CHAPTER 2
BMGR MILITARY MISSION AND RESOURCE MANAGEMENT SETTING

2.1 INTRODUCTION

As established in Section 1.1, the proposed INRMP for the BMGR must support the military purposes of the range while providing for the proper management and protection of its natural and cultural resources and sustainable public use consistent with those military purposes. This chapter describes the military use and resource management setting in which the proposed INRMP must accomplish these tasks.

The chapter begins with a description of the current military mission and land use requirements at the BMGR that must be supported by the INRMP (Section 2.2). Section 2.3 describes the history of the BMGR including its acquisition, historical military use, and natural and cultural resource management history. This historical information provides context for understanding the co-evolution of military and management activities within the BMGR and the relative importance of current management issues. Section 2.4 reviews DoD land management policy guidance that governs how military reservation lands are to be managed to support the needs of ongoing and future military missions.

Land use and resource management within the BMGR is also affected by the missions and activities of certain non-military agencies. As indicated in Section 1.3, AGFD plays a major role in the management of wildlife resources both within the BMGR and on lands within Arizona that neighbor the range. The proximity of the range to the international border between the United States and Mexico has given the U.S. Border Patrol an active law enforcement mission that, in part, takes place within the range. The activities of AGFD and the U.S. Border Patrol are described in Section 2.5.

The safety and security requirements of the military mission as it relates to public access opportunities within the BMGR are described in Section 2.6. This section also defines resource management units within the range that are based on these safety and security requirements, public access opportunities, and natural and cultural resource conditions. The alternative resource management strategies that are studied in this EIS for the development of the proposed INRMP are focused, in part, on these management units.

Section 2.7 describes natural and cultural resource management opportunities and constraints within the BMGR that are derived from the military mission of the range, existing natural and cultural conditions, and public access and use opportunities and constraints. The management opportunities and constraints described in this section are drawn from the conditions described in the preceding sections of Chapter 2. The resource management goals and alternative management strategies presented in Chapter 3 reflect these opportunities and constraints.

Finally, Section 2.8 closes Chapter 2 with descriptions of (1) DoD requirements to apply ecosystem management principles to the management, conservation, and protection of resources within the BMGR, and (2) the need to address the pre-existing management issues within the proposed INRMP. This section also addresses the importance of both resource monitoring and adaptive management as ecosystem management tools.

2.2 CURRENT MILITARY MISSION AND LAND USE OF THE BMGR

As previously noted, BMGR lands are made available for military purposes by virtue of the MLWA of 1999 for use as (1) an armament and high-hazard testing area; (2) training for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support; and (3) other defense related purposes. The current primary mission of both BMGR—East and BMGR—West is military aircrew training. The range has been used periodically for testing and some other defense related purposes, but, since its inception, non-training activities have been secondary to the primary training mission of the BMGR (see Section 2.3.2 for a review of past military use of the BMGR). The primacy of the aircrew training mission at the BMGR is expected to continue into the foreseeable future.

The current primary mission of BMGR—East is to support the training of Air Force, Air Force Reserve Command (AFRC), Air National Guard (ANG), and Army Reserve National Guard (ARNG) student aircrews transitioning to frontline combat aircraft. Regular users currently served in this capacity by BMGR—East include the:

- Air Education and Training Command (AETC), 56th FW, Luke AFB, which trains Air Force F-16 aircrews
- Air Combat Command (ACC), 355th Wing, Davis-Monthan AFB, which trains all Air Force A-10 and OA-10 aircrews
- AFRC, 944th FW, Luke AFB, which trains AFRC F-16 aircrews
- ANG, 162nd FW, Tucson International Airport, which trains F-16 aircrews for the ANG and U.S. foreign allies that are recipients of Foreign Military Sales F-16s[10]
- ARNG, Western ARNG Aviation Training Site (WAATS), Silverbell Army Heliport, which trains UH-60, AH-1, and AH-64 aircrews

BMGR—East is also used to support readiness training by aircrews from operational (i.e., combat ready) units. Regular BMGR—East users currently served in this capacity include the:

- ACC, 355th Wing, Davis-Monthan AFB, A-10 and OA-10 aircrews
- ANG, 162nd FW, Davis-Monthan AFB, hosts seasonal ANG and AFRC training deployments to the BMGR (this ANG activity is officially referred to as Operation Snowbird)
- ARNG, 1/258th Attack Helicopter Battalion (AHB), Silverbell Army Heliport, UH-60 and AH-64 aircrews

The current primary mission of BMGR—West is to support readiness training by Marine Corps and Navy aircrews from operational units. Regular users currently served in this capacity by BMGR—West include the:

- Marine Aircraft Group (MAG) 13, MCAS Yuma, AV-8B and F-5 aircrews
- Marine Aviation Weapons and Tactics Squadron (MAWTS) 1, MCAS Yuma, aircrews from all types of Marine aviation units
- 3rd Marine Aircraft Wing (MAW), MCAS Miramar, F/A-18, C-130, AH-1, CH-46, and CH-53 aircrews
- MCAS Yuma, host to training deployments from Marine Corps and Navy aviation units from throughout the fleet

[10] F-16 aircraft that are sold to U.S. foreign allies.

In addition to these regular users from the BMGR region, the range is also used to support training by "casual users" from outside the local flying area. These important casual user training deployments originate from active duty, reserve, and ANG flying units from other areas of the country and from U.S. and allied units from overseas. MCAS Yuma is the most active deployment site for Marine aviation units from both the east and west coasts. The air station hosts between 50 and 70 unit deployments involving up to 700 aircraft per year. The air station hosts Navy fliers as well. On the Air Force side, Davis-Monthan AFB is the host installation for a long-standing "Operation Snowbird" training program involving 15 to 20 Air Force Reserve and ANG units and up to 200 aircraft per year. Operation Snowbird is a hosted Air Force program established to allow units that are stationed in locations with seasonably severe (usually winter) weather to deploy for one or more weeks for fair weather training on the BMGR. A permanent tenant organization is in place at Davis-Monthan AFB to administer the Snowbird program. No other ranges located in warm climates have both the needed air base and range capabilities and range time capacity to accommodate the Snowbird program. Without the BMGR and its favorable weather, Snowbird units would experience decreased combat readiness through the winter months.

From the perspective of supporting military operations, the BMGR is composed of lands reserved for military purposes and overlying restricted airspace (Figures 2-1 and 2-2). The four restricted airspace areas overlying the range—R-2301E, R-2301W, R-2304, and R-2305—are designated by the Federal Aviation Administration (FAA) to support the military training missions of the range. BMGR—East and BMGR—West currently support a wide diversity of tactical aviation training activities as well as selected ground training and training support operations. To support these activities and operations, BMGR—East and BMGR—West land areas and restricted airspace are partitioned into a number of smaller subranges or operations areas in order to provide locations where multiple simultaneous training or other operations can be effectively and safely supported. The use and operation of BMGR—East is controlled by AFI 13-212 Volume 1, Weapons Ranges, Luke AFB Supplement 1.[11] In accordance with this AFI, the BMGR—East land area is currently subdivided so as to support nine aviation subranges, one Air Force auxiliary airfield, two outlying auxiliary airfields, one Explosive Ordnance Disposal (EOD) training range, one small arms range, and four weapons range support areas (see Figure 2-1). The nine BMGR—East subranges include eight aircraft weapons ranges and an electronically instrumented air combat tactics (ACT) range. The eight aircraft weapons ranges include an air-to-air firing range for training in air-to-air gunnery or missile firing and seven subranges for air-to-ground weapons delivery training. Manned Ranges 1, 2, 3, and 4 and North, South, and East Tactical (TAC) ranges constitute the air-to-ground weapons ranges. The instrumented ACT range is the Goldwater Range Measurement and Debriefing System (GRMDS). Gila Bend Air Force Auxiliary Field (AFAF) is the Air Force auxiliary airfield and the two outlying auxiliary airfields include Auxiliary Airfield 6 (AUX-6) and Stoval Auxiliary Airfield.

The use and operation of BMGR—West is controlled by MCAS Yuma Station Order 3710.6H. The BMGR—West land area is currently partitioned into four aviation subranges, 35 existing

[11] AFI 13-212 Volume 1 Luke AFB Supplement 1 provides official information and procedures for all units/users, military or civilian, operating in BMGR—East. Among other components, this AFI includes procedures governing all surface access to BMGR—East. Compliance with all provisions of this AFI is mandatory for all range users.

and four approved undeveloped ground support areas, an outlying auxiliary airfield, a developed training complex, a rifle range, a parachute cargo drop zone, an EOD operating area, and a live ordnance jettison area range (see Figure 2-2). The four aviation subranges include: the Auxiliary Airfield 2 (AUX-2) operating area, the Moving Sands and Cactus West target complexes, and the tactical aircrew combat training system (TACTS) range. The 39 total undeveloped ground support areas are locations to which Marine ground units may deploy for various periods of time to participate in training exercises that involve both Marine air and ground units. The outlying auxiliary airfield is AUX-2 and the developed training complex is the Cannon Air Defense Complex. AUX-2 also serves as an additional ground support area for ground unit deployments.

Current subranges and other land use areas of the BMGR are described in the following sections beginning with BMGR—East (Sections 2.2.1 through 2.2.7) and followed by BMGR—West (Sections 2.2.8 through 2.2.9).

2.2.1 East Tactical Range

Area Description. Includes all of the land area within the lateral airspace boundaries of East TAC Range that lie within BMGR—East (see Figure 2-1). East TAC underlies part of the R-2304 airspace.

Area Size. 177 square miles, or 113,520 acres.

Military Land Use—Air-to-Ground Weapons (Tactical) Range. East TAC Range supports approximately 34 identified target complexes for use in training aircrews to use gunnery, bombs, rockets, and missiles to attack enemy positions, equipment, and material. Nearly all of these targets are authorized for live-fire and two—HE Hill[12] and the live Maverick[13] air-to-ground (missile) target—are approved for armed (exploding) munitions. The targets are realistic simulations of tactical features such as airfields, railroad yards, missile emplacements, truck convoys, and battlefield tank formations.

The targets and their directly associated ordnance impact and laser hazard areas affect approximately 8,700 acres (or less than 8 percent) of the East TAC Range. Lasers, which function as part of the target sighting systems of some aircraft and munitions, are also employed in the East TAC Range (as well as North and South TAC ranges). These lasers could cause eye damage to surface users. The remainder of the land area lies within, between, or near the surface danger zones in which errant ordnance or laser energy may strike without harm to people or property East TAC Range is configured to contain the surface danger zones (i.e., potential ordnance strike/blast or laser hazard areas) associated with its target complexes. The number of ordnance strikes falls off sharply with increasing distance from targets. However, all East TAC locations must be regarded as potentially hazardous during ordnance delivery training missions.

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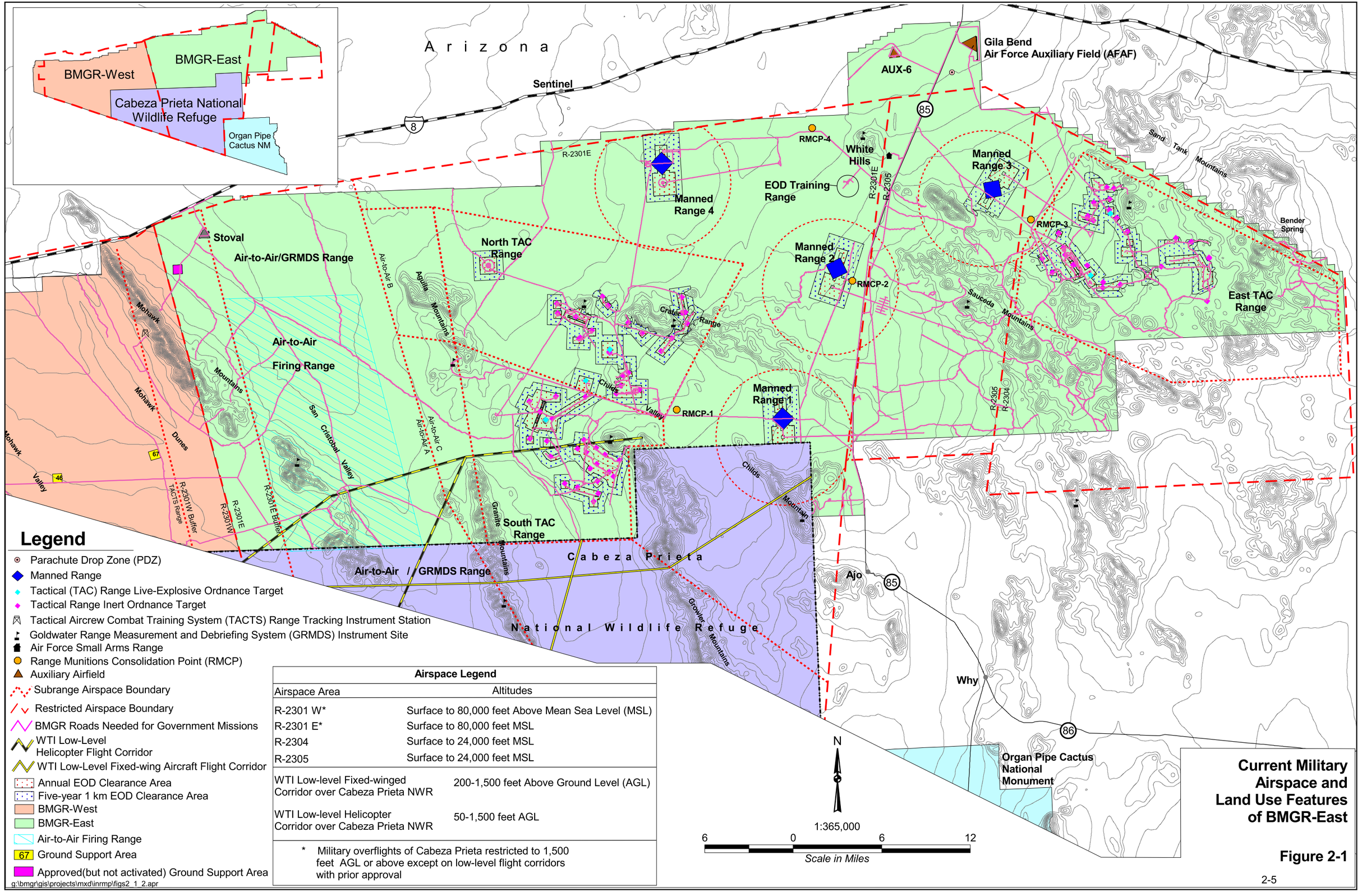
[12] The three HE (high explosives) Hill targets on the BMGR are authorized for use with armed Mark (MK)-81, MK-82, MK-83, and MK-84 series of general purpose 250-, 500-, 1,000-, and 2,000-pound bombs. There is one HE Hill target in each TAC range.

[13] The Maverick missile is a rocket-propelled antitank weapon that is precision-guided to the target by television, laser, or infrared tracking, depending on the model. The maximum attack range of the Maverick is about 13 nautical miles.



Legend

- Parachute Drop Zone (PDZ)
- Manned Range
- Tactical (TAC) Range Live-Explosive Ordnance Target
- Tactical Range Inert Ordnance Target
- Tactical Aircrew Combat Training System (TACTS) Range Tracking Instrument Station
- Goldwater Range Measurement and Debriefing System (GRMDS) Instrument Site
- Air Force Small Arms Range
- Range Munitions Consolidation Point (RMCP)
- Auxiliary Airfield
- Subrange Airspace Boundary
- Restricted Airspace Boundary
- BMGR Roads Needed for Government Missions
- WTI Low-Level Helicopter Flight Corridor
- WTI Low-Level Fixed-wing Aircraft Flight Corridor
- Annual EOD Clearance Area
- Five-year 1 km EOD Clearance Area
- BMGR-West
- BMGR-East
- Air-to-Air Firing Range
- 67 Ground Support Area
- Approved(but not activated) Ground Support Area

Airspace Legend

Airspace Area	Altitudes
R-2301 W*	Surface to 80,000 feet Above Mean Sea Level (MSL)
R-2301 E*	Surface to 80,000 feet MSL
R-2304	Surface to 24,000 feet MSL
R-2305	Surface to 24,000 feet MSL
WTI Low-level Fixed-winged Corridor over Cabeza Prieta NWR	200-1,500 feet Above Ground Level (AGL)
WTI Low-level Helicopter Corridor over Cabeza Prieta NWR	50-1,500 feet AGL

* Military overflights of Cabeza Prieta restricted to 1,500 feet AGL or above except on low-level flight corridors with prior approval

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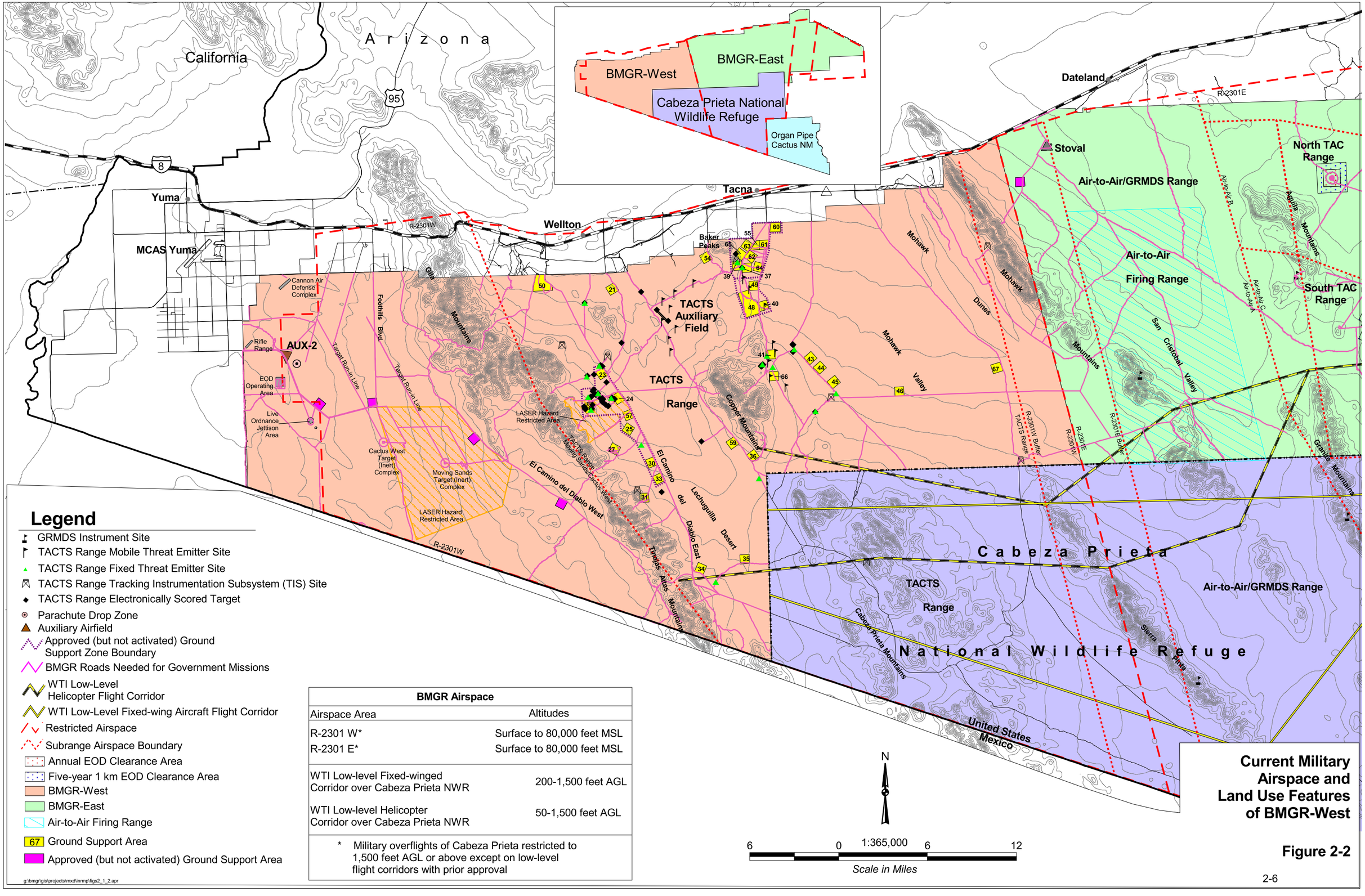
Current Military Airspace and Land Use Features of BMGR-East

Figure 2-1



Legend

- GRMDS Instrument Site
- TACTS Range Mobile Threat Emitter Site
- TACTS Range Fixed Threat Emitter Site
- TACTS Range Tracking Instrumentation Subsystem (TIS) Site
- TACTS Range Electronically Scored Target
- Parachute Drop Zone
- Auxiliary Airfield
- Approved (but not activated) Ground Support Zone Boundary
- BMGR Roads Needed for Government Missions
- WTI Low-Level Helicopter Flight Corridor
- WTI Low-Level Fixed-wing Aircraft Flight Corridor
- Restricted Airspace
- Subrange Airspace Boundary
- Annual EOD Clearance Area
- Five-year 1 km EOD Clearance Area
- BMGR-West
- BMGR-East
- Air-to-Air Firing Range
- 67 Ground Support Area
- Approved (but not activated) Ground Support Area

BMGR Airspace

Airspace Area	Altitudes
R-2301 W*	Surface to 80,000 feet MSL
R-2301 E*	Surface to 80,000 feet MSL
WTI Low-level Fixed-winged Corridor over Cabeza Prieta NWR	200-1,500 feet AGL
WTI Low-level Helicopter Corridor over Cabeza Prieta NWR	50-1,500 feet AGL

* Military overflights of Cabeza Prieta restricted to 1,500 feet AGL or above except on low-level flight corridors with prior approval

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Current Military Airspace and Land Use Features of BMGR-West

Figure 2-2

Ground personnel are generally excluded from East TAC Range during live-fire training unless authorization has been obtained for personnel with a legitimate purpose to occupy a designated observation post. The entire TAC range must also be regarded as potentially contaminated with unexploded ordnance (UXO).[14] The vast majority of such contamination, however, is found in close proximity to targets. East TAC Range is typically available (except for federal holidays) to support aircrew training from 7:00 a.m. to 11:00 p.m. local time Monday through Friday and from 8:00 a.m. to 5:00 p.m. local time on four weekend days per month.

Ongoing EOD programs to control surface build-up of expended munitions within BMGR weapons ranges are in place for both safety and environmental management purposes (Appendix B). EOD surface clearances are performed within East TAC Range (as well as North and South TAC ranges) according to criteria for both annual and five-year clearance schedules (AFI 13-212 Volume 1). The annual clearance criteria require that tactical range targets be cleared each year to a distance of 1,000 feet from the target. The five-year surface clearance criteria specify that targets be cleared of munitions to a distance of 1000 meters (3,280 feet), or to the distance at which the density of munitions on the surface is reduced to five complete ordnance items per acre, whichever is closer to the target. The five-year EOD clearance criteria of some individual targets within tactical ranges overlap because of the close proximity of these targets to each other. The 1,000-meter, five-year EOD clearance criteria were implemented Air Force wide in August 2001. These criteria are a reduction from the previous five-year clearance criteria that required munitions be cleared out to a distance of one nautical mile (6,080 feet), or further if necessary to reduce the density of munitions to less than five complete ordnance items per acre. The reduction in the five-year clearance distance resulted from the improved accuracy of aircraft weapons delivery systems, which has reduced the extent of target areas affected by munitions delivery training in contrast to that experienced with earlier types of aircraft and weapons systems.

Approximately 8,700 acres of East TAC Range are subject to annual EOD clearances and an additional 15,400 acres will be cleared every five years under the new 1,000-meter criteria. Approximately 34,400 acres of East TAC Range were subject to five-year EOD clearances under the previous one nautical mile criteria.

