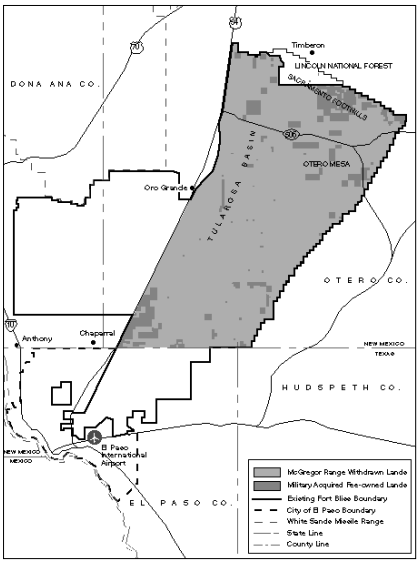
McGregor Range, New Mexico Land Withdrawal Renewal Legislative Environmental Impact Statement

Volume I

United States Army

May 1999

This Legislative Environmental Impact Statement (LEIS) has been prepared in support of an application by the United States Army to renew the withdrawal of McGregor Range, which is critical to maintaining our nation's military readiness. The Army's application for renewal of the McGregor Range withdrawal is for the 50-year period 2001 through 2051.



McGregor Range provides an environment for tough, realistic training necessary for retaining quality soldiers by providing world-class training at both the individual and unit level. To be effective, the ideal training range must provide sufficient land and airspace to conduct training at realistic distances. Additionally, access to a variety of conditions (e.g., simulated threats, operational space, topographic relief, and safety constraints) and scheduling availability. Existing ranges are utilized to the greatest extent possible without jeopardizing the lives of our forces while maintaining stewardship of the lands and its resources. Our forces require training areas of the size and configuration of McGregor Range to realistically prepare soldiers and units for known and emerging threats to our nation and its interests, and to test and refine innovative concepts and new strategies to deter, compel, and if required, fight and win combat engagements into the 21st century.

The LEIS is organized as follows in Volume I:

- Chapter 1 discusses the purpose and need for McGregor Range.

- Chapter 2 describes the proposed action and alternatives analyzed in the LEIS. A foldout is provided at the end of the chapter to assist the reader's understanding of military use of the land.

- Chapter 3 provides an overview of the baseline environmental conditions of McGregor Range and the potentially affected environment.

- Chapter 4 addresses the potential impacts of implementing the alternatives described in Chapter 2, when compared to baseline conditions presented in Chapter 3. A foldout is provided at the end of Chapter 4 to assist the reader's understanding of the withdrawal configuration alternatives.

- Chapters 5, 6, 7, 8, 9, and 10 present the list of preparers and contributors, agencies and persons consulted, references, distribution list, glossary, and an index, respectively.

- Foldouts are provided at the end of the document to assist the reader's understanding of acronyms used throughout the LEIS.

- Volume II, *Public Comment and Response Document*, contains the responses to public comments received during the public comment period. Boxes containing numbers in the margins of Volume I indicate where text has been changed in response to a comment from Volume II. As an example, comment number one was a question about duration of withdrawal —you will find [1] in the margin where changes to the text in Volume I were made.

McGregor Range Land Withdrawal
Legislative Environmental Impact Statement

Volume I

Prepared for:

U.S. Army Air Defense Artillery Center and Fort Bliss
Program Manager, McGregor Renewal
Fort Bliss, Texas and New Mexico 79916

Prepared by:

U.S. Army Corps of Engineers
Fort Worth District
819 Taylor Street
Fort Worth, Texas 76102-0300

Technical Assistance:

Science Applications International Corporation
3900 Paradise Road, Suite 285
Las Vegas, Nevada 89109

May 1999

This document has been prepared under Contract No. DACA6395-D-0020 with the
U.S. Army Corps of Engineers, Fort Worth District,
819 Taylor Street, Fort Worth, Texas, 76102.

Please cite this document as follows:

U.S. Army, 1999. McGregor Range Land Withdrawal Legislative Environmental Impact Statement, Volumes I and II. Prepared by the U.S. Army Corps of Engineers, Fort Worth District and Science Applications International Corporation, for the McGregor Range Renewal Program Manager, Fort Bliss, Texas and New Mexico. June.

Number of pages in Volume I: 711
Number of pages in Volume II: 388

DoD, DoD contractors, and the public can obtain copies of this report from:

Office of Scientific and Technical Information
P.O. Box 62
Oak Ride, TN 37831
(615) 576-8401

This report is publicly available from the:

Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

APPENDICES

TABLE OF CONTENTS (Continued)

APPENDICES (Continued)

TABLE OF CONTENTS (Continued)

APPENDICES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

COVER SHEET

a. Responsible Agency: U.S. Army, Fort Bliss

b. Proposals and Actions: McGregor Range, located in Otero County, New Mexico, has supported the military mission of the U.S. Army at Fort Bliss from the 1940s to the present. In 1986, the public lands comprising McGregor Range were withdrawn from the public domain for a period of 15 years through the *Military Lands Withdrawal Act* (Public Law 99-606). This withdrawal expires November 6, 2001. To continue the military use of these public lands, the U.S. Army must apply for continuation of the withdrawal in accordance with the *Engle Act of 1958*, which requires an Act of Congress for military withdrawals encompassing more than 5,000 acres. This *Legislative Environmental Impact Statement* has been prepared in support of an application by the U.S. Army to renew the withdrawal of McGregor Range for military use. The Army's application for renewal of the McGregor Range withdrawal is for the 50-year period 2001 through 2051. The Army considered six Alternatives. Under Alternative 1, the Army's proposed action, the boundaries of McGregor Range would be the same as the 1986 withdrawal where 608,385 acres of public land are withdrawn. Under Alternative 2, the Tularosa Basin and Otero Mesa portions of McGregor Range would be withdrawn for continued military use (568,385 acres). The Sacramento Mountains foothills portion of McGregor Range, including the Culp Canyon Wilderness Study Area, would return to the public domain. Under Alternative 3, the Tularosa Basin portion of McGregor Range would be withdrawn for military use (428,385 acres). The Otero Mesa and Sacramento Mountains foothills portions of the range would return to the public domain. Under Alternative 4, only the portion of the Tularosa Basin south of New Mexico Highway 506 would be withdrawn (364,385 acres). No portion of McGregor Range north of New Mexico Highway 506 and on Otero Mesa would be withdrawn for military use. Under Alternative 5, the No Action Alternative, the withdrawal of McGregor Range would not be renewed. Alternative 6 would require separate congressional action to establish a National Conservation Area on Otero Mesa and designate Culp Canyon as a wilderness area, in addition to the return of Otero Mesa and the Sacramento Mountains foothills portion of McGregor Range to the public domain.

c. Comments and Inquiries: Written comments regarding this document should be directed to:

Dr. Andrew Vliet, DPhil
Program Manager, McGregor Renewal
U.S. Army Air Defense Artillery Center and Fort Bliss
Attn: P.O. Box 6020
Fort Bliss, Texas 79906
Telephone: (915) 568-6708 or (888) 248-8329
FAX: (915) 568-6643
E-mail: mcgregor@emh10.bliss.army.mil

d. Designation: *Legislative Environmental Impact Statement*

e. Abstract: This *Legislative Environmental Impact Statement* has been prepared in accordance with the *National Environmental Policy Act*. The document includes analyses of the potential environmental consequences that the alternative actions may have on land use, airspace, transportation, utilities, earth resources, air quality, water resources, biological resources, cultural resources, socioeconomics, environmental justice, noise, safety, and hazardous substances and waste. The findings indicate that potential environmental impacts from the proposed actions and the alternatives may include changes to land use, and some impacts to biological resources and cultural resources.

EXECUTIVE SUMMARY

This *Legislative Environmental Impact Statement (LEIS)* has been prepared in support of an application by the United States (U.S.) Army to renew the withdrawal of McGregor Range, which is critical to maintaining our nation's military readiness. The *Military Lands Withdrawal Act (MLWA)* provides that the Army may seek renewal of the McGregor Range withdrawal. In connection with the application for renewal, the MLWA specifies that the Secretary of the Army will publish a Draft *Environmental Impact Statement (EIS)*, consistent with the requirements of the *National Environmental Policy Act (NEPA)*, if there is a continuing requirement for military use of this range. Since this action is a proposal for legislation, the Army and the Bureau of Land Management (BLM) have mutually agreed to use the LEIS process, pursuant to 40 Code of Federal Regulations (CFR) 1506.8, to comply with the requirements of Public Law (PL) 99-606. This LEIS is being prepared in cooperation with BLM and local government. Therefore, pursuant to the LEIS process, the Army has decided to prepare a final LEIS, and a Notice of Availability of the final LEIS will be published in the *Federal Register*. However, there will not be a Record of Decision (ROD) because the decision to renew the withdrawal is made by the U.S. Congress and signed into law by the President.

McGregor Range, located in Otero County, New Mexico, has supported the military mission of the U.S. Army at Fort Bliss from the 1940s to the present. McGregor Range is comprised primarily of public lands, which are lands owned by the Federal Government and administered by the Department of the Interior (DOI), BLM, pursuant to the *Federal Land Policy and Management Act (FLPMA)* (PL 94-579) and other public land laws. At McGregor Range, the public lands have been withdrawn from the provisions of various public land laws for military use. Public lands comprising the range were subsequently withdrawn through Public Land Order (PLO) 1470 in 1957 for a period of 20 years. At that time, the public lands were interspersed with private ranch holdings that were purchased by the Army and are now owned in fee by the Army. Portions of McGregor Range were first leased by ranchers to the Army during the 1940s. The PLO withdrawing McGregor Range expired in 1977, but the legislation required by the *Engle Act of 1958* (43 United States Code [USC] 155) to continue the withdrawal was not passed until 1986 when Congress enacted the MLWA PL 99–606. Throughout the intervening period, the Army continued its mission on McGregor Range. PL 99-606 renewed the withdrawal for a period of 15 years, through 2001.

The area encompassed by the current boundary of McGregor Range includes approximately 608,385 acres of public domain lands withdrawn under PL 99-606 in 1986; and 71,083 acres of Army fee-owned lands within Otero County, New Mexico. McGregor Range also includes 18,004 acres of U.S. Forest Service (USFS) lands, which are used by the Army in accordance with a Memorandum of Understanding (MOU) between the USFS and the Department of the Army (DA) Fort Bliss. The 18,004 acres of USFS land are not included in this withdrawal renewal. McGregor Range is surrounded by lands administered primarily by the BLM and USFS to the north and west, with pockets of privately owned lands to the east used for ranching. To the south and west are withdrawn and Army fee-owned lands in El Paso County, Texas, and Otero and Doña Ana counties in New Mexico.

124

The public domain lands within McGregor Range are managed by the Army and BLM in accordance with an MOU signed in 1990, the BLM's White Sands *Resource Management Plan (RMP)*, as amended by the McGregor Range *Resource Management Plan Amendment (RMPA)*. The MOU expires in the year 2001 unless canceled or renewed. In accordance with PL 99-606, the Army has priority use of McGregor Range at all times to support its mission. However, BLM has management responsibility for wildlife, including improvements for sustaining wildlife, and for a variety of nonmilitary uses and resources in defined geographic areas, including energy and mineral resources, grazing, vegetation, recreation and

hunting, wilderness, visual and cultural resources, and management of nonmilitary-caused fires. Consistent with provisions of FLPMA, the BLM tries to maximize multiple uses whenever possible.

Fort Bliss administers, trains, and deploys active duty U.S. Army, Army National Guard, Army Reserves, and other service personnel and units. Periodic exercises involve units from other installations, and from other services and allied nations. Units are organized, trained, and equipped for national emergency or crisis and overseas deployment. McGregor Range supports the training requirements of a variety of U.S. and allied units, as well as other federal agencies. Mission activities conducted on McGregor Range include training to maintain the operational readiness of active duty, reserve, and National Guard units, and weapons system testing. Field training exercises (FTX) include various combinations of training, field operations, communications, command and control, simulated enemy contact, camouflage, smoke generation, and weapons firings. Use of McGregor Range is paramount to maintaining combat readiness. Joint Training Exercises (JTX), such as Roving Sands, are conducted on McGregor Range. In addition, live firing exercises (FIREX) occur on McGregor Range. The 1-week long FIREX associated with Roving Sands is the largest density of missile firing at the range. White Sands Missile Range (WSMR) uses the Fort Bliss Training Complex for limited tests.

The current withdrawal under PL 99-606 expires November 6, 2001. To continue the military use of these public lands, the U.S. Army must apply for continuation of the withdrawal. The lead agency for the preparation of the LEIS is the DA. The BLM is a cooperating agency. To assist the congressional decision-making process associated with the Army's application, this LEIS is organized as follows:

- Chapter 1 discusses the purpose and need for McGregor Range.
- Chapter 2 describes six alternatives including No Action. Under Alternative 5, the No Action Alternative, the withdrawal of McGregor Range for military purposes would not be renewed.
- Chapter 3 provides an overview of the existing (baseline) environmental conditions of McGregor Range and the potentially affected environment.
- Chapter 4 addresses the potential environmental consequences of implementing the alternatives described in Chapter 2, when compared to baseline conditions presented in Chapter 3. Cumulative effects, mitigation measures, and irreversible and irretrievable commitment of resources associated with the alternatives are also discussed in Chapter 4.
- Chapter 5, 6, 7, 8, 9, and 10 present the Preparers and Contributors, Persons and Agencies Consulted, Distribution List, References, Glossary, and Index, respectively.
- Appendices provide additional technical support data.
- Volume II, *Public Comment and Response Document,* contains the responses to the public comments received during the comment period. Boxes containing numbers in the margin of Volume I indicate where text has been changed in response to a comment from Volume II.

PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose for renewing the land withdrawal for McGregor Range is to provide a safe and secure location to train military personnel and test equipment to meet nationally directed missions and requirements. Realistic training that fully engages military capabilities is the primary means to ensure readiness and prepare our military to fight and win in combat. This training is central to the way the U.S. Armed Services fight. Effective training consists of a careful progression of exercises directed at

individuals, crews, and units. All training exercises are fully evaluated to provide feedback and lessons learned for the development of future tactics and doctrine. Whether training is conducted at the individual level or as a full-scale field exercise, realistic training is critical to maintaining military proficiency, and the ability to evaluate the effectiveness of training is central to ensuring the readiness of military forces to respond to threats wherever they arise. Joint and combined training exercises have improved U.S. operability and understanding of the strengths of each military service, as well as those of our allies. The skill of our nation's air defense soldiers is developed through training on McGregor Range.

An effective training range must provide sufficient land and airspace to conduct training at realistic distances. Access to a variety of conditions (e.g., simulated threats, operational space, topographic relief, and safety constraints) and scheduling availability are also important characteristics for a training range. Existing training areas such as McGregor Range are used to the greatest extent possible, while maintaining sound stewardship of the lands and its resources. Our forces require training areas of the size and configuration of McGregor Range to realistically prepare soldiers and units for known and emerging threats to our nation and its interests, and to test and refine new concepts, weapons systems, and strategies to deter, compel, and if required, to fight and win.

U.S. military strategy requires strong armed forces that are trained, equipped, and ready to defend our nation's interests. McGregor Range is needed to:

- Provide sufficient space to conduct real-world military training;
- Train soldiers to use the Patriot missile system, Avenger, Stinger, Bradley Linebacker, and other advanced weapons systems;
- Maintain highest quality military and operational readiness standards;
- Support allied military education and training programs; and
- Integrate Army, Navy, Air Force, and Marine elements during joint FTXs such as Roving Sands.

The training conducted at McGregor Range ensures the ability of air defense troops to:

- Intercept and destroy missiles in flight,
- Intercept and destroy aircraft in flight,
- Protect U.S. military forces at home and abroad, and
- Safeguard civilian populations.

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

Six alternatives have been identified for analysis in this LEIS. These alternatives include options for renewal of the withdrawal for all, part, or none of the existing withdrawn land area. The Army proposes to apply for renewal of the lands currently comprising McGregor Range (Alternative 1) for the 50-year period 2001 through 2051.

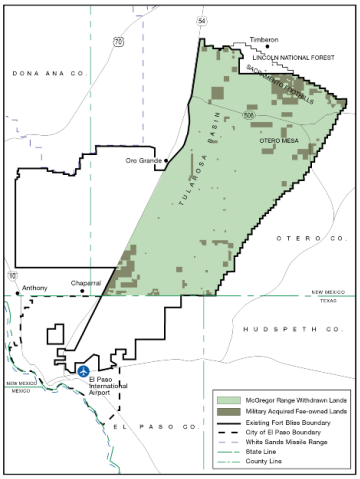
The military uses of the withdrawn land and Army fee-owned land are as defined for McGregor Range in two Fort Bliss documents: (1) the *Training Area Development Concept (TADC)* and (2) the Fort Bliss Mission and Master Plan *Programmatic Environmental Impact Statement (PEIS)*. Potential military uses of McGregor Range, as described in these documents, would require additional project-specific NEPA documentation. Some nonmilitary uses would be permitted on withdrawn lands under multiple use objectives for each withdrawal alternative.

The LEIS includes Alternatives 2, 3, 4, 5, and 6, under which Congress would renew the withdrawal for only a portion of McGregor Range and return the remainder to the public domain. Under these alternatives, the Secretary of the Army would need to prepare a written determination concerning the contamination of the areas returned to the public with explosive, toxic, or other hazardous substances. Public access to returned areas would be in accordance with DOI and Army consideration of the clean-up of ordnance and explosive hazards. The No Action Alternative, under which the U.S. Army would cease military use of McGregor Range and make the land available to DOI for return to the public domain, is included. Under Alternatives 2 through 6, the Secretary of the Interior could decide not to accept certain areas due to future liability, thereby necessitating transfer to the Army.

The alternatives addressed in the LEIS are:

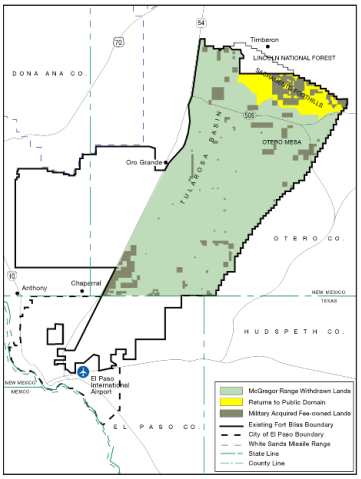
Alternative 1 (Army's Preferred Alternative):

Under this alternative, the withdrawal of McGregor Range would be renewed under the same conditions as provided in PL 99-606. The McGregor Range boundary would remain as it is currently.



The renewed withdrawal would be for 608,385 acres. McGregor Range also includes 71,083 acres that are owned by the U.S. Government and managed by the Army. In addition 18,004 acres of USFS managed land are used as a safety buffer and for dismounted training; that acreage is not included in the withdrawal but would continue to be used through an agreement with the USFS. McGregor Range currently encompasses all of these lands (approximately 697,472 acres). McGregor Range is publicly accessible via U.S. Highway 54 and New Mexico Highway 506. The public is excluded from areas within Tularosa Basin south of New Mexico State Highway 506 due to safety concerns. Public access is allowed on other areas of McGregor Range when it does not interfere with the military mission.

Alternative 2:



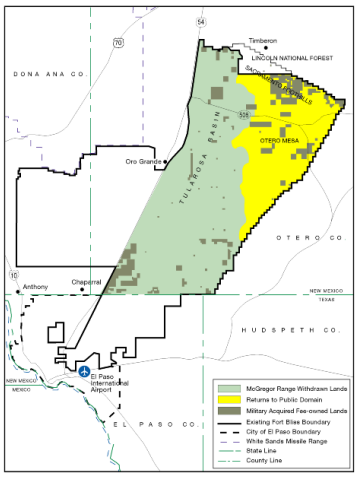
The Tularosa Basin and Otero Mesa portions of McGregor Range would be withdrawn for continued military use. The Sacramento Mountains foothills portion of McGregor Range, including most of the Culp Canyon Wilderness Study Area (WSA), would return to the public domain.

Under this alternative, Congress would renew the withdrawal of 568,385 acres of public land.

The area returned to the public domain is about 40,000 acres, comprised of currently withdrawn lands in Training Areas (TAs) 13 and 14, and parts of 12, 15, and 16 (grazing units 4 and 5 and portions of 3 and 8), and including Culp Canyon WSA. Army fee-owned in-holdings, within the area returned to the public domain, would be retained for specialized training.

Alternative 3:

The Tularosa Basin portion of McGregor Range would be withdrawn for continued military use. The Otero Mesa and Sacramento Mountains foothills portions of McGregor Range would return to the public domain.

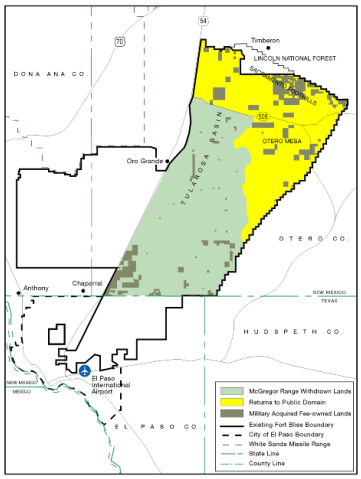


Under this alternative, Congress would renew the withdrawal of 428,385 acres of public land.

The area returned to the public domain is about 180,000 acres, comprised of currently withdrawn lands in TAs 13 through 23 and part of 12 (grazing units 4, 5, 7 through 15, and about half of grazing unit 3). This area would include Culp Canyon WSA and the McGregor Black Grama Grassland Area of Critical Environmental Concern (ACEC). The withdrawn area of McGregor Range would encompass areas within the Tularosa Basin and the escarpment of Otero Mesa. Army fee-owned in-holdings within the lands returned to the public domain area would be retained for specialized training.

Alternative 4:

Under this alternative, Congress would not withdraw any portion of McGregor Range north of New Mexico Highway 506 or on Otero Mesa.



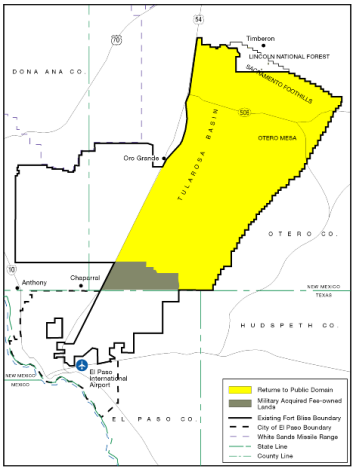
The Tularosa Basin portion of McGregor Range south of New Mexico Highway 506, encompassing 364,385 acres, would be withdrawn for military use.

The area returned to the public domain would be about 244,000 acres comprised of currently withdrawn lands in all the existing grazing units, and would include Culp Canyon WSA and McGregor Black Grama Grassland ACEC. The portion of grazing unit 2 south of New Mexico Highway 506 would be exchanged for the area between New Mexico Highway 506 and grazing unit 3. Army fee-owned in-holdings within the lands returned to the public domain would be retained for specialized training.

Alternative 5 No Action:

Under this alternative, the withdrawal of 608,385 acres of currently withdrawn land on McGregor Range would not be renewed. The currently withdrawn land would return to the public domain.

Army fee-owned in-holdings within the lands returned to the public domain would be exchanged for public lands in TAs 8 and 32, in order to maintain essential infrastructure around McGregor Range Camp, the McGregor Ammunition Supply Point (ASP), and the Meyer Range Complex.

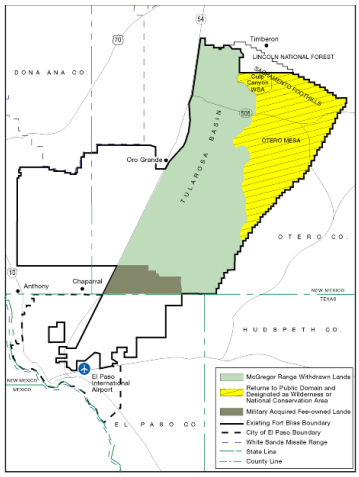


There would be no further military use of the land returned to the public domain. Restricted airspace above the land area would continue to be used for aircraft training by Army aviation and U.S. Air Force (USAF) units within the region. The lands held by the Army in fee would be exchanged for public lands in TAs 8 and 32, which would continue to be available for training purposes. The exchange would be to retain the infrastructure associated with McGregor Range Camp, the McGregor ASP, and Meyer Range. Installation facilities on McGregor Range that would have to be relocated elsewhere include:

- Orogrande Range;
- Short-range Air Defense (SHORAD) Range; and
- McGregor Range Firing Complex.

Alternative 6:

During scoping it was suggested that Congress designate the Culp Canyon WSA as a wilderness area. In addition, it was suggested that Congress designate the Otero Mesa and Sacramento Mountains foothills, including in-holdings held in fee by the Army as a National Conservation Area (NCA). The affected fee-owned in-holdings would be exchanged for public lands within TAs 8 and 32 on McGregor Range.



This alternative would require further congressional action in addition to the renewal of the military land withdrawal, and could potentially alter the management practices associated with the area included in the NCA. The existing grazing area would continue to be available for multiple uses, to the extent that the areas have productive value and would be managed in accordance with public land laws and congressional specifications for the NCA. The NCA, as envisioned, could be designated along with Alternative 3, 4, or 5.

ENVIRONMENTAL CONSEQUENCES

The LEIS alternatives were superimposed on the existing environment to produce the environmental consequences for 14 broad categories of environmental resources: land use, airspace, transportation, utilities, earth resources, air quality, water resources, biological resources, cultural resources, socioeconomics, environmental justice, noise, safety, and hazardous materials and items of special concern. The environmental consequences resulting from the withdrawal of various portions of the existing McGregor Range are briefly summarized below for each environmental resource.

Land Use

Under Alternative 1, the full renewal of the withdrawn land would allow the U.S. Army to continue its current air defense mission, allow continued military training for other U.S. services and allied forces, and would provide flexibility to support future programs and expanded operations based upon McGregor Range capabilities. Ongoing environmental effects from mission activities and nonmilitary activities would continue. The withdrawn land would continue to be managed to avoid or minimize environmental impacts as described in the White Sands RMP, as amended by the McGregor Range RMPA.

62

Under Alternatives 2, 3, 4, 5, and 6, the size of the withdrawn land would vary. The U.S. Army would be able to continue use of the withdrawn, Army fee-owned, and USFS lands to support its current air defense mission and to implement some future programs and expanded missions. Alternative 5 would result in the return of the majority of lands on McGregor Range to the public domain. Alternatives 5 and 6 include transfer of the Army fee-owned land to the BLM in exchange for land encompassing the McGregor Range Camp, the McGregor ASP, and Meyer Range. The reduced land area would restrict the variety of training scenarios of high- and medium-altitude air defense (HIMAD) missile firing profiles that could be accomplished on McGregor Range under Alternatives 2, 3, 4, and 6. Ground troop maneuvering would no longer occur on land returned to the public domain.

Nonmilitary activities on withdrawn land and land returned to the public domain under each alternative would continue to be managed under the White Sands RMP as amended. Use of some lands returned to the public domain could be restricted until after ordnance and explosive hazards clean-up activities are completed.

Airspace

Alternatives 1 and 2 would not affect airspace use or management in the Region of Influence (ROI).

Alternatives 3, 4, and 6 would not affect airspace use or management in the ROI. However, the return of Otero Mesa and other areas of the existing McGregor Range to the public domain would preclude development of the USAF tactical complex on Otero Mesa, potentially reducing the level of activity within the Restricted Area 5103.

63

If the Restricted Area is maintained in its current configuration, Alternative 5 would not affect airspace use in the ROI. Civil aircraft would continue to be prohibited from traversing R-5103 above McGregor Range when the Restricted Area is activated. However, it is possible that with discontinuation of all air-to-ground and ground-to-air activities, the Restricted Area airspace, in consultation between the U.S. Department of Defense (DoD) and the Federal Aviation Administration (FAA), could be reconfigured to change the vertical boundaries, lateral boundaries, and/or operating procedures. It is also possible that the Restricted Area could be changed to a Military Operations Area (MOA) with fewer restrictions on civil aircraft use.

Transportation

Civilian traffic on U.S. Highway 54 would occasionally be impeded by military traffic as a result of activities associated with any of the land withdrawal alternatives including Alternative 5, No Action. Under Alternatives 2, 3, 4, and 5, periodic closures of New Mexico Highway 506 would be reduced or eliminated, which would be a beneficial impact.

Utilities

Demand for utility services to support military activities on withdrawn land will remain under Alternatives 1, 2, 3, 4, and 6. Under Alternative 5, utility service to McGregor Range Camp, the McGregor ASP, and Meyer Range would continue.

There would be no impacts to utilities unless water and power demands increase significantly, which would result in increased purchases from El Paso and/or require installation of additional lines. Similarly, no impacts to wastewater utilities are expected. However, a significant increase in the need for wastewater treatment would require expansion of existing systems.

Earth Resources

There would be no impacts to geological resources under any alternative, since the management practices of the current White Sands RMP, as amended by the McGregor Range RMPA, are assumed to continue on all withdrawn, Army fee-owned, and public domain lands within the current boundaries of McGregor Range. However, lands returned to the public domain under Alternatives 2, 3, 4, and 5 could be opened for locatable minerals development.

Under Alternative 1, regardless of the activity level, major sources of impacts to soil resources on McGregor Range would be the off-road vehicle maneuvering in TA 8 and ground disturbance associated with missile firings. Other sources of impacts to soils could include ground disturbance from facility construction and demolition, ordnance clean-up activities, and erosion from vegetation loss as a result of range fires ignited by military activities.

Military activities on withdrawn and Army fee-owned land under Alternatives 2, 3, 4, and 6 would be the same as those described in Alternative 1, except that military FTXs currently conducted or planned for the entire withdrawn area would be restricted to withdrawn and fee-owned land. However, with military activities constrained, activities in the remaining withdrawn area would remain similar to current uses of that portion of McGregor Range.

Nonmilitary activities would be similar under all alternatives except that public use of lands returned to the public domain could increase because the Army would no longer control access. Additional public use (e.g., off-road vehicle driving) could potentially impact soils in localized areas.

Under Alternative 5, there would be no further use of McGregor Range for military activities other than in TAs 8 and 32. Consequently, except for ordnance and explosive hazards clean-up activities, there would be no continuing impacts to the soil resource from military activities. The entire McGregor Range could be made available for nonmilitary uses. The reintroduction of grazing to the Tularosa Basin could impact the soil resource.

Air Quality

Under Alternatives 1, 2, 3, 4, and 6, most of the air quality emissions on McGregor Range would be from mobile sources associated with the field exercises, including off-road operation of wheeled and tracked vehicles (TA 8 only); combustion of fuels in vehicles, equipment, and aircraft; missile firings; and ordnance detonation. Emissions produced during training exercises are dispersed widely and have no significant long-term adverse impacts on air quality. Fugitive dust emissions created on McGregor Range primarily result in localized, short-term effects. Impacts at locations beyond the perimeter of McGregor Range are expected to be insignificant.

Under Alternative 5, No Action, military use of McGregor Range would be limited to the areas of McGregor Range Camp, McGregor ASP, and Meyer Range. Potential air quality impacts would continue to have localized, short-term effects.

Water Resources

Water resources in the ROI would continue to be used to support on-going and future military activities on withdrawn and Army fee-owned land under all alternatives. McGregor Range Camp would continue to be supplied with purchased water. No new wells or additional withdrawals from existing wells are planned, except at Davis Dome near McGregor Range Camp, where an on-going investigation of geothermal resources is underway. There, geothermal water has the potential to produce electric power for a desalination plant to provide drinking water from the saline aquifer. This source could be used to augment or replace water currently pumped by Fort Bliss from the Hueco Bolson aquifer near the Main Cantonment Area. That action would result in a favorable impact to the groundwater resource in both areas by enabling saline groundwater to be used on McGregor Range and by reducing pumpage from the heavily over-pumped east El Paso well fields. Impacts to the aquifer from use of treated water would be evaluated in future NEPA documentation of the effect of developing a desalination facility.

Water resources from the Sacramento River and Carrisa Springs would continue to be used for nonmilitary activities under the Army's current water rights under Alternatives 1, 2, 3, and 4. The water right supporting the wildlife and livestock uses on McGregor Range would be transferred to the BLM under Alternatives 5 and 6.

Regional water resources, while not significantly affected by military activities, have cumulative impacts to resources that supply the water purchased for McGregor Range Camp. Under a current-trends scenario with no increased surface-water supply, a water-supply shortage to the area (El Paso, Juarez, Fort Bliss) could occur between 2013 and 2025. However, municipal water will continue to be available to customers, including McGregor Range, but its short supply may increase costs.

Biological Resources

On-going and future military activities on withdrawn lands have the potential for impacts to biological resources. Impacts from activities that result in ground disturbance or fires could continue to occur indirectly and cumulatively to vegetation, wildlife, and sensitive species from on-going and future military activities on withdrawn lands and nonmilitary activities in the areas returned to the public domain.

Impacts could occur indirectly and cumulatively to wetlands and arroyo-riparian drainages (probable Waters of the U.S.), wildlife, and sensitive species from future and on-going military activities on withdrawn lands, as well as from nonmilitary activities in the areas returned to the public domain under all alternatives.

Since current and future military and nonmilitary activities may continue to affect biological resources, impacts to vegetation, wetlands and arroyo-riparian drainages, wildlife, or sensitive species would result.

Cultural Resources

While current and future military and nonmilitary activities may continue to affect cultural resources, no significant adverse impacts to archaeological, architectural, landscape, or traditional cultural property resources would result.

The primary sources of impacts to cultural resources under all alternatives are ground disturbance, noise, vibration, and visual impacts from on-going and future military activities on withdrawn lands, as well as nonmilitary activities in the areas returned to the public domain. Continuing public access could be the source of impacts to cultural resources including archaeological, architectural, traditional cultural property, and historic landscape resources. The potential for additional public access under Alternatives 2, 3, 4, and 6 could provide increased opportunity and access to these cultural resources on lands returned to the public domain, possibly resulting in inadvertent damage or vandalism to some cultural resources.

The cessation of military activities on most of McGregor Range under Alternative 5 would result in elimination of possible impacts from military ground disturbance in those areas returned to the public domain. The decrease in ground disturbance related to military activities in areas previously closed to the public, could be offset by a return to grazing on currently ungrazed lands and other nonmilitary activities. Impacts to cultural resources could increase depending upon the location and levels of grazing the BLM would adopt for the returned lands. Impacts to setting by noise or visual intrusion are likely to decrease with the cessation of training activities and future construction. However, lands returned under Alternative 5 would continue to be managed under the White Sands RMP, as amended.

Socioeconomics

The majority of impacts on socioeconomic resources associated with implementation of the alternatives, are directly related to changes in the number of personnel assigned, and procurement levels at Fort Bliss. With variations in these two attributes, changes in consumption expenditures of personnel (based on the payroll of personnel) and purchases of goods and services in the local economy can be expected. Additional impacts can be expected from changes in the manner in which the natural resources of McGregor Range are utilized; specifically, mineral, energy, and grazing resources.

Under all alternatives except Alternative 5, changes in personnel levels and procurement activity at Fort Bliss are not expected, thus, only the current beneficial impacts to socioeconomic resources would be anticipated. Under Alternative 5, the loss of facilities on McGregor Range would result in the loss of several activities and units at Fort Bliss; however, these losses are expected to be less than 300 military, Army civilian, and related contractor personnel. In addition, the management practices on withdrawn, Army fee-owned, and land returned to the public domain are expected to remain as specified in the White Sands RMP, as amended by the McGregor Range RMPA. Thus, economic impacts would be negligible.

Environmental Justice

Under Alternatives 1, 2, 3, 4, and 6, continued withdrawal of lands would not result in environmental justice impacts. Because the acreage of withdrawn lands for all other alternatives is less than Alternative 1, Alternative 1 may be perceived to have the greatest potential effect. However, none of the alternatives, including Alternative 5 where all withdrawn land is returned to the public domain, would cause environmental health or safety risks that would disproportionately affect minority or low-income populations, or children.

Noise

Under Alternatives 1 and 2, noise impacts resulting from current mission activities and proposed activities such as the USAF tactical target complex and the potential Army helicopter training range, would primarily occur on training ranges and is within land use compatibility guidelines for nearby areas. Therefore, the elevated noise is not considered to be significant. Levels of nonmilitary use would be expected to remain relatively at current levels.

Under Alternatives 3, 4, and 6, the lateral boundaries of the restricted airspace are not proposed to change; however, the USAF tactical target complex on Otero Mesa could not be used, and less area would be available to provide Surface Danger Zones (SDZs) for missile firings. Therefore, in general, noise related to missile firings and fixed- and rotary-wing aircraft operations would remain similar, but less than discussed for Alternatives 1 and 2.

Under Alternative 5, aircraft noise would not be expected to exceed current levels, and would probably be less, since some current aviation noise results from aircraft supporting other McGregor Range activities. All air-to-ground and ground-to-air activities on McGregor Range would cease, thus eliminating noise from these sources.

Safety

Under Alternatives 1, 2, 3, 4, and 6, safety considerations associated with military activities result from increased human presence, use of ordnance, live firing of missiles, and aircraft overflight. In general, changes in the levels of use of specific ranges, or in the number of live firing events do not necessarily increase safety risks. Scheduling prevents incompatible range-use conflicts.

Current safety impacts would not change on withdrawn land. Ground and explosive safety risks will remain low. However, a degree of risk remains in areas with ordnance and explosive hazards. The Army has an on-going evaluation of the ordnance and explosive hazards on McGregor Range.

Under Alternative 5, potential hazards to public safety associated with the granting of public access in portions of McGregor Range such as the Tularosa Basin may preclude return of this area to the public domain, necessitating transfer of that land to the Secretary of the Army for future clean up. Current safety impacts would not change on TA 8 and portions of TA 32. Therefore, ground and explosive safety risks in TAs 8 and 32 will remain low.

145

Hazardous Materials and Items of Special Concern

Under Alternatives 1, 2, 3, 4, and 6, increases in the use of hazardous materials and items of special concern could result from on-going military, future military, and nonmilitary activities that occur on withdrawn lands. Items of special concern include medical and biohazardous waste, asbestos, lead-based paint, pesticides, radon, low-level radioactive waste, and petroleum storage tanks. Both hazardous materials and items of special concern would continue to be managed on withdrawn lands in accordance with applicable laws, regulations, and Army procedures. As demolition of facilities on McGregor Range continues, asbestos abatement and lead waste generation would continue. No adverse impacts would result.

The return of all withdrawn lands to the public domain under Alternative 5, could result in decreased use of hazardous chemicals by the Army outside of TA 8 and portions of TA 32. If this occurs, and is not offset by nonmilitary use of hazardous chemicals on these lands, minor long-term beneficial environmental impacts could result from the reduced risk of exposure and/or spills.

MILITARY MISSION CONSEQUENCES

The principal military mission on McGregor Range is training. Air Defense training conducted at McGregor Range is essential to develop the ability of air defense soldiers to:

- Intercept and destroy missiles in flight;
- Intercept and destroy aircraft in flight;
- Protect U.S. military forces at home and abroad; and
- Safeguard civilian populations.

An additional mission is weapons system and equipment test operations. Test operations help ensure the soldier has the best available weapons and equipment.

The variations in Patriot training and test scenarios available at Fort Bliss, under each of the McGregor Range withdrawal alternatives, is illustrated in Figure ES-1.

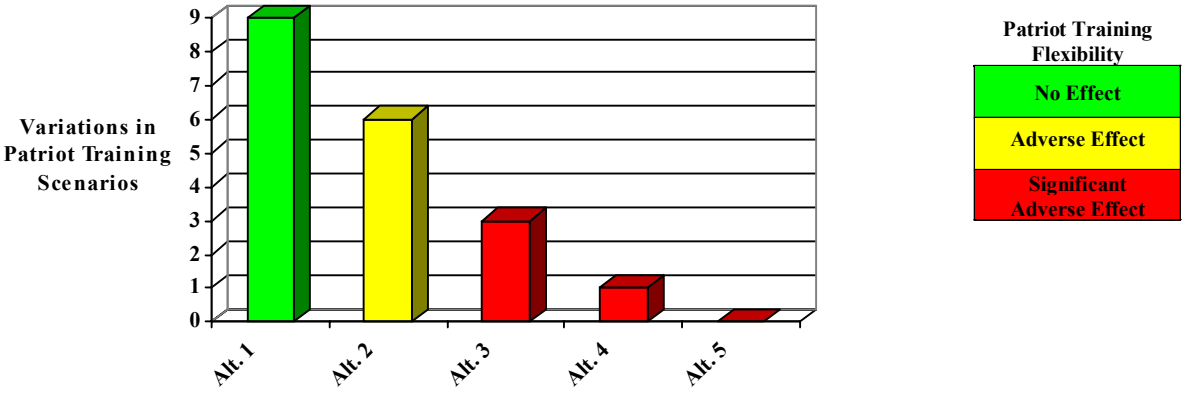


Figure ES-1. Variations in Patriot Training Scenarios.

Effective training requires the use of land and airspace for training exercises, safe weapons firing, test operations, surface impact capabilities, off-road vehicle maneuver, on-road vehicle maneuver, controlled access FTXs, dismounted training, and aircraft operations. The consequences of each alternative on the military mission are shown in Table ES-1. Additionally, the capability to support emerging concepts and doctrine related to warfighting (such as Army Force XXI and Army-After-Next) would be significantly impacted because of the spatial requirements that these operations will require.

MITIGATION

Both military and nonmilitary activities conducted on withdrawn or public domain land could have potentially adverse impacts to specific environmental resources, principally on soils and vegetation. Specific future projects on both withdrawn and public domain lands will be the subject of appropriate NEPA documentation. Either the Army or the BLM, as appropriate, will prepare project-specific NEPA documentation. Specific project related mitigation actions would be determined at the time of the project definition.

Table ES-1. Military Mission Consequences

Mission Capability [1]	*Alternative 1*	*Alternative 2*	*Alternative 3*	*Alternative 4*	*Alternative 5*	*Alternative 6*
Weapons Firing						
Patriot/HIMAD	**No effect**	**-33%**	**-89%**	**-89%**	**-100%**	**-89 to 100%**
Small Missiles						
McGregor Launch Complex	**No effect**	**No effect**	**No effect**	**No effect**	**-100%**	**-89 to 100%**
SHORAD Range Operations	**No effect**	**Training Modification Required**	**Training Modification Required**	**Training Modification Required**	**-100%**	**Training Modification Required**
Orogrande Range Operations	**No effect**	**Training Modification Required**	**Training Modification Required**	**Training Modification Required**	**-100%**	**Training Modification Required**
Small Arms						
Meyer Range	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**
Test Operations						
Laser Operations						
Orogrande Range	**No effect**	**Test Modification Required**	**Test Modification Required**	**Test Modification Required**	**-100%**	**Test Modification Required**
Missile System Components						
Orogrande Range: Air Defense Artillery Test Directorate (ADATD) Operations	**No effect**	**Test Modification Required**	**Test Modification Required**	**Test Modification Required**	**-100%**	**-100%**
SHORAD Range Operations	**No effect**	**No effect**	**No effect**	**No effect**	**-100%**	**No effect**
McGregor Launch Complex	**No effect**	**No effect**	**No effect**	**No effect**	**-100%**	**No effect**
Surface Impact						
Multiple Launch Rocket System (MLRS)	**No effect**	**No effect**	**No effect**	**Training Modification Required**	**-100%**	**No effect**
Air-to-ground						
Otero Mesa Site	**No effect**	**No effect**	**-100%**	**-100%**	**-100%**	**-100%**
Class C Bombing Range	**No effect**	**No effect**	**No effect**	**-100%**	**-100%**	**No effect**
Off-road Vehicle Maneuver						
TA 8	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**
On-road Vehicle Maneuver	**No effect**	**-6%**	**-26%**	**-35%**	**-100%**	**-26%**
Controlled Access FTX	**No effect**	**No effect**	**-48%**	**-57%**	**-100%**	**-48 to –100%**
Dismounted Training	**No effect**	**-6%**	**-26%**	**-35%**	**100%**	**-26%**
Aircraft Operations						
Fixed-wing Air-to-air	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**
Rotary-wing Nap-of-the-Earth (NOE)	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**

[1] Impacts to mission capability are presented as the percentage change in training scenarios, land acreage available, or qualitatively as to requirements to modify training or test programs.

No Effect	Adverse Effect	Significant Adverse Effect

Five means of mitigating an environmental impact are recognized in the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR Parts 1500 to 1508): avoidance, limitation of action, restoration of the environment, preservation and maintenance operations, and replacement. The withdrawal alternatives include actions and agreements designed to mitigate adverse effects from military use. The McGregor Range RMPA that was developed by the BLM through the NEPA process following the MLWA of 1986, addresses practices designed to mitigate conflicts in land use for both military and nonmilitary purposes.

The 1990 MOU between the Army and the BLM regarding environmental resource management on McGregor Range implements these means to avoid impacts, limit actions that can result in impacts, accomplish restoration activities, and support preservation and maintenance operations to the degree funding for the appropriate agency allows. It is assumed that the RMPA would continue in effect after the withdrawal renewal for any lands withdrawn by Congress, and that the 1990 MOU would also be renewed to provide continued management guidance for McGregor Range. No additional mitigation measures would be required. With these mechanisms in place, the Army and BLM have a process for ensuring that any mitigation measures needed to reduce or eliminate adverse impacts from either military or nonmilitary activities are identified and implemented. Changes in neither military activity or missions, nor nonmilitary activities on the land are proposed in the decision before Congress, therefore, no mitigation measures are required.

Purpose and Need

1.0

1.0 PURPOSE AND NEED FOR RENEWAL OF THE McGREGOR RANGE LAND WITHDRAWAL

1.1 INTRODUCTION

This *Legislative Environmental Impact Statement (LEIS)* has been prepared in support of an application by the United States (U.S.) Army (referred to as Army) to renew the withdrawal of McGregor Range which is critical to maintaining our nation's military readiness. The following section provides a general introduction to this proposal (Section 1.1). Subsequent sections discuss the purpose and need (Section 1.2), the land withdrawal renewal process (Section 1.3), decisions to be made (Section 1.4), scope of the LEIS (Section 1.5), and other regulatory requirements (Section 1.6).

McGregor Range, located in Otero County, New Mexico, has supported the military mission of the U.S. Army at Fort Bliss from the 1940s to the present. In 1986, the public lands comprising McGregor Range were withdrawn from the public domain for a period of 15 years through the *Military Lands Withdrawal Act (MLWA)* (Public Law [PL] 99–606). This withdrawal expires November 6, 2001. To continue the military use of these public lands, the Army must apply for continuation of the withdrawal in accordance with the *Engle Act of 1958*, which requires an Act of Congress for military withdrawals encompassing more than 5,000 acres.

McGregor Range is comprised primarily of public lands, which are lands owned by the Federal Government and administered by the Department of the Interior (DOI), Bureau of Land Management (BLM), pursuant to the *Federal Land Policy and Management Act (FLPMA)* (PL 94-579), and other public land laws. At McGregor Range, the public lands have been withdrawn from the provisions of various public land laws for military use. Public lands comprising the range were subsequently withdrawn through Public Land Order (PLO) 1470 in 1957 for a period of 20 years. At that time, private ranch holdings were interspersed with public lands. These private lands and interests were purchased by the Army and are now owned in fee by the Army. Portions of those lands were first leased by ranchers to the Army during the 1940s. The PLO withdrawing McGregor Range expired in 1977, but the legislation required by the *Engle Act* to continue the withdrawal was not passed until 1986 when Congress enacted PL 99-606. Throughout the intervening period, the Army continued its mission on McGregor Range under an agreement with the DOI.

Fort Bliss administers, trains, and deploys active duty U.S. Army, Army National Guard, Army Reserves, and other service personnel and units. Periodic exercises involve units from other installations, and from other services and allied nations. Units are organized, trained, and equipped for national emergency or crisis and overseas deployment. McGregor Range supports the training requirements of a variety of U.S. and allied units, as well as other federal agencies.

1.2 PURPOSE AND NEED FOR THE LAND WITHDRAWAL RENEWAL

The mission of the nation's military is to defend the U.S. and to secure and enhance U.S. interests and policies around the world, which includes ensuring strong relations with our allies, deterring aggression, and protecting our rights of trade and travel. Military power is also required to deter competing military activities, compel nations and organizations with hostile intentions to re-evaluate their plans and, if necessary, fight and win any conflict with a potential enemy. In addition, the U.S. military is currently expected to participate in a broad range of conflict prevention, peacekeeping, and civil support activities.

Military power is composed of a wide range of elements, the most central of which include the quality of: (1) personnel, (2) training, (3) equipment, (4) infrastructure, (5) maintenance, and (6) logistic capability. McGregor Range provides a challenging, realistic training environment necessary for retaining quality soldiers by providing world-class training at both the individual and unit level. McGregor Range also provides unique capabilities for the operational test and evaluation of weapon systems. As doctrine and weapon system capabilities continue to evolve, ranges such as McGregor Range will assume greater importance in providing capabilities in validating these concepts and systems in conditions similar to those expected during wartime.

Realistic training that fully engages military capabilities is the primary means to ensure readiness and prepare our military to fight and win in combat. This training is central to the way the U.S. Armed Services fight. Effective training consists of a careful progression of exercises directed at individuals, crews, and units. All training exercises are fully evaluated to provide feedback and lessons learned for the development of future tactics and doctrine. Whether training is conducted at the individual level or as a full-scale field exercise, realistic training is critical to maintaining military proficiency, and the ability to evaluate the effectiveness of training is central to ensuring the readiness of military forces to respond to threats wherever they arise. Joint and combined training exercises have improved U.S. operability and understanding of the strengths of each military service, as well as those of our allies. Training of our nation's military is performed at military installations and ranges such as McGregor Range.

To be effective, a training range must provide sufficient land and airspace to conduct training at realistic distances. Access to a variety of conditions (e.g., simulated threats, operational space, topographic relief, and safety constraints) and scheduling availability are also important characteristics for a training range. Existing ranges are utilized to the greatest extent possible, while maintaining stewardship of the lands and its resources. Our forces require training areas of the size and configuration of McGregor Range to realistically prepare soldiers and units for known and emerging threats to our nation and its interests, and to test and refine innovative concepts and new strategies to deter, compel, and if required, to fight and win.

The primary mission of Fort Bliss is to train U.S. air defense soldiers, to develop weaponry, and to ensure that the U.S. and its allies possess an air and missile defense capability against all threats. The Patriot missile is the cornerstone of the Army's integrated air defense system. Patriot soldiers are among the Army's most frequently deployed air defense forces and are equipped with the world's most technologically advanced missile defense system. During the Persian Gulf War, the Patriot missile system intercepted Iraqi Scud missiles before they hit their targets. Patriot troops from Fort Bliss are deployed to Korea, Europe, and the Middle East, where they provide critical air defense for U.S. forces and local populations.

U.S. military strategy requires armed forces that are trained, equipped, and ready to defend our nation's interests. McGregor Range is necessary to:

- Provide sufficient space to conduct realistic and challenging military training for our nation's military forces;
- Train soldiers to use the Patriot, Avenger, Stinger, Bradley Linebacker, Hawk, and other advanced weapons systems;
- Maintain high operational readiness standards;
- Develop and test future concepts for war fighting; and
- Integrate Army, Navy, Air Force, and Marine Corps elements through joint field training exercises (FTXs) such as Roving Sands.

The air defense training conducted at McGregor Range ensures the U.S. the ability to:

- Intercept and destroy both aircraft and missiles in flight.
- Intercept and destroy other aerial platforms (i.e., unmanned aerial vehicles).
- Protect U.S. military forces and civilian populations from air attack at home and abroad.

The people of the U.S. have invested heavily in the technological components of the military and the infrastructure of the existing training ranges. Replacement or relocation of McGregor Range would require a substantial new investment. Additionally, the capability to support emerging concepts and doctrine related to war fighting (such as Army Force XXI and Army-After-Next) would be significantly impacted because of the spatial requirement that these operations will require.

The Army has a long history of developing innovative approaches to future warfighting challenges. The operational plan for the early 21st century, Army Force XXI, and its follow-on, Army-After-Next, is being designed with organizations and capabilities that will allow it to be rapidly tailored, strategically deployable, and effectively employable in joint and multinational operations. Army Force XXI provides rapid and effective response to changing situations and local conditions. Mission planning and rehearsal will be conducted simultaneously with the build-up of decisive forces, as automated systems and simulations, capable of operating from ships and aircraft, provide the capability to plan, coordinate, and war game possible courses of action while forces are en route.

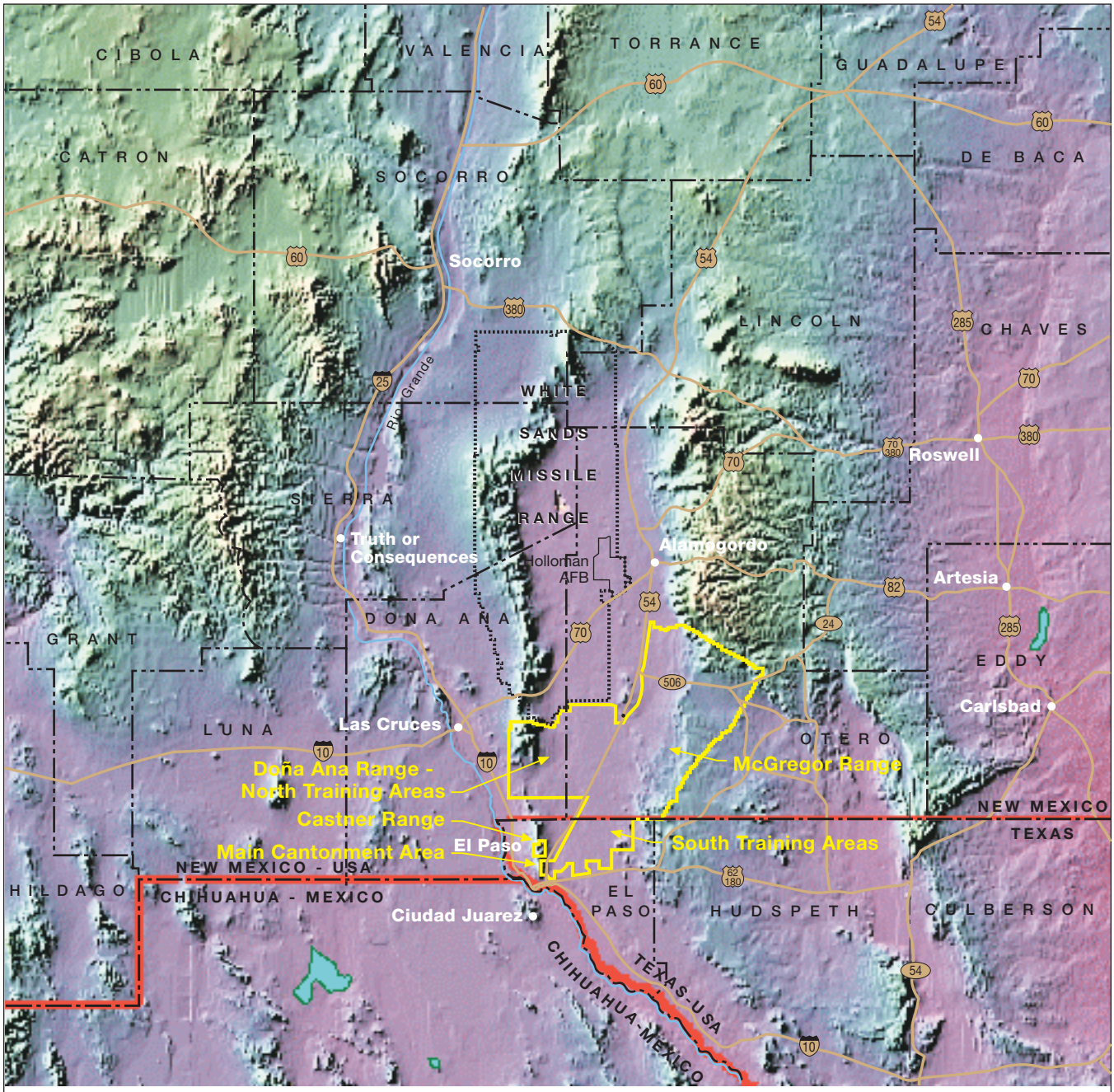
14

Vastly improved capabilities of long-range missiles with smart submunitions, precision weapons delivered throughout the battlespace, and attack helicopters capable of operations deep within enemy forces, integrated with an air campaign, are critical to ensuring that national objectives are met. Army Force XXI operations, must be fully integrated as the land force commander draws from a suite of complementary capabilities of each service, our allies, and other government and nongovernment organizations. The training and test activities conducted on McGregor Range are critical to achieving the expectations set for Army Force XXI and its follow-on in national preparedness planning, the Army-After-Next.

1.2.1 Overview and History of McGregor Range

Fort Bliss, a U.S. Army Training and Doctrine Command (TRADOC) installation, is comprised of approximately 1.12 million acres of land in Texas and New Mexico. The Main Cantonment Area of Fort Bliss is located adjacent to El Paso, Texas. The installation also includes McGregor Range (which is the subject of this LEIS) and Doña Ana Range–North Training Areas in New Mexico, and the South Training Areas in Texas (Figure 1.2-1).

The area encompassed by the current boundary of McGregor Range (Figure 1.2-2) includes approximately 608,385 acres of withdrawn public lands and 71,083 acres of Army fee-owned lands within Otero County, New Mexico (Table 1.2-1). McGregor Range also includes 18,004 acres of U.S. Forest Service (USFS) lands, which are used by the Army in accordance with a Memorandum of Understanding (MOU) between the USFS and the Department of the Army (DA) Fort Bliss. There are also Army fee-owned in-holdings within the Lincoln National Forest. The USFS lands are not part of the withdrawal application. The range is surrounded by lands administered primarily by the BLM and USFS to the north and west, with pockets of privately owned lands to the east which are used for ranching. To the south and west, are withdrawn and Army fee-owned lands in El Paso County, Texas, and Otero and Doña Ana counties in New Mexico.



Source: Photographic image copyright 1995 by Johns Hopkins University, Applied Physics Laboratory, used with permission. http://fermi.jhuapl.edu/states/mapsl/nm.gif

McGEIS 111a.dg.2.3.99

Figure 1.2-1. Fort Bliss, Texas and New Mexico.

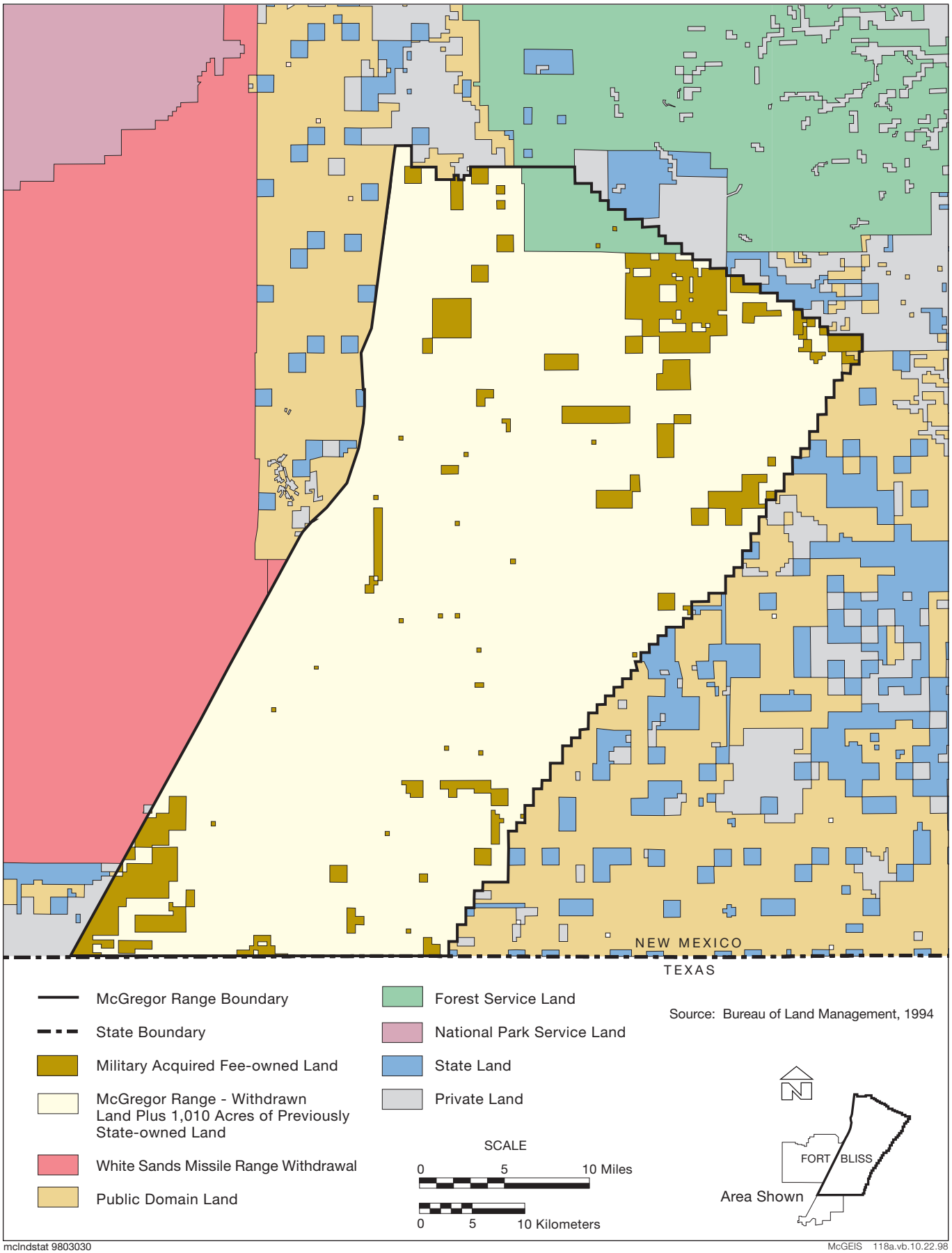


Figure 1.2-2. Ownership of Land Encompassed by McGregor Range and Surrounding Area.

Table 1.2-1. McGregor Land Status Summary

Land Status	*Acres*
Public Land (withdrawn, PL 99-606) *	608,385
Army fee-owned land throughout withdrawn area	71,083
Lincoln National Forest (cooperative use area)	18,004
Total	*697,472*

* Included in this withdrawal application.

The withdrawn lands within McGregor Range are managed by the Army and the BLM in accordance with an MOU signed in 1990 (Appendix A). The MOU expires in the year 2001, unless canceled or renewed before then. The Fort Bliss environmental management programs are directly applicable to all lands and military activities on McGregor Range. The environmental management program on McGregor Range interfaces with BLM's White Sands *Resource Management Plan (RMP)* (BLM, 1986a) through the McGregor Range *Resource Management Plan Amendment (RMPA)* (BLM, 1990a). The responsibilities of Fort Bliss and the BLM are specified in the MOU concerning policies, procedures, responsibilities related to land use planning and resource management of McGregor Range (BLM, 1990b).

The BLM recognizes that Fort Bliss missions have priority use on McGregor Range and will secure Fort Bliss concurrence before authorizing any nonmilitary uses. The BLM has managerial responsibilities for public use of the withdrawn land, as enumerated in PL 99-606. However, the daily uses are subordinate to the military missions and uses of McGregor Range.

1.2.2 The U.S. Army Mission at Fort Bliss and McGregor Range

Fort Bliss is one of 16 installations under the management of TRADOC. It is the home of the U.S. Army Air Defense Artillery Center and Fort Bliss (USAADACENFB), the U.S. Army Air Defense Artillery (ADA) School, and over 30 partner units and organizations. It is the second largest Army post, and is the only troop training installation in the U.S. capable of supporting long-range overland missile firings. Activities supported by Fort Bliss include troop and equipment training, as well as air defense and air-to-ground training, and ground maneuver training. Fort Bliss is comprised of a complex of facilities, training areas, and ranges to support training and test activities of the Army and other organizations, including the Main Cantonment Area, and the Fort Bliss Training Complex: McGregor Range, Doña Ana Range–North Training Areas, and South Training Areas (Figure 1.2-1). The training areas located on McGregor Range are illustrated on Figure 1.2-3. The Main Cantonment Area, Doña Ana Range–North Training Areas, and the South Training Areas will be discussed in this LEIS only as they pertain to cumulative impacts on McGregor Range.

1.1.1.1 Unit Stationing

Currently, four air-defense brigades assigned to the U.S. Army Forces Command (FORSCOM) are stationed at Fort Bliss. These units utilize McGregor Range to support firing of Patriot missiles, unit FTXs, and individual training at the Meyer Range Complex. The U.S. Army Combined Arms Support Battalion (USACASB) provides the management, control, maintenance, and operation of the Fort Bliss field training areas, including McGregor Range. The organization's responsibilities also include scheduling and controlling the overlying airspace (Restricted Area R-5103), range camps, and associated facilities and equipment.

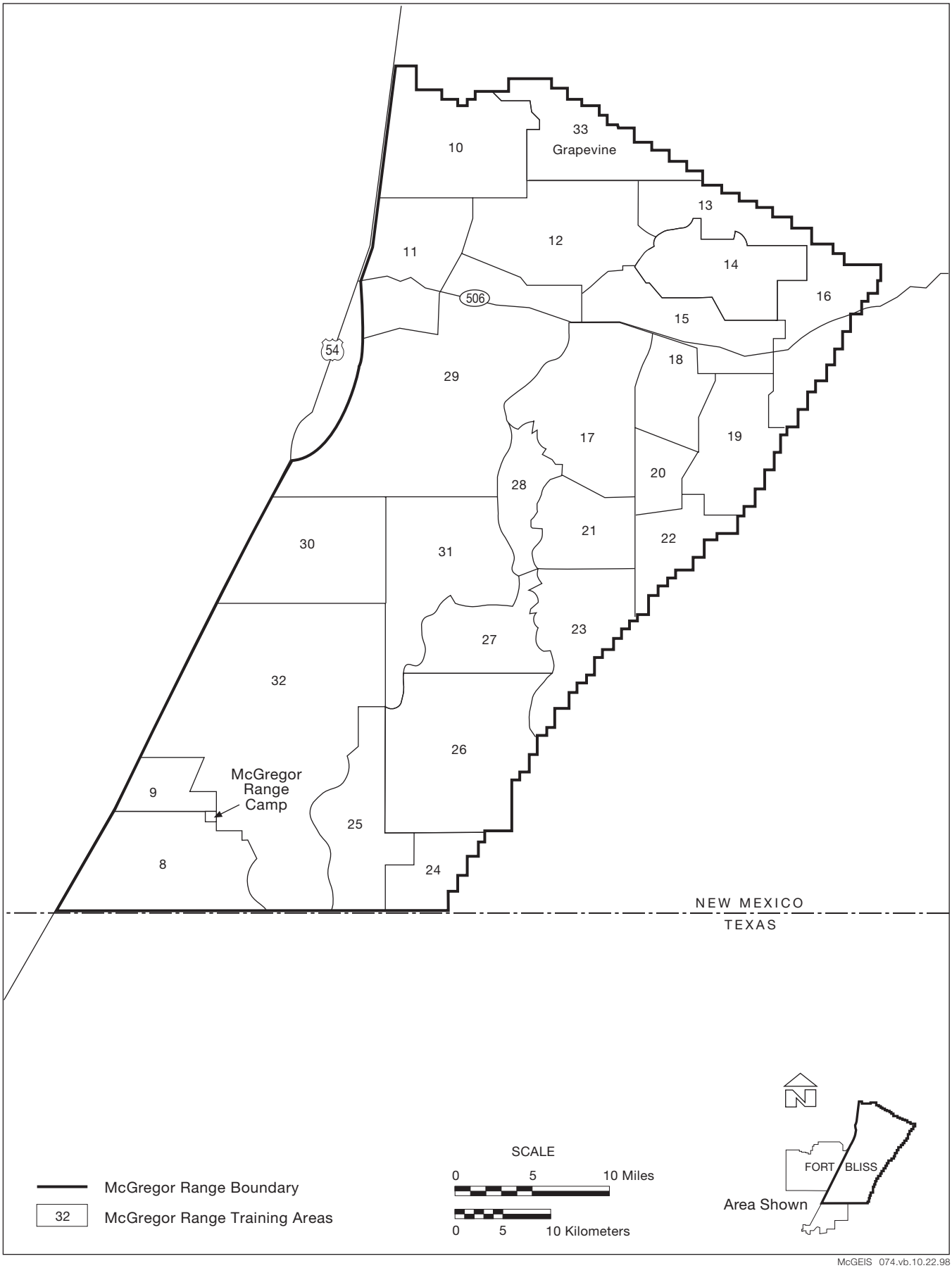


Figure 1.2-3. McGregor Range Training Areas.

The ADA School educates and trains U.S. military students (active duty and reserve components), civilians, and students of selected allied forces, in air defense artillery and other subjects that support the air defense mission. The 6th ADA Brigade supports the ADA School through advanced individual training, and supports training of U.S. Army, Army National Guard, Army Reserves, Marine Corps, allies, and other students. The 6th ADA Brigade operates in a semi-classroom environment on McGregor Range with limited field exercises. The 6th ADA Brigade uses McGregor Range for training with Bradley Linebacker, Avenger, and man-portable Stinger missiles.

1.1.1.2 Installation Strength

The most recent Fort Bliss authorized strength data available, used in this LEIS, is from the *Army Stationing and Installations Plan (ASIP)* for fiscal year (FY) 96 through FY 02, dated September 17, 1996 (U.S. Army, 1996a). Table 1.2-2 presents the peacetime authorized strength in 1990, FY 96, FY 97, and that anticipated for Fort Bliss from FY 98 through FY 02, which are the only years available for analysis.

Table 1.2-2. Peacetime Authorized Strength, FY 90 and FY 96 through FY 02

	FY 90	*FY 96*	*FY 97*	*FY 98*	*FY 99*	*FY 00*	*FY 01*	*FY 02*
Officers	1,960	1,470	1,520	1,520	1,540	1,510	1,470	1,520
Warrant Officers	340	190	250	250	250	240	240	250
Enlisted	16,000	8,980	9,670	9,520	9,790	9,440	9,190	9,820
Civilian Employees	7,790	7,520	7,420	7,350	7,400	7,400	7,400	7,400
Total Population	*26,090*	*18,160*	*18,860*	*18,640*	*18,980*	*18,590*	*18,300*	*18,990*

Source: U.S. Army, 1996a.

These numbers are rounded to the nearest ten authorized positions. Currently, all authorized positions at Fort Bliss directly or indirectly support activities conducted on the Fort Bliss Training Complex, including McGregor Range.

McGregor Range also supports training during periods of mobilization. Mobilization is the process of assembling and organizing national resources to support national objectives in time of war or other emergencies. Mobilization involves the deployment of active duty, reserve, and National Guard units and individuals; and conversion of installations to long-term mobilization mission training, and medical and support centers. During periods when various phases of mobilization occur, the number of personnel assigned to Fort Bliss for various periods will increase. Table 1.2-3 presents the mobilization strength anticipated for Army Reserve and National Guard units assigned to Fort Bliss during the phases of deployment and mobilization, leading to a sustaining base for full mobilization. The additional Army Reserve and National Guard personnel associated with deployment and mobilization are categorized into three groups: Force Support, Regional Conflict, and Sustaining Base.

Table 1.2-3. Mobilization Authorized Strength

	Force Support	*Regional Conflict*	*Sustaining Base*	*Total*
Army Reserve	340	1,820	5,620	*7,780*
National Guard	1,950	4,330	2,160	*8,440*
Total	*2,290*	*6,150*	*7,780*	*16,220*

Only the last group, Sustaining Base personnel, would remain at Fort Bliss for the duration of any conflict. Personnel of the other two groups would remain at the installation for relatively short periods of time prior to their deployment. In the absence of specific information regarding the duration of stay and the levels of expenditures by personnel during such times, a number of programmatic assumptions are made to enable quantitative analysis. To estimate effective mobilization strength, it is assumed that the duration of the hypothetical regional conflict would be 1 year. It is assumed that the number of Sustaining Base personnel at the installation could increase by 7,780. Personnel associated with both the Force Support Package (2,290) and Regional Conflict (6,150) categories (8,440 total personnel) are assumed to remain at the installation for an average of 1 month. Thus, the 8,440 such personnel equate to 703 full-time equivalent (FTE) personnel. It is assumed that all these additional personnel would reside in facilities located on the main cantonment or at installation range camps including McGregor Range Camp.

Effective personnel levels during peacetime and mobilization conditions through FY 02 and beyond are not expected to go beyond the ASIP peacetime authorization plus the (7,780 + 703 FTE) mobilization personnel. The potential strength of the installation could vary up to 27,500 personnel, or slightly more than the strength of the installation during 1990. However, since mobilization requires separate congressional action, the peacetime authorized strength and potential future uses of the training complex including McGregor Range are assumed for the LEIS.

Based upon installation capabilities, there could be additional construction and training capabilities developed. The most noticeable change would be the addition of a training exercise involving two brigades. Such an exercise could involve a total of up to 10,000 personnel and have a duration of 2 weeks (or an equivalent of 383 FTE personnel). Changes based upon temporary personnel would raise the FTE strength in FY 02 to approximately 19,370.

1.1.1.3 Mission Activities on McGregor Range

Mission activities conducted on McGregor Range include training to maintain the operational readiness of active duty, reserve, and National Guard units through various training, operations and field exercises, and testing as discussed below.

Unit FTXs. While some training land is located within the Main Cantonment Area to support unit and classroom training near the administrative and maintenance facilities, the majority of the FTXs associated with readiness training is conducted on the Fort Bliss Training Complex. Field exercises include various combinations of training, field operations, communications, command and control, simulated enemy contact, camouflage, smoke generation, and weapons firings. With five air defense brigades assigned to Fort Bliss, use of McGregor Range training areas is paramount to maintaining combat readiness. This includes use for tactical deployment, air defense operations, and air defense firing sites for missile firings. Other typical use of the Fort Bliss Training Complex includes the Mobilization Army Training Center (MATC) for 5 to 10 weeks per year to support training of reserve and National Guard units. U.S. Marine Corps (USMC) Hawk training also is conducted on the range complex. Table 1.2-4 shows typical McGregor Range usage during 1996. Throughout the year, FTXs are conducted on McGregor Range by units that are located at Fort Bliss and at other Army and service installations.

Joint Training Exercises (JTXs). Each year JTXs are held at Fort Bliss. The most notable of these is the Roving Sands exercise. Roving Sands is a JTX coordinated by the Chairman, U.S. Joint Chiefs of Staff (USJCS), scheduled by the U.S. Atlantic Command, and sponsored by FORSCOM. This JTX is the only exercise that actually plans and executes multi-service integrated air defense operations that involve all four military armed services. Participation in Roving Sands has increased from approximately 10,000

Table 1.2-4. Typical Units Supported by McGregor Range

Unit	*Component*	*Home Location*	*Range Area Used*	*Billets*	*Personnel*	*Length of Stay (Days)*
208th Signal	Active	Fort Bliss, TX	Meyer Ranges	None	40	2
2/6 ADA	Active	Fort Bliss, TX	McGregor – Short-range Air Defense (SHORAD)	None	100	1
70th Ordnance	Active	Fort Bliss, TX	McGregor - TA 8	McGregor	300	15
7/6 Cavalry	Reserve	Conroe, TX	McGregor - Cane Cholla, Doña Ana - Ranges 40/48/49	McGregor	260	14
3/4 ADA	Active	Fort Bragg, NC	McGregor - Drop Zone, SHORAD Range	McGregor	198 150	14 19
3/1 Special Forces Group (SFG)	Active	Fort Lewis, WA	McGregor, Meyer Ranges, Doña Ana Range–North Training Areas	Doña Ana	100	52
1/5 SFG	Active	Ft. Campbell, KY	McGregor - Training Areas, Meyer Ranges, Doña Ana Range–North Training Areas	McGregor Doña Ana	200	36
Japanese Annual Service Practice	Allied	Japan	McGregor - Tactical Air Control (TAC)	McGregor	100	90
1/82 Aviation	Active	Fort Bragg, NC	McGregor - Hellfire firing	McGregor	N/A	4
Combined Federal Officer Training	Law Enforcement Agencies	El Paso, TX	Meyer Range, Doña Ana Range–North Training Areas	McGregor	35	7
1/3 SFG	Active	Fort Bragg, NC	McGregor - Training Areas, Meyer Ranges, Drop Zones	McGregor	95	36

personnel in 1994 to 18,000 in 1996 and 20,000 in 1997, and includes troops from the U.S., Canada, Netherlands, United Kingdom, and Germany. Field training was conducted for approximately 2 weeks following a 1-week deployment period, and concluded with a 1-week redeployment of forces. In 1998, the Roving Sands exercise was reduced in scale from previous years because of the build-up of U.S. forces in the Persian Gulf. In April, approximately 5,000 to 6,000 troops gathered in the El Paso area for the exercise. A process to select exercise sites on McGregor Range has been incorporated in the planning of all Roving Sands exercises. The site-selection process emphasizes avoidance or minimization of adverse impacts to breeding birds and mammals, threatened or endangered species, soil, water supplies, historic resources, and other significant resources. Ground activities are limited to established training ranges, and sites that have been cleared for historic resources and endangered species on McGregor Range.

Each year following Roving Sands, a live Firing Exercise (FIREX) occurs. This FIREX is the largest density of missile firing at McGregor Range and usually lasts for 1 week, with over 6 units participating.

In addition to the Army ADA brigades, USMC, German, and Dutch units typically fire 4 types of missiles in the following approximate quantities: 8 to10 Hawk missiles; 14 to 15 Patriot missiles; 56 to 60 Stinger missiles; and 8 to10 Roland missiles.

Allied Units. Danish, Belgian, German, Japanese, and other allied air defense units have conducted annual service practices on the Fort Bliss Training Complex for over 30 years. The Japanese Self-defense Force (JSDF) uses McGregor Range for training with the Hawk and Patriot missiles. During 1996, the JSDF participated in their 32nd consecutive Annual Service Practice (ASP), which was held from August

through December. In 1996, the JSDF deployed 17 Hawk units and fired 17 missiles with 634 Japanese soldiers participating in the Hawk firings. The JSDF deployed 24 Patriot units to McGregor Range and fired 30 Patriot missiles. A total of 833 Japanese soldiers participated in the Patriot firings. The JSDF training with Hawk and Patriot missiles is expected to remain an annual constant for the foreseeable future. Allied units may fire other weapon systems consistent with range capabilities.

The White Sands Missile Range (WSMR) uses the Fort Bliss Training Complex for limited tests. Operations directed by Test and Experimentation Command (TEXCOM), Air Defense Artillery Test Directorate (ADATD), U.S. Army Missile Command (MICOM), and WSMR Office of Test Directorate (OTD), use Training Areas (TAs) 3A through 7D with restricted airspace R-5107A and the SHORAD and Orogrande ranges within restricted airspace R-5103. WSMR may also use McGregor Range as a secondary safety zone for some tests. The following discussion describes representative test activity conducted on McGregor Range during 1996.

Four tests of various equipment systems that were conducted on McGregor Range during 1996 are described below.

1. The Force Development Test and Experimentation (FDTE) for Patriot Advanced Capabilities (PAC-3) configuration was held February through March 1996, on McGregor Range, Orogrande Range, and the Doña Ana Range–North Training Areas.

2. A Follow-on Operational Test and Experimentation (FOTE) of the Patriot PAC-3 system was conducted during May and June 1996 on McGregor and Orogrande ranges, and Doña Ana Range–North Training Areas.

3. An Initial Operational and Test Evaluation (IOTE) of the Bradley Stinger Fighting Vehicle-Enhanced (BSFV-E) also was conducted during May 1996 on McGregor and Orogrande ranges, and Doña Ana Range–North Training Areas. The system under test included four BSFV-E firing units. They were deployed within a forward area air-defense concept, with the mission of providing low-altitude air defense to a simulated heavy maneuver force.

4. During October and November 1996, an IOTE of the Joint Tactical Information Distribution System (JTIDS) was conducted on Orogrande Range. The test was conducted to verify the operational effectiveness and suitability of the JTIDS Class 2M terminal that supports Army air and missile defense units mission needs, and its inter-operability with Air Force and Navy elements using Class 2H terminals.

1.3 LAND WITHDRAWAL RENEWAL PROCESS

The process for renewing the withdrawal of public lands comprising McGregor Range is governed by a number of interrelated laws and regulations, including the following:

- The *Engle Act of 1958*, which requires an Act of Congress for all military withdrawals of 5,000 acres or more. The *Engle Act* provides the umbrella legislative authority for the MLWA and the proposed legislation to renew the McGregor withdrawal.

- The MLWA of 1986 established the current withdrawal of McGregor Range through November 6, 2001. The MLWA includes provisions for renewing the withdrawal and requires the Secretary of the Army to prepare a draft LEIS no later than November 6, 1998, if the Army wishes to continue military use of McGregor Range. It also requires the Secretary of the Army to file an application with

the DOI for the continued withdrawal of McGregor Range, in accordance with DOI's land withdrawal regulations and procedures.

- The FLPMA (PL 94-579, October 21, 1976) was enacted by Congress "to establish public land policy; to establish guidelines for its administration; to provide for the management, protection, development, and enhancement of the public lands; and for other purposes." It is the primary legislation guiding the BLM in its responsibility to manage the public lands and resources in a combination of ways that best serve the present and future needs of the American people.

- The *Land Withdrawal Regulations* (43 Code of Federal Regulations [CFR] Part 2300) describe the rules and procedures implementing the Secretary of the Interior's authority to process land withdrawal applications. The application for the renewal of McGregor Range will be processed in accordance with 43 CFR Part 2300.

The relationship among these laws and regulations is illustrated in Figure 1.3-1. As outlined in 43 CFR Part 2300, the land withdrawal process consists of the following steps: pre-application consultations; application and publication of the application in the *Federal Register*; preparation of supporting studies and reports including this LEIS, for a case file; preparation of BLM recommendations; transmittal of the case file to the Director of BLM and Secretary of the Interior; draft legislation and the case file submitted to Congress; and legislative action by Congress. Table 1.3-1 lists the studies and documentation performed and provided in compliance with the Land Withdrawal regulations.

1.4 DECISIONS TO BE MADE

This LEIS provides the analysis and documentation of environmental effects to enable Congress to make an informed choice regarding the McGregor Range land withdrawal. The specific alternatives analyzed include:

Alternative 1. The current boundaries of McGregor Range land withdrawal would remain the same.

Alternative 2. The Tularosa Basin and Otero Mesa portions of McGregor Range would be withdrawn for continued military use. The Sacramento Mountains foothills portion of McGregor Range, including the Culp Canyon Wilderness Study Area (WSA), would return to the public domain.

Alternative 3. The Tularosa Basin portion of McGregor Range would be withdrawn for continued military use. The Otero Mesa and Sacramento Mountains foothills portions of McGregor Range would return to the public domain.

Alternative 4. The Tularosa Basin portion of McGregor Range south of New Mexico Highway 506 would be withdrawn for continued military use. Otero Mesa, the Sacramento Mountains foothills, and the portion of Tularosa Basin north of New Mexico Highway 506 would return to the public domain.

Alternative 5 (No Action Alternative). The withdrawal of McGregor Range would not be renewed and the land would return to the public domain.

Alternative 6. Congress could designate the Otero Mesa and Sacramento Mountains foothills as a National Conservation Area (NCA) and Culp Canyon as a wilderness area on lands returned to the public domain under Alternatives 3, 4, and 5.

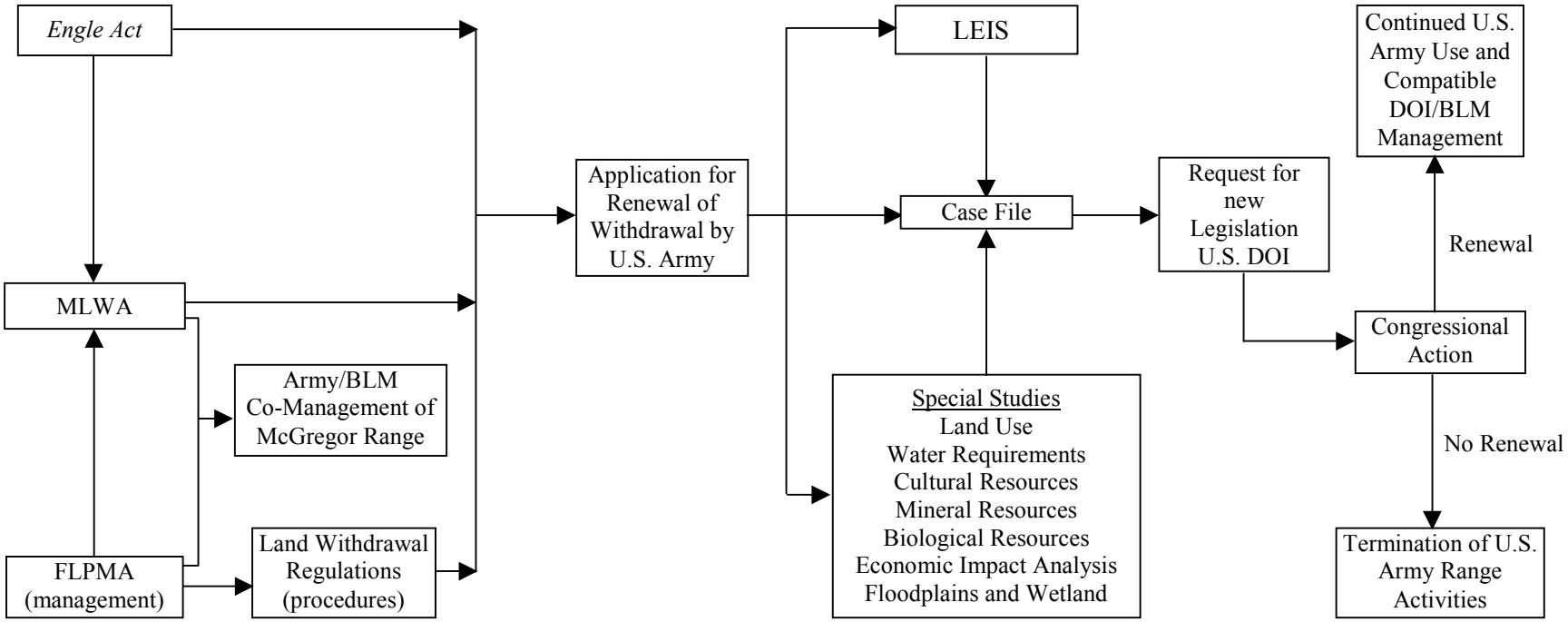


Figure 1.3-1. Withdrawal Authorities and Process for McGregor Range.

Figure 1.3-1. Withdrawal Authorities and Process for McGregor RangeTable 1.3-1. Withdrawal Application Documentation

Requirement	*Documentation Prepared for Renewal of the McGregor Range Land Withdrawal*
Preparation of an *Environmental Impact Statement (EIS)* or *Environmental Assessment (EA)* on the proposed withdrawal	McGregor Range Renewal LEIS
A statement as to the extent and manner in which the public participated in the environmental review process	McGregor Range Renewal LEIS
Analysis of the known and estimated mineral potential and market demands for lands within the proposed withdrawal	Mineral and Energy Resource Assessment of McGregor Range
Determination if the proposed withdrawal includes floodplains or wetlands	Wetlands and Floodplains Report
A statement concerning the requirements for water use and the presence of water rights within the withdrawal	Water Resources Assessment
A biological assessment of threatened or endangered species and their habitat within the withdrawal or in its vicinity	Biological Assessment
Identification of cultural resources within the withdrawal	Cultural Resources Report
Identification of roadless areas or roadless islands within the withdrawal	Land Use Report
A report on present land uses and the effects of withdrawal on those uses	Land Use Report
Analysis of the economic impact of the proposed uses of the withdrawal	Economic Impact Report
Evidence of consultation with federal, state, and local agencies and nongovernmental groups and individuals	Persons and Agencies Contacted, McGregor Range Renewal LEIS

1.5 SCOPE OF THE LEGISLATIVE ENVIRONMENTAL IMPACT STATEMENT

This document provides Congress with information to make environmentally informed decisions regarding the McGregor Range land withdrawal. To the degree possible given existing data, it qualitatively and quantitatively evaluates the potential environmental impacts of implementing the alternatives.

The MLWA provides that the Army may seek renewal of the McGregor Range withdrawal. In connection with the application for renewal, the MLWA specifies that the Secretary of the Army will publish a Draft EIS consistent with the requirements of the *National Environmental Policy Act (NEPA)*, if there is a continuing requirement for military use of this range. Since this action is a proposal for legislation, the Army and the BLM have mutually agreed to use the LEIS process pursuant to 40 CFR 1506.8 to comply with the requirements of PL 99-606. This LEIS is being prepared in cooperation with BLM and local government. Therefore, pursuant to the LEIS process, the Army has decided to prepare a final LEIS and a Notice of Availablility of the LEIS will be published in the *Federal Register*. However, there will not be a Record of Decision (ROD), because the decision to renew the withdrawal is made by the U.S. Congress and signed into law by the president.

1.5.1 Requirements of the NEPA

This LEIS is prepared in compliance with the NEPA of 1969 (PL 91-190, 42 United States Code [USC] 4321-4347, as amended), the Council on Environmental Quality (CEQ) *Regulations for Implementing the Procedural Provisions of NEPA [40 CFR 1500-1508]*, and Army Regulation (AR) 200-2, *Environmental Effects of Army Actions* (U.S. Army, 1988).

1.5.2 Agency and Public Participation in the LEIS

Public involvement with this environmental impact analysis process was accomplished through scoping, public review of the DLEIS**,** and public hearings on the DLEIS.

1.1.1.4 The Scoping Process

Public meetings were scheduled in communities near McGregor Range to solicit public input for preparation of an LEIS on the renewal of the McGregor Range land withdrawal and to obtain an understanding of the views of interested federal and state agencies, special interest groups, and private individuals regarding issues, alternatives, and environmental justice concerns to be addressed in the LEIS. The meetings described here were part of the Army's scoping period, which began on October 29, 1997 with publication in the *Federal Register* of a Notice of Intent (NOI) to prepare the LEIS.

Meeting notification letters (in English and Spanish) were mailed October 31, 1997, to approximately 700 identified interested parties and property owners in Otero and Doña Ana counties, New Mexico, and El Paso County, Texas; throughout the states of Texas and New Mexico; and across the U.S. Flyers were sent to the postmasters of several small communities surrounding McGregor Range, asking them to post the meeting notification in a public place. Newspaper advertisements were published on Tuesday, November 4, 1997, in the *El Paso Times,* the *Alamogordo Daily News,* the *Albuquerque Journal,* and the *Las Cruces Sun-News*. In addition, the ad was run on Thursday, November 6, 1997, in the *Las Cruces Bulletin*, and on Friday, November 7, 1997, in the *Hudspeth County Herald.* Fort Bliss representatives provided press releases, briefings, and information sessions to government agencies, elected officials, and others potentially impacted by the proposed action prior to the three formal scoping meetings.

Public scoping meetings were held in Alamogordo, New Mexico, on November 18, 1997; Las Cruces, New Mexico, on November 19, 1997; and El Paso, Texas, on November 20, 1997. During these meetings, the Army received verbal and written input from 21 individuals, special interest groups and government agencies, out of a total of 74 attendees. In addition, one individual submitted 111 written comments from other citizens. The scoping meeting in Alamogordo, had 42 participants; with 12 people providing oral comments. The scoping meeting held in Las Cruces, drew 18 attendees. Four of the 18 participants provided written and oral comments at the meeting. Oral comments were received at the third scoping meeting, held in El Paso and attended by 14 people. In addition to comments received during scoping meetings, the Army received written comments from 24 individuals, organizations, interest groups, and governmental agencies.

1.1.1.5 Issues Identified in Scoping

The following is a summary of issues and/or concerns that were expressed during scoping via meetings and letters. Comments were received from individual citizens, special interest groups, and BLM representatives. The resource analysis of environmental consequences in Chapter 4 considers these public comments as they relate to each alternative. Most of the comments addressed the withdrawal alternatives. Other resource areas addressed include socioeconomics, biological resources, and archeological resources.

The following suggestions were made regarding the withdrawal alternatives:

- The Army should consider an alternative that designates the Otero Mesa and Sacramento Mountains foothills as an NCA on McGregor Range.

- Culp Canyon should be designated as a wilderness area.

- The land withdrawal should continue as it currently exists.
- Alternatives should consider increased public access.
- Return the entire McGregor Range to the public domain.
- Return Otero Mesa and Sacramento Mountains foothills to the public domain, while maintaining the Tularosa Basin portion of the range for military use.
- McGregor Range should be managed by Holloman Air Force Base (HAFB) so New Mexico can receive federal funds and support for the use of the lands.

The following statement regarding socioeconomics was expressed:

- McGregor Range plays a major role in the economic well being of Otero County.

The following comment regarding mineral exploration was received:

92

- All of the 271,000 acres currently designated for nonmilitary co-use, should provide for mineral exploration.

The following comments regarding archeological resources were received:

- The historic and archeological resources on McGregor Range should be protected.
- Historic and archeological resources need to be recognized and listed in the *National Register of Historic Places (NRHP)*.

The following comments regarding biological resources were received:

- The biological resources of McGregor Range should be protected by supporting the NCA.
- Biologically sound, long-term management programs for use of the wildlife resources on McGregor Range should be established and incorporated into any future uses of the range.

1.1.1.6 Public Hearings on the Draft LEIS

On November 6, 1998, the Department of the Army issued the *Draft McGregor Range, New Mexico Land Withdrawal Renewal Legislative Environmental Impact Statement*, also referred to as the *McGregor Range Draft LEIS*, for review by the states of New Mexico and Texas, Indian tribes, local governments, other federal agencies, private organizations, and the general public. As with the scoping meetings, hearing notification letters were sent in English and Spanish. The formal comment period lasted 95 days, ending on February 9, 1999.

As part of the comment process, the Army held public hearings in Alamogordo and Las Cruces, New Mexico, and El Paso, Texas, to discuss the *Draft McGregor Range LEIS*. Nearly 70 people attended the hearing in Alamogordo; 14 in Las Cruces; and five in El Paso. The Army received 397 comments from the hearings and through letters and e-mail.

Volume II of this LEIS, the *Public Comment and Response Document*, contains three chapters and one appendix. Chapter 1.0 contains this introduction and summarizes the methodology used to resolve the

comments. Chapter 2.0 provides a summary of the issues and comments received. Chapter 3.0 contains the full text of the public comments on the *Draft McGregor Range LEIS* that raise issues, ask questions, or recommend changes to the text of the *Draft McGregor Range LEIS*, as well as all three public hearing transcripts. This chapter also contains the Army's responses to the public comments and describes how the comments affected the *Draft McGregor Range LEIS*. Appendix A of Volume II contains the full text of the public comments on the *Draft McGregor Range LEIS* that state a preference for a specific alternative. Boxes containing numbers in the margins of Volume I indicate where text has been changed in response to a comment from Volume II.

1.5.3 Other Environmental Analyses and Decisions Relevant to the Action

Previously prepared EAs and EISs that address on-going actions, issues, or baseline data at McGregor Range are used as background information or incorporated by reference into this LEIS as appropriate. Examples of such NEPA documentation are:

- The *Land Use Withdrawal McGregor Range, Fort Bliss, Texas, Environmental Impact Statement*, August 1977 (U.S. Army, 1977), describes the evaluation of environmental effects of the Army's request for renewal of the previous withdrawal, which terminated August 20, 1977, for an initial 15 years, followed by two 10-year periods. Congress did not act on the McGregor Range land withdrawal until passage of the MLWA of 1986, which renewed the withdrawal for 15 years until 2001.

- The *Grazing Management, McGregor EIS Area, New Mexico* (BLM, 1980) prepared by the BLM addressed the impacts from grazing on McGregor Range.

- The *Resource Management Plan Amendment, McGregor Range*, September 1990 (BLM, 1990a), and the *Proposed Resource Management Plan Amendment/Final Environmental Impact Statement for McGregor Range*, May 1989 (BLM, 1989), prepared by the BLM, address the degree of public use of resources and the intensity of BLM resource management on land withdrawn for military use at McGregor Range.

- The *Final Programmatic Environmental Impact Statement for the Joint Training Exercise Roving Sands at Fort Bliss, Texas and New Mexico and White Sands Missile Range, New Mexico*, published in February 1994 (U.S. Army, 1994a), addressed the potential cumulative impacts associated with conducting the JTX for five annual exercises.

Several actions that may affect McGregor Range that have NEPA documentation completed or under development will be incorporated into this LEIS by reference, and will be included in the cumulative effect analysis.

- Draft *Fort Bliss Mission and Master Plan Programmatic Environmental Impact Statement (PEIS), Texas,* 1998 (U.S. Army, 1998a). Fort Bliss has jurisdiction over the land and airspace comprising McGregor Range in New Mexico. The PEIS describes potential impacts from existing mission activities and reasonably foreseeable changes projected as the installation proposes to adopt revisions to the *Real Property Master Plan (RPMP)*, implement the *Integrated Natural Resources Management Plan (INRMP)* (U.S. Army, 1998b), and *Integrated Cultural Resources Management Plan (ICRMP)* (U.S. Army, 1998c), and consider activities envisioned in the *Training Area Development Concept (TADC)* (U.S. Army, 1998d) and other installation initiatives.

- Final *Environmental Impact Statement, Proposed Expansion of German Air Force Operations at HAFB, New Mexico*, April 1998 (U.S. Air Force [USAF], 1998). Fort Bliss has jurisdiction over the

land and airspace comprising McGregor Range in New Mexico. The USAF Air Combat Command (ACC) prepared an EIS on a proposal to expand German Air Force (GAF) operations at HAFB, New Mexico, through the bed-down of an additional 30 PA-200 Tornado aircraft at the base. The proposed action includes construction of various facilities at HAFB and the establishment of a new air-to-ground tactical target complex for use by USAF and GAF units. Three options for the new air-to-ground target complex were evaluated in the EIS, including two locations that are on the McGregor Range portion of the Fort Bliss Training Complex. On May 29, 1998, the USAF selected West Otero Mesa as the location for the tactical target complex. At the time of Final LEIS publication, there is ongoing litigation involving the Holloman EIS and USAF decision.

- *Environmental Assessment, Military Intelligence Battalion (Low Intensity)[MIBN (LI)] Relocation from Naval Training Center, Orlando, Florida, to Fort Bliss, Texas*, October 1995 (U.S. Army, 1995a). This EA evaluated the relocation of the MIBN (LI), a subordinate battalion (BN) of the 513th Military Intelligence Brigade to Fort Bliss, as a result of the closure of the Naval Training Center at Orlando, Florida. McGregor Range has a tactical airstrip (Wilde Benton) and restricted airspace R-5103 that support MIBN (LI) aircraft operations.

- *Environmental Assessment for Theater High Altitude Defense System Activation of Objective Battalions Fort Bliss, Texas, Basing,* February 1995 (U.S. Army, 1995b). The EA presents the evaluation of a proposed action to activate two battalions of Theater High-altitude Air Defense (THAAD) personnel at Fort Bliss.

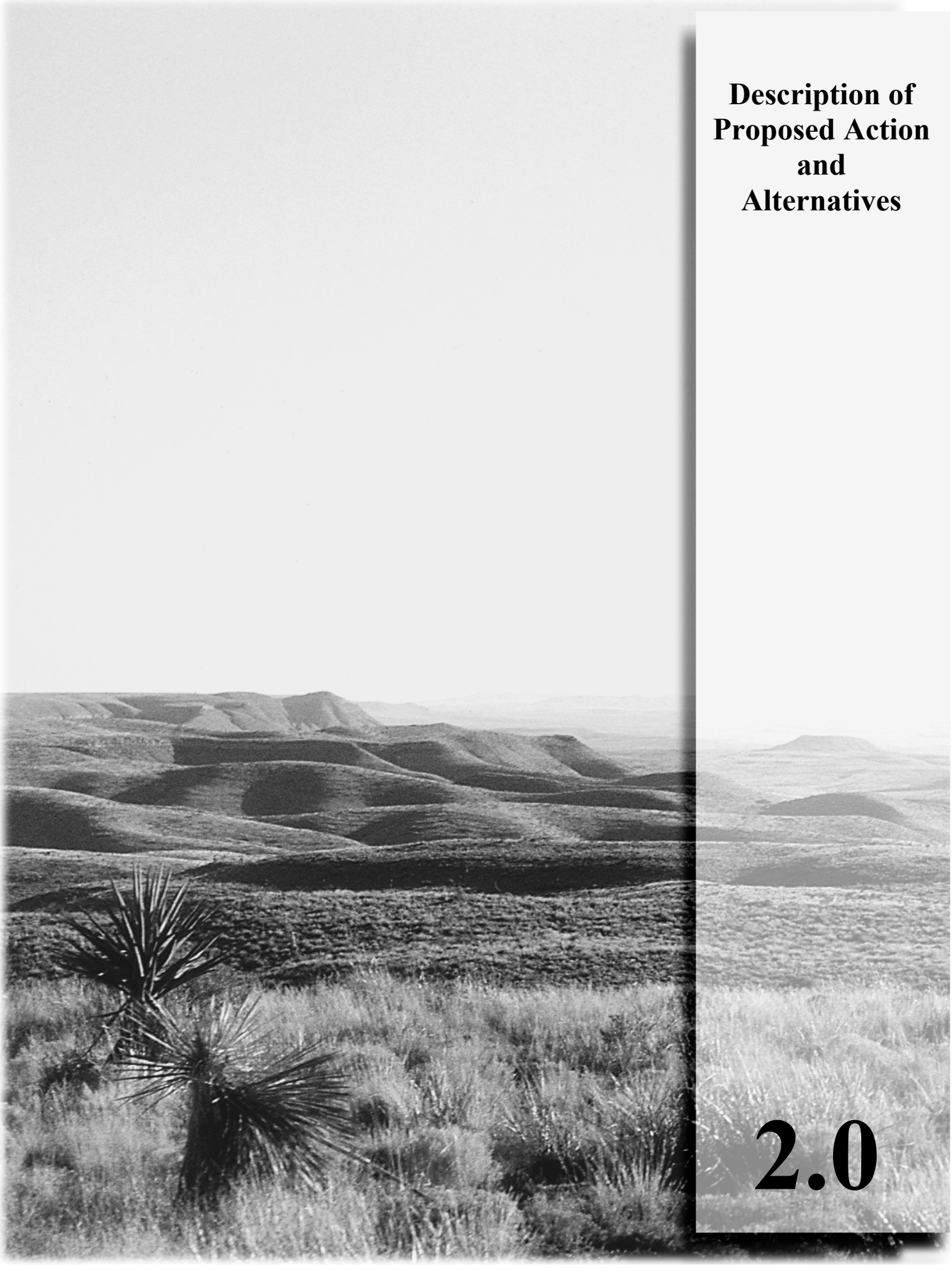
- *Environmental Assessment for Exploration of Geothermal Resources at Davis Dome, Otero County, New Mexico*, December 1996 (BLM, 1996a). This EA evaluated the characterization of a potential geothermal resource located in the area of McGregor Range Camp. The project included excavation of up to five trenches and installation of up to three subsurface boreholes to a depth below the water table. The maximum area of disturbance was expected to be no more than 20 acres.

