U. S. AIR FORCE AND MARINE CORPS

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Barry M. Goldwater Range

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the United States Air Force's (USAF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which includes Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Where applicable, external resources, including Air Force Instructions (AFIs); Department of Defense Instructions (DoDIs); Marine Corps Orders (MCOs); USAF Playbooks; United States Marine Corps (USMC) Handbooks; federal, state, and local requirements; Biological Opinions (BO); and permits are referenced.

The Barry M. Goldwater Range (BMGR) is unique in that management is shared between the USAF and USMC. Although this 2023 INRMP follows the USAF standardized template, USMC-specific policies have been incorporated and the plan adheres to Marine Corps Order (MCO) 5090.2 of the Environmental Compliance and Protection Program (USMC 2018).

Certain sections of this INRMP begin with standardized, USAF-wide "common text" language that address USAF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the USAF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are maintained and updated by the approved plan owner. This text has been edited to include USMC language as appropriate.

NOTE: The terms "Natural Resources Manager," "NRM," and "NRM/POC" are used throughout this document to refer to the installation person responsible for the natural resources program, regardless of whether this person meets the qualifications within the definition of a natural resources management professional in DoDI 4715.03, Natural Resources Conservation Program.

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DOCUMENT CONTROL

Standardized INRMP Template

In accordance with (IAW) the Air Force Civil Engineer Center (AFCEC) Environmental Directorate Business Rule (BR) 08, *EMP Review, Update, and Maintenance*, the standard content in this INRMP template is reviewed periodically, updated as appropriate, and approved by the Natural Resources Subject Matter Expert (SME).

This version of the template is current as of 26 June 2020 and supersedes the 2018 version.

NOTE: Installations are not required to update their INRMPs every time this template is updated. When it is time for installations to update their INRMPs, they should refer to the eDASH EMP Repository to ensure they have the most current version.

Installation INRMP

Record of Review—The INRMP is updated no less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. IAW the Sikes Act and AFMAN 32-7003, *Environmental Conservation*, and MCO 5090.2 *Environmental Compliance and Protection Program* the INRMP is required to be reviewed for operation and effect no less than every five years. An INRMP is considered compliant with the Sikes Act if it has been approved in writing by the appropriate representative from each cooperating agency within the past five years. Approval of a new or revised INRMP is documented on a signature page signed by the Installation Commander (or designee), a designated representative of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries when applicable (AFMAN 32-7003).

Annual reviews and updates are accomplished by the installation Natural Resources Manager (NRM), and/or a Section Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the Section Natural Resources Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of USFWS, state fish and wildlife agency, Native American Tribes, and NOAA Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signing the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

INRMP APPROVAL/SIGNATURE PAGES

Signature pages, provided as separate documents during signature phase, will be inserted here when complete.

EXECUTIVE SUMMARY

The Barry M. Goldwater Range (BMGR) in southwestern Arizona has served as a military training and testing range since 1941. While federal agency responsibility for natural and cultural resources management has varied over the years, the Military Lands Withdrawal Act (MLWA) of 1999 (Public Law 106-65), which renewed the approximately 1.7-million-acre military range, assigned this responsibility to the Secretaries of the Air Force and Navy for the eastern and western portions of the Range, respectively.

The U.S. Air Force (USAF) and U.S. Marine Corps (USMC), in partnership with the Department of the Interior (DOI) and the Arizona Game and Fish Department (AZGFD), prepared an Integrated Natural Resources Management Plan (INRMP), IAW the MLWA; the Sikes Act Improvement Act (hereafter referred to as "Sikes Act") (16 U.S. Code § 670a et seq., as amended through 2014); the National Environmental Policy Act (NEPA) of 1969 (42 U.S. Code §§ 4321-4370h, as amended through 1992); and other applicable laws. This 2023 INRMP is the third update for the BMGR and is the product of a thorough review of the 2018 INRMP.

IAW the MLWA, the review was facilitated by the preparation of a Public Report that summarizes current use and conditions since the 2018 INRMP was implemented. The use and conditions assessment includes natural and cultural management actions, environmental remediation actions, and public access and outreach. This revised INRMP incorporates the findings of the Public Report and of consultations with partner agencies and Native American Tribes.

This update identifies management and other agency responsibilities and summarizes the historical and current military uses of the BMGR. It also includes climate change projections, possible climate change impacts to natural resources, and climate change vulnerability assessments for protected and focal species on the installation. Other significant updates are to the BMGR East boundary, which now includes the Sentinel Plain and Ajo Air Station, and updates on the road systems of BMGR.

The update includes a preliminary list of projects planned for the next five years that have been reviewed by the public, partnering agencies, and Native American Tribes. These projects are intended to accomplish the objectives and goals of the installation listed in Chapter 8 of the plan. The three overarching goals for natural resources management are:

- 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.

Each planned USAF or USMC project is identified by federal fiscal year (FY) for which funding is requested, the priority of that project, the expected length of the project in years, and potential partners. Implementation of this INRMP is subject to the availability of annual funding appropriated by Congress and none of the proposed projects or actions shall be interpreted to require obligations or payment of funds in violation of any applicable federal law, including the Anti-Deficiency Act of 1982 (31 U.S. Code § 1341).

1.0 OVERVIEW AND SCOPE

This INRMP was developed to provide effective management and protection of natural resources. It summarizes the installation's natural resources and outlines strategies to adequately manage those resources. Natural resources are valuable assets of the USAF and the USMC. They provide the natural infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural resources increases the effectiveness of USAF and USMC adaptability in all environments. The primary objective of the USAF and USMC natural resources program is to sustain, restore, and modernize natural infrastructure to ensure operational capability and no net loss in the capability of the lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural resources within the context of the installation's mission. The INRMP is intended for use by all installation personnel. The Sikes Act is the primary legal driver for the INRMP. The USAF and USMC have stewardship responsibility for the physical lands on which installations are located to ensure all natural resources are properly conserved, protected, and used in sustainable ways.

1.1 Purpose and Scope

BMGR is a U.S. military installation that encompasses approximately 1.77 million acres in southwestern Arizona. The USAF and the 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 also used for other national defense purposes, most of which support or are associated with tactical air training. The USAF is the primary user of and managing agency for the eastern portion of the Range, referred to as 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 (Figure 1-1).

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, U.S. Department of the Navy (USN), Air National Guard (ANG), Army National Guard (ARNG), and Air Force Reserve Command. The BMGR has been one of the nation's most productive military reservations for training tactical aircrews since World War II. As the nation's third largest military reservation, the BMGR has the training capabilities, capacities, and military air base support that provide the flexibility needed to sustain a major share of the country's aircrew training requirements now and into the foreseeable future.

The predominant use of the BMGR throughout its history has been to provide land and airspace for tactical air training. The Military Withdrawal Lands Act (MLWA) of 1999 (Public Law 106-65), which superseded the MLWA of 1986 (Public Law 99-606), extends statutory authorization for the BMGR to October 2024 and continues the historical military purposes of the Range. This act reserves the BMGR for use by the Secretaries of the Air Force and Navy for

- an armament and high-hazard testing area;
- training for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support; and
- equipment and tactics development and testing and other defense-related purposes consistent with those specified in Public Law 106-65 § 3031(a)(2).

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. Additionally, a companion land withdrawal application for the Gila Bend Addition, a 2,366-acre parcel of land east of the Gila Bend Auxiliary Airfield, was submitted in 2019. 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 deciding 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.

During the withdrawal extension process, the Air Force identified several areas on the periphery of BMGR, including the Sentinel Plain and Ajo parcels, that the Air Force intended to relinquish to the DOI. When Congress granted the Air Force a withdrawal extension for the BMGR via the MLWA of 1999, it extended the MLWA of 1986 withdrawal term for the Sentinel Plain and Ajo Airport parcels, until such time the Air Force relinquished these lands to the Department of Interior. Since these lands were never relinquished by the Air Force, the Sentinel Plain and Ajo Airport parcels remain withdrawn to the Air Force under the MLWA of 1986. Additionally, the MLWA of 1986 Ajo Parcel (except for a small sliver near Highway 85) has also been withdrawn indefinitely since 1950 to the Air Force via Public Land Order No. 652. At present, the Air Force has identified a continuing military need for both the Sentinel Plain and Ajo Airport parcels as part of BMGR and does not intend to relinquish either parcel currently. Three small 1940s-era fee acquisition parcels on the eastern edge of the Gila Bend Auxiliary Field were not addressed in the 2018 INRMP but are covered in the 2023 INRMP.

Parallel to its continuing value as an essential national defense asset, the BMGR is also nationally significant as a critical component in the largest remaining expanse of relatively unfragmented Sonoran Desert in the U.S. Except for State Route (SR) 85, the land is free of major developments and is ecologically linked to the Organ Pipe Cactus National Monument (NM), Cabeza Prieta National Wildlife Refuge (NWR), Sonoran Desert NM, and other lands administered by the U.S. Bureau of Land Management (BLM), as shown in Figure 1-1. Within this contiguous complex, the BMGR is composed of almost 55% of the land area and is more than twice the size of any other component.

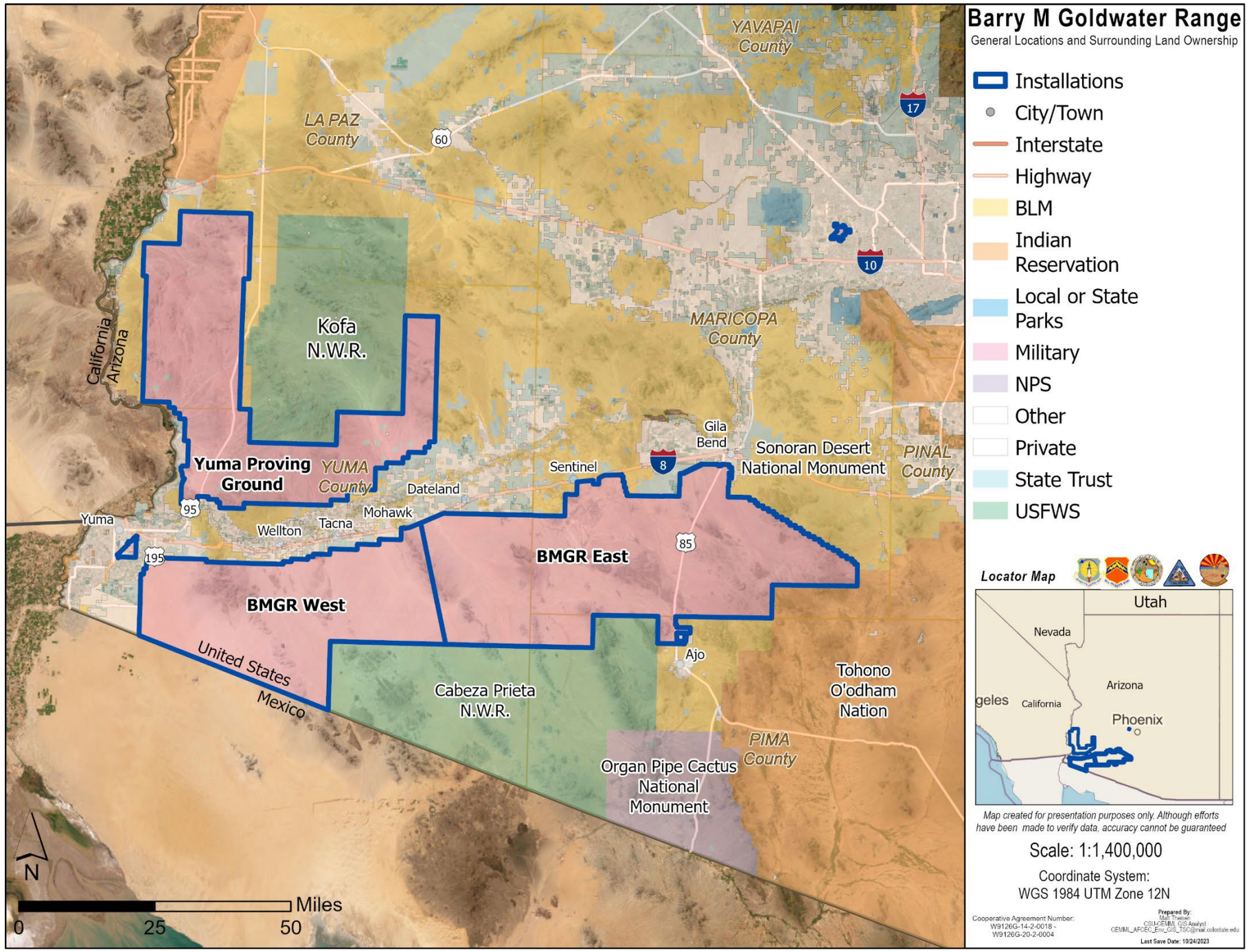

Figure 1-1. General location and surrounding land ownership of Barry M. Goldwater Range

1.2 Management Philosophy

The INRMP serves as a key component of the Installation Development Plan, which provides background and rationale for the policies and programming decisions related to land use, resource conservation, facilities and infrastructure development, and operations and maintenance to ensure that they meet current requirements and provide for future growth. The INRMP supports the mission by identifying the natural resources present on the installation, developing management goals for these resources, and integrating these management objectives into mission requirements and regulatory compliance to minimize natural resource constraints.

This INRMP outlines the steps needed to fulfill compliance requirements related to natural resources management and foster environmental stewardship. It is organized into the following principal sections:

- An Installation Profile that presents range resources and the regulatory environment under which they are managed (Section 2.0)
- Environmental Management System, Roles and Responsibilities, Training, and Record Keeping practices maintained by the USAF and USMC (Sections 3.0 through 6.0)
- The Natural Resources Program Management that details how the base manages the resources presented in Section 2.0 (Section 7.0)
- Management recommendations that incorporate the installation's goals and objectives for natural resource management areas (Section 8.0)
- Specific work plans for effective implementation of the INRMP (Section 10.0)

Management issues and concerns, as well as goals and objectives, are developed from analysis of all available information, surveys, and background documents, and are reviewed by USAF and USMC personnel involved with or responsible for various aspects of natural resources management. The INRMP was developed using an interdisciplinary approach and is based on existing information about the physical and biotic environments, mission activities, and environmental management practices at BMGR. Information was obtained from a variety of documents, interviews with installation personnel, on-site observations, regional data sources and in-house data, and communications with both internal and external stakeholders. Coordination and correspondence with these agencies are documented, which satisfies a portion of the requirements of 32 Code of Federal Regulations (CFR) 989, *Environmental Impact Analysis Process (EIAP)*. Goals and objectives require monitoring on a continuous basis and management strategies are updated whenever there are changes in mission requirements, adverse effects to or from natural resources, or changes in regulations governing management of natural resources.

The USAF is the primary user of and managing agency for BMGR East. Air Force Manual (AFMAN) 32-7003, *Environmental Conservation*, provides the direction to implement Air Force Policy Directive 32-70, *Environmental Quality*, and DoDI 4715.03, *Natural Resources Conservation Program*. AFMAN 32-7003 explains how to manage natural resources on USAF installations IAW applicable federal, state, and local laws and regulations. AFMAN 13-212, *Range Planning and Operations*, provides guidance on comprehensive range planning, including the integration of operational requirements and missions in preparation of INRMPs and Integrated Cultural Resources Management Plans (ICRMPs). AFMAN 13-212 further provides that "Each INRMP and ICRMP will be written [IAW] AFMAN 32-7003 to support the current and future known mission requirements and will be amended as mission requirements change significantly."

The USMC is the primary user of and managing agency for BMGR West. Guidance for the USMC INRMP process is provided in Marine Corps Order (MCO) 5090.2 of the *Environmental Compliance and Protection*

Program (USMC 2018), DoDI 4715.03, and the *Handbook for Preparing, Revising, and Implementing Integrated Natural Resources Management Plans on Marine Corps Installations*. This handbook guides the preparation, revision, and implementation of INRMPs in compliance with the Memorandum of Understanding (MOU) between the DoD, the USFWS, and the International Association of Fish and Wildlife Agencies, and IAW the Sikes Act as implemented by the Office of the Secretary of Defense in *Updated Guidance on Implementation of the Sikes Act Improvement Act*.

The DoD has modified its land management focus over the past two decades from the protection of individual species to ecosystem management. The two principal reasons for these changes are (1) the Sikes Act emphasis on promoting effective wildlife and habitat protection, conservation, and management; and (2) the concern that a disproportionate amount of attention in the past has been placed on managing the needs of individual, high-profile species in possible conflict with underlying ecosystem functions.

Ecosystem management incorporates the concepts of biological diversity and ecological integrity in a process that considers the environment as a complex system that functions as a whole, not as a collection of parts. In its application, a goal-driven approach is used to manage natural and cultural resources in a manner that:

- supports present and future mission requirements;
- preserves ecosystem integrity;
- is implemented at a scale compatible with natural processes;
- is cognizant of nature's timeframes;
- recognizes social and economic viability within functioning ecosystems;
- is adaptable to complex and changing requirements; and
- is realized through effective partnerships among private, local, state, Tribal, and federal interests.

Traditionally, academic disciplines such as ecology, biogeography, population genetics, economics, sociology, philosophy, and others are synthesized and applied to the maintenance of biological diversity. Because ecosystem management is based on ongoing studies of ecology, biological diversity, and resources management, and because ecosystems are open, changing, and complex, this planning and management philosophy requires flexibility, namely in the form of adaptive management. Provisions to allow for adaptive management include monitoring, assessment, reassessment, and adjustment as necessary.

DoD policy guidelines on ecosystem management are intended to promote and protect natural processes. Those guidelines, however, do not preclude active management or intervention deemed necessary to address issues such as the removal of invasive species, supporting endangered species recovery, or managing barriers to wildlife movement inside or outside of the installation. The DoD expects its resource managers to use the best available science, collaborative efforts with federal and state wildlife agencies, and consultations with outside experts and the public in reaching and implementing management decisions, including specific needs for intervention.

1.3 Authority

The Sikes Act, 16 USC § 670a, and the MLWA of 1999 provide legal authority for the BMGR INRMP.

The Sikes Act requires that an INRMP be written and implemented for all DoD installations with significant natural resources. The Sikes Act provides that "the Secretary of Defense shall carry out a program to provide for the conservation and rehabilitation of natural resources on military installations" and that an INRMP is to be prepared to facilitate implementation of that program. Consistent with the use of military installations

to ensure the preparedness of the Armed Forces, the Sikes Act further specifies that the Secretaries of the military departments shall carry out a natural resources management program to provide for:

- conservation and rehabilitation of natural resources on military installations;
- sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and non-consumptive uses; and
- public access—subject to safety requirements and military security—to military installations to facilitate use.

The MLWA of 1999 provides that the Secretaries of the Navy, Air Force, and Interior jointly prepare an INRMP for the Range. 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]…" (Table 1-1).

Accordingly, this plan has been developed cooperatively between the USAF, USMC, the USFWS, AZGFD, and BLM. The USAF and USMC natural resource programs ensure continued access to land, air, and water resources to conduct realistic military training and testing, as well as to sustain the long-term ecological integrity of the Range.

The table entitled "Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP," included as Appendix A of this plan, summarizes key legislation and guidance used to create and implement this INRMP. Refer to the complete listing of AFMANs, MCOs, the Federal Register, and the USC to ensure that all applicable guidance documents, laws, and regulations are reviewed. Installation-specific policies, including state and local laws and regulations, are summarized in Table 1-1.

Table 1-1. Integrated Natural Resources Management 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 following INRMP elements: • Wildlife management, land management, and wildlife-oriented recreation • Wildlife habitat enhancement or modifications • Integration of, and consistency among, the various activities conducted under the plan • Establishment of specific natural resources goals, objectives, and time frames for proposed actions • Sustainable use of natural resources by the public 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 • Enforce applicable natural resource laws (including regulations) • No net loss in the capability of military installation lands to support the military mission of the BMGR

Table 1-1. Integrated Natural Resources Management Plan elements specified in the Sikes Act and Military Lands Withdrawal Act of 1999

MLWA of 1999
The INRMP shall include the following provisions: • Provide for the proper management and protection of the natural and cultural resources of withdrawn lands. • Provide that any hunting be conducted IAW the provisions of 10 U.S.C. § 2671 (the general military policy for hunting, fishing, and trapping on military reservations). • Identify current BMGR test and target impact areas and related buffer or safety zones. • Provide necessary actions to prevent, suppress, and manage brush and range fires that occur within or along the BMGR boundary because of military activities. • Provide that all gates, fences, and barriers constructed are designed and erected to allow wildlife access to the extent practicable and consistent with military security, safety, and sound wildlife-management use. • Incorporate any existing management plans pertaining to the BMGR, to the extent that INRMP preparers mutually determine that incorporation of such plans into the INRMP is appropriate. • Include procedures to ensure that the periodic reviews of the plan under the Sikes Act are conducted jointly by the Secretaries of the Navy, USAF, and Interior, and that affected states, Native American Tribes, and the public are provided a meaningful opportunity to comment upon any substantial revisions to the plan that may be proposed. • Provide procedures to amend the plan as necessary. • Ensure compliance with cultural resources statues and regulations, including DoDIs, Air Force Manuals, Executive Orders, Executive Memorandums, and federal regulations such as the American Indian Religious Freedom Act, National Historic Preservation Act, and Native American Graves Protection and Repatriation Act. Compliance with these statues and regulations requires access to the Range and consultation with Native American Tribes.

1.3.1 Agency Responsibilities

The MLWA of 1999 transferred all lands and interest in such lands within the boundaries established for BMGR from the Secretary of the Interior to the Secretary of the Air Force and the Secretary of the Navy. This transfer includes land control and federal jurisdiction for managing the natural and cultural resources of the BMGR. The MLWA does not provide jurisdiction and land control to entities or agencies that are not specifically mentioned in the MLWA. These entities include, for example, Department of Homeland Security (DHS), U.S. Customs and Border Protection (CBP) and local law enforcement. Consequently, if any non-mentioned agencies outside of the USAF and Navy want to access or operate within the BMGR, they must receive prior approval from appropriate USAF and Navy representatives. If approval is granted, it does not create a right or precedence for future BMGR access.

The Secretary of the USAF, who has primary surface-management responsibility for BMGR East, delegated local command and control for BMGR East to the Commander of the 56 Fighter Wing (56 FW) at Luke Air Force Base (AFB). As a result, Luke AFB also assumes responsibility for preparing and implementing the INRMP for BMGR East. Similarly, the Secretary of the Navy, who has primary surface-management responsibility for BMGR West, delegated local command and control for BMGR West and responsibility

for preparing and implementing the INRMP for that portion of the Range to the Commanding Officer of Marine Corps Air Station (MCAS) Yuma. Therefore, the Commanders of Luke AFB and MCAS Yuma provide local command and control for military operations, access and use, and daily resource-management activities for their respective portions of the BMGR. Although the USAF and USMC hold primary surface-management responsibility for the BMGR, the Secretary of the Interior and AZGFD are responsible for its natural resources. The 1999 MLWA assigned the Secretary of the Interior to assist the Secretaries of the USAF and Navy in jointly preparing the INRMP and conducting periodic reviews for updating the plan as necessary. This role has been delegated to the Manager of Cabeza Prieta NWR.

As provided by the MLWA of 1999, the Secretary of the Interior also has the authority to transfer land management responsibility for the BMGR from the USAF and/or USMC to the DOI if the Secretary determines that (1) the USAF or USMC has failed to manage natural and cultural resources IAW the INRMP, and (2) this failure is resulting in significant and verifiable degradation of the natural or cultural resources of the BMGR. Another provision of the MLWA of 1999 directs the USAF and/or USMC to consult with the DOI before using the BMGR for any purpose other than the purposes for which it was withdrawn and reserved. The Arizona State Director of the BLM has local responsibility for representing the DOI in such oversight activities and consultations.

Therefore, regarding number (1), it is incumbent upon the USAF and Navy to implement measures called upon by the Sikes Act/INRMP to properly manage the natural resources at BMGR. With respect to number (2), the USAF and Navy must be vigilant in holding responsible and accountable any other entities or agencies (federal, state, local, and public provided all these entities/agencies received prior approval to access BMGR) for any violations affecting the Navy and USAF's management and control of BMGR. These other entities and agencies do not have automatic grant or access to the BMGR. This is like any other military-controlled installation. If they were given approval of access, they must abide by the law, especially the mandates to comply with the MLWA of 1999, the Sikes Act, and other applicable rules and regulations. Additionally, Conservation Law Enforcement Officers, as well as servicing military law enforcement officials, can issue the necessary actions against violators from the federal, state, local, or public sectors.

1.3.2 Arizona Game and Fish Department Authority

The state of Arizona has primary jurisdiction over wildlife management within the BMGR, except where pre-empted by federal law. The MLWA of 1999 or Sikes Act neither diminishes nor expands the jurisdiction of the state with respect to wildlife management. In addition, AZGFD is the state agency responsible for providing safe opportunities for all forms of responsible outdoor recreation including but not limited to hunting, fishing, trapping, shooting, wildlife watching, off-highway vehicle use, and dispersed camping.

Established in 1929 under Title 17 of the Arizona Revised Statutes (ARS), AZGFD is governed by the Arizona Game and Fish Commission. Under the provisions of ARS 17-231, the Arizona Game and Fish Commission establishes policy for the management, preservation, and harvest of wildlife. Under the umbrella of the Commission, the AZGFD's mission is "To conserve, enhance, and restore Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations" (AZGFD 2017*a*).

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

- developing and maintaining habitat assessment/evaluation, protection, management, and enhancement projects (e.g., artificial water developments and food plots);
- conducting wildlife population surveys;

- managing wildlife predators and endangered species or special status species (management of federally listed endangered species is a responsibility shared with the USFWS);
- enforcing hunting regulations;
- establishing game limits for hunting, trapping, and non-game species collection;
- issuing hunting permits; and
- assisting and advising the DoD to manage off-highway vehicle use in terms of habitat protection and advocating for user opportunities.

In managing the state's wildlife, AZGFD makes determinations on the appropriateness and need to translocate wildlife into or out of the BMGR. Should wildlife translocations affecting the BMGR be proposed, appropriate environmental studies and regulatory compliance would be completed, as required, prior to implementing any specific proposal.

1.3.3 U.S. Border Patrol Authority

As stated in Section 1.3.1, the MLWA of 1999 transferred BMGR land interest specifically to the Navy and the USAF. BMGR was not transferred to any other federal, state, or local agencies, such as DHS and for that matter, not to CBP. However, as a portion of the international border barriers were built on BMGR—about 31 miles out of 1,954 miles of international land border between the United States and Mexico—DHS/CBP requires access to those barriers. Because BMGR is a military installation and is not under the jurisdiction and management control of DHS/CBP, CBP can access the border wall through the City of San Luis corridor. However, to access through BMGR, CBP requires approval from U.S. Navy and USAF per the MLWA of 1999. An existing memorandum of agreement (MOA) between CBP and the USMC permits CBP to conduct limited maintenance on INRMP-approved roads. The USAF is working with the CBP to develop a similar MOA and works in cooperation with CBP on road access while the MOA is in development. These roads have been surveyed and assessed and are consistent with the natural and cultural resources management. CBP is not authorized to create its own roads within the BMGR.

Although BMGR is a military installation with its requisite jurisdictional authorities, it is not cost-efficient nor reasonable to enclose BMGR with a fence approximately 350 miles long with manned access gates. In addition, although the primary border wall within BMGR addresses vehicular trespass from the Mexican border, this primary wall and the secondary wall do not completely negate the possibility of individual undocumented migrants crossing the border. Thus, undocumented aliens (UDAs), foreign born individuals who do not possess a valid visa or other immigration documentation, and smuggling traffic may occur within BMGR because of its proximity to the international border (Figure 1-1).

CBP is also charged with installing border infrastructure as needed to deter illegal crossings and maintaining operational control of the border (Homeland Security Act of 2002, Public Law (P.L.) 107-296, 6 U.S. C. §§ 101 et seq. [U.S. Department of Homeland Security 2002]; Section 102 of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996 [Public Law 104-208, as amended]; 8 U.S.C. § 1103, Aliens and Nationality; and other acts). Within CBP, the U.S. Border Patrol 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, the CBP coordinates with 56 Range Management Office (RMO) Conservation Law Enforcement Officers (CLEOs) and Pima and Maricopa County Sheriff Offices. Within BMGR West, CBP coordinates with Range Management Department (RMD) CLEOs, Yuma County Sheriff's Office, and Yuma County Search and Rescue.

In January 2007, the Department of Homeland Security waived numerous environmental, natural, and cultural resources conservation actions and endangered species protection laws to expedite construction of the border fence along the international boundary within the BMGR and adjacent public lands (USFWS 2007*a*), (Sikes Act; MLWA; National Environmental Policy Act [NEPA] 42 U.S.C. § 4321 et seq.; Endangered Species Act [ESA] 16 U.S.C. § 1531 et seq.; Clean Water Act 33 U.S.C. § 1251 et seq.; Wilderness Act, 16 U.S.C. § 1131 et seq.; National Historic Preservation Act of 1966 54 U.S.C. § 300101 et seq.; National Wildlife Refuge System Administration Act, 16 U.S.C. § 668dd–668ee; and Administrative Procedure Act 5 U.S.C. § 551 et seq.; Haddal et al. 2009). In addition, starting around 2019, on behalf of the DHS, the U.S. Army Corps of Engineers (USACE) began building a secondary barrier, of which portions (about 31 miles) are on BMGR and remain incomplete. These actions negatively impact the mandate of the MLWA of 1999 and the Sikes Act and management of sensitive species including the flat-tailed horned lizard (*Phrynosoma mcallii*, FTHL).

1.4 Integration with Other Plans

INRMP revisions and concurrence with the final plan must be coordinated through BMGR East and West's chains of command, USFWS, AZGFD, and other stakeholders such as Tribal groups and the public. The NRM must ensure that the INRMP, Integrated Pest Management Plan (IPMP), Bird/Aircraft Strike Hazard (BASH) plan, Wildland Fire Management Plan (WFMP), and any other plans that may affect natural resources, are mutually supportive and not in conflict. U.S. Marine Corps guidance states: "Mission requirements and priorities identified in (this INRMP) shall, where applicable, be integrated in other environmental programs and policies."

Implementation of this INRMP will support and sustain the military mission of the Range with no net loss in the capability of the BMGR lands to support the mission. The INRMP is incorporated (i.e., referenced as appropriate) into the MCAS Yuma Range and Training Areas Standard Operating Procedures (SOP) Station Order 3710.6K.

IAW the MLWA of 1999, the INRMP provides for protection of the cultural resources of BMGR by ensuring that natural resources management actions are fully supportive of and compliant with ICRMP prescriptions for the Range (see Section 7.14). INRMPs and ICRMPs are prepared as separate but integrated plans rather than as components of a single plan.

AFMAN 13-212 requires that USAF installations review and coordinate all range-related documents, including INRMPs, ICRMPs, and subordinate plans, to ensure compatibility with other range plans. INRMPs often incorporate subordinate plans that address installation actions such as pest control or wildfire suppression.

MCO 5090.2 requires that USMC INRMPs and the installation master plan shall identify the boundaries of endangered and threatened species habitat, wetlands, and other geographically specific areas important to natural resources stewardship. MCO 5090.2 also requires that the WFMP be incorporated into or consistent with the INRMP and ICRMP and that the IPMP is reviewed by the Natural Resources Manager for consistency with the INRMP.

2.0 INSTALLATION PROFILE

Table 2-1. Installation profile

Office of Primary Responsibility (OPR)	56 Range Management Office for BMGR East and the RMD for BMGR West have overall responsibility for implementing the natural resources management program and are the lead organizations for monitoring compliance with applicable federal, state, and local regulations.	
Natural Resources Manager/Point of Contact (POC)	**BMGR East** 56 RMO/ESM 7101 Jerstad Lane, Building 500 Luke AFB, AZ 85309 623-856-8487	**BMGR West** MCAS Yuma Conservation Manager RMD P.O. Box 99134/Building 151 MCAS Yuma, AZ 85369-9134 928-269-3401
State and/or local regulatory POCs (Include agency name for Sikes Act cooperating agencies)	**USFWS Ecological Services** Assistant Field Supervisor for Southern Arizona 201 N. Bonita, Ste. 141 Tucson, AZ 85745 520-670-6144	**AZGFD** Regional Supervisor-Region IV 9140 E 28th Street Yuma, AZ 85365 928-341-4040
Total acreage managed by installation	BMGR Total — Approximately 1.7 million acres BMGR East — Approximately 1 million acres BMGR West — Approximately 700,000 acres	
Total acreage of wetlands	0 acres	
Total acreage of forested land	0 acres	
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	Yes, see Table 2-2 for list of biological opinions.	
Natural Resources Program Applicability (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0)	☒ Fish and Wildlife Management ☒ Outdoor Recreation and Access to Natural Resources ☒ Conservation Law Enforcement ☒ Management of Threatened, Endangered, and Host Nation-Protected Species ☒ Water Resource Protection ☐ Wetland Protection ☒ Grounds Maintenance ☐ Forest Management ☒ Wildland Fire Management ☐ Agricultural Outleasing ☒ Integrated Pest Management Program ☒ Bird/Wildlife Aircraft Strike Hazard (BASH) ☐ Coastal Zone and Marine Resources Management ☒ Cultural Resources Protection ☒ Public Outreach ☒ Geographic Information Systems (GIS)	

Table 2-2. Active USFWS Biological Opinions and informal concurrences for Barry M. Goldwater Range

Date; FWS Number	Title/Description	Location Covered
17 Apr 1996; 02-21-95-F-0114	U.S. MCAS-Yuma in the Arizona Portion of the Yuma Training Range Complex (BMGR West)	BMGR West
18 Mar 1998; 2-21-95-F-114	Amends Biological Opinion # 02-21-95-F-0114 to include Stoval airfield.	
16 Nov 2001; 2-21-95-F-114R2	Sonoran pronghorn (*Antilocapra americana sonoriensis*) and lesser long-nosed bat (*Leptonycteris yerbabuenae*) and associated re-initiations	
17 Dec 2002; 2-21-95-F-114R3	2002 re-initiation addresses possible effects of contaminants issues at the MCAS munitions training range	
6 Aug 2003; 02-21-95-F-0114R4	2003 re-initiation addresses Peirson's milkvetch (*Astragalus magdalenae peirsonii*) misidentification	
21 Oct 2009; 22410-1995-F-0114-R005	2009 re-initiation addresses West Coast Basing of the MV-22	
17 Sept 2010; 22410-1995-F-0114-R006	2010 re-initiation addresses West Coast Basing of the F-35B Joint Strike Fighter and associated re-initiations	
3 Nov 2015; 22410-1995-F-0114-R007	2015 re-initiation addresses additions of F-35 squadrons, MV-22 operations, and maintenance of air and ground facilities	
2 Aug 1997; 02-21-96-F-094	Consultation on Military Training at BMGR East addressing impacts to the Sonoran pronghorn and lesser long-nosed bat and associated re-initiations	BMGR East

Table 2-2. Active USFWS Biological Opinions and informal concurrences for Barry M. Goldwater Range

Date; FWS Number	Title/Description	Location Covered
16 Nov 2001; 22410-1996-F-0094-001	2001 revised biological opinion finding training operations are unlikely to jeopardize Sonoran pronghorn or Peirson's milkvetch.	
6 Aug 2003; 02-21-96-F-094-R2	2003 revised biological opinion in response to ruling in Defenders of *Wildlife, et al., v. Bruce Babbitt, et al*. Revised opinion found no effect on Peirson's milkvetch or the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*).	
4 May 2010; 22410-1996-F-0094-003	2010 re-initiation of the revised biological opinion	
14 Mar 2014; 22410-1996-F-0094-004	2014 re-initiation addresses ending seasonal restrictions on public use during Sonoran pronghorn fawning season	
19 Sept 1997; 02-21-92-F-0227	Western Army National Guard Aviation Training Site Expansion Project addressing impacts to lesser long-nosed bat, cactus ferruginous pygmy-owl, and peregrine falcon (*Falco peregrinus*).	Maricopa, Pima, Pinal Counties, AZ including BMGR East
16 Nov 2001; 02-21-92-F-0227-R1 & 02-21-93-F-389-R1	2001 re-initiation addresses the Sonoran pronghorn	
6 Aug 2003; 02-21-93-F-389-R2	2003 re-initiation addresses the Sonoran pronghorn	

Table 2-2. Active USFWS Biological Opinions and informal concurrences for Barry M. Goldwater Range

Date; FWS Number	Title/Description	Location Covered
26 Aug 2005; 02-21-05-F-0492	Biological Opinion for the Integrated Natural Resources Management Plan for the BMGR, Arizona, and associated re-initiations; addresses impacts to the Sonoran pronghorn, lesser long-nosed bat, and acuña cactus (*Echinomastus erectocentrus* var. *acunensis*).	BMGR East & West
7 Jan 2013; 22410-2005-F-0492-R001	Conference report and compatibility determination to support the 2013 INRMP revision	
14 Mar 2014; 22410-2005-F-0492-R003	Addresses ending seasonal restrictions on public use during Sonoran pronghorn fawning season	
2 May 2018; 22410-2005-F-0492-R005	Compatibility determination to support the 2018 INRMP revision	
3 May 2017; 02EAAZ00-2017-F-0039	Formal Section 7 Consultation on the U.S. Army Yuma Proving Ground's Extended Range Cannon Artillery Test Program, Yuma and Maricopa Counties, Arizona and associated re-initiation; addresses impacts to the Sonoran pronghorn and lesser long-nosed bat	BMGR East & West
30 Sept 2019; 02EAAZ00-2017-F-0039-R001	2019 re-initiation addresses the acuña cactus and Sonoran pronghorn	
12 Dec 1994; 02-21-92-F-066	1994 Biological Opinion on the widening and realignment of Military Training Routes in AZ	Military Training Routes in AZ

Table 2-2. Active USFWS Biological Opinions and informal concurrences for Barry M. Goldwater Range

Date; FWS Number	Title/Description	Location Covered
19 Mar 2014; 02-21-1992-F-066	2014 Letter from USFWS concurring with Air Force proposal to avoid eagle breeding areas by 2,000 feet from 1 Dec to 30 Jun	
26 Apr 2012; 22410-2010-I-0353	USFWS concurrence regarding basing of F-35 aircraft at Luke AFB. Document addresses multiple species throughout AZ	BMGR East; Military Training Routes and Military Operating Areas in AZ
23 Dec 2013; 02EAAZ00-2010-I-0353	2013 Letter from USFWS concurs with Air Force proposal to reduce avoidance buffer around Mexican Spotted Owl Protected Activity Centers (PACs) underlying Military Training Routes from 1,320 feet to 500 feet	
27 Feb 2013; 02EAAZ00-2013-I-0085	USFWS concurrence that MCAS Yuma upgrades of Electronic Warfare Sites (EWS) may affect, but are not likely to adversely affect, the Sonoran pronghorn	BMGR West
2 Feb 2017; 02EAAZ00-2017-I-0267	USFWS concurrence that MCAS Yuma Sonoran pronghorn Drinker Upgrades may affect, but are not likely to adversely affect, Sonoran pronghorn	BMGR West
27 Jan 2020; 02EAAZ00-2020-I-0332	USFWS concurrence that MCAS Yuma Counter-Intrusion Project may affect, but is not likely to adversely affect, Sonoran pronghorn	BMGR West
05 Mar 2020; 02EAAZ00-2020-I-0502	USFWS concurrence that MCAS Yuma Mohawk Coring Study may affect, but is not likely to adversely affect, Sonoran pronghorn	BMGR West

Table 2-2. Active USFWS Biological Opinions and informal concurrences for Barry M. Goldwater Range

Date; FWS Number	Title/Description	Location Covered
05 Aug 2021; 02EAAZ00-2021-TA-1120	USFWS concurrence with USAF proposals to reduce eagle take in airspace managed by Luke AFB. Bald and golden eagle nests with a history of occupancy/production now receive a 1,000-foot buffer from 15 Dec to 15 Jul.	BMGR East

2.1 Installation Overview

2.1.1 Location and Area

BMGR is in southwestern Arizona in portions of Yuma, Maricopa, and Pima counties (Figure 1-1). Portions of BMGR East are in each of the three counties; BMGR West is located entirely in Yuma County. The Range is approximately 133 miles across on its longest east–west axis. The north–south axes vary in width: at the western end, the north–south axis is approximately 15 miles wide, is generally 18 to 28 miles wide through much of the Range's length, and narrows to about 4 miles at its eastern end.

The effective size of BMGR for supporting military aviation training is nearly 40% larger than its surface area, as the restricted airspace that overlies the Range is about 2.7 million acres. Also contributing to the effective size of BMGR is the adjacent Cabeza Prieta NWR, which the MLWA of 1999 stipulates must be managed to support certain military aviation training needs. The refuge, which is about 860,000 acres, is entirely within the footprint of the Range's restricted airspace. The restricted airspace over the refuge extends from the ground surface to 80,000 feet above ground level (AGL) and is fully incorporated in military aviation training.

Additionally, more than 85,000 cubic nautical miles of special use airspace are used for military operations beyond the airspace above BMGR, Luke AFB, and MCAS Yuma, including not only the adjacent federal lands, but also Tohono O'odham Nation lands and other parts of southwestern Arizona, as well as a region northeast of Flagstaff, AZ (see Luke AFB INRMP).

Three parcels comprise the bulk of the installation: BMGR East, BMGR West, and the Gila Bend Air Force Auxiliary Field (AFAF; Table 2-3).

Table 2-3. Installation and Geographically Separated Unit location and area descriptions

Installation and Geographically Separated Units (GSU)	Main Use/Mission	Acreage	Addressed in INRMP?	Describe Natural Resource Implications
BMGR East	Student and operational aircrews training, particularly advanced training for student aircrews transitioning to frontline combat	~1,000,000 acres	INRMP coverage	Major implications include BASH concerns, spread of invasive species, surface disturbances, and erosion
BMGR West	Student and operational aircrews training, particularly readiness training for aircrews in operational combat	~700,000 acres	INRMP coverage	Major implications include BASH concerns, spread of invasive species, surface disturbances, and erosion
Gila Bend Air Force Auxiliary Field (AFAF)	Support training in forward area airfield operations, observation points, and other facilities	2,011 acres	Covered as part of BMGR East	Major implications include BASH concerns, spread of invasive species, and erosion

2.1.2 Installation History

Barry M. Goldwater Range was established on 5 September 1941 to support the new Army Air Force, which became the USAF in 1947. The Army used the new range for flight training programs at Luke Field (now Luke AFB) and Williams Field as the U.S. prepared its armed forces for deployment in World War II. The parcel of land initially set aside for the Range included most of what is now BMGR East. By March 1943, parcels had been added to the Range to expand training capacity in the eastern portion of the Range and support flight training programs to the west at Yuma Army Air Base, which later became MCAS Yuma. Four key characteristics of the Range were critical to its intended mission. It was in close flying proximity to the air bases that it served, was uninhabited and undeveloped, possessed an ideal climate with good visibility and little rainfall, and was large enough to be divided into several sub-areas that could safely support simultaneous but independent training missions. The size of BMGR and its proximity to military air bases are two of the most important assets of the Range for supporting contemporary military training. Military use has continued to preclude habitation or development, except for infrastructure needed for military use.

The Yuma Army Air Base (now MCAS Yuma) was developed as a training command site separate from those at Luke and Williams fields. This base, and the addition of the western parcels to the gunnery and bombing range, established a second area of aircrew training operations independent from those conducted in the eastern range areas. This split of resources has continued and is reflected by BMGR East and West divisions of the Range.

President Franklin D. Roosevelt originally designated BMGR through authority provided to the president at that time to execute federal land withdrawals. BMGR remained under administrative withdrawal until 1986 when Congress passed the MLWA of 1986 (Public Law 99-606), which renewed the Range for military use for another 15 years and provided guidance for its use and management. The MLWA of 1986 was superseded by the MLWA of 1999 (Public Law 106-65 1999), which renewed the Range for an additional 25 years. The USAF and USMC are seeking another extension prior to the expiration of PL 106-65 1999 in October 2024.

2.1.2.1 Military Use History

Throughout BMGR's history, it has provided land and airspace for air combat training. During World War II, the training emphasis was on aerial gunnery. The eastern range area was used primarily for advanced aircrew training in fighter aircraft, including air-to-air gunnery, air-to-ground gunnery (i.e., strafing), and air combat flight maneuvers. Training in bombing ground targets was added to the curriculum in the final years of the war. The western range area was also used for training fighter aircrews, but the principal activity was air-to-air gunnery training for bomber aircrews.

War Department development during World War II occurred at three auxiliary air bases—Gila Bend, Ajo, and Dateland—and 14 outlying auxiliary airfields. Student aircrews were sent to the auxiliary air bases for concentrated instruction in gunnery and bombing training. Gila Bend Air Force AFAF is the only one of the three auxiliary air bases that is inside the modern boundaries of BMGR and continues to operate as a military installation. The former auxiliary base at Ajo is now Eric Marcus Municipal Airport, a public-use facility. The former auxiliary base at Dateland is now a privately owned airport restricted to authorized users.

Available evidence indicates that the 14 outlying auxiliary airfields were day-use-only facilities where personnel were not permanently stationed. These airfields likely were used as locations to rotate aircrews and to refuel or rearm aircraft between successive gunnery training missions. Eight of the 14 outlying auxiliary airfields remain within the modern boundaries of BMGR; the other six are in locations that are no longer part of the Range. Three of the eight outlying auxiliary fields that remain inside BMGR continue to be used for military purposes. The USMC continues to use Auxiliary Field 2 (AUX-II), located at the far western end of BMGR West to support a variety of training activities. Within BMGR East, Stoval Airfield, located southwest of Dateland near the northern boundary of BMGR, and AUX 6, located west of Gila Bend AFAF, are used for occasional training activities.