Surface Entry. All surface entry to East TAC Range by military and civilian personnel is controlled because of the safety hazards presented by the ongoing munitions delivery training missions performed in this tactical range and by the relatively high concentrations of UXO present on the ground surface. General public access to East TAC Range, and all other BMGR

[14] UXO refers to military munitions that have been primed, fused, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material and remain unexploded either by malfunction, design, or any other cause. Most of the expended munitions used currently (more than 99 percent, based on 1996 data) and in the past on the BMGR are training rather than warfighting rounds. Training munitions may include small explosive charges used to produce puffs of smoke to reveal the location hit when the bomb, rocket, or missile was delivered, but do not include high yield high explosives warheads. Training munitions may also contain propellants (such as solid fuel rocket or missile motors or "live" ammunition propellant cartridges (cannon or machine gun rounds), pyrotechnics (such as in flares), incendiaries (such as tracer rounds or white phosphorus) or other explosive agents. Expended training munitions that contain these substances because they failed to detonate, burn, or discharge are regarded as UXO because they have the potential to cause severe injury or death if they are disturbed or mishandled. Expended "live" warfighting munitions that failed to detonate, burn or discharge or did so incompletely are also regarded as UXO.

weapons ranges, is currently considered to be incompatible with the munitions delivery training mission and the prevailing levels of UXO surface contamination and is not permitted in accordance with AFI 13-212 Volume 1 Luke AFB Supplement 1. This official restriction on public access to BMGR—East weapons ranges—which includes all manned ranges, tactical ranges, and the air-to-air firing range—differs from some earlier official range access policies and unofficial range entry practices, but represents the Air Force's determination of the range security procedures that are currently needed to protect public safety and prevent interference with ongoing training and support missions.

Available Air Force records indicate that recreational use of BMGR weapons ranges was supported and controlled, through the range entry permit system, during non-training or EOD detonation periods in the 1980s (Air Force Regulation [AFR] 50-46 Luke AFB Supplement 1 1981 and U.S. Air Force 1986). By the early to mid-1990s, however, the Air Force determined that the difficulties associated with ensuring that visitors were clear of weapons ranges prior to EOD detonation periods or the resumption of air-to-ground or air-to-air weapons training were too tenuous to adequately protect public safety and to avoid costly disruptions in training schedules. In addition, the hazards associated with the high concentrations of UXO, that are typically found on or near the ground surface within weapons ranges, reinforced the determination that recreational use of these ranges was incompatible with public safety requirements at all times. As a consequence, since 1994, all tactical, manned range, and air-to-air firing range areas within BMGR—East have been classified as reserved for military operations and other official duties only. The restrictions on general public access to all weapons range areas were published in each subsequent edition of AFI 13-212 Volume 1 Luke AFB Supplement 1, on official range maps issued with range entry permits or distributed in visitor information brochures, and in the LEIS for renewal of the BMGR land withdrawal (U.S. Air Force 1999). In addition, 56 RMO Operating Instruction 1-3, Barry M. Goldwater Range Permitting Process (dated 1 July 2002), allows public access to BMGR—East only in Area B, the retired Ajo Air Force Station area, and the Bender Spring Area between East TAC and Sonoran Desert NM.

This official restriction on public access to weapons ranges was subsequently enforced everywhere within BMGR—East with the exception of the Paradise Well area, which lies east of the Sand Tank Mountains in the easternmost portion of East TAC Range (see Figure 2-1). Enforcement of the restrictions on general public access to the Paradise Well area was inconsistent as both range security personnel at Gila Bend AFAF and BLM law-enforcement officers had the understanding that continuing the tradition of public access to this area was both safe and approved. Although the Paradise Well area is within East TAC Range, it is outside of intended munitions delivery areas associated with established targets and is generally not as contaminated with UXO as are the established areas. There are no road connections between the East TAC Range target areas and the Paradise Well area and the potential for cross-country travel between these locations is disrupted by the rugged Sand Tank Mountains. The area was posted as a part of the BMGR with standard range access restrictions but was not identified as a part of East TAC Range to which higher levels of internal access restrictions applied. Nevertheless, the Paradise Well area is within the designated munitions impact area.

The Air Force reviewed the public access situation at the Paradise Well area in the fall of 2001. This review found that this location, which lies below restricted airspace reserved for East TAC Range operations, is frequently overflown by aircraft, with armed weapons systems, that are turning to deliver munitions on East TAC targets to the west. These munitions delivery

overflights create the potential for the inadvertent release of munitions into the Paradise Well area. The Air Force concluded that the unofficial public access practices were not adequate for protecting public safety because of (1) the inadvertent munitions delivery potential, (2) the remote location of the area makes it difficult to verify that it is clear of visitors prior to training missions, and (3) the levels of UXO contamination occurring there. The Air Force further determined that continuous restrictions on public access were necessary to provide for adequate public safety and to avoid interruption of flying missions due to the presence of unauthorized personnel underlying munitions delivery flight paths. The existing restrictions on public access to the Paradise Well area were reconfirmed in December 2001 and full enforcement of these restrictions was implemented. At the same time, range entry signs in this area were changed to advise persons that the Paradise Well area is a part of East TAC Range and is closed to public access.

Entry to East TAC Range is arranged for special purposes, such as scientific research, that are approved by the 56th RMO on a case by case basis in accordance with 56 RMO Operating Instruction 1-3, *Barry M. Goldwater Range [East] Permitting Process*. In accordance with the MLWA of 1999, Native Americans would also be allowed access to and ceremonial use of sacred sites, traditional plant gathering areas, and other places of cultural significance that may be located within East TAC Range, or other restricted BMGR—East locations, to the extent that such access is consistent with the military purposes for which such lands are withdrawn and reserved [P.L. 106-65 §3031(b)(3)(E)(ii)(II)]. Approved visits to East TAC Range, or other restricted BMGR—East locations, may require an official escort for safety purposes.

2.2.2 North and South Tactical Ranges

Area Description. Includes all of the land area within the lateral airspace boundaries of North and South TAC ranges (see Figure 2-1). North and South TAC ranges underlie part of the R-2301E airspace.

Area Size. 306 square miles, or 195,997 acres (116,843 acres in North TAC and 79,154 acres in South TAC).

Military Land Use—Air-to-Ground Weapons (Tactical) Ranges. North and South TAC ranges are directly analogous to East TAC Range. They serve the same aircrew training purposes as East TAC Range and feature similar target arrays. North TAC Range has approximately 20 identified target complexes; South TAC Range has approximately 17. There is one HE Hill target within each of these TAC ranges. A single live Maverick target is located in North TAC Range near its common boundary with South TAC Range. Ongoing EOD programs to control surface build-up of expended munitions currently subject a total of 17,747 acres of the North and South TAC ranges combined to annual EOD clearances and 26,600 acres to five-year EOD clearances.

The patterns of land use within North and South TAC ranges are also comparable to those in East TAC Range. The sizes and shapes of these ranges, the types of ordnance authorized for use, and the approved methods of delivery and target placement are collectively configured to contain all ordnance impact and blast effects. Nearly all ordnance strikes are on or near the designated targets. The greater land area reserved for these ranges is needed, however, to safely contain infrequent off-target ordnance impacts. All areas of North and South TAC ranges must be

regarded as potentially hazardous during live-fire training missions. UXO could be encountered in surface or subsurface locations throughout these TAC ranges. The locations with the highest probability of such contamination, however, are in close proximity to targets.

Surface Entry. All surface entry to North and South TAC ranges by military and civilian personnel is controlled because of the safety hazards presented by the ongoing munitions delivery training missions performed in these tactical ranges and by the relatively high concentrations of UXO present on the ground surface. General public access to North and South TAC ranges is not permitted because it is incompatible with the current training mission and prevailing levels of UXO surface contamination. As described in Section 2.2.1, Native Americans will be provided with access to sacred sites, traditional plant gathering areas, and other places of cultural significance within North and South TAC ranges to the extent compatible with military training and support activities. Other members of the public may also enter these tactical ranges for special purposes that are approved in accordance with 56 RMO Operating Instruction 1-3, *Barry M. Goldwater Range [East] Permitting Process,* on a case by case basis. Approved visits may require an official escort for safety purposes.

2.2.3 Manned Ranges 1, 2, 3, and 4

Area Description. Includes the land area within the lateral airspace boundaries of Manned Ranges 1, 2, 3, and 4 (see Figure 2-1). Manned Ranges 1 to 4 underlie portions of the R-2301E, R-2304, and R-2305 airspace.

Area Size. 261 square miles, 166,960 acres.

Military Land Use—Air-to-Ground Weapons (Manned) Ranges. Each of the four parcels associated with the four manned ranges contains the air-to-ground target impact areas of the range and the surrounding area of land over which aircraft fly with armed weapons delivery systems. Each manned range has (1) two bull's-eye targets for training in conventional bombing and rocketry, (2) one bull's-eye target for training in simulated nuclear weapons delivery or conventional bombing, (3) one applied tactics target (a single target vehicle without a cleared area or bull's-eye) for conventional bombing or rocketry training, (4) one target for training in low-angle strafe, and (5) one tactical strafe target for low-angle strafe. Personnel are present in two observation towers at each manned range to control the movement of aircraft and the delivery of munitions within the range and to score the accuracy of those deliveries. The accuracy of munitions deliveries can be scored on the conventional bombing and rocketry, simulated nuclear weapons delivery, low-angle strafe targets, and on the applied tactics targets, but not on the tactical strafe targets. Only inert munitions are used on the manned ranges. Ongoing EOD programs to control surface build-up of expended munitions currently subject 7,615 acres of land within Manned Ranges 1, 2, 3, and 4 to annual EOD clearances and 19,070 acres to five-year EOD clearances.

Surface Entry. All surface entry to Manned Ranges 1, 2, 3, and 4 by military and civilian personnel is controlled because of the safety hazards presented by the ongoing munitions delivery training missions performed in these ranges and by the relatively high concentrations of UXO present on the ground surface. General public access to Manned Ranges 1, 2, 3, and 4 is not permitted because it is incompatible with the current training mission and prevailing levels of UXO surface contamination. As described in Section 2.2.1, Native Americans will be provided

with access to sacred sites, traditional plant gathering areas, and other places of cultural significance within Manned Ranges 1, 2, 3, and 4 to the extent compatible with military training and support activities. Other members of the public may also enter these manned ranges for special purposes that are approved in accordance with 56 RMO Operating Instruction 1-3 on a case by case basis. Approved visits may require an official escort for safety purposes.

2.2.4 Air-to-Air Firing Range

Area Description. Includes the ordnance and target fallout area[15] for the Air-to-Air Firing Range, located between the Aguila and Mohawk mountains within the R-2301E airspace (see Figure 2-1).

Area Size. 158 square miles, 101,040 acres.

Military Land Use—Air-to-Air Firing Range Munitions and Target Fallout Area. The designated lands serve as a fallout area for munitions expended in the overlying Air-to-Air Firing Range. Current munitions use is limited to 20 millimeter (mm) cannon rounds fired in air-to-air gunnery. Aerial Gunnery Target System[16] (AGTS) tow targets fall into this land area if the tow cable is severed from the tow aircraft or the targets must be jettisoned because of gunnery damage.

Before the AGTS was employed for air-to-air training, Deployable Aerial Rigged Targets (or DARTs) were used as aerial tow targets. Large quantities of expended DARTs remain scattered throughout the land area underlying the Air-to-Air Firing Range. The 14-foot-long DARTs were designed to simulate an aircraft target.

Past training activities in the Air-to-Air Firing Range included regular use of live air-to-air missiles. This training activity typically included the launch of a 5-inch High Velocity Aircraft Rocket (HVAR) to serve as a target drone followed by the launch of a "Sidewinder" Air Intercept Missile (AIM) 9 (an infrared-guided missile) with a live HE warhead to intercept and destroy the HVAR. Some AIM-9 missile warheads failed to detonate during these training exercises and some HVAR or AIM-9 missile motors failed to ignite or burn completely. As a result, some HVARs or AIM-9s or other types of air-to-air ordnance are likely present as UXO on the ground surface below the Air-to-Air Firing Range and adjacent R-2301E airspace that was incorporated in the air-to-air firing area in years past. A survey of UXO concentrations below the Air-to-Air Firing Range and adjacent R-2301E airspace has not been completed nor has UXO disposal been undertaken because Air Force criteria for active range clearance activity does not require programmatic EOD clearances as described previously for other ranges.

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[15] A fallout area is a term used to describe a designated land area within the BMGR that is used to receive expended air-to-air or surface-to-air munitions and aerial targets or target debris.

[16] The AGTS incorporates a towed banner target with an acoustical sensor that scores gunnery hits by counting the audible passage of cannon rounds through the banner material. The AGTS can be reeled in and recovered by the tow aircraft if the target has not been excessively damaged. The formerly used DARTs were rigged dart-shaped targets about 14 feet long and 4 feet across at the base. The cannon projectiles in each shooting aircraft were coated with a different color of paint that rubbed off on the DART as the round hit. Most DARTs were not lost over the range, but were jettisoned at a recovery area south of Gila Bend AFAF so that each shooter's score could be counted from among the colored hits.

Surface Entry. All surface entry to the Air-to-Air Firing Range fallout area by military and civilian personnel is controlled because of the safety hazards presented by the ongoing weapons training missions performed in this range and by the expected concentrations of UXO present on the ground surface. General public access to the Air-to-Air Firing Range impact area is not permitted because it is incompatible with the current training mission and probable levels of UXO surface contamination. As described in Section 2.2.1, Native Americans will be provided with access to sacred sites, traditional plant gathering areas, and other places of cultural significance within Air-to-Air Firing Range area to the extent compatible with military training and support activities. Other members of the public may also enter the Air-to-Air Firing Range area for special purposes that are approved in accordance with 56 RMO Operating Instruction 1-3 on a case by case basis. Approved visits will be scheduled only on days when air-to-air weapons use is not occurring and may require an official escort for safety purposes.

2.2.5 Goldwater Range Measurement and Debriefing System Range

Area Description. The GRMDS occupies an extensive block of airspace stretching across the lateral expanse of the R-2301E, R-2304, R-2305, and Sells Military Operations Area (MOA) airspace through which the relative flight paths and actions of appropriately equipped aircraft are electronically tracked and recorded.

Area Size. GRMDS coverage exceeds the area of BMGR—East, but each GRMDS electronic instrument site occupies only a few hundred square feet of land area.

Military Land Use—Electronic Instrument Sites. The GRMDS is composed of 17 ground-based, electronic instrument sites that are used to observe, measure, record, and replay the simultaneous actions of up to 36 aircraft participating in air-to-air training engagements. The GRMDS can also simulate air-to-air weapons use so that aircrews can realistically incorporate the use of aircraft weapons in their training without firing actual weapons. Nine of the instrument sites are located within BMGR—East, four are within the Cabeza Prieta NWR, and four are located east of the Tohono O'odham Nation on BLM and private lands. The extensive geographic coverage of the instrument sites provides the GRMDS with the capacity to support large-scale aircraft training operations. Fifteen of the 17 electronic instrument sites are tracking and instrumentation subsystem (TIS) stations, which are small and require a land area of no more that 15 feet by 15 feet. The TIS equipment is minimal, consisting of receiving and transmitting antennas, solar panel, enclosed electronic instruments, and a microwave transmitter. Most of the TIS stations are positioned within elevated mountain locations that are accessible for servicing only by helicopter (see Figure 2-1). These sites have been located where there is sufficient adjacent level ground for a safe helicopter landing area. The site on Childs Mountain within the Cabeza Prieta NWR is both a TIS and system master site that is electronically linked to all of the remote TIS sites and the GRMDS control center at Luke AFB by microwave transmission. A second master station is located east of the Tohono O'odham Nation on BLM land.

Surface Entry. Surface access by military or civilian personnel to the GRMDS instrument sites within BMGR—East is regulated by the access control procedures in effect for the specific location of the site. Access to GRMDS instrument sites is restricted to authorized service personnel. The public is restricted from these sites. These restrictions apply as well to instrument sites in off-range locations.

2.2.6 R-2301E, R-2304, and R-2305 Inter-range Safety Buffer Areas

Area Description. Includes BMGR—East lands that underlie R-2301E, R-2304, and R-2305 airspace but are outside of the tactical, manned, and air-to-air firing ranges.

Area Size. 882 square miles, or 564,215 acres.

Military Land Use—Potential Ordnance/Aerial Target Impact Area, Low-level Overflights, Stoval Outlying Auxiliary Airfield, Air Force Small Arms Range, Range Munitions Consolidation Points (RMCPs), EOD Training Range, and Access Control Areas. The three TAC ranges, four manned ranges, and Air-to-Air Firing Range are configured within BMGR—East to support simultaneous training operations within all eight weapons ranges. Each range is of a size and shape designed to contain the weapons training activities it is designated to support. In addition, each of the eight ranges is positioned so that its flight operations can occur safely and cause the least amount of interference with the flexibility afforded to flight operations in the other ranges. As a result, the spacing of these weapons ranges in BMGR—East leaves intervening lands that are managed to:

- serve as access control areas that could safely contain infrequent and unplanned impacts from unintentionally released ordnance or aerial targets without undue risk to people or property
- provide controlled access areas that can be readily incorporated into the safety buffers of existing weapons ranges or form a temporary safety buffer area to support irregularly scheduled training or test activities that would expose personnel on the ground surface to safety hazards. For example, North and South TAC ranges are frequently augmented through the addition of the Air-to-Air B and Air-to-Air C airspace to provide additional airspace in which aircraft can maneuver and reposition for munitions delivery training attacks on North or South TAC range targets.
- support routine, low-level overflights by excluding incompatible land uses
- support ongoing target maintenance and EOD functions
- provide positive access control to the perimeters of existing weapons ranges.

Developed facilities within the BMGR—East inter-range area include Stoval Auxiliary Airfield, the Air Force Small Arms Range, four RMCPs, and the Munitions Treatment Range (now used as the EOD Training Range, see Figure 2-1). Stoval Airfield is an unmanned outlying auxiliary airfield that was constructed to support training during World War II. The airfield consists of three approximately 150- to 3,700-foot runways laid out as an equilateral triangle with a parking apron appended to its northeastern facing side. Although this airfield has not been maintained and its macadam surface has deteriorated, Stoval Airfield continues to support periodic training activities requiring remote, primitive airfield conditions. One such activity is the semiannual Weapons Tactics Instructors (WTI) Course conducted by the Marine Corps that includes Marine air and ground units. Stoval Airfield is incorporated in the WTI Course as a deployment site for ground units performing air defense, communications, and command and control functions and as a location for conducting helicopter and C-130 aircraft operations from a forward airfield. The Marine Corps has completed environmental documentation to establish a new ground support area of up to 250 acres in size southwest of Stoval Airfield (U.S. Marine Corps 1997). The support area site is wholly within a previously disturbed Air Force test site that was active in the late 1970s and early 1980s in association with the former MX (missile experimental, a type of Intercontinental Ballistic Missile) Missile development program.

The approximately three-acre Air Force Small Arms Range is located in the inter-range area west of State Route 85 and east of the White Hills. This facility is used for training security personnel in the use of small arms.

RMCPs 1, 2, 3, and 4 serve as range EOD and maintenance support areas for BMGR—East. Expended munitions and munitions scrap 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 (see Appendix B). Each RMCP is about 5.8 acres in size. Chain link fences topped with barbed wire enclose the perimeter of the RMCPs and entry is controlled through locked gates.

The EOD Training Range is located north of Manned Range 2 and a short distance south of the Manned Range 4 access road (see Figure 2-1). This facility occupies the detonation portion of a former Munitions Treatment Range that was inactivated in 1996. The training range is used for instructing EOD technicians in conducting safe detonations of UXO. Detonation of high-explosive charges weighing up to 2,000 pounds net explosive weight is authorized in this area.

Surface Entry. All surface entry by military and civilian personnel to the areas underlying R-2301E, R-2304, and R-2305 outside of the tactical, manned, and Air-to-Air Firing ranges is strictly controlled to prevent exposure to safety hazards presented by training or test missions or by elevated concentrations of UXO. General public access, with a valid range permit, is allowed only in the following four locations (see Figure 2-1). The Air Force reserves the right to close any of these areas to entry, however, whenever necessary to support training missions and protect public safety.

- an area designated as Air Force Management Area B that is east of State Route 85 and south of the Sauceda Mountains
- a small area that is west of State Route 85, opposite the Ajo Airport to the east of the highway, and east of Childs Mountain
- a small area in the vicinity of Bender Spring that is in a buffer zone between the northern boundary of East TAC Range and the northern BMGR boundary
- a loop road through the Mohawk Dunes west of the Air-to-Air Firing Range on the boundary with BMGR—West that provides access only for drive-through traffic.

As a result of a 2001 Air Force safety review, general public access practices within BMGR—East to the west of the Air-to-Air Firing Range and the Mohawk Mountains have changed. The affected location is adjacent to BMGR—West and includes the BMGR—East area within the R-2301E airspace buffer that is south of the Mohawk Mountains (see Figure 2-1). The aforementioned loop road is located in the northern portion of this area and crosses through the Mohawk Dunes. With the exception of the loop road, which is designed to accommodate drive-through traffic only (i.e., no backcountry hiking or overnight camping), this area is now closed to general public access to provide a buffer from weapons use within the Air-to-Air Firing Range.

The 2001 safety review also found that public use of the lead-in lines to Manned Ranges 1 and 2—which extend east of State Route 85 into the aforementioned Management Area B—as roads was inadvisable because these lead-in lines are used to direct aircraft over Area B on certain types of ordnance delivery approaches at Ranges 1 and 2. As a result of these review findings, the Range 1 and Range 2 lead-in lines were closed to public access in 2002 as a safety

requirement to protect visitors from potential inadvertent releases of ordnance from aircraft approaching these weapons ranges.

As described in Section 2.2.1, Native Americans will be provided with access to sacred sites, traditional plant gathering areas, and other places of cultural significance within the otherwise restricted inter-range areas to the extent compatible with military training and support activities. Other members of the public may also enter these inter-range areas for special purposes that are approved in accordance with 56 RMO Operating Instruction 1-3 on a case by case basis. Approved visits will be scheduled only on days when conflicts with military activities will not occur. An official escort may be required to accompany the visiting party for safety purposes.

2.2.7 Gila Bend Air Force Auxiliary Field and Auxiliary Airfield-6

Area Description. Includes Gila Bend AFAF, AUX-6, and the adjacent BMGR—East lands east and west of State Route 85 and north of the R-2301E and R-2305 airspace areas.

Area Size. 41 square miles, or 26,125 acres.

Military Land Use—Gila Bend AFAF and Outlying Auxiliary Airfield Operations, Parachute Training Drop Zones, and Access and Encroachment Control. The lands north of the R-2301E and R-2305 airspace boundary are managed to control public access to Gila Bend AFAF, the primary parachute training drop zone (DZ), Manned Ranges 3 and 4, the Air Force Small Arms Range, and East TAC Range. Gila Bend AFAF includes a fixed-wing aircraft runway and a heliport. The 8,500-foot by 150-foot paved runway is used for emergency or precautionary recoveries of military aircraft that malfunction or are damaged during operations on the BMGR. The runway is also used daily by aircraft performing overhead approaches and patterns. The six-pad heliport is used routinely to support ARNG training operations. No aircraft are permanently based at Gila Bend AFAF.

Gila Bend AFAF is also used by F-16 and A-10 aircrews from Luke and Davis-Monthan AFBs and the Arizona ANG as an outlying field for practicing traffic pattern and emergency simulated flameout (engine power loss) procedures. The airfield is equipped with a simulated laser target (SLT) transmitter. A-10 aircrews use the SLT to practice illuminating a target with a weapons system aiming laser. No weapons are actually employed and no hazardous laser energy is emitted in this activity.

Helicopter aircrews from the WAATS and the ARNG 1/258th AHB use Gila Bend AFAF as a forward operating area to support live-fire training within North and East TAC ranges. WAATS and 1/258th AHB activities at Gila Bend AFAF include aircrew changes and helicopter refueling and rearming.

A control tower provides air traffic control whenever Gila Bend AFAF is open. Normal operating hours are 7 a.m. to 11 p.m. Monday through Friday. The auxiliary field is also equipped with a fire department, tie down ramp, munitions storage area, and aircraft hangar. Aircraft with malfunctions or damage are repaired at Gila Bend AFAF by maintenance crews that travel from their home base to the auxiliary field for each event.

The Range Operations Control Center (ROCC or Range Ops) for BMGR—East, which was moved from Gila Bend AFAF to Luke AFB in December 2002, is responsible for authorizing

and coordinating all military and non-military aircraft entering and departing R-2301E, R-2304, and R-2305 airspace, as well as surface users entering or departing BMGR—East.

Gila Bend AFAF houses support facilities for EOD, range control, maintenance, and security functions within BMGR—East and air traffic control, fire department, and flightline service for the airfield. Billeting for visiting personnel working temporarily on BMGR—East is also located at the airfield. The primary parachute training DZ is located about 3.5 miles west southwest of Gila Bend AFAF. An alternate parachute training DZ is located on the airfield.