1.6 OTHER REGULATORY REQUIREMENTS

In addition to NEPA and the land withdrawal requirements, other federal statutes that may apply to the proposed action are listed in Table 1.6-1.

Table 1.6-1. Other Major Federal Environmental Statutes, Regulations, and Executive Orders (EOs) Applicable to Federal Projects

Environmental Resource	*Statutes*
Air	*Clean Air Act (CAA) of 1970*, as amended in 1977 (PL 95-95) and 1990 (PL 91-604) 40 CFR 52-99
Noise	*Noise Control Act of 1972* (PL 92-574) and Amendments of 1978 (PL 95-609) 40 CFR 201-211
Water	*Federal Water Pollution Control Act (FWPCA) of 1972* (PL 92-500) and Amendments: *Clean Water Act of 1977* (PL 95-217), 40 CFR 100-140 and *Water Quality Act of 1987* (PL 100-4), 40 CFR 401-471, and *Safe Drinking Water Act of 1972* (PL 95-523) 40 CFR 141-149 and Amendments of 1986 (PL 99-339) and 1996 (PL104-182)
Land	FLPMA of 1976 (PL 94-579); *Engle Act* of 1958 (43 USC 155); MLWA (16 USC 460ff); Land Withdrawal Regulations (43 CFR Part 2300); *Public Rangelands Improvement Act of 1978*; *Wilderness Act of 1964* (PL 88-577); *National Forest Management Act of 1976* (PL 94-588); *Taylor Grazing Act* (43 USC 315)
Biological Resources	*Migratory Bird Treaty Act of 1918*; *Bald and Golden Eagle Protection Act of 1940*; *Fish and Wildlife Coordination Act of 1958* (PL 85-654); *Fish and Wildlife Act* (PL 85-624); *Sikes Act of 1960* (PL 86-797), 1974 (PL 93-205) and Amendments 1986 (PL 99-561), 1997 (PL 105-85, Title XXIX); *Endangered Species Act of 1973* (PL 93-205) and Amendments 1988 (PL100-478); *Fish and Wildlife Conservation Act of 1980* (PL 96-366); *Lacey Act Amendments of 1981* (PL 97-79)
Wetlands and Floodplains	Section 401 and 404 of FWPCA of 1972 (PL 92-500), 40 CFR 100-149; Executive Order (EO) 11988, *Floodplain Management-1977*; EO 11990, *Protection of Wetlands-1977*; *Emergency Wetlands Resources Act of 1986* (PL 99-645); *North American Wetlands Conservation Act of 1989* (PL 101-233); Section 10 of *River and Harbor Act of 1899* (33 USC 403; 52 Stat. 802)
Cultural Resources	*National Historic Preservation Act (NHPA*) of 1966 (PL 89-665) and Amendments of 1980 (PL 96-515) and 1992 (PL 102-575); EO 11593, *Protection and Enhancement of the Cultural Environment-1971*; EO 13007, *Indian Sacred Sites-1996*; *Archaeological and Historic Preservation Act of 1974*; *American Indian Religious Freedom Act (AIRFA*) of 1978 (PL 95-341); *Antiquities Act of 1906*; *Archaeological Resources Protection Act (ARPA) of 1979* (PL 96-95); *Native American Graves Protection and Repatriation Act (NAGPRA) of 1990* (PL 101-601)
Solid/Hazardous Materials and Waste	*Resource Conservation and Recovery Act (RCRA) of 1976* (PL 94-5800) as Amended by (PL 100-582), 40 CFR 240-280; *Superfund*, 40 CFR 300-399; *Toxic Substances Control Act*, 40 CFR 702-799; *Federal Insecticide, Fungicide, and Rodenticide Act*, 40 CFR 162-180; *Emergency Planning and Community Right-to-Know Act*, 40 CFR 300-399
Environmental Justice	EO 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*; EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*



Description of Proposed Action and Alternatives

2.0

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This section describes alternatives for withdrawal of McGregor Range following the expiration in 2001 of the withdrawal enacted in 1986. The Army proposes to renew the McGregor Range withdrawal in its current configuration for the 50-year period 2001 through 2051 (Alternative 1). The Army employs various planning cycles for different aspects of its mission. For example, the Army uses a 6-year programming cycle for operational activities with facility planning over a 20-year horizon. Doctrinal and equipment life-cycle planning can extend over a period of 40 years or more. The proposed 50-year withdrawal period encompasses each of these periods and enables long-term national security plans to rely on a stable land resource. Other alternatives analyzed in this LEIS include options for renewal of the withdrawal for part of the existing withdrawn land area. The No Action Alternative is also described, under which the Army would cease military use of McGregor Range and make the land available to DOI for return to the public domain. 11

The following sections describe the military uses that would be conducted on the withdrawn land (as well as Army fee-owned land interspersed with the withdrawn land), the nonmilitary uses that would be permitted under multiple use objectives for each alternative, and, for the partial withdrawal alternatives, the uses that may occur on lands that are returned to the public domain.

The military uses are as defined for McGregor Range in the TADC. The TADC is a pre-planning document that describes the current Fort Bliss training range capabilities, and potential future uses and enhancements. These enhancements are long-range and conceptual in nature, and include potential new construction, training facilities, and associated improvements to current range capabilities. The TADC provides a framework for facilities planning and management of Fort Bliss including McGregor Range, to respond to the Army's current and future needs. The TADC is part of a broader framework for the continued evolution of land use and management proposals within the context of the ongoing missions at Fort Bliss and existing land and airspace boundaries.

The TADC describes a variety of mission activities performed at Fort Bliss training areas that are grouped into 10 mission- and training-related land use categories, environmental management, and public access (Table 2.0-1). The figures in this section illustrate the distribution of these categories across the McGregor Range. Additional detail concerning these activities is available in the TADC (U.S. Army, 1998d).

The activities listed in Table 2.0-1 are not confined to discrete geographic areas but are dispersed over various portions of the range as required to support training needs. McGregor Range is organized in 26 training areas, as shown in Figure 1.2-3. Each training area supports a range of activities.

Future training needs could affect the level of use of McGregor Range in ways such as development of additional controlled access FTX sites, development of a helicopter training complex, establishment of a launch facility for a tactical ballistic missile (TBM) target for Patriot training and a small number of Army Tactical Missile Systems (ATACMS) fired into McGregor Range (4 to 6 per year) to support test operations at WSMR. 15

In addition, the USAF is expanding GAF operations at HAFB, New Mexico. Three alternative locations were considered for an air-to-ground tactical target complex, two of which are on McGregor Range. On May 29, 1998, the USAF selected Otero Mesa as the location for the tactical target complex. The tactical target complex includes a 5,120-acre impact area, and 180 square mile safety area for use by the U.S. and GAF units, primarily from HAFB. The description of the Otero Mesa option and the associated environmental impact analysis is presented in the USAF EIS (USAF, 1998). 56

Table 2.0-1. Training Categories

Training Category	*Activities*
1. Mission Support Facility	Test facilities; landing zones/pads; drop zones; radar facilities
2. Weapons Firing	Firing areas for short range and High-to-Medium-Altitude Air Defense (HIMAD), surface-to-surface, surface-to-air, and air-to-surface weapons, launch sites; firing points; laser certified ranges; small arms ranges
3. Surface Impact	Live artillery; live fire surface-to-surface missile impact areas; air-to-surface target areas
4. Surface Danger Zone (SDZ)/Safety Footprint	Target debris areas and safety footprint for weapons use
5. Off-Road Vehicle Maneuver	Use of tracked or wheeled vehicles, not confined to roads
6. On-Road Vehicle Maneuver	Use of wheeled or tracked vehicles on existing roads
7. Controlled Access FTX Areas	Air Defense training sites; FTX assembly; training; communication, command, and control
8. Dismounted Training	Dismounted training; pyrotechnics
9. Aircraft Operations	Fixed-wing and rotary-wing overflights and air-to-air training
10. Built-up Areas	Range Camps
ENV. Environmental Conservation	Environmental management activities; conservation efforts conducted on Fort Bliss, i.e., Integrated Training Area Management (ITAM) Program, INRMP, and ICRMP
PA. Public Access	Areas available for public use for grazing and recreation

The following sections describe military and nonmilitary uses projected to occur on McGregor Range under each of the alternatives. These include current activities, as well as potential future activities that may occur to meet evolving training needs.

2.1 ALTERNATIVE 1 (Army's Preferred Alternative)

Under the proposed action, the withdrawal of McGregor Range would be renewed under the same conditions as provided in PL 99-606.

The area encompassed by the current boundary of McGregor Range includes approximately 608,385 acres of withdrawn public lands and 71,083 acres of Army fee-owned lands. McGregor Range also includes 18,004 acres of USFS lands, which are used by the Army in accordance with a MOU between the USFS and the DA (Appendix A).

Under this alternative, the boundaries of McGregor Range would remain the same. The withdrawal would include the 608,385 acres withdrawn under PL 99-606.

McGregor Range is publicly accessible via U.S. Highway 54 and New Mexico State Highway 506. The public is excluded from areas within Tularosa Basin south of New Mexico State Highway 506 due to safety concerns. Public access is allowed on other areas of McGregor Range when it does not interfere with the military mission.

2.1.1 Military Missions and Capabilities on Withdrawn Lands

Military use of the withdrawn area currently conducted includes:

- Short-range and medium- and high-altitude missile training;
- Short-range and medium- and high-altitude missile testing and experimentation programs, particularly DA/U.S. Department of Defense (DoD)-directed operational testing, per the Five-Year Test Program, of Air and Missile Defense Weapons Systems;
- Roving Sands combined forces exercises;
- FIREX for Hawk, Patriot, Stinger, and Roland Missiles;
- Helicopter gunnery and Hellfire training; low altitude nap-of-the-earth (NOE) tactical training, which is flight as close to the surface as possible;
- Laser operations;
- Fixed-wing aircraft bombing practice at the Class C Bombing Range;
- Airborne personnel, equipment drops, and Special Operations Forces ground troop maneuvers;
- Small arms training at Meyer Range Complex; and
- Limited use of the southern-most portion of McGregor Range for tracked vehicle operations.

Figure 2.1-1 shows the lands proposed to be withdrawn as McGregor Range under this alternative. Lands owned by the Army and USFS lands used in accordance with a MOU within the full boundary of McGregor Range are also shown on Figure 2.1-1. The color coding of training areas in Figure 2.1-1 corresponds to training area land use categories listed in Table 2.1-1. As shown in Table 2.1-1, the activities in Table 2.0-1 have been grouped into 9 mappable training area land use categories designated A through I. In Table 2.0-1, the training categories across the top row of the table correspond to the training categories presented in the first column of Table 2.1-1. This table is also included at the end of this chapter as a fold-out to aid in reading Figure 2.1-1 and the other figures in this chapter.

Each training area land use category, while a discrete map unit, carries with it multiple permitted uses that are compatible from a mission standpoint. As Table 2.1-1 shows, aircraft operations are conducted throughout the range and environmental management and conservation are performed in all areas except surface impact areas that present a hazard to personnel.

Major field exercises such as Roving Sands make use of most, if not all, training areas on McGregor Range depending on the training objectives of the exercise. The Roving Sands JTX is an integrated air defense exercise that focuses upon communications and interoperability of U.S. service and allied units. The exercise includes air-to-air combat scenarios and air-to-ground attacks. The JTX Roving Sands is conducted annually in spring or early summer for approximately 1 month, and uses most of the range for a variety of ground and air activities. During this period, very little nonmilitary use is permitted. Live-fire activities are performed for approximately 1 week and usually result in periodic closure of New Mexico Highway 506 during the exercise. Additional information regarding the Roving Sands JTX is

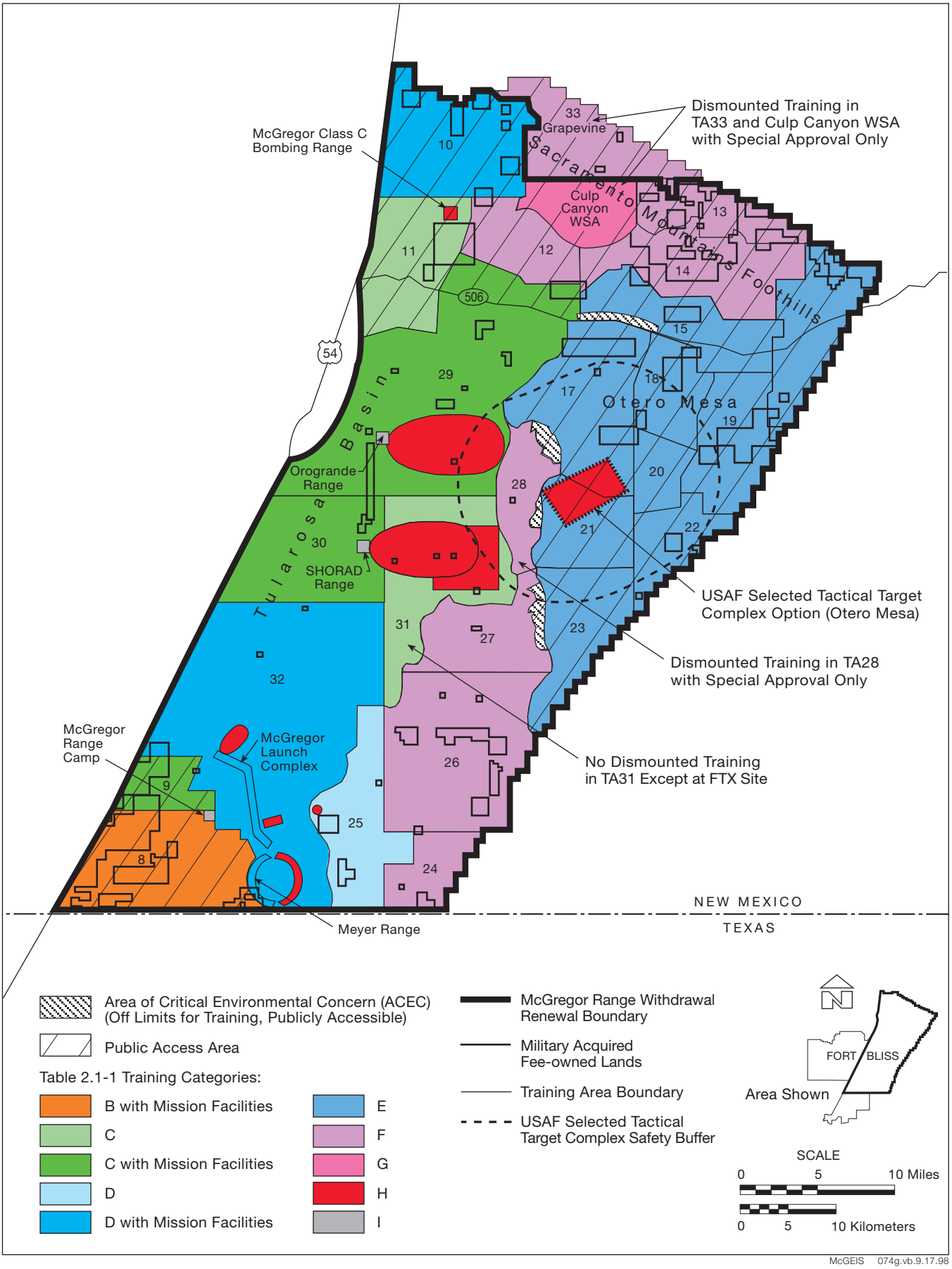


Figure 2.1-1. Land Status Under Alternative 1.

Table 2.1-1. Fort Bliss Training Area Land Use Categories.

Training Area Land Use Category	Fort Bliss Training Categories (Table 2.0-1)											
	1	2	3	4	5	6	7	8	9	10	ENV*	PA**
	Mission Support Facility	Weapons Firing	Surface Impact	SDZ/Safety Footprint	Off-Road Vehicle Maneuver	On-Road Vehicle Maneuver	Controlled Access FTX	Dismounted Training	Aircraft Operations	Built-up Areas	Conservation	Public Access
A		●		●	●	●		●	●		●	●
A with Mission Facilities	●	●		●	●	●		●	●		●	●
B					●	●		●	●		●	●
B with Mission Facilities	●				●	●		●	●		●	●
C		●		●		●	●	●	●		●	●
C with Mission Facilities	●	●		●		●	●	●	●		●	●
D		●		●		●		●	●		●	○
D with Mission Facilities	●	●		●		●		●	●		●	
E				●		●	●	●	●		●	●
F				●		●		●	●		●	○
G				●				●	●		●	●
H			●						●			
I	●			●		●			●	●	●	●

McGEIS 110.dg.11.3.98

● Training Category Occurs in Land Use - Uses May Not Be Concurrent
○ Public Access on Some Areas
* Environmental Management
** Public Access

Note: A foldout of this table is located at the end of Chapter 2.

presented in the *Final Programmatic Environmental Impact Statement for the Joint Training Exercise Roving Sands at Fort Bliss, Texas and New Mexico and White Sands Missile Range, New Mexico*, February 1994 (U.S. Army, 1994a).

TA 8, at the southwestern corner of the range, is the only area other than controlled access FTX sites where off-road wheeled vehicle maneuvers occur. McGregor Range Camp, located in TA 8, 23.5 miles north of the main cantonment, is used for a variety of administrative, troop housing, and training functions. Enlisted barracks capacity for transient and permanent personnel is 1,154. Mobilization capacity is 1,154 for enlisted personnel and 66 for officers. Range Control functions are located at Davis Dome, near the range camp.

A series of firing locations for HIMAD missiles are located in the south part of the range on the McGregor Launch Complex. These are used for a variety of large and small air defense missile systems and may also be used for Multiple Launch Rocket System (MLRS) firings. The direction of firings is usually from south to north. ATACMS firings are conducted about six times annually and impact in WSMR. ATACMS firings require temporary closure of U.S. Highway 54.

Small missiles are fired from the SHORAD and Orogrande ranges and Forward Area Weapons (FAW) Site 10, all located on the west side of McGregor Range in TAs 29, 30, and 32. Typical missiles include Stinger, Advanced Medium-range Air-to-air Missile (AMRAAM), Hellfire, Tube-launched, Optically-tracked, Wire-guided (TOW), and Chaparral. SDZs for these are contained within the Tularosa Basin. Patriot missile live-fire exercises are the current activity that requires the most land area. Figure 2.1-2 is a graphic depiction of three Patriot training scenarios using MQM-107 aerial targets and TBM targets and their associated flight areas and SDZs. The SDZ is designed to contain debris from missile intercepts, missiles destroyed in flight, and the impact of fragments.

TA 32 contains the McGregor Missile Launch complex and Meyer Range and associated surface impact areas. Other impact areas include the Class C Bombing Range in TA 11, the areas east of SHORAD and the Orogrande complex and TA 31 that contains the MLRS target impact area. TA 10 at the northwest corner of the range includes a proposed launch point for a potential TBM target system for the Patriot. At present, Fort Bliss does not have the capability to use a TBM target for live fire exercises. This type of target capability is required in the future as threats posed by these systems (i.e., Scud) increase. Since all Patriot Battalions based in the continental U.S. are located at Fort Bliss, capability to employ a TBM target into the live fire exercises is being investigated. This type of target requires a SDZ extending from TA 10 south to TA 25 approximately opposing the flight corridor of the Patriot, in addition to the SDZ required for Patriot firing. The TBM target would overfly TAs 10, 11, 12, 25, 26, 27, 29, 30, and 31.

The training areas on Otero Mesa and the Sacramento Mountains foothills support on-road vehicle maneuvers and dismounted training (training of soldiers on foot without motor vehicles), SDZ, and aircraft operations. TAs 15 through 23 on Otero Mesa contain controlled access FTX sites, primarily for communications and target engagement training involving the Patriot and Hawk systems. Controlled access FTX sites are field training sites where military access is subject to increased control and restricted to activities with limited ground disturbing effects. Examples include training involving wheeled vehicle movement off-road limited to entering and exiting the site, no site improvements, no clearing of vegetation on the site, and no digging on the site. Public access is not restricted at controlled access FTX sites in public access areas when not in use by the military. The Culp Canyon WSA in TA 12 may only be used for dismounted training with special approval. The BLM will continue to manage the WSA under the *Interim Management Policy and Guidelines Under Wilderness Review* (1987). Fort Bliss will continue to be responsible for compliance with the guidelines and will generally limit surface use of the WSA to ground forces military training. Fort Bliss will notify the BLM, Las Cruces Field Office, 30 days prior to conducting any activities within the WSA (BLM, 1990b).

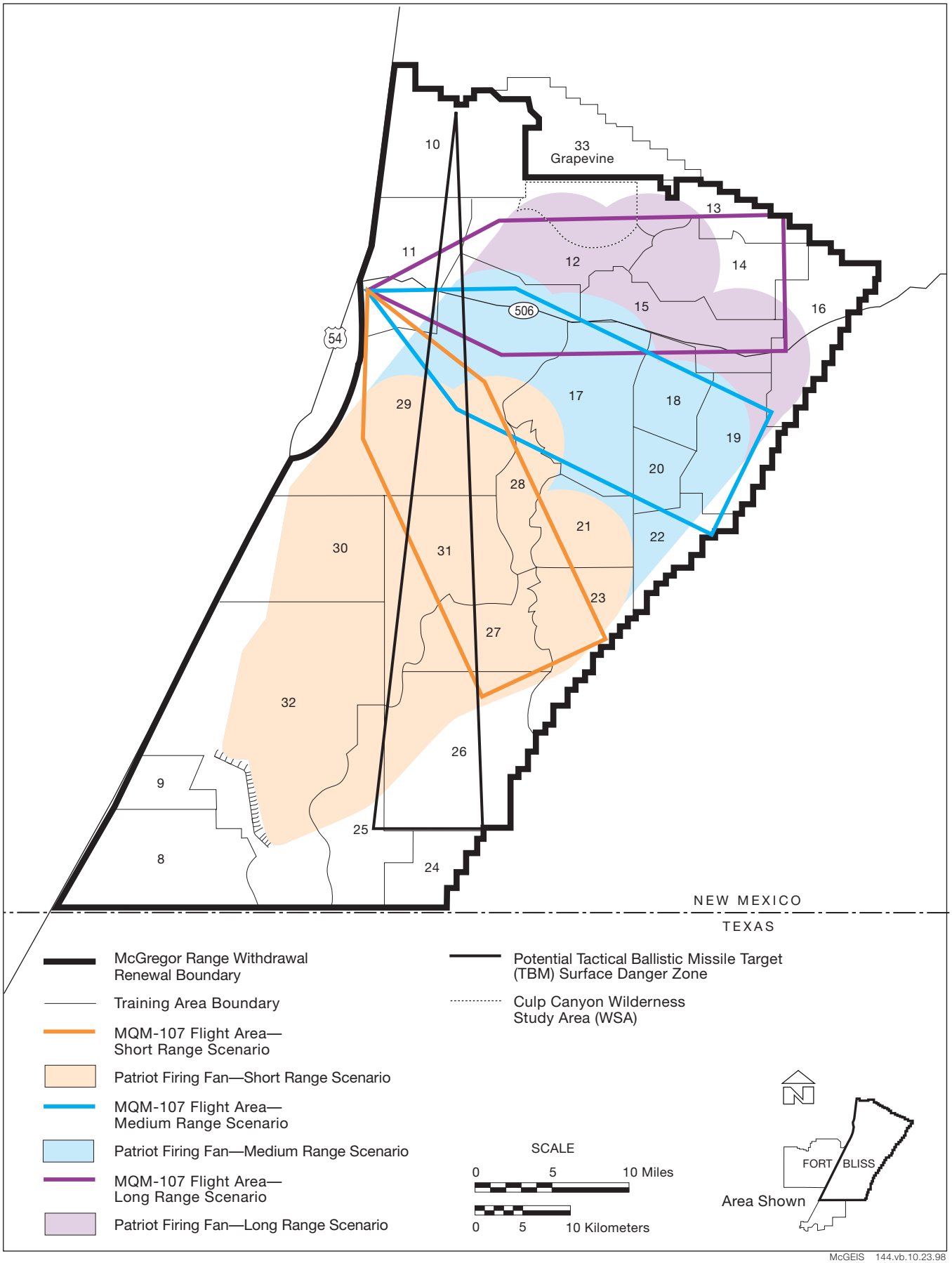


Figure 2.1-2. Target Flight Areas and Surface Danger Zones Associated with Patriot Missile Firings—Alternative 1.

Aerial gunnery missions are conducted by helicopters at Cane Cholla Aerial Gunnery Range in TA 32 and by fixed-wing aircraft at the Class C Bombing Range north of New Mexico Highway 506 in TA 11. Class C targets are located in the Class C Bombing Range only. The area immediately around the Class C targets (about 20 acres) is fenced to exclude livestock. Public access to areas north of New Mexico Highway 506 within the vicinity of the Class C Bombing Range is not permitted when this area is in use. An average of four to five sorties use this target daily. A sortie represents a flight of a single military aircraft from takeoff through landing. Paradrop missions are occasionally conducted on the range's Drop Zone in TA 8 and the Wilde Benton landing strip in TA 29. Low-altitude (less than 300 feet above the ground) tactical navigation by helicopters occurs in four Terrain Flying Areas on McGregor Range. Terrain Flying Areas 2, 3, 4, and a portion of 5 are designated for both day and night use. The boundaries of these areas are shown in Figure 2.1-3. Terrain Flying Area 4 includes two NOE routes for very low-altitude, terrain-following helicopter training located in the northern portion of airspace R-5103B. All routes in this NOE course run in a west to east direction. The McGregor Range portion of Terrain Flying Area 5 is located over TA 8.

During DA/DoD-directed Operational and Development Testing and Experimentation of Air Defense Systems, visual or radar observation is required for radar certification and verification of Air Defense Systems. Aircraft fly scripted profiles at required altitudes to ensure background clutter is captured in the data for analysis.

The ADATD operates mobile "A" stations (remote unmanned ground instrumentation stations) with 37 100-foot towers for data collection and radar verification, at several locations on the Otero Mesa and in the Tularosa Basin. The ADATD has utilized McGregor Range extensively for the following testing and experimentation support activities:

- Low flying attack profile with fixed and rotary aircraft;
- Laser tracking of aircraft and ground vehicles;
- Live short-range missile firings (Stinger, Chaparral, Air Defense Anti Tank System (ADATS), etc.);
- Live anti-aircraft gun firings (Bradley, Vulcan, etc.);
- Live laser designated weapon firings;
- Live Patriot missile firings;
- Live (High-mobility multi purpose wheeled vehicle Advanced Medium-range Air-to-air Missile (HUMRAAM) firing to include over the horizon (mesa); and
- Live "shoot-on-the-move" firings.

Small arms (including rifles, pistols, machine guns, and grenades), demolition, and other similar individual training is conducted at Meyer Range in the south part of the McGregor Range (TA 32). Meyer Range activities can occur simultaneously with most other military operations.

The level of use or intensity of use varies among training areas and for the types of training missions performed in each training area. A general, current level of assessment of the McGregor Range training areas is provided in the following paragraphs, based on number of scheduled days in each training area as a percentage of the total days in the year. For current conditions, 1996 was used as the baseline year. Level of use is based on the criteria in Table 2.1-2.

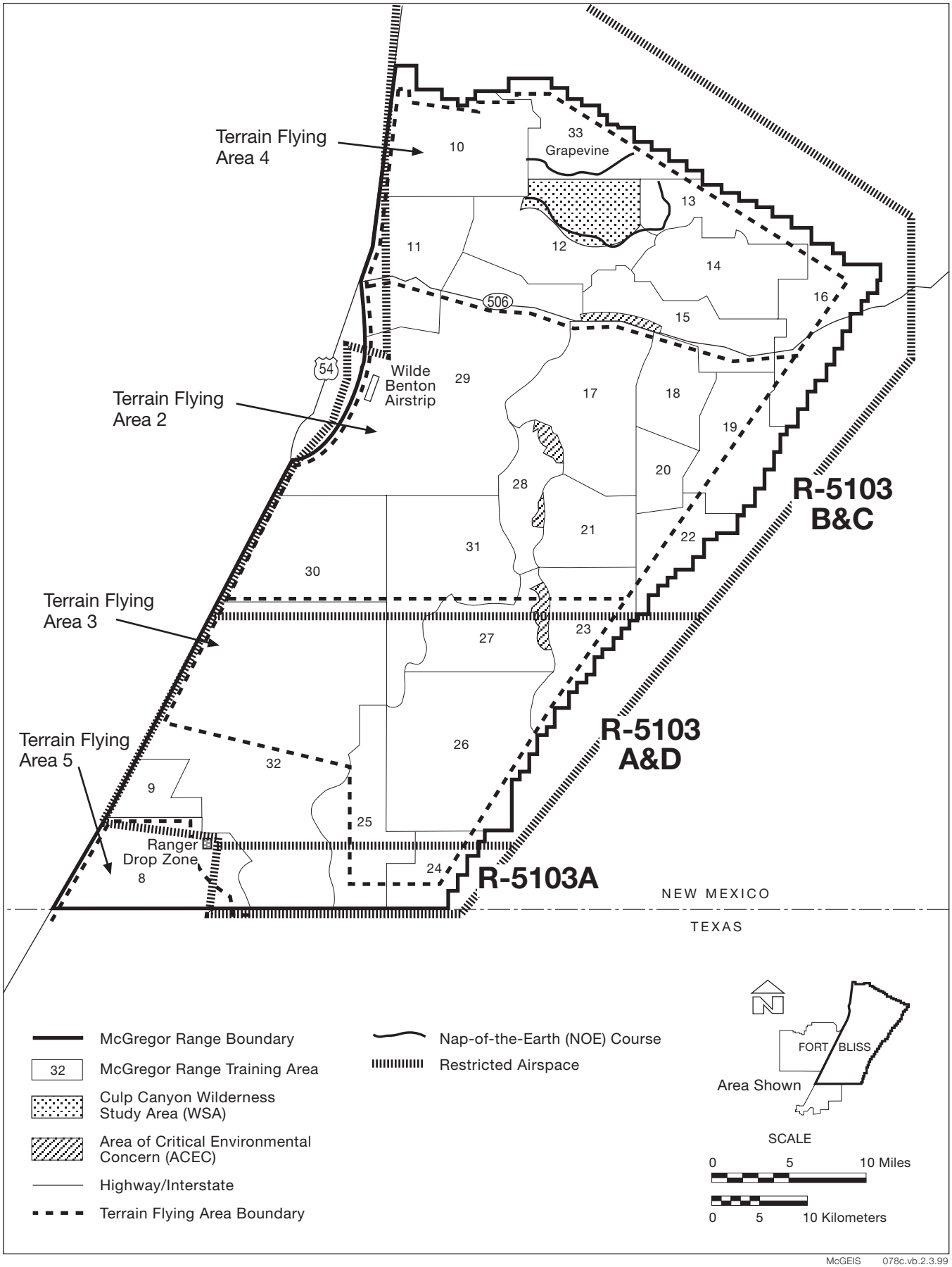


Figure 2.1-3. Terrain Flying Areas and Restricted Airspace Over McGregor Range.

Table 2.1-2. Level of Military Use Criteria

Level of Use	*Percent Scheduled Use*
Very Low (VL)	0 through 25 percent
Low (L)	26 through 50 percent
Moderate (M)	51 through 75 percent
High (H)	76 through 100 percent

Table 2.1-3 depicts the most frequent training for each training area at McGregor Range. The table also includes Culp Canyon WSA and the restricted airspace overlying the range (Figure 2.1-3). The level of use in training areas at McGregor Range varies from very low to high. The areas that receive the highest concentration of training use are primarily centered around the facilities in TAs 29, 30, and 32, and associated impact areas in TA 31, and SDZs in TAs 27, 28, and 31 within the Tularosa Basin portion of the range. TA 11, where the Class C Bombing Range is located, receives a moderate level of use for training activities.

McGregor Range TA 32 contains the McGregor Launch Complex, Meyer Range, Cane Cholla Helicopter Gunnery Range, and the Hellfire missile firing point which makes it the most highly used training area in the Fort Bliss Training Complex. The highest percent of training use area is facilities use.

Use of TAs 29 and 30, where the Orogrande and SHORAD ranges are located, respectively, is roughly equivalent, and generally higher than other training areas in the Fort Bliss Training Complex. Level of training use on TAs 28 and 31, although high, is primarily confined to surface impact areas and SDZs.

Most of the use in the majority of the training areas is as SDZ for weapons firing. Training areas within SDZs of SHORAD missions, including TAs 17 and 21, show a slightly higher level of use than areas within SDZs of HIMAD missiles, although use in these areas is still low. TAs 24, 25, and 26 are also within SDZs for weapons firings from TA 32. Training use in these training areas remains low.

Some training areas also support on-road vehicle maneuvers, primarily associated with ADA training activities. Portions of that training may involve use of controlled-access sites used for the Roving Sands JTX. Because use of those sites can be rotated from year to year, some training areas experience higher use than others in any given year, especially in the Otero Mesa portions of McGregor Range. In 1996, the majority of use of TA 8 was for off-road and on-road wheeled vehicle maneuvers. TA 8 is the only training area at McGregor Range where off-road wheeled vehicle maneuvers are permitted. However, since the relocation of the 3rd Armored Cavalry Regiment (ACR), off-road vehicle use has declined, and more of the vehicle activity involves on-road travel by ADA units. Several training areas, as well as Culp Canyon WSA, are used for dismounted training, but that use is typically very low.

McGregor Range is overlain by Restricted Airspace R-5103. Use of that airspace for air operations is high. Restricted Area R-5103 must be activated during missile firings to ensure safety.

McGregor Range has been subject to a substantially higher level of environmental study than the other ranges/training areas. Although portions of McGregor Range are accessible to the public (TAs 8 through 23), public access use is very low (less than 25 percent of the days in the year).

As military training requirements evolve, McGregor Range could support additional types of activities. Table 2.1-4 identifies additional future actions and activities on McGregor Range. Specific locations have not yet been determined for some of these possible future actions. Most of these actions would result in

Table 2.1-3. Training Category(ies) by Training Area(s)

TA	*Primary Training Categories*	*Training Level of Use*	*Projected Training Categories*	*Training Level of Use*
8	Off-road Vehicle Maneuvers	L	Mission Support Facilities; Off-road Vehicles	H
9	On-road Vehicle Maneuvers; SDZ	VL	On-road Vehicle Maneuvers; SDZ	VL
10	SDZ	L	SDZ	L
11	SDZ; Mission Support Facilities; Weapons Firing; Surface Impact	M	SDZ; Mission Support Facilities; Weapons Firing; Surface Impact	L
12	SDZ	L	SDZ	L
13	SDZ	L	SDZ	L
14	SDZ	L	SDZ	L
15	SDZ	L	SDZ	L
16	SDZ	L	SDZ	L
17	SDZ	L	SDZ; Mission Support Facilities; Surface Impact	H
18	SDZ	VL	SDZ	H
19	SDZ	VL	SDZ	H
20	SDZ	VL	SDZ	H
21	SDZ	L	SDZ; Mission Support Facilities; Surface Impact	H
22	SDZ	VL	SDZ	H
23	SDZ	L	SDZ	H
24	SDZ	L	SDZ	L
25	SDZ	L	SDZ	L
26	SDZ	L	SDZ	L
27	SDZ	H	SDZ	H
28	SDZ	H	SDZ	H
29	SDZ; Mission Support Facilities; Weapons Firing; Surface Impact	H	SDZ; Mission Support Facilities; Weapons Firing; Surface Impact	H
30	SDZ; Mission Support Facilities; Weapons Firing; Surface Impact	H	SDZ; Mission Support Facilities; Weapons Firing; Surface Impact	H
31	SDZ	H	SDZ	H
32	Mission Support Facilities; Built-up Areas; SDZ	H	Missions Support Facilities; Built-up Areas; SDZ	H
33 (Grape-vine)	SDZ	VL	SDZ	VL
WSA	SDZ	VL	SDZ	VL
R-5103	Flight Operations	H	Flight Operations	H

Note: See Table 2.1-2 for VL, L, M, and H percent scheduled use.

intensified use of existing facilities and capabilities in the Tularosa Basin portion of McGregor Range. The effect of these projected activities on training level of use is shown in Table 2.1-3. One example of this would be the potential use as an Army aviation combat training range. Additional controlled access FTX sites could be sited outside the Tularosa Basin. Should these installation capabilities be required to

Table 2.1-4. Possible Future Activities on McGregor Range

Status	*Installation Capability/Envisioned Project*
In Process NEPA Documentation Ongoing or Completed	• Construction of an air-to-ground tactical target complex on Otero Mesa. • Additional controlled access FTX sites, each approximately one to several square miles in size located in nonmountainous terrain on McGregor Range. • Geothermal sources in southern McGregor Range are being explored, but continued exploration could involve other locations. • Road and communication system improvements are ongoing.
Under Consideration	• Support testing of extended range of Block IB ATACMS. Launches may originate from Fort Wingate in northern New Mexico to impact on McGregor Range. • Development of a capability to use a TBM target launched from a new facility in the northwest part of McGregor Range. • Construction of a Military Operations Urbanized Terrain (MOUT) Training Complex on McGregor Range. • Installation of a geothermal binary generation and desalination plant. • Additional support facilities for 500 to 800 persons would be constructed near McGregor Range Camp. • Post mobilization National Guard heavy brigade validation may occur. • Construction of a rail spur from Union Pacific (UP) rail line (along U.S. Highway 54) to McGregor Range Camp. • Construction of additional classrooms at Meyer Range. • Construction of a new Law Enforcement Complex at Meyer Range. • Construction of additional facilities at McGregor Range Camp and linking of the domestic water distribution system on Doña Ana Range–North Training Areas to McGregor Range. • Phase III expansion of a new Ammunition Supply Point (ASP) in south McGregor Range, located between U.S. Highway 54 and McGregor Range Camp.
Additional Installation Capability	• Development of the existing Cane Cholla and Hellfire Training Area into a state-of-the-art Helicopter Training Complex in southern McGregor Range. The training area would be about 13 by 14 miles and include a 1,000-acre impact area. • Combat aviation training would utilize this gunnery facility and 62 by 124 miles of associated restricted airspace over Fort Bliss and WSMR. • Heavy Division Training Center that supports additional brigade-size training exercises. These activities would be at the scale of the Roving Sands exercise, involving about 10,000 troops for a duration of about 2 weeks each year. McGregor Range aviation gunnery and NOE flight training capabilities would be used.

support future missions, project specific NEPA documentation will be prepared to support future mission requirements.

57

The main projected initiatives that could affect level of use at McGregor Range training areas include the USAF target complex, development of additional controlled access FTX sites, development of a helicopter training complex, and launching of a small number of ATACMS into McGregor Range (4 to 6 per year). The USAF action includes a new air-to-ground tactical target complex on McGregor Range. When the target complex is constructed, it is expected to replace much of the use of the existing Class C Bombing Range in TA 11, which would consequently experience a decrease in training use. The tactical

target complex would increase training use substantially in TAs 17, 18, 19, 20, 21, 22, and 23 from very low or low to high. With the exception of TAs 17 and 21, all of the increase would be in Category 4, SDZ. The tactical target complex will introduce mission facilities and surface impact area as new uses in TAs 17 and 21.

Figure 2.1-4 illustrates the existing controlled access FTX sites that are used only for Roving Sands and the approximately 150 square miles of terrain on McGregor Range suitable for siting additional controlled access FTX sites. Also shown, are 13.5 square miles additional controlled access FTX sites being evaluated in separate NEPA documentation for site-specific characteristics.

The additional controlled access FTX sites would be used for training small contingents in command and control, communications, and simulated target engagement activities. These areas would be similar to the existing sites used for Roving Sands and while they may be used more often throughout the year, the sites also could be rotated from year to year.

With the potential construction of a MOUT training facility in TA 8, the distribution of use would change over current conditions, with more activity in facility use and MOUT training activities that may involve pyrotechnics. Use of TA 29 for SDZs would increase with the projected increase in SHORAD missions. TA 31 would also experience an increase in the percent of use for SDZs associated with helicopter gunnery missions.

With the exception of the training areas potentially affected by the USAF proposed new tactical target complex in TAs 17 and 21, or TA 31, as described above, the training areas that could experience the largest increase in level of use would be TAs 8 and 32. As noted above, the level-of-use increase in TA 8 (about 130 percent) would be primarily in facilities use if a MOUT is developed in this training area. Increased use of TA 32 would be concentrated in and around McGregor Range Camp.

2.1.2 Nonmilitary Uses of Withdrawn Lands

Nonmilitary uses of the land would remain largely the same as they are under PL 99-606. Nonmilitary uses are managed by BLM with Fort Bliss concurrence in accordance with PL 99-606, the White Sands RMP as amended by the McGregor Range RMPA and the MOU between the Army and BLM. Areas on the range are managed for protection of archaeological and historical resources, and habitat conservation in accordance with the RMPA. In addition, there are special use areas for grazing, research, and public recreation. Exploration and development of mineral resources are managed by the BLM in accordance with the White Sands RMP (BLM, 1986a) as amended (BLM, 1988b).

93

The 271,000 acres of withdrawn and Army fee-owned land, available for grazing are comprised of TAs 10 through 23, which are designated grazing areas 1 through 5 and 7 through 15. Grazing will continue to take place in accordance with the specific decisions (Mc/G-1 through Mc/G-16) in the White Sands RMP (BLM, 1986a). These decisions provide objectives and procedures for the livestock grazing program that takes place on McGregor Range. In addition to grazing, the primary nonmilitary uses in these areas include hunting and dispersed recreational use such as hiking and observing nature. Depending on which future military developments are implemented, there could be some reduction in the acreage available for those uses or the times that access is permitted.

Throughout McGregor Range, a variety of wildlife are sustained by varying suitable habitat conditions. Areas specially protected include the McGregor Black Grama Grassland Area of Critical Environmental Concern (ACEC) for its special grassland habitat and Culp Canyon WSA for its wilderness qualities. Management of the Otero Mesa and Sacramento Mountains foothills portions of McGregor Range would continue to be managed under the White Sands RMP as amended by the RMPA.

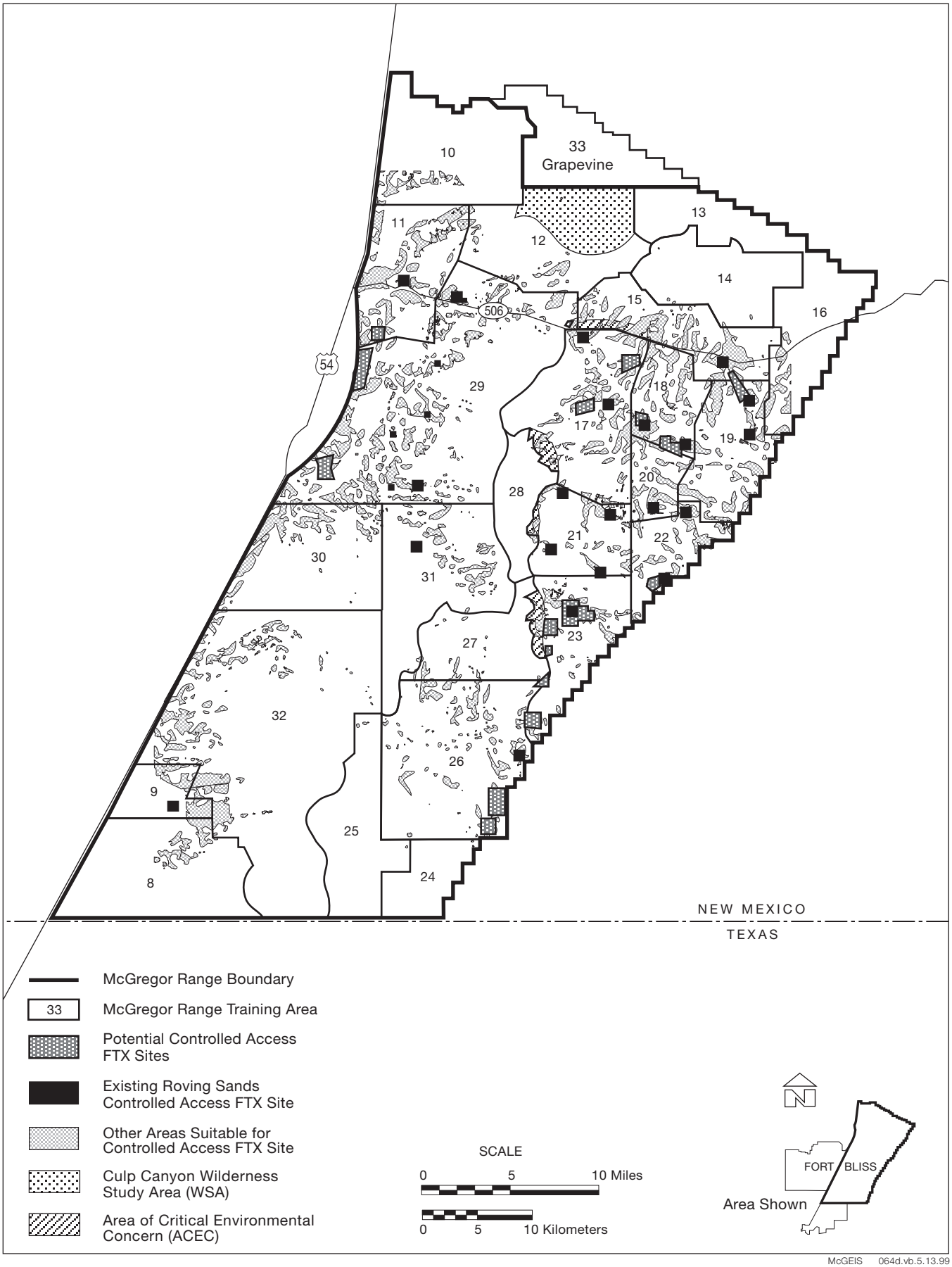


Figure 2.1-4. Existing and Potential Controlled Access FTX Sites on McGregor Range.

Access to training areas is controlled by Fort Bliss. Members of the public must obtain annual access permits from USACASB through the Range Development and Enforcement Office, and are required to check in and out with McGregor Range Control to ensure safety and avoid interference with military missions. The Las Cruces Field Office of the BLM is also authorized to issue recreational access permits. Between 1,000 and 1,700 permits are issued annually for recreational purposes on the Fort Bliss Training Complex. Approximately 23 percent (230 to 391) of the recreational permits are for access to McGregor Range. Permit holders are responsible for complying with specific procedures for entry, use, and departing the range. Current access procedures allow concurrent use of any area for selected military missions (such as environmental resource surveys) with public use.

2.1.3 Use of Lands Returned to the Public Domain

Since the boundaries of McGregor Range would be the same as the 1986 withdrawal, there would be no land returned to the public domain.

2.2 ALTERNATIVE 2

The Tularosa Basin and Otero Mesa portions of McGregor Range would be withdrawn for continued military use. The Sacramento Mountains foothills portion of McGregor Range, including most of the Culp Canyon WSA, would return to the public domain. This area is about 40,000 acres, comprised of currently withdrawn lands in TAs 13 and 14, and parts of 12, 15, and 16, and including Culp Canyon WSA. Army fee-owned in-holdings within the lands returned to the public domain area would be retained for specialized training. Grazing under BLM management would continue on Army fee-owned in-holdings.

Under this alternative, Congress would renew the withdrawal of 568,385 acres and not withdraw public lands in the Sacramento Mountains foothills portion of McGregor Range. The Secretary of the Army would need to prepare a written determination concerning the contamination of these areas with explosive, toxic, or other hazardous substances. The Secretary of the Interior, in consultation with the Secretary of the Army, would decide what decontamination is economically feasible given different potential future use and relative risks. The Secretary of the Interior could decide not to accept certain areas due to future liability, necessitating transfer to the Army.

2.2.1 Military Missions and Capabilities on Withdrawn Lands

Figure 2.2-1 illustrates the area that would be withdrawn under Alternative 2. Army fee-owned land within McGregor Range is also shown on Figure 2.2-1. With the loss of the Sacramento Mountains foothills land area on the north end of the range, McGregor Range would continue to support some current missions and some future missions based upon installation capabilities as described by Alternative 1. However, current mission activities that use the Sacramento Mountains foothills would be constrained and/or reduced. For example:

- The orientation of training scenarios used in live-firing of the Patriot missile will need to be adapted to avoid including the foothills area in the SDZ, thus limiting the full range of training possibilities available on the current configuration of McGregor Range (Figure 2.2-2). Each training scenario would be structured to contain all of the SDZs on withdrawn land. The most northern MQM-107 aerial target option that extends across this area would no longer be available, reducing the potential number of training scenarios by one-third.

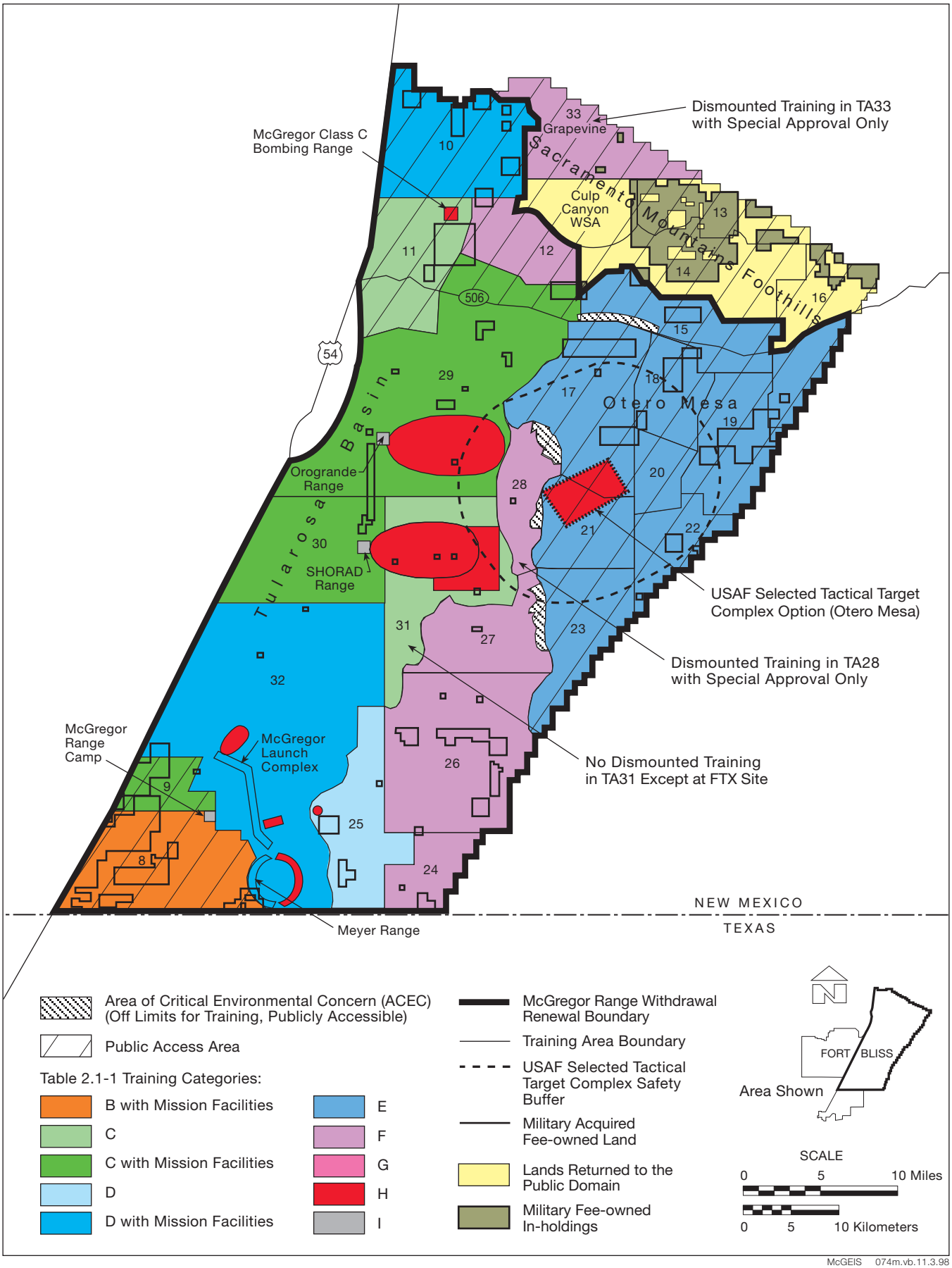


Figure 2.2-1. Land Status Under Alternative 2.

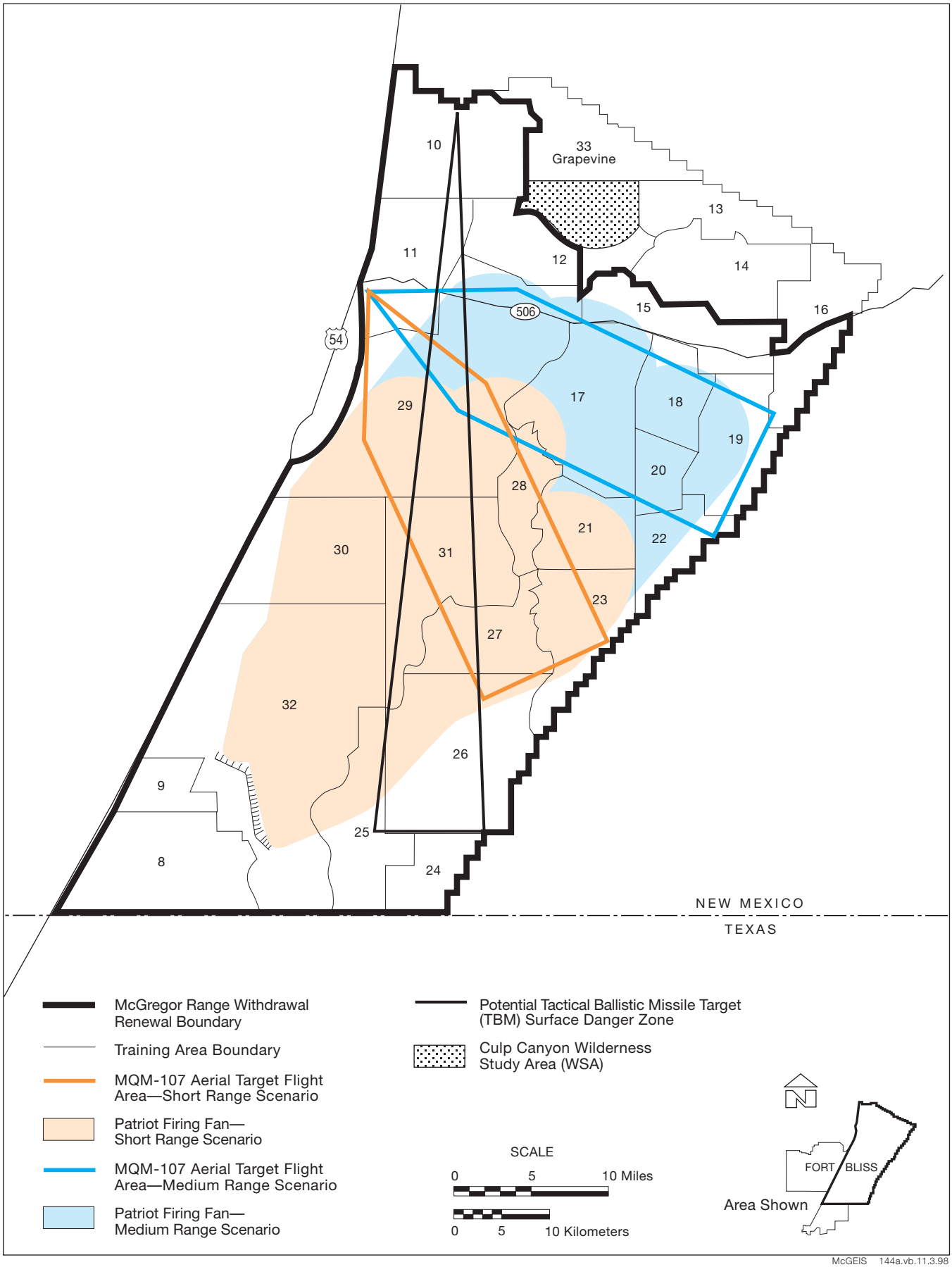


Figure 2.2-2. Target Flight Areas and Surface Danger Zones Associated with Patriot Missile Firings—Alternative 2.

- Dismounted training opportunities in the foothill environment for units currently using the area, for example: special operations forces, would be reduced. The Culp Canyon WSA would no longer be used for dismounted military training or as a safety buffer. This training would be limited to withdrawn and fee-owned land and areas available through agreement with the USFS.

2.2.2 Nonmilitary Uses on Withdrawn Lands

Nonmilitary uses of the land would remain largely the same as they are under PL 99-606. Nonmilitary uses are managed by BLM with Fort Bliss concurrence in accordance with PL 99-606, the White Sands RMP as amended by the McGregor Range RMPA and the MOU between the Army and BLM. Areas on the range are managed for protection of archaeological and historical resources, and habitat conservation in accordance with the RMPA. In addition, there are special use areas for grazing, research, and public recreation.

Under this alternative 231,000 acres of withdrawn and Army fee-owned land would be coincident with grazing areas 1 through 5 and 7 through 15 (TAs 10 through 23) excluding grazing areas 4 and 5 (TAs 13 and 14). Grazing will continue to take place in accordance with the specific decisions (Mc/G-1 through Mc/G-16) in the White Sands RMP as amended by the RMPA (BLM, 1986a). These decisions provide objectives and procedures for the livestock grazing program that will take place on McGregor Range. In addition to grazing, the primary nonmilitary uses would include hunting, and dispersed recreational use such as hiking and observing nature. Depending on which future military developments are implemented, there could be some reduction in the acreage available for those uses or the times that access is permitted.

Throughout the area withdrawn for McGregor Range, a variety of wildlife are sustained by varying, suitable habitat conditions. Special areas contained in the revised configuration of McGregor Range include the McGregor Black Grama Grassland ACEC for its special grassland habitat. Management of the Otero Mesa and Tularosa Basin north of New Mexico Highway 506 would continue under the RMPA as it currently exists.

- As under Alternative 1, members of the public would continue to obtain annual access permits from Commander (CDR), USACASB through Range Development and Enforcement and be required to check in and out with McGregor Range Control to ensure safety and avoid interference with military missions. Permit holders are responsible for complying with specific Army procedures for entry, use, and departing the training areas. Current access procedures allow concurrent use of any area for selected military missions with public use (such as environmental resource surveys).

2.2.3 Uses of Lands Returned to the Public Domain

Lands in the Sacramento Mountains foothills would no longer be managed in accordance with the 1990 MOU between the BLM and Fort Bliss concerning policies, procedures, and responsibilities related to land use planning and resource management of McGregor Range. This MOU was incorporated into the McGregor Range RMPA. These lands would continue to be managed in accordance with the White Sands RMP (BLM, 1986a). The U.S. Army would continue to provide sufficient water for wildlife and maintenance of the grazing program, as specified in the current MOU for these lands.

The primary changes in nonmilitary use if the Sacramento Mountains foothills were returned to the public domain include:

- Grazing authority would be derived from the public land laws. Under Alternative 2, grazing units 4 and 5 (TAs 13 and 14) and portions of grazing areas 3 and 8 (TAs 3 and 16) would return to the public domain. These grazing units would be deleted from the area covered by the specific provisions

of the White Sands RMP, as amended, McGregor Range (BLM, 1990a) and revert to management under the White Sands RMP (BLM, 1986a).

Management of grazing permits on public land is administered by the BLM on the basis of qualified applicants for grazing privileges. The BLM's authority to manage resources on public lands is derived from Section 302 of PL 94-579, FLPMA of 1976. Grazing on public land in New Mexico generally is administered in accordance with 43 CFR 4100, *Grazing Administration–Exclusive of Alaska.* Lands returned to the public domain could revert to provisions of the *Taylor Grazing Act* (43 USC 315). However, because the Army acquired all base property when it acquired the fee-owned land at McGregor Range, there may be no qualified applicants under the Act. Lack of existing base property on McGregor Range may prevent BLM from adjudicating grazing privileges in most areas of the range (Phillips, 1998). Base property means: (1) land that has the capability to produce crops or forage that can be used to support authorized livestock for a specified period of the year, or (2) water that is suitable for consumption by livestock and is available and accessible, to the authorized livestock when the public lands are used for livestock grazing. To qualify for grazing use on the public lands, an applicant must own or control land or water base property. Since the U.S. Army holds the formerly private land and the water right that supports wildlife and, subsequently, livestock grazing on McGregor Range, it is expected that there would be few, if any, qualified applicants for grazing privileges under the terms of the *Taylor Grazing Act* (Phillips, 1998).

If there were no qualified applicants under the *Taylor Grazing Act*, it is possible that BLM could continue the present auction system to allow grazing to continue under current arrangements, using its authority to permit vegetative sales. Congressional designation of the current method of grazing as specified in the RMPA would serve to solidify the legal aspects of the issue (Phillips, 1998).

- Unrestricted access to 40,000 acres for recreation. Hunts scheduled by New Mexico Department of Game and Fish (NMDGF) would continue as needed in response to herd sizes.

- Applications for mineral exploration on 29,000 acres, including oil and gas and geothermal resources would not be subject to Army concurrence. Future use of the area for mineral extraction would depend on the quality, quantity, and accessibility of resources. Mineral use is suspended in the Culp Canyon WSA pending congressional action.

2.3 ALTERNATIVE 3

The Tularosa Basin portion of McGregor Range would be withdrawn for continued military use. The Otero Mesa and Sacramento Mountains foothills portions of McGregor Range would return to the public domain. This area is about 180,000 acres, comprised of currently withdrawn lands in TAs 13 through 23 and part of 12. This area would include Culp Canyon WSA and the McGregor Black Grama Grassland ACEC. The withdrawn area of McGregor Range (about 428,385 acres) would encompass areas within the Tularosa Basin and the escarpment of Otero Mesa and is illustrated in Figure 2.3-1. Army fee-owned in-holdings within the lands returned to the public domain area would be retained for specialized training. Grazing on Army fee-owned in-holdings would continue under BLM management.

Under this alternative, Congress would renew the withdrawal of 428,385 acres and would not withdraw the Otero Mesa and Sacramento Mountains foothills portions of McGregor Range. The Secretary of the Army would need to prepare a written determination concerning the contamination of the areas with explosive, toxic, or other hazardous material. The Secretary of the Interior, in consultation with the Secretary of the Army, would decide what decontamination, if necessary, is economically feasible

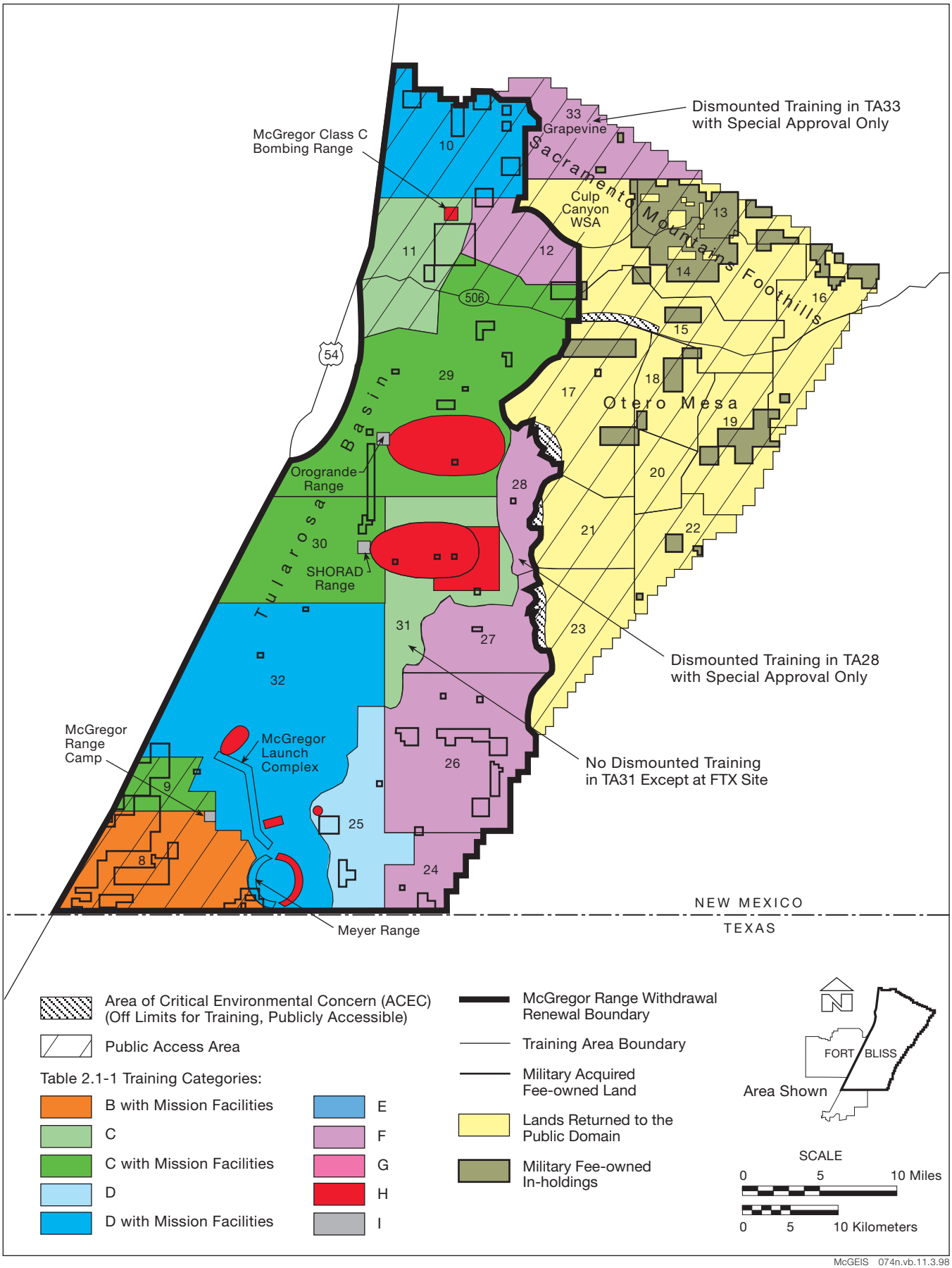


Figure 2.3-1. Land Status Under Alternative 3.

(considering potential future use). The Secretary of the Interior could decide not to accept certain areas due to future liability, thereby necessitating transfer to the Army.

2.3.1 Military Missions and Capabilities on Withdrawn Lands

Figure 2.3-1 illustrates the area that would be withdrawn under Alternative 3. Army fee-owned land within McGregor Range is also shown on Figure 2.3-1. Mission activities that use the Otero Mesa and Sacramento Mountains foothills portions of McGregor Range would be further constrained and/or reduced from that under Alternative 2. For example:

- Several training scenarios used in live-firing of the HIMAD missiles will need to be eliminated to avoid including the Otero Mesa in the SDZ. The orientation of training scenarios that use the MQM-107 aerial target would be constrained to the Tularosa Basin presenting a highly limited target engagement scenario Figure 2.3-2. Over half of the most easterly SDZ would not be available as a target area or secondary danger area, approximately one third of the center SDZ would not be available as a target area or secondary danger area, and the far secondary danger area of the most westerly SDZ would need to be structured to contain all of the SDZ on withdrawn land. Two-thirds of the present most northern and over half of the central MQM-107 aerial target options that extend across this area would no longer be available.

- Small missiles could continue to be used from firing locations in the south part of the range. Most small missile types currently used at the SHORAD/Orogrande complex could continue. Some safety fans for small missiles extend slightly over TA 17. Continuation of this capability may require slight adjustments to firing scenarios or limited firing range for some munitions.

- Aerial gunnery by both rotary-wing aircraft at Cane Cholla, and fixed-wing aircraft at the Class C Bombing Range in TA 11 (grazing unit 2) would continue.

- Ground troop maneuvers could continue in the withdrawn areas, however, training opportunities for special operations forces on the Otero Mesa and in the Sacramento Mountains foothills parts of McGregor Range would be limited to fee-owned lands and areas available through agreement with USFS.

- Roving Sands exercises could continue but would be severely limited by the reduced land area. Several controlled access FTX sites located in the lands returned to the public domain would no longer be available.

Currently, the McGregor Range and the Doña Ana Range–North Training Areas on Fort Bliss are wide enough east to west to realistically accommodate a single ADA brigade as deployed based on doctrine. During large-scale exercises such as Roving Sands, up to four brigade equivalents have been deployed in this area to obtain the best training possible given the land available. The loss of Otero Mesa and Sacramento Mountains foothills would further increase the density of ADA forces during the training. This is an unrealistic training density when compared with actual operations in the Persian Gulf and Korea. This constraint reduces the command's capability to test unit interoperability, that is, how well the various U.S. services perform their missions together. Fewer controlled access FTX sites further reduce the realism of ADA training.

Portions of future missions that use the installation capabilities as described in Alternative 1 would still be feasible under this alternative. However, current or future missions that use the installation capabilities that would not be supportable under this alternative include:

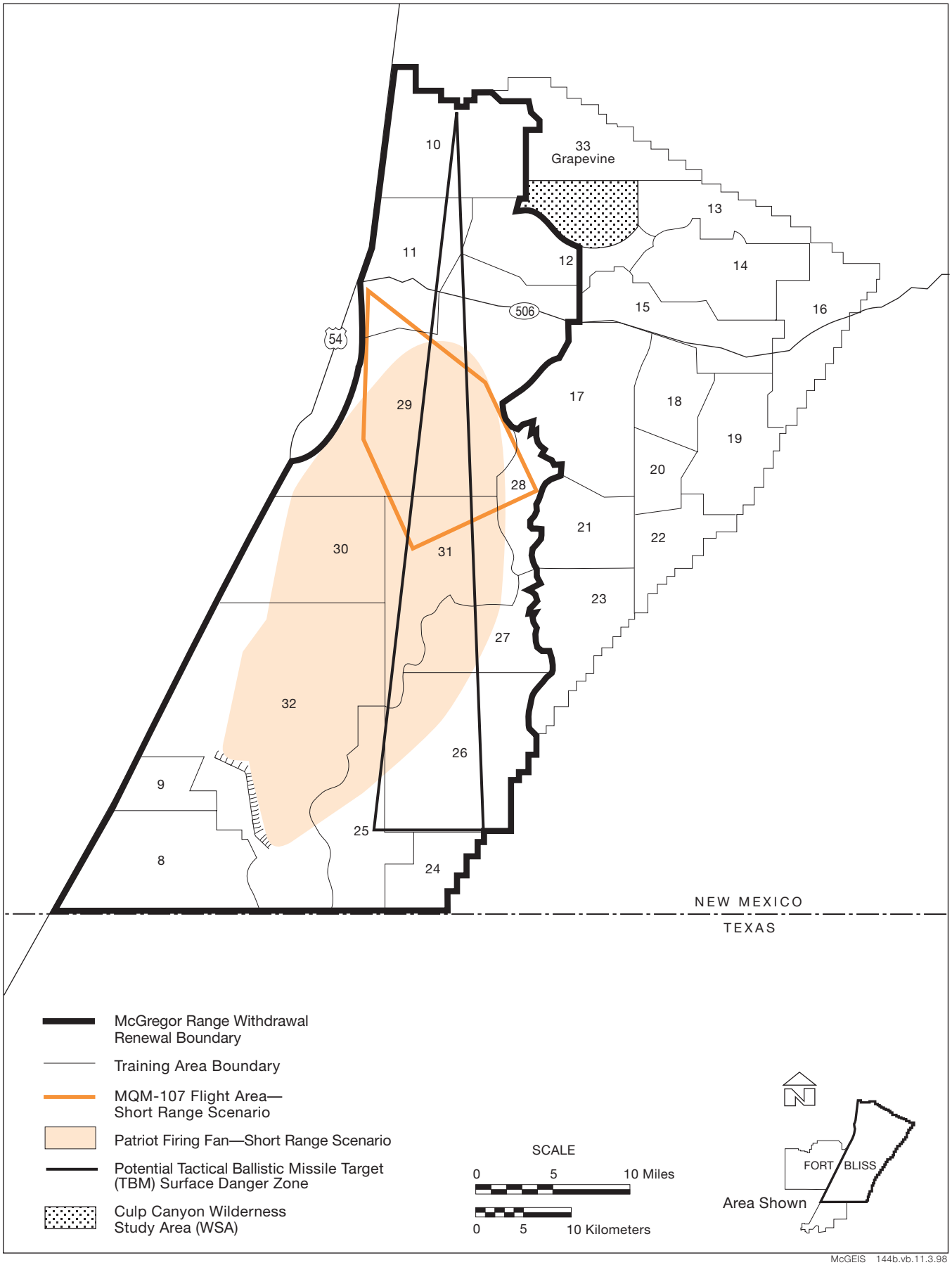


Figure 2.3-2. Target Flight Areas and Surface Danger Zones Associated with Patriot Missile Firings—Alternative 3.

- Air defense related training components of joint service exercises (i.e., Roving Sands) that currently or could use the Otero Mesa and Sacramento Mountains foothills area would have to be modified to reduce the spatial component of the training scenario. Several existing controlled access FTX sites would no longer be available and sites for additional or replacement controlled access FTX sites would need to be confined to the reduced withdrawn and fee-owned lands or other areas of Fort Bliss. Access to the fee-owned lands may be necessary for training on these lands to continue.

- Use of the USAF tactical target complex to be constructed on Otero Mesa would no longer be possible.

2.3.2 Nonmilitary Uses on Withdrawn Lands

Nonmilitary uses of the land would remain largely the same as they are under PL 99-606. Nonmilitary uses are managed by BLM with Fort Bliss concurrence in accordance with PL 99-606, the White Sands RMP as amended by the McGregor Range RMPA and the MOU between the Army and BLM. Areas on the range are managed for protection of archaeological and historical resources, and habitat conservation in accordance with the RMPA. In addition, there are special use areas for grazing, research, and public recreation.

In 91,000 acres of withdrawn and Army fee-owned lands, coincident with grazing areas 1, 2, and part of 3 (TAs 10 through 12) grazing will continue to take place in accordance with the specific decisions (Mc/G-1 through Mc/G-16) in the White Sands RMP (BLM, 1986a) as amended by the RMPA. These decisions provide objectives and procedures for the livestock grazing program that will take place on McGregor Range. In addition to grazing, the primary nonmilitary uses would include hunting, and dispersed recreational use such as hiking and observing nature. Depending on which future military developments are implemented, there could be some reduction in the acreage available for those uses or the times that access is permitted.

Access to training areas would remain controlled by Fort Bliss. Military units, government agencies, and contractors would continue to be required to coordinate access and use with the CDR, USACASB (through the Range Scheduling Office) to ensure public safety and to avoid interference with other military missions.

Members of the public would obtain annual access permits from CDR, USACASB through Range Development and Enforcement and be required to check in and out with McGregor Range Control to ensure safety and avoid interference with military missions. Permit holders for withdrawn land access would remain responsible for complying with specific Army procedures for entry, use, and departing the training areas. Under this alternative, current access procedures allow concurrent use of any area for selected military missions (such as resource surveys) with public use.

2.3.3 Uses of Lands Returned to the Public Domain

Lands on the Otero Mesa and in the Sacramento Mountains foothills would no longer be managed in accordance with the 1990 MOU between the BLM and Fort Bliss. These lands would be managed in accordance with the White Sands RMP (BLM, 1986a). The U.S. Army would continue to provide water sufficient for wildlife and maintenance of the grazing program as specified in the current MOU.

The primary changes in nonmilitary use if the Otero Mesa and Sacramento Mountains foothills areas were returned to the public domain include:

- As under Alternative 2, lands returned to the public domain would continue to be managed under the public land laws. Lack of existing base property on McGregor Range may prevent BLM from adjudicating grazing privileges in most areas of the range under the *Taylor Grazing Act* (Phillips, 1998). In that case, it may be possible to continue grazing practices as vegetative sales. Congressional designation of the current method of grazing as specified in the White Sands RMP, as amended by the RMPA, would serve to solidify the legal aspects of the issue (Phillips, 1998).

  Under Alternative 3, grazing units 4, 5, 7 through 15, and portions of 3 (TAs 13 through 23 and part of 12) would return to the public domain. These grazing units would be deleted from the area covered by the RMPA, McGregor Range (BLM, 1990a) and the RMPA would be revised to reflect the range boundary changes. Similarly, the White Sands RMP (BLM, 1986a) would be amended to reflect these grazing units as being outside of McGregor Range.

- Reduction of road closures along New Mexico Highway 506 due to HIMAD live fire operations.

- Unrestricted access to 180,000 acres for recreation. Hunts would continue to be managed and scheduled by the NMDGF.

- Applications for mineral exploration on 169,000 acres, including oil and gas and geothermal resources would not be subject to Army concurrence. Future use of the area for mineral extraction would depend on the quality, quantity, and accessibility of resources. Mineral use is suspended in the Culp Canyon WSA pending congressional action.

- Return of the McGregor Black Grama Grassland ACEC to public domain land, assumed to continue to be used for scientific purposes.

2.4 ALTERNATIVE 4

Under this alternative, Congress would not withdraw any portion of McGregor Range north of New Mexico Highway 506 or on Otero Mesa. This area would be about 244,000 acres comprised of currently withdrawn lands in TAs 10 through 23, and would include Culp Canyon WSA and McGregor Black Grama Grassland ACEC. The portion of grazing unit 2 (TA 11) south of New Mexico Highway 506 would be exchanged for the area between New Mexico Highway 506 and grazing unit 3 (TA 29). The Tularosa Basin portion of McGregor Range, south of New Mexico Highway 506, encompassing about 364, 385 acres as shown in Figure 2.4-1 would be withdrawn for military use. Army fee-owned in-holdings within the lands returned to the public domain would be retained for specialized training. Grazing would continue under BLM management on Army fee-owned in-holdings.

The Secretary of the Army would need to prepare a written determination concerning the contamination of these areas with explosive, toxic, or other hazardous material. The Secretary of the Interior, in consultation with the Secretary of the Army, would decide what decontamination is economically feasible (considering potential future use). Alternatively, the Secretary of the Interior could decide not to accept certain areas due to future liability, necessitating transfer to the Army.

2.4.1 Military Missions and Capabilities on Withdrawn Lands

With the loss of the land area north of New Mexico Highway 506 and Otero Mesa, McGregor Range could continue to support only some of its current missions, with constrained or reduced activities for others. Reductions in mission activities would be similar to those described for Alternative 3 in Section 2.3.1 with the following additional degradation:

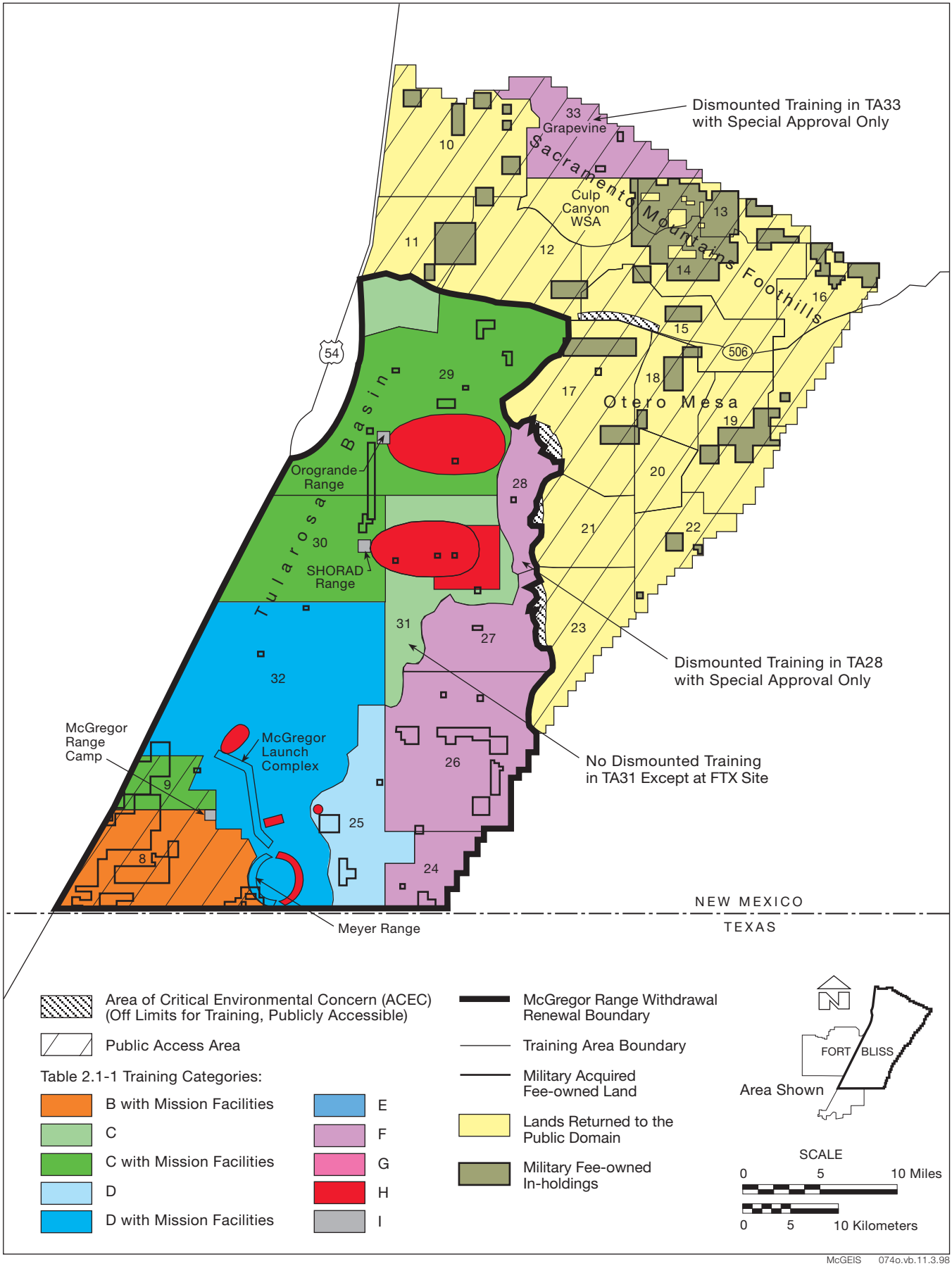


Figure 2.4-1. Land Status Under Alternative 4.

- The orientation of training scenarios used in live-firing of the HIMAD missiles would need to be significantly modified to avoid including land in the Tularosa Basin north of New Mexico Highway 506, the Otero Mesa, and Sacramento Mountains foothills area in the SDZ (Figure 2.4-2). Under Alternative 4, Patriot missile firings would be limited from one firing point with one short-range firing scenario. This would be tactically unrealistic and, therefore, of little training value.

In addition to restrictions associated with Alternative 3, Alternative 4 would present these additional constraints:

- McGregor Range would no longer be able to support fixed-wing aerial gunnery training at the existing Class C Bombing Range located on lands returned to the public domain.

- SDZs for some small missile missions may extend east into TA 17 (grazing unit 9) and would need to be modified or curtailed.

- Aerial gunnery by both rotary- and fixed-wing aircraft would be limited to target areas with safety buffers within a smaller portion of Tularosa Basin, south of New Mexico Highway 506.

- Projections of future missions related to installation capabilities would be similar to Alternative 3 under this alternative. Also, siting options for additional controlled access FTX sites would be extremely constrained within the remaining withdrawn area.

2.4.2 Nonmilitary Uses on Withdrawn Lands

Nonmilitary uses of the land would remain largely the same as they are under PL 99-606. Nonmilitary uses are managed by BLM with Fort Bliss concurrence in accordance with PL 99-606, the White Sands RMP as amended by the McGregor Range RMPA and the MOU between the Army and BLM. Areas on the range are managed for protection of archaeological and historical resources, and habitat conservation in accordance with the RMPA. In addition, there are special use areas for grazing, research, and public recreation.

2.4.3 Uses of Lands Returned to the Public Domain

Lands in the Otero Mesa and lands north of New Mexico Highway 506 in the Sacramento Mountains foothills would no longer be managed in accordance with the 1990 MOU. These lands would be managed in accordance with the White Sands RMP (BLM, 1986a). The U.S. Army would continue to provide water sufficient for wildlife and maintenance of the grazing program as specified in the current MOU for these lands. The primary changes in nonmilitary use of the lands returned to the public domain include:

- As under Alternative 3, lands returned to the public domain would continue to be managed under the public land laws. The lack of existing base property on McGregor Range may prevent BLM from adjudicating grazing privileges in most areas of McGregor Range under the *Taylor Grazing Act* (Phillips, 1998). In that case, it may be possible to continue grazing practices as vegetative sales. Congressional designation of the current method of grazing as specified in the White Sands RMP, as amended by the RMPA, would serve to solidify the legal aspects of the issue (Phillips, 1998). In addition, a portion of TA 29 north of New Mexico State Highway 506 would be added to the grazing area. The RMP would be revised to reflect the range boundary changes. Similarly, the White Sands RMP (BLM, 1986a) would be amended to reflect these grazing units as being outside of McGregor Range.

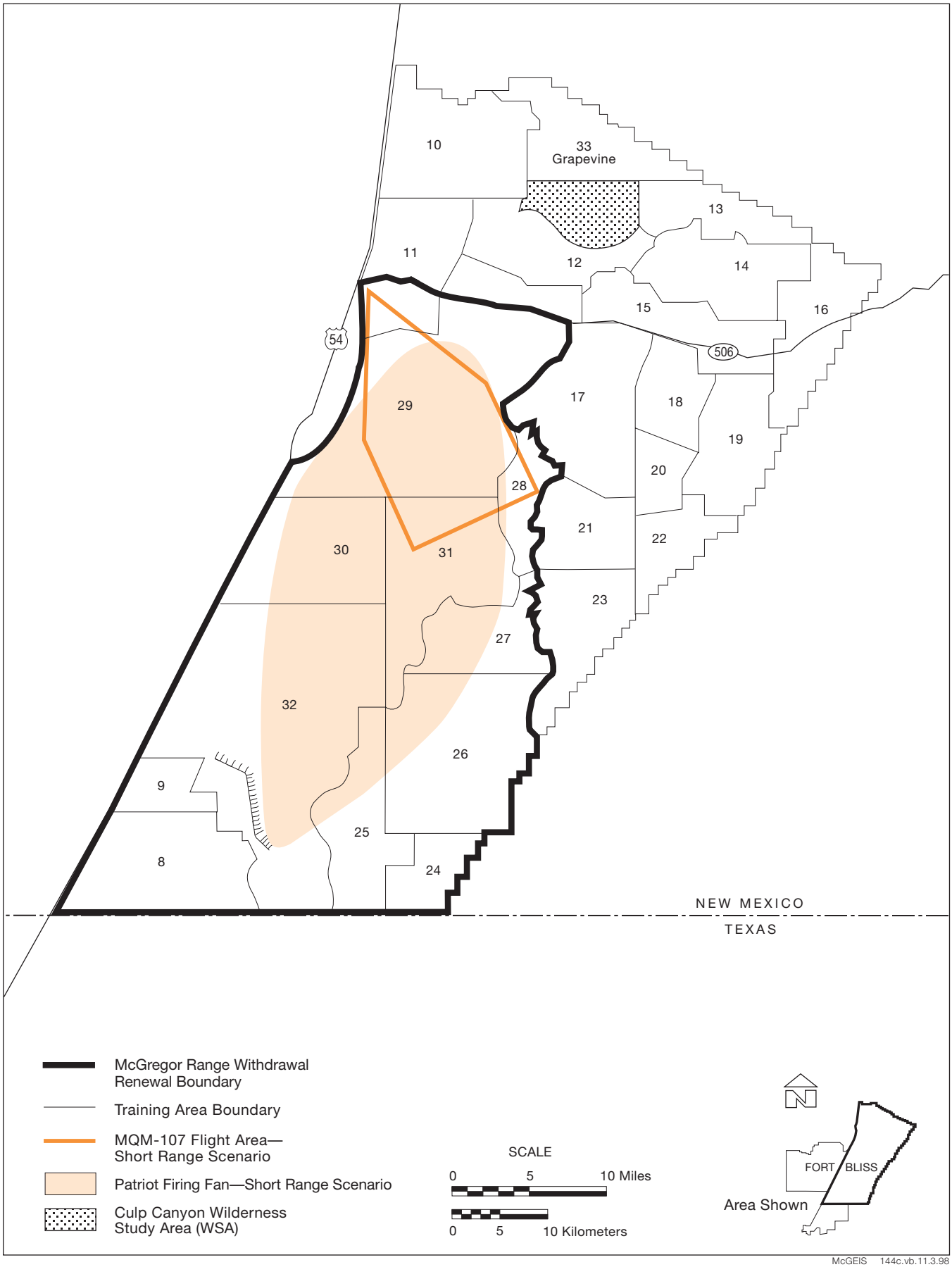


Figure 2.4-2. Target Flight Areas and Surface Danger Zones Associated with Patriot Missile Firings—Alternative 4.

- Elimination of road closures along New Mexico Highway 506 due to HIMAD live fire operations.

- Unrestricted access of 244,000 acres for recreation. Hunts would continue to be managed and scheduled by the NMDGF.

- Application for mineral exploration on 233,000 acres, including oil and gas and geothermal resources would not be subject to Army concurrence. Future use of the area for mineral extraction would depend on the quality, quantity, and accessibility of resources.

- Return of the McGregor Black Grama Grassland ACEC to public domain land, assumed to continue to be used for scientific purposes.

2.5 ALTERNATIVE 5 – NO ACTION

Under this alternative, the withdrawal of 608,385 acres of currently withdrawn land on McGregor Range would not be renewed. The land would return to the public domain. Army fee-owned in-holdings within the lands returned to the public domain would be exchanged for public lands in TAs 8 and 32, to maintain essential infrastructure around McGregor Range Camp, the McGregor ASP, and the Meyer Range Complex. The Secretary of the Army would need to prepare a written determination concerning the contamination of the areas with explosive, toxic, or other hazardous material. The Secretary of the Interior, in consultation with the Secretary of the Army, would decide what decontamination is economically feasible (considering potential future use).

There would be no further military use of the McGregor Range withdrawn land area. Restricted airspace above the land area could continue to be used for some aircraft training by Army aviation and USAF units within the region. Figure 2.5-1 shows the lands status under the No Action Alternative. The lands obtained by the Army in exchange for fee-owned in-holdings would continue to be available for training purposes. Installation facilities on McGregor Range that would have to be relocated elsewhere include:

- Orogrande Range;
- SHORAD Range; and
- McGregor Range Firing Complex.

The loss of these facilities and the associated SDZs will result in the loss of several activities and units at Fort Bliss, in addition to those described for Alternatives 2, 3, and 4. The activities lost include:

- Short-range and medium- and high-altitude missile training;
- ADATD/Air Defense Board testing of long-and short-range weapons;
- Roving Sands combined forces exercises;
- FIREX for Hawk, Patriot, Stinger, and Roland Missiles;
- Helicopter gunnery and Hellfire training;
- Laser operations; and
- Airborne personnel, equipment drops, and Special Operations Forces ground troop maneuvers.

Operations directed by WSMR primarily use the Orogrande and SHORAD ranges. After Congress acts in 2001, organizations from the MICOM (23 authorizations), the TEXCOM (200 authorizations [including Department of the Army Civilian (DAC), and dedicated technical support contractors during testing periods]) (U.S. Army, 1996a) and elements of the USACASB relocated. The ADATD/Air Defense Board has utilized McGregor Range for decades due to the large expanses of restricted land and

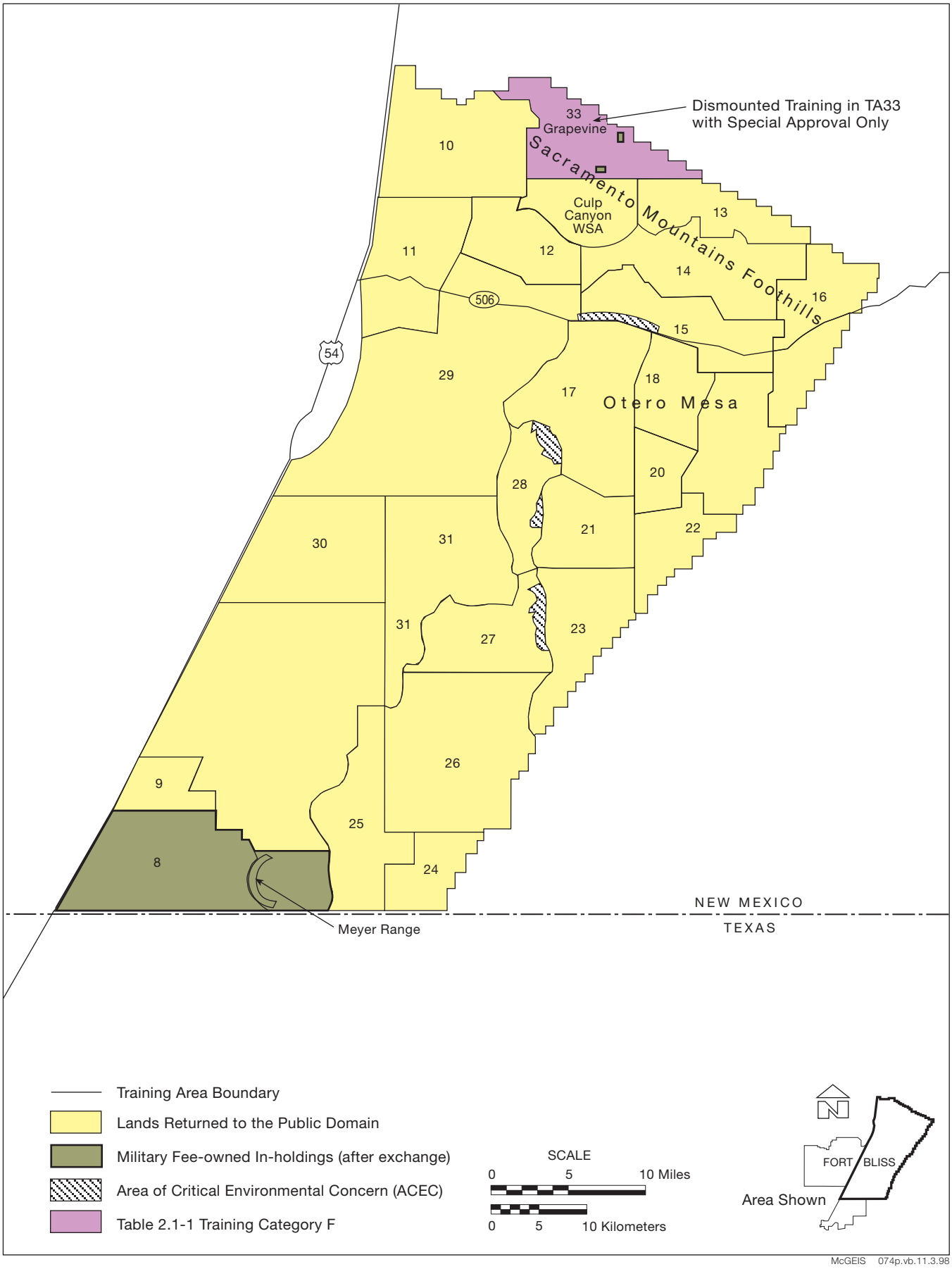


Figure 2.5-1. Land Status Under the No Action Alternative.

airspace essential for both long- and short-range weapons testing. The types of tests conducted by this organization may not be executable at any other Continental U.S. (CONUS) land-based range facility. Adapting other facilities for test missions may not be realistic, technically feasible, or would add prohibitively to test costs. Millions of dollars are spent yearly on Operational Testing and McGregor Range has the land, airspace, and flexibility necessary for cost-effective testing. In addition, the allied forces ASPs at McGregor Range and the associated military sales contracts would be eliminated.

Decisions by the Secretary of the Interior and the Secretary of the Army concerning what decontamination is practicable or economically feasible would influence the extent and type of future uses on large portions of lands returned to the public domain. The Secretary of the Interior also could decide not to accept any portion or all of the lands currently withdrawn due to future liability, necessitating transfer to the Army.

Impact areas that cannot be economically decontaminated in the Tularosa Basin may be permanently unsuitable for some public uses. Surface clearance of some areas in the basin may be sufficient for activities that would not involve subsurface ground disturbance (such as grazing or wildlife conservation). Some contaminated areas may need to be fenced to preclude public access.

The existing grazing areas (271,000 acres) would continue to be available for multiple uses, to the extent that the areas have productive value and would be managed in accordance with public land laws. As under Alternatives 2, 3, and 4, lands returned to the public domain would revert to the public land laws. Lack of existing base property on McGregor Range may prevent BLM from adjudicating grazing privileges in most areas of the range under the *Taylor Grazing Act*. In that case, it may be possible to continue grazing practices as vegetative sales. Congressional designation of the current method of grazing as specified in the White Sands RMP, as amended by the RMPA, would serve to solidify the legal aspects of the issue (Phillips, 1998).

Under Alternative 5, currently withdrawn TA 8 and a portion of TA 32 would be transferred to DoD in exchange for Army fee-owned land elsewhere on McGregor Range. Water rights associated with the fee-owned lands would also be exchanged. The RMPA for McGregor Range (BLM, 1990a) would be revised and the White Sands RMP (BLM, 1986a) would be amended to reflect that the former McGregor Range is included in this management plan.

In addition to vegetation sales, BLM could open areas designated for locatable minerals, leasable minerals, and salable minerals. Some cultural resources could be opened up for interpretative recreational opportunities. However, some areas could continue to be unavailable for public access and/or minerals extraction due to ordnance and explosives hazards until the area is cleaned up.

Wildlife would continue to use areas of suitable habitat throughout the range. Future conditions for wildlife resulting from decreased military use and potentially increased public access and grazing would depend on the management actions implemented by BLM.

2.6 ALTERNATIVE 6

During scoping, it was suggested that Congress designate the Culp Canyon WSA as a wilderness area. In addition, it was suggested that Congress designate the Otero Mesa and Sacramento Mountains foothills, including in-holdings held in fee by the DA, as an NCA. This alternative would require congressional action separate from the renewal of the military land withdrawal and could potentially alter the management practices associated with the area included in the NCA. The NCA, as envisioned, could be

designated along with Alternative 3, 4, or 5. In this case, Army fee-owned land on the NCA would no longer be available for training and would be exchanged for public lands in TAs 8 and 32.

In the *New Mexico Statewide Wilderness Study* (BLM, 1988a) a "No Wilderness" status was proposed for the Culp Canyon WSA, based upon the low quality of wilderness value and the potential for conflict with military use. The area is managed in accordance with the *Interim Management Policy and Guidelines for Lands under Wilderness Review*, whereby no impairing activities can occur that may permanently alter wilderness value.

The lands suggested for NCA designation are currently managed in accordance with the BLM's RMPA for McGregor Range (BLM, 1990a). Scoping comments suggested that the NCA be established to return full administration of the land to the DOI to allow the Secretary of the Interior and the BLM to showcase the customs and culture of the region. The public commentors envision the NCA as enhancing the protection and/or restoration of the historical, archaeological, paleontological, scientific, recreational, wildlife, and educational resources of the area and may include grazing as a traditional use of the land. Designation of this area as an NCA would follow congressional action and would require modifications of both the White Sands RMP and the McGregor Range RMPA because the configuration of McGregor Range would change from that described in the current plans. These modifications would be concurrent with or follow congressional action on the Army's application for renewal of the land withdrawal. This alternative has the potential to increase public access and use of the Culp Canyon WSA.

The existing grazing area (271,000 acres) would continue to be available for multiple uses, to the extent that the areas have productive value and would be managed in accordance with public land laws and congressional specifications for the NCA. Grazing would continue to take place in accordance with the specific decisions (Mc/G-1 through Mc/G-16) in the White Sands RMP (BLM, 1986a). These decisions provide objectives and procedures for the livestock grazing program that will take place on McGregor Range. Congressional designation of the current method of grazing would be helpful to solidify the legal aspects of the issue.

Under Alternative 6, the RMPA for McGregor Range (BLM, 1990a) and the White Sands RMP (BLM, 1986a) would be amended to reflect the NCA designation and associated management practices. The following summary outlines the establishment, uses, and management practices envisioned for the NCA.

- **Establishment.** Congress would establish the NCA in the State of New Mexico. This designation would recognize the NCA's historic landscape and showcase the custom and culture of the rural west. The NCA would be administered by the BLM and managed under the authority of FLPMA.

- **Uses.** The uses to be considered include, but are not limited to, all forms of outdoor recreation including scenic enjoyment, hunting, hiking, horse-back riding, camping, picnicking, watershed management, wildlife management, minerals development, preservation of ecological diversity, scientific study, and access.

- **Planning.** The Secretary of the Interior, in accordance with Section 202 of FLPMA, would prepare and implement a comprehensive long-range plan for the management, use, development, and protection of the public lands within the NCA. Such plan would take into account the principles of multiple use. The plan would be developed in consultation with the public and with the Advisory Committee (below). The plan would be completed within 3 years of congressional designation. The plan would be reviewed and re-evaluated periodically.

- **Water Rights.** Water rights from the Sacramento River and Carrisa Springs sufficient to support wildlife resources and grazing would be transferred to the BLM from the DoD for the purposes of supporting the objectives of the NCA.

- **Mining Claims.** Nothing in the congressional designation would affect the applicability of the U.S. mining laws, except that patents shall not be issued on any mining claim. All mining claims located on public lands within the NCA would be subject to such reasonable measures as the Secretary of the Interior may prescribe to effectuate the purposes of this act. Such measures would provide for protection of the functionality of the ecosystems present, and protect against undue impairment of other scenic, environmental, or social values.

- **Advisory Committee.** A committee would be established to advise on the establishment and implementation of the plan.

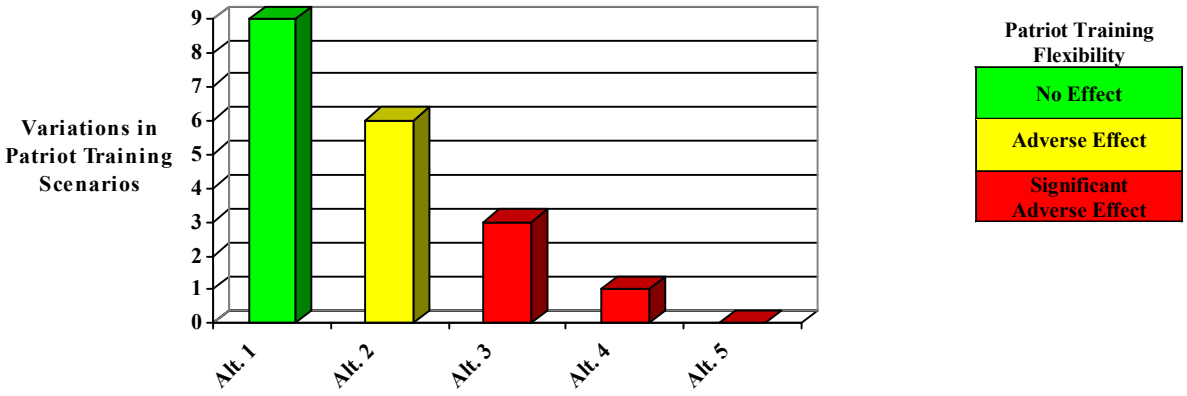
- **Land Acquisition.** State or local government lands could be acquired by purchase, exchange, or donation. DoD fee-owned lands would be exchanged for other public land since military use would be incompatible with the goals of the NCA.