BMGR was not used for several years following World War II. The outbreak of the Korean War and growing concern regarding the Cold War prompted reactivation of the gunnery range, Luke AFB (formerly Luke Field), Gila Bend AFAF at the gunnery range, and Yuma AFB (now MCAS Yuma) in early 1951. Reactivation of the Range required substantial repairs and new construction. New target developments transformed BMGR East from a predominantly aerial gunnery training facility into a complex that could support all phases of tactical air combat training. Instruction in air-to-air gunnery continued to be an important function, but the new era also brought training in air-to-air missile firing and an expanded emphasis on the use of aircraft for air-to-ground attack using guns, missiles, rockets, and bombs. Development of the Range to support these new training missions included four ground-controlled subranges; five independently located vehicle convoy subranges; a camouflage subrange; a realistic tactical subrange; an air-to-air firing subrange; and a napalm (or fire-bomb) subrange.

United States Air Force use of BMGR East area during the middle of the Cold War and the Vietnam War era (1960 to 1974), continued to focus on the training of aircrews to fly fighter and attack aircraft. The

tactical, ground-controlled, air-to-air gunnery, and air-to-air maneuvering subranges that had been established during the 1950s were used to provide the necessary training support. However, the subranges were modified throughout this period to meet evolving training needs. By 1960, North, South, and East tactical (TAC) ranges were well established in terms of the ground surface areas dedicated as ordnance impact locations. By 1974, the partitioning of BMGR East into the four manned ranges, three tactical ranges, and the air-to-air were completed. They are still in use today.

BMGR East was redeveloped and upgraded in the second half of the 1970s to support training that would more realistically resemble potential threat areas. An electronic warfare range was installed to realistically simulate the types of air defense threats that aircrews could encounter in actual combat. The USAF also installed an electronic tracking and telemetry range (now referred to as the Air Combat Training System range). These upgrades and additions generally supported aircrew training needs at BMGR East through the end of the Cold War and the first Persian Gulf War in 1991.

The primary use of the western range area from 1950 to 1958 was to support an air-to-air gunnery and air-to-air rocket firing proficiency program of the USAF Air Defense Command (ADC). This program was based at the Yuma AFB. Air Defense Command was responsible for training and deploying the fighter interceptor squadrons that defended the U.S. against airborne attack. The Range became the single location to which all ADC units deployed annually for proficiency training. The focus of the proficiency program from 1951 to 1954 was on air-to-air gunnery. No new development of BMGR West surface area seems to have been necessary to support ADC proficiency training.

The USMC became a regular user of BMGR in 1959 when Vincent AFB was transferred to the USMC and became Marine Corps Auxiliary Air Station Yuma (MCAS Yuma from 1962 forward). In contrast to USAF use of BMGR, which had emphasized and continues to emphasize student aircrew instruction, USMC training focused and continues to focus primarily on operational aircrews and units. USMC training stressed air-to-air tactics, gunnery, and missile firing, as well as air-to-ground weapons use. Two target complexes were constructed within the far-western part of the Range to support air-to-ground weapons training. A rifle range and a training and administrative site, later called the Cannon Air Defense Complex, were also constructed in this area and are still in use.

Through the mid-1970s, the area of BMGR West east of the Gila and Tinajas Altas Mountains was regularly used as a fallout area for aerial gunnery and missile training. Today, this use only occurs during special and infrequent training events. Also during that time, electronic tracking and telemetry instruments were installed in the eastern portions of BMGR West to form the electronic architecture of a Southwest Tactical Training Range, which remains in use and is composed of ground-based electronic instrument sites used to track, record, and replay the actions of up to 36 aircraft simultaneously as they participate in air-to-air or air-to-ground combat training.

The primary training emphasis within BMGR West during the late Cold War and first Persian Gulf War era continued to be readiness training for combat-qualified aviation units. Ground units with a role to play in the integration of USMC air–ground combat teams were also incorporated in some exercises to enhance training realism.

Since the early 1990s, the need for live air-to-air gunnery and missile firing exercises has declined, but neither the USAF nor the USMC has reduced its requirements for live air-to-ground weapons training. Both the USAF and USMC have added electronic instrumentation that simulates air defense systems and refines their targets to keep pace with evolving air combat tactics and threats.

2.1.2.2 Land Management History

The land management history of BMGR differs from that of most federal public lands controlled by a single federal agency (such as the BLM, USFWS, and National Park Service [NPS]), where resource management is the primary mission. Typical federal agency models are based on a clear purpose and patterns of management are established by the agency's mission, regulations, past management plans and practices, past and current land uses, resource conditions, and public involvement. Management of the BMGR has differed from this model in several important ways. First, there were no clear DoD or DOI resource management priorities specific for the Range until the 1980s. Moreover, there was no clear authority for resources management at either federal or state levels. As a result, there was no development of mutually held goals or coordination of purpose. Second, a comprehensive natural resources management plan was prepared in 1986 and fully implemented in 1990; subsequently, INRMPs were completed in 2007, 2012, 2018, and 2023. Finally, at many points in the Range's history, management agencies have found themselves with competing or conflicting responsibilities, legal guidance, goals, and purposes without an effective means of resolving these issues. Primary federal management responsibilities for BMGR lands since 1940 are in Table 2-4.

Table 2-4. Federal management responsibility for Barry M. Goldwater Range (BMGR) lands

Date	BMGR West	BMGR East
Prior to September 1941	General Land Office and U.S. Grazing Service (BLM)	
September 1941 to December 1958	USAF	
January 1959 to November 1986	USMC	USAF
November 1986 (MLWA) to November 2001	BLM	
November 2001 to November 2024	USMC	USAF

Considerable progress has been made in recent years toward resolving resource management issues. The MLWA of 1999 clearly established that the USAF and USMC would be responsible for managing the natural resources of the Range IAW the Sikes Act; thus, the 2007 INRMP became the first plan to be implemented without conflicting federal management guidance. The 2012 and 2018 updates represented the continuation of the implementation of Sikes Act provisions and provided direction for proper management and protection of cultural and natural resources on withdrawn lands. This 2023 INRMP update maintains this direction and includes projects for the FY 2024–2028 timeframe.

2.1.3 Military Missions

The primary mission of BMGR remains unchanged and has become more critical with the beddown of F-35s at both installations. Student and operational aircrew training occurs throughout the Range. However, the pre-eminent activity at BMGR East is advanced training for student aircrews transitioning to frontline combat aircraft and, at BMGR West, readiness training for aircrews in operational combat is predominant. In addition, BMGR serves the USN, Air Force Reserve Command, ANG, and ARNG in these capacities. Other installations that regularly practice at BMGR include MCAS Miramar, Davis-Monthan AFB, Silverbell Army Heliport, and Morris Air National Guard Base at Tucson International Airport. In addition to regular users, "casual user" training deployments that originate from active duty, reserve, and ANG flying units from other areas of the U.S. and allied units from overseas also train at the Range.

2.1.4 Natural Resources Needed to Support the Military Mission

Natural resources required to support the military mission include vast air space and land area for air-to-air and air-to-ground weapons testing and training. Four key attributes of the natural setting and environment of BMGR are essential to its overall suitability and capacity for supporting tactical aviation and air defense training, aviation tactics development and testing, and other assigned national defense missions. These attributes include:

- a location away from most major population areas yet within the effective training flight radius of aircraft at USAF, USMC, ANG, and ARNG installations in Arizona and California;
- the uninhabited and undeveloped expanse of land and overlying airspace necessary to provide either (1) aviation subranges (up to 13) to support multiple, independent training activities simultaneously or (2) large-scale, range-wide exercises;
- year-round flying weather that allows most training activities to be performed efficiently as planned without weather delays or postponements; and
- varied, wide-open terrain that allows development of diverse, tactical air–land combat training scenarios with realistic air-to-ground target simulations generally with minimal modifications aside from constructing or installing tactical simulations, electronic instrumentation, and other range infrastructure.

Although BMGR provides a particular advantage for preparing military personnel to operate in arid, hot, and otherwise austere environments (e.g., southwest Asia, Middle East), the Range has long proven to be useful for training war fighters for air–land combat operations in nearly all global theaters. The key to this capability is the fact that tactical features and emplacements, such as airfields or air defense sites, can be simulated within the expansive BMGR in positions and configurations that realistically replicate diverse air–land warfare environments. Similarly, BMGR landscape has also accommodated the infrastructure requirements of the limited ground-based training and support activities conducted at the Range.

2.1.5 Surrounding Communities

The perimeter of BMGR is approximately 350 miles long. Adjacent lands are predominantly federal and Tribal and are rural and undeveloped. Federal lands under the jurisdiction of the BLM, Bureau of Reclamation, or USFWS are dedicated to long-term conservation purposes or a combination of conservation and multiple public uses. These lands abut approximately 52% of BMGR perimeter (see Figure 1-1). Additionally, the Tohono O'odham Nation shares 7% and private or State Trust lands share approximately 30% of the perimeter. The remaining 11% of the perimeter abuts the international boundary between the U.S. and Mexico at BMGR West.

Private, State Trust, and BLM lands predominate along the northern boundary of BMGR from Gila Bend to Yuma along Interstate Highway 8 and along the western boundary near Yuma. Much of this land has been converted to agriculture over the past decades. Agricultural crop production is particularly prevalent west of Gila Bend near the towns of Aztec, Tacna, Wellton, and Yuma. New urban development will likely grow faster than agriculture and alter future land use patterns.

The largest adjacent communities and their population estimates (U.S. Census 2020) are summarized in Table 2-5. Most of the population near BMGR resides in Yuma County. In 2007, when the housing market collapsed, Yuma County, like most of the nation, experienced a decline in population growth and construction activity (Yuma County 2012). Before the recession, 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

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).

Table 2-5. Community populations surrounding Barry M. Goldwater Range, 2010 to 2020

City	2010 U.S. Census Data	2020 U.S. Census Data
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

The federal government owns approximately 80% of the land in Yuma County. Military and agricultural lands represent the two largest segments of unincorporated Yuma County, with approximately 40% used for military purposes. Of the remaining 60%, 47% is used for agriculture (Yuma County 2012).

The community of Gila Bend lies just north of BMGR East. Its population is 1,892 and it is the site of a 280-megawatt solar-generating station (Town of 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 (Town of Gila Bend 2017).

Ajo, in Pima County, is a small community located just south of BMGR East. Ajo is a former copper-mining hub that has recently experienced growth. The population increases dramatically during the winter months as people arrive from farther north to enjoy the warmer climate of Arizona; many have become permanent residents.

Lands of the Tohono O'odham Nation encompass approximately 2.8 million acres southeast of BMGR. The Nation is organized into 11 districts, with Hickiwan District abutting BMGR's most southeastern border. The total enrolled members of the Tohono O'odham Nation is 33,648 individuals with 13,055 living on Nation lands. Their land use includes ranching, livestock grazing, and seasonal livestock 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 5-year period.

2.1.6 Local and Regional Natural Areas

BMGR and adjacent government lands include a wide array of biologically diverse ecological gradients that characterize the interface between the Arizona Upland and Lower Colorado River Valley in the Sonoran Desert. Once considered a barren wasteland, the Sonoran Desert is now recognized as the most biologically diverse of the great North American deserts. The Sonoran Desert encompasses about 100,000

square miles in southwestern Arizona, southeastern California, and Baja California and western Sonora in Mexico (Arizona-Sonora Desert Museum 2017). It is the most tropical of the three North American warm deserts (Chihuahuan, Mojave, and Sonoran) and hosts the greatest number of plant communities (Arizona-Sonora Desert Museum 2017).

BMGR, Cabeza Prieta NWR, Organ Pipe Cactus NM, Sonoran Desert NM, and contiguous BLM-administered lands occupy landscapes that are ecologically interdependent. Management actions to conserve ecosystem functions and biological diversity in any one of these areas benefit adjacent areas. Further, ecosystem linkages within BMGR East extend into contiguous, largely natural areas of Tohono O'odham Nation lands.

Lands adjacent to BMGR that offer recreational opportunities include the Sonoran Desert NM, Cabeza Prieta NWR, and El Pinacate and Gran Desierto de Altar Biosphere Reserve, Mexico. The Sonoran Desert NM is located along the northeast corner of the Range near East Tactical Range (ETAC); the portion of the monument adjacent to the Range was formerly part of BMGR but was relinquished to the BLM with the passage of the 1999 MLWA. This area is managed by the BLM for semi-primitive recreational opportunities and some motorized access. The Cabeza Prieta NWR and Wilderness is located along portions of BMGR's southern border (Figure 1-1).

The areas where recreation is most likely to occur are predominantly undeveloped desert. Most non-agricultural areas are also undeveloped desert, including the land in Mexico south of BMGR boundary and much of the land north of BMGR along Interstate 8, particularly between the communities of Gila Bend and Mohawk.

2.2 Physical Environment

2.2.1 Climate

The Southwest region of the U.S. is characterized by a hot and arid variable climate that is strongly influenced by its geographic location and circulation patterns such as the El Niño-Southern Oscillation, the Pacific North American Pattern, and the Pacific Decadal Oscillation. Most of the annual precipitation typically occurs during mid-winter storms or late summer monsoons. Average annual rainfall in the higher elevations along the easternmost portion of BMGR may approach 9 inches and, in the western extremes of the Range near Yuma, is typically no more than 3 inches. Across the entire range, average rainfall is less than 5 inches per year. In the Sonoran Desert, however, rainfall patterns are irregular. As a result, some range locations may receive little or no rain during the same season or year in which other areas receive average or above-average precipitation.

The Sonoran Desert is also subject to frequent and sometimes prolonged drought. As a result, some of BMGR's interior valleys receive an average of only 0.5 inches of rainfall annually. Overall effects of the minimal rainfall are exacerbated by high temperatures and regional evaporation transpiration potentials. Summer daytime temperatures often exceed 110 °F with annual evaporation potentials that vary from more than 86 inches in the western part of the Range to about 72 inches in the eastern, greatly exceeding the available precipitation. When the stable weather patterns that promote aridity in BMGR region periodically break down, all or portions of the Range may receive two to three times the normal annual rainfall, sometimes in only one or a few storms.

The Southwest, and the Western North American region in general, has become warmer and drier over the past century, with hot extremes increasing in frequency and intensity. Projections indicate this trend will continue into the 21st century, along with an increasing risk of severe hydrological drought. Given the range

of precipitation variability in this region, there is disagreement on past precipitation trends, although model projections suggest an increasing intensification of heavy precipitation with winter precipitation extremes becoming more frequent (Overpeck et al. 2013, Seneviratne et al. 2021). Significant changes in climate in this region will have broad impacts on ecosystems and consequences for biodiversity (Bagne and Finch 2012).

DoDI 4715.03, Natural Resources Conservation Program, states that "DoD Components shall, in a regionally consistent manner, and to the extent practicable and using the best science available, utilize existing tools to assess the potential impacts of climate change to natural resources on DoD installations." AFMAN 32-7003, *Environmental Conservation*, states:

> *Climate variability and extreme climate events may significantly affect native ecosystems and require the Air Force to adjust natural resources management strategies to support military mission requirements and address the needs of sensitive species. The installation INRMP must consider historical regional trends in climate, and projections of future climate change vulnerabilities and risk to natural infrastructure and sensitive species using authoritative region-specific climate science. The INRMP should list, or include by reference, installation-specific historical climate data and region-specific climate projections. INRMP goals and objectives for ecosystem management and biodiversity conservation must employ an adaptive ecosystem-based management approach that will enhance the resiliency of the ecosystem to adapt to changes in climate.*

In 2019, DoD released *A Guide to Incorporating Climate Considerations into INRMPs* (Stein et al. 2019). This guide was developed to help installation managers prepare for and reduce climate-related vulnerabilities and risks and offers a structured process for incorporating climate considerations into INRMPs.

2.2.1.1 Regional Climate Monitoring Program

In 2008, BMGR East began a climate monitoring program by installing eight manual download temperature and precipitation monitors. The network was expanded in 2011 with a network of 11 communication-grade weather stations (Campbell Scientific), manual-download data loggers, and manual-read precipitation storage gauges. In addition to real-time stations, BMGR East has maintained existing rain gauges and manual-download data loggers to increase the number of climate-monitoring points to 31. Since 2002, biologists monitoring the federally endangered Sonoran pronghorn have also recorded daily precipitation at eight rain gauges installed at observation points in North and South TAC. These instruments and observations provide a more spatially explicit understanding of weather and climate variables across the installation. The automated communicating stations transmit data in real time and collect measurements on the following climatic variables (Black 2019):

- temperature
- relative humidity
- precipitation
- wind speed
- wind direction
- solar radiation
- soil moisture

Real-time weather data can be accessed by visiting the Western Regional Climate Center (WRCC) website at https://wrcc.dri.edu/bmgr/. This website provides access to real-time weather and archived climate data needed by the 56 RMO, Maricopa County Flood Control Department, National Oceanic and Atmospheric Administration, regional law enforcement agencies, and national scale climate monitoring programs, and are publicly available. Access to real-time and archived data informs time-sensitive resource management issues (Black 2019), including where and when to:

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

The WRCC also emails weekly and monthly summary reports for all these stations. Cabeza Prieta NWR and Organ Pipe Cactus NM each have several stations providing real-time data via the WRCC website with plans to link more stations into the network.

BMGR West is currently working to upgrade its five manual download weather stations with Remote Automatic Weather Stations (RAWS) through the BLM. Acquisition and deployment are anticipated to be completed by FY23. 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 variances 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 spatial and temporal distribution of precipitation on a regional scale. The study area encompasses a large portion of southwest Arizona (Figure 2-1). The partnering agencies in this regional monitoring effort (Black 2019) include:

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

Partner agency staff aggregate monthly precipitation data for each water year (1 October to 30 September, to preserve the winter precipitation period graphically) rather than calendar year (1 January to 31 December). Monthly precipitation values are combined with data from neighboring agencies, including the National Oceanic and Atmospheric Administration's Cooperative Observer Program stations throughout the region, the El Pinacate and Gran Desierto de Altar Biosphere Reserve, a UNESCO world heritage site, 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 2019). These aggregate datasets contain monthly precipitation totals for 160 stations across the region. For locations without rain gauges, data from gauges in the surrounding area are used to estimate precipitation amounts at those locations.

Adding new stations, especially at mountain locations, would allow for more robust datasets and capture the spatial variability of desert precipitation better.

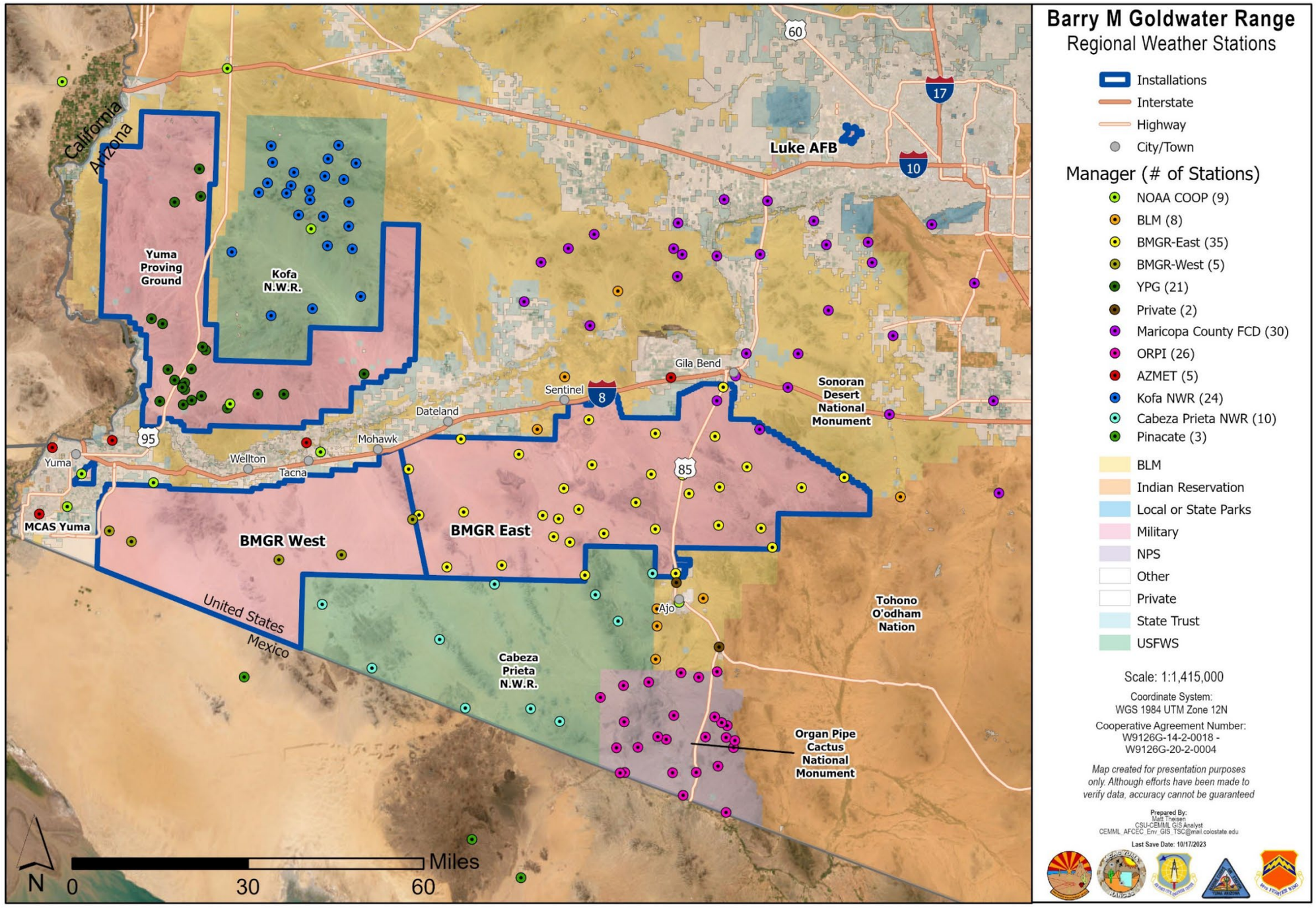

Figure 2-1. Barry M. Goldwater Range regional weather stations

2.2.1.2 Climate Projections for BMGR East and West

To explore how environmental conditions at the installation might shift due to climate change, Colorado State University's Center for Environmental Management of Military Lands (CSU CEMML) generated site-specific climate projections for BMGR East and West under two future carbon emissions scenarios: Representative Concentration Pathway (RCP) 4.5 (moderate emissions scenario) and RCP 8.5 (high emissions scenario). These projections are used to assess potential impacts of future climate on installation natural resources.

The climate assessment was based primarily on publicly available data and data provided by USAF and USMC. Climate projections were based on recent global climate model simulations developed for the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (IPCC AR5), the IPCC Coupled Model Intercomparison Project Phase 5 (IPCC-CMIPP5), and the U.S. National Center for Atmospheric Research Community Climate System Model (NCAR CCSM; Hibbard et al. 2007; Moss et al. 2008, 2010; Gent and Danabasoglu 2011; Hurrell et al. 2013).

Historical daily climate data from 1980 through 2009 were used to represent the 30-year historical reference point used by the IPCC to define a baseline for comparison to climate change scenarios. Future climate conditions for BMGR East and West under the two emissions scenarios were projected to produce a decadal time series of daily climate values for 2026 to 2035 and 2046 to 2055, represented hereafter as 2030 and 2050, respectively (CEMML 2019).

Climate Model Results

Climate projections for BMGR East and West are presented in Table 2-6 and Table 2-7, respectively. Both minimum and maximum temperatures are expected to increase over time (for both the 2030 and 2050 time periods) under both emissions scenarios (RCP 4.5 and 8.5). The study also projects changes in precipitation patterns at both locations. The results vary widely depending on scenario, which is expected given the complexity of modeling precipitation processes for this large area.

BMGR East

For the decade centered around 2030, 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 2-6). The two scenarios predict greater warming by 2050, with RCP 4.5 warming by 3.2 °F and RCP 8.5 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 associated with the NCAR CCSM model. For 2030, the RCP 4.5 scenario projects a large increase in PRECIP of 50%, while RCP 8.5 projects an increase of 35%. For 2050, RCP 4.5 projects a moderate increase in PRECIP (11%) while RCP 8.5 shows a greater increase of 24% (CEMML 2019). Although annual precipitation is projected to increase overall, precipitation amounts in April, May, and June will remain mostly unchanged (not shown here). 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 (CEMML 2019).

Table 2-6. Summary of climate data, Barry M. Goldwater Range East

Variable	Historical	RCP 4.5		RCP 8.5	
		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
HOTDAYS	131.8	137.9	149.9	143.6	154.5
WETDAYS	0.0	0.0	0.0	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 the decade centered around 2030, both scenarios project a similar increase in TAVE of between 2.1 °F and 2.3 °F above the historical average (Table 2-7). For 2050, RCP 4.5 is associated with a warming of 3.2 °F, while RCP 8.5 is associated with a greater warming of 4.6 °F for this period.

For 2030, the RCP 4.5 scenario projects a large increase in PRECIP of 61% while RCP 8.5 projects an increase of 58%. For 2050, both scenarios project a moderate increase in PRECIP of 24% (CEMML 2019). 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 2-7. Summary of climate data, Barry M. Goldwater Range West

Variable	Historical	RCP 4.5		RCP 8.5	
		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	123.4	131.1	142.6	136.2	147.0
WETDAYS	0.1	0.0	0.0	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.

2.2.2 Landforms

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. Fifteen named mountain ranges represent two physiographic types: sierras and mesas. The Mohawk Range, west of the San Cristobal Valley, is made up of rugged sierras with characteristic jagged profiles. The Aguila Mountains, east of the San Cristobal Valley, are Sierra-type mountains, with one mesa. Elevations range from 185 feet above mean sea level (AMSL) at the southwest corner of BMGR West to 4,002 feet AMSL at the eastern edge of BMGR East atop the Sand Tank Mountains.

The westernmost valley plains are within the Gran Desierto dune system, which extends to the west and south into Mexico. Smaller sand dune systems have also formed in several other range locations, with the most expansive being Mohawk Sand Dunes in the Range's central portion.

Volcanic landforms are found in some parts of the Range. The most notable is the Sentinel Plain Volcanic Field. A second volcanically formed 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 ancient volcanic conduits.

2.2.3 Geology and Soils

The mountain ranges are formed from igneous, metamorphic, and sedimentary rock types. The alluvial valleys are deep bedrock basins filled with silt, clay, sand, and gravel. These deposits can be more than 10,000 feet thick. Along many of the mountain bases, sloping deposits of alluvial fill, known as bajadas, fan outward from the mountains onto the valley floors.

Some parts of the Range have extensive sheet-like formations of lava from past flows. These flows form irregular plains with rough basalt surfaces. The largest such lava flow in southern Arizona extends into the northern part of the Range, south of the community of Sentinel. BMGR region is in a tectonically stable area with few earthquakes and few active faults.

BMGR East

BMGR East has an aridic soil moisture regime and a hyperthermic soil temperature regime. As a result, the soils are primarily Aridisols with few occurrences of Entisols, and one small area classified as Andisols (Natural Resources Conservation Service [NRCS] 2012). The soils are typically shallow and rocky with thin A horizons and vary in texture. They are calcareous and well drained with limited water-holding capacity (NRCS 2012, as cited in Whitbeck 2013).

In 2019, CEMML completed field investigations for Phase 1 of a multi-year erosion project. The initial assessments and analyses included incorporating soils and other natural and cultural resources data to identify areas of concern. These areas were prioritized for detailed investigation and targeted erosion modeling (CEMML 2020). Soil losses were estimated using the RUSLE model, which uses equations that incorporate estimates of soil loss and erodibility based on soil characteristics. Information for this analysis was extracted from publicly available NRCS soils data and further processed for use in the study model (NRCS 2013). Incorporation of the study's recommendations will be key as the potential for severe erosion increases under a changing climate.

Erosion monitoring at BMGR East includes using ground-based light detection and ranging (LiDAR), measuring and monitoring select eroded areas using a survey-grade total station, and placing wattles at severely eroded areas around Aux B, such as headcuts of gullies.

BMGR West

IAW the 2012 INRMP Five-Year Action Plan, the UofA developed and implemented a digital soil mapping technique specifically for characterizing the complex alluvial and aeolian deposit–dominated landscape of BMGR West (Rasmussen and Regmi 2015). This project resulted in a range-wide, digitally assessed, high spatial resolution soil-landscape classification map depicting soil landscape variability and distribution (Rasmussen and Regmi 2015). Additional soil sampling and multi-year survey work by the USDA-NRCS Tucson Soil Survey office will produce a ground-truthed range-wide soils map. This map, combined with the digital work previously completed, will aid in decision making, especially when assessing soil erosion potential and associated natural hazards.

In June 2015, BMGR West began to monitor erosion across the Range using three field methods: (1) deployment of a three-dimensional camera, (2) LiDAR, and (3) manual erosion measurement with an electronic, survey-grade theodolite total station (Duan et al. 2017). Monitoring erosion will help BMGR West resource managers prioritize erosion-prone areas and identify dominant erosional processes (Duan et al. 2017). The results will influence restoration strategies for selected sub-basins across the Range (Duan et al. 2017).

2.2.4 Hydrology

Principal rivers in the region include the Gila and Colorado Rivers. The Gila River runs east to west just north of BMGR boundary. Surface water on BMGR lands, however, is very limited. No perennial or intermittent streams are present, and ephemeral stream flow occurs only after sizeable rainfall events. Surface water drainage generally flows outward from the mountain ranges and northward into numerous

feeder washes, which connect to larger washes that flow to the Gila River. The Gila in turn flows west into the Colorado River and eventually empties into the Colorado River Delta in north Mexico.

Some rainwater collects in natural rock catchments (also known as *tinajas* or tanks), human-modified natural catchments, or artificially constructed wildlife water storage structures (e.g., guzzlers) where the water may persist for weeks or months without recharge until it eventually evaporates or is consumed by wildlife or people. The scarcity of natural surface water is the primary limiting factor for both natural and cultural resources on the Range.

Natural flooding events are highly variable in frequency and intensity and can have a large effect on 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. Significant rainfall events over the past few years have caused considerable erosion, sometimes temporarily making roads impassable and impacting natural and cultural resources.

BMGR East

BMGR East lies primarily within three of the seven hydrological basins of the Sonoran Desert: the Lower Gila River, Tenmile Wash, and San Cristobal Wash (Heilen et al. 2013). The hydrographic subdivisions are dissected by a network of ephemeral washes that generally flow from southeast to northwest toward the Gila River. Washes tend to migrate across valley floors where drainage follows a braided pattern.

The largest of the subdivisions is the Tenmile Wash system, which contains more than 459,998 acres within BMGR East. Tenmile Wash originates in the Batamote Mountains south of Area B and receives flow from Childs Mountain and the Little Ajo Mountains. It flows through the southern portion of Area B, the northern portion of Manned Range 1 and North Tactical Range (NTAC), and the extreme western portion of Range 4, before reaching the Gila River. Relict stream channels of Tenmile Wash have been documented 1.24 miles south of its present location. The Tenmile Wash subdivision drains over 19.3 square miles and contains Midway Wash. Midway has channels that originate in the Sauceda Mountains on the east side of Area B and the Batamote Mountains south of Area B. It flows through parts of Area B, Range 2, and Range 4, terminating on Range 4. At least one channel of Midway Wash flows into the Lago Seco (Dry Lake) playa on Range 4.

The San Cristobal/Growler subdivision covers nearly 300,000 acres and contains Growler Valley and San Cristobal Valley. The San Cristobal/Growler Wash system has a very low gradient along much of its course and has created a broad, interlacing network of many small, branching channels. The San Cristobal wash originates in the Cipriano Hills in the southern end of the Puerto Blanco Mountains in the Organ Pipe Cactus NM and flows northwest through the San Cristobal Valley in the north-central portion of BMGR. Growler Wash, a tributary of San Cristobal Wash, originates in Organ Pipe Cactus NM as Alamo Wash. Alamo Wash drains the Ajo, Growler, and Bates Mountains and becomes Growler Wash once it has passed through Growler Canyon. It then flows north-northwest through the Growler Valley, where it turns west in the lower portion of South Tactical Range (STAC). It finally joins San Cristobal Wash in the San Cristobal Valley and flows north to the Gila River. Daniels Arroyo, which drains Childs Mountain, the Little Ajo Mountains, and the Growler Mountains located on STAC, is the major tributary of Growler Wash.

The Lower Gila River Subdivision contains Quilotosa and Sauceda Washes, which originate in the Sand Tank Mountains and Sauceda Mountains, respectively, and flow to the Gila River.

Four other natural water sources on BMGR East are *tinajas*, *charcos*, playas, and springs (Bryan 1925). *Tinajas* are natural rock-cut tanks generally found on the floor of valley drainages. They provide the most

reliable source of water in the region. Some hold water year-round while others are intermittent or ephemeral, lasting from a few weeks to a few months. Broyles (1996) identified 128 *tinajas* in the Western Papagueria (the area of southeast Arizona from the Gila River to the Mexican Border), which could provide up to 792,515 gallons (3,000,000 liters) of water when full. New *tinajas* are identified annually and are mapped, photographed, and recorded in BMGR East GIS. The association of rock images (petroglyphs and pictographs) with water is evident at Chris Glyphs, White Tank, Black Tank, and Eagle Tanks *tinajas*. The rock images at these locations are archaeological sites.

Charcos are small natural or artificial water holes found in relatively impermeable soils in adobe (clay) flats and along streambeds of washes with relatively flat areas of sandy clay (Bryan 1925). *Charcos*, named after the Spanish word for "pool of standing or stagnant water," are found as either single pools or as a series of pools.

Playas are shallow lakebeds resulting from internal drainage patterns within closed geological basins. Many playas are fed only by rainwater, which moves into the depression as surface water via wash channels. Others are fed by shallow groundwater typically recharged by precipitation events.

Two types of springs are found in the region: fracture springs, which depend on rainwater percolated into and stored in fractures of certain rock types, and fissure springs, which derive their water from flow moving along fault lines (Bryan 1925).

Groundwater is found primarily in tertiary volcanic rocks and alluvial deposits. Recharge occurs via infiltration of rainfall runoff and underflow from adjacent alluvial basins. Groundwater quality is poor and typically includes high concentrations of total dissolved solids and fluoride (56 FW 2010). Depth to groundwater is shallow, varying from 10 to 60 feet in wells dug in crystalline rock and 19 to 88 feet in wells dug in alluvium (Bryan 1925).

Wells provide an additional source of water on BMGR East. In the late 1880s, ranchers dug wells for livestock. By the early 2000s, wells were dug to water forage plots for Sonoran pronghorn. Wells registered to the USAF are located at Gila Bend AFAF, NTAC, and at Range Munitions Consolidation Point 1 (USAF 2010). Production wells at Gila Bend AFAF and Range Munitions Consolidation Point 1 supply water for construction, dust control, potable water for selected facilities, and for maintenance activities (USAF 2010).

BMGR West

BMGR West consists of three major watersheds: Fortuna, Coyote, and Mohawk washes, which drain to the north into the Gila River (Duan et al. 2017).

2.2.4.1 Stream Channel Modeling for BMGR East

CSU CEMML conducted stream channel overflow modeling (or flood modeling) for BMGR East along the San Cristobal/Growler Wash System in the San Cristobal Valley and Tenmile Wash to examine the extent of flooding associated with projections of changes in climate. The team also conducted flood modeling for the Gila Bend AFAF.

Flood modeling did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. Models instead used local watershed characteristics and the design storms generated from precipitation analyses. The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts). Four variable inputs influence inundation projections: (1) variation in total precipitation between design storms, (2) variation in the daily distribution of precipitation over the

3-day period, (3) land cover change over the watershed area used in hydrologic modeling, and (4) land cover change in the area within the installation used in hydraulic modeling.

The projected inundation associated with each climate scenario and the relative change from baseline conditions at BMGR East and Gila Bend AFAF are summarized in Table 2-8 and Table 2-9, respectively. The spatial extent of projected flooding is depicted in the Hydrology Appendix of the CEMML climate change report (CEMML 2019). Projected changes in stream channel overflow can be used to assess potential vulnerabilities to species, habitats, the mission, and built and natural infrastructure from changes in flooding extent.

The CEMML climate change team did not conduct stream channel flow and inundation modeling for BMGR West because available data were not sufficient to conduct a reasonable analysis.

Table 2-8. Projected inundation along San Cristobal/Growler Wash and Tenmile Wash, Barry M. Goldwater Range East

	Baseline	**RCP 4.5**		**RCP 8.5**	
	2000	**2030**	**2050**	**2030**	**2050**
Projected inundation (acres)	49,920	93,624	43,020	71,670	85,172
Change in inundation area from baseline (acres)		43,704	−6,900	2,1750	35,253
Percent change from baseline (%)		87.5%	−13.8%	43.6%	70.6%

Table 2-9. Projected inundation at Gila Bend Air Force Auxiliary Force (AFAF), Barry M. Goldwater Range East

	Baseline	**RCP 4.5**		**RCP 8.5**	
	2000	**2030**	**2050**	**2030**	**2050**
Projected inundation (acres)	439.8	31.3	301.3	447.4	397.7
Change in inundation area from baseline (acres)		−408.5	−138.5	7.6	−42.1
Percent change from baseline, (%)		−93%	−32%	2%	−10%

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

Ecoregions delineate areas of general similarity in ecosystem type and describe the variety, quality, and quantity of environmental resources. They are critical for structuring and implementing ecosystem management strategies across various agencies and organizations. Ecoregions are identified through the spatial patterns and composition of biotic and abiotic phenomena, including geology, physiography,

vegetation, climate, soils, land use, wildlife, and hydrology. A Roman numeral hierarchical scheme has been adopted for classifying different levels of ecological regions, with Level I being the coarsest and Level IV the most detailed. This hierarchical system provides a spatial framework for the research, assessment, management, and monitoring of ecosystem components.

Most of BMGR is located within the Dry Domain (Level I), Tropical/Subtropical Desert Division (Level II), American Semi-Desert and Desert Province (Level III) (Bailey 2014). Ecosystems in this division are typically arid and have high air and soil temperatures with extreme variation between day and night temperatures (Bailey 2014).

The Range has maintained its ecological integrity over the past 80 years, largely because its mission predominantly uses the airspace above the Range. Furthermore, the restrictions placed on land use exclude grazing and mineral extraction, and limit both development and public access to some degree (Rosenberg 2015).

2.3.2 Vegetation

2.3.2.1 Historical Vegetation Cover

Agriculture began in the Sonoran Desert around 2000 BCE with the arrival of corn from Mexico. By 1500 BCE, Early Agriculturalists constructed irrigation ditches or short canals along the floodplain of the Santa Cruz River in Tucson. Around 450 CE, people in the Phoenix Basin began to construct massive irrigation systems that included hundreds of miles of prehistoric irrigation canals. Other agricultural strategies included “Ak Chin” agriculture, where fields are cultivated near the mouth of an arroyo and floodwaters from the wash are diverted onto the fields. When Europeans arrived, they introduced Eurasian plants, animals, and microbes that transformed the landscape in “an ecological revolution” (NPS 2016). Mining and livestock grazing were the two largest land uses, which by the mid-19th century had caused substantial degradation in the central and southern Sonoran Desert, with numerous accounts of overgrazing and subsequent abandonment (NPS 2016). In 1937, a coarse-scale vegetation map was developed for Arizona in which the authors classified the mountains as “Palo Verde-Cacti, and Burr Sage” and the valleys as “Creosote Bush + Salt Brush” (Nichol 1937).

2.3.2.2 Current Vegetation Cover

Nearly 290 species of Sonoran Desert plants characteristic of the Arizona Upland and of the Lower Colorado River Valley have been documented on BMGR. The bajadas of all of the mountain ranges (Growler, Crater Range, Aguila) are characterized by the Arizona Uplands subdivision of the Sonoran Desert. The most extensive area of Arizona Uplands is found in the Sauceda, Sand Tank, Mohawk, and Copper Mountains. The Lower Colorado River Valley subdivision occurs in the valleys between the mountain ranges. The distribution of plant communities in both of these areas is influenced by the diverse landscape of the Range, in which the series of widely spaced rugged mountain ranges, broad valley plains, sand dune systems, surface water drainages, and playas are the most important features.

As a part of the 2007 INRMP planning process, The Nature Conservancy reviewed the ecological structure, composition, and processes of the current vegetation cover and identified 13 natural communities. Nine of these 13 natural communities and their estimated sizes, based on the best available GIS information, are as follows:

- Valley Bottom Floodplain Complex—29,000 acres
- Dune Complex and Dune Endemics—30,000 acres

- Creosote Bush (*Larrea tridentata*)-Bursage (*Ambrosia* spp.) Desert Scrub—1,360,000 acres
- Creosote Bush-Big Galleta (*Hilaria rigida*) Scrub—24,000 acres
- Paloverde (*Parkinsonia* spp.)-Mixed Cacti-Mixed Scrub on Bajadas —191,000 acres
- Paloverde-Mixed Cacti-Mixed Scrub on Rocky Slopes—63,000 acres
- Sand Tank Mountains Uplands—10,000 acres
- Elephant Tree (*Bursera microphylla*)-Limberbush (*Jatropha cinerea*) on Xeric Rocky Slopes—91,000 acres
- Desert Playa—170 acres

Areas occupied by the Salt Desert Scrub community and by the Desert *Tinajas*/Springs community are small and were not estimated as part of the 2007 assessment. Two xeroriparian communities are associated with washes. The extent of these communities is best described in linear units:

- Valley Xeroriparian Scrub—2,325 linear miles
- Mountain Xeroriparian Scrub—400 linear miles

Southwest Arizona Seamless Mapping Effort

In 1981, the NPS developed a vegetation map for the Organ Pipe Cactus NM following the protocol developed by P.L. Warren and others from the UofA (Malusa and Sundt 2015). Since this time, an effort has been underway to map all connecting federal land management entities, following the same standardized protocol, through the support of the Desert Southwest Cooperative Ecosystem Studies Unit and UofA. Completed mapping units include BMGR West, Organ Pipe Cactus NM, Cabeza Prieta NWR and BLM lands in the Ajo Block, and BMGR East (Malusa 2003; McLaughlin et al. 2007; Osmer et al. 2009; Malusa 2010; Shepherd 2011; Whitbeck 2013; Malusa and Sundt 2015; Weston and Fehmi 2016, Malusa 2022). The last unmapped 100,000 acres of BMGR East were completed in 2022 (Malusa 2022), allowing development of one cohesive map for all mapped federal lands within southwestern Arizona using a common methodology and common mapping units. This seamless map will provide a baseline for ecosystem management decisions and help land and resource managers better understand how wildlife species use the landscape and associated vegetation. 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.

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

BMGR East

The UofA conducted detailed mapping in five phases. The first phase began in 2003 with the mapping of the NTAC and STAC (McLaughlin et al. 2007). Next the ETAC Range and Area B were mapped, then the western San Cristobal Valley, and then the eastern San Cristobal Valley, Aguila Mountains, and Sentinel Plain (Osmer et al. 2009; Shepherd 2011; Whitbeck 2013; Weston and Fehmi 2016). To complete the remaining portions of the comprehensive vegetation-association mapping effort, the remaining areas were mapped over the course of FY 2018 and FY 2019, and the effort was finalized in 2022 (Table 2-10, Figure 2-2). BMGR East anticipates continuing the vegetation mapping efforts in the two new land areas of Sentinel and Ajo to be used in informing management efforts.

Table 2-10. Vegetation associations mapped at Barry M. Goldwater Range East

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

Note: Recreated from Malusa (2022).

