate emission scenario projects a moderate increase in PRECIP (11%) while the high emission scenario shows a greater increase of 24%. Although annual precipitation is projected to increase overall, precipitation amounts in April, May, and June will remain mostly unchanged. Historically, these months receive the lowest amount of precipitation. The combination of projected increases in temperature and unchanged precipitation in these months could worsen/extend any existing drought conditions. Precipitation will likely increase during most other months, although the results vary by scenario, and may be offset ecologically by increased temperatures (CEMML 2019).

Table 3-1. Summary of climate data, Barry M. Goldwater Range East.

Variable	Historical	Moderate Emissions		High Emissions	
		2030	2050	2030	2050
PRECIP (inches)	6.2	9.3	6.9	8.4	7.7
TMIN (°F)	57.5	60.0	60.4	60.2	62.0
TMAX (°F)	87.3	89.0	90.9	89.6	92.0
TAVE (°F)	72.4	74.5	75.6	74.9	77.0
GDD	7,720	8,194	8,418	8,270	8,711

Table 3-1. Summary of climate data, Barry M. Goldwater Range East.

Variable	Historical	Moderate Emissions		High Emissions	
		2030	2050	2030	2050
HOTDAYS	132	138	150	144	155
WETDAYS	0	0	0	0	0

Notes: TAVE °F = annual average temperature; TMAX °F = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = annual average precipitation; GDD = average annual accumulated growing degree days with a base temperature of 50 °F; HOTDAYS (average # of days per year) = average number of hot days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

BMGR West

For 2030, both scenarios project a similar increase in TAVE of between 2.1 °F and 2.3 °F above the historical average (Table 3-2). For 2050, the moderate emission scenario is associated with a warming of 3.2 °F, while the high emission scenario is associated with a greater warming of 4.6 °F for this period.

For 2030, the moderate emission scenario projects a large increase in PRECIP of 61% while the high emission scenario projects an increase of 58%. For 2050, both scenarios project a moderate increase in PRECIP of 24%. Although annual precipitation is projected to increase overall, most April, May, and June precipitation amounts will remain the same. Historically, these months receive the lowest precipitation. Projected increases in temperature combined with no increases in precipitation could cause or exacerbate drought conditions by increasing moisture losses to the atmosphere. Precipitation will likely increase during most other months, although results vary by scenario (CEMML 2019).

Table 3-2. Summary of climate data, Barry M. Goldwater Range West.

Variable	Historical	Moderate Emissions		High Emissions	
		2030	2050	2030	2050
PRECIP (inches)	3.8	6.1	4.7	6.0	4.7
TMIN (°F)	56.2	58.6	58.9	58.6	60.6
TMAX (°F)	87.2	88.9	90.9	89.5	92.0
TAVE (°F)	71.7	73.8	74.9	74.0	76.3
GDD	7,533	7,984	8,220	8,038	8,527
HOTDAYS	123	131	143	136	147
WETDAYS	0	0	0	0	0

Notes: TAVE °F = annual average temperature; TMAX °F = annual average maximum temperature; TMIN °F = annual average minimum temperatures; PRECIP (inches) = annual average precipitation; GDD = average annual accumulated growing degree days with a base temperature of 50 °F; HOTDAYS (average # of days per year) = average number of hot days exceeding 90 °F; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 2 inches in a day.

3.3 Vegetation

3.3.1 Vegetation Community Mapping

Barrel cactus (Ferocactus wislizeni) in flower.

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 Sauceda 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.

In 1981, the NPS developed a vegetation map for Organ Pipe Cactus National Monument using the protocol developed by P.L. Warren and others from the UofA (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 UofA. Completed areas include BMGR West, Organ Pipe Cactus National Monument, Cabeza Prieta NWR and BLM lands in the Ajo Block, and, in 2022, BMGR East (Malusa 2003, 2010, 2022; McLaughlin et al. 2007; Osmer et al. 2009; Shepherd 2011; Whitbeck 2013; Malusa and Sundt 2015; Weston and Fehmi 2016). The maps of the surveyed areas have been compiled into a single map for all federal lands mapped within southwestern Arizona. This seamless map provides a baseline for ecosystem management decisions and helps land and resource managers understand how wildlife 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 a broad level of classification 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. 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 if locally important for management.

Detailed mapping of BMGR East was conducted by UofA in 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 the eastern San Cristobal Valley, Aguila Mountains, and Sentinel Plain (Osmer et al. 2009, Shepherd 2011, Whitbeck 2013, Weston and Fehmi 2016). Mapping of the remaining areas concluded in 2022.

Vegetation mapping (Table 3-3, Figure 3-2) for BMGR West began in 2009 and was completed in 2014 (Malusa 2010, 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 United States. Within this macrogroup there are six alliances, including creosote bush (*Larrea tridentata*), bursage (*Ambrosia deltoidea*), saltbush (*Atriplex* spp.), brittlebush (*Encelia farinosa*), watercourse, and blue paloverde (*Parkinsonia florida*). 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.

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. Table 3-3 lists and quantifies the broadly categorized vegetation associations that cover BMGR West (Malusa and Sundt 2015). Figure 3-2 depicts BMGR West vegetation communities mapped at the association level.

Table 3-3. Vegetation associations at Barry M. Goldwater Range 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 (*Agave* spp.) / White Bursage	2,864
White–Bursage - Creosote	26,403	Brittlebush - Ironwood - Blue Paloverde	2,600
Wolfberry	15,082	Arrowleaf (*Pleurocoronis pluriseta*) / Sumac (*Rhus* spp.) / Beargrass (*Nolina microcarpa*) / 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 (*Hyptis emoryi*) - Holly Leaf Bursage (*A. ilicifolia*)	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 (*A. hymenelytra*) - White Bursage	147
Creosote - Teddy Bear Cholla	9,867	Mesquite - Paloverde Bosque	19
Creosote Floodplain	6,256		

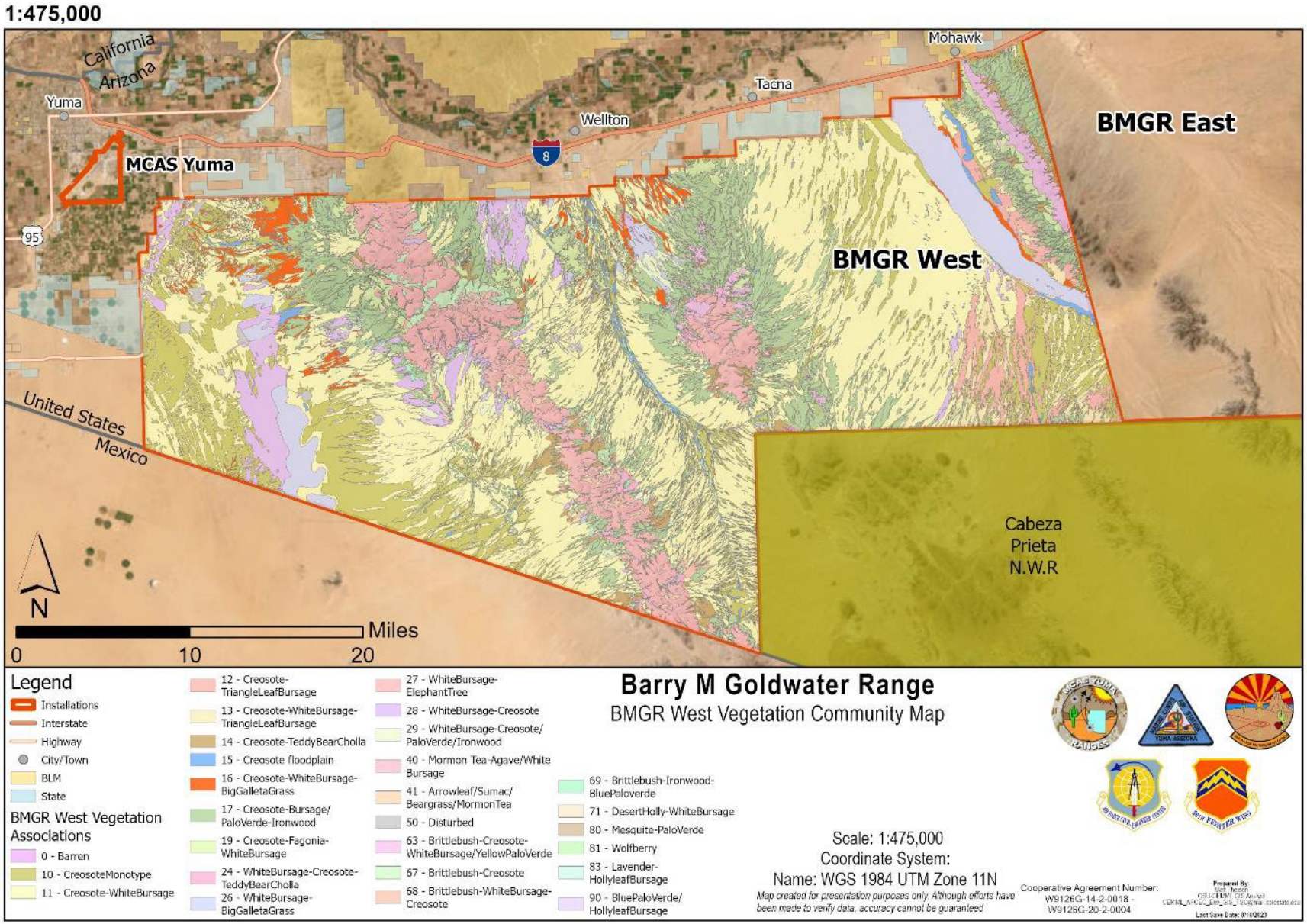


Figure 3-2. Barry M. Goldwater Range West vegetation communities.

Update

BMGR East

The final portion of BMGR East, consisting of 11,000 acres along the easternmost portion of the boundary and 90,000 acres of high sloping areas, was mapped in FY18 and FY19 with the effort finalized in 2022 (Malusa 2022). The recent additions of the Sentinel Plain and Ajo airport areas have not been mapped, but a project to map those areas is anticipated with a request for funds for this effort in FY25. A description and illustration of the completed findings are detailed in Table 3-4 and Figure 3-3.

Table 3-4. Vegetation associations at Barry M. Goldwater Range East.

Vegetation Association	Total Acres	Vegetation Association	Total Acres
Creosote - Bursage	217,757	Creosote - Brittlebrush	10,457
Creosote – Bursage - Paloverde/Ironwood	170,183	Bursage - Elephant Tree	9,830
Creosote monotype	128,692	Creosote - Mesquite	8,251
Brittlebush – Creosote - Yellow Paloverde	115,539	Creosote - Teddy Bear Cholla	7,082
Creosote - Triangle Leaf Bursage	102,230	Bursage - Jojoba	4,915
Creosote floodplain	70,023	Barren	2,016
Creosote - White Bursage	64,063	Mormon Tea - Wolfberry	1,811
Bursage/Paloverde – Ironwood - Creosote	47,105	Bursage - Big Galleta Grass	1,114
Creosote - White Bursage - Big Galleta Grass	28,777	White Bursage - Creosote	934
Bursage/Paloverde/Creosote - Teddy Bear Cholla	18,439	Mesquite - Wolfberry	830
Wolfberry watercourse	17,324	Wolfberry - Lavender	741
Disturbed	17,010	White Bursage - Creosote/Paloverde/Ironwood	269
Saltbush - Creosote	13,731	Brittlebush - Paloverde	128

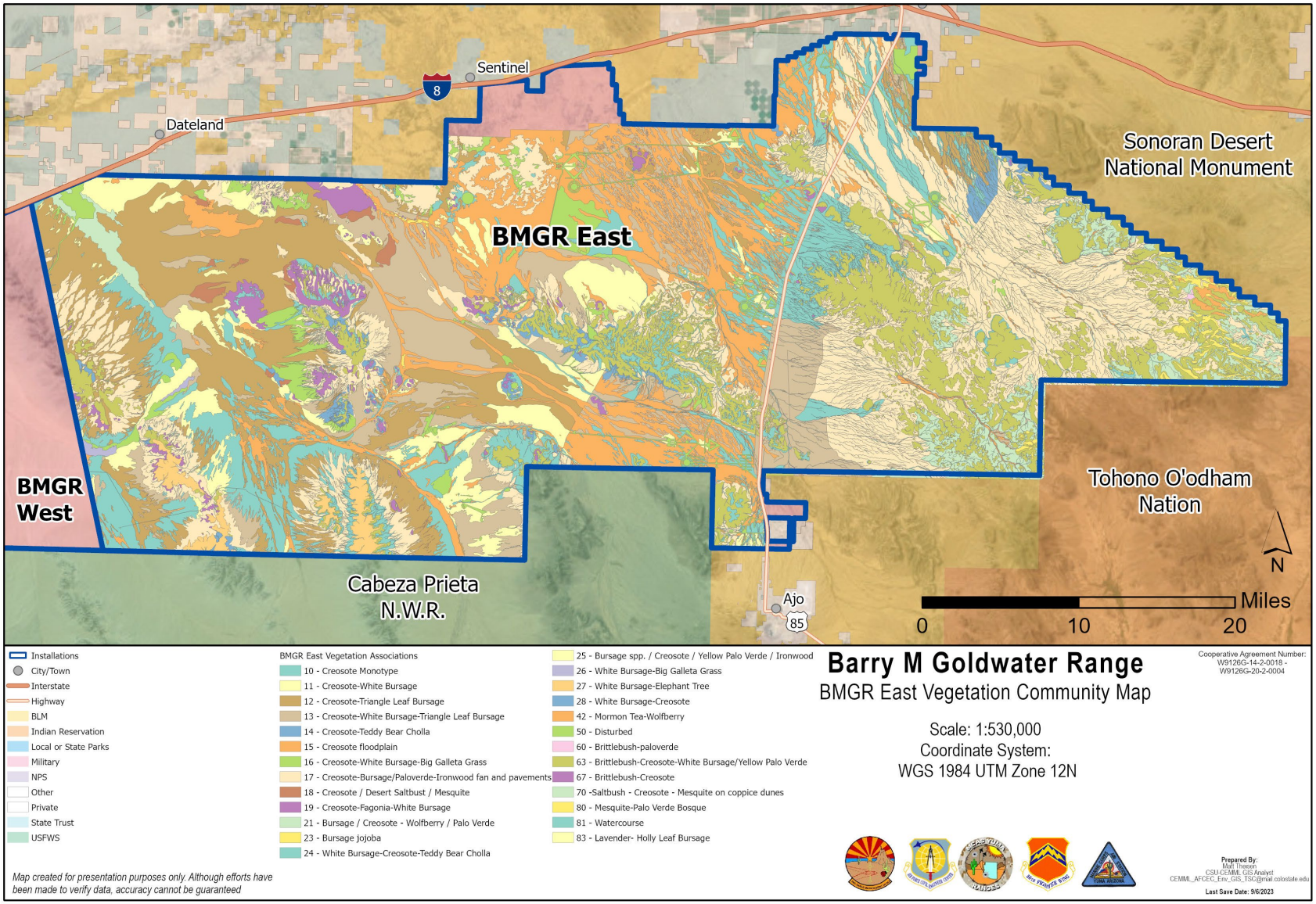


Figure 3-3. Barry M. Goldwater Range East vegetation communities.

Future Vegetation Cover

Future climate conditions are likely to expose BMGR vegetation to increased average air temperatures, changes in precipitation, decreased soil moisture during dry periods, more extreme high temperature events, and increased wildfire frequency and intensity over the coming century. Although predictions of monsoon activity in North America are highly uncertain (Bukovsky et al. 2013), more frequent and/or intense tropical storms could alter desert stream geomorphology and riparian vegetation communities, particularly in dry washes or floodplains. Some habitat features (e.g., mesquite bosques) will likely benefit from the overall annual increases in precipitation due to seasonal rainfall, but the variable rainfall and increased potential for drought and erosion may outweigh the benefits (CEMML 2019).

Desert vegetation is expected to shift westward and upward in elevation over the coming century (Barrows 2011, Barrows and Murphy-Mariscal 2012) and, in some areas, may replace upslope vegetation that is less suited to the increasingly hot and seasonally dry conditions. This could result in a decrease of the higher-elevation vegetation types at BMGR (Lenihan et al. 2008, Friggens et al. 2013).

To track and understand trends in upland vegetation, BMGR East has conducted vegetation monitoring at 30 plots across the range since 2019. Botanists visit six of the plots in a rotating panel design such that each plot is visited once every 5 years. The methodology for this effort follows the terrestrial vegetation and soils monitoring protocol and standard operating procedures established by the Sonoran and Chihuahuan Desert Network (Hubbard et al. 2012). The study evaluates vegetation and soil characteristics including vegetation composition, soil bulk density, soil crust frequency, and soil stability. This project should be expanded to include additional vegetation types such as xero-riparian associations (which may require a different protocol than that used for uplands). To tie vegetation information to microclimate characteristics and begin to understand trends in the effects of climate change on vegetation, new plots should be paired with weather stations and analyzed in concert with weather data such as temperature and precipitation. Establishing these monitoring studies early on will provide valuable baseline information about changes in vegetation.

3.3.2 Invasive Plants

Exotic, invasive, or noxious plants are generally characterized by their ability to easily colonize disturbed areas. They can have specialized dispersal mechanisms that allow them to quickly become the dominant vegetation in an area, thus altering native vegetation communities. Roads, trespass 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*)
- Lehmann lovegrass (*Eragrostis lehmanniana*)
- Salt cedar (*Tamarix ramosissima*)
- Athel tamarisk (*Tamarix aphylla*)
- Russian thistle (*Salsola tragus*)
- Red brome (*Bromus rubens*)
- Stinknet (*Oncosiphon piluliferum*)

Several studies and mapping efforts have been undertaken since the 2012 INRMP revision to better understand the distribution, density, and life history of invasive species at BMGR (e.g., Li and Malusa 2014, Damery-Weston 2016). In particular, the Cloud Mapping Effort started on BMGR West has matured into a critical tool for invasive species early detection and mapping efforts on BMGR East and West. CLEOs, contractors, 56 RMO personnel, and MCAS Yuma personnel can use the mobile application associated with the Cloud Mapping Effort to record observations of Sahara mustard, buffelgrass, fountain grass, stinknet, and colocynth gourd. Once uploaded, observations are available online, providing a dynamic and near real-time capacity to monitor infestations.

Invasive plant control work at BMGR East and West is a critical part of managing the landscape for military mission sustainment and to meet Air Force and Marine Corps obligations to endangered species management. Control work, consisting of hand pulling, herbicide application, and mechanical control, is conducted on BMGR East by 56 RMO staff, AZGFD, and in coordination with Arizona Department of Transportation (ADOT), which controls invasive plants by request on their right-of-way along SR 85. On BMGR West, MCAS Yuma staff and a contractor treat invasive species with hand pulling and herbicide application.

BMGR East

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 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 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 2 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 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 (*Antilocapra americana sonoriensis*) habitat.

BMGR West

The MCAS Yuma RMD, in cooperation with the 56 RMO, partnered with researchers from UofA to characterize and model Sahara mustard invasion throughout BMGR (Li and Malusa 2014, Li 2016). 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 and UofA. It entails using the Geographic Information System (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. 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 and audio, and to take specific notes for each point. Once completed, these points are automatically uploaded to an online map, making the data immediately available to UofA staff, MCAS Yuma, and invasive plant control contractors. 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, UofA 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. UofA staff also perform before and after surveys of treatment areas, generate reports detailing the success or failure of each treatment effort, and analyze 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 UofA 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).

Upon receipt of data from the GIS Cloud app and treatment recommendations from UofA staff, contractors determine and implement 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 explicit contractor protocols and regulations. In addition, the contractor purchases, stores, and delivers herbicides to project sites and observes all herbicide label requirements and guidance for each of the planned treatment options. The contractor 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 contractor 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 Global Positioning System [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. Since the GIS Cloud app monitoring and treatment program began in 2015, there have been treatments for five invasive species, including Sahara mustard, buffelgrass, salt cedar, Athel tamarisk, and fountain grass.

An important outcome of this program is enhanced knowledge on the occurrence and abundance of invasive plants, especially Sahara mustard. Because BMGR West is 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 (e.g., BLM, Bureau of Reclamation).

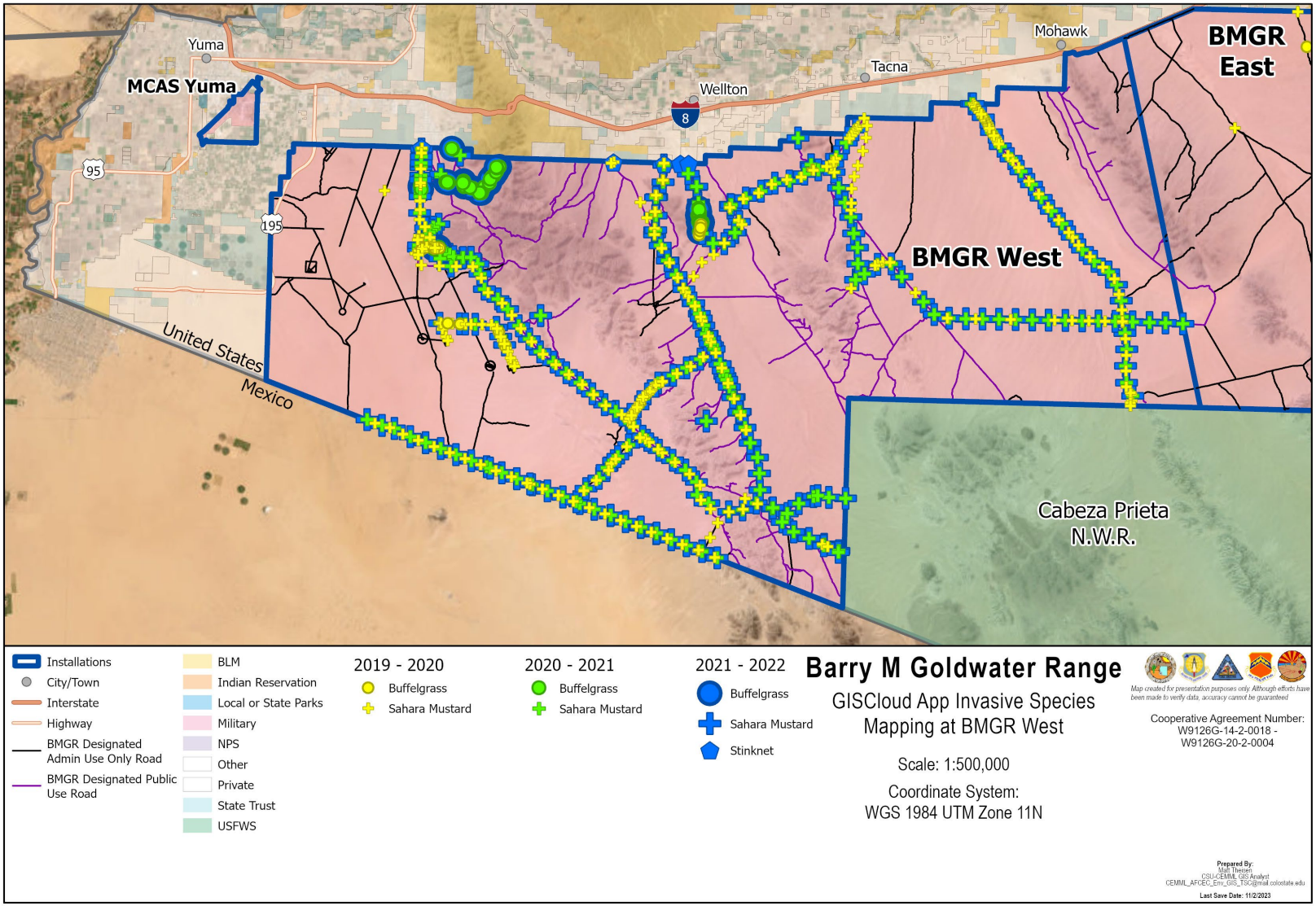


Figure 3-4. Mapping invasive species with the GIS Cloud App at Barry M. Goldwater Range West

Update

Staff from the 56 RMO at BMGR East have also used the Cloud Mapping app since 2018 to document and track invasive species infestations (Figure 3-5). The success of the program regionally has prompted staff at the Cabeza Prieta NWR to adopt the GIS Cloud app to monitor and treat Sahara mustard and buffelgrass on the Refuge, and staff from the El Pinacate Preserve in Mexico have expressed interest in initiating a similar monitoring program. It is desirable to establish an interagency program that can sufficiently standardize the use of the GIS Cloud app across agencies and coordinate treatment efforts among agencies to target source populations that infest areas across jurisdictional boundaries.