The designation of the area as an NCA is not part of the Army's application for military land withdrawal, but could be a separate action affecting McGregor Range lands. The establishment of an NCA by Congress is outside the jurisdiction of the DoD and would be administered by the DOI. This LEIS, the purpose of which is to address the application for military withdrawal, does not address the impacts of wilderness and NCA designation in detail.

2.7 COMPARISON OF ALTERNATIVES BY RESOURCE AND POTENTIAL IMPACTS

Chapter 4.0 presents an analysis of the impacts resulting from each withdrawal renewal alternative. These alternatives range from the renewal of the land withdrawal as authorized in 1986 by PL 99-606 to the return of all currently withdrawn land to the public domain. Figure 2.7-1 illustrates the changes in military value as represented by general variations in Patriot training scenarios that can be incorporated into live-firing exercises under each withdrawal alternative. Alternative 6 would be similar to Alternatives 3, 4, and 5. However, fee-owned in-holdings would no longer be available for training use in areas returned to the public domain. The loss of the fee-owned land would result in greater loss of mission capability.

Table 2.7-1 provides a comparison of alternatives by resource and potential impact of the various configurations of McGregor Range. Impacts from reconfiguration of McGregor Range are indirect in the sense that activities on the land have the potential to impact the land rather than administrative changes in the withdrawal boundaries. Impacts to the current mission capability from reconfiguration of the military land withdrawal are shown on Table 2.7-2.



Note: Alternative 6, an NCA, could be designated in combination with Alternative 3, 4, or 5.

Figure 2.7-1. Military Training Value by Renewal Alternative.

Table 2.7-1. Comparison of Alternatives by Resource and Potential Impacts

Alternative 1	*Alternative 2*	*Alternative 3*	*Alternative 4*	*Alternative 5*	*Alternative 6*
Land Use					
Continued military use throughout McGregor Range.	Cessation of military ground operations on public lands in the Sacramento Mountains foothills; continuation of military aircraft training and training on fee-owned land.	Cessation of military ground operations on public lands in the Sacramento Mountains foothills and on Otero Mesa; continuation of military aircraft training and training on fee-owned land.	Cessation of military ground operations on public lands on Otero Mesa and north of New Mexico Highway 506; continuation of military aircraft training and training on fee-owned land.	Cessation of all military ground operations on McGregor Range, except in TA 8 and portions of TA 32; continuation of military aircraft training.	Same as Alternative 3, 4, or 5, except no military ground operations on fee-owned parcels in Sacramento Mountains foothills or on Otero Mesa.
Continuation of nonmilitary land uses, primarily grazing and recreation, on Otero Mesa and north of New Mexico Highway 506.	No substantive change in nonmilitary land uses.	No substantive change in nonmilitary land uses.	No substantive change in nonmilitary land uses.	Possible nonmilitary use of previously withdrawn portion of Tularosa Basin, consistent with safety restrictions.	Same as Alternative 3, 4, or 5.
Continued management of nonmilitary land use managed in accordance with the White Sands RMP, as amended by the McGregor Range RMPA.	Continued management of returned land and nonmilitary land use on withdrawn land in accordance with the White Sands RMP, as amended by the McGregor Range RMPA.	Continued management of returned land and nonmilitary land use on withdrawn land in accordance with the White Sands RMP, as amended by the McGregor Range RMPA.	Continued management of returned land and nonmilitary land use on withdrawn land in accordance with the White Sands RMP, as amended by the McGregor Range RMPA.	Continued management of returned land in accordance with the White Sands RMP, as amended by the McGregor Range RMPA.	Same as Alternative 3, 4, or 5.
Areas adjacent to McGregor Range are affected by noise from military operations and periodic closures of New Mexico Highway 506.	No change in impact to adjacent land uses.	Reduction in impacts to adjacent land areas from noise and closures of New Mexico Highway 506.	Reduction in impacts to adjacent land areas from noise; elimination of New Mexico Highway 506 closures.	Reduction in impacts to adjacent land areas from noise; elimination of New Mexico Highway 506 closures.	Same as Alternative 3, 4, or 5.
Use of McGregor Range consistent with Visual Resource Management (VRM) objectives.	No change to visual resources.	No change to visual resources.	No change to visual resources.	No change to visual resources.	No change to visual resources.

Table 2.7-1. Comparison of Alternatives by Resource and Potential Impacts (Continued)

Alternative 1	*Alternative 2*	*Alternative 3*	*Alternative 4*	*Alternative 5*	*Alternative 6*
Airspace					
Civil aircraft prohibited from traversing McGregor Range when restricted airspace is activated.	No change in airspace impacts.	No change in airspace impacts.	No change in airspace impacts.	No change in airspace impacts.	No change in airspace impacts.
Transportation					
New Mexico Highway 506 periodically closed for HIMAD firings.	Little to no change in closures of New Mexico Highway 506.	Reduction in closures of New Mexico Highway 506.	Elimination of New Mexico Highway 506 closures.	Elimination of New Mexico Highway 506 closures.	Same as Alternative 3, 4, or 5.
Civilian traffic on U.S. Highway 54 occasionally impeded by military traffic.	No change in impacts to traffic on U.S. Highway 54.	No change in impacts to traffic on U.S. Highway 54.	No change in impacts to traffic on U.S. Highway 54.	Reduction in effects on civilian traffic on U.S. Highway 54.	Same as Alternative 3, 4, or 5.
Utilities					
Utilities consumption to support military operations and construction at various locations on McGregor Range.	No change in utilities consumption.	Little to no change in utilities consumption.	Little to no change in utilities consumption.	Utilities consumption for military activities on McGregor Range limited to McGregor Range Camp and TA 8, and portions of TA 32.	Same as Alternative 3, 4, or 5.
Solid waste and nonhazardous scrap metal from military operations managed in accordance with applicable laws, regulations, and Army procedures.	No change in nonhazardous waste impacts.	Reduction in nonhazardous scrap metal generated by air-to-ground training on Otero Mesa.	Reduction in nonhazardous scrap metal generated at tactical target complex on Otero Mesa and Class C bombing range.	Reduction in nonhazardous waste generation by military operations at McGregor Range.	Same as Alternative 3, 4, or 5.

Table 2.7-1. Comparison of Alternatives by Resource and Potential Impacts (Continued)

Alternative 1	*Alternative 2*	*Alternative 3*	*Alternative 4*	*Alternative 5*	*Alternative 6*
Earth Resources					
McGregor Range is withdrawn from mining and mineral leasing laws. Development of saleable minerals and leasable resources is possible in areas designated in RMPA.	29,000 acres no longer withdrawn from mining and mineral leasing laws. Army permission no longer required to develop saleable minerals and leasable resources in those areas.	169,000 acres no longer withdrawn from mining and mineral leasing laws. Army permission no longer required to develop saleable minerals and leasable resources in those areas.	233,000 acres no longer withdrawn from mining and mineral leasing laws. Army permission no longer required to develop saleable minerals and leasable resources in those areas.	McGregor Range no longer withdrawn from mining and mineral leasing laws. Army permission no longer required to develop saleable minerals and leasable resources.	Same as Alternative 3, 4, or 5.
Military and nonmilitary activities affect soils susceptible to erosion.	No change in soils erosion impacts.	Reduction in erosion due to military activities on Otero Mesa.	Reduction in erosion due to military activities on Otero Mesa and Tularosa Basin north of New Mexico Highway 506.	Reduction in erosion due to military activities; potential increase in erosion from clean-up activities and grazing in Tularosa Basin.	Same as Alternative 3, 4, or 5.
Air Quality					
Temporary air quality impacts from fugitive dust and military vehicle and aircraft emissions.	No change in air quality impacts.	Slight reduction in fugitive dust and vehicle emissions on Otero Mesa. Reduction in emissions from aircraft using tactical target complex under Alternatives 1 and 2.	Slight reduction in fugitive dust and vehicle emissions on Otero Mesa. Reduction in emissions from aircraft using tactical target complex and Class C bombing range under Alternatives 1 and 2.	Reduction of fugitive dust and vehicle and aircraft emissions in northern Tularosa Basin and on Otero Mesa.	Same as Alternative 3, 4, or 5.
Water Resources					
Water from Sacramento River and Carrisa Springs used for wildlife and livestock.	No change in water used for wildlife and livestock.	No change in water used for wildlife and livestock.	No change in water used for wildlife or livestock.	No change in water used for wildlife or livestock.	Same as Alternative 3, 4, or 5.
Municipal water sources consumed to support military requirements on McGregor Range.	No change in military water consumption.	No change in military water consumption.	No change in military water consumption.	Reduction in municipal water consumption for military use other than McGregor Range Camp and Meyer Range.	Same as Alternative 3, 4, or 5.

Table 2.7-1. Comparison of Alternatives by Resource and Potential Impacts (Continued)

Alternative 1	*Alternative 2*	*Alternative 3*	*Alternative 4*	*Alternative 5*	*Alternative 6*
Potential development of geothermal water sources.	No change in potential development of geothermal resources.	No change in potential development of geothermal resources.	No change in potential development of geothermal resources.	No change in potential development of geothermal resources.	Same as Alternative 3, 4, or 5.
Biological Resources					
Vegetation, wetlands and arroyo-riparian drainages, wildlife, and sensitive species may be impacted by military activities that result in ground disturbance and fires.	29,000 acres no longer subject to impacts from military activities on vegetation, wetlands and arroyo-riparian drainages, wildlife and sensitive species.	169,000 acres no longer subject to ground disturbance impacts from military activities to vegetation, wetlands and arroyo-riparian drainages, wildlife and sensitive species. There would be fewer potential impacts from fire.	233,000 acres no longer subject to ground disturbance impacts from military activities to vegetation, wetlands and arroyo-riparian drainages, wildlife, and sensitive species. There would be less impacts from fire.	Impacts to vegetation, wetlands and arroyo-riparian drainages, and wildlife from military activities outside of TA 8 and portions of TA 32 would be eliminated. Impacts from grazing on previously ungrazed lands could increase	Same as Alternative 3, 4, or 5.
Cultural Resources					
Potential for impacts to archaeological, architectural, and other cultural resources from military and nonmilitary ground disturbance.	Impacts from military activities to archaeological, architectural, or other cultural resources on 29,000 acres would cease.	Impacts from military activities to archaeological, architectural, or other cultural resources on 169,000 acres would cease.	Impacts from military activities to archaeological, architectural, or other cultural resources on 233,000 acres would cease.	Impacts from military activities to archaeological, architectural, or other cultural resources outside of TA 8 and portions of TA 32 would cease.	Same as Alternative 3, 4, or 5.
Socioeconomics					
Beneficial effect on local economy from military employment and purchases.	No change in socioeconomic effects.	No change in socioeconomic effects.	No change in socioeconomic effects.	Minor reduction in military employment and purchases.	Minor to no change in military employment and purchases.
Environmental Justice					
No disproportionately high or adverse effects on minority or low-income populations.	No change in environmental justice impacts.	No change in environmental justice impacts.	No change in environmental justice impacts.	No change in environmental justice impacts.	No change in environmental justice impacts.

Table 2.7-1. Comparison of Alternatives by Resource and Potential Impacts (Continued)

Alternative 1	*Alternative 2*	*Alternative 3*	*Alternative 4*	*Alternative 5*	*Alternative 6*
Noise					
Noise from military operations and aircraft flights is within land use compatibility guidelines.	No change in noise impacts.	Reduction in aircraft noise associated with tactical target complex.	Reduction in aircraft noise associated with tactical target complex and Class C bombing range.	Reduction in aircraft noise associated with target complexes and missile firings.	Same as Alternative 3, 4, or 5.
Safety					
Low level of ground, flight, and explosive safety risks associated with military operations.	No change in safety risks.	Slight reduction in ground and explosive safety risks from military vehicles and air-to-ground operations on Otero Mesa.	Slight reduction in ground and explosive safety risks from military vehicles and air-to-ground operations on Otero Mesa and north of New Mexico Highway 506.	Reduction in safety risks from military operations on returned lands. Increased potential for public exposure to ordnance and explosive safety risks in portions of Tularosa Basin.	Same as Alternative 3, 4, or 5.
Hazardous Materials and Other Items of Special Concern					
Hazardous waste from military operations would continue to be managed in accordance with applicable laws, regulations, and Army procedures.	No change in hazardous waste impacts.	No change in hazardous waste impacts.	No change in hazardous waste impacts.	Reduction in hazardous waste generation by military operations at McGregor Range.	Same as Alternative 3, 4, or 5.

Table 2.7-2. Military Mission Consequences

Mission Capability [1]	*Alternative 1*	*Alternative 2*	*Alternative 3*	*Alternative 4*	*Alternative 5*	*Alternative 6*
Weapons Firing						
Patriot/HIMAD	**No effect**	**-33%**	**-89%**	**-89%**	**-100%**	**-89 to 100%**
Small Missiles						
McGregor Launch Complex	**No effect**	**No effect**	**No effect**	**No effect**	**-100%**	**-89 to 100%**
SHORAD Range Operations	**No effect**	**Training Modification Required**	**Training Modification Required**	**Training Modification Required**	**-100%**	**Training Modification Required**
Orogrande Range Operations	**No effect**	**Training Modification Required**	**Training Modification Required**	**Training Modification Required**	**-100%**	**Training Modification Required**
Small Arms						
Meyer Range	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**
Test Operations						
Laser Operations						
Orogrande Range	**No effect**	**Test Modification Required**	**Test Modification Required**	**Test Modification Required**	**-100%**	**Test Modification Required**
Missile System Components						
Orogrande Range: ADATD Operations	**No effect**	**Test Modification Required**	**Test Modification Required**	**Test Modification Required**	**-100%**	**-100%**
SHORAD Range Operations	**No effect**	**No effect**	**No effect**	**No effect**	**-100%**	**No effect**
McGregor Launch Complex	**No effect**	**No effect**	**No effect**	**No effect**	**-100%**	**No effect**
Surface Impact						
MLRS	**No effect**	**No effect**	**No effect**	**Training Modification Required**	**-100%**	**No effect**
Air-to-ground						
Otero Mesa Site	**No effect**	**No effect**	**-100%**	**-100%**	**-100%**	**-100%**
Class C Bombing Range	**No effect**	**No effect**	**No effect**	**-100%**	**-100%**	**No effect**
Off-road Vehicle Maneuver						
TA 8	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**
On-road Vehicle Maneuver	**No effect**	**-6%**	**-26%**	**-35%**	**-100%**	**-26%**
Controlled Access FTX	**No effect**	**No effect**	**-48%**	**-57%**	**-100%**	**-48 to –100%**
Dismounted Training	**No effect**	**-6%**	**-26%**	**-35%**	**100%**	**-26%**
Aircraft Operations						
Fixed-wing Air-to-air	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**
Rotary-wing NOE	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**	**No effect**

[1] Impacts to mission capability are presented as the percentage change in training scenarios, land acreage available, or qualitatively as to requirements to modify training or test programs.

No Effect	Adverse Effect	Significant Adverse Effect

This Page Intentionally Left Blank

Fort Bliss Training Area Land Use Color Coding Matrix

Training Area Land Use Category	Fort Bliss Training Categories (Table 2.0-1)											
	1	2	3	4	5	6	7	8	9	10	ENV*	PA**
	Mission Support Facility	Weapons Firing	Surface Impact	SDZ/Safety Footprint	Off-Road Vehicle Maneuver	On-Road Vehicle Maneuver	Controlled Access FTX	Dismounted Training	Aircraft Operations	Built-up Areas	Conservation	Public Access
A		●		●	●	●		●	●		●	●
A with Mission Facilities	●	●		●	●	●		●	●		●	●
B					●	●		●	●		●	●
B with Mission Facilities	●				●	●		●	●		●	●
C		●		●		●	●	●	●		●	●
C with Mission Facilities	●	●		●		●	●	●	●		●	●
D		●		●		●		●	●		●	○
D with Mission Facilities	●	●		●		●		●	●		●	
E				●		●	●	●	●		●	●
F				●		●		●	●		●	○
G				●				●	●		●	●
H			●						●			
I	●			●		●			●	●	●	●

McGEIS 110a.dg.10.22.98

● Training Category Occurs in Land Use - Uses May Not Be Concurrent
○ Public Access on Some Areas
* Environmental Management
** Public Access

Affected Environment

3.0

3.0 AFFECTED ENVIRONMENT

The existing environmental conditions for McGregor Range are presented in this chapter. The baseline year for the information presented in this section is 1996. The information is used to identify and evaluate environmental changes resulting from the proposed alternatives. The regions of influence (ROIs) vary, as dictated by the resources under consideration. The environmental resources discussed in this chapter include land use, airspace use, transportation, utilities, earth resources, air quality, water resources, biological resources, cultural resources, socioeconomics, environmental justice, noise, safety, and hazardous materials and items of special concern.

GEOGRAPHIC SETTING

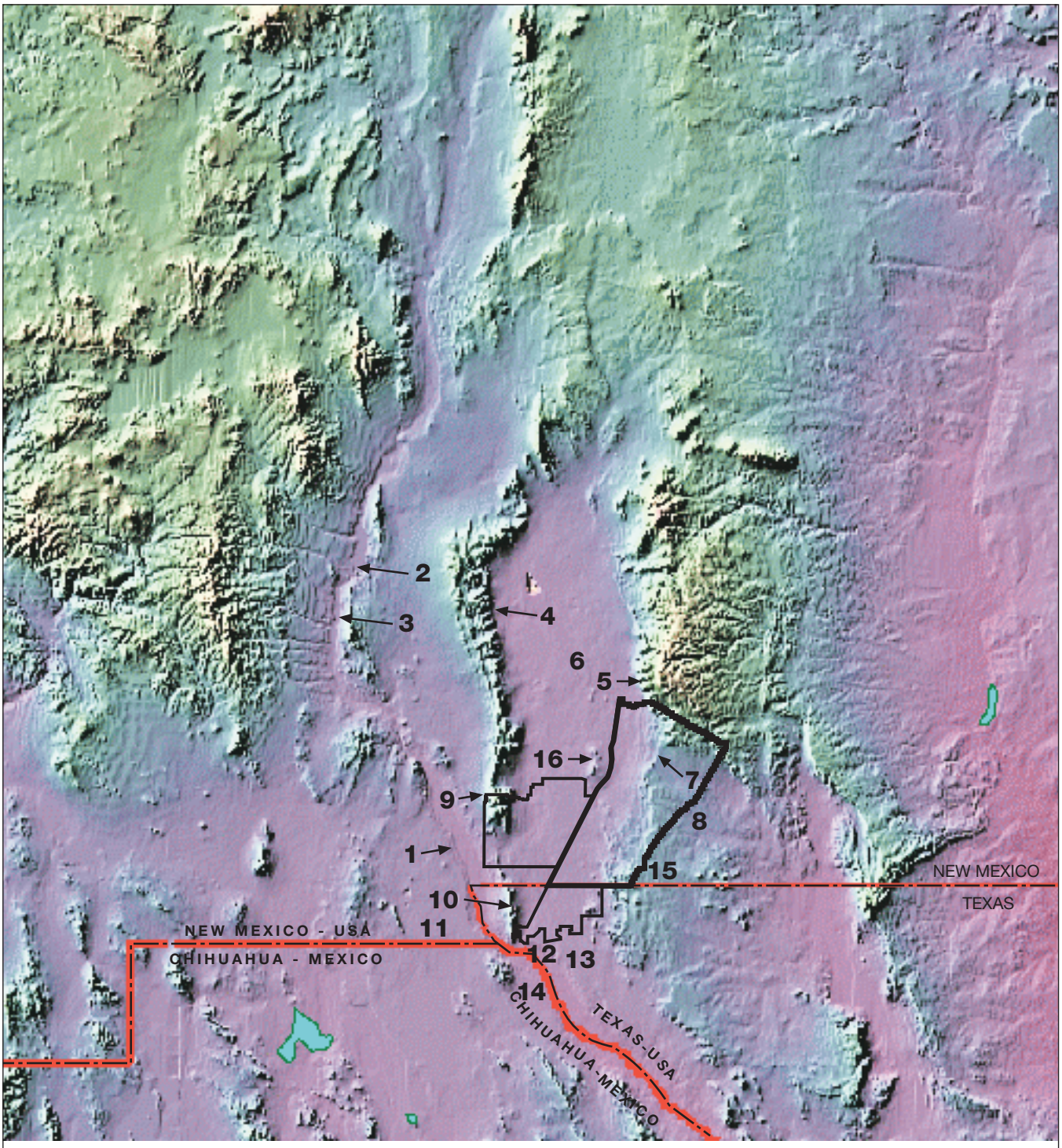
The Fort Bliss installation encompasses 1.12 million acres within portions of two states and three counties in the western-most part of Texas and in south central New Mexico, as shown in Figure 1.2-1. At its greatest extent, it is approximately 70 miles from north to south (trending north-northeast) and approximately 50 miles from east to west. McGregor Range (697,472 acres) is located in Otero County, New Mexico, and the rest of the installation is predominately located in portions of Doña Ana County, New Mexico, and El Paso County, Texas. The primary population centers in the area include Alamogordo and Las Cruces, New Mexico; El Paso, Texas; and Ciudad Juarez, Republic of Mexico. The main cantonment of Fort Bliss, where most mission support, logistic, administrative, and community functions are concentrated, is surrounded by the City of El Paso, Texas, and falls within the El Paso Standard Metropolitan Statistical Area.

McGregor Range is one of the outlying training areas of the Fort Bliss installation and is located north of the Main Cantonment Area. Other outlying training areas include the South Training Areas in El Paso County, Texas, and the Doña Ana Range–North Training Areas within Otero and Doña Ana counties, New Mexico. Areas surrounding the training areas include privately owned lands, public domain lands managed by the BLM, state-owned land, Lincoln National Forest, and WSMR.

Elevations on McGregor Range are from about 4,000 feet above mean sea level (MSL) along the western boundary to over 7,000 feet above mean sea level in the Sacramento Mountains on the northeast (U.S. Army, 1977). The terrain of McGregor Range is spread across the Hueco Mountains, Otero Mesa, the Sacramento Mountains foothills, and the Tularosa Basin. Figure 3.0-1 portrays the physiographic features of the area surrounding McGregor Range.

CLIMATE

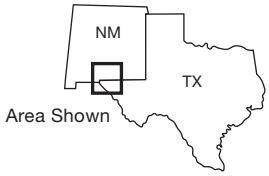
McGregor Range and Fort Bliss are located in the northern Chihuahuan Desert and have a semi-arid to arid, subtropical desert climate characterized by low rainfall, relatively low humidity, hot summers, moderate winters, wide temperature variations, and an abundance of sunshine throughout the year. Records of the weather in the area near Oro Grande, New Mexico, have been kept since 1905 indicate that the area has an average annual precipitation of 10.2 inches (National Oceanic and Atmospheric Administration [NOAA], n.d.). Precipitation averages 8 to 10 inches at lower elevations, and increases to 16 inches or more in the mountain foothills. As a part of BLM studies of McGregor Range, 16 rain gauges were established in 1971 and are read monthly (BLM, 1980). More than one-half of the total average annual precipitation occurs during the months of July, August, and September. During these months, brief but heavy rainstorms frequently cause localized flooding. A small percentage of annual precipitation falls in the form of snow. Periods of extreme dryness lasting up to several months are not unusual.



Fort Bliss Boundary
McGregor Range Boundary

1	Rio Grande	9	Organ Mountains
2	Elephant Butte Reservoir	10	Franklin Mountains
3	Caballo Reservoir	11	Mesilla Bolson
4	San Andres Mountains	12	El Paso
5	Sacramento Mountains	13	Hueco Bolson
6	Tularosa Basin	14	Ciudad Juarez
7	Otero Mesa Escarpment	15	Hueco Mountains
8	Salt Basin	16	Jarilla Mountains

Source: Photographic image copyright © 1995 by Johns Hopkins University, Applied Physics Laboratory, used with permission. http://fermi.jhuapl.edu/states/maps1/nm.gif



McGEIS 111.vb.2.26.99

Figure 3.0-1. Physiographic Features of the Area Surrounding McGregor Range.

Temperatures are generally warm, ranging from highs in the mid-50 degrees Fahrenheit (°F) during the winter months to highs above 90°F during the summer. The annual temperature averages 62°F at lower elevation stations and decreases about 4°F for each 1,000-foot increase in elevation (BLM, 1980).

Daytime humidity is generally low, ranging from 10 to 14 percent. Because of the mountainous terrain and the Rio Grande Valley, there are diurnal and locational fluctuations in humidity. Typical of the desert climate, rapid cooling from nighttime re-radiation causes increases in relative humidity during the night. Average daily relative humidity increases to about 40 percent at midnight and to 51 percent by 6:00 a.m.

Wind speeds in the McGregor Range area have an annual average of 8.5 miles per hour (mph) (Western Regional Climate Center, 1998). Stronger winds (up to 30 mph or more) are common, especially in the Spring when dust storms are frequent (BLM, 1980). From October through February, average wind speeds range from 8.2 to 9 mph and are predominantly from the north. The combination of moderately strong sustained winds and the low average precipitation contribute considerably to the occurrence of dust and sand storms in the area. During the summer months, average wind speeds drop to their lowest levels of the year (less than 8 mph). The predominant wind direction during the summer months is from the south-southwest. Wind speeds vary at different locations and strong gusts well above the average wind speed are known to occur at some locations.

A combination of abundant sunshine, high temperatures, low relative humidity, and continuous winds results in an evaporative rate that is more than 10 times the amount of annual precipitation. The annual evaporation, as measured by a U.S. Weather Bureau Class A evaporation pan over a 4-year period, is 108.15 inches (Knowles and Kennedy, 1956).

Land Use

3.1

3.1 LAND USE

This section presents land use information for McGregor Range and, to some extent, the Fort Bliss installation. The ROI for land use includes areas adjacent to the McGregor Range boundaries in Otero and Doña Ana counties, New Mexico, and El Paso County, Texas.

3.1.1 Land Resources and Management of McGregor Range

McGregor Range is part of the Fort Bliss installation, which is comprised of about 1.12 million acres (Table 3.1-1). Ninety-nine percent of the 1.12 million acres is used as training and impact areas supporting military training activities. Also included in the Fort Bliss Training Complex are Doña Ana Range–North Training Areas, located in Otero and Doña Ana counties, in New Mexico, and the South Training Areas in El Paso County, Texas (see Figure 1.2-1). Castner Range, also located in El Paso County, Texas, is no longer an active training range. With the exception of the impact area on Doña Ana Range–North Training Areas, all active areas used for training activities are divided into numbered training areas. These are designated numerically (e.g., TA 2A, TA 13) for the purpose of specifying geographical locations for mission activities. Surrounding areas are predominantly open, undeveloped rangeland used for cattle ranching and some dispersed recreation.

Table 3.1-1. Acreage of Fort Bliss Installation Components

Area	*Acres*
Main Cantonment	10,965
Doña Ana Range–North Training Areas	297,006
McGregor Range	697,472
South Training Areas	104,042
Castner Range	7,040
Castner Recreation Area	70
Total	*1,116,595*

As part of the land withdrawal renewal process, a *Land Use Study* (U.S. Army, 1998e) has been prepared that describes the land management framework for the current withdrawn area. The study identifies current land uses and users and assesses effects of proposed uses on existing and potential resource use. This section presents information on current land status and management, existing uses and users, special use areas, and summary of compatibility of land uses on McGregor Range with surrounding areas.

3.1.1.1 Land Status

McGregor Range is comprised of 697,472 acres owned by the U.S. Government. Of this, 71,083 acres are military acquired land owned in fee by the Army. Under the MLWA of 1986 (PL 99-606) 608,385 acres of public land were withdrawn for military use. In addition, 18,004 acres of USFS-managed land are used through cooperative agreement as a safety buffer and for ground troop maneuvers. Table 3.1-2 summarizes land status acreage for McGregor Range, and Figure 1.2-2 illustrates the general land status of McGregor Range.

The Army has annual rights to about 110,000 gallons per day (gpd) of water from the Sacramento River and Carrisa Springs for preservation of fish and wildlife (U.S. Army, 1998f). All mineral rights on withdrawn public land and Army fee-owned land are managed by the BLM, with Army concurrence regarding consistency with military missions. The Sacramento River also supplies water to the community of Oro Grande.

Table 3.1-2. Land Status of McGregor Range

Owner	*Acres*[1]
Withdrawn Land (PL 99-606)	608,385
Army-owned throughout withdrawn area	69,723
USFS	18,004
Army-owned within National Forest	1,360
Total	*697,472*

[1] Rounded to nearest whole number.
[2] State lands acquired by BLM in 1992.

The State of New Mexico owns a right-of-way (ROW) for New Mexico Highway 506, but Otero County maintains the highway. The public ROW was grandfathered in when the FLPMA was passed in l976, because it adopted the authority granting public access under the older mineral law, RS2477 (Creager, 1996). In addition, a ROW for a 345 kilovolt (kV) electric power line, held by El Paso Power Company until the year 2036, traverses McGregor Range north of New Mexico Highway 506. El Paso Electric Company (EPEC) holds a natural gas pipeline ROW in the south part of the range until the year 2009.

3.1.1.2 Land Management

In 1986, BLM adopted the White Sands RMP. This plan sets the basic management framework for all lands within the resource area, including McGregor Range, which is within the resource area.

Under the MLWA, the Secretary of the Interior manages nonmilitary uses of the withdrawn lands on McGregor Range, including recreation, wildlife habitat management, and grazing, with approval from the Army. However, the Secretary of the Army has the authority to limit nonmilitary uses and public access to the range for the purpose of military operations, public safety, or national security. The BLM (Las Cruces Field Office) manages daily nonmilitary uses of McGregor Range within the parameters defined by the 1990 MOU.

In accordance with the MLWA and Section 202 of the FLPMA (PL 94-579) of 1976, the BLM prepared an amended RMP for McGregor Range and adopted the RMPA in 1990. BLM also entered into a MOU as specified by PL 99-606, between the Secretary of the Interior and the Secretary of the Army in 1990 to implement the amended plan. The RMPA includes management objectives for lands, realty, and access; mineral resources; soil, water, and air; livestock grazing; wildlife and habitat management; recreation; visual resources; wilderness; cultural resources; and fire management. Army-owned lands within the range boundary are included in the RMPA land area for overall resource planning where appropriate. For example, the planning area for wildlife or livestock management functions includes Army-owned property that is functionally indistinguishable from adjacent withdrawn land. However, planning of realty actions is confined to lands under the owning agency. A description of the BLM's overall land management planning process, and specific management objectives and planned actions for McGregor Range is provided in Chapter 3 of the *McGregor Range, New Mexico, Land Withdrawal Renewal Land Use Study* (U.S. Army, 1998e).

The USFS manages portions of Lincoln National Forest within McGregor Range under the *Lincoln National Forest Plan* (USFS, 1986). These lands fall within Management Area 2C, known as the "Grapevine" area. All resources in this area are managed at a low level, with an emphasis on preserving soil productivity.

All activities and access on McGregor Range are controlled by the Army in accordance with the *Standard Operating Procedures (SOPs) for Weapons Firing and Maneuver Area Use* (U.S. Army 1996b). The

SOP prescribes the general safety requirements and procedures for users of the training areas and ranges. All persons are required to coordinate access and use with the Range Commander (through the Range Development and Enforcement Office) to ensure safety and to avoid interference with military missions. This procedure applies to government employees, contractors, and the public at large. Current access procedures allow concurrent use of some areas for a military mission or Army and BLM maintenance and resource survey activities, with public recreational use. Members of the public must obtain annual recreation access permits from either the Army or the BLM. Approximately 1,000 to 1,700 recreation permits are issued annually for purposes such as hunting, hiking, nature conservation interests, and guided nature tours. Permit holders are responsible for complying with specific procedures for entry, use, and departing the range (Bankston, 1997).

The Army currently uses the Army ITAM program as a tool for monitoring vegetative cover impacts from different mission activities. Various elements of this program provide information about land condition trends, land rehabilitation characteristics, and training requirements using digital geographic information system (GIS), allowing selection of training locations that will require the minimum of cost for land restoration and environmental compliance. On McGregor Range, the INRMP applies to Army fee-owned land and managing impact of military missions on withdrawn public land, as specified in the BLM/Army MOU (Appendix A). The BLM retains management for public access uses on withdrawn and Army fee-owned land as enumerated in the FLPMA PL 99-606 and the McGregor Range RMPA (BLM, 1990a).

17

3.1.2 Land Uses and Land Users on McGregor Range

Within McGregor Range are facilities, equipment, and infrastructure for specific military activities. Most of the land area is used for a variety of overlapping military and nonmilitary uses (including ground maneuvers, safety zones, recreation and hunting, grazing and natural resource field surveys).

3.1.2.1 Military Use

Conceptual plans for current and future military use of the McGregor Range training areas have been translated into a land use planning framework in the TADC (U.S. Army, 1998d). This process and the resultant description of current training area use are presented in Chapter 2. Ten mission and training activities, and environmental conservation and public access uses were identified and grouped into nine training area land use categories (Table 2.1-1) that reflect the layering and mix of activities and uses that occur in the training areas. Most categories share several similar uses, and are differentiated by additional mission activities. For example, most categories include use for SDZs, aircraft operations, and dismounted training, but only some areas are used for field training activities, off-road vehicle maneuvering, or weapons firing.

Figure 2.1-1 illustrates projected training area use on McGregor Range. The primary distinguishing military mission on McGregor Range is air defense missile training including live firing and systems testing, made possible by the extensive land area. The Tularosa Basin portions of McGregor Range are used extensively for firing short-range missiles, and the entire range for HIMAD missiles. These missile types impact their targets in mid-air and consequently do not have designated impact areas on the ground. Instead, they have SDZs that are used during firings within which access is temporarily restricted, and debris is deposited. Figure 2.1-2 illustrates the safety zones associated with the Patriot and its targets currently fired on McGregor Range. Consequently, most land use categories include use as a SDZ during intermittent missile firings. Most of the major support facilities for these activities are located in the south part of the range near McGregor Range Camp in TA 32, at the SHORAD Range in TA 30, and at the Orogrande complex in TA 29.

Areas within the Tularosa Basin are used for weapons firing, and associated safety zones. Impact areas are less extensive and are directly associated with targets for specific firing locations. An exception to this use is the southwest corner of the range where no weapons firing occurs and limited off-road wheeled and tracked vehicle maneuvering is permitted. No other part of McGregor Range is used for off-road vehicle operations other than the limited movement into and within controlled access FTX sites. With the exception of controlled access FTX sites, military activities on Otero Mesa and escarpment, and north of New Mexico Highway 506 are limited to intermittent use as SDZs, for dismounted training (by foot soldiers), and on-road vehicle maneuvers. Most of these sites are located on Otero Mesa, with a few in the Tularosa Basin. Built-up areas are associated with McGregor Range Camp, and the SHORAD and Orogrande complexes. Except for impact areas and built-up areas, conservation activities occur throughout McGregor Range.

Locations of major facilities, equipment, and general infrastructure supporting military uses on McGregor Range are indicated in Figure 3.1-1. The primary military activities conducted are briefly described below.

McGregor Range Camp supports a variety of mission support functions including administrative, troop housing, training, and storage of equipment. Enlisted barracks capacity for transient and permanent personnel is 1,154. Mobilization capacity is 1,154 for enlisted personnel and 66 for officers. Range Control functions are located at Davis Dome, about 1 mile east of the range camp. A series of firing locations for HIMAD and short range air-to-ground missiles are located about 1 to 2 miles north and east of McGregor Range Camp.

Aerial gunnery missions are conducted by helicopters at Cane Cholla Aerial Gunnery Range in TA 32 (about 3 miles northwest of the range camp) and by fixed-wing aircraft at a Class C Bombing Range north of New Mexico Highway 506 in TA 11. Other air missions include paradrops at drop zones and Wilde Benton landing strip and low-altitude tactical navigation by helicopters in specified areas.

Small missiles (such as Stinger) are fired from SHORAD complex, and target drones and laser operations are conducted at Orogrande complex.

Small arms training is concentrated at Meyer Range in the southernmost part of McGregor Range. Activities at this complex can occur simultaneously with most other uses.

Ground troop maneuvers are conducted throughout McGregor Range except in TAs 28, 33, and Culp Canyon WSA which require special approval, and TA 31 where it is prohibited except at the existing controlled access FTX site. The varied terrain of the Sacramento Mountains foothills, including Culp Canyon and co-use areas within the Lincoln National Forest, offer good training environments for on-foot training.

Each year, Roving Sands FTX is conducted during spring or early summer for about 2 weeks, using most of the range for a variety of air and ground activities. Twenty-five controlled access sites, each about 0.4 square miles, are located throughout McGregor Range. These are used during exercises by air defense units. These areas have undergone environmental evaluation and clearance. Not all sites are used every year, thus allowing recovery of disturbed areas.

Overall, the highest level of military use is concentrated in the Tularosa Basin portions of McGregor Range, south of New Mexico Highway 506. This is attributable to almost daily use of facilities (Figure 3.1-1) in TAs 32, 30, and 29. The Class C Bombing Range in TA 11 is used for air-to-ground bombing practice by HAFB units. Most military use of Otero Mesa and areas north of New Mexico Highway 506

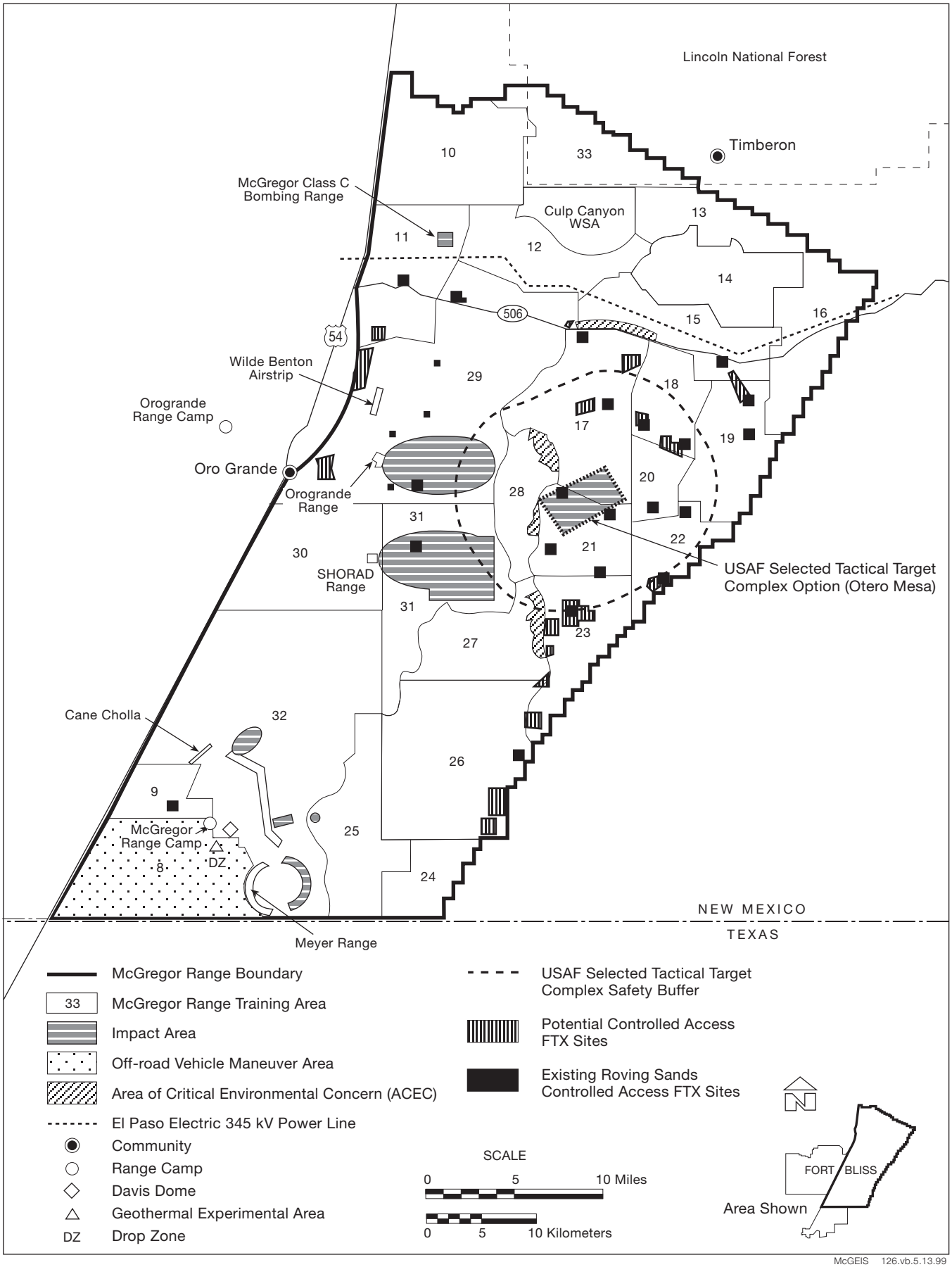


Figure 3.1-1. Location of Existing and Potential Future Major Facilities on McGregor Range.

(TAs 12 through 23, and 33) is intermittent, during periodic HIMAD missile firing programs, and Roving Sands. This same area is heavily scheduled by the Army for training and maintenance including road repairs, and environmental management activities, such as habitat conservation and rehabilitation, and biological and archeological studies and surveys. These activities account for over half of the scheduled use of Otero Mesa and the Sacramento Mountains foothills. Under current procedures, they do not preclude concurrent use by the general public.

3.1.2.2 Nonmilitary Use

In addition to military use of McGregor Range, the withdrawal action (PL 99-606) designated the DOI as the natural resource manager as per the FLMPA, including the continuation of grazing, protection of wildlife and wildlife habitat, control of predatory animals, and recreation, to the extent that they do not conflict with the military mission. It also provided for prevention and suppression of nonmilitary-caused fires by BLM. The following paragraphs summarize nonmilitary users and uses of resources on McGregor Range.

Access and ROWs. Easements and ROWs on land within McGregor Range are used for regional and local infrastructure. New Mexico Highway 506 crosses the north end of the range, providing access from U.S. Highway 54 to small communities and ranches on the north and east side of the range. Permits are not required to use this roadway. However, the Army restricts access along the route when military operations may cause unsafe conditions. At these times, three access points are manned by Fort Bliss civilian personnel and/or military police for the duration of the closure. The highway is usually closed for portions of 2 or 3 days each week during missile firings from September through November, and for portions of each day during a 2-week period following Roving Sands. A closure schedule is distributed to local ranchers and the Fire Department in the community of Timberon every week. Road closure details for 1996 may be found in Appendix B.

EPEC has a ROW for a high voltage (345 kV) electric transmission line across the north end of McGregor Range. ROWs are not required for infrastructure constructed by the Army within McGregor Range, such as telephone or utility distribution lines. However, ROWs are needed for new telephone or utility lines originating off-range that enter onto the range. ROW applications on withdrawn land are generally processed and granted by BLM with Army concurrence (Creager, 1996).

U.S. Border Patrol holds a ROW (NM90666) for relocation of a check point the northwest entrance where New Mexico Highway 506 intersects U.S. Highway 54 and a ROW (NM90665) for drag roads in the vicinity. The *EA for the Construction of Drag Roads near the U.S. Highway 54 Border Patrol Checkpoint, Otero County, New Mexico* resulted in a Finding of No Significant Impact (FONSI). The FONSI was issued by the U.S. Border Patrol and JTF-6 in 1993. The EA analyzed the impacts of a network of drag roads to be installed around the U.S. Highway 54 checkpoint station at the intersection of New Mexico Highway 506. The FONSI states that the planned action would result in only minor or temporary impacts on vegetation, air quality, and noise levels. Based on the results of the analyses presented in the EA, the action would not have a significant effect on the human environment (U.S. Army, 1993d). A network of drag roads totaling 28 miles in length was constructed in 1994 around the Border Patrol checkpoint at the intersection of U.S. Highway 54 and New Mexico Highway 506. Existing roads and ROWs, approximately 13 miles, were regraded for use as drag roads. Where existing roads did not exist, approximately 15 miles of 15-foot-wide dirt roads were constructed. These roads are maintained by the Border Patrol. Any additional specific proposals or uses in the future, that could affect roadway access, would need to be reviewed and approved by BLM. The BLM would need Army concurrence before approving new uses that might affect military activities on withdrawn land.

19

Energy and Minerals. Under PL 99-606, the withdrawn lands of McGregor Range were withdrawn from use under the mining laws, mineral leasing, and geothermal leasing laws. As such, under the RMPA, McGregor Range is closed for locatable minerals but re-evaluated periodically to see if any areas can be opened. About 100,000 acres are open for oil and gas, and geothermal leasing and 287,360 acres are open for salable materials. Any application to BLM for exploration, extraction, or production of locatable minerals (such as gold, zinc, copper), salable minerals (such as sand and gravel), and leasable minerals (such as oil, gas, and geothermal resources) on withdrawn land, would have to be approved by the Army prior to BLM's processing and granting the application.

A recent gas discovery to the east of McGregor Range has prompted oil companies to express interest to the BLM regarding future exploration on McGregor Range (Sanders, 1998), however, there has been no formal request for exploration on McGregor Range to date. Any future use for oil and gas exploration on withdrawn land would need to be approved by the Army.

A recent assessment of mineral and energy resources on McGregor Range was conducted jointly by staff of the New Mexico Bureau of Mines, New Mexico State University, and TRC Mariah Associates, Inc. (U.S. Army, 1998g). Currently the U.S. Army is exploring opportunities to use geothermal resources in the south part of McGregor Range. Additional information on mineral and energy resources and potential is provided in Section 3.5.

Water Use. Water used on McGregor Range to support military activities is primarily supplied from a public purveyor to McGregor Range Camp. Some groundwater sources are used periodically during construction projects for dust control. The Army holds a water right that entitles them to use up to 110,000 gallons per day from surface water sources. Water from this source is also used for domestic use in the small community of Oro Grande on the west side of McGregor Range. The water right is for fish and wildlife. However, the tanks filled from this supply are also used by livestock. Water is also collected in earthen tanks for use by wildlife and livestock.

20

Grazing. A long history of grazing throughout the area is closely tied to early settlement of the southwest. Originally, settlers generally established a formal claim for land around a spring where a homestead would be built, and cattle would graze on surrounding unclaimed public domain areas, as was the practice in Mexico. Several presidents supported colonization and liberal sales and grants of settled areas to the land users. By the end of the nineteenth century, speculative land practices and depletion of timber and other resources prompted Congress to repeal this policy, and to set aside "national forest lands." Subsequently, in 1934, under the *Taylor Grazing Act*, the remaining unclaimed federal lands were put under the management of the DOI. During this time, livestock grazing continued on federal lands, and regulations evolved allowing these practices to continue. A permit system evolved that recognized priority in occupancy and use of rangeland; grazing permits for specific parcels of land remained with individuals (Otero County, n.d.).

The original land acquired for McGregor Range in the 1940s and 1950s was mostly comprised of public domain areas. Several ranchers in the areas owned small properties in-fee, and held grazing permits for extensive portions of public land. Through negotiations with ranchers it was decided that the Army would use the public lands for 4 days each week. Most ranchers considered 3 days as inadequate to work a ranch and favored selling their grazing permits to the Army. A few ranchers were strongly opposed to losing use of public lands and their homesteads, and condemnation of these properties ensued. In addition to acquiring fee-owned lands and grazing rights, a portion of the current McGregor Range within the Tularosa Basin was officially withdrawn for military use in 1957 under PLOs 1470 and 1547 (U.S. Army, 1997a).

From this time until the mid 1960s, grazing was suspended on McGregor Range, but trespass grazing continued because there were no fences, and it was impossible for the Army to patrol the large area. In 1966, the Army designated a portion of the range as a co-use area, in which grazing could be permitted under supervision of the BLM. The co-use area contained 515,000 acres. The BLM divides the co-use area of McGregor Range into six distinctive natural units (BLM, 1980):

1. The Mountain Foothills unit (23.4 square miles) occurs at the north end of the range and is an upland area with a characteristic pinyon-juniper woodland.

2. The Canyonlands unit (59.4 square miles) is the rugged, rocky lands which separate the Mountain Foothills from the lower country to the south and west.

3. The Mesa (171.1 square miles) is a gently rolling grassland in the southeastern portion of the range.

4. The Rimlands unit (100.0 square miles) is the rugged, rocky area which separates the Mesa from the lower country to the west.

5. The Alluvial Fans unit (296.9 square miles) is sloping shrublands at the foot of the Canyonlands and Rimland units.

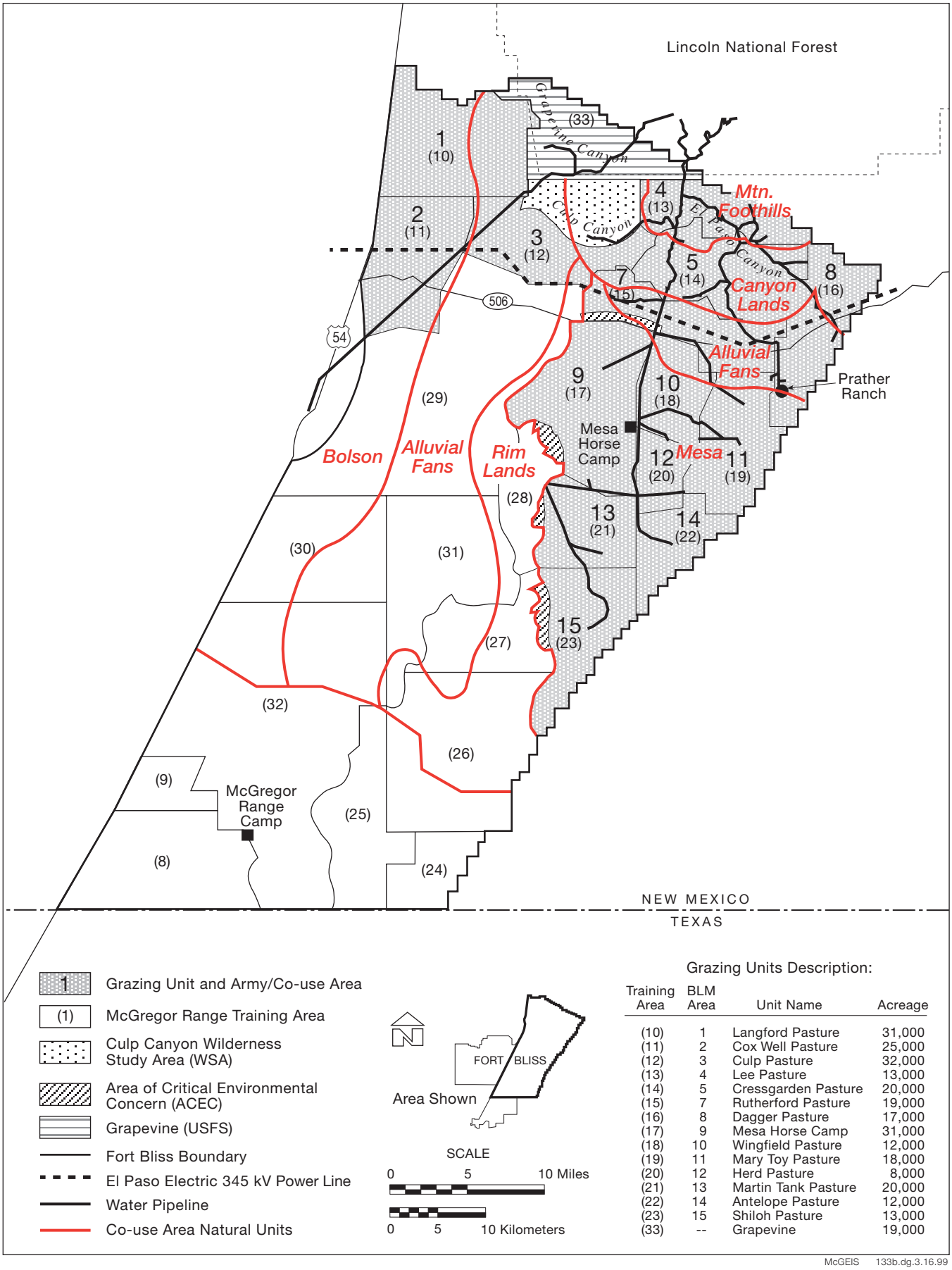
6. The Bolson, or Basin (153.1 square miles), is the lowland area on the west side of the range, characterized by the presence of stabilized sand dunes.

Grazing is allowed in fourteen pastures, containing 271,000 acres. Thirteen of the pastures were developed in the 1960s; another became available for grazing in 1981 (BLM, 1980).

In 1966, the BLM established an auction system for grazing units on McGregor Range, unlike the priority system that prevails for most public lands under the *Taylor Grazing Act*. Grazing was initiated in 1967. Pastures were defined by historical utilization. By 1970, BLM had developed the present management program, which allowed approximately 9 months of grazing each year, usually from October 1 to June 30. In the event one pasture is damaged by fire, a rested pasture may be put into service. In a typical year prior to 1970 4,500 cattle utilized the range and there had been about 40,000 animal units per month (AUMs) of livestock grazing. Income from the bidding is retained by the BLM for maintenance of, and improvements to, the grazing lands of McGregor Range (BLM, 1980). Money collected from grazing fees is placed in a fund to directly pay for the costs of running the program.

After expiration of the original withdrawal of 1957, the DoD and the DOI entered into an MOU in 1977 that allowed the Army to continue to use the land as they had since 1957. Subsequently, Congress formally withdrew about 608,385 acres of public land for military use in 1986 under the MLWA. Under terms of the withdrawal, grazing continued to be permitted on a noninterference basis with military missions. The areas that have been opened up to grazing have relatively low safety risk from prior military operations (e.g., ordnance and explosive hazards and debris). This area corresponds generally with TAs 10 through 23.

As agreed to in the 1990 MOU (Appendix A), the BLM continues to manage the grazing program and determines livestock grazing levels. Grazing units continue to be put up for public auction to the highest bidder every year. There are 14 grazing units within the co-use area, shown in Figure 3.1-2, which currently support 2,400 cattle. In 1996, about 28,900 AUMs were auctioned on 13 active units (of which 22,350 AUMs applied to the 1996/1997 grazing season). Most grazing contracts run for 9 months, from October through June of the following year. Sometimes a contract will still run for 18 months or up to 42



Grazing Units Description:

Training Area	BLM Area	Unit Name	Acreage
(10)	1	Langford Pasture	31,000
(11)	2	Cox Well Pasture	25,000
(12)	3	Culp Pasture	32,000
(13)	4	Lee Pasture	13,000
(14)	5	Cressgarden Pasture	20,000
(15)	7	Rutherford Pasture	19,000
(16)	8	Dagger Pasture	17,000
(17)	9	Mesa Horse Camp	31,000
(18)	10	Wingfield Pasture	12,000
(19)	11	Mary Toy Pasture	18,000
(20)	12	Herd Pasture	8,000
(21)	13	Martin Tank Pasture	20,000
(22)	14	Antelope Pasture	12,000
(23)	15	Shiloh Pasture	13,000
(33)	--	Grapevine	19,000

McGEIS 133b.dg.3.16.99

Figure 3.1-2. Nonmilitary Uses and Infrastructure on McGregor Range.

months, depending on rangeland conditions, allowing a season of summer grazing. Table 3.1-3 summarizes the acreage and AUMs currently under contract on McGregor Range.

Table 3.1-3. Animal Unit Months for Grazing Units on McGregor Range, October 1996

Grazing Unit No.	*AUMs*	*Bid Price per AUM*	*Contract Period*	*No. of Cattle*	*Acres per Head (cattle)*
1	1,802	$11.00	Oct 8, 1996, through July 8, 1997	200 C or 286 Y	155
2	1,802	$12.75	Oct 8, 1996, through July 8, 1997	200 C or 286 Y	125
3	-	Not bid	-	-	-
4	4,480	$16.00	Nov 15,1995, through May 15, 1997	250 C or 358 Y	132
5	-	-	-	-	-
7	10,496	$12.20	Oct 1, 1994, through Mar 31, 1998	250 C or 358 Y	76
8	3,597	$12.00	Oct 1, 1995, through Mar 31, 1997	200 C or 286 Y	85
9	2,702	$11.50	Oct 10, 1996, through July 10, 1997	300 C or 429 Y	103
10	2,252	$14.00	Oct 6, 1996, through July 6, 1997	250 C or 358 Y	48
11	3,603	$15.25	Oct 2, 1996, through April 2, 1998	200 C or 286 Y	90
12	901	$13.25	Oct 4, 1996, through July 4, 1997	100 C or 143 Y	80
13	3,590	$14.10	Oct 4, 1995, through April 2, 1997	200 C or 286 Y	100
14	2,702	$14.75	Oct 3, 1996, through April 3, 1998	150 C or 214 Y	80
15	1,802	$16.75	Oct 1, 1996, through April 1, 1998	100 C or 143 Y	130

C = cattle; Y = yearlings.
Source: BLM, 1996b.

A study conducted by New Mexico State University on competitive pricing for McGregor Range indicates that nonfee costs (such as maintenance, improvements, water, lost animals, etc.) are less for ranchers on McGregor Range, because some of these services are provided by BLM (for example, water). Table 3.1-4 shows total nonfee costs on private and public leased rangeland, compared to McGregor Range. Table 3.1-4 also shows that prices bid for AUMs on McGregor Range in the early 1990s were comparable to fee costs on other lands. However, recently, auctioned AUMs have been valued from $11 up to $16.75, compared to the standard AUM fee of $1.35 and permit cost $4.90 currently set for BLM lands administered under the *Taylor Grazing Act* (43 USC Section 315a-r; 43 CFR 4130.8-1) (Aguirre, 1997). Fluctuations in bid prices over time indicate that the value of AUMs (lease rates) on McGregor Range varies in an open market. External conditions, particularly low rainfall, have been correlated to dramatic increases in what ranchers have been willing to pay for good grazing conditions (Fowler et al., 1994). These increased prices have provided additional operating revenue for BLM's services in recent years. The Army provides assistance in fire suppression under the terms of the 1990 MOU (BLM, 1990b), but does not financially support grazing activities on McGregor Range.

Table 3.1-4. Average Grazing Costs ($/AUM) on Public and Private Leased Land in New Mexico and McGregor Range

	Native Rangeland		*McGregor Range*	
Cost	*Private*	*BLM*	*1990*	*1992*
Non-Fee Costs[1]	12.80	16.16	11.22	11.90
Fee Costs[2]	6.88	4.90	5.21[3]	4.88[3]
Total Cost	*19.68*	*21.06*	*16.43*	*16.78*

[1] Includes ranching operation and maintenance costs.
[2] Includes leases rates, grazing fees, permit costs.
[3] Market driven at public auction: variable cost.
Source: Fowler, Torell, and Gallacher, 1994.

Money collected from grazing fees on McGregor Range continues to go into a fund to directly pay for the costs of running the program. Eight of 14 units were bid with a total bid value of $186,077.83. Payments for 4 units on 18-month contracts and 1 unit on a 42-month contract contributed an additional $111,044.40 for a total FY 97 collection of $297,122.23 (Aguirre, 1996).

Grazing units on McGregor Range are valuable due to extensive range improvements, high quality forage, services provided to ranchers by BLM, and availability and delivery of Army-owned water through an extensive pipeline system that was constructed and maintained by ranchers and BLM over several generations. There are about $4.6 million of improvements in the form of water pipelines, holding tanks and troughs, corrals, wells, fences, and windmills (Christensen, 1996). The Army has annual rights to about 110,000 gpd of water from the Sacramento River and Carrisa Springs that is used for preservation of fish and wildlife. Currently, both wildlife and cattle benefit from this water, delivered via pipeline to watering tanks on McGregor Range. Additional information on the water distribution and supply system on McGregor Range is provided in Section 3.7.

Tasks performed by BLM include repairs to water pipelines, corral and fence maintenance, evaluation of rangeland condition, and assistance with moving cattle onto and off the range. Currently, a three-man Range Management team performs these functions, spending about 80 percent of their time on Otero Mesa and the Sacramento Mountains foothills grazing units. About 50 to 75 percent of this time is used to check and repair water pipelines. A phased program to replace old pipeline has been intermittent and dependent on funding. Congressional appropriation in the early 1990s allowed about half the links to be replaced, resulting in reduced upkeep for new portions. Most of the waterlines on Otero Mesa have not yet been replaced and still require considerable maintenance. These lines are checked for leaks and damage about twice each week (usually Mondays and Fridays). The minimum amount of time needed to check waterlines south of New Mexico Highway 506 is 6 to 8 hours. Two persons working simultaneously can reduce the window needed to 3 to 4 hours. Additional time is required for repairs (Christensen, 1997).

In addition to day-to-day maintenance, BLM assists ranchers with bringing cattle onto the range in October, and taking them off in March or July (depending on the period of specific grazing contracts). It takes between 1 and 7 days to move cattle onto or off of different grazing units (depending on size and location of the unit and condition of the cattle). Cattle cannot be moved to and from all the grazing units at the same time; therefore, it can take several days during these months to move cattle. Military operations are generally coordinated between the Army and BLM to allow ranchers to bring cattle onto the range or take them off. Ranchers can usually perform these tasks without conflicting with current military activities (Christensen, 1996). Several corrals are used for staging cattle during round-up times, and for housing sick cattle. Under current management, many grazing contractors perform intermittent caretaking of their cattle during most of their contract period. However, the amount of time individual ranchers spend in tending cattle varies widely.

Under the bid/auction system, grazing units do not necessarily stay with the same rancher, as they do with most BLM grazing units. In the last 5 years, most units had two or three different grazing contractors, and three units had up to four different grazing contractors. Two units (units 4 and 5) were used under contract by the same rancher, and these units were only available for 2 years, while unit 15 has been held by the same rancher for 4 years. Also, because BLM provides water and maintenance services that are not usually included in grazing contracts, grazing units on McGregor Range are operable for out-of-state ranchers as well as local ranchers. Over 50 percent of the contracts were with ranchers in New Mexico, about 25 percent with ranchers out of Texas, about 17 percent from Arizona, and the remainder from Colorado and California. Currently, 10 grazing units are held by out-of-state grazing contractors, mostly from west Texas. Three units are held by in-state grazing contractors, of which one is categorized by the BLM as an Otero County ranch operator (Christensen, 1997).

Livestock grazing in the 18,004-acre Grapevine co-use area is managed by the USFS. Approximately 150 to 200 head of cattle graze in the co-use area. Military activities have not affected grazing operations (Goodwin, 1998).

Wildlife and Habitat Management. BLM has responsibility for wildlife and habitat resources on public lands. The primary objective is to ensure optimum populations and the natural abundance and diversity of wildlife. This is accomplished through management plans and coordination with other agencies, including Fort Bliss, U.S. Fish and Wildlife Service (USFWS), and NMDGF. Plans and actions must also protect federal and state-listed and candidate threatened and endangered species. Management plans consider the interactive effect of multiple-use resource objectives to meet a balance in deciding management priorities. They also provide standard procedures that protect wildlife. NMDGF has responsibility for game species and also manages hunting on McGregor Range. Scheduled hunts are coordinated with Fort Bliss to minimize conflicts with military missions and to ensure safety of hunters (see *Recreation*, below).

Recreation. McGregor Range offers a variety of settings that are suitable for an assortment of recreational activities. Of interest are: (1) its relative remote and isolated quality, (2) special scenic and habitat features in desert, grassland, and foothills vegetative regimes, (3) opportunities for hunting, and (4) wilderness value.

Recreational use on McGregor Range is co-managed by BLM and the Army, and is allowed by the Army on a noninterference basis with the military mission. Public access and use is controlled by the Army. Members of the public must obtain annual access permits issued by the Army. These are available from both the Army and the BLM. Between 1,000 and 1,700 permits are issued annually (Bankston, 1997). Current permit holders include members of the Audubon Society, New Mexico State University, Sierra Club, ranchers, and members of the general public (Bankston, 1997).

Permit holders are responsible for complying with specific Army and BLM procedures for entry, use, and exiting the range. When permits are issued, recipients are required to read these procedures, and to sign an agreement of compliance. All recreational permits are issued by the USACASB Range Development and Enforcement Office. To ensure safety and to avoid interference with military missions, the McGregor Range Control must be contacted each time access is requested.

Public access is only permitted in areas that are considered safe and compatible with current and past military activity (Figure 2.1-1). On a weekly basis, the Range Scheduling Office issues a roster of areas that are available for nonmilitary use. Public access to TAs 29, 30, 31, and 32 is never permitted due to potential hazards from ordnance and explosive hazards and debris in active impact areas.

Recreational opportunities on McGregor Range are mostly classified as semiprimitive, motorized (SPM) by BLM, indicating the range's potential for isolation and opportunities for interacting with the natural environment. Areas close to New Mexico Highway 506 are classified as roaded-natural (RN). Both SPM and RN opportunities exist in abundance, with similar ecological settings on BLM and USFS lands surrounding the range. An area of 6,812 acres within Culp Canyon WSA is classified as semiprimitive, nonmotorized (SPNM) offering opportunities for isolation from the sights and sounds of human activities.

The primary recreational uses of McGregor Range are hunting, hiking, and observing nature. For the 12-month period from January 1 through December 31, 1997, logs indicate that 330 persons requested access for recreational use on McGregor Range. Visitors often requested access into more than one training area on McGregor Range during the same visit. Based on areas requested, the average recreational use of any training area was 14 occasions in 1997. The most frequently requested area was TA 8 (30 occasions). The two small depressions near McGregor Range Camp were used 20 times. These locations in the south part

of the range are easily accessible from El Paso and have good opportunities for game-bird hunting. Requests for use of training areas north of New Mexico Highway 506, including TA 33 within Lincoln National Forest, and Culp Canyon WSA in TA 12, ranged from 20 to 28 times in 1997. Less accessible areas on Otero Mesa tended to have fewer requests (about 9 to 10 occurrences), probably due to lack of game-bird hunting opportunities and because they are not as accessible because of the driving distance from population centers.

Both licensed antelope and deer hunts are conducted annually on McGregor Range. These hunts are managed by NMDGF consistent with federal laws and Army regulations. Hunting schedules are coordinated with the Army well in advance to ensure that they can occur without conflict with military missions. Since this coordination has occurred, no hunts have been canceled due to military uses. Scheduled hunts occur from late September through early November.

Otero Mesa has antelope herds of trophy quality, and antelope hunts are restricted to muzzle-loading guns. A portion of McGregor Range corresponding to the BLM's grazing areas on Otero Mesa, south of New Mexico Highway 506, is part of Antelope Management Unit 29 of NMDGF. Unit 29 extends to the east of McGregor Range and is comprised of about 536,000 acres, of which the McGregor portion is about 111,000 acres.

The number of licenses issued for both antelope and deer hunts is based on herd size. Currently, 95 licenses are being issued annually for the Unit 29 antelope hunt in September, of which 20 are assigned to the McGregor Range portion of the unit. Current numbers of licenses are typical of recent years, although prior to the drought that has persisted through the mid-1990s, about 195 licenses were typical (Madsen, 1997).

Similarly, deer hunting on McGregor Range is part of Big Game Management Unit 28, located on McGregor Range only. In 1997, 50 licenses were issued for public deer hunting in Unit 28 north of New Mexico Highway 506 (including portions of the range within Lincoln National Forest). The number of licenses available to the public and military users varies annually is determined by NMDGF and depends on herd sizes. NMDGF uses a lottery system on both McGregor Range and the Big Game Management Unit 29 to the east of McGregor Range. Licenses are issued through a drawing of names in accordance with a limit set by head size. Deer hunts are usually held in early November. Camping occurs during some scheduled hunts. At other times, requests to camp are approved by Range Control and the Security and Safety officer for McGregor Range similar to all other recreational access requests. Camping is restricted to a few sites north of New Mexico Highway 506 and on Otero Mesa.

During hunting seasons, access by about 10 persons may be recorded each week. At other times, official access to the range for public recreation is infrequent (Grossenheim, 1997). Occasionally, individuals or groups with a particular interest in observing nature or hiking will recreate on Otero Mesa or in the foothill areas. Vehicular use is restricted to roadways and established trails on McGregor Range.

Special Management Areas. The McGregor Black Grama Grassland ACEC is comprised of four separate stands of black grama grasses located along the Otero Mesa escarpment and New Mexico Highway 506. ACECs are areas where special management attention is needed to protect, and prevent irreparable damage to important cultural or natural resources, or to protect human life from natural hazards. The McGregor Black Grama Grassland ACEC is managed to protect valuable biological resources and to study the ecology of undisturbed grassland. The location of these areas is shown in Figure 3.1-1. The ACEC is within SDZs for missile firings and underlies restricted airspace used for aircraft operations. These areas are fenced to prevent cattle from grazing in the ACEC. The public are allowed access to the ACEC under the same restrictions and regulations as other publicly accessible parts of McGregor Range.

Military training is not allowed in the ACEC. The ACEC is maintained and managed jointly through cooperative agreements between the Army, BLM, and New Mexico State University.

Culp Canyon WSA, comprised of 10,937 acres, is located north of New Mexico Highway 506 within the McGregor Range, and south of the Lincoln National Forest boundary. The area is valued for its outstanding opportunities for solitude and primitive, unconfined recreation such as hiking, hunting, horseback riding, and backpacking. Due to a high deer population, the area provides good hunting. The area has several cultural resource sites and habitat for state-listed plant species, state-listed animal species, and one federally listed endangered animal species (see Section 3.8).

The WSA is managed under the BLM's *Interim Management Policy and Guidelines for Lands Under Wilderness Review* to prevent impairment of wilderness value. In the *New Mexico Wilderness Study Report* (BLM, 1988a), BLM did not recommend Culp Canyon WSA for wilderness status. Occasionally, low-impact ground troop training and low-level helicopter training missions use NOE routes over the east part of Culp Canyon (BLM, 1988a). The area is also used as a SDZ for several types of missile firings.

Cultural Resources. BLM is responsible for managing cultural resources throughout the range for which the BLM or third parties are the proponents of an action (see MOU in Appendix A). The public has access to a wide range of cultural resources throughout the co-use portions of McGregor Range. However, low public use of the range has provided a beneficial level of protection to potentially sensitive resources. According to the RMPA, the Escondida Pueblo site will be fenced to exclude livestock and other surface disturbing activities. Also, by limiting use of motorized vehicles to established roads and trails, potential damage to cultural resources is reduced. See Section 3.9 for further discussion of cultural resources.

3.1.3 Surrounding Areas

3.1.3.1 Jurisdiction and Management

Lands surrounding McGregor Range comprise a mosaic of private, city, state, and federal ownership, and are used to meet a wide variety of purposes. The federal agencies administering adjacent lands include the BLM, DoD, and USFS. Both Texas and New Mexico own adjacent lands managed by their respective State Land Offices.

Figure 3.1-3 shows that within the surrounding region are a number of areas that are designated and managed for their special resource value. The National Park Service manages White Sands National Monument located 25 miles north of Fort Bliss. The park is surrounded by WSMR on three sides, and coordinates with the Army regarding a variety of military activities. Guadalupe National Park is located in Texas along the border with New Mexico, about 75 miles from Fort Bliss. The Capitan and White Mountain wilderness areas lie 90 and 55 miles, respectively, to the north of McGregor Range, and are administered by the USFS. The Jornada Experimental Range of the Department of Agriculture and San Andres National Wildlife Refuge of USFWS are adjacent to WSMR, about 15 miles northwest of Doña Ana Range–North Training Areas. The Solar Observatory Experimental Area and Apache Point Observatory are located about 10 miles north of McGregor Range, in the Sacramento Mountains.

Information on additional unique, sensitive, and special-use areas including wetlands, protected flora and fauna, wildlife habitat, and cultural resources in the region is provided in Sections 3.8 and 3.9. These areas are managed to restrict incompatible uses, and therefore influence existing and potential land use.

The following paragraphs provide a brief description of federal, state, and local entities with responsibility or jurisdiction over land areas adjacent to Fort Bliss.

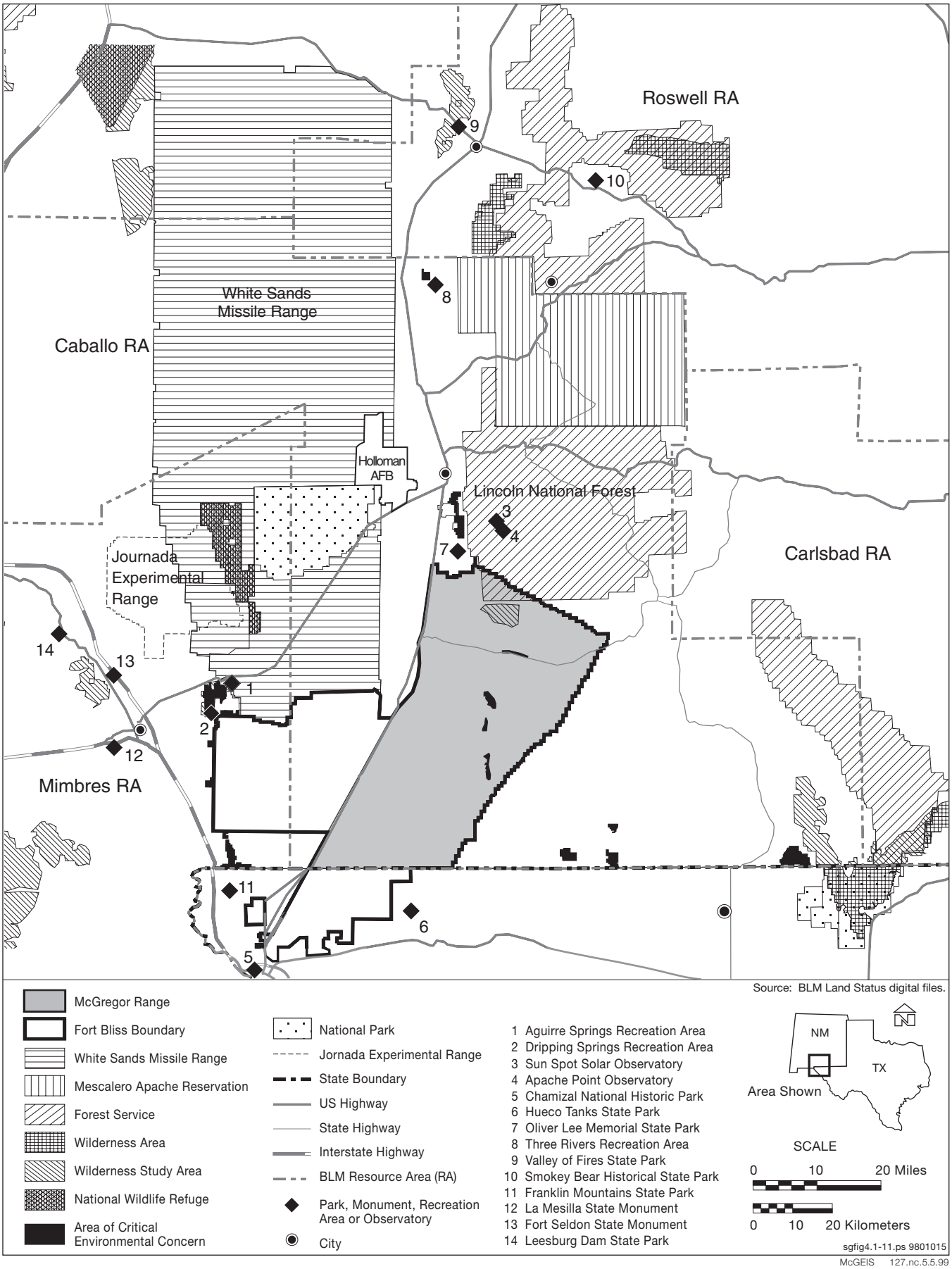


Figure 3.1-3. Specially Designated Areas in Region Surrounding McGregor Range.

Federal Lands. Federal agencies administering surrounding lands and working cooperatively with Fort Bliss include the DoD, BLM, and USFS.

DoD facilities include HAFB and WSMR. WSMR adjoins the northern boundary of Doña Ana Range–North Training Areas, to the west of McGregor Range. WSMR is approximately 2.3 million acres of which 1.8 million are perpetually withdrawn public land under PLO 833, 380,000 are withdrawn private land, and 48,000 acres are co-use land (U.S. Army, 1998n). Their primary mission is to support a range of test and evaluation programs by the U.S. Government, as well as allied governments and private industry. Fort Bliss and WSMR cooperatively use each other's land area to expand their capabilities in support of specific missions. HAFB is located further north, near Alamogordo, in Otero County, New Mexico. Fort Bliss supports HAFB by making restricted airspace available for USAF training and use of McGregor Range for the Class C target in TA 11.

Until recently the BLM public domain lands surrounding McGregor Range have been administratively divided into two Resource Areas (RAs); Mimbres RA and Caballo RA (formerly White Sands RA), and are now both part of the Las Cruces Field Office. BLM lands are managed for multiple use and sustained yield under FLPMA. RMPs have been developed for these RAs and are the framework for management actions.

USFS properties are administered by the Lincoln National Forest, an administrative unit of the Southwestern Region of the Forest Service. These federal administrative units are also guided by long-rangeland use plans, encompassing a wide variety of complex land use issues. The Sacramento district is immediately located north of (and partially within) McGregor Range. The Guadalupe district of Lincoln National Forest is located east of the range, essentially along the eastern edge of the Otero Mesa plateau.

Dominant land use on federal lands immediately surrounding Fort Bliss includes grazing, developed and dispersed recreation, protection of sensitive resources, mineral development, and fuel wood gathering.

State Lands. Currently, neither New Mexico nor Texas has a statewide land use plan or policy. However, numerous policies, laws, and regulations of New Mexico influence activities on both state lands and McGregor Range (McGregor Range does not border state lands in Texas) in a wide variety of ways. These include, but are not limited to, compliance with laws associated with natural resources, environmental documentation, wetlands, threatened and endangered species, air and water quality, wildlife management, transportation, social, and economic issues.

Several state agencies influence how land may be managed, developed or used, either directly, through regulations and management plans, or indirectly, through policy and strategic plans and advisory committees. These agencies include the New Mexico State Game and Fish Commission; New Mexico Economic Development District; New Mexico Environmental Department (NMED); New Mexico Water Quality Control Commission (NMWQCC); NMDGF; New Mexico Department of Energy, Minerals and Natural Resources (NMDEMNR).

County Governments. Local governments within the region also influence and control land use and development to varying degrees. McGregor Range lies totally within Otero County, New Mexico. Its southern border is adjacent to Fort Bliss land in El Paso County, Texas. The *Otero County Plan* is primarily a goal statement with policy documents used to guide the future growth and development in a manner consistent with the respective communities' goals; including the physical, social, and economic environment.

Over 65 percent of the land in Otero County is owned by the Federal Government and an additional 10 percent is in the Mescalero Apache Reservation (Bureau of Business and Economic Research [BBER] 1994). In 1993, Otero County adopted an *Interim Land Use Policy Plan* (Otero County, n.d.), and is now developing a *Comprehensive Land Use Plan*. The primary goal of the plan is to guide the use of public (federal) lands and resources in the county and to protect the rights of private landowners. Several reports and draft portions of the comprehensive plan identify historic and customary use areas of value to county residents, including use of water, agriculture, livestock grazing, timber and wood production, mineral production, cultural resources, recreation, hunting, federal and military activities, transportation and access, wilderness, wildlife, and threatened and endangered species. Specific to McGregor Range, the county supports multiple use of federal lands, maximizing livestock production, maintaining access along New Mexico Highway 506, and recreational use for hunting, hiking, and observing nature. No timber resources, except fuel wood, are present on McGregor Range. The county has also adopted Ordinance 93-04, based on NEPA, regarding desired county involvement in the federal NEPA process.

Otero County is also updating its 1974 comprehensive land use plan for nonfederal lands. It is anticipated that this plan could include elements of performance zoning. It will also adopt the procedural elements of the revised state subdivision regulations, and include an appendix with specific subdivision standards based on water and terrain.

Major categories considered in the *Doña Ana County Plan* include overall land use and zoning, agriculture, parks, recreation and open space, water resources, population and housing, and transportation. Specific plans for these major categories are called for in the future, consistent with the general framework of the county plans. Coordination with city, state, and federal agencies is emphasized, recognizing the strong interrelationship each county has with these entities. Plans give consideration to the character of the county and the suitability of areas within the county for particular uses and are expected to promote the health, safety, and welfare of county residents.

El Paso County borders the south and east boundaries of the South Training Areas. El Paso County currently has no comprehensive land use plan. Development is controlled through a building permit review process to ensure that lot sizes can accommodate required on-site wastewater storage and treatment for the structure(s) proposed.

Each county controls development through review of individual building permit applications and through subdivision regulations. Permits are approved if soil conditions and lot size accommodate septic system requirements for the proposed structure and use. Subdivision regulations generally require new areas of development to provide access and integration of new roadways with the existing network. They also regulate lot size, density, and utility infrastructure to ensure that development meets minimum standards for public health and safety.

Municipalities. No incorporated municipalities border McGregor Range or Doña Ana Range–North Training Areas in New Mexico.

Cities within the region that are indirectly influenced by Fort Bliss activities on McGregor Range include Las Cruces in Doña Ana County and Alamogordo in Otero County. Both these cities use a zoning process to control land use and development.

The City of El Paso shares a boundary with the main cantonment and South Training Areas. A comprehensive plan, *The Plan for El Paso*, was developed in 1988 (El Paso, 1988). The current zoning ordinance implements this plan.

3.1.3.2 Existing Land Use in Surrounding Area

Figure 1.2-2 illustrates the generalized land status and Figure 3.1-4 shows the location of important special use areas in the vicinity of McGregor Range. The following paragraphs summarize the dominant existing land uses, including livestock grazing, mining, recreation, forestry, military, and residential. Some lands are specially designated or managed for protection of a particular resource or use and are also described.

Grazing. Grazing is the dominant land use throughout the area. Ranches generally consist of combinations of private, state, and federal lands. The BLM and USFS set grazing levels in accordance with management plans to meet multiple-resource sustainable yield objectives. The BLM manages most of the grazing lands in Otero County. Grazing costs are currently set at the base fee of $1.35 per AUM under the *Taylor Grazing Act* (43 CFR Part 4130.8).

Table 3.1-5 summarizes permitted numbers of cattle on federal and state lands. In 1996/1997, a total of about 20,260 head of cattle grazed on 2,112,000 acres in Otero County, of which about 9,560 head were permitted on about 930,600 acres of BLM-administered land. An additional 5,450 cattle on 573,000 acres were permitted on USFS land in Otero County. An estimated 2,650 head grazed on State Trust land. Additional cattle graze on private land throughout the county. Private property accounts for less than 20 percent of the county land area. Assuming the same proportion of private land is used for grazing as federal land and at equivalent grazing levels, there would be an additional 4,000 head of cattle on private land in Otero County. In addition, one operator adjacent to grazing unit 8 on McGregor Range is authorized to graze 1,725 head of sheep (Phillips, 1998).

21

Table 3.1-5. Summary of Grazing Permitted on Federal and State Lands in Otero County

Location	*Annual Permitted Cattle Numbers* [1]	*Acreage*[4]
BLM	9,560	930,600
State	2,650 [2]	337,280
Lincoln National Forest	5,450 [3]	573,000
McGregor Range	2,400	271,000
Total	*20,060*	*2,111,880*

[1] Actual numbers can vary from year to year depending on grazing conditions.
[2] Based on estimated 5 AUMs per acre for Otero County, compared to state average of 11 AUMs per acre. Also, assume grazing on all State Trust lands.
[3] Estimate includes portions of Sacramento and Guadalupe districts within Otero County.
[4] Area grazed may vary from year to year depending on range conditions. Small percentage of state.
Source: BLM, 1997a; Dubose, 1997; Thornhill, 1998; Newman, 1998.

Recent decisions on Amendments to Forest Plans for Arizona and New Mexico have changed standards and guidelines for threatened and endangered species. These have resulted in changes in grazing levels in some areas. The USFS is in the process of evaluating the effects of these changes on grazing in Lincoln National Forest (Hannon, 1997). Since the mid-1990s, below average rainfall has resulted in many areas being grazed at lower than permitted levels.

In recent years, financial viability of livestock operations in the region has been affected by a series of impacts including drought, reductions in beef prices, reduced availability of public lands for grazing due to environmental concerns, increased administrative and regulatory requirements of land managers, and

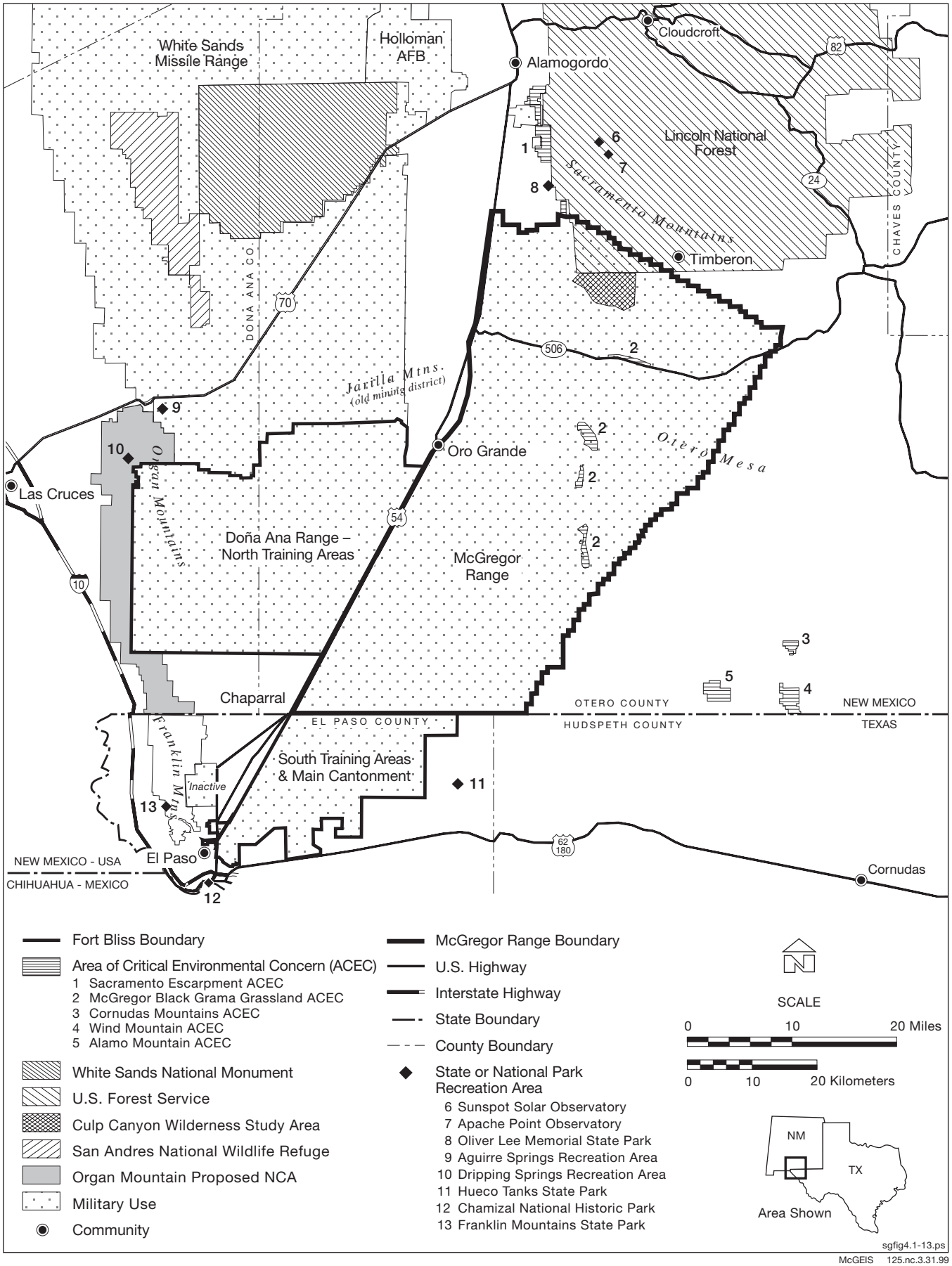


Figure 3.1-4. Special Use Areas Surrounding McGregor Range.

grazing allotment reductions. Cumulatively, this has had the greatest impact on ranches with large debt loads. In addition, the Farm Services Administration is considering a reduction in its guarantee to lending institutions from 90 to 60 percent, further affecting the ability of ranchers to renew loans or to find new lenders (Thal, 1997a, 1997b).

An analysis of grazing data for Otero County indicated that a larger proportion of small ranching operations (generally less than 100 head of cattle) operate at below the break-even point than larger ranching operations, indicating the marginality of small-scale operations (Thal, 1997a, 1997b).

Minerals. Some oil and gas potential exists in Otero County. These reserves may become more economically viable for production, depending on market conditions. Other mineral activity, such as precious metals, particularly in the Jarilla Mountain area, also has low production potential at this time. Additional information regarding mineral and energy resources is provided in Section 3.5 and Appendix C.

Some oil and gas leases for exploration on State Trust lands between McGregor Range and the Guadalupe Mountains have been let in recent years. Recent discovery of commercial quantities of gas from a well to the east of McGregor Range has initiated interest in exploration. As much as 30,000 acres of public land have recently been nominated for exploration in this area (Sanders, 1998).

Recreation. Overall, the south central region of New Mexico provides a wide range of recreational opportunities at State and National Parks and Monuments, Wilderness Areas, and on national forests and public land (see Figures 3.1-3 and 3.1-4). Both dispersed and developed recreational opportunities are available on BLM and USFS lands adjacent to McGregor Range. Dispersed recreation occurring over large areas independent of developed facilities include; hunting, hiking, off-highway driving, sightseeing, camping, picnicking, studying nature, viewing of historic and prehistoric artifacts, and a variety of other recreational activities. Hunters come to the region from all over New Mexico, Texas, and from other states (DOI, 1993, 1986). State lands that are suitable for recreation are often designated as parks. Oliver Lee State Park, located about 2 to 3 miles to the north of McGregor Range, on the west edge of the Sacramento Mountains, is a popular recreation site with camping, hiking, and interesting historic features. This park is easily accessible by residents of Alamogordo, New Mexico.

Hueco Tanks State Park is located in El Paso County, just south of TAs 25 and 24. The park is notable for its extensive pictographs and is popular for hiking and rock climbing. About 75,000 visitors come to the park annually.

Areas to the west of U.S. Highway 54 are popular for off-road vehicle and motorcycle use. The Jarilla Mountains contain a historic mining area that is valued for its cultural attributes and recreational use such as sightseeing, hiking, prospecting, and rock hounding.

Surrounding State Trust lands have similar uses as federal lands, with less access for recreation.

Special Management Areas. The BLM has recently designated several ACECs in Otero County. To the north, the Three Rivers Petroglyphs site has unique cultural resources and the Sacramento Escarpment ACEC has exceptional scenic value. To the east, Cornudas Mountain, Wind Mountain, and Alamo Mountain ACECs all have cultural, scenic, and recreational value, and Alkali Lakes has value for particular species of flora.

About 50 to 70 miles to the east of McGregor Range is a clustering of special management areas with recreational value due to their scenery, naturalness, or unique geologic features. This area includes Brokeoff WSA, which is not recommended for wilderness designation (BLM, 1988a), Guadalupe

Escarpment WSA, Lonesome Ridge WSA, Mudgetts WSA, Carlsbad Caverns National Park and Wilderness Area, and Guadalupe National Park and Wilderness Area.

To the west, the BLM has proposed the Organ Mountains NCA. The NCA includes an existing WSA and several ACECs with scenic, and biologic value. Proposed management actions for the NCA emphasize protection of threatened and endangered species, wildlife habitat, and cultural resources, and improvement of rangeland and recreational opportunities (DOI, 1989).

Forestry. Within south-central New Mexico, most timber resources are managed by the USFS. Lincoln National Forest, which overlaps portions of Lincoln, Chaves, Eddy, and Otero counties, has about 1.1 million acres, of which about 257,000 acres (23 percent) are tentatively suitable forestland for harvesting under variable management objectives and conditions (USFS, 1986).

Military. McGregor Range is part of a 3.2 million-acre contiguous military use land area, which includes the South Training Areas and Doña Ana Range–North Training Areas of the Fort Bliss Training Complex (1.12 million acres), WSMR (2 million acres) (BLM, 1986a), and HAFB (57,000 acres); neither of which share a common boundary with McGregor Range. These military use lands comprise about 2.2 million acres of Otero County.

Residential. Private lands in the vicinity of McGregor Range are generally used for ranching, land investment, or residential development. Several ranchers have homesteads on private holdings to the east and west of McGregor Range. These parcels are generally located at a water source. Ranchers primarily use leased federal and state lands for cattle grazing.

Adjacent and nearby unincorporated areas include Timberon and Oro Grande in Otero County, and Chaparral in Otero and Doña Ana counties. The community of Timberon partially underlies restricted airspace (R-5103B). There are about 5,200 property owners in this area, with about 350 permanent residents, and an additional 200 summer residents. Located in the Sacramento Mountains foothills, it is growing as a vacation and retirement destination (Roberts, 1996).

The community of Chaparral straddles Doña Ana and Otero counties (Vallejos, 1997). Because the land in this area is relatively inexpensive, steady growth (at about 3 to 4 percent per year) is projected for the future. It is likely that growth will result in demands for additional services, and that independent wastewater treatment services will become economical. At that point, residential lot sizes could decrease and infill development could increase intensity of residential development bordering Doña Ana Range–North Training Areas to the south (Price, 1997). BLM lands to the west of Chaparral could also become available for development through disposal transactions (Hargrove, 1997), potentially expanding residential development.

Nearby land in unincorporated El Paso County is largely undeveloped, but new residential subdivisions are starting to be built near the El Paso city limits. Low-density residential development over the next 20 years is anticipated in areas between U.S. Highway 54 and the El Paso County boundary. Although the city has no common boundary with McGregor Range, it is possible for future city development to occur in proximity to the southernmost training areas.

Private land in west Texas, bordering McGregor Range on the southeast, is located in the Hueco Mountains, and not likely to be suitable for community development.

The City of Alamogordo is located about 28 miles to the north of McGregor Range. The city has experienced growth to the south (towards McGregor Range) in recent years. The BLM identifies large blocks of land for disposal or exchange immediately north of McGregor Range, but it is unlikely that

lands would be exchanged or sold for uses other than those of national interest in the foreseeable future (Creager, 1998). Areas to the north, close to Alamogordo would be suitable for future municipal expansion (DOI, 1986). Other areas to the northeast and east of McGregor Range have also been identified for disposal or exchange.

3.1.4 Land Use Compatibility

PL 99-606 allows the Army to exclude nonmilitary uses that may be incompatible with its mission for reasons of national security or for public safety. The Army has not permitted nonmilitary activities in current and historic impact areas in the Tularosa Basin due to safety concerns. The area identified for grazing in the White Sands RMP, as amended, and 1990 MOU is not used as a ground impact area (with the exception of a small area around the Class C Bombing Range in TA 11). Its periodic use as a SDZ during missile firings, for ground troop maneuvers, and for FTX missions does not generally generate hazardous debris. Consequently, public access for recreation and ranching has been compatible when these areas are not being used for military operations.

Current activities on McGregor Range are generally compatible with surrounding land uses, which are predominantly grazing. Use of R-5103, primarily by aircraft using the Class C Bombing Range, contributes to an average day-night noise level (L_{dn}) of about 53 decibels (dB)[1]. These levels are compatible with dispersed residential areas on the south side of Timberon in the Sacramento Mountains. Isolated structures are avoided by a minimum of 500 feet, and community areas by a lateral distance of one-half mile or more, or a minimum vertical distance of 1,000 feet (in accordance with Air Force Instruction 11-206). Culp Canyon WSA also underlies R-5103 and is exposed to overflights. Noise from explosive sources has not been identified as an issue by rural residents in the area.

Safety risks occasionally preclude use of New Mexico Highway 506 (and occasionally U.S. Highway 54) during HIMAD missile firings. Closure interrupts access to residential communities in the Sacramento Mountains and to ranches on the east side of McGregor Range. All locations have alternative access, but they may not be the most direct route. While this may be inconvenient, current uses have continued, and in some areas developed, under these constraints. Because all locations have alternative access routes, many residents in the area rely on different routes even if they are not the most direct route (Roberts, 1996). Emergency services to these areas are provided from Cloudcroft, or by airlift, and therefore do not rely on New Mexico Highway 506.

3.1.5 Aesthetics and Visual Resources

Aesthetics and visual resources include the natural and man-made physical features that give a particular landscape its character and value. The feature categories that form the overall impression a viewer receives of an area include landform, vegetation, water, color, adjacent scenery, scarcity, and man-made (cultural) modifications (BLM, 1986b).

McGregor Range is located in arid high plains of southern New Mexico. The visual environment is characterized by extensive open areas and surrounding undeveloped land in western Texas and south central New Mexico. This section describes the visual environment including overall appearance and elements, management goals and guidelines, and visual resource value. The visual ROI is comprised of areas visible from McGregor Range, or locations that have unobstructed views of McGregor Range.

[1] A description of noise metrics and methodology for calculating noise exposure is provided in Section 4.10 and Appendix F (*Noise*).

3.1.5.1 McGregor Range

The natural context of McGregor Range is arid Chihuahuan Desert, characterized by vistas framed by distant mountain ranges or escarpments, dominated by the overlying blue sky. Variations in elevation and precipitation result in a range of vegetative regimes with indistinct boundaries. These create a patchwork of varying textures and patterns in the middle and distant landscape, caused by bunched or continuous grassy vegetation and areas of scattered shrubby vegetation. Broad valley floors and alluvial slopes are bisected by steep-sided but relatively shallow intermittent streams that provide visually interesting forms in the foreground, but that are less noticeable at a distance. Mixed hues of reddish brown, and gray-colored soils, rocks, and woody vegetation, are the dominant colors of the ground plane. In some areas, clumped or grassy vegetation introduce a range of pale sage and dark gray. Low-angle light at sunset and sunrise augments the color of the sky and landscape and increases the visibility of sculpted forms. However, in general, the natural landscape does not have outstanding features of visual interest such as dramatic landforms with high relief or highly contrasting variations in color or texture.

The cultural landscape is defined by both the natural setting and human modifications. Throughout the area, man-made features are evidence of current and past uses and events. These include (but are not limited to) roadways (both paved and unpaved), fences, wooden corals, isolated homesteads, powerlines, watering tanks, windmills, pipelines, antennae, and satellite dishes. Most of these are noticeable in the foreground, but are either not perceptible, or only defined by subtle lines or forms in the middle and distant landscape. While VRM objectives are generally aimed at minimizing the intrusion of man-made alterations on the landscape, these features can add interest and interpretative opportunities. In so far as the cultural landscape documents the activities of its builders and users over time, it can be endowed with meaning and importance.

Withdrawn public land on McGregor Range has been categorized under the BLM's VRM classification system. The purpose of this system is to provide an inventory of visual resources and to provide management objectives according to the visual quality and sensitivity of an area. BLM lands are classified as VRM Classes, I, II, III, IV, and unclassified (from the most valued and sensitive alteration, to the least). Areas along U.S. Highway 54 and New Mexico Highway 506 are Class III, where changes in the basic elements of the landscape may be evident but should remain subordinate. Culp Canyon WSA is rated as Class II to preserve the character of the natural landscape. The remainder of McGregor Range is rated as Class IV where the level of change to characteristic landscape can be high. This classification is applied to areas where visual sensitivity is lower due to lower viewer numbers in areas away from public access roadways. Historic and current uses for livestock operations is evident in supporting infrastructure. In the immediate vicinity of watering areas, stock corrals and the McGregor Range Camp, vegetation is limited.

The south part of the Tularosa Basin is mostly comprised of hummocky mesquite dunes. From vantage points on Otero Mesa, this terrain forms a homogenous pattern of dark shrubs against a sandy-ground plain. When passing through the mesquite dunes, visibility is restricted to the foreground because of obstruction by the surrounding dunes. Further north, the valley has low growing, generally widely spaced, pale-colored shrubs. Soil coloration, the patterns from shrubs and their shadows, and linear features such as roads and fences are the major defining elements of the foreground. On Otero Mesa, bunch grasses replace some of the low shrubs. The overall foreground is similar to the valley floor, with greater seasonal variations in vegetative color. In some areas, particularly ungrazed areas, the grasses create a distinctive even texture, and provide striking panoramic views from some middle and distant locations.

The McGregor Range Camp is visible when traveling along some roadways, but specific qualities of its built environment are not discernible, and it is unobtrusive in the overall landscape. Other constructed or mobile military structures and equipment are smaller in scale and therefore less visible to public viewers

using roadways. Man-made modifications tend to be most visible to persons on foot or horseback due to closer viewing distances. However, relatively few people have this vantage point.

3.1.5.2 Surrounding Areas

Adjacent visible areas within Fort Bliss include Doña Ana Range–North Training Areas along the southwest border, and the South Training Areas, directly south of McGregor Range. The Organ Mountains on Doña Ana Range–North Training Areas are a prominent landscape feature in the middle and distant landscape from vantage points on McGregor Range. These mountains have outstanding scenic quality due to dramatic forms of precipitous mountains. The remaining areas on Doña Ana Range–North Training Areas and the South Training Areas in the Tularosa Basin are mostly comprised of hummocky mesquite dunes. From vantage points on Otero Mesa, this terrain forms a homogenous pattern of dark shrubs against a sandy ground plane. Northeast of the South Training Areas, the foothills of the Hueco Mountains rise from the desert floor providing moderate visual interest in the distance. The lower slopes have relatively little, mostly low-growing vegetation.

Adjacent BLM and USFS land has been classified according to its visual quality and sensitivity. The surrounding area has several locations with high scenic quality and sensitivity. An 8,947-acre portion of the Organ Mountains to the west of Doña Ana Range–North Training Areas, is designated as a scenic ACEC within the proposed Organ Mountains NCA and is managed as a VRM Class I area (where management actions should not alter the natural landscape). Views from most locations in the ACEC onto McGregor Range are obstructed by intervening terrain of the Organ Peaks. The Sacramento Escarpment ACEC, located north of McGregor Range, is also managed as VRM Class I. Distant views of the northwest corner of McGregor Range may be visible from some viewing locations in this ACEC. To the east, Wind Mountain, Alamo Mountain, and Cornudas Mountains ACECs have scenic value, but only distant views of McGregor Range. Most of the public, state, and private land to the west of U.S. Highway 54, and east of McGregor Range that include portions of Otero Mesa, generally have lower visual resource values due to lack of distinguishing landscape features, low number of viewers, and existing infrastructure.