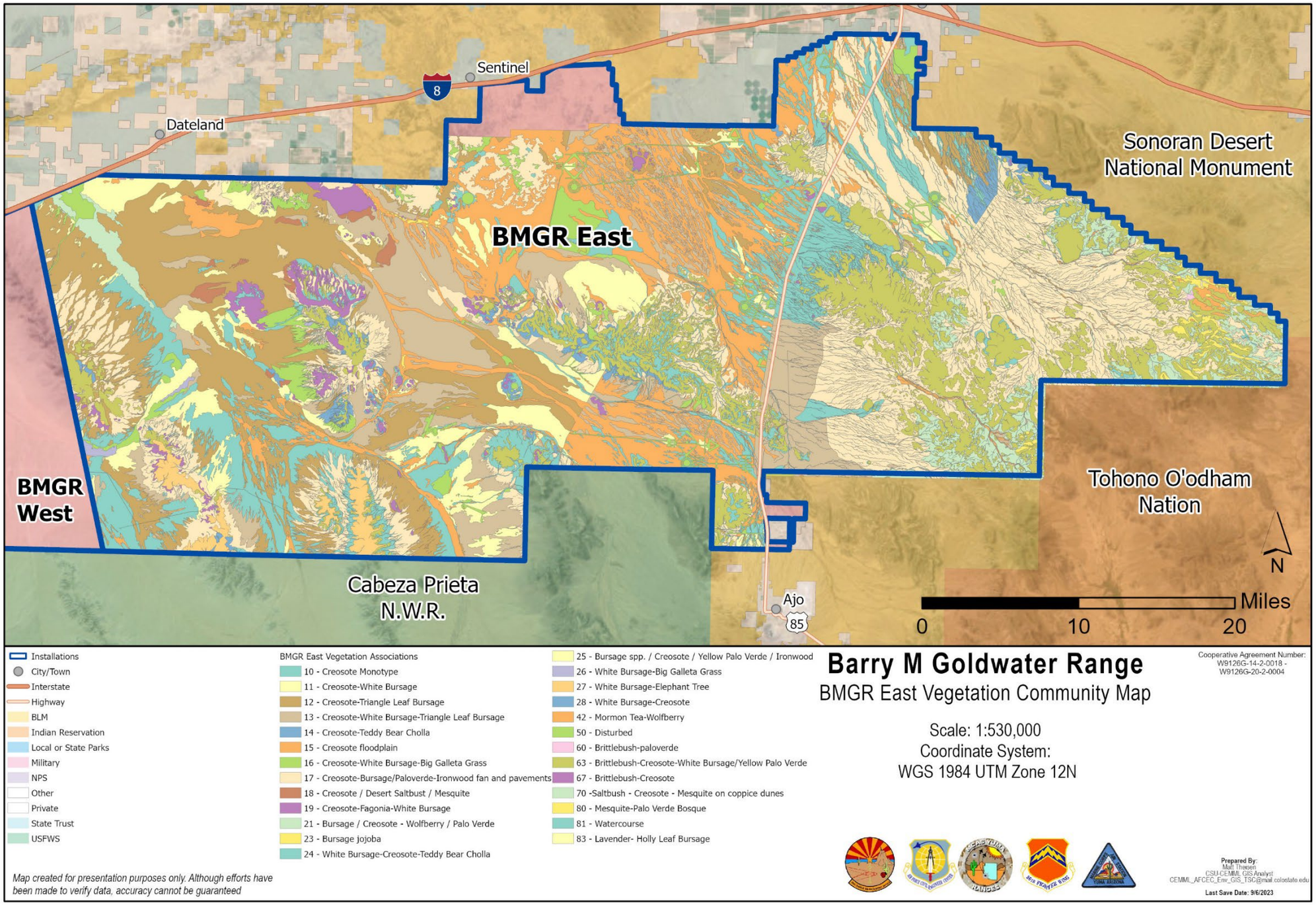

Figure 2-2. Barry M. Goldwater Range East vegetation community map

BMGR West

Vegetation mapping efforts began in 2009 and were completed in 2014 (Malusa 2010, 2012; Malusa and Sundt 2015; Figure 2-3). Most of BMGR West is in the Mojave-Sonoran Semi-Desert Scrub Macrogroup, which covers most of the Mojave and Sonoran deserts in the southwestern U.S. This macrogroup contains six alliances: Creosote, Bursage, Saltbush, Brittlebush, Watercourse, and Blue Paloverde. Within these alliances are 23 associations, such as Creosote-Teddy Bear Cholla. Finally, within these associations are 40 subassociations, the most detailed mapping unit.

The remainder of BMGR West falls under the Great Basin & Intermountain Dry Shrubland & Grassland Macrogroup. This vegetation is characterized by shrubs like Mormon tea (*Ephedra viridis*) and is restricted to the north slopes of the higher mountains. On BMGR West, this macrogroup comprises one alliance, two associations, and two subassociations (Malusa and Sundt 2015). Figure 2-3 depicts BMGR West vegetation communities mapped at the association level. 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 mapped vegetation subassociations. Table 2-11 lists and quantifies the broadly categorized vegetation associations (Malusa and Sundt 2015).

Table 2-11. Barry M. Goldwater Range West vegetation associations

Vegetation Association[1]	**Total Acres**
Creosote – White Bursage	275,715
Creosote – Bursage / Paloverde – Ironwood	97,543
Creosote Monotype	96,401
White Bursage – Elephant Tree	49,096
White Bursage – Big Galleta Brass	28,040
White Bursage – Creosote	26,403
Wolfberry	15,082
Creosote – Triangle Leaf Bursage	14,252
Creosote – White Bursage – Big Galleta Grass	13,639
Creosote – Fagonia – White Bursage	11,984
Creosote – White Bursage – Triangle Leaf Bursage	10,629
Brittlebush – Creosote – White Bursage / Yellow Paloverde	10,073
Creosote – Teddy Bear Cholla	9,867
Creosote Floodplain	6,256
White Bursage – Creosote / Paloverde / Ironwood	5,687
Disturbed	4,155
Brittlebush – Creosote	4,075
White Bursage – Creosote – Teddy Bear Cholla	3,949
Mormon Tea – Agave (*Agave* spp.) / White Bursage	2,864

Table 2-11. Barry M. Goldwater Range West vegetation associations

Vegetation Association[1]	**Total Acres**
Brittlebush – Ironwood – Blue Paloverde	2,600
Arrowleaf (*Pleurocoronis pluriseta*) / Sumac (*Rhus* spp.) / Beargrass (*Nolina microcarpa*) / Mormon Tea	1,937
Brittlebush – White Bursage – Creosote	1,934
Barren	911
Lavender (*Hyptis emoryi*) – Holly Leaf Bursage (*A. ilicifolia*)	444
Blue Paloverde / Holly Leaf Bursage	263
Desert Holly (*A. hymenelytra*) – White Bursage	147
Mesquite – Paloverde Bosque	19

[1] Forward slashes (/) separate different strata; the en-dashes (–) separate species within a stratum.

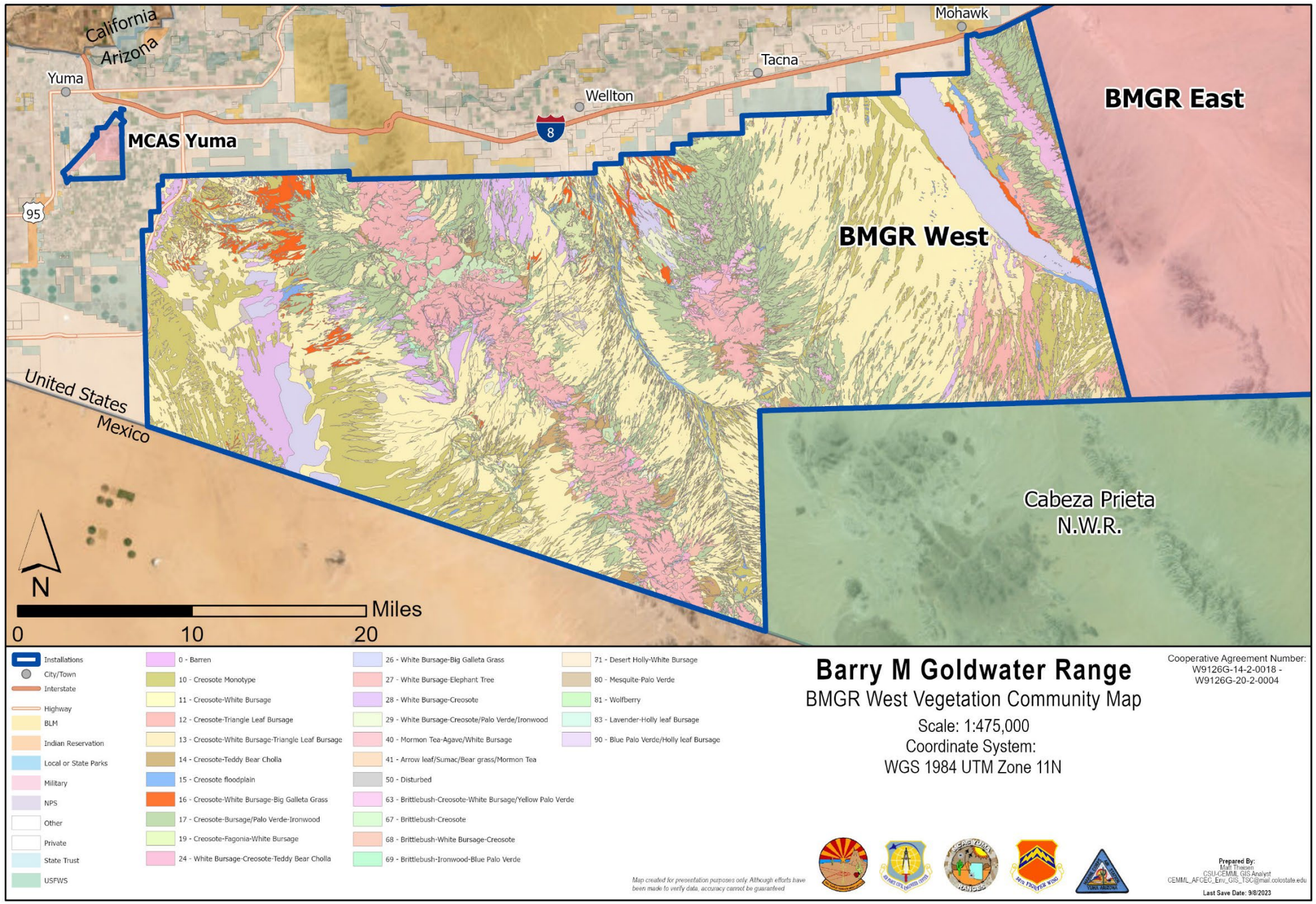

Figure 2-3. Barry M. Goldwater Range West vegetation community map

2.3.2.3 Future Vegetation Cover

Desert habitats are sensitive to changes in the climate that exacerbate existing hot and dry conditions, which are especially extreme from April to June. Many species are vulnerable to these changes because they already exist close to their physiological limits. Thus, even small changes in temperature and precipitation can have a significant impact on plant species composition in this region. Interacting disturbances (e.g., changes in flooding and wildfire, CBP road dragging, CBP incursions on non-INRMP approved roads) could further alter plant survival. Deserts are particularly vulnerable to invasive grasses, which can provide fuels for wildfires that may prevent re-establishment of native vegetation and facilitate further invasion (known as the grass–fire cycle). Ultimately, this combination of shifting conditions and invasive grasses could lead to conversion from a desert shrubland to nonnative grassland system (Hilberg et al. 2017).

Future climate conditions are likely to expose BMGR vegetation to increased average air temperatures, changes in precipitation (Section 2.2.1.2), decreased soil moisture during dry periods, more extreme high temperature events, and increased wildfire frequency and intensity (Section 7.9) 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 (Section 2.2.4.1). 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 (Friggens et al. 2013; Lenihan et al. 2008).

To track and understand trends in upland vegetation, since 2019 BMGR East has conducted vegetation monitoring at 30 plots across the Range. Botanists visit five 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.

2.3.2.4 Turf and Landscaped Areas

This section of the INRMP applies to installations that are developed. BMGR is an undeveloped desert and none of the lands are landscaped or have turf. Gila Bend AFAF, on BMGR East, has several small turf areas and several rows of planted trees. Gila Bend AFAF is operated and maintained by a USAF contractor and all turf and landscape areas are maintained by the contractor or sub-contractor as part of the service contract agreement. The total area of Gila Bend AFAF is 2,011 acres with less than 7 acres containing turf or landscaped areas.

2.3.3 Fish and Wildlife

Wildlife found at BMGR is typical of the Sonoran Desert ecosystem. Inventories show that more than 200 bird species, more than 60 mammal species, 50 reptile species, and 10 amphibian species occur or could potentially occur within BMGR and the adjacent Cabeza Prieta NWR. Due to the lack of permanent water sources, amphibians are limited and there are no fish. The diversity and population sizes of wildlife species and the amount of habitat have remained relatively stable and typical for this portion of the Sonoran Desert because land withdrawn for military use excludes or limits other land uses such as livestock grazing, farming, mining, and off-road vehicle recreation. Due to BMGR's large size, connection with two national monuments and one national wildlife refuge, significant distance from metropolitan areas, and minimal anthropogenic impacts, the Range is one of the last remaining large swaths of pristine Sonoran Desert.

Figure 2-4. Arizona Game and Fish Department conducts surveys for many species at Barry M. Goldwater Range, including flat-tailed horned lizard (left), Le Conte's thrasher (middle), and bighorn sheep (right).

Threats to wildlife populations and habitat include an increase in the number of trespass livestock, defined as feral individuals of a domestic species such as cattle, horses, and burros that are outside of Wild Horse and Burro Habitat Management Areas (see Section 7.11). Trespass livestock compete with native wildlife for water, space, and forage, and damage fragile desert habitat by trampling, grazing, and introducing invasive species and pathogens. Increased vulnerability to wildfires (see Section 7.9) created by the expansion of invasive species and persistent, reoccurring droughts, may be related to climate change.

Threats to habitat and wildlife from illegal cross-border traffic continue, as the secondary border wall has not been completed. Activity by UDAs on the Range such as usage of wildlife water developments, disturbance of wildlife, and littering, are negatively impacting habitats and wildlife on the Range. CBP's interdiction efforts to minimize illegal border activity, such as creating roads and dragging roads, are also negatively affecting wildlife and habitat. Dragging roads is the mechanical smoothing of high-traffic areas to monitor for recent foot traffic. Done frequently, it can remove soil from an area resulting in negative impacts including increased susceptibility to erosion, introduction of nonnative species, disturbance to wildlife, and altered local hydrology.

2.3.3.1 Climate Impacts on Fish and Wildlife

Wildlife populations on BMGR are 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). See Section 7.11 for invasive species information.

Water scarcity is already an issue for wildlife populations at the Range, and this scarcity is likely to persist. Although models project increased precipitation and the distribution of rainfall throughout the year and year-to-year variation may be complex, much of that will fall in the winter during brief and increasingly intense storms (CEMML 2019). Increases in winter storms have the potential to fill manmade 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 (see Section 7.9.1). 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 lose water through evaporation or seepage into the ground such as *tinajas*. As water temperatures rise, dissolved oxygen content will decline, 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 changing vegetation 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.

2.3.4 Threatened and Endangered Species and Species of Concern

2.3.4.1 Relevant Legislation

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 Species of Greatest Conservation Need (SGCN) in this INRMP.

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, note that 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, AFMAN 32-7003 and 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 should be 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. Further, the act defines "take" actions as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." 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 DOI (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 CFR 10.13). The MBTA 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*b*).

Further, Executive Order (EO) 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 an MOU 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. 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, through the State Wildlife Action Plan, identifies SGCN—wildlife species that are most in need of conservation actions. 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 three differing tiers based on their score in the vulnerability assessments; however, conservation of all SGCN species is a priority of the AZGFD (AZGFD 2022).

2.3.4.2 BMGR Threatened, Endangered, and SGCN Species

Two species listed under the ESA are 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 Sonoran pronghorn (see Section 7.4.1) depends on the Sonoran Desert ecosystem of BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus NM. The acuña cactus was federally listed as endangered in 2013 and is found mainly at BMGR East, Tohono O'odham Nation lands, BLM lands, Organ Pipe Cactus NM, and areas southeast of Phoenix (between Cactus Forest and Kearny). The lesser long-nosed bat, 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 flat-tailed horned lizard (FTHL) has no federal protection in the U.S., but it is listed as threatened in Mexico and is an SGCN in Arizona and a species of concern in California. The FTHL occurs at BMGR West and is managed IAW the Candidate Conservation Agreement and the FTHL Range Management Strategy (RMS), to which the 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 federal and state land management stakeholders, developed the RMS for the species. The continued adherence to the RMS has been instrumental in precluding listing of 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 (see Section 7.4.4) occurs at the far western portion of BMGR West and has been the subject of considerable ESA and federal court activities. Much of the FTHL's historical habitat (possibly as much as 50%) in the U.S. 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. Future threats of loss are currently occurring due to renewable energy companies through their political connections and other government entities wanting to encroach on the military range. As an RMS Signatory Agency, MCAS Yuma has incorporated RMS measures into this INRMP, including participating as an FTHL Interagency Coordinating Committee member, Management Oversight Group member, and conducting annual occupancy and demographic surveys and research.

The Sonoran Desert tortoise (*Gopherus morafkai*) is not a federally listed species after being found not warranted to be listed under the ESA in 2022, but it is an Arizona SGCN. BMGR applies conservation

strategies as outlined in the Candidate Conservation Agreement, which is discussed in more detail in Section 7.4.2 Desert Tortoise Update.

The fringe-toed lizard (*Uma rufopunctata*) is currently under review for federal listing, and more information is needed to determine whether listing is warranted. Recent genetic analysis confirmed that fringe-toed lizards from the Mohawk Dunes in southwestern Arizona 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 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.

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

The USFWS designated the cactus ferruginous pygmy-owl (*Glaucidium brasilianum*) 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 NM. As the owls have been observed in close proximity to BMGR, there are annual surveys as funding allows.

Federally threatened and endangered species and Arizona SGCN species known to occur or having the potential to occur at BMGR are listed in Table 2-12. In addition, AWCS scores are listed.

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
Mammals[4]								
Lesser long-nosed bat (*Leptonycteris 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 and West).
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.

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
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, prefers rugged rocky canyons with abundant crevices (BMGR East and West).
Sonoran pronghorn (wild population) (*Antilocapra americana sonoriensis*)	LE	1	✓	✓	—	—	32 FR 4001, 1 March 1967	Southwestern Arizona: vegetation - Palo verde-chain fruit cholla,

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
								creosote-bursage, and palo verde-mixed cacti. BMGR West and East, east of the Copper Mountains (BMGR East and West).
Sonoran pronghorn (Experimental Population) (*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. (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 desert scrub habitats (greasewood, rabbitbrush, creosote bush, cactus,

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
								mesquite, paloverde, etc.) (BMGR West).
Crawford's desert shrew (*Notiosorex crawfordi*)	—	NR	—	✓	—	—	—	Not restricted to a specific vegetation type, so long as there is sufficient cover. 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).
Arizona wood rat (*Neotoma devia*)	—	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

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
								western Arizona (BMGR West).
Birds[5]								
Southwestern willow flycatcher (*Empidonax traillii extimus*)	LE	SC/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 present.
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; Delisting: 72 FR 37346, 9 July 2007	Aquatic habitat not found at BMGR.

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
Golden eagle (*Aquila chrysaetos canadensis*)	BGEPA	1	—	✓	—	—	—	On cliffs or in large trees that afford an unobstructed view (BMGR East and West).
Sprague's pipit (*Anthus spragueii*)	—	2	✓	—	✓	—	—	Winters in grassy fields along lower Colorado River from north of Yuma to Parker (may be seen 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).

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
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 NM 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).

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
Tropical kingbird (*Tyrannus melancholicus*)	—	NR	—	—	✓	—	—	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).
Le Conte's thrasher (*Toxostoma lecontei*)	—	2	✓	✓	—	—	—	Open desert scrub, alkali desert scrub, and desert succulent scrub (BMGR East and West).

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
Mountain plover (*Charadrius montanus*)	—	2	✓	✓	—	—	—	Xeric or disturbed uplands; short vegetation, bare ground, and flat topography. Not on the AZGFD Heritage Data Management System for Maricopa, Pima, and Yuma counties. However, known to occur on BMGR East, and surveys in 2011 and early 2012 identified the plover in Maricopa County (Gila Bend AFAF) and Yuma County.
Bendire's thrasher (*Toxostoma bendirei*)	—	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).

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
Brown-crested flycatcher (*Myiarchus tyrannulus*)	—	NR	—	✓	—	—	—	Found in association with saguaros; also frequents river groves and other areas where large trees 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).

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
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). Observed during migration (BMGR East).
Hooded oriole (*Icterus cucullatus*)	—	2	✓	✓	—	—	—	Favors groups of palms for nesting (BMGR East).
Lucy's warbler (*Oreothlypis 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).

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
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, 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 cardon cacti stands, Joshua tree (*Yucca brevifolia*) and mesquite groves, and open pine and pinyon-juniper forests (BMGR East and West).

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
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; requires fine, loose sand for burrowing; vegetation is usually scant, consisting of creosote bush or other scrubby growth (BMGR 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

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
								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*)	SoC	NR	—	✓	—	—	—	Rocky areas in desert ranges, especially in canyons with permanent or intermittent streams (BMGR West).
Mexican rosy boa (*Lichanura trivirgata trivirgata*)	SoC	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).

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
Sonoran Desert tortoise (*Gopherus morafkai*)	—	1	✓	✓	—	—	—	Sonoran desert scrub and semi-desert 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								

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
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).
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 in BMGR East (Urreiztieta 2013, Abbate

Table 2-12. Threatened and Endangered Species and Species of Greatest Conservation Need (SGCN)

Common Name (Scientific Name)	Federal[1] Status	AZGFD AWCS Tier[2,3]	SGCN	Present	Potential to Occur	Not Expected to Occur	Federal Register (FR) Reference	Habitat or Potential Habitat at BMGR
								2017); the species has not been detected in 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 Yuma Dunes in BMGR West are potential habitat.
Sand food (*Pholisma sonorae*)	SoC	—	—	✓	—	—	—	Drifting sand below 500 feet elevation in creosote bush scrub (Yuma Dunes in the extreme southwestern portion of BMGR West).

[1] **Federal Status: BGEPA**=Bald and Golden Eagle Protection Act, **LE**=Endangered (U.S. Fish and Wildlife Service), **LT**=Threatened (U.S. Fish and Wildlife

Service), **CA**=Candidate Species (U.S. Fish and Wildlife Service), **DE**=Delisted (U.S. Fish and Wildlife Service), **MBTA**=Migratory Bird Treaty Act, **NL**=Not listed, **SoC**=Species of Concern (U.S. Fish and Wildlife Service), **XN**=Experimental non-essential population.

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

[3] **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.

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

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

2.3.4.3 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 could be further 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 outlined in Section 2.2.1.1, Climate Change Projections.

Lesser Long-nosed Bat- CCVA Score: High

The lesser long-nosed bat, an AZGFD SGCN, was federally listed as endangered in 1988 and removed from the ESA list in 2018. It has been documented on BMGR East. This species was federally listed in 1988 because of threats from human disturbance of its roosts, loss of food sources through land clearing and overgrazing, overharvest of a primary food source (agave), and direct killing by humans, many of which still occur today (USFWS 2018). In addition to these threats, invasive plant species, increasing wildfire frequency, and climate change are all degrading lesser long-nosed bat habitat, which could cause population declines (USFWS 2018, NatureServe 2022*h*). Climate change could present a significant threat to these bats. Shifting distributions and changes in flowering and fruiting of their required food plants could lead to increased mortality during migration and decreases in their populations (USFWS 2018). Although population sizes of lesser long-nosed bat have been stable in the past decade, their specialization on cactus and agave, which could be impacted by climate-related changes, disturbance at their roost sites, and low reproductive rate resulted in a high climate change vulnerability score.

Western Red Bat- CCVA Score: Low

The western red bat, an AZGFD SGCN, has been detected on BMGR. Climate change could degrade this species' preferred riparian habitat, which is important both for foraging and cover. Projected increases in temperature and drought frequency are expected to negatively impact riparian corridors throughout the western U.S. (Solick et al. 2020, NatureServe 2022*a*). Unlike most other North American bats, western red bats regularly give birth to multiple pups, which can help populations recover following declines (Bat Conservation International 2022*a*). Although climate-related impacts could negatively affect western red bats, they have a large population size, wide distribution, and do not seem to be susceptible to white-nose syndrome (WNS; a common cause of bat decline), resulting in a low climate change vulnerability score.

Cave Myotis- CCVA Score: Low

The cave myotis is an AZGFD SGCN that has been documented at BMGR. Although it has been detected with WNS, the cave myotis has not experienced mass die-offs (White-Nose Syndrome Response Team 2023). As WNS spreads further west, however, this species may become increasingly vulnerable (NatureServe 2022*d*). Population trends of the cave myotis are not well known, but they are assumed to be declining due to human disturbance of roosting areas, mine closures, and the loss of foraging habitat

(NatureServe 2022*d*). Despite their potential decline in abundance, climate-related impacts are not formidable threats for cave myotis. The species has maintained a large distribution and relatively stable range-wide population size, resulting in a low climate change vulnerability score.

Yuma Myotis- CCVA Score: Low

The Yuma myotis, an AZGFD SGCN, has been confirmed on BMGR. While some of these bats have tested positive for WNS, the disease has not caused large die-offs, although this could change as WNS spreads farther west (White-Nose Syndrome Response Team 2023). Yuma myotis are highly dependent on open water, and aquatic insects comprise most of their diet; therefore, they are susceptible to the loss of riparian and open water habitats that may result from climate change (Duff and Morrell 2007, Tye and Geluso 2019). Despite the potential impacts to their habitat, Yuma myotis maintain a wide western distribution with large, stable populations, resulting in a low climate change vulnerability score.

Mexican Free-tailed Bat- CCVA Score: Low

The Mexican free-tailed bat, an AZGFD SGCN, has been confirmed at BMGR. Because it migrates long distances, it is at high risk of mortality due to wind turbines (NatureServe 2022*f*). Arnett and Baerwald (2013) estimated that approximately 21,300 to 44,100 Mexican free-tailed bats were killed by wind turbines in the U.S. and Canada from 2000 to 2011. The fungus *Pseudogymnoascus destructans* (*Pd*; the fungus that causes WNS) has been detected on Mexican free-tailed bats, but they have not shown diagnostic signs of WNS (White-Nose Syndrome Response Team 2023). Despite the impacts of wind turbines, they have large and stable populations across much of the Western Hemisphere, resulting in a low climate change vulnerability score.

California Leaf-nosed Bat- CCVA Score: Low

The California leaf-nosed bat, an AZGFD SCGN, has been confirmed on BMGR. Population trends for this bat are not well known but the largest threat to their population is human disturbance of cave and mine roosts (NatureServe 2023*a*). During summer months when they are rearing young, this species is especially sensitive to human disturbance, which can lead to roost abandonment and death of young (Bat Conservation International 2022*b*). Additionally, the loss of desert riparian habitat, which this bat uses for feeding, has likely decreased its populations (NatureServe 2023*a*). Overall, the California leaf-nosed bat is assumed to have a stable or slightly declining population. It is not known how climate change may impact this species, but the bats' preferred riparian habitat and prey availability are both susceptible to the impacts of increasing temperatures and seasonal droughts. Despite this, the California leaf-nosed bat retains a healthy population size, fairly large distribution, and no major climate-related threats, resulting in a low climate change vulnerability score.

Greater Western Mastiff Bat- CCVA Score: Medium

The greater western mastiff bat, or California bonneted bat, is an AZGFD SGCN that has been documented on BMGR. Greater western mastiff bats are strong flyers and require open bodies of water (Bat Conservation International 2022*c*). This reliance on larger bodies of water limits their distribution and increases their susceptibility to climate change threats such as increasing temperatures and changes in precipitation. Because this species roosts in small colonies in cliff-face crevices and feeds high above the ground, little is known about its status and behavior, and even less is known about how climate may impact it (Bat Conservation International 2022*c*, NatureServe 2022*g*). Given the species' specialized feeding and roosting habitats, along with the generally limited knowledge about how climate change could impact its behavior and status, the greater western mastiff bat was given a medium climate change vulnerability score.

Long-eared Myotis- CCVA Score: Low

The long-eared myotis, an AZGFD SGCN, has been documented on BMGR. This species occurs across a variety of habitats and is known to roost in trees, rock crevices, dead snags, and beneath bark (Bat Conservation International 2022*d*). The long-eared myotis suffers wind turbine–related mortalities, with an estimated 3,500 to 7,500 bats killed per year across the U.S. and Canada from 2000 to 2011 (Arnett and Baerwald 2013). Despite these mortality numbers, the species retains a large population and wide distribution. Although the threat of WNS is considered low, a single long-eared myotis was found dead with WNS in Washington state in 2019. The disease could become a larger threat if it spreads farther (NatureServe 2022*c*). Although climate change could impact the habitat and prey availability of long-eared myotis, the species is widely distributed across different habitats, maintains a healthy population size, and has few to no major threats to its populations, resulting in a low climate change vulnerability categorization.

Townsend's Big-eared Bat- CCVA Score: Low

The Townsend's big-eared bat, an AZGFD SGCN, has been acoustically detected at BMGR. It is insectivorous and widespread throughout the western U.S. and British Columbia, Canada (Schmidt 2003, Gruver and Keinath 2006, NatureServe 2022*b*). Townsend's big-eared bats do not seem to be susceptible to WNS (Maher et al. 2012, Langwig et al. 2015, Whiting et al. 2018, NatureServe 2022*b*). However, they are assumed to be declining due to disturbance and destruction of their roosting habitat, especially in western portions of their range (Schmidt 2003, Gruver and Keinath 2006, NatureServe 2022*b*). Insectivorous bats may be among the most sensitive species to climate change and serve as early-warning indicators of large-scale ecological effects, with research finding bat reproduction to be lower in hotter and drier years (Jones et al. 2009, Adams 2010, Sherwin et al. 2013, Hayes and Adams 2017). Higher temperatures may also prompt bats to break hibernation more frequently, putting individuals at greater risk of mortality through rapid energy use (Ingersoll et al. 2010). Climate change may affect the timing between insect emergence and bat emergence, which could reduce successful bat foraging in the spring (Sherwin et al. 2013). Although warming temperatures and increasing precipitation could benefit bats if they promote greater food availability and faster juvenile development, disruption of hibernation, extreme weather events, and spread of disease could cause significant mortality (Sherwin et al. 2013). Due to its wide distribution, ability to move across landscapes and disperse long distances, and resistance to WNS, the Townsend's big-eared bat resulted in a low climate change vulnerability categorization.

Sonoran Pronghorn- CCVA Score: Very High

The Sonoran pronghorn is a federally endangered subspecies that ranges across both BMGR East and West. Its range is restricted to three populations in southwest Arizona and two in northwest Sonora, Mexico (NatureServe 2022*i*). Following a severe population decline in 2002, multiple conservation measures and management actions have helped the population rebound to over 200 individuals in the United States (USFWS 2023*b*).

The Sonoran pronghorn requires large expanses of habitat with vegetative mosaics suitable for foraging and predator detection and avoidance, as well as access to water. The species is highly nomadic in response to the sporadic rainfall in its habitat. Habitat loss and fragmentation have caused a substantial decline of this sub-species and climate change–related drought, thermal stress, and reduced access to water have had further negative impacts (UWFWS 2016*a*). In the Sonoran ecosystem, drought severity and frequency are expected to increase due to projected declines in regional precipitation, especially in the summer. Drought was the primary cause of the large die-off event in 2002, but the long-term response of the Sonoran

pronghorn population to climate change will depend on the outcome of changing precipitation variables and subsequent conservation actions (Horne et al. 2016, USFWS 2016*a*).

The Sonoran ecosystem is also projected to experience higher temperatures due to climate change, which could increase heat stress and degrade foraging habitat (Gedir et al. 2015, USFWS 2016*a*). Human intervention, including artificial water and food sources, has helped support Sonoran pronghorn numbers (deVos and Miller 2005), but climate change models project temperature and rainfall conditions that are not conducive to Sonoran pronghorn survival (Bagne and Finch 2012, USFWS 2016*a*). Due to the low abundance and restricted distribution of Sonoran pronghorn, as well as their historical sensitivity to drought and projections of increasing frequency and severity of droughts in the southwestern U.S., this species received a very high climate change vulnerability score (CEMML 2019).

Desert Bighorn Sheep- CCVA Score: Moderate

The desert bighorn sheep, an AZGFD SGCN, occurs on BMGR and is managed as a game species and culturally significant animal. Desert bighorns are threatened by drought, urbanization, outdoor recreation activities, fire suppression, and other human activities (Schoenecker 1997, Cain et al. 2005, Colchero et al. 2009, Antaya 2018). This species is extremely sensitive to human presence and will avoid suitable habitats with anthropogenic activities or noise pollution (Schoenecker 1997). Water availability is important for bighorn sheep breeding and survival and is threatened by warming temperatures and increased frequency of summer droughts due to climate change (Bagne and Finch 2012). Decades of fire suppression in fire-adapted portions of its range have also led to denser and taller shrubs, which desert bighorn avoid because they limit visibility and can make predators harder to avoid (Cain et al. 2005). Although desert bighorn sheep are adapted to dry and hot environments, their declining populations increase their susceptibility to climate-related impacts, such as droughts and changes to habitat, which resulted in a moderate climate change vulnerability score.

Golden Eagle- - CCVA Score: Low

The golden eagle, an AZGFD SGCN, nests on BMGR. This large apex raptor is widely distributed across the Northern Hemisphere and protected under the BGEPA. Golden eagle populations declined in the early 1900s due largely to bounty hunting, but current threats to their population include electrocution, wind turbines, poisoning, habitat loss, and reduced prey availability from habitat degradation, disease, and rodent control (Lehman et al. 2007, Great Basin Bird Observatory 2010, Katzner et al. 2020, NatureServe 2022*j*). After decades of relatively stable populations, golden eagle numbers, particularly in the western U.S., are beginning to decline (Great Basin Bird Observatory 2010). Although climate change has not directly caused golden eagle declines, increasing drought conditions are associated with lowered persistence and colonization (Tack et al. 2020), and high temperatures in spring have reduced brood survival (Kochert et al. 2019). Despite potential impacts from a projected warmer and drier regional climate, golden eagles have a wide distribution, large population size, and a relatively stable population trend, resulting in a low climate change vulnerability score.

Cactus Ferruginous Pygmy-owl- CCVA Score: Very High

The cactus ferruginous pygmy-owl (CFPO) is a subspecies that has been proposed for listing as threatened on the ESA. It has not been detected on BMGR but has the potential to occur on the eastern portion of BMGR East. Its biggest threats are habitat loss and fragmentation, and declines in vegetation quality, both of which are affected by climate change (USFWS 2021*a*). Higher temperatures and increased frequency and intensity of summer droughts could negatively impact CFPO habitat as well as habitat connectivity and nest and prey availability (Bagne and Finch 2012, USFWS 2021*a*). Due to their low abundance, CFPO are

also at a higher risk of population extinction due to stochastic events, such as severe storms (USFWS 2021*a*, NatureServe 2023*c*). Furthermore, future drought conditions could synergize with other human activities, leading to more precipitous declines in available habitat.

Agriculture has been responsible for most of the historical and current habitat losses in Arizona; however, deforestation, changes in fire regimes, and water diversion are all leading to losses of the mature riparian woodlands that these owls occupy (Proudfoot et al. 2020; USFWS 2021*a*, *b*; NatureServe 2023*c*). Finally, this species has been noted to inbreed, and therefore may be vulnerable to genetic events such as inbreeding depression (USFWS 2021*a*, *b*). Researchers evaluated the viability of regional populations of CFPO under three separate scenarios: Scenario 1—continuation of current risks, Scenario 2—increased risks in the future, Scenario 3—reduced risks in the future, and found both the Arizona and Sonoran Mexico populations to have a low chance of viability (<60% of persisting for 30 years) in all three scenarios (USFWS 2021*a*). Due to their limited range, low abundance, and susceptibility to climate-related impacts to their preferred habitat and prey base, the CFPO received a very high climate change vulnerability score.

Bendire's Thrasher- CCVA Score: High

The Bendire's thrasher, a USFWS BCC and AZGFD SGCN, has been observed on BMGR East. Relatively little is known about the population trends of this species but breeding bird survey data has shown a 4.4% annual decline since 2010 (Desmond and Sutton 2017). Additionally, its population is projected to decline 30% to 50% in the next 20 years (Rosenberg et al. 2016, Desmond and Sutton 2017). Historical declines of Bendire's thrashers may be a result of urban and agricultural expansion, especially along the Gila River where agriculture has led to overgrazing and encroachment of non-native shrubs (Desmond and Sutton 2017, NatureServe 2022*l*). This species may also be sensitive to increasing competition; areas where the curve-billed thrasher (*Toxostoma curvirostre*) has expanded are correlated with Bendire's thrasher declines (Desmond and Sutton 2017, NatureServe 2022*l*). Bendire's thrasher occupies sparse desert scrub and desert grassland habitats that often include soap tree yuccas (*Yucca elata*) and/or Joshua trees (Desmond and Sutton 2017, Salas and Desmond 2018, England and Laudenslayer 2020, Salas 2021). Increasing temperatures and potential increases in the frequency and duration of droughts in the Southwest may negatively impact Bendire's thrasher populations by altering desert vegetation, potentially limiting prey availability, and decreasing nest success (Rosenberg et al. 2016, Desmond and Sutton 2017, Salas and Desmond 2018, Salas 2021). Due to their recent and projected population declines, and expected habitat impacts from climate change, the Bendire's thrasher received a high climate change vulnerability score.

LeConte's Thrasher- CCVA Score: Moderate

LeConte's thrasher (*Toxostoma lecontei*), a USFWS BCC and AZGFD SCGN, occurs on BMGR East and West. Breeding bird survey data indicates that this species is declining; however, these data may not represent actual trends because many inventories are conducted after most nestlings have fledged (NatureServe 2022*m*). It appears that LeConte's thrashers are undergoing annual declines of around 2.45% and have experienced long term declines of about 67% since the 1970s (Sheppard 2020, NatureServe 2022*m*). Habitat loss and degradation due to agricultural and human development, especially along the Gila River, are the main threat to this species (Sheppard 2020, NatureServe 2022*m*). Livestock overgrazing and off-highway vehicle use in the desert shrublands of this region can degrade thrasher habitat and facilitate the encroachment of invasive species (Sheppard 2020, NatureServe 2022*m*). LeConte's thrasher is well adapted to hot, dry deserts, and requires sparse shrub cover (Jongsomjit et al. 2012, Sheppard 2020). Climate change could alter its habitat and the availability of prey (Bagne and Finch 2012). Additionally, climate change is expected to exacerbate the spread of invasive plants, which may increase the frequency of fires, further impacting the LeConte's desert scrub habitat (Bagne and Finch 2012). Although this species

is highly adapted to hot, dry habitats, its lowered abundance and expected climate-related impacts to its desert scrub habitat resulted in a moderate climate change vulnerability score.

Gray Vireo- CCVA Score: Low

The gray vireo, an AZGFD SCGN, has been documented at both BMGR East and West in the winter and during migration. Although its population trend is not well known, it has relatively small breeding and wintering distributions and low abundance (New Mexico Department of Game and Fish [NMDGF] 2007, Barlow et al. 2020). It is assumed that gray vireo populations have declined in the past, primarily from habitat alteration, but the current population seems to be stable and even increasing in certain areas (NMDGF 2007, Barlow et al. 2020, NatureServe 2022*k*). Primary threats to gray vireos are changes in fire regimes, cowbird parasitism, and livestock grazing (NMDGF 2007, NatureServe 2022*k*). Increasing temperatures, wildfire frequency, and drought intensity are all climate-related impacts that could affect gray vireo habitat, but currently it has a stable population and no direct climate-related threats, resulting in a low climate change vulnerability score.

Yuman Desert Fringe-toed Lizard- CCVA Score: Moderate

The Yuman desert fringe-toed lizard (YFTL) occurs on BMGR West and is currently under review for listing under the ESA. It is closely related to, but genetically distinct from, other fringe-toed lizard species in the region (Derycke et al. 2020, NatureServe 2023*d*). Little is known about the abundance or population trends of YFTL, but it has restricted geographical boundaries that make range expansion unlikely. Like other fringe-toed lizards, YFTLs require sandy flatlands along dune bottoms, sparsely intermixed with perennial shrubs (Durtsche 1995, Turner 1998, NatureServe 2023*d*). Urbanization and agricultural expansion have decreased available habitat for fringe-toed lizards throughout this region of the U.S. Furthermore, military vehicle training and Border Patrol activities pose risks to these lizards in the sandy shrublands they inhabit (NatureServe 2023*d*, *e*). Although YFTL are adapted to harsh, arid environments, increasing temperatures and drought conditions could alter dune communities and lead to low substrate moisture during embryonic development, leading to decreased recruitment (Bagne and Finch 2012, Derycke et al. 2020). The extremely restricted range of the YFTL increases its susceptibility to climate-related impacts such as severe and prolonged drought, but it is adapted to hot, dry desert environments and its populations are assumed to be relatively stable, resulting in a moderate climate change vulnerability score. Increasing the monitoring of YFTL and other fringe-toed lizard populations would help to identify trends and better refine management objectives for this species.

Flat-tailed Horned Lizard- CCVA Score: Moderate

The flat-tailed horned lizard (FTHL), an AZGFD SGCN, occurs on BMGR West. Population trends for this species have stabilized due to significant conservation efforts (Barrows and Allen 2009, NatureServe 2022*o*). However, habitat loss and fragmentation continue to threaten FTHL populations, as does off-highway vehicle use, border patrol incursions, and the dominance of invasive Argentine ants (*Linepithema humile*) over native harvester ants, the FTHL's primary food source (Grant and Doherty 2009, NatureServe 2022*o*). FTHLs prefer fine, aeolian sand plains, and they generally remain on flat ground around the edges of dune bottoms (Barrows et al. 2008). Low and sparse shrub cover is important, serving as both cover and burrowing hibernacula for FTHLs and habitat for harvester ants (Barrows and Allen 2009, Young 2010, NatureServe 2022*o*). Potential impacts of climate change on this species include shifting vegetation composition and cover, decline of native prey base from invasive species, and increased frequency and duration of droughts (NatureServe 2022*o*). Although their current populations are fragmented and reduced, and climate-related impacts could impact their habitat and prey, conservation efforts have stabilized their

population trends and they retain a wide distribution, resulting in a moderate climate change vulnerability score.

Mohawk Dunes Fringe-toed Lizard- CCVA Score: Moderate

The Mohawk dunes fringe-toed lizard (MFTL) is a part of a closely related complex of fringe-toed species. It was formerly assigned to the taxonomy of the Yuman desert fringe-toed lizard (YFTL) (*U. rufopunctata*); however, there is recent evidence of speciation for this population, and it has been given its own nomenclature of *Uma thurmanae* (Derycke et al. 2020). The MFTL has an extremely restricted range that is geographically separated from other fringe-toed lizard populations by more than 100 km (Derycke et al. 2020). The Mohawk Dunes are a small, isolated stretch of dunes located along the western foothills of the Mohawk Mountains that extend northward from BMGR toward Interstate 8. To the south and to the west, MFTL is restricted by a vast desert of alluvial deposits that are unsuitable habitat. Trend data is not abundant for this newly identified species, but its restricted distribution and isolation increase its susceptibility to anthropogenic impacts and stochastic events such as long-term droughts (Turner 1998, NatureServe 2023*e*). As with YFTLs, MFTL habitat and burrows can be damaged by military vehicle and off-highway vehicle use (Grant and Doherty 2009; NatureServe 2023*d*, *e*). There are no immediate plans to conduct ground-based training within the Mohawk Dunes complex.

Fringe-toed lizards prefer fine, windblown aeolian sand flats adjacent to dunes, with sparse perennial shrubs for cover and hunting opportunities (Durtsche 1995, Turner 1998, NatureServe 2023*d*). Like YFTLs, climate change may negatively affect MFTL populations by altering dune communities and vegetation, while increasing temperatures and droughts could decrease sand moisture during egg development, leading to decreased recruitment (Bagne and Finch 2012, Derycke et al. 2020). The restricted range of the MFTL increases its susceptibility to climate-related impacts, yet it is adapted to hot, dry desert environments and its populations are assumed to be relatively stable, resulting in a moderate climate change vulnerability score. Increasing the monitoring of MFTL and other fringe-toed lizard populations would help to identify trends and better refine management objectives for this species.

Sonoran Desert Tortoise- CCVA Score: Moderate

The Sonoran Desert tortoise is an AZGFD SGCN that can be found across BMGR. Its distribution extends south and east of the Colorado River in Arizona into northern Mexico (NatureServe 2022*n*). The Sonoran Desert tortoise is a slow-growing, long-lived species with relatively low fecundity (USFWS 2021*c*). Its distribution has not undergone any significant reduction and past population declines have been local and due to urbanization and human development (USFWS 2021*c*). Other threats to their population are habitat fragmentation, livestock grazing, disease, and invasive grasses (NatureServe 2022*n*). Although desert tortoises are adapted to dry desert conditions, projected climate change may still impact their populations. Shifts in temperature and precipitation could have deleterious effects on the tortoise's habitat, incubation, and thermoregulation. Higher projected temperatures are likely to alter sex ratios, hatchling survival, and thermoregulation capacity, which may cause the tortoises to remain underground for longer periods to escape increasing ambient temperatures.

Sonoran Desert tortoise females may be able to adjust for annual temperature variation by nesting earlier or later in the season than usual or by nest site selection. This could include digging deeper nests or selecting cooler, shaded sites. Studies involving the Sonoran Desert tortoise are limited but one such study indicates that the species is likely to begin nesting earlier in the season to compensate for increased annual temperatures (Lovich et al. 2017). Earlier nesting seasons could be detrimental to the species as it narrows the window of time females have to obtain nutrients to develop their eggs, possibly resulting in decreased

clutch size or reproductive failure. These efforts to adjust for higher temperatures may not be reliably successful and egg clutches could still reach critical temperatures that result in all female offspring or egg death (Lovich et al. 2017). Although Sonoran Desert tortoises are well adapted to arid climates, climate-related impacts such as prolonged droughts and increasing temperatures could impact tortoise recruitment, while invasive grasses and increased wildfire frequency and intensity could negatively affect their populations, resulting in a moderate climate change vulnerability score.

Monarch Butterfly- CCVA Score: Very High

The monarch butterfly 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, 2012; USFS 2015; NatureServe 2022*p*). The North American populations are migratory, breeding in summer across the U.S. and southern Canada and overwintering in a small region in the mountains of Mexico and southern California (NatureServe 2022*p*). Studies have indicated that climate is a major driver of the species' population dynamics (Barve et al. 2012, Zipkin and Oberhauser 2012). Therefore, projected climate change scenarios, such as altered timing and magnitude of weather events, could have substantial effects on monarch populations (Barve et al. 2012, Zipkin and Oberhauser 2012). In fact, multiple ecological niche models have projected that their populations will decline due to climate-related impacts and habitat loss in both winter and summer ranges (Oberhauser and Peterson 2003, Batalden et al. 2007, Barve et al. 2012, NatureServe 2022*p*). Due to recent population declines and their susceptibility to climate-related impacts, such as extreme weather events and droughts, monarch butterflies received a very high climate change vulnerability score.