Since 2018, BMGR West monitoring efforts surveyed 3,099.26 acres and found that 193.22 acres were infested with invasive species. Control efforts during this period treated 2,741.42 gross acres and with a net acreage of 193.12. Table 3-5 provides detail on the time, species, and acreage of monitoring and control efforts, and Figure 3-4 depicts the results of Cloud app mapping on BMGR West.

Table 3-5. Invasive Plant Control Results at Barry M. Goldwater Range West, 2018 - 2022.

Year	Season and Species	Total Surveyed Acres[a]	Net Infested Acres	Acres Treated	
				Gross	Net
2018	Spring, Sahara mustard	22.37	0.23	22.11	0.23
	Fall/Winter, Sahara mustard	169.98	13.65	169.98	13.65
	Spring, Buffelgrass	22.37	0.16	0.26	0.16
	Fall/Winter, Buffelgrass	14.69	1.03	14.16	1.03
2019	Spring, Sahara mustard	613.00	71.26	613.00	71.26
	Spring, Buffelgrass	1.18	0.07	1.18	0.07
	Spring, Saltcedar	0.01	<0.01	0.01	<0.01
	Spring, Buffelgrass	12.01	0.06	0.17	0.03
2020	Spring, Sahara mustard	2,240.90	104.00	1,917.50	103.90
	Spring, Buffelgrass	2,240.90	0.04	0.30	0.04
2021	No invasive plant control conducted due to drought.				
2022	Spring, Buffelgrass	2.75	2.75	2.75	2.75

[a] Acreage definitions: **Surveyed Area**: Any area covered during the course of weed management / control activities. An area may be considered "surveyed" regardless of the presence / absence of target weed species. Surveyed area is obtained by walking the perimeter or taking perimeter points with a GPS unit, or by digitizing area on a screen using landform references.

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

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

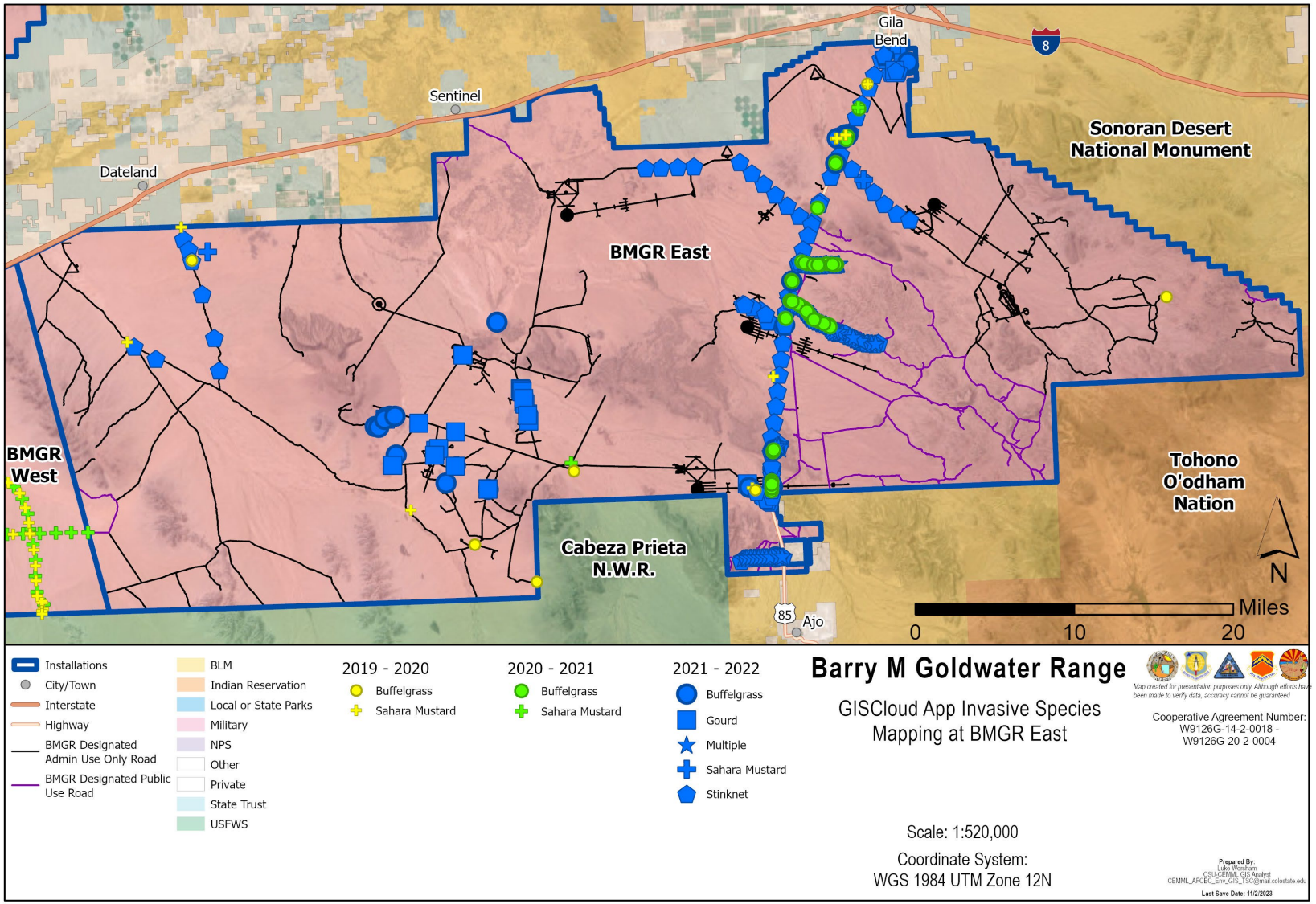


Figure 3-5. GIS Cloud App invasive species mapping effort at Barry M. Goldwater Range East, effort includes instances of no invasive species found.

Bufflegrass

Buffelgrass, a fire-tolerant perennial, has expanded noticeably along the SR 85 corridor in BMGR East. 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). AZGFD and ADOT treated buffelgrass along SR 85 in 2021.

BMGR West treated buffelgrass annually from 2018 through 2022 except for 2021, which was too dry to produce buffelgrass and no treatments were needed (Lake Mead EPMT 2021). Over that period, the area treated for buffelgrass has declined to just 0.04 net acres, indicating successful treatment, but also an urgent need for ongoing efforts to maintain control.

Sahara Mustard

Sahara mustard is a cool-season, winter annual herb that flowers early in the year (December to February) with small, dull-yellow flowers that are inconspicuous compared to most other true mustards (Bossard et al. 2000). A single large plant can produce up to 16,000 seeds. Dried plants tend to break off near the soil surface and then tumble across the landscape like Russian thistle, spreading seeds along the way.

Given the species' affinity for sandy soils and its life history, Sahara mustard continues as the most prevalent invasive species at BMGR. The spread of this species is a greater concern at BMGR West because the soils there are generally sandier. Habitat type, species competition, and other biotic and abiotic factors are likely to have a substantial influence on the spread of this species. Sahara mustard tends to produce a dense, highly flammable, monoculture ground cover. As such, it can reduce native plant diversity and increase fire risks. Given that Sonoran Desert plant communities are not fire-adapted, greater frequencies of wildfire have potentially devastating results.

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

BMGR West conducted control efforts annually from 2018 through 2022 except for 2021, which was too dry to produce Sahara mustard and no treatments were conducted (Table 3-5). Over that time

period, the area surveyed and the acres treated have both increased, indicating that this species should continue to be a priority for treatment across BMGR (Lake Mead EPMT 2021).

Stinknet

Stinknet occurs in large, dense infestations on Luke AFB in the EOD facility, at the 56 RMO office, and at various other improved, semi-improved, and unimproved sites around the range (CEMML 2022*b*). This poses a risk to BMGR East, as traffic between the EOD Facility and 56 RMO office in particular could spread propagules throughout the entire range.

Stinknet was found at three locations on BMGR East in 2021, and these locations were treated with a preemergent herbicide that same year. Over the 2021 to 2022 winter season, stinknet was found at the Gila Bend AFAF, in scattered spots along Interstate 8, and on several side roads off SR 85 leading into BMGR East ranges. In BMGR West, infestations are concentrated on the north side along Interstate 8 and the northern boundary of the range (GIS Cloud Portal 2023).

AZGFD treated stinknet along SR 85 at milepost 32, along Range 1 Road, and at the Gila Bend AFAF in 2021 with a preemergent herbicide. Some sites still had stinknet during follow-up visits, but overall the treatments were deemed effective. Treatments along Range 1 Road were preceded by informal Section 7 consultation with USFWS to ensure no effect to Sonoran pronghorn (Scobie et al. 2022*a*). BMGR East is primarily concerned with stinknet treatments at Gila Bend AFAF, Range 1 Road, the SR 85 CBP checkpoint, and small patches along SR 85.

Colocynth

A small population of colocynth, or desert gourd, was found in 2017 adjacent to the Range 1 access road close to an active archeological excavation. 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.

In June 2019, about 60 plants were found growing along the Range 1 access road and smaller numbers were found in NTAC and STAC. This discovery was followed up by hand-removal of mature fruits and herbicide treatment of growing plants in early July 2019. In spring 2021 through January 2022, AZGFD personnel surveyed NTAC, STAC, and Range 1 Road, and treated gourds in all three areas. AZGFD recommended ongoing surveys and removal with either hand pulling or chemical treatment. Surveys are particularly needed along roads connected to infestations prior to any grading maintenance, as this can bury and spread the seeds (Scobie et al. 2022*a*).

Colocynth thrives in hyper-arid desert landscapes (left). Colocynth flower (middle) and colocynth fruit (right). Photos courtesy of Qatar Natural History Group.

Salt Cedar

Salt cedar control near Stoval Airfield on BMGR East in 2020 was successful, with surveys in 2021 detecting no regrowth and only one small additional plant (Scobie 2022*a*). Salt cedar control on BMGR West was conducted in 2019 in a 0.0029-acre area (Lake Mead EPMT 2021). Follow-up treatments were not required in 2020, but infestations should be monitored annually and surveys for new infestations should be conducted along with other invasive plant surveys and in high-risk areas, such as seasonally wet sites and roadsides.

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 species, such as saguaro cactus (*Carnegiea gigantea*), organ pipe cactus (*Stenocereus thurberi*), blue paloverde, ocotillo (*Fouquieria splendens*), and creosote bush, are very susceptible to fire and may take decades to reestablish.

The expansion of nonnative, 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 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 leads to increased fire activity, which in turn favors increased abundance for those same invasive species and subsequently more frequent and larger fires. The end result of this potential scenario is an altered 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.

3.4.1 Update

BMGR East

Since 2006, there have been 380 fires at different locations at BMGR East, ranging in size from a few square yards to several hundred acres, with 135 of those fires occurring since 2019 (Table 3-6). 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 locations with the most fires include NTAC, STAC, ETAC, and Range 3, likely explained by their training purpose. The tactical ranges support training in gunnery, bomb, rocket, and missile deployment for aircrews while Range 3 is a helicopter gunnery range. Of the fires reported since 2006, 321 of the 385 fires (83%) were started by military training and a small number started from unauthorized campfires (Table 3-7).

Table 3-6. Location of Fires on Barry M. Goldwater Range East.

	NTAC	STAC	ETAC	RANGE 1	RANGE 2	RANGE 3	RANGE 4	AIR TO AIR	OTHER	TOTAL
2006	3	5	5	5	1	0	1	2	1	**23**
2007	3	0	9	1	1	2	1	0	2	**19**
2008	2	0	6	0	0	0	0	0	1	**9**
2009	1	1	9	1	2	1	0	0	0	**15**
2010	0	5	14	2	0	7	2	0	1	**31**
2011	3	2	3	1	0	2	2	0	0	**13**
2012	0	1	15	1	1	5	1	0	1	**25**
2013	1	2	8	3	1	7	1	0	1	**24**
2014	6	7	6	2	1	5	3	0	0	**30**
2015	3	2	3	5	2	3	2	0	1	**21**
2016	1	1	4	4	2	3	0	0	1	**16**
2017	3	3	0	0	0	3	0	0	0	**9**
2018	0	0	5	0	1	2	1	0	1	**10**
2019	3	1	11	2	5	10	4	0	1	**37**
2020	4	8	9	0	3	10	0	0	2	**36**
2021	6	1	6	0	0	2	1	0	0	**12**
2022	2	0	5	0	1	5	0	0	0	**13**
2023	6	3	15	1	1	9	1	1	0	**37**
Total	**47**	**42**	**133**	**28**	**22**	**76**	**20**	**3**	**13**	**380**

Table 3-7. Fires by Seasonality and Ignition Type at Barry M. Goldwater Range East from 2016 to 2023.

Month	Military Training	UDA Campfire	Vehicle	Lightning	Unknown	Total
January	17	2	0	0	1	**20**
February	14	0	0	0	1	**15**
March	20	1	1	0	1	**23**
April	41	5	2	0	1	**49**
May	84	12	0	0	3	**99**
June	53	11	0	1	2	**67**
July	26	3	0	0	1	**30**
August	11	3	0	1	1	**16**
September	17	2	0	0	0	**19**
October	11	1	0	0	0	**12**
November	12	2	1	0	0	**15**
December	10	4	0	0	1	**15**
Total	**316**	**46**	**4**	**2**	**12**	**380**

The 56 RMO finalized the BMGR East Wildland Fire Management Plan (WFMP) in 2021. The plan defines roles and responsibilities and provides guidance for the offices, departments, and agencies involved. It also describes pre-fire suppression and suppression actions to be taken on a strategic and tactical basis (56 RMO 2014). The document serves as the guiding plan for wildfire response protocols.

As part of this WFMP development process, the 56 RMO also signed an MOU with the BLM for fire suppression assistance on BMGR East (DOI and USAF 2020). The purpose of the MOU is to clarify existing policies for response to wildland fires at BMGR East, to establish procedures and guidelines for cooperation between the parties to ensure BLM response, and to provide BLM assistance with wildland fire emergencies occurring on those lands. Through interagency cooperation and partnership for the management of BMGR East, the parties agree there is mutual interest in a cooperative response to wildland fires that may affect lands within and outside BMGR East boundaries.

The Air Force Wildland Fire Center has initiated the Wildland Fire Regional Support Program. This national program provides wildland fire support at USAF installations through regional Wildland Support Modules that include capacity for prescribed burning, mechanical fuels reduction activities for ecosystem management, and mitigation of wildfire as a threat to the ecosystem, mission activities, and military readiness. The Wildland Support Module teams possess the qualifications to supplement and support on-installation wildfire suppression activity if requested and available.

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 implements a WFMP. A WFMP was developed in 2018 that defines roles and responsibilities for offices, departments, and agencies involved in pre-wildfire suppression activities, and it provides guidance for firefighters, public safety officials, and the RMD to maximize military training operations prior to and during a wildland fire event. In 2019, after completion of the WFMP, the MCAS Yuma RMD developed a Memorandum of Agreement (MOA) with the BLM for fire suppression assistance at BMGR West. This MOA had the purpose of establishing a framework to suppress wildfires occurring on or adjacent to BMGR West, and the MOA outlined the responsibilities of both parties.

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 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 that found at BMGR and Cabeza Prieta NWR combined today. These populations are 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.
- Surface-drainage patterns generally isolate the range and its surrounding area hydrologically, thus protecting it from upstream water-borne pollutants, sedimentation, and watershed modification.

Ringtail and kit fox live in rocky habitat and sandy burrows throughout the Barry M. Goldwater Range.

Threats to wildlife on the range include trespass livestock, increased vulnerability to wildfires, illegal cross-border traffic, and road dragging. The impacts from these threats include increased competition for limited resources, degraded habitats, and increased disturbance.

AZGFD 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 preempted by federal law. AZGFD began wildlife management activities at BMGR in the late 1950s to establish wildlife waters and continues their upkeep today. AZGFD also has involvement with many aspects of BMGR's wildlife program. For example, it continues to organize and conduct bighorn sheep (*Ovis canadensis*) and mule deer (*Odocoileus hemionus*) surveys at BMGR every 3 years, annual call-counts of mourning (*Zenaida macroura*) and white-winged doves (*Z. asiatica*) at Range 3 and ETAC, and LeConte's thrasher (*Toxostoma lecontei*) surveys at BMGR East and West. AZGFD also performs annual surveys for the flat-tailed horned lizard (FTHL; *Phrynosoma mcallii*) and speckled rattlesnake (*Crotalus mitchellii*).

AZGFD conducts surveys for many species at BMGR, including flat-tailed horned lizard (left), LeConte's thrasher (middle), and bighorn sheep (right).

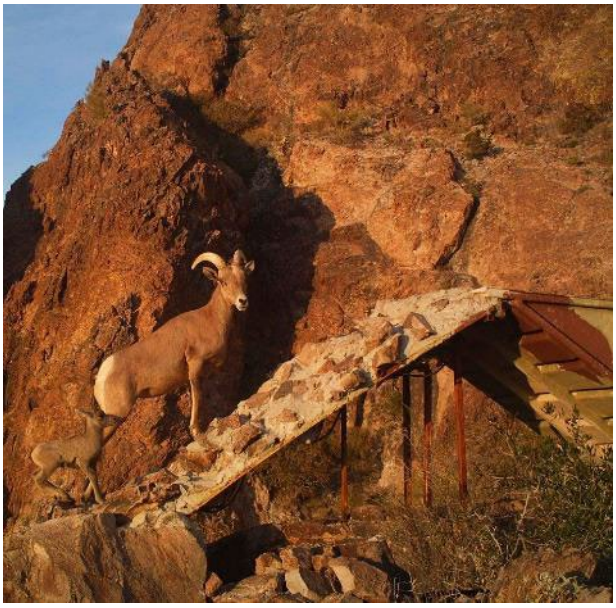
3.5.1 Update

BMGR East

In 2015 the U.S. Army Corps of Engineers Omaha District and AZGFD entered into a 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 and Arizona Game and Fish Department 2015). The agreement facilitates AZGFD 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 AZGFD and other partners include complying with the Sonoran pronghorn Recovery Plan and conducting other wildlife activities during the FY 2024–2028 timeframe. This includes annual surveys for the endangered Sonoran pronghorn and acuña cactus (*Echinomastus erectocentrus* var. *acunensis*), plus other species including flat-tailed horned lizard, mourning dove, white-winged dove, and LeConte's thrasher. Long-term monitoring plots are surveyed every 3 years for Sonoran Desert tortoises (*Gopherus morafkai*). On a 3-year basis, the AZGFD surveys for bighorn sheep within BMGR East typically near the Sand Tank Mountains, Suaceda Mountains, Sikort Mountains, and Coffeepot Mountains, all of which fall under AZGFD game management unit 40A. Aerial bighorn sheep surveys are also conducted on BMGR West on a 3-year basis within the Gila, Tinajas Altas, Copper, and Mohawk mountain areas.

AZGFD may also conduct capture and collar operations, which include collecting blood samples, nasal swabs, collaring, and ear tagging. Blood samples are used to determine the strain type and disease profiles in bighorn sheep for future management needs such as translocations or population augmentations. Aerial surveys inform management actions and hunting permits for the species within the game management unit. Additionally, the AZGFD conducts biennial deer surveys that focus on the flats in Sauceda valley and other valleys in game management unit 40A. Surveys for other species, such as bats, golden eagles (*Aquila chrysaetos*), doves, and LeConte's thrasher are conducted if funding is available.



Camera trap image of bighorn sheep with lamb at a wildlife water

Sonoran Desert toad (*Incilius alvarius*) is a large toad that lives in desert ecosystems across the southwestern United States and northern Mexico. This is a large and relatively long-lived species; however, evidence of breeding has been scarce, possibly because of its tadpoles' similarity to red spotted toad (*Anaxyrus punctatus*). Adults have been documented on BMGR East and they are common in the town of Ajo. In order to improve knowledge of the species beyond occasional detection by audio loggers, genetic testing of tadpoles could be used to determine species, elucidate population connectivity, and clarify the role of these desert waters as stepping-stones among populations. BMGR East may consider supporting such genetic testing if warranted and not in conflict with the military mission.

Red-spotted toad in wetland.

In-house staff and partners will continue the effort to control invasive species to improve 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 5 years can be found in Table 9-1. Sensitive species monitoring and conservation projects are discussed in detail in Section 3.7, *Protected Species and Species of Concern*.

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 at BMGR West concluded in 2018. This project accomplished 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. Amphibians and reptiles were surveyed through several methods including visual encounters, drift fences with pitfall and funnel traps, cover board arrays, and automated recording devices for anuran (frogs, toads, and tree frogs) calls. Small mammal surveys involved setting trapping grids of Sherman traps and tomahawk traps. These surveys resulted in the documentation of 24 species of small mammals, four species of amphibians, and 36 species of reptiles. The AZGFD concluded that the populations of these species are relatively intact and protected from development and that their persistence is compatible with, and complementary to, the military mission at BMGR West (O'Donnell et al. 2020).