Road access to Manned Range 3 and East TAC Range extends south and southeast from Gila Bend AFAF. The Air Force controls use of these roads to protect the safety of the public and military personnel and to prevent interruption of training operations.

AUX-6 is used on an irregular schedule throughout the year as a staging area or forward arming and refueling point for helicopter operations and as a field training/bivouac site for ARNG or Air Force Security Police units. AUX-6 is not used for munitions training by ground or air forces.

Surface Entry. All surface entry to Gila Bend AFAF, AUX-6, and the adjacent BMGR—East lands east and west of State Route 85 and north of the R-2301E and R-2305 airspace areas is controlled to provide security for these installations and to protect the safety of all military and civilian personnel. General public access to these areas is not permitted because it is incompatible with ongoing training or support missions. Members of the public can enter Gila Bend AFAF to obtain a BMGR Range Entry Permit from the Security Police Office for the purposes of visiting areas within the BMGR that are open to the public. Portions of Gila Bend AFAF are also open to recreational use by military personnel and military retirees. The installation maintains 41 family camping spaces with water and electrical hookups. As described in Section 2.2.1, Native Americans will be provided with access to sacred sites, traditional plant gathering areas, and other places of cultural significance within the otherwise restricted inter-range areas to the extent compatible with military training and support activities. Other members of the public may also enter these inter-range areas for special purposes that are approved in accordance with 56 RMO Operating Instruction 1-3 on a case by case basis. Approved visits will be scheduled only on days when conflicts with military activities will not occur. An official escort may be required to accompany the visiting party for safety purposes.

2.2.8 Ground Support Areas and TACTS Range

Area Description. Includes the BMGR—West lands east of the Gila and Tinajas Altas mountains.

Area Size. 674 square miles, or 431,642 acres.

Military Land Use—Ground Support Areas, TACTS Range Facilities, Surface-to-Air Firing Range, and Standoff Air-to-Surface Weapons Range. This area serves a mix of Marine Corps and Navy training purposes within BMGR—West (see Figure 2-2). A regularly scheduled Marine Corps use of the area is for ground troop deployments in support of the semiannual WTI Course. Marine air defense, air control, communications, and command units select among 35 existing ground support areas as sites from which they may perform their missions. Although the aggregate area of the 35 current sites and the four approved, but as yet unused support areas, is

only about two percent of the total area of BMGR—West east of the Gila and Tinajas Altas mountains, the distribution of all 39 existing and approved support areas provides ground units with positions that are tactically realistic for the WTI training scenario. Marine Corps ground units also use the ground support areas for training at other times.

The Yuma Training Range Complex (YTRC) EIS (U.S. Marine Corps 1997) includes environmental documentation for establishing four new ground support areas and three new ground support zones within BMGR—West (see Figure 2-2). Each of the three new ground support zones encompasses several of the existing ground support areas. Although the zones have been approved, the Marine Corps continues to restrict ground units to the previous ground support areas. The current intent of the Marine Corps is to continue to rely upon the ground support areas for training deployments until such time that changes in the training scenario, weapons, or warfighting tactics dictate a need to use different locations within the zones. New locations within the zones would also be selected for ground unit deployments to replace current ground support areas that prove to have insufficient soil-bearing strength to support training activities without suffering unacceptable erosional effects. In circumstances such as this, a support zone location with acceptable soil characteristics would be identified to replace the former support area.

The TACTS Range, which has nine remote TIS stations and one TIS/master station, is directly analogous to the GRMDS within BMGR—East in terms of subsystem components for supporting training in air-to-air combat. Eight of the TACTS TIS stations are located within BMGR—West, one is within the Cabeza Prieta NWR, and the TIS/master station is located within BMGR—West at Baker Peaks (see Figure 2-2). The TACTS Range also has the components necessary to simulate both air-to-ground weapons delivery missions and surface-to-air missile threats.

The air-to-ground weapons delivery component of the TACTS Range 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. Aircrews training in air-to-ground weapons delivery maneuver their aircraft as to attack these targets but neither carry nor release actual munitions. Instead, electronic pulses (rather than actual ordnance drops) are used to simulate the trajectories of munitions. As a result, there are no munitions impact areas. The probable success of the intended attack is generated and scored via computer simulation. The TACTS Range is also configured to accommodate the use of airborne targeting lasers to designate the target intended for attack, but only for targets within the main airfield complex about 11 miles south of Wellton, Arizona. The targeting lasers used are not eye safe and could cause eye injury or blindness if an observer looks directly into the laser light. The area approved for laser use is posted as a laser hazard area (see Figure 2-2) and no personnel are allowed to enter this area when it is active without eye protection that is approved for the specific type of laser in use.

Seventeen mobile and 18 fixed electronic threat emitter sites are located adjacent to existing roads within BMGR—West east of the Gila and Tinajas Altas mountains. Threat emitter sites are locations where electronic equipment that transmits tracking and targeting radars to simulate surface-to-air antiaircraft missiles is periodically operated or permanently installed. Controllers operate the threat emitters to challenge aircrews training within the TACTS Range with realistic air defense threats.

The radar energy transmitted by the threat emitters is sufficient to be a radiation burn hazard to people close to the transmitter and in the path of the transmitted energy. Personnel on the ground at active mobile threat emitter sites keep people clear of hazardous areas associated with the emitter equipment. The fixed threat emitter transmitters are sufficiently elevated to ensure that no emitted energy can strike the ground at a range any less than that needed to attenuate the energy to a safe level. The fixed emitters are posted and fenced within an area of about 40 feet by 40 feet to keep people and large mammals (e.g., Sonoran pronghorn) a safe distance from the site. Power for the fixed emitters is provided at each site by a twenty kilowatt, liquid petroleum gas (LPG) fired generator. These emitters are operated remotely by microwave signals from TACTS Range controllers. No personnel are on site. The generators produce 40 decibels (A-weighted, or dBA) of acoustical energy (or noise) at a radius of 90 feet. This noise level is equivalent to that of a quiet private office. The fixed generators/threat emitters are typically operated for about 40 hours per month.

The Surface-to-Air Missile (SAM) Firing Range lies east of the Baker Peaks and Copper Mountains. The firing direction is to the southeast across the Mohawk Valley. Although this firing range has been inactive since 1999, it was used annually to support a live-fire validation test of the HAWK[17] surface-to-air missile system from 1980 until its retirement after 1998. The same area was also used for firing Stinger surface-to-air missiles. The Stinger firings usually occurred coincident with the HAWK missile exercise period. Both weapon systems were fired at target drones. All access to the test land area was suspended during the test period to protect the safety of civilians and military personnel and to prevent interruption of the test program. Units participating in or supporting the SAM firings occupied the ground support areas located on the east side of the Baker Peaks and Copper Mountains during the firing exercises. Future use of the Baker Peaks SAM range will probably not include the HAWK surface-to-air missile system but could involve firing Stinger missiles or other types of SAMs.

The area of BMGR—West that is east of the Gila and Tinajas Altas mountains has a potential future role as a surface danger zone that would underlie the trajectories of standoff air-to-ground weapons. Current standoff weapons carried on tactical aircraft include glide bombs, such as the Joint Direct Attack Munition (JDAM). Air-to-ground missiles fired from tactical aircraft can be launched at distances of up to tens of miles from the intended target. Weapons with increasingly longer standoff range are under development. Although no plans have yet been developed to use the BMGR as a training or test site for such weapons, the range has the capacity to accommodate this type of use. A likely scenario for standoff weapons training on the BMGR would include the launch or release of the weapon from the aircraft within R-2301W with the intent of an impact within North or South TAC ranges. Under these circumstances, the area of BMGR—West that is east of the Gila and Tinajas Altas mountains would serve as a safety buffer zone that could receive munition impacts as a result of a malfunction in the weapon system or error in the delivery process. Access to those portions of the BMGR that could potentially be impacted by an errant standoff weapon would have to be suspended during training periods.

Surface Entry. At most times, there is no requirement to restrict military or civilian personnel from entering most locations within the area of BMGR—West east of the Gila and Tinajas Altas mountains (see Figure 2-2). The exceptions include TACTS Range electronic instrument sites,

[17] The official name of the HAWK missile is an acronym meaning Homing All the Way Killer, a reference to the missile's on-board radar tracking system that guides the weapon to the target.

and target simulation and laser hazard areas, which are off limits to all persons that are not specifically authorized with access to these locations. Ground unit deployments (for other than missile firings) require that access to BMGR—West be restricted only within ground areas occupied by troops to protect the safety of both participating and nonparticipating personnel and to prevent disruption of the training exercise. Future SAM firings or standoff weapons use would require that much larger areas of BMGR—West be closed to entry during the affected training periods. General public access to the area of BMGR—West that is east of the Gila and Tinajas Altas mountains is currently permitted at most times because it is compatible with the regularly scheduled ongoing training missions. Native Americans will be provided with access to sacred sites, traditional plant gathering areas, and other places of cultural significance within otherwise restricted access areas located east of the Gila and Tinajas Altas mountains to the extent compatible with military training and support activities. Approved visits will be scheduled only on days when conflicts with military activities will not occur. An official escort may be required to accompany the visiting party for safety purposes.

2.2.9 Moving Sands and Cactus West Target Complexes, Auxiliary Airfield-2, and Cannon Air Defense Complex

Area Description. Includes the BMGR—West lands west of the Gila and Tinajas Altas mountains.

Area Size. 248 square miles, or 158,688 acres.

Military Land Use—Moving Sands and Cactus West Target Complexes, AUX-2, Parachute Drop Zone, Ground Support Areas, Rifle and Pistol Range, Cannon Air Defense Complex, EOD Operating Area, and Live Ordnance Jettison Area. The area of BMGR—West west of the Gila and Tinajas Altas mountains currently supports six types of training facilities and two training support areas (see Figure 2-2). The training facilities include the Moving Sands and Cactus West target complexes, AUX-2, a parachute DZ, four approved ground support areas, a rifle range, and the Cannon Air Defense Complex. The two training support areas include an EOD operating area and a live ordnance jettison area.

The Moving Sands and Cactus West target complexes provide a variety of scored air-to-ground targets for bombing, rocketry, and strafing. Ordnance deliveries on both complexes are restricted to the use of inert training practice munitions of up to 1,000 pounds. Both the Moving Sands and Cactus West complexes include circular target areas of 1,500 feet in radius for training in conventional bombing and rocketry and separate targets for training in low-angle strafing. The Moving Sands complex also contains a Mobile Land Target (MLT). The MLT is a remotely controlled movable target that runs in a racetrack pattern and can be operated at various speeds up to 50 miles per hour.

The Cactus West conventional target is a bull's-eye type of target designed to provide aircrews with training in the basic mechanics of delivering air-to-ground ordnance in a structured and tightly controlled target setting. The Moving Sands conventional bull's-eye was reconfigured in the late 1990s to represent a developed urban site with simulated streets and buildings set within the original 1,500-foot radius circular impact area. This target was reconfigured for the purpose of training aircrews in the difficult challenge of engaging targets in an urban environment. The Moving Sands urban target is also approved for air-to-ground laser use for designating targets. A

posted laser hazard area extends around this target to warn surface users not to enter this area because of the risk of eye damage (see Figure 2-2). Both target complexes are equipped with lighting for night operations, a radar reflector, and a distance-marked 11.2-mile-long run-in line. The run-in line, however, is no longer required for training purposes. Hits on the bombing/rocketry targets at the Cactus West Range are scored by a Weapons Impact Scoring System[18] (WISS). Training use on a portion of the Moving Sands urban target is also supported by a WISS. The strafing targets on both ranges are scored acoustically; the MLT on the Moving Sands range is not scored.

AUX-2 is a small, outlying airfield remaining from the World War II training era. The basic airfield structure of AUX-2 is that of an equilateral triangle of about 3,700 feet on a side. The original east-west oriented runway of AUX-2 has been redeveloped with aluminum runway matting and a landing control tower to resemble the deck and control island of a U.S. Navy Landing Helicopter Assault (LHA) ship. This LHA deck is used to train and refresh helicopter and AV-8B aircrews in the basic flight mechanics and visual references used for landing, taking off, and taxiing their aircraft aboard an LHA ship.

A second northeast-southwest oriented runway serves as a 4,000-foot-long landing strip, known as a tactical landing zone (TLZ). The TLZ is used to train C-130 transport aircrews in landings and takeoffs from narrow, unimproved, and even improvised forward airfields. The third leg of the triangle is a range access road.

Construction of a new hard-surfaced runway at AUX-2 to support AV-8B training in narrow-width roadway operations (also called road ops) was addressed in the YTRC EIS (U.S. Marine Corps 1997) and has been approved, but has not yet been implemented. This runway is planned to be parallel to, and on the western side of, the present TLZ. This runway would be 4,200 feet long by 34 feet wide, and have concrete vertical take-off and landing pads at each end.

The TLZ also serves as a DZ for tow banners used by the Marine Corps as aerial gunnery targets within the Chocolate Mountain Aerial Bombing and Gunnery Range in southeastern California. Tow banners are collected for scoring by ground personnel. A tow cable cutter is located about 2,000 feet south of the southwest end of the TLZ.

A parachute DZ used for training C-130 aircrews to perform cargo parachute drops is presently located a short distance southeast of AUX-2 at the inactive Rakish Litter target bull's-eye (see Figure 2-2). A tactical forklift vehicle is used to recover the cargo pallets dropped in this training.

Four new ground support areas for troop deployments have been approved but not implemented for the area of BMGR—West west of the Gila and Tinajas Altas mountains to support the WTI Course. The approximate locations of the new support areas have been identified; these positions could be adjusted, however, if relocation is warranted by the findings of pending cultural resource surveys of the sites.

The rifle and pistol range is located just inside the BMGR entrance gate at Yuma County 19th Street. This entrance also provides access to AUX-2 and the Moving Sands and Cactus West

[18] WISS is basically an automated television camera/computer system that detects and triangulates the locations of bomb hits within the target impact areas.

target complexes (see Figure 2-2). The rifle range has 30 firing lanes and is used by MCAS Yuma personnel to meet proficiency requirements for the use of small arms.

The Cannon Air Defense Complex, located in the northwest corner of the BMGR, provides administrative, support, and training areas for a Marine Air Control Squadron (see Figure 2-2). The complex is a permanent facility of about 0.3 square miles in size with a developed cantonment area. The perimeter is fenced to deter unauthorized access.

The EOD operating area is positioned close to and southwest of AUX-2. This area, which is operated under a Resource Conservation and Recovery Act (RCRA) Part B interim permit[19], has the dual purpose of providing for EOD training and for disposing of munitions with expired shelf-lives. Both open burn and open detonation techniques are employed. The second area, located about 5 miles west northwest of the Cactus West target bull's-eye, is used as a jettison area for aircraft that need to safely release live but unarmed ordnance or drop tanks.[20]

The live ordnance jettison area is the old bull's-eye of the former Panel Stager target. This target was inactivated in 1986 when it was replaced by the new Moving Sands and Cactus West target complexes. Aircrews carrying live but unarmed ordnance are directed to this site when an in-flight malfunction requires the jettisoning of the munitions, or other external stores such as fuel tanks, prior to a precautionary recovery of their aircraft at MCAS Yuma. EOD personnel are tasked to recover jettisoned bombs and dropped fuel tanks following each release event. Any fuel spills at this site, or at any other BMGR location, are addressed according to the current Spill Response Plan[21] and through consultations with the Arizona Department of Environmental Quality.

Surface Entry. Entry to the portion of BMGR—West that is west of the Gila and Tinajas Altas mountains and also west of the extension of Foothills Boulevard and the western alignment of El Camino del Diablo is restricted at all times to authorized personnel (see Figure 2-2). This portion of the range includes the Moving Sands and Cactus West target complexes and laser hazard area, live ordnance jettison area, AUX-2, EOD operating area, rifle and pistol range, parachute DZ, and Cannon Air Defense Complex. Hazards and/or security issues associated with these locations and the need to prevent unauthorized entry from disrupting ongoing training require that entry be restricted. Public recreation is not permitted within this area. Native Americans will be provided with access to sacred sites, traditional plant gathering areas, and other places of cultural significance within otherwise restricted access areas located west of the Gila and Tinajas Altas mountains to the extent compatible with military training and support activities. Other members of the public with a legitimate need to visit this area for special purposes will also be accommodated on a similar basis. Requests for visits to these locations will be approved by the Range Management Department at MCAS Yuma on a case-by-case basis. Approved visits will

[19] The RCRA Part B interim permit is available for public review at the MCAS Yuma Environmental Office during regular business hours.

[20] A drop tank is an aerodynamically shaped fuel tank that is carried externally by an aircraft, on the underside of the fuselage or wings, to extend its flight range. Drop tanks can be jettisoned in an emergency to reduce the aerodynamic drag and weight of the aircraft or to eliminate explosive quantities of fuel.

[21] The Spill Response Plan is available for public review at the MCAS Yuma Environmental Office during regular business hours.

be scheduled only on days when conflicts with military activities will not occur. An official escort may be required to accompany the visiting party for safety purposes.

General public access to the portion of BMGR—West that is west of the Gila and Tinajas Altas mountains but east of the extension of Foothills Boulevard and the western alignment of El Camino del Diablo is generally not restricted (see Figure 2-2). Requirements for temporary restrictions on entry to this area to support special training activities are implemented on an event by event basis.

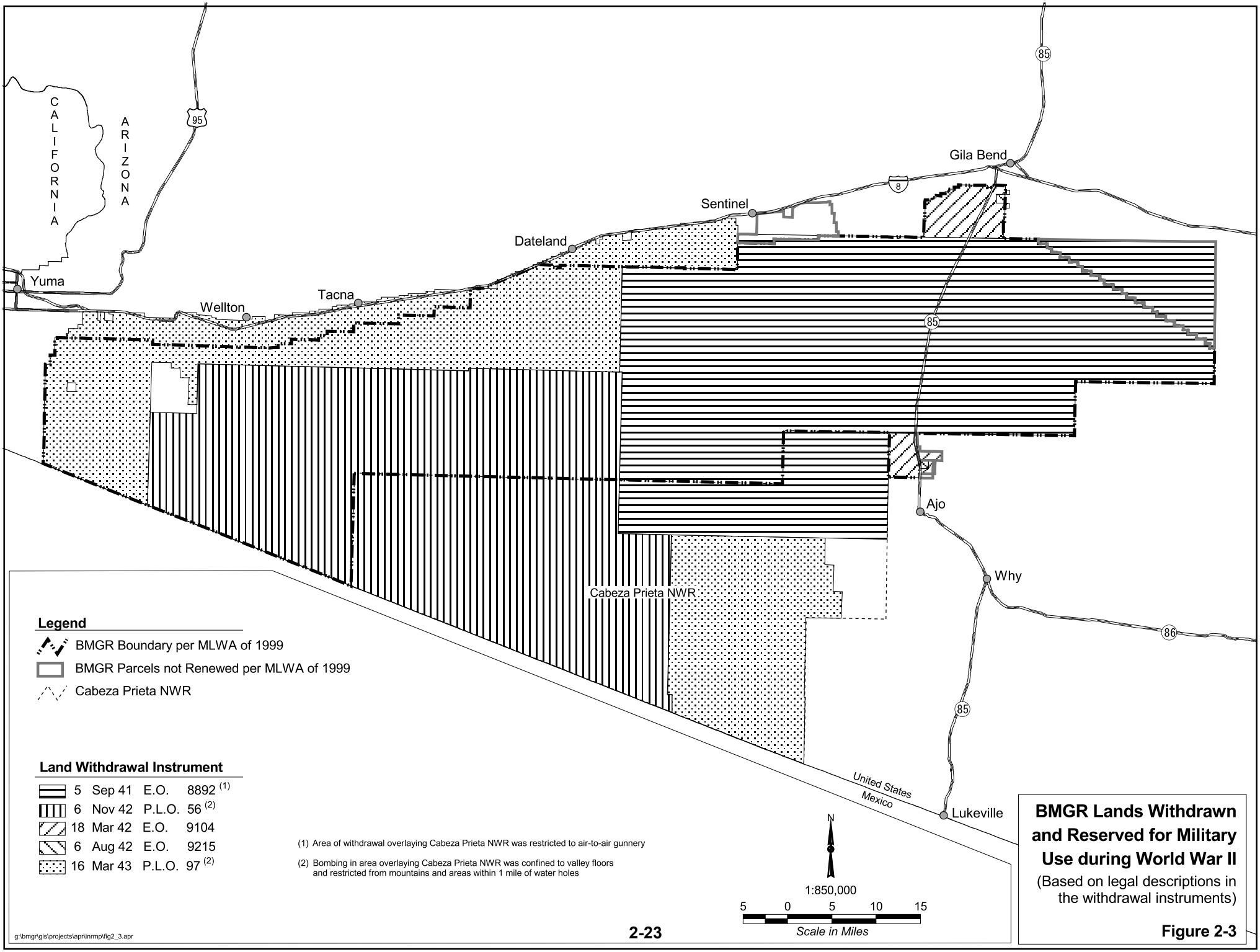
2.3 BMGR HISTORY

The land acquisition, military use, and resource use and management histories of the BMGR are summarized here to describe the stage upon which future management of the range environment will be directed. The land acquisition history for the BMGR, which dates from 1941, includes a long and complex series of land withdrawals and state and private land purchases. The acquisition history of the range is pertinent to the development of the draft EIS for the proposed INRMP in that it identifies the time period over which the various properties within the range have been subject to military use, restrictions on non-military land use, and various forms of management. The account of military land use adds to the acquisition history by defining how BMGR lands have been previously used for military purposes. This information is important for at least three reasons. First, constraints on some land or management activities may be necessary because of the known or potential presence of UXO on or below the ground surface. Second, the extent to which ground surfaces or natural biological communities may have been disrupted by former military activities may provide a gauge for assessing the effects of such activities and the effectiveness of either natural or management-induced restoration. Third, historical information is necessary to analyze cumulative impacts over time, as required by NEPA. The resource use and management history of the BMGR is similarly valuable for providing information on the extent to which the range environment has been previously affected by non-military use and the effectiveness of former management actions.

2.3.1 Acquisition

Acquisition of the BMGR for military aviation training purposes began barely three months before the United States entered World War II after the Japanese attacked Pearl Harbor on 7 December 1941. The first 1,077,500 acres of the range (known then as the Gila Bend Gunnery Range) were withdrawn by Executive Order 8892 signed by President Franklin D. Roosevelt on 5 September 1941 (U.S. Air Force 1986) (Figure 2-3). This step was just one of a great many taken to create military bases and training ranges across the Nation prior to and during World War II. In Arizona alone, 22 military airfields and three bombing and gunnery ranges were established from 1940 through 1943. During this period, four additional parcels were added to the BMGR land withdrawal through either executive order (E.O.) or public land order (P.L.O)[22] (Table 2-1). The last World War II addition, on 16 March 1943, raised the range to its full wartime land area of 2,776,968 acres (4,330 square miles).

[22] Public land orders may be implemented at the direction of the President by his designees. In the case of the BMGR, President Roosevelt, through E.O. 9146 (dated 24 April 1942), delegated to his Secretary of the Interior, the authority to issue P.L.O.s pertaining to Department of the Interior lands.