Acuña Cactus- CCVA Score: Very High

The acuña cactus is a federally endangered subspecies that exists in three distinct clusters on BMGR East. It has a restricted distribution from southern Arizona to northern Sonora, Mexico, with only six occurrences in the U.S. and one in Mexico (NatureServe 2022*q*, USFWS 2022*a*). From 1981 to 2021, in all populations that have been monitored, population trend appears to be declining, indicating that mortality exceeds recruitment in plants >25mm in height. Researchers attributed this to drought, climate change, border activity, mining activity, urban development activity, livestock activity, nonnative plant invasion and fire regime alteration, uprooting, herbivory and predation, and illegal collection (USFWS 2022*a*). Droughts can impact acuña cactus populations by decreasing or almost eliminating seed recruitment and lowering adult survivorship (USFWS 2013, 2022*a*). Phenological models of Sonoran Desert shrubs show that since the late 1800s, climate change may have shifted flowering up to 41 days earlier (Bowers 2007). Decreased water availability, especially in winter, results in lower flower production and decreased recruitment (USFWS 2013, 2022*a*). Smaller, younger acuña cactus individuals may be especially vulnerable to prolonged drought because they have less water storage capacity. The acuña cactus is not fire-adapted and increases in fire intensity and frequency could have negative impacts on its survival and recruitment (USFWS 2022*a*, *b*). Invasive species encroachment, which is expected to increase due to climate change, could also negatively impact acuña cactus populations by outcompeting them for water and increasing the fuel load and potential fire frequency of the region (Bagne and Finch 2012, USFWS 2022*a*, *b*).

Decreases in the abundance of pollinators and seed dispersers could also lead to continued low recruitment of acuña cactus (Bagne and Finch 2012). A recent study projected that, despite climate change, acuña cactus populations would remain relatively stable until 2070. Researchers found that the acuña cactus populations were maintained by established, long-lived adults that had low mortality rates, but that climate change severely impacted the recruitment of young individuals, leading to a steep population decline following the

mortality of mature plants (Larios et al. 2020). Because changes in climate are partly responsible for the observed decline in acuña cactus, and because climate-related impacts such as warmer temperatures, increased severity and frequency of droughts and wildfire, and encroachment by invasive species are projected to negatively affect their populations, the acuña cactus received a very high climate change vulnerability score.

2.3.5 Wetlands and Floodplains

Wetlands and floodplains are special categories of water resources. Water resources are protected under the Clean Water Act and the Rivers and Harbors Act. These acts require controls on management and stewardship of many types of "waters," such as rivers, perennial streams, and certain wetlands. Wetlands and floodplains, along with other types of waters, are also important habitat components; sources of many types of food, shelter, and cover resources for plants and animals; and are also a critical resource for humans. Certain types of water resources may be designated as waters of the U.S. or waters of the state, and certain wetlands may qualify for additional protection as jurisdictional wetlands.

BMGR does not currently have any waters of the U.S., waters of the state, or jurisdictional wetlands, but regulations governing the qualifications for these categories change, and should the need arise, BMGR will conduct surveys to determine if any protected categories of waters exist. EO 11990 directs the management of wetlands.

Floodplains are low-lying areas along streams or rivers that may be inundated during high flow events. They are important to natural resource management because they often support unique communities of species adapted to a certain disturbance regime, and because infrastructure built on floodplains may be at risk of damage from flood events. EO 11988 directs the management of floodplains.

Due to the low amounts of precipitation in the Southwest, xeroriparian communities dominate over typical wetland communities. Xeroriparian areas are typically dry wash sites with denser vegetation communities than those of the surrounding desert and are important habitat used by many species. Larger washes are generally lined with mesquite, ironwood, paloverde, and a variety of other trees, shrubs, and herbaceous plant species, whereas smaller washes may support an occasional tree or simply contain larger shrubs than the surrounding plant community (BLM 2000). Large and small mammals depend on these areas for forage and cover. Birds depend on them for nesting, forage, and predator avoidance, and use them heavily during migration (BLM 2000). Xeroriparian communities contribute to overall biodiversity, supporting a wider range of plants and insects than surrounding uplands.

Broad floodplains are associated with the major washes, which generally flow down the axes of the valleys between adjacent ranges (Klawon and Pearthree 2001). These floodplains are composed mainly of sand, silt, and clay sediments with gravelly, often braided channel deposits, and are subject to flash flooding from storm events. Although flood hazards exist, the Federal Emergency Management Agency has not delineated 100-year floodplains in this area (USAF 2010).

The hydrologic integrity of floodplains on BMGR East and West is threatened by roads that cross perpendicular to the flow. These roads are maintained with dragging and grading, which can lower the road's elevation profile and disconnect the hydrology of the lower watershed from the region above the road. Roads then become ephemeral washes that trap and channel water across, instead of down, the floodplain. This cycle then causes extensive deterioration of the roads, requiring even more frequent grading.

BMGR East

Ephemeral washes include Sauceda Wash, Quilotosa Wash, Tenmile Wash, Midway Wash, and Growler/San Cristobal Wash. These systems have many large and small tributaries that are dry except after rare heavy or prolonged rain events (BLM 2000).

Except for Midway Wash, all of the ephemeral washes including Sauceda Wash, Quilotosa Wash, Tenmile Wash, and San Cristobal/Growler Wash on BMGR East flow to the Gila River. Mesquite bosques, along with ironwood, paloverde, and a variety of other trees, shrubs, and herbaceous plants, are found along Tenmile Wash, Midway Wash, and Growler/San Cristobal Wash.

BMGR West

The Mohawk Valley, a large arroyo, runs along the valley's axis and eventually dissipates into progressively smaller interior deltas. These deltas drain north but do not reach the Gila River (Malusa and Sundt 2015).

In contrast, the Coyote Wash arroyo contains islands of naturally developed floodplains, which run along the entire 31-mile length of the Lechuguilla Valley (Malusa and Sundt 2015). Historically, Coyote Wash joined the Gila River at the town of Wellton, but it now ends at a berm protecting the Wellton Mohawk Canal. The wash is an important xeroriparian feature that provides habitat for both plants and animals (Malusa and Sundt 2015).

Fortuna Wash originates in Fortuna Canyon on the west side of the Gila Mountains. It is fed by numerous smaller washes as it drains north through the Fortuna Foothills toward the Gila River. The arroyo is still largely intact despite being surrounded by urban development north of the BMGR and ephemeral stream flows still have the potential to reach the Gila River when conditions are right.

2.3.5.1 Climate Impacts on Wetlands

Xeroriparian communities, such as those of the larger ephemeral washes of BMGR East and arroyos of BMGR West, may benefit from projected increased levels of seasonal precipitation and inundation. However, the warmer temperatures projected under a changing climate may counter increases in precipitation via increased evapotranspiration, particularly during drier months (CEMML 2019). In addition, climate change is likely to negatively affect these systems through erosion caused, in part, by increasingly intense storm events (Overpeck et al. 2013, Seneviratne et al. 2021). Increased erosion from storms may exacerbate road maintenance challenges, particularly along roads that are perpendicular to washes. Increased erosion can alter wetland and xeroriparian systems that may not tolerate increased sediment loads.

Water availability in the desert Southwest overall is declining with climate change (Griffis-Kyle, personal communication). Amphibians are an excellent indicator of desert water sources for wildlife given that they are tied to aquatic resources for both habitat and hydration, and thus can be a useful monitoring target. BMGR East may support additional aquatic and/or amphibian species monitoring if warranted, including potentially investigating the following research questions:

- What is the role of timing and duration of inundation of stepping-stone aquatic habitats, such as *charcos*, potholes, and intermittent streams/washes, in the connectivity of amphibian populations, and how may connectivity provided by these stepping-stones be harmed during drought or with changes to rainfall regimes from climate change?
- Can wetland site quality be ranked across a spectrum of measurements that would help managers more effectively distribute their efforts in water management? Amphibians could be used as a case

study to build and test an integrative ranking system as proof of concept. Then the system could be adapted to apply to wildlife species of interest, such as T&E species or game species.

2.3.6 Other Natural Resource Information

N/A

2.4 Mission and Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

Natural resource constraints on the mission and mission planning include a combination of factors. Federal and state environmental laws and regulations, as well as physical and ecological factors, can affect the use of the Range and other facilities. Similarly, conservation measures included in biological opinions and conservation agreements can constrain military operations.

Operations and development on much of BMGR must consider the presence of Sonoran pronghorn and reduce or prevent effects to the species. Due to its endangered status, all actions at BMGR that may affect Sonoran pronghorn must undergo Section 7 consultation under the ESA. Approximately 70% of BMGR East and 36% of BMGR West are within Sonoran pronghorn habitat (Figure 7-4 and Figure 7-5). At BMGR East, air and ground operations on the NTAC, STAC, and Range 1 are affected by the presence of animals in the vicinity of targets and along roads, and in any proposed development or expansion of facilities on these ranges or below the air-to-air range (generally throughout the area west of SR-85). These operations must consider their potential impacts on Sonoran pronghorn habitat and species recovery. To enhance fawn recruitment, the 56 FW schedules range maintenance and explosive ordnance clearances on NTAC and STAC outside the fawning season.

Concerted efforts of the USAF, USMC, AZGFD, USFWS, and other members of the recovery team have resulted in improved status of Sonoran pronghorn through numerous recovery actions (e.g., habitat protection and enhancements, establishment of a non-essential experimental population, construction and maintenance of wildlife water sources). These and other actions are part of the *Recovery Plan for the Sonoran Pronghorn*. If successful, they will lead to downlisting and, ultimately, delisting of the species (USFWS 2016*a*). In the interim, however, the increased number of animals on the Range has the potential to increase mission constraints. On BMGR East, daily monitoring of target areas on NTAC, STAC, and Range 1 typically results in closing several targets to ordnance delivery for the day because of the presence of one or more animals in the immediate vicinity. It is anticipated that target closures will increase with population increases, and this will further constrain mission execution unless procedures currently in place evolve to mitigate this effect. However, the USFWS has worked with the military to reduce mission constraints. For example, in 2010, the USFWS issued a non-jeopardy BO with authorized incidental take of multiple Sonoran pronghorn. The BO allowed for reduced target closure distances to limit constraints on the military, while still minimizing risks to Sonoran pronghorn from military operations (USFWS 2010*a*). Additionally, the USFWS has provided feed and water near the Range boundaries (east, west, and south) to lure Sonoran pronghorn away from actively used targets. These activities are discussed in detail in Section 7.4.1 Sonoran pronghorn.

Under the terms of a 2016 Candidate Conservation Agreement (USFWS 2015), the 56 FW and MCAS Yuma agreed to implement measures to protect the Sonoran Desert tortoise (see Section 7.4.2) and its habitat across all BMGR. The provisions of the INRMP, especially road and vehicle travel management, contribute to the protection of the species. Both USAF and USMC travel management services are committed to keeping off-road vehicle use to the minimum required for range maintenance and operations.

Another agreed-upon measure in the Candidate Conservation Agreement is to schedule explosive ordnance clearances and range maintenance in sensitive areas at BMGR East (primarily the ETAC Range) during seasons when the tortoise is less active. Combined with the scheduling constraints imposed by avoiding the Sonoran pronghorn fawning season, this restriction precludes significant flexibility in scheduling tactical range clearance and maintenance closures.

Approximately 114,800 acres of the Yuma Desert Management Area for FTHL occurs on BMGR West. This accounts for roughly 88% of the species' remaining habitat in Arizona. As a signatory to the 1997 Candidate Conservation Agreement and as prescribed by the 2003 FTHL Rangewide Management Strategy (2003 RMS), MCAS Yuma has agreed to a disturbance cap of no more than 1% of the FTHL habitat managed by the installation. Additional habitat losses on lands contiguous to BMGR West will likely result in increased management emphasis on the remaining protected habitat within the Range. Precluding listing of this species under the ESA is vital to maintaining the success and mission readiness capabilities at BMGR West. MCAS Yuma remains focused on expanding range capabilities while maintaining sufficient habitat for the species. Adhering to the 1% disturbance threshold and implementation of the 2003 RMS, as well as effective management of the FTHL and its habitat, will continue to be fundamental to this effort.

Birds and wildlife represent significant threats to flight safety and can impact the timing of aircraft operations and training. Bird/Wildlife Aircraft Strike Hazard (BASH) concerns are greatest during landings or takeoffs or when aircraft fly at low altitudes, rather than during in-flight operations that are typical at BMGR. A BASH Reduction Plan is in place at BMGR East and West and is discussed in detail in Section 7.12 Bird/Wildlife Aircraft Strike Hazard.

The invasion of Sahara mustard (*Brassica tournefortii*) and buffelgrass (*Pennisetum ciliare*), primarily in BMGR West, and stinknet (*Oncosiphon pilulifer*), Sahara mustard, and buffelgrass in BMGR East, has the potential to limit ground or air-to-ground training in areas where these species form dense monocultures. These monocultures can be a fuel source, increasing fire danger when there are ignition sources such as vehicles and air-to-ground artillery. The spread of Sahara mustard and buffelgrass is controlled through mechanical and chemical removal. Invasive species may further constrain the military mission by degrading habitat for native, rare, threatened, and endangered species, potentially leading to additional listings and increased regulatory burdens. Curtailing spread of small existing infestations and preventing new infestations is always a cheaper and more efficient option than widespread control of invasive species after a large-scale invasion. A discussion on the impacts and control efforts for invasive plant species is provided in Section 7.11.1 Invasive Species.

Erosion resulting from dragging of roads by CBP and use of unauthorized off-road vehicles has occurred in areas. Fugitive dust from wind-driven erosion has the potential to disrupt training due to reduced visibility, fouling of mechanical and electrical systems, and effects on the health of personnel training at BMGR. Increased erosion along roads from more intense storms, particularly roads that bisect major washes, may result in additional expenses for maintenance, both to keep roads in working order for mission needs and to repair damage to natural resources.

2.4.2 Land Use

Although BMGR is technically a withdrawn land area, from the perspective of supporting military operations, the Range is composed of both lands and overlying restricted airspace reserved for military purposes (Figure 2-7, Figure 2-8, and Figure 2-9). The restricted airspace dimensions of BMGR remain unchanged from those that were in effect following the implementation of the MLWA of 1999. The four restricted airspace areas overlying the Range—R-2301W, R-2301E, R-2304, and R-2305—are designated

by the Federal Aviation Administration to support the military training missions of the Range. BMGR supports a wide diversity of tactical aviation training activities as well as selected ground training and training support operations.

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 regularly occur either as independent but simultaneous events or as large-scale, combined action events;
- the flexibility to host irregularly scheduled training or testing activities, (e.g., air-to-air missile shoots or long-range air-to-ground weapons deliveries) that require restricted air and land space configurations that cannot be accommodated by standard weapons ranges or other activity areas; and
- buffers that permit multiple independent training events to safely occur simultaneously and protect public safety.

Although substantial changes in aircraft, weapons, and warfighting tactics have occurred over the decades, development and improvements in weapons ranges and other training sites has led to only a modest expansion in the surface use needed to support training activities. The basic configurations of the weapons ranges established from 1950 through the 1980s, coupled with necessary upgrades and routine maintenance, have enabled many of these facilities to provide long-standing and sustainable training support.

After several decades, the aggregate footprint of surface disturbance that affects the ground surface, surface hydrology, and/or vegetative communities is approximately 13%. The greatest disturbance occurs within 1,000 feet of a target. Disturbance includes impacts from munitions, rockets, and flares, large and small bomb craters, vehicle tracks and bomb drags from Explosive Ordnance Disposal (EOD) clearances to remove unexploded ordnance, and construction and maintenance activities associated with targets and roads.

Therefore, the primary focus of ecosystem and biodiversity management at BMGR has been landscape-level protection and conservation rather than manipulation or restoration. Similarly, the primary focus of protected species management has been the protection and conservation of existing natural habitats, in conjunction with surveys, to ensure understanding of species' distributions, abundances, and management needs. The current endangered or threatened status of protected species at BMGR has resulted largely from historical and ongoing losses of off-range habitat, disease, adverse climatic trends, and other negative effects of non-military activities. Although military activities pose some risks to certain species, these potential effects are comprehensively mitigated, and military use of the Range has not been found to jeopardize any protected species. In fact, effects of substantial habitat protection at BMGR have contributed markedly to the continued existence and recovery potential of the Sonoran pronghorn and continued conservation of the FTHL. Additional information on the Sonoran pronghorn, FTHL, and other protected or sensitive species is provided in Section 7.4 Management of Threatened and Endangered Species.

BMGR East

BMGR East land area is currently divided into eight aviation subranges for safely supporting multiple and simultaneous training or other operations. BMGR East also includes Gila Bend AFAF, Stoval Auxiliary Airfield, and AUX 6 to support training in forward area airfield operations, observation points, and other facilities.

In 2010, proposed range enhancements were analyzed in the *Final Environmental Impact Statement for Proposed BMGR East Range Enhancements* (USAF 2010) and approved for implementation in a Record

of Decision (ROD). Since implementation of the 2018 BMGR INRMP, the following enhancements either have been completed or may occur during the 5-year planning period covered by the 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 this 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 enlarge existing drainage patterns to direct flows toward Tenmile Wash.

The remaining "enhancements" described in the 2010 Environmental Impact Statement (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 STAC and realistic low-level air-to-air intercepts in the air-to-air combat tactics Range. Currently, overflights of the refuge are restricted to altitudes of 1,500 feet AGL or higher, except within approved corridors, under the terms of a 1994 MOU between the DoD and DOI. The 2010 EIS assessed proposals to lower the overflight floor to 500 feet AGL to support low-level attack and intercept training that would provide combat conditions that aircrews may encounter in real-world scenarios. Implementation of this approved action will not occur until the MOU is renegotiated.
- Authorize additional ground-based training for combat search and rescue teams, special operation teams, USMC units, and potentially other small squads of troops that involve clandestine insertions and extractions from helicopters or vehicles, cross-country land navigation, and other activities while traveling in stealth on foot. The 2010 EIS assessed proposals to expand the opportunities for this type of training. Helicopter insertions and extractions and vehicle movements associated with this training would be restricted to existing helicopter landing zones and roads. This proposal has been implemented.
- Establish streamlined procedures to facilitate environmental reviews and approvals for reconfiguring or otherwise updating tactical range targets on a timely basis to provide training that reflects the combat conditions that U.S. warfighters will encounter when meeting real world threats. This proposal has been implemented.

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. These 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. With

the exception of the R-2301W restricted airspace being divided into four aviation subranges, all listed training facilities and features are ground-based.

The USN-approved development of the Auxiliary Landing Field (ALF) complex to support Marine Corps F-35B training for the West Coast basing of the F-35B aircraft (USFWS 2010*a*) was completed in 2015. The F-35 will replace the AV-8B aircraft in USMC squadrons based at MCAS Yuma. The current military features, facilities, and uses are shown in Figure 2-9 and detailed in Table 2-16 with notations as to whether they were constructed after 2012.

2.4.2.1 BMGR Road System and Public Access

Continued surveys and monitoring of the road system have prompted Luke AFB and MCAS Yuma to propose changing the road classifications and adding recently created roads to support military training, resource management, and law enforcement. The status of the BMGR road system and public access opportunities are addressed below.

BMGR East

The 2023 road system includes maintained roads through active target complexes. However, it does not include vehicle routes used within the complexes to construct and maintain individual targets or those used for EOD clearance activities. The surface areas within target complexes affected by construction, maintenance, and EOD clearance vehicles are in open areas already heavily disturbed by bombing and strafing. Vehicle operations associated with these activities contribute to ground disturbance. Occasionally, the USAF may need to reuse a closed road when it is the only means of accessing a location for certain activities, such as conducting a Native American group visit to a remote sacred site and traditional cultural property or transporting equipment to an isolated location. The closed road would be used for such an 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 and 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 (e.g., to verify that no species newly listed as either threatened or endangered, or proposed for listing, under the ESA is likely to occur in the area). Closed roads that have been reclassified as recovered former roads would require careful assessment of the potential effects of the proposed reuse on their recovered status before new use of these former routes could be approved. Additionally, a review of Aguila Road and any other roads occurring within the Sentinel and Ajo parcels will undergo an environmental review for potential impacts to the environment.

As indicated in Table 2-13, the active road system recorded in 2023 includes 762 miles of roads, 187 miles of which are designated for public access. Because extensive areas of BMGR East are used on a regular basis for hazardous military activities, public access is limited. Public access to Management Unit 6 (which includes what is known as Area B) is subject to temporary closures as needed for military purposes. Areas currently open to the public also may be closed to protect vulnerable natural or cultural resources from damage.

As outlined in Table 2-13, additional surveys and monitoring of roads have led to the changes in miles of roads as follows (Figure 2-5):

- 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. This difference is from the addition of two new land areas: Sentinel Plain area and Ajo Airport area.

Table 2-13. Barry M. Goldwater Range East designated road system 2012, 2018, and 2023

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

BMGR West

The designated road system continues to function as documented in the 2012 INRMP, with a few minor exceptions. The 2012 INRMP reported three road designations: miles of administrative-use-only roads inside military hazard/security areas, miles of administrative-use-only roads outside of military hazard/security areas, and miles of roads classified for administrative or public use outside of restricted military hazard/security areas. For 2018 and 2023, the road designation system was simplified to two categories: miles of roads classified for administrative use only and miles of roads classified for public and administrative use. The difference in miles of administrative-use-only roads is due to more accurate surveys of the roads. No new roads were added to BMGR West during 2012–2018, but additional roads have been added to the 2023 INRMP.

The area available for public access continues to include about 75% of BMGR West. All or portions of the public use area are subject to occasional temporary closures to support military activities that present safety hazards and/or have security requirements.

The active road system includes a total of 710 miles of active roads, including 437 miles of public access roads (Table 2-14 and Figure 2-6).

Table 2-14. Barry M. Goldwater Range West designated road system 2012 and 2018

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

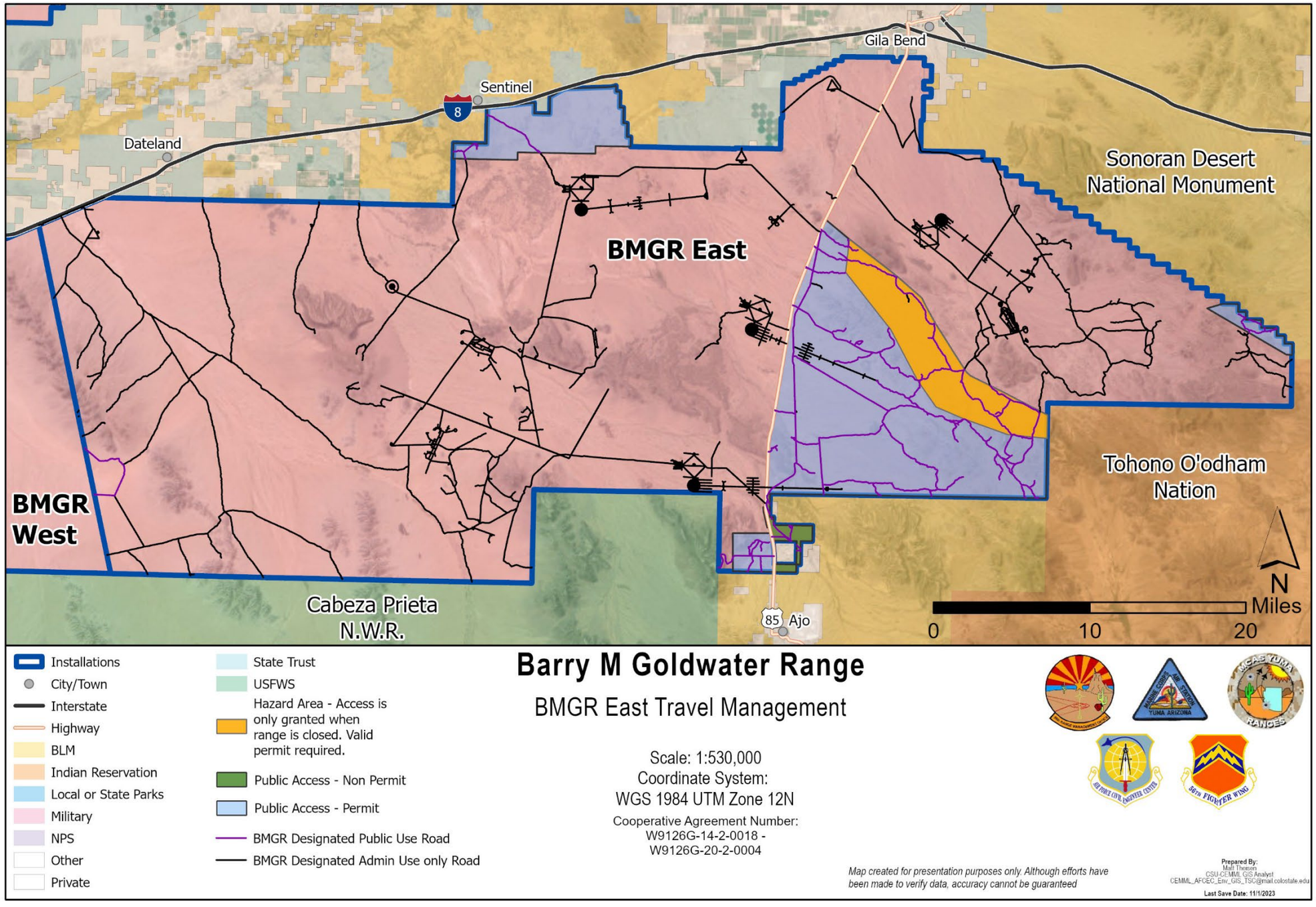

Figure 2-5. Barry M. Goldwater Range East travel management

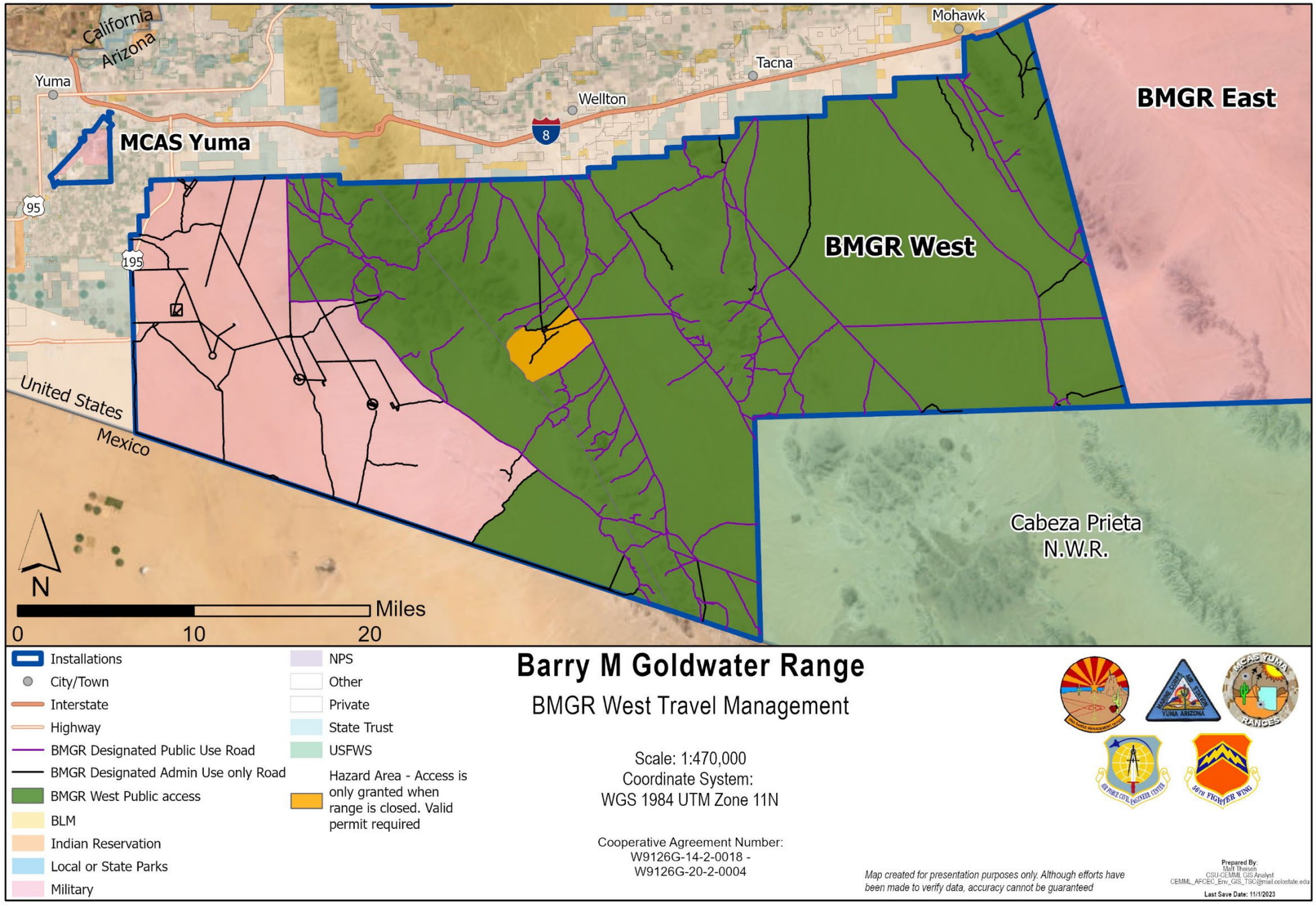

Figure 2-6. Barry M. Goldwater Range West travel management

Table 2-15. Barry M. Goldwater Range East current military training facilities, features, and use

Area/Activity	Description of Current Training Feature, Facility, and Military Use	Status Since 2018 INRMP
BMGR East Land Base	BMGR East, which represents 60% of the total BMGR acreage, is divided 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, R-2305 lateral boundaries, the altitude floors and ceiling remain unchanged since before 1960. They are not affected by the land withdrawal. R-2301E overlies most of BMGR East land area, including Stoval AUX, two tactical ranges (NTAC and STAC), three of the four numbered ranges (1, 2, and 4), and the Air-to-Air range. The area extends from the surface to 80,000 feet MSL. R-2304 overlies ETAC, part of Area B, which is open to the public by permit, and a small portion of the Tohono O'odham Nation. R-2305 overlies Range 3 and its facilities and extends south over a portion of Area B. The vertical limits of both R-2304 and R-2305 are surface to 24,000 feet MSL.	Unchanged
Numbered Ranges	Four numbered ranges capable of supporting Class A (scored) operations support primary instruction in air-to-ground delivery of bombs, rockets, and gunnery (inert/training ordnance only). The airspace associated with these ranges may be scheduled concurrently with adjacent tactical ranges as needed. Facilities on and use of these subranges remain almost entirely unchanged since well before the 2012 INRMP update. The single exception was conversion of the left side of Range 3 to a helicopter gunnery range. Construction of this facility began in 2012; it has since been completed and is in use.	Unchanged
Tactical Ranges	Three tactical ranges (NTAC, STAC, and ETAC) support aircrew training in gunnery, bomb, rocket, and missile employment. Targets simulate tactical features such as airfields, railroad yards, missile emplacements, truck convoys, urban areas, and enemy compounds. Threat simulators may be included in training scenarios to better reflect real-world conditions. Only practice ordnance may be employed on most targets; high-explosive ordnance may be used only on six targets specifically designated for this purpose. The tactical ranges continue to be used daily for ordnance delivery training.	Unchanged
Air-to-Air Range	A portion of this range may be used for air-to-air gunnery and missile firing; however, these operations are scheduled infrequently. This area is used daily for aerial combat and maneuvering training with no ordnance expenditure.	Unchanged

Table 2-15. Barry M. Goldwater Range East current military training facilities, features, and use

Area/Activity	Description of Current Training Feature, Facility, and Military Use	Status Since 2018 INRMP
Range Munitions Consolidation Points (RMCPs)	RMCPs 1, 2, 3, and 4 continue to serve as range EOD and maintenance support areas. Expended munitions, munitions scrap, and target debris that is safe for handling is cleared from the three tactical and four manned ranges and transported to the RMCPs for demilitarization and decontamination processing before being released for off-range recycling or disposal. The RMCPs are also used as staging locations for target construction, maintenance, and replacement operations. The use and configuration of these areas are unchanged since the 2012 update.	Unchanged
EOD Training Range	The EOD Training Range continues to be used for instructing EOD technicians to perform safe detonations of expended but unexploded ordnance. Detonation of high-explosive charges weighing up to 2,000 pounds net explosive weight is authorized in this area.	Unchanged
Small Arms Range	Since 2012, minor improvements and repairs to the Small Arms Range have been completed. The range continues to be used almost daily for small arms training by the 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 new air traffic control tower was 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 (Auxiliary Airfields)	Auxiliary Airfield 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 these locations. AUX-11 is no longer used as an airfield, but the area immediately south serves as a site for exercise-specific communications operations.	Unchanged

Table 2-15. Barry M. Goldwater Range East current military training facilities, features, and use

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. As of 2022, no sites are currently being used. The sand and gravel may be used in target construction or road repairs as needed.	Unchanged
EOD Clearance	EOD clearances occur annually, every 2 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 2 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

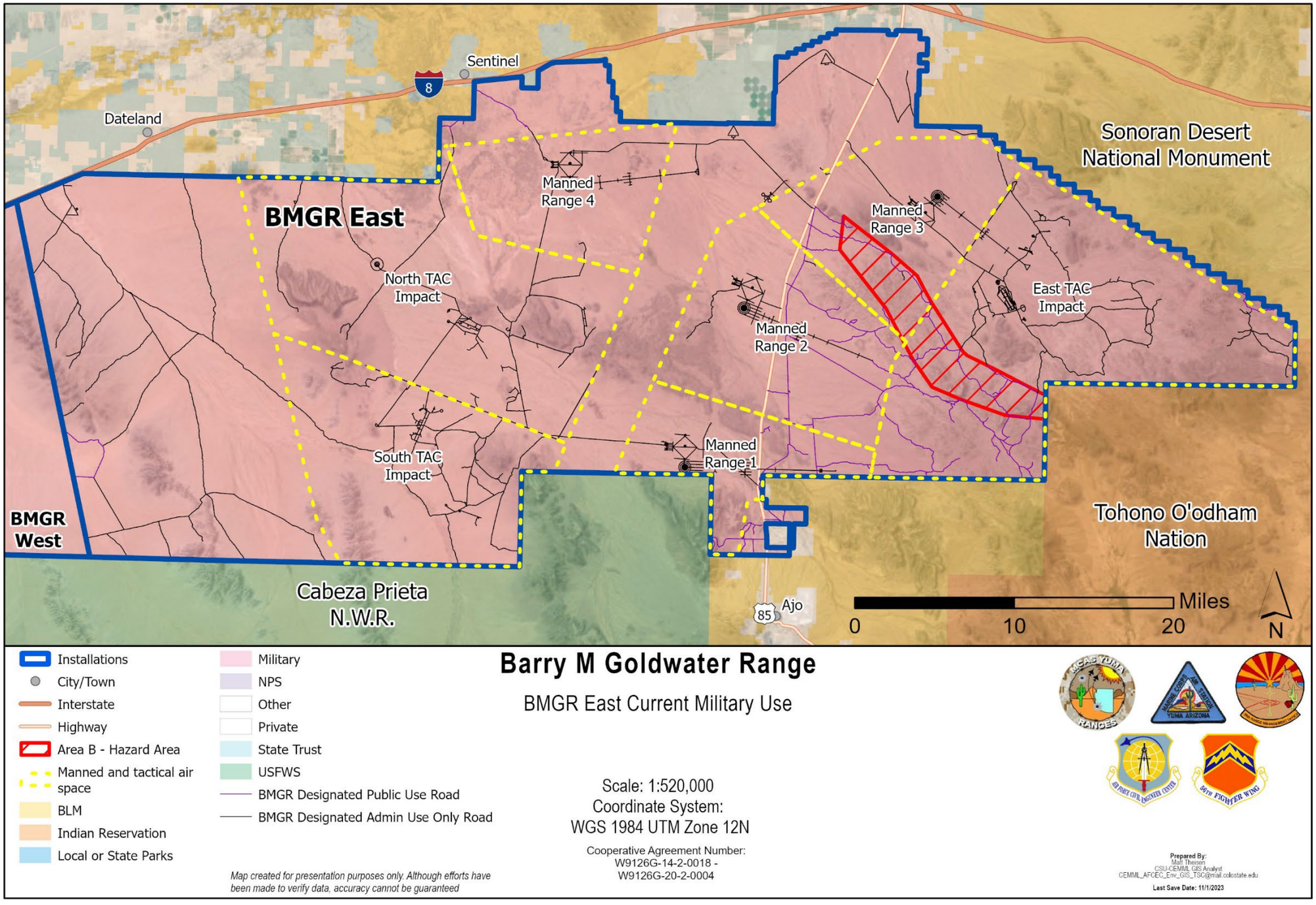

Figure 2-7. Current military use at Barry M. Goldwater Range East

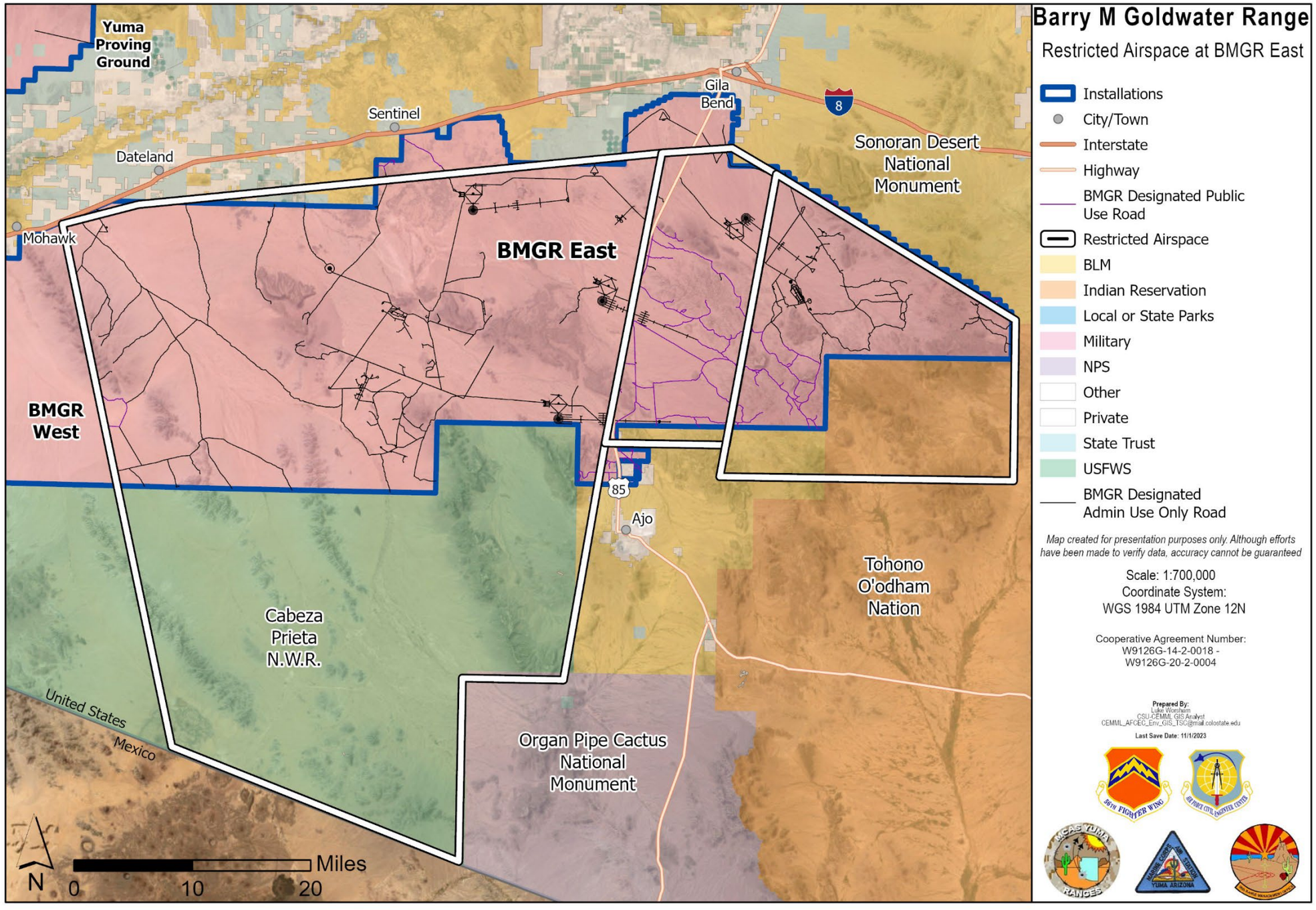

Figure 2-8. Restricted airspace at Barry M. Goldwater Range East

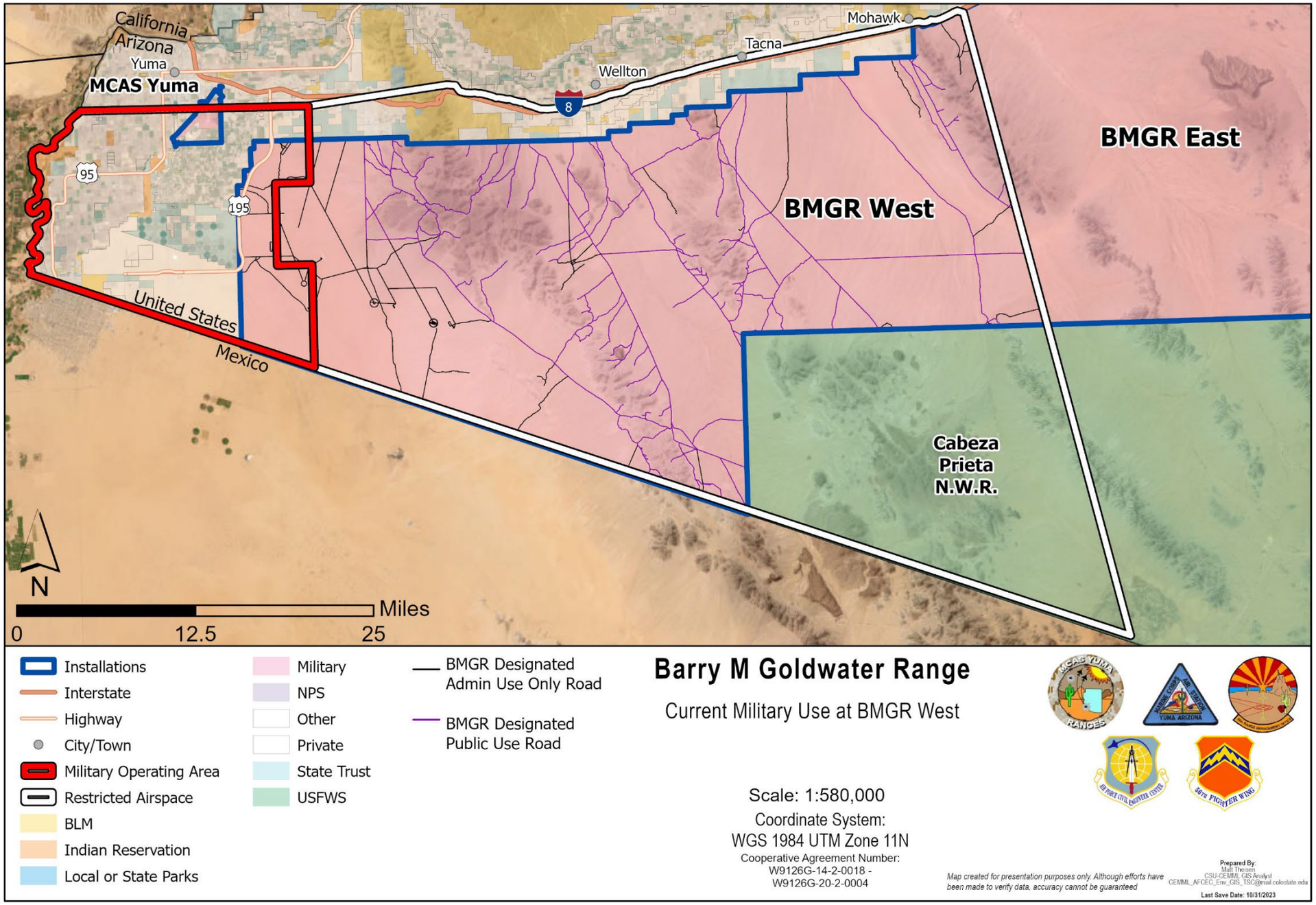

Figure 2-9. Current military use at Barry M. Goldwater Range West

Table 2-16. Barry M. Goldwater Range West current military training facilities, features, and use

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 MSL) 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 was added in 2021 maximizing its training potential. The entire Forward Operating Base 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

Table 2-16. Barry M. Goldwater Range West current military training facilities, features, and use

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
Cactus West Target Complex	Cactus West Target Complex includes (1) a bull's-eye target located inside a 1,500-foot radius bladed circle, and (2) two-berm and panel targets for strafing practice. Ordnance deliveries are restricted to inert and practice munitions. As described later in this table, the Cactus West Target receives impacts from the Convoy Security Operations Course 2 Range and as a Live Ordnance and Drop Tank Jettison Area.	Unchanged
Urban Target Complex (UTC)	The UTC provides a simulated urban setting with streets, 240 buildings, multiple targets, and vehicles for training aircrews in precision air-to-ground attack in densely developed and populated areas. The UTC Range is located inside the fenced area. The complex also has a moving land target, which consists of a remotely controlled vehicle that pulls a target sled on an oval track. Nine unimproved landing zones 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 positions and 17 mobile positions that can track, record, and replay the simultaneous actions of 36 aircraft and scoring weapon use. The air-to-ground weapons delivery component 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 x 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

Table 2-16. Barry M. Goldwater Range West current military training facilities, features, and use

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
Air-Ground Training Facilities		
Ground Support Areas	Thirty-three undeveloped ground support areas allow units to participate in off-road training exercises. Most ground troop deployments are coordinated with aviation training exercises to enhance the realism of air–ground training evolution for both elements.	Unchanged
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
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.	Changed

Table 2-16. Barry M. Goldwater Range West current military training facilities, features, and use

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
Deuce Village	Deuce Village is located within Ground Support Area Site 56 and serves as an aviation Military Operational Urban Training facility. It is a non-live fire training facility used to facilitate integrated training of both air and ground components.	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
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
Hazard Areas	Hazard Areas 2, 3, and 4 were extended southernly 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.	Unchanged

Table 2-16. Barry M. Goldwater Range West current military training facilities, features, and use

Range Feature or Facility	Description of Current Training Feature, Facility and Military Use	Status Since 2018 INRMP
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	The Munitions Treatment Range 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 the impact area for the Multi-Purpose Machine Gun Range.	Unchanged

2.4.3 Current Major Mission Impacts on Natural Resources

2.4.3.1 Impacts from Invasive Species

The spread of invasive plant species degrades the quality of the Range for military use and sustainment of listed species by altering native vegetation communities, increasing fire risk, and impairing the resiliency of the landscape and its ability to adapt to future stressors. These impacts may affect future military training missions and degrade critical wildlife habitat. Invasive plants displace native vegetation through direct competition and by altering the natural Sonoran Desert fire regime. The spread of invasive species such as Sahara mustard and buffelgrass leads to increasing fuel loads and increases fuel connectivity, endangering fire-intolerant native species. Nonnative grasses and forbs such as stinknet can form monocultures across the landscape that not only alter vegetation composition, but also promote increased fire size, frequency, and intensity (Geiger and McPherson 2005). Moreover, invasive species tend to be the first species to recover post-fire, thus increasing their density and coverage. Combined, all these factors result in a positive feedback loop, whereby increasing abundance and density of invasive species lead to increased and more

intense fire activity, which in turn favors increased abundance of those species and, subsequently, increasingly frequent and larger fires.