The USFS uses visual quality objective (VQO) categories to manage visual resources. Areas are classified as Preservation (with the highest visual value and most sensitive to man-made changes, similar to VRM Class I), Retention, Partial Retention, Modification, and Maximum Modification (with diminishing visual value and sensitivity to visible alterations). Co-use and adjacent land in Lincoln National Forest, Sacramento district is primarily classified as Modification areas due to alterations (such as roads, signage, and evidence of productive uses), and relatively low visual quality. There are some Retention areas, mostly in mountainous terrain along the Sacramento escarpment, where changes within the natural landscape should not be evident. Parts of Grapevine Canyon, directly north of Culp Canyon WSA, are rated Maximum Modification, due to noticeable existing roadways and grazing infrastructure that dominate the landscape (USFS, 1998).

In general, when viewed from locations beyond the installation boundary, isolated facilities and equipment in the middle and far distance within training areas are visually subordinate to the natural landscape. Distant viewing locations on the east side of the Organ Mountains of Doña Ana Range–North Training Areas are not open to the public. Areas of higher elevation in the Sacramento Mountains and its foothills have distant views onto McGregor Range. Expansive vistas of grasslands on Otero Mesa appear relatively uninterrupted by man-made structures, except for a few roadways, stock corrals, and water improvements.

Airspace

3.2

3.2 AIRSPACE

Airspace, when describing its use for aviation purposes, is defined, managed, and utilized in a manner that best serves the competing needs of commercial aviation, general aviation, and the requirements associated with defense-related activities. The Federal Aviation Administration (FAA), which is responsible for the overall management of airspace, has established four airspace designations that are designed to protect aircraft while operating to or from an airport, transiting enroute between airports, or operating within "special use" areas identified for military purposes. These airspace designations are controlled airspace, uncontrolled airspace, special use airspace, and other airspace. Rules of flight and air traffic control (ATC) procedures have been established to govern how aircraft must operate within each type of designated airspace.

All aircraft operate under either instrument flight rules (IFR) or visual flight rules (VFR). Instrument weather conditions require the use of IFR that entail specific aircraft operating requirements and adherence to ATC-assigned routes and altitudes. In visual weather conditions, aircraft operate under VFR in which pilots must observe and maneuver to avoid other aircraft. Pilots may fly along any desired route of flight without any ATC clearance when operating under VFR.

The type and dimension of individual airspace areas within a given region, and their spatial and procedural relationships to one another, are contingent upon the different aviation activities conducted in that region. When any significant change is planned, such as new or revised defense-related activities within an airspace area or a change in the complexity or density of aircraft movements, the FAA reassesses the airspace configuration to determine if such changes could adversely affect: (1) ATC systems and/or facilities; (2) movement of other air traffic in the area; or (3) airspace already designated and used for other purposes such as Restricted Areas or Military Training Routes (MTRs).

The ROI (Figure 3.2-1) considered for the McGregor Range LEIS is the airspace that is affected by training activities on McGregor Range and Doña Ana Range–North Training Areas and aviation activities at the Biggs Army Air Field (AAF). The McGregor Range and Doña Ana Range–North Training Areas are contained within Restricted Area airspace located north of El Paso in New Mexico. Restricted Areas are established around locations where hazardous activities such as artillery and missile firings, bombing, and gunnery are conducted. Access to this airspace is limited to only those aircraft participating in these activities when the airspace is active. When the FAA designates the area for joint use, these may be used by nonparticipating aircraft with permission of the controlling agency, or using agency as appropriate.

Biggs AAF mission activities occur within the airspace terminal area under the control of the FAA-operated El Paso Approach Control facility at the El Paso International Airport (EPIA). The lateral boundaries of the El Paso Approach Control terminal area, which excludes any airspace beyond the United States-Mexico border, are approximately 25 nautical miles (nm) to the west of EPIA, 35 nm to the east and southeast of the EPIA, and 17 nm to the north of the EPIA. The Approach Control Area encompasses altitudes from the surface to 17,000 feet above MSL. The Approach Control Area contains elements of special use Restricted Area airspace and MTRs.

3.2.1 Restricted Airspace

McGregor Range is located under Restricted Areas R-5103A, R-5103B, R-5103C, and R-5103D. The lateral boundaries of these restricted areas extend northward approximately 45 nm from the New Mexico-Texas border to approximately 8 nm south of Alamogordo, New Mexico, and eastward within a radius of 25 nm of U. S. Highway 54. The altitudes for R-5103A extend from the surface to, but not including 18,000 feet MSL and R-5103D from 18,000 feet MSL to unlimited; for R-5103B from the surface to 12,500 feet MSL; and for R-5103C from 12,500 feet MSL to unlimited. The published hours of operation for R-5103A/B/C/D are from 7:00 a.m. to 8:00 p.m., Monday through Friday (NOAA, 1996).

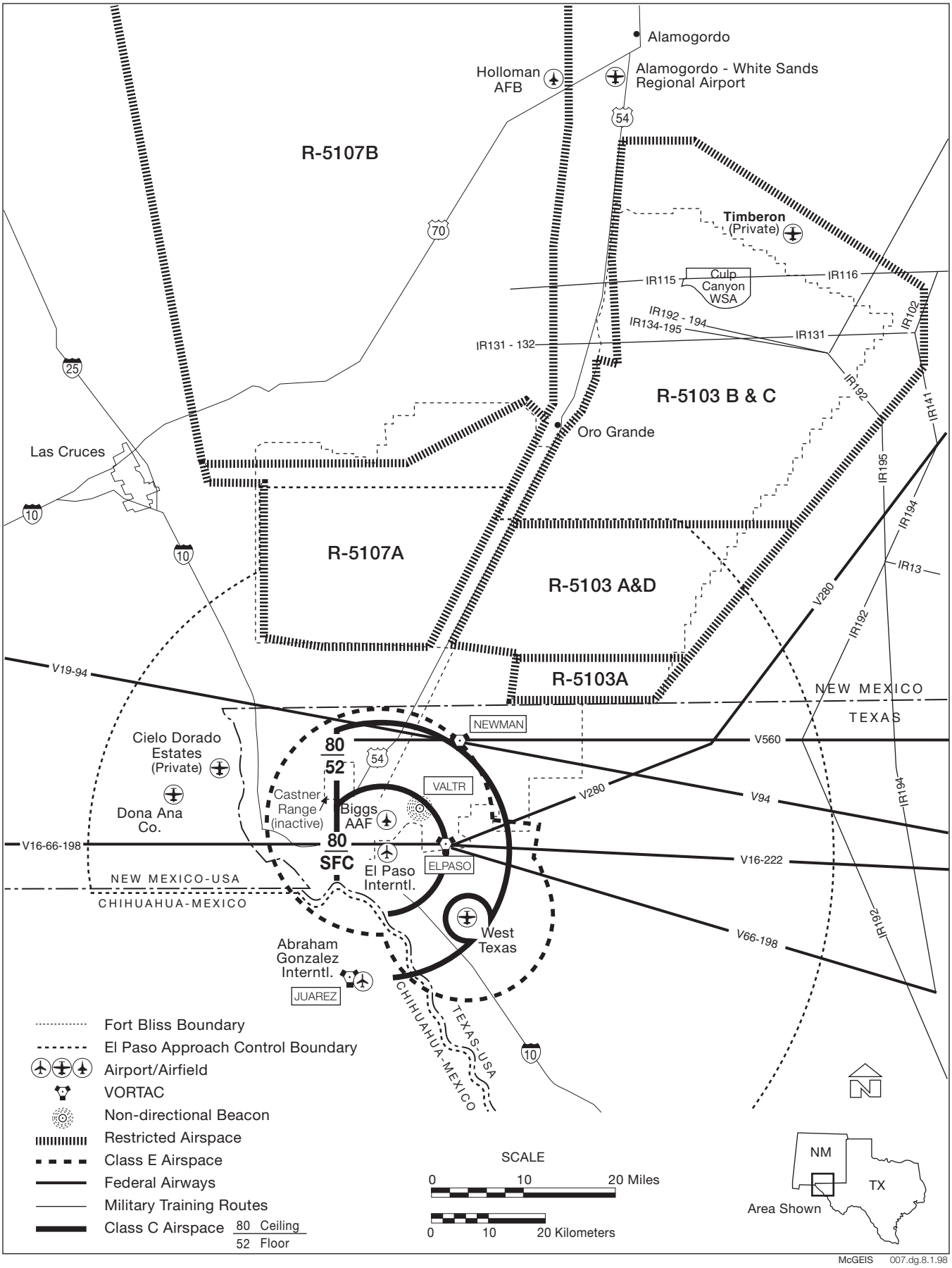


Figure 3.2-1. Airspace Region of Influence.

Changes to these restricted area hours of operation can occur and such changes are disseminated through the nationwide Notice to Airmen (NOTAM) system that pilots are expected to review prior to flight in the vicinity of restricted or other defense-related airspace. The number of air operations conducted at the McGregor Range in calendar year (CY) 96 is delineated in Table 3.2-1.

Table 3.2-1. McGregor Range Air Operations, 1996

Range Area	*Sorties*
McGregor Helipad	5
North McGregor/R-5103 B & C	321
South McGregor McGregor/R-5103 A & D	283
Orogrande	35
SHORAD	6
Ranger Drop Zone	29
IFC-23	53
Wilde Benton Landing Zone	23
McGregor Range Class C Bombing Range (Bombing Circle)	1,151
Total Sorties	*1,906*

Note: An aircraft sortie is one take-off and landing associated with the flight of an aircraft. This table shows the sorties through Fort Bliss airspace. Includes sorties with >5 scheduled missions. Unscheduled missions such as medical evacuation, VIP transport, or other missions that include <5 aircraft not included.
Source: U.S. Army, 1996b.

The Doña Ana Range–North Training Areas is located in Restricted Area R-5107A, approximately 5 nm north of the New Mexico-Texas border and west of U.S. Highway 54. The lateral boundaries of this restricted area extend approximately 13 nm to the north and south. The east/west boundaries are approximately 13.5 nm wide at the southern boundary and 23 nm wide at the northern boundary. Altitudes in R-5107A extend from the surface to unlimited. This restricted area is published as active 24 hours a day, 7 days per week.

3.2.2 Military Training Routes

Defined as air routes of varying lengths, widths, and altitudes, MTRs are used for low altitude flight tactics and navigation at speeds greater than 250 knots. Segments of nine MTRs originate, terminate, or transit the McGregor Range restricted airspace as shown in Figure 3.2-1. In FY 96 there was an average of 0.5 daily flight operations on MTR IR-134 (King, 1997). Aircraft normally use IR-134 during daylight hours. MTRs IR-102, IR-115, IR-116, IR-131, and IR-132 are limited to use for Air-launched Cruise Missile (ALCM) missions and no ALCM missions were conducted on these routes in 1996. MTRs IR-192, IR-194, and IR-195 are routes on which there was no activity in 1996. The USAF has proposed that the MTRs originally established for ALCM tests be consolidated and converted to low-level training routes. This action includes changes in aircraft operations along IR-102 and indirectly alters operations in IRs 134/195 and 192/194. Table 3.2-2 summarizes the altitude and route widths for those segments of the MTRs located within the McGregor Range area.

3.2.3 Airports

The El Paso Approach Control Area boundaries encompass four public-use civil airports, one military airport (Biggs AAF), and one private-use civil airport (the Cielo Dorado Estates Airport). The four public-use civil airports are the EPIA, the West Texas Airport, the Doña Ana County Airport, and the Fabens Airport. Biggs AAF and EPIA are contiguous with the Biggs Runway 03/21 located

Table 3.2-2. MTRs Within the ROI

MTR	*Altitude Range*	*Route Width*	*Operating Hours*
IR-102	500' AGL–10,000' MSL	7-10 nm	Daylight hours by NOTAM
IR-115	500' AGL-12,000' MSL	10 nm	Daylight hours by NOTAM
IR-116	500' AGL-12,000' MSL	10 nm	Daylight hours by NOTAM
IR-131	500' AGL-12,000' MSL	10 nm	Daylight hours by NOTAM
IR-132	500' AGL-12,000' MSL	10 nm	Daylight hours by NOTAM
IR-134	100' AGL-12,500' MSL	Varied as defined by geographical coordinates	Sunrise-11:00 pm
IR-192	100' AGL-12,500' MSL	10-20 nm	Sunrise-11:00 pm
IR-194	100' AGL-12,500' MSL	7-24 nm	Sunrise-11:00 pm
IR-195	100' AGL-12,500' MSL	Varied as defined by geographical coordinates	Sunrise-11:00 pm

Notes: AGL = above ground level, MSL = Mean Sea Level, NOTAM = Notice to Airman.
Source: DoD, 1997.

approximately 1.4 nm north of EPIA's Runway 04/22. Both Biggs AAF and EPIA have Air Traffic Control Towers (ATCT) for the control of arriving and departing aircraft at each facility. El Paso Approach Control provides terminal area ATC radar services to Biggs AAF, EPIA, and the West Texas Airport. The West Texas Airport has no ATCT but the airport is served by a published instrument approach procedure. The Doña Ana County and Cielo Dorado Estates airports are VFR-only airports for which there are no ATC services.

The Timberon Airport, a small, private-use VFR-only civil airport lies within the northeastern boundary of R-5103B/C. However, R-5103B excludes the airspace below 1,500 feet AGL in the vicinity of the airport to protect the airport from the restricted area military activities. Two airports close to the R-5103B/C boundary are HAFB located 8 nm northwest of R-5103B, and the Alamogordo-White Sands Regional Airport, a public-use civil airport, located 5 nm north of R-5103B/C.

Although Biggs AAF and the EPIA are contiguous, each have distinct airspace and ATC operating parameters and procedures. Simultaneous operations typically occur at both airports. However, their proximity to one another, and the relationship of their runway configurations, can require air traffic considerations, particularly during peak traffic periods or instrument weather conditions, in which landings and takeoffs at both facilities may be coordinated and controlled as a single airport. Biggs AAF ATCT is open 10 hours on weekdays, and closed on Saturdays and Sundays except when extended hours are requested. When the ATCT is closed, aircraft arriving to or departing from Biggs AAF receive air traffic advisories and departure clearances from El Paso Approach Control.

In CY 96, 44,811 aircraft operations (defined as one takeoff and one landing) were conducted at Biggs AAF as shown in Table 3.2-3. Biggs AAF ATCT staff estimate that 25 percent of these operations (11,200) were touch-and-go practice takeoffs and landings (Sepulveda, 1997). In CY 96, there were 134,601 aircraft operations at the EPIA, including 69,701 commercial air carrier and air cargo operations; 59,650 general aviation operations; and 5,250 military aircraft operations (EPIA, 1996).

Table 3.2-3. Annual Aircraft Operations and Touch-and-Go's at Biggs AAF, CY 96

Aircraft Category	*Operations*		*Touch-and-Go's*	
	Day	*Night*	*Day*	*Night*
Military	35,130	1,849	8,783	462
Civil	7,440	392	1,860	98
Total	*42,570*	*2,241*	*10,643*	*560*

Source: U.S. Army, 1996c.

Transportation

3.3

3.3 TRANSPORTATION

This section discusses the existing ground transportation in the McGregor Range vicinity. The current roadway network and railway systems are described.

3.3.1 Roadway Network

U.S. Highway 54, a two-lane highway that connects El Paso, Texas, north to Alamogordo, New Mexico, is the major highway that runs along the western border of McGregor Range. The two major interstates in the area are I-10 and I-25. Both provide access to El Paso and Fort Bliss, located to the south of McGregor Range. The major east-west access is I-10, which runs through downtown El Paso and passes just south of the Main Cantonment Area. I-25 provides the major northern access and is available by following I-10 approximately 44 miles northwest of El Paso to Las Cruces, New Mexico.

The major road on McGregor Range is New Mexico Highway 506 that travels in an east-west direction and crosses the range in the northern area (Figure 3.3-1). This road provides access to McGregor Range on the west at U.S. Highway 54, and travels east where it intersects with County Road FO52, and continues northeast until it exits the range. New Mexico Highway 506 is a gravel road that is maintained by Otero County, and primarily serves as access to the communities of Timberon and Piñon, New Mexico, but also serves Dell City, Texas. The annual average daily traffic (AADT) volume on New Mexico Highway 506 was less than 30 vehicles per day in 1995. Operations on the range require New Mexico Highway 506 and U.S. Highway 54 to be closed occasionally for safety reasons. The road-closing schedule is provided to Otero County and is available to the public to alleviate unnecessary delays. Figure 3.3-1 illustrates the McGregor Range road network: there are 1,002 miles of roads throughout McGregor Range training areas. There are three guard stations on New Mexico Highway 506 that are used to close the road when necessary: one is located at the intersection with U.S. Highway 54; the second is at the intersection with FO52, and the third is on the east end of the range at County Road EO1. There is a fourth guard station on FO52 at the boundary of the range south of the intersection with New Mexico Highway 506. Other Otero County roads that are in the northeast area of the range or to the east of the range include FO34, FO35, FO37, FO50, FO51, and FO67. There are numerous other roads in this vicinity and on the range, including a network totalling 28 miles of drag roads near the intersection of New Mexico Highway 506 and U.S. Highway 54 used by the U.S. Border Patrol, that are not maintained by Otero County or the BLM. These are primarily dirt roads that provide access to much of the BLM land in the area. The Army maintains the road network on McGregor Range. Off-road vehicle maneuver is allowed only in TA 8. Figure 3.3-1 also shows authorized points for crossing U.S. Highway 54 and the pipeline in TA 8 that traverses the training area.

24

3.3.2 Railways

Two commercial carriers, the Union Pacific/Southern Pacific (UP/SP), and the Burlington Northern/Santa Fe (BN/SF) railroads, provide rail service to El Paso. The UP/SP is the most important to operations at Fort Bliss because it provides direct service from El Paso to the installation and acts as a common carrier for the installation. The UP/SP has three lines in the El Paso area: the northeast trackage parallels U.S. Highway 54; the west trackage parallels I-10; and the southeast trackage that also parallels I-10. To support its operations, the UP/SP operates and maintains 11 yards in the El Paso area. The yards that are of particular importance to Fort Bliss are the Davis, Alfalfa, and Stanton rail yards. All three yards have storage facilities and handling facilities to service hundreds of railcars. To support installation activities, the Strategic Rail Corridor Network (STRACNET) can be accessed through the main UP/SP track running west to Tucson and northeast along the western border of McGregor Range to Alamogordo. Access from Fort Bliss to these STRACNET lines is coordinated through UP/SP.

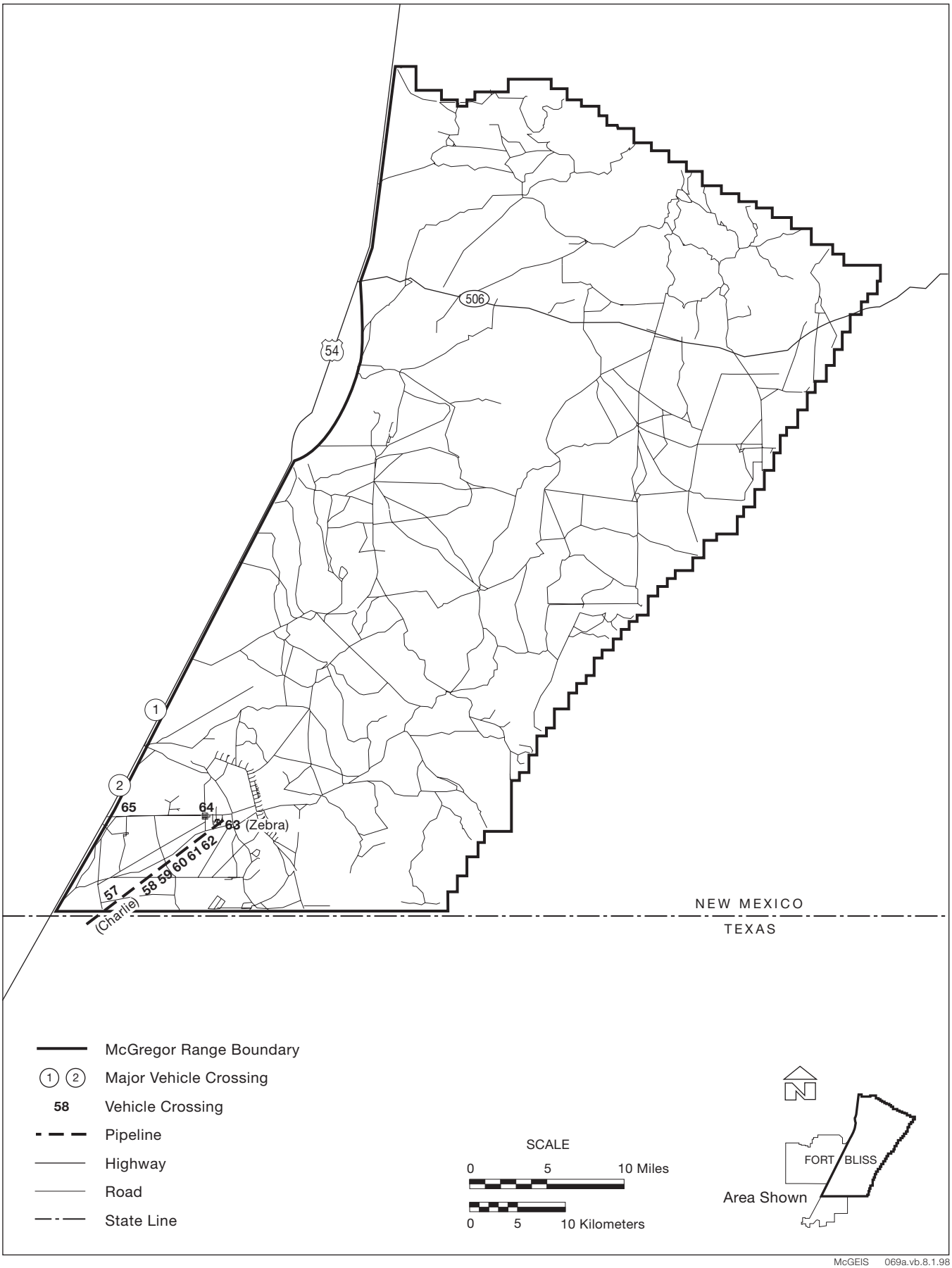


Figure 3.3-1. McGregor Range Regional Roadway Network and Authorized Vehicle Crossings.

Utilities

3.4

3.4 UTILITIES

The discussion regarding utilities on McGregor Range includes water supply, wastewater treatment, solid waste disposal, energy, and communications.

3.4.1 Water Supply

No perennial streams are present in McGregor Range. Stream and spring flow have been captured in the Sacramento Mountains to the north and diverted onto McGregor Range by ranchers since the late 1800s. In the early 1900s, pipelines began to replace the existing ditches, until, at the present time two water delivery systems, consisting of three main lines are in place. One line crosses the northwest quarter of McGregor Range to supply the community of Oro Grande with potable water, and the other two lines in a series of branches, deliver water to wildlife (and secondarily to livestock) on the southern slopes of the Sacramento Mountains and that part of the Otero Mesa that lies in McGregor Range (BLM, 1985). The latter system delivers an estimated 60 to 65 gallons per minute (gpm) (about 100 acre feet per year [afy]) (U.S. Army, 1998f). In addition, numerous earthen dams collect runoff in channels of the larger arroyos in the grazing areas. Surface water on McGregor Range is too unreliable for development as a military or public water supply.

Groundwater resources in McGregor Range have not been developed extensively. A groundwater study was completed (Rapp, 1958) to determine if a supply of 100 gpm of potable water could be developed for the McGregor Range Camp. In general, groundwater was too saline for human consumption, and the Army found it more economical to import El Paso city water to McGregor Range Camp.

A 12-inch, 19.5-mile steel line with a capacity of 2,115 gpm (3.046 million gallons per day [mgd]) supplies water to McGregor Range Camp from a city booster station (U.S. Army, 1997b). A gravity-fed, looped distribution system, consisting of two elevated storage tanks, each of 250,000 gallon capacity, and several thousand feet of water line serve McGregor Range Camp. The water is chlorinated as it enters the distribution system at McGregor Range Camp. Water consumption at McGregor Range Camp, including that at Meyer Range, for FY 96 was 31,761,000 gallons (97 acre feet [af]), which included water used on two road construction projects that year. Consumption for the previous year (without road construction) was 25,116,000 gallons (77 af).

A composite 6-inch, 8-inch, and 10-inch asbestos concrete (AC) line from McGregor Range Camp provides water to Meyer Range. The line is capable of handling a flow of 705 gpm or 1.02 mgd (U.S. Army, 1997b). The Meyer Range system consists of one storage tank; 3,120 feet of 8-inch line; 150 feet of 6-inch line; 790 feet of 4-inch line; 900 feet of 2-inch line; and service lines. The elevated steel storage tank provides for an on-site gravity system. This facility has a 25,000-gallon capacity and was built in 1966. It is connected to the distribution system by an 8-inch AC line. An altitude valve on the incoming 6-inch line to the tank prevents the tank from overflowing, necessitated by a 63-foot drop in hydraulic pressure (head) between the range camp and Meyer Range (U.S. Army, 1985).

Davis Dome is serviced by a 4-inch line from the main 8-inch line. When pressures in the main system are not sufficient to properly serve Davis Dome, a small 30 gpm capacity booster pump station is utilized (U.S. Army, 1985).

The ASP located west of the McGregor Range Camp is serviced with water by a feeder line from the main water line running along the south side of the McGregor Range entrance road from U.S. Highway 54 to the McGregor Range Camp. A small water distribution network serves the MQM-107 launch facility on south McGregor Range and is fed by a 1,000-gallon tank that is filled by the using unit. The MQM-107 launch facility at north McGregor Range is fed by a 1,500-gallon tank that is filled by the

using unit. The SHORAD Range water is brought to the area by truck and pumped into an elevated 100,000-gallon storage tank. The north McGregor Range is serviced by a 10,000-gallon storage tank that is filled by the using unit. This tank serves a fire hydrant and the repair shop. The pumphouse contains a 7.5 horsepower pump that is rated at 300 gpm against 60 feet of head. The distribution network consists of a 6-inch diameter pipe feeding the fire hydrant and a valved 2-inch diameter service line for the repair shop. The water is chlorinated before delivery (U.S. Army, 1985).

A project is underway to investigate geothermal properties of the groundwater in the Davis Dome area (see Section 3.7.2.1). Preliminary reports indicate that sufficient geothermal energy is available to power a potential desalination plant at the site.

3.4.2 Wastewater Treatment

The sanitary sewer system at McGregor Range Camp consists of a gravity system that flows approximately one-half mile to the southwest of the camp and empties into a single-cell lagoon with a surface area of 10.23 acres. The daily biochemical oxygen demand (BOD) load for the lagoon is 409.2 pounds/day, using a loading rate of 40 pounds/day/acre (Landis, 1997).

At Meyer Range, 6 miles southeast of McGregor Range Camp, a gravity flow system feeds into a lift station that pumps wastewater about one-half mile to a two-cell lagoon series with a surface of 1.68 acres each. The BOD load for the lagoons is 134.4 pounds/day, using a loading rate of 40 pounds/day/acre (Landis, 1997).

The sewage treatment system at the SHORAD range consists of a 100,000-gallon evaporation pond. The pond is seldom used and does not overflow (Landis, 1998).

Stormwater drainage from McGregor Range Camp and Meyer Range consists of sheet flow to the west and southwest, eventually flowing into an ephemeral lake a mile southwest of the camp. Analysis of the storm drainage system indicated that the lake has adequate volume to contain a 10-year discharge. A small amount of nuisance ponding may occur within the range camp and at Meyer Range. Evaluation of the 25-year stormwater event indicated that protection of the facilities at the range camp and Meyer Range is adequate (U.S. Army, 1985).

3.4.3 Solid Waste Disposal

Solid waste generated on McGregor Range is placed in dumpsters and picked up by the private contractor that services the Main Cantonment Area (Lenhart, 1998).

3.4.4 Energy

Electrical power is provided by EPEC through a 39.8/69 kV transmission line that extends from McGregor Range Camp to an EPEC substation. The substation is equipped with a 7,500 kV oil-cooled transformer.

McGregor Range Camp receives natural gas from the Gas Company of New Mexico, who purchases the gas from El Paso Gas Company. A 2-inch high pressure natural gas pipeline extends 14.15 miles from an intrastate pipeline to McGregor Range Camp. A 1-inch distribution system provides gas to buildings throughout the range camp. There is no natural gas service to Meyer Range. Meyer Range is dependent on liquid petroleum gas (LPG) to meet its heating needs. Two 2,000-gallon tanks serve the bivouac area, and a 5,000-gallon tank serves the range area.

3.4.5 Communications

Fort Bliss, including McGregor Range Camp, is served by a contract-operated commercial telephone system. The central exchange has more than 350 city connections and 78 FTS2000 Integrated Switch Digital Network (ISDN) trunk lines. Fort Bliss is also currently using the Defense Switched Network (DSN) as a communication link with other U.S. military lines. There are 96 trunk lines. The DSN bypasses and operates separately from commercial telephone networks. The DSN gives a higher degree of security to communications than commercial systems and is reserved exclusively for intragovernmental service.

The installation currently has cellular telephones leased from a private contractor. The systems are completely portable and have a range of approximately 60 miles, but are limited by the location of the antenna station in the southern Franklin Mountains.

Microwave and fiber optic systems at Fort Bliss allow communication within the entire installation. The radio systems in use include FM, VHF, and trunking radios. A Military Affiliate Radio System station also is used on the post for communications and mobilization exercises. Frequencies for all of these systems are properly assigned and utilized according to federal law, Army regulations, and post orders.

Earth Resources

3.5

3.5 EARTH RESOURCES

The following discussion of earth resources is divided into two major topics: geology and soils. The geology section describes the physiography, and mineral and energy resources of McGregor Range. The soils section describes the soils present on McGregor Range and their associated properties. The ROI for earth resources consists of McGregor Range.

3.5.1 Geology

3.5.1.1 Physiography

McGregor Range is within the Basin and Range Physiographic Province. Extension of the crust throughout the province during the past 30 million years has produced characteristic short, linear mountain ranges separated by intervening valleys (Stewart, 1978). Superimposed along the eastern side of the Basin and Range is a peculiar physiographic feature that extends from west Texas and northern Mexico northward through central New Mexico. This feature, called the Rio Grande Rift Valley, extends northward into the Southern Rocky Mountains physiographic province of southern Colorado and northern New Mexico. From Albuquerque northward, the Rio Grande Rift Valley is a relatively distinct, continuous physiographic feature containing numerous basins. South of Albuquerque, the rift broadens and encompasses several valleys and small, linear mountain ranges. At about the latitude of El Paso, Texas, the Rio Grande Rift Valley turns abruptly to the southeast.

From south to north, McGregor Range is comprised of the Hueco Mountains, Otero Mesa, and the Sacramento Mountains. The Hueco Mountains form the western edge of the Diablo Plateau, which extends far into southeast New Mexico and Texas. Otero Mesa is continuous with the Diablo Plateau. North of Otero Mesa the Sacramento Mountains rise steeply. The west side of McGregor Range encompasses a part of the Tularosa Basin which, at 100 miles long and 60 miles wide, is one of the largest valleys in the Rio Grande Rift Valley.

3.5.1.2 Mineral and Energy Resources

Figure 3.5-1 shows the location of mining districts, quarries, geothermal areas, and exploration holes for oil and gas in and near McGregor Range. Table 3.5-1 lists, and briefly describes the mining districts in the area.

The objective of the BLM minerals program under the White Sands RMP as amended by the McGregor Range RMPA, is to provide for the public use of locatable, salable, and leasable minerals on withdrawn public land on McGregor Range consistent with the laws that govern these activities and to minimize environmental damage. Locatable minerals include metallic minerals such as gold, silver, lead, zinc, and copper and nonmetallic minerals such as barite and fluorspar. Salable minerals include industrial minerals and material such as sand, gravel, clay, caliche, stone, and volcanic cinders. Under leasable minerals, oil, gas, and geothermal are the principal activities. The current management policies for mineral and energy resources are described in Section 3.1.2.2*, Nonmilitary Use*.

Renewal of the land withdrawal for McGregor Range requires that a mineral assessment accompany the withdrawal application. To meet this requirement, a mineral- and energy-resource assessment of McGregor Range was conducted jointly by staff of the New Mexico Bureau of Mines, New Mexico State University, and TRC Mariah Associates, Inc. (U.S. Army, 1998g). The results of this assessment and a review of additional sources are summarized below. Additional material from this study is provided in Appendix C.

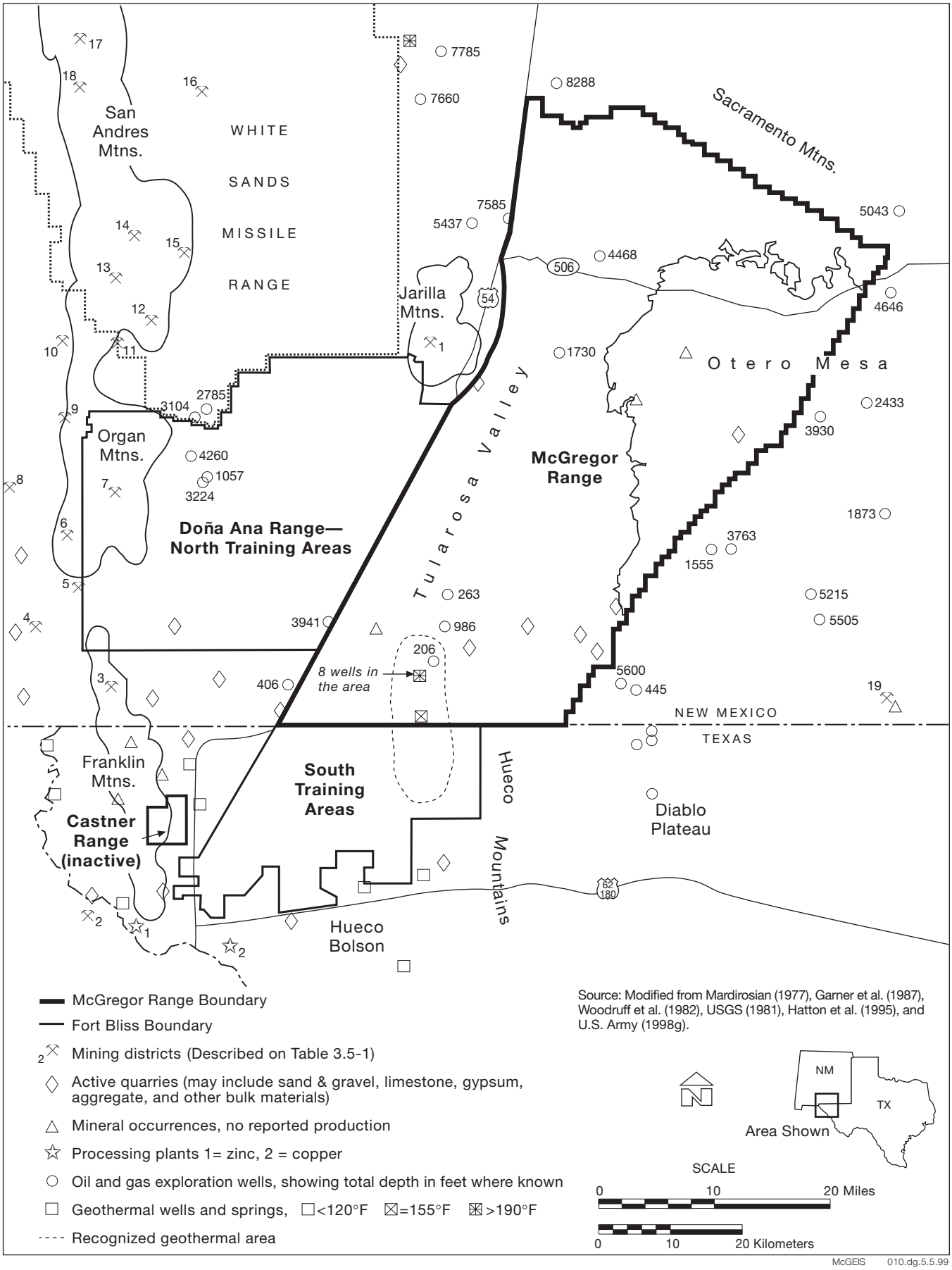


Figure 3.5-1. Mineral and Energy Resources in the McGregor Range Area, Texas and New Mexico.

Table 3.5-1. Mining Districts in the Vicinity of McGregor Range

Mining District or Mine (see Figure 3.5-1)	*Description*
#1. Orogrande (Jarilla)	Replacement and skarn deposits of copper, lead, gold, silver, and iron in Pennsylvanian carbonate rocks adjacent to Tertiary intrusive rocks; also placer deposits. Production estimated between $1 and $10 million.
#2. Brickland	Limestone, clay, and shale from Cretaceous rocks for cement. Production less than $1 million.
#3. North Franklin Mountains (Copiapo)	Iron from replacement deposits in limestone along shear zones. Lead and fluorspar from veins in dolomite. Gypsum from limestone beds. Production less than $1 million.
#4. East Vado (active)	Building stone. Production less than $1 million.
#5. Mesquite	Clay from Pennsylvanian shale. Production less than $1 million.
#6. Bishop Cap	Fluorspar from veins in limestone. Production less than $1 million.
#7. White Spar	Barite from veins in limestone. Production less than $1 million.
#8. Tortugas	Fluorspar from veins and faults in limestone and shale. Production less than $1 million.
#9. Ruby (or Hayner)	Fluorspar from veins in limestone and shale. Production less than $1 million.
#10. Organ	Replacement deposits of copper, gold, lead, silver, and zinc in Paleozoic carbonate rocks near Tertiary intrusive rocks. Production estimated between $1 and $10 million.
#11. Golden Lily	Fluorspar from veins in Precambrian granite. Production less than $1 million.
#12. Tennessee	Fluorspar from contact zone between Precambrian granite and dikes. Production less than $1 million.
#13. Black Mountain	Gold from irregular replacement deposits in dolomite. Production less than $1 million.
#14. Bear Canyon	Barite and lead from replacement deposits in limestone. Production less than $1 million.
#15. Stevens	Fluorspar and barite from replacement deposits in limestone. Production less than $1 million.
#16. Lake Lucero	Sodium compounds and borax from brines in Lake Lucero and surface deposits in nearby alkali flats. Production less than $1 million.
#17. San Andres	Barite and lead from irregular replacement deposits in limestone. Production less than $1 million.
#18. Green Crawford	Copper from veins in limestone. Production less than $1 million.
#19. Cornudas	Nephaline syenite in igneous rocks. A large resource, but no production reported.

Sources: Mardirosian, 1977; Garner et al., 1987; U.S. Army, 1998g.

Metallic Minerals. Five mining districts (or mines) in the vicinity of the McGregor Range have produced metallic minerals (see #1, 3, 10, 13, and 18 on Figure 3.5-1 and Table 3.5-1). None of these districts is currently active (Hatton, et al., 1995). The Orogrande district in the Jarilla Mountains (#1) and the Organ district in the Organ Mountains (#10) have been the largest producers in the area, chiefly copper, gold, lead, silver, zinc, and iron. The value of production at each district was less than $10 million (Mardirosian, 1977). Small amounts of metallic minerals have also been produced from the Black Mountain district (#13, gold), the Green Crawford district (#18, copper), and the North Franklin Mountains district (#3, iron), all of which are in the Organ and San Andres mountains.

Several areas on McGregor Range have been identified as having some potential for gold, silver, copper, lead, zinc, platinum group, iron, niobium, thorium and rare earths, beryllium, tin, and manganese (Figure 3.5-2; [U.S. Army, 1998g]). At most locations the potential is low. The Jarilla Mountains have a moderate potential for deposits of gold, silver, copper, lead, and zinc.

Industrial Minerals and Materials. Industrial minerals and materials are currently produced from numerous quarries in the vicinity of McGregor Range (Figure 3.5-1). The materials produced are mostly sand, gravel, and limestone. Except for #4 on Figure 3.5-1, none of these quarries are within established or recognized mining districts and are shown on Figure 3.5-1 as "active quarries." Large amounts of sand, gravel, and building stone are available throughout the Tularosa Basin and Hueco Bolson, as is limestone from Paleozoic rocks in neighboring mountains and mesas.

Mining districts that have produced industrial minerals and materials are chiefly in the Franklin, Organ, and San Andres mountains (Figure 3.5-1). Materials produced include limestone, clay, and shale for cement; building stone; fluorspar; and barite. The value of the materials produced has been less than $1 million at each district. Only the Vado quarries (#4) are currently active (Hatton et al., 1995). Small amounts of sodium compounds and borax have been produced from a district near White Sands National Monument (#16 on Figure 3.5-1).

Industrial rocks and minerals occur widely on McGregor Range. Commodities with some potential for development, however, are limited to sand and gravel, limestone, caliche, and gypsum (Figures 3.5-3 and 3.5-4; [U.S. Army, 1998g]). The economics of mining these materials depends largely on the costs of transportation. Large amounts of these materials are available in neighboring basins and mountains.

Energy Resources. The discussion of energy resources for McGregor Range includes geothermal resources, oil and gas resources, and uranium resources.

Geothermal. Geothermal resources of commercial proportion (generally hotter than 194º F and capable of generating commercial amounts of electricity) are most prevalent in areas of crustal instability, high heat-flow, and young igneous rocks (Muffler et al., 1978). In contrast, low-temperature geothermal resources (less than 194º F) occur widely, apparently originating from deep groundwater circulation in regions with normal or higher-than-normal geothermal gradients. Low-temperature resources can be used for such things as space heating, heating domestic water, and desalination.

The Rio Grande Rift Valley is characterized by crustal instability, moderate to high heat-flow (from 1.5 to more than 2.5 heat-flow units), and warm to hot subsurface waters. The U.S. Army is investigating the potential of a geothermal area at the south end of McGregor Range (Figure 3.5-5). Water temperatures within the 25-mile-long geothermal area range from 176 to 230º F (Henry and Glock, 1981). Temperatures as high as 134º F have been reported from well depths of only 450 feet (Woodruff et al., 1982). Current information indicates that heated water at temperatures between 180 to 185º F exists at 400 to 600 feet. The maximum temperature record was 192º F at 2,285 feet below the surface; economic use of this resource is currently being evaluated by the U.S. Army (U.S. Army, 1998g). A moderate potential for low-temperature geothermal resources exists along the west side of the range (Figure 3.5-5). Geothermal potential elsewhere on the range is low.

Oil and Gas. The favorability of an area to contain commercial quantities of oil and gas depends on many factors. Important factors include the presence and volume of source rocks; the degree of maturation of the source rocks; the availability of reservoir rocks; and the availability of stratigraphic or structural features to trap the migrating oil and gas. If the severity of post-entrapment tectonic, igneous, and geothermal activity is too intense, the petroleum can vaporize or escape to the atmosphere or hydrosphere along faults and fractures and by fresh-water flushing.

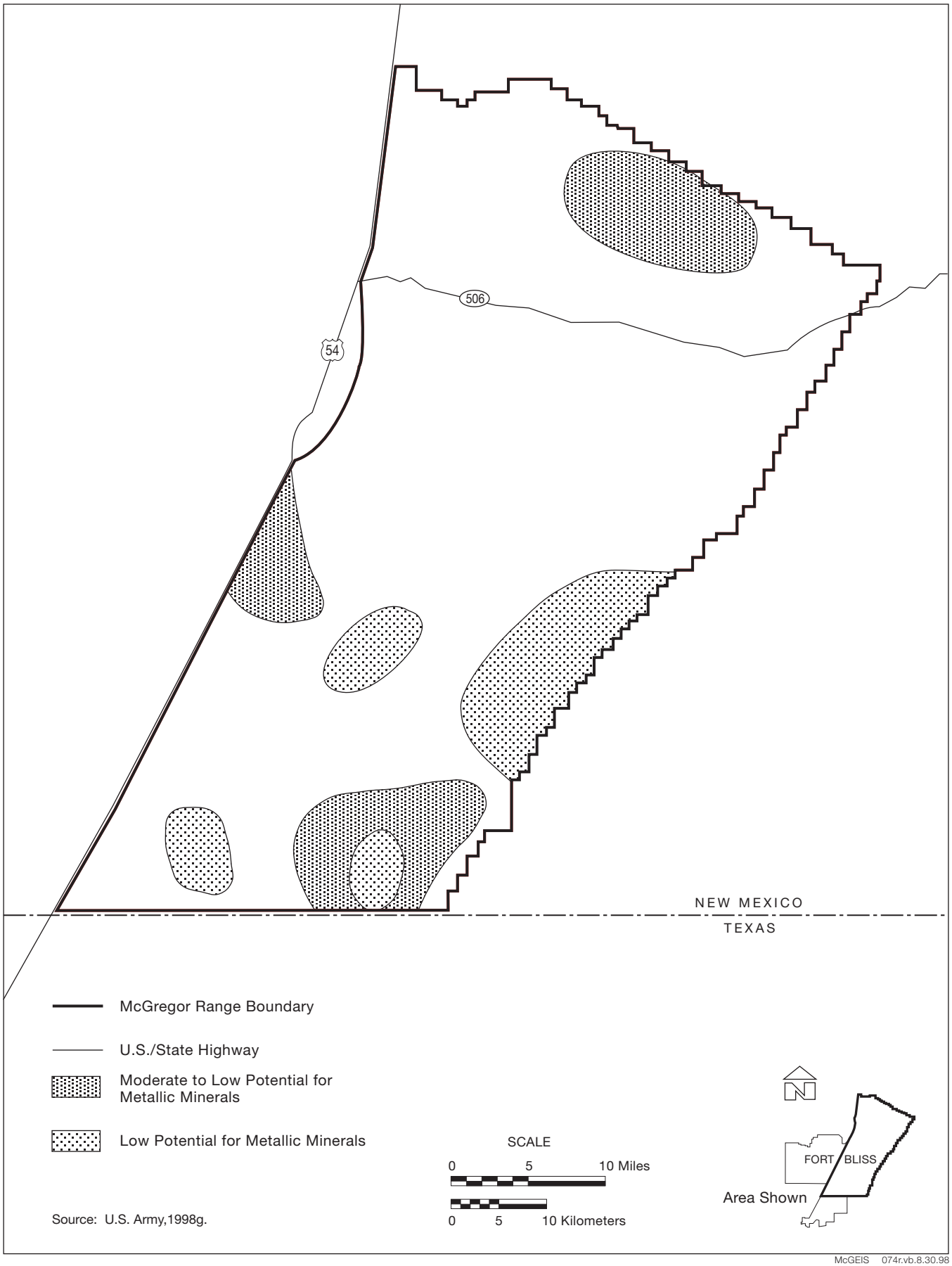


Figure 3.5-2. Areas of Potential for Metallic Minerals on McGregor Range.

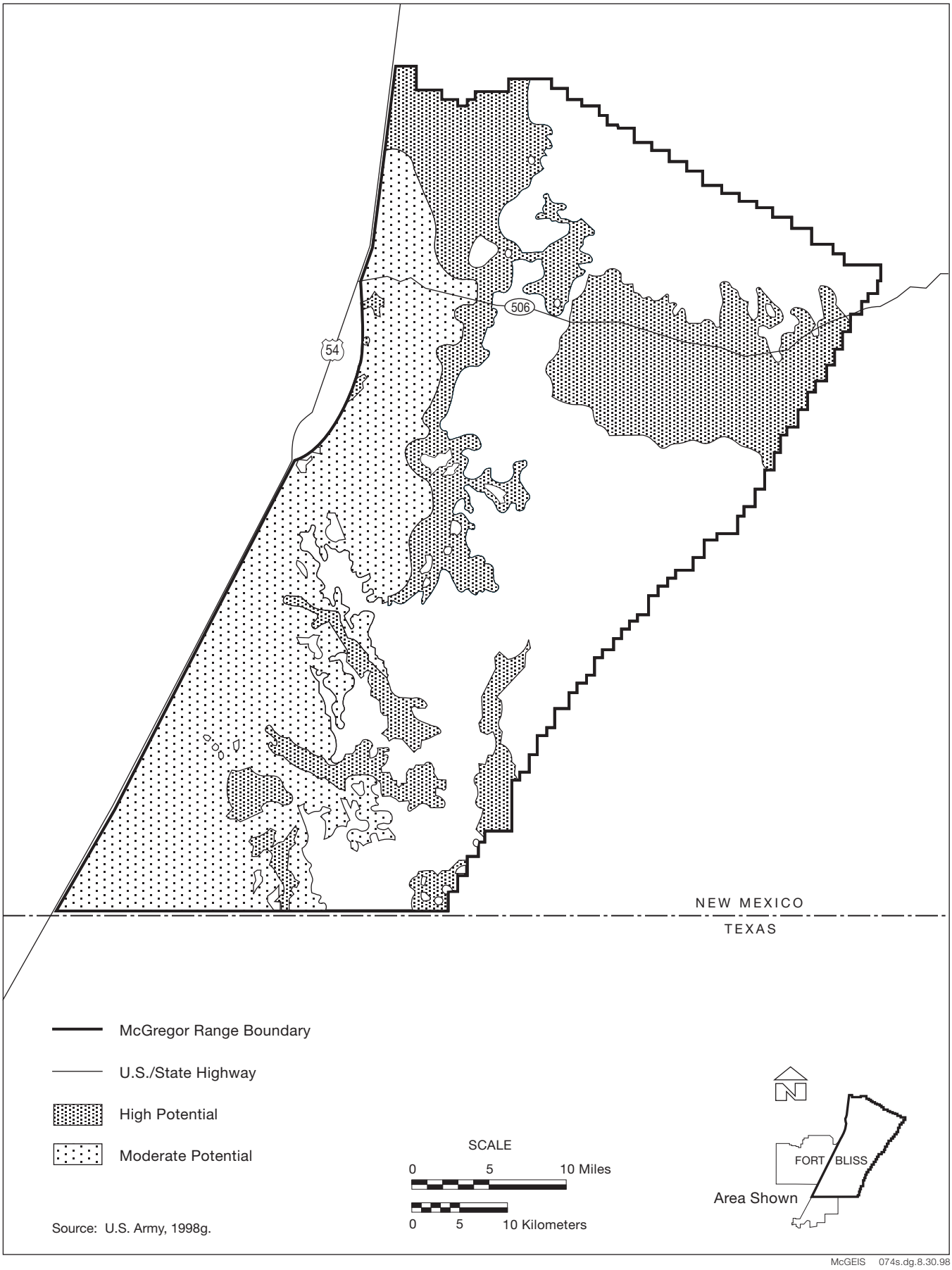


Figure 3.5-3. Resource Potential for Sand and Gravel on McGregor Range.

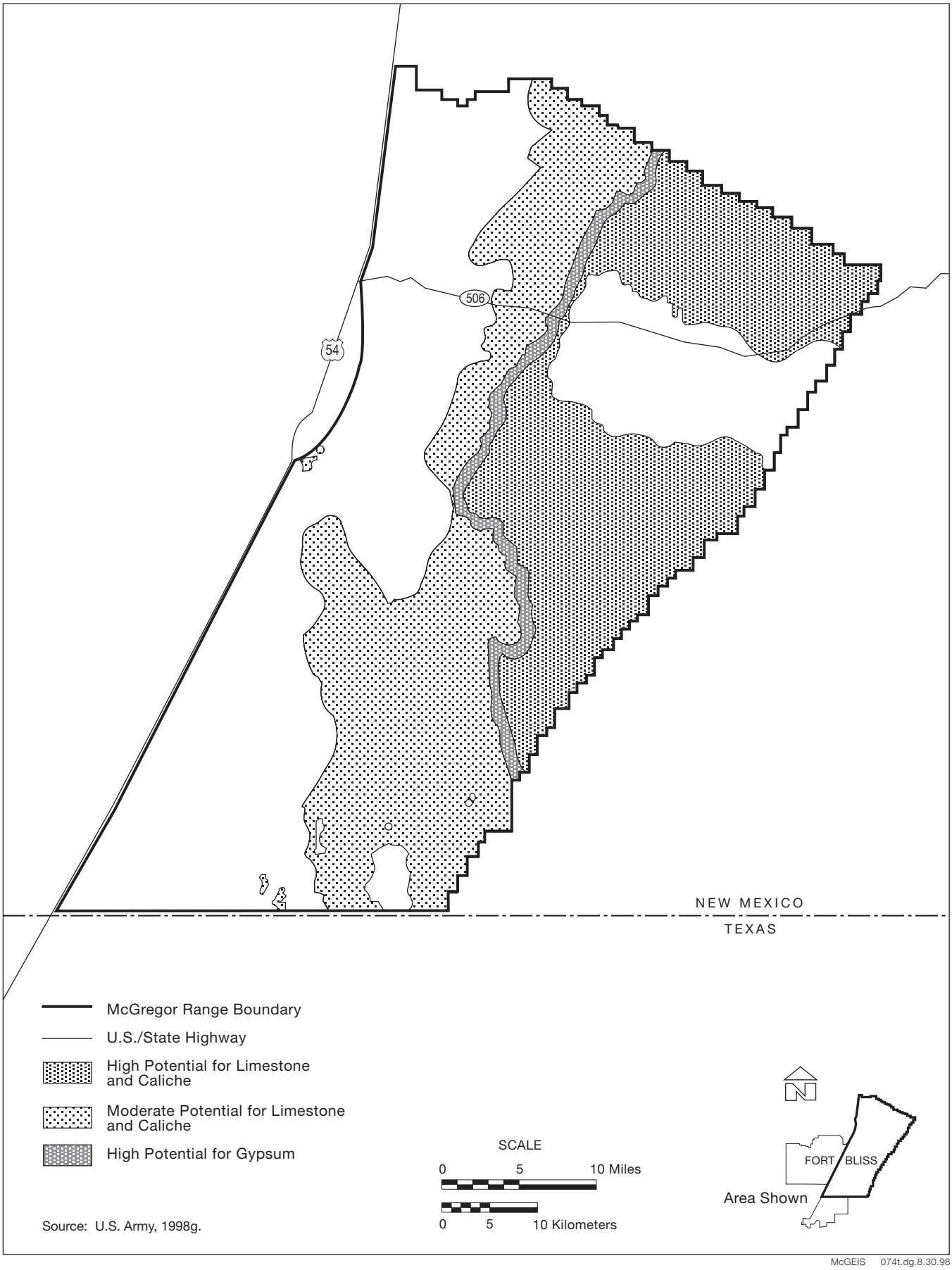


Figure 3.5-4. Resource Potential for Limestone, Caliche, and Gypsum on McGregor Range.

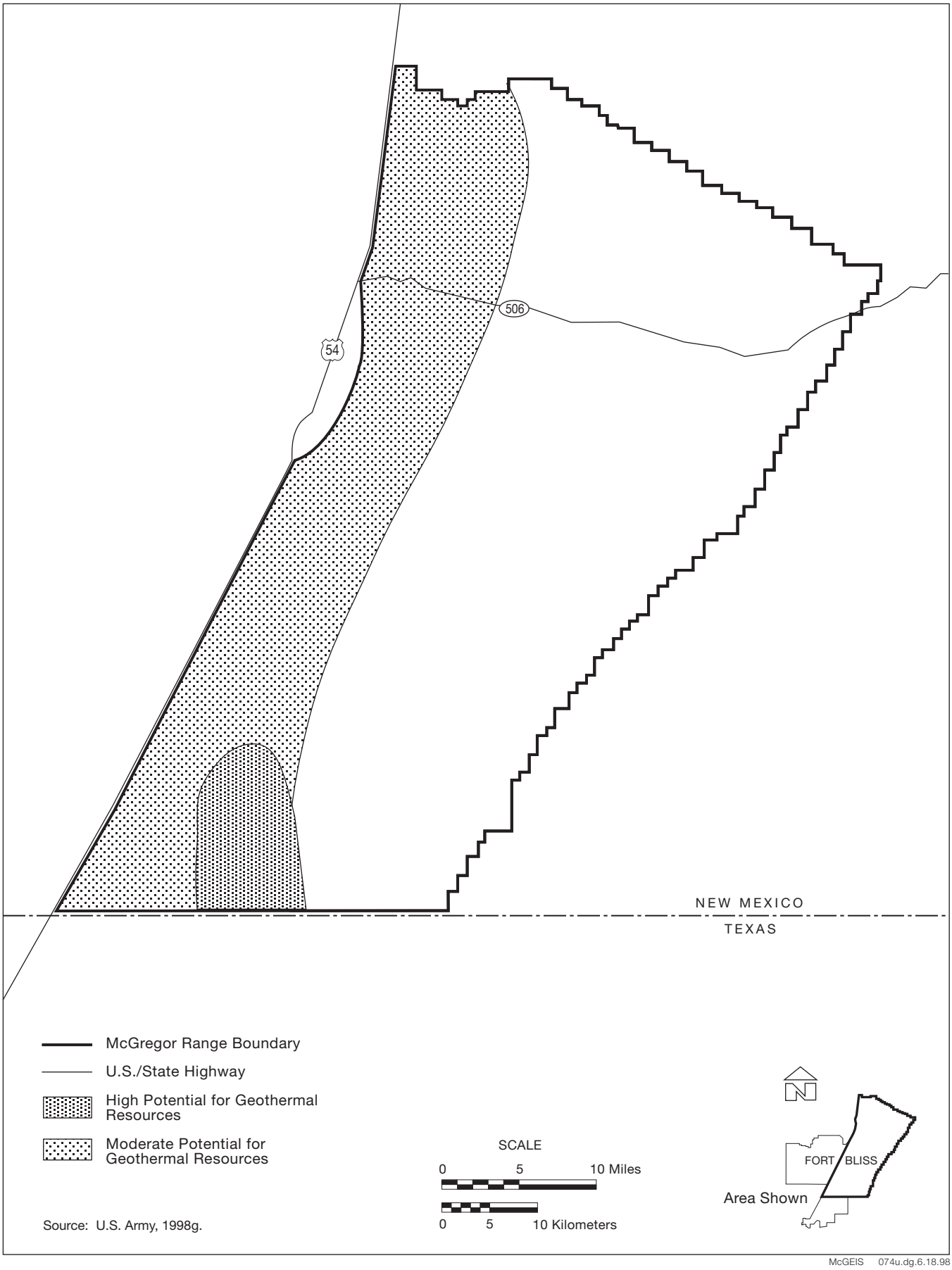


Figure 3.5-5. Areas of Potential for Geothermal Resources on McGregor Range.

178

179

Paleozoic source and reservoir rocks underlie the Tularosa Basin (King and Harder, 1985). Through 1980, several oil and gas exploration wells had been drilled in the McGregor Range area (Figure 3.5-1), but all were dry (USGS, 1981). Foster (1978) lists the wells that had oil and gas shows. The most successful test wells were drilled in 1974 at the northern end of the Tularosa Basin near Three Rivers, where noncommercial volumes of natural gas were recovered from Pennsylvanian and Permian strata (King and Harder, 1985). Most oil and gas shows from the Tularosa Basin have been from Pennsylvanian and Permian rocks, and a few from Mesozoic rocks (Foster, 1978). Testing of pre-Pennsylvanian rocks has been limited and generally unsuccessful. According to the appraisal by King and Harder (1985), the Tularosa Basin contains abundant source rocks, reservoir rocks, and hydrocarbon traps (stratigraphic pinchouts, unconformities, and structural traps).

The results of exploration drilling on the Otero Mesa-Diablo Plateau have been disappointing (Black, 1975; King and Harder, 1985). Silurian and Permian rocks account for most of the shows. Black (1975) suggests that the lower Paleozoic rocks of the Orogrande Basin are adequate source rocks and that fault and stratigraphic traps along the flanks of the late Paleozoic Padernal Uplift are favorable targets. Otherwise, the Otero Mesa-Diablo Plateau is not considered by King and Harder (1985) as a particularly favorable area for hydrocarbons because of a relatively small volume of source rocks, few traps, and late Tertiary uplift and erosion.

In addition to the less-than-promising results of drilling to date in the Tularosa Basin, the overall geologic history of south-central New Mexico and west Texas is not particularly favorable for the preservation of moderate to large accumulations of oil and gas. Late Cenozoic crustal extension and high heat-flow during development of the basin and range, and the Rio Grande Rift Valley probably destroyed any moderate- to large-size reservoirs that had survived Early- to Middle-Tertiary igneous activity in the region (Thompson, 1976) (reservoirs with more than 10 million barrels of recoverable oil or 60 billion cubic feet of recoverable gas). If oil and gas resources exist at McGregor Range, they are likely to be small (less than 10 million barrels of recoverable oil or 60 billion cubic feet of recoverable gas). A well drilled recently east of McGregor Range has been determined to be a commercial gas well. This indicates that commercially viable gas resources may exist in the Pennsylvanian rocks on McGregor Range (Jentgen, 1998). This discovery off McGregor Range has prompted oil companies to express interest to the BLM regarding future exploration on McGregor Range (Sanders, 1998), however, there has been no formal request for exploration on McGregor Range. Figure 3.5-6 shows the oil and gas potential of McGregor Range assigned by U.S. Army, (1998g).

Uranium. The Grants Mineral Belt in northwest New Mexico is the nation's largest producer of uranium (U.S. Department of Energy, 1980). Decreasing demand, however, forced all conventional mines in the state to close in the early 1980s (McLemore and Chenoweth, 1989). Although uranium can occur in a variety of geologic environments, sandstone of Jurassic age has been the most prolific source (Chenoweth, 1976). Jurassic rocks do not occur in south-central New Mexico and west Texas.

Uranium minerals have been reported from several areas at and near McGregor Range, but uranium deposits are not known to exist on McGregor Range. The potential to develop commercial quantities of uranium at these sites, or elsewhere in the region, is low, considering that highly favorable areas exist elsewhere in New Mexico.

3.5.2 Soils

Nearly all of McGregor Range is included in the *Otero County, New Mexico Soil Survey* (U.S. Department of Agriculture [USDA], 1981). This survey was conducted and published by the Natural Resources Conservation Service (NRCS) and was mapped at the series, complex, and association

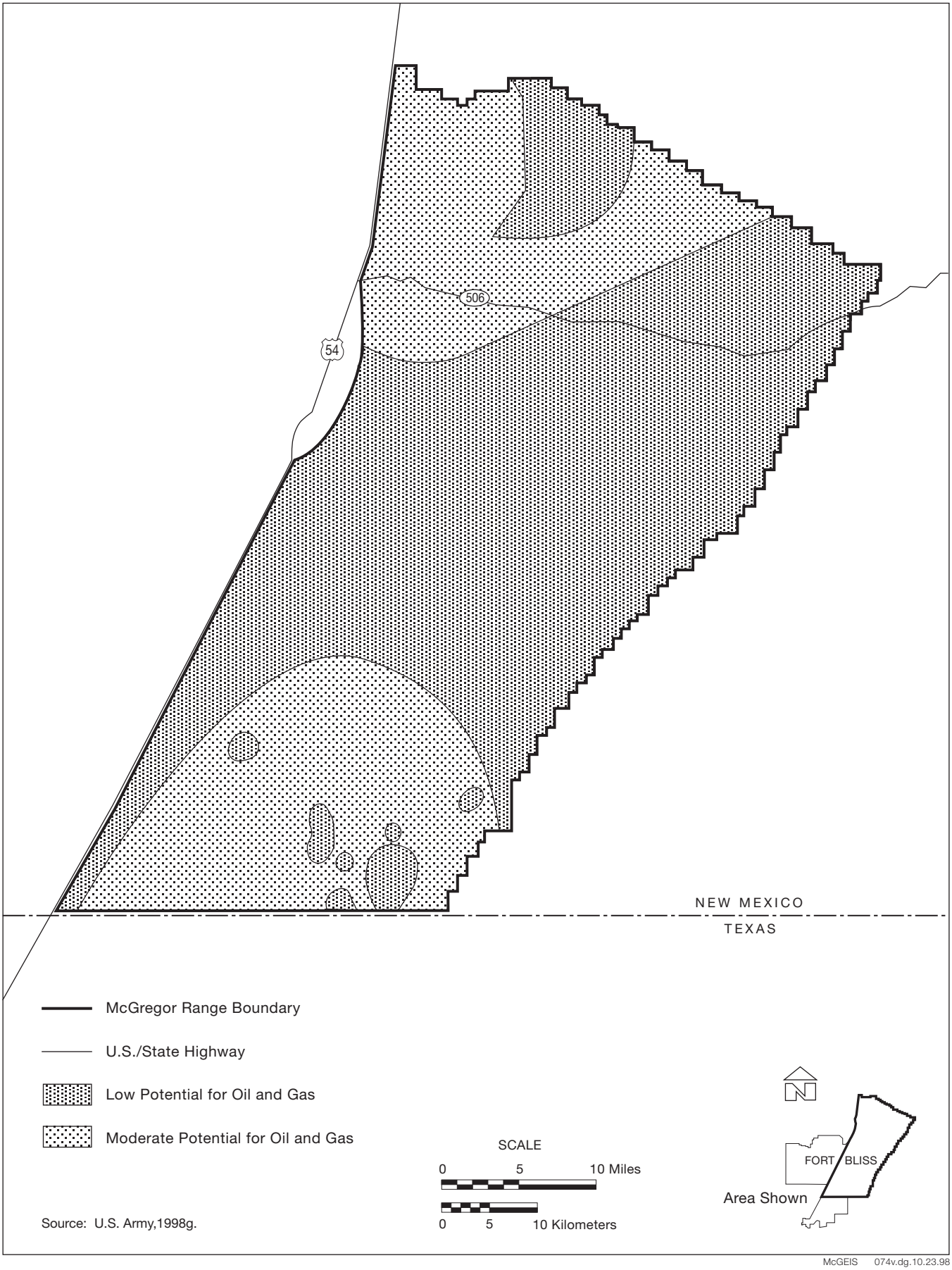


Figure 3.5-6. Oil and Gas Potential on McGregor Range.

levels. An effort is currently underway by the NRCS to resurvey McGregor Range. The purpose of the new survey is to update and refine the current survey, and to map soils that were not previously surveyed. Soils not included in the Otero County survey are found in an unpublished survey conducted by the USFS (Figure 3.5-7).

The majority of the soils on McGregor Range are classified as either aridisols or entisols, although a few mollisols are found in the area. Aridisols are soils with well-developed pedogenic horizons that developed under conditions of low moisture, and have very little water leaching through the profile (Donahue et al., 1977). Consequently, some of these soils have lime-cemented hardpans (caliche). Entisols are young soils with little or no development of soil horizons located in areas where the soil is actively eroding (slopes) or receiving new deposits of soil materials (alluvial fans, flood plains, and eolian sand dunes). Mollisols occur in the mountains of McGregor Range. They are distinguished by a deep, dark-colored surface horizon, rich in organic matter and saturated with bases.

Soils on McGregor Range generally consist of sandy, silty, and gravely loams, and fine sands and silts. The soils are alkaline and calcareous, having developed from the weathering of gypsum, sandstone, limestone, and igneous and metamorphic rocks. Windblown sediments from exposed lakebeds occur widely.

The soils of McGregor Range can be separated into two general categories based upon the following physiographic positions: valley and basin floors; and mountains, mountain foot slopes, and escarpments. Soils in the valleys and basins are shallow to deep, nearly level to very steep, well-drained to excessively drained soils that formed in alluvium, alluvium modified by wind, and eolian material (USDA, 1981).

Most of the basin floors are covered by coppice dunes (eolian deposits trapped by mesquite thickets). These soils are found mainly in the Tularosa Basin. The major soil complexes and associations that occur in the valleys and basins include Mimbres-Tome, Nickel-Tencee, and Pintura-Doña Ana. Soils in the valleys and basins are used mainly for grazing, wildlife habitat, and watershed. Military uses include ground-troop training, wheeled and tracked vehicle maneuvering (off-road vehicle maneuvering is limited to TA 8), and missile launching. On-road vehicle training is conducted on the 1,002 miles of roads that cover 2,673 acres of McGregor Range.

Land surfaces on mountains, mountain foot slopes, and escarpments are either rock outcrops or shallow to deep, well-drained, and nearly level to extremely steep soils that formed in alluvium and colluvium mostly derived from limestone (USDA, 1981). These soils are found mainly in the Sacramento and Hueco mountains, and on Otero Mesa. Major soil units in this category include Ector-Rock outcrop, Lozier-Rock outcrop, and Philder very fine sandy loam. These soils are used mainly for grazing, wildlife habitat, and watershed. In the mountainous areas, military uses are limited because of steep slopes and rough terrain, although some vehicle maneuvering and ground-troop training does occur on these soils.

Wind and water erosion is currently the most significant process affecting soils on McGregor Range. Soils unprotected by vegetation are susceptible to erosion from wind and water runoff. Gullying is the most prevalent form of erosion, but sheet and rill erosion from water, and wind erosion are processes that can also significantly affect soil movement. Wind and water erosion calculations and assumptions are presented in Appendix H, *Soils.*

The BLM natural units (see Section 3.1.2.2) are considered to have no significant wind erosion: Mountain Foothills, Canyonlands, and Rimlands. The Mesa and Alluvial Fans are subject to moderate erosion rates (20 to 23 tons per acre per year gross erosion), while soil movement in the Bolson is very high (140 tons per acre per year gross erosion). Estimates of water erosion in the co-use area have a rate of sediment yield between 0.3 and 0.5 af per square mile per year throughout the McGregor grazing EIS area (BLM, 1989).

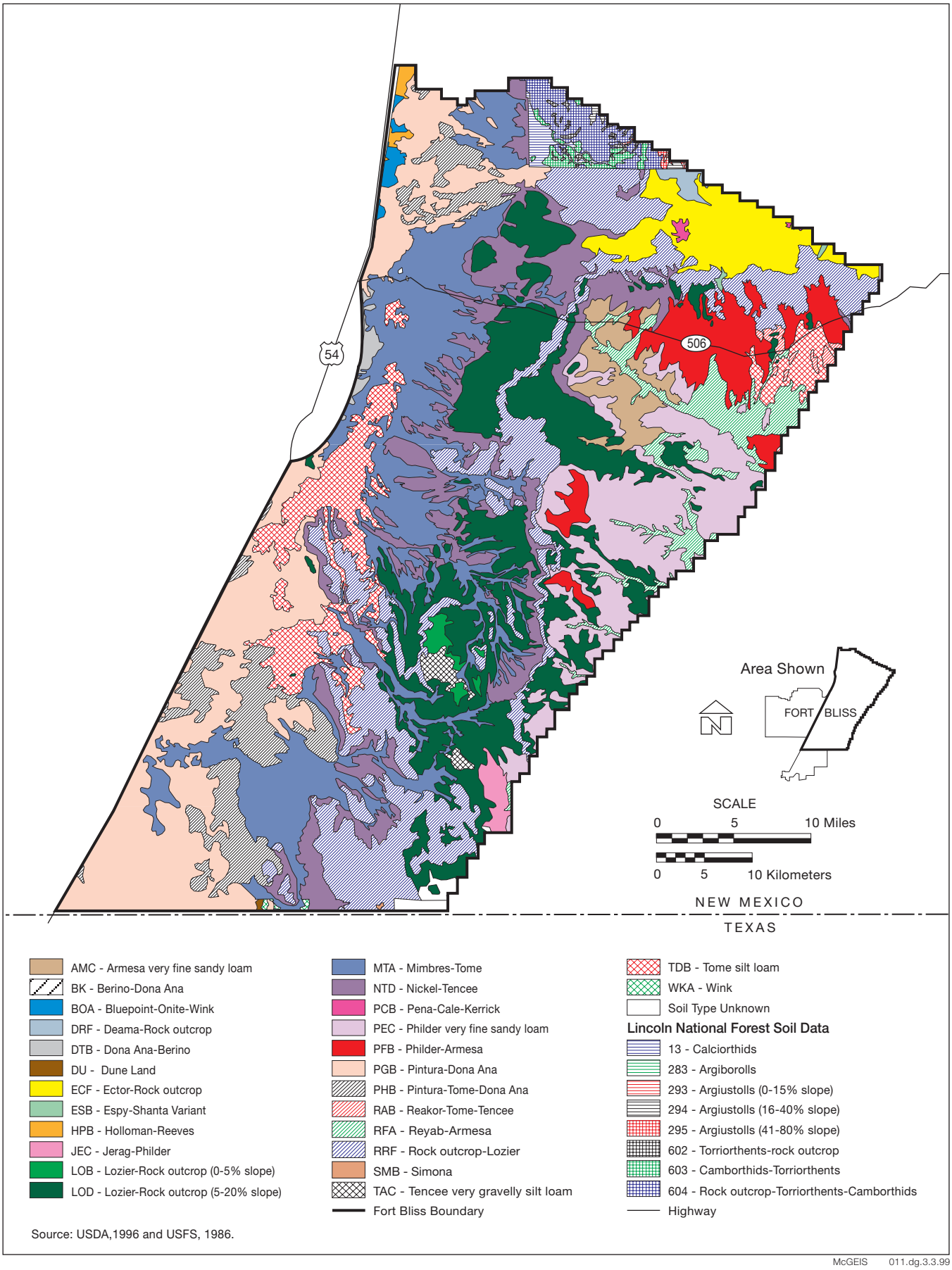


Figure 3.5-7. Distribution of Soil Associations on McGregor Range.

The annual soil loss from wind and water varies primarily according to soil type and vegetative cover. The analysis conducted by the BLM in 1979 described soil loss by natural unit shown by Table 3.5-2.

Table 3.5-2. Soil Loss from Wind and Water on McGregor Range

*Natural Unit**	*Wind***	*Water****
Mountain Foothills	0	0.47
Canyonlands	0	0.32
Mesa	20	0.37
Rimlands	0	0.35
Alluvial Fans	23	0.45
Bolson	140	0.29

* See Section 3.1.2.2; ** Tons per acre per year; *** Acre feet per square mile per year.
Source: BLM, 1980.

Erodibility of soils varies considerably across McGregor Range. Figure 3.5-8 shows the erodibility of soils, as well as the location of steep slopes on the range. In general, soil erodibility is a function of soil type, slope, and vegetative cover. Sandy soils are extremely susceptible to wind erosion; loamy sands are highly erodible and capable of supporting a productive vegetative cover. Soils with large amounts of clay are moderately erodible and capable of supporting vegetation. Loamy soils with less than 35 percent clay are slightly erodible, and stony or gravely soils and rock outcrops are not generally subject to erosion.

The majority of steep rocky hills and mountains on McGregor Range have only slight erosion potential (USDA, 1981), although during periods of severe thunderstorm activity, large volumes of runoff can build up rapidly, causing flash floods that can produce large gullies. Soils covered by grasses such as those on Otero Mesa have relatively low amounts of erosion, unless they are disturbed, while areas that are predominantly shrublands (creosotebush and mesquite) have higher rates of erosion (particularly from wind) due to the large amounts of exposed soil between shrubs.

There are several areas where accelerated erosion is a problem on McGregor Range. Soils in the coppice-dunes area of the Tularosa Basin are subject to wind erosion. Most of the soil movement in this area is localized from dune to dune, but on windy days, blowing dust particles rise to the atmosphere (BLM, 1988b). This process could significantly lower air quality. On training ranges in the Tularosa Basin, roads have been constructed in such a manner that they have become channels for rainwater runoff. This has caused a considerable amount of erosion (BLM, 1988b). A similar problem has occurred on roads leading up to Otero Mesa (USAF, 1998). Grazing by livestock has reduced the vegetative cover and exposed the soil surface to erosion in localized areas on Otero Mesa, such as holding areas, watering points, and mineral licks.

Qualitative observations during the BLM's 1979 field season indicated that near water facilities, the soil is compacted by livestock over areas as large as 10 acres. On clay soils, the compaction could reduce infiltration capacity by as much as 50 percent. On most other soils, the reduction could be 15 to 30 percent. There is no effect on sandy or gravelly soils. Because of the reduced infiltration, soil moisture is reduced in the vicinity of water supplies and the survival potential of seeds may be reduced slightly. In areas away from water, the effects of grazing generally relate to the breaking of soil crusts by trampling (BLM, 1990a).

Soil contamination is not a problem on McGregor Range, although the potential for releases of reportable soil contaminants does exist.

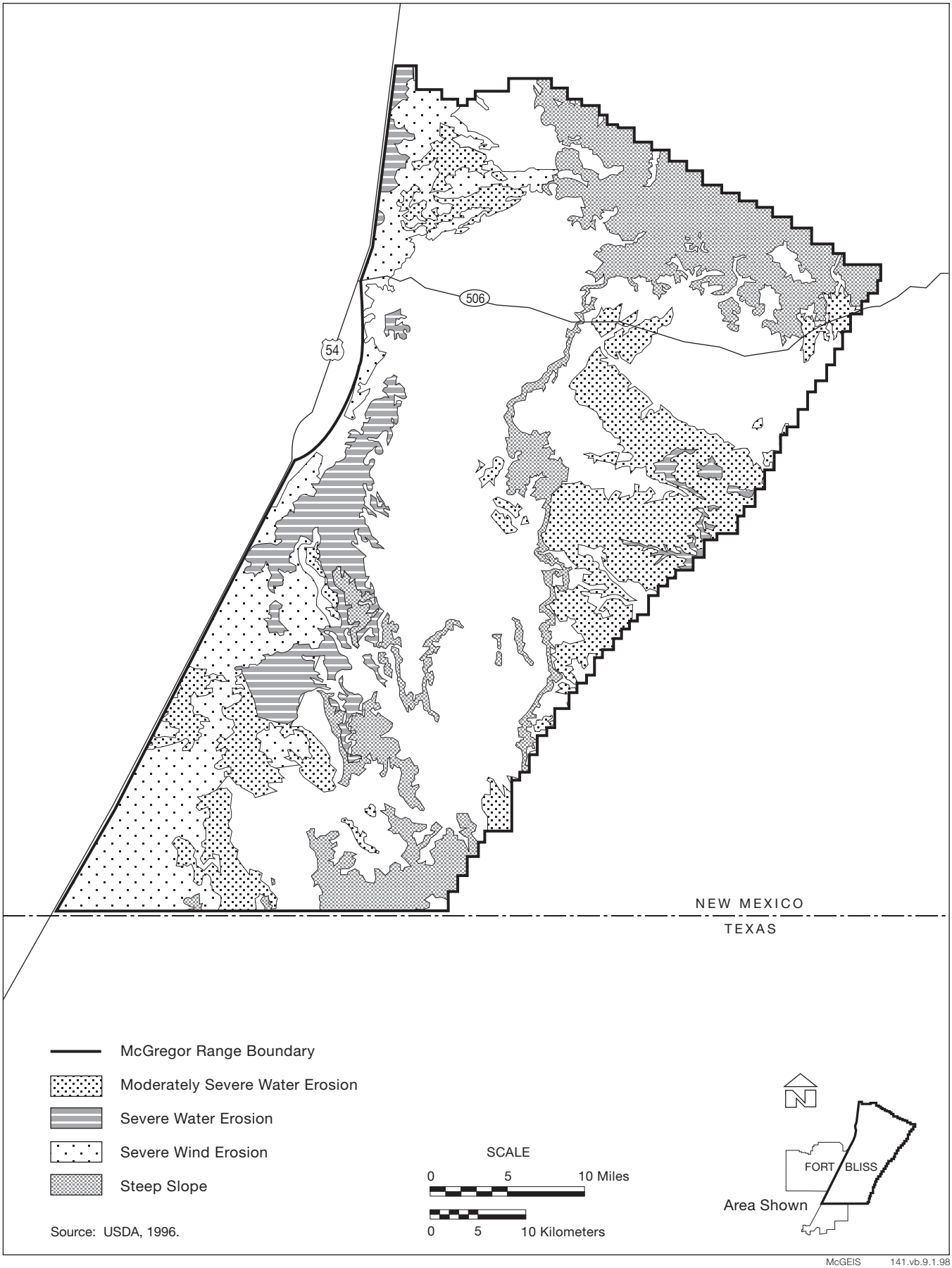


Figure 3.5-8. Steep Slopes and Erodible Soils Within McGregor Range.

Air Quality

3.6

3.6 AIR QUALITY

This section presents the current air quality conditions in the vicinity of McGregor Range, and compares it to the relative federal and state air quality standards.

Air quality in a given location can be described by the concentration of individual pollutants in the atmosphere, and is generally expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. Meteorological conditions have a significant impact on the pollutant concentrations, because they control the dispersion or mixing of pollutants in the atmosphere through the influences of wind speed, wind direction, atmospheric stability, and other meteorological variables.

3.6.1 Applicable Regulations and Standards

3.6.1.1 Federal Air Quality Standards

The significance of a pollutant in a region or geographical area is determined by comparing the concentration in the atmosphere to federal and state Ambient Air Quality Standards (AAQS) for the pollutant. Under the authority of the CAA, the U.S. Environmental Protection Agency (EPA) has established nationwide air quality standards to protect public health and welfare, with an adequate margin of safety. These federal standards, known as the National Ambient Air Quality Standards (NAAQS), were developed for six "criteria" pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter less than 10 micrometers in diameter (PM_{10}) and particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). The standards are defined in terms of concentration (e.g., ppm) determined over various periods of time (averaging periods). Short-term standards (1-hour, 8-hour, or 24-hour periods) were established for pollutants with acute health effects, while long-term standards (annual periods) were established for pollutants with chronic health effects. These standards are shown in Table 3.6-1.

Two of these standards have been newly promulgated by EPA in 1997: a new 8-hour O_3 standard (which will eventually replace the historic 1-hour standard); and a new standard for $PM_{2.5}$, which was not regulated until this year. EPA has stated that both of these new standards will be implemented over an extended period of time. In the case of the O_3 standard, the 1-hour standard will continue to apply to areas not attaining it for an "interim period" (expected to be several years). For the new $PM_{2.5}$ standard, there will be a 3-year period during which air monitoring data will be acquired to determine present ambient levels of $PM_{2.5}$, since no previous monitoring has been conducted for this pollutant. Designation of areas as attainment or nonattainment of the $PM_{2.5}$ standard is not scheduled until the 2002 to 2005 timeframe.

In a semi-arid to arid region such as McGregor Range, a new particulate $PM_{2.5}$ standard could be a cause of concern, particularly when there is essentially no ambient monitoring data available at present to determine current compliance status. However, fine particles, measured by $PM_{2.5}$, are generally produced by combustion processes (e.g., boilers, internal combustion engines), while coarse particles, measured by PM_{10}, result from windblown dust on deserts and fields, or road dust kicked up from motor vehicles. A relatively small number of combustion sources are located at McGregor Range.

3.6.1.2 State Air Quality Standards

Under the CAA, state and local agencies may establish air quality standards and regulations of their own, provided these are at least as stringent as the federal requirements. Activities at McGregor Range can have

Table 3.6-1. Ambient Air Quality Standards

		Federal NAAQS		*New Mexico AAQS*	
Air Pollutant	*Averaging Time*	*Primary*	*Secondary*	*Primary*	*Secondary*
CO	8-hour	9 ppm	—	8.7 ppm	—
	1-hour	35 ppm	—	13.1 ppm	—
NO_2	AAM	0.053 ppm	0.053 ppm	0.05 ppm	0.053 ppm
	24-hour	—	—	0.10 ppm	—
SO_2	AAM	0.03 ppm	—	0.02 ppm	—
	24-hour	0.14 ppm	—	0.10 ppm	—
	3-hour	—-	0.5 ppm	—	0.5 ppm
PM_{10}	AAM	50 µg/m^3	50 µg/m^3	—	50 µg/m^3
	24-hr	150 µg/m^3	150 µg/m^3	—	150 µg/m^3
$PM_{2.5}$ [(a)]	AAM	15 µg/m^3	15 µg/m^3	—	—
	24-hour	65 µg/m^3	65 µg/m^3	—	—
Total Suspended Particulates (TSP)	AGM	—	—	60 µg/m^3	—
	30-day	—	—	90 µg/m^3	—
	7-day	—	—	110 µg/m^3	—
	24-hr	—	—	150 µg/m^3	—
O_3 [(b)]	1-hour	0.12 ppm	0.12 ppm	0.12 ppm	0.12 ppm
	8-hour	0.08 ppm	—	—	—
Pb and Pb Compounds	Calendar Quarter	1.5 µg/m^3	1.5 µg/m^3	1.5 µg/m^3	1.5 µg/m^3

[a] The 8-hour O_3 standard was promulgated in 1997, and will eventually replace the 1-hour standard. However, the 1-hour O_3 standard will continue to apply to areas not attaining it for an interim period.

[b] The PM standard (particulate matter with a 2.5 µm diameter) was promulgated in 1997, and will be implemented over an extended timeframe. Areas will not be designated as in attainment or nonattainment of the PM standard until the 2002-2005 timeframe.

AAM = Annual Arithmetic Mean, AGM = Annual Geometric Mean, ppm = parts per million, µg/m^3= micrograms per cubic meter.

Sources: New Mexico Air Quality Bureau, 1997.

an impact on air quality in New Mexico. The State of New Mexico revised its own AAQS in November 1995. According to the preamble of the new regulation, the New Mexico AAQS are not intended to provide a sharp dividing line between air of satisfactory quality and air of unsatisfactory quality. They are; however, numbers that represent objectives to preserve the State's air resources. Table 3.6-1 shows the national and state AAQS that apply with respect to McGregor Range (New Mexico Air Quality Bureau, 1997).

Attainment Areas. EPA has classified all areas of the U.S. as meeting the NAAQS (in attainment) or not meeting the NAAQS (in nonattainment) for each individual criteria pollutant. The CAA Amendments of 1990 established a framework to achieve attainment and maintenance of the health-protective NAAQS. Title I sets provisions for the attainment and maintenance of the NAAQS.

State Implementation Plans. Individual states are required to establish a State Implementation Plan (SIP), which is approved by EPA. A SIP is a document designed to provide a plan for maintaining existing air quality in attainment areas, and programmatically eliminating or reducing the severity and number of NAAQS violations in nonattainment areas, with an underlying goal to bring state air quality conditions into (and maintain) compliance with the NAAQS.

The principal method of maintaining or improving ambient air quality is by controlling emissions from sources: the SIP establishes regulations to control stationary emission sources; and EPA establishes regulations to control mobile sources, which are installed by vehicle manufacturers. In attainment areas, Prevention of Significant Deterioration (PSD) regulations apply; in nonattainment areas, New Source Review regulations apply.

A complex web of control regulations can apply to large stationary emission sources, including Best Available Control Technology (BACT), New Source Performance Standards (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAPs), and Maximum Achievable Control Technology (MACT). Based on the type of source, the emission levels of criteria pollutants, and the location, one or more of these control requirements may be applicable.

The PSD regulations provide special protection from air quality impacts for certain areas, primarily National Parks and Wilderness Areas, that have been designated as "Class I" areas. Mandatory PSD Class I areas, established under the CAA Amendments of 1977 for the states of New Mexico and Texas, are listed under 40 CFR 81.421 and 81.429, respectively. These are areas where visibility has been determined to be an important issue by the EPA Administrator, in consultation with the Secretary of the Interior. The nearest PSD Class I area to McGregor Range is Guadelupe Mountains National Park, which is approximately 45 miles to the southeast. Other PSD Class I areas in the region include Big Bend National Park, Carlsbad Caverns National Park, the White Mountain Wilderness Area, and the Bosque del Apache Wilderness Area.

Conformity Rule. Under the General Conformity Rule of the CAA, Section 176(c), activities must not: (a) cause or contribute to any new violation, (b) increase the frequency or severity of any existing violation, or (c) delay timely attainment of any standard, interim emission reductions, or milestones in conformity to a SIP's purpose of eliminating or reducing the severity and number of NAAQS violations or achieving attainment of the NAAQS.

3.6.2 Current Attainment Status

McGregor Range covers portions of south-central New Mexico in Otero County. A review of the attainment status for New Mexico indicated that Otero County is designated as attainment for all criteria pollutants. As discussed above, this attainment status is based on the historic 1-hour O_3 standard rather than the new 8-hour standard, although it is unlikely that the attainment designation of this area will change when the new standard is fully implemented. In addition, there will be no attainment/nonattainment designations for $PM_{2.5}$ until the 2002 to 2005 timeframe.

The area or ROI affected by a project's emission sources will vary depending upon the pollutant type. For inert pollutants (all pollutants other than O_3 and its precursors, such as NO_2), the ROI is generally limited to an area extending a few miles downwind from the source. O_3 is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors. O_3 precursors are mainly volatile organic compounds (VOCs) in the form of hydrocarbons, and nitrogen oxides (NO_x). The ROI for O_3 may extend much farther downwind than for inert pollutants. As a result, nonattainment areas around large metropolitan areas will often be larger for O_3 than for other pollutants.

The New Mexico Air Quality Bureau does not monitor ambient air pollutant concentrations on the Fort Bliss Training Complex. Routine air quality monitoring occurs at several stations located west and north of the Training Complex. Monitoring data from these areas for 1993 through 1995 are presented in Table 3.6-2, and indicate generally good air quality (New Mexico Air Quality Bureau, 1994, 1997). PM_{10} is the only criteria pollutant that exceeded the federal standard, mainly during extremely high wind conditions.

3.6.3 Existing Air Quality Emissions

McGregor Range is not considered to be a major air emissions source by the Air Quality Bureau of the State of New Mexico because it is primarily comprised of multiple minor individual emission sources that are included on the Air Quality Bureau's List of Insignificant Activities. Consequently, McGregor Range is not

Table 3.6-2. Air Quality Monitoring Data for South-central New Mexico

Pollutant/Monitoring Station	*Averaging Time/Measurement*	*Maximum Concentration by Year*		
		1993	*1994*	*1995*
CO (ppm)				
Las Cruces Armory	8-Hour	3.8	3.5	3.4
Las Cruces University		8.9	5.1	4.5
Las Cruces Armory	1-Hour	8.4	6.6	6.2
Las Cruces University		12.2	8.3	6.9
O_3 (ppm)				
La Union	1-Hour	0.125	0.100	0.111
Sunland Park		0.140	0.137	0.137
Las Cruces University		0.054	0.079	0.080
PM_{10} ($\mu g/m^3$)				
Las Cruces, Env. Dept.	AAM	21	22	24
Las Cruces, Roadrunner Blvd.		—	—	21
Las Cruces, Holman Rd.		—	—	21
Anthony		37	41	40
Sunland Park		32	35	41
Sunland Park (continuous)		—	53	47
La Luz		—	—	14
Las Cruces, Env. Dept.	24-Hour	53	53	14
Las Cruces, Roadrunner Blvd.		—	—	71
Las Cruces, Holman Rd.		—	—	79
Anthony		99	154	40
Sunland Park		103	106	142
Sunland Park (continuous)		—	491	165
La Luz		—	—	309
				23
NO_2 (ppm)				
Las Cruces, Holman Rd.	AAM			0.005
SO_2 (ppm)				
La Union	AAM	0.002	0.001	0.002
Sunland Park		0.010	0.007	0.007
La Union	24-Hour	0.020	0.006	0.006
Sunland Park		0.100	0.057	0.040
La Union	3-Hour	0.080	0.035	0.025
Sunland Park		0.380	0.181	0.190
Pb ($\mu g/m^3$)				
Sunland Park Racetrack	QAM	0.13	0.040	0.045
Sunland Park		0.11	0.041	0.046

Notes: ppm = part per million by volume, $\mu g/m^3$ = micrograms per cubic meter, AAM = Annual Arithmetic Mean, QAM = Quarterly Arithmetic Mean.
Source: New Mexico Air Quality Bureau, 1997.

required to have any air permits for its operations. Fort Bliss has an on-going program to evaluate new activities under NEPA for their impacts on air quality and regulatory compliance including NSPS and NESHAP.

An updated emissions inventory has not been conducted for McGregor Range because of its status as a minor source of air emissions. However, representative air emission sources at McGregor Range will include portable and emergency gasoline/diesel/JP-8 generators, solvent degreasers, fuel storage tanks, and fuel dispensing facilities.

Water Resources

3.7

3.7 WATER RESOURCES

This chapter focuses on water resource issues specific to Army facilities and operations within three interrelated geographic areas: the upper Hueco Bolson, the lower Tularosa Basin, and the western Salt Basin.

The upper Hueco Bolson is that part of the Hueco Bolson that lies northeast of the Rio Grande. It extends north from El Paso County, Texas, to parts of Doña Ana and Otero counties in south central New Mexico. The Bolson is bounded on the east by the Hueco Mountains and Otero Mesa, and on the west by the Franklin and Organ mountains (Figure 3.0-1). A gentle topographic rise, 5 to 10 miles north of the New Mexico-Texas state line, separates the basin from the geologically similar Tularosa Basin to the north (Orr and White, 1985). The topographic divide, however, is not the groundwater divide (Knowles and Kennedy, 1956), and the New Mexico State Engineer defined the north boundary of the Hueco Groundwater Basin about 20 miles north of the state line. This designation effects only the southwest corner of the Tularosa Basin; the Hueco Groundwater Basin, as defined, does not extend eastward onto McGregor Range. Geologically, however, the Hueco Bolson in New Mexico extends eastward to the Hueco Mountains and Otero Mesa. This administrative rather than physical demarcation resulted from applications for groundwater withdrawals by the City of El Paso north of the New Mexico-Texas state line (Chudnoff, l997). Army facilities in the Upper Hueco Bolson include: the McGregor Range Camp, the Doña Ana Range–North Training Areas Camp, and related military facilities.

The Tularosa Basin encompasses approximately 6,500 square miles in south-central New Mexico and includes parts of Otero, Doña Ana, Otero, and Lincoln counties. Alamogordo, in Otero County, is the principal center of population. Military installations in the area are HAFB, WSMR, and in the southern part of the basin, McGregor Range and the Doña Ana—North Training Areas of Fort Bliss. The area also includes White Sands National Monument, managed by the National Park Service, and large tracts of federal lands managed by the BLM. Only the lower part, roughly the southern third, of the basin is within the McGregor Range ROI (Figure 3.0-1). The lower Tularosa Basin is bounded on the east by the Sacramento Mountains and Otero Mesa, and on the west by the Organ and San Andres mountains. On the south, the basin is contiguous with the geologically similar upper Hueco Bolson.

Roughly the northeast quarter of McGregor Range, including the southern slopes and foothills of the Sacramento Mountains and the western part of Otero Mesa, is within the Salt Basin, listed as an undeclared groundwater basin by the New Mexico State Engineer. At the west side of Otero Mesa a 500- to 1,000-foot escarpment separates the mesa from the floor of the Hueco Bolson. The escarpment extends north from the Hueco Mountains to the Sacramento Mountains. The basin is bounded on the east by the Guadalupe Mountains and extends from Otero County, New Mexico, south into Texas. The Salt Basin contains no population centers in the McGregor Range vicinity.

3.7.1 Surface Water

The mountain slopes and foothill areas around the margins of the Hueco Bolson are characterized by small intermittent and ephemeral streams (arroyos) which, during periods of heavy or prolonged storms, discharge onto the bolson floor, where the runoff infiltrates or is lost to evapotranspiration. No well-defined natural drainage channels are present on the bolson floor in New Mexico. Surface water that originates in the upper Hueco Bolson is not considered an adequate or dependable source of supply.

The Tularosa Basin is characterized by small streams and arroyos, which occasionally discharge to the central part of the basin, where the water is contained in shallow ephemeral lakes (playas). Several playas have become permanent features, including Lake Lucero in the lower basin. Many of the surface water drainages that originate in the mountains are perennial in their upper reaches and support wetlands and

aquatic wildlife. These and many of the ephemeral streams are classified or proposed for classification by the U.S. Army Corps of Engineers (USACE) (U.S. Army, 1998h) as probable Waters of the U.S. (Figure 3.7-1). To qualify as a USACE jurisdictional wetland, it must have hydric soil, be saturated to the surface sometime during the growing season, and contain wetland plant species. Waters of the U.S. includes "water such as intrastate lakes, rivers, streams (including intermittent streams)" (33 CFR 328.3(a)[3]). The exact boundary of the Waters of the U.S. will be delineated for site-specific projects and a final determination by the USACE district engineer is needed before a jurisdictional determination is complete. A total of 1,291 dry washes with distinct streambeds and sides comprising 2,475 miles were mapped on McGregor Range. In addition, thirteen intermittently flooded lakes with distinct ordinary high water marks totaling 132 acres and 110 artificial water resources (691 acres) including sewage lagoons, storm-water retention basins, and cattle tanks were mapped on McGregor Range (U.S. Army, 1996b). Ranchers historically have captured and developed surface water for livestock in most of these streams. Under normal conditions, the mountain drainages are not tributary to larger streams. No significant volume of surface water is discharged from the basin.

The Salt Basin watershed in McGregor Range includes the western part of the Otero Mesa and the southern slopes and foothills of the Sacramento Mountains. Similar to the Tularosa Basin, the Salt Basin is characterized by small ephemeral streams that discharge toward the central areas of the basin (see Figure 3.7-1). Virtually all stream channels in the Sacramento Mountains and Otero Mesa on McGregor Range are classified or proposed for classification as probable Waters of the U.S. by the USACE (U.S. Army, 1998h). Under natural conditions, small playas would develop in low-lying areas during periods of high runoff; however, earthen dams now capture most of the available water for livestock. A few streams are perennial in their upper reaches outside the boundary of McGregor Range. However, the Sacramento River, prior to the installation of upstream diversions, probably was perennial for at least part of its course through McGregor Range. Three such diversions capture water for use on McGregor Range and the adjoining community of Oro Grande. The diverted water is transported, via three pipelines: one crosses the northwest quarter of McGregor Range to Oro Grande, and the other two supply water to numerous tanks and troughs across Otero Mesa (Figure 3.7-2). Figure 3.7-3 shows the earthen impoundments on McGregor Range.

Several surface water rights, with points of diversion, pertain to McGregor Range. Table 3.7-1 lists all surface water rights, permits, decrees, licenses, applications, and claims in the files of the New Mexico State Engineer's Office (NMSEO) in Santa Fe, New Mexico, current to September 1, 1997.

Existing water rights 02528 and 02528-A (Oro Grande Community Water Company and Bessie Lee Norris, respectively) indicate that Southwest Smelting and Refining Company constructed the Orogrande pipeline in 1905 and 1906, thereby obtaining water rights for beneficial use totaling 3 million gpd (3,350 afy). Following a series of transfers of ownership of the water right, the Southern Pacific Railroad acquired full ownership. In 1914, the railroad entered into an agreement with Oro Grande to provide the community with unspecified quantities of water.

80

In 1977, the Oro Grande Mutual Domestic Water Consumers and Mutual Sewage Works Association filed a Declaration of Ownership of Water Right-Perfected Prior to March 19, 1907, to gain rights to 100,000 gpd of water for domestic purposes. The pipeline is maintained by the Oro Grande Community Water Company, which lays claim to the water on the grounds that the community has used the water continuously, uninterruptedly, and openly from the date of the inception (1906) to the present time.

Claim 02013 indicates that diversions from the Orogrande pipeline are for beneficial use for livestock and domestic purposes. This claim is a Declaration of Ownership of Water Right-Perfected Prior to March 19, 1907, for approximately 33 gpm. The claim is presumed to be assigned to the DA in accordance with the settlement of Civil Action 3209, U.S. District Court for the District of New Mexico, March 19, 1957.

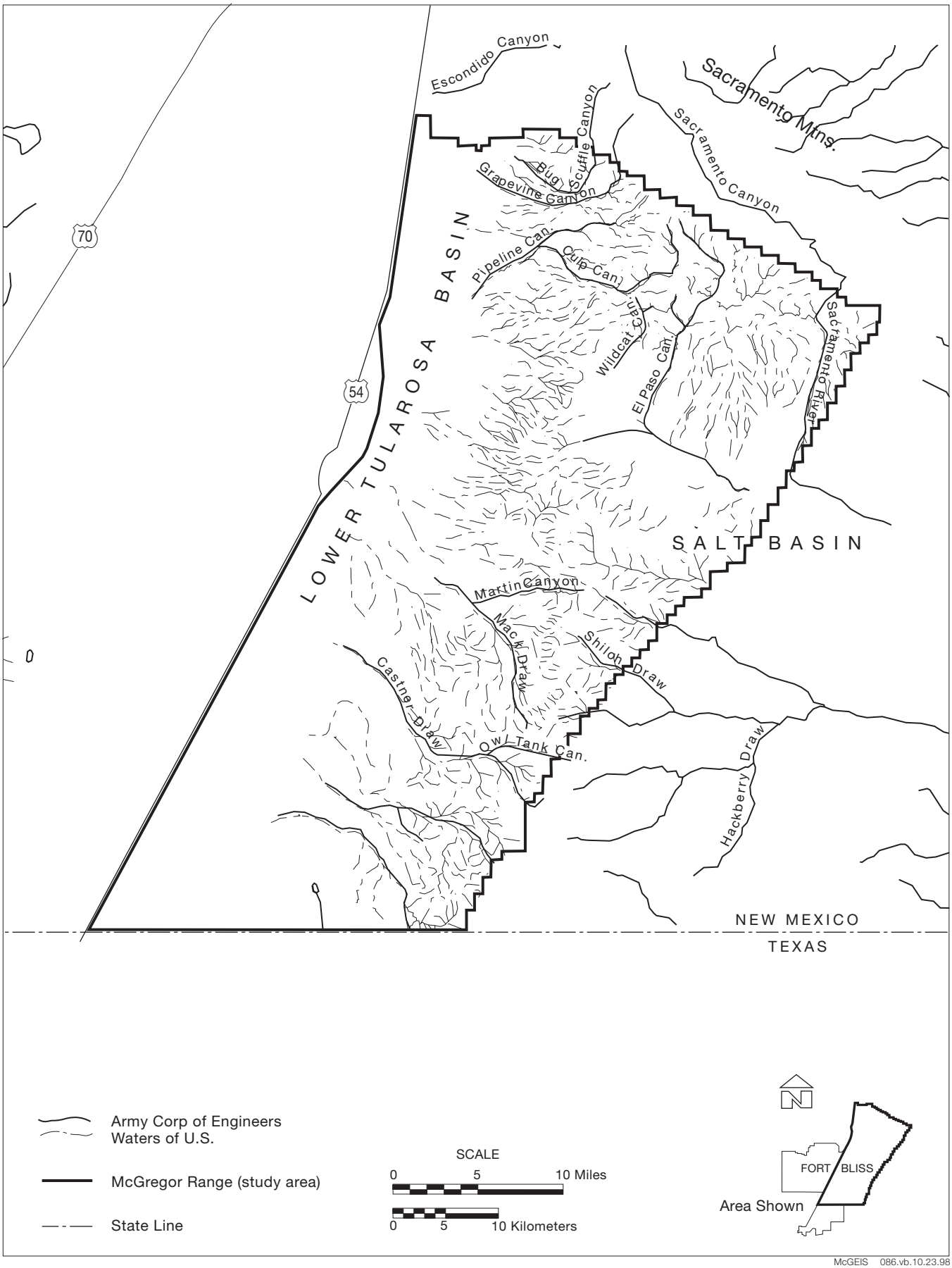


Figure 3.7-1. Surface Water Drainage on McGregor Range.