BMGR Lands Withdrawn and Reserved for Military Use during World War II

(Based on legal descriptions in the withdrawal instruments)

Figure 2-3

TABLE 2-1
LAND ACQUISITION HISTORY FOR THE BMGR

Legal Instrument	Date	Acreage	Description
E.O. 8892	5 Sep 41	1,077,500	Established range: tract included most of the current BMGR—East and northwest area of Cabeza Prieta NWR
E.O. 9104	18 Mar 42	45,168	Expanded range: included three widely separated tracts - Gila Bend AFAF and AUX-6 area; Ajo Auxiliary Army Airfield area; and a tract in the northwestern portion of the range in the vicinity of the Gila Mountains
P.L.O. 56	6 Nov 42	949,000	Expanded range: included southwestern portion of current BMGR—East, all but the most northern and western portion of current BMGR—West, and western portion of Cabeza Prieta NWR
P.L.O. 97	16 Mar 43	705,300	Expanded range: included northwestern portion of current BMGR—East, northern and westernmost portions of current BMGR—West, many thousands of acres north of the current northern boundaries of BMGR—West, and the southeastern portion of the Cabeza Prieta NWR.
Total World War II Withdrawals(4)	5 Sep 41 – 16 Mar 43	2,776,968	Maximum extent of World War II range land area
Transfer	1946	-640	Reduced range: Ajo Auxiliary Army Airfield was inactivated and the property was transferred from the range to Pima County for public use as the Ajo Municipal Airport
P.L.O. 512	August 48	-45,168	Reduced range: this P.L.O. revoked P.L.O. 9104
P.L.O. 652	26 Jun 50	43,895	Re-expanded range: returned to the range all but 1,273 of the 45,168 acres deleted by P.L.O. 512
P.L.O. 680	27 Oct 50	-556,200	Reduced range: this P.L.O. revoked the withdrawal of all but 149,100 acres withdrawn under P.L.O. 97 and opened the affected lands to homesteading by qualified veterans. Area affected included northwestern portion of current BMGR—East near Stoval Airfield, northern and western portion of current BMGR—West boundary, and southeastern portion of Cabeza Prieta NWR
Special Land Use Permits AR 04214 and AR 032722	8 Apr 53 – 8 Apr 78 in five-year increments	17,131	Expanded range: leased BLM lands south of Sentinel, Arizona, to Air Force to buffer now inactive target sites and Manned Range 4
Department of the Interior Letter	27 Oct 52	2,106,902	Continued range: letter extended existing withdrawals indefinitely pending issuance of a P.L.O., which was never forthcoming

TABLE 2-1
LAND ACQUISITION HISTORY FOR THE BMGR

Legal Instrument	Date	Acreage	Description
P.L. 87-597 (76 Stat. 399)	24 Aug 62	Tract A 140,570 Tract B 345,091	Re-expanded range: returned to the range all but 70,539 of the 556,200 acres deleted by P.L.O. 680, Tract A was in the southeastern portion of the Cabeza Prieta NWR and Tract B was in the western and northern sections of the current BMGR—West
P.L.O. 5324	21 Dec 72	479,100	Continued range: P.L.O. extended withdrawals under P.L. 87-597 for five years until 24 Aug 1977
Proposed Withdrawal and FLPMA	5 May 77	502,792	Continued range: proposed legislative renewal of lands withdrawn under P.L. 87-597 and leased under AR 04214 and AR 032722, extends effect of withdrawals until 5 May 79
FLPMA	6 May 79	2,664,432	Continued range: FLPMA continues all withdrawals then in effect until otherwise modified under its provisions or other applicable law
Proposed Withdrawal and FLPMA	15 Dec 81	2,664,432	Continued range: proposed legislative renewal of all range land withdrawals plus lands formerly leased under AR 04214 and AR 032722, extends withdrawal effect to all properties proposed for withdrawal
P.L. 99-606	6 Nov 86	2,668,100	Continued range: legislative withdrawal and reservation of BMGR for military purposes for 15 years; first range withdrawal in one consolidated legal instrument
Purchase	1986 - 1999	83,721	Continued range: 83,721 acres of state trust and private lands within the boundary of the BMGR were purchased by the DoD during this period to eliminate the need to secure the use of these lands for military purposes through ongoing lease or lease-condemnation processes.
P.L. 106-65	5 Oct 99	1,650,200	Continued but reduced range: legislative withdrawal and reservation of BMGR for military purposes for 25 years, range land area reduced from 2,668,100 acres to 1,650,200 withdrawn acres because of the non-renewal of Cabeza Prieta NWR, Sand Tank Mountains area, Ajo Airport area, Sentinel Plain area, and Interstate 8 vicinity area.
Total Current Acquisitions	5 Oct 99 - present	1,733,921	The 1,650,200 acres withdrawn from the public domain by the MLWA of 1999 plus the addition of 83,721 acres of former state and private lands purchased by DoD brings the total range area to 1,733,921 acres.

Sources: U.S. Air Force 1986, MLWA of 1986, and MLWA of 1999.

The statutory authority cited by President Roosevelt for creating the Gila Bend Gunnery Range and many other military reservations by executive order alone was found in an Army appropriations act of 1918 with only one relevant line stating "That by order of the President, any Government property or unappropriated or reserved public lands may be reserved from entry, designated, and used for such aviation stations or fields for testing and experimental work …"

(U.S. Air Force 1986). This Presidential power was later taken away by Congress, which reserved for itself the sole authority to enact land withdrawals for military purposes that are more than 5,000 acres in aggregate through the passage of the Defense Withdrawal Act of 1958 (P.L. 85-337), also known as the Engle Act.

Lands incorporated in the range during World War II included all of the properties presently within the BMGR plus about 95 percent of the Cabeza Prieta NWR (known then as the Cabeza Prieta Game Range); the Sand Tank Mountains, Ajo Airport, and Interstate 8 vicinity properties removed from the range by the MLWA of 1999 (see Figure 1-1); and lands contiguous to the northern boundary of BMGR—West and northwestern BMGR—East that were removed from the range in October 1950 (U.S. Air Force 1986). The Sentinel Plain area (see Figure 1-1), which was also removed from the BMGR by the MLWA of 1999, was not included in the range until 1953.[23]

In 1946, the year after the end of World War II, military ranges and airfields throughout the country were closed or inactivated, including all of the military airfields in Arizona except Williams and Davis-Monthan Army airfields (redesignated as Air Force bases in 1948). Control of the gunnery range passed to Williams AFB at this time. The range fell into a period of low or non-activity for several years following the war. The outbreak of the Korean War and the growing press of the Cold War, however, prompted reactivation of the gunnery range, Luke AFB (formerly Luke Field), Gila Bend AFAF at the gunnery range, and Yuma Air Base[24] (formerly Yuma Army Airfield) in early 1951 (Keane and others 1997). The Presidential authorizations for the gunnery range during World War II had included expiration provisions that would be triggered six months after the termination of the unlimited national emergency proclaimed by President Roosevelt on 27 May 1941 as the Nation faced the growing threat of war (U.S. Air Force 1986). That unlimited national emergency was proclaimed terminated on 28 April 1952 by President Harry S. Truman following the Treaty of Peace with Japan that was brought into force on 8 September 1951 (Proclamation No. 2974, CFR 158 [1952]). Without the reactivation of the gunnery range necessary for Korean and Cold War training, jurisdiction of the various withdrawals and leased range land parcels would have reverted to the BLM, Bureau of Reclamation, State of Arizona, and private owners. Authorization for continued use of the gunnery range lands was issued on 27 October 1952 from the Office of the Secretary of the Interior via a letter sent to the Secretary of the Air Force the day before World War II era executive orders and public land orders were scheduled to expire (U.S. Air Force 1986). The letter was issued pending the issuance of a new public land order to formalize the continuing withdrawal of the range lands for military purposes. Although that public land order was never forthcoming, the range withdrawals continued to remain in force by other mechanisms until the passage of the MLWA of 1986, which granted a 15-year withdrawal of the BMGR for military purposes in a single legal instrument. That process was repeated by Congress 13 years later with

[23] The Sentinel Plain area was originally made a part of the range through special land use permits issued by the BLM (Serial Numbers AR 04214 and AR 032722) rather than through a withdrawal and reservation process. Apparently, the Air Force requested the special land use permits, which could be issued quickly by the local BLM office, to provide a buffer area for now inactive napalm and simulated convoy targets situated close to the northern range boundary south of Sentinel (U.S. Air Force 1986). The Sentinel Plain area was finally incorporated into the range land withdrawal by the MLWA of 1986 but was later removed from the BMGR by the MLWA of 1999.

[24] Yuma Air Base was redesignated as Vincent AFB in 1956. Vincent AFB became Marine Corps Auxiliary Air Station, Vincent Field, Yuma in 1959 and Marine Corps Air Station Yuma in 1962.

the passage of the MLWA of 1999 that renewed the BMGR land withdrawal, with a reduced land area, for 25 years until 2024.

Lands belonging either to the State of Arizona or under private ownership were included within the boundaries established for the range during World War II. Continued use of these lands by the state or private owners was deemed to be incompatible with the intended use of the new range as an aircraft weapons training area for military aircrews. Consequently, the affected state trust lands[25] were secured for military use by a lease-condemnation process while private properties were secured by lease only with the cooperation of the landowner or, when necessary, by lease-condemnation. Annual lease fees were paid to the state and private landowners for the use of these properties. Over the years, a program that exchanged federal land outside of the range for state trust or private lands inside the range on a dollar value basis reduced the volume of these inholdings; however, 83,721 acres of these properties remained within the BMGR after the MLWA of 1986. DoD purchased the inholdings prior to the passage of the MLWA of 1999.

2.3.2 Historical Military Use

The BMGR was initially established in the fall of 1941 to support the Army Air Force[26] flying training programs at Luke Field (Luke AFB after 1 January 1951) and Williams Field (Williams AFB after 1947) that had begun flying operations in June 1941 (Keane and others 1997). The range was needed primarily for aerial gunnery training, but was also used for bombing training. The first parcel of land selected for the range had three key characteristics critical to its intended mission. First, located southeast to southwest of Gila Bend, the new range would be in close flying proximity to Luke and Williams fields (straight line flying distances of about 52 and 69 miles respectively). Second, except for some scattered ranches and mines, the land was uninhabited and undeveloped. Third, at 1,077,500 acres (1,684 square miles), the initial range tract was large enough to be subdivided into several separate training areas that could safely support several simultaneous but independent training missions, which added significantly to the productivity of the overall training program. The continued proximity of the BMGR to military air bases and its size continue to be two of the most important assets of the range for supporting contemporary military training. Military use has continued to preclude habitation and development of the range except for infrastructure needed for military training.

Although starting at 1,077,500 acres, the range was already expansive; land continued to be added to the complex until it reached the full World War II era size of 2,776,968 acres (see Table 2-1). These additions were required to give the range the needed training capacity to produce qualified aircrews for the Nation's war effort. The western land areas of the range were added to support flight training programs at Yuma Army Air Base. Flight training was already underway at Yuma Army Air Base, which had opened for operations on 29 June 1942, when the western

[25] Most of these properties were lands held in trust for the state for the benefit of the public schools and some other public institutions such as universities and penitentiaries. State trust lands are administered by the Arizona State Land Department with the goal of maximizing revenues for the trust beneficiaries. Lease-condemnation was necessary to secure trust lands for federal military use because the state was required by law to consider the highest revenue generating use for these properties.

[26] The U.S. Air Force was established as an independent service on 18 September 1947. The Air Force evolved from the Army Air Service which became the Army Air Corps in 1926, which in turn became the Army Air Force in June 1941.

extent of the range land area was added in November 1942 and March 1943 (see Table 2-1 and Figure 2-3). The development of Yuma Army Air Base as a training command separate from those at Luke and Williams fields and the addition of the western parcels to the gunnery and bombing range established a second area of aircrew training operations that were independent from those conducted in the eastern range areas. By the close of 1942, the eastern and western range components were known as the "Gila Bend Gunnery Range" and "Yuma Aerial Gunnery and Bombing Range," respectively.[27] By providing additional multiple locations for further subrange development, the east-west division of the range proved to be an effective means of maximizing the types and volume of training benefits that could be achieved from the withdrawn lands. This basic east-west split of range resources has been continued ever since and is currently represented by the BMGR—East and BMGR—West divisions of the range.

Starting with these initial World War II range use activities, development and use of the BMGR to support military training can be roughly separated into five historic eras that are applicable to both the eastern and western components of the range. These development/use eras include:

- World War II Era, 1941 to 1949
- Korean War and Early Cold War Era, 1950 to 1959
- Middle Cold War and Vietnam War Era, 1960 to 1974
- Late Cold War and Persian Gulf War Era, 1975 to 1991
- Post Cold War Era, 1992 to Present

The purposes, character, and extent of each of these development/use eras are summarized in the following five subsections. Additional details on the development and use of the range for military purposes are provided in Appendix B.

2.3.2.1 World War II Era (1941 to 1949)

The training emphasis throughout the range during World War II was on aerial gunnery. The eastern range area was used primarily for advanced aircrew training in fighter aircraft. This training included 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 later years of the war. The western range area was also used to some extent for training fighter aircrews, but the principal instructional activity was in air-to-air gunnery training for bomber aircrews.

The level of development necessary to support training at the BMGR during the second World War was limited principally to three manned auxiliary air bases—at Gila Bend, Ajo, and Dateland—and 14 unmanned outlying auxiliary airfields. Personnel that either supported or participated in training were stationed at each of the three manned auxiliary air bases. Buildings were constructed at each of these bases to provide personnel housing and spaces for offices, workshops, aircraft hangars, classrooms, and storage, among other activities. The runways, taxiways, and parking ramps necessary for aircraft operations were also developed. The base at

[27] The BMGR has had a number of official and unofficial names in addition to the two referenced above. Some of these include "Ajo-Gila Bend Aerial Gunnery Range;" "Williams Bombing and Gunnery Range;" "Luke-Williams Bombing and Gunnery Range;" and, from 1963 to 1986, "Luke Air Force Range." Barry M. Goldwater Air Force Range became the official name of the range with the passage of the MLWA of 1986. This was shortened to Barry M. Goldwater Range and Barry M. Goldwater Range—East and Barry M. Goldwater Range—West became the designated names of the eastern (Air Force) and western (Marine Corps) components, respectively, with the passage of the MLWA of 1999.

Gila Bend (now Gila Bend AFAF) is the only one of the three manned auxiliary air bases that remains inside of the BMGR and that continues to operate as a military installation. Student aircrews were sent to these auxiliary bases during World War II for concentrated periods of instruction in gunnery and possibly bombing training.

Available evidence indicates that the 14 outlying auxiliary airfields were day use only facilities at which personnel were not permanently stationed. Each of these 14 auxiliary airfields had three interconnecting, macadam-surfaced runways laid out as an equilateral triangle with an adjacent parking apron. No other permanent built-up infrastructure was present at these airfields. These airfields likely were used as locations to rotate aircrews and possibly to refuel or rearm aircraft between successive gunnery training missions. Eight out of the 14 auxiliary airfields remain within the BMGR; the other six are in locations that are no longer a part of the range. Three of the eight auxiliary fields that remain inside of the BMGR continue to be used for military purposes. The Marine Corps continues to use AUX-2, located at the far western end of BMGR—West, as a day use facility. Within BMGR—East, the auxiliary fields that continue to be used are Stoval Airfield, located southwest of Dateland near the northern BMGR boundary, and AUX-6, located within the Sentinel Plain and southwest of Gila Bend.

Luke AFB (then Luke Field) and Gila Bend AFAF were inactivated at the close of World War II. Ajo Army Airfield was deeded to Pima County in 1946 for use as a municipal airport. Control of the gunnery range passed to Williams AFB, which remained open. The extent to which the eastern side of the range continued to be used prior to the outbreak of the Korean War is not known. Yuma Army Air Base and Dateland Auxiliary Airfield were also inactivated at the close of World War II and the western side of the range apparently fell into disuse.

2.3.2.2 Korean War and Early Cold War Era (1950 to 1959)

The outbreak of the Korean War in 1950 rekindled the requirement to use the BMGR for aircrew training on a full-time basis. Full-time use of the range has continued unabated until the present.

Gila Bend AFAF and the eastern range area had fallen into disrepair during the inter-war years (1946-1950) and required substantial repairs and new construction. A suite of new target developments transformed BMGR—East from the predominantly aerial gunnery training facility that it had been during World War II into a complex that could support all phases of tactical air combat training. The new developments were designed to support instruction in both the employment of fighter aircraft weapons (guns, missiles, rockets, and bombs) and tactics in air combat. The changes at BMGR—East reflected lessons learned during World War II and the emerging demands of warfare in the jet aircraft age. Instruction in air-to-air gunnery continued to be an important range function, but the new era also brought training in air-to-air missile firing and a greatly expanded emphasis on the use of aircraft for air-to-ground attack. Development of the range to support these new training missions began in 1951 and the first phase of modernization was completed in 1954. By this time, BMGR-East was equipped with: (1) four ground controlled subranges; (2) five independently located vehicle convoy subranges; (3) a camouflage subrange; (4) a realistic tactical subrange; (5) an air-to-air firing subrange; and (6) a napalm (or fire-bomb) subrange.

One consequence of the expanded requirements to support training in air-to-ground attack was that development of the eastern range area included locations both around the perimeter and in

the interior of BMGR—East. Previous development of this area of the range had been restricted principally to perimeter locations adjacent to U.S. Highway 80 and State Route 85, which provided easy access to the range for both development and use. The ground controlled subranges continued to be located along these highways to provide daily access for the ground crews who manned these facilities. The ground controlled subranges of this era were the forerunners in both function and location of the four manned ranges that are currently in use within BMGR—East. The development of the new tactical subrange, convoy subranges, and camouflage subrange required additional land and airspace in order to support the aircrew training activities that would occur at these locations. These new subranges were developed within interior locations of BMGR—East that later became North TAC Range, South TAC Range, and East TAC Range.

The primary use of the western range area from 1950 to 1951 was the support of an air-to-air gunnery and air-to-air rocket firing proficiency program of the U. S. Air Force Air Defense Command (ADC). This program was based at the Yuma Army Air Base (Vincent AFB after 1956). ADC was responsible for training and deploying the fighter interceptor squadrons that defended the United States 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. From 1954 through 1958, the primary proficiency mission was switched from aerial gunnery to training with aircraft-launched air-to-air rockets. Interceptor launched air-to-air rockets were a new air defense weapon at the time. More than 60 interceptor squadrons participated in this training each year and launched tens of thousands of aerial rockets over the BMGR—West area. No new development of the BMGR—West surface area is known to have been necessary to support the ADC proficiency training mission with the exception of an EOD area that was established south of AUX-2.

2.3.2.3 Middle Cold War and Vietnam War Era (1959 to 1974)

Air Force use of the BMGR—East area during the middle Cold War and Vietnam War era continued to focus on the training of aircrews to fly fighter and attack aircraft. The four basic types of subranges—tactical subranges, ground-controlled subranges, air-to-air gunnery subranges, and air-to-air maneuvering subranges—that had been established during the 1950s continued to provide the necessary training support, although the designs of the subranges were modified throughout this period to meet evolving training needs. By 1960, North, South, and East TAC ranges were well established in terms of the ground surface areas dedicated as ordnance impact locations. The types and layouts of targets within these three tactical ranges and the dimensions of the airspace reserved for the operation of each subrange would be modified in the future years, however, to meet new safety and training needs.

The training era began with six ground controlled subranges in operation within BMGR—East; but by the end of the period, the old ground controlled subranges had been inactivated and replaced with the four modern manned ranges in use today. Air-to-air gunnery occurred in two locations; a primary gunnery range was positioned within BMGR—East over the San Cristobal Valley and an alternate firing range was located over the Cabeza Prieta NWR. The primary gunnery range was also used for air-to-air missile firings.

The presence of the Marine Corps as a regular BMGR user began in 1959 when Vincent AFB was transferred to the Marine Corps and became Marine Corps Auxiliary Air Station Yuma

(MCAS Yuma from 1962 forward). The interservice transfer of Vincent AFB was accompanied by a new joint-use agreement between the Air Force and Navy that granted Marine Corps use of the western area of the BMGR and its overlying restricted airspace. Marine Corps use of the western side of the range has continued ever since. The Air Force, however, retained control of and responsibility for the entire BMGR until control of BMGR—West was assigned to the Secretary of the Navy by the MLWA of 1999.

Marine Corps use of its new range stressed both air-to-air and air-to-ground air combat training. Air-to-air gunnery and air-to-air missile firing activities continued much as they had under the Air Force ADC. Two new target complexes, called Rakish Litter and Panel Stager, were constructed within the far-western part of the range to support the air-to-ground component of Marine Corps training. These complexes were similar to the Air Force ground controlled ranges in that they had bull's-eye type targets and range control personnel were present on the ground to direct the use of the subrange. These target complexes were used for aircrew training in the aircraft delivery of bombs, rockets, and gunfire. The munitions used on these target complexes were restricted to inert training ordnance, including bombs of up to 1,000 pounds in weight. Other Marine Corps developments during the 1960s in the far western range area included a rifle range; machine-gun range; surface-to-air missile firing site; and a built-up training and administrative site, which was later called the Cannon Air Defense Complex. The rifle range and Cannon Air Defense Complex are still in use, but the machine-gun range and missile firing site have been inactivated.

Marine Corps ground use of the interior of BMGR—West east of the Gila and Tinajas Altas mountains was limited during this historical period to: (1) a fallout area for aerial gunnery and missile firing munitions and (2) electronic instrumentation sites. The aerial gunnery and missile firing subrange was in the southern half of the R-2301E airspace. The munitions-fallout area for this subrange included the western half of the Cabeza Prieta NWR and the southern half of BMGR—West. The electronic instrument sites included 10 remote tracking and telemetry test substations that form the electronic architecture of the TACTS Range that remains in current use. Nine of the 10 stations are located within BMGR—West; the tenth is located inside the Cabeza Prieta NWR.

2.3.2.4 Late Cold War and Persian Gulf War Era (1975 to 1991)

During the late Cold War and Persian Gulf War era, the eastern range area continued to be one of the principal Air Force training locations for student pilots transitioning to operational fighter and attack aircraft. BMGR—East was also important during this period for supporting the readiness training needs of operational Air Force, Air Force Reserve, and ANG units stationed in the local region and became increasingly important as a preferred site for readiness training deployments by units from locations where inclement winter weather curtailed flying activities. The important developments that occurred within BMGR—East during this period included: (1) construction of an electronic warfare (EW) range in 1975, (2) redevelopment of the target simulations in all three tactical ranges from 1975 through 1979, (3) expansion of tactical range EOD clearance activities from 1976 through 1977, (4) implementation of an MX missile test project in 1978, and (5) construction of an air combat maneuvering instrumentation (ACMI) range in 1979 and 1980.

Aircrews training on the EW range were challenged with electronic signals that simulated the frequencies of air defense radars—used to guide surface-to-air missiles and anti-aircraft artillery fire—and jamming systems. The EW range realistically simulated the types of air defense threats that aircrews could encounter in actual combat.

The tactical range redevelopment project was designed to bring the target scenarios within these subranges up to date with the types of conditions that aircrews could realistically encounter in combat. East TAC was redeveloped to simulate the probable look of a European theater of operations, North TAC as a Korean theater of operations, and South TAC as a Middle Eastern theater of operations.

The area subject to periodic EOD clearances within North, South, and East TAC ranges was greatly expanded beginning in 1975 to improve the safety conditions of the range. Prior to this time, manned ranges were cleared of expended munitions and scrap on a monthly and annual basis, but tactical ranges were cleared only as required for target repair and replacement. The EOD clearances on tactical ranges were limited to the paths needed to reach targets and the areas around targets in which the movement of vehicles and personnel was required to complete repair and replacement work, generally extending not more than 1,000 feet from the target (U.S. Air Force 1974). Targets within the tactical ranges were heavily contaminated with munitions as well as target scrap. The death of a civilian contractor and the injury of two other civilian workers who were torch-cutting scrap bombs near East TAC in 1975 drove the Air Force to consider range safety in a larger context. That condition coupled with range safety issues elsewhere in the Air Force led to a revised and expanded service-wide EOD program that established the current five-year EOD clearance criteria. The new criteria required that the ground surface of each target be cleared of expended munitions to a radius of one nautical mile (1.15 statute miles or 6,080 feet) or until the density of the munitions present was less than five intact items per acre. Each target had to be cleared under the new criteria at least once every five years. An annual requirement to clear surface exposed munitions out to a distance of 1,000 feet from the target was formalized at this time.

The new five-year EOD clearance program was applicable to both tactical and manned ranges and resulted in a dramatic increase in the acreage affected by this activity. In 1974, the total number of acres reported cleared of munitions for the four manned ranges and three tactical ranges combined was 27,575 acres, but, in 1976, 47,800 acres were cleared in South TAC alone (U.S. Air Force 1976; Stone 1977). In 1998, the Air Force reported that 152,895 acres of BMGR—East were affected by all EOD clearances (U.S. Air Force 1999). That figure included 118,042 acres for the three tactical ranges and 34,853 acres for the four manned ranges. The areas that are currently affected by annual and five-year EOD clearances within BMGR—East appear to have been fully established by the middle to late 1970s. Based on this timeframe for the initial five-year EOD clearances, each of the three tactical ranges had been subject to five or six five-year clearance cycles by 2000.