Invasive animals, including trespass livestock, damage native vegetation directly through herbivory, increased soil trampling and degradation, and indirectly by dispersing invasive plant seeds into new areas. In addition to damaging native vegetation communities, trespass livestock also compete with wildlife for available forage and water resources and can spread diseases to wildlife. Impacts to the military training mission caused by trespass livestock include the delay, interruption, and cancellation of live-fire training activities; increased risk of livestock/vehicle collisions; and fire fueled by the expansion of invasive plants.

A more detailed list of impacts, as well as current and future management objectives for combating invasive plant and animal species, is included in Section 7.9 Wildland Fire Management and Section 7.11 Integrated Pest Management Program.

2.4.3.2 Instrument Sites

In support of electronic aircraft tracking and C2/safety voice communication for pilot training at BMGR, multiple instrument sites are situated on mountain peaks and ridges in the area surrounding BMGR East. Many of these sites are situated on existing BLM communication sites. Each site is managed IAW the BLM land use plan and a site-specific communication site management plan. The Childs Mountain communication site is on land managed by USFWS.

Established sites were assessed for potential environmental impacts in previous NEPA documents: *Environmental Assessment to Upgrade and Expansion of the Goldwater Measurement and Debriefing System* (1995) and *Environmental Assessment to Expand the Goldwater Range Measurement and Debriefing System with Three New Sites* (1996).

Continued use of these sites is reviewed as existing permits and leases are renewed. Potential environmental impacts are assessed IAW 32 CFR 989, Air Force Environmental Impact Analysis Process (EIAP), and DAFI 32-7020 Environmental Restoration Program. Two environmental baseline surveys were completed in 2020 as part of the review for continued use of both the Keystone Peak and Smith Peak communication sites.

2.4.3.3 Remediation Activities

An investigation and subsequent remediation activities were completed at several former munitions treatment and disposal areas at AUX 6 at BMGR East where ammunition was disposed of until the early 1970s. Three Solid Waste Management Units (SWMU) underwent remediation:

- SWMU 2-1 is the site of a former underground munitions-burning furnace, associated fuel tank, and pipeline. It is located within the infield portion of AUX 6 bounded by the three runways. Munitions residue was removed from the furnace after it had been shut down and allowed to cool.
- SWMU 2-2, located in the southeast portion of AUX 6, was reportedly used for thermal treatment of munitions, including pyrotechnics, cartridge-actuated devices, and 20 mm 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. Combustible dunnage (largely wood items) and diesel accelerant were used to ignite/burn munitions placed in a trench; resulting explosions scattered shrapnel around the trenches. Open detonation of munitions entailed placing a high-explosive donor on each item followed by

detonation; the most commonly used donor charge was C-4 plastic explosive composed of chlorotrimethylene-trinitramine and a plasticizer.

The SWMUs at AUX 6 are subject to the closure requirements of 40 CFR 264 (*Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*) Subpart G (Closure and Post-Closure). A Hazardous Waste Management Area Post-Closure Permit under the Resource Conservation and Recovery Act (RCRA; 42 U.S.C. 6901 et seq.) has been obtained by Luke AFB from Arizona Department of Environmental Quality for Unit 8 of the Munitions Treatment Range in June 2006. A condition of the Post-Closure Permit required completion of a RCRA Facility Investigation to determine whether munitions constituent releases require additional corrective measures to formally close SWMUs 2-1 and 2-3. All fieldwork and remediation have been completed with the final report issued in January 2018. Details of investigation findings and subsequent remediation activities were provided in BMGR INRMP Public Report on Military Use, Environmental Conditions, Resource Management Activity, and Public Access Involvement 2018–2023.

2.4.4 Potential Future Mission Impacts on Natural Resources

To meet the needs of the future, BMGR must become a fully relevant fifth generation range. The basing of F-35A aircraft at Luke AFB and F-35B at MCAS Yuma will drive short-term and long-term changes. To maximize effectiveness, F-35 operations and training require large blocks of airspace for specific time periods and plentiful, sophisticated, and realistic targets and threats. Options to address these needs, which have the potential to affect natural resources, include the expansion of available airspace (requiring either physical expansion of airspace, increased range operating hours, or both), as well as acquisition and placement on the Range of more realistic targets, perhaps in previously undisturbed areas. Placement of targets in previously undisturbed areas may result in mission impacts to natural resources and cultural resources, and would be conducted only after completion of appropriate analysis.

2.4.4.1 Climate Impacts on Mission and Mission Planning

The large expanses of remote, undeveloped land and airspace that are needed to fulfill the mission of BMGR do not require specific habitat or vegetation types that may be integral to mission readiness at other installations. Climate change will have negligible to no effect on the amount of air and land space available. Increased risk of widespread fires (related to increased temperatures, increased winter rains, and invasive grasses) could impact infrastructure such as targets and electronics, and can cause mission impacts through degradation of air quality from smoke or dust. Fires and flood damage to roads could reduce required access for maintenance crews, Sonoran pronghorn monitors, and personnel who maintain infrastructure. In addition, climate change is expected to have secondary effects on the mission.

Future impacts to the mission linked to climate change could include the following:

- Increases in temperature extremes and wind velocity, leading to unsafe environmental conditions for personnel and/or the launch of current and planned weapons and equipment, increased maintenance requirements, requirements for new equipment, and/or decreased launch capacity (U.S. DoD 2014)
- Increased dust generation, affecting equipment and visibility (U.S. DoD 2014)
- Damage to vital mission infrastructure from increased wind velocities (Sydeman et al. 2014)
- Increased seasonal dryness and/or drought potential
- An increased regulatory environment due to shifts in species composition and distributions

- Potential loss of future training areas due to erosion and/or changes in vegetation that may otherwise be needed in light of a changing geopolitical landscape
- Potential to disrupt the acquisition and transportation of materials required for the maintenance, construction, and storage of the equipment required for these systems (U.S. DoD 2014)

2.4.4.2 Impacts from Recreation, Illegal Border Traffic, and Deterrence Efforts

Ground disturbance is one of the key factors influencing soil stability and erosion. On a broad scale, the exclusion of certain surface-disturbing activities (e.g., mining, grazing, development) and limiting areas where military surface use occurs minimize ground disturbance and the associated effects. Decisions implemented by the 2007 INRMP established a designated road system; closed the Range to off-road driving except for approved military, resource management, and law enforcement purposes; and established vehicle operating rules. Roads have been posted or otherwise restricted to clearly identify those that are (1) open for administrative (i.e., government) and public use, (2) open only for administrative use, or (3) closed to all users. Public access to the Range is granted by permit only and all permitted users are provided with current maps that show the roads and areas that are restricted for administrative use and roads that are open for public use.

Although the designation of the BMGR road system has provided an important tool for controlling and managing roads and vehicle use, off-road driving and the proliferation of new unauthorized vehicle routes have continued. 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). In the past decade, roads and increasing motor traffic have disturbed the naturally formed desert pavement that can take tens of thousands of years to develop in parts of the Sonoran Desert (Seong et al. 2016). Soil erosion may also directly impede military training; high wind speeds in areas with heavy soil erosion can reduce visibility and decrease air quality.

Vehicle traffic associated with UDAs and illegal drug smugglers crossing the international border from Mexico and traveling cross-country through the Organ Pipe Cactus NM, Cabeza Prieta NWR, BMGR, and/or the Tohono O'odham Nation have compounded erosion and habitat damage. Although completion of the border barrier fence in 2007 has reduced illegal cross-border vehicle traffic, it has led to an increase in illegal cross-border foot traffic. In response, CBP has expanded its patrolling into new areas where illegal vehicles historically did not travel. Attempts to apprehend and rescue UDAs have resulted in a proliferation of unapproved new roads and off-road driving in these new areas. Cross-border illegal foot traffic has also caused an upsurge in humanitarian aid drops. Food, water, clothing, and medical supplies are dropped at areas along UDA foot trails by humanitarian groups as well as nefarious groups intending to directly support illegal drug-smuggling activities. Regardless of the intent, this practice has led to increased amounts of litter and trash along the UDA trails, which the military is responsible for cleaning up. Additionally, anticipated relief in the form of repairs and improvements to the existing border wall in 2020 and the construction of a secondary border barrier have not been completed.

Due to increased illegal foot traffic, CBP agents have expanded the use of road dragging—smoothing out portions of roads with equipment to monitor for UDA foot traffic. Repeatedly dragging roads tends to widen the road surface, increasing the area of disturbance associated with roads across the landscape, and is not permitted on BMGR. Additionally, these activities have contributed to the formation of berms along many of the drag roads. In certain places, roadbeds have receded below natural grade and, in effect, the berms become small dams that impede the surface flow of water from natural crossroad drainages found across the Range. These small berm dams are causing surface runoff from small to moderate storm events to pond

on the upstream sides of the roads. As a result, thick stands of vegetation, often composed of invasive species, develop in response to the increased soil moisture, which may exacerbate the risk of wildfire and further dispersal of these species. Additionally, since water flow is effectively cut off from surrounding areas, the natural vegetation community declines for some distance downstream, across and along the sides of the roads. The altered surface flows can increase erosion and create abrupt vertical drops in the surface (head cuts) and generally lead to an increased need for more regular road maintenance.

BMGR East

To determine the full scope of damage that illegal border crossing and deterrence is having on the landscape, the USAF began a project in 2017 at BMGR East to monitor drag roads. The purpose is to inform management techniques to prevent increases in erosion. Results include recording road surface change through construction of measured cross-sections from data taken at sample sites and field-based and remote sensing analyses for determining erosional losses and gains in priority locations (CEMML 2022*a*).

Cultural resource sites near recreational areas at BMGR East are being impacted or are at risk of being impacted from recreational user activities. Over 70% of archaeological 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.

BMGR West

At BMGR West, a military installation, CBP has considerably widened and deepened numerous roads from dragging inappropriately and without proper consent and approval from the military, thus exacerbating erosion, and creating new, potentially problematic drainage channels. Additionally, in 2014, the U.S. Geological Survey (USGS) released its final report to quantify disturbances to soils, vegetation, and cultural resources caused by migrant and smuggling traffic, border security, and general recreational vehicle use. 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). The results of this work suggest that impacts from anthropogenic activities such as vehicular disturbance on BMGR West are especially acute in areas adjacent to the U.S.–Mexico border (Villareal et al. 2016). The models are helping managers identify additional areas where off-road vehicle traffic may have the greatest negative impacts and where restoration or protective site designations may be warranted (Villarreal 2014, Villarreal et al. 2016).

Due to the increase in UDA foot traffic, CBP has also expanded its network of rescue beacons since 2007. Rescue beacons are solar-powered radio call boxes that allow UDAs or other individuals to signal for help when they are lost or endangered by exposure or other environmental hazards. The CBP periodically smooths out the area around the rescue beacons by dragging them as they monitor for recent foot traffic. These drag areas were originally intended to be minimal in size but have been steadily enlarged over time without prior consent and without proper military approval.

CBP's 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:

- Drag only within the roadbed

- No loading of drag devices with materials to increase drag weight
- Turn around in designated areas only
- No increase in turn-around area size
- Drags will not be relocated until they are thoroughly cleaned to remove potential invasive species and/or seeds
- Coordination of desired drag before initiating a new one

Additional efforts between the USAF, USMC, and CBP to reduce the negative impacts from other sources are listed below:

- Barry M. Goldwater Range Executive Council (BEC) meetings between affected agencies are held six times a year to identify substantive issues, conflicts, or other matters for consideration regarding potential impact upon lands or resources in the BMGR region (see Section 7.15 for details on the BEC).
- Regional Road Network Books and Global Positioning System (GPS)/Adobe PDF maps have been created to delineate roads allowed for support of the CBP mission.
- All law enforcement agencies are required to complete the Range Access and Safety Training Program. (Note: This training is separate and apart from the public recreation permit requirement, which is not required for law enforcement in performance of their official duties.)
- CBP Air, Sector, and Station Chiefs are required to attend BMGR orientations.
- CBP can access BMGR East Small Arms Range for training.
- CBP has access to and use of Gila Bend AFAF facilities, airfield, and all-terrain vehicle storage facilities.
- Airspace access agreements for CBP rotor, fixed wing, and Unmanned Aircraft Systems.
- Special operation support is provided to facilitate BMGR East access.
- CBP radios are routed through the Gila Bend Emergency Coordination Center to enable direct contact between the military and CBP.
- BMGR East has standardized protocols for CBP range access and road-dragging activities.

Despite these measures, only time will tell whether CBP will comply and change its destructive behavior toward natural resources and whether it will comply or continue to comply with these protocols and policy since history demonstrates otherwise due to CBP's organization and the high turnover rate of CBP field agents.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

Both the USMC and USAF environmental program adhere to the Environmental Management System (EMS) framework and its Plan, Do, Check, Act cycle for ensuring mission success. EO 13834, *Efficient Federal Operations*; DoDI 4715.17, *Environmental Management Systems*; AFMAN 32-7003, *Environmental Management*; and International Organization for Standardization (ISO) 14001 standard, *Environmental Management Systems—Requirements with guidance for use*, provide guidance on how environmental programs should be established, implemented, and maintained under the EMS framework.

The natural resources program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively manage associated risks, and instill a culture of continual improvement. The INRMP serves as an administrative operational control that defines compliance-related activities and processes.

BMGR East

The 56 FW is assigned to Luke AFB and as such has purview over Luke AFB and BMGR East, which includes the Gila Bend AFAF, as separate but related installations. The scope of Luke AFB's EMS includes all the activities, services, and products associated with the operations of the 56 FW and tenants.

The 56 RMO, Environmental Science Management (56 RMO/ESM), along with the 56 FW Civil Engineer Environmental Element, enacts program management, technical oversight and compliance of all environmental aspects of Gila Bend AFAF and BMGR East. The 56 RMO manages the natural and cultural resources of Gila Bend AFAF and BMGR East.

BMGR West

The USMC Headquarters and Headquarters Squadron enterprise includes MCAS Yuma and BMGR West. MCAS Yuma has several tenant units. The scope of MCAS Yuma's EMS includes all the activities, services, and products associated with the operations of the MCAS Yuma and tenants.

The MCAS Yuma Environmental Department provides MCAS Yuma, BMGR West, and tenants with effective program management, technical oversight, and compliance of all environmental aspects. The RMD manages the natural and cultural resource aspects of BMGR West.

4.0 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the natural resources program are listed in the table below. Specific natural resources management–related roles and responsibilities are described in appropriate sections of this plan.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
RMO Director/Commanding Officer and MCAS Yuma Commanding Officer	The 56 FW Commander has delegated Range Operating Authority for oversight of all BMGR East functions to the 56 RMO Director. The 56 RMO Director is the Range Operating Authority for BMGR East and oversees the management and operational functions, including ESM operations. The MCAS Yuma Commanding Officer oversees BMGR West Natural Resources Program. **Roles and Responsibilities** • Approves the INRMP by signature and certifies all INRMP updates. • Ensures that the INRMP is consistent with the use of the Range to ensure the preparedness of the Armed Forces. • Controls access to and use of the BMGR's natural resources. • Commits to seeking funding and executing all "must fund" projects and activities within identified timeframe. • Provides appropriate staffing to execute INRMP implementation.
Air Force Civil Engineer Center Natural Resources Media Manager/Subject Matter Expert/Specialist	Advocates for resources and funding to implement approved INRMPs (BMGR East only).
Installation Natural Resources Manager/Point of Contact	• Supports military training by managing the natural resources of the Range IAW applicable laws, EO, and directives. • Coordinates INRMP updates, revisions, and implementation requirements with applicable federal, state, and Tribal government agencies, as well as nongovernmental organizations and parties.
Installation Unit Environmental Coordinators (UECs); see AFMAN 32-7003 (USAF 2017*a*) for role description	Conducts UEC duties as required (BMGR East only).
Installation Wildland Fire Program Manager	BMGR East and BMGR West have current WFMPs. Each WFMP assigns roles/responsibilities IAW this INRMP.

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Pest Manager	• Primary point of contact for all range pesticide use. • Assists natural resources staff with the safe, effective, economical, and environmentally acceptable management of pests.
Range Operating Agency	• The 56 RMO is the Range Operating Agency for BMGR East and oversees the ESM section. • The MCAS Yuma RMD advises the Commanding Officer to meet INRMP goals and objectives.
Conservation Law Enforcement Officer	• Enforces natural and cultural resource laws. • Addresses trespass issues. • Assists natural resource personnel with INRMP implementation. • Collects GIS coordinates of invasive species using the GIS Cloud app.
NEPA/Environmental Impact Analysis Process Manager	Conducts NEPA/Environmental Impact Analysis Process for all installation projects in coordination with the Natural Resources and Environmental Managers.
Cultural Resources Manager	• Supports military training by managing the cultural resources of the Range IAW applicable laws, EO, and directives. • Ensures the INRMP supports cultural resources management on the Range.

5.0 TRAINING

USAF and USMC installation NRMs/POCs and other natural resources support personnel require specific education, training, and work experience to adequately perform their jobs. Section 107 of the Sikes Act requires that professionally trained personnel perform the tasks necessary to update and carry out certain actions required within this INRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

Installation Supplement—Training

- NRMs at Category I installations must take the course "DoD Natural Resources Compliance," endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval Civil Engineer Corps Officers School. Other applicable environmental management courses are offered by the Air Force Institute of Technology, the National Conservation Training Center managed by the USFWS, and the Bureau of Land Management Training Center.
- Natural resource management personnel shall be encouraged to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses.
- All individuals who will be enforcing fish, wildlife, and natural resources laws on USAF lands must receive specialized, professional training on the enforcement of fish, wildlife, and natural resources in compliance with the Sikes Act. This training may be obtained by successfully completing the Land Management Police Training course at the Federal Law Enforcement Training Center.
- Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits.
- Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement.
- The DoD-supported publication *Conserving Biodiversity on Military Lands—A Handbook for Natural Resources Managers* (https://www.denix.osd.mil/biodiversity/) provides guidance, case studies, and other information regarding the management of natural resources on DoD installations.

Natural resources management training is provided to ensure that installation personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan.

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

The installation maintains required records IAW Air Force Manual 33-363, *Management of Records*, and disposes of records IAW the Air Force Records Management System records disposition schedule (RDS). Numerous types of records must be maintained to support implementation of the natural resources program. Specific records are identified in applicable sections of this plan, in the Natural Resources Playbook, and in referenced documents.

Installation Supplement—Recordkeeping

BMGR East

All natural resources–related documentation for BMGR East is stored and maintained at the 56 RMO office, Building 500 on Luke AFB. The 56 RMO maintains a GIS database for BMGR East that includes resource, infrastructure, and operations data. This database resides on the Air Force network.

BMGR West

BMGR West maintains required records and disposes of records IAW Marine Corps Order 5210.11F, Marine Corps Records Management Program. All natural resources–related documentation and GIS shapefiles for BMGR West are stored and maintained at the Range Management Building 151 on MCAS Yuma. All natural resources–related hardcopy documentation for BMGR West is stored and maintained at the RMD office, Building 151 on MCAS Yuma. Administrative files are also stored in the same location. The RMD uses the Geospatial Information and Services (GEOFidelis) GIS server and virtualized computing environment for BMGR West data, which resides off-site and is on the Non-classified Internet Protocol Router Network.

6.2 Reporting

The installation NRM is responsible for responding to natural resources–related data calls and reporting requirements. The NRM and supporting AFCEC Natural Resources Media Manager and SMS should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

Installation Supplement—Reporting

BMGR East

BMGR East NRMs are responsible for responding to natural resources–related data calls and reporting requirements. The Natural Resources Manager and supporting Air Force Civil Engineer Center Media Manager and Subject Matter Specialists should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

BMGR West

BMGR West NRMs are required to respond to natural resources–related data calls and reporting requirements per MCO 5090.2 (USMC 2018).

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the current status of the installation's natural resources management program and program areas of interest. Current management practices, including common day-to-day management practices and ongoing special initiatives, are described for each applicable program area used to manage existing resources. Program elements in this outline that do not exist on the installation are identified as not applicable and include a justification, as necessary.

Installation Supplement—Natural Resources Program Management

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. 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. 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. These goals, objectives, and projects are designed to effectively manage the natural resources on the installation and can be found in Chapter 8.

7.1 Fish and Wildlife Management

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation **IS** required to implement this element.

Program Overview/Current Management Practices

Existing inventories show that over 200 bird species, more than 60 mammal species, 10 amphibian species, and over 50 reptile species potentially occur within the combined area of BMGR and the adjacent Cabeza Prieta NWR. Available evidence indicates that the diversity of wildlife species and habitats present in 1941 when BMGR was established continues to be found within the Range today. Moreover, species populations appear to be relatively stable and typical for this portion of the Sonoran Desert. This may be attributed to a number of factors:

- The land is withdrawn for military use, which has excluded or limited other land uses—such as livestock grazing, farming, mining, and intensive off-road vehicle recreation—that could have altered physical and biological systems to a greater extent than that associated with military training.
- Ecological interconnections between BMGR, two national monuments, and one national wildlife refuge have remained unfragmented and undiminished.
- The primary land use—aviation training—has limited on-the-ground disturbances of soils and vegetation to relatively small and dispersed portions 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 minimizes public visitation pressure and the effects of prolonged, intensive use.

- As a result of surface drainage patterns on and around the Range, its hydrological features are relatively isolated, which protects them from upstream sources of water-borne pollutants, sedimentation, and watershed modifications.

AZGFD has management authority for the state's wildlife, which is held in trust for the citizens of the State of Arizona. This authority applies to BMGR unless otherwise pre-empted by federal law. AZGFD began its management activities at BMGR in the 1950s, when it established water sources for wildlife (see Section 7.5), which the agency still maintains today.

BMGR East

In August 2015, the USACE Omaha District and AZGFD entered into a 5-year cooperative agreement to "collect, analyze, and apply environmental and cultural resource data and implement land rehabilitation and maintenance for optimal management of lands under control of the DoD" (USACE and AZGFD 2015). The agreement facilitates AZGFD management activities at BMGR East, which typically include conducting wildlife surveys to track population trends, providing recommendations based on survey data for restoring or maintaining populations of resident species, managing wildlife populations at levels appropriate 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 Sonoran pronghorn, acuña cactus, flat-tailed horned lizard, mourning dove (*Zenaida maroura*), white-winged dove (*Z. asiatica*), and LeConte's thrasher. Long-term monitoring plots are surveyed every 3 years for Sonoran Desert tortoises. On a 3-year basis, the AZGFD surveys for bighorn sheep within BMGR East typically near the Sand Tank Mountains, Sauceda Mountains, Sikort Mountains, and Coffeepot Mountains, all of which fall under the AZGFD game management unit 40A. Aerial bighorn sheep surveys are also conducted on BMGR West on a 3-year basis within the Gila, Tinajas, Copper, and Mohawk mountain areas. AZGFD may also conduct capture and collar operations, which include but are not limited to collecting blood samples, nasal swabs, collaring, and ear tagging. Blood samples are used to strain type and disease profiles in bighorn sheep for future management needs such as translocations or augmenting populations. 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 found within the Sauceda valley and other valleys found within game management unit 40A. Surveys for other species, such as bats, golden eagles, doves, and LeConte's thrasher are conducted if funding is available.

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*), or possibly due to declines. 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 their desert water habitat as stepping-stones among populations. BMGR East may consider supporting such genetic testing if warranted and not in conflict with the military mission.

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

A complete list of wildlife surveys and habitat improvement projects planned for the next 5 years can be found in Table 10-1, BMGR East Five-Year Work Plan: FY 2024–2028. Sensitive species monitoring and conservation projects are discussed in detail in Section 7.4, Management of Threatened and Endangered Species.

BMGR West

In 2016, BMGR West initiated its first comprehensive inventory of amphibians, reptiles, and small mammals. This project concluded in 2018 and accomplished three objectives: (1) create maps indicating species distribution, (2) identify an efficient, repeatable monitoring methodology, and (3) develop 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 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, 4 species of amphibians, and 36 species of reptiles. The AZGFD concluded that 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 target four different bird groups: all diurnal species, diurnal raptors, owls, and nightjars. Surveys were conducted using point count transects and driving transects. Surveys documented 111 species of birds: 43 species breeding on the Range and 68 migratory species. Of these documented species, 34 are considered 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 conducted by the end of FY23. Additional wildlife surveys and habitat improvement projects planned for the next 5 years can be found in BMGR West Five-Year Work Plan (Chapter 10, Annual Work Plans). Management actions for threatened and endangered species are discussed in more detail in relevant subsections of Section 7.4, Management of Threatened and Endangered Species.

7.1.1 Camera Trapping

Beginning in 2008, camera trapping has been used extensively on both BMGR East and West with an average of 18 deployed cameras throughout the project. Camera traps are set up to quantify wildlife use of various water development types in specific surroundings. Camera traps are deployed at both artificial catchments and modified *tinajas* within 20 feet of sites where animals come to drink. Cameras are deployed in the field 12 months per year at bighorn sheep waters and 6 months per year at non-bighorn waters during the hottest and driest time of the year. Camera sites are typically visited once a month to inspect equipment for operability, replace batteries, and download data. These data aid in understanding the variety of species usage, wildlife behaviors, and population sizes. The data also may be used to assess wildlife occupancy by vegetation type, elevation, and structure type (e.g., artificial structure or modified *tinaja*), and whether wildlife usage differs with proximity to military targets. However, as of January 2022, camera trap data

shall not be placed, maintained, or used for the purpose of taking or aiding in the take of wildlife (AZGFD R12-4-303).

Camera traps also record the use of wildlife watering sites by trespass livestock and UDAs; just one catchment camera recorded over 60 UDA visits in 2012 alone. The cameras have captured UDAs drinking from the waters and tampering with tank float valves, dismantling and stealing cameras, disturbing wildlife, and leaving garbage around catchments. UDA and trespass livestock use of wildlife watering sites also increases the amount and frequency of water that must be hauled in by AZGFD.

7.1.2 Climate Impacts on Fish and Wildlife Management

Wildlife management is not likely to need to change substantially with respect to climate change, but current wildlife management issues are likely to persist or become more pronounced in the future. Management plans should be flexible enough to adapt to changing wildlife concerns (Hellmann et al. 2008).

Wildlife surveys should continue to be conducted on a regular basis to monitor and document changes in native species. Changing climatic conditions may present opportunities for invasive species to flourish and push out native species, so invasive species monitoring will also continue to be important. Changing climate conditions may also impact spread and occurrence of wildlife disease, thus monitoring of current and new diseases is imperative for managing wildlife populations.

Water resources at BMGR are important components of wildlife habitat, so managers may need to adapt water management as the climate changes. Rising temperatures and changes to precipitation patterns may impact water quantity and quality, which managers can address in some areas by constructing artificial shade structures such as awnings or pergolas to prevent evaporation and to lower dissolved oxygen losses due to rising temperatures (Poff et al. 2002). Erosion due to wildland fires (Section 7.9) and changing vegetation (Section 2.3.2.1) may further impact water quality, so wildland fire management and vegetation management will continue to be important wildlife management tools.

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The Installation **IS** required to implement this element.

Program Overview/Current Management Practices

BMGR offers a variety of public recreation activities as well as access to natural areas. Approximately 38% of the Range is open to the public (Figure 7-1, Figure 7-2). Permitted activities include camping, hiking, hunting, and target shooting. Due to potential hazards associated with historical military training operations and safety requirements of current military activities, all visitors 18 and older are required to obtain an annual permit prior to entry to BMGR East and West public areas, Cabeza Prieta NWR, and Area A of the Sonoran Desert NM. Range access permits are currently available online via RecAccess, but the online platform may change based on future requirements and permit service contracts. The permit system requires adult visitors to register with the RecAccess system 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, areas, and number of visits, which can be used in reports to assist with carrying out the natural and cultural resources management mission. Future plans include increasing the fidelity of information collected to include activity types and more specificity of locations visited.

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, require additional coordination, or the applicant must pass a background check to obtain a Special Use Permit for the activity:

- The use of metal detectors, drones, remote-controlled aircraft, ultralights, and powered parachutes is prohibited.
- Parties with 10 or more vehicles (with permit)
- Discharge of firearms before sunrise or after sunset is prohibited
- Discharge of fully automatic firearms is prohibited
- Extended camping is prohibited. Camping is limited to 14 consecutive days within a 28-day period.
- Scientific studies of any type (requires additional coordination)
- Collecting wildlife specimens (requires additional approval by AZGFD)

All public recreational users of the Range are expected to comply with range rules. The practice of leaving food, water, clothes, and medical supplies along UDA foot trails has led to increased litter and trash. If identified, such groups will be escorted off the Range, have their permits revoked, and may face investigation and prosecution from BMGR East and West CLEOs and CBP. Cross-country and off-road travel is strictly prohibited—all vehicles are required to remain on designated roads and adhere to posted speed limits while traveling on the Range. At Cabeza Prieta NWR, vehicles are restricted to the Camino del Diablo and Christmas Pass Roads. In general, roads are considered closed unless designated open by an official carsonite marker post (at BMGR East) or a 4 inch by 4 foot lettered/numbered, wooden intersection marker (at BMGR West). Disturbance or removal of cultural resources and 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 information can be valuable in determining which sections of the public use areas are used the most and would benefit from road condition monitoring. High-use roads identified from the monitoring stations included Childs Mountain Road and roads leading from State Route 85 into Area B from access gates 8, 9, and 15. These high-use roads are focal areas for monitoring habitat disturbance and invasive species monitoring (Scobie et al. 2022*a*).

BMGR East

Approximately 13% of BMGR East is open for public recreation (Figure 7-1). 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 these range-specific rules:

- Rock hounding/Prospecting and Geocaching—Removal or disturbance of sand, gravel, rocks, minerals, and fossils is strictly prohibited.
- Hazard Areas—For safety reasons, the 56 RMO has established "Hazard Areas" that are off-limits to permit holders when the Range is open. This restriction affects access to the northernmost portions of Area B.
- Hunting—Hunting is restricted to public access areas. Public access areas east of SR 85 fall under the AZGFD hunting Unit 40A (AZGFD 2017*b*). 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, and quail. Please refer to the AZGFD Hunt Regulations booklet for specifics on each species. 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. Between 2008 and 2013, no bighorn sheep permits were available due to population declines, and in 2014 only one permit was available. A slight increase in population size resulted in two permits being available each year from 2015 to 2021. Consideration of translocating bighorn sheep into management unit 40A is ongoing with the AZGFD. Public access areas west of SR 85 on BMGR East (i.e., area near Ajo) and the hunting unit in BMGR West are all part of AZGFD management unit 40B (as described below under BMGR West).

BMGR West

Currently, approximately 75% of BMGR West is open for public recreation through the permit system (Figure 7-2). 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 these range-specific rules:

- Rock hounding—Surface-rock collection is allowed in most of 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 Unit 40B (AZGFD 2017*b*). 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.

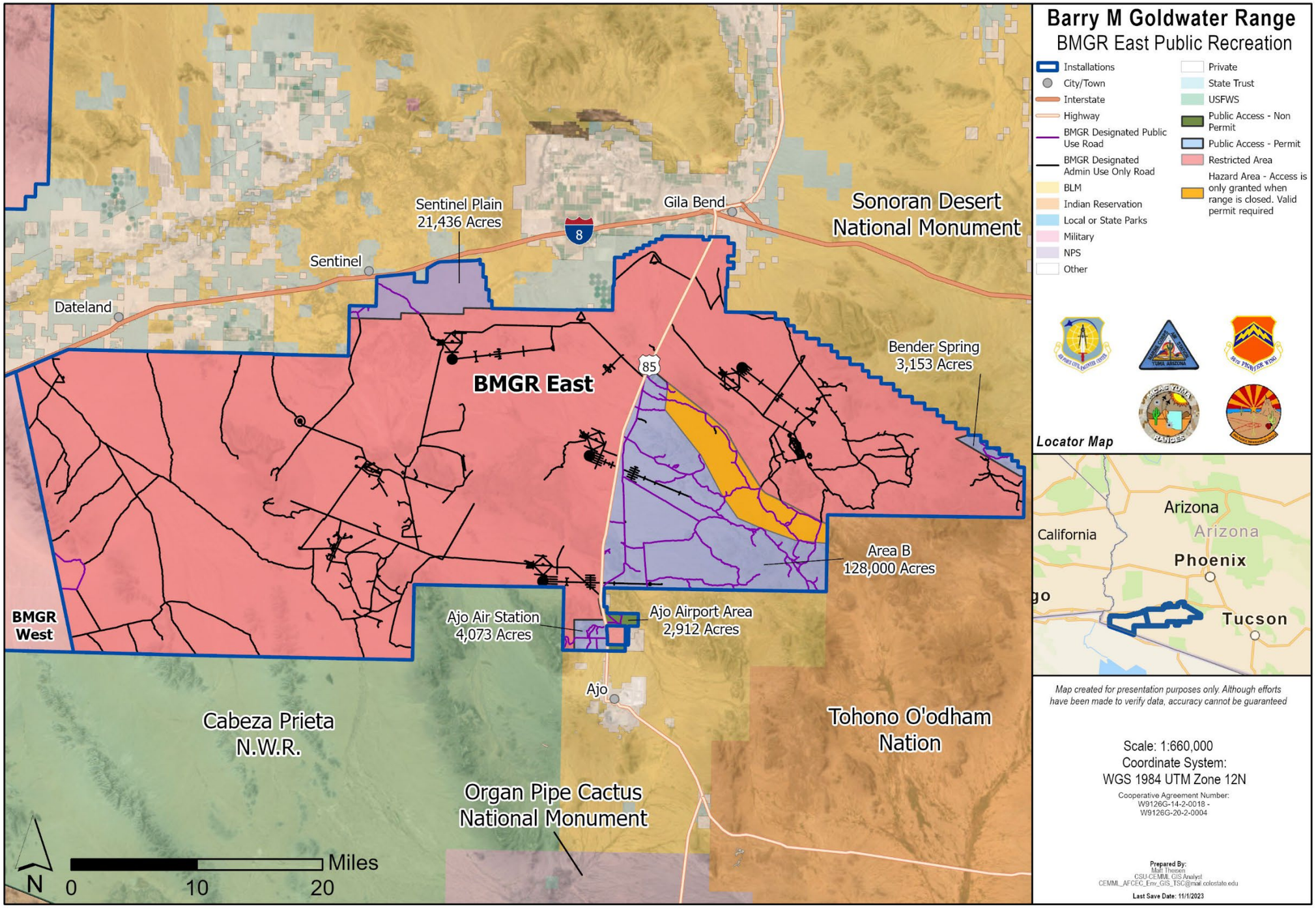

Figure 7-1. Public Recreation on Barry M. Goldwater Range East

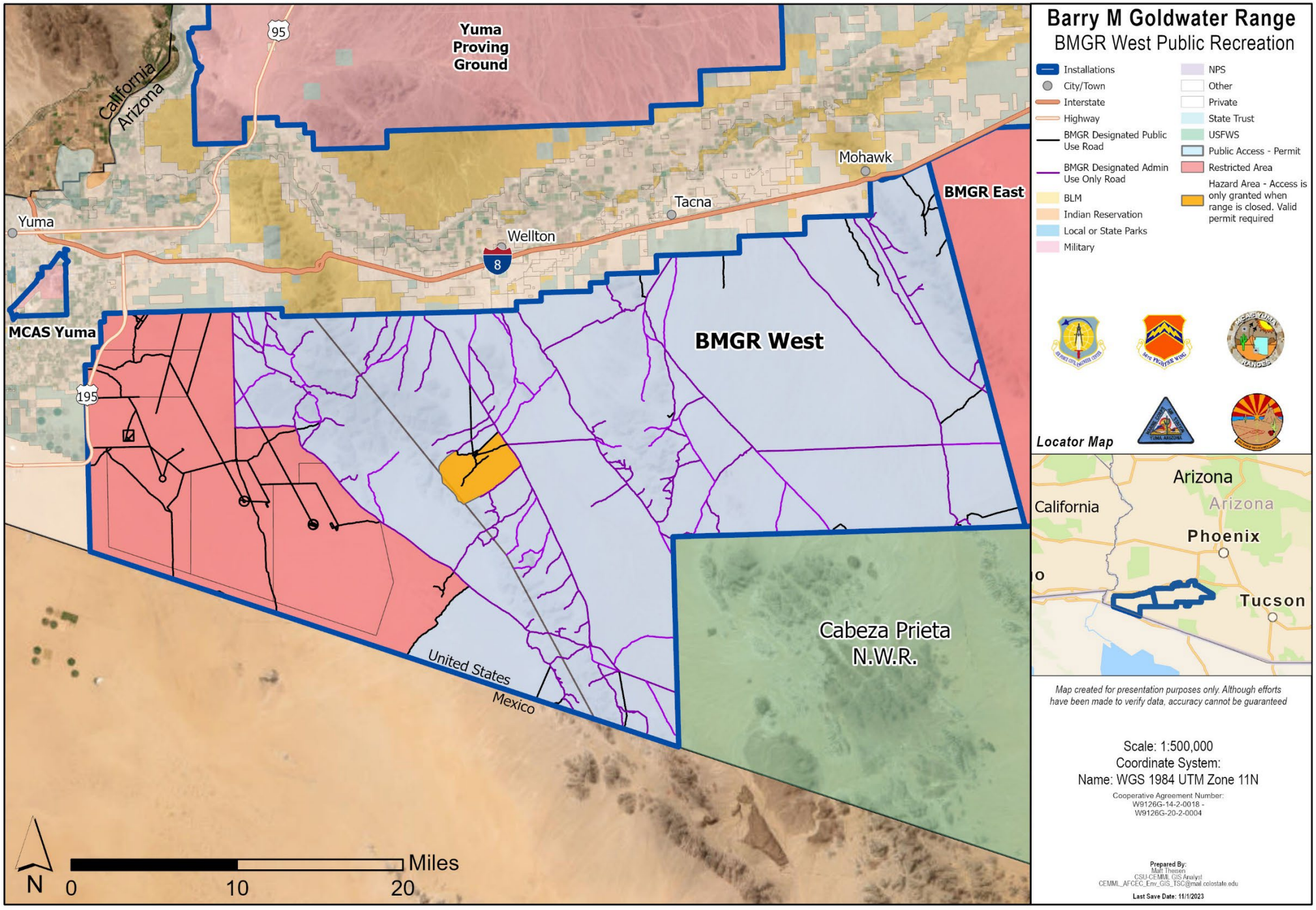

Figure 7-2. Public Recreation on Barry M. Goldwater Range West

7.2.1 Climate Impacts on Outdoor Recreation

Few changes to outdoor recreation and public access to natural areas are expected due to climate change, although users need to be aware of risks from increasingly extreme high temperatures and intense storm events that may result in rapid and dangerous flash flooding. Activities such as camping, hiking, and target shooting may continue, but managers should be aware of added safety risks due to more extreme temperatures. Hunting opportunities will need to be frequently assessed as environmental conditions shift. Common species such as javelina, mule deer, doves, and quail will likely persist. Because waterfowl are extremely unlikely to occur in the area and bighorn sheep populations can vary, opportunities for hunting these less-common species will need to be evaluated frequently based on population size on the Range.

7.3 Conservation Law Enforcement

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. The installation **IS** required to implement this element.

Program Overview/Current Management Practices

Law enforcement on the Range is defined within the Sikes Act; Assimilative Crimes Act, 18 U.S.C. § 13; Uniform Code of Military Justice, 10 U.S.C. § 807(b); and other applicable laws and regulations. The Sikes Act mandates each military department to ensure that sufficient professionally trained CLEOs are available and assigned responsibility to perform tasks to implement INRMPs. Enforcement of natural resource laws is a fundamental part of a Natural Resources Program and shall be coordinated under the direction of the Natural Resources Manager. Because the ICRMP is incorporated (i.e., referenced as appropriate) into the INRMP, the USAF and USMC also must enforce laws and regulations that protect cultural resources.

In addition to conducting enforcement activities, CLEOs serve as the eyes and ears of the Range. CLEOs assist with conservation activities such as wildlife surveys, habitat restoration, and water projects. They also help formulate hunting objectives, monitor protected species, and resolve nuisance and human/wildlife conflicts. CLEOs patrol and/or conduct surveillance where there is a potential for poaching or cultural resource vandalism. CLEOs also play a role in mapping and slowing the spread of invasive species, as they spend most of their time patrolling the Range and may be the first to identify such species. They assist NRMs by using the GIS Cloud app to record the GPS coordinates and capture images of invasive species to facilitate prompt management actions.

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

BMGR East

The 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 (FWO) program. As of 2023, one of the positions is filled with the second position anticipated to be filled soon.

The FWOs are tasked with enforcing federal and state laws. Patrol requirements consist of enforcement of installation regulations for outdoor recreation, state hunting laws, ESA, Archeological Resources Protection Act, and other conservation laws; preventing illegal trespass and dumping; enforcing off-highway and all-

terrain vehicle use rules; advising and assisting outdoor recreation participants to ensure their safety; and preventing conflicts with military testing and training activities.

The FWOs have authority to conduct investigations and issue citations; serve warrants; make arrests; coordinate case prosecution with the AZGFD, the 56 FW Staff Judge Advocate, the Federal District Court of Arizona, and Assistant United States Attorneys; and provide testimony in court. The FWOs 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.

BMGR West

MCAS Yuma employs four full-time CLEOs to investigate, apprehend, and/or detain individuals suspected of breaking the laws and regulations that pertain 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 their non-compliance with the MLWA of 1999, the Sikes Act, and other applicable rules and regulations. Unlike other USMC law enforcement (e.g., Provost Marshal's Office), USMC CLEOs are not Title 10 law enforcement officers. Headquarters Marine Corps derives the enforcement authority that pertains to MCAS Yuma's CLEO's Program through an MOA between the Headquarters and the USFWS, (reference c) in MCO 5090.4B. Specific to MCAS Yuma CLEOs, additional concurrent criminal jurisdictional authority is derived from Arizona Revised Statute (A.R.S) 37-620.

Figure 7-3. Sonoran pronghorn with a GPS collar.

7.4 Management of T&E Species, Species of Concern, and Habitats

Applicability Statement

This section applies to USAF installations that have threatened and endangered species on USAF property. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

7.4.1 Sonoran pronghorn

The Sonoran pronghorn has been listed as a federally endangered species since 1967. Although methods and geographic study areas used to estimate the Sonoran pronghorn population have varied over time,

estimates from 1925 through 1991 indicate that relatively low numbers of Sonoran pronghorn (approximately 50 to 150 animals) were present in southwestern Arizona. Sonoran pronghorn, however, were more abundant prior to European settlement (USFWS 2016*b*). The area of Sonoran pronghorn distribution has become smaller over the years as a result of habitat loss and fragmentation (USFWS 2016*b*). In 1992, AZGFD initiated regular biennial aerial surveys of the Sonoran pronghorn population. Based on these surveys, the modern U.S. population peaked at an estimated 282 animals in 1994, and the population low was estimated at 21 to 33 animals in 2002 after a severe drought.

The Sonoran pronghorn's current range includes portions of BMGR East (Figure 7-4) and BMGR West (Figure 7-5). 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 generally consists of representatives from the Luke AFB, MCAS Yuma, AZGFD, NPS (from Organ Pipe Cactus NM), BLM (from the Lower Sonoran Field Office), Arizona State University, UofA, Commission for Ecology and Sustainable Development of the State of Sonora (Mexico), National Commission for Protected Natural Areas (Mexico), Phoenix and Los Angeles Zoos, Customs and Border Protection, and the Tohono O'odham Nation.