Beginning in 2020, the AZGFD began conducting a 3-year inventory of birds on BMGR West. The purpose of this project was to establish a baseline understanding of bird diversity on the range to inform future monitoring efforts and natural resources stewardship. These surveys targeted four

different bird groups: (1) all diurnal species, (2) diurnal raptors, (3) owls, and (4) nightjars. Surveys were conducted using point count transects and driving transects. Surveys documented 111 species of birds: 43 species found to be breeding on the range and 68 migratory species. Of these documented species, 34 are considered Species of Greatest Conservation Need (SGCN) by AZGFD. These study results only documented a small fraction of the 393 species known to occur within Yuma County, likely due to a lack of wetland habitat on BMGR West and poor weather conditions in 2020 and 2021. Only two invasive species, European starling (*Sturnus vulgaris*) and Eurasian collared-dove (*Streptopelia decaocto*), were observed on the installation and in low abundance, suggesting that invasive bird species are not a significant threat to native species on the range (O'Donnell et al. 2022).

BMGR West anticipates that a multi-year bat inventory will be awarded and initiated by the end of FY23. Additional wildlife surveys and habitat improvement projects planned for the next 5 years can be found in Table 9-2. Sensitive species monitoring and habitat enhancement projects are discussed in detail in Section 3.7, *Protected Species and Species of Concern*.

Climate Impacts on Fish and Wildlife

Wildlife populations on BMGR could be impacted by several climate change–related factors. Climate change will likely favor newly arriving species, particularly generalist species whose ranges are expanding. These species may outcompete native species already experiencing reduced fitness due to other environmental changes (Hellmann et al. 2008) such as hotter temperatures, longer periods of drought, increased winter precipitation, and more frequent flooding. While the trend toward greater invasive species presence is global, it is expected to be far more pronounced in the Southwest, where many animals are already at their physiological limit in the desert climate (Archer et al. 2008).

Water scarcity is already an issue for wildlife populations at the range, and this scarcity is likely to persist. Although models project increased precipitation, much of that will fall in the winter during brief and increasingly intense storms. Increases in winter storms have the potential to fill artificial wildlife catchment systems and natural *tinajas*. The increased storage may help water resources last into the spring and early summer dry period, particularly if protected from evaporation.

Greater frequency and intensity of wildfires resulting from a combination of temperature extremes and drought conditions, combined with changes in vegetation type and distribution (such as increasing nonnative grassland), will likely lead to habitat degradation, increased erosion, and higher runoff rates. Although desert wildlife communities are highly adapted to hot, arid conditions, some species may not be able to cope with increases in temperature and evapotranspiration, and with potential resultant reductions in water supplies (Archer et al. 2008). Generalist species will likely be better able to acclimate to rising temperatures through behavioral adaptations. For example, the Gila monster (*Heloderma suspectum*) becomes nocturnal on hot days but remains diurnal on cooler days (Stahlschmidt et al. 2011).

Increasing temperatures could impair water quality in water systems without outflows to an external body of water such as a river or ocean, and the hydrologic system could lose more water through evaporation or seepage into the ground. As water temperatures rise, dissolved oxygen content will decrease, decreasing habitat quality particularly for larval amphibians. Increasing water

temperature will also raise the chances of algal blooms, further depleting dissolved oxygen content and habitat quality (Paerl et al. 2011).

A study conducted southeast of BMGR indicated that the density of woody shrubs has increased three-fold from the 1970s to the late 1990s in parts of the Sonoran Desert due to higher winter precipitation (Brown et al. 1997). This trend is likely to continue based on the projected increasing precipitation totals from climate models, assuming that the precipitation regime does not instead favor annual grasses to the extent that fire is introduced as a regular disturbance, resulting in a grassland ecosystem instead. Changing vegetation communities will likely have a negative impact on species that depend on specific native plants for their survival (Dukes and Mooney 1999).

Other wildlife species may change in a less predictable manner. For example, the common chuckwalla (*Sauromalus ater*)—which is currently abundant in the region—is predicted to lose 92% of its habitat in the Sonoran Desert of California (Barrows 2011). Kangaroo rat (*Dipodomys deserti*) and silky pocket mouse (*Perognathus flavus*) populations have already declined significantly because of vegetation changes induced by climate change. On the other hand, rare species such as the desert pocket mouse (*Chaetodipus penicilatus*) and Bailey's pocket mouse (*Chaetodipus baileyii*) have responded positively to changing vegetation (Brown et al. 1997). As such, managers should take an ecosystem-based approach to prepare for a broad range of changes in wildlife populations due to the changing conditions.

3.6 Wildlife Waters

Barry M. Goldwater Range East staff construct a wildlife water in 2013.

Surface water availability is highly limited at BMGR during most times of the year, which led AZGFD to develop wildlife watering sites in the late 1950s. *Playas*, *tinajas*, and other natural water resources, which are important to migratory birds and other wildlife, were often modified to extend the availability of water into drier seasons. AZGFD has constructed catchments at locations across BMGR to collect and store rainfall. Currently, over 40 wildlife watering sites are maintained across the range through a partnership between the 56 RMO, MCAS Yuma RMD, and AZGFD. During periods of extreme drought, AZGFD will refill these water sources routinely by hauling in tens of thousands of gallons of water, by vehicle and helicopter, to support wildlife. These sites are also being used and affected by illegal immigration and trafficking across the range. In some cases, damage occurred multiple times at the same system immediately following repairs, ultimately leaving the system inoperable, unrepairable, and in need of complete replacement. The volume of human use of

some systems documented via camera monitoring has raised concerns about disrupting wildlife use during critical periods of drought.

Camera traps capture images of UDAs using wildlife waters.

3.6.1 Update

BMGR East

Example of a wildlife water.

Texas Tech researchers conducting amphibian research at BMGR detected elevated levels of ammonium 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 (*Bd*; *Batrachochytrium dendrobatidis*). In addition to further inquiries about *Bd*, the Texas Tech University researchers also posed questions about ranavirus; specifically if it is present, and if so does ranavirus infection in amphibians differ spatially, temporally, and in conjunction with *Bd*. BMGR East may continue to support this amphibian research if warranted and not in conflict with the military mission.

Results of the water-quality analyses have varied over 4 years of sampling beginning in 2013. 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 concentrations measured at one wildlife water 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. 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).

Report findings of the ongoing Texas Tech surveys for 2019, 2020, and 2021 suggest that precipitation drives water quality even when water supplies are supplemented by AZGFD. During dry periods, biogeochemical reactions in drinking water troughs and access points create feedbacks that worsen water quality. In lower-precipitation years, water quality suffers in most catchments and *tinajas*, but temporary water supplies provided for Sonoran pronghorn maintain higher water quality, particularly during the dry summer months (Griffis-Kyle et al. 2020, 2021, 2022).

Even small precipitation inputs improved water quality at natural sites to above EPA standards, particularly during sampling in June through September 2020 (Griffis-Kyle et al. 2020). In 2019, researchers installed aerators to reduce ammonia concentrations as high nitrite levels are harmful to mammals, which is a concern for conservation efforts for the Sonoran pronghorn. Sampling results suggest that aerators are successful at reducing excess ammonia but can break without continued maintenance (Griffis-Kyle et al. 2020, 2021, 2022). One consideration to resolve this issue is to use windmills to aerate the water. The chytrid fungus was found at several sites in the Sauceda Mountains and the Sand Tank Mountains but was only found at one site in 2021, possibly due to a wetter start to the monsoon season (Griffis-Kyle et al. 2022). Additional monitoring is needed to provide insight into how the disease is impacting amphibians on BMGR and how prevalence of the disease is affected by variables in the physical environment.

A concern among tribal cultural experts and archaeologists is 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 AZGFD 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 5-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 AZGFD's annual maintenance of all existing water developments and redevelopments, as required.

BMGR West

Over the next 5-year period covered by this INRMP, BMGR West will continue to work with AZGFD to monitor and maintain the existing wildlife waters network. BMGR West is also working with AZGFD to redevelop previously existing tanks at Dripping Springs and Sheep Mountain.

3.7 Protected Species and Species of Concern

Several pieces of legislation regulate the listing criteria for special status species and dictate the responsibilities of federal landholders. The acts described below are the primary drivers for actions relating to threatened and endangered (T&E) species and Arizona SGCN in the INRMP.

Bat acoustic monitoring devices provide continual monitoring of bats with minimal disturbance.

The most prominent piece of legislation affecting installation natural resources is the Endangered Species Act (ESA), enacted in 1973. This act requires that all federal agencies implement protection programs for designated species or critical habitat and use their authorities to further the purposes of the Act. Federal agencies, in consultation with the USFWS, must ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. However, most DoD properties can be exempted from critical habitat designation if the INRMP benefits the species for which critical habitat is proposed. Further, the act prohibits any action that causes a "taking" of any listed species of endangered fish or wildlife. To comply with the ESA, the USAF and USMC are required under their respective regulations, Air Force Manual (AFMAN) 32-7003 and Marine Corps Order (MCO) 5090.2, to inventory their lands for federally listed T&E species and, if present, provide an overall ecosystem management approach for the protection and management of the species. Although not required, when practical, a similar approach is used for listed federal candidate species and state-listed species.

The Bald and Golden Eagle Protection Act (BGEPA) prohibits any person or agency, without a permit issued by the Secretary of the Interior, from "taking" bald or golden eagles, including their parts, nests, or eggs. If these species are present on the installation, potential impacts of construction projects, training events, or other actions should be assessed. Consultation with the USFWS may be necessary to reduce or eliminate impacts on the species.

The Migratory Bird Treaty Act (MBTA) is intended to ensure the sustainability of all protected migratory species by prohibiting their take without prior authorization by the Department of the Interior (16 U.S.C. 703-712). The MBTA is a federal statute that implements four treaties with 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 (50 Code of Federal Regulations [CFR] 10.13). The MTBA prohibits the taking, killing, or possessing of migratory birds unless allowed by regulation or permit. In 2003, the National Defense Authorization Act directed the Secretary of the Interior to exempt the Armed Forces from incidental take during military readiness activities authorized by the Secretary of Defense. Effective 30 March 2007, the USFWS issued a Final Rule authorizing such take, provided it does not have a significant adverse effect on a species' population (USFWS 2007).

Further, Executive Order No. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, provides guidelines for federal agencies to protect migratory birds. This EO requires federal agencies that are taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding with the USFWS. Accordingly, the 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 the 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.

The Arizona Wildlife Conservation Strategy (AWCS) is the state's primary wildlife management guidance and includes a 10-year strategic plan from 2022 through 2032. The AWCS consists of two key components, a habitat-based conservation plan that is data driven and a web-based data management system that provides tools to support conservation planning and inform land use decisions. Using these components, the purpose of the AWCS is to

- collectively develop and implement priority actions that address the needs of vulnerable species and habitats;
- identify areas on the landscape with the greatest potential for conserving and protecting the most species with the greatest need;
- provide a combination of data, expert knowledge, and decision-support tools to guide strategic development and management that minimizes negative impacts to wildlife and habitat; and
- expand the conservation community through engagement of government agencies, nongovernmental organizations, Tribes, industry, and citizens, with a common goal of preserving Arizona's natural heritage.

The AWCS identifies wildlife species that are most in need of conservation actions, known as SGCN. The AZGFD conducted vulnerability assessments for all species over which the department has statutory authority as defined in Arizona Revised Statutes Title 17. Species were scored for seven vulnerability criteria consisting of extirpated status, federal or state legal status, declining status, disjunct status, demographic status, concentration status, and distribution status. Species were assigned to one of three tiers based on their score in the vulnerability assessments; however, conservation of all SGCN species is a priority of the AZGFD (AZGFD 2022).

There are currently two species listed under the ESA known to occur at BMGR: Sonoran pronghorn and acuña cactus. The Sonoran pronghorn was federally listed as endangered in 1967 and is primarily found in southwestern Arizona. The pronghorn's survival depends on the Sonoran Desert ecosystem that is distributed across BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus National Monument. The acuña cactus, listed in 2013 as endangered, is found primarily at BMGR East, Tohono O'odham Nation, BLM lands, Organ Pipe Cactus National Monument, and areas southeast of Phoenix between Cactus Forest and Kearny. The lesser long-nosed bat (*Leptonycteris yerbabuenae*; LLNB), previously federally listed as endangered, was delisted in April 2018, but BMGR continues to monitor it under the post-delisting monitoring plan (USFWS 2018).

The FTHL has no federal protection, but it is listed as threatened in Mexico, a 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 AZGFD are parties. The FTHL has been petitioned for listing under the ESA four times: 1993, 2001, 2006, and 2010. The species was not listed under the ESA in large part because BMGR West, in cooperation with other state and federal natural resource management agencies, developed the RMS for the species. The continued adherence to the RMS has been instrumental in precluding listing the species. In 2011, the USFWS referenced the RMS 135 times in their decision to withdraw their proposed rule to list the FTHL under the ESA. The FTHL 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 historical habitat (possibly as much as 50%) in the United States has been lost due to agricultural and residential development; and more recently, due to the construction of the incomplete secondary barrier system at the border. MCAS Yuma continues to monitor and address the threat of encroachment relating to renewable energy projects and other noncompatible uses of BMGR West that would result in negative impacts to FTHL habitat. 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 and participating as a Management Oversight Group member.

Peirson's milkvetch (*Astragalus magdalenae 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 Pierson'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, reinitiation or consultation with the USFWS may be warranted.

The Sonoran Desert tortoise 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 3.7.1.2, *Sonoran Desert Tortoise Update*.

Federally threatened and endangered species documented on the Range and those that have not been documented but have the potential to occur are listed in Table 3-8. In addition, each species' Arizona Status and AWCS score are listed.

Table 3-8. Threatened and Endangered Species and Species of Greatest Conservation Need.

Common Name (*Scientific Name*)	Federal[a] Status	Arizona Status[b]/ AWCS Score[c]	Species of Greatest Conservation Need	Species or Habitat			Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
Mammals[4]								
Lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*)	DE	1	✓	✓			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).
Western red bat (*Lasiurus blossevillii*)		2	✓		✓			Typically solitary with a preference for riparian habitats.
Cave myotis (*Myotis velifer*)		2	✓	✓				Primarily found at lower elevations in arid habitat that is dominated by creosote bush, cacti, or desert riparian shrubs.
Yuma myotis (*Myotis yumanensis*)		2	✓	✓				Found in a wide range of habitats at lower elevations including moist and dry forests, riparian zones, grasslands, shrub-steppe, and deserts.
Mexican free-tailed bat (*Tadarida brasiliensis*)		2	✓	✓				Generally roosts at sites near water or in caves.
Spotted bat (*Euderma maculatum*)		2	✓		✓			Riparian areas, rocky cliffs (BMGR West).
Southern yellow bat (*Lasiurus ega*)		NR			✓	✓		In association with palm trees, may occur in vicinity (BMGR East and West).
California leaf-nosed bat (*Macrotus californicus*)		2	✓	✓				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 (*Eumops perotis californicus*)		2	✓	✓				Lower and upper Sonoran Desert scrub near cliffs, preferring the rugged rocky canyons with abundant crevices (BMGR East and West).
Sonoran pronghorn (*Antilocapra americana sonoriensis*)	LE	1	✓	✓			32 FR 4001, 1 March 1967	Southwestern Arizona: vegetation - Palo verde-chain fruit cholla, creosote-bursage, and palo verde-mixed cacti. BMGR West and East, east of the Copper mountains (BMGR East and West).
Sonoran pronghorn (*Antilocapra americana sonoriensis*)	XN	1	✓	✓			76 FR 25593, 5 May 2011	Southwestern Arizona: vegetation - Palo verde-chain fruit cholla, creosote-bursage, and palo verde-mixed cacti. This population occurs east of SR 85 and south of I-8 (BMGR East).
Canyon Mouse (*Peromyscus crinitus*)		3	✓	✓				Rocky habitats or gravel sites adjacent to rocky areas (BMGR West).
Kit fox (*Vulpes macrotis*)		NR		✓				In valleys and on sandy plains in the Southwestern deserts (BMGR East and West).
Little pocket mouse (*Perognathus longimembris*)		NR		✓				Found in various types of desert scrub habitats (e.g., greasewood, rabbitbrush, creosote bush, cactus, mesquite, paloverde) (BMGR West).
Crawford's desert shrew (*Notiosorex crawfordi*)		NR		✓				Not restricted to any particular vegetation type, so long as there is sufficient cover. They are often found in packrat houses, or under dead agaves, old logs, or other debris (BMGR West).
Desert bighorn sheep (*Ovis canadensis mexicana*)		NR		✓				Desert mountain ledges and grassy basins (BMGR East and West).

Table 3-8. Threatened and Endangered Species and Species of Greatest Conservation Need.

Common Name (*Scientific Name*)	Federal[a] Status	Arizona Status[b]/ AWCS Score[c]	Species of Greatest Conservation Need	Species or Habitat			Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
Arizona woodrat (*Neotoma devia*) (on the list provided by MCAS Yuma, but not on the AZ SGCN list)		NR		✓				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).
Birds[d]								
Southwestern willow flycatcher (*Empidonax traillii extimus*)	LE	1	✓			✓	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 found at BMGR.
Yuma clapper rail (*Rallus longirostris yumanensis*)	LE	1	✓			✓	32 FR 4001, 11 March 1967	Marsh habitat not found at BMGR.
Bald eagle (*Haliaeetus leucocephalus*)	BGEPA	1	✓			✓	Proposed for delisting: 64 FR 36453, 6 July 1999; Delisted: 72 FR 37346, 9 July 2007	Aquatic habitat not found at BMGR.
Golden eagle (*Aquila chrysaetos canadensis*)	BGEPA	1		✓				Cliffs or in large trees that afford an unobstructed view (BMGR East).
Sprague's pipit (*Anthus spragueii*)		2	✓		✓			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 (*Glaucidium brasilianum cactorum*)	T	1	✓		✓			Xeroriparian areas (BMGR East and West).
Peregrine falcon (*Falco peregrinus anatum*)		1	✓	✓				Isolated cliffs; winter migrant (BMGR East and West).
Ferruginous hawk (*Buteo regalis*)		2	✓	✓				Arid to semiarid regions, as well as grasslands and agricultural areas (BMGR East).
Belted kingfisher (*Ceryle alcyon*)		NR			✓			Found near water (fresh or salt); rare transient at BMGR.
Crested caracara (*Caracara cheriway*)		NR			✓			Semi-desert, in both arid and moist habitats, but is more common in the former. Observed in Sonoran Desert National Monument near BMGR East.
Snowy egret (*Egretta thula*)		3	✓		✓			Marshes, lakes, ponds, lagoons, mangroves, and shallow coastal habitats; may appear during seasonal migration (BMGR East and West).
Tropical kingbird (*Tyrannus melancholicus*)		NR			✓			Situations with scattered trees, savanna, open woodland, forest edge, plantations, residential areas, and agricultural lands.
Desert purple martin (*Progne subis hesperia*)		2	✓	✓				Desert Southwest in saguaro cacti cavities (BMGR East).
Gila woodpecker (*Melanerpes uropygialis*)		2	✓	✓				All desert habitats, nesting in saguaro cacti (BMGR East and West).
Gilded flicker (*Colaptes chrysoides*)		2	✓	✓				All desert habitats, nesting in saguaro cacti (BMGR East and West).

Table 3-8. Threatened and Endangered Species and Species of Greatest Conservation Need.

Common Name (*Scientific Name*)	Federal[a] Status	Arizona Status[b]/ AWCS Score[c]	Species of Greatest Conservation Need	Species or Habitat			Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
LeConte's thrasher (*Toxostoma lecontei*)		2	✓	✓				Open desert scrub, alkali desert scrub, and desert succulent scrub (BMGR East and West).
Mountain plover (*Charadrius montanus*)		2	✓	✓				Xeric or disturbed uplands; short vegetation, bare ground, and a flat topography. Not on the AZGFD 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 (*Toxostoma bendirei*)		2		✓				Relatively open desert grassland, shrubland, or woodland with scattered shrubs or trees (BMGR East and West).
Black-tailed gnatcatcher (*Polioptila melanura*)		NR		✓				Desert brush, dry washes, and mesquite *bosques* (BMGR East and West).
Brown-crested flycatcher (*Myiarchus tyrannulus*)		NR		✓				Found in association with saguaros; also frequents river groves and other areas where trees are large enough to provide sites for cavity nesting (BMGR East).
Common poorwill (*Phalaenoptilus nuttallii*)		NR		✓				In all Sonoran Desert habitats, but most common on sparsely vegetated *bajadas* (BMGR East and West).
Costa's hummingbird (*Calypte costae*)		2	✓	✓				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 (*Micrathene whitneyi*)		3	✓	✓				Deserts, dry shrublands, riparian woodlands, and open pine-oak forests (BMGR East and West).
Gray vireo (*Vireo vicinior*)		2	✓	✓				Nonbreeding winter resident found in desert and arid scrub, semi-open areas with scattered scrub and semi-open arid brushland (BMGR West).
Hooded oriole (*Icterus cucullatus*)		2	✓	✓				Favors groups of palms for nesting (BMGR East).
Lucy's warbler (*Vermivora luciae*)		NR			✓			Mesquite *bosques* and edges of riparian woods in desert zones (BMGR East and West).
Phainopepla (*Phainopepla nitens*)		NR		✓				Scrub habitats, with desert mistletoe present for foraging (BMGR East and West).
Prairie falcon (*Falco mexicanus*)		2	✓	✓				Canyons, open country, grasslands, and deserts (BMGR East and West).
Scott's oriole (*Icterus parisorum*)		2	✓	✓				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 (*Passerina versicolor*)		NR		✓				Streamside thickets, brush mostly in areas of dense thorny brush, often with an upper story of scattered trees (BMGR East).
Western screech-owl (*Megascops kennicottii*)		2	✓	✓				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).

Table 3-8. Threatened and Endangered Species and Species of Greatest Conservation Need.

Common Name (*Scientific Name*)	Federal[a] Status	Arizona Status[b]/ AWCS Score[c]	Species of Greatest Conservation Need	Species or Habitat			Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
White-throated swift (*Aeronautes saxatalis*)		3	✓	✓				Rocky cliffs and canyons, typically found nesting in arid regions, but near major rivers (BMGR East and West).
Pyrrhuloxia (*Cardinalis sinuatus*)		2	✓	✓				Desert scrub and mesquite thickets (BMGR East).
Reptiles								
Yuman Desert fringe-toed lizard (*Uma rufopunctata*)		2	✓	✓			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).
Mohawk Dunes fringe-toed lizard (*Uma thurmanae*)		2	✓	✓				Restricted to sparsely vegetated windblown sand dunes and sandy flats; 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 (*Phrynosoma mcallii*)		1	✓	✓			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 (*Lichanura trivirgata gracia*)	SC	NR		✓				Rocky areas in desert ranges, especially in canyons with permanent or intermittent streams (BMGR West).
Mexican rosy boa (*Lichanura trivirgata trivirgata*)	SC	NR		✓				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).
Sonoran Desert tortoise (*Gopherus morafkai*)		1	✓	✓				Sonoran desert scrub and semidesert grassland, prefers rocky slopes and *bajadas* (BMGR East).
Desert night lizard (*Xantusia vigilis*)		NR		✓				Arid and semiarid, among fallen leaves and trunks of yuccas, agaves, cacti, and other large plants, also in crevices of rock outcroppings and under logs and bark of foothill pines; it ranges locally into pinyon-juniper, sagebrush-blackbrush, and chaparral-oak (BMGR West).
Long tailed brush lizard (*Urosaurus graciosus*)		NR		✓				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).
Invertebrates								
Monarch butterfly (*Danaus plexippus*)	CA	NR			✓			Occupies habitat with milkweed and flowering plants, generally preferring open areas. Requires the presence of milkweed for breeding.
Amphibians								
Western (or Great Plains) narrow-mouthed toad (*Gastrophryne olivacea*)		NR			✓			Moist crevices or burrows, near ephemeral water sources (BMGR East and West).