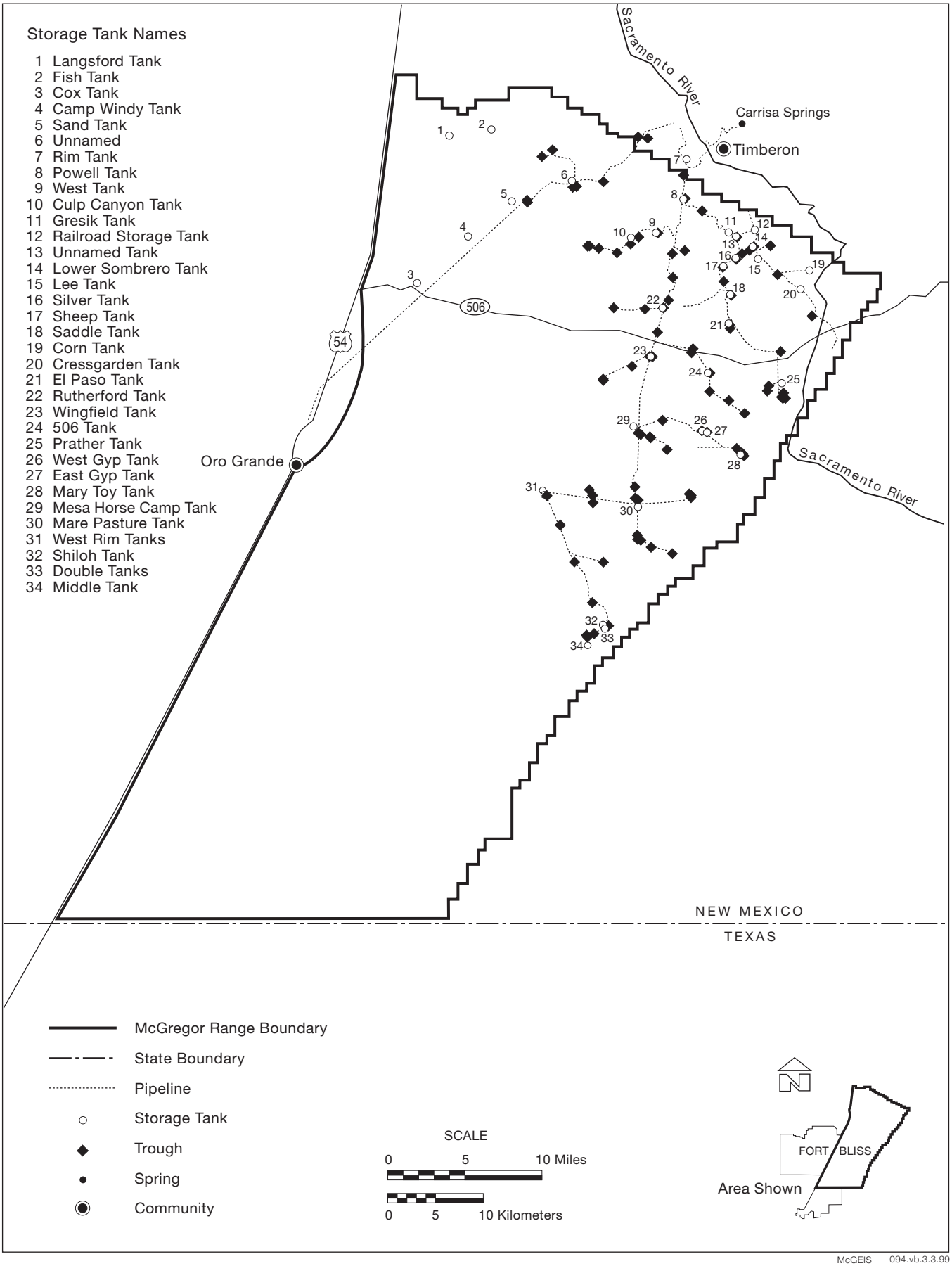
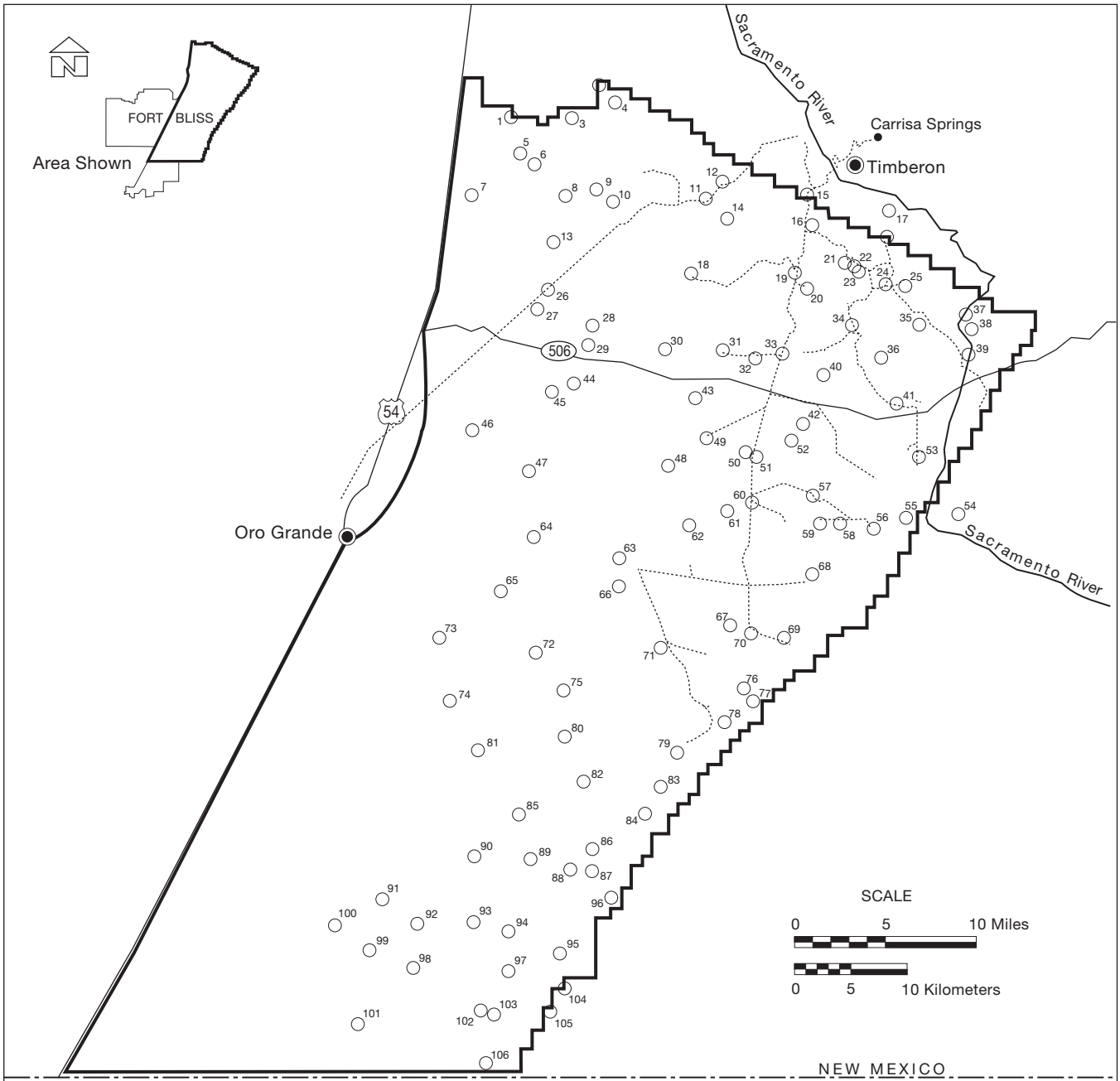


Figure 3.7-2. Water Pipelines, Storage Tanks, and Watering Troughs on McGregor Range.



○ Earthen Impoundment

1 Tony Tank
2 Sacramento City Tank
3 Fish Tank
4 Unnamed Tank
5 Johnson Grass Tank
6 Sand Tank
7 Escondido Tank
8 Boone Tank
9 Unnamed Tank
10 No Good Tank
11 Lower Juniper Reservoir
12 Upper Juniper Reservoir
13 Gordvine Tank
14 Alegrita Tank
15 Rim Tank
16 Powell Tank
17 Summer Tank No. 2
18 Culp Canyon Tank
19 Mainline Tank
20 Munson Tank
21 Aldaz Tank
22 Gresik Tank
23 Tanner Tank
24 Lee Tank
25 Corn Tank
26 Camp Windy Tank
27 Jim Tank
28 Unnamed Tank
29 Big Culp Tank
30 Little Culp Tank
31 West Poe Tank
32 Middle Poe Tank
33 Rutherford Tank No. 2
34 El Paso Tank
35 Cressgarden Tank
36 Summer Tank No. 2
37 Parker Ranch Tanks
38 Parker Tank
39 Dagger Tank
40 Rutherford Tank
41 Van Winkle Tank
42 Gravel Tanks
43 Road Tanks
44 Wright Tank
45 Lee Tank
46 Wilde Tank
47 CCC Tank
48 Broke Tanks
49 Double Tank
50 Bottom Tanks
51 Godfrey Tank
52 Foy Tank
53 McGregor Tank North
54 Shipment Tank
55 Green Tank
56 Toy Tanks
57 Gyp Tanks
58 Payne Tanks
59 Unnamed Tank
60 Mesa Horse Camp Tank
61 Little Tank
62 West Tanks
63 North Tank
64 Little Crockett Tank
65 Middle Tank
66 Hay Meadow Tank
67 Big Tank
68 Cockleburr Tank
69 Antelope Tank
70 End of Line Tank
71 Martin Tank
72 Little Mack Tank
73 Sulphur Tank
74 Road Tank
75 Mack Tanks
76 Corner Tanks
77 Corner Tanks
78 Tripod Tank
79 Roberts Tank
80 Broyle Tank
81 Tinney Tank
82 Green Tank
83 Wet Weather Tank
84 Wet Weather Tank
85 Campbell Tank
86 Owl Tank
87 Foster Ranch Tank
88 Childs Tank
89 Castner Tank
90 Grey Tank
91 Chaparral Tank
92 Flat Tank
93 Charley Tank
94 Hackberry Tank
95 Grey Tank
96 Escondido Tank
97 Red House Tank
98 New Tank
99 Coyote Tank
100 Unnamed Tank
101 Lake Tanks
102 Big Cement Tank
103 Little Cement Tank
104 Fisher Tank
105 Mountain Tank
106 Wallbridge Tanks

McGregor Range Boundary
Water Pipeline

McGEIS 093.dg.3.3.99

Figure 3.7-3. Water Pipelines and Earthen Impoundments on McGregor Range.

Table 3.7-1. Surface Water Rights Associated with McGregor Range

Number	*Priority Date*	*Name*	*Type*	*Diversion*	*Quantity afy*
042	10/02/07[1]	Timberon	Application	Carrisa Springs	10
042-Amended	12/30/74[2]	Timberon	Application	Carrisa Springs	
03025	05/24/84[3]	BLM	License	Parker Ranch Tanks	7
03026	05/24/84[3]	BLM	License	Dagger Tank	13
01657	08/08/60[3]	DA	License	Sacramento River	67
01657	08/08/60[3]	DA	License	Carrisa Springs	56
02013	03/03/70[3]	Ferguson Construction	Claim	Orogrande Pipeline	53
02528	06/06/77[3]	Oro Grande	Claim	Sacramento River Aquaduct	3,360
02528-A	06/06/77[3]	Bessie Lee Norris (for B.B. Johnson Estate)	Claim	Sacramento River Aquaduct	17
2432	07/31/41[4]	Ranch Realty	License	Stocktank	17
2512	11/04/44[4]	Vincent M. Lee	License	Culp Canyon Reservoir	143
3132	11/14/64[4]	City of Alamogordo	Permit	Juniper Reservoirs	145
3324	06/19/74[5]	Timberon	Application	Carrisa Springs	1,995
3675	10/14/80[4]	USFS	License	Ed Spring	1
LWD-S-62 (LWD-0-33)[7]	07/20/79[6]	Pearl Prather - Lewis	Decree	Lake Tank	1
LWD-S-86	11/23/89[6]	Bryan Prather	Decree	Stock tank	2
LWD-S-87	11/23/89[6]	Bryan Prather	Decree	Stock tank	1

[1] Priority date is date in which "Water Claim" was filed at the NMSEO.
[2] Priority date is date in which an "Amended Declaration to 042" was filed at the NMSEO.
[3] Priority date is date "Declaration of Ownership of Water Right - Perfected Prior to March 19, 1907" was received at the NMSEO.
[4] Priority date is date in which the application to "Appropriate the Natural Public Surface Waters of the State of New Mexico" was filed in the NMSEO.
[5] Priority date is date in which "Notice of Intention to Make Formal Application for Permit To Appropriate the Natural Public Surface Waters of the State of New Mexico" was filed in the NMSEO.
[6] Priority date is date "Declaration of Ownership of Livestock Water Dam or Tank" was received at the NMSEO.
[7] Under New Mexico State water status, Livestock Water Dams (LWD) are filed as a Declaration of Ownership of the Livestock Water Dam or Tank. Under New Mexico State law, a declaration is only a statement of the declarant's claim. Acceptance for filing does not constitute approval or rejection of the claim. The claim is not a water right; it is a claim to the water of the said dam or tank.

Source: NMSEO files.

80

License 2512 (Vincent M. Lee) is presumed to be continuous with License 01657 held by the Army. License 2512, the Culp Canyon Reservoirs, is presumed to have been assigned to the Army in accordance with the settlement of Civil Action 3209, U.S. District Court for the District of New Mexico, March 19, 1957. This decree is presumed to include rights to water stored in Culp Canyon Reservoir and Upper and Lower Juniper Reservoirs for distribution and use on McGregor Range.

The Army holds Water Right Number 01657 for its diversions onto McGregor Range. The water is used by livestock as well as wildlife. This right entitles the Army to divert 60,000 gpd of surface water flow

from the Sacramento River and 50,000 gpd from Carrisa Springs. The stated beneficial use of the Army's water right was changed to "for the preservation of fish and wildlife" from "livestock and domestic purposes" in 1963.

The McGregor pipeline system (exclusive of the Oro Grande system) is a large gravity-fed water network that is operated, and maintained by the BLM for wildlife and livestock. The system has been in existence since the early 1900s and has been modified, expanded, and relocated extensively since then, mostly in piecemeal fashion. The three intakes for the system are in the Sacramento Mountains, north of McGregor Range. Two lines feed Rim Tank, an open reservoir with a capacity of 2 million gallons, on the north boundary of McGregor Range. The system is designed to gravity flow from this reservoir, or bypass it, into the McGregor pipeline—a 65-mile trunk and branching system that feeds several branches and lines in the Sacramento Mountains foothills and the western part of Otero Mesa. A smaller independent system, the El Paso line, runs through El Paso Canyon to the east boundary of McGregor Range in the north part of Otero Mesa (BLM, 1985). The two systems normally deliver 75 gpm (about 120 afy) (Christensen, 1998).

3.7.2 Groundwater

Groundwater at McGregor Range is discussed by geographic area: the Upper Hueco Bolson, Lower Tularosa Basin, and western Salt Basin.

3.7.2.1 Upper Hueco Bolson

The Hueco Bolson is a downfaulted basin characterized by a series of subparallel step faults that form a deep structural bedrock trough on the west side of the basin. Many of the faults extend to the surface, where they offset basin-fill deposits. The upper Hueco Bolson contains Tertiary and Quaternary basin-fill sedimentary deposits that extend northward into the Tularosa Basin and southward into the lower Hueco Bolson. Basin-fill deposits are bounded by less permeable carbonate rocks of the Hueco Mountains and Otero Mesa escarpment to the east; by less permeable igneous, metamorphic, and sedimentary rocks of the Organ and Franklin mountains to the west; and are underlain by less permeable consolidated rocks. Data from geophysical surveys and deep test wells indicate that basin-fill deposits in the trough are as much as 8,000 feet thick (Orr and Risser, 1992). Eastward from the trough, near the front of the Hueco Mountains and the Otero Mesa escarpment, their thickness tapers to near zero.

Basin-fill deposits on the west side of the upper Hueco Bolson in New Mexico consist of approximately 1,000 feet of sand with gravel, clay, silt, and sandstone lenses. Limited data from the east side of the bolson indicate deposits are primarily fine-grained sand, silt, and clay. Throughout most of the west side of the Hueco Bolson, the percentage of clay increases with depth (Orr and Risser, 1992).

Water enters the groundwater flow system in the basin-fill deposits mostly as mountain-front recharge from storm runoff in alluvial fan areas adjacent to the Organ and Franklin mountains. Recharge on the east side of the basin is less significant, as surface water from the Hueco Mountains drains primarily to the east, and because of the fine-grained nature of the basin-fill deposits near the Hueco Mountains. Subsurface recharge also occurs as underflow from the Tularosa Basin along the northern boundary of the Hueco Bolson and from the Mesilla Bolson through Fillmore Pass between the Franklin and Organ mountains (Orr and Risser, 1992). Flow modeling by the U.S. Geological Survey (USGS) indicates that 3.1 percent of the precipitation falling on adjacent mountain drainage areas reaches the saturated zone. Their investigation estimated an annual recharge rate of 4,500 afy to the Hueco Bolson from the Organ and Franklin mountains. Underflows of 3,800 afy from the Tularosa Basin and 260 afy through Fillmore Pass were indicated (Orr and Risser, 1992). Based on these results, annual recharge to the upper Hueco Bolson is approximately 8,560 afy.

About 2.6 million af of fresh water may be in storage in the New Mexico part of the upper Hueco Bolson (Orr and Risser, 1992). However, the thickness of the fresh water zone in New Mexico decreases from west to east. A line representing the eastern limit of fresh-water containing less than 1,000 milligrams per liter (mg/L) of total dissolved solids (TDS) extends from near Newman at the southwest corner of McGregor Range north through the length of the basin and into the Tularosa Basin (Figure 3.7-4). The USGS (Rapp, 1958) noted that the quality of groundwater greatly improves to the southwest of McGregor Range toward the Franklin Mountains.

Evapotranspiration is not a significant component of the groundwater flow system throughout most of the northern part of the Hueco Bolson, because the depth to groundwater generally exceeds 200 feet.

Course-grained alluvial aquifers near the mountain fronts are characterized by relatively high values of hydraulic conductivity. Fine-grained alluvial deposits are characterized by relatively low hydraulic conductivity. Large ratios of horizontal to vertical hydraulic conductivity are due to discontinuous, thinly bedded clay units throughout most of the basin-fill deposits. Aquifer-test results in wells in the Upper Hueco Bolson indicate that the small ratio of vertical to horizontal hydraulic conductivity results in delayed drainage of water from overlying deposits and that, in the long-term, the storage coefficient should approach the specific yield of an unconfined aquifer (Orr and Risser, 1992).

Hydraulic conductivity estimates were derived from aquifer tests in wells in the western half of the Hueco Bolson. Most of these wells penetrate only the upper 1,000 feet or less of basin-fill deposits. Based upon the aquifer-test data, hydraulic conductivity estimates for the basin-fill deposits range from less than 1 to more than 200 feet per day. Transmissivities of 5,000 to 22,000 square feet per day have been reported from aquifer tests on the western side of the Hueco Bolson in Texas. Hydraulic conductivity estimates from these wells range from 15 to 43 feet per day.

Groundwater resources in the Upper Hueco Bolson of McGregor Range have not been developed extensively. A groundwater study was completed for the USGS (Rapp, 1958) to determine if a supply of 100 gpm of potable water could be developed for the McGregor Range Camp. Except for isolated areas, groundwater was too saline for human consumption, and the Army found it more economical to import El Paso city water to McGregor Range.

Fort Bliss is currently conducting an exploration program for geothermal resources at Davis Dome on McGregor Range (Luna, 1997). Geothermal water at temperatures ranging from 180 to 185° F is present at depths of 400 to 600 feet. The maximum-recorded temperature was 192.4° F at a depth of 2,258 feet (Mathis, 1998). Fort Bliss engineering personnel indicated that the site could produce 3 megawatts of electric power that could be used to power a desalination plant producing 7 mgd of drinking water from the saline aquifer at a significantly lower cost than Fort Bliss now pays for water (Luna, 1997). This source would be used to augment or replace water currently pumped by Fort Bliss from the Hueco Bolson in Texas.

3.7.2.2 Lower Tularosa Basin

The Tularosa Basin was formed as a structural trough during a period of Middle to Late Cenozoic faulting. The faulting exposed Precambrian through Tertiary-age igneous and sedimentary rocks along the scarps bounding the basin. These same rocks underlie Cenozoic fill deposits in the central area of the basin. Some of the Paleozoic and Mesozoic rocks are known to yield small quantities of water to wells in adjacent areas but are not considered to be major aquifers in the McGregor Range area. Deposition of alluvial fill accompanied the faulting in the Tularosa Basin. Fill deposits include sand, gravel, and clay in alluvial fans along basin margins and extensive lake, alluvial, and evaporite deposits within the interior

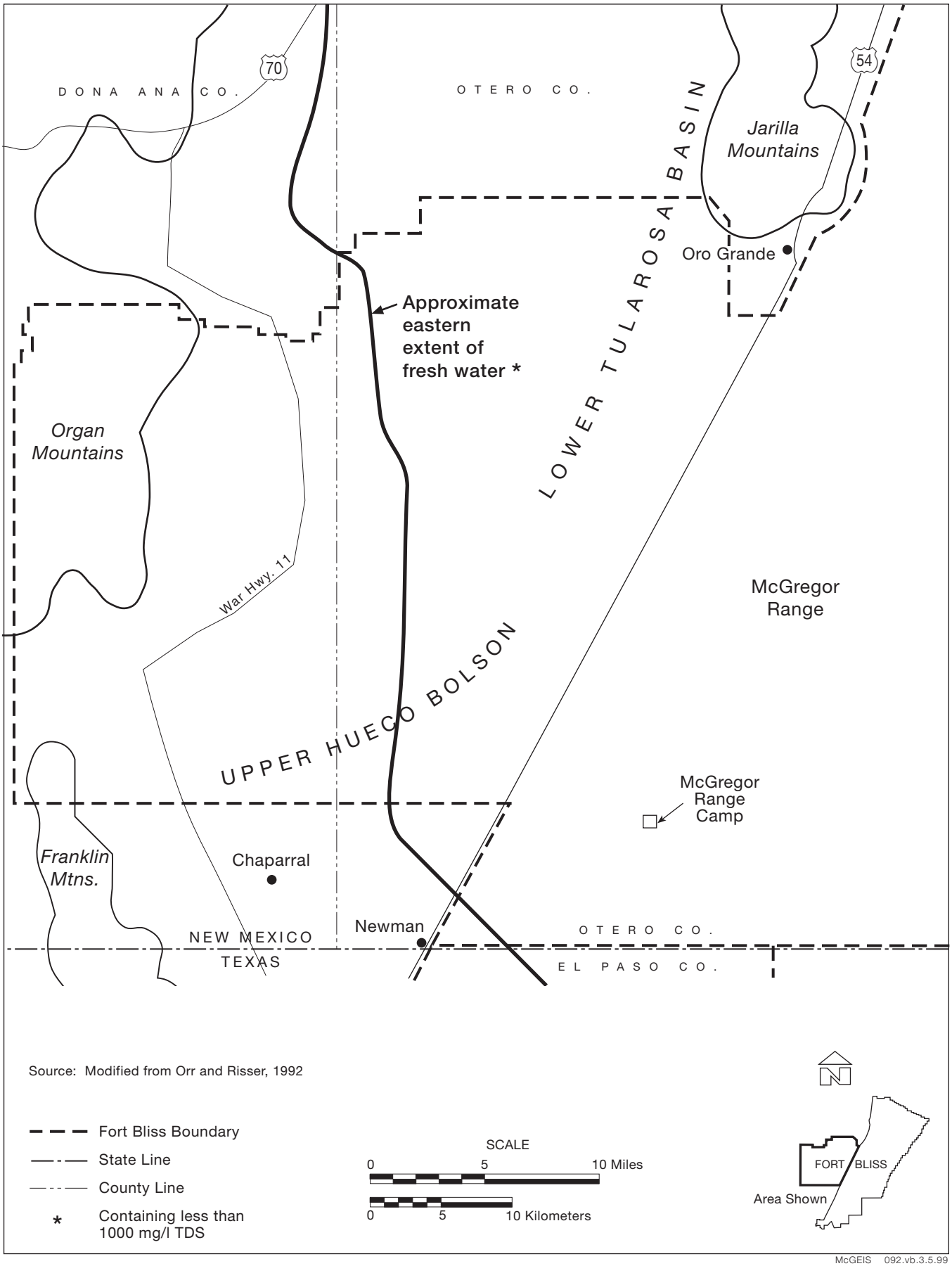


Figure 3.7-4. Eastern Extent of Fresh Water in the Upper Hueco Bolson.

basin. Large quantities of saline water occur within most of the Tularosa Basin sediments (Orr and Meyers, 1986). Two primary sources of groundwater are present in the lower Tularosa Basin: (a) the central basin aquifer, which consists of alluvial, wind, and lake deposits; and (b) alluvial aquifers at the mouths of major canyons on the valley perimeter.

The central basin aquifer is characterized by lake deposits with lesser amounts of alluvial and wind deposits. While large quantities of water are available in this unit, the quality of the water is poor and generally unsuitable for public consumption without treatment. Evaporate deposits in the central basin may contain large amounts of very saline water.

The alluvial aquifers consist of course to fine-grained sediments in a series of coalescing alluvial fans along the margins of the basin. These fans were formed from detritus derived from source areas in the bordering mountains. The sizes of the fans vary, depending on the size of their respective drainage areas. The fan deposits occur in the subsurface as pediment deposits or thin veneers overlying bedrock and as thicker units basinward, where they intertongue with central basin deposits (Orr and Meyers, 1986).

The thickness of alluvial fan deposits ranges from less than 100 feet on the higher step-faulted blocks adjacent to the Sacramento escarpment to about 4,000 feet in the central areas of the basin. Surficially, these deposits are characterized by very coarse, poorly sorted sediments adjacent to the mountain front and by well-sorted, increasingly fine-grained sediments basinward. Abrupt lithologic changes occur at the surface in places where lenticular beds of gravel and sand grade horizontally to silt and clay (Orr and Meyers, 1986).

Water enters the groundwater flow system in the lower Tularosa Basin principally as mountain-front recharge from storm runoff in alluvial fan areas adjacent the mountains. Models used by the USGS in the Franklin and Organ mountains indicate that 3.1 percent of the precipitation falling in the Organ Mountains drainage areas reaches the saturated zone (Orr and Risser, 1992). Surface drainage areas in the Organ Mountains, that contribute water to the lower Tularosa Basin, encompass about 225 square miles. If the average annual precipitation over this area is 12 inches and actual recharge to the basin-fill is 3.1 percent of the precipitation that falls on the mountain drainage area, recharge to the western part of the Tularosa Basin is about 4,460 afy (U.S. Army, 1998f).

Potentiometric surfaces in wells on the east margin of the Tularosa Basin reveal the presence of groundwater ridges in proximity to the mouths of major canyons. Such ridges in the water table indicate recharge to the aquifer by infiltration of surface flow. Alluvial fan sediments west of the Sacramento Mountains, from the mouth of Grapevine Canyon to beyond the northern boundary of McGregor Range, were found to be saturated with fresh water in a zone about 3 miles wide and from 0- to about 1,400-feet thick. The USGS (Orr and Meyers, 1986) estimated 1.4 to 2.1 million af of fresh water in storage in the area from Grapevine Canyon to Escondido Canyon (about 3 miles south of Alamogordo). An additional 3.6 to 5.4 million af of slightly saline water may be in storage in the same area. Movement of groundwater is westerly, toward the center of the basin, at a gradient of 10 to 50 feet per mile. The investigation did not extend southeast of Grapevine Canyon, and it is not known how far similar hydrologic conditions may extend in that direction. Recharge from the Sacramento Mountains to the eastern part of the Tularosa Basin is estimated at 4,500 afy (U.S. Army, 1998f).

Evapotranspiration in the Tularosa Basin is not a significant component of the groundwater flow system because the depth to groundwater generally exceeds 200 feet.

The estimated freshwater hydraulic conductivities of alluvial fan deposits and basin-fill deposits in the lower Tularosa Basin range from 1 to more than 300 feet per day. However, because of the higher viscosity of saline water, the saline-water hydraulic conductivity is less than that of similar fresh-water

aquifers. Water levels in these deposits respond to short-term pumping stress as if under leaky-confined conditions probably because the interbedded clays restrict the vertical flow of water. Under long-term stress, the storage coefficient in alluvial deposits should approach the specific yield, which has been estimated at 15 to 20 percent. Saturated sand units comprise roughly 3 to 26 percent of the basin-fill sediments. The hydraulic conductivities of such sand units may be about 1 foot per day, and the units probably respond to stress as leaky-confined aquifers (Orr and Meyers, 1986).

Groundwater development in the Tularosa Basin area of McGregor Range, except for a few livestock wells, has not been extensive, primarily because of the salinity of the water. The NMSEO has eight listed wells and one indicated well[a] on file for McGregor Range, all in the Tularosa Basin (Table 3.7-2).

80

Table 3.7-2. Groundwater Rights Associated with McGregor Range

Number	*Priority Date*[1]	*Name*	*Type*	*Diversion*	*Quantity afy*
T-370	01/12/83	White's Lone Star Mobile Homes	72-12-1 Permit	Domestic Well[3]	32
T-1015	11/15/84	Ortega Construction	72-12-1 Permit (expired)	Construction Well[3]	3
T-1400	NA[2]	USAF	72-12-1 Permit	Prospecting Well[3] (GCOW-1)	Aquifer Yield Limited
T-1400-EXPL	10/07/86	USAF	Permit (cancelled)	Exploratory/ Monitoring Well[4] (GCTW-1)	
T-1400-OBS	10/07/86	USAF	Permit (cancelled)	Exploratory/ Monitoring Well[4] (GCOW-2)	Not Drilled
T-1401-EXPL	10/07/86	USAF	Permit (cancelled)	Exploratory/ Monitoring Well[4] (GCTW-2)	Not Drilled
T-1412	11/03/86	USAF	72-12-1 Permit (cancelled)	Prospecting Well[3] (GCAO-1)	Dry
T-1412-EXPL	11/03/86	USAF	Permit (cancelled)	Exploratory/ Monitoring Well[4] (GCAT-1)	Dry
T-1680	06/01/88	Larry Perry	72-12-1 Permit	Domestic Well[3]	11

[1] Priority Dates are the date in which the New Mexico State Engineer's signature appears on the "Application for Permit" or "Application to Appropriate Underground Waters in Accordance with Section 72-12-1 New Mexico Statutes."
[2] Water Rights file T-1400 (Application for Permit for prospecting, mining, or drilling to discover or develop natural resources) is missing from the T-1400 et al. file at the NMSEO.
[3] It is generally considered that 72-12-1 wells are not a water right, but a permit to divert for water for domestic or sanitary purposes for up to 3 afy.
[4] New Mexico State Statute assumes that exploratory/monitoring wells are not considered a diversion.
Source: NMSEO Files.

[a] Water Rights file T-1400; Application for Permit for prospecting, mining, or drilling to discover or develop natural resources, is missing from the T-1400 et al. file at the NMSEO. Indications that the application was filed are found in memorandums contained in said file T-1400 et al.

White's Lone Star Mobile Homes filed for a water permit (Water File T-370) in January 1983 in Section 2, Township 19S, Range 9E. A site visit revealed that the well has been abandoned and has either been plugged or destroyed (U.S. Army, 1998f).

Ortega Construction filed for a water permit (Water File T-1015) in October 1984 in Section 14, Township 23S, Range 9E. This well was drilled to approximately 800 feet for construction of public works, highways, and roads. Appropriation and use of water under this permit was not to exceed a period of one year from November 5, 1984. The well no longer exists.

In October 1986, the U.S. Department of the Air Force, Ballistic Missile Services filed four permits to drill exploratory wells (Sections 9,25, and 27, Township 19S, Range 10E) and two applications to appropriate underground waters (Section 25 and 27, Township 19S, Range 10E) all in the Grapevine Canyon area. On March 2, 1987, after drilling four wells, the Air Force requested that all permits and applications be cancelled.

Larry Perry filed for a water permit (Water File T-1680) in May 1988 in Section 23, Township 22S, Range 9E. Field work revealed that the NMSEO file location is in error. The well is located in Range 8E, 6 miles to the west, near Oro Grande, and is not on McGregor Range (U.S. Army, 1998f).

80

Presently, no active applications or new registrations are in effect on McGregor Range. Geothermal test wells drilled during calendar year 1997 are unregistered or controlled under a different program or are not completed through the NMSEO. According to records provided by the USGS and the BLM, additional wells in the south part of McGregor Range are not registered with the NMSEO. However, it is believed that these wells are small capacity stock wells, and appear to be "Exempt Wells" as defined by New Mexico State Statute.

3.7.2.3 Western Salt Basin

Middle Cenozoic block faulting in the Otero Mesa area of the Salt Basin exposed Paleozoic and Mesozoic carbonate rocks, but did not produce the downfaulted blocks and alluvial fill that are characteristic of the Tularosa Basin. The carbonate rocks are known to yield small quantities of saline water (the source of the basin name), but are not considered to be major aquifers. Coarse- to fine-grained sediments form a series of coalescing alluvial fans along the north margin of the Salt Basin. The fans contain detritus derived from source areas in the bordering Sacramento Mountains (Orr and Meyers, 1986).

In general, groundwater developed from the Paleozoic and Mesozoic formations in the basin ranges from brackish to saline. These formations are not believed to be a likely source for development of a potable water supply. However, fresh-water bearing sediments on the east side of the Tularosa Basin near Grapevine Canyon probably extend into the alluvial areas south of the Sacramento Mountains (McClean, 1970). The thickness of fan deposits saturated with fresh water (containing less than 1,000 mg/L TDS) is estimated to range from 0 to as much as 1,400 feet. Saturated sediments include poorly sorted boulders, sand, and silt near fan apexes, to silt and clay near the base of the fans (Orr and Meyers, 1986). Additional work needs to be done in that area to determine the presence of a fresh-water aquifer and the size of its likely recharge area. The brackish to saline groundwater in the carbonate rocks of Otero Mesa flows easterly toward the center of the Salt Basin (Orr and Meyers, 1986).

Groundwater resources are not extensively developed in the Salt Basin, and no significant use of groundwater occurs in the basin within McGregor Range. A few small-capacity stock and domestic wells have been completed on Otero Mesa. However, the possibility of a fresh water aquifer in the alluvium south of the Sacramento Mountains represents a potential resource for nondomestic use in that area of McGregor Range.

Biological Resources

3.8

3.8 BIOLOGICAL RESOURCES

Existing biological resources are discussed in this section. The ROI for biological resources encompasses McGregor Range on Fort Bliss, including the Sacramento Mountains foothills, the Hueco Mountains in New Mexico, Otero Mesa, and Tularosa Basin. For the purposes of analyzing cumulative impacts, the ROI also includes the remainder of Fort Bliss, including the South Training Areas and the Doña Ana Range–North Training Areas. It also includes the Lincoln National Forest and BLM land north and east of McGregor Range.

Due to its large size (about 698,500 acres) and varied topography, McGregor Range exhibits a high degree of biodiversity. The vegetation mirrors this diversity in that plant communities range from the Chihuahuan Desert plant communities in the Tularosa Basin to pinyon pine/juniper woods in the Sacramento Mountains foothills (U.S. Army, 1996d, 1997c).

Wildlife species diversity is also high; for example, of the State of New Mexico's 123 species of amphibians and reptiles, 47 species occur and 19 species have the potential to occur on Fort Bliss (U.S. Army, 1997c; Degenhardt et al., 1996). Most of these species are found on McGregor Range. Recent breeding bird studies have shown that the number of species (species richness) in the Chihuahuan Desert on McGregor Range (Kozma and Mathews, 1997) is higher than reported in Chihuahuan Desert habitat off the range (Raitt and Maze, 1968; Naranjo and Raitt, 1993). These and other studies on Fort Bliss have demonstrated that arroyo-riparian drainage areas are used more extensively by wildlife than adjacent upland areas. Almost 2,500 miles of these arroyos have been mapped on McGregor Range. Many of these arroyos, as well as upland areas, are likely in good to excellent condition in terms of providing wildlife habitat as shown by Kozma and Mathews (1997). The following sections summarize the biological resources on McGregor Range; additional detailed information is in Appendix D, *Biology*.

3.8.1 Vegetation

The major plant community types in the area of McGregor Range are desert grasslands, Chihuahuan Desert scrub, and plains mesa sandscrub. Types that occur in the mountains in the area are juniper savanna, conifer and mixed woodlands, and montane conifer forests (Dick-Peddie, 1993). The vegetation on McGregor Range and the rest of Fort Bliss was characterized and mapped (U.S. Army, 1996d, 1997c), and this section is based on those reports. Within the Tularosa Basin, alluvial fans and piedmonts support desert shrub and grassland plant communities. Desert shrub plant communities dominate the Tularosa Basin floor, and Otero Mesa generally supports desert grassland plant communities. The upper Sacramento Mountains foothills generally support a wooded plant community dominated by open and closed stands of pinyon pine (*Pinus edulis*) and juniper (*Juniperus monosperma,* and *J. deppeana*) (Figure 3.8-1).

The plant communities and other areas on Fort Bliss were mapped using satellite imagery and 34 mapping units, totaling 1,113,403 acres, were identified. Of this total, 698,482 acres (almost 63 percent) constitutes McGregor Range. Approximately 35,900 acres, or 5.2 percent, of McGregor Range consists of rock, barren soil, military facilities, and roads (mapping units 24, 25, and 26). Of the remaining 31 vegetation mapping units identified (U.S. Army, 1996d, 1997c), 23 occur on McGregor Range (Table 3.8-1). These 23 mapping units were grouped into eight categories (Table 3.8-2) and mapped (Figure 3.8-1).

Coppice dunes and sandscrub are the dominate vegetation types in the western one-fifth of McGregor Range and honey mesquite is the dominate plant in some areas while sandsage is dominate in others. These types give way to creosotebush dominated plant communities where tarbush and lowland

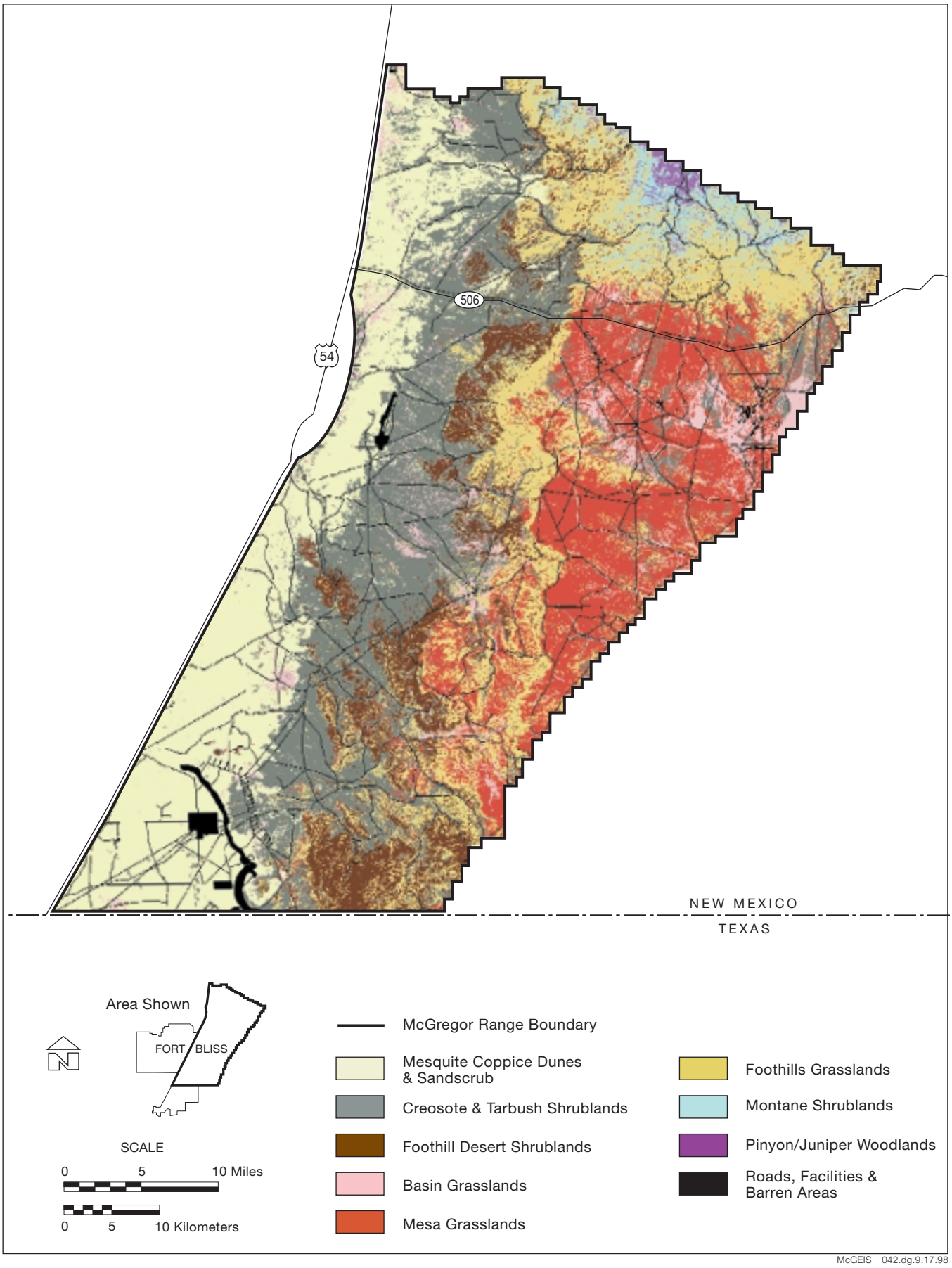


Figure 3.8-1. McGregor Range Vegetation.

Table 3.8-1. Descriptions of 27 Mapping Units on McGregor Range

Plant Community (mapping units)	*Description*
Shrublands	
Basin desert shrubland coppice dunes) (1)	Consists of the large coppice dunes in the Tularosa Basin. Honey mesquite (*Prosopis glandulosa)* is the dominant shrub with four-winged saltbush (*Atriplex canescens*) common in some areas. Sparse undergrowth; mesa dropseed (*Sporobolus flexuosus)* common in some areas.
Plains/coppice dunes sandscrub (2)	Sandsage (*Artemisia filifolia)* common with some mesquite and Mesa dropseed. Occurs at north and south end of coppice dune fields.
Plains sandscrub (3)	Sandsage/mesa dropseed common plants. Located on sandy areas mostly in Tularosa Basin with small amounts on Otero Mesa.
Basin desert shrubland (4)	Dominated by honey mesquite and alkali sacaton (*Sporobolus airoides*) in broad clay depressions at northern edge of coppice dunes.
Basin/lowland desert shrub (5)	Bottomland tarbush (*Flourensia cernua*) dominate with tobosagrass *(Hilaria mutica*) and burrograss (*Scleropogon brevifolius*) also common. Occurs on silty alluvial fan toe slopes and bottomlands on northern Otero Mesa and in the basin below mesa.
Lower piedmont desert shrubland – creosotebush and tarbush (6)	Dominated by creosotebush (*Larrea tridentata)* and bush muhly (*Muhlenbergia porteri)*; tarbush is common in some areas. Occurs in heavy depositional soils of the lower toe slopes and the basin bottom.
Upper piedmont desert shrubland – creosotebush/bush muhly (7)	Dominated by creosotebush and bush muhly. Occurs on gravely soil of the upper piedmont and foothills of the Sacramento Mountains.
Foothill desert shrubland – white thorn acacia (8)	Dominated by viscid acacia (*Acacia noevernicosa*); other species are sideoats grama (*Bouteloua curtipendula*), black grama (*B. eriopoda)*, and ocotillo (*Fouquieria splendens*). Occurs on shallow gravely soils of foothills, mesa escarpments, and upper piedmont.
Foothill desert shrubland – ocotillo - mariola (9)	Ocotillo and mariola (*Parthenium incanum*) are common plant species. Occurs on the rocky Sacramento Mountains foothills.
Foothill desert shrubland – Lechugilla/sideoats grama (10)	Dominated by lechugilla (*Agave lechuguilla)* and sideoats grama. Occurs on all aspects of the Hueco Mountains and unnamed hills.
Montane shrubland – mountain mahogany (11)	Mountain mahogany (*Cercocarpus montanus*), curlyleaf muhly, and New Mexico needlegrass are dominant. Occurs predominantly on rocky south-facing slopes at mid-elevation in the Sacramento Mountains foothills.
Grasslands	
Sandy plains desert grassland (12)	Dominated by mesa dropseed and soaptree yucca (*Yucca elata)*. Occurs mostly south of McGregor Range Camp on sandy sites.
Basin/lowland desert grassland – tobosa grass and alkali sacaton (13)	Dominated by tobosagrass and alkali sacaton and occurs in heavy depositional soils on flats, bottomlands, and swales. Usually associated with drainages on Otero Mesa and Sacramento Mountains foothills.
Basin/lowland desert grassland – burrograss (14)	Monotypic growth of burrograss. Occurs in drainage's on Otero Mesa and broad alluvial depressions in the basin.
Foothills piedmont desert grassland (15)	Black and sideoats grama dominant with soaptree yucca and creosotebush. Occurs on gravely footslopes and piedmont of the Sacramento and Hueco mountains.
Foothill grasslands (16)	Dominated by sideoats grama, sacahuista (*Nolina microcarpa)*, and curlyleaf muhly (*Muhlenbergia setifolia)*. Occurs on gravely or rocky slopes near Otero Mesa escarpment and canyon walls of the escarpment.
Mesa grassland – blue grama/alkali sacaton (17)	Blue grama (*Bouteloua gracilis)* and alkali sacaton common along with soaptree yucca and purple threeawn (*Aristida purpurea)*. Occurs on silty-clay soils near the Sacramento Mountains foothills.
Mesa grassland – black and blue grama/soaptree yucca (18)	Dominated by blue and black grama plus soaptree yucca and banana yucca (*Yucca baccata)*. Covers extensive areas on fine silty soil on Otero Mesa and low tablelands beneath the mesa.

Table 3.8-1. Descriptions of 27 Mapping Units on McGregor Range (Continued)

Plant Community (mapping units)	*Description*
Mesa grassland – black and blue grama/banana yucca (19)	Black and blue grama plus banana yucca are dominant. Occurs on shallow soils on southern Otero Mesa.
Mesa/foothill grasslands (20)	New Mexico needlegrass (*Stipa neomexicana)*, sideoats grama, black grama, banana yucca common. Occurs on rocky ridges of slopes of the southern Otero Mesa.
Foothill grasslands – sideoats grama, curlyleaf muhly (21)	Sideoats grama, curlyleaf muhly, skeletonleaf goldeneye (*Viguiera stenoloba)*, ocotillo, and common sotol (*Dasylirion wheeleri)* are common. Occurs on Otero Mesa escarpment and rocky slopes of the Sacramento and Hueco mountains.
	Woodlands
Woodland – oneseed juniper (22)	Oneseed juniper, curlyleaf muhly, and hairy grama are dominant. Occurs on rocky, gravely slopes at moderately high elevation in the Sacramento Mountains foothills.
Woodland – pinyon pine (23)	Pinyon pine, alligator juniper, sideoats grama, sandpaper oak (*Quercus pungens)*, and gray oak (*Quercus grisea)* are dominant. Occurs on rocky, well developed soils on high elevation slopes of the Sacramento Mountains foothills.
	Military Lands and Roads
Barren military land (24)	Rock, barren soil, and impact areas.
Military facilities (25)	Military facilities.
Roads (26)	Roads.

Note: Mapping units renumbered from the presentation in the source document.
Source: U.S. Army, 1996d.

Table 3.8-2. Summary of Desert Shrubland, Grassland, and Woodland Plant Communities and Disturbed Ground on McGregor Range

General Plant Community Type	*Mapping Units*[a]	*Acres*	
		Number	*Percent*
Shrublands			
Mesquite coppice dunes and sandscrub	1, 2, 3, 4	136,730	19.8
Creosotebush and tarbush shrublands	5, 6, 7	157,506	22.9
Foothill desert shrublands	8, 9, 10	55,511	8.1
Montane shrublands	11	18,115	2.6
Total Shrublands		*367,862*	*53.3*
Grasslands			
Basin grasslands	12, 13, 14	37,467	5.5
Mesa grasslands	17, 18, 19, 20	113,825	16.5
Foothill grasslands	15, 16, 21	129,495	18.8
Total Grasslands		*280,787*	*40.8*
Woodlands			
Pinyon/juniper woodlands	22, 23	4,360	0.6
Total Woodlands		*4,360*	*0.6*
Disturbed Ground			
Facilities and barren areas	24, 25, 26	35,896	5.2
Total Disturbed Ground		*35,896*	*5.2*
Grand Total		*688,905*[b]	*99.9*

[a] From Table 3.8-1.
[b] Area mapped on McGregor Range.
Source: U.S. Army, 1996d.

grasslands are associated with loamy soils in the drainages. The Hueco Mountains are in the southeast portion of McGregor Range and lechugilla, creosotebush, and mariola communities dominate the shallow soils on the steep slopes while desert grasslands dominated by sideoats grama and black grama occupy the gentler slopes. The Otero Mesa occurs on eastern part of McGregor Range and the vegetation is predominately black and blue grama with tobosa grass and burrograss in the broad drainages. New Mexico needlegrass, as well as various shrubs, can be found on rocky ridges. The Sacramento Mountains piedmont is west of the Sacramento Mountains and east of the Tularosa Basin, and includes part of the Otero Mesa escarpment. Soils are shallow and rocky on the escarpment where vegetation is a mixture of shrublands and grasslands (mostly sideoats grama and curlyleaf muhly). Creosotebush and mariola plant communities occur on the coarse rocky soil of the upper piedmont giving way to almost pure stands of creosotebush further down on the piedmont. The Sacramento Mountains foothills are at the north end of McGregor Range and vegetation is predominately pinyon pine/juniper woodlands and montane shrublands (mountain mahogany) in the upper slopes of the foothills; these types give way to Chihuahuan Desert shrublands at lower elevations (U.S. Army, 1996d).

At lower elevations in the area, the native plant communities are adapted to arid conditions. The communities generally produce limited amounts of desirable forage and are very susceptible to deterioration if disturbed. At higher elevations, the greater availability of moisture tends to result in higher forage yields, and a greater stability. Since moisture conditions also relate to soil type and topographic position, many variations in vegetation correlate with soil and slope characteristics. For example, on Otero Mesa, feathergrass and sideoats grama tend to be found on gravelly ridges while tobosa is found in the moister swale areas. In the Canyonlands (BLM natural unit, see Section 3.1.2.2), the moister sites contrast with drier sites by having more curlyleaf muhly and skeleton leaf goldeneye and less mariola and sideoats grama.

The long-term effects of variations in climate can be deduced from studies of the Jornada Experimental Range (23 miles northeast of Las Cruces) and from research on other rangelands. Differing opinions are held by researchers regarding grasslands on the Jornada Experimental Station. On the Jornada, severe droughts have caused reductions in the basal cover of black grama to about the same amount, regardless of grazing intensity. During wet periods, the basal cover has recovered to a similar degree on all but heavily grazed pastures. Increases in vigor, basal area, and stored foods in black grama occurred whenever there was substantial, well-timed precipitation throughout a 15-month period (two growing seasons), regardless of grazing intensity. In years of little or no rainfall there is little significant growth of the forage grasses. The relationships also are affected by many other factors (BLM, 1980).

Of the approximately 689,000 acres of land mapped on McGregor Range, about 53 percent, or 367,900 acres, are desert shrublands, mostly in the Tularosa Basin (Table 3.8-2). About 136,700 acres of the shrublands (about 20 percent of McGregor Range) are covered with mesquite-dominated plant communities, most of which are coppice dunes. Creosote-dominated plant communities cover over 157,500 acres, or 23 percent, of the total land on McGregor Range. Shrub-dominated plant communities have replaced grassland plant communities, including black grama grasslands, over large areas in southern New Mexico in the last century (Buffington and Herbel, 1965). For example, over 86,000 acres of a 144,500-acre study area on the Jornada Experimental Range was grasslands with no shrubs in 1858; no such habitat existed by 1963 although black grama grasslands still occur elsewhere on the Jornada Experimental Range as indicated above. During the same time period, mesquite dominated habitat increased from 6,266 acres in 1858 to 66,151 acres in 1963 and creosote-dominated areas increased from 640 acres to about 12,000 acres during the same period (Buffington and Herbel, 1965). Mesquite-dominated areas have continued to expand even after livestock have been removed from the range for many years. Long-term studies in permanent exclosures at the Jornada Experimental Range from 1935 to 1980 showed that black grama grass totally disappeared by 1980, even in areas where it was the dominate species in 1935; the greatest decline in black grama took place between 1950 and 1955 during a severe

drought. These former black grama grasslands are now mesquite-dominated areas (Hennessy et al., 1983). It is believed that the formation of mesquite coppice dunes is related to drought and livestock grazing. Under heavy livestock grazing and/or drought, grass cover was reduced. In addition, cattle feed on mesquite seeds and the dispersal of these seeds is of "great importance in the spread of mesquite to adjacent areas" (Buffington and Herbel, 1965). Openings created by the reduction in grass cover were occupied by mesquite. The establishment of this species altered the site and extensive soil movement occurred, forming coppice dunes. In addition, soil moisture conditions and competition were such that black grama could not become reestablished (Hennessy et al., 1983).

It is likely that much of the mesquite- and creosote-dominated areas on Fort Bliss were once grasslands and this conversion from grassland to shrublands is considered a step in the decertification process (Schlesinger et al., 1990). Long-term studies carried out at the Jornada Experimental Range have shown that the conversion to shrublands has resulted in a reduction in plant species diversity (Huenneke, 1995). Grasslands had 2.5 times more plant species then mesquite and 1.7 times more plant species than the creosote type. Net primary productivity did not differ significantly between the grassland and shrubland types (Huenneke, 1995).

Once established, coppice dunes persist and the return to grasslands, even in areas where livestock have been excluded for many years, is highly unlikely (Gardner, 1951; Buffington and Herbel, 1965; Hennessy et al., 1983). Chemical treatment has proven successful in reducing mesquite growth over the short term (about 3 years on the Jornada Experimental Range). Satellite imagery data over a several-year period was used to track photosynthetic activity of the mesquite canopy. No ground transects were sampled. The satellite data indicated that during the first 3 years after treatment, an increase in grass growth was noted. After 3 years, mesquite began to recover and a reduction in grass growth resulted (Eve and Peters, 1995).

Grassland plant communities cover about 281,000 acres, which accounts for 41 percent of the land on McGregor Range. Within McGregor Range, Otero Mesa covers about 161,400 acres or 54 percent of the grasslands on McGregor Range (U.S. Army, 1996d). Otero Mesa extends southeast away from McGregor Range and covers about 1,202,000 acres (USAF, 1998). The remainder of the grassland plant communities occur in the Tularosa Basin. The largest contiguous blocks of grasslands are found on Otero Mesa and below the escarpment.

Montane shrublands and pinyon pine/juniper woodlands cover about 22,500 acres, or almost 3 percent of McGregor Range; these plant community types are in the Sacramento Mountains foothills (U.S. Army, 1996d).

Since 1966, when the BLM grazing system was instituted on McGregor Range, modern grazing management practices have been followed. Grazing has been excluded over much of McGregor Range for decades. Some of the plant communities are approaching presettlement conditions such as the black grama/blue grama grassland, sand sagebrush, and mesa drop seed communities described below (U.S. Army, 1997c). One such area is a 123,500-acre black grama/blue grama grassland tract on and below southern Otero Mesa, which have not been grazed for many years. The area is characterized by high grass cover with a low incidence of shrubs and weedy species, and a general absence of exposed and eroded soil. Similarly, grazing units on Otero Mesa contain grasslands in excellent conditions. The black grama grasslands in this area are particularly important because they have been much reduced starting in the 19th century as indicated above. Three high-quality sand sagebrush communities are also found on McGregor Range east of Oro Grande in the Tularosa Basin, on the Sacramento Mountains foothills, and on northern Otero Mesa. The nearest known sand sagebrush plant community of the type found on the northern Otero Mesa of similar high quality is 150 miles north on WSMR. Mesa dropseed grassland occur on isolated patches within the mesquite coppice dune fields. One of the largest grasslands of this type (1,230 acres) is along the New Mexico-Texas border near Newman and another area of Mesa

dropseed is northeast of Oro Grande in the Tularosa Basin. These areas may be remnants of much larger grasslands that covered the Tularosa Basin before intensive livestock grazing and the encroachment of mesquite (U.S. Army, 1997c).

Exotic plant species have become established on some areas on McGregor Range. African rue *(Peganum hormala)* has become established on Otero Mesa. It invades disturbed sites, and once successfully established, it can spread and out compete the native grasses. Russian thistle *(Salsola iberica)* is another species that becomes established on disturbed ground and this species can be found throughout McGregor Range. Salt cedar *(Tamarix ramosissima)* has become established at some stock tanks and at other widely scattered locations on McGregor Range. Another potential problem plant is malta starthistle *(Centaurea melitensis*, that is currently known to grow along U.S. Highway 54 and may occur along other roadways on McGregor Range. Another species of concern is Johnson grass (*Sorghum halepense*), which occurs in some drainages on Fort Bliss. Fort Bliss has initiated a 2-year study to map the distribution and abundance of some of the exotic plant species on Fort Bliss. From this information, a strategy will be developed to control any exotic plants that Fort Bliss deemed necessary to maintain the biological diversity on post or for other appropriate reasons.

3.8.2 Wetlands and Arroyo-riparian Drainages

Wetlands and arroyo-riparian drainages have been studied on McGregor Range (for more details see Appendix D). The USACE Waterways Experiment Station is currently mapping and characterizing all Waters of the U.S., including wetlands on Fort Bliss (U.S. Army, 1998h; 1997d). To qualify as a USACE jurisdictional wetland, it must have hydric soil, have evidence of saturation to the surface sometime during the growing season, and contain wetland plant species. Waters of the U.S. includes "water such as intrastate lakes, rivers, streams (including intermittent streams)" (33 CFR 328.3[a][3]).

Probable Waters of the U.S. have been mapped on McGregor Range (Figure 3.7-1). A total of 1,291 dry washes with distinct streambeds and sides, comprising 2,475 miles, were mapped on McGregor Range and the South Training Areas. In addition, 13 intermittently flooded lakes with distinct ordinary high water marks, totaling 132 acres, and 110 artificial water resources (691 acres) including sewage lagoons, storm-water retention basins, and cattle tanks were mapped (U.S. Army,1998h).

The vast majority of arroyo-riparian drainages on McGregor Range do not qualify as USACE jurisdictional wetlands but, as indicated above, thousands of miles of these water ways are probable Waters of the U.S. Perennial riparian corridors of the western U.S. have been studied extensively and the density and diversity of flora and fauna in many of these areas determined. However, the flora and fauna of arroyo-riparian drainages on McGregor Range and elsewhere have not been fully studied (Cockman, 1996; Kozma, 1995).

Cockman (1996) studied arroyo-riparian ephemeral drainages on McGregor Range and determined that drainages had the following characteristics in relation to upland areas:

- Shrub, tree, and forb cover are higher on the main channel than the surrounding area.
- Species richness of shrubs, trees, grasses, and forbs are higher in the main channel than all other locations.
- Heights of shrubs along the main channel are nearly twice that of shrubs in the uplands.
- Obligate species such as desert willow tended to be taller than nondrainage species.

- Obligate species at one elevation may occur outside of the drainage at another elevation. For example, Apache plume (*Fallugia paradoxa*)is obligate in the submesa drainages but occurs outside the drainages in the foothills. Species such as little-leaf and big-leaf sumac (*Rhusmicrophylla and R. trilobata*) occur at many locations in the foothill and submesa drainages (Cockman et al., 1996). Little-leaf sumac occurs frequently in drainages in the Tularosa Basin, and less frequently, in deep, sandy areas not associated with drainages.

3.8.3 Wildlife

Information regarding amphibians and reptiles, avifauna, and mammals is presented in this section. More detailed information is presented in Appendix D.

3.8.3.2 Amphibians and Reptiles

Surveys for amphibians and reptiles were conducted on Otero Mesa and in the Tularosa Basin on McGregor Range in 1996 and 1997. Based on these surveys and other information, a total of 8 species of amphibians and 39 species of reptiles have been observed on Fort Bliss; an additional 19 species and subspecies of amphibians and reptiles have the potential to occur (U.S. Army, 1997d, e, 1996e) (Appendix D). Seven of the amphibian species are toads, and the eighth species is the barred tiger salamander (*Ambystoma tigrinum mavortium),* which is found in stock tanks on the Otero Mesa and in the Tularosa Basin. The box turtle (*Terrapene ornata)* is the only species of turtle observed on Fort Bliss and is most common in the grassland plant communities on the Otero Mesa, although it has been regularly observed in the desert shrubland communities in the Tularosa Basin (U.S. Army, 1997d, e, 1996d, e).

The most diverse group of reptiles are the lizards; 20 species have been recorded from Fort Bliss, including 6 species of whiptails (Appendix D) (U.S. Army, 1997e). The largest number of lizard species occur in the grassland habitat (17 species) followed by the desert shrublands (13), and Sacramento Mountains foothills (10) (U.S. Army, 1997e). Some species, such as the western marbled whiptail (*Cnemidophorus marmoratus)* and Texas horned lizard (*Phrynosoma cornutum*) are found in essentially all areas on McGregor Range; while others, such as the leopard lizard (*Gambelia wislizenii*), have been reported only from the desert shrubland habitat, and the lined tree lizard (*Urosaurus ornatus),* only in the wooded habitat of the Sacramento Mountains foothills (U.S. Army, 1997e).

Eighteen species of snakes have been recorded from Fort Bliss (U.S. Army, 1997e, 1996e) (Appendix D). On McGregor Range, the largest number of species occur in the grassland habitat on Otero Mesa (13 species), followed by the desert shrubland and the Sacramento Mountain foothills (11). Species such as the western diamondback rattlesnake (*Crotalus atrox)* and gopher snake (*Pituophis catenifer)* are common and widespread throughout McGregor Range. Other species, such as the Mojave (*C. scutulatus)* and prairie (*C. viridis)* rattlesnakes, have been reported only from the grassland habitat on Otero Mesa and the Texas long-nosed snake (*Rhinocheilus lecontei)* was observed only in the Sacramento Mountains foothills (U.S. Army, 1997e) and the desert shrubland habitat of the Tularosa Basin (U.S. Army, 1996e).

3.8.3.3 Avifauna

A total of 334 species of birds have been recorded from Fort Bliss (U.S. Army, 1996f) and 223 of these have been recorded from McGregor Range (Table D.3-3 in Appendix D). Sixty-three of the species not recorded from McGregor Range were diving birds, wading birds, waterfowl, shorebirds, gulls, and terns that use aquatic habitats; appropriate aquatic habitat for these species either does not exist or is rare on McGregor Range. Many of these aquatic and wetlands species have been observed at the sewage lagoons and oxidation ponds near the Fort Bliss cantonment area in Texas. Another 16 species not recorded on McGregor Range were warblers that are rare to very rare migrants on Fort Bliss. These species may

occur on McGregor Range, but have been observed elsewhere on Fort Bliss due to more observers in the cantonment area and at the sewage lagoons and oxidation ponds.

In recent years, detailed studies of the bird life in various habitats on McGregor Range were conducted and some of these studies are still in progress. These studies have centered on determining existing conditions and have concentrated on documenting breeding bird communities in various habitats, the occurrence of neotropical migrants, and the status of sensitive species. This section summarizes the results of the breeding bird, neotropical migrant, and raptor studies, while sensitive species are addressed in Section 3.8.4. Breeding bird surveys have been conducted in numerous locations scattered throughout McGregor Range (see Figure D.3-2 in Appendix D) and the results of these studies are summarized below. More detailed information regarding these studies appears in Appendix D.

Tularosa Basin

Breeding birds. In 1996 and 1997, 24 sites were sampled for breeding birds in the Tularosa Basin in desert shrubland habitats dominated by sandsage, mesquite, creosote, and viscid acacia (U.S. Army, 1996g, 1997f) (see Table D.3-4 in Appendix D). The black-throated sparrow *(Amphispiza bilineata)* was by far the most common species recorded in all four habitats in 1996 and in 1997. The western kingbird (*Tyrannus verticalis),* Scott's oriole (*Icterus parisorum),* mourning dove (*Zenaida macroura),* and ash-throated flycatcher (*Myiarchus cinerascens)* were other common species. In 1997, 718 nests of 42 species were observed, compared to 453 nests of 34 species in 1996 (U.S. Army, 1996g, 1997f). During both years, the largest number of nests belonged to the black-throated sparrow and the largest number of nests were found in the mesquite habitat.

Breeding bird studies at eight sample locations in arroyo and upland habitats in the Chihuahuan Desert showed the black-throated sparrow, northern mockingbird (*Mimus polyglottos)*, verdin (*Auriparus flaviceps)*, brown-headed cowbird (*Molothrus ater)*, mourning dove, and ash-throated flycatcher were the most common species (U.S. Army, 1995c, 1996g, 1997g; Kozma, 1995;). A total of 1,214 nests of 32 species were detected from 1993 through 1997 and nests of the black-throated sparrow, northern mockingbird, Scott's oriole, mourning dove, and house finch (*Carpodacus mexicanus*) were the most commonly observed. Nest density was about twice as high in arroyo habitat, and Torrey yucca (*Yucca torreyi*), javelina bush (*Microrhamnus ericoides)*, and little-leaf sumac were most frequently used for nesting, even though these shrubs were among the lowest in density (Kozma and Mathews, 1997).

Breeding bird surveys conducted along eight transects at four arroyo/upland sites in the Chihuahuan Desert below the Otero Mesa escarpment, in 1997, resulted in 40 species of birds comprising 689 individuals being recorded (USAF, 1997a, b) (Table D.3-5 in Appendix D). Seventeen percent more species and 29 percent more individuals were recorded in the arroyos than the uplands, and the black-throated sparrow accounted for 25 percent of the birds recorded, followed by the northern mockingbird (8 percent), and ash-throated flycatcher (7 percent).

Neotropical migrants. Many bird species breed in North America and winter in Central and South America (called neotropical migrants), and many of these species started to decline in the early 1980s (Robbins et al., 1993). Forest fragmentation on the breeding grounds, the elimination of wintering habitat in the tropics, and the loss of important stop-over habitat are likely major reasons for these declines (Flather and Sauer, 1996; Sheery and Holmes, 1996; Moore et al., 1993).

In the west, over 60 percent of the neotropical migrants use riparian areas for stop-over habitat during migration or for breeding (Krueper, 1993), and most of the riparian areas that have been studied are mesic sites dominated by species such as willow and cottonwoods. McGregor Range contains few such mesic riparian areas, but arroyo-riparian drainages on the range attract more neotropical migrants in comparison

to adjacent uplands (Kozma, 1995; U.S. Army, 1995c; 1996h; 1997g). During 5 years of mist netting along arroyo-riparian drainages and in adjacent uplands, 27 species of neotropical migrants were captured 342 times and all species captured more than once, were more common in the arroyos than uplands (Table D.3-6 in Appendix D).

These studies of nesting and migratory birds on McGregor Range demonstrate that arroyo-riparian areas are used by more species more consistently than upland sites. As indicated in Section 3.8.2, approximately 2,475 miles of arroyos with well-developed channels and sides occur on McGregor Range and the South Training Areas. Many of these arroyos, as well as similar areas on other parts of Fort Bliss, likely provide habitat that is used to a greater degree than adjacent upland habitat by nesting birds and neotropical migrants moving through the Chihuahuan Desert.

Raptors. Data collected at 24 breeding bird sample locations showed that the Swainson's hawk (*Buteo swainsoni)* and turkey vulture (C*athartes aura*) were the most common raptors observed in the desert shrublands during spring and summer of 1996 and 1997 (Table D.3-7 in Appendix D) (U.S. Army, 1996g, 1997f). Surveys along the Otero Mesa escarpment revealed that a breeding pair of falcons, consisting of a prairie falcon (*Falco mexicanus)* and a possible prairie/peregrine falcon (*Falco peregrinus)* hybrid, were nesting near Rough Canyon (USAF, 1997c, d). Numerous stick nests and a number of golden eagles (*Aquila chrysaetos)* were also observed but nesting was not confirmed in 1997. An active golden eagle nest was observed along the escarpment in 1998 (U.S. Army, 1998i). Data from wintering bald eagle (*Haliaeetus leucocephalus)* surveys in the desert shrubland habitat showed that the golden eagle and red-tailed hawk were the most common wintering species (U.S. Army, 1995d, 1996i) (Table D.3-8 in Appendix D).

Otero Mesa

Breeding birds. In 1996 and 1997, 8 sites were sampled for breeding birds in the black grama grasslands and the mesa grasslands (dominated by blue grama grass), an additional four sites were sampled in the black grama grasslands of the Tularosa Basin (U.S. Army, 1996g, 1997f). As in the desert shrublands habitats, there was a substantial increase in the number of birds recorded in the grassland habitats in 1997; approximately twice as many birds were detected in 1997 than 1996 (Table D.3-9 in Appendix D). In 1996, the horned lark (*Eremophila alpestris*) was the most common species recorded in the mesa grasslands; the eastern meadowlark (*Sturnella magna*) was most abundant in the mesa grasslands in 1997, and the black-grama grasslands both years. Other common breeding bird species were the black-throated sparrow, mourning dove, northern mockingbird, common nighthawk (*Chordeiles minor)*, Scott's oriole, and ash-throated flycatcher.

Breeding bird surveys along eight transects in the grassland habitat of Otero Mesa in 1997 resulted in the observation of 45 species comprising 720 individuals (USAF, 1997a, b) (Appendix D). For the combined transects, 45 percent more species and 34 percent more birds were observed in the grassland swales than in the adjacent uplands. The eastern meadowlark was the most abundant species, followed by the northern mockingbird, mourning dove, and black-throated sparrow.

Raptors. The turkey vulture and red-tailed hawk were the most common species of raptor observed at 12 breeding bird sampling sites in 1996 and 1997, respectively (Appendix D) (U.S. Army, 1996h; 1997f). Additional species observed on Otero Mesa during the spring and summer were the golden eagle, merlin (*Falco columbarius)*, burrowing owl (*Athene cunicularia)*, and great horned owl (*Bubo virginianias*). During surveys for wintering bald eagles, the red-tailed hawk was the most common raptor observed (U.S. Army, 1995d; 1996i) (Appendix D). The golden eagle and American kestrel were also fairly common wintering species.

Hueco Mountains

Breeding birds. Reconnaissance surveys for breeding birds were conducted in the Hueco Mountains on McGregor Range in June 1997 (U. S. Army, 1997h). Six routes totaling about 28 miles, were traversed along arroyos and in uplands within an area of approximately 6,700 acres. A total of 40 species comprising 737 individuals were recorded during six surveys on June 10 and 12, 1997 (Table D.3-11 in Appendix D). The black-throated sparrows were the most common species encountered. Other common species were the northern mockingbird, cactus wren, canyon towhee (*Pipilo fuscus*), house finch, and mourning dove. Scaled (*Callipepla squamata*) and Gambel's (*Callipepla gambelii)* quail were fairly common and were most frequently associated with the larger arroyo-riparian drainages (U. S. Army, 1997h).

Raptors. The turkey vulture and red-tailed hawk were the most frequently observed raptors in the Hueco Mountains in June 1997, while the Swainson's hawk and American kestrel were infrequently detected. Raptor surveys were conducted along the east facing Hueco Mountain escarpment, as well as in the interior of these mountains. The red-tailed hawk, American kestrel, and golden eagle were observed along the escarpment. However, the surveys indicated that the golden eagle probably does not nest along the escarpment, although the red-tailed hawk and American kestrel may. Observations in the interior of the Hueco Mountains on McGregor Range showed that there were few cliffs that would support cliff-nesting raptors such as the golden eagle or prairie falcon, and these two species were not observed in this area. The turkey vulture, red-tailed hawk, and American kestrel were observed and these species likely nest in the Hueco Mountains (U.S. Army, 1999). There is no data regarding wintering raptors in the Hueco Mountains, but the same species that winter elsewhere in the desert shrubland and grassland habitats on the McGregor Range likely occur in these mountains.

Sacramento Mountains

Breeding birds. The Sacramento Mountains foothills occur within McGregor Range, and breeding birds were sampled at six sites in the pinyon pine/juniper woods. The most common breeding birds recorded were the northern mockingbird, common bushtit (*Psaltriparus minimus)*, spotted towhee (*Pipilo maculatus)*, and black-chinned sparrow (*Spizella atrogularis)* (U.S. Army, 1996g; 1997f) (see Table D.3-12 in Appendix D).

Raptors. The turkey vulture was the most common species of raptor observed at breeding bird sampling locations in the pinyon pine-juniper habitat. The red-tailed hawk was observed occasionally, while the golden eagle and sharp-shinned hawk (*Accipiter striatus)* were seen once in 1996 (Table D.3-7 in Appendix D) (U.S. Army, 1996g; 1997f). During wintering bald eagle surveys, the golden eagle was the most common raptor observed. The red-tailed hawk, bald eagle, and American kestrel were also fairly common wintering species (Table D.3-8 in Appendix D) (U.S. Army, 1995d, 1996i). The great horned owl and western screech owl (*Otus kennicotti)* were detected during spotted owl (*Strix occidentalis)* surveys of the Sacramento Mountains foothills during the winter of 1995 to 1996; however, no spotted owls were observed (U.S. Army, 1996j).

3.8.3.4 Mammals

A total of 58 species of mammals are known to occur, and an additional 19 species have the potential to occur on McGregor Range, including 17 species of bats. Two maternity colonies of the fringed myotis (*Myotis thysanodes)* were observed in abandoned cabins in the Sacramento Mountains foothills (Smartt, 1980); a maternity colony was observed in one of these cabins in 1998 and based on behavioral traits, it is likely a fringed myotis colony (U.S. Army, 1998j). Surveys for bats along the Otero Mesa escarpment and nearby stock tanks (See Appendix D) indicated that bats roost in small scattered groups; no large

roost sites were observed. Western pipistrelles (*Pipistrellus hesperus)*, *Myotis* sp. and free-tailed bats (*Tadarida*) were observed emerging from the escarpment and at some stock tanks (USAF, 1997e, f).

Fort Bliss conducted rodent surveys at 24 sampling sites in 12 habitat types on McGregor Range in 1997 and 1998 (U.S. Army, 1997i) (see Figure D.3-1 in Appendix D). The largest number of rodents were captured in the swale and the acacia scrub habitat and the lowest number was in the mesquite dunes (Table D.3-14 in Appendix D). In 1997, the most abundant species were the silky pocket mouse (*Perognathus flavus)* and Merriam's kangaroo rat (*Dipodomys merriami)*. Other common species were the deer mouse (*Peromyscus maniculatus)*, hispid cotton rat (*Sigmodon hispidus)*, white-footed mouse (*Peromyscus leucopus)*, cactus mouse (*Peromyscus eremicus),* western harvest mouse (*Reithrodontomys megalotis),* and Ord's kangaroo rat (*Dipodomys ordii)*. The largest number of species was in the sandy arroyo scrub (14) and *Chilopsis* arroyo (14) and the smallest number (7) was in the mesquite coppice dunes (U.S. Army, 1997i).

A study of rodents in arroyos and adjacent upland habitats in the Chihuahuan Desert for 2 years on McGregor Range, found the relative abundance was over six times greater in the arroyos than adjacent habitats. The white-footed mouse, deer mouse, western harvest mouse, and white-throated woodrat (*Neotoma albigula)* were more common in the arroyos, and Merriam's kangaroo rat, and the desert plains pocket mouse (*Perognathus flavescens)* was more abundant in adjacent upland habitats (U.S. Army, 1996h).

The desert cottontail (*Sylvilagus audubonii)* and black-tailed jackrabbit (*Lepus californicus)* are common on McGregor Range. The coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), badger (*Taxidea taxus*), and bobcat (*Lynx rufus*) are predators in the desert shrubland and grassland habitats. The mountain lion (*Puma concolor*) was observed in the Sacramento Mountains foothills along the Otero Mesa escarpment in 1979 (Smartt, 1980), and in Rough Canyon along the Otero Mesa escarpment in 1996 (U.S. Army, 1997j).

The mule deer (*Odocoileus hemionus*) occurs throughout Fort Bliss, and on McGregor Range is most common in the mountainous portions including the Sacramento Mountains foothills. The number of mule deer in the Sacramento Mountains foothills on McGregor Range ranged from 587 in 1984 to 206 in 1995 (Table D.3-15 in Appendix D) (NMDGF, 1997). In addition, the number of deer observed north of New Mexico Highway 506 was substantially greater than the number observed south of this highway (Table D.3-15 in Appendix D).

The pronghorn antelope (*Antilocapra americana*) occurs mostly in the grassland communities of Otero Mesa and below the Mesa, with occasional use of the desert shrubland habitat in the Tularosa Basin. An estimated 500 to 700 pronghorn inhabit the Otero Mesa of Fort Bliss. The oryx (*Oryx gazella)* is common in the desert-shrubland communities and has become common in the Tularosa Basin portion of McGregor Range. The javelina (*Dicotyles tajacu*) are widely dispersed in the Tularosa Basin and have been observed infrequently in many locations. Recent observations in the Sacramento Mountains foothills and on Otero Mesa indicate that this species may be expanding its extent on McGregor Range.

3.8.4 Sensitive Species

Various species of flora and fauna occur on McGregor Range that are listed as threatened, endangered, or species of concern by the USFWS and the State of New Mexico (sensitive species) (See Table D.4-1 in Appendix D). In addition, the diverse habitats on McGregor Range have the potential to support species that have not been confirmed. The following sections present brief summaries of selected sensitive species known to occur or have the potential to occur on McGregor Range. More detailed descriptions of these species appear in Appendix D. In addition, federally listed species will be addressed in greater detail in a biological assessment that will be prepared separately. The draft biological assessment is tentatively

scheduled to be completed during the spring of 1999. Refer to Table D.4-1 for the scientific names of sensitive species discussed in this section.

3.8.4.1 Plants

One federally endangered and five plant species of special concern occur or have the potential to occur on McGregor Range. The federally and state endangered Sneed pincushion cactus is known to occur on the Doña Ana Range–North Training Areas on Fort Bliss (U. S. Army, 1991a, 1998i) and this species was not observed in the Hueco Mountains in Texas (U. S. Army, 1991a). The Alamo beardtongue and Hueco Mountain rockdaisy are federal species of special concern and the Alamo beard tongue is a state rare and sensitive species. These species have been recorded in the Hueco Mountains in Texas (U. S. Army, 1991a, 1998i). Surveys for these two species in potential habitat in the Hueco Mountains of McGregor Range, in 1998, did not detect these plants (Corral, 1998). These species are very unlikely elsewhere on McGregor Range.

The night blooming cereus is a federal species of concern and a state rare and sensitive species, and is known to occur in the alluvial gravelly sands portions of the desert shrubland habitat on the Doña Ana Range–North Training Areas (U. S. Army 1990, 1998i). A survey for this species took place in a 5,000-acre segment of the Chihuahuan Desert on McGregor Range in 1997 and it was not observed (USAF, 1997g). Potential habitat for this species occurs in the Tularosa Basin on McGregor Range.

The sand prickly pear is a federal species of concern and a state endangered species, and occurs in the sandy soils of mesquite coppice dunes; it has been recorded from BLM land about 0.8 mile from the Doña Ana Range–North Training Areas boundary. It was not observed during surveys on Doña Ana Range–North Training Areas in 1996 (U. S. Army, 1998i), and there is a very low potential that this species would occur in the alluvial gravelly sand portions of the mesquite coppice dune plant community on McGregor Range. Prior to 1992, there were only two records of the grama grass cactus (federal species of concern) on Otero Mesa on McGregor Range. Surveys in 1993 and 1994 showed that this species was much more abundant and this species is now considered common on Otero Mesa (Corral, 1997).

3.8.4.2 Invertebrates

The Los Olmas tiger beetle is a federal species of concern and has not been observed on McGregor Range but has the potential to occur in areas of limestone soil. The population trends for this species are not known and it is listed as possibly occurring in New Mexico (BISON-M, 1997).

3.8.4.3 Reptiles

One federal reptile species of concern and a state threatened species may occur on McGregor Range. The Texas horned lizard is a federal species of special concern and is common and widespread on McGregor Range (U. S. Army 1997e). The mottled rock rattlesnake is not a federal species of concern but is a State of New Mexico threatened species. This species is typically found in rocky canyons and hillsides and has been reported from the Organ Mountains near Fort Bliss. It is possible in the Hueco Mountains and Otero Mesa escarpment on McGregor Range.

3.8.4.4 Birds

Nineteen federal and/or state listed or sensitive bird species occur or have the potential to occur on McGregor Range (Table D.4-1 in Appendix D). The interior least tern, willow flycatcher, and piping plover and federally listed species that have not been reported (least tern) or occur only sporadically (willow flycatcher and piping plover) on McGregor Range. The subspecies of willow flycatchers

observed on McGregor Range was not determined so it is not known if the endangered southwestern willow flycatcher has occurred on McGregor Range. These three species occur only as migrants because appropriate nesting habitat is lacking on post. The remaining federally listed bird species either occur as wintering species, or as breeding species if suitable nesting habitat occurs on post.

Peregrine Falcon. The peregrine falcon is a federal and state endangered species and has not been recorded as a breeding species at Fort Bliss, although an unconfirmed peregrine/prairie falcon and a prairie falcon made a nesting attempt on the Otero Mesa escarpment in 1997 (USAF, 1997c, d). A survey for potential peregrine falcon nesting habitat was conducted during the fall of 1979 in the Organ Mountains and the Sacramento Mountains foothills on McGregor Range (U.S. Army, 1980a). No peregrine falcons were observed during this study although four prairie falcon and three golden eagle nest sites were found in the Organ Mountains and one prairie falcon nest site was found in the Sacramento Mountains foothills just north of the McGregor Range boundary (U.S. Army, 1980a). The peregrine falcon is occasionally observed on McGregor Range (U.S. Army, 1996g, 1997f, k) indicating that it is an occasional winter resident and migrant.

Northern Aplomado Falcon. The northern aplomado falcon is a federal and state endangered species that once inhabited the grasslands of southern Texas, New Mexico, and Arizona; historic records show that it was common until about 1940 (Hector, 1987). The reasons for this species' decline are unclear. Habitat loss and pesticide contamination likely contributed to this decline (Hector, 1987).

25

Sporadic observations of the northern aplomado falcon have been reported since 1991 in areas near Fort Bliss and an unconfirmed sighting occurred on McGregor Range in May 1997 when an immature bird was observed in the desert shrubland-grassland habitat in the Tularosa Basin (USAF, 1997d). In 1992, breeding populations were discovered south of the border in grassland habitat in the State of Chihuahua, Mexico (Montoya et al., 1997). Given the recent sighting of this species near Fort Bliss and the existence of potential grassland habitat on Otero Mesa, surveys for this species were conducted in 1994 and 1996 on Fort Bliss (U.S. Army, 1994b, 1997k). In 1994, 495 miles of survey routes were traversed over 23 days from February 2 through April 21. No northern aplomado falcons were observed, although 13 other species of raptors were noted and the location of 30 nest structures were mapped (U.S. Army, 1994b).

In 1996, the northern aplomado falcon survey was expanded to include habitat evaluation and avian prey-base studies on Fort Bliss (U.S. Army, 1997k). Results of this study were compared to similar habitat and prey-base assessments conducted at occupied aplomado falcon territories in Chihuahua, Mexico (Montoya et al., 1997). No northern aplomado falcons were observed during these surveys (U.S. Army, 1997k). Habitat and prey-base study results for Fort Bliss showed some similarities and differences when compared to equivalent studies in Chihuahua, Mexico. Based on this analysis, it appears that the number of woody species and potential nest sites would be adequate to support northern aplomado falcons on Otero Mesa (U.S. Army, 1997k). The comparison of vegetation and prey-base data from Otero Mesa and occupied territories in Mexico showed that the percent grass cover and biomass of potential prey species were much less on Otero Mesa (U.S. Army, 1997k; Montoya et al., 1997). Precipitation patterns and soil type may contribute to the observed differences between Otero Mesa and Mexico. Some believe that livestock grazing has had a greater impact on the grasslands on Otero Mesa than in Mexico. These preliminary results indicate that the grassland habitat on Otero Mesa may have a reduced capacity to support northern aplomado falcons compared to occupied territories in Mexico and that the principal reason for this may be livestock grazing. However, further study is necessary before a more definitive determination of northern aplomado falcon habitat and food requirements can be made (U. S. Army 1997k). The Army, along with the BLM and WSMR, will conduct further studies of the potential aplomado falcon habitat on Otero Mesa. Ongoing studies include a 5-year study initiated by the BLM, WSMR, and New Mexico State University. In addition, the USAF is sponsoring a 10-year effort for the monitoring of aplomado falcon habitat on Otero Mesa.

Bald Eagle. The bald eagle is a federal and state threatened species that winters in southern New Mexico including a small population (5 to 30 individuals) in the Sacramento Mountains; one of the known roost sites is about 4 miles from the northern border of McGregor Range (U.S. Army, 1995d). Surveys for wintering bald eagles in the Sacramento Mountains foothills on McGregor Range were conducted during the winters of 1994 to 1995 and 1995 to 1996, and bald eagles were observed 28 and 16 times respectively (U.S. Army, 1995d, 1996i). During both winters, most bald eagles were observed at the extreme northern boundary of McGregor Range where high ridges and hills provide favorable perch sites and updrafts. Vegetation in this area is mainly grassland with varying amounts of shrubs (mountain mahogany and oak) and two trees (pinyon pine and juniper) providing favorable foraging conditions (U.S. Army, 1995d). Only one bald eagle was observed over the grasslands of Otero Mesa. There were no observations of eagles feeding or hunting. Food sources on Fort Bliss may include deer carrion and rabbits.

Mexican Spotted Owl. The Mexican spotted owl is a federal threatened species and its range includes southern New Mexico where it occurs in suitable habitat in isolated mountain ranges (U.S. Army, 1996j). The Sacramento Mountains contain a breeding population of Mexican spotted owls and the closest known breeding pair is 10 miles from the McGregor Range boundary (U.S. Army, 1996j). This species was observed on McGregor Range during the winter of 1989 to 1990 and surveys for this species were conducted in the Sacramento Mountains foothills on McGregor Range from December 12, 1995, to February 21, 1996. No spotted owls were heard or observed during these surveys (U.S. Army, 1996j). No mixed conifer habitat and only a few isolated ponderosa pine occur in the Sacramento Mountains foothills on McGregor Range. Based on the habitat in the foothills on Fort Bliss and the ecology of the spotted owl, it seems likely that the southern Sacramento Mountains foothills on McGregor Range are only used by spotted owls on an occasional basis during the winter or dispersal (U.S. Army, 1996j).

Black Tern, White-faced Ibis, and Northern Goshawk. Of the eight federal candidate or species of special concern, the black tern, white-faced ibis, and northern goshawk occur only sporadically on McGregor Range, and appropriate nesting habitat is lacking. The remaining species (mountain plover, ferruginous hawk, western burrowing owl, loggerhead shrike, and Baird's sparrow) occur as nesting or wintering species or potential nesting habitat is present.

Mountain Plover. The mountain plover is a proposed threatened species and has declined by 63 percent since 1966 (Knopf, 1994) and is considered an associate of the short grass prairie dominated by blue grama and buffalo grass (*Buchloe dactyloides)* (Knopf and Miller, 1994). Various observers have noted that the mountain plover nests and forages in areas of disturbed ground such as occur at prairie-dog towns and areas heavily grazed by livestock (Knopf and Miller, 1994; Miller and Knopf, 1993; Sager, 1996).

In a recent statewide survey, the mountain plover was observed at 35 sites in 11 counties during the breeding season in New Mexico. This species was observed in a variety of habitats, but bare ground was a common feature at all the sites and livestock grazing had created most of the bare ground (Sager, 1996). The mountain plover has not been observed on Fort Bliss; based on its habitat requirements, Otero Mesa on McGregor Range provides the best potential habitat for this species especially in the denuded areas around stock tanks and troughs. The mountain plover was not recorded during field surveys for this species in a 5,000-acre proposed tactical target complex site in the grassland habitat on Otero Mesa and in grassland habitat in a second proposed tactical target complex site in the Tularosa Basin (USAF, 1997h, i). This species was also not recorded during surveys of other potential habitat in a 13,000-acre section of Otero Mesa such as along roads at heavily grazed stock tanks or prairie-dog (*Cynomys ludovicianus arizonnensis)* towns (USAF, 1997h, i; U.S. Army, 1998k).

Ferruginous Hawk. The ferruginous hawk is a federal species of concern and it breeds from the Canadian provinces south to Arizona and Oklahoma and nests on trees, bushes, large rocks, and hillsides. It is a

grassland species and typically feeds on prairie dogs and ground squirrels (Finch, 1992). Observations on McGregor Range confirm this because all but one ferruginous hawk observed during wintering bald eagle surveys were associated with the grassland habitat of Otero Mesa (U.S. Army, 1995d, 1996i). The ferruginous hawk has been observed on McGregor Range during the fall, winter, and spring including three observations at prairie-dog towns on Otero Mesa in March 1996 (U. S. Army, 1996i) and 21 observations during the winter of 1994 to 1995 and two observations during the winter of 1995 to 1996 (U.S. Army, 1995d, 1996i). Surveys during February and April 1997 resulted in seven observations of the ferruginous hawk in February and zero observations in April (U.S. Army, 1998i). These observations indicate that the ferruginous winters at and migrates through Fort Bliss. This species is not known to nest on Fort Bliss and was not observed during intensive breeding bird surveys during 1996 and 1997 (U.S. Army, 1996g, 1997f) or during the April 1997 ferruginous hawk surveys (U. S. Army 1998k).

Western Burrowing Owl. The western burrowing owl is a federal species of concern and it nests in desert grasslands on Otero Mesa and in desert shrublands in the Tularosa Basin. It was observed at 20 of the active and inactive prairie-dog towns observed on Otero Mesa in 1996 (U.S. Army, 1996l). Field studies in 1997 showed that there were 18 to 22 pairs at 11 of 16 prairie-dog towns inspected on Otero Mesa on McGregor Range (U.S. Army, 1997l). All military facilities on McGregor Range were inspected in 1997, and 11 pairs of burrowing owls were observed nesting in concrete conduit boxes at radar tracking sites just east of McGregor Range Camp (U.S. Army, 1997l). Elsewhere in the Tularosa Basin, burrowing owls may occur occasionally in mesquite dunes habitat and along eroded arroyos. The extent of use of these habitat types in the desert shrublands habitat in the Tularosa Basin has not been determined (U.S. Army, 1997l). In 1997, one burrowing owl was repeatedly observed along a road in the Tularosa Basin between Shorad and Mack Tanks; it was living in some kangaroo rat holes (USAF, 1997h).

Loggerhead Shrike. The loggerhead shrike is a federal species of concern and its presence on McGregor Range consists of wintering and resident birds. This species is fairly common in the desert habitat on McGregor Range during the breeding season; 53 were recorded from 12 breeding bird sampling locations in the grasslands on Otero Mesa and 50 from 24 sampling locations in four desert shrubland habitats in the Tularosa Basin (U.S. Army, 1996h). The loggerhead shrike has also been recorded during breeding bird surveys in 1993 and 1994 in arroyo-riparian and upland habitats (Kozma, 1995). These results indicate that the loggerhead shrike is fairly common on Fort Bliss although there is no historic data to determine long-term trends. The long-term trend for the period 1968 through 1996 for the breeding bird survey in New Mexico shows a decline throughout the period similar to that observed on a national scale (Sauer et al., 1997).

Baird's Sparrow. Baird's sparrow is a federal species of concern and a state threatened species. It was once one of the most abundant nesting species in the northern prairie states and Canada and has declined in abundance by about 90 percent with cultivation and conversion of much of its mixed-grass prairie nesting habitat (DeSmet and Conrad, 1989). This species winters and migrates through New Mexico and the declines on the nesting grounds are evident in New Mexico. It was once relatively numerous and wide-spread in New Mexico but in recent years is very rarely reported (NMDGF, 1996). Baird's sparrow was observed on McGregor Range during migration and is believed to winter on the post (Smartt, 1980; U.S. Army, 1997m). Surveys for this species were conducted at 28 sites on McGregor Range from late February to early April 1997 and it was observed 27 times. Preferred habitat on McGregor Range were swales on Otero Mesa with dense tall growth of tobosagrass along with black and blue grama grassland and low shrub density. Baird's sparrows were not observed along swales that had been heavily grazed or had dense growth of tall grass such as dropseed (*Sporobolus* sp.) (U.S. Army, 1997m).

Costa's Hummingbird, Varied Bunting, Bell's Vireo, and Gray Vireo. The Costa's hummingbird, varied bunting, bell's vireo, and gray vireo are state threatened species that occur or have the potential to occur on McGregor Range. The varied bunting and Bell's vireo have been observed as occasional migrants

through McGregor Range and it is unlikely that these species nest on McGregor Range due to the lack of appropriate habitat. The gray vireo was recorded from McGregor Range in 1980 (Smartt, 1980) and potential breeding habitat exists in the Sacramento Mountains foothills. However, intensive breeding bird surveys in the pinyon pine-juniper habitat in the Sacramento Mountains foothills in 1996 and 1997 have failed to detect this species (U. S Army 1996i, 1997f). Surveys for the gray vireo took place in the pinyon-juniper and montane shrublands habitat in the Sacramento Mountains foothills on McGregor Range in June 1998 and no confirmed sightings took place (U.S. Army, 1998l).

3.8.4.5 Mammals

Bats. Seventeen species of bats may occur on McGregor Range and nine are federal species of concern, including the small-footed myotis, occult little brown bat, fringed myotis, cave myotis, long-legged myotis, Yuma myotis bat, spotted bat, pale Townsend's bat, and big free-tailed bat. In addition, the spotted bat is a state threatened species. There have been few surveys for bats on Fort Bliss so the status of these species of special concern is not known. Two maternity colonies of several hundred fringed myotis were observed in abandoned buildings in the Sacramento Mountains foothills in 1979 by Smartt (1980); follow-up surveys in 1998 indicated that a *Myotis* sp. maternity colony (likely fringed myotis) still inhabited one of these abandoned buildings (U.S. Army, 1998j). Surveys for bats along the Otero Mesa took place during the late spring and summer of 1997 and 1998 (see Section 3.8.3). No large roost sites were observed along the Otero Mesa escarpment and sensitive species that can be heard such as the spotted bat were not recorded. *Myotis* sp. were recorded and could have represented sensitive species but species determinations were not made (USAF, 1997e, f; U.S. Army, 1998j).

Gray-footed Chipmunk. The gray-footed chipmunk is a federal species of concern and a state threatened species that occurs in the woodland and forested habitats in the Sacramento Mountains foothills on McGregor Range. It has also been collected from the Otero Mesa and may be a resident of the canyons in the Otero Mesa escarpment (U.S. Army, 1997j).

Black-tailed Prairie Dog. The black-tailed prairie dog is a federal species of concern and occurs in the grassland habitat on Otero Mesa on McGregor Range. A total of 10 active and 12 inactive prairie-dog towns were observed on Otero Mesa in 1996. Prairie-dog density was low (less than 4 per acre); there was an estimated 399 black-tailed prairie dogs in 10 towns (U. S. Army 1996k). In 1997, black-tailed prairie-dog surveys were conducted on Otero Mesa and 16 towns were observed; 12 were active. The number of prairie dogs recorded in 1997 was 482, which is a 17 percent increase over 1996. However, prairie-dog densities on Otero Mesa are an order of magnitude less then densities reported elsewhere. The reasons for the low populations on the Otero Mesa are not clear (U.S. Army, 1998k). Sensitive species observed at the prairie-dog towns on Otero Mesa were the burrowing owl and ferruginous hawk.

Cultural Resources

3.9

3.9 CULTURAL RESOURCES

The ROI for cultural resources consists of McGregor Range, New Mexico. Cultural resources on McGregor Range include pueblos, numerous lithic and ceramic scatters, human burials, rock art, rockshelters, historic Native American sites, ranch and homestead structures, and military sites.

3.9.1 Definition of the Resource

Cultural resources are prehistoric or historic districts, landscapes, sites, buildings, structures, objects, artifacts, and other evidence of human use. These resources can be grouped into four major categories: archaeological resources, architectural resources, historic landscapes, and traditional cultural resources.

Prehistoric and historic archaeological resources are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., stone tools, bottles). To archaeologists, prehistoric archaeological resources pre-date the beginning of written records. In the Tularosa Basin and nearby areas, prehistoric resources are all Native American and range from isolated stone tools to pueblo sites. Historic resources are defined as those formed after the beginning of written records. Historic archaeological resources on McGregor Range include the remains of homesteads, ranches, a town site, farms, campsites, roads, fences, trails, dumps, and other features.

Architectural resources include standing buildings, dams, canals, bridges, and other structures of historic, aesthetic, or scientific significance. In the McGregor Range area, architectural resources can include historic ranch and homestead structures, as well as World War II and Cold War-era military facilities, buildings, and structures.

A historic landscape is a geographic area that includes related cultural and natural features and the spatial relationships among those features. Historic landscapes are generally 50 years or more in age and can include military installations with associated operations areas, as well as ranching landscapes, farming landscapes, industrial landscapes, and traditional landscapes. Historic vernacular landscapes are those modified by human activity to reflect traditions, customs, or values in the everyday lives of people. Ethnographic or traditional landscapes contain natural and cultural resources that a Native American tribe or other group defines as traditional cultural resources (e.g., settlements, religious sites, or geological features).

Historic landscapes often form layers representing changes in how people used the land. A historic military landscape (including training areas, buildings, targets, and roads), for example, could overlay an earlier historic ranching landscape (including buildings, fences, grazing land, and stock ponds), each forming a distinctive layer of history on the land. More recent historic landscape layers often affect earlier layers, sometimes using the same resources (e.g., water, open land) or features constructed during earlier periods (e.g., roads).

Traditional cultural resources are cultural resources associated with practices and beliefs of a living community that are rooted in its history, and are important in maintaining the continuing cultural identity of the community (Parker and King 1992; Parker 1993). In the McGregor Range area in southern New Mexico, these are usually associated with Native American groups, although other groups may also have a basis for defining traditional cultural resources. Native American traditional resources may include archaeological sites; locations of significant events; sacred areas; traditional sources of raw materials; and traditional hunting or gathering areas, each of which Native Americans may consider essential for the preservation of their culture. The Mescalero Apache have been identified as having traditional lands on McGregor Range. Although the Tigua Claim of 1822 extended into TA 8 on McGregor Range, the most recent Tigua Claim does not extend into other areas of Fort Bliss. Two other modern tribes, the

Comanche and Kiowa, have been identified as possible occasional visitors to the area in the past. Both have been long absent from the region and neither group has identified traditional cultural resources on McGregor Range. The Army plans to conduct a survey of traditional cultural resources in the area during 1998 and 1999.

3.9.2 Cultural Resource Management on McGregor Range

Fort Bliss shares use of portions of McGregor Range with two other agencies; the BLM, and the USFS, Lincoln National Forest. A 1990 MOU with the BLM regarding the McGregor Range withdrawal specifies that the proponent of an undertaking, whether the BLM or Fort Bliss, is responsible for permitting and oversight of cultural resource investigations performed as part of compliance with Section 106 of the NHPA. The MOU further stipulates that both the BLM and Fort Bliss will consult on undertakings involving cultural resources on McGregor Range; they will share information on completed projects; and, that the agencies will annually coordinate future projects.

The co-use lands shared with the USFS are in the Sacramento Mountains foothills on the northern part of McGregor Range. A 1974 MOU between Fort Bliss and the USFS specifies that the USFS is responsible for administering all archaeological and paleontological activities in the co-use lands.

3.9.3 Cultural Resources on McGregor Range

Since the 1920s, there have been hundreds of cultural resource studies on Fort Bliss and in the El Paso area. Investigators have identified more than 15,000 cultural resources on all Fort Bliss lands. The majority of the recent cultural resource surveys at Fort Bliss were undertaken either to provide baseline management information (under Section 110 of the NHPA), or to assess the effects of specific undertakings on cultural resources (under Section 106 of the NHPA).

Approximately 30 percent of the 698,482 acres comprising McGregor Range have been surveyed for cultural resources. Investigators have identified more than 3,000 cultural resources on the range, the vast majority of which are prehistoric archaeological sites. Of these, 48 sites with prehistoric components, and 54 sites with historic components have been determined eligible for nomination to the NRHP. Some sites contain both prehistoric and historic components. The majority of the remaining known cultural resources have been determined either not eligible for the NRHP or require further testing. Evaluation for eligibility is not complete for more than 3,000 sites.

Cultural resources on McGregor Range are diverse and include scatters of Paleo-Indian; Archaic and Formative materials; rockshelters; rock art sites; historic ranching sites; historic Native American sites; the town site of Turquoise; several of Oliver Lee's pipelines; two reservoirs; railroad sites (U.S. Army, 1997n); and military sites, including Cold War era Nike test sites. Five pueblos have been identified on McGregor Range. Taking into account recent surveys, known site densities, and topography, there could be as many as 6,000 archaeological sites on McGregor Range, and numerous architectural resources. Although no traditional cultural resources have been identified, they have the potential to occur. Table 3.9-1 summarizes known and projected resources on McGregor Range, by resource type and NRHP eligibility.

3.9.3.1 Prehistoric Archaeological Resources

Information provided by Fort Bliss, and supplemented with a search of the National Park Services listing of NRHP properties for Otero County, New Mexico, identified one NHRP-listed property on McGregor Range: Escondido Pueblo Ruin. As of July 1998, the Fort Bliss cultural resource database contained

Table 3.9-1. Cultural Resources on McGregor Range

Resource	*Known Cultural Resources**
Total Prehistoric Archaeological Sites	*3,480*
Eligible	48
Not Eligible	58
Evaluation not complete	*3,374*
Total Historic Archaeological Sites	199
Eligible	46
Not Eligible	131
Evaluation not complete	22
*Total Architectural Resources***	*224*

* Data compiled from Fort Bliss cultural resources database as of July 1998.
** Includes Cold War and historic structures.

records of 3,480 prehistoric sites on McGregor Range. Forty-eight of these are considered eligible for the NRHP; 58 are not eligible; and evaluation is not complete for the remainder. The prehistoric sites on McGregor Range include several that have not been formally evaluated for NHRP eligibility but are considered by archaeologists to be important. These include, among others, Pendejo and Pintada rockshelters and McGregor pueblo. Fort Bliss has initiated work to develop formal National Register nominations for these and other significant prehistoric sites on McGregor Range.