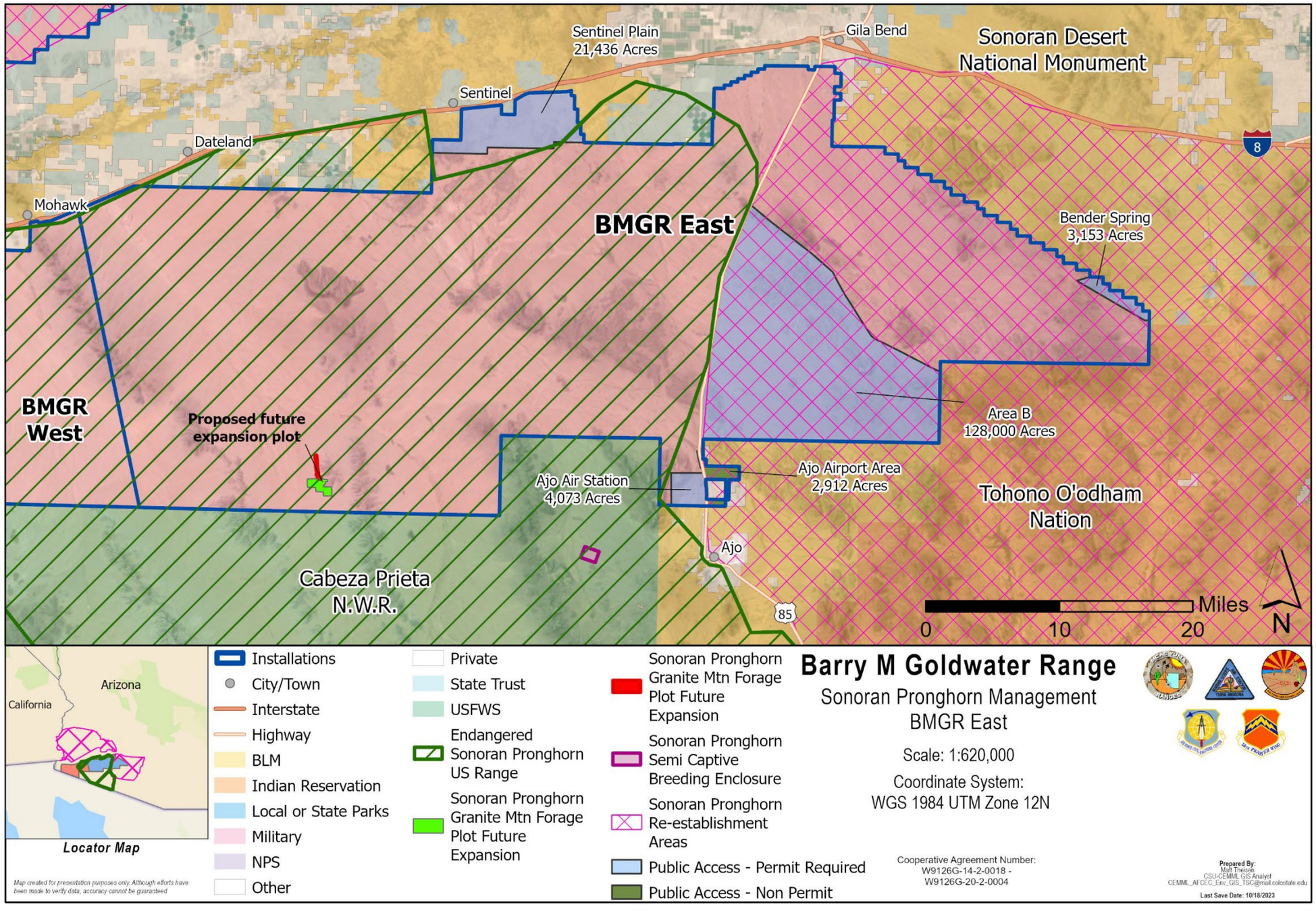

Figure 7-4. Sonoran pronghorn management at Barry M. Goldwater Range East

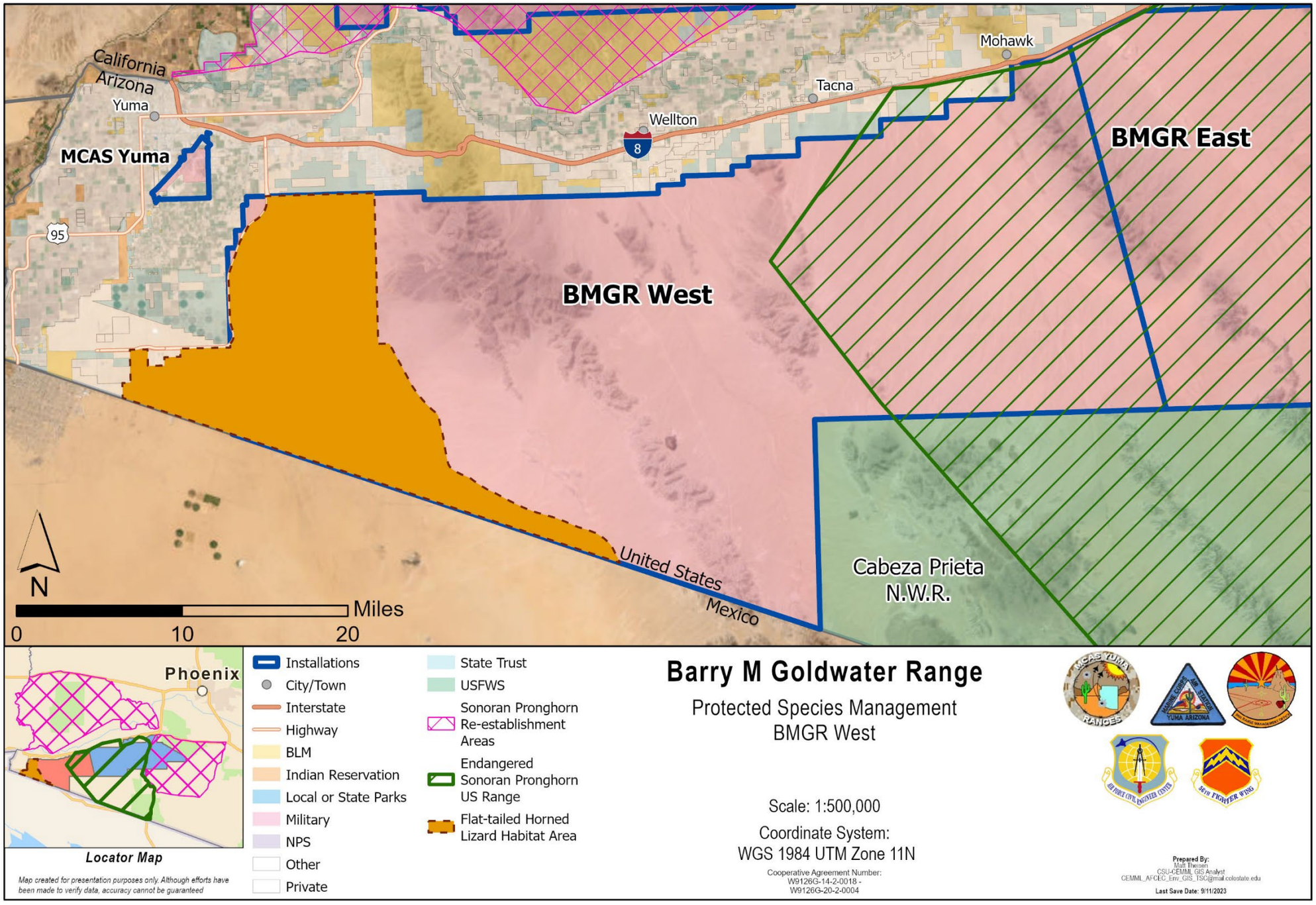

Figure 7-5. Protected species management at Barry M. Goldwater Range West

Concerted efforts of the USAF, USMC, AZGFD, USFWS, and other members of the recovery team have resulted in improved status of Sonoran pronghorn through the implementation of numerous recovery actions. 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. The Sonoran pronghorn recovery team is working with stakeholders in California to establish a non-essential experimental population in historical habitat for the species found within the Chuckwalla Bench area of California. A non-essential experimental population is a special designation that the USFWS can apply to a population of a threatened or endangered species prior to re-establishing it in an unoccupied portion of its former range.

These and other actions of the recovery plan, if successful, will ultimately lead to downlisting and delisting of the species. However, the increased number of animals on the Range has the potential to constrain BMGR's mission. The USFWS continues to work with the military to reduce mission constraints and minimize risks to Sonoran pronghorn from military operations. For example, in 2010, the USFWS issued a non-jeopardy biological opinion that allowed for reduced target-closure distances, as described below.

To reduce potential impacts to Sonoran pronghorn from military exercises, 56 RMO developed Operating Instruction 13-01 for BMGR East. This instruction established standardized scheduling, monitoring, and report procedures for pronghorn on NTAC, STAC, and Numbered Ranges 1, 2, and 4. The procedures are designed to identify and protect Sonoran pronghorn on BMGR East that are west of SR 85. Operations consist of monitoring target areas during the first fly day of the work week with subsequent daily monitoring if a pronghorn is observed. If a pronghorn is not detected in a target area but was observed in the area within a week, a second day of monitoring is required. Monitoring is conducted by qualified biologists and includes visual observations from vantage points with the aid of binoculars and spotting scopes and telemetry surveillance. Once a pronghorn is spotted, an approximate location is provided to range operations within 30 minutes so limitations on target use are implemented in a timely manner (USAF 2020).

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 (USAF 2022).

Several Sonoran pronghorn watering sites, forage enhancement plots, and supplemental feed stations have been established to help these animals survive the dry Southwest summers. The goal is to conserve and

protect the Sonoran pronghorn and its habitat so that its long-term survival is secured, and it can be removed from the list of threatened and endangered species. Specific recovery goal objectives are listed below.

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

The Sonoran pronghorn recovery efforts are a great success story for endangered species management. 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 estimate of 29 individuals was observed (USFWS 2023*a*). 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 Sonoran pronghorn numbers, water projects, forage enhancements, and related projects. The updates cover the entire U.S. Sonoran pronghorn distribution, with certain aspects pertaining to the BMGR.

7.4.2 Sonoran Desert Tortoise

The USFWS determined in February 2022 that a listing of the Sonoran Desert tortoise on the ESA was not warranted. In 2015, a Candidate Conservation Agreement for the Sonoran Desert tortoise was developed as a collaborative and cooperative effort between land and resource management agencies, including the BMGR managing agencies (USAF and USMC). The key effort of the conservation strategy is to focus on conservation, habitat improvement, and ongoing management of the tortoise status and habitat. Some of the key actions 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 its burrows and are required to inspect the area around their vehicles for tortoises prior to vehicle movement.
- Off-road travel by official vehicles is highly restricted, with extreme exceptions for activities such as clearance of unexploded ordnance or CBP actions, and all recreational vehicular travel is restricted to designated roads. 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.

- An invasive plant species monitoring and treatment program is followed 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 at BMGR.
- BMGR maintains a full-time CLEO staff to enforce conservation laws and regulations.

In 2012, a landscape-level habitat model was developed to identify locations where Sonoran Desert tortoise occupancy is most likely (Grandmaison et al. 2012). This knowledge, coupled with training maps, will allow range managers to identify specific locations where training and habitat overlap, and to take appropriate measures to reduce conflict to ensure their continued coexistence and compatibility with the military mission. The model also serves as a valuable tool for prioritizing new areas to survey, including the Growler and Crater mountains, where there is a relatively high probability of tortoise occupancy (Grandmaison et al. 2012).

The BMGR East Five-Year Work Plan includes surveying new areas and/or re-surveying 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 have been conducted there in 2019 and 2022, with surveys conducted between July and October both years. This seasonality is based on previous work with the species that suggests these months coincide with peak tortoise activity (Averill-Murray et al. 2002, Woodman et al. 2005). Surveys covered the monitoring plot in its entirety with surveyors walking parallel transects at 49-foot intervals. When a tortoise was encountered, environmental data, demographic data, and locale data were collected and the individual was assigned a unique number. Nine unique tortoises were encountered 13 times and three unique tortoises were encountered four times in 2019 and 2022, respectively. Density estimates for the 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 other three individuals. There were no carcasses found during the 2022 surveys.

The absence of carcasses of individuals 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 is 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).

7.4.3 Bats

From 2012 to 2014, BMGR East and West conducted a study to identify and avoid potential conflicts between bats and the military mission at BMGR East and West and at the nearby Yuma Proving Ground (Piorkowski et al. 2014). New data were collected and combined with data from previous studies to identify potential bat roost sites. The study determined that there is relatively little area across the BMGR where

bats can rest, hibernate, and rear young. The loss of traditional roosts, such as caves, has led to abandoned mines becoming increasingly crucial habitat features for roosting bats. This could create conflicts, as many of these abandoned mines exist in areas open for public recreation, where they also represent a potential safety hazard to recreationists as confined spaces, entrapment sites, or fall hazards. Several methods (such as installing bat gates at mine entrances) could prevent people from entering these areas while still allowing free passage for roosting bats.

Figure 7-6. Bat survey techniques at Barry M. Goldwater Range include acoustic monitoring, mist netting, and roost assessments

By assessing bat diversity and habitat-use patterns, land managers will be able to better identify and address any potential population and range declines and mitigate or reverse those declines. To detect roost site locations and avoid potential conflicts between bats and the BMGR mission, several large-scale bat monitoring studies have occurred or are being implemented. A combination of survey methods are being used, including acoustic monitoring, capture (e.g., mist netting), and roost assessments (Figure 7-6).

To better understand bats at BMGR East, a large-scale monitoring study was first implemented in 2013 with the AZGFD. Through the years, methods of this monitoring have been refined and now use a combination of roost, capture, and acoustic surveys. 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 7-1).

BMGR is 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 7-1. 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*

Table 7-1. Bat species detected at Barry M. Goldwater Range.

Common Name	Scientific Name
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 yerbabuenae*
Little brown myotis	*Myotis lucifugus occultus*
Silver-haired bat	*Lasionycteris noctivgans*
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*

Note: from Schwab 2018 and Mixan et al. 2022

7.4.3.1 Lesser Long-Nosed Bat

The lesser long-nosed bat (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).

To provide data that complements 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.

1. 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. 2022) or other monitoring actions.

2. The three occupied LLNB roosts 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.
3. 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.

7.4.4 Flat-Tailed Horned Lizard

BMGR West conducted extensive fieldwork on the FTHL from 2011 to 2014 (Goode and Parker 2015; Figure 7-7). The purpose of the study was to address two main issues identified by the USFWS and raised in the Biological Opinion: (1) potential impacts of jet noise on hearing and behavior of the FTHL, and (2) potential effects of increased vehicle traffic on roads in the vicinity of the F-35B ALF (known as KNOZ) (USFWS 2010*b*). In 2012, a total of 499 FTHLs were removed from the KNOZ footprint. Twenty FTHLs were sent to the San Diego Zoo for a captive breeding program, and the remaining individuals were either translocated to mark–recapture plots or immediately moved to the other side of the exclusion fencing. During the 4 years of field work, 353 FTHLs were radio-tracked 7,561 times. Home range characteristics and movement patterns of non-translocated versus translocated lizards differed only in that translocated FTHLs had significantly larger home ranges in the season immediately following translocation. Although the survival rate of translocated FTHLs was lower than that of those that were not translocated, the difference was not statistically significant, and reproductive behavior was witnessed in both translocated and non-translocated individuals.

Figure 7-7. Baseline surveys for the flat-tailed horned lizard provide valuable information for management of this species

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

With funding provided by USMC and the Bureau of Reclamation, AZGFD conducts annual occupancy and demographic 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 is located 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 within BMGR West and the other on the Bureau of Reclamation parcel. In 2011, AZGFD randomly selected 75 smaller (approximately 328-foot by 656-foot) occupancy plots, a subsample of which is surveyed annually.

From 2008 to 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 annually over the 7-year study period varied greatly. From 2011 to 2014, FTHLs were detected during 43 of 82 (52.4%) occupancy surveys and in 21 of 29 plots (72%) (Grimsley and Leavitt 2015). Of the individuals captured, 21 were male and 22 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 YDMA are above the 30% trigger point recommended by the FTHL RMS. This suggests management goals are being met and that habitat conditions are stable to support FTHL throughout the YDMA (Romero et al. 2023). The recent increase in occupancy since 2018 is encouraging and an important trend to follow in the future. Recommendations by the AZGFD include (Romero et al. 2023):

- 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.

7.4.5 Acuña Cactus

In 2013, the acuña cactus was designated as a federally endangered species (Figure 7-8). It is also protected by the Arizona Native Plant Law and is designated as a highly safeguarded native plant. On 19 September 2016, the USFWS designated critical habitat for the acuña cactus. The critical habitat includes six geographically separate units totaling approximately 18,535 acres (USFWS 2022*b*). One unit is adjacent to the northeastern portion of BMGR East; however, lands within the BMGR are exempt from 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.

Figure 7-8. Flowering acuña cactus on Barry M. Goldwater East

BMGR East has developed a long-term demographic survey, using similar protocols implemented at Organ Pipe Cactus NM, for monitoring the acuña cactus (56 RMO 2007). 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 (Figure 7-8). 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 locations of individual plants will be used to further define the most suitable habitat conditions, which is currently considered to be drained knolls, gravel ridges between major washes, and hilltops in granite substrates. Models of areas with suitable habitat will be used to identify areas to survey and monitor. Data from the monitoring will be compiled into reports on an annual basis, and analyzed to determine population trends for the species, which may lead to implementation of adaptive management actions, such as road closures or fire-suppression activities (56 RMO 2007). The annual reports will be shared with the AZGFD's Heritage Data Management System, and it is anticipated that there will be annual meetings of all natural resource management agencies to discuss trends. Additionally, wildlife biologists at the 56 RMO have been communicating with the AZGFD to identify possible additional survey locations within BMGR East.

In addition to conducting surveys, other conservation measures will be taken or have been completed to minimize the potential for disturbance of 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 within the BMGR, thus eliminating these threats to acuña cactus. The acuña cactus and its habitat are generally protected from disturbance by the rugged terrain and hilltop locations where it occurs at BMGR as well as fencing to prevent entry of feral livestock.

The USAF continues its protection of acuña cactus habitat. It will prevent new impacts, such as establishing new military targets and off-road vehicle use, in areas with potential habitat; avoiding disturbance of vegetation and pollinators within 2,952 feet (900 meters) 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.

To ensure acuña cactus numbers continue to grow, several recommendations should be followed (Abbate 2017):

- Continue to monitor acuña cactus populations and collect morphological measurements for individuals within new populations.
- Focus monitoring efforts on ridges, hillsides, and gentle slopes where the cacti are most likely to be located.

- Consider fencing off areas where cactus populations are most vulnerable to being crushed or uprooted due to animal movement and grazing. Wildlife-friendly fencing should be used and placed to minimize disruption to the movement of native wildlife.
- 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.

7.4.6 Migratory Birds and Bald and Golden Eagles

7.4.6.1 Migratory Bird Treaty Act

The EIS F-35A Training Basing Mitigation Plan for Luke AFB (USAF 2012) addresses migratory bird protection. The plan stipulates that, in the military training airspace: (1) existing flight restrictions concerning altitude and offset distances from sensitive species will be strictly adhered to, and (2) the quarter statute mile overflight avoidance of Mexican spotted owl (*Strix occidentalis lucida*) activity centers will be maintained, as stated via informal consultation with the USFWS (note that this buffer distance was later modified as described below). The plan also stipulates that an open dialogue will continue between 56 RMO Airspace Managers and Environmental Science staff to (1) ensure compliance with biological opinions and identify/address any emerging issues associated with airspace use, (2) ensure that protected owl-activity centers are charted and avoidances described on in-flight guides for military training routes, respectively, and (3) continue monitoring, recording, and tracking deviations, and noise complaints, and communicate reported deviations to appropriate offices. In 2013, 56 RMO requested and USFWS concurred (see USFWS letter dated 23 Dec 2013) with a proposal to reduce the radial distance of the avoidance buffer around Mexican spotted owl activity centers underlying military training routes from 1,320 feet (0.25 mile) to 500 feet.

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. The list identifies species that may be sighted; the species list is extensive and is not repeated in this document.

7.4.6.2 Bald and Golden Eagles

The bald eagle was listed under the ESA in 1978 and is currently protected under the MBTA and BGEPA. Beginning in the 1990s, pilots of military aircraft flown or managed by the 56 FW observed a lateral separation of one nautical mile around bald eagle breeding areas (BA) during the breeding season (1 December to 15 July), IAW 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.

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 BAs. First, the avoidance buffer during the breeding season was changed from one nautical mile of lateral separation to 2,000 feet of lateral and vertical separation. Second, the breeding season was then observed from 1 December to 30 June, IAW 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 meeting 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 on eagle responses to military aircraft.

In 2006, AZGFD began to investigate breeding golden eagle distribution and status statewide, which led to an improved understanding and current ongoing monitoring efforts. In 2006, AZGFD surveyed 85 previously known BAs, finding that 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 2015–2021 (Milbrandt et al. 2022). After the 2017 season, there were 275 known golden eagle BAs, 46 historical BAs, and 474 potential BAs outside of Native American lands in Arizona. 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). Currently, within BMGR are 21 potential BAs, with six confirmed BAs.

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 had three primary objectives: (1) identify and survey the potential distribution of golden eagle BAs 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:

- Continue monitoring of 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 pre-incubation through the first 4 weeks post-hatch. 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 areas predicted by the habitat model as having a high likelihood of being golden eagle nesting habitat. With 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.

A past effort was made to compile and standardize all historical locations of eagle nests and associated data for a subset of Air Force installations in the western U.S., including Luke AFB and BMGR. 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. 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.

BMGR East is anticipating beginning surveys for golden eagle nests using aircraft systems beginning in FY25. Data from opportunistic surveys will be collected throughout the year so targeted surveys can be completed during the nesting season. Nesting habitat subject to low-altitude training exercises will be prioritized for surveys. Surveys in nesting habitat subject to high-altitude training or in areas where training activities are not likely to occur will be completed as resources allow. 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.

7.4.7 Monarch Butterfly

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 BEC and the IEC
- 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.
- Invasive plant species control efforts

7.4.8 Climate Impacts on Threatened and Endangered Species Management

The effectiveness of management actions taken to protect threatened and endangered species will depend on the speed at which the climate changes, the nature of the climatic changes, and the ability of each species to respond to those changes. Our understanding of organism responses to a changing climate is not yet sufficient to be able to predict how an individual species will respond. In addition, the response of sub-populations of a single species may vary. For example, genetic variation within a species can aid adaptation to changing environmental conditions, but populations may not be able to undergo selection for preferred traits if environmental conditions change too rapidly (Hoffmann and Sgrò 2011). Behavioral changes (e.g.,

host-plant or food source switching) and phenotypical responses (e.g., changes in body size associated with longer growing seasons) have already been observed in some organisms (Ozgul et al. 2010; Iwamura et al. 2013).

Many current management activities for threatened or endangered species are appropriate for increasing species' resilience or facilitating adaptation to climate change. An ecosystem approach that prioritizes functional diversity, maintenance of habitats, habitat variability, and habitat connectivity will potentially help species adapt to changing conditions or migrate to more favorable habitats. However, when approaching the uncertainty that is inherent with managing species under changing environmental conditions, additional analysis and planning is required.

Historical patterns used for management decisions are likely to be insufficient for future management challenges (Bierbaum et al. 2013). Proactive approaches that anticipate change can help extend the period over which species can adapt to changing climate and avoid catastrophic declines associated with extreme and variable events that act on an already stressed ecosystem (CEMML 2019).

7.5 Water Resource Protection

Applicability Statement

This section applies to USAF installations that have water resources. This section **IS** applicable to this installation.

Figure 7-9. Camera traps capture wildlife watering sites used by undocumented immigrants

Program Overview/Current Management Practices

Surface water availability is highly limited at BMGR during certain 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 the AZGFD. During periods of extreme drought, AZGFD will routinely refill these water sources by hauling in tens of thousands of gallons annually, via truck and helicopter, to support wildlife species. These sites are also being used and affected by undocumented

immigrants and drug traffickers (Figure 7-9) across the Range. Damage has occurred due to this human usage, and in some cases, multiple times at the same system 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 with disrupting wildlife use during critical periods of drought.

BMGR East

AZGFD does not consider water quality in natural and artificial water catchments to be a significant issue with wildlife as previous studies in the Sonoran Desert have found a lack of evidence of increased contaminants in these systems (Rosenstock et al. 2005). Additionally, continued maintenance and cleaning of the catchments by the AZGFD will reduce the risk of decreased water quality. However, 56 RMO believes previous water quality studies conducted on the Range reflect a continued need for water quality monitoring at BMGR East. Water quality sampling of natural and artificial water resources at BMGR East has been performed for several years by the USGS and scientists from Texas Tech University with a focus on amphibian research. Elevated levels of ammonium (NH_3) found at several sites prompted a 4-year program of sampling by the USGS (USGS 2013–2016). Samples were taken from areas and water depths where animals would drink. The water was tested for a variety of chemical parameters, blue-green algae (cyanobacteria), and chytrid fungus (Bd; *Batrachochytrium dendrobatidis*), a common cause of amphibian decline. In addition to further inquiries about Bd, the Texas Tech University researchers also posed questions about ranavirus; specifically, is it present, and if so, does ranavirus infection of 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. Ammonia concentrations at several sites have occasionally exceeded the Arizona Department of Environmental Quality's acute and/or chronic standards for aquatic life and wildlife (Arizona Department of Environmental Quality 2009; USGS 2013–2016). In 2015, the iron (Fe) concentrations at wildlife watering site 1148 exceeded the EPA-recommended freshwater criterion for aquatic life (USGS 2013–2016). Blue-green algae concentrations were below the detection limits for microcystin, cylindrospermopsin, and saxitoxin. Several wildlife watering sites tested positive for chytrid fungus in 2013, 2014, and 2016, although most positive samples were below the detection limit (USGS 2013–2016).

Report findings of the Texas Tech surveys for 2019, 2020, and 2021 (Griffis-Kyle et al. 2020, 2021, 2022) 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 worsened water quality (Griffis-Kyle et al. 2020, 2021, 2022). 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.

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 instead of aerators. The fungus Bd 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.

Some of the natural surface waters and tinajas have been modified to provide better access and water resource reliability for wildlife. 56 RMO archaeologists have identified the tinajas as archaeological sites. In addition, tribes have identified natural surface waters as Sacred Sites (EO 13007). Modifications and ongoing maintenance have resulted in damage to these important archaeological sites and Sacred Sites. The Tribes would like to have the enhancements and modifications removed and, to the extent possible, have the affected *tinajas* restored to a natural state. The USAF is working with the Tribes and AZGFD to remove the structures and has prohibited any alterations of existing structures. Only construction and remodeling of existing artificial wildlife watering sites is permitted.

Over the next 5-year planning period, BMGR East will continue a holistic review based on previous studies and relevant literature to evaluate the benefits and adverse effects of wildlife watering sites, continue water quality monitoring, develop recommendations for management, and support AZGFD annual maintenance of all existing water development as required.

BMGR West

BMGR West will continue to work with AZGFD to monitor and maintain the existing wildlife watering site network from 2023 to 2027. BMGR West is also working with AZGFD to redevelop previously existing tanks at Dripping Springs and Sheep Mountain.

7.6 Wetland Protection

Applicability Statement

This section applies to USAF installations that have existing wetlands on USAF property. This section **IS NOT** applicable to this installation.

7.7 Grounds Maintenance

Applicability Statement

This section applies to USAF installations that perform ground maintenance activities that could impact natural resources. This section **IS NOT** applicable to this installation.

Program Overview/Current Management Practices

The BMGR does not support or require ground maintenance activities. Minimal ground maintenance activities do occur at the Gila Bend AFAF, which has several small turf areas and rows of planted trees. Gila Bend AFAF is operated and maintained by a USAF contractor and all ground maintenance activities are completed by the contractor or sub-contractor as part of the service contract agreement. The total area of Gila Bend AFAF is 2,011 acres, with less than 7 acres requiring ground maintenance.

7.8 Forest Management

Applicability Statement

This section applies to USAF installations that maintain forested land on USAF property. This section **IS NOT** applicable to this installation.

Program Overview/Current Management Practices

7.9 Wildland Fire Management

Applicability Statement

This section applies to USAF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section **IS** applicable to this installation.

Figure 7-10. Wildfire at Barry M. Goldwater Range East

Program Overview/Current Management Practices

Until the early 2000s, wildfires larger than a few acres in size were extremely rare in the Sonoran Desert. The natural fire-rotation interval for portions of the Sonoran Desert, including the BMGR, was estimated to be 274 years (Schmid and Rogers 1988). The low densities of native vegetation typically do not provide sufficient fuel to carry fires over large areas, although native fuel loads can occasionally be high after wet winters. Sonoran Desert vegetation is typically not fire-tolerant, and large fires within these vegetation communities have the potential to significantly alter vegetation composition at the ecosystem or landscape level (Figure 7-10, Figure 7-11). Desert plant species, such as saguaro cactus, organ pipe cactus (*Stenocereus thurberi*), blue paloverde, ocotillo, and creosote bush are very susceptible to fire mortality and may take decades to re-establish from seedbanks or recolonization through dispersal from nearby source populations.

Figure 7-11. Fire scar on saguaro cactus at Barry M. Goldwater Range East

The spread of nonnative, invasive plants has altered the natural fire regime in some areas. Historically, bare space between shrubs and trees limited the extent of fires in the Sonoran Desert. However, changes in climate, human activities, and the resulting spread of invasive species are leading to increased fuel loads and fuel connectivity, changing fuel characteristics, and putting fire-intolerant vegetation at risk. Introduced grasses and forbs increase fuel continuity across the landscape, altering vegetation composition and promoting larger fires and greater fire frequency and intensity (Geiger and McPherson 2005). This, coupled with the tendency of many invasive species to be the first species to recover post-fire (often at greater than pre-fire densities and coverage), leads to a positive feedback loop. Under this scenario,

increasing density and cover of invasive species lead to increased fire activity, which in turn favors increased density and cover of those species, which then leads to even greater fire frequency and size. The result is an altered fire regime and a new vegetation community that may not be able to sustain the same wildlife species or offer the same ecosystem services such as erosion control. In 2008 or 2009, a wildfire at BMGR West that was evidently fueled by Sahara mustard burned approximately 500 acres of native creosote-bursage vegetation. Post-fire field inventory showed that the mustard was the only species recovering in that area (Malusa 2010), indicating that the vegetation community may be changing over time (which may in turn be driving a change in fire regime). This trend places a priority on continuous, coherent, and data-driven invasive species management to protect the quality of the Range for native plants and wildlife and to prevent impacts to military training activities and mission readiness.

BMGR East

Fires on BMGR East are typically small and located within target complexes except for occasional small grass fires along SR 85 that are likely started by passing vehicles. Invasive plants generally do not play a critical role in the spread of many of these fires. However, wildfires in 2005 burned approximately 132,000 acres of BMGR East, requiring emergency intervention from the National Interagency Fire Center. The 2005 fire season was considered an anomaly due to the heavy winter rains that led to increased fuel loading of native vegetation, but climate projections indicate that this may become a more frequent occurrence, which could lead to increased fire risk. It is likely that the spread of invasive species contributed to the fuel load available to carry these fires. As a result of this fire, Sonoran pronghorn favored the area. The removal of vegetation allowed pronghorn to detect predators from further distances. Post fire vegetation growth responses may have provided increased forage availability for pronghorn.

Since 2006, there have been 380 fires on BMGR East ranging in size from a few square yards to several hundred acres with 135 of those fires occurring since 2019 (Table 7-2). These fires are reported to and investigated by the 56 RMO Wildland Fire Program Manager. An account of each incident is reported and stored in the 56 RMO BMGR East Fire History Spreadsheet. 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 are started from unauthorized campfires (Table 7-3).

Table 7-2. Fire Locations by Year on Barry M. Goldwater Range East

Year	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 7-3. Fire by Seasonality and Ignition Type on Barry M. Goldwater Range East, 2006-2023

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 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 as well as a tactical basis (56 RMO 2014). The document serves as the guiding plan for wildfire response protocols. The Air Force Wildland Fire Center developed a revised WFMP template in the fall of 2019, after the first round of WFMP deliverables. The BMGR East WFMP was one of the first plans developed, and it lacked multiple sections identified in the revised Air Force WFMP template; it is now compliant.

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 wildland fire response 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 56 RMO will notify BLM of all wildfires located within 2 miles of any shared border with BLM; BLM assistance for the suppression of wildland fires on BMGR East will be on a case-by-case basis.

The Air Force Wildland Fire Center has initiated the Wildland Fire Regional Support Program. This national program of Wildland Support Modules (WSMs) is staffed by CSU, University of Montana, USFWS, and BLM wildland fire personnel to provide wildland fire support at USAF installations. This support includes 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 WSM possesses the qualifications to supplement and support on-installation wildfire suppression activity if

requested and available. Within the west region, Nellis AFB serves as the WSM base installation encompassing Nellis AFB, Luke AFB, BMGR East, and Davis Monthan AFB.

The BLM Module Lead has taken over the BMGR East long-term fire repeat photography project. 56 RMO wildlife biologists initiated the fire repeat photography photo plots within a burned area in 2006. The project grew to include many more photo points, cardinal directions, and control points. The project monitoring frequency is every fifth year; however, BLM will visit a subset of the photo points annually. Using repeat photography following a wildland fire may provide patterns of post-fire environmental change, particularly recovery and mortality of vegetation and soil disturbance.

BMGR West

Few wildfires have occurred at BMGR West. Overall, wildfire risk is much lower at BMGR West than it is at BMGR East, largely due to the difference in precipitation patterns that support only minimal vegetation growth at BMGR West. Even with this lower risk, however, MCAS Yuma is required to implement a WFMP, per MCO 5090.2. The 2018 WFMP defines roles and responsibilities for offices, departments, and agencies involved in pre-wildfire suppression and 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 an MOA with the BLM for fire suppression assistance at BMGR West. This MOA established a framework to suppress wildfires occurring on or adjacent to BMGR West and outlined the responsibilities of both parties.

7.9.1 Climate Impacts on Wildfire Management at BMGR East and West

The greatest impacts of climate change on wildfire activity at the Range will be via changes in vegetation. Invasive species, including fire-adapted grasses and annuals, have invaded many parts of the Sonoran Desert. Wherever those species become common, fires are likely to become larger and much more frequent. This creates a cycle that is distinct from the current very low fire frequency regime of the desert. Precise estimation of invasive plant extent and intensity was beyond the scope of the CSU CEMML study, so the below analysis assumes the absence of large-scale grass or annual invasion (CEMML 2019).

Wildfires in the Sonoran Desert are generally limited by fuel continuity more than any other single factor. The desert is typically dry enough to support combustion and ignition sources are inevitable on a live-fire military range. However, much of the land area is too sparsely vegetated in its natural state to support fire growth, and those fires that happen to occur in patches of fuels are isolated and rarely grow larger than a few acres. While fires may occur, the acreage of any individual fire, or fires in aggregate, is generally quite small.

On rare occasions, unusually abundant winter rainfall produces a flush of vegetation that may support more robust fire activity, as occurred in the winter of 2004 to 2005, leading to the largest fires on record in the Sonoran Desert that summer. The increased overall precipitation projected in climate models suggests increasing amounts of precipitation associated with winter events, which may lead to a slightly higher likelihood of fire seasons like that observed in 2005 as native and invasive vegetation respond to increased rainfall. Higher populations of invasive species one year will also bolster soil seed banks and expand infestations through vectors such as vehicular traffic, road maintenance, and even native or trespass wildlife movements.

7.10 Agricultural Outleasing

Applicability Statement

This section applies to USAF installations that lease eligible USAF land for agricultural purposes. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Approximately 1,500 acres of land surrounding the MCAS Yuma airfield are leased for agricultural production, which directly supports the mission success of BMGR West. While these lands are not specifically tied to the BMGR and their management does not fall within the purview of this INRMP, revenue streams generated by the agricultural lease program help to accomplish projects identified in the INRMP.

7.11 Integrated Pest Management Program

Applicability Statement

This section applies to USAF installations that perform pest management activities in support of natural resources management (e.g., invasive species, forest pests). This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The Federal Insecticide, Fungicide, and Rodenticide Act of 1996 (FIFRA) provides for federal regulation of pesticide distribution, sale, and use (7 U.S.C. § 136 et seq.). All pesticides distributed or sold in the U.S. must be registered (licensed) by the EPA. Before the EPA may register a pesticide under FIFRA, the applicant must show, among other things, that using the pesticide according to specifications "will not generally cause unreasonable adverse effects on the environment."

FIFRA defines the term "unreasonable adverse effects on the environment" to mean "(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide; or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 408 of the Federal Food, Drug, and Cosmetic Act."

Rules, EOs, and regulations applicable to integrated pest management are listed below.

- EO 13751, December 2016, Safeguarding the Nation from the Impacts of Invasive Species
- EO 11987, May 1977, *Exotic Organisms*
- DoD Directive 4715.1, February 1996, *Environmental Security*
- DoD Instruction 4715.03, May 1996, *Environmental Conservation Program*
- DoD Regulation 4150.7-P, September 1996, DoD Plan for the Certification of Pesticide Applicators
- AFMAN 32-1053, September 2019, Integrated Pest Management Program
- Office of the Chief of Naval Operations Instruction 5090.1B, with changes 1–4, *Environmental and Natural Resources Program Manual*
- MCO 5090.2, June 2018, Environmental Compliance and Protection Program
- MCAS Yuma Integrated Pest Management Plan Technical Review

DoD Directive 4715.1 provides policies and procedures to establish and maintain safe, effective, and environmentally sound integrated pest management programs to prevent or control pests and disease vectors that may adversely impact readiness or military operations by affecting the health of personnel or damaging structures, material, or property. It also ensures that pest management programs achieve, maintain, and monitor compliance with all applicable EOs and Federal, State, and local statutory and regulatory requirements. The pest management programs incorporate sustainable philosophy, strategies, and

techniques in all aspects of DoD and contractor vector control and pest management planning, training, and operations, including installation pest management plans and other written guidance to reduce negative effects of pesticides.

7.11.1 Invasive Plants

IAW the management goals provided by the 2023 BMGR INRMP, vegetation inventory and monitoring plans have been developed and implemented for both BMGR East and BMGR West (Villarreal et al. 2011). These plans adopted several protocols from existing regional vegetation monitoring programs, allowing for the integration, collaboration, and sharing of both BMGR East and West monitoring efforts with surrounding land management agencies. As part of these vegetation monitoring efforts, both sides of BMGR have now been inventoried and mapped according to a standardized approach used across the various adjacent federal lands (USFWS, BLM, and NPS). After completion in 2022, inventory and monitoring efforts will continue over the next several years to establish quantifiable trends in vegetation communities over time.

One of the issues that will be identified in the ongoing vegetation inventory and monitoring efforts is how the spread of exotic, invasive, or noxious plants impact native Sonoran Desert vegetation communities. Exotic species, as defined in DoDI 4715.03, are "species that occur in a given place, area, or region as the result of direct or indirect, deliberate or accidental introduction of the species by human activity." EO 13751 requires federal agencies to identify actions that may affect invasive species; use relevant programs to prevent introduction of invasive species; detect, respond, and control such species; monitor invasive species populations; provide for restoration of native species; conduct research on invasive species; and promote public education. An invasive species, as defined in EO 13751, is a "non-native organism whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health."

Exotic, invasive, or noxious plants are characterized by (1) their ability to easily colonize disturbed areas and (2) specialized dispersal mechanisms that allow them to quickly become the dominant vegetation in an area. These abilities differ between species, but invasive plants generally have the potential to impact native vegetation communities. Roads, livestock, and people serve as the primary vectors for invasive species at BMGR. The 2007 INRMP reported that the density and distribution of non-native species was not accurately known, although BMGR East was estimated to have a comparatively greater distribution of invasive species than BMGR West due to its higher rainfall and proximity to vector sources for invasive species. 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; also, the BMGR GIS Cloud Mapping Effort).

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. Conservation Law Enforcement Officers, 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 (*Citrullus colocynthis*). Once uploaded, observations are available online, providing a dynamic and near real-time capacity to monitor infestations. The application was initially set up in 2013 to track just Sahara mustard and buffelgrass, then fountain grass was added in 2016 and stinknet and colocynth gourd were added in 2021.

Arizona Department of Agriculture maintains a list of prohibited and regulated noxious weeds that are broken into Classes A, B, and C:

- "Class A Noxious Weed" is categorized as a species of plant that is not known to exist or has limited distribution in the State and is a high priority pest for quarantine, control, or mitigation.
- "Class B Noxious Weed" is categorized as a species of plant that is known to occur, but of limited distribution in the State and may be a high priority pest for quarantine, control, or mitigation if a significant threat to a crop, commodity, or habitat is known to exist.
- "Class C Noxious Weed" is categorized as a species of plant that is widespread but may be recommended for active control based on risk assessment.

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.

7.11.1.1 High-priority Invasive Plants

Sahara Mustard (*Brassica tournefortii*)

Figure 7-12. Sahara mustard at Barry M. Goldwater Range

Sahara mustard is listed as a Class B weed in Arizona (Figure 7-12). It 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. According to Bossard et al. (2000), Sahara mustard was first recorded in the late 1920s in the Coachella Valley of California. In 1957, the species was found near Yuma, AZ, and had become widespread by the 1970s. Due to its early growth and flowering phenology, Sahara mustard is able to capitalize on winter soil moisture early in the growing season, allowing the species to largely complete its lifecycle prior to when many native species begin to flower (Bossard et al. 2000).

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. Also, given that Sonoran Desert plant communities are not fire-adapted, greater frequencies of wildfire have potentially devastating results.

BMGR West conducted control efforts annually from 2018 through 2020; 2021 was too dry to produce Sahara mustard and no treatments were conducted (Table 7-4). Over that 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). Annual control efforts should be funded at sufficient levels to survey and treat known infestations and allow for additional treatment of new infestations.

Table 7-4. Invasive Plant Control Results at Barry M. Goldwater Range West, 2018–2021. Recreated from Lake Mead Invasive Plant Management Team 2021.

Year	Season and Species	Total Surveyed Acres[a]	Net Infested Acres	Acres Treated	
				Gross	Net
2018	Spring, Sahara mustard	22.37	0.230	22.11	0.23
	Fall/Winter, Sahara mustard	169.98	13.650	169.98	13.65
	Spring, Buffelgrass	22.37	0.160	0.26	0.16
	Fall/Winter, Buffelgrass	14.69	1.026	14.16	1.03
2019	Spring, Sahara mustard	613.00	71.260	613.00	71.26
	Spring, Buffelgrass	1.18	0.073	1.18	0.07
	Spring, Saltcedar	0.01	0.003	0.01	0.003
	Spring, Buffelgrass	12.01	0.025	0.17	0.03
2020	Spring, Sahara mustard	2240.90	104.000	1917.50	103.90
	Spring, Buffelgrass	2240.90	0.040	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 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 accounting for 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 an individual is assigned a coverage multiplier.

Stinknet (*Oncosiphon piluliferum*)

Stinknet is listed as a Class B weed in Arizona (Figure 7-13). It was first documented in the United States in Riverside County, California, in 1981 (Sanders and Friedman 1996) and in Arizona in 1997 and has become a severe and ubiquitous invader across Arizona. It has the capacity to spread and carry wildfire,

cause contact dermatitis in some people, release noxious smoke when burned, and is unpalatable to grazers. It may pose one of the greatest health and human safety hazards of all invasive plants in Arizona, and possibly the Desert Southwest. In Arizona, stinknet can germinate as early as October if precipitation is sufficient. Germination timing can be plastic, with cohorts germinating in response to individual rains through early April. Reports vary in terms of when flowering and viable seed set may occur, ranging from three months after germination to mid-April through May. If seed set can begin 3 months after germination, then viable seed could be produced as early as January (Scheuring and Chamberland 2020).

Figure 7-13. Stinknet in flower(© Keir Morse)

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 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 pre-emergent 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 AFAF in 2021 with a pre-emergent herbicide. Some sites still had stinknet during followup 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.

Buffelgrass (*Pennisetum ciliare*, Syn. *Cenchrus ciliaris*)

Listed as a Class C weed, buffelgrass (Figure 7-14) is native to the arid and semi-arid regions of East Africa, the Arabian Peninsula, Madagascar, Pakistan, and northern India (Cox et al. 1988). It arrived in Australia in 1880 and in Texas in 1917. The species was first introduced into the United States, South America, and Mexico to improve productivity of grazing pastures and control erosion (California Invasive Plant Council 2006). Across the region, buffelgrass is spreading rapidly, and, where it becomes established, it often displaces native vegetation and forms a dense monoculture. Buffelgrass has the potential to alter the natural Sonoran Desert fire regime, further impacting and displacing fire-intolerant communities of native vegetation (McDonald and McPherson 2011; U.S. Forest Service 2014). Buffelgrass is found across the BMGR, and recent research by Whittle and Black (2014) and Damery-Weston (2016) has provided insight into the rate of buffelgrass expansion for areas at BMGR East along SR 85. AZGFD and ADOT treated buffelgrass along SR 85 in 2021 (Scobie et al. 2022*a*).

Figure 7-14. Buffelgrass infestation in Area B

BMGR West treated buffelgrass annually from 2018 through 2020; 2021 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. Annual surveys and treatments should be funded at a level sufficient to maintain control of buffelgrass across BMGR West.

Fountain Grass (*Pennisetum setaceum*)

Fountain grass (a Class C weed; Figure 7-15) is a coarse perennial grass with a densely clumped growth form that can reach 5 feet in height (Bossard et al. 2000). Originally native to Africa and the Middle East (Williams et al. 1995), fountain grass has been introduced to many areas in the U.S. and other parts of the world due, in part, to its popularity as an ornamental plant (Neal and Senesac 1991; Williams et al. 1995). Its seeds are easily dispersed by vehicles, humans, livestock, wildlife, wind, and water (Cuddihy et al. 1988; Tunison 1992; Bossard et al. 2000). Fountain grass is found in areas on BMGR East and West and, like buffelgrass and Sahara mustard, its fire-tolerant nature could lead to altered fire regimes if these species are left unmanaged (California Invasive Plant Council 2006).