Table 3-8. Threatened and Endangered Species and Species of Greatest Conservation Need.

Common Name (*Scientific Name*)	Federal[a] Status	Arizona Status[b]/ AWCS Score[c]	Species of Greatest Conservation Need	Species or Habitat			Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
				Present	Potential	Not Expected		
Plants								
Acuña cactus (*Echinomastus erectocentrus* var. *acunensis*)	LE	1	✓	✓			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 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 (*Astragalus magdalenae* var. *peirsonii*)	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 (*Pholisma sonorae*)	SC			✓				Drifting sand below 500 feet elevation in creosote bush scrub (Yuma Dunes in the extreme southwestern portion of BMGR West).

[a] **Federal Status: BGEPA**=Bald and Golden Eagle Protection Act; **LE**=Endangered, **LT**=Threatened, **DE**=Delisted, **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.

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

[c] **Arizona Wildlife Conservation Strategy score (species' vulnerability): 1**=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; **2**=Scored 1 for vulnerability, but matches none of the criteria listed under 1A; **3**=Unknown status species.

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

3.7.1 Changes in the Protection Status of Species since the 2018 INRMP

Fringe-toed Lizard

The Yuman desert fringe-toed lizard is currently under review for federal listing, and more information is needed to determine whether listing is warranted. Fringe-toed lizards in the Mohawk Dunes area of BMGR were considered to be Yuman desert fringe-toed lizards until a recent genetic analysis in 2020 confirmed that fringe-toed lizards from the Mohawk Dunes should be classified as a distinct species, *Uma thurmanae* (Derycke et al. 2020). Discussions with AZGFD Herpetologist and BMGR East & West Wildlife Biologists concluded that mapping the Mohawk Dunes fringe-toed lizard distribution, assessing the overall population status, and documenting existing and potential threats are the first steps needed to work toward a potential future Candidate Conservation Agreement.

Desert Tortoise

In 2020, the USFWS reconsidered a previous not-warranted finding on the listing of the Sonoran Desert tortoise (then known as a subspecies of *Gopherus agassizii*) in 2015. In 2022, the USFWS again found that an ESA listing was not warranted, but the species still has SGCN status with AZGFD. 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.

Desert tortoise being fitted with a research transmitter.

Cactus Ferruginous Pygmy-Owl

The USFWS designated this species as threatened under the ESA on 21 August 2023. This listing was based on low population counts and fragmented habitat for the species. The northern Sonora Desert population is believed to be in the high hundreds with the species facing threats of habitat fragmentation, urbanization, agricultural development, and associated infrastructure. Included in these threats is an increase in human water use which has negatively impacted riparian vegetation communities that the species uses. This species has not been observed on BMGR; however, it has been observed at the Cabeza Prieta NWR and Organ Pipe National Monument. Due to the species being observed in close proximity to BMGR, there are annual surveys for the species as funding allows.

3.7.2 Federally Listed Threatened and Endangered Species and Species of Concern

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) 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, AZGFD 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 3-6) and West (Figure 3-7). The USAF and USMC actively participate in and financially support the Sonoran Pronghorn Recovery Plan and the actions of the Sonoran Pronghorn Recovery Team. Led by the USFWS, the recovery team consists of representatives from Luke AFB, MCAS Yuma, AZGFD, Organ Pipe Cactus National Monument, BLM (Lower Sonoran Field Office), UofA, 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, the Tohono O'odham Nation, and a representative from the U.S. Department of Homeland Security (Atkinson 2012).

Sonoran pronghorn temporarily stay in a captive breeding pen.

Concerted efforts by the USAF, USMC, AZGFD, USFWS, and other members of the recovery team, and their implementation of numerous recovery actions, have led to improved status of Sonoran pronghorn. Key actions have included the initiation of the semi-captive breeding programs at the Cabeza Prieta NWR (2003) and later at Kofa NWR (2011), and the establishment of two nonessential experimental populations, as allowed by Section 10(j) of the ESA, one centered at Kofa NWR and the other centered on Area B of BMGR East. 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. The Sonoran Pronghorn Recovery Team is working with stakeholders in California to establish a nonessential experimental population in historical habitat for the species found within the Chuckwalla Bench area of California.

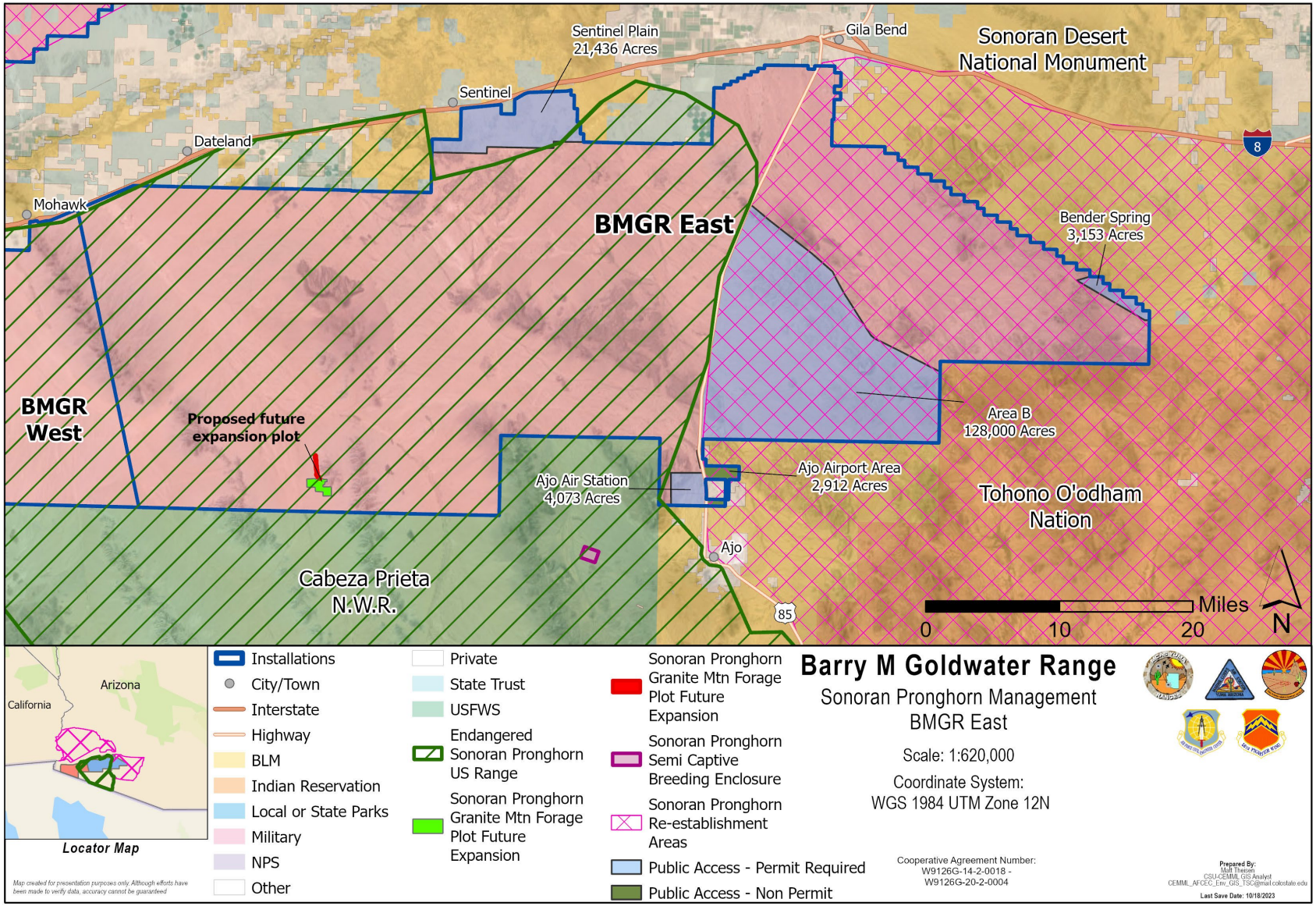


Figure 3-6. Sonoran pronghorn management at Barry M. Goldwater Range East.

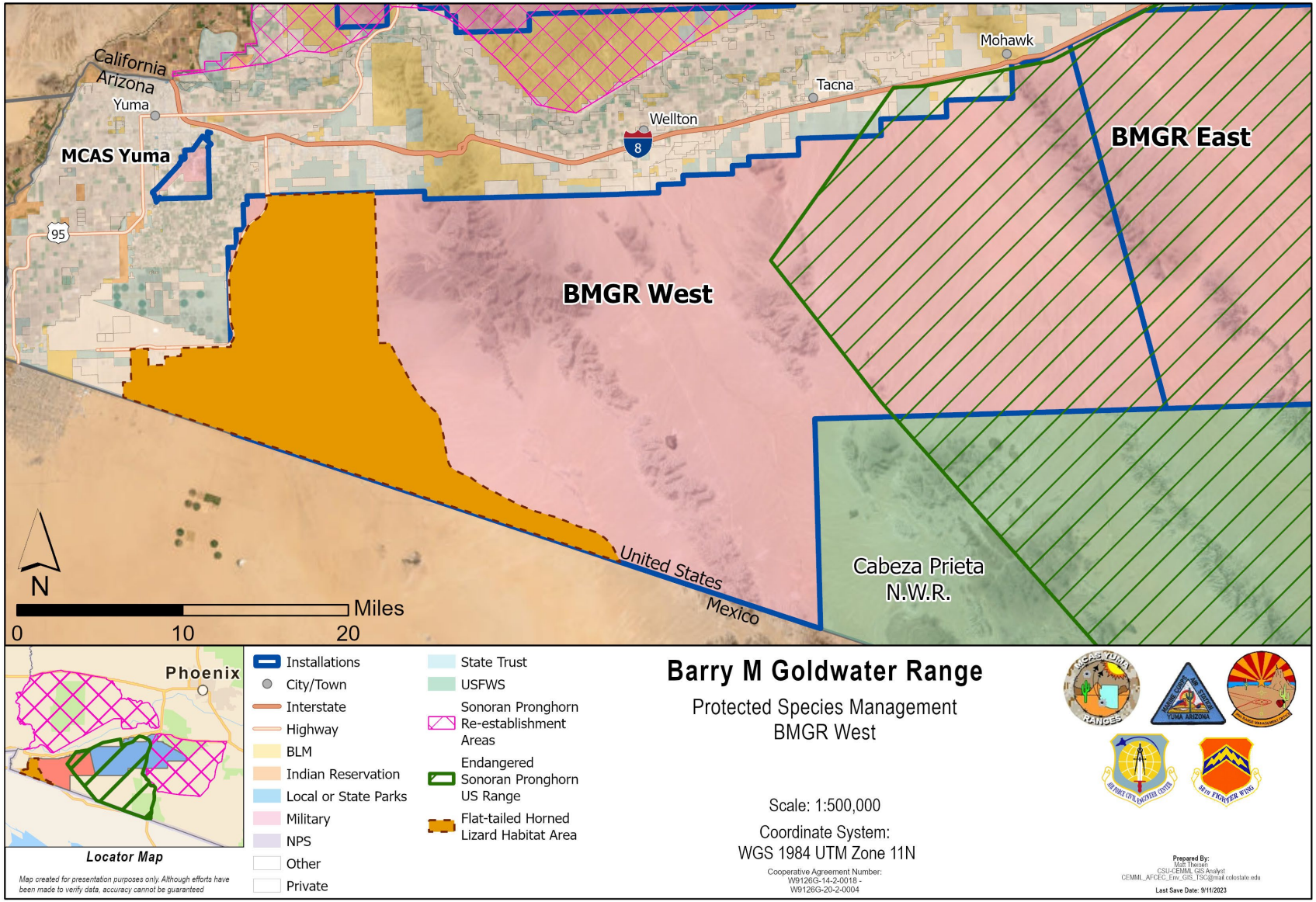


Figure 3-7. Protected species management at Barry M. Goldwater Range West.

If successful, these and other actions of the recovery plan will eventually lead to down-listing and then delisting of the species. However, in the shorter term, 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 0.93 miles (1.5 kilometers) of high explosive ordnance targets on either NTAC or STAC, then the training mission will be canceled or diverted to a different tactical range (USFWS 2010*b*). Additionally, no ordnance deliveries of any kind (including inert ordnance) would be authorized within 0.31 miles (0.5 kilometers) 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 0.62 miles (1 kilometer) downrange of the target and no ordnance of any type will be released if the pronghorn is within 0.31 miles (0.5 kilometers) of a target in any direction. If a vehicle is within 1.5 miles of a pronghorn, vehicle speed must be reduced to 15 mph. EOD detonations will be cancelled if a pronghorn is sited within 0.93 miles (1.5 kilometers) of the controlled detonation area.

Additionally, BMGR East is developing a Sonoran pronghorn movement modeling project with the Army Corps of Engineers to reliably forecast Sonoran pronghorn movement on the tactical ranges. The modeling is based on identifying, collecting, pruning, integrating, and analyzing all Sonoran pronghorn data collected at BMGR. The model will be based on Eulerian-Lagrangian-agent Method (ELAM) informed machine learning. The Sonoran pronghorn movement modeling will be implemented by 2028, with data collected during implementation being used to improve and increase the capabilities of the model. Ultimately, the objective of this modeling is to predict future movements of Sonoran pronghorn from data collected in previous days for planning and conservation purposes.

A Sonoran Pronghorn Incident Response Protocol was established by the Sonoran Pronghorn Recovery Team in September 2022. It provides guidance in the event of detection of an injured, sick, or dead free-ranging Sonoran pronghorn. The protocol establishes an Incident Response Team (IRT) consisting of individuals representing state and federal entities with Sonoran pronghorn experience. In the event of an incident, the person who initially discovers the Sonoran pronghorn must call the Sonoran Pronghorn Recovery Coordinator and the IRT representative of the land where the incident occurred. The protocol consists of a mandatory reporting of the incident, an initial investigation into the incident, a follow-up investigation, a necropsy or injury recovery as applicable, and a take assessment.

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 presence of 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. Recent biennial population surveys of the endangered population, referred to as the Cabeza population, conducted by AZGFD in December of 2022 estimated a population of 211 individuals. Within this population, at least 111 individuals were on BMGR East while 41 individuals were on BMGR West. A survey was conducted for the Sauceda population in December 2022; however, the surveys were incomplete due to aircraft mechanical issues. For the portion of the survey that did occur, an estimated 29 individuals were observed (USFWS 2023). Surveys for Sonoran pronghorn in the Kofa subunit were conducted in January of 2023 and estimated this population at 212 animals.

AZGFD 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.

Sonoran Desert Tortoise Update

In 2015, a Candidate Conservation Agreement for Sonoran Desert Tortoise 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 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. Range users are briefed on the Sonoran Desert tortoise and their burrows, and are instructed to inspect the area around their vehicles for the species prior to moving the vehicle.
- All recreational vehicular travel is restricted to designated roads, and off-road travel by official vehicles is highly restricted with extreme exceptions including clearance of

unexploded ordnance. Roads are evaluated during INRMP reviews and are closed if deemed redundant and unnecessary.
- Designated speed limits are established for all roads.
- A Fire Management Plan was developed 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 including the mapping, monitoring, and controlling of invasive vegetation with potential to alter vegetation communities and increase fire potentials, 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.
- BMGR maintains a full-time CLEO staff to enforce conservation laws and regulations.

In 2012, a landscape-level habitat model was developed to project where Sonoran Desert tortoise occupancy is most likely to occur. This knowledge, coupled with maps of training sites/activities, allows 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. 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 Sonoran Desert tortoise occupancy (Grandmaison 2012).

The BMGR East Five-Year Work Plan includes surveying new areas and/or resurveying known occupied and suitable habitat every 3 years. A long-term monitoring plot is established in the northwest region of the Sauceda Mountains of Area B, an area chosen based on the habitat model results. The methods of this monitoring effort are based on previous long-term population trend study plots for this species from Averill-Murray (2000) and Averill-Murray and Klug (2000). Two monitoring surveys were conducted there in 2019 and 2022, with surveys conducted between July and October both years. Nine unique tortoises were encountered 13 times and three unique tortoises were encountered four times in 2019 and 2022, respectively. Density estimates for the Sonoran Desert tortoise population in the monitoring plots were found to be 7.5 and 3 individuals per square kilometer in 2019 and 2022, respectively. While no evidence of nesting or eggshells were found in 2022, a single nesting site was found in 2019. There were five Sonoran Desert tortoise carcasses found in 2019 with depredation being the cause of mortality for two individuals and no discernable cause of death for the three other individuals. There were no carcasses found during the 2022 surveys.

The absence of carcasses is evidence that increased predator activity is not likely to be the cause of the significant abundance differences between surveys. One possible cause for the low abundance in 2022 was the abnormally high rainfall in the summer of 2022, which may have resulted in increased vegetation, allowing some individuals to disperse from the monitoring plot to exploit increased resources. BMGR East has high-quality tortoise habitat, but some ideal shelter areas contained trash from UDA activity. The decline in abundance from 2019 does not necessarily indicate that the population is declining but does highlight the importance of continued surveys (Rubke and O'Donnell 2020, Karam and O'Donnell 2023).

Flat-Tailed Horned Lizard Update

Flat-tailed horned lizard captured at BMGR West.

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 2010*a*). 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. 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 that 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 without 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, AZGFD 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% of the management area falls within BMGR West and the remainder is owned by the Bureau of Reclamation (Grimsley and Leavitt 2015). In 2008, AZGFD 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, AZGFD randomly selected 75 smaller (about 328 × 656 feet) occupancy plots, a subsample of which is surveyed annually.

Between 2008 and 2014, AZGFD 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 7-year study period varied widely.

Between 2011 and 2014, FTHLs were detected during 43 of 82 (52%) occupancy surveys and in 21 of 29 plots (72%) (Grimsley and Leavitt 2015). Of the individuals captured, 21 were male and 22 were female (Grimsley and Leavitt 2015).

Data from 2011 to 2022 show that modeled occupancy estimates at the AZGFD plots had a negative trend from 2011 to 2017, then increased from 2018 to 2022. The AZGFD concluded that occupancy estimates in each year of monitoring the YMDA are above the 30% trigger point recommended by the FTHL Rangewide Management Strategy (Romero et al. 2023). This suggests management goals are being met and that habitat conditions are stable to support Flat-tailed Horned Lizards throughout the YDMA (Romero et al. 2023). Recommendations by the AZGFD include:

- continue annual monitoring at the Yuma Desert Management Area with 75 plots surveyed across six sessions to ensure occupancy remains above trigger point;
- determine what factors influence detections of FTHL;
- determine a way to quantify presence of harvester ant colonies to assess whether this measure of prey abundance correlates with FTHL occupancy;
- investigate how the presence of predators correlates with FTHL occupancy; and
- publish a manuscript of the long-term occupancy monitoring.

Acuña Cactus Update

On 19 September 2016, the USFWS designated critical habitat for the acuña cactus. The critical habitat includes six geographically separate units totaling approximately 18,535 acres. One unit is adjacent to the northeastern portion of BMGR East; however, lands within the BMGR were exempted from the critical habitat designation. At least three distinct clusters of acuña cactus exist in BMGR East (Urreiztieta 2013, Abbate 2017). The plant has not been detected in BMGR West, nor is it expected to occur.

Acuña cactus in flower.

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 National Monument. This protocol consists of establishing monitoring plots to systematically search for living and dead individuals. Currently, three plots are established. Each individual is marked with a pin flag next to it and photographs showing an ID tag are collected. These monitoring plots are surveyed annually to track demographic parameters of the population on the range. This

protocol is designed to assess population dynamics by monitoring growth, mortality, recruitment, and reproductive status of populations on BMGR East (Scobie et al. 2022*b*).

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 AZGFD'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 monitoring and controlling invasive species (ongoing); developing and implementing a fire management plan (complete; includes assessment of fire risk and maintaining a firefighting agreement with BLM); developing and implementing procedures to control trespass livestock (ongoing); monitoring illegal immigration, contraband trafficking, and border-related law enforcement (ongoing); and continuing informal coordination with law enforcement authorities (ongoing).

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 as well as fencing to prevent entry of feral livestock.

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 (900 m) of known or newly discovered acuña cactus plants; and continuing to monitor and control invasive plant species. Detailed vegetation mapping was completed in FY 2019 for BMGR East, and these data might contribute to more precise acuña cactus habitat modeling efforts. Furthermore, when resources are available, the USAF may aid in or enable ex situ conservation efforts to establish new populations of acuña cactus on BMGR and other areas as appropriate.

Although a recent study indicated that the acuña cactus population at BMGR East has increased by roughly 3%, 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 team size to two individuals to restrict damage to small acuña cacti, which are vulnerable to crushing and uprooting.

3.7.3 Bats

Pallid bats (Antrozous pallidus) roosting on a cave wall at Barry M. Goldwater Range East.

To better understand bat fauna 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. Surveys from 2013 to 2021 have documented 10 bat species with another seven species having a probable presence on the range. An Air Force Enterprise–wide bat acoustic project was conducted in 2017 that included BMGR East. The project placed acoustic monitors at six survey sites on BMGR East for over 600 detector-nights. The study documented 159,227 bat passes, and a total of nine species were identified in the acoustic survey, including four species of concern: the cave myotis, California leaf-nosed bat, greater mastiff bat, and Townsend's big-eared bat (Schwab 2018). Acoustic detections from these studies that are not confirmed through more certain methods are considered "probable" (Mixan et al. 2022). The species detected during these studies, including species with a probable presence, bring the total bat diversity on the range to 18 species (Table 3-9).

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. 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. The monitoring described above with the AZGFD will continue over the next 5 years and will be used to develop future management actions. All data and results from these

monitoring activities will be shared with partners including the North America Bat Monitoring Program (NABat), USFWS, and AZGFD.

Table 3-9. Bat species detected at Barry M. Goldwater Range.