The MX Missile Buried Trench Construction and Test Project, which was part of a larger Air Force study program to develop a deployment mode for the MX Intercontinental Ballistic Missile (ICBM), was conducted immediately west of Stoval Airfield. The buried trench concept was to shuttle MX missiles in buried reinforced concrete tunnels to prevent the Soviet Union or any other adversary from knowing where to aim their missiles in a first strike attempt to eliminate an American retaliatory nuclear capability (U.S. Air Force 1978). The study on the

BMGR was a proof of concept test with two purposes: (1) to test the ability of an apparatus to erect the missile through the top of the tunnel and overlying earth cover to prepare it for launch, and (2) to test the ability to shuttle the missile transport and launch vehicle through the tunnel. The total area disrupted by this project was 200 acres. The project is believed to have been active from 1978 to 1980 and was reactivated briefly in 1986. The site was resealed following the completion of this test and has since remained inactive. No missiles were launched from this test site.

Although the BMGR's primary purpose and use are for military aircraft training, the range has also been reserved for use as a high-hazard testing area. The buried trench project and a companion MX missile test project that began in 1977 within BMGR—West are significant in that these projects are the only large-scale, surfaced-based test activities known to have occurred on the BMGR.

The ACMI system (now referred to as the GRMDS) was directly analogous to the Air Combat Maneuvering Range (ACMR) system constructed by the Navy and Marine Corps in 1972 within BMGR—West. Development of the ACMI Range involved the installation of three remote TIS stations at dispersed locations within BMGR—East and four subsystem stations at dispersed locations within the Cabeza Prieta NWR.

The primary training emphasis within the western range area during the late Cold War and Persian Gulf War era continued to be on readiness training for combat qualified Marine and Navy aviation units. Ground units with a direct or supporting role to play in the integration of Marine Corps air-ground combat teams were also incorporated in some exercises to both enhance the realism of the aviation training and provide realistic training for the ground component. In addition to this training, the western range area was also used by the Air Force Weapons Laboratory as a test location for evaluating underground shelter facilities designed to protect ICBMs. Ten surface use and development activities were identified as occurring within the western range area in support of these training and test operations. Two of these activities—Quarterly Battery Training, which began in 1975, and the WTI Course, which began in 1978—involved Marine ground unit use of selected range surface. Three of the activities were sequential steps in the series of tests conducted by the Air Force Weapons Laboratory from 1977 to 1985. One activity involved an upgrade to the Rakish Litter and Panel Stager target complexes in the late 1970s and a second activity, in 1986, included the inactivation of these complexes and the simultaneous construction of the Moving Sands and Cactus West target complexes as replacements. Development of new ACMR facilities, in 1982 and 1986, comprised two of the three remaining activities. The tenth activity was the 1987 construction of a landing and take-off practice area at AUX-2 that simulated the flight deck of a U.S. Navy LHA ship.

Quarterly Battery Training involved the deployment of a HAWK anti-aircraft missile unit to the western half of the range for a three- to five-day training exercise. This activity required the movement of the unit’s personnel, vehicles, and equipment to one or more locations on the range that were considered to be tactically favorable for their mission. No missiles were carried during this exercise, but the unit would employ air defense radars in simulated engagements with aircraft training in R-2301W. Quarterly Battery Training was important in the military surface use history of the BMGR for two reasons. First, it was one of the earliest ground-unit training uses of the range and, second, it appears to have been the first that required the unit to have the option to use a number of different range locations (now called ground support areas) during an

exercise in order to provide realistic training. The average area occupied by a ground unit at any one location was several hundred meters on a side.

Use of the BMGR as a training site for the semiannual WTI Course began in 1978. Like Quarterly Battery Training, this activity also required that ground units have a number of surface locations to which they could deploy available within the range. Similar to the experience of Quarterly Battery Training, a number of specific range locations emerged after several WTI Courses as having the best tactical characteristics to support the missions of the various ground units. In the years following the inception of Quarterly Battery Training and WTI Course use of the range, the surface locations used to support these two training exercises were also used for other ground-based training activities. Marine Corps units that routinely participated in the WTI Course used the same surface locations for additional training activities specific to the unit.

An inventory of the ground support areas needed to provide the flexibility required for the various Marine Corps ground-based training exercises was completed in 1988. At that time, the inventory found that 41 individual ground support areas were in periodic use. The 41 areas included AUX-2, Stoval Airfield, the 35 undeveloped ground support areas that remain actively used, and four undeveloped ground support areas that have since been retired. Most sites were one square kilometer (0.386 square miles) or less in size but a few multiple-unit sites were larger. The aggregate area available in the 41 ground support areas was 19.0 square miles (49.2 square kilometers). This same inventory of sites constitutes the ground support areas that currently are approved for Marine Corps ground unit use of the BMGR.

The first large-scale, surfaced-based test project known to have occurred on the BMGR was initiated in April 1977 within BMGR—West at a location about 12 miles south of Wellton, Arizona. This project was the first of a series of tests that was part of the larger Air Force study program to develop workable basing modes for the MX ICBM. The BMGR—West projects evaluated the potential for two protective shelter designs, a hardened underground missile silo and a buried hardened tunnel through which a missile would be shuttled, to survive the effects of a nuclear weapon attack. The program involved exposing subscaled prototypes of the proposed shelters to blast and shock pressures generated by conventional high explosives in an increasingly powerful series of separate detonation tests calculated to simulate the effects of a nuclear weapon attack. The validity of the tunnel-basing mode was further tested within the eastern range area beginning in 1978. The BMGR—West test series, which culminated in 1985, resulted in the clearance or excavation of 650 to 700 acres in several irregularly shaped but closely located parcels. All of the aboveground infrastructure and debris from this series of projects was removed from the site except for two large bunkers, one which the Marine Corps now uses as a storage facility.

In the early 1980s, the Rakish Litter and Panel Stager target complexes were both equipped with a WISS. This scoring system used closed-circuit television cameras, operated remotely by personnel at MCAS Yuma, to measure the impact position of air-to-ground weapons with respect to referenced positions within these complexes. The WISS eliminated the need to station personnel at the Rakish Litter and Panel Stager complexes to measure the accuracy of munition impacts.

In 1986, the Rakish Litter and Panel Stager target complexes were inactivated and replaced with two new target complexes constructed within BMGR—West. The locations of the Rakish Litter

and Panel Stager target complexes had required aircraft to overfly off-range residential areas that had been developed since these target complexes were built in the 1960s. The two new complexes, called Moving Sands and Cactus West, were located southeast of AUX-2 in positions that eliminated the need for aircraft to overfly noise sensitive off-range areas. Each of these new target complexes consisted of one air-to-ground rocket and bomb bull's-eye target with a 59,200-foot-long northwest-southeast oriented run-in line, two strafing targets, and one MLT. Munition deliveries on the bull's-eye targets were scored by a WISS. Ordnance use within the Moving Sands and Cactus West complexes was restricted to inert practice ordnance of up to 1,000 pounds in weight.

The upgrades to the ACMR (now called tactical aircrew combat training system or TACTS) in 1982 and again in 1986 added an air-to-ground weapons delivery training component (called no-drop weapon training system) to the TACTS that permitted instruction in air-to-ground weapons use without the use of actual munitions. The new facilities included target simulations and the electronic instruments needed to simulate munitions deliveries. The performance of aircrews in attacking the ground-based targets was calculated and recorded for a later replay by the TACTS.

The LHA deck was constructed on the existing east-west runway of the World War II era AUX-2 airfield. The purpose of the LHA deck was to provide a location for helicopter and AV-8B aircraft aircrews to practice landings, takeoffs, and shipboard aircraft handling procedures prior to their deployment to an actual LHA ship. Aircrews flying the C-130 tactical airlift aircraft also began using AUX-2, during the late 1980s, as a site for readiness training in operating out of unimproved airfields. Landing and takeoff operations are conducted on the northeast-southwest oriented runway of the old auxiliary airfield.

2.3.2.5 Post Cold War Era (1992 to Present)

The downsizing that the U.S. military has experienced since the end of the Cold War in 1989 and the Persian Gulf War in 1991 has had the effect of eliminating some training missions on the BMGR and reducing the importance of others. At the same time, some new facilities have been constructed and new training activities have been implemented. In terms of changes in military land use, however, the last decade has been relatively quiet compared to the first five decades of range development. Notable changes within BMGR—East since 1991 have included construction of four RMCPs, a sharp decline in the training requirement for live-fire air-to-air gunnery, and inactivation of the munitions treatment range. Changes within BMGR—West have included installation of radar threat emitters, construction of the Moving Sands Complex urban target, designation of the TACTS Range laser hazard area, expansion of the ground support areas, reductions in ground unit training activities, and elimination of the HAWK Firing Exercise (FIREX) mission.

Prior to 1993, munitions residue that had been recovered through EOD processes was cleared from the manned and tactical range targets and buried in pits dug in designated areas of these ranges and marked with signs. A 1997 field inventory identified 30 munitions burial areas within BMGR—East (U.S. Air Force 1997a). Beginning in 1993, this practice was no longer permissible under new environmental requirements. A munitions demilitarization, decontamination, and recycling process had to be implemented under the new requirements before munitions residue could be disposed. Four RMCPs were established within BMGR—East adjacent to the manned and tactical ranges (see Figure 2-1) to provide locations to which

munitions residue cleared from the training ranges could be transported, secured, and processed for final disposal (see Appendix B).

Live-fire instruction in air-to-air gunnery was a staple of aircrew training within BMGR—East from World War II through the early 1990s. Changes in training requirements implemented following the Persian Gulf War, however, reduced live-fire air-to-air gunnery activity within BMGR—East to a minimal level. By 1992, a change in the F-16 training syllabus eliminated live-fire air-to-air gunnery as a requirement for aircrews to qualify in this aircraft. Gunnery remains as a factor in air-to-air combat, but the Air Force has found that initial aircrew qualification training in the F-16 can be completed satisfactorily based on simulated aerial gunnery experience gained on the GRMDS alone. A requirement for this training remained in effect, however, for the ANG and the 162nd FW continues to conduct several dozen live-fire air-to-air gunnery missions annually in the F-16. This number of sorties stands in sharp contrast to the several hundreds of gunnery missions that were flown prior to the Persian Gulf War. The reduction in air-to-air gunnery training requirements was reflected in a 1994 MOU between DoD and the Department of the Interior (DOI) that placed the Alternate Air-to-Air Firing Range overlying the Cabeza Prieta NWR into an inactive status.

The early 1990s also brought another important change related to air-to-air gunnery training within BMGR—East. From 1956 until 1993, a rigid DART was used as an aerial gunnery training target. The DART was towed behind one aircraft on a 1,500-foot-long cable and fired upon by another aircraft. Several thousands of DARTs are estimated to have been expended over BMGR—East and the Cabeza Prieta NWR over the course of 37 years of their use as a result of cannon fire that severed the tow cable or that damaged the aerodynamics of the DART requiring that it be jettisoned. The AGTS tow target replaced DARTs as aerial gunnery targets in 1994. The AGTS consists of a fabric banner, about 12 feet long, that is reeled out and in on a cable from a pod attached under the wing of the tow aircraft. Gunnery hits on the AGTS are acoustically scored in flight. AGTS may be expended as a result of hits on the tow cable but these tow targets are not subject to aerodynamic instability.

A RCRA-permitted munitions treatment range, located north of Manned Range 2 near the Manned Range 4 access road (see Figure 2-1), that was approved for the disposal of munitions with expended shelf or service lives through open burning or open detonation was inactivated in 1996. A portion of this range presently remains active only as an EOD detonation training facility. The net explosive weight limit for a single training explosion is 2,000 pounds of high explosives.

Sites for the use of mobile radar threat emitters were first developed within BMGR—West in 1985 to provide aircrews with the challenge of flying in a combat environment with sophisticated and dangerous air defenses. The first permanent fixed emitter was installed on the range in 1995 at a site on the northeastern side of the Copper Mountains. Seven additional fixed site emitters were installed in 1997 and 1998 to bring the number of these types of emitters to the current total of eight.

Conversion of the Moving Sands conventional bull's-eye target as a simulated urban complex occurred during this same period. This urban target complex was developed after combat experiences in the Persian Gulf War and Somolia had demonstrated the difficulty of identifying,

designating, and attacking targets in an urban setting without damaging or destroying nearby civilian populations or property.

The laser hazard area overlying the TACTS Range main airfield target complex was established in 1999 as a part of the TACTS Range upgrades that included development of the fixed site threat emitters during the same period. The laser hazard area supports training with airborne lasers used to designate targets within the main airfield complex selected for simulated attack within the TACTS Range no-ordnance-release scoring system.

Following the Persian Gulf War, the Marine Corps anticipated a need for additional ground support areas within BMGR—West for ground unit training deployments during the WTI Course or other times. At that time, the ground support system consisted of 41 individual ground support areas that collectively comprised 19.6 square miles. Following an environmental planning and review process documented in the Yuma Training Range Complex EIS (U.S. Marine Corps 1997), the Marine Corps approved expanding the ground support system by 16.5 square miles. This included incorporating 19 existing support areas and other lands into three consolidated ground support zones, retaining 16 existing ground support areas and AUX-2 outside of the zones, adding five new ground support areas, and inactivating four other existing support areas. Downsizing of the Marine Corps, however, ultimately reduced the number of ground unit squadrons available to participate in the WTI Course because of competing operational deployments and readiness requirements. As a result, the expanded ground support areas and zones approved for ground unit use have not yet been activated for training activities. At the same time, advancements in electronics so reduced the sizes of new generation radar and communications equipment that the numbers of personnel and vehicles required by some types of Marine Corps ground units was in turn significantly reduced. As a result, the size of the surface use footprints of these units during BMGR training deployments also decreased.

Finally, the HAWK antiaircraft missile was retired from the Marine Corps inventory after 1998 leading directly to the inactivation of the air defense units that had employed this weapon system. HAWK missile units were a major component of the ground troop presence on the BMGR during WTI Courses and their inactivation has correspondingly reduced the need for ground support locations during these training events. The newly approved ground support locations remain available for use, however, should future training missions require their activation or if environmental management problems at a currently active site require that training activities be relocated.

The elimination of HAWK missile units and, by default, the HAWK FIREX had the additional effect of at least temporarily placing the surface-to-air missile firing range within BMGR—West into an inactive status. The firing range remains available, however, to support missions requiring the launch of other types of surface-to-air missiles.

2.3.3 Natural and Cultural Resource Management History of the BMGR

The natural and cultural resources management history of the BMGR has been somewhat unique in contrast to that of most federal public land. Over the course of at least the last half-century, most federal lands—such as those under the jurisdiction of the U.S. Forest Service, NPS, BLM, or USFWS—have been managed by a single federal agency for which resource management is the primary mission. As a result, clear purposes and patterns of management have developed

based on 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 typical model in several important ways. First, primary management responsibility for the range has undergone several jurisdictional switches between DoD and DOI agencies with the result that a long-term, comprehensive, resource management program has not yet been fully put in place. The first comprehensive natural resources management plan for the range was not prepared until 1986, and a land management plan was not implemented for the range until 1990. Second, for at least the first four decades after the creation of the BMGR, there were no clear DoD or DOI resource management priorities specific for the range. Third, through much of the history of the range, the lack of a central federal authority for resources management led to actions by a number of agencies, at the federal and state levels, that occurred without the development of mutually held goals or coordination of purpose. Fourth, at many points in the range's history these same agencies have found themselves with competing or conflicting responsibilities, goals, and purposes without an effective means of resolving these issues and coordinating their management efforts. Much progress has been made in recent years toward resolving these issues. The following review will identify the management legacy that has been developed for the range and the progress that his been made towards establishing effective control and coordination of range management.

Primary federal surface management responsibility for the lands currently within the BMGR has changed five times since 1941. The five land jurisdiction periods applicable to the range include:

- prior to September 1941—General Land Office and U.S. Grazing Service (these two agencies were merged in 1946 to form the BLM)
- September 1941 to December 1958—Air Force, full responsibility for entire range
- January 1959 to November 1986—Air Force, administration of the entire range and military operations management of BMGR—East; Navy/Marine Corps, military operations management of BMGR—West
- November 1986 (MLWA of 1986) to 6 November 2001—Air Force, military administration of the entire range and military operations management of BMGR—East; Navy/Marine Corps, military operations management of BMGR—West; BLM, land management for entire range
- 6 November 2001 (MLWA of 1999) to 6 November 2024—Air Force, full responsibility for military operations and land management of BMGR—East; Navy/Marine Corps, full responsibility for military operations and land management of BMGR—West.

Prior to the withdrawal and reservation of the first 1.1-million-acre parcel of the range in September 1941, most of the federal lands currently within the BMGR were under the jurisdictions of the General Land Office and the U.S. Grazing Service, which administered livestock grazing permits. Some mining and livestock grazing activities are known to have occurred within the future military reservation lands, but there were no specific natural resource management programs in place other than the administration of mining claims and grazing permits.

The establishment of the military range in 1941 transferred the authority to control access to and use of the affected properties to the War Department (DoD after 1947). This transfer of jurisdiction did nothing to foster development of natural or cultural resources management programs for the affected lands, but the action did have the effect of suspending and eventually

ending sanctioned mining and livestock grazing activities within the range properties. The new range lands were withdrawn from all forms of appropriation under the public land laws. This withdrawal was not because appropriative land uses (such as mining and livestock grazing) were regarded at the time as inappropriate resource uses, but because these uses were incompatible with the basic purpose of the military reservation. That purpose was to provide a location where military aircrews could perform live-fire training with aircraft weapons without either endangering public safety or incurring disruptive interference from the need to protect private property or access to that property.

From the perspective of resource conservation, the effect of excluding appropriative land uses from the range would arrest further commercial development or settlement of the range properties. This resulted in the unplanned but nevertheless beneficial effect of protecting many areas of the range from further disturbance. Creation of the military range did not cause mining and livestock grazing activities to be ended immediately. A number of court and enforcement actions were necessary both when the BMGR was created and at several times during its first several decades of existence to eliminate recurring incidences of trespass livestock grazing from various portions of the military range. However, the important consequence of these actions for future resources management is that the BMGR today, coupled with the Cabeza Prieta NWR and Organ Pipe Cactus NM, is the most expansive, least grazed, and least developed area of the Sonoran Desert.

The Air Force exercised primary surface management and military operations control for the entire range from 1941 to 1958. In 1959, the Air Force delegated local management and operations control for the BMGR—West area to the Navy/Marine Corps, but retained administrative oversight authority for the entire range. The Air Force and Navy/Marine Corps retained primary surface management control of the range until the passage of the MLWA of 1986. With the exceptions of selected wildlife management activities, a series of inter-agency agreements, and environmental compliance efforts for proposed federal projects (after 1970), the period from 1941 to 1982 was generally characterized by little government or public attention to developing broader resource management programs for the BMGR. These early activities, however, were important for establishing management foundations that are important to the development of the proposed INRMP.

Specific wildlife management activities within the range area presumably began with AGFD enforcement of State hunting regulations and other wildlife laws before the military reservation was established. Perhaps the most notable early action on this score was the prohibition on hunting Sonoran pronghorn that was put in place in 1922, 45 years before this species was federally listed as endangered. Wildlife habitat and population reconnaissance surveys were conducted early in the range area by AGFD in support of its hunting management responsibilities. Wildlife surveys have continued to be a cornerstone management activity on the BMGR and now often involve the collaborative efforts of all of the BEC members. The earliest evidence of Air Force involvement in wildlife management activities identified during the preparation of this EIS occurred in the Fall of 1962 when the Air Force provided helicopter support for aerial bighorn sheep population surveys (U.S. Air Force 1962). The development and maintenance of game waters for wildlife enhancement, particularly for the benefit of bighorn sheep, began at least as early as the 1940s through the efforts of AGFD and the USFWS. Wildlife water development has continued to be an important wildlife management activity and issue.

The aforementioned series of inter-agency agreements, which began as early as 1951, are historically important because they demonstrate (1) recognition of the relationships between some military activities and resource management issues, (2) recognition of individual agency authorities and responsibilities, and (3) continuing efforts to facilitate effective inter-agency resource management cooperation. The earliest agreement in this series was developed in August 1951 between the DOI and DoD. This agreement, and four successor agreements in 1960, 1975, 1991, and 1994, established restrictions on military overflights and surface use of the Cabeza Prieta NWR. Prior to the MLWA of 1999, more than 95 percent of the refuge was also included within the military reservation. As a result of these agreements, military overflights of the refuge have been restricted to altitudes of 1,500 feet above ground level (AGL) or higher except within low-level overflight corridors mutually approved by the DOI and DoD, World War II authorization for military bombing practice within the refuge has been eliminated, procedures have been set in place for responding to aircraft crashes within the refuge, and military surface use of the refuge has been restricted to mutually approved locations and activities.

Aside from the early agreements pertaining to the Cabeza Prieta NWR, a 1978 MOU between the Air Force, Navy/Marine Corps, and Arizona Game and Fish Commission is particularly notable as a prelude to an agreement that would lead to the first comprehensive natural resources management plan for the BMGR. The 1978 MOU recognizes that the responsibility for the conservation and control of wildlife and other wildlife resources and for regulating hunting rights rests with the State, and that the protection and conservation of wildlife and wildlife resources must be consistent with the requirements of the military purposes of the BMGR. This inter-agency agreement was important because it represented the earliest formal recognition of the relative responsibilities of the Air Force, Navy/Marine Corps, and AGFD for wildlife management on the BMGR as established by the Sikes Act and reserved State's rights. This inter-agency agreement also provided a formal basis for cooperative action as demonstrated that same year through a cooperative plan agreement among the same parties for the conservation, development, and management of wildlife resources.

Following the 1978 agreement was the much more broadly defined 1982 natural resources management cooperative agreement between the Air Force, Navy/Marine Corps, USFWS, BLM, and AGFD. This agreement acknowledged and defined the relative roles and responsibilities of each of these agencies for the cooperative management of natural resources on the BMGR. This landmark agreement is important for two key reasons. First, this agreement marked the first time that the five agencies, that were to form the BEC in 1997, acknowledged that they each have constructive resource management roles to play and that effective management of the natural resources of the range depended upon their collective and cooperative efforts. Second, the 1982 agreement called for the development of the first range-wide natural resources management plan for the range. The Air Force was assigned as the lead agency for the development of the plan and, with contracted support from the University of Arizona and cooperative participation from the other members of the 1982 agreement, produced the Luke Air Force Range Natural Resources Management Plan in 1986 (U.S. Air Force 1986). This plan was the first comprehensive management plan developed for the range and, as such, advanced resource management perspectives and expectations. The 1986 plan demonstrated the importance of:

- establishing an overall management vision for the range and long-term management goals for each natural and cultural resource element
- addressing a broad rather than narrow scope of natural and cultural resource elements in a single plan in order to promote integrated management

- identifying the land and airspace use requirements of the military mission and acknowledging those requirements as baseline conditions with which resource management must be consistent
- adapting management strategies to promote resource protection and conservation opportunities that are created by military use requirements
- identifying and supporting the collective management responsibilities and interests of the multiple federal and state agencies involved with the range in order to promote inter-agency communication and cooperation
- recognizing that future resource management success would require an ongoing inter-agency framework to foster open communication and cooperation on BMGR resource management issues.

In many respects, the 1986 resources management plan reflects requirements for INRMPs that have since been either set in place or reinforced by the MLWA of 1999, Sikes Act Improvement Amendment of 1997, and DoD policy. In 1986, however, Congress determined (through the MLWA of 1986) that the DOI rather than the DoD would have the lead responsibility for managing the lands of the BMGR and the 1986 resources management plan was not implemented. Instead, that plan became the basis from which the BLM developed the Goldwater Amendment in accordance with the MLWA of 1986 and the FLPMA to provide guidance for managing the natural and cultural resources of the BMGR. The Goldwater Amendment adopted many of the goals of the 1986 plan, including the protection of plant communities, wildlife habitats, and species diversity.

The Air Force and Navy/Marine Corps retained primary surface management control of the range until the MLWA of 1986 signaled the beginning of the fourth change in federal land jurisdiction for the BMGR. That Act signified the primacy of the military purposes of the range over all other land uses and left the military agencies with the authority to control access to and use of the properties within the range to the extent necessary to support those purposes. The Secretary of the Interior, however, was assigned the responsibility for managing the range lands. This shared management situation persisted under the MLWA of 1986 until Congress transferred the primary federal land surface management responsibility to the Secretaries of the Air Force and Navy as provided by the MLWA of 1999.