Figure 7-15. Fountain grass infestation. Photo courtesy of NPS.

Mediterranean grass (*Schismus arabicus* and *S. barbatus*)

Mediterranean grass is native to Eurasia (Jackson 1985). The species was introduced into North America, South America, Australia, and the west coast of Europe where Mediterranean climate regimes occur (Bor

1968). In North America, it likely spread westward from Arizona into California during the early 1900s (Burgess et al. 1991). It was first recorded in California in 1935 (Robbins 1940) and is now well established in the southwestern United States. Both species are of particular concern in the Sonoran Desert because of their ability to form dense continuous fuels, which can carry fire quickly between patches of native vegetation.

Colocynth (*Citrullus colocynthis*)

Colocynth (Figure 7-16), or desert gourd, is an invasive desert melon that thrives in sandy, arid soils. Its long taproot reaches deep for moisture, allowing it to outcompete native vegetation (Burrows and Shaik 2015). Native to the Mediterranean, Middle East, and Asia, colocynth has become widely invasive across portions of Australia (Shaik et al. 2015) and has been found in the United States within Death Valley National Park (Swearingen 2008). A small population was found in 2017 adjacent to the Range 1 access road at BMGR East near an active archeological excavation (Scobie et al. 2022). All identified plants and fruits were pulled and disposed of, although some broken and partly eaten fruits indicated that seed dispersal may have occurred (S. Fox, wildlife biologist, BMGR, personal communication, 2017). 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*).

Figure 7-16. Colocynth plants (left), flower (middle), and fruits (right). Photos courtesy of Qatar Natural History Group.

7.11.1.2 Other Invasive Plants

Other nonnative species that have been identified at BMGR include Lehmann lovegrass (*Eragrostis lehmanniana*), salt cedar (*Tamarix ramosissima*), Athel tamarisk (*Tamarix aphylla*), Russian thistle (*Salsola tragus*), and red brome (*Bromus rubens*). If left undetected, unmonitored, and unmanaged, nonnative invasive species could fundamentally alter the BMGR's ecosystem structure through competition with native species, reduction of species diversity, and enhanced spread of wildfires (Villarreal et al. 2011). 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). 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.

7.11.1.3 Spread of Invasive Plants

Roads

Roads have been identified as a major contributor to the spread of invasive plants at BMGR (Figure 7-17), and the proliferation of new roads, especially as CBP created them through inappropriate and improper road dragging without prior consent and approval from military authorities, and subsequent increases in soil disturbance is of particular concern to range managers. Seeds from invasive species can be caught in wheel wells, undercarriages, and tire treads as vehicles drive through infested areas. As vehicles travel into uninfested areas, seeds may fall out, thereby effectively dispersing invasive species' seeds into a new area. Additionally, roads often create favorable germination and growing conditions for invasive species by altering drainage patterns, catching additional water, disturbing the soil, and burying seeds (particularly when drag road surfaces are smoothed). In recent years, increased activities related to geocaching, CBP use, and illegal humanitarian aid drops have led to increased off-road vehicle use in some areas. This increased use has heightened the risk for resource damage and increased the chances for invasive species to spread into new areas. Off-road vehicle use, road closure signage, fencing, informational brochures, and increased CLEO patrolling have been implemented in recent years in hopes of curbing these activities before harsher enforcement actions become necessary. The proliferation of stinknet on Luke AFB increases the risk of additional introductions to BMGR East via roads. Improvements to biosecurity such as trackout grates and vehicle washing protocols could reduce that risk.

Figure 7-17. Roadside invasive plants; buffelgrass (left) and Sahara mustard (right)

Another factor influencing the spread of invasive plants over the past 10 years is the ground disturbance associated with drag roads and the drag areas around rescue beacons along the southern border fence. A network of rescue beacons has been installed throughout the BMGR to mitigate UDA injuries and/or fatalities arising from the region's extreme environment. Customs and Border Patrol periodically smooths out the areas around the rescue beacons and along the main roads to enhance detection of recent UDA foot traffic. These drag areas and roads were intended to be minimal in size but have been improperly enlarged over time without prior consent and proper military approval as dragging has continued. Disturbance associated with dragging is of particular concern for the spread of invasive species that thrive in disturbed soils. Range managers at both BMGR East and West continue to monitor these roads and maintain a dialogue with CBP regarding impacts and maintenance of these roads.

Wildfire

Wildfires can interfere with military training and mission readiness, in addition to degrading habitat quality for native plant and wildlife species. Wildfires larger than a few acres were almost unknown until the last 15 years because the low densities of native Sonoran Desert vegetation typically do not provide sufficient fuel for carrying a fire over large areas. The spread of invasive plants, however, has substantially raised the threat of wildfire because they grow in high densities, will readily carry a wildfire, serve as a ladder fuel into taller stands of native vegetation, and tend to recover from fire more readily than native vegetation. A wildfire evidently fueled by Sahara mustard burned approximately 500 acres of native creosote-bursage community at BMGR West in 2008 or 2009. Field inventory showed that the mustard was the only species recovering in the area after the fire (Malusa 2010).

7.11.1.4 Invasive Plant Management Actions

BMGR East

Buffelgrass has greatly expanded along the SR 85 corridor (Figure 7-17), with much of this expansion occurring outside of the BMGR fence line along the highway right-of-way. Buffelgrass has also been reported in the STAC, areas within the San Cristobal Valley, and within portions of Area B, south of the Crater Mountains, where it appears to be extending away from the highway along several small drainages. Staff from the 56 RMO have conducted a multi-year study mapping the rate of buffelgrass spread along SR 85. Results suggest that buffelgrass expansion onto BMGR East is limited to draws and washes, making control efforts feasible (Whittle and Black 2014).

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

Luke AFB has developed and implemented an IPMP that includes guidance and protocols for invasive species removal and management for Luke AFB, 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; herbicide storage mixing, safety, and disposal guidance; and guidance for invasive species removal and control. Methods for control include a combination of physical and mechanical removal as well as the application of herbicide through both foliar spot spraying and aerial application (Figure 7-18). Restricted-

Figure 7-18. A USAF C-130 applying herbicide along a roadway at Barry M. Goldwater Range East

use herbicides are not approved for use at either Gila Bend AFAF or BMGR East, and only EPA-registered pesticides containing glyphosate as the primary active ingredient are currently being applied at BMGR East. In general, regardless of the way the herbicides are applied at BMGR East, 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).

Physical removal and disposal of invasive plants by hand is prioritized in small (<100 acres), environmentally sensitive areas. Application of herbicide with ground equipment is conducted in areas with low-density stands of invasive weeds that are accessible by vehicle and foot. Ground-based equipment is also being used for targeted applications in accessible infested areas with high densities of environmentally sensitive species. Aerial application of herbicide is restricted to high-density areas of invasive species. It is typically applied by larger aircraft, which may include a USAF C-130 outfitted for pesticide dispersal. The USAF had an Environmental Assessment (EA) in place for a Sahara mustard control program using aerial herbicide application for 2 years at BMGR East (Finding of No Significant Impact was signed on 19 July 2012; 56 RMO 2012). The purpose of this program was to reduce wildfire risk and improve range quality for wildlife and native vegetation communities on approximately 7,800 acres that had high densities of Sahara mustard and few other environmentally sensitive plant species. This program resulted in improved control of Sahara mustard along approximately 15 linear miles of roadways. If aerial herbicide treatments are required in the future, NEPA documents will be prepared. Additionally, the USAF will be required to re-enter consultation with the USFWS prior to conducting any future aerial treatments within Sonoran pronghorn habitat.

56 RMO staff have been using GIS cloud-based software to monitor the presence and spread of invasive species on BMGR East. This software can be accessed by installation personnel through mobile phones providing greater encapsulation of the status and distribution of invasive species. Data collected from BMGR East staff is illustrated in Figure 7-19.

Gila Bend AFAF

The Gila Bend AFAF serves as an emergency runway and provides the facilities required to support maintenance and operations for both the airfield and BMGR East. The airfield is operated and maintained by a USAF contractor and all pest management functions are completed by the contractor or sub-contractor, as required under the service contract agreement. Gila Bend AFAF utilizes a comprehensive, integrated pest management approach to weed and pest control that takes into account the various chemical, physical, and biological suppression techniques available and analyzes the weed's or pest's habitat and its interrelationship within the ecosystem. Pest management activities at Gila Bend AFAF are guided by the Luke AFB IPMP (Luke AFB 2015) and are specifically addressed in Attachment 7 of that document. The IPMP defines the roles, protocols, contracting requirements, reporting protocols, and treatment procedures for weed and pest management activities at Gila Bend AFAF. The plan also discusses regulatory compliance; safety and health protocols; herbicide/pesticide storage, mixing, and disposal procedures; and provides a list of approved herbicide/pesticides for use on the AFAF. Under this plan, restricted-use pesticides are not permitted to be used at the AFAF or BMGR East.

Pest issues at Gila Bend AFAF are primarily related to BASH threat species, including round-tailed ground squirrel (*Spermophilus tereticaudus*), coyote (*Canis latrans*), rock pigeon (*Columba livia*), and a variety of dove species including the mourning dove, white-winged dove, and Eurasian collared-dove (*Streptopelia decaocto*). Weed issues are similar to those found at BMGR East and include Sahara mustard and buffelgrass. All pest management actions at Gila Bend AFAF are recorded and retained within the Integrated Pest Management Information System program.

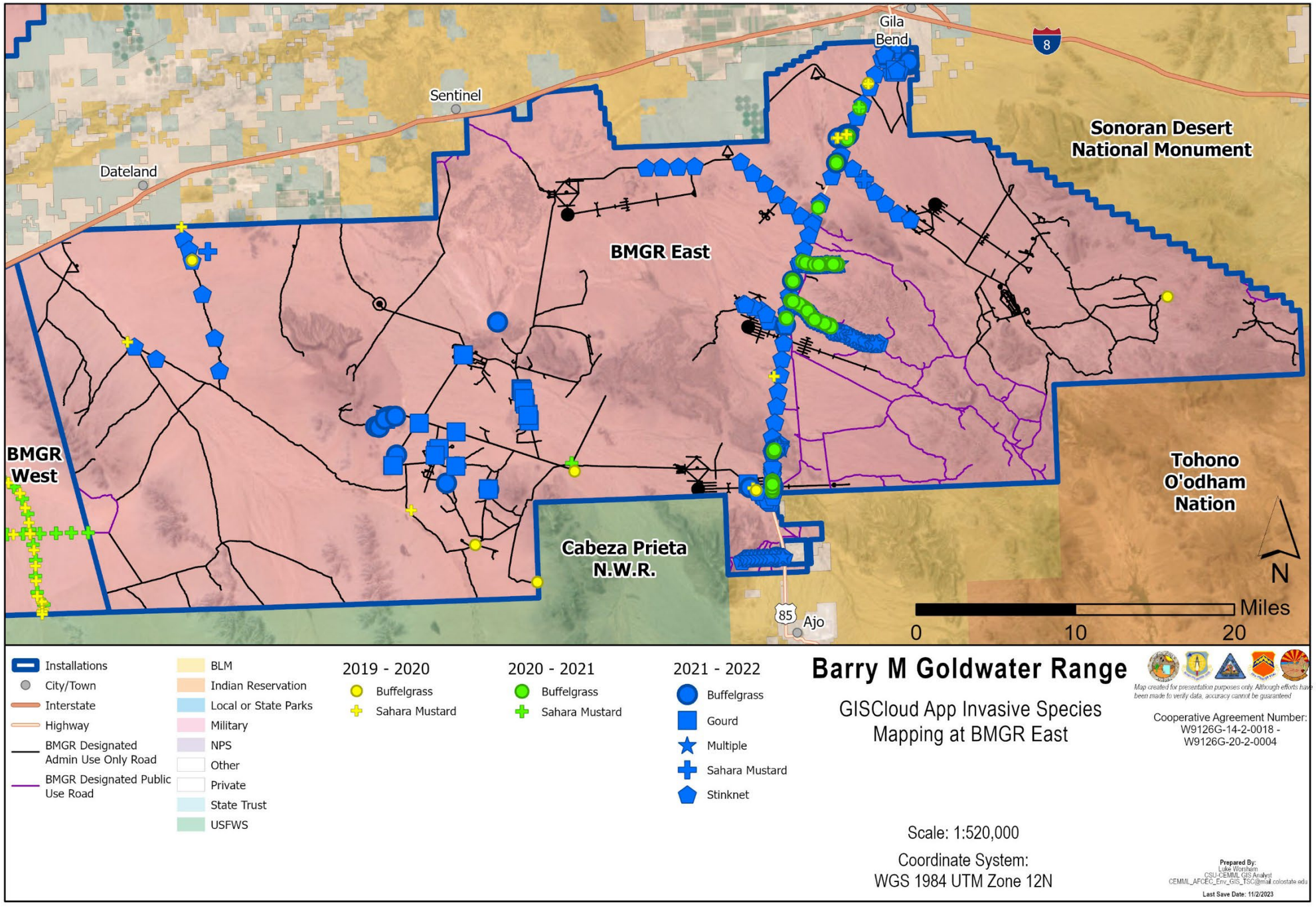

Figure 7-19. GIS Cloud App invasive species mapping effort at Barry M. Goldwater Range East, effort includes instances of no invasive species found

BMGR West

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

Results from this research (Li and Malusa 2014, Li 2016) are encouraging, as it seems that Sahara mustard can be effectively controlled because the seedlings are vulnerable to adverse post-germination conditions. After extended periods of winter drought, Sahara mustard source populations are reduced to isolated areas where soils retain moisture. These populations will expand again across the landscape as favorable conditions return. Successful elimination of persistent local populations after droughts can effectively reduce the species' presence over the Range. The knowledge gained from this study has provided strong scientific insight for managing Sahara mustard and led to the development of a management program adopted by BMGR West RMD to reduce the presence of this species over time.

This management program involves a continuing partnership with the MCAS Yuma RMD and the UofA. This project employs cloud-based mapping to document invasive species presence across BMGR West, allowing for targeted follow-up control efforts to be implemented efficiently. The project gives managers a timely method for mapping and tracking the spread of invasive weeds across the Range, with particular focus on Sahara mustard and buffelgrass. This effort is based on cloud-based mapping, using the GIS Cloud app and smartphones to gather data quickly and easily on invasive species distribution and abundance. The app records the sighting location and provides dropdown menus for recording the species and estimating its abundance. In addition, the app has options to record photos, audio, and take specific notes for each point. Once completed, these points are automatically uploaded to an online map that makes the data immediately available to UofA staff. The mapping effort is coordinated primarily through the Station's four CLEOs using smartphones with the GIS Cloud app. Conservation Law Enforcement Officers 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 data-quality control, interpretation, expert surveys to assess current invasion conditions, maintaining the GIS Cloud app, and prioritizing treatment areas based on real-time distribution of invasive plant emergence and habitat favorability. UofA staff also perform before-and-after surveys of treatment areas and generate reports detailing the success or failure of each treatment effort and analyzing the results of the generated distribution models. Due 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 to 2017 and over 2,800 data points since the program's inception in 2015.

Upon receipt of data from the GIS Cloud app (Figure 7-20) and treatment recommendations from UofA staff, contractors determine and implement the appropriate weed control treatment for each area provided. 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 potential areas identified for treatment during the following year; maintaining accurate records of project activities (using GPS/GIS technology), including tracking the amount of herbicide and other chemicals used (i.e., surfactants), areas surveyed, and acres and species treated; and then compiling their work into a final annual report that is electronically submitted to MCAS Yuma RMD within 30 days of project completion. One major benefit of this project is that MCAS Yuma personnel never have to handle or apply any herbicides.

An important program outcome is extensive knowledge of the occurrence and abundance of invasive plants, especially Sahara mustard, at BMGR West. BMGR West is subjected to substantial invasion pressure from Sahara mustard source populations outside of the Range's jurisdiction. Successful control requires interagency collaborations to contain invasive populations at BMGR East, Cabeza Prieta NWR, and other agency lands (e.g., BLM, Bureau of Reclamation). The success of the management program has prompted staff at the Cabeza Prieta NWR to adopt the GIS Cloud app to monitor and treat Sahara mustard and buffelgrass on the Refuge. Staff from the 56 RMO at BMGR East have also used the app since 2018. In addition, staff from the El Pinacate Preserve in Mexico have expressed interest in initiating a similar monitoring program. It is desirable to establish an interagency program that can sufficiently standardize the use of the GIS Cloud app across agencies and coordinate treatment efforts among agencies to target source populations that infest areas across jurisdictional boundaries.

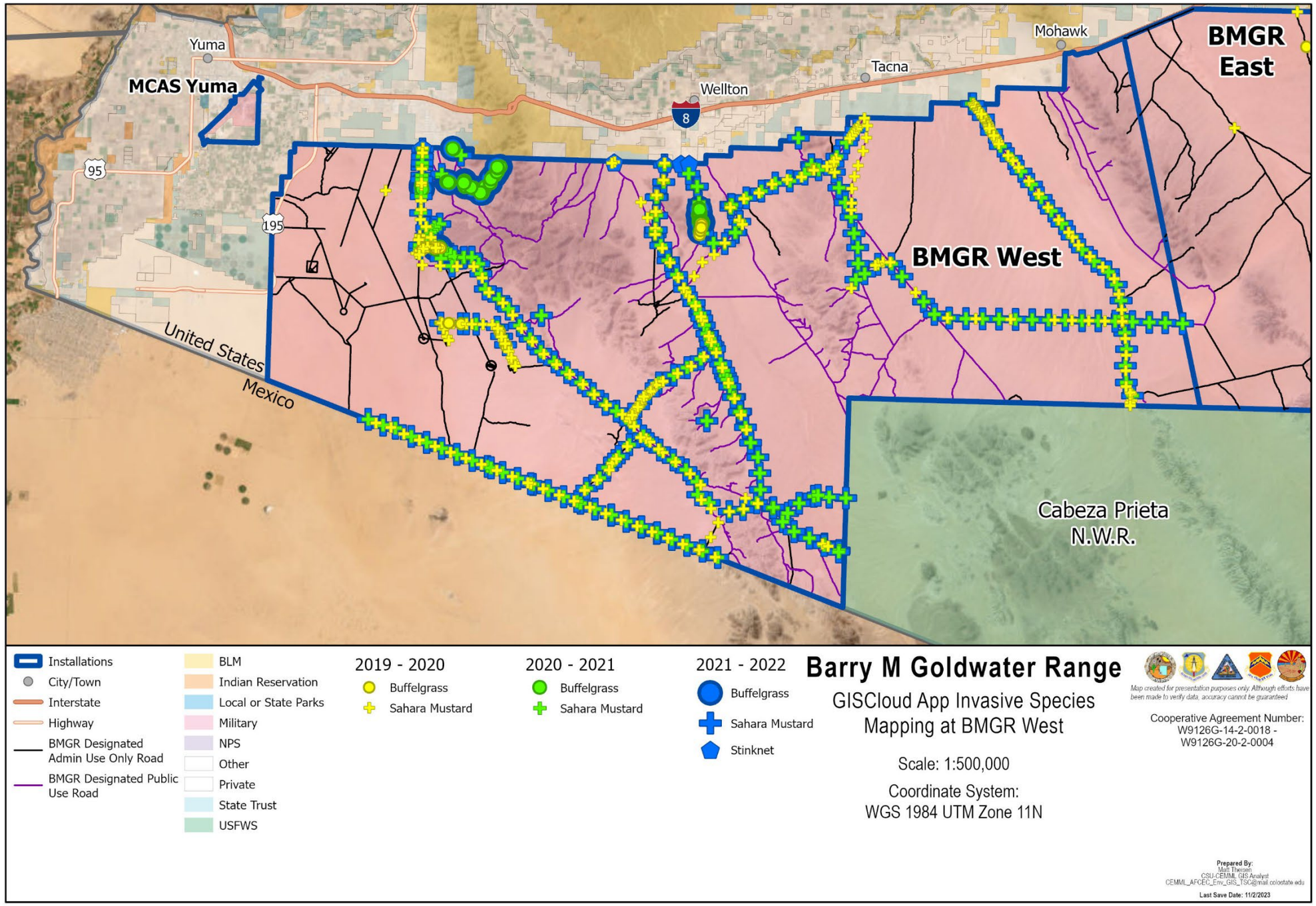

Figure 7-20. Mapping invasive species with the GIS Cloud App at Barry M. Goldwater Range West

7.11.2 BMGR East Trespass Livestock

Since the early 1970s, feral horses and burros (*Equus* spp.) have received protection 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 (FLPMA) and the Public Rangeland Improvement Act of 1978 (PRIA). Technically, these animals are not wildlife; rather, they are descendants of escaped livestock. The term "wild free-roaming" provides special protections to these animals under the WFRHBA. On a national scale, the management of feral horses and burros falls to the BLM or U.S. Forest Service when these animals are found within a designated Wild Horse and Burro Herd Management Area (HMA). HMAs were designated in the PRIA and represent areas where wild horses and burros were documented at the time of the passage of the WFRHBA. Each HMA has an associated management plan that provides specific herd management goals and objectives and determines what each HMA's carrying capacity or Appropriate Management Level (AML) should be. The HMA management plan also determines what the minimum and maximum population levels are for wild horses and burros to allow for population growth over a 4- to 5-year period. Each HMA's AML is determined through a rigorous, multi-year analysis and evaluation of rangeland habitat conditions, including data on each area's vegetation and soil resources. The AML, along with any revision to the AML, is set for each HMA in an open, public process during field planning efforts.

Figure 7-21. Damage to native vegetation by trespass livestock. This ocotillo has been partly girdled by trespass burros.

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 horses and burros in trespass. Herd population evaluations and management constraints are not required, and the management of these trespass animals often defaults to the local land management agency as well as the state. The BMGR does not contain a designated Wild Horse and Burro HMA. The closest HMA to the BMGR is the Cibola-Trigo HMA, located 8 miles north of BMGR West or 40 miles west of BMGR East along the Colorado River; any wild horses or burros found on BMGR are not protected as "wild and free roaming." 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. Previous INRMPs, as well as the annual INRMP reviews, have repeatedly expressed that trespass livestock, specifically cattle, horses, and burros, are a growing problem (Figure 7-21, Figure 7-22).

Impacts of these animals to natural resources are typically greater at BMGR East given its proximity to adjacent grazing allotments and other land uses. Damage inflicted by trespass livestock that have been observed or have the potential to occur at BMGR includes, but is not limited to, the following:

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

- Increased competition with native protected/endangered wildlife species for available forage and water resources (e.g., Sonoran pronghorn)
- Potential for disease transmission to native wildlife species
- Increased soil degradation and erosion potential from trampling and foraging
- 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

Figure 7-22. Trespass burros degrading habitat in Barry M. Goldwater Range East

- Increased public safety risk from livestock/vehicle collisions with potential to impact all range users including:
    - public recreationists
    - CBP
    - 56 RMO and MCAS Yuma RMD staff and support personnel
    - other range managers, and contractors
    - military personnel

- Potential direct negative impacts to the military training mission include but are not limited to:
    - delays, interruptions, and cessation of live-fire training missions if animals are on range
    - increased risk of vehicle collisions during ground-based training efforts
    - increased wildfire risk if trespass animals aid in the dispersal of fire-adapted weed species

Given that BMGR does not contain a designated Wild Horse and Burro HMA and that protections provided under applicable federal law (i.e., WFRHBA, FLPMA, PRIA) do not extend to trespass horses and burros on the Range, the 56 RMO and MCAS Yuma RMD staff wish to develop policies, programs, and methods to aid in the management of these animals.

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. Additionally, livestock observances and issues within the Range are discussed during BEC meetings.

Working with Surrounding Land Management Agencies

The 56 RMO and MCAS Yuma RMD staff will work cooperatively with surrounding land management agencies and individuals (BLM, USFWS, BLM grazing permittees, Tohono O'odham Nation), as well as

the Arizona Department of Agriculture (AZDA) and the AZGFD, to ensure coordinated management of trespass livestock.

Fencing

Figure 7-23. Example of strategic fencing at Barry M. Goldwater Range East to exclude trespass livestock

The BMGR staff recognize that Arizona is a fence-out state, meaning it is the property owner's responsibility to keep animals out, and that the BMGR does not reside in an Arizona no-fence district. While it is unfeasible and not cost-effective to fence the entire military boundary of the BMGR, certain corridors can be effectively fenced off to exclude trespass livestock (Figure 7-23). The BMGR staff will prioritize efforts to work with adjacent BLM staff and BLM grazing permittees to install new wildlife-friendly fencing, as appropriate, 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 infrastructure installed. The USAF is currently working to complete and maintain an 18-mile long fence along the southern boundary of BMGR East to help deter trespass livestock.

Trespass Livestock Removal and Management

Figure 7-24. Trespass livestock at Barry M. Goldwater Range East

Trespass livestock will be prioritized for removal from the BMGR lands following all applicable state and federal laws (Figure 7-24). The BMGR staff will work with ranchers and stakeholders to push back into BLM-managed areas any privately owned, BLM permittee livestock found on the Range. All other privately owned livestock will be rounded up and held for property recovery procedures, as determined by ARS 3-1402 and 43 CFR Subpart 4150. The 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.

For non-branded stray livestock that are not claimed during the established recovery notification period, as outlined in ARS 3-1402, the 56 RMO shall provide a letter to the AZDA stating that all applicable state, federal and DoD rules were followed, allowing the AZDA to produce a Form 1 letter (after the livestock inspection) that will authorize USAF ownership of the animals. On becoming USAF property as determined by the State of Arizona, these animals will be sold at public auction. To initiate this

new trespass livestock removal policy, staff at the 56 RMO are currently pursuing viable procurement methods and opportunities that may be used by a contractor selected to perform duties under an awarded contract. Such duties could include actively riding the Range, 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 law and or an issued Statement of Work. The 56 RMO would also explore the possibility of having the contractor monitor for invasive weeds as well as observe and report on any other known or potential impact to natural and cultural resources.

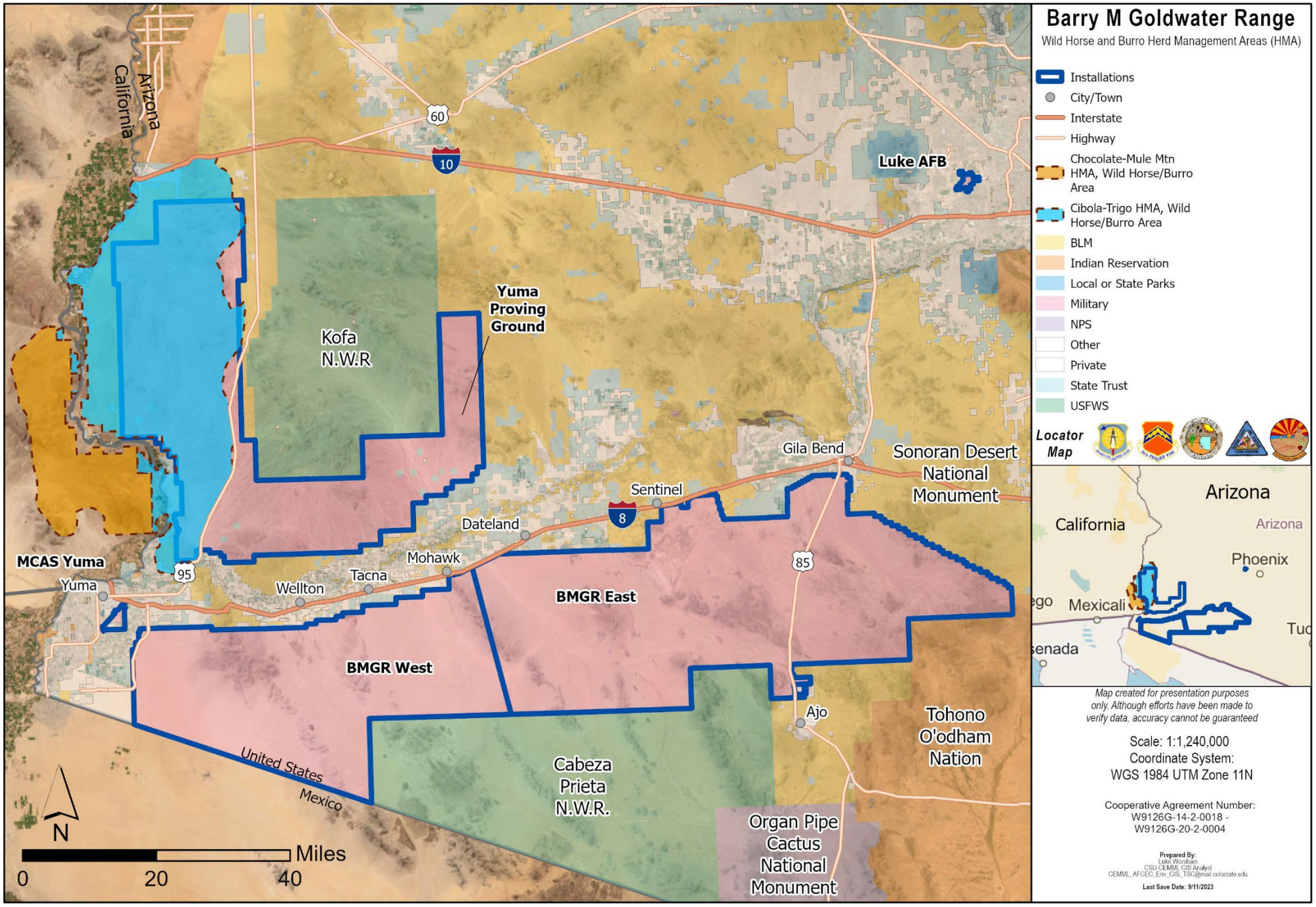

Figure 7-25. Wild horse and burro Herd Management Areas (HMA)

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)

Applicability Statement

This section applies to USAF installations that maintain a BASH program to prevent and reduce wildlife-related hazards to aircraft operations. This section **IS** applicable to this installation.

Figure 7-26. Turkey vultures represent a major Bird Airstrike Hazard threat. Photo courtesy of NPS.

Program Overview/Current Management Practices

The BMGR lies within the Pacific Flyway, a minor flyway for waterfowl and a major flyway for raptors and small songbirds. The BMGR serves as an important training area for aircraft from the 56 FW out of Luke AFB and Marine Corp Air Squadrons out of MCAS Yuma. BASH reduction plans are developed for DoD military installations where elevated hazards exist and can be controlled and mitigated, as is the case at BMGR East and West.

BMGR East

BASH concerns are greatest when aircraft fly at low altitudes (at takeoff and landing) rather than during typical in-flight operations at BMGR (Figure 7-26, Figure 7-27). Luke AFB Instruction 91-212 established a BASH plan that applies to Gila Bend AFAF and BMGR (USAF 2021). IAW this plan, the USAF uses the Avian Hazard Advisory System (AHAS), which is a data-driven, remote-sensing system to alert aviators about the presence of birds in the airspace. The AHAS system evaluates weather and radar data and provides real-time alerts to aviators when large concentrations of birds are in the airspace. The AHAS is available online and coverage includes the entire continental United States. Additionally, as part of the prevention program, AHAS provides pilots and flight schedulers with a near real-time tool when selecting flight routes.

Environmental management guidelines, as identified in the BASH Plan for Gila Bend AFAF, includes controlling vegetation (e.g., maintaining vegetation height between 7 and 14 inches, removing dead vegetation, removing perches), controlling water (e.g., modifying ditches, eliminating standing water), controlling waste (e.g., collecting and disposing waste rapidly), and controlling birds through chemical and physical alterations (e.g., bird-proof structures, insect and rodent control). Priority BASH management actions under this plan include vigilant threat monitoring and reporting, management of the environment both at and surrounding the Gila Bend AFAF, carrion removal along SR 85 to reduce the abundance of large avian scavengers (e.g., turkey vultures), and bird/wildlife harassment and depredation, as required. A private contractor is currently conducting daily threat monitoring at Gila Bend AFAF and for areas of BMGR East near

Figure 7-27. A-10 Thunderbolt II conducting training exercises. Photo courtesy of Luke Air Force Base.

Range 1 and 2. Status reports are issued monthly. These reports summarize, in part, the number of BASH strikes per month; number of BASH threat days per month; number of surveys conducted per month; average number of birds by size; maximum and mean animal counts per month by species; total carrion removed per month and location of disposal; and other environmental information (e.g., wastewater pond depth). In addition to monthly reporting, the contractor is also providing annual BASH reports that summarize and analyze all monthly data and provides useful trend data to the 56 RMO. A summary of the annual BASH management data results for 2017 to 2022 is provided in Table 7-5.

Table 7-5. Summary of Bird Aircraft Strike Hazards management actions taken annually during 2017–2022 at the Gila Bend Air Force Auxiliary Field and other areas at Barry M. Goldwater Range East

Year	BASH Threat Days			BASH Strike	Carrion Removed	Number of Times	
	Low	Moderate	Severe			Wildlife Harassed	Wildlife Depredated
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: Annual BASH Summary Reports for BMGR East (Tunista Services, LLC, and Chiulista Services, Inc. 2017–2022).

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 retained and updated by the 56 RMO and includes all incidents dating back to 2006. Mammal depredation (e.g., rabbits and coyotes) at Gila Bend AFAF is authorized by a permit issued annually by AZGFD to the 56 RMO/ESM and applies only to Gila Bend AFAF.

Primary avian species surveyed under this project include, but are not limited to, turkey vulture (*Cathartes aura*), common raven (*Corvus corax*), raptors (e.g., red-tailed hawk [*Buteo jamaicensis*]), prairie falcon, golden eagle, American kestrel [*Falco sparverius*]), doves (mourning doves, white-winged doves, Eurasian collared-doves), and horned larks (*Eremophila alpestris*) (Table 7-6). Round-tailed ground squirrels are also surveyed at Gila Bend AFAF, as they represent one of the main food sources for raptors. Data are provided in the Annual BASH Summary Report for BMGR East (Tunista Services, LLC, and Chiulista Services 2012–2016). Species included in the "other" category include 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 7-6. Summary of annual Bird Air Strike Hazard survey results for four locations at Gila Bend Air Force Auxiliary Field and Barry M. Goldwater Range East

Species	Year	Gila Bend AFAF		Gila Bend AFAF Perimeter		SR 85 (Range 1 and 2)		Gila Bend AFAF Oxidation Pond	
		Total Individuals	No. Surveys	Total Individuals	No. Surveys	Total Individuals	No. Surveys	Total Individuals	No. Surveys
Avian sp.	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	—	—	—	—	—	—

Table 7-6. Summary of annual Bird Air Strike Hazard survey results for four locations at Gila Bend Air Force Auxiliary Field and Barry M. Goldwater Range East

Species	Year	Gila Bend AFAF		Gila Bend AFAF Perimeter		SR 85 (Range 1 and 2)		Gila Bend AFAF Oxidation Pond	
		Total Individuals	No. Surveys	Total Individuals	No. Surveys	Total Individuals	No. Surveys	Total Individuals	No. Surveys
Other	2020	537	247	—	—	—	—	—	—
Total		**11,027**	**247**	**4,152**	**66**	**2,002**	**105**	**4,907**	**61**
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**

BMGR West

A BASH Reduction Plan, StaO 3750.1D, has been developed and implemented for BMGR West 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. Personnel on the BASH Working Group are listed below:

- Commanding Officer (Chairperson)
- Airfield Operations Officer
- Air Traffic Control Facility Officer
- Conservation Manager
- Aviation Safety Officer
- Natural Resources Specialist
- Pest Management Officer
- Tenant Unit Representatives
- 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. The MCAS Yuma Conservation Manager maintains all required dispersal/depredation permits and harassment/depredation equipment. The MCAS Yuma Conservation Manager also retains all BASH records and ensures that properly trained personnel are available for required management actions. The Conservation Office monitors migratory, seasonal, and resident bird activities and serves as liaison between MCAS Yuma and the USFWS, AZGFD, U.S. Department of Agriculture Animal and Plant Health Inspection Service, and the Audubon Society. All remains from BASH strike incidents are sent to the Smithsonian Institute for official review, identification, and cataloging.

7.13 Coastal Zone and Marine Resources Management

Applicability Statement

This section applies to USAF installations that are located along coasts and/or within coastal management zones. This section **IS NOT** applicable to this installation.

7.14 Cultural Resources Protection

Applicability Statement

This section applies to USAF installations that have cultural resources that may be impacted by natural resource management activities. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The USAF and USMC are responsible for protecting and managing the cultural resources at BMGR IAW a suite of federal laws and regulations (Appendix A). Federal law protects cultural resources that satisfy government criteria for being listed on the National Register of Historic Places. The USAF and USMC, in consultation with Tribes and other interested parties, work with the Arizona State Historic Preservation

Office 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.

BMGR East

The most recent ICRMP for BMGR East was finalized and signed in January 2022 (USAF 2022). A key component of the MLWA is the integration of natural and cultural resource concerns through the successful implementation of the ICRMP and INRMP. These efforts have been identified as a series of projects, some of which are high priorities for the 5 years covered by the ICRMP. The goals of the ICRMP are as follows:

- Follow Section 106 process for new projects
- Continue long-term survey/inventory projects on previously disturbed areas
- Develop and implement programmatic agreement with AZ State Historic Preservation Office 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 both military use zones and public access areas. Public recreation, and the associated effects, are potential threats to cultural resources. To determine the extent of the threat, the programmatic agreement for implementation of the 2007 INRMP required the prioritization of surveys along roads and adjacent areas likely to be affected by public access (56 RMO 2009). Surveys conducted along public access roads in Area B have recorded 107 sites with over 70% of these sites being disturbed by roads, off-road parking, campfires, camping, and vandalism. The USAF developed strategies to protect these resources from public activities such as vehicle-based camping, campfires, theft, and vandalism. Strategies include regular monitoring of known resources, permit enforcement, and increased recreational supervision.

Most of the projects that require surveys of large, contiguous areas are related to military actions. The 56 RMO is committed to systematic surveys of areas affected by ongoing training activities and, as of 2020, surveys had been conducted on 204,428 acres of BMGR East. Surveys and projects that have been completed since the 2012 INRMP are listed below.

- Completed in 2012—Intensive archaeological survey of 1,003 acres on Manned Range 1
- Completed in 2012—Petroglyph recording: Lookout Mountain, Area B
- Completed in 2012–2013—Archaeological survey and condition assessment of the GPS site (AZ Z:5:55 [Arizona State Museum (ASM)])
- Completed in 2012–2013—Stoval Supplemental Project: Resurvey 50 acres and archeological testing of six sites
- Completed in 2013—Pathways to Preservation: Archaeological Research Design and Management Strategy for the BMGR East
- Completed in 2013—Petroglyph recording, Black Tank, Range 2
- Completed in 2014—Intensive archaeological survey of 155 acres for the Sierra del Diablo Sonoran pronghorn forage plot pipeline realignment in the Southern San Cristobal Valley
- Completed in 2014—Emergency archaeological survey, rerecording, and remapping of AZ Z:5:68 (ASM)

- Completed in 2014—Hand excavation testing to determine presence of subsurface archaeological site
- Completed in 2015—Mechanical excavation to determine content and extent of AZ Z:5:68 (ASM)
- Completed in 2015—Draft and final Historic Properties Treatment Plan for data recovery
- Completed in 2015—Archaeological data recovery at five sites within the runway clear zone, Gila Bend AFAF
- Completed in 2015—Intensive archaeological survey of 500 acres in Rankin Valley
- Completed in 2015—Intensive archaeological survey of 154 miles (6,209 acres) and 2,831 acres of interstitial space: recording of 106 sites
- Completed in 2017—Intensive archaeological survey of 1,500 acres of Rankin Valley
- Completed in 2017—Data recovery within the APE of AZ Z:5:68 (ASM), Range 1 Road Emergency
- Completed in 2017—Native American Graves Protection and Repatriation Act (NAGPRA) reburial on the Tohono O'odham Nation
- Completed in 2016—Vanderpot, Rein, et al., Gila Bend Air Force Auxiliary Field: Archaeological Data Recovery at Five Sites and One Isolate within the Airfield Flight-Line Clear Zone, BMGR East, Arizona. Cultural Resource Studies in the Western Papagueria 30, BMGR East Cultural Resource Management Program, Luke AFB, Arizona
- Completed in 2018—Intensive archaeological survey of 23.7 miles of administrative roads that were previously not surveyed in the San Cristobal Valley
- Completed in 2019—Intensive archaeological survey of 2,000 acres of land on Manned Range 2 that were not surveyed and documentation and condition assessment of four Rockshelter sites in Area B, a 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, Sonoran 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

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 Arizona State Parks and public land managers throughout Arizona, including the 56 RMO, and is supported by the Arizona State Parks Foundation. The 56 RMO cultural resource manager serves as the Agency Coordinator for ASSP activities. This role 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 recent (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. It should be noted that 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 shall consult with the tribes to further identify specific natural resource concerns the tribes may have and will work with natural resource staff to address those issues to the best extent reasonably possible moving forward.

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 historic properties needed to sustain the withdrawal of public lands for military operations (USMC 2019). 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, but not limited to, 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, IAW 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 update details the Marine Corps' short- and long-term plans for compliance with Section 110.

7.14.1 Integrated Natural-Cultural Resources Management

There are several areas of overlap in the management of cultural and natural resources on the BMGR. Integrating the ICRMP and the INRMP are essential for meeting the requirements of the National Historic Preservation Act (NHPA); 54 U.S. Code, Sections 101 [d] [1], [d] [6], Section 110 [a] [2], and Section 106; the ESA; NEPA; the Military Lands Withdrawal Act of 1999 (MLWA); AFMAN 32-7003, Environmental Conservation; and DoD American Indian and Alaska Native Policy.

Guidance for cultural resources components integrated into INRMPs is provided in AFMAN 32-7003 and includes the following:

- Compliance requirements might arise for federal regulations under the NEPA, NHPA, Archaeological Resources Protection Act, NAGPRA, American Indian Religious Freedom Act, or an executive order relating to sacred sites and government relations between Native America Tribes and DoD entities.
- The requirements of the above regulations should be considered throughout the INRMP and not constrained to a single section on cultural resources.

- The INRMP must specify which, if any, natural resources management activities may trigger a NHPA Section 106 consultation process such as ground-disturbing activities or agricultural out-leasing. Similar considerations should be provided for other federal regulations described above.
- Archaeological data can help interpret how current environments and natural resources evolved through analysis of bone, pollen, macrofossils, soils, and radiocarbon. Data can be used for modern biodiversity studies and provide information on how the local and regional environments have changed over thousands of years.
- Under AIRFA, EO 13007, and the MLWA, DoD entities are required to allow Tribes reasonable access to sacred and ceremonial sites, such as locations where people traditionally collected certain plants and animals. Through EO 13007, DoD entities are to avoid adverse effects to the physical integrity of sacred sites and to ensure reasonable notice to Tribes when land management policies might restrict future access or impact sacred sites.

It is DoD policy to consult with Tribes and incorporate American Indian views into cultural and natural resources management of military lands. Both ICRMPs and INRMPs must consider the conservation of "protected Tribal resources," which are natural resources and properties of traditional, religious, or cultural importance, either on or off Indian lands, and incorporate this information into management plans.

Consultation with Native American Tribes (hereafter "Tribes"), a key component and requirement of DoD policy and various statutes, has revealed that Tribes consider natural resources to be primarily cultural resources. Therefore, undertakings that affect natural resources are subject to Section 106 review, in addition to natural resource legislation and regulatory process when endangered species are involved.

Tribes have a living connection to the landscape; it is dotted with significant places. Tribal cultural and spiritual values are based on the interwoven nature of plants, animals, water, earth, sky, wind, fire, and people. Tribes do not compartmentalize natural or cultural resources, as Western science does; rather, they are interwoven or integrated; the physical and the spiritual worlds intersect.

In consultation with Tribes culturally affiliated with the BMGR, a review of oral histories, myths, and songs has resulted in the identification of general categories of natural resources that are cultural resources and/or of cultural, religious, or traditional importance. Cultural affiliation studies conducted by Tribes identify specific plants, animals, minerals, and locations on the BMGR that are important to them. The Tohono O'odham Nation has identified 36 natural waters, 55 places in the landscape, several plants, and several animals that are important to them.

What is clear is that the perspective of Tribes, their Traditional Environmental Knowledge (TEK), and the living connection to the land are important for resource managers. TEK is the evolving knowledge held by indigenous and local cultures about their immediate environment and the cultural practices that build on that knowledge (USFWS 2011). TEK is location specific and includes detailed knowledge of the relationships between plants, animals, natural phenomena, landscapes, and timing of events that are used for lifeways, including but not limited to hunting, fishing, trapping, agriculture, and forestry; and a holistic knowledge or "world view" that parallels the scientific discipline of ecology (USFWS 2011). This body of knowledge, practice, and belief continually evolves by adaptive processes and is handed down through generations by cultural transmission about the relationships of living beings (human and non-human) with one another and with the environment. For Tribes, the cultural or spiritual values of plants, animals, and physical aspects of the landscape may differ significantly from those of resource managers familiar with Western Science. For example, natural surface waters, such as *tinajas*, are altered to provide water for game animals. *Tinajas* are archaeological sites based on the presence of grinding features and tools; they are a specific type (Traditional Cultural Property/Place) of Historic Property that is eligible for inclusion in the

National Register of Historic Places; and they are Sacred Sites. Tribes have requested that alterations to *tinajas* or other natural waters be removed and that no new alterations occur in the future.