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

Lesser Long-nosed Bat

The LLNB was previously listed on the ESA but, due to population recovery, was delisted in 2018 (USFWS 2018). The post-delisting monitoring plan for the lesser long-nosed bat includes monitoring for potential roost occupancy and threats, and an assessment of forage availability through phenology and distribution of lesser long-nosed bat forage resources.

Acoustic monitors that aid in the detection of the LLNB were established in 2013, with one monitor each at five water tanks and one monitor on the Gila Bend AFAF. The first LLNB detections occurred in 2016, with a total of 13 calls detected at four of the tanks. LLNBs have subsequently been detected every year since 2016 with at least one detection at each tank; however, no individuals have been detected at Gila Bend AFAF. In total, 174 LLNB calls have been detected since 2016. The first roost survey that detected the species was in 2016 at the Jack-in-the-Pulpit Mine, where six to eight individuals were observed. Individuals were also observed at the same location in 2017 (one individual) and 2019 (two pregnant females). Additionally, one individual was detected at both Sauceda Cave and Mohawk 45 in 2019 (Mixan et al. 2022).

Lesser long-nosed bat in hand.

To ensure that data are compliant with the LLNB post-delisting monitoring plan, the following activities may be implemented, as appropriate and as time and funding allow, on lands within the BMGR:

- The USFWS and AZGFD will be notified of any roost sites found to be occupied by LLNB through either the ongoing large-scale bat monitoring study (Mixan et al. 2016) or other monitoring actions.
- The currently occupied LLNB roost will be monitored regularly, and the data will be provided to the USFWS and AZGFD. Research is encouraged to determine the occupancy and use patterns of this roost by LLNB.
- To better understand occupancy and use patterns by the LLNB, forage phenology monitoring site(s) may be established to track forage resources over time. This effort will follow protocols consistent with the U.S. National Phenology Network's ongoing program to monitor plant phenology across the U.S. The results will be added to the National Phenology Network system. Conducting forage phenology monitoring at the BMGR depends on time and funding availability.

3.7.4 Monarch Butterfly

The monarch butterfly (*Danaus plexippus*) is a federal candidate species that migrates through BMGR but does not breed there. Since the early 2000s, monarch populations in North America have declined by 90% due to habitat loss and severe weather events (Anderson and Brower 1996, Brower et al. 2002, USFS 2015, NatureServe 2022). Monarch butterfly larvae are obligate consumers of native milkweeds (*Asclepias* spp.); thus, the adults need milkweed plants on which to lay their eggs (Morris at al. 2015). Due to the minimal amount of milkweed on BMGR, monarch breeding is unlikely; however, the low-elevation desert ecosystems at BMGR are part of an important monarch butterfly migration route. A small number of butterflies overwinter during mild winters (Morris et al. 2015). Important habitat-management practices for monarch butterflies at BMGR protect natural migration

and overwintering habitats from anthropogenic disturbances. Management actions already in place at BMGR are listed below:

- Regulating off-road recreation
- Restricting ground-disturbing activities in focused ground-support areas
- Adhering to NEPA processes for ongoing and new activities
- Limiting development
- Encouraging interagency collaboration through the Barry M. Goldwater Range Executive Council and the Intergovernmental Executive Council
- Enforcing regulations with the presence of four full-time CLEOs on BMGR West and one full-time CLEO on BMGR East with an additional CLEO anticipated in FY24
- Controlling invasive plant species

3.7.5 Migratory Birds and Eagles

Migratory Bird Treaty Act

From 2012 to 2014, AZGFD completed a breeding bird survey on BMGR and an additional bird inventory was conducted in 2020 to 2022 by AZGFD. Most species of birds found at the BMGR fall under MBTA protection. MCAS Yuma and Luke AFB have prepared a bird checklist that is provided to visitors if requested. Because the list is extensive, it is not included in this document.

Eagles

Beginning in the 1990s when the bald eagle was listed under the ESA, pilots of military aircraft flown or managed by the 56 FW have observed a 1-nautical-mile lateral separation around bald eagle breeding areas (BA) during the breeding season (1 December to 15 July), 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.

Golden eagle.

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 AZGFD, 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 1 December to 30 June, in accordance with a 2006 Conservation Assessment, which was renewed in 2014.

In 2021, 56 RMO proposed alterations to the eagle avoidance measures. These alterations were needed as increased survey efforts had identified numerous BAs, resulting in decreased training capabilities at BMGR. The 56 RMO were unable to meet pilot training requirements while following the old eagle avoidance measures. The new avoidance measures were implemented after concurrence was given by the USFWS on 5 August 2021. They are the current avoidance measures for BMGR East (56 RMO, USFWS, unpublished communication, 2021). The new avoidance measures reduce the avoidance buffer around active BAs from 2,000 feet to 1,000 feet from 15 December to 15 July. BAs with high productivity scores are given the buffer distance, and no avoidance measures are taken around BAs with low productivity scores. The productivity scores are based on percent occupancy and if young were produced in the BA. The 1,000-foot buffer is adequate based on national guidelines on eagle management, the effectiveness of the same buffer at other DoD installations, and based on studies of eagle responses to military aircraft.

Beginning in 2006, AZGFD 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, AZGFD surveyed 85 previously known 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 AZGFD 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 historical BAs, and 474 potential BAs outside of Native American lands in the entire state of Arizona. Within BMGR are 21 potential BAs, with six confirmed BAs. In 2022, surveys found three occupied BAs, including 20 new nests. Two of the occupied BAs had been occupied in years prior, while one, the Midway BA, was found to be occupied for the first time. Additionally, three new potential BAs were identified (Milbrandt et al. 2022).

The DOD also contracted with AZGFD to design and implement a 3-year study (2013 to 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 historical 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 5 years.
- Avoid disturbance around potential and historical 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. Historical 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 historical 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.

All historical locations of eagle nests and associated data were compiled for a subset of Air Force installations in the western United States, including Luke AFB and BMGR. Ongoing surveys by the AZGFD since 2020 are used in tandem with data collected from previous efforts to produce 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 1 December to 30 June. 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.

In February and March 2020, AZGFD performed an Air Force-funded golden eagle nest occupancy survey of BMGR East. The survey was conducted by helicopter and included two full searches (one in February and another in March) of all potential nesting habitat. During the survey, five active BAs were discovered within the following mountain ranges: one in Aguilas, one in southern Mohawks, one in Sand Tanks, and two in the Saucedas. Following these surveys, the 56 FW erected a seasonal 2,000-foot aircraft avoidance buffer around each BA.

BMGR East is anticipating beginning surveys for golden eagle nests using a small, unmanned aircraft system beginning in FY25. Surveys will be completed opportunistically throughout the year so targeted surveys can be completed during the nesting season. Nesting habitat subject to low-altitude training exercises will be prioritized over nesting habitat subject to high-altitude training or in areas where training activities are not likely to occur. Lower-priority habitat will be surveyed rotationally across several years. This effort will inform 56 RMO on the effectiveness of management actions and the eagle avoidance measures.

Bird/Wildlife Aircraft Strike Hazard

Environmental management guidelines, as identified in the Bird/Wildlife Aircraft Strike Hazard (BASH) Reduction Plan for Gila Bend AFAF (USAF 2021), 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., collecting and disposing of waste rapidly), and controlling birds through chemical and physical alterations of habitat components that attract them (e.g., installing devices that exclude birds from

potential perches, nesting sites, and roosting sites; controlling 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 [*Cathartes aura*]), and conducting bird/wildlife harassment and depredation as required.

BASH concerns are greatest when aircraft fly at low altitudes (at both takeoff and landing) rather than during in-flight operations. Luke AFB Instruction 91-212 established a BASH plan that applies to Gila Bend AFAF and BMGR (USAF 2021). In accordance with this plan, the USAF uses the Avian Hazard Advisory System, which is a data-driven, remote sensing system to alert pilots to 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.

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. 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 AZGFD to the 56 RMO/Environmental Sciences Management and applies only to Gila Bend AFAF.

A BASH Reduction Plan has been developed and implemented for BMGR West (MCAS Yuma Station Order 3750.1D) with the most recent version signed in January 2021. 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, AZGFD, 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.

BMGR East Update

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; maximum 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 provide trend data to the 56 RMO (Tunista Services, LLC, and Chiulista Services, Inc. 2017-2022). A summary of the annual BASH management data results for 2017 to 2022 are provided in Table 3-10 and Table 3-11.

Primary avian species surveyed under this project include turkey vulture, common raven (*Corvus corax*), raptor species (e.g., red-tailed hawk [*Buteo jamaicensis*], prairie falcon [*Falco mexicanus*], golden eagle, American kestrel [*Falco sparverius*]), dove species (mourning and white-winged doves, Eurasian collared-dove), and horned lark (*Eremophila alpestris*). Round-tailed ground squirrel (*Xerospermophilus tereticaudus*) surveys are also conducted at Gila Bend AFAF, as the species represents one of the main food sources for raptor species. Data are provided in the Annual BASH Summary Report for BMGR East (Tunista Services, LLC, and Chiulista Services, Inc. 2017-2022). 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 3-10. Summary of annual Bird/Wildlife Air Strike management actions (2017 to 2022) at Gila Bend Air Force Auxiliary Field and Barry M. Goldwater Range East by year.

Year	BASH Threat Days			BASH Strike	Carrion Removed	Frequency	
	Low	Moderate	Severe			Harassment	Depredation
2017	331	0	0	0	180	1	0
2018	273	6	0	1	119	25	0
2019	270	2	0	1	535	22	0
2020	270	0	0	0	1,536	8	0
2021	310	1	1	2	449	12	0
2022	252	1	0	2	662	18	1
Total	**1,706**	**10**	**1**	**6**	**3,481**	**86**	**1**

Source: The Annual BASH Summary Reports for BMGR East (Tunista Services, LLC, and Chiulista Services, Inc. 2017-2022).

Table 3-11. Annual Bird/Wildlife Air Strike management data results for 2017 to 2022 by species.

Species	Year	Gila Bend AFAF		Gila Bend AFAF Perimeter		SR 85 (Range 1 and 2)		Gila Bend AFAF Oxidation Pond	
		Total individuals	Number of surveys	Total individuals	Number of surveys	Total individuals	Number of surveys	Total individuals	Number of surveys
Avian spp.	2017	7,816	248	4,237	109	1,910	99	8,954	96
Ground squirrel	2017	334	248	—	—	—	—	—	—
Other	2017	468	248	—	—	—	—	—	—
Total		**8,618**	**248**	**4,237**	**109**	**1,910**	**99**	**8,954**	**96**
Avian spp.	2018	7,682	251	4,858	104	1,594	103	7,705	86
Ground squirrel	2018	216	251	—	—	—	—	—	—
Other	2018	469	251	—	—	—	—	—	—
Total		**8,367**	**251**	**4,858**	**104**	**1,594**	**103**	**7,705**	**86**
Avian spp.	2019	**10,808**	**247**	**3,978**	**66**	**2,385**	**105**	**6,443**	**67**
Ground squirrel	2019	**291**	**247**	—	—	—	—	—	—
Other	2019	**450**	**247**	—	—	—	—	—	—
Total		**11,549**	**247**	**3,978**	**66**	**2,385**	**105**	**6,443**	**67**
Avian spp.	2020	9,628	247	4,152	66	2,002	105	4,907	61
Ground squirrel	2020	862	247	—	—	—	—	—	—
Other	2020	537	247	—	—	—	—	—	—
Total		**11,027**	**247**	**4,152**	**66**	**2,002**	**105**	**4,907**	**61**

Table 3-11. Annual Bird/Wildlife Air Strike management data results for 2017 to 2022 by species.

Species	Year	Gila Bend AFAF		Gila Bend AFAF Perimeter		SR 85 (Range 1 and 2)		Gila Bend AFAF Oxidation Pond	
		Total individuals	Number of surveys	Total individuals	Number of surveys	Total individuals	Number of surveys	Total individuals	Number of surveys
Avian spp.	2021	7,653	246	2,672	70	1,484	103	4,605	63
Ground squirrel	2021	465	246	—	—	—	—	—	—
Other	2021	186	246	—	—	—	—	—	—
Total		**8,304**	**246**	**2,672**	**70**	**1,484**	**103**	**4,605**	**63**
Avian spp.	2022	8,107	247	3,742	75	1,789	94	6,730	59
Ground squirrel	2022	286	247	—	—	—	—	—	—
Other	2022	194	247	—	—	—	—	—	—
Total		**8,587**	**247**	**3,742**	**75**	**1,789**	**94**	**6,730**	**59**
All Years Total		***56,452***	***1,486***	***23,640***	***490***	***11,164***	***609***	***39,344***	***432***

3.7.6 Climate Impacts on Threatened and Endangered Species and Species of Concern

Habitat change and disruption to food availability are two major threats to threatened and endangered species on the range, and these could be exacerbated by climate change. Changes in temperature and precipitation are likely to affect prey populations. The abundance of forage and seasonal cues may also change, resulting in a mismatch between food availability and food needs for some species. Populations of some threatened and endangered species are further imperiled by having life stages that are especially sensitive to temperature and precipitation changes. Habitat requirements may change for some species if they adapt their behavior under changing environmental conditions (CEMML 2019).

Climate change poses serious threats to fish and wildlife species, both by itself and in conjunction with other stressors. Using the climate change assessment developed by CEMML (2019) for BMGR, climate change vulnerability assessments (CCVA) were conducted for BMGR's federal- or state-listed species and for SGCN species of management priority. The climate change vulnerability assessments in the associated report combine background information about the species' ecology, distribution, and demographics with climate projections.

There were 11 mammal, five bird, four reptile, one invertebrate, and one plant species assessed for climate change vulnerability. Of the 22 species accessed, six had high to very high climate change vulnerability scores. These species included the lesser long-nosed bat, Sonoran pronghorn, cactus ferruginous pygmy-owl, Bendire's thrasher, monarch butterfly, and acuña cactus. These assessments are vital to the natural resource managers on BMGR as they inform which species may need additional conservation support or monitoring in the future.

3.8 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 at BMGR 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 National Monument, Cabeza Prieta NWR, BMGR, and/or the Tohono O'odham Nation. Soil compaction, erosion, and damage to native vegetation resulting from off-road driving can modify the distribution and pattern of overland flow during rain events, reducing available soil moisture for

vegetation. This causes further erosion by reducing soil cohesion in addition to affecting critical habitat areas (Brooks and Lair 2009, Villarreal et al. 2016).

As a result of illegal cross-border foot traffic, the CBP is patrolling new areas where illegal vehicles had not traveled in the past. Attempts to 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, CBP 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, which may exacerbate the risk of wildfire and further dispersal of these 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.

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 in 2015 that is still ongoing. The purpose of the project is to help inform management as to how they could prevent further erosion and changes in surface hydrology.

Road elevations are measured and conditions photo-documented 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.

CBP Wellton and Ajo Stations have adopted supplemental protocols intended to reduce negative impacts of dragging operations on cultural and natural resources. The USMC and CBP have developed an MOU outlining road maintenance expectations. To reduce changes in surface drainage and soil erosion from road dragging activities, the USAF, USMC, and CBP have developed the following SOPs:

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

Additional efforts between the USAF, USMC, and CBP to reduce the negative impacts from other sources have included the following:

- Convening meetings between the BMGR Executive Council 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 GPS/Adobe PDF maps to delineate roads allowed for use in support of the CBP mission
- Requiring all law enforcement agencies to complete the *Range Access and Safety Training Program*
- Requiring CBP Air, Sector, and Station Chiefs to 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
- Establishing standardized protocols at BMGR East for CBP range access and road-dragging activities

Other factors contributing to soil erosion and ground disturbance include the use of OHVs, including Utility Terrain Vehicles 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. 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.

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 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 OHV 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 3-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.

Observation tower housing cameras that monitor human activities and erosion.

In accordance with the BMGR INRMP 5-Year Action Plan for 2012–2017, UofA 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 range-wide, highly detailed map that classifies the variability and distribution of soils across the BMGR West landscape (Rasmussen and Regmi 2015).

3.8.1 Update

BMGR East

Cultural resource sites near recreational areas at BMGR East are being damaged or are at risk of being impaired from recreational user activities. Up to 87% of known cultural resource sites along roads in Area B have been disturbed by recreational activities including parking and camping-related activities. Of the cultural resources at risk, rock shelters and rock image sites are most vulnerable from these impacts. Rock shelters are often easily seen from the access roads, which may attract the attention of recreationalists.

3.9 BMGR East Trespass Livestock

Trespass burros at BMGR are not protected under the Wild Free-Roaming Horses and Burros Act.

Since the early 1970s, certain 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) 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 3-8). 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 4- to 5-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.

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 previous INRMPs and the annual INRMP reviews 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

- 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 (e.g., Sonoran pronghorn);
- potential for disease transmission to native wildlife species;
- increased soil degradation and erosion potential;
- surface water depletion and destruction of environmentally sensitive/culturally significant water resources;
- potential water quality impacts associated with fecal contamination and increased erosion and sedimentation;
- destruction and trampling of cultural resource sites;
- invasive plant species seed dispersal;
- increased public safety risk from livestock/vehicle collisions with potential to impact all range users, including public recreators; BP, 56 RMO and MCAS Yuma RMD staff, support personnel, other range managers, contractors, and military personnel;
- potential direct negative impacts to the military training mission including 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.

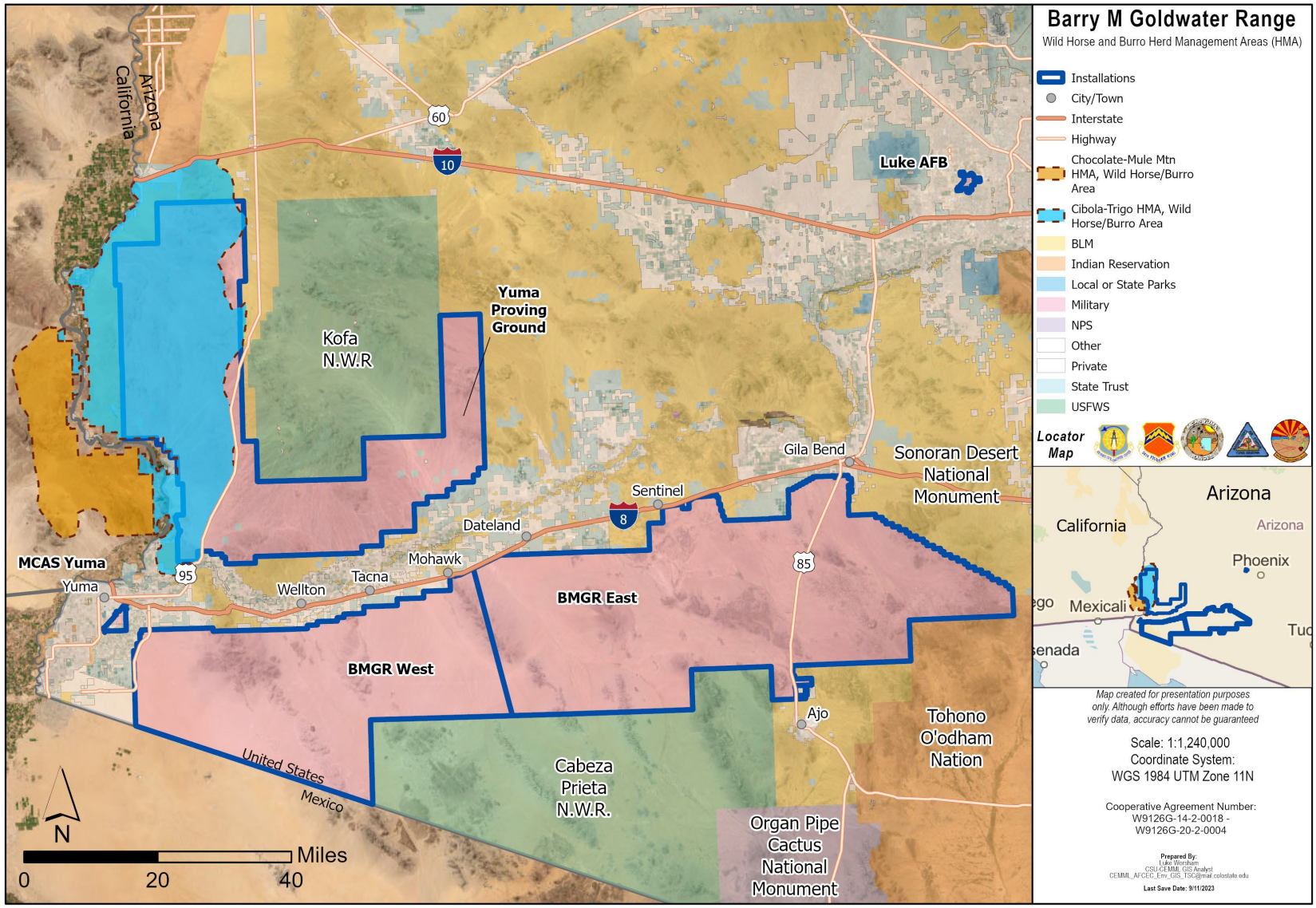


Figure 3-8. Wild horse and burro Habitat Management Areas.

Management actions that the 56 RMO staff can initiate in recognition of the need to reduce negative impacts from trespass livestock include the strategies listed in the following sections, but may also include actions such as developing an Environmental Assessment to more formally evaluate options for trespass livestock management and/or removal.

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 AZGFD to ensure coordinated management of trespass livestock. BMGR staff will continue to coordinate with the respective agencies to resolve livestock issues.

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 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.

Stewardship of cultural resources and maintaining tribal access to Barry M. Goldwater Range cultural sites is a high priority for the Air Force and Marine Corps.

4.1 Update

4.1.1 BMGR East

The most recent ICRMP for BMGR East was finalized and implemented in 2022. 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 projects in the Management Action Plan, some of which are high priorities for the 5 years covered by the ICRMP. The goals of the ICRMP are as follows:

- Complete surveys and Section 106 reviews as needed to support range improvements and sustain the training mission
- Continue long-term survey and inventory projects on previously disturbed areas
- Develop and implement a programmatic agreement with AZ SHPO for the streamlined operation, maintenance, and enhancement of BMGR East
- Provide management of cultural resources
- Address curation facility issues
- Continue Native American consultation
- Develop and implement mitigation plans and strategies

Archaeological surveys have been conducted in 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 2020, surveys have been completed on 204,428 acres of BMGR East. Surveys and projects that have been initiated since the 2018 INRMP are listed below:

- Completed in 2018—Intensive archaeological survey of 23.7 miles of previously unsurveyed administrative roads in the San Cristobal Valley
- Completed in 2019—Intensive archaeological survey of 2,000 acres of previously unsurveyed land on Manned Range 2 and documentation and condition assessment of four Rockshelter sites in the Area B public-use area
- Completed in 2019—Supplemental imperiled feature excavation and provenance analysis of obsidian and ceramic artifacts from multiple sites
- Completed in 2020—Intensive archaeological survey of the BMGR East Fence Line Project, Area B, Maricopa and Pima Counties, Arizona. AZTEC Cultural Resource Report No: AZ20-24
- Completed in 2021—Intensive archaeological survey of Manned Range 2
- Completed in 2022—Intensive archaeological survey of Manned Range 1
- Completed in 2023—Intensive archaeological survey of Manned Range 2
- 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 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 30 site stewards work on BMGR East. 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 administered by the Arizona State Parks and public land managers throughout Arizona, including the 56 RMO, and is supported by the Arizona Site Steward Program Foundation. 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.