3.9.3.2 Historic Archaeological Resources

As of July 1998, the Fort Bliss cultural resource database contained records of 199 historic archaeological sites (including mining and ranching features) on McGregor Range. Forty-six of these have been evaluated as eligible for the NRHP; 131 are considered not eligible; and evaluations are not yet complete for 21.

3.9.3.3 Historic Architectural Resources

Historic architectural resources on McGregor Range include ranching and homestead structures and Cold War-era military structures. Fort Bliss records identify 21 historic architectural resources (ranching and homesteading) for which Historic American Building Survey (HABS)/Historic American Engineering Record (HAER) documentation has been conducted. More than 200 Cold War-era buildings have been identified. These include:

- Firebee-Towbee Launch Site consisting of eight structures built in 1966;
- Radio-controlled Aerial Target (RCAT) Launch Site consisting of seven structures built in the late 1950s and early 1960s;
- Red-headed/Roadrunner Facility consisting of ten structures built in 1966;
- McGregor Range Camp consisting of about 150 structures built in the late 1950s to the mid-1960s;

- Meyer Small Arms Range consisting of 28 structures built in the early to mid-1960s.

3.9.3.4 Traditional Cultural Properties (TCPs)

Detailed information on traditional beliefs, values, customs, sacred sites, and use areas is often not available, as Native Americans are reluctant to share such information with outsiders. However, the NHPA and EO 13007 require consideration of Native American concerns in the management of cultural resources. Fort Bliss has therefore consulted with, and will continue to consult with, Native American groups with traditional ties to the area.

Since being contacted by Fort Bliss regarding their concerns (Bowman, 1997), the Tigua have not identified any specific areas on the installation as sacred. The present Tigua Claim area does not extend into Fort Bliss. Any potential concerns would most likely relate to cultural resources on the southern part of the installation because of its proximity to their reservation in El Paso.

The entire area surrounding Fort Bliss falls within the traditional territory of the Mescalero Apache. Carmichael (1994) provides an overview of Mescalero Apache sacred features in the region. Generally, several types of topographic features have spiritual significance, including caves, springs, and certain mountain peaks. To a lesser extent, resource areas containing specific botanical and geological materials used in ceremonies are also considered important by the Mescalero. Consultation efforts related to other undertakings in the region have indicated that the Mescalero have concerns about resources on Fort Bliss.

As part of its responsibilities under the NAGPRA, Fort Bliss has completed an initial inventory of all cultural remains found previously on Fort Bliss lands, including McGregor Range, that contain human remains or artifacts associated with these remains (U.S. Army, 1995e). A search of the site records and cultural materials collections housed at Fort Bliss and other facilities indicated that there are three recorded sites on McGregor Range that have or had either human remains or suspected human remains. In some cases, the human remains had been removed. As required by the NAGPRA, federally recognized tribal groups with historic ties to the area (the Mescalero Apache, Comanche, Kiowa, and Tigua) were notified by letter of the materials and asked for their comments. Fort Bliss is currently in consultation with the Tigua (Marshall, 1998). None of the inventories conducted to date have identified Piro-Manso-Tiwa human remains or associated funerary objects.

73

3.9.4 Evaluation of the Resources

Under federal law, impacts to cultural resources may be considered by agencies to be adverse if the resources have been determined to be significant. Significant resources are generally those that are eligible for inclusion in the NRHP under 36 CFR Part 60.4, *NRHP Criteria for Evaluation*; or, that are important to Native American or other traditional groups as outlined in EO 13007 and amendments to the NHPA. A cultural resource that has been determined eligible for inclusion in the NRHP is called a historic property. A historic property must usually be more than 50 years old, although exceptions can occur (Sherfy and Luce, n.d.). For example, more recent cultural resources on a military base may be considered significant if they are of exceptional importance in understanding the Cold War (1946 to 1989).

To be considered eligible for inclusion in the NRHP, prehistoric and historic archaeological resources, architectural resources, historic landscapes, and traditional cultural resources must meet one or more of the criteria outlined in 36 CFR Part 60.4. Significant resources are those:

a. that are associated with events that have made a significant contribution to the broad patterns of our history; or

b. that are associated with lives of persons significant in our past; or

c. that embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; possess high artistic values; or represent a significant and distinguishable entity whose components may lack individual distinction; or,

d. that have yielded, or may be likely to yield, information important in prehistory or history.

To be listed in or determined eligible for listing in the NRHP, a cultural resource must meet at least one of the above criteria and must also possess integrity. Integrity is defined as the authenticity of a resource's historic identity, as evidenced by the survival of physical characteristics that existed during the resource's historic or prehistoric occupation or use. The NRHP recognizes seven aspects or qualities that, in various combinations, define integrity: location, design, setting, materials, workmanship, feeling, and association. Integrity of location means that the cultural resource has not been moved. Integrity of design, materials, and workmanship means that the resource's original building materials, plan, shape, and design elements remain intact. Integrity of setting means that the surrounding landscape remains largely as it was during the resource's period of significance. Integrity of feeling and association means that the resource retains a link to an earlier time and place and is able to evoke that era.

Cultural resources are first identified through field surveys and inventories that provide a description of the resource and recommendations for its eligibility to the NRHP. Fort Bliss reviews eligibility recommendations and determines the resource's eligibility. These determinations are reviewed by the State Historic Preservation Office(r) (SHPO), who can either concur or not concur with the determinations. Disagreements are resolved by the final decision maker, the Keeper of the National Register. The NHPA and 36 CFR Part 60.4 provide detailed guidance on this process. In additional to the procedures discussed above, evaluation of prehistoric archaeological resources, traditional cultural resources, and historic landscapes is explained in more detail below.

3.9.4.1 Evaluation of Prehistoric Archaeological Sites

As part of its continuing cultural resource management efforts, Fort Bliss issued *Significance Standards for Prehistoric Archaeological Sites at Fort Bliss* (Abbott et al., 1996). This document presents one method of quantitatively evaluating the integrity and significance of a site or group of similar sites. It provides a basis for more consistent evaluations of NRHP eligibility based on explicit local research domains and data needs. Similar standards are not available for historic archaeological sites. The seven research domains for prehistoric cultural resources are:

Chronometrics. Chronometric data, such as radiocarbon dates, are used to determine the age of sites and to understand changes in settlement, subsistence, and other aspects of prehistoric human behavior.

Geoarchaeology. Geoarchaeology at Fort Bliss involves five processes (aeolian, alluvial fan, arid lacustrine, slope formation, and soils) that affect how people used the environment and how archaeological sites are formed.

Paleoclimate. This research domain is concerned with how the environment in southern New Mexico and west Texas changed through time.

Technology. The technology research domain is concerned with how prehistoric tools were made, used, and discarded.

Settlement Systems. The study of settlement systems is concerned with where people lived and how mobile they were.

Subsistence. This domain is concerned with how people obtained and processed plants and animals for food.

Cultural Interaction. This domain asks how prehistoric people in the Fort Bliss area interacted with people in neighboring areas.

3.9.4.2 Native American Consultation and Evaluation of TCPs

For this LEIS, TCPs are defined as traditional cultural resources that are eligible for inclusion in the NRHP. Legislatively, TCPs were recognized in the 1992 amendments to the NHPA. These amendments grew out of passage of the AIRFA and the NAGPRA.

Evaluation of a TCP's significance uses the standard NRHP evaluation criteria, with several key conditions. These are: (1) the property must have been important to maintaining traditions for at least 50 years; (2) the property must be described and its significance documented; and (3) the property must have a boundary (Parker and King, 1992; Parker, 1993). Although some traditional cultural resources may not fulfill the criteria for significance under 36 CFR 60.4, they may still be of significance to Native American groups. For example, under EO 13007 there is no requirement that a sacred site be over 50 years old.

Consultation with interested tribal groups is required as part of any action that might affect TCPs, sacred sites, or access to certain areas. The *April 29, 1994 Memorandum on Government-to-Government Relations with Native American Tribal Governments*, issued by the President, requires the development of effective day-to-day working relationships with sovereign tribal governments. The memorandum stipulates that:

- The head of each executive department and agency shall be responsible for ensuring that the department or agency operates within a government-to-government relationship with federally recognized tribal governments.

- Each executive department and agency shall consult, to the greatest extent practicable and to the extent permitted by law, with tribal governments prior to taking actions that affect federally recognized tribal governments. All such consultations are to be open and candid, so that all interested parties may evaluate for themselves the potential impact of relevant proposals.

- Each executive department and agency shall assess the impact of federal government plans, projects, programs, and activities on tribal trust resources and assure that tribal government rights and concerns are considered during their development of such plans, projects, and activities.

- Each executive department and agency shall take appropriate steps to remove any procedural impediments to working directly and effectively with tribal governments on activities that affect the trust property and/or government rights of the tribes.

Several laws and regulations address the requirement of federal agencies to notify or consult with Native American groups, or otherwise consider their interests when planning and implementing federal undertakings. Legal mandates requiring consideration of Native American interests include:

- **NHPA of 1966.** The NHPA requires agencies to consult with Native American tribes if a proposed federal action may affect properties to which they attach religious and cultural significance.

- **AIRFA of 1978**. AIRFA sets the policy of the U.S. to "protect and preserve for Native Americans their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian . . . including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship though ceremonies and traditional rites."

- **ARPA of 1979**. ARPA requires issuance of a permit to conduct archaeological excavation or collection on federal land. ARPA states, "If a permit issued under this section may result in harm to, or destruction of, any religious or cultural site, as determined by the federal land manager, before issuing such permit, the federal land manager shall notify any Indian tribe which may consider the site as having religious or cultural importance."

- **NAGPRA of 1990**. Among other things, NAGPRA requires federal agencies to consult with tribes concerning the discovery and disposition of Native American human remains and certain types of cultural items on federal land.

- **EO 13007, Indian Sacred Sites**. EO 13007, issued on May 24, 1996, requires that in managing federal lands, agencies must accommodate access and ceremonial use of sacred sites and must avoid adversely affecting the physical integrity of these sites.

- **Department of Defense American Indian and Alaska Native Policy, October 20, 1998**. This policy supports tribal self-governance and government-to-government relations between the federal government and tribes.

3.9.4.3 Evaluation of Historic Landscapes

Like other cultural resources, historic landscapes are evaluated for significance using NRHP criteria. On McGregor Range, there is the potential for the presence of two types of historic landscapes – rural historic landscapes and historic military landscapes. All layers of a landscape can be important historically. Their importance depends on the historical context within which they were constructed and on the integrity retained by the individual landscape layer.

Rural Landscapes. A rural historic landscape may qualify for listing on the NRHP as a historic site or district. It is defined as a "geographical area that historically has been used by people, or shaped or modified by human activity, occupancy, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, building and structures, roads and waterways, and natural features" (McLelland and Keller, 1995).

Rural landscapes are not usually professionally designed. Rather, they are the result of activities associated with farming, ranching, industry, transportation, migration, or conservation of resources. A rural area may contain one or more rural historic landscapes as well as other historically significant properties.

Rural historic landscapes are identified through the tangible evidence they contain of the activities of the people who used the land. The physical evidence for rural historical processes includes transportation networks (e.g., stock trails, roads, railroads), boundary demarcations (e.g., fences, irrigation ditches, roads), vegetation related to land use (e.g., introduced plants), buildings, structures and objects, clusters (e.g., groupings of buildings, fences, or other features), archaeological sites, and small-scale elements (e.g., cattle gates, abandoned machinery) (McLelland and Keller, 1995).

The Oliver Lee Circle Cross Ranch is potentially eligible for inclusion in the NRHP. The BLM administers a large portion of the former ranch, some of which was withdrawn to the Army in 1957, for the formation of McGregor Range. The BLM has proposed an undertaking to rebuild selected range improvements on the Otero Mesa portion of McGregor Range. Past Fort Bliss and BLM projects have located and recorded historic range improvement features on McGregor Range, such as fences and pipelines, as historic sites. New Mexico SHPO NRHP eligibility concurrence determinations generally were not made for features such as fences, without a demonstration that they could be related to a larger historical context (BLM, 1997b). BLM recently completed a rural historic landscape National Register evaluation for a landscape based on Oliver Lee's historic sphere of influence (Hart, 1997). The potential boundary of the historic landscape encompasses McGregor Range.

27

Vegetation and land use history are important in evaluating the integrity of agricultural landscapes. Introducing irrigation, for example, may affect integrity of design in a rural landscape if there is a shift from cattle grazing to planting of fruit trees. Other changes that may reduce the integrity of a landscape include widening and resurfacing roads; changing land use and management; introducing new land uses like recreational areas, landfills, or utilities; abandoning historic buildings; replacing or altering bridges, barns, and other features; and removing fences and other boundary markers.

Military Landscapes. A historic military landscape reflects the traditions and history of military activity in an area as it is expressed in the relationships among the buildings, structures, and grounds of an installation. A military landscape is typically associated with historically important persons or events; or is an important indicator of the broad patterns of history; or represents a significant example of design or construction (Loechl et al., n.d.).

Military landscapes are identified by the evidence they provide of: military mission in the siting and layout of installations and facilities; military cultural values in building placement and landscape design; a high degree of similarity of structure design within and among installations; restricted access; and, clearly defined borders (Loechl et al., n.d.). Military landscapes undergo regular change as the military mission changes.

Land use history and setting are used to evaluate the integrity of a military landscape. Integrity can be affected by the relocation of buildings or roads; changes in landscape design; and the loss of important topographic features, vegetation, spatial relationships, original materials, or workmanship.

Socioeconomics

3.10

3.10 SOCIOECONOMICS

Socioeconomic resources include population and economic activities (employment and earnings). The ROI for socioeconomics is defined as the geographical area within which the principal direct and secondary socioeconomic effects of actions associated with activities at McGregor Range are likely to occur, and where most consequences for local jurisdictions are expected. From a socioeconomic perspective, it is necessary to consider activities at both McGregor Range and Fort Bliss in general, in which McGregor Range is an integral part. Although field exercises are conducted on the range, the great majority of personnel both administering and supporting these exercises are located at the main cantonment.

Two major factors were important in determining the ROI used in the socioeconomic analysis. The first was the residential distribution pattern of civilian personnel employed at Fort Bliss. This residential distribution is an aid in determining where the greatest effects would occur since it reflects the revealed residential preferences of those currently employed at the installation. It also defines the area within which a high proportion of payroll expenditures (of both civilian and military personnel) can be expected to occur. Similar residential information is not available for the active duty personnel and their dependents who reside off the post. However, experience from other military installations suggests strongly that the geographical area containing the vast majority of such persons is less extensive than that encompassed by the civilian personnel.

The second factor in determining the extent of socioeconomic effects is the degree of linkage among the economies of the various communities in the region. These linkages, based on trade among sectors within the region, determine the nature and magnitude of multiplier effects of actions at the installation.

Utilizing data obtained from the Civilian Personnel Office (CPO) at Fort Bliss, it is possible to estimate the place of residence, by ZIP Code area, of civilian personnel assigned to the post. The database utilized for this task contained a total of 2,804 records, of which 2,631 were applicable to the task of identifying, at the aggregate level, the residential distribution of civilian personnel working at Fort Bliss. Of the total number of entries, over 96 percent reported residence addresses in Texas with the remaining reporting a place of residence in neighboring New Mexico.

Forty-eight ZIP Code areas in Texas contain at least one civilian employee, as well as 16 areas in New Mexico. Of the total 64 ZIP Code areas, only 16 contain in excess of 1 percent of the total number of personnel contained in the database. These 16 ZIP Code areas contain over 93 percent of the civilian personnel employed at Fort Bliss. All of these ZIP Code areas are within approximately 15 miles of the Main Post. It is estimated that 2,528 (96.1 percent) of the civilian personnel reside within El Paso County, Texas, another 82 (3.1 percent) reside in Doña Ana County, New Mexico, and an additional 6 persons (0.2 percent) reside in Otero County, New Mexico. The tri-county area contains 99.4 percent of the civilian personnel.

The economic impact that Fort Bliss has on surrounding communities includes, in addition to the influence of personnel directly associated with the installation, the presence of military retirees and their dependents and the benefits they derive from the federal government. To a large extent, these retirees locate close to large military installations, such as Fort Bliss, to avail themselves of the services located there. This is especially the case where the installation in question houses a major medical facility, such as the William Beaumont Army Medical Center (WBAMC) at Fort Bliss.

The Directorate of Resource Management at Fort Bliss reports, on a consistent basis, payments made to military retirees and annuitants within the area falling within 100 miles of the post. This area includes the following counties in Texas: El Paso, Brewster, Culberson, Hudspeth, Jeff Davis (part), Presidio, and

Terrell. It also includes the following counties in neighboring New Mexico: Doña Ana, Grant, Hidalgo, Lincoln, Luna, Otero, and Sierra. Of those retirees resident within this area, the large proportion (68.8 percent) are Army retirees, with the Air Force contributing an additional 22.5 percent. Within the area contained in Texas, the proportion of Army retirees rises to 82.7 percent, yet comprises only 35.3 percent of the total in the New Mexico portion of the area. The large majority of the retirees in the New Mexico part are Air Force retirees, most probably related to the presence of HAFB in Otero County, New Mexico.

The major real property assets of Fort Bliss are located in three conterminous counties: El Paso County, Texas, Doña Ana County, New Mexico, and Otero County, New Mexico. McGregor Range is located in Otero County, the main post and Biggs AAF are located in El Paso County, and the Doña Ana Range–North Training Areas is in Otero and Doña Ana counties.

3.10.1 Demographics

The ROI for population is the three-county area comprised of Doña Ana and Otero counties, New Mexico, and El Paso County, Texas. The largest communities within this geographical area are the cities of El Paso, Texas; Las Cruces, New Mexico; and Alamogordo, New Mexico.

Although not included in the ROI, it is important to mention the strong cultural and economic links that exist between El Paso County, Texas, and Ciudad Juarez, located in Mexico, immediately adjacent across the Rio Grande. Ciudad Juarez is the fourth largest city in Mexico and largest city in the State of Chihuahua. The combined population of this international metroplex stood at 1,309,109 in 1990, with the largest contribution of 798,499 made by Ciudad Juarez and the remaining 591,610 residing in El Paso County, Texas. The population of the metroplex grew to 1,582,387 by 1995, at an average annual rate of 2.6 percent over the period 1990 to 1995. The population of Ciudad Juarez over this time period grew at an average annual rate of 2.8 percent while that of El Paso County grew at 2.4 percent.

3.10.1.1 Fort Bliss

As of the end of FY 96, active duty personnel present on post numbered 11,530. This number showed a marked decline (of 25.9 percent) from the previous year when personnel numbered 15,562, and a decline of 41.3 percent from the 19,648 persons present in FY 91. Over the period FY 90 through FY 96, the number of active duty personnel on post has declined at an average annual rate of -8.8 percent per year. The number of active duty family members living on the post has fallen only moderately over the same time period from 9,079 in FY 90 to 8,069 in FY 96. This small decline is attributable to the Army policy of maintaining high occupancy rates for military family housing. By comparison, the number of active duty military family members residing off the post has declined from 15,316 to 8,371 over the same time period, at an average annual rate of decline of -9.6 percent. Between FY 90 and FY 96, the total number of military personnel and dependents assigned to Fort Bliss fell from 44,399 persons to 27,970 persons, exhibiting an average annual decline of -7.4 percent as shown in Table 3.10-1.

The estimated total population supported by Fort Bliss (defined as the number of active duty military personnel and civilian employees and each of their respective dependents) has ranged from a high of 71,399 persons in FY 91, to a low in FY 96 of 51,175, a reduction of 28.3 percent over a 5-year period. This population was estimated to number 69,307 in FY 90, which represented 8.9 percent of the total population contained in the three-county ROI and 11.7 percent of the El Paso County population in 1990. By FY 95, this Fort Bliss population contingent had fallen to 59,119, which comprised 6.7 percent and 8.9 percent, respectively, of the population of the ROI and El Paso County.

Table 3.10-1. Fort Bliss Personnel (Active Duty and Civilian) and Dependents, FY 90 to FY 96

FY	*Active Duty Personnel (On Post)*[1]	*Active Duty Family Members (On Post)*	*Active Duty Family Members (Off Post)*	*Military Retirees*	*Military Retiree Family Members*	*Total Military & Family Members*	*Civilian Personnel (On Post)*[1]	*Civilian Personnel Family Members**	*On Post Employment*[1]	*Total Population Supported (Incl. Retirees)*	*Total Population Supported (Excl. Retirees)*
1990	20,004	9,079	15,316	15,052	24,986	*84,437*	7,664	17,244	27,668	*109,345*	*69,307*
1991	19,648	9,781	16,630	15,034	24,984	*86,077*	7,797	17,543	27,445	*111,417*	*71,399*
1992	19,788	9,678	16,606	15,072	24,666	*85,810*	7,765	17,471	27,553	*111,046*	*71,308*
1993	19,431	8,951	14,667	15,241	27,421	*85,711*	7,608	17,118	27,039	*110,437*	*67,775*
1994	17,149	9,026	14,615	23,552	35,324	*99,666*	7,579	17,053	24,728	*124,298*	*65,422*
1995	15,562	8,522	10,582	24,492	36,738	*95,896*	7,524	16,929	23,086	*120,349*	*59,119*
1996	11,530	8,069	8,371	14,299	21,900	*64,169*	7,140	16,065	18,670	*87,374*	*51,175*

[1] Fort Bliss Direct Employment (U.S. Army, 1998m)
* Average family size for El Paso County in 1990 of 3.25 persons is assumed.

3.10.1.2 Counties And Communities

Historic and Current. The population in the ROI increased over the period 1970 to 1995, from 470,161 persons to 880,883 persons, at an average annual rate of 2.54 percent. The highest growth rate occurred in the 1970s (at an average annual rate of 2.82 percent), followed by the 1990s (at 2.49 percent), and the 1980s (at 2.29 percent) as shown in Table 3.10-2. This growth, in all time periods, exceeded that of both the states of New Mexico and Texas, as well as the nation.

Table 3.10-2. Population of ROI, Counties, States, and Nation (1970 to 1995)

Geographical Area	*Population*				*Average Annual Percentage Growth Rate*			
	1970	*1980*	*1990*	*1995*	*1970 to 1980*	*1980 to 1990*	*1990 to 1995*	*1970 to 1995*
United States	203,302,020	226,542,204	248,718,291	262,755,270	1.09%	0.94%	1.10%	1.03%
State of New Mexico	1,017,055	1,303,302	1,515,069	1,685,401	2.51%	1.52%	2.15%	2.04%
Doña Ana County	69,773	96,340	135,510	158,849	3.28%	3.47%	3.23%	3.35%
Otero County	41,097	44,665	51,928	55,027	0.84%	1.52%	1.17%	1.17%
State of Texas	11,198,655	14,225,513	16,986,335	18,723,991	2.42%	1.79%	1.97%	2.08%
El Paso County	359,291	479,899	591,610	667,007	2.94%	2.11%	2.43%	2.51%
3-County Region	470,161	620,904	779,048	880,883	2.82%	2.29%	2.49%	2.54%

Source: U.S. Department of Commerce, 1993.

Of the three counties, the most rapid growth was experienced in Doña Ana County, New Mexico, where the average annual rate of change registered 3.35 percent over the period 1970 to 1995. During this period, the population more than doubled, from 69,773 in 1970 to 158,849 in 1995. The population of El Paso County, Texas, grew at an average annual rate of 2.51 percent over the 25-year period, with the population increasing from 359,291 in 1970 to 667,007 in 1995. The least rapid growth occurred in Otero County, New Mexico, where the number of residents increased from 41,097 in 1970 to 55,027 in 1995, at an average annual rate of 1.17 percent (Table 3.10-2).

In Otero County, New Mexico, 27,596 persons (53.1 percent) of the 1990 county population of 51,928, reside in the City of Alamogordo. Another 3,251 persons (6.3 percent of the county population) reside in the two incorporated communities of Tularosa and Cloudcroft. An additional 10,084 persons (19.4 percent of the county population) reside in unincorporated communities (HAFB, Boles Acres, La Luz, and Mescalero), with the remaining population residing in rural areas.

Of the total 1990 population in El Paso County, Texas, the overwhelming proportion (87.1 percent) is contained within the City of El Paso. Five other incorporated places (Anthony, Clint Town, Horizon City, Socorro Town, and Vinton Village) contain an additional 5.1 percent of the total county population, and an additional seven unincorporated communities contain 6.3 percent of the county population. The remaining 1.5 percent of the population reside in rural areas.

In the case on Doña Ana County, New Mexico, the largest incorporated community (the City of Las Cruces) contained 45.9 percent of the 1990 county population. Other incorporated communities contain 8.3 percent of the county population with unincorporated communities contributing another 12.2 percent.

The remaining 33.6 percent of the total county population reside in rural portions of the county. Each of the counties contains only one sizable community: City of El Paso in El Paso County; City of Las Cruces in Doña Ana County; and City of Alamogordo in Otero County.

Population Projections. Population projections for the years 2000, 2005, 2010, 2015, 2020, 2025, and 2030 are presented in Table 3.10-3 for the states of New Mexico and Texas, each of the three counties in the ROI, and the cities of Alamogordo, El Paso, and Las Cruces. The projected population growth rate for the State of New Mexico is anticipated to average 1.68 percent per year over the period 2000 to 2010, and 1.6 percent over the periods 2010 to 2020 and 2020 to 2030. The rates of change for both Doña Ana County and Otero County are below those projected for the state. The population of Otero County is projected to grow at an annual rate of 1.0 percent during the period 2000 to 2010 and 1.11 percent during the two succeeding periods of 2010 to 2020 and 2020 to 2030. The average annual growth rates for Doña Ana County for each of these three time periods are 1.59 percent, 1.43 percent, and 1.43 percent, respectively.

The population of El Paso County is anticipated to increase well above the rate projected for the State of Texas. The average annual growth rate is projected to decline from 2.50 percent during the period 2000 to 2010, to 2.35 percent between 2010 and 2020, and to 2.22 percent over the period 2020 to 2030. Growth for the City of El Paso is projected to be less than that for the county, declining over each of the three time periods from 1.93 percent, to 1.87 percent, to 1.72 percent, on average, per year.

3.10.2 Economic Activity

The ROI for economic activities is comprised of the three-county area containing Otero and Doña Ana counties in New Mexico and El Paso County in Texas. Together, these counties supported 387,641 full-time and part-time jobs in 1994, having increased from 195,275 jobs in 1970. The region experienced an average annual growth rate of 3.49 percent in the 1970s, 2.61 percent in the 1980s, and

Table 3.10-3. Population Projections, 2000 to 2030

Geographic Area	*Year*							*Rate of Change*		
	2000	*2005*	*2010*	*2015*	*2020*	*2025*	*2030*	*2000 to 2010*	*2010 to 2020*	*2020 to 2030*
Texas [1]	20,344,813	22,163,397	24,128,848	26,303,267	28,684,923	31,230,913	33,912,478	1.72%	1.74%	1.69%
El Paso County [2]	778,674	883,232	996,771	1,119,881	1,257,975	1,408,823	1,566,848	2.50%	2.35%	2.22%
City of El Paso [2]	661,095	727,424	800,407	878,124	963,386	1,049,209	1,142,678	1.93%	1.87%	1.72%
New Mexico [4]	1,851,916	2,017,558	2,188,443	2,368,643	2,563,681	2,774,779	3,003,259	1.68%	1.60%	1.60%
Dona Ana County [4]	173,677	188,566	203,412	218,368	234,424	251,660	270,163	1.59%	1.43%	1.43%
City of Las Cruces [3]	79,624	86,450	93,256	100,113	107,474	115,376	123,859	1.59%	1.43%	1.43%
Otero County [4]	56,740	59,473	62,683	66,232	69,982	73,944	78,131	1.00%	1.11%	1.11%
City of Alamogordo [3]	30,153	31,606	33,312	35,198	37,190	39,296	41,521	1.00%	1.11%	1.11%
3-County Region	1,009,091	1,131,271	1,262,866	1,404,481	1,562,381	1,734,427	1,915,142	2.27%	2.15%	2.06%

[1] Scenario 1.0.
[2] Medium growth scenario.
[3] Assumes Community has constant (1990) share of county population.
[4] Projections past 2015 assume continuation of 2010 to 2015 growth rate.
Source: Texas A&M University, 1996.

2.15 percent in the 1990s. Employment at Fort Bliss declined over the period FY 90 to FY 96, from 27,668 (20,004 active duty military and 7,664 civilian personnel) to 18,670 (11,530 active duty and 7,140 civilian personnel).

3.10.2.1 Employment

Fort Bliss. As of the end of FY 96, active duty personnel present on post numbered 11,530 (U.S. Army, 1998m). This number showed a marked decline (of 25.9 percent) from the previous year (15,562 personnel) and a decline of 41.3 percent from the number present in FY 91 (19,648 persons). Over the period FY 90 through FY 96, the number of active duty personnel on post has declined by an average of -8.7 percent per year. Over the same time period, the number of civilian personnel on the post has declined from 7,664 to 7,140, at an average annual rate of -1.2 percent. Total employment (active duty military and civilian) on the post remained relatively stable over the period FY 90 through FY 93, at over 27,000 personnel. However, over the next 3 years, the number of personnel fell to 18,670: a decline of almost 25 percent (Table 3.10-1). It is estimated that in FY 90, total employment at Fort Bliss (active duty military and civilian personnel) numbered 27,668. This comprised 7.8 percent of the total full- and part-time employment in the ROI. It contributed 10.2 percent of the employment in El Paso County. By FY 94, these shares had declined to 7.0 percent for the ROI and 9.1 for El Paso County.

Counties: Historic and Current. Total full- and part-time employment in the three-county ROI rose from 195,275 jobs in 1970, to 387,641 jobs in 1994. This increase exhibited the following average annual rates of change: 3.49 percent in the 1970s; 2.61 percent in the 1980s; and 2.15 in the 1990s (Table 3.10-4).

Of the three counties in the ROI, Otero has the smallest economy and is the one that has exhibited the slowest rate of growth over the period 1970 through 1994. The average annual rate of growth during the decades of the 1970s was 1.7 percent; 1.4 percent in the 1980s; and 0.4 percent in the 1990s. In Doña Ana County, full- and part-time employment increased at an average annual rate of 3.9 percent in the

Table 3.10-4. Three-County ROI: Full- and Part-time Employment by Type and Industry, 1970, 1980, 1990, and 1995

Three-County ROI	*Year*				*Average Annual Percentage Change*		
	1970	*1980*	*1990*	*1995*	*1970-1980*	*1980-1990*	*1990-1995*
Total full- and part-time employment	195,565	277,615	355,152	394,509	3.57%	2.49%	2.12%
By Type:							
Wage and salary employment	176,788	245,667	305,561	340,273	3.34%	2.21%	2.18%
Proprietors' employment	18,777	31,948	49,591	54,236	5.46%	4.50%	1.81%
Farm proprietors' employment	1,545	1,776	2,051	2,140	1.40%	1.45%	0.85%
Nonfarm proprietors' employment	17,232	30,172	47,540	52,096	5.76%	4.65%	1.85%
By Industry:							
Farm employment	4,780	4,600	4,129	4,490	-0.38%	-1.07%	1.69%
Nonfarm employment	190,785	273,015	351,023	390,019	3.65%	2.55%	2.13%
Private employment	124,827	191,739	261,021	296,364	4.39%	3.13%	2.57%
Ag. serv., forestry, fishing, and other	823	1,950	3,670	5,093	9.01%	6.53%	6.77%
Mining	287	723	864	822	9.68%	1.80%	-0.99%
Construction	8,795	13,388	16,116	21,035	4.29%	1.87%	5.47%
Manufacturing	26,290	40,146	47,102	51,653	4.32%	1.61%	1.86%
Transportation and public utilities	10,638	13,630	15,259	17,774	2.51%	1.14%	3.10%
Wholesale trade	7,850	11,247	14,698	15,558	3.66%	2.71%	1.14%
Retail trade	28,881	43,627	60,195	67,829	4.21%	3.27%	2.42%
Finance, insurance, and real estate	10,234	19,129	21,481	21,616	6.45%	1.17%	0.13%
Services	31,029	47,899	81,636	94,984	4.44%	5.48%	3.08%
Government and government enterprises	65,958	81,276	90,002	93,655	2.11%	1.03%	0.80%
Federal, civilian	16,862	15,630	16,580	14,652	-0.76%	0.59%	-2.44%
Military	27,524	28,876	24,215	19,897	0.48%	-1.74%	-3.85%
State and local	21,572	36,770	49,207	59,106	5.48%	2.96%	3.73%
Military as Percent of Total	*14.07%*	*10.40%*	*6.82%*	*5.04%*	*NA*	*NA*	*NA*

Note: NA = Not Applicable.
Source: U.S. Department of Commerce, 1996a.

1970s; 4.1 percent in the 1980s; and 2.2 percent in the 1990s. The preponderance of this employment is concentrated in El Paso County, Texas, which contributed 76.3 percent of the total regional employment in 1970; 77.3 percent in 1980; 76.0 percent in 1990; and 76.5 percent in 1994. In El Paso County, full- and part-time employment increased at an average annual rate of 3.6 percent in the 1970s; 2.4 percent in the 1980s; and 2.3 percent in the 1990s.

By way of comparison, corresponding growth rates for the nation were 2.2 percent in the 1970s; 2.0 percent in the 1980s; and 1.0 percent in the 1990s. For the State of Texas, the respective rates were 4.0 percent; 2.3 percent; and 2.2 percent; while, for the State of New Mexico they were 4.1 percent; 2.6 percent; and 2.9 percent.

The industrial sector contributing most to total employment in 1994 in the ROI was services with a share of 23.2 percent. This was followed by retail trade, which contributed 17.6 percent, state and local government with 14.8 percent, and manufacturing with 13.4 percent. Since El Paso County dominated the regional employment, the aforementioned four sectors also contributed the greatest shares to total employment in the county, although in slightly different order. The major difference in the sectoral profile of Doña Ana County was the contribution made by the construction sector (6.2 percent) while the

military sector contributed 20.9 percent in Otero County. This latter contribution is attributable to the presence of HAFB.

The dependence that the regional economy has on military activities can be described by comparing the level of military employment against total full- and part-time employment. For the ROI, the share of total employment contributed by the military fell significantly over the period 1970 to 1994. In 1970 the share stood at 15.5 percent; however, it declined to 11.5 percent by 1980, 7.9 percent by 1990 and 6.6 percent by 1994. The vast majority of the military presence accounted for here is both the Army at Fort Bliss in El Paso County, Texas, and WSMR in Doña Ana and Otero counties, New Mexico, and the USAF at HAFB in Otero County, New Mexico. The decline in the share of employment contributed by the military is attributable to two main trends: down-sizing of the military; and increasing economic diversification as shown in Figure 3.10-1.

For El Paso County, Texas, military employment comprised 13.9 percent of total full- and part-time employment in 1970. This share dropped to 9.8 percent in 1980, 6.5 percent in 1990 and 4.6 percent in 1994. Otero County, New Mexico, has an employment base much smaller than that of El Paso County, Texas, and the military contribution to total employment is much larger. In 1970, 32.3 percent of all full- and part-time employment in Otero County was comprised of military personnel. This share fell progressively through the years: 29.7 percent in 1980; 22.8 percent in 1990; and 20.9 percent in 1994. Military employment contributes only a small share to total employment in Doña Ana County, New Mexico: 2.0 percent in 1970; 1.4 percent in 1980; 1.3 percent in 1990; and 1.2 percent in1994.

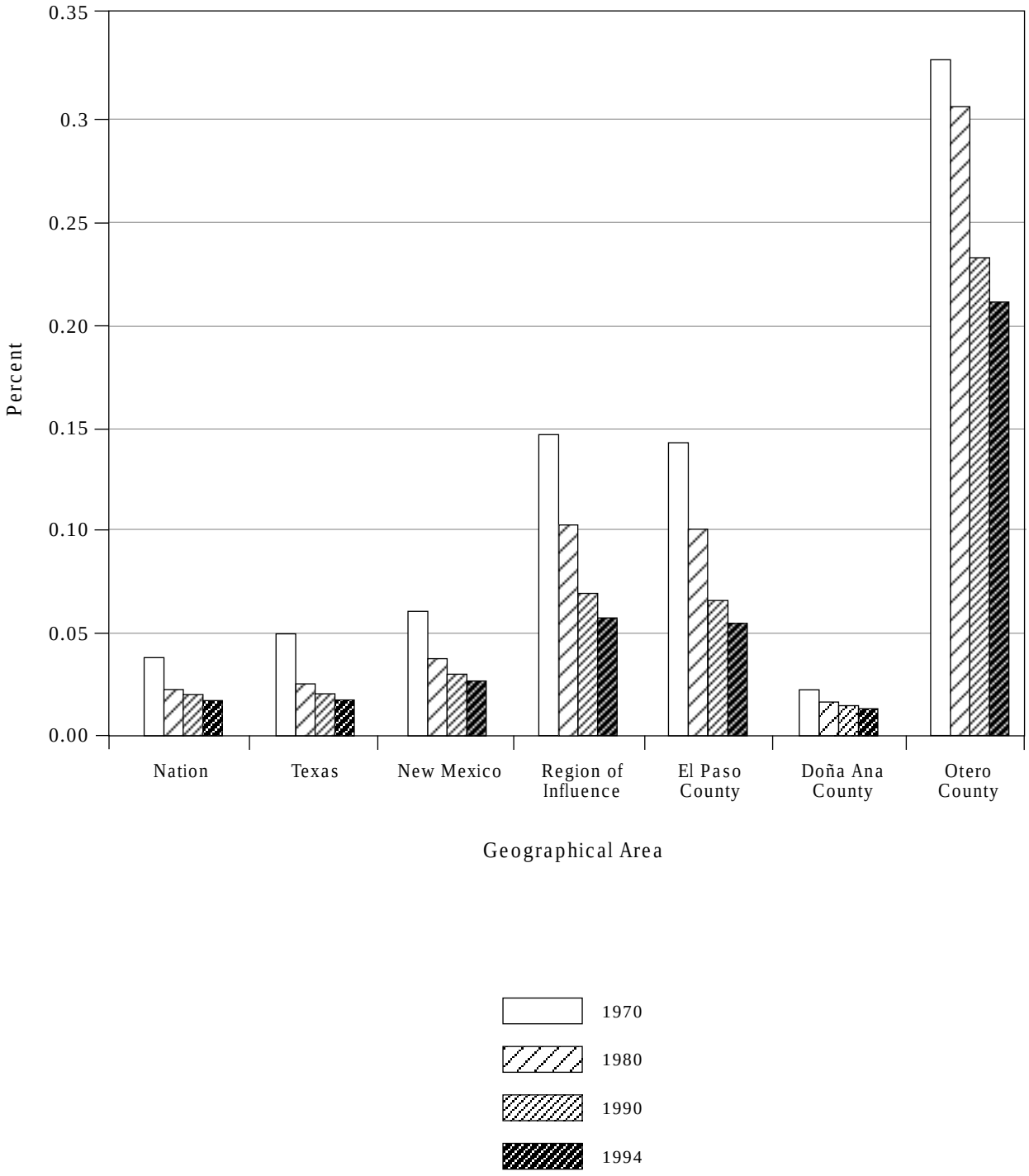
For the State of Texas, the contribution made by military employment to total employment was 4.6 percent in 1970; 2.5 percent in 1980; 2.0 percent in 1990; and 1.7 percent in 1994. The corresponding shares for the State of New Mexico were 5.7 percent, 3.6 percent, 2.9 percent, and 2.6 percent. For the nation as a whole, military employment contributed 3.6 percent of total employment in 1970, 2.2 percent in 1980, 1.9 percent in 1990, and 1.6 percent in 1994.

Projections. Over the period 2000 through 2015, total employment in the ROI is anticipated to increase from 450,384 jobs to 564,410 jobs. This represents an average annual increase of 1.3 percent. This rate of increase exceeds slightly, that projected for the State of Texas. The highest rate of change is expected to occur in Doña Ana County (annual average rate of 1.6 percent) and the lowest in Otero County (0.9 percent per year). The average annual rate of change for the State of New Mexico is expected to be 1.4 percent.

3.10.2.2 Earnings

Fort Bliss. Over the period FY 91 through FY 96, Fort Bliss expenditures have exceeded one billion dollars annually. Table 3.10-5 presents expenditures by nine major categories for each year, FY 90 through FY 96. The categories are: military payroll, civilian payroll, local purchases and contracts, non-local purchases and contracts, utilities, military construction, retired military pensions, non-U.S. expenditures, and student impact aid to local school districts.

The consistently largest proportion of total expenditures has been military payrolls, which has fluctuated from a high of 44.6 percent ($608,583,148) in FY 94 to a low of 29.9 percent ($350,040,274) in FY 96. The second largest contribution to total expenditures is contributed by pension payments to retired military personnel and annuitants. This has varied between 18.6 percent and 26.4 percent over the 6-year time period. The third largest category of expenditures is for civilian payroll, which has varied between 10.9 percent and 15.8 percent. Other significant expenditure categories are local purchases and contracts



McGEIS 034.dg.9.1.98

Figure 3.10-1. Military Employment, 1970, 1980, 1990, 1994.

Table 3.10-5. Fort Bliss Payroll and Expenditures, FY 90 to FY 96 (Current Year Dollars)

FY	*Military Payroll*	*Civilian Payroll*	*Local Purchases Contracts*	*Nonlocal Purchases Contracts*	*Utilities*	*Military Construction*	*Retired Military Pensions*	*Non-U.S. Expenditures*	*Student Impact Aid*	*Total*
1990	337,385,232	149,662,897	82,348,380	126,359,528	13,312,869	17,714,439	198,351,021	21,342,386	2,336,388	*948,813,140*
1991	393,182,440	142,070,851	89,919,767	132,458,699	13,210,688	11,411,275	217,602,905	25,074,732	2,415,144	*1,027,346,501*
1992	446,086,008	147,572,446	87,829,180	132,449,459	14,435,616	15,458,166	212,952,551	26,406,660	2,596,920	*1,085,787,006*
1993	505,581,206	168,052,713	83,066,742	140,332,872	14,822,036	29,812,875	222,286,609	24,950,592	4,783,320	*1,193,688,965*
1994	608,583,148	148,757,113	127,172,779	112,860,349	14,024,601	44,673,948	278,532,091	25,950,046	2,904,720	*1,363,458,795*
1995	475,572,690	161,211,458	114,967,255	102,806,371	21,806,621	64,165,180	348,482,567	25,640,592	2,904,720	*1,317,557,454*
1996	350,040,274	168,429,090	128,465,805	105,520,385	12,724,342	72,306,938	299,773,543	32,073,720	2,465,100	*1,171,799,197*
Percentage Composition										
1990	35.6%	15.8%	8.7%	13.3%	1.4%	1.9%	20.9%	2.2%	0.2%	*100.0%*
1991	38.3%	13.8%	8.8%	12.9%	1.3%	1.1%	21.2%	2.4%	0.2%	*100.0%*
1992	41.1%	13.6%	8.1%	12.2%	1.3%	1.4%	19.6%	2.4%	0.2%	*100.0%*
1993	42.4%	14.1%	7.0%	11.8%	1.2%	2.5%	18.6%	2.1%	0.4%	*100.0%*
1994	44.6%	10.9%	9.3%	8.3%	1.0%	3.3%	20.4%	1.9%	0.2%	*100.0%*
1995	36.1%	12.2%	8.7%	7.8%	1.7%	4.9%	26.4%	1.9%	0.2%	*100.0%*
1996	29.9%	14.4%	11.0%	9.0%	1.1%	6.2%	25.6%	2.7%	0.2%	*100.0%*

that have ranged between 7.0 percent and 11.0 percent, and nonlocal purchases and contracts that have ranged between 7.8 percent and 13.3 percent. The proportion of total expenditures contributed by this latter category has consistently decreased annually between FY 90 and FY 95.

When payroll and expenditure figures are adjusted for the effects of inflation (expressed in 1996 constant year dollars), total expenditures were lower in 1996 ($1,171,799,197) than in any year since 1991. Local purchases and contracts were higher in 1996 ($128,465,805) than in any year except 1994 (over the period 1990 to 1996). Nonlocal purchases were at their lowest level in 1996, as were military payroll payments.

Fort Bliss is the single largest employer in the ROI and, thus, exerts a substantial direct influence on the local economy. The installation also contributes significantly to regional employment, in an indirect manner, through the goods and services that are purchased locally and also through the employment that is induced through payroll expenditures of both military and civilian personnel located at Fort Bliss. The indirect and induced employment is referred to as secondary employment and is the result of the "multiplier effect." Some of the expenditures made in the local economy do not result in increased secondary employment because of the "leakage effect," whereby a certain proportion of goods and services consumed in the region are provided by firms and organizations located outside the region where the secondary employment effect will be experienced.

The levels of secondary employment associated with operations at Fort Bliss over the period 1990 through 1996 are presented in Table 3.10-6. Secondary employment has ranged from a high of 10,208 jobs in 1994 to a low of 7,230 jobs in 1990. After reaching a high point in 1994, the number of jobs has declined and stood at 8,267 in 1996. The majority (55 percent) of this secondary employment (4,546 jobs in 1996) is concentrated in the services sector of the economy, followed by retail trade (1,491 jobs and 18 percent), and construction, maintenance and repair (658 jobs and 8 percent).

Table 3.10-6. Secondary Employment in the ROI, By Sector, FY 90 to FY 96

Industrial Sector	*FY 90*	*FY 91*	*FY 92*	*FY 93*	*FY 94*	*FY 95*	*FY 96*
Agriculture and Mining	138	144	155	171	192	165	138
Construction, Maintenance & Repair	262	206	244	368	506	629	658
Manufacturing	375	388	415	463	533	474	408
Transportation & Utilities	287	298	317	347	395	357	300
Wholesale Trade	342	352	377	404	452	389	346
Retail Trade	1,488	1,553	1,665	1,842	2,073	1,785	1,491
Finance, Insurance & Real Estate	377	394	421	463	524	453	380
Services	3,961	4,187	4,301	4,585	5,533	5,064	4,546
Total	*7,230*	*7,522*	*7,895*	*8,643*	*10,208*	*9,316*	*8,267*
Percent Contribution							
Agriculture and Mining	1.91%	1.91%	1.96%	1.98%	1.88%	1.77%	1.67%
Construction, Maintenance & Repair	3.62%	2.74%	3.09%	4.26%	4.96%	6.75%	7.96%
Manufacturing	5.19%	5.16%	5.26%	5.36%	5.22%	5.09%	4.94%
Transportation & Utilities	3.97%	3.96%	4.02%	4.01%	3.87%	3.83%	3.63%
Wholesale Trade	4.73%	4.68%	4.78%	4.67%	4.43%	4.18%	4.19%
Retail Trade	20.58%	20.65%	21.09%	21.31%	20.31%	19.16%	18.04%
Finance, Insurance & Real Estate	5.21%	5.24%	5.33%	5.36%	5.13%	4.86%	4.60%
Services	54.79%	55.66%	54.48%	53.05%	54.20%	54.36%	54.99%
Total	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*	*100.00%*

Counties: Historic and Current. Total nonfarm earnings paid to workers in the ROI have increased from $1,174,576,000 in 1970 to $3,316,367,000 in 1980; $6,589,552,000 in 1990; and $8,297,869,000 in 1994 (Table 3.10-7). The greatest contributions to the total earnings in 1994 were made by the following industrial sectors: services (21.7 percent); manufacturing (14.2 percent) and; retail trade (11.5 percent). Earnings of military employees accounted for 6.8 percent of total nonfarm wages and salaries.

Table 3.10-7. ROI Earnings, 1970, 1980, 1990, and 1995

Three-County ROI	*1970*	*1980*	*1990*	*1995*
Wage and salary disbursements	$1,042,412	$2,824,818	$5,518,812	$7,142,141
Other labor income	$43,293	$229,880	$593,066	$789,939
Proprietors' income	$108,073	$281,335	$699,897	$954,758
Farm earnings	$21,490	$23,496	$114,704	$87,947
Nonfarm earnings	$1,172,288	$3,312,537	$6,697,071	$8,798,891
Private earnings	$714,118	$2,255,650	$4,588,077	$6,136,248
Ag. serv., forestry, fishing, and other	$3,517	$13,144	$39,744	$57,295
Mining	$1,353	$24,215	$5,813	$7,255
Construction	$61,417	$183,654	$282,091	$434,068
Manufacturing	$163,278	$514,932	$1,026,177	$1,229,043
Transportation and public utilities	$92,700	$300,200	$466,372	$635,054
Wholesale trade	$64,533	$190,861	$358,764	$464,115
Retail trade	$133,006	$391,528	$737,874	$1,008,660
Finance, insurance, and real estate	$43,223	$136,906	$226,971	$324,484
Services	$151,091	$500,210	$1,444,271	$1,976,274
Government and government enterprises	$458,170	$1,056,887	$2,108,994	$2,662,643
Federal, civilian	$156,432	$298,770	$552,919	$638,968
Military	$164,546	$338,338	$525,666	$528,167
State and local	$137,192	$419,779	$1,030,409	$1,495,508

Source: U.S. Department of Commerce, 1996b.

The contribution to total regional earnings made by all military employees in the three-county region has decreased from 14.0 percent in 1970 to 6.8 percent in 1994. Over this same time period, other sectors have increased their share: state and local government earnings has risen from 11.7 percent in 1970 to 17.1 in 1994; services has increased from 12.9 percent to 21.7 percent; and manufacturing from 13.9 percent to 14.2 percent.

The large proportion (78.1 percent) of nonfarm earnings in the ROI occur in El Paso County, Texas. The contribution to total earnings of employees in El Paso County, made by military employees, has decreased from 13.7 percent in 1970 to 6.2 percent in 1994. Over this same time period, other sectors have increased their share: state and local government earnings has risen from 11.2 percent in 1970 to 15.9 in 1994; services has increased from 12.5 percent to 21.7 percent; and manufacturing from 16.4 percent to 16.7 percent.

Environmental Justice

3.11

3.11 ENVIRONMENTAL JUSTICE

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* requires that Fort Bliss make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. For the LEIS, census data was used to estimate the number of persons in minority populations and low-income populations living in areas that could potentially be affected by the project and alternatives. This information, which is included below, describes an aspect of the baseline conditions for the project area.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* requires that each federal agency identify and assess environmental health risks and safety risks that may disproportionately affect children, and address such risks in their policies, programs, activities and standards. Further, for regulatory actions subject to the EO, agencies must now conduct an evaluation of environmental health and safety effects on children, and include an explanation of why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the agency.

The ROI for environmental justice is a three-county area consisting of Otero County, New Mexico, where McGregor Range is located; as well as Doña Ana County, New Mexico, located west of Otero County; and, El Paso County, Texas.

3.11.1 Minority Populations and Low-income Populations

For purposes of this analysis, minority populations and low-income populations were defined as follows:

Minority populations are persons of Hispanic origin of any race; Blacks; American Indians, Eskimos, and Aleuts; and Asian or Pacific Islanders (without double-counting persons of Hispanic origin who are also contained in the latter groups).

Low-income populations are persons living below the poverty level, which is $12,674 for a family of four in 1989, and adjusted for household size, as reported in the 1990 census.

Estimates of these two populations were then developed using data from the *1990 Census of Population and Housing* (Department of Commerce, 1992a) that estimates each of the separate categories contained in these definitions.

In 1990, the three-county ROI contained 779,048 persons, of which 538,423 persons (69.1 percent) were minorities, and 198,378 persons (25.5 percent) were living below the poverty level.

Otero County, New Mexico, contained 51,928 persons, of which 18,591 persons (35.8 percent) were minorities, and 8,404 persons (16.2 percent) were living below the poverty level. Persons of Hispanic origin comprised 12,380 persons (23.8 percent). Blacks comprised 5.3 percent of the county's population (2,755 persons), and Asian or Pacific Islanders comprised 966 persons (1.9 percent). In addition, American Indians, Eskimos, or Aleuts comprised 2,984 persons (5.7 percent) of the population**.** The Mescalero Apache Reservation is located in northeastern Otero County, with small, unpopulated portions also located in Lincoln County, New Mexico. Approximately 2,664 persons lived on the reservation in 1990, of which 97.0 percent were minority and 48.4 percent were living below the poverty level.

Doña Ana County, New Mexico, contained a population of 135,510, of which 80,234 (59.2 percent) were minorities, and 34,676 (25.6 percent) were living below the poverty level. A total of 76,448 persons (56.4

percent) were of Hispanic origin. In addition, 2,172 persons (1.6 percent) are Black; 1,164 persons (0.9 percent) are Asian or Pacific Islander; and 1,009 persons (0.7 percent) of the population are American Indian, Eskimo, or Aleut.

El Paso County contained 591,610 persons, of which 439,598 persons (74.3 percent) were minorities, and 155,298 (26.3 percent) were living below the poverty level. Persons of Hispanic origin comprised 411,619 persons (69.6 percent) of the total population. A total of 22,110 persons (3.7 percent) of the population is Black; 6,485 persons (1.1 percent) Asian or Pacific Islander; and 2,590 persons (0.4 percent) American Indian, Eskimo, or Aleut. For each county, some persons in the latter categories are also included in the subtotal for persons of Hispanic origin. In order to avoid double-counting these persons, they are added in only once when the minority population total is calculated.

The three-county ROI has 131 census tracts. There are 13 census tracts in Otero County, 23 in Doña Ana County, and 95 in El Paso County. For the analysis of baseline conditions, individual census tracts are assumed to contain disproportionately high percentages of minority populations if either of two criteria are met: (1) the percentage of persons in minority populations in the census tract exceeds the average for the ROI, which is 69.1 percent; or (2) the minority population exceeds 50.0 percent, indicating that in that census tract, minorities constitute a majority of the persons who could potentially be affected by the project. Individual census tracts are assumed to contain disproportionately high percentages of low-income persons if the percentage of persons living below the poverty level in the census tract exceeds the ROI average, which is 25.5 percent for the three counties.

Figure 3.11-1 shows disproportionately low-income and minority census tracts in the ROI. Minorities comprise more than 50 percent of the total population in 93 out of 131 census tracts in the ROI, or 71.0 percent of all census tracts. The minority population percentage exceeds the ROI average of 69.1 percent in 68 of the 131 census tracts, or 51.9 percent of the time. The percentage of the population living below the poverty level exceeds the ROI total of 25.5 percent in 60 of the 131 census tracts, or 45.8 percent of the time.

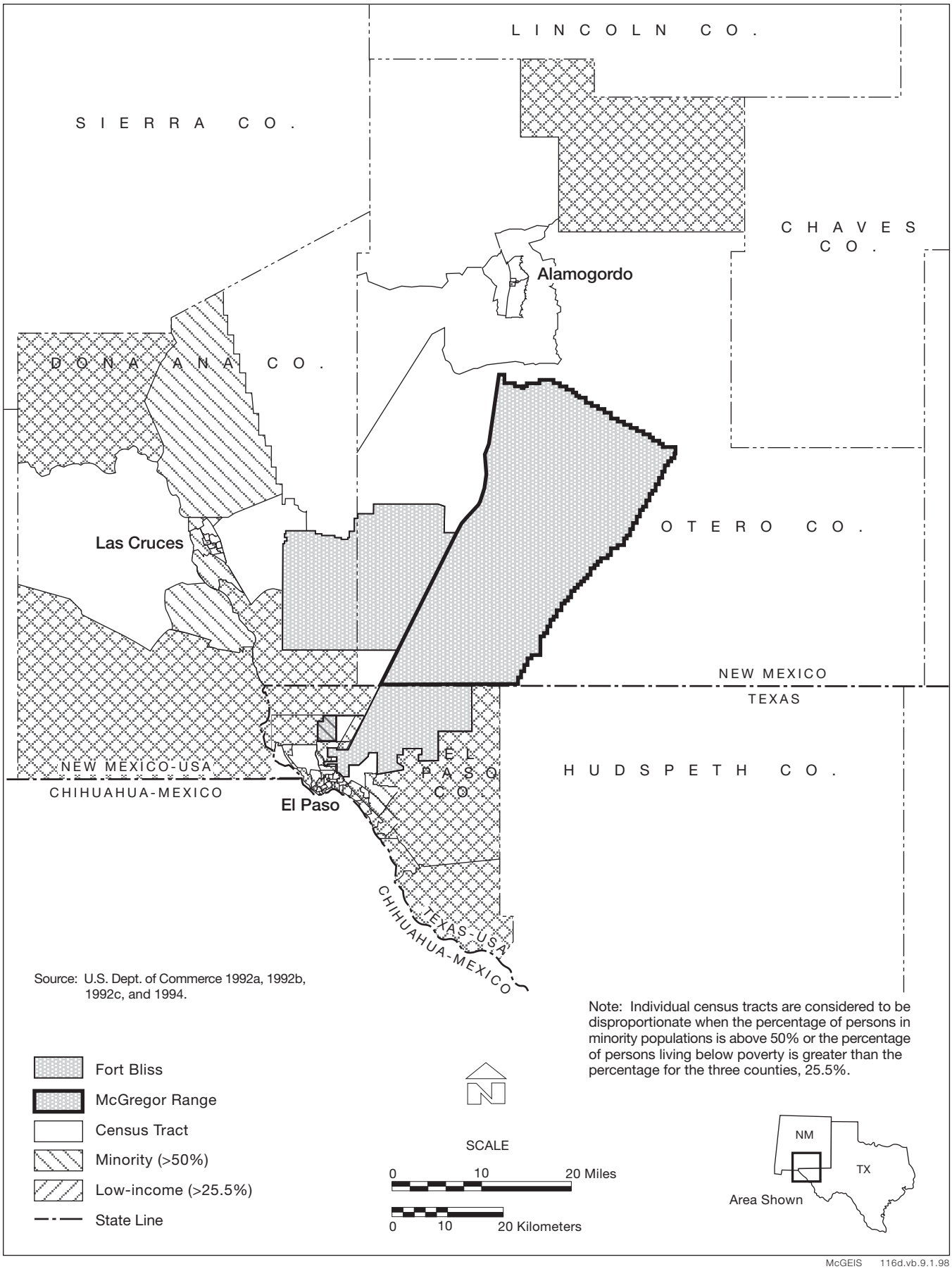


Figure 3.11-1. Census Tracts With Disproportionate Low-income and Minority Populations.

Noise

3.12

3.12 NOISE

Noise is defined as any unwanted sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive, stationary or transient. The ROI for noise includes those areas associated with military training airspace and land areas used by the military services for other activities that could result in the exposure of specific land areas to elevated noise levels.

The physical characteristics of noise, or sound, include its intensity, frequency, and duration. Because noise events have a range of characteristics, and the human ear does not respond to sounds of varying frequency and intensity in a linear fashion, various "weighting" factors are applied to noise measurements to produce measured values that correspond to human response. The most commonly used weighting scales are the "A" and "C" scales.

The normal human ear can usually detect sounds that range in frequency from about 20 hertz (Hz) to 20,000 Hz. However, all sounds throughout this range are not heard equally well. Therefore, some sound meters are calibrated to emphasize frequencies in the 1,000 to 4,000 Hz range. The human ear is most sensitive to frequencies in this range, and sounds measured with these instruments are termed "A-weighted." The "A-weighted" scale is normally used to describe noise arising from transportation and human activities. Values of A-weighted noise are shown in terms of A-weighted decibels (dBA).

In contrast, when describing large amplitude, impulsive sounds such as explosions and weapons noise, the actual total amount of acoustic energy created by the event is an important consideration. Sounds of this nature are normally measured on the "C-weighted" scale, which gives nearly equal emphasis to sounds of most frequencies. Mid-range frequencies approximate the actual (unweighted) sound level, while the very low and very high frequency bands are significantly affected by C-weighting. Values of C-weighted noise are shown in terms of C-weighted decibels (dBC).

The noise metrics (measurements) used to assess noise are the maximum sound level (L_{max}), the sound exposure level (SEL), the A-weighted/C-weighted Day-Night Average Sound Level (ADNL/ CDNL), and the Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Each of these metrics represents a "tier" for quantifying the noise environment. Further discussions of these metrics are presented in Appendix F, *Noise*.

Sound levels calculated for aviation activities in the special use airspace associated with McGregor Range are all L_{dnmr}. The noise levels associated with the detonation of high explosives are all in terms of CDNL. Day-Night Average Noise Level metrics are the preferred noise metrics of the U.S. Department of Housing and Urban Development (HUD), the U.S. Department of Transportation (DOT), the FAA, the EPA, and the Veteran's Administration (American National Standards Institute [ANSI], 1980, 1988; EPA, 1974; Federal Interagency Committee on Urban Noise [FICUN], 1980; Federal Interagency Committee on Noise [FICON], 1992).

Ambient background noise is not considered in the noise calculations that are presented below. In the case of A-weighted noise, there are several reasons for this. First, ambient background noise, even in wilderness areas, varies widely, depending on location and other conditions. For example, studies conducted in an open pine forest in the Sierra National Forest in California have measured up to a 10 dBA variance in sound levels simply due to an increase in wind velocity (Harrison, 1973). Therefore, assigning a value to background noise would be arbitrary. Secondly, and probably most important, is that it is reasonable to assume that ambient background noise in the ROI would have little or no effect on the calculated Day-Night Average Sound Levels. Since noise levels are calculated logarithmically, louder sounds dominate the calculations, and overall, aircraft noise would be expected to be the dominant noise

source characterizing the acoustic conditions in the region. In the case of C-weighted noise, thunder would probably be the only naturally occurring exposure to this noise, and it would be impossible to predict or estimate values for such events.

To assess noise effects, the Army has defined three noise zones to be considered in land use planning. These zones are described by the noise levels to which they are exposed, and, based on sociological considerations, compatible land uses are recommended. These zones are summarized in Table 3.12-1. In general, within Zone I, where very few people will be bothered by noise levels, unrestricted land use is indicated. In Zone II, as outdoor noise levels increase and more people become annoyed at the noise, restrictions or qualifications are placed on certain land uses, specifically regarding residential development. In Zone III, as noise levels escalate, fewer and fewer compatible land uses are indicated.

Table 3.12-1. Land Use Planning Guidelines

Noise Zone	*Population Highly Annoyed*	*Noise Limits*		
		Transportation ADNL	*Impulsive CDNL*	*Small Arms dBP*
I	<15%	<65 dBA	<62 dBC	<87 dBP
II	15-39%	65-75 dBA	62-70 dBC	87-104 dBP
III	>39%	>75 dBA	>70 dBC	>104 dBP

Notes: ADNL = A-weighted Day-Night Average Noise Level, CDNL = C-weighted Day-Night Average Noise Level, dBP = Peak unweighted sound pressure level.
Source: U.S. Army Center for Health, and Preventive Medicine, 1994.

Separate values are provided for A-weighted and C-weighted noise levels. Since these types of noise are measured on different scales, it is not appropriate to sum the noise levels. Therefore, each is measured and considered separately, applying its distinctive criteria for assessment. When applicable, noise associated with small-arms firing is assessed using actual dBP.

As part of the mission at Fort Bliss, Army and USAF aircraft conduct aviation activities within regional military training airspace associated with training ranges. Noise also results from detonation of high explosives and use of other ordnance on training ranges.

3.12.1 Current Noise Levels

3.12.1.1 A-Weighted Noise

Aviation activities associated with Fort Bliss operations occur over the areas designated as North McGregor and South McGregor. These operations involve Army and USAF rotary- and fixed-wing aircraft. These areas correspond to restricted airspace designated R-5103 B/C and R-5103 A/D, respectively. USAF fixed-wing fighter aircraft operating primarily out of HAFB also perform training in R-5103B, using the air-to-ground bombing range in the northern portion of McGregor Range.

Around airports, flight activities follow well-defined patterns. In military training airspace, however, flight activities are more apt to be intentionally random and dispersed, reflecting typical combat maneuvers. As a result of these random flight paths, sound levels in this type of airspace have been found to be uniformly distributed throughout the airspace. Therefore, sound levels in these regions consider not only the speeds, altitudes, and engine power settings of aircraft, but the overall size of the airspace and the time spent in the airspace element as well. Although some aircraft may adhere to specific tracks on a

specific mission (e.g., a C-130 at a drop zone or a helicopter flying an NOE training mission), over time, aircraft flight routes approach random distributions throughout the airspace.

Using the Air Force's Military Operations Area (MOA) Range Noise Assessment Program (MR_NMAP), which is specifically designed to consider these unique aspects of flight within these areas, the uniformly distributed sound levels in terms of L_{dnmr} were calculated for each airspace element. These values under current operations are shown in Table 3.12-2.

Table 3.12-2. Uniformly Distributed Noise Levels in Restricted Areas Under Current Operations

Airspace	*Current Noise Level (in L_{dnmr})*
R-5103B/C (North McGregor)	43
R-5103A/D (South McGregor)	40
North and South McGregor (Combined)	44

Source: Lucas and Calamia, 1994.

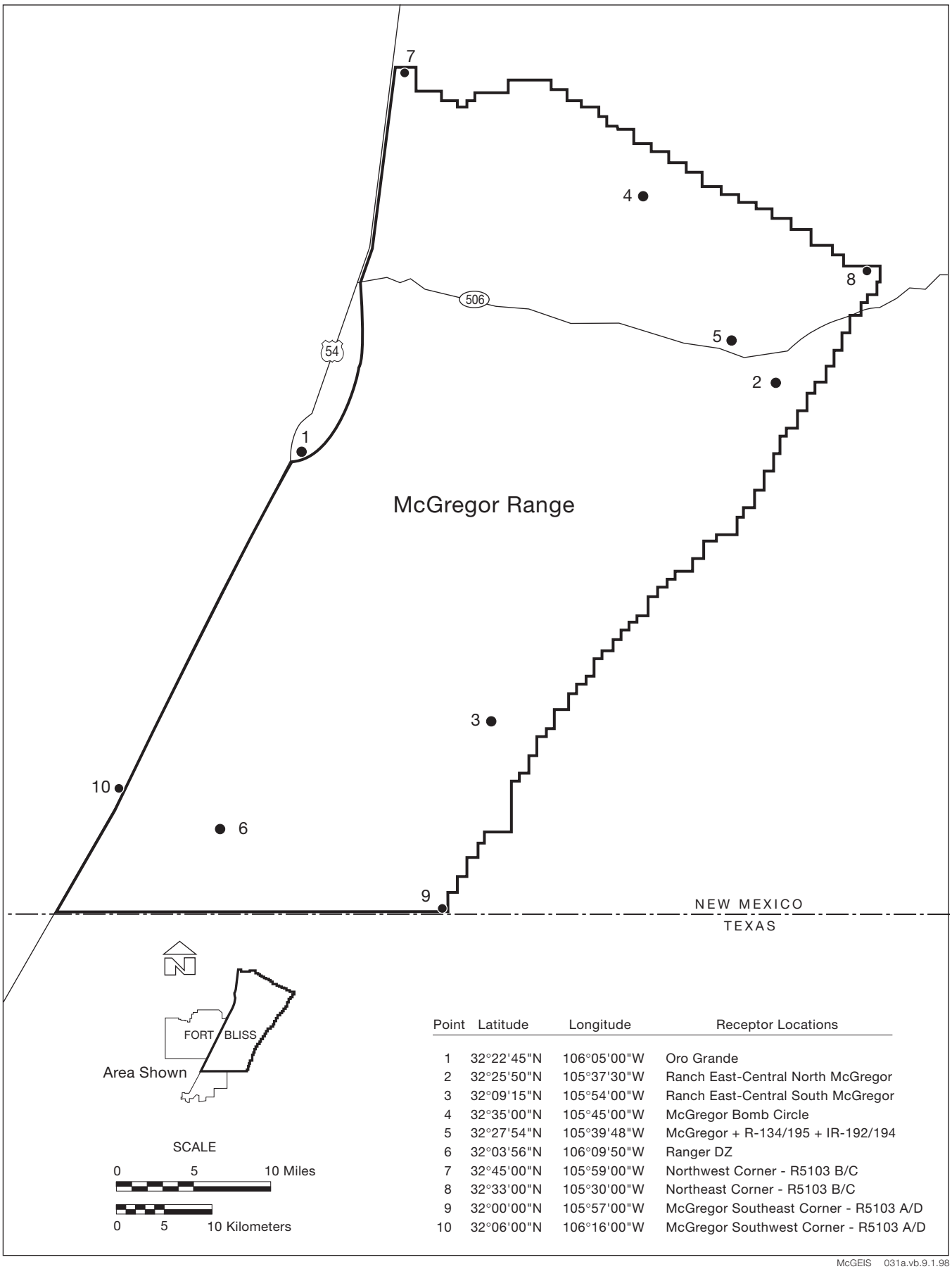
To further assess the noise levels occurring throughout the military training airspace, ten representative ground locations were selected for specific analysis. These specific ground locations represent potential noise receptors in the area, as well as locations where cumulative or concentrated military flight training may occur. These locations, and their noise exposure are addressed in Table 3.12-3. Their location on McGregor Range is illustrated in Figure 3.12-1.

Table 3.12-3. Noise Levels at Specific Points

Point	*Description*	*Noise Level (in L_{dnmr})*
1	Orogrande	39
2	Ranch East-Central North McGregor	47
3	Ranch East-Central South McGregor	46
4	McGregor Bomb Circle	51
5	McGregor Range + IR-134/195 + IR-192/194	52
6	Ranger Drop Zone	35
7	McGregor Northwest Corner Restricted Airspace	35
8	McGregor Northeast Corner Restricted Airspace	47
9	McGregor Southeast Corner Restricted Airspace	35
10	McGregor Southwest Corner Restricted Airspace	36

Source: Lucas and Calamia, 1994.

As shown, under current conditions, all noise levels are compatible with Noise Zone I criteria. No elevated noise levels that would create a Noise Zone II or III condition are expected to extend off the range.



Point	Latitude	Longitude	Receptor Locations
1	32°22'45"N	106°05'00"W	Oro Grande
2	32°25'50"N	105°37'30"W	Ranch East-Central North McGregor
3	32°09'15"N	105°54'00"W	Ranch East-Central South McGregor
4	32°35'00"N	105°45'00"W	McGregor Bomb Circle
5	32°27'54"N	105°39'48"W	McGregor + R-134/195 + IR-192/194
6	32°03'56"N	106°09'50"W	Ranger DZ
7	32°45'00"N	105°59'00"W	Northwest Corner - R5103 B/C
8	32°33'00"N	105°30'00"W	Northeast Corner - R5103 B/C
9	32°00'00"N	105°57'00"W	McGregor Southeast Corner - R5103 A/D
10	32°06'00"N	106°16'00"W	McGregor Southwest Corner - R5103 A/D

McGEIS 031a.vb.9.1.98

Figure 3.12-1. Location of Noise Receptors in the Vicinity of McGregor Range.

3.12.1.2 C-Weighted Noise

Impulsive noise caused by explosives occurs throughout McGregor Range. This includes impact points, ordnance firing points, and the small arms ranges. Noise at all locations has not been specifically modeled to determine noise zones. However, in most instances, the noise is sporadic, and relatively localized to specific areas on the range. Since the range area is designated for ordnance firing and impact, elevated noise levels are expected and are fully compatible with this type of land use.

In order to assess the relative sensitivity of areas off the range to noise occurring on the range, a specific scenario was considered. One range area capable of supporting a significant amount of high explosive is Demolition Area 2. This area is situated approximately 11 miles from U.S. Highway 54, and is approved for the detonation of up to 5,000 pounds of net explosive weight.

The Army's Noise Assessment Prediction System (NAPS) model was used to assess the results of such a detonation. NAPS is a single-event model that generates sound levels based on meteorological conditions. NAPS calculates sound pressure levels (SPLs) in dBP, based on the Trinitrotoluene (TNT)-equivalent weight of the explosive. The model uses a ray trace approach that takes into account spherical spreading, absorption, and refraction. Appendix F presents a more detailed discussion of impulsive noise associated with the detonation of high explosives.

The dBP metric used by NAPS does not reflect the cumulative effects from multiple noise events over time. The preferred metric is CDNL. However, by considering the mathematical relationships between dBP, C-weighted sound exposure level (CSEL), CDNL, and the number of events per day, CDNL values can be derived from the dBP values generated by NAPS.

The scenario was modeled with NAPS, using a U.S. Standard Atmosphere with no winds. For this evaluation, there are two levels of significance. Federal Occupational Safety and Health Administration (OSHA) standards prescribe that an individual should never be exposed to impulsive sounds greater than 140 dBP without hearing protection (29 CFR Ch. XVII § 1926.52[e]). The second is 136.4 dBP, which corresponds (at a rate of one explosion per day) to CDNL 62 dBC, the threshold for Noise Zone II (refer to Appendix F for additional information about the derivation of these values).

The detonation of 5,000 pounds of net explosive weight produces a SPL of 140 dBP or greater out to approximately 5,380 feet from the point of detonation. Safety requirements would preclude any human presence in this zone; therefore, there are no health or safety risks associated with this acoustic level.

Using output from the model, the SPL (in dBP) at 11.2 miles was determined. After converting the into a CSEL, the equation was solved for a single event, and the number of events required to equate that contour to CDNL 62. These calculations indicate that a single event results in CDNL 36 at the range boundary, and that approximately 371 day-equivalent detonations could occur at Demolition Area 2 per day, and the noise level of CDNL 62 (Noise Zone II) would not extend past the range boundary.

The capacity factor is expressed in terms of day-equivalent events. Due to the penalty associated with noise events at night, this equates to about 37 night-equivalent events per day. However, these events can also be combined. For example, 271 day events and 10 night events per day equals 371 day-equivalent events.

This example considered a worst-case scenario. Since all other locations are further removed from the range boundaries, their capacities would be proportionately greater. Furthermore, levels of operations are well below capacities. Based on the above, excessive impulsive noise levels associated with high explosives would not be expected to impact land areas off of McGregor Range.

Safety

3.13

3.13 SAFETY

Safety issues addressed in this section include ground, flight, and explosive safety considerations. The ROI for safety is the area encompassed by McGregor Range. Fire safety is generally included as part of ground safety but is also considered in other categories, as well. Ground safety concerns activities associated with on-going operations and maintenance. Ground safety also considers potential hazards associated with the delivery of ordnance on weapons ranges. Aircraft flight safety addresses the risk of aircraft mishaps, and includes both rotary- and fixed-wing aircraft operations throughout the restricted airspace which supports military activities on McGregor Range. Explosive safety considerations involve the use, storage, processing, and handling of ordnance used on the range in support of the Fort Bliss mission.

3.13.1 Ground Safety

All day-to-day operations and maintenance activities on McGregor Range are performed by trained, qualified personnel, and are conducted in accordance with applicable equipment technical directives, approved occupational safety and health standards, and sound maintenance practices. The handling, processing, storage, and disposition of any hazardous by-products, resulting from operations and maintenance, are accomplished in accordance with all federal and state requirements applicable to those specific substances.

McGregor Range supports delivery of a wide variety of ground-to-ground, ground-to-air, and air-to-ground ordnance. McGregor Range is the major range supporting air defense weapons systems. The various ranges supported by the McGregor Range Camp are involved in ground-based activity, and the ordnance they support are shown in Table 3.13-1.

Table 3.13-1. Activities Conducted on Ranges Supported by McGregor Range Camp

Site Designation	*Ordnance Supported*
TAC0, TAC1, TAC7, TAC12, TAC18, TAC24	Patriot Missile
Hawk Sites 1 through 8	Hawk
Field Firing Sites A, C, E, G	Hawk, MLRS
FAW Site 10	Stinger, Chaparral, Avenger, Roland, M60, .50 caliber (cal), 81 millimeter (mm) mortar (illumination only)
FAW Site 4	81mm mortar (illumination only), M3, M60, .50 cal, M16
Aerial Gunnery Range, Cane Cholla	2.75-in rockets, 7.62mm, 40mm, 20mm, Light Antitank/Antiarmor Weapon (LAW), 81mm mortar, 4.2 in. mortar (mortars used for illumination only)
ATACMS	ATACMS
Demolition Site 2	Explosive Ordnance Disposal (EOD), Demolition Training. (Maximum net explosive weight 5,000 pounds)

Note: Demolition Site 2 is not on Meyer Range 23.
Source: U.S. Army, 1996l.

All activity on McGregor Range is governed by detailed safety standards documented in SOPs. For each weapon or weapon system used, SDZs are projected onto the ground around the firing area, under the projectile's flight path, and around the impact area. These zones account for the flight, impact, fragmentation pattern, and possible ricochet of the projectile after it impacts the ground, as well as any

debris patterns that would be associated with the projectile or its target. SDZs are unique to each specific type of ordnance, and vary in size and shape depending on the weapon used.

Prior to any launch or firing, these areas are subjected to an aerial sweep to ensure they are clear of unauthorized personnel and equipment. Once cleared, access points are monitored to ensure no personnel inadvertently enter the hazardous area. Access is barred until the range is declared safe (U.S. Army, 1996l).

Detailed guidance for the safe conduct of the firing is provided in SOPs. Potential malfunctions (e.g., misfires, hangfires, etc.) are considered, and safety procedures are prescribed to ensure a safe recovery and disposition of the malfunctioning munition.

The Orogrande Range and the SHORAD are also part of the McGregor Range complex. The Orogrande Range is used primarily by the TEXCOM's ADA Test Directorate for weapons system testing. The range can support use of Chaparral, Stinger, and Avenger missiles, 81mm mortars (illumination only), and laser operations. Weapons supported by the SHORAD Range include Stinger, Avenger, and Chaparral missiles, 25mm, 7.62mm, and .50 caliber ammunition (U.S. Army, 1996b).

The Meyer Range Complex is located approximately 6 miles southeast of the McGregor Range Camp. The range supports small arms, hand grenades, M-60 machine guns, Claymore mines, M249, M203, AT-4, and M79 grenade launchers (U.S. Army, 1996b).

As with all ranges on the McGregor complex, detailed safety procedures are documented in SOPs that govern the use of each specific weapon/weapon system employed on the Orogrande, SHORAD, and Meyer ranges.

Table 3.13-2 summarizes ordnance expended on the McGregor ground ranges in 1996.

There is one fire truck stationed at the McGregor Range Camp. However, this truck is limited in response to the cantonment area of the range camp and a 5-mile radius around that area (Kern, 1997).

The initial response element to fires detected on ranges would be the troops assigned to the military unit using the range. SOPs require dedication of some troops to fire response (U.S. Army, 1996b). If a fire escapes from the immediate area of ignition and begins to spread, additional response would be requested from the Fort Bliss Fire Department. Depending on the specific location of the fire, and its indicated potential involvement, other agencies may be requested to respond. However, the Army is not part of any interagency support agreements with the BLM or mutual support agreements with any civil fire departments in the region (Kern, 1997).

3.13.2 Flight Safety

The public's primary concern regarding flight safety is the potential for aircraft accidents. Such mishaps may occur as a result of mid-air collisions, collisions with man-made structures or terrain, weather-related accidents, mechanical failure, pilot error, or bird-aircraft collisions. Flight risks apply to all aircraft; they are not limited to the military.

The military services define four categories of aircraft mishaps: Classes A, B, C, and high accident potential (HAP). Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $1 million, destruction of an aircraft, or damage to an aircraft beyond economical repair. Class B and C mishaps, and HAP, are less serious, result in lower costs, and cause less serious injuries. This LEIS focuses on Class A mishaps because of their potentially catastrophic results.

Table 3.13-2. Ordnance Expended on McGregor Ground Ranges

Ordnance	*Range*						
	TAC Sites	*Hawk Sites*	*Field Firing Sites*	*FAW Sites*	*ATACMS*	*SHORAD*	*Meyer*
Patriot	38						
Stinger				315		63	
ATACMS					6		
Roland				4			
Avenger				2		13	
Chaparral				90		2	
Hawk		34					
MLRS			130				
BAT				453		78	
STLS				35		48	
ADATS				14			
.50 Cal				4,200		59,190	
5.56mm							620,170
7.62mm						58,060	34,049
9mm							53,431
25mm						7,410	
M3P						4,000	
M249							7,100
40mm							250
M203							430
Pellets							3350
NBC							21
Grenades							83
M60							300
M64							10
M67							100
BGM71E							9
MK19							425
12 Gauge							300

Source: U.S. Army, 1996l.

While it is impossible to predict the precise location of an aircraft accident, in considering potential impacts to persons and private property, several factors are relevant: the ROI and immediate surrounding areas have relatively low population densities; pilots of aircraft are instructed to avoid direct overflight of population centers at very low altitudes; and, the limited amount of time the aircraft is over any specific geographic area limits the probability that impact of a disabled aircraft in a populated area would occur.

Other effects of an aircraft crash include the potential for fire and environmental contamination. Weather and surface conditions (topography, vegetation, etc.) will determine the extent of fire. When an aircraft crashes, it may release hydrocarbons. Those petroleums, oils, and lubricants (POLs) not consumed in a fire could contaminate soil and water, depending on the physical characteristics of the area where the crash occurs.

Based on historical data on mishaps involving U.S. aircraft at all installations world-wide, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. Combat losses due to enemy action are excluded from these statistics.

Based on scheduled use of airspace regions, the annual amount of flight time of each aircraft using the airspace can be estimated. Then, the Class A mishap rate per 100,000 flying hours can be used to compute a statistical projection of anticipated time between Class A mishaps in each applicable element of airspace. These data are only statistically predictive. Class A mishaps result from many factors, not simply the amount of flying time of the aircraft.

Rotary-wing operations occur throughout the McGregor Range area. There are several landing areas, and terrain flying areas that support low altitude flight operations. Detailed safety procedures govern the use of these facilities, and hazards to flight associated with the use of these areas (U.S. Army, 1993a).

In 1996, 842 aviation operations occurred in the McGregor Range airspace that were directly associated with Fort Bliss operations. Additionally, an unscored air-to-ground bombing range (bomb circle) that is used by the USAF for training originating from HAFB is located in the northern portion of McGregor Range. Last year, 1,151 aircraft delivered training ordnance on that target. All of the training ordnance were training or inert bombs that do not explode.

When airspace use by all fixed- and rotary-wing aircraft using McGregor Range is considered, there is little overall risk associated with aviation activities on McGregor Range. For all aircraft involved, the minimum statistically estimated time between Class A mishaps is more than 95 years. If this level of flight activity is considered to remain constant, it equates to one chance in 22,466 of an accident, or a risk probability of 0.00004. All other aircraft using the airspace have significantly lower risk.

During the last 5 years, one incident occurred on McGregor Range where two helicopters collided in mid-air. Both aircraft were destroyed (Pino, 1997).

3.13.3 Explosive Safety

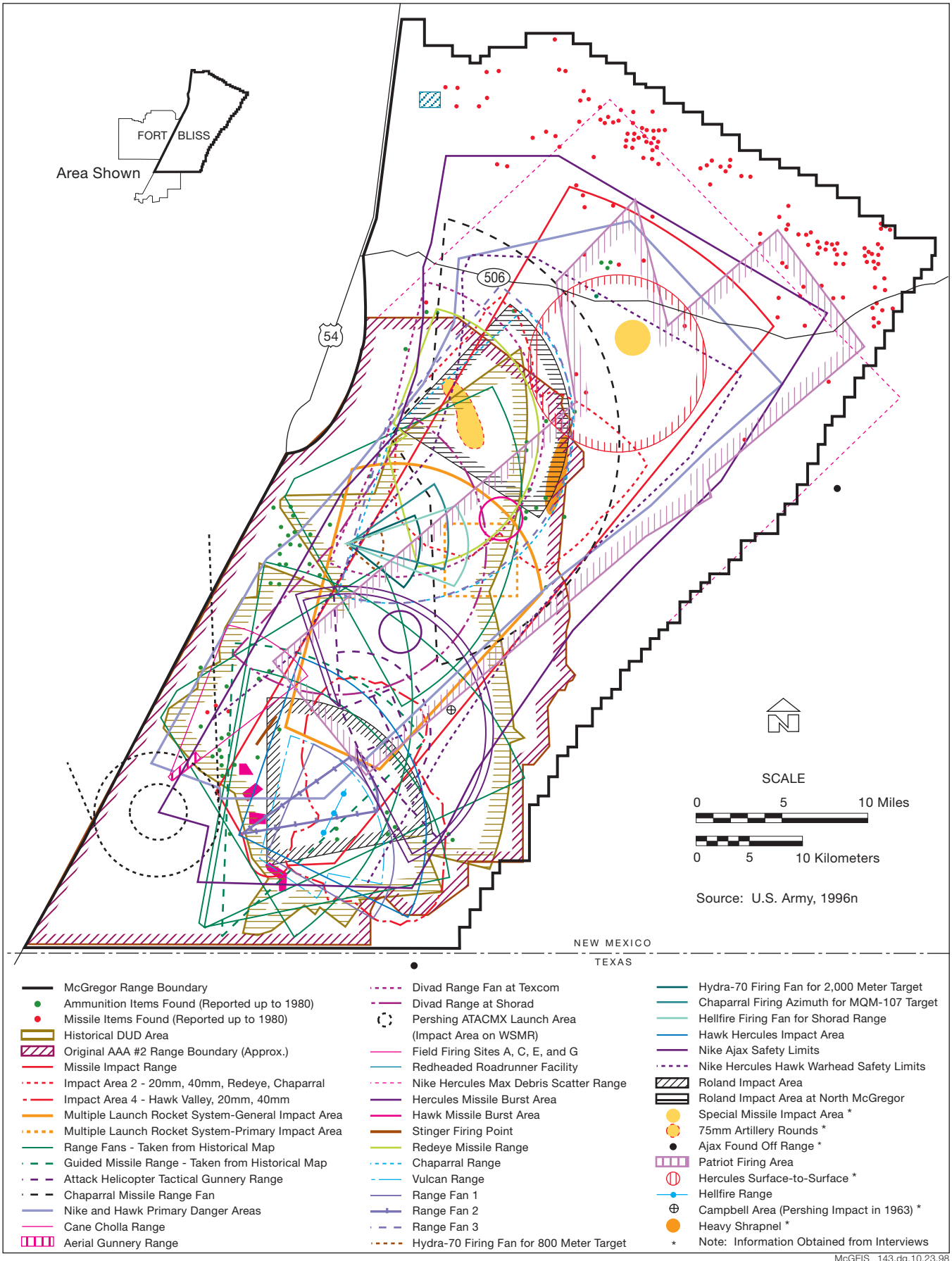
All explosives associated with the mission at Fort Bliss are stored, processed, handled, and transported by trained, fully-qualified personnel using approved technical data and explosive safety practices. Explosives are used throughout the Fort Bliss Complex.

Ordnance and explosives are stored on McGregor Range in approved and licensed storage facilities. No explosive safety waivers are in effect (Tressler, 1997).

During training, use of ordnance on the range is guided by SOPs that provide detailed direction on the handling of explosives, and explosive safety (U.S. Army, 1996m). When feasible after an exercise, the area used is groomed to ensure proper disposal and disposition of all ordnance, including that which is considered an ordnance or explosive hazard, or malfunctioned ordnance. Impact areas are not sanitized on a regular basis. Therefore, ordnance or explosive hazards may be encountered in those areas. Detailed instructions regarding designating and marking of ordnance or explosive hazard, if it is encountered, is provided in SOPs. When necessary, EOD specialists are available to render the ordnance safe. It is either destroyed in-place, or removed for demolition on an EOD range (U.S. Army, 1996m).

During 1996, an archive search report of potential ordnance and explosive hazards was prepared addressing McGregor Range (U.S. Army, 1996n).

The following locations on McGregor Range represent some of the areas with the highest potential for ordnance or explosive debris contamination (Figure 3.13-1). Review of historical documents indicates that almost all sections of McGregor Range have been used for ordnance-related activities. Many areas have received multiple uses from various weapons systems. Besides the intense use of specific locations,



McGEIS 143.dg.10.23.98

Figure 3.13-1. Historic Weapons Firing Locations, Impact Fans, and Locations of Known Ordnance Debris on McGregor Range.

the overall range has been subjected to possible ordnance and explosive hazards from the high- and medium-altitude missiles. The report describes areas with potential ordnance and explosive hazards from both historical and current activities. Discussed are antiaircraft artillery (AAA) ranges, missile debris firing areas, and MLRS areas and missile debris areas.

3.13.3.1 AAA Ranges

All impact areas within the AAA range fans may contain duds. All weapons fired on the ranges, other than the smaller caliber weapons, were high dud producers. Ordnance debris found in 1980 indicated that some debris was found outside the fan areas.

3.13.3.2 Missile and Rocket Firing Areas

The range fans and subsequent impact areas of the following locations should be considered as possible remaining ordnance areas.

FAW 4 and Appropriate Fans. The 20mm, 25mm, and 40mm ammunition fired on the range have been known in the past to be dud producers. Also, 81mm mortars were used on the range. These mortars were illuminating, not high explosive (HE), but may still pose a hazard.

FAW 10 and Appropriate Fans. The 20mm, 25mm, and 40mm ammunition fired on the range have been known in the past to be dud producers. It has been documented that high explosive incendiary (HEI) 20mm Vulcan rounds were fired here. The 81mm mortars were present at this range as well.

3.13.3.3 Cane Cholla

This range may have a high level of unexploded ordnance. The 20mm, 25mm, and 40mm ammunition fired on the range have been known in the past to be dud producers. The 40mm ammunition included grenade launched rounds. Illuminating 4.2-inch and 81mm mortars were also used on this range and may pose a hazard. The 2.75-inch Folding-fin Aircraft Rocket (FFAR) rockets, AT-4's and LAW rockets fired on the range may pose the greatest threat.

3.13.3.4 SHORAD and TEXCOM Ranges

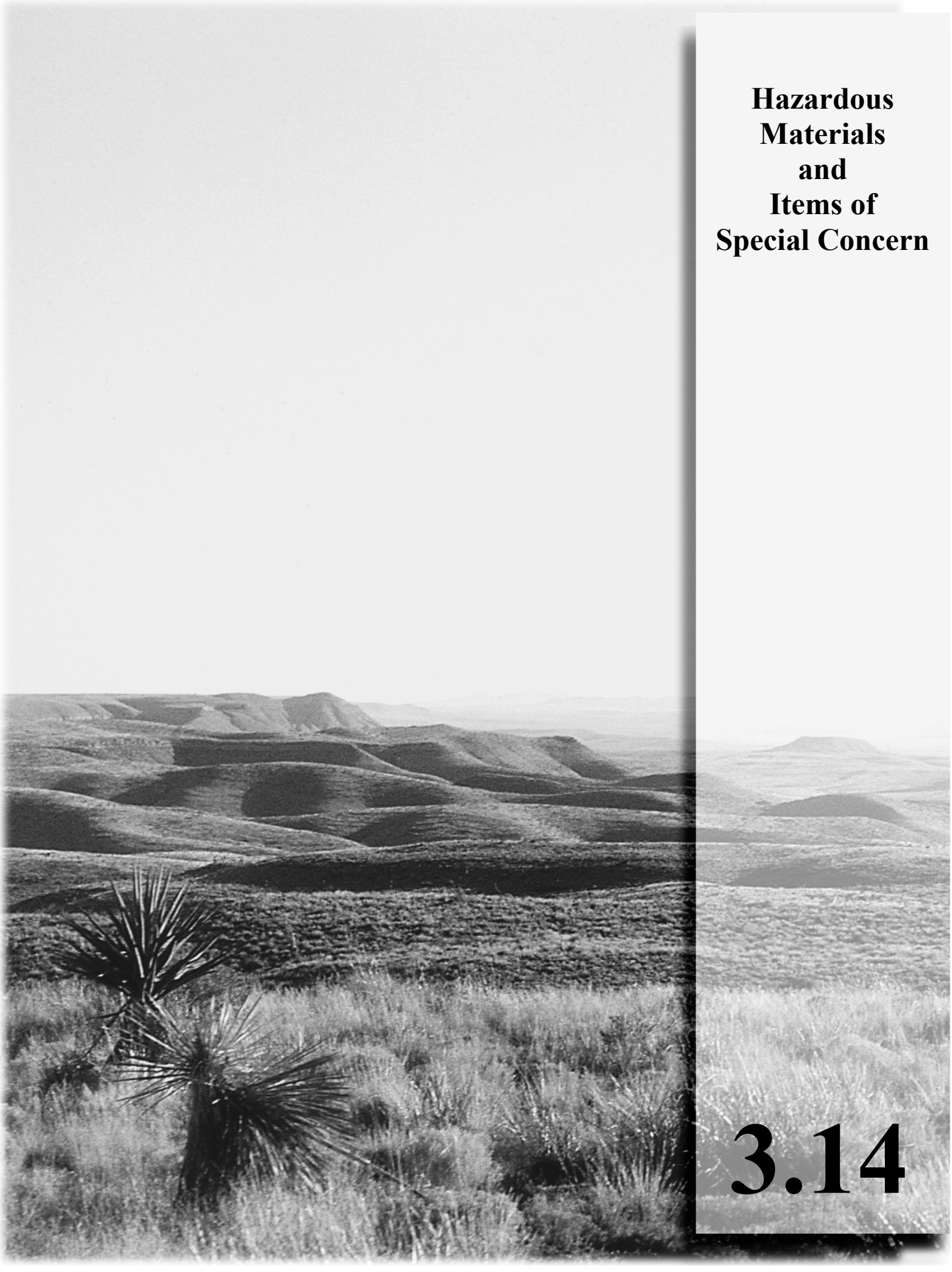
These ranges are kept relatively clean of surface debris because both are certified for laser operations. Human health and safety concerns are prime considerations when a range or target area is certified for laser use. This is due to the potential for eye damage from exposure to the laser beam. Therefore, target areas are cleared of any foreign or natural reflective surfaces before being certified for laser use. However, duds from the 40mm Sergeant York may still be present in the areas. At SHORAD, 2.75-inch Hydra rockets, TOW missiles, 25mm ammunition, and various forms of the Gun–Low Altitude Air Defense System (GLAADS) ammunition were fired. These may all be high dud producers. The 81mm illuminating mortars were also present at TEXCOM.

3.13.3.5 Field Firing Site A and Related Fans

Vulcan Army Training and Evaluation Program (ARTEP) firings of 20mm rounds took place on this range.

3.13.3.6 Duster and Small Arms Air Defense (SAAD) Range

Both 20mm and 40mm ammunition were fired on these ranges. Duds may be present.



Hazardous Materials and Items of Special Concern

3.14

3.14 HAZARDOUS MATERIALS AND ITEMS OF SPECIAL CONCERN

This section provides a description of the hazardous materials, items of special concern, and related environmental media management programs at McGregor Range.

The ROI is McGregor Range in Otero County, New Mexico; the sanitary landfill on Fort Bliss; the less-than-90-day storage facilities on Fort Bliss; and, the permitted hazardous waste storage facility on Fort Bliss.

3.14.1 Hazardous Materials

3.14.1.1 Hazardous Chemicals

Training exercises and installation maintenance require the use of many types of hazardous chemicals. McGregor Range stores and uses hazardous chemicals, including a variety of flammable and combustible liquids. Types of hazardous chemicals used during range operations include acids, corrosives, caustics, glycols, compressed gases, aerosols, batteries, hydraulic fluids, solvents, paints, cleaning reagents, pesticides, herbicides, lubricants, fire retardants, photographic chemicals, alcohols, insecticides, sealants, and ordnance.

Fort Bliss prepares a yearly chemical storage report in accordance with the *Emergency Planning and Community Right-to-know Act (EPCRA)* Section 312. The report identifies the hazardous chemicals stored on Fort Bliss, including McGregor Range, in excess of 10,000 pounds, and generally includes the chemical name, physical state of the chemical, associated hazards, type of storage container, amount stored, and storage locations. Twenty chemicals were identified in the 1996 report, to include: aqueous film-forming foam, ethylene glycol, hydraulic fluid, lube oil, oil-based paints, phosphorus, propane, thinner, diesel fuel, gasoline, JP-8, chlorine gas, methanol-based cleaner, sulfuric acid electrolyte, latex paints, chlorofluorocarbons (CFCs), diphacione, isophorone diisocyanate, vinyl acetate, and sulfur dioxide.

In addition to the EPCRA Section 312 chemical storage report, Fort Bliss also prepares a yearly Section 313 chemical use data package. The data package is used to determine if Fort Bliss is required to submit Toxic Release Inventory (TRI) Form R Reports under Section 313. Form R Reports must be submitted for each TRI chemical that is processed, manufactured, or otherwise used, in excess of the reporting threshold quantity. The chemicals on Fort Bliss, including McGregor Range, are categorized as "otherwise used" and the reporting threshold is 10,000 pounds per TRI chemical. In 1996, 14 Fort Bliss TRI chemicals exceeded the 10,000 pound threshold: 1,2,4-trimethyl benzene, benzene, chlorine gas, cumene, ethylbenzene, ethylene glycol, methanol, toluene, xylene, hexane, tert-butyl alcohol, naphthalene, methyl ethyl ketone, and methyl tert-butyl ether. Sufficient quantities of these chemicals fell under EPCRA activity exemptions listed in 40 CFR 372.38. As a result, Fort Bliss had no TRI chemicals to report in the 1996 reporting year.

3.14.1.2 Hazardous Waste

Hazardous chemical use on McGregor Range results in the generation of a small amount of hazardous waste. Commonly generated hazardous wastes may include used fuel and POLs, waste paint, solvents, used batteries, fuel filters, and explosive ordnance destruction wastes. In general, these wastes are generated from vehicle and ground support equipment maintenance, infrastructure maintenance, and training exercises (U.S. Army, 1997o). The transportation, storage, and disposal of these hazardous wastes are regulated by the DOT, OSHA, EPA, and the NMED.

The NMED, Hazardous and Radioactive Material Bureau (HRMB) currently regulates the disposal and environmental remediation of five locales within McGregor Range. These locales include the following:

79

- McGregor "Rubble Pit" (Landfill No. 13);
- McGregor Range Oxidation Pond;
- McGregor Camp Fire Training Area;
- McGregor Range former Drum Storage Area;
- McGregor Range Open Detonation Unit (permitted for Hazardous Waste Treatment Disposal).

Any alternative use of these properties requires coordination between the Army and the NMED.

The Fort Bliss Range Command (USACASB) hazardous waste program includes an *Installation Hazardous Waste Management Plan* and SOPs for the disposal of hazardous waste and POL products; waste accumulation points (WAPs); and, less-than-90-day storage areas. These documents provide information on training; hazardous waste management roles and responsibilities; hazardous waste identification, accumulation, transportation, storage, and disposal; and, spill control, consistent with federal and state regulations. In addition, a *Spill Prevention Control and Countermeasure Plan* has been developed for the U.S. Army ADA Center and Fort Bliss, WBAMC, Biggs AAF, and the USACASB, to prevent discharges of oil and other hazardous chemicals.

Initially, hazardous waste is managed by a generator (i.e., unit leader or manager, shop supervisor or foremen, or motor pool officer) who has received training in Hazard Communication and Hazardous Waste Site Operations. The waste is accumulated in designated areas known as WAPs, or satellite accumulation areas, that are designated, labeled, operated, and inspected in accordance with SOP requirements, which implement Texas Natural Resources Conservation Commission (TNRCC), NMED, and EPA requirements. Up to 55 gallons of a single hazardous waste stream or 1 quart of acutely hazardous waste may be accumulated in a WAP. There are approximately six WAPs on McGregor Range.

Once a WAP container becomes 80 percent full, appropriate DOT labels are affixed; it is inspected by the Defense Reutilization and Marketing Office (DRMO), and transported within 72 hours to the newly upgraded RCRA Part B permitted hazardous waste storage area located at Biggs AAF, Building 11614.

The facility at Building 11614 is permitted by the TNRCC for storage of RCRA hazardous waste as well as non-RCRA wastes classified by the TNRCC as Class 1. The TNRCC waste Class 1, is defined as: any industrial solid waste or mixture of industrial solid wastes, which, because of its concentration, or physical or chemical characteristics, is toxic; corrosive; flammable; a strong sensitizer or irritant; a generator of sudden pressure by decomposition, heat, or other means; or may pose a substantial present or potential danger to human health or the environment when improperly processed, stored, transported, or disposed of or otherwise managed.

The permit, HW 50296, was issued in January 1991 and is valid until January 2001. The facility includes seven permitted units. The seven units are divided into two areas, the processing area, which includes a metal building (Unit 1) with a storage capacity of 8,800 gallons, a concrete pad (Unit 2) with a storage capacity of 31,900 gallons with no free-liquids, and a canopy facility (Units 3A and 3B) with a storage capacity of 16,720 gallons with no free liquids; and the conforming storage area, which includes three modular buildings (Units 4, 5, and 6) for storing liquid wastes with a storage capacity of 19,800 gallons, and a concrete pad (Unit 7) with a storage capacity of 47,520 gallons with no free-liquids. General information, facility siting, facility management, waste analysis, engineering reports, geology reports, closure and post-closure plans, financial assurance releases from solid waste units and corrective action,

air quality, fees, and confidential information requirements for the RCRA Part B Permit and applicable modifications have been completed in compliance with TNRCC regulations (U.S. Army, 1994c).

One "less-than-90-day" (no permit required) hazardous waste temporary storage location has been established on McGregor Range; however, the unit is not currently operated by the USACASB. Negotiations are currently underway between the Directorate of Environment (DOE) and Range Command to start operations. The 90-day unit will eventually be used by range personnel to temporarily store hazardous waste prior to pick up by a waste contractor for treatment and/or disposal, and the waste will not be transported to the RCRA Part B storage location at Biggs AAF (McKernan, 1997).

In addition, off-specification or stockpiled ordnance may be classified as hazardous waste under the provisions of RCRA. At McGregor Range, ordnance is expended in a variety of small arms, grenades, mortars, howitzers, artillery, rockets, and missiles during training exercises and testing activities. Currently, material classed as ordnance or explosive hazards is either detonated in-place with explosives or removed for further evaluation.

The NMED issued RCRA Part B Permit NM4213720101-01 to the Army ADA Center, Fort Bliss, in June 1995. The permit authorizes treatment of hazardous waste munitions by open detonation (OD) at the OD Treatment Unit until June 2005. The OD Treatment Unit is a manmade excavation, approximately 500 feet by 200 feet by 20 feet deep, used for the destruction of explosives or munitions by detonation from a disposal discharge. It is located on an active portion of McGregor Range within the impact area for ballistic aerial targets, large-caliber munitions, and rockets.

The OD unit has been in use since 1965 to thermally treat pyrotechnics, explosives, and propellants produced from demilitarization of existing stockpiles and off-specification material. The Explosive Ordnance Detachment conducts explosive treatment at the OD unit approximately three to four times per year, or generally every quarter (U.S. Army, 1997p). Quantities of explosives that are currently allowed for treatment, according to the permit are 2,500 pounds per quarter; however, only 69 pounds were treated in CY 96.