Although management under the terms of the MLWA of 1986 has been controversial at times, a number of positive management accomplishments occurred under the tenure of this Act. One of the earliest and most important accomplishments was the public involvement process that the BLM conducted during the development of the Goldwater Amendment. Development of this plan marked the first time that the public was given an opportunity to have input as to the future management and public use of the BMGR. This process allowed members of the public to become better informed about range management issues, identify issues about which they were concerned, and provide comment about the resolution of those issues.

An ongoing public involvement process was not established following the completion of the Goldwater Amendment in 1990 and steps were not taken to establish regular, clear channels of communication among the five signatory agencies of the former 1982 natural resources management cooperative agreement. Public concerns were nevertheless registered about the perceived questionable quality of BMGR management and in 1996 the BLM, Air Force, Marine Corps, USFWS, and AGFD initiated a series of ongoing public involvement partnership

meetings to openly discuss range management issues. These BMGR partnership meetings also provided a forum by which the five management agencies could renew the practice of holding periodic management consultation and coordination meetings that had occurred in the 1980s after being initiated by the 1982 cooperative agreement. The success of these renewed inter-agency contacts led the same five agencies to develop the BEC as an informal committee in 1997 and as an official entity in 1998. Congress recognized the success of the BMGR partnership meetings and the BEC and mandated, through the MLWA of 1999, the formation of an Intergovernmental Executive Committee. This committee is to consist of selected representatives from interested federal agencies as well as from state, local, and tribal governments for the purpose of exchanging views, information, and advice relating to the management of natural and cultural resources on the BMGR.

Another important accomplishment of the Goldwater Amendment was recognition of the need to provide special management protections to some locations of the BMGR that have sensitive resource values. In this capacity, the Goldwater Amendment built upon a resource protection legacy initiated on the range and elsewhere in Arizona by Arizona State Parks through a 1980 survey of candidate locations for State Natural Area designation. Five State Natural Areas were designated on the range in 1982 through cooperative agreements between the State Parks Board, Air Force, and Marine Corps. The BLM, in turn, designated three of the State Natural Areas as ACECs and two as Special Recreation Management Areas (SRMAs) through the development of the Goldwater Amendment. A Backcountry Byway centered on the western segments of El Camino del Diablo was also designated. As the focus of BMGR management has shifted to the development of this EIS for the proposed INRMP, future management of the existing ACECs, SRMAs, Backcountry Byway, and possibly other candidate natural areas is once again one of the leading management issues.

2.4 DOD LAND MANAGEMENT POLICY GUIDANCE APPLICABLE TO THE PROPOSED INRMP

2.4.1 Land Use Versus Land Management

Understanding the distinct differences between land use and land management is fundamentally important to the context under which the proposed INRMP must be developed. For federal agencies, land use is defined as the purposes for which land is used to support an agency's mission. Land management is defined as the activity pursued to support continuation of the agency's land use. The land managing agencies of the Departments of Agriculture and the Interior (e.g. Forest Service, USFWS, NPS, and BLM) have land uses that are intrinsically based on natural and cultural resources management. The varying missions of these agencies are to manage land for multiple uses, fish and wildlife purposes, or protection of sensitive resources for the benefit and enjoyment of visitors. As a result, land use and land management for these agencies are deeply intertwined. Indeed, resource management plans prepared by these agencies often examine alternative mixes of land use for the properties under their jurisdictions as well as alternative methods of managing those uses. In essence, agencies of the Departments of Agriculture and the Interior are defined in large part by their land management missions.

The mission of the Armed Forces, however, is national defense. The use of land by defense agencies is grounded in the need to use land for defense mission purposes rather than for the management of land for its own sake. This is why it is important that land use and land

management be understood as separate concepts. Defense agencies must manage land first and foremost so that land uses necessary to support military missions can continue while simultaneously ensuring compliance with the suite of laws governing protection of natural and cultural resources. In turn, compliance with environmental and cultural resource laws is necessary to accomplish the military mission.

The Sikes Act addresses the issue of land use versus land management by directing that DoD land management must be "consistent with the use of military installations to ensure the preparedness of the Armed Forces" [16 U.S.C. 670a (a)(3)]. In other words, the BMGR must be used to support National defense purposes and each natural or cultural resource management goal or course of action set forth in the proposed INRMP must be consistent with those purposes. This means that resource management alternatives designed to protect, conserve, or rehabilitate natural or cultural resources must also be capable of supporting and sustaining the military mission.

However, proposed natural or cultural resource management practices can directly support military mission requirements. Some practices, such as dust suppression on roads or measures to comply with environmental laws such as the ESA or NHPA, may be designed and implemented directly in support of specific mission requirements. Other management practices, though, may support the military mission indirectly by furthering the biological health of the range or the security of its cultural resources. These actions could help to prevent unnecessary conflicts between military operations and resource protection requirements and, as a result, lend support to the continuing use of the BMGR for military purposes. The history of the BMGR includes many examples of management practices that are mutually compatible and beneficial to sustaining both military operations and resource conservation values and public use opportunities. The alternative management scenarios being assessed in this EIS for the proposed INRMP are specifically designed to consider natural and cultural resource management approaches that can both support military mission requirements and benefit land conservation and sustainable public use goals.

2.4.2 Legal Requirements Guidance

Consistent and compatible with the straightforward military mission support requirement, the MLWA of 1999 and Sikes Act also require the INRMP to facilitate a management program that: (1) protects and conserves the natural and cultural resources of the BMGR, and (2) provides for public access and sustainable use of those resources. Other specific requirements, as summarized in Table 2-2, include providing for wildlife and land management, wildlife-oriented recreation, wildlife habitat enhancement or modification, and wetland conservation (including protection, enhancement, or restoration); supporting Native American access to sacred sites; and requiring that gates, fences, or other barriers constructed in the future allow for wildlife access.

TABLE 2-2
INRMP ELEMENTS SPECIFIED IN THE
SIKES ACT IMPROVEMENT AMENDMENTS AND MLWA OF 1999

Sikes Act Improvement Amendments

To the extent appropriate and applicable, provide for:

- wildlife management, land management, and wildlife-oriented recreation
- wildlife habitat enhancement or modifications
- wetland protection, enhancement, and restoration, where necessary for support of wildlife or plants
- integration of, and consistency among, the various activities conducted under the plan
- establishment of specific natural resources goals and objectives and time frames for proposed actions
- sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of wildlife resources
- appropriate public access subject to requirements necessary to ensure safety and military security
- enforcement of applicable natural resource laws (including regulations)
- no net loss in the capability of military installation lands to support the military mission of the BMGR

MLWA of 1999

The INRMP shall:

- be developed in consultation with affected Indian tribes and include provisions that address (1) meeting the trust responsibilities of the United States with respect to Indian tribes, lands, and rights reserved by treaty or federal law; (2) allowing access to and ceremonial use of sacred sites to the extent consistent with the military purposes of the BMGR; and (3) providing for timely consultation with affected Indian tribes
- provide that any hunting on the BMGR be conducted in accordance with the provisions of 10 U.S.C. 2671 (the general military policy for hunting, fishing, and trapping on military reservations)
- identify current BMGR test and target impact areas and related buffer or safety zones
- provide necessary actions to prevent, suppress, and manage brush and range fires occurring within the BMGR as well as brush and range fires occurring outside of the BMGR resulting from military activities
- provide that all gates, fences, and barriers constructed on the BMGR are designed and erected to allow wildlife access, to the extent practicable and consistent with military security, safety, and sound wildlife management use
- incorporate any existing management plans pertaining to the BMGR, to the extent that INRMP preparers mutually determine that incorporation of such plans into the INRMP is appropriate
- include procedures to ensure that the periodic reviews of the plan under the Sikes Act are conducted jointly by the Secretaries of the Navy, Air Force, and Interior, and that affected States, Indian 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

2.4.3 DoD Ecosystem Management and Biodiversity Policy Guidance

DoD has shifted its land management focus over the last 10 years or so from protection of individual species to ecosystem management. The two principal reasons for this shift are (1) the Sikes Act emphasizes promoting effective wildlife and habitat protection, conservation, and management, and (2) there is a 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. Current DoD policy to display environmental security

leadership within DoD operations, activities, and installations worldwide is set forth in DoD Directive 4715.1, *Environmental Security*. Under this directive, DoD Instruction 4715.3, *Environmental Conservation Program*, outlines policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on property under DoD control. This instruction calls for INRMPs to be based, to the maximum extent practicable, on ecosystem management. The goal of DoD ecosystem management is to maintain and improve the sustainability and native biological diversity of ecosystems while supporting human needs, including the DoD mission. This goal is reflected in the Department level land management policies of the Air Force and Marine Corps. Consequently, ecosystem management and protection of biological diversity must be important guiding elements of the proposed INRMP.

DoD policy guidelines on ecosystem management are intent on promoting/protecting natural processes but do not preclude active management intervention deemed necessary to deal with issues such as invasive species, endangered species recovery, or barriers to wildlife movement inside or outside of the installation. 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 management decisions. If that science together with collaborative efforts and consultations identify a need for management intervention, then the needed management actions are to be implemented.

2.4.4 Department of Interior Oversight Requirements

The MLWA of 1999 assigns important BMGR oversight management functions to the Secretary of the Interior. Chief among these is the responsibility set forth via an authority for transfer of management responsibility from the Navy/Marine Corps or Air Force to the DOI if the Secretary of the Interior determines that (1) the Navy/Marine Corps or Air Force has failed to manage BMGR natural and cultural resources in accordance with the proposed INRMP and (2) this failure is resulting in significant and verifiable degradation of the natural or cultural resources of the BMGR. Thus, the Secretary of Interior has been granted considerable power as an official watchdog over the military's management of BMGR natural and cultural resources.

If the Secretary of the Interior determines that the Navy/Marine Corps or Air Force failure to manage is resulting in significant and verifiable degradation of BMGR natural or cultural resources, the process for the transfer of management responsibility is outlined in the MLWA as follows:

(1) The Secretary of the Interior must give the Secretary of the Navy or Air Force, as the case may be, written notice of such determination, a description of the deficiencies in management practices, and an explanation of the methodology employed in reaching the determination.
(2) Within 60 days of the notification, the Secretary of the Navy or the Secretary of the Air Force, as the case may be, shall submit a response to the Secretary of the Interior, which may include a plan of action for addressing any deficiencies identified in the notice in the conduct of management responsibility and for preventing further significant degradation of BMGR natural or cultural resources.
(3) If, three months after notification, the Secretary of the Interior determines that deficiencies identified in the notice are not being corrected and that significant and verifiable degradation of BMGR natural or cultural resources is continuing, the Secretary

of the Interior may submit a notice and a report to the Committees on Environment and Public Works, Energy and Natural Resources, and Armed Services of the Senate and the Committees on Resources and Armed Services of the House of Representatives.

(4) Not earlier than 90 days after the Secretary of the Interior submits the notice and report to the aforementioned congressional committees, the Secretary of the Interior may transfer management responsibility for BMGR natural and cultural resources from the Secretary of the Navy or the Secretary of the Air Force, as the case may be, to the Secretary of the Interior in accordance with a schedule for such transfer established by the Secretary of the Interior.

After such a transfer of management responsibility, the Secretary of the Interior may transfer management responsibility back to the Secretary of the Navy or the Secretary of the Air Force if the Secretary of the Interior determines that procedures and plans have been established to ensure that the lands concerned will be adequately managed by the Secretary of the Navy or the Secretary of the Air Force, as the case may be, in accordance with the proposed INRMP.

Another oversight responsibility assigned to the DOI is a requirement for the Navy/Marine Corps and the Air Force to consult with the DOI before using the BMGR for any purpose other than the purposes for which it was withdrawn and reserved.

2.5 NON-MILITARY AGENCY MISSIONS AND LAND USE

As detailed in Section 1.2, in addition to the Air Force and Marine Corps, various federal and state non-military agencies have management responsibilities on the BMGR. Two such non-military agencies with missions that have and will continue to require future operations on the BMGR are the AGFD and the U. S. Border Patrol, whose primary objectives include wildlife management and law enforcement, respectively. Thus, a brief summary of the agency missions and land uses on the BMGR associated with these missions is presented to provide further context with regard to the need for the INRMP to be developed on a collaborative interagency basis.

2.5.1 Arizona Game and Fish Department

The AGFD has management authority of the state's wildlife, which is held in trust for the citizens of the State of Arizona; this wildlife management responsibility also applies to the BMGR unless otherwise pre-empted by federal law. Established in 1929 under Title 17 of the Arizona revised statutes, AGFD is directed by the Arizona Game and Fish Commission, the governing body of the department. Under the provisions of Arizona Revised Statutes 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 AGFD's mission is as follows:

> To conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs, and to provide wildlife resources and safe watercraft and off-highway vehicle recreation for the enjoyment, appreciation, and use by present and future generations.

The primary wildlife management responsibilities of AGFD on the BMGR include:

- enforce hunting regulations
- develop and maintain habitat assessment/evaluation, protection, management, and enhancement projects (e.g., artificial water developments and Sonoran pronghorn food plots)
- conduct wildlife population surveys
- establish game limits for hunting, trapping, and non-game species collection
- manage wildlife predators and endangered species/special status species (management of federally listed endangered species is a responsibility shared with the USFWS)
- manage off-highway vehicles in terms of habitat protection and user opportunities
- issue hunting permits.

Management activities include conducting wildlife censuses to determine population trends, followed by recommendations for restoring or maintaining resident species; controlling wildlife populations at appropriate sustained levels for protection of other BMGR resources values; and enforcing state game laws. AGFD organizes and conducts bighorn sheep surveys every year on BMGR lands, however specific mountain ranges within the BMGR are usually surveyed only every three years. AGFD also conducts research on Sonoran pronghorn through aerial and vehicular tracking of individual animals via radio-collar telemetry (U.S. Air Force 1986). AGFD is also a member of the Sonoran Pronghorn Recovery Team, which also consists of representatives from the USFWS, Luke AFB, MCAS Yuma, NPS, BLM, the University of Arizona, and the Mexican Government (U.S. Air Force, Luke AFB 2000). Although no tribal representatives have committed to be members of the current Recovery Team, Tohono O'odham Nation representatives have occasionally attended the Recovery Team meetings.

AGFD and the BLM jointly prepared the 1997 Lechuguilla-Mohawk HMP. AGFD joined with the BLM and Luke AFB to prepare the 1999 Draft Barry M. Goldwater East HMP. The objectives of these plans include maintenance and enhancement of habitat for Sonoran pronghorn *(Antilocapra americana sonoriensis*), desert tortoise (*Gopherus agassizii*), flat-tailed horned lizard (*Phrynosoma mcallii*), mule deer (*Odocoileus hemionus*), desert bighorn sheep (*Ovis canadensis*), upland game, nongame species, and other sensitive wildlife habitat on the BMGR. To implement these objectives, AGFD is actively engaged in water hole management on the BMGR. This involves the construction and maintenance of man-made and reconstructed natural water catchments and development of support roads (U.S. Air Force 1986).

In managing the state's wildlife, AGFD makes determinations on the appropriateness and need to transplant wildlife, which may include transplants into or out of the BMGR. Should wildlife transplants affecting the BMGR be proposed, a separate environmental analysis to comply with NEPA would be completed prior to implementing any specific proposal.

2.5.2 U.S. Department of Homeland Security, Border Patrol

The U.S. Border Patrol, a unit of Customs and Border Protection, is responsible for preventing UDAs from illegally entering the United States and apprehending UDAs who have already entered the United States illegally. The southern boundary of the westernmost portion of the BMGR shares approximately 37 miles of the international border between the United States and Mexico. In recent years, Border Patrol apprehensions of UDAs in the BMGR vicinity have represented about 3 percent of all apprehensions along the Southwestern border (Brigman 2005,

Daniels 2005, Immigration and Naturalization Service 2001 and 2002, Department of Homeland Security 2003 and 2004). Statistics on apprehensions are included in Section 4.14.1. On the BMGR, the Border Patrol conducts daily reconnaissance by air or ground surveillance. Activities involving the smuggling of drugs or other contraband also occur on the BMGR, although it is less common than in more populated border areas.

There are two Border Patrol jurisdictional sectors on the BMGR, the Tucson and Yuma sectors, divided by the Pima/Yuma County line. These two jurisdictional units, the Tucson and Yuma sectors of the Border Patrol, are responsible for the entire Arizona-Mexico border and portions of the California-Mexico border (in Imperial County). The western unit, the Yuma Sector, includes BMGR lands within Yuma County. The eastern unit, the Tucson Sector, performs operations in Pima, Santa Cruz, and Cochise counties. Within the Yuma Sector, Arizona field stations are located in Wellton and Yuma, and a California field station is located in Blythe. Within the Tucson Sector, the Ajo field station is located near the BMGR in Why, Arizona.

Traditional Border Patrol operations/activities include patrolling roads and off-road areas, dragging unimproved roads to facilitate the observation of foot traffic, conducting aerial reconnaissance, and inspecting vehicles at checkpoints. For the most part, the Border Patrol conducts ground surveillance by observing tracks on drag roads. Drag roads are prepared by dragging several bolted-together tires across a dirt road or well-used trail in order to assist agents in detecting evidence of illegal crossings by people or vehicles. Currently, the Tucson and Yuma sectors maintain six OH6 Alpha helicopters and three fixed-wing aircraft (two Cessnas and one Piper Supercub) that can provide assistance to any station within the two sectors. There is one established helicopter flight route within the Yuma Sector. Each morning, a helicopter flies from the Yuma station to the U.S.-Mexico border, flies along the border, and returns to the station. This flight takes approximately four hours. The three fixed-wing aircraft are used for higher elevation surveillance and pilot training (Immigration and Naturalization Service 2001).

Border Patrol activities within the Ajo Station area, including the BMGR, consist of road patrols and off-road operations utilizing four-wheel drive vehicles and dirt bikes. No dragging operations are conducted from this field station and air patrol flights are usually related to search and rescue missions (Immigration and Naturalization Service 2001).

Due to the extreme temperatures that occur in southwestern Arizona from May through October, it is necessary that the Border Patrol conduct rescue missions to save UDAs who are severely dehydrated or suffering from other heat-related distress. In recent years, some of the border crossing points that historically have been used the most extensively are being monitored more closely. This has resulted in an increase in crossings of more remote areas, particularly through the Cabeza Prieta NWR and Organ Pipe Cactus NM, but also the BMGR. Because of the remoteness of these areas and the harsh environmental conditions, the Border Patrol's role in rescue missions has also been increasing.

The Border Patrol also offers assistance on the range (and the Cabeza Prieta NWR) to AGFD, BLM, and USFWS. Border Patrol helicopters are occasionally used to locate lost recreationists, report illegal off-road vehicle (ORV) usage, and assist in wildlife management activities (USFWS 2000b). The Border Patrol also maintains distress beacons that may be activated by persons needing rescue services.

2.6 SAFETY AND SECURITY, PUBLIC ACCESS, AND BMGR MANAGEMENT UNITS

The basic purpose of the BMGR is to provide a secure location in which military training activities can be freely conducted without endangering the safety of military or civilian personnel and without interference or interruption. As already noted, the current aviation weapons training ranges as well as the various surface training and ground support areas within the BMGR have been configured to accomplish this basic purpose. This section identifies the current range locations that must be restricted to general public access based on the distribution of these weapons ranges and training and support areas. Conversely, locations within the range that are generally acceptable for accommodating public visitation based on military training support requirements have also been delineated. Visitation to these areas, however, may be limited to selected times, restricted from selected sites, or otherwise controlled in order to accommodate military use and natural or cultural resource protection goals.

This section also identifies BMGR resource management units that are based on a number of factors including natural landscape features and vegetative communities, safety and security access restrictions, road density distributions, designated special management areas, and natural community conservation elements identified by The Nature Conservancy. The purpose of these units is to define geographically cohesive areas over which natural resources can be managed for consistent purposes.

2.6.1 Safety and Security Restrictions on Access

As provided by the MLWA of 1999, the BMGR was established for military purposes and the entire range is subject to access closures. The closure authority invested in the Air Force and Marine Corps allows these agencies to close to the public any road, trail, or other portion of the range as necessary to support military operations, public safety, or national security. The Act also specifies that closures to public access are to be limited to the minimum areas and periods that are required to support these purposes [P.L. 101-65 §3031(b)(2)(A) and (B)]. Safety hazards or security concerns are present on a near continuous basis within many areas of the BMGR and general public access must be restricted from these locations (Figure 2-4).

Approximately 62 percent of the BMGR falls within this category and must be restricted from public access because of ongoing hazards associated with munitions delivery training, known or suspected high concentrations of UXO on the ground surface, laser use hazards, airfield safety and security, or other safety or security requirements at training or support sites. Safety hazards or security concerns are present within the other 38 percent of the BMGR only at selected times or in selected confined locations, such as an electronic instrument site. These areas of the BMGR can generally accommodate public visitation on a regular basis as long as certain necessary restrictions regarding access to local electronic instrument, training, support, or resource protection sites are observed. Access to the range by all military and civilian personnel is regulated by permit at all times and in all locations. Approximately 80 percent of all range areas open to public visitation are in BMGR—West. The area of BMGR—West open to general public access encompasses about 521,000 acres, which is about 75 percent of the BMGR—West land area. Public access to BMGR—East is limited to about 133,000 acres, which is almost 13 percent of the BMGR—East land area.

Persons wishing to visit the range for personal purposes must obtain a current range permit before entering the range. Persons on official business on the range are not required to obtain a visitor's permit, but do need to attend a safety briefing and to call in prior to going on the range. Each entry to a restricted area of the range is by prior approval only and requires that the visitor report off the range immediately following departure. Persons wishing to visit areas of the range generally open to public access must report their intended visit and range permit number to a telephone call-in service prior to their trip. Persons visiting publicly accessible areas within BMGR—East are also required to call-off the range following the trip. All visitors are advised of irregularly scheduled range closures that may affect areas of the range they intend to visit through the call-in service. Most of the eastern side of the range (approximately 87 percent) is restricted from general public access, because BMGR—East supports three tactical ranges, four manned ranges, and an air-to-air firing range as well as Gila Bend AFAF, AUX-6, and other training and support areas requiring security (see Figure 2-4). The principal areas within BMGR—East available for general public access are located in Management Unit 6. The larger of the two areas, which is also known as Air Force Special Management Area B, contains about 126,000 acres. The second area is almost 4,100 acres. A third area of about 2,800 acres, located in Management Unit 7 adjacent to the Sonoran Desert NM, is also available to public access. Finally, a road corridor in far western BMGR—East forms a public travel way linking roads that circumnavigate a portion of the Mohawk Dunes in BMGR—West. The location of this loop corridor, which contains about 500 acres, is often mistakenly thought to be part of BMGR—West.