During a 2022 tribal meeting, BMGR East cultural resource staff heard concerns from the Native American tribes affiliated with the BMGR East regarding natural resources on the Range. Tribes often look at cultural and natural resources as being the same thing. Few specifics were provided at that meeting beyond a mention of bighorn and eagles. The BMGR East cultural resource staff will consult with the tribes to further identify specific natural resource concerns the tribes have and will work with natural resource staff to address those issues to the best extent reasonably possible moving forward.

4.1.2 BMGR West

The ICRMP for BMGR is designed to support the military mission through proactive cultural resources management and to fulfill legal obligations for the protection of historical properties needed to sustain the withdrawal of public lands for military operations (USMC 2019). 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. The plan uses Part I of the 2009 three-part BMGR ICRMP, which provides the basic components and general overview of cultural resources management on BMGR. Part III provides specific guidance for cultural resources management on BMGR West. The ICRMP discusses major topics including a summary of regulations, a review of key roles and responsibilities, a summary of previous work, and priorities for the future.

Approximately 210,450 acres (30%) of the roughly 694,000 acres of the western portion of BMGR West has been systematically surveyed. There have been 107 cultural resources investigations and surveys, which have resulted in the recording of approximately 617 sites by 2022 and efforts are continuing. Of the 617 recorded sites, one is listed on the NRHP, 116 have been determined eligible for listing, 206 have been determined not eligible for listing, and 294 have not been evaluated.

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% of BMGR is open to the public (Figure 5-1, Figure 5-2). Activities include camping, hiking, hunting, and target shooting.

5.1 Update

In an effort to simplify the permitting process, improve data collection, and to promote a better overall visitor experience, MCAS Yuma awarded a contract for a new online permitting system in FY23. The new permit system, RecAccess, went live in June 2023 and the previous system, iSportsman, has now been decommissioned. As with the previous permitting system, permits are only available online. Prospective visitors to the BMGR East and West public areas, Cabeza Prieta NWR, and Area A of the Sonoran Desert NM can obtain a permit at the following website: https://bmgr.recaccess.com. The permit system requires adult visitors to register with the program and agree to the rules and stipulations of a Hold Harmless Agreement. Prior to entering the range, visitors must check in online for the dates and areas they plan to visit. During the check-in process, specific safety information and area closures must be acknowledged. Visitors must be in possession of their permit and post a copy within easy view in any vehicles left unattended. Individuals under the age of 18 must be accompanied by an adult. Persons entering the range without a valid permit may be fined and/or barred from BMGR.

The online permit program allows BMGR managers to collect data on visitation dates, specific location use, number of visits, and planned activities, which can be used in reports to assist with carrying out the natural and cultural resources management mission.

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 AZGFD.

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

- Use of metal detectors, drones, remote-controlled aircraft, ultralights, and powered parachutes (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 AZGFD)

Unimproved public access road.

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-inch wide by 4-inch 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.

AZGFD established 26 monitoring stations at access gates at BMGR East that use buried traffic counters and motion-activated cameras to determine the number of vehicles using gates in the public access areas. This effort was finalized in 2021 and the information collected is valuable in determining which sections of the public use areas are used the most and would benefit from road condition monitoring. Information on high use entry gates and areas within Area B was documented and could lead to the installation of information kiosks or developed campsites. 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.

5.1.1 BMGR East

Approximately 13% of BMGR East is open for public recreation (Figure 5-1). The three BMGR East public use areas include Area B (~128,000 acres), Bender Springs (~3,100 acres), and Ajo Air Station (~4,000 acres). Visitors to BMGR East must abide by the range-specific rules listed below.

- *Rock hounding*—Prospecting, removing, or disturbing 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 AZGFD hunting Unit 40A (AZGFD 2017). Big game species that may be hunted within this area include bighorn sheep, javelina, deer, and mountain lion (*Puma concolor*). Small game species include dove, jackrabbit, cottontail, coyote, fox, bobcat (*Lynx rufus*), skunk (*Mephitis* and *Spilogale* spp.), ringtail (*Bassariscus astutus*), raccoon (*Procyon lotor*), badger (*Taxidea taxus*), and quail. The number of bighorn sheep permits is determined by results of population surveys conducted by AZGFD and has varied over the last 10 years due to

population fluctuations. Please refer to the AZGFD Hunt Regulations booklet for specifics on each species. Public access areas west of SR 85 at BMGR East (i.e., area near Ajo) fall under the same AZGFD hunting unit as BMGR West, 40B (described below).

5.1.2 BMGR West

Approximately 75% of BMGR West is open for public recreation (Figure 5-2). Approximately 11,416 permits were issued from 2020 to 2021 while 12,050 permits were issued from 2021 to 2022. 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 AZGFD hunting Unit 40B (AZGFD 2017). Big game species that may be hunted within this area include bighorn sheep, javelina, deer, and mountain lion. Small game species include dove, jackrabbit, cottontail, coyote, fox, bobcat, skunk, ringtail, raccoon, badger, quail, waterfowl, and ring-necked pheasant (*Phasianus colchicus*), although the presence of waterfowl and pheasants is extremely unlikely. Please refer to the AZGFD Hunt Regulations booklet for specifics on each species. The number of bighorn sheep permits to be made available is assessed every 3 years and is based on results of population surveys conducted by AZGFD; as with BMGR East, the number of permits has varied over the last 10 years due to population fluctuations. Currently, 14 bighorn sheep permits are available annually: six tags for the Gila Mountains, four tags for the Tinajas Altas Mountains, and four tags for the Copper and Mohawk Mountains. MCAS Yuma may issue special use permits for bighorn sheep hunters to access Dart Tank for hunting or scouting, an area in which other recreational activities are prohibited.

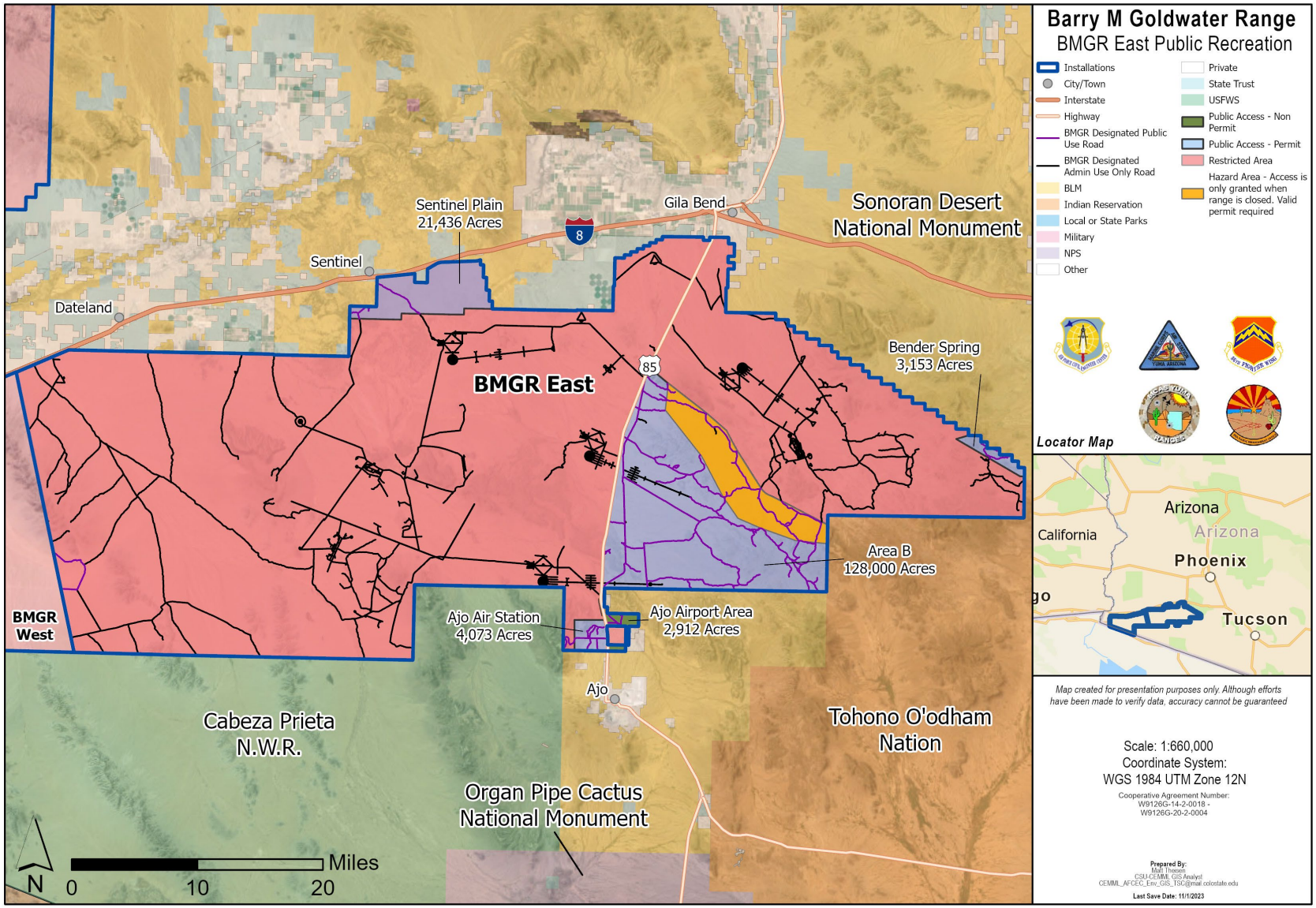


Figure 5-1. Public recreation at Barry M. Goldwater Range East.

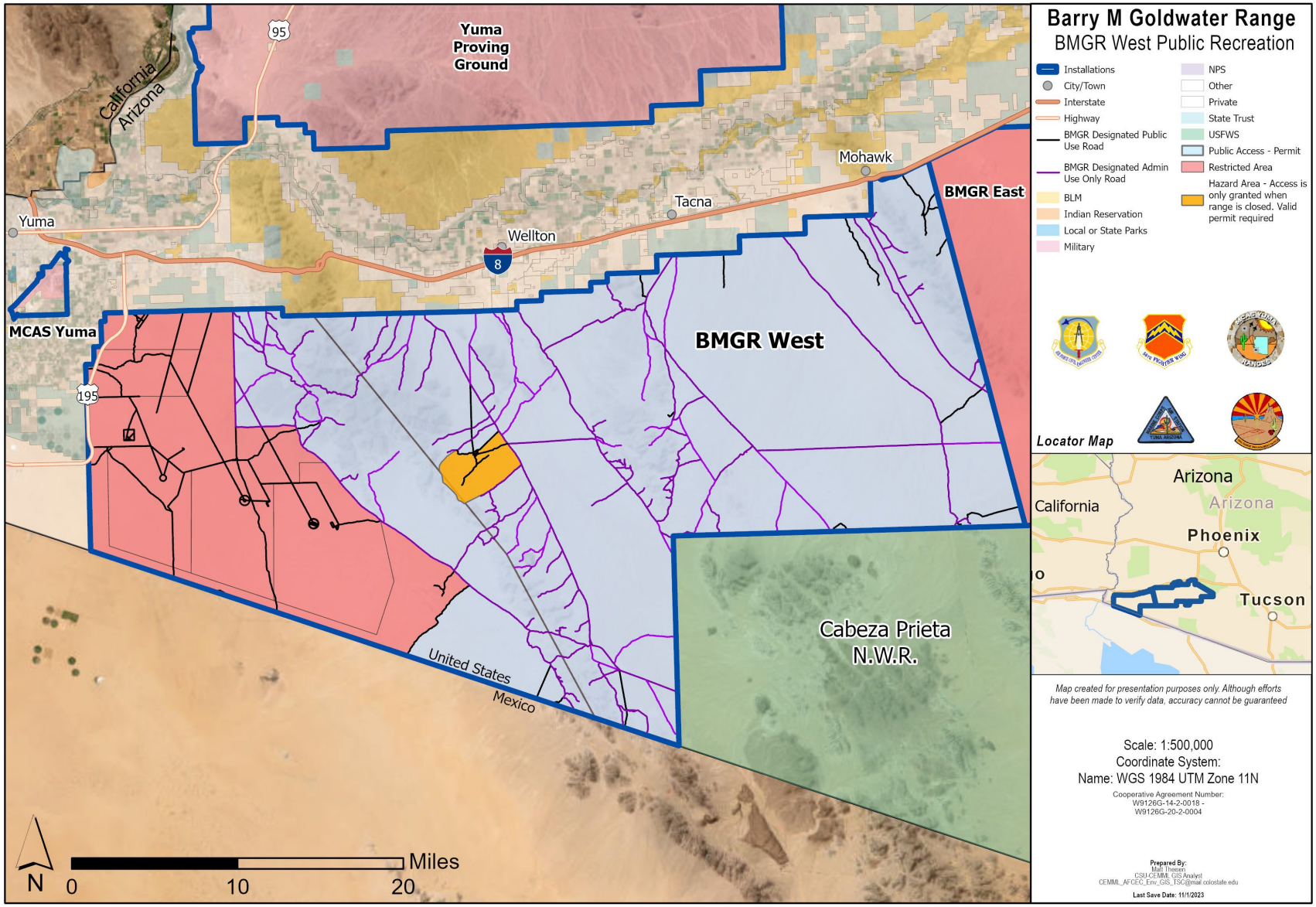


Figure 5-2. Public recreation at Barry M. Goldwater Range West.

5.2 Conservation Law Enforcement

Conservation Law Enforcement Officer on duty on Barry M. Goldwater Range East.

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 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 resource program goals and objectives and improves the CLEO's ability to protect resources, enforce policies, and relay important information to the public. Indeed, education is a key element in preventative law enforcement.

5.2.1 BMGR East

The USFWS has recently partnered with the USAF to provide CLEO service support to installations across the country. BMGR East currently has two authorized and credentialed CLEO positions through the Federal Wildlife Officer program. As of 2023, one of the positions is filled with the second position anticipated to be filled soon. The CLEOs are tasked with enforcing federal and state laws and

AZGFD 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. A Conservation Law Enforcement Program Operations Plan (CLEP-OP) was approved that will ensure enforcement of all applicable federal laws and regulations, including Department of Defense and Air Force regulations, for the management and protection of natural and cultural resources at BMGR East. The CLEP-OP will be a component plan of the INRMP and reviewed regularly.

5.2.2 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 BMGR West with an emphasis on protecting natural and cultural resources. CLEOs are uniformed law enforcement officers with fully delegated law enforcement authority, including authority through cross delegation with USFWS allowing them to enforce federal wildlife statutes as well as holding violators—federal, state, local, and public—responsible and accountable for any offences committed.

CHAPTER: 6 CHANGES IN THE BMGR ROAD SYSTEM

The designated road system and public access opportunities at BMGR are mostly unchanged from the 2018 INRMP. 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 CBP 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

6.1.1 BMGR East

The 2023 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. Such vehicle operations contribute to ground disturbance, but the surface areas within target complexes are located in open areas already heavily disturbed by bombing and strafing. The USAF may occasionally need to reuse a closed road when it is the only means of accessing a specific location for conducting necessary 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 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.

Example of a road closure sign.

The active road system, as recorded in 2023, includes a total of 762 miles of road, 187 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 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, 2018, and 2023 at Barry M. Goldwater Range East.

Road Category	**2012**	**2018**	**2023**
Miles of road for administrative (government) use only	581	568	575
Miles of road open for public use	175	176	187
Total Miles of Road	**756**	**744**	**762**

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

- Roads open for administrative (government) use only increased by 7 miles since 2018. This difference is from the addition of two new roads. The new Aguila road supports access to the northwestern portion of the Aguila Mountains for biological monitoring. The new road segment south of the Granite Mountain road supports access to a pronghorn water development.
- Roads open for public use increased by 11 miles since 2018. This difference is from the addition of two new land areas: Sentinel Plain area and Ajo Airport area.

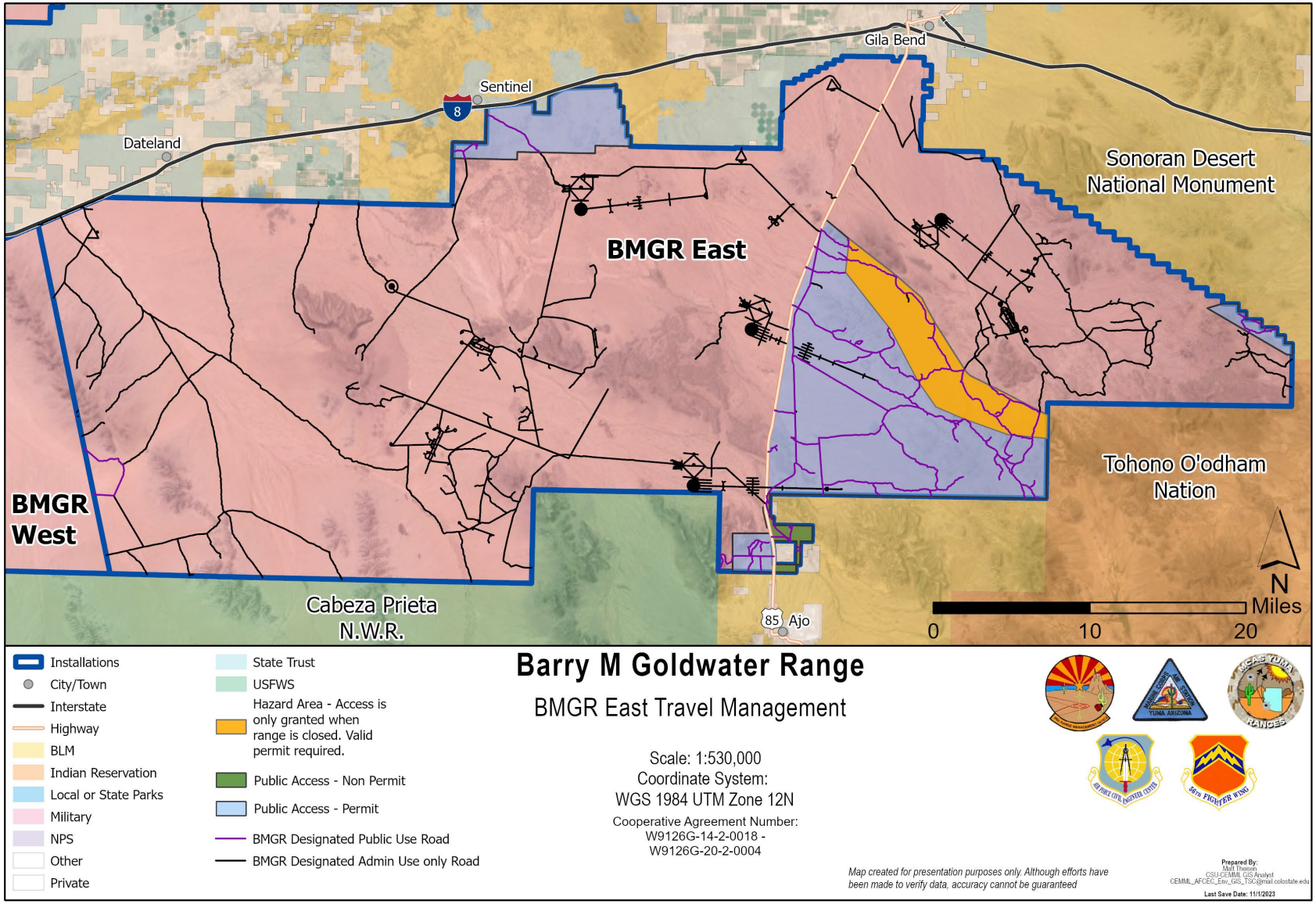


Figure 6-1. Travel management system at Barry M. Goldwater Range East.

6.1.2 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 the 2018 and 2023 INRMPs, 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 and administrative use. The difference in miles of administrative-use-only road is due to more accurate surveys of the roads. No new roads were added during the 2012 to 2018 timeframe, but additional roads have been added in 2023.

The area available for general public access continues to include about 75% 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 710 miles of active road and includes 437 miles of public access road (Table 6-2 and Figure 6-2).

Table 6-2. Designated road system in 2012, 2018, and 2023 at Barry M. Goldwater Range West.

Road Category	2012	2018	2023
Miles of road classified as administrative-use-only	195	209	273
Miles of road classified as public and administrative use	427	427	437
Total Miles of Road	**622**	**636**	**710**

Road restoration work along 25E.