In addition, the RCRA Part B Permit requires semi-annual soil sampling in and around the OD Treatment Unit. The OD Treatment Unit has been sampled four times since the permit was issued. The *Sampling and Analysis Plan* is provided in the permit as Attachment J. Samples are collected at the following locations at a depth of between 6 inches and 1 foot: one sample from the bottom of each of the two OD pits; three samples from the sides of each pit; four samples around the perimeter of each pit to evaluate the effect of kickout; and, three background samples from an area of the site which has not been impacted by operations. Samples are collected at the following locations from a depth of surface to 6 inches and 6 inches to 1 foot: eight random samples from the bottom of the treatment unit (flat area excavated surrounding the pits), and eight samples from the perimeter outside the treatment unit. In addition, samples are taken from 5-foot intervals from a 50-foot boring placed approximately in the middle of the treatment unit. The samples are analyzed for explosives, inorganics (including nitrate-nitrite constituents), metals, polychlorinated biphenyls (PCBs), and dioxins/furans. Metals and nitrate-nitrite concentrations detected are compared to established background levels and the explosives results are compared directly to the laboratory reporting limits. The results for the four compliance sampling events were not found to significantly differ from those of the initial unit characterization. However, the presence of Trinitrotrimethylenetriamine (RDX) and high melting explosive or octogen (HMX), and the conditions at the outer station (001) will be investigated further during the next compliance sampling event.

A permit modification request, for a revised sampling scope to reduce the level of sampling, has been prepared and submitted to the NMED for review and consideration, due to the relative consistency in

conditions at the OD Treatment Unit with ongoing activities. The compliance sampling scope and schedule will be revised, as appropriate, in accordance with NMED recommendations.

Fort Bliss submits a *Biennial Report* to the NMED and EPA prior to March 1, in every even-numbered year and covers the activities for the previous odd-numbered years, per 40 CFR 262.41. This report details information on the hazardous wastes generated, including the DOT hazard class; EPA hazardous waste identification number, quantity of waste; the EPA Identification Number of each treatment, storage, and disposal facility the waste was sent to; and a description of the Fort Bliss waste minimization program. The amounts of hazardous waste generated by Fort Bliss operations at McGregor Range in 1996 are provided in Table 3.14-1 (McKenzie, 1997).

Table 3.14-1. McGregor Range Hazardous Waste Generation Rates 1997

Location	*Pounds of Waste Generated*
McGregor Range	8,599
McGregor Range OD Treatment Unit	69

3.14.2 Items of Special Concern

3.14.2.1 Medical and Biohazardous Waste

Medical wastes include wastes generated by hospitals, clinics, physicians' offices, dental offices, veterinary facilities, and other medical laboratories and research facilities. Biohazardous waste, often called hospital waste, can typically include human blood and blood products, cultures and stocks of infectious agents and associated biologicals, isolation wastes, contaminated sharps, animal carcasses, contaminated bedding material, pathological wastes, and unused sharps.

McGregor Range generates small quantities of medical wastes at the range clinic. Large-scale training exercises, such as Roving Sands, may add several thousand pounds of waste per month during the exercise. The waste is collected and transported to the Troop Clinic where it is stored. The waste is picked up by a contractor every other day, and removed from the post. Ultimately, the waste is shipped to Dacona, Colorado, for disposal by a medical waste disposal contractor, BFI, in their permitted facility (Sims, 1997).

3.14.2.2 Asbestos

Asbestos-containing materials (ACMs) are those materials that contain greater than one percent asbestos. Friable, finely divided, and powdered wastes containing greater than one percent asbestos are defined as wastes, and are subject to regulation. A "friable" waste is one which can be reduced to a powder or dust under hand pressure when dry. Nonfriable asbestos-containing wastes, such as floor tiles, are considered to be nonhazardous, regardless of their asbestos content, and are not subject to regulation.

Approximately 80 percent of all buildings on Fort Bliss, including McGregor Range, contain some form of asbestos. Many of the buildings were built or renovated between 1940 and 1975, when the use of asbestos was common in the industry. The majority of the asbestos was in the form of pipe insulation. Several other types of ACMs, such as floor tiles, cement siding, and wall/ceiling coverings remain in place throughout McGregor Range facilities. So long as these ACMs remain nonfriable, they are not a health risk.

To date, asbestos surveys have not been accomplished in buildings on McGregor Range. Asbestos testing is being done in buildings that have been identified for renovation or demolition. Asbestos abatement is done prior to renovation or demolition (Felix, 1997).

Fort Bliss has a *Draft Asbestos Management Plan* for the identification and removal of friable asbestos on McGregor Range. Asbestos-containing waste materials resulting from demolition projects are disposed of in the Fort Bliss sanitary waste landfill. The landfill permit from the TNRCC allows disposal of ACM in the landfill. The material is disposed of at the bottom of the working cell and is covered by 1 foot of dirt or 3 feet of solid waste. The Fort Bliss DOE has an Asbestos Program Manager (APM) who is the primary contact for all asbestos-related projects on McGregor Range. The APM has distributed a Command Policy Letter to all personnel regarding command responsibilities, personnel responsibilities, and procedures for accomplishing asbestos-related projects.

3.14.2.3 Lead-based Paint

For a number of years, the Federal Government has been working to reduce the health risk from lead-based paint in residences and other buildings. The use of lead-based paints for residential and consumer use was banned by the Federal Government in 1978. The EPA and HUD, through Federal Register; Volume 63, No. 106, June 1998, "Proposed Rule, Identification of Dangerous Levels of Lead," are seeking to promulgate regulations consistent with Section 403 of the *Toxic Substance Control Act*, as amended by the *Residential Lead-Based Paint Reduction Act of 1992*.

As a means to control and minimize public exposure to lead, Fort Bliss has developed a draft *Lead Hazard Management Plan* that follows the provisions of the *Texas Environmental Lead Reduction Rules*. A Lead-based Paint Management Team that includes representatives from Family Housing, Preventive Medicine, the Public Affairs Office, and the Staff Judge Advocate is in-place at Fort Bliss.

Many of the facilities at McGregor Range were constructed prior to 1978 and are likely to contain lead-based paints. Lead wastes generated from building demolition are characterized to determine if they are a hazardous waste. To date, all lead wastes have been determined to be nonhazardous and are disposed of in the Fort Bliss landfill. If lead wastes were found to be hazardous, they would be stored in a less-than-90-day facility or the on-post permitted hazardous waste storage facility to await treatment or disposal at a permitted off-post facility. The on-post hazardous waste storage facility has a permit from the TNRCC. The permit was granted subject to the TNRCC rules.

3.14.2.4 Pesticides

It is DoD policy to reduce the use of pesticides and Fort Bliss has developed a *Pest Management Plan*, approved in December 1997, to meet this policy. The plan is applicable to McGregor Range operations and describes the installation's pest management requirements; outlines the resources necessary for surveillance and control of pests; and describes administrative, safety, and environmental requirements.

Pesticides and herbicides are not stored on McGregor Range. These materials are stored in their original containers at the following designated areas within the Fort Bliss cantonment area: the pesticide mixing/storage facility, Building 2509; Rock House Building 1235; Building 60-75; the Underwood Golf Course; Veterinary Clinic, and Self-Help Center. The containers are segregated by type and are positioned so the labels are visible. Excess or canceled storage containers are disposed by the DRMO. A sample inventory, from the *Pest Management Plan*, of the types and amounts of pesticides/herbicides maintained on Fort Bliss is provided in Table 3.14-2.

Table 3.14-2. Fort Bliss Pesticide Sample Inventory

Rodenticides	
Apache Fly Bait	5 lb. (1 unit)
Dursban Pro	8 gal.
Max Force Ant Station	96 stations (4 units)
Ortheen Tree Orna	21 lb. (2 units)
Pest Strips 18.6%	196 oz. (70 units)
PT Pyrethrium PT 565 Plus	972 oz. (54 units)
Resmethrin	77 oz. (7 units)
Rodere-Paraffinized 0.005%	4 units
Tempo 2	10 L (42 units)
Torus (1GR)	5 fl. oz. (15 units)
Insecticides	
Carbaryl (Sevin)	60 lb. (6 units)
Combat Bait	252 packs (22 units)
Dipel Dust	224 oz. (14 units)
d-Phenothrin	1,560 oz. (130 units)
Dursban	15 lb.
Dursban-4E	13 gal. (13 units)
Ficam	3 lb. (3 units)
Malathion	220 gal. (44 units)
Perma-Dust	31 lb. (31 units)
Roach Motels	2 units
Safrotrin	87.5 fl. oz. (70 units)
Sevimol	5 gal.
Temp-20%	1,152 packs (48 units)
Torpedo TC	5 gal. (5 units)
ULD-B100	510 oz. (15 units)
ULD-B300	374 oz. (11 units)
Herbicides	
Atrex	8,250 lb.
Chipco 26019	16 gal.
CU2SO4	400 lb.
Dalapon	167 lb.
Hyvar	1,900 lb.
Krovar	1,026 lb.
Pramitol	250 lb.
Roundup	224 lb. (28 gal.)
Tordon	200 lb.
Miscellaneous	
Bird Repellent (liquid)	2 gal. (2 units)
Bird Repellent Roost-No-More	199.5 oz. (19 units)
Mildew Control	304 fl. oz. (19 units)
MSMA	29 gal.

Source: U.S. Army, 1997q.

The Preventive Medicine Section conducts surveys throughout the year to determine what pests are present. On McGregor Range, the primary pests are roaches. This information is provided to the Preventive Maintenance Section to obtain the required pesticides. In accordance with EPA and DoD requirements, the program utilizes four certified Pest Controllers, five in-house DoD-certified herbicide applicators; and the Underwood Golf Course employs one DoD-certified pest applicator and one State of Texas-certified applicator. Each DoD pest controller is certified by the Academy of Health Sciences at Fort Sam Houston, Texas. Recertification is required every 3 years. The Preventive Maintenance Section applies pesticides on McGregor Range as needed to control these pests. In addition, the Preventive Maintenance Section Roads and Grounds crew applies required herbicides. Pesticides and herbicides are only transported in assigned vehicles with lockable storage compartments and each vehicle is equipped with spill control equipment.

Pesticide and herbicide application is documented monthly on Form 1532. The form includes the name of the target pest, type of operation, total units treated, unit, site, name of the pesticide/herbicide applied, amount, final concentration, and hours spent. This information is tracked by the organizations that apply, store, or sell pesticides and herbicides to include the Preventive Maintenance Section, Land Management Section, Underwood Golf Course, Veterinary Clinic, and Self-Help Center. The 1532 forms, which summarize the monthly data, are then sent to Command Headquarters, TRADOC, Entomology in Fort Monroe, Virginia, at the end of each calendar year (McKernan, 1997; U.S. Army, 1997q).

3.14.2.5 Radon

Radon is found in high concentrations in rocks containing uranium, granite, shale, phosphate, and pitchblade. In outside air, radon is diluted to insignificant concentrations. If radon is present in soils surrounding a building, it could potentially enter the building through small openings and accumulate in enclosed areas such as basements.

The Fort Bliss radon-monitoring program was discontinued in 1995 at the direction of the Director of Health Services, Preventive Medicine Department. The program was canceled based on the geological location of the Fort Bliss community, and the results of more than 500 completed radon tests. All analytical results for radon were below the regulatory threshold (Shahrijar, 1997).

3.14.2.6 Low-level Radioactive Waste

Fort Bliss commands, including those on McGregor Range, generate low-level radioactive waste in the form of commodity items such as compasses, dials, gauges, and sighting devices that are no longer fit for use. These wastes include tritium, radium, and promethium. Other radioactive materials, such as chemical warfare alarms and monitors, are shipped back to the Aniston Army Depot for proper management and are not considered Fort Bliss wastes. Medical radioactive waste is not generated on McGregor Range.

All nonmedical, low-level radioactive waste is managed by the Director of Health Services Radiation Protection Officer. A post-radioisotope committee provides oversight to the program. Low-level waste is segregated at a turn-in point and is stored within a double fenced and locked area on the Main Cantonment Area. The building is marked with the words “Radioactive Materials” on three sides. The waste is stored in 55-gallon drums that are also labeled with the words “Radioactive Materials.” Fort Bliss generated approximately three 55-gallon drums of low-level radioactive waste materials over the 2-year period 1995 through 1996 (Collins, 1997).

The Director of Health Services Radiation Protection Officer coordinates all shipments with the Army Material Command, who in turn coordinates with the Barnwell, South Carolina, low-level waste disposal

contractor. The disposal contractor completes the proper manifests and labels for the shipment and transports the waste from Fort Bliss to Barnwell, South Carolina.

USAADACENFB Pamphlet 40-1 and SOP *"Processing Radioactive Material for Turn-In"* provide guidance in the proper procedures for management and turn-in of radioactive commodities.

3.14.2.7 Petroleum Storage Tanks

The underground storage tank (UST) regulations are the responsibility of the EPA and are regulated within RCRA as amended by the Hazardous and Solid Waste Amendments of 1984. The State of New Mexico has adopted their own regulations and has been delegated the federal UST program. The Uniform Fire Code and National Fire Protection Association requirements that address USTs and above-ground storage tanks (ASTs) may be enforced by state Fire Marshals.

Fort Bliss is completing a four-phase project to upgrade their existing USTs to meet federal and state requirements, and reduce their total number of USTs to less than 150. There are 10 USTs and 1 AST located on McGregor Range that are currently in use for storing diesel fuel, leaded and unleaded gasoline, used oil, antifreeze, and JP-8 jet fuel. These tanks range in size from 300 to 20,000 gallons (Lenhart, 1997). The tanks were upgraded prior to December 22, 1998, as required by 40 CFR 280.20, *Upgrading of Existing UST Systems*, (Lenhart, 1999).

Fort Bliss had identified 29 sites that formerly had leaking petroleum storage tanks; however, none of the sites identified were located on McGregor Range. The sites were reported to the TNRCC and NMED, as appropriate and remedial actions were performed in consultation with the respective agency. A list of these sites is provided in the *Fort Bliss Mission and Master Plan PEIS* (Lenhart, 1997).

3.14.3 Related Management Programs

3.14.3.1 Installation Restoration Program (IRP)

The IRP is the DoD program designed to identify, characterize, and remediate environmental contamination on military installations. The program was implemented in response to *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* requirements to remediate sites that posed a health threat. Section 211 of the Superfund Amendments Reauthorization Act amended CERCLA and established the Defense Environmental Restoration Program that ensures that DoD agencies have the right to conduct their environmental restoration programs.

Historically, the materials that have been identified during DoD IRP activities have resulted from fuel management and spills, fire protection training, landfills, pesticide application, and industrial operations associated with vehicle operations and maintenance.

The McGregor Range IRP began in 1983, in response to an installation assessment in February 1983. POLs are the primary contaminant of concern on McGregor Range. No off-range contamination has occurred and the range is not on the National Priorities List. A cooperative working relationship has been established between regulatory agencies and the IRP program manager. Citizens have participated in public meetings held before and during major restoration projects.

By 1996, a total of 11 IRP sites had been identified on McGregor Range and entered into the Defense Site Environmental Restoration Tracking System (DSERTS). Ten of the sites are at the McGregor Range Camp or within a few miles of the camp. The other site is the active oxidation pond at Meyer Range (Blough, 1997).

3.14.3.2 Pollution Prevention

EPA and DoD are both in the process of implementing follow-on guidance for EO 13101, G*reening the Government*. The thrust of this EO is for the Federal Government to take a more aggressive leadership role in promoting recycling and the use of recycled products, as well as to encourage technological innovations and other government-wide initiatives to prevent pollution through waste minimization.

The Hazardous and Solid Waste Amendments of 1984 require RCRA large quantity generators to certify that a program to reduce the amount and toxicity of hazardous waste is in place. RCRA permits for treatment, storage, or disposal of hazardous waste must also contain this certification. As a RCRA large quantity generator and permitted storage and treatment facility, Fort Bliss, including McGregor Range, has made this certification.

TNRCC regulations require the development of a *Source Reduction/Waste Minimization Plan* by facilities that either generate large quantities of hazardous waste or release toxic chemicals. Army policy, set forth in AR 200-1 (U.S. AR 200-1, 1997), is to reduce the quantity or volume and toxicity of hazardous wastes generated by Army operations and activities wherever economically practicable or environmentally necessary. To meet these requirements, Fort Bliss developed a hazardous substance minimization (HAZMIN) plan. The HAZMIN plan, dated January 1996, only addresses the source reduction and waste minimization aspects of pollution prevention. This plan includes activities on McGregor Range. In addition, Fort Bliss will adopt the *Integrated Pollution Prevention Plan (IPPP)*, being developed by the Air Force Center for Environmental Excellence, to address other pollution prevention and waste minimization issues. These issues include water and air pollution, PCB management, reduction of ozone-depleting substances, UST and POL management, energy conservation issues, EPCRA requirements, pesticide management, and solid waste management. The IPPP will include McGregor Range. The final draft of the IPPP was accepted by the Army in July 1998. The plan will be used in September 1998 to develop 12 projects.

In 1995 Fort Bliss was selected by the TRADOC as one of six pilot installations for the implementation of Hazardous Substance Management System (HSMS). The HSMS is the DoD-wide automated system for the "cradle-to-grave" tracking of hazardous chemicals purchased and used on post, and of the hazardous wastes generated and disposed of as a result of using the hazardous chemical. Fort Bliss has achieved HSMS initial operational capability and limited Hazardous Material Pharmacy (HazMart) operations. By August 1998, the two largest users of hazardous materials, the Installation Maintenance Division and the Department of Public Works, were entered in the HazMart component of the HSMS. The HazMart serves as the centralized location on post for the physical management of the requisitioning, receipt, storage, issue, usage, and eventual coordination for the disposal of hazardous chemical and hazardous waste.

Fort Bliss has a central recycling center and one drop-off point that has containers for cardboard, paper, glass, and plastics. A fluorescent tube crushing operation is also being implemented to save valuable space at the landfill and to control the disposal of mercuric compounds contained in the tubes. McGregor Range participates in the Fort Bliss workplace recycling program that was implemented in November 1996. Range personnel turn in used antifreeze, wet lead acid batteries, used tires, used oil, scrap metal, and solvents for recycling.

Environmental Consequences

4.0

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents the environmental consequences, (direct and indirect effects, and cumulative impacts) of implementing one of the six alternatives described in Chapter 2. Discussions of resources are based on the environmental setting specific to the described resource (Chapter 3) as they are potentially impacted. The discussion of environmental consequences follows the order of presentation of the fourteen resources described in Chapter 3. Therefore, Chapter 2 has described the proposed action and alternatives, Chapter 3 has described the environmental setting into which the action is being proposed, and Chapter 4 now describes the environmental consequences of implementing the alternatives. The detailed description of each alternative is presented in Chapter 2. To assist the reader, a brief description of the alternatives is presented below.

ALTERNATIVE 1

Under Alternative 1, the withdrawal of McGregor Range would be renewed for the same area provided in PL 99-606. The withdrawal would be the 608,385 acres currently withdrawn under PL 99-606. As described in Section 2.1.1, current military activities would continue and could expand in the future with additional training needs.

ALTERNATIVE 2

Under Alternative 2, Congress would renew the withdrawal of 568,385 acres in the Tularosa Basin and Otero Mesa portions of McGregor Range. About 40,000 acres in the Sacramento Mountains foothills portion of McGregor Range, including the Culp Canyon WSA, would return to the public domain. Army fee-owned in-holdings within this area would be retained for specialized training. Current mission activities that use the Sacramento Mountains would be constrained or reduced.

ALTERNATIVE 3

Under Alternative 3, the Tularosa Basin portion of McGregor Range would remain withdrawn for continued military use. The withdrawn area of McGregor Range (about 428,385 acres) would encompass areas within the Tularosa Basin and the escarpment of Otero Mesa. About 180,000 acres in the Otero Mesa and Sacramento Mountains foothills portions of McGregor Range would return to the public domain. Army fee-owned in-holdings within this area would be retained for specialized training. Current mission activities that use the Sacramento Mountains and Otero Mesa would be constrained or eliminated.

ALTERNATIVE 4

Under Alternative 4, only portions of the Tularosa Basin south of New Mexico Highway 506 would be withdrawn for military use (about 364,385 acres). About 244,000 acres north of New Mexico Highway 506 and on Otero Mesa would be returned to the public domain. Army fee-owned in-holdings within this area would be retained for specialized training. Current mission activities that use the area north of New Mexico Highway 506 and Otero Mesa would be constrained or eliminated. Most potential, future training activities may not be supportable under this alternative.

ALTERNATIVE 5 – NO ACTION

Under Alternative 5, the No Action Alternative, the withdrawal of McGregor Range would not be renewed and all the land would return to the public domain. Army fee-owned in-holdings within this

area would be exchanged for public lands in TAs 8 and 32, in order to maintain essential infrastructure around McGregor Range Camp, the McGregor ASP, and the Meyer Range Complex.

ALTERNATIVE 6

During scoping, it was suggested that Congress designate the Culp Canyon WSA as a wilderness area. In addition, Congress could designate the Otero Mesa and Sacramento Mountains foothills, including in-holdings that are held in fee by the DA, as a NCA. The affected fee-owned in-holdings would be exchanged for other public lands elsewhere within McGregor Range. Alternative 6 would require separate congressional action (a separate withdrawal) and could potentially alter the management practices associated with the area included in the NCA.

DIRECT AND INDIRECT EFFECTS AND CUMULATIVE IMPACTS

Direct effects are those caused by the action and occur at the same time and place (40 CFR 1508.8). For example, the effects of a congressional decision to change the segregation of public lands through the size of the McGregor Range military land withdrawal would have a direct effect on land use management by both military and nonmilitary users of the currently withdrawn land.

Indirect effects are caused by the action (congressional decision to segregate public lands) and are later in time or farther in distance, but are still reasonably foreseeable. For example, a decision to reduce the size of the withdrawal so that some military missions could not be adequately accomplished causing units to be reassigned to other installations, reduced, or disbanded would result in indirect effects on the local economy (40 CFR 1508.8). Other examples of indirect effects are the impacts of military uses on water, biological, or cultural resources. Another example is the indirect effects of nonmilitary activities on public land that is presently withdrawn but would be returned to the public domain. This occurs under Alternatives 2, 3, 4, 5, and 6.

Cumulative impacts are incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7).

Cumulative environmental impacts are most likely to arise when a relationship exists between a proposed action or alternative and other actions that have or are expected to occur in a similar location, time period, and/or involving similar actions. For example, the Army and the BLM entered into a 1966 MOU that allows co-use grazing on the McGregor Range. This decision was separate from the congressional decision withdrawing the land 9 years earlier, in 1957. The incremental effects of grazing on resources such as vegetation, when added to the effects of military activity, become cumulative impacts. Similarly, as a result of the 1990 Army and BLM MOU, current effects of nonmilitary uses of withdrawn land under Alternatives 1, 2, 3, and 4, such as grazing, mineral development, or recreation on physical, biological, and/or cultural resources result in cumulative impacts. In addition, projects in close proximity to the proposed action or alternative would be expected to have more potential for cumulative impacts than those more geographically separated. These projects could be proposed by various agencies (federal, state, or local) or persons.

The cumulative effects assessment in this LEIS focuses on addressing two fundamental questions: (1) Does a relationship exist such that the impacts from the proposed action or alternative might affect or be affected by the impacts of the other actions? And (2) if such a relationship exists, does this assessment

reveal any potentially significant impacts not identified when the proposed action or alternative is considered alone?

For the purposes of this LEIS, two types of activities have been identified that, in combination with the proposed action, have the potential for contributing to cumulative impacts on resources within McGregor Range or an ecosystem that occurs on but extends beyond McGregor Range. They are:

- On-going or projected military activities in the ROI, including areas of Fort Bliss other than McGregor Range, WSMR, and HAFB;

- Nonmilitary activities and plans that also affect areas or resources affected by the proposed action or alternative, including resource management and planning by BLM and USFS (such as grazing, mineral development and recreational use), and those activities of the states of New Mexico and Texas, Doña Ana and Otero counties, New Mexico, and El Paso County, Texas.

These activities are described in detail in Appendix G, *Cumulative Impacts Analysis Background*. The activities are summarized as follows.

Military activities on the Fort Bliss Training Complex with potential for cumulative effects on McGregor Range and contiguous ecosystems include training and testing activities on the South Training Areas and Doña Ana Range–North Training Areas. These include:

- Weapons firing,
- SDZs,
- Off-road vehicle maneuvers,
- Dismounted training, and
- Aircraft operations.

Military activities at WSMR are centered on mission support for research, development, testing, and evaluation of Army missile and rocket systems. WSMR is adjacent to the Doña Ana–North Training Areas of Fort Bliss, west and northwest of McGregor Range. Training, testing, and environmental resource management activities at each installation can affect resources and ecosystems that transcend installation boundaries.

Military activities at HAFB, other than the USAF construction of a new air-to-ground tactical target complex, such as the deactivation of units such as the 435th Fighter Squadron that reduced flight operations over McGregor Range, have the potential to contribute to the cumulative effects on McGregor Range.

58

The BLM Las Cruces Field Office encompasses McGregor Range. The White Sands RMP, as amended by the McGregor Range RMPA describe BLM area-wide activities with potential to affect McGregor Range. The White Sands RMP serves as the basis from which the BLM co-manages lands on McGregor Range and on public lands in the vicinity of McGregor Range and WSMR. The RMPA provides a comprehensive framework under the White Sands RMP for managing the withdrawn lands of McGregor Range. The RMPA sets forth the land-use decisions, terms, and conditions for guiding and controlling future management actions on McGregor Range that could contribute to cumulative effects. The objectives of the RMPA are to:

- Make withdrawn public land and its resources on McGregor Range available for use and development for the public;

- Provide for the public use of locatable, leasable, and salable minerals consistent with the laws that govern these activities and to minimize environmental damage;

- Maintain and enhance the soil, water, and air resources on McGregor Range;

- Maintain a desirable plant community which is equivalent to the present rangeland ecological condition and to protect federal, state, and candidate threatened and endangered plants;

- Stabilize ecological condition and trend, or improve trend in other areas and increase production;

- Ensure optimum population and a natural abundance and diversity of wildlife resources by restoring, maintaining, and enhancing habitat conditions and to conserve rare, vulnerable, and representative habitats, plant communities, and ecosystems on McGregor Range;

- Manage recreation use to protect the health and safety of users, to protect natural and cultural resource values, and to promote public use and enjoyment;

- Manage visual resources to protect the quality of the scenic values;

- Protect and provide for the proper use of cultural resources.

The USFS manages lands adjacent to the northeastern boundary of McGregor Range including grazing, minerals, water, soils, fuel wood gathering, hunting, and recreation. USFS actions that could affect McGregor Range are included in the *Forest Management Plan* for the Lincoln National Forest (USFS, 1986).

The states of New Mexico and Texas administer certain lands and highways in the ROI. New Mexico is evaluating plans to widen portions of U.S. Highway 54 near McGregor Range. Texas has no current plans known to contribute to cumulative effects on McGregor Range.

Doña Ana and Otero counties, New Mexico, and El Paso County, Texas are in the ROI for this LEIS. In the New Mexico counties, community and private developments could contribute to cumulative effects. Growth in El Paso County could cumulatively affect regional groundwater supplies and regional air quality.

MITIGATION MEASURES

Mitigation measures have been incorporated into each alternative, if the impact analysis indicates that adverse impacts would result from implementation of the alternative. These measures are intended to reduce or eliminate the negative impact to the resource.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This section identifies the major irreversible and irretrievable commitments of resources that are identifiable at the level of this analysis. A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of resources neither renewable nor recoverable for later use by future generations.

Land Use

4.1

4.1 LAND USE

Assessment of impacts on land use resulting from withdrawal actions defined for each alternative considered:

- potential effect of withdrawal action on land use and environmental resource management planning;
- potential effect of continued military and nonmilitary activities on existing land uses and users of military withdrawn lands in the future; and
- effect that return of lands to the public domain would have on land use management under the public land laws.

It is assumed that withdrawn public lands would continue to be managed under the existing White Sands RMP and RMPA (BLM, 1986a, 1988b), and the MOU (BLM, 1990b) between the Army and the BLM. These documents would be revised or amended, as necessary, to reflect any changes in withdrawn area. Any future revisions to this management framework to improve management practices or to redefine responsibilities would need to be agreed to and implemented cooperatively between the Army and the BLM. Because these types of actions have not been identified, environmental impacts of amendments or changes, if any, would need to be assessed in the future. It is also assumed that there would be no military use of land not included in the withdrawal renewal, except through specific agreements similar to the existing cooperative-use agreement between the Army and the USFS. However, no new co-use arrangements have been included in the definition of actions in the LEIS. It is also assumed that new legislation enacted by Congress, authorizing continued military withdrawal (as defined for each alternative), would provide for priority military use of withdrawn lands as under PL 99-606 (MLWA, 1986).

Public lands throughout the west have differing value and resource potential. These variations are reflected in local RMPs that identify management priorities and actions to achieve the greatest benefit for the public. The White Sands RMP provides the overall planning framework for the withdrawn lands on McGregor Range. The RMPA provides further information identifying the resources that are found on McGregor Range and for understanding their value. The following sections use the White Sands RMP and RMPA framework for discussing potential effects on land use and land users for each alternative.

Land use affects management of other biophysical and cultural resources; these effects are addressed more fully in other sections of this document. Additional information is found for the following resources: soil (Section 4.5.2); mineral and energy resources (Section 4.5.7.1); water (Section 4.7.2); and air (Section 4.6.2); habitat, wildlife, and water and fire management (Section 4.8.2); and cultural resources (Section 4.9.2).

4.1.1 Alternative 1

Under Alternative 1, there would be no change in boundaries of the withdrawal area (size of the withdrawal, 608,385 acres), and no change in the management status of the lands included in McGregor Range. As described in Section 2.1, military activities could vary from the same as currently conducted, to an expanded range of capabilities and intensified use.

4.1.1.1 Effects on Land and Resource Management Plans for McGregor Range

BLM
No changes to the existing RMPA (BLM, 1990a) would be anticipated for withdrawal renewal of McGregor Range. Currently, management activities address potential multiple uses for several resources (such as minerals and vegetation), and any nonmilitary use and access must be approved by the Army. The Army would be responsible for military activities on withdrawn lands, or on public lands as specified in the existing MOU (BLM, 1990b). Some ongoing surveys and inventories of resources on McGregor Range could provide new information for deciding appropriate management actions. Where these may be different from existing RMPs, they could be incorporated into focused activity plans such as coordinated RMPs or habitat management plans.

The Army's natural and cultural resource management plans and activities would continue to address actions to minimize impacts from military uses within the MOU management framework. The existing White Sands RMP (BLM, 1986a), RMPA (1988b), and activity plans would continue to be the primary resource planning documents for withdrawn public land.

If Congress does not designate Culp Canyon WSA as wilderness, then an amendment to the RMPA or new activity level plan may be required in the future. This is not directly related to the proposed withdrawal renewal. Military use of this area would not be different from current activities, but nonmilitary uses could be different if the area is no longer managed to preserve wilderness qualities. These activities are compatible with interim management objectives to preserve wilderness qualities. It is anticipated that future ground troop activity uses would be compatible with wilderness management. Noise from possible increased low-level helicopter flights could be annoying to some recreationists. Because visitation to this area is extremely low, and operations would be relatively infrequent and short in duration, impacts to wilderness resources would be minimal.

Otero County
The Draft *Otero County Comprehensive Land Use Policy Plan* has not been adopted. It is, therefore, not known to what extent the implementation of county plans may differ with federal resource management's goals and objectives. Preliminary draft components indicate land uses of value to county residents and county policy to protect the interests of private property owners. However, the renewal proposal would not affect private property rights or interests since the area of concern is within the public domain. Of the several cultural and customary uses of land in the county, McGregor Range has been used primarily for hunting and gathering of food, cattle grazing, and more recently, recreational activities such as hiking, observing nature, and enjoyment of the area's isolation. Also, the county maintains access for remote rural communities on New Mexico Highway 506. The county's primary interest is maintaining access for these customary uses.

Although constrained by Army procedures for access and periodic closures for military activities, these customary uses have continued, and will continue in the future. Expanded training operations could reduce access for ranching activities and recreation. However, the grazing program will continue, and recreational access will be available intermittently, and can frequently be accommodated at some location on the range at the time access is requested. Access for rural residents around Timberon and Piñon may be inconvenienced by additional closures of New Mexico Highway 506, but these areas have more direct routes to Alamogordo, the county seat to the north.

Preliminary reports provided by Otero County to reflect their current policy and interests in public lands indicate that extensive military uses on WSMR and Fort Bliss are important in defining land uses for Otero County. These uses provide an important economic base for the county. Overall, continued withdrawal is considered consistent with county land use policy and planning.

4.1.1.2 Effects on Land Uses and Land Users of McGregor Range

Military Use. Full renewal of the current withdrawal of 608,385 acres, plus 1,010 acres of previously state-owned land (609,395 acres), would allow the U.S. Army to continue its current air defense mission. This withdrawn area, the 71,083 acres of Army fee-owned land, and the MOA for existing military use of USFS lands in Lincoln National Forest (18,004 acres) would provide flexibility to support the existing mission activity and expanded operations, if required in the future. Most areas of McGregor Range would continue to have the same kind of military activities, while the level of use could increase from new capabilities. Development of a target complex on Otero Mesa would expand military use of TAs 17 and 21 to include surface impacts. The impact area would be cleared regularly, limiting build-up of potentially hazardous material or debris from training ordnance. Use of associated safety areas for this facility would require coordination of missile firings, ground troop uses, and use of FTX sites on Otero Mesa. Because of this, the number of hours for military use may increase, and therefore, decrease the time available for other purposes. Effects of restricted use on nonmilitary uses is described below.

Nonmilitary Use. Provisions for nonmilitary uses of the land would remain largely the same as under PL 99-606. In about 271,000 acres coincident with 14 grazing units, the primary nonmilitary uses would continue to be livestock grazing, hunting, and dispersed recreational use such as hiking and observing nature, managed in accordance with the White Sands RMP (BLM, 1986a) as amended by the McGregor Range RMPA (BLM, 1990a). Depending on which future military developments are implemented, there could be some reduction in the acreage available for these uses or reduction in time that access is permitted. Some areas on McGregor Range (such as Culp Canyon WSA and McGregor Black Grama Grassland ACEC) would continue to be protected for their special resource qualities.

In general, with the exception of the USAF tactical target complex (see *Access and Realty* and *Livestock Grazing* below), continuation of current levels and types of military activities would result in no change to current users. Intensification and increased military activities in training areas in the Tularosa Basin, south of New Mexico Highway 506 (including potential helicopter gunnery and combat aviation training facilities), would generally have little effect on current public uses (such as grazing and recreation), since this area is already being used more or less exclusively for military purposes. Proposed and envisioned actions that would expand use of the remainder of the range (271,000 acres within the designated grazing areas) have the greatest potential for affecting current uses.

30

Access and Realty. There would be no change in conditions affecting access to withdrawn lands or real estate on McGregor Range. New Mexico Highway 506 would continue to be open for public access without requiring an Army permit. Periodic closures for missile firings would continue and may increase slightly in frequency. The closure schedule would continue to be publicly distributed on a regular basis to local residents. Closures may continue to be inconvenient for rural residents when the road is closed for a few hours on missile firing days (Appendix B). However, alternate access routes exist, and helicopter services are available for emergencies. Use of the GAF target complex is expected to reduce access of 60,000 acres on Otero Mesa for up to 60 hours per week (USAF, 1998).

Location of possible future facilities would need to be sited to avoid existing ROWs, particularly the existing commercial 345 kV powerline.

The installation initiative to potentially pave a roadway to Meyer Range may affect existing natural gas and electric line easements between McGregor Range Camp and the El Paso County line. Similarly, siting of a potential rail spur line could affect existing utility supply lines serving McGregor Range Camp and SHORAD/Orogrande complex.

Energy and Minerals. The Army does not propose to change the procedures for exploration or extraction of minerals presented in the McGregor Range RMPA (BLM, 1990a). The range would continue to be withdrawn from public mining laws. The RMPA provides for access to certain resources with Army concurrence. Under the McGregor Range RMPA, the range would remain closed to locatable minerals; therefore, no change in mineral activity would result. Due to limited potential for viable commercial mineral reserves on the withdrawn land, this would have little impact on mineral resources in the region (U.S. Army, 1998g). The Army, in coordination with BLM, may develop and use geothermal resources in the south part of the range for heating of facilities in McGregor Range Camp, and possibly, to provide a local power source for a desalination plant. Due to the relatively low temperatures of the geothermal resource, there is limited potential for commercial power generation using currently available technology.

Oil and gas resources on McGregor Range would continue to be available as described in the RMPA. The RMPA states that 100,000 acres on McGregor Range are open for oil and gas and geothermal leasing with Army concurrence. The remainder of the range would be closed to leasable mineral and energy resources. New interest in oil and gas exploration on McGregor Range and immediately to the east has been expressed to BLM resulting from recent discoveries of commercial quantities of gas in the area outside the range. In all cases, continuing military activities would not result in depletion of locatable mineral, leasable mineral, or oil and gas resources. Over 287,000 acres would continue to be open for salable minerals such as sand and gravel, building stone, and caliche.

Water Use. Water demands could increase as a result of potential military activities based upon installation capabilities and construction of several facilities to support these future activities. Sources for additional water would likely be from public suppliers via pipeline or truck, depending on where the supplies are needed. No additional water appropriations are anticipated, but use of water from regional aquifers is implied. Construction of a USAF tactical target complex on Otero Mesa would require relocation of some of the existing water lines, which support wildlife and livestock south of New Mexico Highway 506.

Army-owned water would continue to be available for preservation of fish and wildlife, and livestock on withdrawn and Army fee-owned land through a BLM-maintained water distribution system. The maintenance of this system would continue to be the responsibility of BLM and funded by the grazing program.

Livestock Grazing. Livestock grazing would continue in currently defined grazing areas. Potentially about 5,000 acres of grazing lands could be removed from existing grazing units 9 and 13 (TAs 17 and 21) for use as a USAF air-to-ground impact area. This would reduce 1998 grazing areas on McGregor Range by about 2 percent, with an equivalent reduction of about 450 AUMs.

In addition, training activities on the new target complex would reduce time available for BLM and ranchers to tend livestock and maintain grazing areas and water lines within the safety area surrounding the target complex. This larger area affects portions of seven grazing units and includes about 60,000 acres that could sustain about 430 animal units (under current grazing levels). Closures would be up to 60 hours per week. Implementation of several actions identified in the environmental documentation for the proposed target complex would reduce potential adverse effects on grazing (USAF, 1998).

Periodic use of existing and proposed controlled access FTX sites could reduce forage on less than 4 percent of the grazing areas on McGregor Range and resulting disturbance to acreage. About 8 square miles of additional sites being considered could potentially affect about 5,120 acres of grazing land from periodic military use. The overall impact to grazing from use of controlled access FTX sites would be

minimal. The U.S. Army will monitor trends in vegetative cover at these sites using a rotational system to minimize degradation of rangeland.

Wildlife and Habitat Management. There would be little change in wildlife and habitat management as a result of continued or expanded training. The Army would be responsible for compliance with the *Endangered Species Act* in areas where military activities cause impacts. The Army would manage biological resources through its ITAM program and INRMP for military activities.

The McGregor Black Grama Grassland ACECs would continue to be managed under Cooperative Agreement between the Army, BLM, and New Mexico State University. No military or civilian activities would occur within the ACECs.

Recreation. Availability of McGregor Range for recreational activity could be reduced by expanded hours of military operations in the future. This would mostly affect seasonal game bird hunting, which is one of the most frequent public recreational uses. Hours available for recreation on some areas of Otero Mesa may be limited to early morning, later afternoon, and some weekends. Given the low number of requests for public access to McGregor Range, and specifically, Otero Mesa, the relative effect of reduced access from continuing or expanded military uses would be minimal. Licensed hunts scheduled by NMDGF would continue; therefore, this use would not be affected. Additional and improved roadways to new facilities could reduce the amount of land with semi-primitive, unmotorized recreational opportunities on McGregor Range, but could improve access for other types of recreation.

Wilderness. No change in the use of Culp Canyon WSA is anticipated. Culp Canyon WSA would continue to be managed under the *Interim Management Policy and Guidelines for Lands Under Wilderness Review* (BLM, 1987) until a congressional determination on its wilderness status is made. Current military use for ground troop maneuvering and as a safety buffer during missile firings would not impair long-term preservation of wilderness qualities.

Cultural Resources. Construction of new facilities, impacts from inert training ordnance, and increased foot and vehicular traffic could potentially affect cultural resources. Fort Bliss is developing procedures in its cultural resource management program that will make compliance with Section 106 of the NHPA proactive in the approval process for any new activity or location for military use. This would minimize potential impacts to cultural resources.

To the extent practicable, new construction and activities would be located to avoid areas that are listed on the NRHP or that have been identified as eligible or potentially eligible for the NRHP. These have been specially designated for avoidance in the SOP for weapons firing and training area use (U.S. Army, 1996b).

Continued control of public access to McGregor Range would help protect cultural resources from vandalism and damage.

4.1.1.3 Effects on Surrounding Areas

Continued withdrawal of McGregor Range for military use would have minimal effect on surrounding areas. The most likely source of impact on surrounding areas would be noise from military activities and closure of New Mexico Highway 506 that provides access to communities on the east and north side of the range. Overflights in the vicinity of some ranches and the community of Timberon may increase noise from aircraft operations for a new tactical target complex. Noise would not be expected to increase over Culp Canyon WSA due to the flight patterns associated with training. Increased HIMAD missile

firings could result in a few additional road closures each year. Closure schedules would continue to be circulated to local residents in advance. Emergency services would continue to use alternate access routes.

4.1.1.4 Effects on Aesthetics and Visual Resources

Most of McGregor Range has been classified as VRM Class IV and III due to the undistinctive visual attributes and low sensitivity. Construction and activities from continuing and expanded military activities would be subordinate to the middle and distant natural landscape and not conflict with management objectives for Class IV and III resources. As necessary, specific proposals could incorporate methods that minimize the extent of visual modifications. Some visible changes to the foreground would need to be evaluated when specific project actions are known. However, unless extensive land disturbance or very large, new facilities or equipment are involved, visual changes are likely to be consistent with the level of recommended modifications. The existing classifications consider the area's primary purpose for military activities and the relatively low number of public visitors who see the area.

The visual quality of Culp Canyon WSA (VRM Class II) would be unaltered.

4.1.2 Alternative 2

Under Alternative 2, the withdrawal area would encompass about 40,000 acres less than the current configuration. Of this, 29,000 acres would revert to control by BLM under the public land laws, and about 11,000 acres comprising Culp Canyon WSA would continue to be managed by BLM under the Interim Guidelines. It is assumed that BLM would continue to manage the 29,000 acres as under the RMPA. Public access to returned areas would be in accordance with DOI and Army consideration of the clean-up of ordnance and explosive hazards. Under this alternative, the potential for dangerous debris in the area that would be returned is extremely low, and most public uses are already permitted in the area. It is, therefore, unlikely that there would be any delay associated with preparing the property for return to the public domain.

About 22,000 acres of Army fee-owned land within this area would continue to be used for specialized training and would be managed by BLM for nonmilitary use on a noninterference basis with military activities. About 568,385 acres would be withdrawn and continue to be managed under the existing RMPA and MOU. Army fee-owned land, 49,000 acres, remains within the withdrawn area and would be managed similar to existing arrangements for grazing and other nonmilitary use. The total land upon which military operations could be conducted (including USFS land) would be about 658,480 acres.

4.1.2.1 Effects on Land and Resource Management Plans for McGregor Range

BLM
This alternative would result in little change in the status of most of the lands currently under PL 99-606, and therefore few changes to the existing RMPA or MOU would be required (except to adopt changes in withdrawn land areas). Use and management of the small portion of land that would revert to exclusive BLM management under the public land laws would generally be similar to the current situation. BLM will continue to use the existing RMPA as the general management framework. A draft *Coordinated RMP* for grazing units 4 and 5 has been prepared by BLM and could be adopted for focused management actions in this area.

Otero County
Additional availability of a small portion of land for multiple uses and recreational access would be consistent with policies and customary uses outlined in Otero County's interim *Land Use Policy Plan*. Not withdrawing the land would have no effect on private property rights. Actual changes in use of the

area is projected to be minimal under the public land laws, based on relatively low resource value and access conditions.

4.1.2.2 Effects on Land Uses and Land Users of McGregor Range

Military Use. Under this partial withdrawal scenario, the Army would be able to continue its current air defense mission and implement most of its proposed and envisioned programs and expanded missions. The reduced land area would restrict the range of HIMAD missile firing profiles that could be accomplished on McGregor Range. This is likely to reduce the number of annual firings by one third and slightly limit flexibility for training. Ground troop training would no longer occur in the returned lands in the Sacramento Mountains foothills or Culp Canyon WSA. Since the Army would retain their fee-owned holdings in the foothills, limited ground troop training could continue on those parcels. Under the Army co-use agreement with Lincoln National Forest, a variety of terrain conditions would continue to be available for special operations forces.

Nonmilitary Use. Provisions for both military and nonmilitary use of withdrawn land and Army fee-owned land (about 640,480 acres) would be similar to uses under PL 99-606 described in Section 4.1.1.1. Return of 40,000 acres to management under the public land laws would have the potential to affect grazing activities on McGregor Range. Under this withdrawal alternative, other multiple-use objectives that would be affected include recreation, wilderness resources, access, and mineral and energy resources. Potential issues and impacts to these uses are identified below.

Access and Realty. Access along New Mexico Highway 506 may benefit slightly due to fewer road closures resulting from fewer missile firings under this alternative. Roads and trails that provide access to the Sacramento Mountains foothills from New Mexico Highway 506 would continue to pass through withdrawn land in TAs 11, 12, 14, and 15, that would be periodically off-limits during missile firings. Military activities would cause periodic closure of these roadways during missile firings, restricting access, at times, into lands returned to the public domain. Alternate roadways from U.S. Highway 54, through Lincoln National Forest, or small roads and trails from the north and east could be used to reach some locations, but tend to be less direct and difficult to travel. Selective road improvements may be needed to provide access to allow more use of lands returned to the public domain.

BLM would be able to issue permits, licenses, leases, and ROWs on lands returned to the public domain without the consent of the Army. Construction of new structures or equipment installation such as antennas or towers in returned land areas would be under restricted airspace, and as such would need to be coordinated with FAA and Army airspace managers.

Energy and Minerals. Under Alternative 2, the BLM would be able to open up 29,000 acres for leases and permits under the mineral and mining laws for exploration, extraction, or production of locatable minerals. Leasable and salable mineral and energy resources would continue to be managed as described in Alternative 1.

Water Use. Army-owned water would still be made available for grazing uses on McGregor Range and BLM would continue to maintain the water distribution system.

Livestock Grazing. Lands returned to the public domain would continue to be managed under the public land laws or Congress could provide specific grazing authorization for these lands. For the most part, grazing activities on the withdrawn lands are anticipated to be similar to current conditions under PL 99-606 and the existing MOU (BLM, 1990b). However, there are inter-related issues arising from returning land to the public domain that can affect these areas. The following issues and concerns have

been identified that could affect future grazing uses on both lands returned to the public domain and withdrawn land:

- effect of differentiating the management and financing structure of the existing grazing program on withdrawn land from the units that would no longer be withdrawn;
- effect of potentially reduced revenues on the existing grazing program if land returned to the public domain reverts to the *Taylor Grazing Act*; and
- selection of permittees on lands returned to the public domain.

Ranchers could need more access to lands returned to *Taylor Grazing Act* provisions, because they would need to spend more time performing tasks that BLM's range management team currently performs on McGregor Range. Consequently, leasee ranchers would need to coordinate their access with range control to avoid unanticipated inconvenience resulting from road closures during missile firings. This would be most necessary in the fall to ensure adequate time and flexibility to bring cattle onto the range.

Army water would continue to be available for wildlife and grazing operations on withdrawn, fee-owned, and public domain lands.

If the current RMPA management structure is not maintained, BLM may be faced with segregating the management and revenues from grazing operations on McGregor Range under the current grazing program, and those on returned lands managed under the *Taylor Grazing Act*. It is not known how BLM would financially or logistically manage the segregation of the two grazing programs that are dependent on the same water system. Under the *Taylor Grazing Act*, selected future permittees would maintain a long-term interest in the grazing units (at least through the typical 10-year permit period). Use of the returned land for grazing would be limited to one or two ranchers, rather than provide potential use to many ranchers in a competitive market environment. The *Taylor Grazing Act* defines criteria that would be used in selecting future permittees (43 USC 315). These include landowners engaged in livestock business in the district who are bona fide occupants or settlers, and who have water or water rights that permit proper use of the land. It has not been determined whether any ranchers have the prerequisite base property (as defined by 43 USC 315) that would qualify them to acquire the grazing privileges on McGregor Range.

Fees collected by BLM on land returned to the public domain could decline under the *Taylor Grazing Act* compared to current and recent past revenues under the current auction system (see Sections 3.1.2.2 and 4.10.2). If the current auction system were not retained on those lands, the operating revenues of the grazing program would be reduced in proportion to the AUMs associated with the returned land. If the BLM were to maintain the water infrastructure in the lands returned to the public domain, the costs could be passed on to ranchers.

Agreements would be needed between the BLM and the Army concerning management and reimbursement for grazing of fee-owned in-holdings within the lands returned to the public domain.

The BLM is likely to implement range management actions, such as controlled burns, on returned land as a method to improve forage and manage fire hazards. Specific actions are not defined, but are likely to benefit grazing, soil cover, watershed, and wildlife habitat.

34

Overall, given the relatively small area that would be returned to the public domain under this alternative, the potential impacts to grazing operations discussed above would be insignificant.

Recreation. Under the public land laws, the lands returned to the public domain are expected to be available for recreation. In theory, access for recreation would increase for returned areas, including Culp Canyon WSA. However, roadways and trails into the returned areas would pass through withdrawn land. Some alternate routes may be available using forest roads (off U.S. Highway 54) leading into Grapevine Canyon in the Lincoln National Forest. Access to returned areas through withdrawn areas would still need to be coordinated with the Army to ensure that recreationists are aware of times when roadways could not be used. This would effectively limit access to these areas to the same periods as under Alternative 1 (full withdrawal): that is, closed for portions of 2 to 3 days per week during missile firings from September through November.

Much of the land within the area returned to the public domain is Army fee-owned property. Since the Army would retain its fee-owned lands within the area returned to the public domain, ground troop activities could still be conducted in the vicinity of other users. It has not been indicated that ground troop activities have directly affected recreational uses, largely because ground troops try to avoid detection and most recreationists would be unaware of their presence. Therefore, no impact is anticipated. It is not known if BLM would determine areas that are suitable for off-road recreational vehicle (ORV) use on the lands returned to the public domain. ORV use on withdrawn lands would continue to be limited to established roads and trails.

Wildlife and Habitat Management. Management of Sacramento Mountains foothills under the public land laws would allow the BLM to implement management actions in these areas without the consent of the Army. Many of the management actions in the existing RMPA have been accomplished or are outdated. A draft Coordinated RMP for grazing units 4 and 5 is being prepared by BLM. However, it has not yet been adopted. Until then, specific actions have not been identified, although it is likely that BLM would use controlled burning practices to reduce build-up of fire fuels and to stimulate production and reduction of certain vegetation types. This could benefit short-term productivity for grazing. Potential for multiple use objectives to compete with wildlife and habitat management objectives are addressed in Section 4.8. BLM would have the authority to expand its definition of critical environments to protect sensitive environments in lands returned to the public domain.

Wilderness. Culp Canyon WSA would continue to be managed under the *Interim Management Policy and Guidelines for Lands Under Wilderness Review* (BLM, 1987). The area would continue to be available for public recreational use, but access constraints (see *Access and Realty*, above) may continue to limit actual use. Although ground troop training has not impaired wilderness qualities, there would no longer be potential for disturbance to wilderness users from unanticipated military activities. Low-level helicopter overflights in the overlying restricted airspace may still occasionally interrupt the natural quiet and cause annoyance for any recreationists in the WSA.

Cultural Resources. Increased public access to potentially important sites could increase the potential for vandalism and damage. However, BLM could promote the interpretive and educational opportunities of some cultural sites for recreational enjoyment. The extent of the resource value in lands returned to the public domain is addressed in Section 4.9.2.

4.1.2.3 Effects on Surrounding Areas

Conditions affecting surrounding areas would be essentially the same as described in Section 4.1.1.3. No effects are anticipated.

4.1.2.4 Effects on Aesthetic and Visual Resources

There would be little change in conditions affecting visual resources under this alternative. Potential siting of mining or energy facilities would need to consider effects on vistas from viewing locations in the WSA (U.S. Army, 1986b). BLM would be responsible for consistency of modifications to the landscape with recommended VRM objectives.

4.1.3 Alternative 3

Under Alternative 3, the withdrawal area would encompass about 180,000 acres less than the current configuration. This returned land area includes about 169,000 acres that would revert to management under the public land laws and about 11,000 acres comprising Culp Canyon WSA. A few areas are identified as possible historic impact areas on Otero Mesa and may require additional investigation and clearance. Public access to returned areas would be in accordance with DOI and Army consideration of the clean-up of ordnance and explosive hazards.

About 36,000 acres of Army fee-owned land within this area would continue to be used for specialized training and presently existing nonmilitary uses such as grazing. About 428,385 acres would be withdrawn and continue to be managed under the RMPA. Army fee-owned property (35,080 acres) within the newly defined boundary, plus 18,004 acres of USFS land, would result in an area of 518,490 acres being used for military activities.

The same process for clean-up of the relinquished lands would be required under this alternative as described in Section 4.1.2. This area is currently available for nonmilitary uses.

4.1.3.1 Effects on Land and Resource Management Plans for McGregor Range

BLM
Changes in use of Otero Mesa and the Sacramento Mountains foothills made possible under the public land laws would require revisions to the RMPA for specific resources. The RMPA would need to reflect changes in the withdrawn area. Some actions identified in the previous RMPA may need to be updated to more accurately reflect recent surveys, studies, and district-level priorities. Particularly, livestock uses and potential interest in oil and gas exploration could result in defining different management objectives for one or more competing resource areas. Habitat and wildlife resource management planning and actions may also be updated. Agreements between the Army and BLM regarding use of water would be required if grazing and wildlife management is to be maintained at current levels. Areas returned to the public domain would be managed under the framework set in the 1986 White Sands RMP, which includes McGregor Range. Local values and new opportunities for public access and use could influence management objectives for one or more resources.

Otero County
Effects on land use policies and plans of Otero County would be similar to those described in Alternatives 1 and 2. Because no official land use planning documents have been finalized or adopted by Otero County, it is not possible to identify impacts to county plans. In general, this alternative would increase access to returned lands for a variety of customary uses, and as such, is consistent with interim land use policies of Otero County. About 65 percent (or as much as 75 percent) of the current grazing area on McGregor Range would be managed under public land laws, the tenets of which are supported by the county's policy plan. Grazing management and levels are assumed to continue at current levels.

4.1.3.2 Effects on Land Use and Land Users of McGregor Range

Military Use. Under this alternative, HIMAD missile firings would be severely constrained. The Army would also lose access and use of several existing and proposed controlled access FTX sites located on land returned to the public domain. Operations at the tactical target complex on the Otero Mesa portion of McGregor Range by the USAF would not occur and could result in additional use of the Class C Bombing Range in TA 10. Some missile training profiles used at SHORAD and Orogrande Complex would also be constrained by reduced land area. Most activity on McGregor Range would be focused on short-range scenarios for missile firings from the McGregor Launch complex in the Tularosa Basin, continuing and expanded activity at Meyer Range, and limited off-road training in TA 8. These changes in land resource would seriously affect the Army's capabilities to support air defense training.

Nonmilitary Use. Provisions for both military and nonmilitary use of withdrawn and Army fee-owned land (about 500,480 acres) would be similar to uses under PL 99-606 described in Section 4.1.1.1. The return of 169,000 acres to management under the public land laws would have greatest potential to affect access, mineral and energy resources, and recreational use. Effects on current and existing nonmilitary land uses and users are addressed below.

Access and Realty. Because the reduced withdrawn area would not support a full range of HIMAD missile firings, access along New Mexico Highway 506 would be improved due to fewer closures. Permits would not be required to access lands returned to the public domain. BLM would be able to issue permits, licenses, and ROWs on land returned to the public domain without the consent of the Army. Construction of new structures or equipment installation, such as antennas or towers, in returned areas would be under restricted airspace, and as such, would need to be coordinated with FAA and Army airspace managers.

Minerals and Energy. Under Alternative 3, the BLM would be able to open up 169,000 acres for leases and permits under the mineral and mining laws for exploration, extraction, or production of locatable minerals. Leasable and salable mineral and energy resources would continue to be managed as described in Alternative 1.

Water Use. The Army would continue to hold the water rights and make water available to the BLM for wildlife and livestock.

Livestock Grazing. As described for Alternative 2, the land returned to the public domain (169,000 acres) could be managed according to congressional authorization or continue under the public land laws. If that occurs, grazing units 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, and portion of unit 3 (Figure 3.1-2) may no longer be contracted under the public auction process provided under the RMPA. This area currently supports about 18,000 AUMs (including about 3,200 AUMs on Army fee-owned land within these units). Potential impacts to livestock grazing under this alternative would be similar to Alternative 2, and could include:

- Increased access to returned grazing lands would greatly increase the time available for ranchers and BLM to perform ranching tasks.

- Army-owned water would still be available for livestock, but the cost of the water and of maintaining the water distribution system could be passed on to new permittees (either as fees paid to BLM, or operating costs to the rancher) if the grazing program returned to the *Taylor Grazing Act*. If the current grazing program continued, there would be no change to grazing activities.

- It is possible that the remaining withdrawn public grazing areas in the Tularosa Basin could be auctioned, but the revenues would not support a full-time management team. Therefore, the quality of grazing in units 1, 2, and part of 3 could also decline, causing the potential for auctioned value of AUMs to decrease.

Wildlife and Habitat Management. Management of wildlife and habitat would be similar to Alternative 2. Management of the McGregor Black Grama Grassland ACEC would revert to exclusive BLM management. Activities in these areas are likely to be similar to current conditions, with slightly more potential for pressures from increased public access to affect the grasslands.

Recreation. Availability of lands returned to the public domain for recreation, including Otero Mesa and the Sacramento Mountains foothills, would increase. These areas are relatively remote and based on current user patterns and availability of other quality recreational land in the area, a high level of use is not anticipated. These areas would generally be used by local residents who know about particular features of the area. These may include specific locations for hiking and observing nature, and use of areas that provide good game bird hunting opportunities. Lack of water would still limit its potential attractiveness for camping and recreation.

In the RMPA, BLM retained the option to review roads and trails that may be available for ORV use. It is possible that, with public input, some roads would be available for this purpose in the future under BLM management.

Wilderness. Conditions affecting Culp Canyon WSA would be similar to those described in Alternative 2 (Section 4.1.2.1). However, because fewer roadways and trails would be closed for military uses, the area would be more accessible for public use.

Cultural Resources. The affects of returning Otero Mesa and the Sacramento Mountains foothills to the public domain would be similar to those described for Alternative 2. BLM would be responsible for managing access and preserving the integrity of cultural resources in lands that return to public domain that may receive increased public use.

4.1.3.3 Effects on Surrounding Areas

Effects on land use in surrounding areas from this alternative would be minimal. Fewer closures of New Mexico Highway 506 under this alternative may increase the reliability and use of this access roadway for local residents. Noise for some rural residents to the north and east of Otero Mesa would be less because the tactical target complex on Otero Mesa would no longer be used and the number of overflights in the vicinity would be reduced.

4.1.3.4 Effects on Aesthetic and Visual Resources

Most public activities that could occur on the returned lands would be consistent with existing visual management objectives. Natural fires and future use of controlled burns on returned areas would have the greatest potential to affect short-term changes to the landscape. Potential for new mining and oil and gas drilling facilities could be highly visible in the foreground and middle distances (3 to 7 miles). Grassland areas on Otero Mesa have been identified as having high quality and value to the public.

4.1.4 Alternative 4

Under Alternative 4, the McGregor Range boundary would encompass about 244,000 acres less than the current configuration. This area includes about 233,000 acres that would revert to management under the

public land laws and about 11,000 acres comprising Culp Canyon WSA. Public access to returned areas would be in accordance with DOI and Army consideration of the clean-up of ordnance and explosive hazards. Like Alternatives 2 and 3, the relinquished area is currently available for nonmilitary uses. A few areas, including possible historic impact areas on Otero Mesa and the existing bombing range in TA 10, may require additional investigation and clearance to allow specific activities.

About 44,000 acres of Army fee-owned land within this area would continue to be used for limited military use and existing nonmilitary use. About 364,385 acres would be withdrawn and continue to be managed under the RMPA and MOU. An additional 27,080 acres of Army fee-owned property within the newly defined boundary would result in a total military use area of about 454,480 acres including USFS lands.

4.1.4.1 Effects on Land and Resource Management Plans for McGregor Range

BLM
Land management effects under this alternative would be similar to Alternative 3. Specific to this alternative is the return to the public domain, land in TA 10 that is currently used by HAFB for air-to-ground training in the Tularosa Basin. Although live ordnance is not used at the Class C Bombing Range as with all land returned to the public domain, this area would need to be cleared of ordnance and explosive hazards prior to reversion to BLM. Possible changes to the RMPA required for this alternative would be similar to those described for Alternative 3.

Otero County
Effects on land use policies and plans of Otero County would be similar to Alternative 2 and 3 (see Sections 4.1.3.2, *Otero County*). Under this alternative, the additional lands returned to the public domain would provide more immediate access for county residents to use the land for a variety of customary uses such as recreation.

4.1.4.2 Effects on Land Use and Land Users of McGregor Range

Military Use. In addition to missions that would no longer be supported under Alternative 3, the Class C Bombing Range would no longer be available for air-to-ground training, and there would not be sufficient land area for the envisioned TBM target for Patriot training under this land configuration. Some profiles for missiles at SHORAD and Orogrande Complex would not be contained within the reduced land area. Most activity on McGregor Range would be focused on short-range scenarios for missile firings from the McGregor Launch Complex in the Tularosa Basin, continuing and expanded activity at Meyer Range, and limited tracked vehicle and off-road training in TA 8. These changes would further reduce the Army's current capabilities to support air defense training.

Nonmilitary Use. The return of 233,000 acres to management under the public land laws would have similar effects on current nonmilitary land uses and land users as described for Alternative 3. The following section focuses on differences in effects on land uses that would result from this land configuration.

Under this alternative, BLM would have control of management actions for all the areas in the currently defined grazing areas on McGregor Range, including portions of the Tularosa Basin. This essentially corresponds to areas that have been available for public access on a noninterference basis under the current withdrawal.

Access and Realty. Access and use of New Mexico Highway 506 and all roads and trails north of the highway and on Otero Mesa would be unconstrained by military activities. BLM would control the entire

ROW for the 345 kV powerline. The configuration of the returned land would allow BLM to utilize or issue permits for uninterrupted corridors across the north part of the current range. The existing bombing range in grazing unit 2 would need to be cleared of any ordnance and explosive hazards before it could be opened up for multiple use and public access. It is unlikely that clean-up activities in this area would delay return of land for public use, since the USAF clears this facility twice annually of bombing debris and detonates any unignited spotting charges that may be found.

Minerals and Energy. Under Alternative 4, the BLM would be able to open up 233,000 acres for leases and permits under the mineral and mining laws for exploration, extraction, or production of locatable minerals. Leasable and salable mineral and energy resources would continue to be managed as described in Alternative 1.

Water Use. BLM would gain management control of all the land served by and traversed by the water pipeline system (except for any Army fee-owned holdings) and would continue to maintain the water distribution system. The Army would maintain its water rights. In the meantime, Army-owned water would be available for BLM through agreement.

Livestock Grazing. As described for Alternatives 2 and 3, lands returned to the public domain would continue to be managed under public land laws or Congress could provide specific grazing authorization for these lands. Potential impacts to livestock grazing under this alternative would be similar to Alternatives 2 and 3.

Increased access opportunity would greatly increase the time available to BLM and ranchers to perform management tasks.

Wildlife and Habitat Management. Conditions for wildlife and habitat management would be similar to Alternative 3 (see Section 4.1.3.1).

Recreation. This alternative would allow unconstrained access along New Mexico Highway 506. Although land in the Tularosa Basin returned to the public domain has lower visual value, it is easily accessible to residents that would be in Alamogordo and small communities along U.S. Highway 54, and its provides quiet settings for outdoor recreation. Accessibility would benefit the use of the area's good dove hunting opportunities in the north part of grazing unit 1. ORV use of roads and trails in the basin areas would be likely to increase.

Wilderness. Unrestricted access to Culp Canyon WSA from roads and trails off New Mexico Highway 506 could provide additional access for recreationists. Minimal changes in wilderness use would result.

Cultural Resources. The affects of returning 233,000 acres to the public domain would be similar to those described for Alternative 2. BLM would be responsible for managing access and preserving the integrity of cultural resources in lands that return to the public domain that may receive increased public use.

4.1.4.3 Effects on Surrounding Areas

Effects on surrounding areas would be similar to those described in Section 4.1.3.3. Assuming that BLM would continue to distribute water in the pipeline that serves the community of Oro Grande, there would be no effect on residential use.

4.1.4.4 Effects on Aesthetic and Visual Resources

Although changes in land use could occur, resulting modification of the landscape from potential mining or quarry operations would be managed by BLM under its VRM guidelines. Potential impacts would be similar to those described in Section 4.1.3.4.

4.1.5 Alternative 5 – No Action

Under this alternative, no land would be withdrawn for continued military use. The Army's fee-owned lands, an additional 71,083 acres, would be exchanged for public lands in TAs 8 and 32. The resulting BLM public domain area would remain about 608,385 acres.

Public access to returned areas would be in accordance with DOI and Army consideration of the clean-up of ordnance and explosive hazards. This area includes the portions on McGregor Range that have had the most consistent military use over 50 years. The potential for hazardous conditions within current and historic impact areas in the Tularosa Basin is high and may require considerable effort to clean up. Areas requiring extensive clean-up may cause delays in final return of the land to public domain.

The following sections focus on effects of reversion of lands to the public domain on land use and land users. Both current uses and resource value and potential value are considered. Where applicable, potential effects from delays in returning land are noted. Additional information regarding effects of land use and changed management status under Alternative 5 is included under specific resource sections.

4.1.5.1 Effects on Land and Resource Management Plans for McGregor Range

BLM
Under this alternative, BLM would have the opportunity to open additional land for specific multiple uses that were not considered possible under military withdrawal. For example, some portions of the Tularosa Basin may be found suitable and made available for mineral actions, grazing, or recreation. The existing White Sands RMP (BLM, 1986a) may be amended or the RMPA (BLM, 1988b) revised to reflect changed opportunities, or changes in management priorities based on new information from ongoing surveys and studies for McGregor Range. Alternatively, coordinated RMPs could be prepared to address specific geographic areas or resources. A revised RMPA could be used to identify areas with higher value due to specific resource potential (such as geothermal or minerals). The resource planning process would include environmental assessments and public participation. Input from this would help identify priorities for use of lands returned to the public domain.

Otero County
The increased area available for multiple-uses under this alternative would be consistent with county policies and goals that emphasize access to land for a variety of customary uses by county residents.

4.1.5.2 Effects on Land Use and Land Users of McGregor Range

Military Use. Military use would be confined to TAs 8 and 32, which include the McGregor Range Camp, McGregor ASP, and the Meyer Range Complex. Activity by the Army for ordnance and explosive hazards removal from lands would continue as funding became available. The effect of this action on the Army's air defense mission would be great. Some facilities and functions on McGregor Range might be relocated to other areas of Fort Bliss resulting in areas with intensified use. These land use adjustments would require additional land and environmental resource planning to ensure consistency with other mission requirements and with Fort Bliss natural and cultural resource management. Future

construction actions and resulting operations would require appropriate environmental analysis in the future.

Nonmilitary Use. A variety of land uses would be possible over almost the entire extent of McGregor Range. Under the public land laws, the returned lands would be managed by BLM for multiple use and sustained yield. The following section summarizes potential effects on land use and land users from no action to renew the withdrawal.

Access and Realty. Public access to portions of the land would be delayed by ordnance removal activities, effectively precluding use until ordnance removal is complete. Some areas, which would be too costly to clean up, may remain permanently inaccessible for public use. This could affect the ease of establishing ROW corridors in the future. BLM encourages the use of existing corridors when feasible, and both New Mexico Highway 506 and the 345 kV power line would provide uninterrupted corridors that could be used for future infrastructure.

Minerals and Energy. Except for any permanently inaccessible lands (due to ordnance and explosive hazards), an area of about 598,400 acres under BLM management (excluding Culp Canyon WSA) would be available under the mining and mineral laws and geothermal leasing laws. However, future productive use would depend on the quality and extent of commercially available products. For example, geothermal reserves have been identified, but the quality of the resource may not provide a commercial opportunity with current technology.

Because of the ground disturbing activities involved in developing mineral and energy resources, higher clean-up standards might apply for areas proposed for these uses. This could cause delays in the availability of specific areas. To the extent that off-limits areas coincided with mineral or energy resources, potential for these land uses could be limited.

Water Use. Water rights would be exchanged with the Army fee-owned land. Water would therefore continue to be available for wildlife and livestock.

Livestock Grazing. Livestock uses would be similar to Alternative 4. It is anticipated that grazing management would be consistent with actions analyzed by the BLM in 1980 and the RMPA, and that additional land in the Tularosa Basin would be used for grazing. Potential livestock uses in most of the Tularosa Basin would be limited by water availability, vegetation, and areas containing ordnance and explosive hazards.

Wildlife and Habitat Management. The RMPA and any future revisions would identify actions that reflect BLM's current priorities for managing resources within the multiple-resource framework. Impacts to these resources are addressed in Section 4.8.5 and 4.1.4.2.

Recreation. In addition to increased recreational opportunities described for Alternatives 2, 3, and 4 (see Sections 4.1.2.1, 4.1.3.1, and 4.1.4.1, *Recreation*), additional areas would be available for recreation. Some locations in the Tularosa Basin have value for game bird hunting. Except for areas that remain inaccessible, most of the Tularosa Basin would provide opportunities for ORV use on designated roadways. Similarly, the Otero Mesa escarpment has good potential for deer hunting, but it is likely to remain off-limits for public use due to potential hazards from ordnance and explosive usage.

Wilderness. There would be no change in use or management of Culp Canyon WSA resulting from this alternative.

Cultural Resources. Under this alternative, BLM would have exclusive management responsibility for cultural resources on lands returned to the public domain. Sites along playa edges in the Tularosa Basin would increase the quantity and variety of cultural resources open to interpretive and educational uses that could benefit public enjoyment. Potential effects to these resources from public access are addressed in Section 4.9.5.

4.1.5.3 Effects on Surrounding Areas

Return of McGregor Range to the public domain would not be likely to affect surrounding areas. There may be slight benefits from the availability of the larger land area and for public uses such as oil and gas industries and recreation. However, this should not alter existing uses.

Assuming that BLM would continue to distribute water in the pipeline that serves the community of Oro Grande, there would be no effect on residential use.

4.1.5.4 Effects on Aesthetics and Visual Resources

Public uses primarily for grazing and recreation (excluding ORV use) would not change the overall features or forms of the natural landscape and would be consistent with current management objectives. Effects of activities such as mining operations, construction of energy facilities or new roadways, new utility corridors, and ORV use, could noticeably modify the landscape. BLM would be responsible for ensuring consistency of modifications with recommended VRM objectives.

4.1.6 Alternative 6

This alternative could be implemented with the military withdrawals in Alternatives 3 and 4 or the No Action Alternative. Army fee-owned in-holdings within land returned to the public domain would be exchanged for public land elsewhere. The NCA would be comprised of 216,000 acres, including about 169,000 acres of previously withdrawn land, 11,000 acres in Culp Canyon WSA, and 36,000 acres of Army fee-owned land.

4.1.6.1 Effects on Land and Resource Management Plans for McGregor Range

BLM
The planning process would identify management goals, multiple land resource potential, and define proposed uses and special management actions for the proposed NCA. This could result in amendments to the White Sands RMP (BLM, 1986a), revisions to the RMPA (1988b), revisions to existing activity plans, or preparation of a coordinated RMP for the NCA. It would also include environmental analysis and public participation. BLM would coordinate with local governments and citizen groups to identify the management objectives that the NCA would promulgate. Management actions for areas not contained in the NCA would be similar to those described in Alternatives 3, 4, or 5.

Otero County
Otero County ordinances state the county's desire to be included in planning of uses on federal lands. Development of the NCA would provide an opportunity for county participation in a land management planning process that could have relevance and benefits for a variety of diverse values of county residents.

4.1.6.2 Effects on Land Use and Land Users of McGregor Range

Military Use. Military uses would be as described for Alternatives 3, 4, or 5 (see Sections 4.1.3, 4.1.4, and 4.1.5) for withdrawn areas. There would be no military land use on fee-owned in-holdings within areas returned to the public domain.

Nonmilitary Use. The designation of an NCA on land returned to the public domain would not affect nonmilitary use of withdrawn land, which would be the same as described for Alternatives 3, 4, or 5.

The purpose for designating an NCA is to provide additional statutory protection for an area with special resources, features, or qualities that in combination have national interest or value. A land management plan would reflect this purpose through resource objectives and planned actions that promote these values for the benefit and enjoyment of future generations. The framework for managing competing resources would prioritize actions that promote the purpose and goals of the NCA.

The concept for the Otero Mesa and Sacramento Mountains foothills NCA would be to preserve and protect the area's cultural and ecological resources and to emphasize the customs and culture of the region. The types of land uses that would occur within the NCA may be similar to existing uses excluding current military uses. The public would be able to use the area for a variety of recreational, scientific, and educational uses. Other traditional uses of the land, such as grazing, will also be included. This suggests that the goals of the management framework would be concerned with preservation of resources rather than for managed productive uses and sustained yields of renewable resources. It is likely that the NCA would include discrete areas (sometimes overlapping) with special management needs and provisions (such as arroyos, ACECs, wilderness) that would impose restrictions on some uses that would not otherwise apply. The NCA has the potential to be managed as a grazing management showcase.

36

The NCA designation might change and affect land use and land users of the public domain land in the following ways:

- It is assumed that the congressional designation of the NCA lands would not affect the provisions of the mining and mineral leasing and geothermal leasing laws, except that patents would not be used on any mining claim.

- It is assumed that the current grazing programs would continue; however, lower grazing levels or use of other techniques, such as rotating the use of grazing units to maintain desired grassland conditions in accordance with management objectives, could be adopted. These could potentially reduce the overall number of cattle grazed in the NCA over current numbers.

- Wildlife and habitat management are likely to be a priority in resource management planning for the NCA. BLM might designate additional ACECs based on multiple values. These areas could be restricted from access for a variety of uses to meet the specific needs of the area.

- Recreational use, including associated educational and interpretive activities, would be allowed in the NCA.

- Camping could be allowed in designated areas where concerns with fire hazards and littering can be controlled. Camping might increase without the scheduling constraints resulting from priority for military uses. Similarly, hunting could be allowed in designated areas and at certain times to ensure the safety of other public users of the area.

- Designation of Culp Canyon as a wilderness area would not likely alter its current public use, but it would be permanently unavailable for mineral and energy uses.

- Cultural resources are identified as a key resource for this area. Archaeological sites are known to exist throughout the area, and a rich history is evident in the grazing infrastructure on the land. Features in the NCA could be connected with other cultural sites in the region, such as Oliver Lee State Park, Guadalupe Mountains National Park, and Three Rivers Petroglyphs ACEC. The BLM has identified a potential NRHP-eligible historic rural landscape that includes the NCA area.

4.1.6.3 Effects on Surrounding Areas

Effects on land use in surrounding areas would be similar to those described in Sections 4.1.3.3, 4.1.4.3, and 4.1.5.3. The NCA might benefit real estate conditions in the community of Timberon that is primarily seeking to attract seasonal vacation residents and retirees. It is not known whether the creation of an NCA would affect game populations and/or affect hunting opportunities in the surrounding areas.

4.1.6.4 Effects on Aesthetic and Visual Resources

Creation of an NCA could affect BLM's visual management objectives and influence the review criteria of future proposals in the area. Similarly, BLM's range management actions might also be affected. For instance, potential visual effects of prescribed burns, range improvements, and grazing levels on vegetative cover might be evaluated differently under NCA status.

It is anticipated that BLM would re-inventory the visual resources in the NCA to account for increased visual sensitivity of more accessible areas and lack of military use. Protection of special grassland habitat could increase the visual distinctiveness of the Otero Mesa landscape.

Because the precise nature and extent of the congressional action cannot be determined, detailed land use analysis of this alternative is deferred until a more specific proposal could be developed by the DOI.

4.1.7 Cumulative Impacts

No specific future actions are currently defined for WSMR that would change the use of the wide range of facilities or programs on the installation. Pending and possible actions at HAFB include deactivation of units at the base. A long-established military presence in the region has played a major role in defining local land use patterns and policies. In general, continuation of military activities on McGregor Range in combination with actions at WSMR and HAFB would not substantially change the effect of military use on land use and land users under any alternative.

Recent decisions have changed grazing standards in some areas to protect the Mexican spotted owl and Northern Goshawk. Proposed standards will be used as a default where local activity-level or allotment plans do not exist, and in general, are less restrictive than local plans, except in certain areas. The potential effect of adopting new grazing standards to affect grazing is being evaluated by the USFS. However, it is expected that the new standards will result in minimal overall changes in grazing levels in the region (Sire, 1998).

New interest in oil and gas resources to the east of McGregor Range could precipitate exploration and production in the area. Due to the sensitivity of this industry to market conditions, it is not possible to predict the extent of operations or construction that might occur. About 30,000 acres of public land have recently been nominated for oil and gas leases, but both a resource planning and environmental impact analysis process must be completed before licenses and permits would be issued.

A wilderness determination by Congress for Culp Canyon WSA would not result in appreciable changes to current use and protection. If Congress acted not to designate a wilderness, it could become available

for multiple-use under the public land laws. In that case, the area may be used for mining and mineral activities. Increased use and access to the area may reduce qualities of isolation, but may increase recreational uses.

BLM has just designated several ACECs outside McGregor Range in Otero County, and has proposed an NCA for the Organ Mountains, directly west of Doña Ana Range–North Training Areas (of Fort Bliss). These actions would provide protection of valued regional resources and provide special opportunities for recreation and enjoyment of the natural environment in the region.

Establishment of an NCA under Alternative 6, in combination with possible designation of an NCA in the Organ Mountains, and ACECs in resource areas of the BLM Las Cruces Field Office, could have a positive affect on preservation of a range of exceptional or sensitive resources. Wilderness resources would benefit from these cumulative initiatives and increase recreational opportunities regionally. Some grazing is likely to continue in the NCAs (at or below current levels), so overall impacts on grazing would be minimal. There would be restrictions on future mining activities in both areas, limiting future opportunities.

4.1.8 Mitigation

Potential adverse effects from future military uses on public land use could be reduced by, to the extent practicable, selecting sites for new facilities and infrastructure that do not interfere with existing ROWs, cultural sites, or sensitive habitat.

4.1.9 Irreversible and Irretrievable Commitment of Resources

No irreversible and irretrievable commitment of land use resources would occur.

Airspace

4.2

4.2 AIRSPACE

The potential impacts to airspace use resulting from the alternatives are discussed below. Cumulative impacts and mitigation measures, if appropriate, are also presented in this section.

4.2.1 Alternative 1

The McGregor Range mission activities under Alternative 1 would not affect airspace use or airport activities in the ROI. Under this alternative, current military use of the airspace would remain essentially unchanged except for initiatives now being evaluated that may expand the level of operations in the McGregor Range training areas. These include (see Section 2.1.1) the development of a helicopter training complex, the launching of 4 to 6 ATACMS per year into McGregor Range, and the development of a new USAF air-to-ground tactical target complex to be located on Otero Mesa. USAF air-to-ground sorties on McGregor Range in R-5103 (B or "low") was 1,151 sorties in FY 95 and projected to decline to 833 in FY 00 without the USAF tactical target complex. When the tactical target complex is constructed, USAF sorties are projected to increase by 100 to 933 in FY 00 (USAF, 1998). Although these initiatives may cause a shift and an increase of activity within McGregor Range, they do not contain the potential to change airspace operating requirements. There are no impacts to air operations.

4.2.2 Alternative 2

McGregor Range activity under Alternative 2 would have no impact upon airport operations or airspace use and management. This alternative provides for the return of the Sacramento Mountains foothills portion of McGregor Range to the public domain, which would change the northeastern ground boundary of the McGregor Range withdrawal. This alternative does not propose any change to the configuration of McGregor Range Restricted Area airspace. Except for changes to existing missile firing scenarios and dismounted training activities that now use the Sacramento Mountains foothills, McGregor Range would support the existing and proposed mission activities described in Alternative 1.

4.2.3 Alternative 3

Alternative 3 would not affect airspace use or airport activities in the ROI. Under this alternative there are no proposed changes to the configuration of McGregor Range Restricted Area airspace. With respect to airspace use, helicopter aerial gunnery at Cane Cholla and fixed-wing air-to-ground operations at the existing Class C Bombing Range would continue. Missile activities would be re-oriented and reduced as necessary, relative to the reduced property boundaries. The return of Otero Mesa and other areas of the existing McGregor Range to the public domain would preclude development of the USAF tactical target complex on Otero Mesa, reducing the level of activity within the Restricted Area. Military operations that are constrained by reduced land areas within McGregor Range would still be contained within the existing Restricted Area airspace.

4.2.4 Alternative 4

Alternative 4 would not have an effect upon airport operations or airspace management within the ROI. Under this alternative, all portions of McGregor Range north of New Mexico Highway 506 and the Otero Mesa would be returned to the public domain. Relative to airspace use, the constraints to missile and aircraft activity described in Alternative 3 would apply to Alternative 4. Additionally, further constraints to other live-fire missile activities would be required. The Class C Bombing Range used for air-to-ground gunnery and bombing training would lie outside of McGregor Range boundaries and that activity would have to be discontinued. As in all previous alternatives, there would be no change to the configuration of the existing McGregor Range Restricted Area airspace.

4.2.5 Alternative 5 – No Action

Alternative 5, the No Action Alternative, provides that the Restricted Airspace above McGregor Range could continue to be used for some military aircraft training. If the Restricted Area is maintained in its current configuration the No Action Alternative would not affect airspace use or airport activities in the ROI.

It is possible that with discontinuance of all air-to-ground, and ground-to-air activities, the Restricted Area airspace, in consultation between the DoD and the FAA, could be reconfigured to change the vertical boundaries, lateral boundaries, and/or operating procedures. It is also possible that the Restricted Area could be changed to a MOA MOAs are established to separate nonhazardous military flight training from other air traffic flying under IFR and to identify for pilots flying under VFR where such military flight training is being conducted. VFR aircraft are not restricted from flying through a MOA. However, all civil and military pilots flying VFR in a MOA are required by federal regulation to maintain visual separation from each other. Any of these airspace actions would follow congressional action on the *McGregor Range LEIS* and would be evaluated under a separate NEPA process.

4.2.6 Alternative 6

Under Alternative 6, the designation of the wilderness area or NCA would not likely affect airspace management. However, this alternative requires congressional action for implementation. Because the precise nature and extent of the congressional action cannot be determined at this time, detailed airspace analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.2.7 Cumulative Impacts

Projected military activities that have the potential to contribute to cumulative airspace use impacts in the McGregor Range airspace ROI are activities at HAFB and WSMR. The cumulative impact of the proposed HAFB action is a positive impact created by a reduction in flight operations in McGregor Range restricted airspace. Activities at HAFB that could impact cumulative airspace use in the ROI are the 100 sorties projected for the USAF tactical target complex. The net cumulative effect is an increase of 100 sorties from FY 97.

70

Based upon the information contained in the WSMR EIS, proposed WSMR activities should have no significant cumulative airspace impacts relative to McGregor Range. With respect to potential airspace related cumulative impacts of WSMR activities, the WSMR EIS (U.S. Army, 1998n) identifies ongoing and projected test programs and other missions anticipated at WSMR. The WSMR EIS provides that, relative to the projects and new programs proposed over the next 10 years at WSMR, changes in the scope of operations resulting from each component cannot be predicted or are not defined and will require separate environmental documentation. However, the broad analysis of potential cumulative impacts conducted in the WSMR EIS did not include airspace as one of the four areas identified as areas of specific cumulative impacts.

4.2.8 Mitigation

Because no significant impacts to airspace management would occur as a result of any McGregor Range alternative or cumulative airspace actions, no mitigative measures are necessary.

4.2.9 Irreversible and Irretrievable Commitment of Resources

No irreversible and irretrievable commitment of airspace resources would occur.

Transportation

4.3

4.3 TRANSPORTATION

The potential impacts to transportation resulting from the alternatives are discussed below.

4.3.1 Alternative 1

The traffic generated on the roadways within the ROI as a result of activities associated with Alternative 1 would not be adversely affected. The City of El Paso has developed a long-range plan that projects the effects on traffic through the year 2015. The increase in the number of vehicle trips is directly related to the increase in population. The background growth rate would accommodate any increase in traffic due to the activities associated with this alternative.

Under sustained mobilization, additional troops would be on site, which would result in additional slow-moving convoys of troops on U.S. Highway 54 between the Fort Bliss Main Cantonment Area and the range camps. This additional traffic would periodically impede local commuters in El Paso and between Alamogordo and El Paso. However, there is a planned widening of U.S. Highway 54 from the Texas-New Mexico border to Alamogordo, which is scheduled to begin in 1999. This action would further reduce any potential impact that military activities on McGregor Range would have on transportation. Alternately, portions of the troop convoys could be routed along roads on the training complex. However, this potentially slows the movement of the convoys. In addition, increased amounts of munitions would be transported between Biggs AAF and the new ASP on McGregor Range. Compliance with DOT regulations would minimize risks to roadway and land users.

Road improvements on the north McGregor Range to support FTX and JTX, such as Roving Sands, would provide increased accessibility for military and nonmilitary uses. This would benefit a variety of activities including environmental surveys, and range maintenance by both the Army and BLM.

Under current use, U.S. Highway 54 and New Mexico Highway 506 are closed occasionally for safety reasons when necessitated by McGregor Range operations. McGregor Range activities under this alternative would not change the established closure practices and expected frequency.

4.3.2 Alternative 2

Traffic impacts associated with Alternative 2 would be the same as described for Alternative 1, with the exception that there would be a reduction in the number of road closures along New Mexico Highway 506 due to HIMAD live fire operations. The reduction in the number of road closures is considered a beneficial impact.

4.3.3 Alternative 3

Traffic impacts associated with Alternative 3 would be the same as described for Alternative 2. Because the reduced withdrawn area would not support a full range of HIMAD missile firings, access along New Mexico Highway 506 would be improved due to fewer closures. The reduction in the number of road closures is considered a beneficial impact.

4.3.4 Alternative 4

Traffic impacts associated with Alternative 4 would be the same as described for Alternative 2. Access and use of New Mexico Highway 506 and all roads and trails north of the highway and on Otero Mesa would be unconstrained by military activities. The reduction in the number of road closures is considered a beneficial impact.

4.3.5 Alternative 5 – No Action

The return of McGregor Range to the public domain and the exchange of Army fee-owned land in TAs 8 and 32 would not substantially change the effects of military activities on traffic within the ROI. Military convoys would still use U.S. Highway 54 between the Fort Bliss Main Cantonment Area and the range camps. Access and use of New Mexico Highway 506 and all roads and trails north of the highway or on Otero Mesa would be unconstrained by military activities.

4.3.6 Alternative 6

Under Alternative 6, the designation of the wilderness area or NCA would not likely affect transportation. However, this alternative requires congressional action for implementation. Because the precise nature and extent of the congressional action cannot be determined at this time, detailed transportation analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.3.7 Cumulative Impacts

No cumulative effect with respect to traffic would be expected as a result of activities associated with the various alternatives.

4.3.8 Mitigation

In the absence of any adverse effect on traffic, no mitigation would be required.

4.3.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources would occur.

Utilities

4.4

4.4 UTILITIES

The environmental impacts to water supply, wastewater treatment, solid-waste disposal, energy and communications are discussed below, in relation to the alternatives described in Chapter 2.

4.4.1 Alternative 1

Under this alternative, the construction and operation phases of several actions being considered and the possibility of mobilization requirements will potentially increase demands for all services. The possible actions include the paving of more than 20 miles of dirt and gravel roads on McGregor Range, a rail spur to McGregor Range Camp, a helicopter training complex, and a geothermal power generation and desalination plant. Any of these actions would increase demands for utilities on McGregor Range on both a temporary and permanent basis. Increases in personnel using the McGregor Range infrastructure under a mobilization scenario would also increase demands for utilities. It is likely that a greater number of military units and personnel will spend time at McGregor Range in wartime, which will require increased support staff and facilities. Mobilization personnel requirements have been estimated at up to 27,500 or slightly more than the strength of the installation in 1990. However, it is not possible at this time to definitively predict utility demand at McGregor Range by the potential number of additional personnel or the length of their stay.

Increased water and power demand could result in increased purchases from El Paso to approximate the 1990 levels and probably would require installation of additional lines to new locations. Expansion of existing wastewater treatment systems and installation of new systems in other areas of McGregor Range would be required. The USAF selected the Otero Mesa site on McGregor Range for its tactical target complex. There would be a significant increase in the amount of inert/subscale munitions expended on McGregor Range. Maintenance of the complex would result in a 30 percent increase (approximately 150,000 pounds per year) in the generation of nonhazardous scrap metal for the HAFB DRMO (USAF, 1998). This scrap metal increase would be significant for the HAFB DRMO, but would not pose an environmental threat or create additional environmental impacts on the Fort Bliss Training Complex or at HAFB. Increased solid waste disposal from possible future activities would require additional deliveries to the landfill near the Main Cantonment Area.

4.4.2 Alternative 2

Under this alternative, most current mission activities as well as most of the future increases in activities and construction as described in Section 2.1.1 would not be affected. Consequently, increased demands on utilities would be similar or slightly less than under Alternative 1.

4.4.3 Alternative 3

Under this alternative, current mission activities that use the Sacramento Mountains and Otero Mesa would be constrained or reduced, and some of the future increases in activities and construction as described in Section 2.1.1 would not be supportable under this alternative. Consequently, increased demands on utilities would be similar or slightly less than under Alternative 1.

4.4.4 Alternative 4

Under this alternative, current mission activities that use the area north of New Mexico Highway 506 and Otero Mesa would be constrained or reduced. Many future increases in activities and construction as described in Section 2.1.1 would not be supportable under this alternative, probably resulting in a small decrease in utility requirements.

4.4.5 Alternative 5 – No Action

Under this alternative, installation facilities on McGregor Range would be closed, with the exception of the McGregor Range Camp, McGregor ASP, and Meyer Range. Utility use for military purposes would be reduced.

4.4.6 Alternative 6

Under this alternative, impacts to utilities would be the same as under Alternative 3, 4, or 5, depending on the portion of the range that will continue to be withdrawn beyond 2001.

4.4.7 Cumulative Impacts

There are no cumulative impacts relating to utilities on McGregor Range, other than those relating to water supply. The El Paso/Fort Bliss regional water supply is affected by the cumulative effects of groundwater pumpage, mostly by El Paso, Texas, and Ciudad Juarez, Mexico. Pumpage from the Hueco Bolson aquifer exceeds recharge, which means that the aquifer is in overdraft condition and is experiencing accelerated rates of water-level decline (see Section 4.7). The lowering of water levels in the aquifer has permitted the infiltration of salt water into the fresh-water zones. It is estimated that the aquifer will be exhausted of recoverable fresh water between 2013 and 2025, which could result in a water-supply shortage in the area. Although municipal water will continue to be available from other sources, a short supply could increase costs to customers, including Fort Bliss. All water used for military purposes on McGregor Range is purchased by Fort Bliss from El Paso. No other utility is expected to experience noticeable cumulative effects.

4.4.8 Mitigation

In the absence of significantly adverse effects, mitigation will not be required for utilities, with the exception of water supply. The impact on water supply is primarily a water resource problem. Mitigation of water resources is discussed in Section 4.7.8.

4.4.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources would occur.

Earth Resources

4.5

4.5 EARTH RESOURCES

The evaluation of impacts to geologic resources resulting from the alternatives includes the effects on metallic minerals potential, oil and gas potential, geothermal resources, and industrial minerals potential.

To assess potential impacts to soil resources on McGregor Range, the annual soil loss from water and wind was calculated using the Revised Universal Soil Loss Equation (RUSLE) (Soil and Water Conservation Society, 1995) and the Wind Erosion Equation (Fuller, 1987). Three categories of impacts to the soil resource were used: undisturbed (no impact), moderate impact, and maximum impact. Soil data for the equations were obtained from the Otero Area, New Mexico Soil Survey (USDA, 1981), RUSLE software databases, and NRCS Map Unit Interpretation Record (MUIR) databases. Results are reported in Table 4.5-1.

The undisturbed scenario assumes current conditions with little disturbance to vegetation or soil from military or nonmilitary actions. The moderate impact scenario assumes a 50 percent reduction in vegetative cover and 50 percent disturbance to the soil surface from military or nonmilitary activities. The maximum impact assumes 100 percent removal of vegetation and 100 percent disturbance to the soil surface from military or nonmilitary activities (See Appendix H for additional assumptions and examples of soil loss calculations). McGregor Range vegetative cover and vegetative cover change from 1986 to 1996 are discussed in Section 4.8, *Biological Resources*. During this period, reductions in vegetative cover from all natural and noninduced sources were in the lower range of the moderate soil disturbance category.

Examples of moderate impacts from military activities include two-track roads, maneuvering lanes, areas with intermittent small craters, and small excavations from ordnance removal activities. Examples of moderate impacts from nonmilitary activities include livestock trails, livestock holding and bedding areas, and excavations from small mining operations. Examples of maximum impact areas for military activities would include vehicle staging areas. Examples of maximum impact areas for nonmilitary activities would include excavations from large mining operations. Table 4.5-1 presents soil associations, acceptable soil loss, and estimated annual soil loss from wind and water for three impact scenarios for soils on McGregor Range. Figure 3.5-7 presents a map of the soils listed in the table. Table 4.5-2 shows the acreage of each soil type on withdrawn lands by alternative. Acreages are not shown for Alternatives 5 (No Action) and 6.

4.5.1 Alternative 1

As described in Section 2.1.1, military activities could vary from the same as currently conducted, to an expanded range of capabilities and intensified use. The impacts to earth resources, including geologic resources and soils, resulting from Alternative 1 (current withdrawal boundaries) are discussed in this section.

4.5.1.1 Geology

Under this alternative, lands on McGregor Range that are currently withdrawn from the mining and mineral leasing laws would remain closed to mineral exploration and possible development in accordance with the RMPA (BLM, 1990a). Some public domain lands within McGregor Range on Otero Mesa and north of New Mexico Highway 506 are managed according to a MOU (BLM, 1990b) between the Army and the BLM (Figure 2.1-1). Currently, the McGregor Range is closed for locatable mineral exploration. However, sales of industrial minerals, and oil and gas development is possible on portions of the range in accordance with the RMPA. Under Alternative 1, it is assumed that these developments would continue to be allowed.

37

Table 4.5-1. Predicted Soil Loss

Map ID[1]	*Soil Unit Name*	*Acceptable Soil Loss*[2] *(tons/acre/yr)*	*Impact Scenario*[3]					
			Undisturbed		*Moderate*		*Maximum*	
			Water	*Wind*	*Water*	*Wind*	*Water*	*Wind*
13	Forest Service Land-Typic Calciorthids	5	0.62	16.50	0.78	35.07	0.6	103.20
283	Forest Service Land-Typic and Lithic Argiborolls	5	0.04	16.50	0.11	35.07	8.00	103.20
293	Forest Service Land-Lithic Argiustolls	5	0.06	0.60	1.50	27.12	2.10	103.20
294	Forest Service Land-Lithic Argiustolls	5	0.09	16.50	2.20	35.07	6.10	103.20
295	Forest Service Land-Lithic Argiustolls	5	0.33	16.50	8.40	35.07	11.00	103.20
602	Forest Service Land-Lithic Torriorthents	5	0.45	16.50	0.55	35.07	0.70	103.20
603	Forest Service Land-Typic Camborthids	5	2.20	16.50	4.00	35.07	4.60	103.20
604	Forest Service Land-Lithic Torriorthents	5	0.73	16.50	2.47	35.07	3.80	103.20
AMC	Armesa very fine sandy loam, 0 to 5 percent slopes	5	0.11	6.40	0.51	30.02	2.70	103.20
BOA	Bluepoint-Onite-Wink association, nearly level	5	0.06	90.62	0.18	87.90	0.59	141.22
DRF	Deama-Rock Outcrop complex, 20 to 50 percent slopes	1	0.04	0.19	0.45	8.48	5.48	49.85
DTB	Doña Ana-Berino association, gently sloping	5	0.35	21.36	0.71	46.88	1.55	129.39
ECF	Ector-Rock Outcrop complex, 20 to 50 percent slopes	1	0.03	0.00	0.15	0.00	1.03	0.00
ESB	Espy-Shanta Variant association, gently sloping	5	0.06	0.45	0.28	20.34	1.28	77.40
HPB	Holloman-Reeves association, nearly level	5	0.09	8.79	0.30	28.53	1.14	92.88
LOB	Lozier-Rock Outcrop complex, 0 to 5 percent slopes	1	0.06	1.65	0.23	3.51	0.83	10.32
LOD	Lozier-Rock Outcrop complex, 5 to 20 percent slopes	1	0.06	1.75	0.31	3.86	1.82	12.60
MTA	Mimbres-Tome association, nearly level	5	0.10	17.16	0.39	26.25	1.34	79.80
NTD	Nickel-Tencee association, strongly sloping	5	0.14	21.34	0.64	29.68	3.03	80.04
PCB	Pena-Cale-Kerrick association, nearly level	5	0.03	3.09	0.18	18.98	1.84	75.60
PEC	Philder very fine sandy loam, 0 to 9 percent slopes	1	0.17	4.10	0.86	28.87	4.44	103.20
PFB	Philder-Armesa association, undulating	5	0.10	4.86	0.57	28.18	3.55	99.07
PGB	Pintura-Doña Ana complex, 0 to 5 percent slopes	5	0.12	21.73	0.35	54.57	1.10	143.22

Table 4.5-1. Predicted Soil Loss (Continued)

Map ID[1]	*Soil Unit Name*	*Acceptable Soil Loss*[2] *(tons/acre/yr)*	*Impact Scenario*[3]					
			Undisturbed		*Moderate*		*Maximum*	
			Water	*Wind*	*Water*	*Wind*	*Water*	*Wind*
PHB	Pintura-Tome-Doña Ana complex, 0 to 5 percent slopes	5	0.16	27.33	0.48	57.68	1.50	150.60
RAB	Reakor-Tome-Tencee association, gently sloping	5	0.24	43.80	0.68	51.65	1.92	109.65
RFA	Reyab-Armesa association, gently sloping	5	0.04	2.60	0.30	26.78	2.50	98.04
RRF	Rock Outcrop-Lozier complex, 20 to 65 percent slopes	1	0.11	7.43	0.56	15.78	3.04	46.44
TAC	Tencee very gravelly silt loam, 0 to 10 percent slopes	1	0.05	9.60	0.28	13.59	1.55	57.60
TDB	Tome silt loam, 0 to 5 Percent slopes	5	0.23	25.20	0.76	39.42	2.64	103.20
WKA	Wink	5	0.042	25.20	0.14	47.60	0.52	129.00

[1] Identification code for soils map in Chapter 3.
[2] Acceptable soil loss - the maximum rate of soil erosion (tons/ac/year) that will permit sustained productivity indefinitely. Given as the t-factor in the soil survey. Acceptable soil losses for Forest Service Land soils were assumed to be 5 tons/ac/year.
[3] Undisturbed = no disturbance to vegetation or soil, moderate impact = 50 percent reduction in vegetative cover and 50 percent disturbance of soil surface, and maximum impact = 100 percent removal of vegetation and 100 percent disturbance of the soil surface.

The impacts of limited mineral access on 608,385 acres of the proposed land withdrawal are economic. Economic impacts depend on the size and strategic importance of the mineral resources that are precluded from development. In general, the withdrawal area has a low to moderate potential for oil and gas (Figure 3.5-8), a high potential for geothermal resources at the southern end of the range (Figure 3.5-7), scattered deposits of various industrial minerals (Figures 3.5-5 and 3.5-6), and a moderate to low potential for metallic minerals including gold, silver, copper, lead, zinc, platinum group, iron, niobium, thorium and rare earths, beryllium, tin, and manganese (Figure 3.5-4). It is not possible to quantify these economic impacts with certainty.

4.5.1.2 Soils

Military Activities. Under Alternative 1, military activities would range from continuation of the status quo to a future potential level based on installation capacity. Regardless of the activity level, major sources of impacts to soil resources on McGregor Range would be the off-road vehicle maneuvering of tracked and wheeled vehicles in TA 8, and ground disturbance associated with missile firings. Other sources of impacts to soils would include facility construction and demolition.

Most off-road vehicle movement has been and will be confined to fixed locations. For instance, movement during Roving Sands 1996 was restricted to twenty 0.4 square mile sites and five 30-acre air defense sites. In addition, Roving Sands sites are located less than 0.3 miles from the road to minimize off-road movement. Within these locations, impacts to soils and vegetation varied from light soil disturbance resulting from foot traffic to complete devegetation and soil surface disturbance on a small percentage of Roving Sands sites.