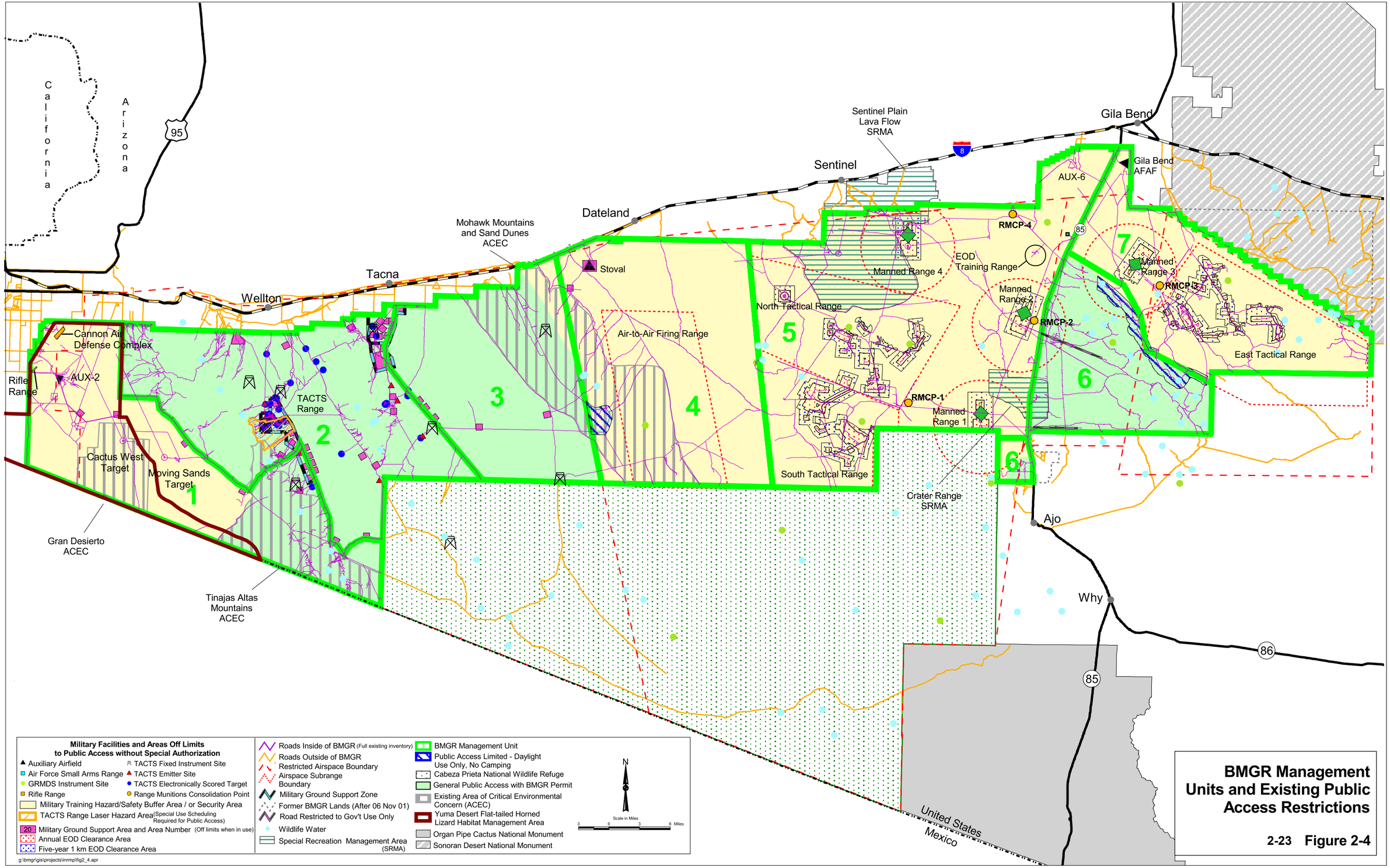
The area of BMGR—West that is available for public use on a routine basis generally lies between the Mohawk Mountains and the Gila and Tinajas Altas mountains but also includes an area along the western footslope of the Gila Mountains. Visitors to this area are currently restricted from all occupied Marine Corps ground support areas, the TACTS Range laser hazard area, and electronic instrument sites. The remaining area of BMGR—West (west of the Gila Mountains) includes locations reserved for the Moving Sands and Cactus West target complexes, AUX-2, the Marine Corps Rifle Range, the Cannon Air Defense Complex, and other potentially hazardous activities. Public access is generally restricted from this area.

2.6.2 BMGR Management Units

Seven management units have been identified within the BMGR; three within BMGR—West and four within BMGR—East (see Figure 2-4). Numbered one through seven from west to east, the surface areas of these units include:

- Management Unit 1 - approximately 230,000 acres
- Management Unit 2 - approximately 265,000 acres
- Management Unit 3 - approximately 195,000 acres
- Management Unit 4 - approximately 280,000 acres
- Management Unit 5 - approximately 440,000 acres
- Management Unit 6 - approximately 138,000 acres
- Management Unit 7 - approximately 188,000 acres

Management Unit 1 includes three existing special management areas—the Gran Desierto and Tinajas Altas Mountains ACECs and the Flat-tailed Horned Lizard Habitat Management Area



BMGR Management Units and Existing Public Access Restrictions

2-23 **Figure 2-4**

(HMA). Most of this unit lies within the safety and security restricted area within the westernmost portion of BMGR—West and is off limits to most public visitation. The eastern extent of this unit generally incorporates the Tinajas Altas Mountains ACEC. Although a number of militaryoperations occur within this unit, the surface effects of these activities are limited to a small aggregate proportion of the entire area. Existing roads provide limited access to most of the unit. The unit includes the full extent of the Yuma Dunes natural community complex (Figure 2-5) and Tinajas Altas Mountains within the United States. The western portion of this management unit is at the lowest elevation, has the least average rainfall of all of the BMGR units, and includes the only portion of the BMGR to drain west to the Colorado River. The creosotebush-bursage desertscrub is the most prevalent throughout the management unit. These valley floor communities are dissected with the valley xeroriparian scrub natural community throughout the lower western drainage of the Gila Mountains as well as the full western drainage and upper portions of the eastern drainage of the Tinajas Altas Mountains within the United States. The Elephant Tree-Limberbush on Xeric Rocky Slopes natural community occurs in this management unit within the Tinajas Altas Mountains. Xeroriparian systems are least prevalent in the western portion of the unit, and increase in the eastern and southern portions of the management unit. The eastern portion of the unit includes tinajas, cultural resources, a population of desert bighorn sheep, an example of the elephant tree-limberbush on xeric rocky slopes natural community, and dissected mountain xeroriparian scrub communities.

Management Unit 2 incorporates a topographically diverse landscape including the Gila Mountains, Copper Mountains, Wellton Hills, and Baker Peaks as well as the Lechuguilla Desert Valley. It includes two examples of the elephant tree-limberbush on xeric rocky slopes natural community. This community and the valley creosotebush-bursage desertscrub community are highly dissected with the valley xeroriparian scrub natural community, which is formed from the extensive drainage system that drains towards the north. To the east of the Copper Mountains there is a Salt Desertscrub natural community. Within the Gila and Copper mountains, there are both managed wildlife water holes and natural springs that are used by bighorn sheep. An extensive array of TACTS Range facilities and Marine Corps ground support areas are located within this unit. With the exception of the TACTS Range laser hazard area, public access is compatible with current military operations throughout most of this unit. This management unit, which includes areas with some of the highest road densities within the BMGR, has long been a popular public outdoor recreation area. From a wildlife management standpoint, Management Unit 2 occupies an area lying between two sensitive habitat areas—the current range of the Sonoran pronghorn in Management Unit 3 to the east and the Flat-tailed Horned Lizard HMA in Management Unit 1 to the west.

Management Unit 3 occupies the easternmost area of BMGR—West. This unit incorporates a large portion of the Mohawk Mountains and Sand Dunes ACEC and most of the Mohawk Dunes natural community complex. The unit is generally bounded on the east by the Mohawk Mountains but the northeastern corner of the area lies on the eastern side of these mountains. This topographically cut off corner of Management Unit 3 is physiographically within the San Cristobal Valley, but lies administratively within BMGR—West. The unit contains some of the most extensive unroaded areas within the BMGR. With the exception of the upland slopes of the Mohawk Mountains, the entire unit is within the current distribution of the Sonoran pronghorn, which extends to the east into Management Unit 4 of BMGR—East and to the south into the Cabeza Prieta NWR. The western portion of this unit includes a large expanse of the creosotebush-

bursage desertscrub natural community dissected with the valley xeroriparian scrub natural community. The eastern portion of this unit is comprised of the northern Mohawk Mountains, which are vegetated with the paloverde-mixed cacti-mixed scrub communities on the bajadas and rocky slopes. Most of this management unit is within the current Sonoran pronghorn distribution area. Military surface use within Management Unit 3 is limited to five widely dispersed ground support areas and scattered TACTS Range instrument sites. The area is generally open to public visitation, but the rates of visitation are less than those experienced in Management Unit 2. Beginning in 2002, Management Unit 3 is closed to public entry from March 15 to July 15 each year as a part of the overall effort to recover the Sonoran Pronghorn. This timeframe spans the normal period for Sonoran Pronghorn births and is critical to the early survival of pronghorn fawns.

Management Unit 4 includes some of the most remote locations within the BMGR. This unit generally underlies the Air Force Air-to-Air Firing Range and lands north of that range that include Stoval Airfield. Like Management Unit 3 to the west, Management Unit 4 straddles the Mohawk Mountains. As a result, the southwest corner of this unit lies on the western side of these mountains and is often mistakenly regarded as being a part of BMGR—West. This entire unit is restricted from general public access. In addition to the Mohawk Mountains, other notable natural features within this unit include the easternmost extent of the Mohawk Dunes natural community complex and the northern extent of a unique valley bottom floodplain natural community complex within the San Cristobal/Growler Wash drainage system. This floodplain community is located on flat valley bottoms where sheet flow with little or no erosional down cutting is the dominant ecological process. The resulting vegetative community includes dense stands of creosotebush, white bursage, ironwood, mesquites, and annual and perennial grasses. The valley bottom floodplain community within the San Cristobal Wash system is considered to be one of the best remaining examples of this community type in the Sonoran Desert. A Salt Desertscrub natural community is also present along the northern portion of the wash system.

With the exception of mountain upland locations, the entire management unit is within the current distribution of the Sonoran pronghorn. Military surface use within Management Unit 4 currently includes the munitions fallout impact area for the Air-to-Air Firing Range; however, the levels of surface disturbance associated with this use are minimal.

Management Unit 5 includes North and South TAC ranges and Manned Ranges 1, 2, and 4. Although the target impact and EOD clearance areas associated with these ranges represent the most extensive military use areas of the BMGR, most of the surface of this unit remains in a relatively undisturbed state. This management unit includes the southern reaches of the San Cristobal valley floodplain complex natural community. While the creosotebush-bursage desertscrub community is dissected with the valley xeroriparian scrub, the paloverde-mixed cacti-mixed scrub communities on the bajadas and rocky slopes are dissected with the mountain xeroriparian scrub. The only example of the creosotebush-big galleta scrub natural community on the BMGR is located in the Sentinel Plain area of this management unit. There are a few managed waters and naturally occurring waters within the Aguila Mountains and Crater Range. The management unit is bound topographically on the west by the Aguila and Granite mountains and to the east by State Route 85. Roughly the western half of this management unit is within the current distribution of the Sonoran pronghorn. Two existing special management areas—the Sentinel Plain Lava Flow and Crater Range SRMAs—are located within Management Unit 5. The SRMA

California

Arizona

Yuma

Wellton

Tacna

Dateland

Sentinel

Gila Bend

Ajo

Why

Lukeville

United States
Mexico

1

2

3

4

5

6

7

6

Legend

Natural Communities*

- Salt Desert Scrub
- Valley Xeroriparian Scrub
- Mountain Xeroriparian Scrub
- Agriculture/Industrial/Urban
- Creosotebush-Big Galleta Scrub
- Creosotebush-Bursage Desert Scrub
- Desert Playa
- Dune Complex and Dune Endemics
- Elephant Tree-Limberbush on Xeric Rocky Slopes
- Paloverde-Mixed Cacti-Mixed Scrub on Bajadas
- Paloverde-Mixed Cacti-Mixed Scrub on Rocky Slopes
- Sand Tank Mountains Uplands
- Valley Bottom Floodplain Complex

Other Features

- Interstate Highway
- Other Highway
- Developed Wildlife Waters
- Springs
- Tinaja (Natural)

g:\bmgr\gis\projects\apr\inrmp\fig2_5.apr

* Natural Communities from The Nature Conservancy (Hall and others 2001) . This work covers the former 2,664,423 acre area of the BMGR prior to its reduction to 1,733,921 acres by the MLWA of 1999.

N

7 0 7 14

Scale in Miles

Natural Community Conservation Elements and BMGR Management Units

Figure 2-5

designation of these features is a misnomer; these former Arizona State Natural Areas were provided with this designation to signify geologically outstanding volcanic formations, not special recreation activities. Public access is restricted throughout the unit because of hazards associated with the weapons ranges and other training sites. As a result, the two SRMAs are not used for recreation.

Management Unit 6 includes two separate sub-units. The larger sub-unit lying east of State Route 85 between the Sauceda and Batamote Mountains is also known as Area B. This unit supports a little disturbed example of the paloverde-mixed cacti scrub on bajadas natural community, one of the richest and most diverse natural communities within the BMGR. Coupled with the adjacent Management Unit 7 to the northeast, Management Unit 6 harbors the most extensively distributed and best preserved example of this natural community. Dense saguaro stands are the dominant over-story cactus species. Manmade and natural waterholes are relatively prevalent within the Sand Tank Mountains and there are several natural springs as well. Military surface use in this area is currently limited to the target lead-in-lines to Manned Ranges 1 and 2 and a GRMDS instrument site on Hat Mountain, a prominent flat-topped peak in the central Sauceda Mountains (see Figures 2-1 and 2-4). Public travel on the two target lead-in-lines is not permitted, but general public access is acceptable in the rest of the sub-unit and it is a popular back-country recreation site. Although the route that remains open for public access in this area requires a longer driving distance to reach the same destination as can be obtained via the Range 1 lead-in line, this longer route provides safer public access. The longer route also traverses interesting and scenic landscapes. The Air Force determined that it was necessary to close the Range 1 and Range 2 lead-in lines to public access because safety must take priority over convenience. The only other access limitation in Management Unit 6 is that the road that roughly parallels and crosses the Management Unit 7 boundary, is restricted to daylight use only. No camping or nighttime travel is permitted along this road because of certain hazards associated with nighttime air-to-ground munitions delivery training in East TAC Range.

The smaller of the two sub-units of Management Unit 6 lies between State Route 85 and Childs Mountain. The southeastern quarter of this sub-unit, which is known as the Ajo Air Force Station area, is compatible with public access. The northern half of the sub-unit provides a safety buffer for munitions delivery training missions at Manned Range 1.

Management Unit 7 includes the easternmost areas of BMGR—East and the most extensive distribution of mountainous uplands in the range units. The Sand Tank and Sauceda mountains form a northwest-opening horseshoe-shaped, continuous ring around the western valley section of this unit. Much of the eastern half of the unit is within the Sand Tank Mountains uplands. These mountains support the only example of the Sand Tank Mountains Uplands natural community within the BMGR and, as already noted, the paloverde-mixed cacti scrub on bajadas natural community is also widely distributed within the unit. There are some manmade and natural waters, primarily in the eastern portions of the unit and a natural spring within the Sand Tank Mountains upland natural community. The Gila Bend AFAF, located in the northern portion of this unit, is the only industrial/urban area identified within the BMGR. Military surface use is generally confined to the northwestern valley areas of the unit and includes Manned Range 3 and East TAC Range (see Figure 2-4). Gila Bend AFAF occupies the northernmost extension of the unit. General public access is not compatible with the military activity within nearly all of this unit because of ongoing

munitions delivery training missions, high UXO concentrations, targeting laser use, and airfield security requirements. Public entry to Management Unit 7 can be accommodated in only two areas. One location includes a narrow area in the northeasternmost corner of the unit between the East TAC Range and BMGR boundaries known as the Benber Springs area. The other area includes two locations along the Management Unit 6 and 7 boundary where a road open to public travel traverses portions of Management Unit 7 (see Figure 2-4). This road is for daylight use only. Overnight camping and nighttime travel is prohibited along this road.

2.6.3 BMGR Road Development History

The history of road development within the BMGR has recently emerged as an important management concern because of the potentially competing interests in roads as necessary for legitimate government and public access versus the potential deleterious effects that these motor vehicle ways may have on natural and cultural resources. Roads currently support motor vehicle access within the BMGR for military training and associated missions, resource management, law enforcement, scientific research, education, traditional cultural activities, and public recreation. The distribution and density of roads within the range are of interest in terms of the adequacy of access provided for these purposes. The distribution and density of the road network in the BMGR and the intensity of motor vehicle traffic on it are also a management concern because of the many potential impacts. Although data are lacking to quantify the extent of the effects, the types of potential impacts include habitat fragmentation, curtailment of wildlife movements, loss or injury of wildlife due to collisions with vehicles, harassment of wildlife, disruption of surface water hydrology and accelerated erosion, and loss of or damage to cultural resources. Competing viewpoints about the need for roads versus their potential adverse effects have often focused on opposing perceptions of the history of road development within the BMGR. One viewpoint holds that there has been an enormous increase in the numbers and miles of roads within the BMGR over the last 25 years. The opposing viewpoint is that most of the roads within the range were established during the historic settlement, ranching, and mining eras prior to World War II or during the military development of the range during the 1940s through the 1960s.

There is no definitive information on the historic development of roads within the BMGR. By the time the range was established in 1941, a fairly extensive network of early roads likely had been established in the area by travelers, settlers, ranchers, and miners. This network was probably composed of unimproved wagon trails and early unimproved and improved motor vehicle roads that provided access to ranching improvements (such as wells, stock tanks, and corrals), developed mines and prospects, and scattered cross-country travel routes between communities/rail stops such as Ajo, Gila Bend, Yuma, and Sentinel. This early network likely provided access to many widely dispersed locations within the range but probably was not densely developed in any local areas.

Some of the early roads appear to have been adopted and improved by the military beginning during World War II to provide access to the interior of the range for developing targets. Additional roads also were no doubt developed to serve specific military purposes as weapons ranges or other facilities during the Korean, Vietnam, and early Cold war eras. Some early roads also may have been developed to provide access to locations where wildlife waters were developed beginning in the late 1940s. The U.S. Geological Survey (USGS) 15-minute series topographic maps for the range area, published in the 1950s and early 1960s, show many of the major portions of the early and current range road system. Recreational visitors to the range may have created

some additional roads perhaps beginning in the 1970s and 1980s. Roads were also likely developed from time to time to support military activities, although the Air Force and the Marine Corps have long shown a preference to using existing road access wherever possible to meet their needs.

The first known attempt to estimate the total mileage of roads within the BMGR was compiled during the preparation of the 1986 Luke Air Force Range Natural Resources Management Plan (U.S. Air Force 1986). This estimate identified 2,029 miles of roads within the range (Figure 2-6). This estimate, however, included roads within 95 percent of the Cabeza Prieta NWR, which was a part of the military range at that time. Also included were roads within three other former BMGR parcels known as Area A, Sentinel Plain, and the Ajo Airport area. The 1986 estimate, which was based on available maps and aerial photography and partially verified by fieldwork, includes the several long drag-roads that were created by the U.S. Border Patrol in BMGR—West and southwestern BMGR—East during the early 1980s.

The range road network shown in the 1986 map generally shows many of the same roads as the maps that depict the current BMGR inventory of 2,222 miles of road (refer to Figures 3-1 and 3-2). Among the readily apparent differences between the 1986 map and the current inventory is the absence in the earlier map of dense local road networks that currently exist—such as in the vicinity of Fortuna Mine, Tinajas Altas, and Dripping Springs—and the absence of many short spur road segments that provide access to locations along the bases of several mountain ranges. The road networks within the tactical ranges shown on the 1986 map lack some road details present within the current network and include a number of now long-abandoned roads that were no longer discernible as roads when the roads and target features within these ranges were surveyed in the late 1990s. The 1986 map also lacks four long and several shorter target lead-in-lines at the Moving Sands and Cactus West Target Complexes and in the vicinity of AUX-2; these lead-in lines were developed before 1986 but did not appear on the maps or aerial photography available to the preparers of the 1986 map. The 1986 map also incorrectly shows an east-west road across the Lechuguilla Desert that is almost aligned with an imaginary westward extension of the northern boundary of the Cabeza Prieta NWR. This road was depicted to represent an additional drag road that the Border Patrol had reported at the time to be scheduled for imminent development. The road was never constructed and does not exist.

Earlier USGS 15-minute series topographic maps and the 1986 management plan map indicate that most of the principal roads that form the current road system within the BMGR were in place no later than the early- to mid-1980s. These roads appear to comprise the bulk of the aggregate road mileage in the range. The 1986 map lacks many of the road segments that form the aforementioned denser local road networks and short spur roads in areas that are open to public use, primarily within areas of BMGR—West; this suggests, but does not clearly demonstrate, that many of these roads may have been created since the 1986 management plan was prepared. Some existing roads may not have appeared on the 1986 map; it relied on the best information available at that time, but did not include high resolution aerial photography or detailed field surveys. As a result, roads, possibly including some of the local networks and spur roads, may have been unintentionally omitted. Anecdotal field observations by Marine Corps and BLM range managers and users, however, corroborate the view that many of the local networks and spur roads in BMGR—West have been created over roughly the last 15 to 20 years.

The general conclusions that may be reached regarding the history of road development in the BMGR include (1) most of the principal roads and the bulk of the aggregate road mileage in the range were established more than 20 years ago; (2) a sizeable number of roads that form dense local networks and spur roads and that tend to be of short length, particularly within BMGR—West, but that likely constitute a minor proportion of the aggregate road mileage in the current range inventory have appeared over roughly the last 20 years; and (3) the balance between roads that have been abandoned and have revegetated/disappeared versus roads that have been created and remain in use appears to be decidedly in favor of progressive increases in both the numbers of roads and aggregate road mileage on the range.

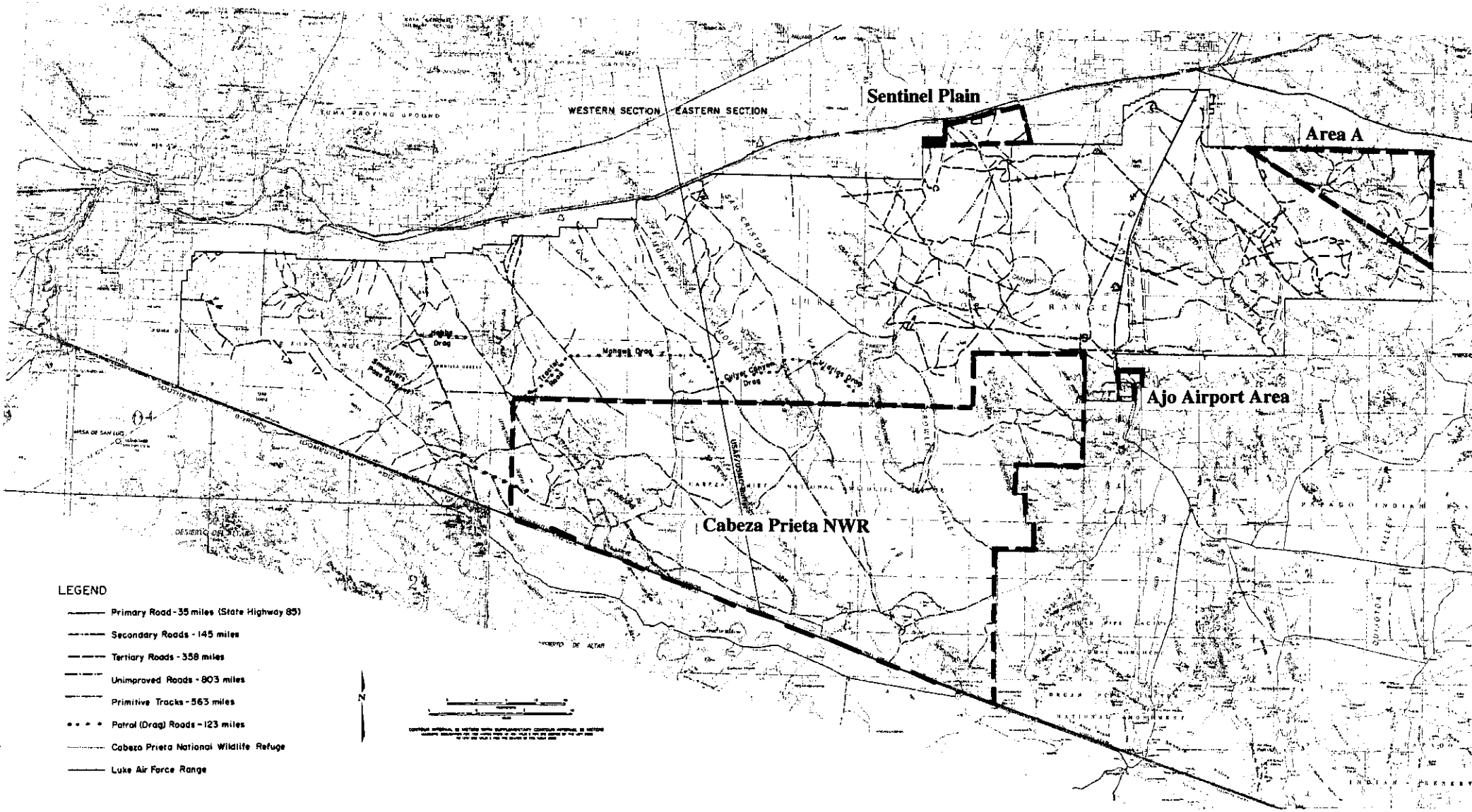
Field observations by military users, range and resource managers, and law enforcement patrol personnel point to the appearance of a sharply increasing number of illegal cross-country vehicle routes on the BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus NM as a result of drug and UDA smuggling across the international border over the last five years and most aggressively in the last two years. The proliferation of these roads has not yet been quantified and remains an uncontrolled range, resource, and law enforcement management problem.