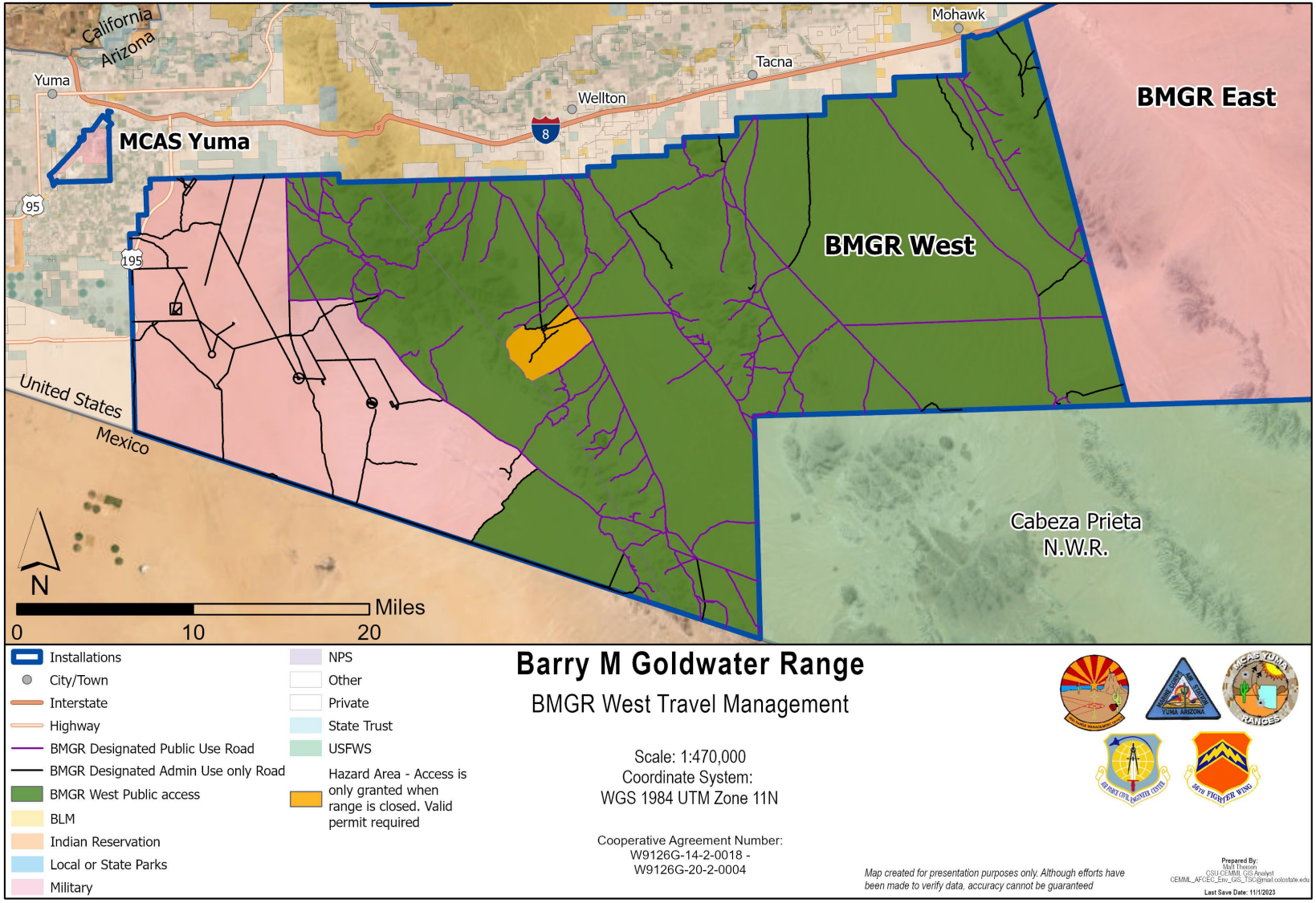


Figure 6-2. Travel management system at Barry M. Goldwater Range West.

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

Solid waste includes 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 East 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 burned in place 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 United States 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 has also been observed in designated recreational-use areas of the range.

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, 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.

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. Digital geophysical mapping investigations were conducted in 2009 and 2012 at SWMU 2-1 and SWMU 2-3. The results from that investigation indicated the presence of potential burial pits and subsurface metal sources at both SWMUs.

7.2.1 Update

BMGR East

Contractors completed investigation and remediation activities at several former munitions treatment and disposal areas at AUX-6 in three phases, as follows:

- Phase I: 12 to 19 November 2015
- Phase II: 11 January to 12 February 2016
- Phase III: 23 January to 30 March 2017

During remediation efforts, munitions and explosives of concern (MEC), munition debris (MD), and non-munitions related debris (NMRD) were located, excavated, and removed. A total of 90 MEC items were recovered and disposed of through detonation events in February 2016 and March 2017. A total of 8,954 items classified as MD, such as small arm debris, were recovered from SMU 2-1 and 4,271 items from SWMU 2-3. A total of 73 NMRD items, including wire, cables, nails, cans, and 55-gallon drums, were removed from SMU 2-1 and 1,828 items were removed from SMU 2-3.

Soil samples were collected at excavation areas and detonation locations and were sampled for harmful or concerning compounds. Analysis of the soil samples resulted in a finding of no significant threats to human health or ecological risks (AETC 2018).

BMGR West

No accidental spills were reported at BMGR West between publication of the 2012 Public Report and 2023. 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,
- miscellaneous requests and participation in events, and
- social media.

The USAF and USMC continue to participate in the BMGR Executive Council (BEC) established in February 2001. The executive board is composed of agency representatives that have vested interests in BMGR lands. The BEC has a permanent Coordinator and an Administrative Liaison that are funded by the USAF and a rotating chairman, and includes representatives from MCAS Yuma, BLM, USFWS, AZGFD, CBP, and directors for the adjacent Sonoran Desert National Monument, Organ Pipe Cactus National Monument, 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-BEC participants with opportunities to present opinions regarding BMGR's management policies and procedures to the IEC for discussion and possible action recommendations. The IEC is currently chaired by the MCAS Yuma Conservation Manager and is composed of representatives from the USAF, U.S. Navy, and DOI as well as representatives of other federal, state, county, and municipal government agencies and Native American Tribes that have interests in BMGR. The IEC meets three times per year, typically in January, May, and September. Future meeting dates are announced at the conclusion of each meeting and reminders are emailed to individuals on the IEC's distribution lists to provide several weeks' notice.

8.1 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;
- the installation of signs, gates, and fences to support road infrastructure and public access; and
- presentations by 56 RMO biologists and archaeologists for the public as well as at local and national professional meetings.

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

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.

8.2 BMGR West

The USMC's public outreach efforts have included developing information and infrastructure improvements to facilitate public recreational activities at BMGR West, as follows:

- A reptile, amphibian, and small mammal checklist is available for wildlife enthusiasts.
- A public brochure and map with details on road access retained for the public and range rules (e.g., rules for camping, off-road vehicle travel, rock hounding, firewood collection, hunting, native plant or wood collection, mine entry, recreational shooting, and trash disposal) are made available to the public.
- A public brochure on how to report and identify invasive weeds is available.
- Signs, gates, and fences have been installed to support road infrastructure and public access.
- Tours of various BMGR West features or resources, such as the Fortuna Mine, are offered.
- Meetings are held with local nongovernmental groups.
- RMD staff visit local recreational vehicle parks to educate seasonal visitors about the BMGR West recreational program.
- The conservation department of RMD maintains and updates a section of the MCAS Yuma website for the public: https://www.mcasyuma.marines.mil/Staff-and-Agencies/Range-Natural-and-Cultural-Resources/.
- The conservation department works with the Installation's Communication, Strategy, and Operations department to update social media pages and video production requests that highlight natural resources topics on BMGR West.

Because the CLEOs patrol the range seven days a week, they are primarily responsible for MCAS Yuma's public outreach efforts. Also, 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 2024–2028

The 2023 INRMP revision replaced the previous management elements, management goals, and resource goals with three broad, overarching goals compliant with AFMAN 32-7003 and MCO 5090.2. These goals are as follows:

- Maintain and enhance natural and cultural resources by meeting requirements of applicable resource management regulations. Follow management plans to ensure resources are sustained for future generations while supporting the military mission of BMGR.
- Apply ecosystem management principles that recognize social and economic values; are adaptable to complex and changing mission and regulatory requirements; and are realized through effective partnerships among private, local, state, Tribal, and federal interests.
- Provide public access to BMGR resources for ecologically sensitive and sustainable multi-purpose use consistent with the military mission, the statutory requirements of the MLWA of 1999, the Sikes Act, and other applicable regulations.

To accomplish these goals, objectives were written with detailed projects that will accomplish the goals set forth while maintaining mission success. In planning for the next 5 years, 56 RMO and MCAS Yuma have each developed a preliminary list of proposed projects for FY 2024–2028 as outlined in Table 9-1 and Table 9-2, respectively. These action steps were identified by considering data acquired through inventory and monitoring activities in the past 5 years, changes that have occurred in the past 5 years (as reported in earlier chapters of this INRMP revision), emerging management issues, and input from other agencies with land management or regulatory authority in the BMGR region.

Table 9-1. Barry M. Goldwater Range East Five-year Work Plan, Fiscal Year 2024-2028.

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code	Standard Title	Project Number	Description
Resource Management	1	1.1	24-28	56 RMO	AFCEC	High	INRP	Mgt, Habitat	1.1.1	Monitor long-term vegetation monitoring plots on five-year intervals at BMGR East and continue regional collaboration to analyze and contextualize data.
Resource Management	1	1.1	24-28	56 RMO	AFCEC	High	INRP	Mgt, Habitat	1.1.2	Expand the existing long-term vegetation monitoring program at BMGR East to leverage weather station data and detailed vegetation mapping to broaden the number of vegetation types monitored and investigate the effects of broader changes in climate on local microclimates and vegetation communities.
Resource Management	1	1.1	25	56 RMO	AFCEC	High	INRP	Mgt, Habitat	1.1.3	Survey the Sentinel Plain and Ajo Air Station areas to map vegetation and sensitive plant populations consistent with the protocol used for the range-wide vegetation mapping effort.
Resource Management	1	1.2	24-28	56 RMO	AFCEC	Medium	INRP	Mgt, Invasive Species	1.2.1	Monitor invasive plant species through annual (at minimum) patrols of range roads, known infestation sites, potential infestation areas, identifying and reporting areas of concern for treatment using the cloud app at BMGR East.
Resource Management	1	1.2	25	56 RMO	AFCEC	High	T&E	Mgt, Species	1.2.2	Using existing data on known infestations and high-risk invasion routes or training sites, develop an invasive plant species inventory and management plan for BMGR East to prioritize and plan for annual survey and control efforts to effectively implement invasive species control and prevention.
Resource Management	1	1.2	24-28	56 RMO	AFCEC	Medium	INRP	Mgt, Invasive Species	1.2.3	Ensure a quick response capability on invasive species on BMGR East, through in-house or contract means for removal and/or treatment of new invasive plant species infestations within two months of detection to prevent incipient infestations from spreading.
Resource Management	1	1.2	24-28	56 RMO	AFCEC	High	T&E	Mgt, Species	1.2.4	Perform at least annual chemical or mechanical control or prevention of desert gourd, buffelgrass, tamarisk, Sahara mustard, fountain grass, and stinknet infestations to prevent degradation of habitat for Sonoran pronghorn, acuña cactus, fringe-toed lizard, Sonoran Desert tortoise, and other native species at BMGR East.
Resource Management	1	1.2	24-28	56 RMO	AFCEC	Medium	INRP	Mgt, Invasive Species	1.2.5	Work with Pest Management to evaluate pest control activities for compliance with the pollinator-friendly practices described in the USAF Pollinator Conservation Reference Guide (USFWS 2017).
Resource Management	1	1.3	24-28	56 RMO	AFCEC	High	T&E	Mgt, Species	1.3.1	Annually support bald eagle nest watch, golden eagle surveys, and assess potential for powerline electrocution of raptors at BMGR East.
Resource Management	1	1.3	25	56 RMO	AFCEC	High	T&E	Mgt, Species	1.3.2	Survey for golden eagle nests on BMGR East using small, unmanned aircraft systems to inform management actions and eagle avoidance measures.
Resource Management	1	1.3	27	56 RMO	AFCEC	High	T&E	Mgt, Species	1.3.3	Continue the commitment to affirmative conservation efforts and survey for cactus ferruginous pygmy-owl populations at

Table 9-1. Barry M. Goldwater Range East Five-year Work Plan, Fiscal Year 2024-2028.

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code	Standard Title	Project Number	Description
										BMGR East every three years and implement appropriate conservation actions if owls are detected to support the listing process and prevent designation of critical habitat on BMGR East.
Resource Management	1	1.3	24-28	56 RMO	AFCEC	High	T&E	Mgt, Species	1.3.4	Complete annual Sonoran pronghorn recovery actions at BMGR East as stipulated in the 2015 Biological Opinion, existing recovery plans, 56 RMO Operating Instruction, and/or as determined by the interagency Sonoran Pronghorn Recovery Team.
Resource Management	1	1.3	24-28	56 RMO	AFCEC	High	T&E	Mgt, Species	1.3.5	Continue annual evaluation of temporal and spatial distribution of the lesser long-nosed bat to support the post-delisting monitoring plan at BMGR East.
Resource Management	1	1.3	24-28	56 RMO	AFCEC	High	T&E	Mgt, Species	1.3.6	Continue annual monitoring of acuña cactus populations at BMGR East to determine plant distribution, habitat condition, and demography trends per established protocols.
Resource Management	1	1.4	24 & 27	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.1	Survey new and/or existing sites of Sonoran Desert tortoise occupation at BMGR East and West and identify suitable habitat every three years to continue the 56 RMO's long history of tortoise conservation and management, support listing decisions, and prevent designation of critical habitat.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.2	Conduct bird surveys for MBTA designated species every three consecutive years at BMGR East as directed by the Arizona Bird Conservation Initiative. Ensure that data are collected in a cost-effective manner but consistent with regional efforts to facilitate regional collaboration.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.3	Support and participate in annual AZGFD surveys for game species at BMGR East.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Habitat	1.4.4	Collaborate with AZGFD on an annual basis to identify and maintain corridors for wildlife habitat connectivity at BMGR East.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.5	Conduct annual bat surveys at BMGR East using various survey techniques such as acoustical, mist netting, roost assessment, etc. IAW the NABat protocols.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.6	Monitor and protect identified bat roosts near public access areas during the maternity season and through hibernation at BMGR East by establishing signs near roosts that restrict access to the immediate area.
Resource Management	1	1.4	25	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.7	Monitor kit fox populations at BMGR East through scent station methods.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.8	Continue ongoing program of population monitoring at wildlife watering sites at BMGR East.

Table 9-1. Barry M. Goldwater Range East Five-year Work Plan, Fiscal Year 2024-2028.

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code	Standard Title	Project Number	Description
Resource Management	1	1.4	25-27	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.10	Conduct surveys for the Mohawk Dunes fringe-toed lizard at BMGR East to assess the species population status, distribution, and threats on the range.
Resource Management	1	1.4	25-26	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.11	On a five-year rotation establish and implement a baseline inventory method to capture small mammal, breeding bird, reptile, amphibian, and other species determined to need sampling diversity and population status at BMGR East.
Resource Management	1	1.4	25-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.12	Using survey results, develop potential distribution maps of documented wildlife at BMGR East. Use maps and survey results to provide further monitoring and management recommendations.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.13	Develop a protocol for bird surveying at BMGR East that is based on and consistent with protocols of other agencies in the region.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.14	Evaluate the impact of non-game species collection on wildlife and habitat, developing guidelines to limit or restrict collection at BMGR East based on results.
Resource Management	1	1.4	25	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.15	Identify areas where native milkweeds can be planted at BMGR East to increase monarch habitat while managing for potential BASH and other mission-related issues.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.16	To inform potential monarch listing process and prevent designation of Critical Habitat on BMGR, monitor native milkweed populations on BMGR East. Record any evidence of monarch butterfly breeding IAW Presidential memorandum "Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators."
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.17	Annually evaluate implementation of monarch BMPs (Section 7.4.7) at BMGR East. Address areas of possible improvement.
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.18	Evaluate whether a survey is warranted for ESA candidate pollinators likely to occur at BMGR East (e.g., western bumble bee, Ferris' copper, and monarch butterflies).
Resource Management	1	1.4	24-28	56 RMO	AFCEC	High	INRP	Mgt, Species	1.4.20	Ensure data collected during surveys is submitted for entry into federal and state supported databases, such as the AKN and NABat.
Resource Management	1	1.5	24-28	56 RMO	AFCEC	High	INRP	Interagency/Intraagency, Government, Sikes Act, CLEO	1.5.1	Monitor illegal immigration, trafficking, and border-related law enforcement habitat damage and direct impacts to wildlife and coordinate with associated agencies and organizations to anticipate and document impacts to BMGR East resources to aid in decision-making and project development.
Perimeter Land Use	1	1.5	24-28	56 RMO	AFCEC	High	INRP	Interagency/Intraagency, Government, Sikes Act	1.5.2	Collaborate with local CBP offices to implement maintenance and restore damaged vegetation and soils associated with border-related law enforcement at BMGR East using best management practices as outlined in CBP's 2012

Table 9-1. Barry M. Goldwater Range East Five-year Work Plan, Fiscal Year 2024-2028.

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code	Standard Title	Project Number	Description
										Environmental Assessment (Department of Homeland Security, U.S. Customs and Border Protection, and U.S. Border Patrol 2012).
Perimeter Land Use	1	1.5	24-28	56 RMO	AFCEC	High	T&E	Mgt, Species	1.5.3	Opportunistically assess and annually document the trespass livestock population at BMGR East and use results to develop a plan to remove trespass livestock and prevent further incursions, as needed.
Resource Management	1	1.5	24-28	56 RMO	AFCEC	High	T&E	Mgt, Species	1.5.4	Annually fund a contract to monitor and control trespass of animals and livestock and assess and mitigate impacts to natural resources from trespass activities per the plan developed in Project 1.5.3.
Resource Management	1	1.5	24-28	56 RMO	AFCEC	High	INRP	Interagency/Intraagency, Government, Sikes Act, CLEO	1.5.5	Use assessments of habitat damage, documented events, and the CBP 2012 EA to develop a plan for limiting trespass and/or resource damage by 2025 and collaborate with adjacent landowners and CBP to implement the plan with annual prevention and restoration projects.
Perimeter Land Use	1	1.6	24-28	56 RMO	AFCEC	Low	INRP	Equipment Purchase / Maintain, CN	1.6.1	Operate and support the 12 existing remote-access weather stations, plus the additional 15 rain gauges at sites across BMGR East.
Resource Management	1	1.6	24-28	56 RMO	AFCEC	Low	INRP	Mgt, Habitat	1.6.3	Annually monitor groundwater levels at BMGR East wells and document results.
Resource Management	1	1.6	24-28	56 RMO	AFCEC	Low	INRP	Mgt, Habitat	1.6.4	Perform a holistic review of surface and groundwater quality monitoring results based on current and previous studies at BMGR East. Collect and review information from relevant literature to develop recommendations for further management.
Resource Management	1	1.6	24-28	56 RMO	AFCEC	High	INRP	Mgt, Habitat	1.6.5	Support AZGFD in constructing climate-smart, balanced drainage systems, reservoirs, and water guzzlers to mitigate possible drought and flash flood impacts at BMGR East. Possibly use solar energy for pumping out stored rain/storm water if needed.
Resource Management	2	2.1	24-28	56 RMO	AFCEC	High	INRP	Mgt, Habitat	2.1.1	Annually assess fire risk through the application of the wildland fire management plans at BMGR East and implement restrictions as needed. Maintain firefighting agreement with the BLM.
Resource Management	2	2.1	24-28	56 RMO	AFCEC	TBD	TBD	TBD	2.1.2	Support research proposals developed by universities, agencies, and other parties to address issues of management concern at BMGR East. Cooperate with researchers formally and informally, providing management information, site access where possible.
Resource Management	2	2.1	24-28	56 RMO	AFCEC	TBD	TBD	TBD	2.1.3	Cooperate with ADOT, BLM, CBP, utility companies, and other parties regarding proposed actions within existing utility/transportation corridors on BMGR East.

Table 9-1. Barry M. Goldwater Range East Five-year Work Plan, Fiscal Year 2024-2028.

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code	Standard Title	Project Number	Description
Manage Real Property	2	2.1	24-28	56 RMO	AFCEC	Low	INRP	Interagency/Intraagency, Government, Sikes Act	2.1.4	Coordinate with CE Real Property for maintenance of utilities by responsible agencies in the State Route 85 easement at BMGR East such as maintenance of powerlines, fiber optic, and CBP checkpoint(s).
Manage Real Property	2	2.1	24-28	56 RMO	AFCEC	Low	INRP	Interagency/Intraagency, Government, Sikes Act	2.1.5	Foster collaboration with regional partners by participating in BEC/IEC meetings, local and regional planning and monitoring of land use, and developing or reviewing environmental assessments or impact statements, resource management plans, and serve as DoD clearinghouse for energy development proposals in Arizona.
Perimeter Land Use	2	2.1	24-28	56 RMO	AFCEC	Low	INRP	Interagency/Intraagency, Government, Sikes Act	2.1.6	Foster collaboration with regional partners by participating in and attending the International Sonoran Desert Alliance's biennial symposium to ensure adequate cooperation and coordination with local stakeholders in conservation efforts for the Sonoran Desert ecosystem.
Public Use	2	2.1	24-28	56 RMO	AFCEC	High	INRP	Interagency/Intraagency, Government, Sikes Act, CLEO	2.1.7	Recruit, train, and retain sufficient NRM and CLEO staff to efficiently and effectively manage natural resources at BMGR East.
Public Use	2	2.2	24-28	56 RMO	In-house	Low	N/A	N/A	2.2.1	Conduct annual erosion inspections of priority heavy road use areas and drag road monitoring at 10 sites on BMGR East.
Resource Management	2	2.2	24-28	56 RMO	In-house	Low	N/A	N/A	2.2.2	Conduct erosion inspections of secondary and tertiary roads at BMGR East on a three-year rotation.
Resource Management	2	2.2	24-28	56 RMO	AFCEC	Low	N/A	N/A	2.2.3	Coordinate with contractors, researchers, engineers and/or other partners to evaluate road maintenance practices at BMGR East that are erosive and non-sustainable, explore engineering and other strategies to mitigate these issues, and develop proposals for implementation.
Motorized Access	2	2.2	As Needed	56 RMO	AFCEC	Low	INRP	Mgt, Habitat	2.2.4	When conducting management or other project activities at BMGR East, control fugitive dust to prevent erosion, protect natural resources, enhance visitor experiences, and protect activities associated with the military mission.
Resource Management	2	2.2	24-28	56 RMO	AFCEC	Low	INRP	Mgt, Habitat; Interagency/Intraagency, Government, Sikes Act	2.2.5	Implement the BMP manual in development to repair eroded sites on BMGR East.
Motorized Access	3	3.1	24-28	56 RMO	In-house	High	N/A	N/A	3.1.1	Limit access through closure of selected roads and recreational areas to the public and other users to protect natural and cultural resources, for law enforcement and safety concerns, and to support and protect military activities at BMGR East.
Motorized Access	3	3.1	24-28	56 RMO	In-house	High	N/A	N/A	3.1.2	Conduct an annual assessment and implementation of needed updates to public visitation maps for BMGR East based on site monitoring, including information about road restrictions, clarification of rules, and resource protection.

Table 9-1. Barry M. Goldwater Range East Five-year Work Plan, Fiscal Year 2024-2028.

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code	Standard Title	Project Number	Description
Public Use	3	3.1	24-28	56 RMO	In-house	High	N/A	N/A	3.1.3	Create and support public awareness projects at BMGR East to educate base personnel and the public about BMGR's cultural and natural resources and related conservation and preservation activities.
Public Use	3	3.1	24-28	56 RMO	In-house	High	N/A	N/A	3.1.4	Evaluate and summarize local short-term and long-term climate/vegetation/wildlife survey data and report to public on trends and extremes, through events and meetings giving opportunities for people to engage with nature and understand impacts of climate change at BMGR East.
Public Use	3	3.1	24-28	56 RMO	In-house	High	N/A	N/A	3.1.5	Continue using outdoor recreation access management systems for BMGR East public use area access, compiling recreation-use statistics, analyzing use patterns, and identifying and monitoring heavily used areas. Use vehicle traffic counters to quantify intensity of use at general and specific areas for management recommendations.
Public Use	3	3.1	24-28	56 RMO	In-house	High	N/A	N/A	3.1.6	Compile recreation-use statistics and related information about public area access at BMGR East, compiling recreation-use statistics, analyzing use patterns, and identifying and monitoring heavily used areas.
Public Use	3	3.1	24-28	56 RMO	In-house	High	N/A	N/A	3.1.7	Maintain and update BMGR East recreational use database based on permits to inform and support resource management decision-making.
Public Use	3	3.1	24-28	56 RMO	In-house	High	N/A	N/A	3.1.8	Install and maintain signage, gates, and fencing at range entry points at BMGR East, along perimeters when needed, and at all road intersections.
Public Use	3	3.2	TBD	56 RMO	In-house	High	N/A	N/A	3.2.1	Using results of BMGR road corridor surveys, assess impacts and benefits of current camping allowances in contrast to establishment of designated camping areas to inform decision-making.
Public Use	3	3.2	24-28	56 RMO	In-house	High	N/A	N/A	3.2.2	Opportunistically conduct surveys/assessments of native wood supplies and collection patterns at BMGR East. Restrict collection as conditions dictate.