Examples related to BMGR include the following:

- Tribes have identified plants and animals that western science considers to be endangered species, such as the Sonoran pronghorn, but to Tribes they are a common game animal.
- Plants and animals that western science considers common or not of great importance may to Tribes be endangered, threatened, sacred and/or powerful.
- The Tohono O'odham Nation has identified Yerba Manza, a medicinal plant, as endangered because it has become rare, while to western science it is common.
- Perhaps one of the most important animals to the Tohono O'odham Nation and other Tribes is the coyote. In western science, coyotes are a controversial predator but an essential component of the ecosystem. To the Tohono O'odham Nation, coyote is one of four primordial beings in the Creation Epic, an extremely important archetype for human characteristics or traits (jokester). It plays a role in sickness, is a character in many stories, and is never eaten.

Integrated resource management requires that cultural and natural resource managers must work closely together. Section 2.7 of the Cultural Resource Playbook, which along with AFMAN 32-7003, Environmental Conservation, addresses integration of the INRMP and ICRMP as follows:

- Identify natural resources and properties that are of traditional, religious, or cultural importance to Tribes.
- Identify the cultural values and importance of plants, animals, water, and features of the physical environment, particularly for specific projects and overall land management.
- Ensure that the ICRMP accounts for cultural resources that should also be managed as natural resources.
- Ensure that the INRMP accounts for natural resources that should be managed as cultural resources such as natural surface waters that are considered historic properties and Sacred Sites.
- Ensure management of endangered species shall consider the ideas and perspectives of Tribes.
- Ensure that consultation with Tribes explains and depicts consultation and reporting requirements when undertakings or other management actions have the potential to affect protected Tribal natural/cultural resources.
- Ensure that DoD policy and the requirement of statutes and regulations are known to cultural/natural staff and factored into the ICRMP and INRMP.

In addition, TEK should be incorporated into resource management plans, projects, and research. An executive memorandum, *Indigenous Traditional Ecological Knowledge and Federal Decision Making*, published on 15 November 2021, provides guidance that federal entities should recognize that TEK contributes to scientific, technical, social advancements and to our collective understanding of the natural world. TEK is a body of observations, oral and written knowledge, practices, and beliefs that promote environmental sustainability and responsible stewardship of natural resources.

TEK and western science are each a separate body of knowledge that overlap and can be complementary. TEK can be used to guide empirical or experimental studies to learn more about plant–animal interactions. Testing indigenous hypotheses through western scientific processes to identify the relative degree of exclusivity of relationships could result in additional insights of significance to ecological and evolutional theory (Nabhan 2000). A number of these studies have revealed that indigenous knowledge of biotic relationships involving rare plants or animals can help guide the identification, management, protection, or

habitat recovery for these species (Nabhan 2000). As such, TEK can help fill the gaps in western science and has a relevant and meaningful role in a government agency's decisions.

The USFWS, in coordination with representatives from Tribes across the country, worked together to update the USFWS policy (USFWS 2016*b*), which provides guidance for inclusion of TEK into management decisions. This means using the best available data and soliciting and considering other sources of information, such as the traditional knowledge and experience of affected Tribal governments in policies, military actions, and determinations that have Tribal implications. To incorporate TEK into its land management decisions, the USFWS Native American Policy states that resource managers should promote enhanced and ongoing communication, cooperation, and trust with Tribes and consider the traditional knowledge, experience, and perspectives of Native American people to manage fish, wildlife, and cultural resources (USFWS 2016*b*). Working collaboratively with local Tribal governments, government agencies can help to protect confidential or sensitive information, including location, ownership, character, and use of cultural resources and sacred sites where disclosure may cause a significant invasion of privacy; risk harm to the historic resource; or impede the use of a traditional religious site by practitioners, to the extent allowed by law (USFWS 2016*b*).

Although the DoD does not currently have a policy that explicitly directs DoD agencies to incorporate TEK into its management philosophy, directives, instructions, and other relevant documents spell out the need to address concerns and needs of federally recognized American Indian Tribes and keep them in communication loops regarding decisions and actions that could affect their lands, resources, and quality of life. Air Force Policy Directive 30-70, section 3.3, stipulates that "the Air Force will conserve natural and cultural resources through effective environmental planning." Policy 1.3.1 of AFI 90-2002 (*Air Force Interactions with Federally Recognized Tribes*) directs the USAF to "take into consideration the significance that Tribes place on protected Tribal resources." Policy 1.5.2 of AFI 90-2002 further specifies that "since most Tribes attribute cultural significance to natural resources, Tribes should be briefed on the content of the natural resources program and provided the opportunity to consult on and participate in, as appropriate, updates or development of INRMPs, AFMAN 32-7003, Natural Resource Management Program IAW the Installation Tribal Relations Plan." Involving Tribal representatives in decisions regarding natural resource projects, particularly those involving eagles and other protected species, will help to ensure that TEK is taken into consideration. Additionally, on 1 December 2022, the Executive Office of the President released an executive memorandum that provided guidance for federal departments and agencies on Indigenous Knowledge. This memorandum directed agencies to recognize and include indigenous knowledge of tribal nations on research, policy, and decision making across the executive branch. Finally, the USMC handbook for preparing, revising, and implementing INRMPs states that "Marine Corps installations must consult with federally recognized Indian Tribes whose interest may be affected by land management on the installation when preparing an INRMP…. In consultation for the INRMP, American Indian Tribes may identify areas and resources present on the installation that are important to the Tribe, provide advice on conservation needs and priorities, and share their specialized knowledge of the resources on the installation."

7.15 Public Outreach

Applicability Statement

This section applies to all USAF installations that maintain an INRMP. Installation **IS** required to implement this element.

Program Overview/Current Management Practices

As the primary users and managers of BMGR East and West, the USAF and the USMC, respectively, have been delegated several responsibilities. One of these responsibilities is to manage the Range in a way that ensures long-term use of the facility as a premier military training location while also ensuring 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 the BMGR. This section provides an overview of the various public involvement programs and opportunities. Focus areas for public involvement programs are listed below.

- Tours
- Published articles
- Speaking events
- Media coordination
- Special projects and events
- Miscellaneous requests and participation in events
- Social media

7.15.1 BMGR Executive Council

The BEC includes representatives of federal and state agencies with statutory authority and management responsibility for the Range and adjacent federal lands, and the resources on those lands: 56 FW, MCAS Yuma, BLM, USFWS, AZGFD, CBP, and directors for the adjacent Sonoran Desert NM, Organ Pipe Cactus NM, and Cabeza Prieta NWR. The BEC has a permanent Coordinator and an Administrative Liaison that are funded by the USAF and located in the 56 RMO, and a rotating chairman. The council meets six times a year to share information and discuss and propose solutions to regional issues.

7.15.2 BMGR Intergovernmental Executive Committee

The MLWA of 1999 directed the Secretary of Interior, Secretary of the Air Force, and the Secretary of the Navy to establish an Intergovernmental Executive Committee (IEC) to be composed of selected representatives from federal, state, local, and Tribal governments. The IEC is established solely for the purpose of exchanging views, information, and advice relating to the management of natural and cultural resources of the withdrawn lands. The IEC is currently chaired by the MCAS Yuma Conservation Manager and is composed of representatives from the USAF, USN, 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. IEC meetings provide opportunities to educate and seek input from the public and special interest groups on management of BMGR's natural resources. 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. The IEC meeting minutes are posted on a public website.

BMGR East

Public outreach efforts by the USAF provide input on the development of information and infrastructure improvements to facilitate public recreational activities, as follows.

- Updated public visitation maps and rules for public education and recreation use.
- An informational video for visitors that addresses safety and environmental awareness.
- Installation of signs, gates, and fences to support road infrastructure and public access.

- 56 RMO biologists and archaeologists give presentations for the public as well as at local and national professional meetings.

The USAF conducts public meetings on various issues that are announced via its website, newsletters, mailings, newspaper advertisements or legal notices, and other means. Luke AFB maintains a web page containing information for BMGR East public outreach opportunities (http://www.luke.af.mil/News/).

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

BMGR West

Public outreach efforts by the USMC have included improving information and infrastructure 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 public access 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.
- 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 non-governmental 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.

The CLEOs are primarily responsible for MCAS Yuma's public outreach efforts because they patrol the Range 7 days a week. In addition, visitors are provided with a brochure that includes a detailed map of road classification (i.e., public, closed, administrative access) and a list of approved and prohibited recreational activities. Guided range tours (e.g., mine tours) can be scheduled through the RMD staff. Finally, the RMD promotes public outreach by supporting research opportunities, publication of research results in peer-reviewed journals, and researcher participation in science conferences and symposiums.

7.16 Climate Change Vulnerabilities

Applicability Statement

This section applies to USAF installations that have identified climate change risks, vulnerabilities, and adaptation strategies using authoritative region-specific climate science, climate projections, and existing tools. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Climate vulnerability in this case refers to the degree to which an installation and its natural resources are susceptible to shifts in the environment due to climate change. At the BMGR, the climate is projected to become warmer, with alterations in the magnitude and seasonality of precipitation (see Section 2.2.1.2). The Range may be susceptible to the following climate-related issues:

- Shifts in the **ecosystem and biotic environment**, including possible expansions of invasive vegetation (Section 2.3.2), loss of native vegetative cover (Section 2.3.2), and reduced water availability and quality for wildlife during the summer dry period (Section 2.3.3)
- Indirect threats to the **mission**, including more frequent equipment and infrastructure maintenance requirements due to increased windspeed/dust, greater summer drought potential due to warmer temperatures, and a potentially enhanced regulatory environment (Section 2.4.5.1)
- Shifts in habitat quality for both invasive/nuisance species and native species, potentially requiring additional **wildlife management** activities (Section 7.1.2)
- Additional impacts to **threatened and endangered species**, including lower water availability, greater heat stress, and shifts in phenology (Section 7.4)
- Increased **wildland fire** activity, especially if invasive grasses continue to expand (Section 7.9)

The best available science was used to develop the global climate models from which the downscaled projections and related climate vulnerability assessments were derived. However, there are gaps in data about the complex feedbacks in this system, which add uncertainty to the climate projections (IPCC 2014). The projections provided in this document are therefore intended to demonstrate the range of conditions to which natural resource managers may have to adapt.

7.17 Geographic Information Systems (GIS)

Applicability Statement

This section applies to all USAF installations that maintain an INRMP, since all geospatial information must be maintained within the USAF GeoBase system. Installation **IS** required to implement this element.

Program Overview/Current Management Practices

GIS is used in daily operations because these data support the natural and cultural resource and environmental stewardship programs while supporting the military operations on BMGR. Over the next 5 years, geospatial data will be updated periodically, and new types of GIS datasets will be collected and processed including, but not limited to, the following actions:

- Further refining and delineating suitable important wildlife habitats and corridors
- Monitoring and tracking sensitive and endangered wildlife and plant species
- Monitoring and managing habitat disturbance and restoration efforts
- Monitoring and tracking invasive species and reporting control effort results
- Monitoring and tracking trespass livestock and monitoring impacts associated with their presence
- Analyzing projects for NEPA compliance and storing data for regulatory reporting
- Updating the transportation road layer including delineating new unauthorized routes as well as reviewing the road conditions and updating the status of the road network
- Identifying and monitoring cultural resource sensitivity zones
- Completing BMGR East range wide vegetation mapping effort and completing integration and edge matching with other similar regional vegetation mapping products (e.g., Malusa 2003)

- Monitoring and delineating drag road impacts and prioritizing areas for restoration and maintenance
- Updating infrastructure layers as the military training mission changes and as the CBP's mission is modified

BMGR East

USAF Instruction 32-10112, Installation Geospatial Information and Services (USAF 2007), provides the policy and guidance for GIS management on all USAF installations. Geospatial data are maintained and managed by the 56 RMO Environmental Science and Management Office. The GIS server resides in the 56 Communication Squadron Network Communication Center and on the Non-classified Internet Protocol Router Network (NIPRNet). Additionally, the geospatial data are maintained within the USAF GeoBase System and services are provided through the GIS database that is centrally located on the server. The BMGR East GIS program uses software from ESRI (Environmental Systems Research Institute) for GIS data management and use. 56 RMO Environmental Science Management Office and 56 Civil Engineer Squadron adhere to the Spatial Data Standards for Facilities, Infrastructure, and Environment, as required by the DoD, to provide GIS standardization for table structure, metadata, and data storage among all DoD installations.

BMGR West

USMC MCO 11000.25a, Installation Geospatial Information and Services Program, also referred to as USMC Installation Geospatial Information and Services (GEOFidelis), provides the policy, guidance, and standards for acquiring, protecting, and utilizing geospatial data and GIS data management in support of USMC installations. Geospatial data are maintained and managed by the MCAS Yuma RMD within the USMC GEOFidelis System. The GEOFidelis program goal is to ensure that USMC installation geospatial data are complete, accurate, current, and available as a USMC-wide resource. The MCAS Yuma RMD and MCAS Yuma Civil Engineer/GIS Department adheres to the Spatial Data Standards for Facilities, Infrastructure, and Environment, as required by the DoD, to ensure GIS standards are used for table structure, metadata, and data storage among all DoD installations.

8.0 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes long-term, expansive goals and supporting objectives to manage and protect natural resources while supporting the military mission. Goals express a vision for a desired condition of the installation's natural resources and are the primary focal points for INRMP implementation. Objectives indicate a management initiative or strategy for specific long- or medium-range outcomes and are supported by projects. Projects are specific actions that can be accomplished within a single year. Also, in cases where off-installation land uses may jeopardize USAF and USMC missions, this section may list specific goals and objectives aimed at eliminating, reducing, or mitigating the effects of encroachment on military missions. These natural resources management goals for the future have been formulated by the preparers of the INRMP from an assessment of the natural resources, current condition of those resources, mission requirements, and management issues previously identified. Below are the integrated goals for the entire natural resources program.

The installation goals and objectives are displayed in the "Installation Supplement" section below in a format that facilitates an integrated approach to natural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

Installation Supplement—Management Goals and Objectives

GOAL 1 MAINTAIN AND ENHANCE NATURAL AND CULTURAL RESOURCES BY MEETING REQUIREMENTS OF APPLICABLE RESOURCE MANAGEMENT REGULATIONS. FOLLOW MANAGEMENT PLANS TO ENSURE RESOURCES ARE SUSTAINED FOR COMPATIBLE USE BY FUTURE GENERATIONS WHILE SUPPORTING THE EXISTING AND FUTURE MILITARY MISSION OF BMGR.

OBJECTIVE 1.1 Identify, protect, conserve, and manage plant communities and populations to promote species diversity and to comply with regulatory requirements for threatened and endangered species and other sensitive and/or important species.

PROJECT 1.1.1 Monitor long-term vegetation monitoring plots on 5-year intervals at BMGR East and continue regional collaboration to analyze and contextualize data. Initiate a similar program of vegetation monitoring on BMGR West

PROJECT 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.

PROJECT 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.

OBJECTIVE 1.2 Inventory, monitor, and control invasive species to protect sensitive natural resources, improve native habitat, and reduce the potential for negative fire impacts per biological opinions and Executive Orders 13112 and 13751.

PROJECT 1.2.1 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.

PROJECT 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.

PROJECT 1.2.3 Ensure a quick response capability on invasive species on BMGR East and West, 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.

PROJECT 1.2.4 Perform at least annual chemical or mechanical control or prevention of desert gourd, buffelgrass, tamarisk, Sahara mustard, and stinknet infestations to prevent degradation of habitat for Sonoran pronghorn, acuña cactus, flat-tailed horned lizard, Sonoran Desert tortoise, and other native species at BMGR East and West.

PROJECT 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).

PROJECT 1.2.6 IAW MLWA 1999 (P.L. 106-65 § 303(c)(6)) and the 2015 Biological Opinion (BMGR West), prevent and suppress fires by assessing fuel loads in high-risk ignition sites such as targets, MV-22 landing sites and public use areas and evaluate the need for fuels reduction and/or invasive species control to reduce fire spread. Annually budget for fuels assessment and treatment projects sufficient to meet the need for fuels reduction.

OBJECTIVE 1.3 Survey for, monitor, and manage for threatened, endangered, and other protected wildlife species IAW the ESA and BGEPA.

PROJECT 1.3.1 Annually support bald eagle nest watch, golden eagle surveys, and assess potential for powerline electrocution of raptors at BMGR East and West.

PROJECT 1.3.2 Survey for golden eagle nests on BMGR East using aircraft systems to inform management actions and eagle avoidance measures.

PROJECT 1.3.3 Continue the commitment to affirmative conservation efforts and survey for cactus ferruginous pygmy-owl populations at 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.

PROJECT 1.3.4 Complete annual Sonoran pronghorn recovery actions at BMGR East and West as stipulated in the BOs pertaining to BMGR, existing recovery plans, 56 RMO Operating Instruction, and/or as determined by the interagency Sonoran Pronghorn Recovery Team.

PROJECT 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.

PROJECT 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.

PROJECT 1.3.7 Continue to brief all military users on BMGR (including aircrews, ground troops, and support personnel) on federally threatened and endangered species that may be affected by training or support activities, as required by the 2009 and 2015 Biological Opinions.

OBJECTIVE 1.4 Monitor, protect, and conserve wildlife and wildlife habitat to promote species diversity, identify areas in need of special management provisions, and support viable and sustainable animal populations as stipulated in the Sikes Act.

PROJECT 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.

PROJECT 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 is collected in a cost-effective manner but consistent with regional efforts to facilitate regional collaboration.

PROJECT 1.4.3 Support and participate in annual AZGFD surveys for game species at BMGR East and West.

PROJECT 1.4.4 Collaborate with AZGFD on an annual basis to identify and maintain corridors for wildlife habitat connectivity at BMGR East and West.

PROJECT 1.4.5 Conduct annual bat surveys at BMGR East and West using various survey techniques such as acoustical, mist netting, roost assessment, etc. IAW the North American Bat Monitoring Program (NABat) protocols.

PROJECT 1.4.6 Monitor and protect identified bat roosts near public access areas during the maternity season and through hibernation at BMGR East and West by establishing signs near roosts that restrict access to the immediate area.

PROJECT 1.4.7 Monitor kit fox populations at BMGR East through scent station methods.

PROJECT 1.4.8 Continue ongoing program of population monitoring at wildlife watering sites at BMGR East and West.

PROJECT 1.4.9 Support AZGFD in conducting surveys for FTHL at BMGR West as outlined in the Rangewide Management Strategy developed by the FTHL Interagency Coordinating Committee.

PROJECT 1.4.10 To inform potential Yuman desert fringe-toed lizard listing process and prevent designation of critical habitat on BMGR, monitor occupancy and demography of the species on BMGR West.

PROJECT 1.4.11 Develop a project to determine what factors besides temperature (Grimsley-Padron and O'Donnell 2020) influence detection of FTHL.

PROJECT 1.4.12 Develop a project to determine a way to quantify presence of ant colonies to assess whether this measure of prey abundance correlates with FTHL presence.

PROJECT 1.4.13 Develop a project to investigate how the presence of predators is correlated with FTHL presence.

PROJECT 1.4.14 Conduct surveys for the Mohawk Dunes fringe-toed lizard at BMGR West and East to assess the species population status, distribution, and threats on the Range.

PROJECT 1.4.15 On a 5-year rotation establish and implement a baseline inventory method to capture small mammal, breeding bird, reptile, and amphibian diversity and population status at BMGR West and BMGR East.

PROJECT 1.4.16 Using survey results, develop potential distribution maps of documented wildlife at BMGR West and East. Use maps and survey results to provide further monitoring and management recommendations.

PROJECT 1.4.17 Develop a protocol for bird surveying at BMGR East and West that is based on and consistent with protocols of other agencies in the region.

PROJECT 1.4.18 Evaluate the impact of non-game species collection on wildlife and habitat, developing guidelines to limit or restrict collection at BMGR East and West based on results.

PROJECT 1.4.19 Identify areas where native milkweeds can be planted at BMGR East and West to increase monarch habitat while managing for potential BASH and other mission-related issues.

PROJECT 1.4.20 To inform potential monarch listing process and prevent designation of Critical Habitat on BMGR, monitor native milkweed populations on BMGR East and West. Record any evidence of monarch butterfly breeding IAW Presidential memorandum “Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators”.

PROJECT 1.4.21 Annually evaluate implementation of monarch BMPs (Section 7.4.7) at BMGR East and West. Address areas of possible improvement.

PROJECT 1.4.22 Evaluate whether a survey is warranted for ESA candidate pollinators likely to occur at BMGR East and West (e.g., Western bumble bee, Ferris’ copper, and monarch butterflies).

PROJECT 1.4.23 Identify and evaluate locations of special interest for protection at BMGR West using collection and analysis of remotely sensed and field data.

PROJECT 1.4.24 Ensure data collected during surveys is submitted for entry into federal and state supported databases, such as the Avian Knowledge Network (AKN) and NABat.

OBJECTIVE 1.5 Identify and restore human-altered and/or animal and livestock trespass-degraded plant and animal habitats where required by regulation under the Sikes Act, and in non-regulatory cases depending on budgetary constraints.

PROJECT 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 and West resources to aid in decision-making and project development.

PROJECT 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 and West using 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).

PROJECT 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.

PROJECT 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.

PROJECT 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.

OBJECTIVE 1.6 Monitor and manage surface water, groundwater, and atmospheric data resources to understand, protect, maintain, and improve water quality and quantity while supporting the needs of the military mission.

PROJECT 1.6.1 Operate and support the 12 existing remote-access weather stations, plus the additional 15 rain gauges at sites across BMGR East.

PROJECT 1.6.2 Upgrade weather stations on BMGR West to wirelessly communicate with Luke AFB.

PROJECT 1.6.3 Annually monitor groundwater levels at BMGR East wells and document results.

PROJECT 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.

PROJECT 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 and West. Possibly use solar energy for pumping out stored rain/storm water if needed. Support construction of up to five new waters on BMGR West, two of which have sites selected.

GOAL 2 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.

OBJECTIVE 2.1 Cooperate and coordinate with adjoining landowners, agencies, and organizations to promote achievement of conservation, protection,

and compliance goals and to create, facilitate, and participate in positive public relations activities.

PROJECT 2.1.1 Annually assess fire risk through the application of the wildland fire management plans at BMGR East and West and implement restrictions as needed. Maintain firefighting agreement with the BLM.

PROJECT 2.1.2 Support research proposals developed by universities, agencies, and other parties to address issues of management concern at BMGR East and West. Cooperate with researchers formally and informally, providing management information and site access where possible.

PROJECT 2.1.3 Cooperate with ADOT, BLM, CBP, utility companies, and other parties regarding proposed actions within existing utility/transportation corridors on BMGR East and West.

PROJECT 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).

PROJECT 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 as required in the 2015 BMGR West Biological Opinion.

PROJECT 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.

PROJECT 2.1.7 Recruit, train, and retain sufficient NRM and CLEO staff (four on BMGR West IAW the 2015 Biological Opinion, and two on BMGR East) to manage natural resources efficiently and effectively at BMGR East and West.

OBJECTIVE 2.2 Develop and implement best management practices, including education of and partnerships with resource users, to promote soil conservation, reduce erosion, and restore and/or rehabilitate degraded areas.

PROJECT 2.2.1 Conduct annual erosion inspections of priority heavy road use areas and drag road monitoring at 10 sites on BMGR East.

PROJECT 2.2.2 Conduct erosion inspections of secondary and tertiary roads at BMGR East on a 3-year rotation.

PROJECT 2.2.3 Coordinate with contractors, researchers, engineers and/or other partners to evaluate road maintenance practices at BMGR East and West that are erosive and non-sustainable, explore engineering and other strategies to mitigate these issues, and develop proposals for implementation.

PROJECT 2.2.4 When conducting management or other project activities at BMGR East and West, control fugitive dust to prevent erosion, protect natural resources, enhance visitor experiences, and

protect activities associated with the military mission.

PROJECT 2.2.5 Implement the BMP manual in development to repair eroded sites on BMGR East.

PROJECT 2.2.6 Evaluate emerging engineering strategies and designs for possible implementation on BMGR West where applicable. Prioritize focus toward maintaining streamflow, mitigating route proliferation, and restoring roads to their historical footprint.

GOAL 3 PROVIDE FOR 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.

OBJECTIVE 3.1 Plan and implement projects that address continued land-based access for mission needs, natural resources management, law enforcement, and sustainable multipurpose uses including public access and access to sacred sites, hunting grounds, and traditional cultural places by authorized groups, while protecting resources, minimizing conflict, and promoting safety.

PROJECT 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 and West.

PROJECT 3.1.2 Conduct an annual assessment and implementation of needed updates to public visitation maps for BMGR East and West based on site monitoring, including information about road restrictions, clarification of rules, and resource protection.

PROJECT 3.1.3 Create and support public awareness projects at BMGR East and West to educate base personnel and the public about BMGR's cultural and natural resources and related conservation and preservation activities.

PROJECT 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 both BMGR East and West.

PROJECT 3.1.5 Continue using outdoor recreation access management systems for BMGR East and West 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.

PROJECT 3.1.6 Compile recreation use-statistics and related information about public area access at BMGR East and West, analyzing use patterns, and identifying and monitoring heavily used areas.

PROJECT 3.1.7 Maintain and update BMGR East and West recreational-use database based on permits to inform and support resource management decision-making.

PROJECT 3.1.8 Install and maintain signage, gates, and fencing at range entry points at BMGR East and West, along perimeters when needed and at all road intersections.

PROJECT 3.1.9 Evaluate site-specific proposals for BMGR West to assess need for, and possible impacts from, additional roads for agency purposes.

OBJECTIVE 3.2 Protect and/or enhance the integrity and diversity of visual resources including the scenic qualities of the landscape through natural resource management activities and consideration of site development needs.

PROJECT 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.

PROJECT 3.2.2 Opportunistically conduct surveys/assessments of native wood supplies and collection patterns at BMGR East. Restrict collection as conditions dictate.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

The Sikes Act encourages the DoD to provide adequate staffing with the appropriate expertise for updating, writing, and implementing the INRMP within the scope of DoD component responsibilities, mission, and funding requirements.

BMGR East

The 56 RMO/ESM includes archaeologists, wildlife biologists, geographers, environmental planners, and a public affairs specialist. The 56 RMO/ESM supports military training by managing the natural and cultural resources of the Range IAW applicable laws, EOs, and directives. The 56 RMO/ESM also provides Contracting Officer's Representative oversight of the Sonoran pronghorn monitoring function of the Range operations contract, and ESM staff serves as the Contracting Officer's Technical Representative on contracts for cultural resources, conservation law enforcement, and other services. One 56 RMO/ESM personnel is a Contracting Officer's Representative for Gila Bend AFAF contracts. Additionally, the CLEO Program is a national program with USAF and USFWS agreements.

BMGR West

The MCAS Yuma RMD staff are experts in the fields of natural and cultural resources management and conservation law enforcement. The staff is devoted to providing the resources and expertise in the planning and implementation of advanced training and exercises while fulfilling the goals and objectives of this INRMP.

9.2 Monitoring INRMP Implementation

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, FTHL, and Sonoran Desert tortoise). This revised INRMP continues to rely heavily on the most current biological data sets, general and species-specific wildlife surveys, research projects, and regional data sets.

Over the next 5-year period, factors upon which this INRMP is based may change, including military mission requirements, federal lists of threatened and endangered species, CBP's destructive behavior to natural and cultural resources, information available for listed species and their ecosystems, as well as the understanding of anthropogenic impacts on resources. The implementation of this INRMP will follow an adaptive management approach that acknowledges uncertainty and monitors the various INRMP components and lessons learned with the end goal of improving the BMGR's future management actions and ecosystem health.

9.3 Annual INRMP Review and Update Requirements

This INRMP update identifies proposed amendments to the 2018 INRMP and changes to natural resources management practices that would be implemented during the subsequent 5-year period. This INRMP revision is available to the public, state and local governments, and Native American Tribes on the Luke AFB and MCAS Yuma websites.

This is the third update of the original 2007 BMGR INRMP prepared in support of an ongoing process to review and update the INRMP every 5 years. This 2023 update of the INRMP was prepared IAW the MLWA of 1999, which provides that periodic reviews of the BMGR INRMP be conducted jointly by the Secretaries of the Navy, Air Force, and Interior, and that affected states and Native American Tribes, as

well as the public, are provided a meaningful opportunity to comment upon any substantial changes to the INRMP (P.L. 106-65 § 3031(b)(3)(E)(ix)). As part of the update process, a Public Report was distributed to describe the changes in military use, environmental conditions, and public access opportunities that have occurred since the 2018 INRMP update. The report also provides an account of the resource management and public involvement activities that have transpired during the same period. This updated INRMP includes information based on the comments received on the Public Report and responses to those comments. The next review and update of the BMGR INRMP is currently scheduled for 2028. A Public Report chronicling changes at BMGR during each 5-year review cycle will be issued concurrent with subsequent revisions.

If warranted, proposed management decisions regarding INRMP amendments and changes to management practices will be reviewed under the auspices of NEPA before being implemented. For this current INRMP update, no changes have been identified that warrant the preparation of a NEPA document.

10.0 ANNUAL WORK PLANS

The INRMP Annual Work Plans are included in this section. These projects are listed by fiscal year, including the current year and four succeeding years. For each project and activity, a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source and priority for implementation. The work plans provide all the necessary information for building a budget within the USAF framework. Priorities are defined as follows:

- High: The INRMP signatories assert that if the project is not funded, the INRMP is not being implemented and the USAF is non-compliant with the Sikes Act; or that it is specifically tied to an INRMP goal and objective and is part of a "Benefit of the Species" determination necessary for ESA Sec 4(a)(3)(B)(i) critical habitat exemption.
- Medium: Project supports a specific INRMP goal and objective and is deemed by INRMP signatories to be important for preventing non-compliance with a specific requirement within a natural resources law or by EO 13112, *Exotic and Invasive Species*. However, if the INRMP is not accomplished within the programmed year due to other priorities, signatories would not contend the lack of INRMP implementation.
- Low: Project supports a specific INRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or supports long-term compliance with specific requirements within natural resources law; but is not directly tied to specific compliance within the proposed year of execution.

The tables below provide the USAF and USMC action plans or work plans. Before proposed action steps, priorities, funding requirements, or other factors for the next 5 years are finalized, range managers will consider the public input, consultations with Native Americans, and any additional partner agency feedback. These lists will be reviewed annually to evaluate progress completed and to adapt the lists, when appropriate, to address emerging issues, changing priorities, availability of funds, or other issues.

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 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 5-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, and 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.

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
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 2 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 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 BMGR

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
										East every 3 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 identify suitable habitat every 3 years to continue the 56 RMO's long history of tortoise conservation and management, support listing decisions, and prevent designation of critical habitat.

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
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 AGFD 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 AGFD 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 North American Bat Monitoring Program (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.

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
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.
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 5-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.

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 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	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 are 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

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
										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/Intra-agency, 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 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/Intra-agency, 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

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
										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 AGFD 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.

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
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.
Manage Real Property	2	2.1	24-28	56 RMO	AFCEC	Low	INRP	Interagency/Intra-agency, 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/Intra-agency, 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/Intra-agency, 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

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
										with local stakeholders in conservation efforts for the Sonoran Desert ecosystem.
Public Use	2	2.1	24-28	56 RMO	AFCEC	High	INRP	Interagency/Intra-agency, Government, Sikes Act, CLEO	2.1.7	Recruit, train, and retain sufficient NRM and CLEO staff (four on BMGR West IAW the 2015 Biological Opinion, and two on BMGR East) 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 3-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.

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
Resource Management	2	2.2	24-28	56 RMO	AFCEC	Low	INRP	Mgt, Habitat; Interagency/Intra-agency, 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.
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

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
										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

Table 10-1. Barry M. Goldwater Range East 5-Year Work Plan: FY 2024–2028

Resource Category	Goal	Objective	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description
										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 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 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 support to 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			$183,959		

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
					baseline inventories for other species have been completed.					
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 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 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 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.					

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
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).					

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
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. An 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.					
Range-wide soil map	One-time	Varies	One-time	In-house, Interagency	The NRCS - Tucson Soil Survey Office is in the 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 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

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
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.					

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
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.					
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 data to determine the degree of change and develop a plan appropriate to the findings.					

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
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	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

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
compliance in support of natural resource management actions.										
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					

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
					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.					
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/	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.					

Table 10-2. Barry M. Goldwater Range West 5-Year Work Plan: FY 2024–2028

Action Step	Fiscal Year	Funding	Frequency	Partners	Comments	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028
transportation corridors.										
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.					
Coordinate 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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- eDASH Natural Resources Program Page
- Natural Resources Playbook
- DoDI 4715.03, *Natural Resources Conservation Program*
- AFI 32-1015, *Integrated Installation Planning*
- AFI 32-10112, *Installation Geospatial Information and Services (IGI&S)*

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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all USAF installations)

- eDASH Acronym Library
- Natural Resources Playbook—Acronym Section
- U.S. EPA Terms & Acronyms

12.2 Installation Acronyms

56 FW	56 Fighter Wing
56 RMO	56 Range Management Office
ADC	Air Defense Command
ADOT	Arizona Department of Transportation
AFAF	Air Force Auxiliary Field
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AGL	Above Ground Level
AHAS	Avian Hazard Advisory System
AKN	Avian Knowledge Network
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
ASM	Arizona State Museum
ASSP	Arizona Site Stewards Program
AUX	Auxiliary Field
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
BR	Business Rule
CBP	U.S. Customs & Border Protection
CCSM	Community Climate System Model
CCVA	Climate Change Vulnerability Assessment
CEMML	Center for Environmental Management of Military Lands
CFPO	cactus ferruginous pygmy-owl
CFR	Code of Federal Regulations
CLEO	Conservation Law Enforcement Officer

CLEP-OP	Conservation Law Enforcement Programs Operating Plan
CSU	Colorado State University
DHS	Department of Homeland Security
DoD	(U.S.) Department of Defense
DoDI	Department of Defense Instruction
DOI	Department of the Interior
DZ	Drop Zone
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EO	Executive Order
EOD	Explosive Ordnance Disposal
ESA	Endangered Species Act of 1973
ESM	Environmental Sciences Management
ESRI	Environmental Systems Research Institute
ETAC	East Tactical Range
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act of 1996
FLPMA	Federal Land Policy and Management Act of 1976
FTHL	Flat-Tailed Horned Lizard
FW	Fighter Wing
FWO	Federal Wildlife Officers
FY	Fiscal Year
GDD	Growing Degree Days
GEOFidelis	Marine Corps Installation Geospatial Information and Services
GIS	Geographic Information System
GPS	Global Positioning System
HMA	Herd Management Area
IAW	IAW
ICRMP	Integrated Cultural Resources Management Plan
IEC	Intergovernmental Executive Committee
INRMP	Integrated Natural Resources Management Plan
IPCC	Intergovernmental Panel on Climate Change
IPCC-CMIPP5	IPCC Coupled Model Intercomparison Project Phase 5
IPMP	Integrated Pest Management Plan
IRT	Incident Response Team
KNOZ	The F-35 Auxiliary Landing Zone is known as KNOZ
LEIS	Legislative Environmental Impact Statement
LLNB	Lesser Long Nosed Bat
MBTA	Migratory Bird Treaty Act of 1918
MCAS	Marine Corps Air Station
MCO	Marine Corps Order
MFTL	Mohawk Dunes Fringe-toed Lizard
MLWA	Military Lands Withdrawal Act of 1999
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding

NABat	North American Bat Monitoring Program
NCAR	National Center for Atmospheric Research
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NIPRNet	Non-classified Internet Protocol Router Network
NM	National Monument
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRM	Natural Resource Manager
NTAC	North Tactical Range
NWR	National Wildlife Refuge
OPR	Office of Primary Responsibility
P.L.	Public Law
PAC	Protected Activity Center
POC	Point of Contact
PRECIP	Annual Average Precipitation
PRIA	Public Rangeland Improvement Act of 1978
RAWS	Remote Automatic Weather Station
RCP	Representative Concentration Pathway
RCRA	Resource Conservation and Recovery Act
RDS	Records Disposition Schedule
RMCP	Range Munitions Consolidation Points
RMD	Range Management Department
RMO	Range Management Office
RMS	Rangewide Management Strategy
ROD	Record of Decision
SGCN	Species of Greatest Conservation Need
SME	Subject Matter Expert
SOP	Standard Operating Procedure
SR	State Route
STAC	South Tactical Range
SWMU	Solid Waste Management Units
T&E	threatened and endangered
TAC	Tactical
TAVE	Annual Average Temperature
TEK	Traditional Environmental Knowledge
TMAX	Annual Average Maximum Temperature
TMIN	Annual Average Minimum Temperature
UDA	Undocumented Alien
UofA	University of Arizona
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USMC	U.S. Marine Corps
USN	U.S. Department of the Navy

USNVC	U.S. National Vegetation Classification Standard
UTC	Urban Target Complex
WFMP	Wildland Fire Management Plan
WFRHBA	Wild Free-Roaming Horses and Burros Act of 1971
WNS	White-Nose Syndrome
WRCC	Western Regional Climate Center
WSM	Wildland Support Modules
YFTL	Yuman Desert Fringe-toed Lizard

13.0 DEFINITIONS

13.1 Standard Definitions (Applicable to all USAF installations)

- Natural Resources Playbook—Definitions Section

13.2 Installation Definitions

- Add unique state, local, and installation-specific definitions.

14.0 APPENDICES

14.1 Standard Appendices

14.1.1 Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP.

Federal Public Laws and Executive Orders	
National Defense Authorization Act of 1989, Public Law (P.L.) 101–189; Volunteer Partnership Cost-Share Program	Amends two Acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101–511; Legacy Resource Management Program	Establishes the "Legacy Resource Management Program" for natural and cultural resources. Program emphasis is on inventory and stewardship responsibilities of biological, geophysical, cultural, and historic resources on DoD lands, including restoration of degraded or altered habitats.
EO 11514, *Protection and Enhancement of Environmental Quality*	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, *Protection and Enhancement of the Cultural Environment*	All Federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, *Exotic Organisms*	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters which they administer.
EO 11988, *Floodplain Management*	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state, territory, and Federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of Federal lands and facilities.
EO 11989, *Off-Road vehicles on Public Lands*	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historic resources are observed.
EO 11990, *Protection of Wetlands*	Requires Federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands have been implemented and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

EO 12088, *Federal Compliance with Pollution Control Standards*	This EO delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the U.S. Environmental Protection Agency (U.S. EPA) authority to conduct reviews and inspections to monitor federal facility compliance with pollution control standards.
EO 12898, *Environmental Justice*	This EO requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13007, *Indian Sacred Sites*	This EO directs federal land managing agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites.
EO 13112, *Invasive Species*	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*	The USFWS has the responsibility to administer, oversee, and enforce the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement.
United States Code	
Animal Damage Control Act (7 U.S.C. § 426–426b, 47 Stat. 1468)	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter into cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16 U.S.C. 668-668c	This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act, (42 U.S.C. § 7401–7671q, July 14, 1955, as amended)	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (Superfund) (26 U.S.C. § 4611–4682, P.L. 96-510, 94 Stat. 2797), as amended	Authorizes and administers a program to assess damage, respond to releases of hazardous substances, fund cleanup, establish clean-up standards, assign liability, and other efforts to address environmental contaminants. Installation Restoration Program guides cleanups at DoD installations.

Endangered Species Act (ESA) of 1973, as amended; P.L. 93-205, 16 U.S.C. § 1531 et seq.	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The ESA requires consultation with the USFWS and the NOAA Fisheries (National Marine Fisheries Service) and the preparation of a biological evaluation or a biological assessment may be required when such species are present in an area affected by government activities.
Federal Aid in Wildlife Restoration Act of 1937 (16 U.S.C. § 669–669i; 50 Stat. 917) (Pittman-Robertson Act)	Provides federal aid to states and territories for management and restoration of wildlife. Fund derives from sports tax on arms and ammunition. Projects include acquisition of wildlife habitat, wildlife research surveys, development of access facilities, and hunter education.
Federal Environmental Pesticide Act of 1972	Requires installations to ensure pesticides are used only IAW their label registrations and restricted-use pesticides are applied only by certified applicators.
Federal Land Use Policy and Management Act, 43 U.S.C. § 1701–1782	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This Act also requires consideration of commodity production such as timbering.
Federal Noxious Weed Act of 1974, 7 U.S.C. § 2801–2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Federal Water Pollution Control Act (Clean Water Act [CWA]), 33 U.S.C. §1251–1387	The CWA is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the U.S. EPA.
Fish and Wildlife Conservation Act (16 U.S.C. § 2901–2911; 94 Stat. 1322, PL 96-366)	Installations encouraged to use their authority to conserve and promote conservation of nongame fish and wildlife in their habitats.
Fish and Wildlife Coordination Act (16 U.S.C. § 661 et seq.)	Directs installations to consult with the USFWS, or state or territorial agencies to ascertain means to protect fish and wildlife resources related to actions resulting in the control or structural modification of any natural stream or body of water. Includes provisions for mitigation and reporting.
Lacey Act of 1900 (16 U.S.C. § 701, 702, 32 Stat. 187, 32 Stat. 285)	Prohibits the importation of wild animals or birds or parts thereof, taken, possessed, or exported in violation of the laws of the country or territory of origin. Provides enforcement and penalties for violation of wildlife related Acts or regulations.
Leases: Non-excess Property of Military Departments, 10 U.S.C. § 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land not currently needed for public use. Covers agricultural outleasing program.
Migratory Bird Treaty Act 16 U.S.C. § 703–712	The Act implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit.

National Environmental Policy Act of 1969 (NEPA), as amended; P.L. 91-190, 42 U.S.C. § 4321 et seq.	Requires federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality (CEQ) created Regulations for Implementing the National Environmental Policy Act [40 Code of Federal Regulations (CFR) Parts 1500– 1508], which provide regulations applicable to and binding on all Federal agencies for implementing the procedural provisions of NEPA, as amended.
National Historic Preservation Act, 54 U.S.C. § 300101 et seq.	Requires federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.
National Trails Systems Act (16 U.S.C. § 1241–1249)	Provides for the establishment of recreation and scenic trails.
National Wildlife Refuge Acts	Provides for establishment of National Wildlife Refuges through purchase, land transfer, donation, cooperative agreements, and other means.
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd–668ee)	Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001–13; 104 Stat. 3042), as amended	Established requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal lands. Includes requirements on inventory, and notification.
Rivers and Harbors Act of 1899 (33 U.S.C. § 401 et seq.)	Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the United States without a federal permit. Installations should coordinate with the U.S. Army Corps of Engineers (USACE) to obtain permits for the discharge of refuse affecting navigable waters under National Pollutant Discharge Elimination System (NPDES) and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken as permitted by the USACE.
Sale of certain interests in land, 10 U.S.C. § 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.
Soil and Water Conservation Act (16 U.S.C. § 2001, P.L. 95-193)	Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water-related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other federal and local programs.

Sikes Act (16 U.S.C. § 670a–670l, 74 Stat. 1052), as amended	Provides for the cooperation of DoD, the Departments of the Interior (USFWS), and the State Fish and Game Department in planning, developing, and maintaining fish and wildlife resources on a military installation. Requires development of an INRMP and public access to natural resources and allows collection of nominal hunting and fishing fees. NOTE: AFI 32-7064 sec 3.9. Staffing. As defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources Management. As stipulated in the Sikes Act, 16 U.S.C. § 670 et. seq., the Office of Management and Budget Circular No. A-76, Performance of Commercial Activities, August 4, 1983 (Revised May 29, 2003) does not apply to the development, implementation, and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, obtain these services from federal agencies having responsibilities for the conservation and management of natural resources.
DoD Policy, Directives, and Instructions	
DoDI 4150.07 *DoD Pest Management Program* dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoD Instruction 4715.1, *Environmental Security*	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment and are given appropriate consideration along with other relevant factors.
DoDI 4715.03, *Natural Resources Conservation Program*	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.
OSD Policy Memorandum, 17 May 2005—*Implementation of Sikes Act Improvement Amendments: Supplemental Guidance Concerning Leased Lands*	Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP.

OSD Policy Memorandum, 1 November 2004— *Implementation of Sikes Act Improvement Act Amendments: Supplemental Guidance Concerning INRMP Reviews*	Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review.
OSD Policy Memorandum, 10 October 2002— *Implementation of Sikes Act Improvement Act: Updated Guidance*	Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and metrics, budgeting for INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.
USAF Instructions and Directives	
32 CFR Part 989, as amended, and AFI 32-7061, Environmental Impact Analysis Process (EIAP)	Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an Environmental Assessment or an Environmental Impact Statement.
AFI 32-1015, *Integrated Installation Planning*	This publication establishes a comprehensive and integrated planning framework for development/redevelopment of Air Force installations.
AFMAN 32-7003, *Environmental Conservation*	Implements AFPD 32-70, *Environmental Quality;* DoDI 4715.03, *Natural Resources Conservation Program*; and DoDI 7310.5, *Accounting for Sale of Forest Products*. It explains how to manage natural resources and cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFI 32-10112 *Installation Geospatial Information and Services (IGI&S)*	This instruction implements Department of Defense Instruction (DoDI) 8130.01, Installation Geospatial Information and Services (IGI&S) by identifying the requirements to implement and maintain an Air Force Installation Geospatial Information and Services program and Air Force Policy Directive (AFPD) 32-10 Installations and Facilities.
AFPD 32-70, *Environmental Quality*	Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.
Policy Memo for Implementation of Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEV) on January 29, 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.

15.0 ASSOCIATED PLANS

15.1 Tab 1—Wildland Fire Management Plan

15.2 Tab 2—Bird/Wildlife Aircraft Strike Hazard (BASH) Plan

15.3 Tab 4—Integrated Cultural Resources Management Plan (ICRMP)

15.4 Tab 5—Integrated Pest Management Plan (IPMP)