2.7 Natural and Cultural Resource Management Opportunities and Constraints

Natural and cultural resources management opportunities arise from the combination of circumstances that are favorable for meeting management goals, objectives, or other requirements. Constraints are those factors that limit or alter those natural and/or cultural resource management opportunities. For the proposed INRMP, the opportunities and constraints analysis is a synthesis of military mission and non-military agency requirements, recreation, what is known about the resource base, and suitable public uses—all of which are subject to change. Thus, the consideration of natural and cultural resource management opportunities and constraints also contributes to the resource monitoring and adaptive management framework inherent in the planning and management philosophy, to be further detailed in Section 2.8.

2.7.1 Military Mission and Non-Military Agency Opportunities and Constraints

Pursuant to the MLWA of 1999 and the Sikes Act, the predominant drivers of natural and cultural resource management at the BMGR are support of the military mission, conservation and protection of natural and cultural resources, and support of ecologically sustainable public use subject to military safety and security requirements. In accordance with these Acts, supporting the military mission of the range is essential and, therefore, the first priority of the proposed INRMP. Some of the military requirements, such as training in the delivery of live ordnance, is a constraint to conserving and protecting natural and cultural resources and also to providing public use. Likewise, conservation and protection of natural and cultural resources may be a constraint to public recreation opportunities. For example, beginning in 2002, public access to Management Unit 3 is restricted from 15 March to 15 July each year to reduce potential harassment pressures on Sonoran pronghorn during fawning season. However, within the confines of the military land use requirements detailed in Section 2.2, there are also various opportunities for natural and cultural resource management as well as public use. In fact, given the character of the military mission at the BMGR and the long-term environmental protection that military use has afforded to most of



Map 11.1 Road classification on Luke Air Force Range.

Source: Natural Resources Management Plan for Luke Air Force Range. 1986. SRNR, University of Arizona and Luke Air Force Base.

Range Road Network Map from the Luke Air Force Range Natural Resources Management Plan (U.S. Air Force 1986)

Note: Lines depicting drag roads have been enhanced (dotted lines, see map legend) to improve photocopying quality and the boundaries of the former Cabeza Prieta NWR, Area A, Sentinel Plain, and Ajo Airport Area parcels of the BMGR have been added (heavy dashed lines).

the range, there are opportunities to use, protect, and conserve resources and latitude available to develop effective management methods. Optimizing those opportunities for meeting biodiversity and stewardship management objectives in a manner integrated with operations/training requirements is the most effective means for serving both the operational and environmental conservation requirements of the military mission.

Within BMGR—East, the primary military constraints are the target impact areas associated with the tactical ranges and manned ranges. Either live or inert ordnance, or both, are repeatedly delivered to these targets, resulting in high levels of disturbance to soils and vegetative communities. While such impacts are generally confined to a relatively small area, these features are critical to the military mission and must be retained. Impacts that have occurred and will continue to result from these activities may limit some natural and cultural resource management opportunities in terms of multiple uses. Natural and cultural resource management is primarily compliance based, doing that which is necessary to mitigate unavoidable impacts and sustain those ecological conditions necessary to support the mission. In these areas, military use also precludes opportunities for other uses that are incompatible with the military mission, including recreation. Just beyond these core target impact areas, military effects are generally associated with the annual and five-year EOD clearance requirements. In these areas, the surface impact of military use is not predominant, natural processes are less affected, and the vegetation and soil are in state of sustainable recovery. While natural and cultural resource preservation cannot be guaranteed based on the need for military operations in these areas, the Air Force has actively been inventorying these areas for natural and cultural resources and acknowledges the opportunities to conserve and protect these resources. Such stewardship is good business for the DoD in retaining the BMGR land withdrawal as a military reservation. In addition, because non-military uses are precluded from these areas for safety and security reasons, the mission supports the opportunity to protect resources. These areas may provide opportunities for natural and cultural resource management, such as wildlife management projects that are compatible with the mission.

Other military use areas, such as the Air-to-Air Firing Range, have resulted in even less ground disturbance. The land underlying the Air-to-Air Firing Range is subject to fallout from weapons delivery and some target debris. Because of the nature of the training, non-military land uses are not allowed, yet there is no core area of impact. Similarly, buffer areas between the tactical and manned ranges are closed to public use for safety and security reasons, yet have almost no military impact beyond errant munitions striking there. This affords an exceptional opportunity for resource conservation and protection, which is particularly valuable in that the land is generally in a natural condition from the decades of having precluded other land use. The necessary limitations on public use for safety and security reasons may be viewed as an opportunity for the implementation of those resource management projects that could have conflicts with recreation use elsewhere on the BMGR. For example, the endangered Sonoran pronghorn would not be disturbed by recreationists in these areas, which may promote the success of an ongoing project to develop enhanced forage growth in selected plots.

The impacts from military use at Gila Bend AFAF, AUX-6, and adjacent lands are concentrated in those areas most modified and frequently used in support of the military mission. Recreational use of these areas is necessarily limited. Within the Gila Bend AFAF area, natural conditions have been altered substantially. Thus, resource management opportunities differ from those elsewhere on the BMGR and may be redirected to matters such as the use of environmentally beneficial landscaping practices. Resource management opportunities in the less developed AUX-6 area are

somewhat parallel to those areas within the weapons ranges that are affected by military use, but retain resource values. Thus, conservation and protection goals and objectives focused on the AUX-6 area would be relatively unconstrained by military and non-military requirements.

The Ajo Air Force Station area and Area B of Management Unit 6 are generally open to public access. Recreational land uses may constrain the potential to conserve or protect some resources in their most natural state, but opens the opportunity for people to enjoy the natural environment. Both the Sikes Act and MLWA of 1999 provide that sustainable public use of the BMGR be supported to the extent that it is consistent with the military purposes of the range. Together, these Acts also require that natural and cultural resources be conserved, protected, and rehabilitated. The challenge here is in determining the extent to which public use is sustainable relative to the requirements to conserve, protect, and rehabilitate the resources of the range. This balance would likely differ depending on the character of the public use activity and the sensitivity of the resources.

BMGR—West has similar opportunities and constraints regarding the balance of military use, resource management, and public use, but in different proportions. Most impacts of military use occur within the developed areas of the Moving Sands and Cactus West Target Complexes, AUX-2, and the Cannon Air Defense Complex. Although the impact areas are relatively small, entry to a sizable portion of BMGR—West, west of the Gila and Tinajas Altas mountains, Foothills Boulevard, and the western alignment of El Camino del Diablo, is restricted at all times to authorized personnel. The primary management objective for these areas must be in support of the military mission. However, outside of the primary impact areas, there are outstanding opportunities for resource conservation, particularly due to the limitations on access. Currently, the HMA for the flat-tailed horned lizard, a special status species, and the Gran Desierto Dunes ACEC encompass much of this area.

The military use within the remainder of BMGR—West is in support of the ground support areas and TACTS Range. There is no requirement to restrict military or civilian personnel from entering most locations within this portion of BMGR—West at most times. With the exception of frequently used portions of ground support areas and simulated target and electronic instrumentation sites, natural conditions predominate in these areas, as is recognized by the Mohawk Mountains and Sand Dunes and Tinajas Altas Mountains ACECs. There are excellent opportunities for recreation use, if compatible with resource conservation and protection requirements.

Non-military agency land use, particularly that of the Border Patrol introduces a secondary layer of uses that influence natural and cultural resource management. Although providing for the requirements for non-military land use are not specifically outlined in the Sikes Act or MLWA of 1999, other national priorities support the performance of this and other agencies' missions in relation to natural and cultural resource protection requirements and goals. The Border Patrol law enforcement and search and rescue missions, which require some off-road vehicle use, have some impact on BMGR resources and may be contrary to some resource conservation goals. The AGFD mission, on the other hand, is focused on resource management. Various wildlife management opportunities are present as a result of past and ongoing AGFD wildlife management programs such as wildlife water developments.

2.7.2 Resource Opportunities and Constraints

While executing the military mission sometimes constrains and sometimes supports the ability to conserve and protect environmental resources, the resource base itself factors into the analysis of resource management opportunities and constraints. An adequate understanding of the resource base, particularly those vulnerable or high-value resources, provides an additional frame of reference. It provides insight into those areas where opportunities for resource management are greatest in terms of resource protection, conservation, enhancement, or recovery. It also identifies those areas where resource conditions may constrain opportunities for use, whether it be military use, non-military agency use, or recreation use.

Luke AFB has partnered with The Nature Conservancy for technical support in the development of this EIS and the proposed INRMP. Specifically, The Nature Conservancy provided expertise in site conservation planning, a planning methodology that uses a focused set of conservation elements to represent the overall native biodiversity of an area within a planning and management context. A number of recognized scientific and agency natural resource experts were engaged in this process to help identify relevant existing ecological, conservation status, threat, and regional biodiversity data. With the assistance of these experts, the Nature Conservancy analyzed the ecological structure, composition, and processes on the BMGR and identified 13 natural community elements (see Figure 2-5) (Hall and Others 2001). Natural communities represent an integration of ecosystem attributes, including biotic and abiotic composition, structure, and function, at scales that are practical and applicable to conservation planning. These communities in combination represent a coarse filter, which is intended to capture, for management purposes, the majority of the biodiversity occurring on the BMGR. The Nature Conservancy also identified 12 species conservation elements for the BMGR. Some of these species conservation elements are individual species while others are guilds composed of at least three or more species.

From this baseline, The Nature Conservancy effort focused on a vision for managing each of these elements and measuring whether management actions are successful in meeting management goals. Against the backdrop of ecological processes that maintain ecosystem function in the Sonoran Desert, a preliminary list of monitoring objectives was developed for each of the 13 natural communities and 12 species conservation elements. Lastly, The Nature Conservancy effort examined opportunities and obstacles for coordinated management with two adjacent landowners—the Cabeza Prieta NWR and Tohono O'odham Nation.

The ecological characteristics of the community and conservation elements; its status, threats to its persistence, and associated threat abatement strategies; and mapping and information needs were documented. These efforts and analyses can be used in the proposed INRMP to further focus on those areas that present the greatest opportunities for natural and cultural resource management. That is, the conditions necessary to sustain native species, ecological communities, and biological diversity. These efforts also helped to define what is important in terms of ongoing monitoring and evaluation of the status and stability of natural communities.

Another important opportunity for natural and cultural resources management results from the areas previously recognized and managed for resource conservation and protection areas on the BMGR (ACECs, SRMAs, HMA, and the backcountry byway). These areas offer opportunities for continuing, expanding, or refocusing management efforts, compatible with the military mission, that are consistent with the legacy of prior management efforts. Military use is generally not

predominant (particularly within the ACECs and HMA) and controls on recreation use, where currently allowed, have already been established in these areas.

Currently recognized resource constraints are primarily driven by compliance requirements such as the protection of cultural resource sites, which must be adequately protected from potential impacts from military, non-military agency, or public use. It also includes incorporating environmental considerations into planning, such as suitability of military or non-military agency operations or intensive recreation use in areas with soils that have limited weight-bearing capacity or high potential for erosion. Requirements for protection and recovery of the Sonoran pronghorn already constrain military and non-military agency operations, requiring various mitigative measures, and future limitations on recreation use may be required. Whereas recovery of the species would lessen constraints on users, further decline of the species may introduce additional constraints. The INRMP must look forward, with ecosystem and biodiversity interests in mind, and consider these types of resource management constraints or vulnerabilities.

2.7.3 Public Use Opportunities and Constraints

Again, based on the legal authority of the Sikes Act and MLWA of 1999, opportunities for sustainable public use of the BMGR must necessarily be constrained by requirements for military use. The predominant opportunity for public use consistent with military missions is recreation. The MLWA, DoD Native American Policy, and the American Indian Religious Freedom Act also specify special provisions for access to and ceremonial use of sacred sites by American Indians.

The resource base present at the BMGR could support a wide range of outdoor recreation uses. However, many potential activities, such as cross-country ORV races or developed campgrounds, are precluded from consideration by military mission or other regulatory constraints. As it is, most BMGR recreation use currently consists of dispersed hunting, backpacking, hiking, dispersed and undeveloped camping, photography, backcountry vehicle driving, and sightseeing. Although similar recreational opportunities are present in the region, opportunities at the BMGR setting are unique in terms of both its environmental and military context. There are no developed recreation sites or facilities on the BMGR. All recreational access to the BMGR is by permit only. Additional AGFD permits must be obtained for hunting. Areas on the BMGR currently open to regular AGFD hunting seasons include Management Units 2, 3, and 6 and the portions of Management Units 1 and 7 open to public access. A portion of Management Unit 4 along the Mohawk Mountains is also open to big horn sheep hunters under an Air Force Special Use Permit. Recreational users of the BMGR are expected to comply with general rules of conduct for public lands, which address sanitation; terms of occupancy; vehicle use; natural and cultural resources; and health, safety, and comfort. Although there is some demand for public off road use, such recreational travel is currently prohibited on the entire BMGR.

These types of recreation uses can and are likely to impact natural and cultural resources to at least some degree. The requisite management task is to determine the extent to which various types of public use may be sustained relative to requirements to conserve, protect, and rehabilitate the resources of the range.

2.8 INRMP PLANNING AND MANAGEMENT PHILOSOPHY

The DoD approach to integrated resource management planning is central to the proposed INRMP. This proposed plan also relies on the application of biodiversity and ecosystem

management concepts. These concepts are critical to understanding the development and application of the INRMP. The following three important and interrelated facets of ecosystem management are needed in order to put this planning and management philosophy into practice for the BMGR: (1) addressing ongoing management issues, (2) developing an inventory and resource monitoring program that is based on ecological principles, and (3) establishing an adaptive management program. Although presented sequentially, these components are actually interactive and activities related to them would often be concurrent. Planning is rarely linear because knowledge increases and conditions (both environmental and military mission) change, necessitating revision of earlier management measures and adaptation of future management measures. Implementing management measures, monitoring the results of those management measures and changing conditions, and adjusting management accordingly sets in motion a continuing and dynamic management process.

The proposed INRMP is the tool that will be used to apply the DoD ecosystem planning and management philosophy to the BMGR. As introduced in Section 1.11, the largely programmatic (i.e., broad-scope) makeup of the INRMP supports the adaptive management approach. While some site-specific actions may be identified, most of the proposed INRMP actions are goal-oriented protocols for resource management. Section 3.2 in Chapter 3 initiates the first step in this process by establishing goals on which to base the plan.

2.8.1 Biological Diversity, Ecological Integrity, and Ecosystem Management Defined

The definitions used in this EIS were derived from DoD Instruction 4715.3, *Environmental Conservation Program*. Biological diversity, sometimes shortened as biodiversity, and ecological integrity, a term interchangeable with ecological health, are both measurements of ecosystems—dynamic and natural complexes of living organisms interacting with each other and with their associated non1iving environments. Biological diversity refers to the variety of life forms and processes and the environment in which they occur. It includes the number and variety of living organisms, genetic differences among them, communities and ecosystems in which they occur, and ecological and evolutionary processes that keep them functioning, yet ever changing and adapting. Ecological integrity refers to the ability to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to the natural habitat of the region.

Ecosystem management incorporates the concepts of biological diversity and ecological integrity in a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole. 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 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 other disciplines are synthesized and applied to the maintenance of biological diversity. Because ecosystem management is based on an emerging understanding of ecology, biological diversity, and resources management, and because ecosystems are open, changing, and complex systems, this

planning and management philosophy requires flexibility. Provisions to allow for adaptive management include monitoring, assessment, reassessment, and adjustment as necessary.

2.8.2 Addressing Ongoing Management Issues

As defined in Section 2.3.3, resource management issues have been addressed at the BMGR since its inception during World War II. The contemporary resource management era, however, can be traced from 1982 with the development of the Natural Resources Management Cooperative Agreement between the Air Force, Navy/Marine Corps, USFWS, BLM, and AGFD. That agreement led to the production of the Luke Air Force Range Natural Resources Management Plan in 1986, which was in turn adopted by the BLM as the basis for preparing the Goldwater Amendment that was completed in 1990. These three events led to the recognition that effective resources management on the BMGR depends on clearly identifying the land and airspace use requirements of the military mission, addressing natural and cultural source management issues from a broad scope and an integrated perspective, promoting resource protection and conservation opportunities created by military use requirements, and emphasizing interagency communications and cooperation on BMGR resource management issues. Progress on all of these fronts has been made since the Goldwater Amendment was implemented. An essential task of the proposed INRMP will be to maintain progress on these continuing management issues while integrating measures to support sustainable public use.

A number of resource-specific management issues that were identified during the development of the Luke Air Force Range Natural Resources Management Plan and the subsequent Goldwater Amendment have remained current over the last decade and were identified during scoping by the public and agencies as ongoing concerns. Examples include the creation, maintenance, and use of roads within the BMGR; development and maintenance of wildlife waters; recovery of the Sonoran pronghorn; public access and vehicle use procedures and restrictions; and native wood use for campfires. Effective management direction must be established by the proposed INRMP to address these and other ongoing concerns.

The proposed INRMP's integrated management approach requires that ongoing and emerging resource issues not be addressed independently, but in relationship to each other and to ecosystem and biodiversity management concerns. Thus, management goals and strategies for issues such as road development and vehicle use must be prepared and balanced in view of their potential effects on other resource elements, such as special status species, wildlife habitat, and cultural resources.

2.8.3 Resource Inventory and Monitoring Program and Subplan

The uncertainty and complexity of nature means that ecosystem management can never be precise, and all possible outcomes of management will not be known or controllable. Management actions that are deliberately experimental can be used to probe the behavior of the natural system and provide a way of managing under conditions of uncertainty. Developing and testing hypotheses helps identify the important assumptions we make about how an ecosystem functions. Thus, an experimental framework is not just about enabling managers to modify management alternatives to make them more effective; its greatest value lies in its ability to build knowledge and understanding, which continuously enriches the management process.

As the results of selected management activities become known, their implications are analyzed, models are validated and adjusted, and management alternatives are revisited. This is a cycle of learning, where today's future context becomes tomorrow's present and a new future context is envisioned. Resource inventory and monitoring involves measuring and reporting results and is, therefore, the tool for measuring the effectiveness of the proposed INRMP once it is implemented. Openly reporting monitoring results promotes accountability for BMGR stewardship, strengthens institutional memory (preserves lessons learned), invites review and comment from outside resource management professionals and the public, and helps communicate management alternatives to others that use the BMGR or manage nearby lands.

As this EIS was prepared, efforts were made to identify data or information that is not currently available but would support better future management of the natural and cultural resources management within the BMGR. Specifically, the fourth subsection for each affected environment resource and management activity section in Chapter 4 is dedicated to this topic (under the heading "Information not Currently Available to Support Management"). The described information is not incomplete or unavailable information that is relevant to determining reasonably foreseeable significant adverse effects on the human environment (i.e., per 40 CFR §1502.22). Most of the items identified involve expensive, large-scale, and often long-term (i.e., multi-year) inventory or monitoring activities such as a range-wide vegetation mapping, soil mapping, visitor use surveys, or vertebrate and invertebrate species surveys. This information would facilitate resource management activities once it is obtained and would be of beneficial use for long-term resource management, but is not necessary for determining whether the proposed action and alternatives would have foreseeable beneficial or adverse effects on resources.

The Core Planning Team considered these items in the development of the alternative management strategies and proposed action for all resources. Those that were incorporated in the alternative management strategies and proposed action were based on the prevalent management issues faced by the Core Planning Team and on input from the public during scoping and the public workshops with regard to these resources. Following the ROD, the Air Force and Marine Corps will establish project priorities and schedules to implement the selected INRMP alternative. The Marine Corps and Air Force will execute the plan and identified projects, based on the availability of funds (see Section 1.5.5).

Additionally, an inventory and monitoring subplan will be developed based on the alternative management strategy selected to constitute the INRMP in the ROD. Detailed inventory and monitoring requirements cannot effectively be developed until the other elements of the full INRMP management strategy are selected. The "Information not Currently Available to Support Management" sections of Chapter 4 will provide at least a partial basis for developing this subplan. The subplan will provide written strategies that identify priorities and methods for conducting needed resource inventories. Consistent with the alternative management strategy selected to constitute the INRMP, the subplan also will incorporate indicators representative of the BMGR ecosystem that would trigger corrective actions before measures of resource degradation hit critical values. If corresponding management issues emerge and the need for this information becomes a priority for management purposes, projects may be identified through the adaptive management provisions of the inventory and monitoring plan and through the annual updates of the five-year schedule of management projects and project priorities. Monitoring objectives recommended by TNC in its report, *Conservation Elements of and a Biodiversity*

Management Framework for the Barry M. Goldwater Range, Arizona (Hall and others 2001) will be considered in the development of the subplan as a potential management tool for conserving the biodiversity of the BMGR. These objectives were offered as a representative approach for biodiversity conservation to 13 natural community and 12 species conservation elements and management categories and associated management standards described by the authors of this report.

The proposed resource inventory and monitoring subplan would be prepared in accordance with the NEPA and other applicable law. Any NEPA documentation prepared for this subplan would be tiered from the EIS for the proposed INRMP and would provide opportunity for public review and comment.

Two general approaches to monitor resources are candidate management tools for the BMGR and may be used individually or in combination. The first monitoring approach uses a program specifically designed to detect and track either the environmental effects and management effectiveness of specific resource management actions or the environmental effects of specific activities within the range that are not resource management actions. The second approach is to design a program that will detect and track conditions and trends within selected natural communities and species conservation elements within the BMGR. Similar data collection methods may be used to implement either of these two general monitoring approaches, but the focus and objectives of these approaches would differ. A monitoring program designed under the first approach would be expected to have a narrowly defined focus oriented towards determining the effects and/or results of a specific action or activity. Useful results may be expected from this type of monitoring over either relatively short or long time frames. Potential examples of this approach include monitoring programs designed to:

- track the introduction and spread of invasive plant species along road corridors and in other vehicle use areas within the range
- determine wildlife use of a new water development
- determine the extent of firewood gathering by recreational visitors
- determine the effectiveness of dust abatement procedures
- track the frequency and extent of off-road vehicle use along a specified road corridor or in a particular area.

Monitoring programs developed under the second approach, such as that proposed by TNC, would likely have a broadly based focus designed to detect and track trends in the ecological health, structure, or functions of the targeted natural communities or species conservation elements. Although the effects of specific management actions or activities on the range may be detected by such a monitoring program, the program objectives may not be designed specifically to gauge those effects. The program monitoring methods may also not be sensitive to measuring changes in the targeted conservation elements that result from other unforeseen causes. The full usefulness of results from this type of ecosystem monitoring may be realized only over relatively long time frames.

2.8.4 Adaptive Management

In simple terms, adaptive management involves a preplanned process designed to continue, modify, or redirect management objectives or actions in response to changing conditions or new

information in order to best achieve desired goals. A key to this definition is the concept that adaptive management requires a preplanned process. An adaptive resource management program is implemented in recognition that change in the resource base, management information, and/or other conditions is inevitable over time and that a preplanned process must be in place to measure these changes and develop appropriate responses to maintain or improve the program's effectiveness. This approach differs from a program that relies solely on periodic management plan updates in that the adaptive program anticipates and adjusts to changing conditions as they emerge rather than deferring management action until a previously scheduled update cycle runs it course. Adaptive management will be incorporated into the inventory and monitoring subplan described in Section 2.8.3.

A key cornerstone of a successful adaptive management program, that also incorporates ecosystem management principles, is a resource monitoring system that provides feedback on the effects of implemented management actions and, as well, gauges both the baseline conditions and trends that characterize natural communities and species conservation elements. Such a monitoring system engages the advantages of both of the monitoring approaches—action and response and ecosystem monitoring—discussed in Section 2.8.3. This duel monitoring approach would be beneficial to the BMGR where limited baseline information and no trend analysis are available to characterize most natural communities and species conservation elements and no systematic assessments of the effectiveness of management actions have been previously implemented.

A second critical component of adaptive resource management at the BMGR would be clear channels for both inter-agency consultations and public and tribal participation. The multiple agency character of resource management and land use within the BMGR as well as active public interest in these issues has been well demonstrated. Effective management of the range's natural and cultural resources could not be achieved without active communication among the agencies that manage and use those resources and with those members of the public, non-governmental organizations, and Native American tribes with interests in those resources