Table 9-2. Barry M. Goldwater Range West Five-year Work Plan, Fiscal Year 2024-2028.

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Resource Management										
FTHL Occupancy Monitoring	Annual	Varies	Annual	In-house, Interagency	In accordance with 2003 FTHL Rangewide Management Strategy (RMS), provide funding and logistical to support conduct annual occupancy surveys within the Yuma Desert Management Area.	$109,376	$109,376	$110,829	114,006	$114,546
Establish and monitor vegetation plots in several plant communities.	TBD	Varies	Annual	In-house	Each plot will be assessed at 5-year intervals.					
Monitor and control invasive plant species.	Annual	Varies	Annual	In-house, Interagency	Annual monitoring and control of invasive plant species is ongoing. A collaborative effort is being developed through the Southwest Arizona Invasive Species Working Group to facilitate a regional approach with neighboring land managers.	$113,449	$116,851	$120,355	$124,365	$127,683
Conduct reptile, small mammal, and amphibian surveys/monitoring.	TBD	Varies	Every 5 Years	In-house, Interagency	A baseline inventory for reptile, small mammal, and amphibian species was completed in 2019. Follow-on surveys are planned and will be conducted once baseline inventories for other species have been completed.			$183,959		
Conduct general bird surveys/monitoring.	2028	Varies	Every 5 Years	In-house, Interagency	A 3-year baseline inventory for avian species is currently underway and anticipated to be complete in FY23. Follow-on surveys are planned and will be conducted once baseline inventories for other species have been completed.					$191,391
Support AZGFD game species surveys.	TBD	Varies	Varies by species	In-house, Interagency	Provide personnel and logistical support to AZGFD to conduct surveys for game species at BMGR West					
Conduct general bat surveys/monitoring.	TBD	Varies	Every 5 Years	In-house, Interagency	Establish a baseline inventory and develop a repeatable monitoring methodology that will capture the diversity and distribution of bat species within the BMGR West. Develop measures to protect important bat roosts as they are identified.	$173,349				
Maintain important wildlife connectivity corridors at BMGR West.	Annual	Varies	Annual	In-house, Interagency	Collaborate with AZGFD and partner agencies to identify and maintain important wildlife connectivity corridors at BMGR West.					

Table 9-2. Barry M. Goldwater Range West Five-year Work Plan, Fiscal Year 2024-2028.

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Weather Station Monitoring	Annual	Varies	Annual	In-house, Interagency	Upgrade existing weather stations to satellite capability. Upload and store weather data on the Western Regional Climate Center website as part of a regional based weather monitoring approach with neighboring land management agencies.	$60,000	$61,200	$61,200	$62,424	$63,672
Implement medium and low priority actions as resources allow.	Annual	Varies	Varies	In-house, TBD	Implement lower-priority actions based upon adaptive management prescriptions or as surplus resources are identified.					
Support special studies to address specific management issues, such as invasive species, species of concern, climate change, etc.	TBD	Varies	Varies	In-house, Interagency	Support research proposals developed by universities, AZGFD, USGS, or other natural resource management agencies that address emerging issues as they are identified.					
Identify and evaluate other possible Special Natural Interest Areas.	Varies	Varies	As Needed	In-house	No Special Natural Interest Areas have been identified since the 2007 INRMP.					
Sonoran Pronghorn Recovery Actions	Annual	Varies	Annual	In-house, Interagency	Support Sonoran pronghorn recovery actions as required by biological opinions, or as identified by recovery plans and the Interagency Recovery Team.	$138,000	$144,900	$152,145	$159,752	$167,739
Erosion Mitigation	Varies	Varies	TBD	In-house, Interagency	Evaluate emerging engineering strategies and designs for possible implementation where applicable. Prioritize focus toward maintaining streamflow, mitigating route proliferations, and restoring roads to their historical footprint.					
Partner with CBP to identify and implement habitat restoration.	Varies	Varies	Annual	In-house, Interagency	Collaborate with local CBP offices to implement maintenance and repair best-management practices as outlined in CBP's 2012 Environmental Assessment (Department of Homeland Security, U.S. Customs and Border Protection, and U.S. Border Patrol 2012).					
Complete and subsequently implement the BMGR West integrated wildland fire management plan.	One-time	Varies	One-time	In-house, Interagency	The BMGR West Integrated Wildland Fire Management Plan was completed in November 2018. A MOA between MCAS Yuma and the BLM for Fire Suppression Assistance on the BMGR West was signed in May 2019, and updated in July 2022.					

Table 9-2. Barry M. Goldwater Range West Five-year Work Plan, Fiscal Year 2024-2028.

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Range-wide soil map	One-time	Varies	One-time	In-house, Interagency	The NRCS - Tucson Soil Survey Office is in process of completing the initial soil survey in southern Arizona. MCAS Yuma is providing logistical support for this effort, which aims to create a soils and ecological site inventory on federal lands that are within the Major Land Resource Area (MLRA) 40 of the Sonoran Desert Basin and Range Physiographic Province. A detailed soil map pertaining to the BMGR West will be created once this effort is complete.					
BMGR West Ortho imagery	TBD	Varies	As needed	In-house, Interagency	Collect high quality imagery via piloted and/or autonomous aircraft; and/or via satellites.					$175,341
Characterize anthropogenic impacts within the BMGR West.	On-going	Varies	On-going	In-house, Interagency	Use the best imagery, soil, precipitation, and vegetation data available to map recent disturbances in an effort to identify and prioritize habitat restoration projects.					
Develop adaptive management strategies for maintaining acceptable limits of change.	TBD	Varies	As needed	In-house, Interagency	Consider existing baseline survey data and regional concerns in an attempt to quantify acceptable limits of change. Develop adaptive management approaches to manage these limits as they are identified.					
Control excessive fugitive dust at permitted construction sites and recreation activity areas.	As required	Varies	As required	In-house	Control fugitive dust as required through NEPA.					
Support AZGFD maintenance, repair, and expansion of existing wildlife water developments.	As needed	Varies	As needed	Interagency	Continue to work with AZGFD to monitor and maintain the existing network of wildlife waters at BMGR West.					
Habitat Restoration	As needed	Varies	As needed	In-house, Interagency	Continue to conduct active and passive restoration of degraded areas.					
Support the AZGFD installation of up to six high priority wildlife watering sites at BMGR West	As needed	varies	As needed	In-house, Interagency	One new wildlife water development was completed since the last INRMP update. Two additional sites have been identified, but have yet to be implemented.					

Table 9-2. Barry M. Goldwater Range West Five-year Work Plan, Fiscal Year 2024-2028.

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Maintain an adequately trained staff to accomplish conservation goals and objectives.	Annual	Annual	Annual	In-house	Ensure that sufficient numbers of professionally and adequately trained natural resource management personnel and conservation law enforcement personnel are available and assigned to manage natural resources at BMGR West.					
Motorized Access										
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 date to determine the degree of change and develop a plan appropriate to the findings.					
Close selected roads to public access where an agency mission or resource protection issue conflicts with public use.	TBD	Varies	As needed	In-house, Interagency	Determine as needed and as funding is available.					
Evaluate site-specific proposals to assess the need for and potential impacts of approving additional roads for agency purposes.	As needed	TBD	As needed	In-house, Interagency	Determine as needed.					
Install/repair 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 the range perimeter, road intersections, and ground support areas.					
Public Use										
Maintain a recreational website to issue access permits and maintain a database to determine public use, roads, and compliance in support of natural resource management actions.	Annual	Varies	Annual	In-house, contractor	Records are maintained via an internal database associated with the permit website.	$14,000	$14,000	$14,000	$14,000	$14,000
Assess benefits and effects of establishing designated camping areas for adaptive management of public use areas.	As needed	Varies	As needed	In-house	Continue to collect information from visitor passes and CLEO records/observations/corrective actions to determine the possible impacts created from public use.					
Revise and maintain a visitor map.	As needed	Varies	As needed	In-house	Ensure visitor use map is updated as needed and publicly available via hard copy and digital formats.					
Retain a minimum of four full-time CLEO positions	Annual	TBD	Annual	In-house	MCAS Yuma currently employs four full-time CLEOs and has historically been successful in backfilling these positions in a timely fashion when vacancies arise.	$11,556	$11,902	$12,259	$12,626	$13,004
Public Outreach	Annual	Varies	Annual	In-house	Support public awareness efforts to educate MCAS Yuma employees and the public concerning natural and cultural resources and conservation activities.					
Compile recreation-use statistics, analyze patterns, and ascertain where use is heavy to identify areas of resource concern.	Annual	TBD	Annual	In-house	This is ongoing and closely monitored by MCAS Yuma's Recreational Planner.					

Table 9-2. Barry M. Goldwater Range West Five-year Work Plan, Fiscal Year 2024-2028.

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
Evaluate the effects of non-game species collection on wildlife, habitat, and other resources, limit or restrict collection activities within the authority of state law.	Annual	In-kind	Annual	In-house, Interagency	Continue to work with AZGFD to monitor non-game species collection and address any associated impacts.					
Manage Realty Property										
Cooperate with ADOT, CBP, and utility companies regarding proposed actions within existing utility/transportation corridors.	As needed	Varies	As needed	Interagency	Continue an open dialogue with partnering agencies at BEC and IEC meetings; ensure the RMD works with local stakeholders to revise and improve management actions and policies where applicable.					
Perimeter Land Use										
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 anecdotal evidence of border-related impacts					
Coordination with neighboring land managers, local governments, and developers.	As needed	Varies	As needed	In-house, Interagency	Coordinate with neighboring land management agencies, species-specific working groups, local governments, and private developers to curtail encroachment and other incompatible land uses that could negatively impact natural resources at BMGR West.					

Note: Programming amounts listed in FY 2024-2028 columns are estimates and actual funding amounts are dependent on appropriations from the U.S. Congress.

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APPENDIX A: BMGR EAST AND WEST INRMP MANAGEMENT ELEMENTS AND STATUS OF 2018 - 2023 ACTION PLAN ITEMS

Table A-1: Action items, listed by management element number and title, proposed for BMGR East in the 2018–2022 INRMP, and action item status/progress as of early 2023.

Element	Action Plan Item	Status	Progress by 2023
Resource Inventory and Monitoring			
1.1 (11)	Monitor and control invasive species	Ongoing	Partnered with AZGFD for continued mapping effort with GIS Cloud, invasive plant surveys, and treatments. Began a multi-year fencing project with AZGFD to secure the southern border of Area B which will result in 18 miles of new fencing to prevent access to trespassing livestock.
1.2	Monitor 30 vegetation plots in several plant communities	Ongoing	30 plots have been established for long-term monitoring, plots will be checked at five-year intervals and will continue to be checked on the same schedule following the protocol established by Hubbard et al. 2012.
1.3	Desert tortoise surveys	Ongoing	A long-term monitoring plot was established in 2019 in collaboration with AZGFD based on the model developed in Grandmaison 2012, was resampled in 2022, and is on a 3-year sampling schedule.
1.4	Raptor management surveys and monitoring	Ongoing	Avian species survey conducted by Tunista Logistic Services annually beginning in 2018 for the Annual BASH Summary Report. AZGFD surveyed raptor nests in 2022 to locate active eagle nests.
1.5	Bird surveys	Ongoing	Avian species survey conducted by Tunista Logistic Services annually beginning in 2018 for the Annual BASH Summary Report.
1.6	Support AZGFD surveys for game ungulates	Ongoing	Biennial deer surveys; bighorn sheep surveys (2020, 2023).
1.7	Support AZGFD surveys for gamebirds	Ongoing	Game bird surveys conducted on an annual basis.
1.8	Collaborate with AZGFD to identify and maintain important wildlife connectivity corridors at BMGR East	Completed	Desert tortoise research identified wash systems as important movement corridors completed in 2012.
1.9	Kit fox population monitoring	Not initiated	Continue kit fox population monitoring using scent stations.
1.10	Bat surveys; evaluate, monitor and protect important bat roosts	Ongoing	Continue bat monitoring efforts with AZGFD to limit conflict with bats and the military mission.
1.11	CFPO survey (low priority)	Ongoing	Repeated surveys every 5 years or opportunistically at BMGR East.
1.12	Weather stations and rain gauges	Ongoing	BMGR East implemented a network of 11 communicating weather stations in 2011; Began collaborative effort with the Western Regional Climate Center on data collection and summary in 2021.
1.13	Monitor use of wildlife waters	Ongoing	Wildlife cameras continuously used to record species that use wildlife waters.
1.14	Medium and low priority actions as resources allow	Not initiated	
1.15	Vegetation mapping	Ongoing	The vast majority of the BMGR has been mapped as of FY2020, the Sentinel Plains and Ajo Airport Area are scheduled to be completed in FY25.
1	Acuna cactus monitoring	Ongoing	Continued monitoring, distribution surveys, habitat modeling, and other efforts both in-house and in partnering with AZGFD; demography plots were established in 2021 in collaboration with AZGFD following protocols established by Organ Pipe NM.

Table A-1: Action items, listed by management element number and title, proposed for BMGR East in the 2018–2022 INRMP, and action item status/progress as of early 2023.

Element	Action Plan Item	Status	Progress by 2023
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 resource surveys for 18 miles of the southern border of Area B for fence construction to discourage trespass livestock; Wildlife water development in the Mohawk mountains and Picogrid remote monitoring stations.
Special Natural/Interest Areas			
2.1	Identify and evaluate other possible Special Natural/Interest Areas	Not initiated	Project to be initiated in future.
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 several 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 East.
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 FY 2023 and a second will begin in FY 2024.
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	Ongoing	Completed public use study with AZGFD in 2021 New RecAccess website beginning in 2023 will continue to 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	Initiated, incomplete	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.

Table A-1: Action items, listed by management element number and title, proposed for BMGR East in the 2018–2022 INRMP, and action item status/progress as of early 2023.

Element	Action Plan Item	Status	Progress by 2023
General Vegetation, Wildlife, Wildlife Habitat, and Wildlife Waters			
11.1	Habitat restoration[1]	Ongoing	Requested 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	Began a multi-year fencing project with AZGFD to secure the southern boundary of Area B which will result in 18 miles of new fencing to prevent access to trespassing livestock.
11.4	Allow for the maintenance and repair of existing water developments[1]	Ongoing	Continued monitoring via camera trapping program; continued collaboration with AZGFD in maintenance of water catchments.
Special Status Species			
12.1	Participate and implement actions per the Sonoran Pronghorn Recovery Plan	Ongoing	Continued multi-agency effort on the semi-captive breeding program at the Cabeza Prieta NWR and at Kofa NWR; AZGFD monitors previously established second population within historical range at BMGR East; continued 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	BMGR East completed a Road Maintenance Best Management Practices (BMP) Manual for roads. The focus of the plan is to reduce the impact of these activities on erosion.
13.2	Evaluate erosion problems in specific areas, develop plans for repair	Ongoing	Continue installing 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	Completed	56 RMO to completed Wildland Fire Management Plan in 2022.
Perimeter Land Use, Encroachment, and Regional Planning			
17.1	Participate in local and regional planning and monitoring land use patters	Ongoing	2023 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.

Table A-2. Action items, listed by management element number and title, proposed for BMGR West in the 2018–2022 INRMP, and action item status/progress as of early 2023

Element	Action Plan Item	Status	Progress by 2023
Resource Inventory and Monitoring			
1, 12	FTHL occupancy surveys	Ongoing	Support AGFD in conducting demographic and occupancy surveys as outlined in the Rangewide Management Strategy developed by the FTHL Interagency Coordinating Committee. Reached milestone of 10-years of data collection in 2022.
1	Identify and monitor vegetation plots in several plant communities	Ongoing	Each plot will be assessed at 5-year intervals.
1, 11	Monitor and control invasive plant species	Ongoing	Annual monitoring and control efforts of invasive plant species continue to be implemented.
1	Reptile, small mammal, and amphibian surveys and monitoring	Complete	This effort was completed by AZGFD in 2020. Follow-on surveys planned.
1	General bird surveys	Complete	This effort was completed by AZGFD in 2023. Follow-on surveys planned.
1.10	Surveys for game ungulates	Ongoing	MCAS Yuma Conservation staff continue to provide logistical and personnel power support to AZGFD to complete game ungulate survey requirements.
1	Bat surveys	In-progress	A cooperative agreement with the AZGFD was awarded in FY23. Field work will begin in CY24.
1	Maintain important wildlife connectivity corridors at BMGR West	Ongoing	MCAS Yuma continues to collaborate with the AZGFD to identify and maintain important wildlife connectivity corridors as they are identified at BMGR West
1	Install and maintain weather stations and rain gauges	Complete	MCAS Yuma provided funding to BLM for the procurement, installation, and maintenance of five Remote Access Weather Stations (RAWS) on BMGR West.
1	Medium and low priority actions as resources allow	Ongoing	Lower-priority actions continue to be completed as adaptive management approaches or availability of resources are identified.
1	Support special studies to address specific management issues, such as invasive species, species of concern, climate change, etc.	Ongoing	MCAS Yuma continues to support research proposals developed by universities, AZGFD, USGS, or others that address various issues of concern as they develop.
2	Identify and evaluate other possible Special Natural, Interest Areas	Ongoing	No special interest areas have been proposed since the 2007 INRMP.
1,12	Participate in and implement actions per the Sonoran Pronghorn Recovery Plan	Ongoing	MCAS Yuma continues to Support Sonoran pronghorn recovery actions as stipulated in Biological Opinions, Recovery Plan, or as determined by the interagency Recovery Team.
13	Examine available engineering management practice that can mitigate erosion	In-progress	MCAS Yuma awarded a contract in FY23 to evaluate possible engineering strategies and designs to restore the natural hydrology of the BMGR West.
11	Partner with the BP to identify and implement habitat restoration	Ongoing	MCAS Yuma continues to seek opportunities to work with CBP Yuma Sector, Yuma Station, and Wellton Station to implement habitat restoration.
16	Complete and subsequently implement fire management plan for BMGR-W	Complete	An Integrated Wildland Fire Management Plan (IWFMP) was completed in 2018. An MOA between MCAS Yuma and BLM for fire suppression assistance was signed in 2019 and updated in 2022.
1	Range-wide soil map	In-progress	The USDA-NRCS Tucson Soil Survey Office completed field work in 2022, a soil map is in development.
1	Aerial imagery for range and base	Not initiated	Project to be initiated in the future.

Element	Action Plan Item	Status	Progress by 2023
1	Characterize anthropogenic impacts	Ongoing	MCAS Yuma continues to utilize aerial imagery, soil, precipitation, and vegetation data available to map recent disturbances, inform management decisions, and identify potential restoration sites.
1	Construct adaptive management strategies for maintaining acceptable limits of change	Ongoing	MCAS Yuma continues to implement an ecosystems management approach that considers existing baseline survey data and regional concerns.
14	Control excessive fugitive dust at permitted construction sites and recreation activity areas	Ongoing	MCAS Yuma controls fugitive dust as needed, and as required through NEPA.
1	Allow maintenance and development of existing water sources supporting wildlife	Ongoing	MCAS Yuma continues to work with AZGFD to monitor and maintain existing network of wildlife waters. Several were upgraded with remote sensed pressure sensors that allow for real-time monitoring.
1, 11, 13, 14, 15	Conduct habitat restoration efforts for damaged areas	Ongoing	MCAS Yuma continues to implement active and passive restoration in degraded areas.
1, 11	Support AGFD installation of up to six high priority wildlife watering sites at BMGR	Ongoing	One new wildlife water was constructed by AZGFD in 2021
1-17	Maintain an adequately trained staff to accomplish conservation goals and objectives	Ongoing	MCAS Yuma continues to ensure that sufficient staffing is maintained and that personnel are adequately trained to manage natural resources on BMGR West.
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	Ongoing	MCAS Yuma continues to utilize 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	Ongoing	Determined as needed.
3	Evaluate site-specific proposals to assess the need for and potential impacts of approving additional roads for agency purposes	Ongoing	Determined as needed.
3, 5	Install signs, gates, and fences to support road infrastructure and public access	Ongoing	Damaged and/or new signs are installed as needed to identify restricted areas, range boundaries, range entry points, 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	Ongoing	MCAS Yuma awarded a contract for a new permit system in FY23. The new permit system went live in June 2023.
4	Assess benefits and effects of establishing designated camping areas for adaptive management of public use areas	Complete	Information collected from the online permitting system and CLEO interactions continues to guide management decisions related to public use of the BMGR West.
5	Revise and maintain visitor map	Complete	The BMGR West visitor map was updated in 2023.
5	Retain a minimum of four full-time CLEO positions	Ongoing	All MCAS Yuma CLEO positions are fully staffed as of September 2023.
5	Public outreach	Ongoing	Conservation staff continue to support public awareness efforts to educate MCAS Yuma employees and the Public concerning natural and cultural resources, historic preservation, and conservation activities.

Element	Action Plan Item	Status	Progress by 2023
5	Compile recreation-use statistics, analyze patterns, ascertain where use is heavy to identify areas of resource concern	Ongoing	The MCAS Yuma Recreational Planner routinely monitors, analyzes, and prepares reports on these statistics to better inform management activities at BMGR West.
8	Evaluate the effects of non-game species collection on wildlife, habitat, and other resources; limit or restrict collection activities within the authority of state law	Ongoing	Determined as needed and as funding is available. MCAS Yuma provided logistical and personnel support to AZGFD for a multi-year study to evaluate the impacts of speckled rattlesnake collection at BMGR West which concluded in 2020.
Manage Realty Property			
10, 17	Cooperate with ADOT, BP, and utility companies regarding proposed actions within existing utility/transportation corridors	Ongoing	MCAS Yuma works cooperatively with the BEC, ICC, MOG, Pronghorn Recovery Team, and local, state, and federal governments to review and deconflict potential impacts as they are identified.
Perimeter Land Use			
17	Monitor illegal immigration, trafficking, and border-related law enforcement to anticipate how BMGR resources may be affected	Ongoing	This is on-going and closely monitored.