Table 4.5-2. Acreage of Soil Types on Withdrawn Lands by Alternatives

Soil Unit (map symbol)	*Alternative 1*	*Alternative 2*	*Alternative 3*	*Alternative 4*
Forest Service Land-Typic and Lithic Argiborolls (283)	7	0	0	0
Forest Service Land-Lithic Argiustolls (293)	240	0	0	0
Forest Service Land-Typic Calciorthids (13)	2,482	0	0	0
Forest Service Land-Lithic Argiustolls (294)	1,039	0	0	0
Forest Service Land-Lithic Argiustolls (295)	809	0	0	0
Forest Service Land-Lithic Torriorthents (602)	1,345	0	0	0
Forest Service Land-Typic Camborthids (603)	2,927	0	0	0
Forest Service Land-Lithic Torriorthents (604)	10,174	0	0	0
Armesa very fine sandy loam (AMC)	13,836	13,836	0	0
Bluepoint-Onite-Wink association (BOA)	1,302	1,302	1,302	0
Deama-rock outcrop complex (DRF)	1,899	0	0	0
Doña Ana-Berino association (DTB)	1,115	1,115	1,115	1,115
Duneland (DU)	7	7	7	7
Ector-Rock outcrop complex (ECF)	26,817	221	103	0
Espy-Shanta Variant association (ESB)	421	0	0	0
Holloman-Reeves association (HPB)	951	951	951	0
Lozier-Rock outcrop complex (0-5 %) (LOB)	4,231	4,207	2,625	2,625
Lozier-Rock outcrop complex (5-20 %) (LOD)	96,858	96,620	70,860	62,542
Mimbres-Tome association (MTA)	106,233	106,233	106,233	89,447
Nickel-Tencee association (NTD)	66,978	64,526	56,958	44,722
Pena-Cale-Kerrick association (PCB)	804	0	0	0
Philder very fine sandy loam (PEC)	51,122	51,122	2,766	2,766
Philder-Armesa association (PFB)	25,595	22,791	0	0
Pintura-Tome-Doña Ana complex (PHB)	34,843	34,843	34,843	26,182
Pintura-Doña Ana complex (PGB)	75,324	74,841	74,841	55,680
Reakor-Tome-Tencee association (RAB)	1,368	1,350	0	0
Reyab-Armesa association (RFA)	19,708	19,708	334	334
Rock outcrop-Lozier complex (RRF)	91,541	65,743	60,399	59,720
Tencee very gravelly silt loam (TAC)	2,845	2,845	2,845	2,845
Tome silt loam (TDB)	37,603	37,598	31,667	31,667
Wink association (WKA)	12	12	12	12

These types of disturbances can accelerate soil erosion by wind and water because they reduce vegetative cover, compact soils, and disrupt protective soil covers such as plant litter and gravel layers. Tracked vehicle maneuvering has been found to disrupt soil crusts and bisect coppice dunes on soils on the Doña Ana Range–North Training Areas at Fort Bliss (Marston, 1984). Such impacts can also supply loose sand that increases the potential for transport of soil by wind.

Wheeled vehicles (High Mobility Multi-purpose Wheeled Vehicles [HMMWVs], heavy trucks) may also cause major impacts to soils. In addition, training sites and roads over soils with a high potential for soil loss from natural, military, or nonmilitary activities may be affected by frequent and concentrated traffic during FTXs. Studies have recently been commissioned by Fort Bliss to determine wheeled vehicle impacts on plants and soil on the Fort Bliss Training Complex. Results of these studies showed that wheeled vehicles increased soil bulk densities, decreased seed germination of native plants and decreased above-ground plant productivity (MacKay et al.,1996; USDA, 1995, 1996).

Range fires ignited by military activities can also impact soils. Range fires can be ignited during military training exercises from hot missile debris, tracer ammunition, flares, and spotting charges used to mark the location of inert ordnance. Range fires reduce vegetative cover, thus making soils more vulnerable to wind and water erosion.

The construction and demolition of military facilities can impact soil resources. The greatest impacts to soils by construction activities would occur during construction of new structures in previously undisturbed areas. These impacts would result from disturbance to vegetation and soil caused by excavation and soil compaction by heavy equipment at the construction site and on access roads. Impacts could also occur from dust and rainwater runoff. Rainwater runoff could cause gullying, mud slides, and flooding. Activities such as clean up, construction, and demolition would require project-specific environmental analyses and mitigations.

Cleanup activities can also impact soils. Cleanup activities such as ordnance and explosive hazards, hazardous waste, and toxic waste removal could lead to moderate and maximum impacts to soil resources depending on the size of the area and the soil unit (Table 4.5-2).

Construction on previously disturbed sites would cause few additional impacts to the soil, unless dust is not controlled or runoff from the disturbance causes erosion on adjacent undisturbed soils. Significant adverse impacts could occur if facility construction occurs in sensitive areas having soils with a high potential for wind and water erosion (Table 4.5-2).

Impacts to soils from building demolition are similar to those described for building construction with the exception that most soils on demolition sites have been previously disturbed. Impacts include excavation, compaction by heavy equipment, erosion caused by rainwater runoff, and dust from exposed soils. Soils at most construction and demolition sites would receive maximum impact (no vegetation, 100 percent disturbance of soil surface) during and after demolition activities. Therefore, without erosion control treatments, soil loss from wind and water could be adverse or significantly adverse depending upon the location of the disturbance with respect to sensitive areas (i.e., areas having sensitive species, stream courses, cultural resources or facilities) and the soil unit (Table 4.5-2).

The proposed 5,120-acre USAF tactical target complex on Otero Mesa would encompass a large undisturbed area and has the potential for impacting soil resources. Soil erodibility at this location ranges from low to high. Soils at the target sites would be impacted either by construction of the targets, or grooming of targets by blading and dragging the soil surface. Operations and maintenance at the Otero Mesa site could cause range fires, especially from the use of tracer ammunition and spotting charges. Fires would consume vegetation and plant litter, and expose the soil surface to erosion. Several roads

used to access the sites would need to be upgraded. This action could cause soil erosion unless careful engineering is conducted to protect the roads and surrounding environment from flowing water. Soils exposed during ordnance and explosive hazards removal, construction, and grooming would be vulnerable to erosion by water and wind, and would be similar to that for the maximum impact in Table 4.5-1.

Military activities could lead to adverse or significantly adverse environmental impacts depending on the location of the activity with respect to sensitive areas (i.e., sensitive species, stream courses, cultural resource areas, or facilities), and the soil unit (Table 4.5-2) where the activity is taking place. The potential for significantly adverse impacts is greatest on those soils identified as having the greatest potential for soil erosion in the maximum soil impact scenario (Table 4.5-1).

4.5.2 Alternative 2

4.5.2.1 Geology

Under this alternative, all but 40,000 acres of currently withdrawn land at the northeast end of McGregor Range would be re-withdrawn for use by the Army. Except for Otero Mesa and selected areas north and south of New Mexico Highway 506 that are managed according to the MOU (BLM, 1990b) between the Army and BLM, the withdrawn area would be closed to locatable mineral exploration (Figure 2.2-1). Possible development of leasable and salable minerals would continue as described in the RMPA.

4.5.2.2 Soils

Under Alternative 2, the Tularosa Basin and Otero Mesa portions of McGregor Range would be withdrawn for continued military use and the Sacramento Mountains foothills portion of McGregor Range would be returned to the public domain. Military activities for Alternative 2 would be the same as those described in Alternative 1 except that military exercises currently conducted or planned for the Sacramento Mountains foothills would be reduced with the exception of activities on Army fee-owned lands. Therefore, activities on fee-owned lands would have the same impacts to soils as described for Alternative 1. The reduction of military activities could be beneficial to the soil resource because of decreased soil erosion from dismounted training.

Lands released to the public may require ordnance and explosive hazards cleanup by the military, although compared to other portions of the range (Tularosa Basin), the quantity of ordnance and explosive cleanup in the Sacramento Mountains foothills is small. These activities have the potential to impact soils in localized areas. Ordnance and explosive hazards removal activities that involve excavation of the soil could cause moderate to maximum impacts depending on the size of the area and the soil unit (Table 4.5-1).

4.5.3 Alternative 3

4.5.3.1 Geology

Under this alternative, about 70 percent (428,385 acres) of the existing McGregor Range withdrawal would be re-withdrawn for use by the Army. These lands would continue to be closed to locatable mineral exploration and possible development. Lands associated with the 1990 MOU with the BLM would be open to leasable and salable mineral exploration and development only if the Army agrees to allow these activities to occur.

4.5.3.2 Soils

Under Alternative 3, the Tularosa Basin portion of McGregor Range would be withdrawn for continued military use and the Sacramento Mountains foothills and Otero Mesa portions of McGregor Range would be returned to the public domain. With the loss of Otero Mesa and the Sacramento Mountains foothills, McGregor Range could only support some of the current military activities. Other military activities would be reduced. Military activities on Army fee-owned lands would be the same as described for Alternative 1. The reduction of military activities could be beneficial to soil resources because of decreased soil erosion from ground troop maneuvers, and construction and maintenance of the tactical target complex on Otero Mesa.

Lands released to the public under Alternative 3 may require ordnance and explosive hazards cleanup by the military. Ordnance and explosive hazards removal activities that involve excavation of the soil could cause moderate to maximum impacts depending on the size of the area and the soil unit (Table 4.5.-1). The increased land area requiring cleanup under this alternative could potentially lead to adverse or significantly adverse impacts depending upon the area, with respect to sensitive areas and the soil units.

4.5.4 Alternative 4

4.5.4.1 Geology

Under this alternative, about 60 percent (364,385 acres) of the existing McGregor Range withdrawal would be re-withdrawn for use by the Army. These lands would continue to be closed to locatable mineral exploration and possible development. Lands associated with the MOU (BLM, 1990b) with the BLM would be open to leasable and salable mineral exploration and development only if the Army agrees to allow these activities to occur.

4.5.4.2 Soils

Under Alternative 4, all portions of McGregor Range north of New Mexico Highway 506 and on Otero Mesa would be released to the public, except for Army fee-owned lands. This reduction in withdrawn land would severely limit military exercises, so that many activities would be discontinued. Released lands would be free from future impacts to soils from military activities, and impacts to soils from military uses on withdrawn lands and fee-owned lands would be reduced.

Lands released to the public under Alternative 4 may require ordnance and explosive hazards cleanup by the military. Ordnance and explosive hazards removal activities that involve excavation of the soil could cause moderate to maximum impacts depending on the size of the area and the soil unit (Table 4.5-1). The increased land area requiring cleanup under this alternative could potentially lead to adverse or significantly adverse impacts depending upon the area, with respect to sensitive areas and the soil units.

4.5.5 Alternative 5 – No Action

4.5.5.1 Geology

Under this alternative (No Action), all public-domain lands within the current withdrawal for military use could revert back to BLM management and control. Depending on the extent and danger posed by prior Army activities, the BLM could open these lands to the mining and mineral-leasing laws.

4.5.5.2 Soils

Under Alternative 5, the withdrawal of McGregor Range would not be renewed and the land would be returned to the public domain. Therefore, there would be no further use of McGregor Range for military activities. Consequently, except for ordnance and explosive hazards cleanup activities, there would be no continuing impacts to the soil resource from military activities.

Ordnance and explosives cleanup has the potential to cause moderate to maximum impacts to soils depending on the size of the area disturbed and the soil unit (Table 4.5-1). Under this alternative, the Tularosa Basin would be released to the public domain and, therefore, may require cleanup. Compared to other portions of McGregor Range, the Tularosa Basin would require more cleanup, which translates to more soil disturbance and greater soil loss from wind and water. If cleanup of Tularosa Basin occurred at the same intensity as that proposed for the tactical target complex, impacts to soils in cleanup areas could be significantly adverse.

Beneficial effects on soil resources, from suspending all military activities, would include reduced erosion from ground troop maneuvering, missile cratering, and off-road vehicle maneuvering (TA 8 only) by wheeled and tracked vehicles. In addition, disturbance of soils from future construction and demolition of military structures would cease.

4.5.6 Alternative 6

Alternative 6 addresses consideration of possible congressional action, if Alternatives 3, 4, or 5 were to be implemented, to designate Otero Mesa, the Sacramento Mountains foothills, and Army fee lands as a NCA. Designation of these lands as an NCA could enhance the protection and restoration of natural resources if appropriate funding levels were made available, and may also encourage public use of these lands. Since it is assumed that NCA lands would remain under a management structure similar to the current RMPA, impacts to geology and soils on these lands is likely to be similar to impacts described for released lands in Alternatives 3, 4, and 5. The precise nature and extent of the congressional action cannot be determined until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.5.7 Cumulative Impacts

4.5.7.1 Geology

Many parts of south-central New Mexico are controlled by various branches of the DoD for military training and for research and development. These areas are generally off limits to mineral exploration. Impacts to the availability of energy and mineral resources as a result of these withdrawals are not quantifiable with certainty. In general, however, as the acreage of restricted land increases, so does the adverse impact to the availability of energy and mineral resources.

The cumulative impacts vary only by the amount of land withdrawn for McGregor Range under all alternatives. The cumulative impacts include past, present, and reasonably foreseeable actions by the Army, other federal agencies, and public and private organizations that limit access to land for the purpose of mineral and energy resource exploration and development.

The impacts of limited access for mineral and energy resource development on withdrawn land are primarily economic as the level of the potential for development have little effect on regional geological resources. Economic impacts depend on the size and strategic importance of the mineral resources that are precluded from development. In general, the withdrawal area has a low to moderate potential for oil and gas (Figure 3.5-8), a high potential for geothermal resources at the southern end of McGregor Range

(Figure 3.5-7), scattered deposits of various industrial minerals (Figures 3.5-5 and 3.5-6), and a moderate to low potential for metallic minerals including gold, silver, copper, lead, zinc, platinum group, iron, niobium, thorium and rare earths, beryllium, tin, and manganese (Figure 3.5-4). It is not possible to quantify these economic impacts with certainty.

4.5.7.2 Soils

Cumulative effects to soils under each alternative from military use and nonmilitary sources on military lands for these alternative are discussed in this section. Military effects are described in the previous discussion. Nonmilitary activities include those activities described in the White Sands RMP (BLM, 1986a) as amended by the McGregor Range RMPA (BLM, 1990a).

Over one-third of McGregor Range is currently grazed by livestock. Grazing occurs on the grasslands of Otero Mesa, the shrublands north of New Mexico Highway 506, and in the shrubland and pinyon pine/juniper communities of the Sacramento Mountains foothills. The BLM and USFS are responsible for the management of livestock in their respective jurisdictions on McGregor Range.

Grazing animals impact soils indirectly by decreasing plant cover through grazing and trampling of plants (Stoddart et al., 1975) and directly by disrupting soil structure and compacting the soil through hoof action (Orodho et al., 1990; Weigel et al., 1990). Reduced soil structure and compaction leads to decreased pore space in soil, which in turn leads to decreased infiltration and increased water runoff. Unchecked water runoff causes soil erosion. Gamougoun et al., (1984) and Weltz et al., (1989) studied effects of cattle trampling on water erosion at the Fort Stanton Experimental Ranch in south-central New Mexico near Fort Bliss, and found that sediment production was greatest under heavy grazing.

Impacts from large grazing animals vary with the distribution of animals across the various pastures on McGregor Range. Grazing impacts are greatest in areas where animals congregate, such as in holding and bedding areas, and around stock tanks, troughs, and mineral licks. Areas around stock tanks and troughs often have much bare ground, little vegetation, and numerous trails (USAF, 1997g), although these areas are typically small and have vegetation within 100 feet of the trough. The soil within an area of 10 acres around a water facility is compacted by cattle trampling. Cattle trampling contributes to soil compaction on about 800 acres on McGregor Range (BLM, 1980). Although no observations of impacts to wetlands on McGregor Range have been made, the heavy use of cattle around stock tanks is an indication of the types of impacts that could occur to soils in the immediate vicinity of wetlands. Impacts can also be severe on livestock trails. In extreme cases, livestock trails on slopes can cut into the slope causing terraces. For the above impacts, the soil surface is generally denuded of vegetation, and surface soils are disturbed and compacted through hoof action. Soils at these sites could receive moderate to maximum cumulative impact from natural factors, military actions, and grazing, depending upon the soils within the individual BLM natural unit. Therefore, without remediation, soil loss from wind and water could be adverse or significantly adverse depending on the location of the disturbance with respect to sensitive areas and the soil unit (Table 4.5-1).

However, cattle trailing and consequent deterioration of McGregor Range were not observed. In contrast to localized disturbances, which are caused by intensive livestock use around water facilities, most impact to soils from livestock on McGregor Range is relatively minor and distributed evenly across the landscape. These impacts are typically manifested by reductions in vegetative cover, disruption of protective soil crusts, and minor soil compaction. Compared to disturbances caused by military exercises and facility construction and demolition, impacts by livestock, although often more wide spread, are less severe because the protective vegetation is generally left intact. However, impacts by livestock grazing added to the soil loss from military activities could lead to cumulative impacts on the soil resource on parts of McGregor Range.

Range fires originating on neighboring lands could potentially migrate onto McGregor Range and destroy vegetative cover, which, in turn, could impact soils. Mining activities on neighboring lands could also initiate soil loss that could accelerate soil erosion on parts of McGregor Range.

Other nonmilitary activities contributing to cumulative impacts would be similar to current activities which include recreation (hunting, hiking, camping), construction of wildlife drinkers, construction of interpretive trails and signs, fence construction, and cultural resource activities.

Recreational activities such as hunting, hiking, and camping cause relatively few impacts to soils on McGregor Range, particularly because off-road driving is prohibited. Activities such as the construction of livestock and wildlife drinkers (and associated pipelines), fence construction and maintenance, and construction of interpretive trails and signs can cause localized soil impacts if they are not remediated. All of these activities have occurred in the past on McGregor Range and could potentially occur in the future.

Cultural resource activities that could impact soils on McGregor Range include surveying and evaluating potential cultural sites, and archeological diggings. Archeological diggings can be destructive to the soil resource when they are conducted in previously undisturbed areas. However, they are typically very localized and small in area and are not expected to cause severe adverse impacts on soils if they are mitigated.

4.5.8 Mitigation

There may be impacts that require mitigation measures. Adverse effects to soils from military activities would be analyzed in project-specific NEPA documents.

4.5.9 Irreversible and Irretrievable Commitment of Resources

Under each of the action alternatives, the Army could develop and use geothermal resources at the southern end of McGregor Range. Development of this resource is irretrievable, even though depletion of the resource in the foreseeable future is unlikely.

Construction associated with Army activities on McGregor Range, under the action alternatives, would consume sand, gravel, and other industrial minerals; and range operations would consume oil, gas, and other natural resources. Consumption and use of these resources are irreversible and irretrievable.

37

The impact of military activities has exposed soils in TA 8 to increased gully erosion and irretrievable loss of soil by wind. These impacts would likely continue regardless of which withdrawal configuration alternative is selected. By following installation management practices and avoiding highly erodible soils, these impacts can be minimized.

Air Quality

4.6

4.6 AIR QUALITY

To determine the air quality impacts of existing or proposed activities within the alternative boundaries of the McGregor Range land withdrawal, they must be evaluated against a set of standard criteria. For NEPA projects, there are several air quality screening criteria that can be used. Air quality impacts from a proposed activity or action would be significant if they: (1) increase ambient air pollution concentrations above any NAAQS; (2) contribute to an existing violation of any NAAQS; (3) interfere with or delay timely attainment of NAAQS; or (4) impair visibility within any federally mandated PSD Class I area. Any new major project that may lead to nonconformance or contribute to a violation of the NAAQS must conduct a conformity analysis before initiating any new action.

4.6.1 Alternative 1

As described in Section 2.1.1, military activities could vary from the same as currently conducted, to an expanded range of capabilities and intensified use. This section presents the air quality impacts of Alternative 1, in which the withdrawal of McGregor Range would be renewed under the same conditions and boundaries that presently exist.

Mission activities take place throughout the range complex, and include training through field exercises.

Most of the air quality emissions on the range complex are from mobile sources associated with the field exercises, including operation of wheeled and tracked vehicles; combustion of fuels in vehicles, equipment, and aircraft; missile firings; and ordnance detonation. Field exercises conducted on the range complex include:

- Short-range and medium-, and high-altitude missile firing;
- Annual Roving Sands combined forces exercises;
- Annual live FIREX for Hawk, Patriot, Stinger, and Roland;
- Helicopter gunnery and Hellfire training, low altitude NOE tactical training;
- Fixed-wing aircraft bombing practice at Class C Bombing Range;
- Airborne personnel, equipment drops, and Special Forces ground troop maneuvers;
- Small arms training at Meyer Range Complex; and
- Limited use of the southern-most portion of McGregor Range for tracked vehicle operations.

Each of these field exercises will result in air emissions. However, the amount and type of air emissions resulting from a particular field exercise will vary significantly, depending on the number of personnel and the amount and type of equipment involved.

Some of the field exercises will result in very low levels of emissions, such as small arms training. Other exercises, such as missile firings, bombing practice, or helicopter gunnery training, will result in somewhat higher levels of emissions, which are confined to specific locations. Finally, the field exercises, in particular the annual Roving Sands combined forces JTX, will involve the most participants and equipment, and have the potential for the greatest amount of air emissions. Consequently, the annual Roving Sands JTX was selected for evaluation as a worst-case (highest air emissions) activity to determine the maximum potential air quality impacts on the McGregor Range complex. All other mission activities that may be conducted at the range complex should have air quality impacts that are both lower and more localized than the Roving Sands JTX.

Roving Sands JTX - As many as 20,000 personnel may be involved in a Roving Sands exercise, using 300 airplanes and helicopters; 3,000 wheeled vehicles; 60 tracked vehicles; and other minor equipment. The basis

of the air quality impact analysis of the Roving Sands JTX is provided in the *Roving Sands EIS* (U.S. Army, 1994a). Vehicle and equipment use during the training exercises would generate localized increases in CO, NO_x, PM_{10}, SO_2, and VOCs. In addition, there are emissions from aircraft participating in the exercise. However, the mobile sources of these pollutants are spread throughout the 2,000 square miles of the range complex during the Roving Sands exercise.

The emission estimates provided in the *Roving Sands EIS* have been estimated for the entire 10-day period during which the Roving Sands exercise is held, and are summarized in Table 4-6.1.

Table 4.6-1 Criteria Pollutant Emissions by Source Category from Roving Sands Exercise Fort Bliss Training Complex

Source Category	*Total Emissions on Fort Bliss Range Complex During Roving Sands Exercise (tons)*				
	CO	NO_x	PM_{10}	SO_2	VOC
Ground Vehicles and Equipment	111.3	61.2	4.3	4.0	8.0
Aircraft	7.9	182.5	3.7	7.4	1.1
Total Emissions	*119.2*	*243.7*	*8.0*	*11.4*	*9.1*

Note: Aircraft are estimated to spend one-quarter of their total flight time over McGregor Range. Consequently, 25 percent of total estimated aircraft emissions sorties are allocated to Fort Bliss.

The air emissions from ground-based sources, such as vehicles and equipment, will be dispersed throughout the range complex of more than 2,000 square miles. Emissions from aircraft will be released at different altitudes during flights, so that emissions will be dispersed over approximately 10,000 cubic miles of airspace. Thus, emissions will be dispersed widely and no significant long-term adverse impacts on air quality would be expected.

Particulate emissions generated by tracked and wheeled vehicles over dirt roads (i.e., fugitive dust emissions) were not included in these estimates. Fugitive dust is generated both during maneuvers on the range complex, and when tracked or wheeled vehicles use the tank trails to move from the Main Cantonment Area to the range complex area. Fugitive dust emissions created on the range complex would primarily result in localized, short-term effects, and impacts at locations beyond the perimeter of the McGregor Range complex are expected to be insignificant.

According to the *Roving Sands EIS* (U.S. Army, 1994a), the total estimated ground-based air emissions from the other FTXs periodically conducted on the range complex would be a maximum of 15 percent of the air emissions from the Roving Sands exercise. Consequently, the other FTXs would also result in no significant air quality impacts.

Possible Future Activities on McGregor Range. There are several possible future activities that could result in impacts to the air quality at McGregor Range. They are discussed below.

USAF Expansion of GAF Operations at HAFB. The expansion of GAF operations at HAFB, New Mexico, through the beddown of an additional 30 PA-200 Toronado aircraft, is one of the most significant future mission activities with a potential to impact air quality at McGregor Range. The expansion includes the establishment of a new air-to-ground tactical target complex on McGregor Range to be used for training by USAF and GAF aircrews.

The proposed action would result in two sources of emissions: temporary emissions resulting from the construction of the tactical target complex on McGregor Range, and increases in emissions from aircraft

using the tactical target complex. Construction activities would result in temporary increases of air emissions, but they are not expected to be significant and would only occur for the duration of the construction period. Consequently, the construction-related impact on air quality is expected to be insignificant. The NAAQS will not be violated under this alternative.

Increased emissions were estimated for aircraft flying over McGregor Range to and from the tactical target complex, and during training operations directly over the tactical target complex (USAF, 1998). These emissions are presented below in Table 4.6-2.

Table 4.6-2 Criteria Pollutant Emissions Resulting from Proposed GAF Operations Over McGregor Range (Holloman II)

Airspace	*Annual Emissions on McGregor Range, New Mexico (tons/year)*				
	CO	NO_x	PM_{10}	SO_2	VOC
McGregor Range	7.8	14.3	1.4	0.8	1.8
Tactical target complex	19.4	84.4	5.7	3.0	3.1
Total Emissions	*27.2*	*98.7*	*7.1*	*3.8*	*4.9*

Source: USAF, 1998.

Emissions of CO and NO_x are much lower than estimated emissions for the Roving Sands exercises discussed earlier. Because these aircraft emissions are released at altitudes ranging from a few hundred feet AGL to thousands of feet AGL, they will be dispersed much more effectively than ground-based emission sources. Consequently, it would be expected that the air quality impacts on McGregor Range of the proposed operations would be insignificant.

Road Upgrades and Improvements. Road grading, excavation, material hauling, placement, and compacting of material will occur under this alternative. The impacts to air quality would be short-term and localized in extent.

Heavy Division Training Center. An additional foreseeable activity, that is not actively being considered at the present time, is the development of a brigade-size Heavy Division Training Center, which could include up to 960 wheeled vehicles and 490 tracked vehicles. The primary air emissions from this activity would be fugitive dust generated by the vehicles while maneuvering. To estimate the potential air impacts from this activity, a comparison was made with the Fort Irwin National Training Center (NTC), which has a similar climate and is currently using comparable numbers of vehicles as envisioned for the Heavy Division Training Center at McGregor Range on monthly "rotations" or field exercises. A network of monitors has collected PM_{10} data for several years along the property boundaries at the NTC (Mojave Desert Air Quality Management District, 1998). These monitors have detected no violations of the PM_{10} NAAQS, so the training exercises at NTC have been shown to result in only short-term, localized air quality impacts. Consequently, it would be expected that similar activities at the envisioned Heavy Division Training Center would also result in insignificant air quality impacts at the McGregor Range perimeter.

4.6.2 Alternative 2

Under Alternative 2, none of the existing or possible future mission activities on McGregor Range with the greatest potential impacts on air quality, such as the Roving Sands JTX, USAF expansion of GAF Operations at HAFB, or ground activities in TA 8 from the envisioned Heavy Division Training Center, would change. It was shown in Alternative 1 that these present or envisioned activities on the range

complex would primarily result in localized, short-term effects, and impacts at locations beyond the perimeter of the McGregor Range complex are expected to be insignificant. The NAAQS will not be violated under this alternative.

4.6.3 Alternative 3

Under Alternative 3, the existing or possible future mission activities on McGregor Range with the greatest potential impacts on air quality, such as the Roving Sands JTX or USAF development of a tactical target complex on Otero Mesa would be severely limited or not feasible.

Ground activities such as those supporting an envisioned Heavy Division Training Center would be the same as discussed in Alternative 1. Consequently, the quantity of air emissions shown in Alternative 1 would be significantly reduced due to the curtailed activity levels under Alternative 3. Air quality impacts under this alternative would therefore be less than the primarily localized, short-term effects found in Alternatives 1 and 2.

4.6.4 Alternative 4

Under Alternative 4, the existing or possible future mission activities on McGregor Range with the greatest potential impacts on air quality, such as the Roving Sands JTX or USAF development of a tactical target complex on McGregor Range would be severely limited or not feasible.

Ground activities such as those supporting an envisioned Heavy Division Training Center would be the same as discussed in Alternative 1. Consequently, the quantity of air emissions shown in Alternative 1 would be significantly reduced due to the curtailed activity levels under Alternative 4. The air quality impacts under this alternative would therefore be expected to be short-term and very localized, to a greater degree than under Alternatives 1, 2, or 3.

4.6.5 Alternative 5 – No Action

Under Alternative 5, there will be no further military use of McGregor Range except in TA 8 and portions of TA 32 which contain McGregor Range Camp, McGregor ASP, and Meyer Range. Consequently, air emissions from military use of the area would be greatly reduced. The air quality would depend on what the future use of the area would be when it is returned to the public domain.

4.6.6 Alternative 6

This alternative requires congressional action for implementation. It is assumed that the NCA would remain under a management structure similar to the RMPA (BLM, 1990a). In that case no impacts to air quality would occur from this alternative. Because the precise nature and extent of the congressional action cannot be determined at this time, detailed air quality analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.6.7 Cumulative Effects

The cumulative air quality impacts of activities at McGregor Range that might be anticipated to occur under the five alternatives were evaluated. The extent of mission activities and air quality impacts would be highest under Alternative 1, in which the land area of the withdrawal would not change. Under this alternative there were a number of activities identified that would produce air emissions, but the resulting air quality impacts are expected to be insignificant, occurring on a short-term basis over a localized area. Because these air quality impacts are insignificant and transient in nature, there are not expected to be any

cumulative air quality impacts. The nearly continuous motion of the atmosphere results in a natural ability to cleanse itself through dilution and transport.

Alternatives 2, 3, 4, and 5 would be expected to have similar or lower air emissions than Alternative 1. Consequently, no cumulative effects would be expected if one of the other alternatives were implemented.

4.6.8 Mitigation

In the absence of significantly adverse effects, mitigation would not be required.

4.6.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources would occur.

Water Resources

4.7

4.7 WATER RESOURCES

The environmental impacts to water resources are discussed below in relation to the alternatives described in Chapter 2.

4.7.1 Alternative 1

Under this alternative the entire McGregor Range would be renewed, and the current boundaries of the range would remain the same. As described in Section 2.1.1, military activities could vary from present conditions to an expanded level of capabilities and intensified use. A greater number of military units and personnel may spend time at McGregor Range, which will require increased support staff and facilities. Construction of roads or new facilities could damage or cause to be relocated surface-water features such as earthen impoundments or pipelines, but this would not impact the resource itself.

No new wells or additional withdrawals from existing wells are planned on McGregor Range, except at Davis Dome, where an on-going investigation of geothermal resources is underway (see Section 3.4.1). There, geothermal water has the potential to produce electric power for a desalination plant to provide drinking water from the saline aquifer. This source would be used to augment or replace water currently pumped by Fort Bliss from the Hueco Bolson aquifer near the Main Cantonment Area. That action would result in a favorable impact to the groundwater resource in both areas by enabling saline groundwater to be used on McGregor Range and by reducing pumpage from the heavily over pumped east El Paso well fields. No negative impact to the groundwater resource is anticipated on McGregor Range.

4.7.2 Alternative 2

Impacts to water resources would be similar to those of Alternative 1. Under this alternative most current mission activities as well as most of the future increases in activities and construction as described in Section 2.2.1 would not be affected.

4.7.3 Alternative 3

Impacts to groundwater resources would be similar to those of Alternatives 1 and 2. Under this alternative, current mission activities that use the Sacramento Mountains and Otero Mesa would be constrained or reduced, and some of the future increases in activities and construction as described in Section 2.3.1 would not be supportable. This would remove the possibility of any disruption from military activities to surface-water features in that area.

4.7.4 Alternative 4

Impacts to water resources would be similar to those of Alternative 3. Under this alternative, current mission activities that use the area north of New Mexico Highway 506 and Otero Mesa would be constrained or reduced. Many future increases in activities and construction as described in Section 2.4.1 would not be supportable under this alternative.

4.7.5 Alternative 5 – No Action

Under this alternative, Army activities on McGregor Range would be terminated with the exception of McGregor Range Camp, the McGregor ASP, and Meyer Range. Military activities would be curtailed drastically. However, water resources on McGregor Range would not be substantially affected due to the retention of these facilities. The return of most of the Tularosa Basin area of McGregor Range to the public domain opens that land for livestock grazing, which will require additional water. Although

military use would be greatly reduced, nonmilitary use would increase. Therefore, no impact to water resources would occur. Groundwater in the area is saline, although pockets of water suitable for livestock may occur locally. Otherwise, water will have to be hauled or piped into the potential grazing areas.

4.7.6 Alternative 6

Impacts under this alternative regarding congressional designation of the Culp Canyon WSA as wilderness and establishment of an NCA would be similar to, or less than, those of Alternative 1. Since the NCA is assumed to have management similar to the current RMPA, no impacts to water resources are anticipated. However, because the precise nature and extent of the congressional action cannot be determined at this time, detailed water resource analysis for this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.7.7 Cumulative Impacts

The City of El Paso currently obtains 44 percent of its water from the Hueco Bolson. Withdrawals by El Paso from the Hueco Bolson aquifer in 1996 were 56,702 af, more than 10 times the amount pumped by Fort Bliss (U.S. Army, 1998a). As much as 100,000 af of water may have been pumped by neighboring Ciudad Juarez, Mexico. The rate of pumping from the Hueco Bolson exceeds the rate of recharge, which means that the aquifer is in overdraft condition and is experiencing accelerated rates of water-level decline. The lowering of water levels in the bolson deposits has permitted the infiltration of salt water into the fresh-water zones in those areas. Downward leakage of brackish water from shallow zones and possible upconing of underlying brackish water from below due to pumpage has increased dissolved solids concentrations in fresh-water zones of the aquifer. Under a current-trends scenario with no increased surface-water supply, two independent studies concluded that the Hueco Bolson would be exhausted of recoverable fresh water by 2013 or 2025, which would result in a water-supply shortage to the area (El Paso, Juarez, Fort Bliss). However, municipal water will continue to be available to customers, including Fort Bliss and McGregor Range, but its short supply may increase costs (U.S. Army, 1998a). The City of El Paso and the El Paso Water Improvement District #1 prepared a long-range *Water Resource Management Plan* to prepare for the water-supply shortage. The plan includes implementation of conservation efforts, and development of alternative water supplies such as: increased reuse of treated wastewater, acquisition of additional Rio Grande Project water, and a desalination plant to use the large amount of brackish groundwater in the Hueco Bolson (U.S. Army, 1998a).

4.7.8 Mitigation

Although water resources on McGregor Range are not expected to be noticeably affected by activities under any of the alternatives, an increased cost of municipal water to supply McGregor Range would constitute an adverse economic effect. High water costs can be mitigated by using less water. Conservation methods, such as retrofitting of low-flow toilets and showerheads at McGregor Range Camp, water-thrifty design of new construction, and replacement of old water mains and laterals, are effective.

Development of alternate water sources for McGregor Range could become feasible in the future. A potentially favorable area is west of the Sacramento Mountains, from the mouth of Grapevine Canyon to beyond the northern boundary of McGregor Range, where alluvial fan sediments are saturated with fresh water (Section 3.7.2.3). A USGS investigation estimated 1.4 to 2.1 million af of fresh water in storage in that area. An additional 3.6 to 5.4 million af of slightly saline water may be in storage in the same area. The investigation did not extend southeast of Grapevine Canyon, and it is not known how much further the fresh-water zone extends into McGregor Range. A second potential favorable area is the geothermal

area at Davis Dome where Fort Bliss engineering personnel have indicated that 7 mgd of drinking water could be produced from the saline aquifer at a significantly lower cost than Fort Bliss now pays for water.

Therefore, saline water in those areas would be potentially available for use in specific areas of McGregor Range under present conditions. In the event of a water-supply shortage, this water would be an alternative to municipal water.

4.7.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of water resources would occur.

Biological Resources

4.8

4.8 BIOLOGICAL RESOURCES

This section assesses the impacts of the alternatives on biological resources, which include vegetation, Waters of the U.S., wildlife, and sensitive species. This assessment includes impacts of military training and testing activities, and nonmilitary activities conducted by the Army or other users of McGregor Range. For purposes of analysis in this LEIS, it is assumed that the broadest possible Army activities and natural resource management practices would be implemented.

The impacts of nonmilitary activities are considered separately from impacts of military activities. Military activities that would affect biological resources include off-road vehicle maneuvers, weapons use, training area maintenance including road construction and maintenance, construction activities, and aircraft overflights. The resulting types of impacts would include vegetation and wildlife habitat loss and disturbance from off-road vehicle maneuvers, the use of controlled access FTX sites, road construction and maintenance, construction, and from weapons impacts; fire from ordnance and vehicles; and noise from vehicles, ordnance, and aircraft. Nonmilitary activities that would affect biological resources include livestock grazing, wildfires, and recreation. However, since no increase in grazing is anticipated for Alternatives 1, 2, 3, 4, and 6, the impacts of grazing for these alternatives are addressed under *Cumulative Impacts* (Section 4.8.7).

4.8.1 Alternative 1

As described in Section 2.1.1, military activities could vary from the same as currently conducted, to an expanded range of capabilities and intensified use. Implementation of Alternative 1 would affect biological resources on McGregor Range within the currently defined boundaries. The impacts to biological resources are described relative to the activities that occur on withdrawn and Army fee-owned land to the degree possible under each withdrawal configuration alternative. Impacts from the McGregor Range boundary changes under each alternative are relative to the type of military or nonmilitary activity conducted on the land. As indicated above, military activities could result in impacts to biological resources from land disturbance, noise, and fire. Wildfires can start when hot missile parts and incoming rounds land on the ground and from ground vehicles used during training. Numerous fires from military and natural sources occur on McGregor Range each year but data on the number, location, date, cause, and number of acres burned are incomplete. Uncontrolled wildfires have the greatest potential to have negative impacts on biological resources. The degree of these impacts would depend on the level of use for current military training and any future proposal to use additional installation capabilities. As stated above, it is assumed that the broadest possible Army activities would take place.

The USAF expansion of the GAF operations at HAFB, New Mexico, includes a new air-to-ground target complex on McGregor Range. The construction and operation of a tactical target complex at the selected site on Otero Mesa on McGregor Range has the potential to impact biological resources. The impacts of the USAF tactical target complex have been evaluated in a separate EIS (USAF, 1998) and the effects of implementation on biological resources are presented in the ROD (Appendix A).

The impacts of military activities are analyzed in Section 4.8.1.1, and potential nonmilitary impacts are assessed in Section 4.8.1.2

4.8.1.1 Effects of Military Activities

Vegetation. Vegetation would be affected by military activities on McGregor Range; these activities would result in ground disturbance and/or fire.

Ground Disturbance. Road maintenance activities and users of the roads have the potential to affect vegetation along roads by (1) widening existing roads during maintenance or from repeated driving on the road edge; (2) creating new sections of road next to sections that are no longer passable; (3) improperly grading roads so they become deeper and are more susceptible to water erosion; and (4) creating gullies along roads. At present, there are an estimated 2,673 acres of land covered with roads on McGregor Range. The amount of vegetation affected along roads by these actions depends on the specific project undertaken.

Off-road vehicle maneuvers would continue to occur only on TA 8 in the southwest corner of McGregor Range (Figure 2.1-1). Potential for off-road vehicle use could range from the current low use to high use in TA 8 (Table 2.1-3), if the installation's heavy division training capability were utilized. These high use levels are expected to be similar to those experienced during 1990 when the 3rd ACR was stationed at Fort Bliss. Research in various vegetation types has shown that off-road vehicles can significantly alter the plant communities by reducing above and below ground plant biomass; altering soil infiltration rates, bulk density, and erosion rates; reducing soil fertility; and increasing root exposure (Barton et al., 1966; Marston, 1986; Wilshire, 1977). More specific research and monitoring in Chihuahuan Desert and mesquite coppice dune vegetation of McGregor Range is available to estimate impacts as described below.

TA 8 is about 32,400 acres and the mesquite coppice dunes plant community is the dominant type (83 percent of total). Disturbed ground covers the next largest area (13 percent), and the remaining land is covered with minor plant community types (Figure 3.8-1). Land Condition-trend Analysis (LCTA) for 1991 through 1993 showed that mesquite coppice dunes used for training had the lowest plant canopy coverage of all plant communities on McGregor Range. Mesquite dunes not used for training (West Buffer Zone) had plant canopy coverage similar to areas used for military training. Mesquite coppice dune plant communities used for off-road training had approximately 60 to 70 percent bare ground, compared to about 50 percent bare ground in mesquite coppice dunes not used for training (O'Regan et al., 1995). In a study of the impacts of tracked vehicles in the creosotebush plant community type in the Chihuahuan Desert on McGregor Range, percent cover of shrubs and perennial grasses was reduced while annual grasses and herbs increased in areas used for tracked vehicle maneuvers (U.S. Army, 1996o). Therefore, it appears that vehicle maneuvers can alter plant communities by changing plant composition from perennial to annual species and reducing litter, but may not necessarily change overall plant cover. Therefore, increased vehicle maneuvers over current conditions under Alternative 1 would likely result in additional loss of perennial vegetation, an increase in annual vegetation, and a loss of litter. This would result in significantly adverse impacts to vegetation in the creosote-grassland type and negligible impacts in the mesquite coppice dune type.

The use of 25 controlled access FTX sites would continue (see Figure 2.1-4). These FTX sites cover 5,132 acres with 15 large sites covering 3,732 acres on Otero Mesa and five large sites (1,248 acres) and five small sites (152 acres) covering 1,400 acres in the Tularosa Basin. The sites on Otero Mesa are primarily in grasslands (3,407 acres) while the sites in the basin are primarily in desert shrublands (1,144 acres). The amount of land disturbed during the 1996 and 1997 Roving Sands exercise was 772 and 394 acres respectively. In 1996, eight FTX sites were disturbed on Otero Mesa and the largest area of disturbance was 26 acres. In 1997, six sites were disturbed and the largest area of disturbance was 105 acres. In addition, no grasslands were disturbed on Otero Mesa during the 1998 Roving Sands exercise.

Military activities at the 10 FTX sites in the Tularosa Basin occurs principally in the desert shrublands plant communities. As indicated above, there is little grass and herbaceous vegetation in the mesquite-coppice dune interdunal spaces while vehicle use in the creosotebush type could result in a reduction in grass cover. However, off-road vehicle maneuvers do not take place at the FTX sites, so impacts to

vegetation would be localized. Therefore, operations associated with Roving Sands at the FTX sites in the Tularosa Basin would result in little impact to vegetation.

The remaining FTX sites are on the Otero Mesa. Activities at these sites during Roving Sands typically results in the flattening or elimination of the grass cover. However, the root systems generally remain intact and after the completion of the exercise, the grass typically resprouts during the summer rainy season. During some years, the recovery can be slowed during droughts and livestock grazing can also hamper recovery. The impacts of the Roving Sands exercise on percent vegetation cover at the FTX sites in the Otero Mesa grasslands are negligible. The percent vegetation cover at the FTX sites is not significantly different from surrounding areas as indicated by the LANDSAT data (see Tables 4.8-6 and 4.8-8). These tables show that the change in vegetative cover over the last 10 years was the same in FTX sites, which are grazed, and grazed grasslands in general. However, LANDSAT data does not provide information on the plant species composition at the recovering sites and the invasion of annual grasses and herbs has been observed at some sites. The impacts of a single Roving Sands exercise on plant species composition at most of the FTX sites are negligible given the small amount of land that is affected (0 to 138 acres from 1996 through 1998) and the subsequent recovery of most of the grasslands. However, the effects of these exercises over a period of years could have a cumulative negative impacts on the perennial grasslands, especially if the affected areas do not recover.

Impacts to vegetation would occur on 13.5 square miles that would potentially be used to establish additional controlled access FTX sites. Some of these sites could be located in the grassland plant communities on Otero Mesa with the remainder immediately east of U.S. Highway 54 in the Chihuahuan Desert shrubland plant communities in the Tularosa Basin. These sites could be used more than once a year and, therefore, have the potential for greater impacts to vegetation than under current conditions at the FTX sites. The potential environmental impacts of these additional sites will be assessed in a separate NEPA document.

Potential construction projects could include a helicopter training complex, development of a 32-building MOUT Complex, a rail spur from U. S. Highway 54 to McGregor Range Camp, an ASP Phase III, and a geothermal program. The number of acres required for these facilities is not available, and any future proposal to construct the project will be subject to NEPA evaluations. These potential construction projects would likely occur in the shrubland plant communities in the Tularosa Basin and have an adverse effect on vegetation.

An estimated 1,000 to 5,120 acres of vegetation would be disturbed during construction, operation, and maintenance of the USAF tactical target complex on McGregor Range. Construction of this complex on Otero Mesa would disturb grassland plant communities (USAF, 1998).

Continued missile training and testing and use of weapons (e. g., missiles and inert bombs) would disturb vegetation in impact areas on McGregor Range. The impacts of falling missile debris and inert weapons strikes are negligible because much of the debris has little or no impact when it strikes the ground and the remaining debris and inert ordnance affect only small areas. Weapons impact areas are in the Chihuahuan Desert shrublands plant communities in the Tularosa Basin, in TA 32 (McGregor launch complex and Meyer small arms range); TAs 39, 30, and 31 (SHORAD, and Orogrande missile ranges); and TA 11 (20-acre Class C Bombing Range) (Figure 2.0-1). In addition, there could be weapons firing from a new helicopter training complex. There could also be an increased use of Otero Mesa (TAs 15 through 23) with much of this increase due to the use of the airspace over Otero Mesa as a weapons firing SDZ. This would indicate a potential for an increase in the number of fires on Otero Mesa.

Fire. Fire is a significant ecological element on southwestern rangelands, and is a natural component of the climax ecosystem. Studies in west Texas have shown the absence of fire in tobosagrass and juniper

communities severely limits forage production. On McGregor Range wildfires have had the following effects: reduction in litter; improved vigor of grass species; increase in cattle utilization; reduction (to some extent) of shrubs such as cholla, soaptree yucca, creosotebrush and broom snakeweed; greater productivity on burned sites (at the time of the BLM 1979 survey); and less cover (more bare soil) on burned sites. Except for the effects of burning, and the very localized consequences of missile impacts, adverse impacts from military uses of the range are not apparent (BLM, 1980).

The total number of fires on McGregor Range and elsewhere on Fort Bliss is not known. A partial record indicated there were 38 fires on Fort Bliss from 1982 to 1995. Thirty-one were from natural causes and eight were man-made fires. Wildfires as well as fires caused by military activities have the potential to have the greatest impacts on vegetation on McGregor Range. Fires resulting from off-road vehicle maneuvers and weapons strikes could occur in training areas where these activities are authorized. Hot missile parts are also a source of fire on McGregor Range. Fires have occurred principally in the Chihuahuan Desert shrublands and grasslands plant communities in the Tularosa Basin and grasslands on Otero Mesa on McGregor Range. Fires from hot missile parts have the potential to occur anywhere within the missile SDZs on McGregor Range (Figure 2.1-2). However, most fires have occurred in TAs 25 through 32, and 17, 21, and 23 (Figure 1.2-3).

Although the impacts of fires on the major plant community grouping (desert grassland, desert shrublands, and pinyon pine/juniper woods) on McGregor Range have not been studied in detail, there are published studies regarding the effects of fire on these plant community types and plant species that form these communities.

Fire is generally thought to have a major role in maintaining grasslands and reducing the spread of shrubs in the western U.S. (Valentine, 1971). Short-grass prairies dominated by blue grama are an example of grasslands that are thought to have co-evolved with fire. However, fire may not play as large a maintenance role on desert grasslands. Each grassland type has a typical fire regime that characterizes the frequency, seasonality, intensity, severity, extent, and effects of fire on the community (Wright and Bailey, 1982). Altering the fire regime can change the species composition of a vegetation community. Short-term impacts of fire generally include reduced plant cover, removal of litter, and increased soil erosion. However, grasslands can recover within one to several years if other factors (e.g., sufficient rainfall, limited grazing, no repeated burning) are favorable (Wright and Bailey, 1982; Martin, 1983). If other factors are unfavorable, such as a burn occurring during a drought or burns occurring in consecutive years, then grass recovery may be delayed or the grass-dominated community may be replaced by more fire-resistant shrubs and herbaceous annual species.

The impacts of fire on grassland communities on McGregor Range may be positive or negative, depending on the specific conditions at the time of the burn. The grasslands on Otero Mesa are dominated by blue grama and black grama (U.S. Army, 1996d). Grass cover is substantially reduced during the first year after a fire but will recover from fires in 2 to 4 years (Finberg, 1994; Bock and Bock, 1992; Martin, 1983). Blue grama is fire tolerant but can be damaged by fire under certain conditions (e.g., drought, heavy grazing immediately after the burn). Some studies have shown that blue grama is slow to recover from fire (Ahlstrand, 1982; Dix, 1960; Finberg, 1994); however, small prescribed burns in Arizona did not appear to have a long-term affect on blue grama (Bock and Bock, 1992), and in New Mexico, blue grama recovered quickly from fire (Dwyer and Pieper, 1967). In general, blue grama recovers within 1 to 4 years after a burn. Black grama is less fire-tolerant than blue grama. Black grama can be slow to recover from fire, especially if the area is grazed (Martin, 1983; Reynolds and Bohning, 1956; Wright, 1974). Cable (1967, 1972) reported that black grama has a poorer response to fire than desert shrubs. Cornelius (1988) suggested that fire was not an important factor in the maintenance of black grama desert grasslands and could be a factor in reducing grass composition and increasing shrub composition in this vegetation type. Buffington and Herbel (1965) reported that fire frequency in

southern New Mexico was historically very low, supporting the hypothesis that fire may not have been a major factor in maintaining desert grasslands in New Mexico. However, other studies in Texas, New Mexico, and Arizona suggest that black grama can recover within 2 to 3 years after a burn. Also, Martin (1983) found that grass production on desert grasslands would generally return to pre-burn levels in 2 to 3 years.

Yucca and cacti are another vegetation component important to the grasslands on McGregor Range that may be affected by fire. Banana and Torrey's yucca are common species in the grasslands plant communities and serve as nesting structure for some bird species. Five years after a fire on the Doña Ana Range–North Training Areas, Torrey's and banana yucca mortality were 61 percent and 30 percent respectively; although, some of these "dead" plants produced root sprouts (U.S. Army, 1994d). Cholla (*Opuntia imbricata)* is a common woody plant species in the Otero Mesa grasslands (U.S. Army, 1997l) and fire kills or injures most plants less then 1.5 feet tall; mortality of tall cholla was minimal (up to 27 percent) (Bunting et al., 1980; Dwyer and Pieper, 1967).

Based on past observations and research, if the grassland vegetation community has time to recover between burns and the burns do not occur during droughts and grazing is controlled, then the grassland vegetation should recover within several years. However, if areas are burned during drought; burned on consecutive years; or grazing is not controlled, then grasses may be reduced and shrubs and herbaceous plants may dominate the area. The size of the yuccas would likely be reduced after burns and this species is slow to recover its prefire height regardless of the frequency of fires. The BLM and Army's ability to minimize the size and frequency of fires (as demonstrated by the limited number and size of fires on McGregor Range) would likely result in the grasslands being maintained on Otero Mesa.

Desert shrub communities on McGregor Range generally are dominated by creosote bush, tarbush, and mesquite with grasses interspersed. In addition, cacti are an important component of these vegetation communities. The effects of fire on vegetation in creosotebush, tarbush, and bush muhly plant communities in the Tularosa Basin on McGregor Range were studied immediately after and 1 year after a burn (U.S. Army, 1996f). It was found that shrub cover was reduced immediately from 23 to 13 percent and remained reduced 1 year after the burn. Grass cover was reduced from about 36 percent to 6 percent immediately after the burn, but increased to about 10 percent 1 year after the burn. Forb canopy coverage increased substantially from pre-burn conditions 1 year after the burn. After a fire in Arizona, 37 percent of the creosote bush sprouted and in California, only 3 percent sprouted (Brown and Minnich, 1986; McLaughlin and Bowers, 1982). Honey mesquite is a common shrub on McGregor Range and plants less than 1.5 years old were easily killed by fire; 2.5-year old plants were severely damaged; and plants over 3.5 years old are very fire tolerant (Wright et al., 1976). Various studies have shown that the closely related velvet mesquite (*Prosopis velutina)* is also very fire tolerant (Bock and Bock, 1978; Cable, 1967; Martin, 1983). Common sotol and lechugilla are common in the desert shrublands of the Hueco Mountains on McGregor Range. A fire in the foothills of the Organ Mountains resulted in 36 percent mortality for sotol (U.S. Army, 1994d), while a 75 percent reduction in cover from a fire was noted for this species elsewhere in New Mexico (Ahlstrand, 1982). This species sprouted from the terminal buds in lightly and moderately burned areas and regained most of its cover after 3 years (Ahlstrand, 1982). Lechugilla did not respond well to a fire that reduced its cover by 81 percent; there was little sign of recovery after 7 years (Ahlstrand, 1982). The effects of fire on prickly pear cactus varies with species; with Englemann prickly pear (*Opuntia engelmannii)* being fairly fire resistant (Bunting et al., 1980; Cable, 1967; Reynolds and Bohning, 1956) and brown-spined prickly pear (*O. phaeacantha)* suffering 70 percent mortality from fire (Bunting et al., 1980). Fire-related mortality to other species of cactus is generally high; barrel cactus (*Ferocactus wislzenii)* suffered 59 to 67 percent mortality (McLaughlin and Bowers, 1982; Reynolds and Bohning, 1956; U.S. Army, 1994d); pincushion cactus (*Mammillaria* sp.) mortality was 74 and 96 percent (Bunting et al., 1980; McLaughlin and Bowers, 1982); hedgehog cactus

(*Echinocerceus* sp.) mortality was 88 to 94 percent (Bunting et al., 1980; McLaughlin and Bowers, 1982); and bee hive cactus (*Coryphantha vivipara*) mortality was 100 percent (Bunting et al., 1980).

Based on past observations and research, fire on desert shrub communities would reduce shrub cover in the short-term, and would result in long-term reduction in plant cover in creosote bush and tarbush-dominated communities. In addition, cacti diversity likely would be reduced. Therefore, the potential effects of fire and the increased risk of fire would be adverse to desert shrub communities.

Pinyon pine/juniper woodlands occur on McGregor Range (U.S. Army, 1996d) primarily at the northern edge near the Sacramento Mountains. A fire burned through sections of this community type in the Organ Mountains in 1994. Two years after the fire, the average percent cover and total number of plant species was greater in the burned site (86 percent cover and 35 species) than the unburned site (49 percent cover and 29 species) (U.S. Army, 1997c). Data regarding tree mortality from this fire are not available. All juniper less than 4 feet tall were killed during a grass fire in New Mexico. Overall, 13.5 percent of the pinyon pines and 24 percent of the junipers were killed (Dwyer and Pieper, 1967). Elsewhere in New Mexico, redberry juniper (*Juniperus pinchotii)* coverage was less on burned sites than unburned and it was estimated that it would take damaged trees 25 to 50 years to attain preburn heights (Ahlstrand, 1982). Other woody species such as mountain mahogany and scrub oak (*Quercus* sp.) are fire resistant and reproduce through sprouts after a fire (Ahlstrand, 1982). As indicated above, fire often results in an increase in herbaceous cover. Overall, fire in the pinyon pine-juniper plant community may result in a decrease in conifer cover, an increase in herbaceous cover and the continued existence of other shrub species such as Mountain Mahogany. Therefore, fire would have a negligible impact on this plant community type and may have a positive effect on a more open pinyon pine-juniper woodlands.

Wetlands and Arroyo-riparian Drainages. Wetlands are protected on McGregor Range; however, off-road vehicle maneuvers (in TA 8 only), weapons training, and facility construction may affect arroyo-riparian drainages. There is a potential that fires could impact wetlands and arroyo-riparian drainages under this alternative; this potential would increase over current risk because of the possible increase in weapons training.

Ground Disturbance. Vehicle maneuvers could impact wetlands and arroyo-riparian drainages in TA 8; this impact could be greater compared to current conditions because of the potential increase in off-road vehicle maneuvers if the installation's training capability were utilized at the 1990 levels. However, wetlands are not currently being disturbed in TA 8 and would not be disturbed if off-road vehicle maneuvers were to increase.

Impacts to wetlands and Waters of the U.S. may occur from the operation of the additional controlled access FTX sites. However, the siting of these training locations would be sufficiently flexible to avoid wetlands and arroyo-riparian drainages. Therefore, depending on the sites selected within Alternative 1 boundaries, the potential effects on probable Waters of the U.S. are currently undetermined.

Weapons training and testing would result in widely scattered but locally concentrated ground disturbance having only negligible effects on probable Waters of the U.S. under current conditions. Expanded military operations such as a new helicopter gunnery range would increase the number of weapons strikes that impact Waters of the U.S. in the Chihuahuan Desert shrublands. However, as under current conditions, these impacts would be negligible because they would be widely scattered but locally concentrated.

Construction in the McGregor Range Camp and other built-up areas would not affect probable Waters of the U.S. However, construction activities on the training areas, such as an initiative to construct a rail spur from near U.S. Highway 54 to McGregor Range Camp and other possible construction projects as listed under vegetation, have the potential to affect probable Waters of the U.S. The importance of desert

washes to the maintenance of biodiversity has been documented (Section 3.8) and every attempt would be made to eliminate or minimize construction activities in these washes. If Waters of the U.S. were impacted, a 404 Permit might be required.

Construction of the USAF tactical target complex on McGregor Range would not impact wetlands because no jurisdictional wetlands occur in the selected site. Up to 8.7 miles of probable Waters of the U.S. could be affected at the selected site on Otero Mesa. Proposed road and target array construction drawings are not yet available so the number of acres of Waters of the U.S. that may be impacted is not known.

Fire. Fires have historically burned through areas considered Waters of the U.S. (mostly arroyo-riparian drainages and swales) on McGregor Range, in the desert grassland and shrubland plant communities on Otero Mesa, and in the Tularosa Basin. As indicated in Appendix D, skeleton goldeneye and little and large leaf sumacs *(Rhus trilobata)* are common shrubs in the foothill drainages (Cockman, 1996). Skeleton goldeneye density was higher on burned than unburned sites and it reproduces through root and crown sprouts (Ahlstrand, 1982). The dominant shrub species in the submesa drainages are desert willow, little and big leaf sumac, honey mesquite, creosotebush, skeleton goldeneye, and tarbush (Cockman, 1996). Based on the information presented in the vegetation section, many of these species, except possibly, creosotebush, would be expected to recover from a fire but would take several years to attain prefire height and density. Yucca and cholla are common woody plants in the swales in the grassland plant communities on Otero Mesa. A large percent of these plants have the potential to be damaged or killed by fire. Some may recover via root sprouts but would likely take many years to attain prefire height.

Fire may burn through wetlands such as those dominated by mesquite, little leaf sumac, and willow *(Salix* sp.*)* that grow around some of the stock tanks in the Tularosa Basin of McGregor Range. As indicated in the vegetation section, mature mesquite plants are fire tolerant, so many of these plants would recover after a fire. However, it would likely take a few years for these plants to attain their preburn height; velvet mesquite attained 48 percent of its prefire height 4 years after being burned in Arizona (Bock and Bock, 1992). Large leafed sumac sprouts vigorously after fires (Dwyer and Pieper, 1967) so it is assumed that little leafed sumac will also sprout after a fire. However, it will probably take many years for damaged sumac to attain their preburn height and density. It is expected that the grasses, sedges, and other herbaceous plants in these wetlands would recover relatively rapidly after a fire. For example, giant sacaton (*Sporobolus wrightii)*, which forms tall dense stands at stock tanks and in dry washes, attained preburn percent cover and 54 percent of preburn height 2 years after a burn (Bock and Bock, 1978).

Based on the above discussion, fires initiated from ordnance and missile debris would potentially result in short-term adverse effects on wetlands and arroyo-riparian drainages (probable Waters of the U.S.) In addition, if weapons-caused fires are substantially more frequent and wide-spread than have occurred in the past, then there is a potential for long-term adverse impacts on probable Waters of the U.S.

Fires from the tactical target complex would have the potential to spread to wetlands in the vicinity. The nearest wetland to either site is at Mack Tanks, (see Figure D.3-3 in Appendix D), which are about 2.5 miles from the lower site. A fire break could surround the tactical target complex and fire suppression measures would greatly minimize the potential for fires from a tactical target complex site reaching this or any other wetlands. It is therefore assumed that there will be no adverse impact on wetlands due to construction and operation of a tactical target complex.

Fires on and near the tactical target complex would impact desert washes that are not directly impacted by construction and operation. The USAF, in coordination with Fort Bliss, will complete consultations with the USACE to ensure that adverse impacts to Waters of the U.S. will be minimized.

Wildlife. Impacts to wildlife from military training and testing would be due to vehicle maneuvers, weapons training and testing, construction, and the resulting potential for noise and fire. Impacts to wildlife due to construction and demolition activities within the McGregor Range Camp and other built-up areas would be negligible, since wildlife resources are limited in these areas.

Ground Disturbance. Off-road vehicle maneuvers in TA 8 would continue to affect wildlife in the mesquite coppice dune plant communities by disturbance of habitat, and potentially crushing mammal burrows and disturbance of nesting birds (see Section 3.8.3 and Appendix D for a description of wildlife species found in the mesquite coppice dune plant communities). If in the future, a type of training similar to that in 1990 were added, there could be a potential for significant adverse impact on wildlife because of increased off-road maneuvers resulting in potential increased loss of habitat.

The use of the existing 25 controlled access FTX sites would result in the temporary disturbance of wildlife for a 10- to 14-day period each year during Roving Sands. Some wildlife use of the FTX sites would be precluded because of the presence of equipment and humans. Additionally, wildlife adjacent to the sites may be impacted by human activity. The impacts to wildlife would be negligible due to the small size of the area used and short duration of this activity. The establishment of additional controlled access FTX sites on 13.5 square miles of McGregor Range would result in additional localized impacts to wildlife. The impacts to wildlife at these sites could be more long-term because the new FTX sites could be used more frequently during the year than the existing sites. The potential impacts to wildlife at the additional FTX sites will be assessed in a separate NEPA document.

Weapons use would result in increased habitat disturbance if military activities increase over current conditions. A potential helicopter training facility in the Tularosa Basin would be one of the principal areas where increased impacts could occur. This facility would cover an area approximately 13 by 14 miles in the mesquite coppice dune and creosotebush plant community types in southern McGregor Range. Wildlife species in these types is discussed in Section 3.8.3 and Appendix D.

Wildlife habitat disturbance could occur from construction of a helicopter training complex; development of a 32-building MOUT Training Complex; a rail spur from U.S. Highway 54 to the McGregor Range Camp; ASP Phase III; and a geothermal project could potentially occur. The number of acres of land that would be disturbed by these facilities is not known; all of these additional construction projects would affect wildlife in the Chihuahuan Desert shrublands plant communities in the Tularosa Basin. This would result in potential burial, stress, and displacement of reptiles, amphibians, birds, and mammals that occur in the desert shrubland habitat in the Tularosa Basin. See Section 3.8.3 and Appendix D for discussions of the species of wildlife known to occur in these plant community types on McGregor Range. This loss of habitat, direct mortality, stress, and displacement of animals from these construction sites would result in adverse impacts to wildlife.

The estimated loss of 1,000 to 5,120 acres of natural plant communities at the USAF target complex would have an impact on wildlife from clearing of land and human disturbance. Arroyo-riparian drainages (Waters of the U.S.) are within the proposed tactical target complex site and these areas have been shown to be particularly important to wildlife (Section 3.8) such as reptiles, nesting birds, and neotropical migrant birds.

Fire. Fires have the greatest potential to adversely affect wildlife on McGregor Range. The effects of fire on invertebrates and vertebrates have been studied on Fort Bliss and elsewhere. Arthropods were sampled after controlled burns in the Chihuahuan Desert shrublands and comparisons immediately after and 1 year after the burn showed that there was no difference in the average number of arthropods at burned and unburned sites (U.S. Army, 1996e). Samples in burned and unburned locations in the Jemez Mountains, New Mexico, shortly after a fire showed a 46 to 69 percent decrease in the number of genera

and 26 to 29 percent decrease in individuals. Light traps in burned areas showed a 75 percent decrease in arthropods shortly after a fire; 1 year later, the volume of arthropods captured in light traps was similar in burned and unburned areas (Pippin and Nichols, 1996). Limited data indicated that the number of harvester ant mounds was greater in burned than unburned areas (Fair and Henke, 1997). These results indicate that fire may have a short-term adverse impact on arthropod species richness and abundance.

The effects of fire on reptiles and amphibians has received little study (Scott, 1996). The box turtle can suffer heavy losses from fire; 25 dead box turtles were found after an August burn in Oklahoma (Bigham et al., 1965). Limited direct mortality from fire to snakes and lizards has been documented in other studies (Erwin and Stasiak, 1979; Simons, 1989). On McGregor Range, reptiles were sampled shortly after a fire on burned and control plots in the Chihuahuan Desert shrublands and it was observed that the common trans-Pecos whiptail lizard was equally abundant on burned and unburned plots. A reduction in the common side-blotched and western marbled whiptail lizards by 54 and 26 percent respectively was noted shortly after the fire. The abundance of these species was similar on burned and unburned plots 2 to 3 months after the fire. Overall, the average lizard species richness was similar in the burned and control plots shortly after the fire (U.S. Army, 1996e). These results indicate that fires may have severe effects on some species such as the box turtle, but have only short-term impacts on species groups such as lizards.

Fires on McGregor Range would have the greatest effect on birds in the Chihuahuan Desert shrublands and grassland plant communities because fires are most frequent in these types. Direct mortality to birds from fires would generally be limited to the destruction of nests with eggs or young birds. In Nebraska, one meadowlark and 38 ground nests of the ring-necked pheasant (*Phasianus colchicus)* were destroyed by fire (Erwin and Stasiak, 1979). Fire alters habitats, which can result in changes to the bird community. Fires in ungrazed grasslands in Arizona attracted species such as the mourning dove, lark sparrow, horned lark, chipping sparrow, and Say's phoebe. Species that avoided recently burned grasslands were Cassin's, grasshopper, and Botteri's sparrows, eastern meadowlark and Montezuma quail (Aid, 1990; Bock and Bock, 1992; Bock and Bock, 1990). Species that did not respond to fire were scaled quail, ash-throated flycatcher, western kingbird, northern mockingbird, canyon towhee, rufous-crowned sparrow, and brown-headed cowbird (Aid, 1990). Some species of birds of prey are attracted to recently burned areas because prey species are exposed by fire or prey species are abundant in new growth after a fire (Beck and Vogl, 1972; Lehman and Allendorf, 1987). Fire could have a direct effect on birds of prey if an active nest site were burned. Preliminary results of a study of the effects of wildfire on breeding birds in various habitats in the Organ Mountains showed that the number of birds in burned and unburned areas was similar. However, the average number of species per census plot for all habitats combined showed that there were over twice as many species detected in the unburned plots. This difference was pronounced in the desert shrubland/grassland habitats where eight species were detected in the unburned plots and two species on the burned plots. The difference between species richness in burned and unburned plots was much less in the arroyo/riparian, mixed conifer, mesic shrublands, and montane shrubland habitat types (U.S. Army, 1994d). Therefore, fires have the potential to result in a reduction in species richness as well as changes in species composition in Chihuahuan Desert shrublands and grassland plant communities.

Mammals have been categorized as having fire-positive or fire-negative responses. Negative response mammals include those that forage for invertebrates in the litter layer, live in dense vegetation, or nest above ground. Mammals that occur at Fort Bliss in this group are the hispid cottonrat, pinyon mouse, pocket mouse, antelope ground squirrel, white-throated woodrat, and western harvest mouse. Fire-positive species include those that use microhabitats with a relatively open herbaceous layer and/or nest under ground. Included in this group are the deer mouse, white-footed mouse, cottontail rabbits, and hispid cotton mouse (Ford and McPherson, 1996). Studies of the effects of fire on mammals have been few. In California, 28 woodrats (*Neotoma fuscipes)* and 9 desert cottontails were found dead after a chaparral fire. It was believed that most of the woodrats and rabbits living in the burned area perished in

the fire (Chew et al., 1959). Two burns in Arizona resulted in the almost complete elimination of the white-throated woodrat and least cotton rat (*Sigmodon minimus)* while deer, white-footed, and grasshopper mice were unaffected (Bock and Bock, 1978). In Nebraska, an inspection of harvest mice nests yielded eight with dead young and 72 of 92 nests where the fire had burned into the inner chamber. Species such as the deer, white-footed, and plains pocket mice were apparently unaffected (Erwin and Stasiak, 1979). An overall short-term increase in the number of small mammals residing in an area 1 year after a fire has been documented (Bock and Bock 1983; Tester, 1965). In general, predators such as the badger, bobcat, red fox, and coyote, as well as most ungulates, show increases in the use areas after a burn (Ford and McPherson, 1966).

Military activity-induced fires could have an adverse impact on wildlife. The installation's capability to support increased training activities could potentially be used. If this occurs, the number of military-related fires could increase over current conditions due to (1) increased off-road vehicle training in TA 8, (2) increased weapons firing, and (3) increased missile firing resulting in more hot missile parts landing on the ground.

Noise. Over most of McGregor Range, noise sources such as military jet aircraft are widely dispersed and relatively infrequent. Noise levels are higher at localized areas such as the 20-acre Class C Bombing Range in the northern part of McGregor Range, rocket launch sites, and built-up areas. However, noise levels could increase over current conditions due to increased military activity on McGregor Range. Specifically, noise levels would be elevated at the potential 13- by 14-mile helicopter gunnery range and at missile firing locations. Wildlife has been reported to exhibit a wide range of responses to noise as discussed below. Based on the evaluation of studies on wildlife response to noise, it is anticipated that adverse impacts to wildlife may occur, particularly in the Chihuahuan Desert shrublands at the helicopter gunnery range.

Wildlife may be startled by noise associated with short-term events such as missile firings/strikes, weapons training, and aircraft overflights. Studies and incidental observations have been made on the response of animals to noise such as aircraft overflights. Reported animal responses vary among species, and the ability of species to adapt to overflights also varies. As an example, the potential consequences from noise are thought to be greatest on breeding animals (DOI, 1995).

Both physiological and behavioral animal responses to noise have been reported (Knight and Gutzwiller, 1995). Physiological effects may include temporary or permanent hearing threshold shifts, masking of auditory signals, increased respiration and heart rate, and increased corticosteroid levels. Reported hearing threshold shifts were related to noise sources that were of much greater duration (minutes and hours) than an aircraft overflight or missile firing, or weapons training. Behavioral responses may include animals becoming alert and turning toward the sound source, running from the sound source, changes in activity patterns (e.g., interrupted feeding), nest abandonment, or change in habitat use. It has been speculated that if the changes are sufficiently severe, the health and survival of an individual animal may be reduced. If a large number of animals are affected, then population declines potentially could result.

In general, literature suggests that the impacts of noise to wildlife populations such as those found on Fort Bliss appear to be short-term and affects individuals, but does not translate to long-term or population-level impacts. However, no conclusive studies have been conducted on the potential long-term impacts from noise exposure. Because of the lack of conclusive studies and inconsistent responses by wildlife reported in studies, potential impacts can only be predicted as variable with a probably low likelihood of population level impacts.

Many studies and surveys have been conducted regarding the impact of noise on birds. The studies and surveys indicate that noise has the potential to result in short-term adverse impacts on individual or small groups of birds (Lamp, 1989). The effects of loud noise on raptors have been studied. The studies indicate that raptors appear to have the ability to adapt to noise and human activities (Anderson et al., 1990).

Few studies have been conducted on the effects of noise on bats. Howell (1992) found that noise from unmanned aerial vehicles overlapped with lesser long-nosed bat's hearing at only one frequency (30 kilohertz [kHz]), and flights at operational cruising altitude (3,000 feet AGL) were inaudible. In another study conducted on the lesser long-nosed bat (Dalton and Dalton, 1993), the authors found no apparent short-term effects of low-altitude jet aircraft on bat maternity roosts; however, the authors stated that the extrapolation of their results to other areas may not be appropriate (Dalton and Dalton, 1993). Griffin et al., (1963) found echolocating Townsend's big-eared bats were able to resist jamming from a constant noise field by orienting to second harmonics. Jamming resistance and an ability to navigate and locate targets despite acoustical clutter and interference has been demonstrated for numerous other bat species (Simmons et al., 1974; McCarthy and Jens, 1983; Troest and Mohl, 1986; Schmidt and Joermann, 1987).

Studies on the effects of noise on wild small mammals have shown response by individual animals but the few studies on populations' attributes did not show changes from noise exposure. Chesser et al., (1975) documented increased adrenal and body weights as well as temporary threshold shifts in hearing. Long-term exposure to noise has been shown to cause increased adrenal weights in mice, which generally corresponds to higher levels of stress. However, no adverse impacts on longevity, reproductive success, or health were detected or noted (Chesser et al., 1975). A study testing the effects of off-road vehicle impacts reported that vehicle noise caused a temporary shift in hearing sensitivity in desert kangaroo rats, with recovery of hearing thresholds taking at least 3 weeks (Brattstrom and Bondello, 1983).

Studies of big game exposed to noise events generally suggest that responses to overflights are usually temporary, and temporary changes would not be detrimental to populations (Lamp, 1989). However, Weisenberger et al., (1996) suggested that the interaction of noise with other environmental factors should be evaluated using free-ranging animals. Historic presence of big game on military installations demonstrates that big game can exist in areas with vehicle maneuvers and low-level military aircraft flights; however, it is unknown whether population levels would be greater if noise events from military events occurred at lower levels. As examples, mule deer and bighorn sheep populations continue to exist under airspace where low-level aircraft sorties have been flown for years at such training areas as Nellis Range, Nevada, and Goldwater Range, Arizona. In a study of the effects of helicopter noise and approach distance on pronghorn antelope, it was determined that helicopters at an altitude of 400 feet and a distance of 3,000 feet had little effect on antelope. As the helicopter moved closer, strong reactions to its presence were observed at an altitude of 150 feet and a distance of 500 feet (Luz and Smith, 1976).

Construction of a tactical target complex would result in an increase in the number of low-level aircraft sorties over portions of McGregor Range near the target complex. Wildlife under and near the flight paths would have a greater potential to be startled. The increased exposure to noise may result in lower wildlife population levels in some areas or reduced use of some areas. As an example, fewer birds may continue to nest along the Otero Mesa escarpment and other portions of McGregor Range because of the increased frequency of aircraft overflights.

Sensitive Species. Sensitive species that occur or have the potential to occur on McGregor Range are discussed in Section 3.8.4 and Appendix D. As with wildlife in general, activities that have the potential to impact sensitive species on McGregor Range are ground disturbance, fire, and noise.

Ground Disturbance. Off-road vehicle maneuvers would occur on TA 8, but there are no known sensitive species in this area so off-road maneuvers would not affect sensitive species.

The continued use of the controlled access FTX sites has the potential to affect potential mountain plover and aplomado falcon habitat on Otero Mesa. As indicated in the vegetation section, 15 FTX sites occur on Otero Mesa and of the 3,732 acres, 91 percent are grasslands. The remaining land is 251 acres of disturbed ground such as roads and 74 acres of shrub-dominated habitat. The impacts of military activities on vegetation at the FTX sites appear above. The military are typically present at the FTX sites for 10 to 14 days per year during the Roving Sands exercise, but all the sites are not used each year. For example, the number of sites used during Roving Sands 1996 through 1997 ranged from was 0 (1998) to 8 (1996). The number of acres affected during the last three Roving Sands exercises on Otero Mesa was 78 (1996), 138 (1997), and 0 acres (1998). This disturbance represents 0 to 4 percent of the land within the 15 FTX sites.

As indicated in Section 3.8.3.4, recent surveys have shown that the mountain plover does not nest on Otero Mesa on Fort Bliss, although one bird was observed during the spring of 1999; and it also has not been observed during migration. However, Otero Mesa is an historic breeding range for this species, and it could occur in the area in the future. The impact of reduced grass cover at some of the FTX sites on Otero Mesa from military activities may be beneficial to mountain plover potential habitat because, as indicated in Section 3.8.3.4, this species is frequently found in areas of reduced grass cover such as prairie dog towns. Military activities at the FTX sites would preclude the mountain plover from using the occupied land. However, this impact would be negligible because of the short duration of the exercise and the small amount of habitat in use.

As indicated in Section 3.8.3.4, the aplomado falcon has not been observed during surveys on McGregor Range during the last few years, although an unconfirmed observation was reported below the Otero Mesa escarpment in 1997. This indicates that this species does not nest on Otero Mesa but much of the grasslands on Otero Mesa are considered potential aplomado habitat. There have been short-term reductions in grass cover in limited areas as indicated above, and this could affect breeding bird populations which are the major prey base for the aplomado falcon. The worst case would be the elimination of breeding birds from the affected areas, which could affect up to 14 pairs in 1996 and 24 pairs in 1997, based on 18 pairs per 100 acres (Raitt and Maze, 1968). Breeding birds would be expected to inhabit the disturbed land during recovery, although there may be a shift in species composition to species better adapted to short grass habitat (see impacts analysis of fire on birds above and grazing in Section 4.8.5). The reduction of grass cover may result in a decrease in the meadowlark population and, as indicated in Section 3.8.3.4, the meadowlark was the aplomado falcon's principal prey species at occupied territories in Mexico. However, other species such as the northern mockingbird, western kingbird, and mourning dove, which would likely not be affected by reduced grass cover, were also important prey species for the aplomado falcon (Montoya et al., 1997). Therefore, the short-term reduction in grass cover at the affected FTX sites would have a negligible impact on the aplomado falcon potential habitat because (1) potential prey species would inhabit the sites during recovery, and (2) a maximum of 4 percent of the habitat at the 15 FTX sites and less then 0.1 percent of the plant communities on Otero Mesa on Fort Bliss would be affected. Human occupation of the FTX sites during Roving Sands would preclude their use by the aplomado falcon. This impact would also be negligible given the short time period (10 to 14 days) the sites are occupied by military personnel, and the small amount of potential habitat that has been affected. The one exception would be if an aplomado falcon established at nest site at or near an FTX sites. In the past, aplomado falcon surveys were conducted on Otero Mesa before Roving Sands and none were found. If an aplomado falcon nest site were discovered, the USFWS and the NMDGF would be notified. Measures would be taken to protect the nest site from military activities associated with Roving Sands, as well as all other military and civilian uses.

The establishment of additional controlled access FTX sites on 13.5 square miles of land also has the potential to impact sensitive species. The locations of these sites are not currently known, although many sites would occur on Otero Mesa (Figure 2.1-4). These new FTX sites could be used more frequently than the existing FTX sites and, therefore, have the potential to have a greater impact on sensitive species. As with other activities that potentially use McGregor Range, NEPA documentation will be prepared once specific locations have been determined and this documentation will include an assessment of potential impacts to sensitive species.

The direct disturbance from weapons strikes are localized in nature and would result in a small disturbance, and would likely have negligible or no impact on sensitive species.

Wildlife habitat could be disturbed from potential construction of a helicopter training complex, development of a 32-building MOUT training complex, a rail spur from U.S. Highway 54 to the McGregor Range Camp, and the McGregor ASP Phase III expansion. The number of acres of land that would be disturbed by these facilities is not known; all of these additional construction projects would have the potential to impact federal species of concern and state sensitive species such as the night blooming cereus, Texas horned lizard, loggerhead shrike, and burrowing owl. Federal and state listed species would likely not be affected. However, there is some flexibility in the placement of these facilities that would reduce or eliminate impacts to sensitive species. The Army would complete project specific NEPA documentation and consultation with USFWS, if required, under the Endangered Species Act to ensure that impacts are minimized to federally listed species.

Sensitive plant and wildlife species such as the night blooming cereus, grama grass cactus, mountain plover, burrowing owl, and prairie dog were not observed during biological surveys of the site for the USAF tactical target complex (USAF, 1997g, i). The loggerhead shrike was observed at or near the site (USAF, 1997b, c) and the Texas horned lizard is likely at the site. Construction and operation of a tactical target complex would result in the reduction of habitat for these two species.

The Otero Mesa tactical target complex site is in good to excellent aplomado falcon potential habitat. If this falcon reinhabits the general area, then they may be startled or otherwise affected by aircraft operations. This could result in an adverse impact to this species. However, there are currently no resident aplomado falcons on McGregor Range.

Fire. As with other biological resources, fires have the greatest potential to have an impact on sensitive species on McGregor Range. Potential impacts of military and naturally caused wildfires on sensitive species are summarized in Table 4.8-1. Based on available information, fire has the potential to have a negative impact on plant species such as night blooming cereus (not known to occur on McGregor Range) and grama grass cactus, less potential to impact species such as Sneed pincushion cactus (not known to occur on McGregor Range), which grows in rocky terrain, and Alamo beard tongue (not known to occur on McGregor Range), which grows on cliffs (Table 4.8-1). The 1994 fire in the Organ Mountains did not have negative impact on sensitive plant species that were in the burned area (U.S. Army, 1994d). Fire has the potential to be a positive force for such species as the Texas horned lizard, ferruginous hawk, mountain plover, and burrowing owl. Other species such as the bald eagle, loggerhead shrike, and bats would likely not be affected by fire (Table 4.8-1). The impacts from fire could increase due to the potential for an increase in military activity over current levels. If there is a large increase in the number of fires on Otero Mesa, negative impacts to potential aplomado falcon habitat could occur if a substantial reduction in potential perch and nest sites (e.g., loss of yucca) or a reduction in the prey base were to occur (because of reduced grass cover for several years). For example, meadowlarks were the principal prey item for aplomado falcons on occupied territories in Mexico (Montoya et al., 1997) and as shown in the *Wildlife* section, meadowlarks tend to avoid burned areas.

Table 4.8-1. Potential Effects of Fire on Sensitive Species and Sensitive Species Habitat on McGregor Range

Species	*Potential Fire Effects*	*References*
Sneed pincushion cactus (*Coryphantha sneedii* var. *sneedii*)	Not known from McGregor Range but has the potential to occur. Effects of fire on this species are unknown. The Organ Mountain pincushion cactus *(Corypantha organensis)* grows in similar habitat and has a growth form like the Sneed pincushion cactus. The Organ Mountain pincushion cactus survived the 1994 fire in the Organ Mountains. The average number of stems, plant size, and reproductive stems were similar in burned and unburned plots. Sneed pincushion occurs in rocky terrain with low fuel loads, which may reduce its susceptibility to fire, such as was observed for the Organ Mountain pincushion cactus.	Bunting et al., 1980; U.S. Army, 1980b
Alamo beard tongue (*Penstemon alamosensis*)	This species grows in rocky canyon bottoms and on cliffs, which would likely limit its susceptibility to fire damage or mortality.	U.S. Army, 1991a
Grama grass cactus (*Toumeya papyracantha*)	This species is fairly common in the grassland plant communities on Otero Mesa. Given its small size and habit of growing within clumps of grass, it would be very susceptible to being killed by fire. Its ability to recover from fire is unknown.	Corral, 1997
Night blooming cereus (*Peniocereus* var. *greggii*)	Not known to occur on McGregor Range but has the potential to occur. Would be susceptible to fire damage and/or mortality in its desert shrub habitat. Ability to recover from fire unknown.	
Hueco Mountain rock daisy (*Perityle huecoensis*)	This species grows in mesic canyons with vertical cliffs well protected from fire. Its ability to recover from fire is not known.	U.S. Army, 1991a
Texas horned lizard (*Phrynosoma cornutum*)	This species was more common in burned than unburned grazed and ungrazed habitat so fire may have a positive impact by opening up the habitat. Fires may have a negative impact on populations that hibernate < 1 inch below ground but other populations that hibernate deeper may not be affected.	Fair and Henke, 1997
Bald eagle (*Haliaeetus leucocephalus*)	Fire in the pinyon pine/juniper habitat used by this species in the winter could eliminate perch sites. However, given the open nature of this habitat, all perch trees would likely not be eliminated so fire would have little impact on wintering bald eagles on McGregor Range.	
American Peregrine falcon (*Falco peregrinus*)	This species occurs only as a sporadic migrant on McGregor Range so fires would not affect it.	U.S. Army, 1980a
Aplomado falcon (*Falco fermoralis septentrionalis*)	This species was associated with grassland habitats in the southwestern U.S. where fire was a common occurrence before fire suppression measures were implemented. Therefore, fire in potential aplomado habitat on McGregor Range would not be expected to reduce its suitability for this species. However, if military activities are expanded and the number of fires increased, fires could have a negative impact on potential aplomado falcon habitat if a reduction in potential roost and nest sites took place or if the prey base were reduced.	
Willow flycatcher (*Empidonax traillii extimus*)	The willow flycatcher is an occasional migrant on McGregor Range and fires would not affect this species.	

Table 4.8-1. Potential Effects of Fire on Sensitive Species and Sensitive Species Habitat on McGregor Range (Continued)

Species	*Potential Fire Effects*	*References*
Piping plover (*Charadrius melodus*)	The piping plover is a very rare migrant on McGregor Range and fire would not affect this species.	
Mexican spotted owl (*Strix occidentalis lucida*)	Although this species does not nest on Fort Bliss, limited potential marginal wintering habitat occurs in the Sacramento Mountains foothills on McGregor Range. Given the marginal nature of the habitat and the apparent infrequent use of this area, fire on McGregor Range is not expected to affect the Mexican spotted owl.	U.S. Army 1996j; U.S. Army, 1991b
Mountain plover (*Charadrius montanus*)	Although the mountain plover is not known to breed on Fort Bliss, fire in potential grassland habitat on Otero Mesa may improve the habitat since this species prefers open areas such as those created by prairie dogs or by grazing.	Knopf and Miller, 1994; Miller and Knopf, 1993; Sager, 1996
Black tern (C*hlidonias niger*)	The black tern is an occasional migrant on McGregor Range and fires are not expected to affect this species.	
Ferruginous hawk (*Buteo regalis*)	Fire may benefit migratory and wintering ferruginous hawks on Fort Bliss by making prey more accessible or resulting in greater prey density in areas of new plant growth.	Lehman and Allendorf, 1987
Burrowing owl (*Athene cunicularial*)	Direct mortality by fire has not been documented, although young caught outside their burrow during a fire could suffer mortality. Fires may benefit burrowing owls by increasing prey availability and reducing litter in its grassland habitat. This species has been reported to use burns 5 days after a fire.	Ford and McPherson, 1996; Howard, 1996; Lehman and Allendorf, 1987
Loggerhead shrike (*Lanius ludovicianus*)	This species is common and widespread on Fort Bliss, so localized sporadic fires would probably not have a negative impact on this species. Fires may benefit this species by making prey more accessible.	
Baird's sparrow (*Ammodramus bairdii*)	Fires could have a negative impact on the thick grass cover used by this species during migration and the winter on McGregor Range.	
Varied bunting (*Passerina versicolor*)	The varied bunting is an occasional migrant on McGregor Range and fires on the range would not be expected to affect this species.	
Bell's vireo (*Vireo bellii*)	Bell's vireo is an occasional migrant on McGregor Range and fires would not affect this species.	
Gray vireo (*Vireo vicinior*)	This species is not known to nest on McGregor Range although potential breeding habitat occurs in the pinyon pine/juniper habitat in the Sacramento Mountains foothills. If this species were to breed in this habitat, a major fire in these areas could adversely affect the habitat of this species.	
Bats	Areas such as cracks and crevices in the Otero Mesa escarpment used by bats would not be impacted by fire. Bats that roost in the various plant communities could be negatively affected by fire. The susceptibility of bats to fire is unknown because little data are available regarding the distribution of bats on McGregor Range.	
Gray-footed chipmunk (*Tamias canipes*)	A fire in the wooded habitat used by this species in the Sacramento Mountains foothills on McGregor Range could have a negative impact due to alteration of its habitat.	
Black-tailed prairie dog (*Cynomys ludovicianus*)	Fire would likely not affect prairie dog towns due to low fuel loads. Fires may benefit this species by creating new plant growth for them to feed on.	

Noise. Noise levels would increase from increased weapons firings and the establishment of a helicopter gunnery range in the southern part of McGregor Range. These noise sources would occur principally in the Chihuahuan Desert shrublands in the Tularosa Basin. The Texas horned lizard, burrowing owl, and loggerhead shrike likely occur in this area. Noise levels that would occur at the gunnery range are not known but they do have the potential to affect the Texas horned lizard. A-weighted noise levels of 95 to 114 dB can result in short-term (1 day) and long-term (greater than 7 days) effects on reptile hearing (DuFour, 1980). The burrowing owl is well known to reside in noisy areas near airports, and currently resides at the radar tracking sites at McGregor Range (U.S. Army, 1997d) where noise from rocket launching and helicopter flights are common. If burrowing owls reside in the area that would be used for the gunnery range, they may be able to adapt to the noise levels. Noise levels at the gunnery range could preclude the use of part of the gunnery range by the loggerhead shrike. Therefore, the potential increase in noise levels at a helicopter gunnery range could have an adverse impact on the Texas horned lizard and loggerhead shrike, and negligible impact on the burrowing owl.

As indicated in Section 3.8.4.4, the Mexican spotted owl is a rare winter visitor in the Sacramento Mountains foothills. This species does not nest in this area and there is no potential nesting habitat. Therefore, the occasional low-level helicopter flights in the Sacramento Mountains foothills would not or would only have a negligible affect on the Mexican spotted owl on the rare occasions this species is in the area.

4.8.1.2 Effects of Nonmilitary Activities

Nonmilitary activities that have the potential to impact biological resources include hunting, other recreation activities, mineral extraction, wildfires, and grazing. Hunting and other recreational activities such as hiking have the potential to disturb a limited amount of vegetation and startle wildlife. Overall, these impacts would be negligible. Mineral extraction could result in the destruction of vegetation and wildlife habitat, including sensitive species habitat. It could also result in the disturbance of wildlife adjacent to the land being disturbed. The magnitude of these impacts can not be determined until specific mineral extraction proposals are available. The BLM and the USFS would be responsible for ensuring that all environmental compliance actions are taken. Wildfires and grazing have the greatest potential to have negative impacts on biological resources. The potential impacts of fire on wildlife resources are discussed above. Livestock grazing on McGregor Range is administered by the BLM, while the USFS administers grazing on the Lincoln National Forest. The potential impacts of grazing on biological resources are described under cumulative impacts.

4.8.2 Alternative 2

Under this alternative, a 40,000-acre tract of the Sacramento Mountains foothills portion of McGregor Range, including most of the Culp Canyon WSA, would return to the public domain (Figure 2.2-1).

4.8.2.1 Effects of Military Activities

In general, most military missions and reasonably foreseeable future missions would be supported under this alternative. Constraints to the military activities would occur in the Sacramento Mountains foothills (see Section 2.2.1). TAs 13, 14, 16, 33, and Culp Canyon WSA make up this tract of land and military activities in these training areas are very low to low (Table 2.1-3). These activities would have no or negligible impacts on biological resources and include using the area as part of the missile firing SDZ, on-road military vehicle movements, and infrequent ground troop movements. The cessation of these activities on the 40,000-acres would have negligible or no impacts on biological resources. Therefore, the impacts to vegetation, Waters of the U.S., wildlife, and sensitive species as a result of military activities under this alternative would be the same as described for Alternative 1.

4.8.2.2 Effects of Nonmilitary Activities

This tract is within grazing units 4 and 5 and parts of units 3 and 5 (Figure 3.1-2). It is assumed that grazing would continue on land returned to the public domain and Army fee-owned land in the area and that grazing intensity would be similar to current levels. In addition, there could be an increase of other nonmilitary activities on this tract such as increased public use including hunting, hiking, and firewood cutting. The increase in these activities, if it occurs, would likely have negligible effect on vegetation and wildlife.

4.8.3 Alternative 3

Under this alternative, 180,000 acres of land within grazing units 4, 5, 7 through 15, and about half of unit 3 would be returned to the public domain. This area includes the Sacramento Mountains foothills and Otero Mesa (Figure 2.3-1).

4.8.3.1 Effects of Military Activities

Under this alternative, some of the Army's military missions could not be conducted and other activities would be reduced in scope because of the loss of Otero Mesa (Section 2.3.1). Under this alternative, off-road vehicle maneuvers would continue on TA 8. Weapons training and testing would be conducted in the Tularosa Basin portion of McGregor Range. In addition, a proposed helicopter gunnery range could be constructed and operated. Types of impacts from military training and testing activities would be similar to those discussed under Alternative 1 (Section 4.8.1); however, the area affected would be smaller. The types of impacts would include physical disturbance of vegetation and habitat, potential for wildfires, and noise.

Vegetation.

Ground Disturbance. Under this alternative, off-road vehicle maneuvers would continue on TA 8 and weapons testing would continue in the Tularosa Basin. Therefore, impacts to vegetation from off-road vehicle maneuvers and weapons impacts would be similar to those described for Alternative 1.

Under this alternative, the controlled access FTX sites would be used in the Chihuahuan Desert shrubland and grassland plant communities in the Tularosa Basin but not on Otero Mesa, as in Alternative 1. Therefore, the 5,132 acres that may be disturbed for these sites would be entirely within the Tularosa Basin area of McGregor Range.

Fire. There would be much less risk of fire from military activities to pinyon-juniper vegetation or to grasslands and other vegetation on Otero Mesa, since these areas would not be withdrawn and thus would not be part of the missile and ordnance safety fans. Impacts of fire on desert grasslands described under Alternative 1 would occur in the grasslands in the Tularosa Basin. Fire impacts to desert shrub vegetation would also be the same as discussed under Alternative 1. Therefore, there would be fewer fires from military activities on Otero Mesa, with no changes in the Tularosa Basin portion of McGregor Range.

Wetlands and Arroyo-riparian Drainages.

Ground Disturbance. Under this alternative, off-road vehicle maneuvers would continue on TA 8 and weapons training and testing would continue in the Tularosa Basin portion of McGregor Range. Therefore, impacts from off-road vehicle maneuvers and weapons impacts to probable Waters of the U.S. would be the same as described for Alternative 1.

Impacts to wetlands and arroyo-riparian drainages would be limited to the Tularosa Basin. There would be no ground disturbance impacts to probable Waters of the U.S. on Otero Mesa or the Sacramento Mountain foothills area. Probable Waters of the U.S. in the Tularosa Basin may be impacted from construction as described under *Waters of the U.S.* in Section 4.8.1.1.

Fire. Impacts of fire to wetlands and arroyo-riparian drainages in the Tularosa Basin would be adverse as described for Alternative 1. Waters of the U.S. on Otero Mesa or the Sacramento Mountains foothills would not be affected by military-related fires, since these areas would not be withdrawn and not be part of the missile and ordnance SDZs.

Wildlife. The potential types of impacts to wildlife from ground disturbance and fires would be similar to those described under *Wildlife* in Section 4.8.1.1. The one difference is that land disturbance and fire from military sources would not affect wildlife or wildlife habitat in the grasslands of Otero Mesa or in most of the Sacramento Mountains foothills. Based on the potential for land disturbance and fire to affect wildlife in the Tularosa Basin, it is assumed that the potential impacts to wildlife due to these factors for this alternative would be the same as described under *Wildlife* in Section 4.8.1.1.

Sensitive Species.

Ground Disturbance. The potential impacts of ground disturbance to sensitive species under this alternative would be negligible, as determined for Alternative 1 (see *Sensitive Species* in Section 4.8.1.1).

Fire. The reduction of military-related fires on Otero Mesa would have a positive impact on those species that are negatively impacted by fire and may be detrimental to those species that react positively to fire (see *Sensitive Species* in Section 4.8.1.1). Military-related fires would continue to occur in the Tularosa Basin and could have an effect on sensitive species that have the potential to occur in these areas. The impacts of fire on sensitive species or their habitat that have the potential to occur in the Tularosa Basin are based on the distribution of sensitive species or their habitats on the range and species specific reactions to fire (Table 4.8-1). Based on this assessment, fire has the potential to have the following impacts on sensitive species under this alternative. This assessment does not include sensitive species that are occasional migrants on McGregor Range (see Table D.4-1 in Appendix D).

- Species, habitat or potential habitat negatively impacted by fire: Sneed pincushion cactus, Hueco Mountain rock daisy, and alamo beard tongue, which may have a low probability of being impacted by fire as indicated on Table 4.8-1; night blooming cereus, which could be destroyed by fire but grows in desert shrublands with low fuel loads; and potential aplomado falcon habitat that could be negatively impacted if increased military activities resulted in more fires with a resultant decrease in the suitability of potential aplomado falcon habitat.

- Species or habitat positively impacted by fire: Texas horned lizard, burrowing owl, and loggerhead shrike.

- Species or habitat where reaction to fire is not known: Bats.

4.8.3.2 Effects of Nonmilitary Activities

For the purpose of this assessment, it is assumed that grazing on these returned lands would continue at current levels and is, therefore, considered a cumulative impact and is addressed in Section 4.8.7. If the level of grazing does increase through an increase in the number of livestock or increased duration of use, the severity of impacts to biological resources would likely increase from those described in Section 4.8.7.

Impacts from recreational activities would include human presence, removal of downed wood, and noise. These activities may increase since public access would likely increase. Impacts to vegetation would likely be negligible. There would be a minor adverse effect to wildlife from these activities, as animals may alter their use of habitat to avoid humans.

The return of 180,000 acres of land to the public domain could result in the exploration and development of mineral resources for oil and gas, and geothermal resources. As indicated in Section 4.5, *Earth Resources*, the potential for geothermal development has been investigated in southern McGregor Range. Oil and gas exploration wells have been developed on McGregor Range. These wells indicate that oil and gas resources may be limited. Therefore, the likelihood of mineral development on the portion of McGregor Range returned to the public domain under this alternative would likely be limited. Direct vegetation loss, temporary displacement of animals, and limited habitat fragmentation on Otero Mesa and in the Sacramento Mountains foothills would likely occur with oil and gas development.

4.8.4 Alternative 4

4.8.4.1 Effects of Military Activities

Under this alternative, 244,000 acres of land (64,000 more acres than under Alternative 3) within all the current grazing units would be returned to the public domain (Figure 2.4-1). As with Alternative 3, McGregor Range would not be able to support some of its military operations and others would be reduced in scope (Section 2.4.1). Under this alternative, the military's ability to conduct live-fire missile testing would be more restricted than under Alternative 3 because there would be no safety fan north of New Mexico Highway 506 (Figure 2.4-2). In addition to the reduced military operations described for Alternative 3, the Class C Bombing Range north of New Mexico Highway 506 would be returned to the public domain.

Given that most of the ground disturbing military activities that would take place under Alternative 3 would take place under this alternative, the impacts to biological resources would be similar to those described for Alternative 3 (Section 4.8.3). However, 64,000 additional acres would not be used for military activities compared to Alternative 3. Therefore, impacts from military operations would occur on less area. There would likely be less noise because of the closure of the Class C Bombing Range, but the impacts of noise on wildlife was considered negligible for Alternatives 1, 2, and 3, as well as for this alternative.

4.8.4.2 Effects of Nonmilitary Activities

It is assumed that grazing would continue at its current levels on lands returned to the public domain and the military would continue to supply water for the stock tanks and troughs maintained by BLM. Therefore, grazing is considered a cumulative impact and is assessed in Section 4.8.7. Compared to Alternative 3, an additional 64,000 acres of land would be available for other nonmilitary activities such as hunting, other recreational activities, firewood cutting, and oil, gas and mineral exploration and extraction. The potential impacts of these activities would be similar to those described for Alternatives 1, 2, and 3.

4.8.5 Alternative 5 – No Action

Under this alternative, the withdrawal of McGregor Range would not be renewed and all land other than TAs 8 and 32 would return to the public domain. It is assumed that all this land, except for hazardous areas, would be open for public access, grazing, and mineral exploration. It is anticipated that public access for purposes such as hunting and hiking would not have an impact on the biological resources due

to the widely dispersed and relatively infrequent nature of these uses. Oil, gas, and mineral extraction and development could result in the direct and indirect disturbance of biological resources but the degree of such impacts can not be determined at this time.

Land within the Tularosa Basin that has been closed to grazing for many years would be open for grazing under the No Action Alternative. Based on the assessment of the impacts of grazing in Section 4.8.7, it is assumed that the resumption of grazing on previously ungrazed areas of McGregor Range would have impacts on biological resources as described below.

Vegetation. Under the No Action Alternative, the impacts of grazing would continue on Otero Mesa and other currently grazed areas. In addition, grazing would potentially begin on currently ungrazed portion of the Tularosa Basin in New Mexico. This includes TAs 8, 9, and 24 through 32 (see Figure 2.5-1). It is assumed that grazing practices would be similar to that on Otero Mesa. Impacts from grazing on vegetation would be similar to those discussed under cumulative impacts.

42

Five general plant community types would be subject to grazing in the Tularosa Basin under the No Action Alternative (Table 4.8-2). The creosotebush type covers the largest area (132,700 acres) followed by the mesquite coppice dunes type (88,700 acres). The creosotebush and mesquite coppice dunes plant communities are the dominant types in the Tularosa Basin (Figure 3.8-1).

Table 4.8-2. Number of Additional Acres of Plant Communities That Would Be Grazed in the Tularosa Basin Under the No Action Alternative

Plant Community Types					
Disturbed ground	*Creosotebush*	*Mesquite dunes*	*Basin grasslands*	*Foothill desert shrublands*	*Mesa grasslands*
25,800	132,700	88,700	84,300	51,600	26,300

Source: U.S. Army, 1996d.

Approximately 111,000 acres of grassland plant communities that have not been grazed for many years would be subject to grazing under this alternative. As presented under *Vegetation* in Section 4.8.1.1, heavy grazing in grassland plant communities can result in an increase in bare ground, decrease in vegetation cover, decrease in black grama grass, reduced species richness, and an increase in undesirable species such as Russian thistle and snakeweed. However, in moderately grazed big sagebrush (*Artemisia tridentata)* range, percent grass cover was statistically significantly higher outside livestock enclosures than within (Holechek and Stephenson, 1983). In heavily grazed areas, shrubs such as creosotebush and mesquite would likely invade these grasslands and may, over time, replace the grasslands. Studies in New Mexico have shown that in over-grazed grasslands, creosotebush advanced into grasslands. Pioneer creosotebush plants formed a nucleus around which colonies developed and the grass eventually disappeared. In lighter grazed areas, creosotebush occurred as isolated individuals but did not appear to develop colonies (Gardner, 1951). Grazing could also promote the replacement of grasslands with mesquite shrublands. As noted under *Vegetation* in Section 4.8.7, a combination of over grazing, drought, and dispersal of seeds by livestock appear to be major factors in the spread of mesquite in the Chihuahuan Desert (Buffington and Herbal, 1965; Gardner, 1951; Hennessy et al., 1983). With the potential of grazing in currently ungrazed areas, the dispersal of mesquite seeds over fairly large areas by livestock, and the eventual drought, implementation of the No Action Alternative would potentially result in the expansion of the mesquite plant community into grasslands. With the advancement of shrublands into grasslands, the alteration and reduction of the grassland plant communities would result in a reduction in plant community diversity. In addition, a reduction in plant species diversity would also be

likely. Studies on the Jornada Experimental Range in the Chihuahuan Desert showed that grasslands have 2.5 times more plant species than mesquite shrublands and 1.7 times more plant species than creosotebush shrublands (Huenneke, 1995) where a grazed pasture adjoins one of the black grama grass study areas of New Mexico State University.

A total of 273,000 acres of currently ungrazed withdrawn and Army fee-owned land on McGregor Range is covered with shrub-dominated plant communities (Table 4.8-2). Many of these shrub-dominated plant communities have a fairly dense ground cover component and grazing has the potential to adversely affect the grasses and herbs that make up this layer. A comparison of grazed and ungrazed grasslands on Otero Mesa on McGregor Range where grazed pasture adjoins one of the black grama grass study areas of New Mexico State University (Table 4.8-3) showed that more plant biomass occurred in ungrazed areas including much greater biomass of black grama in ungrazed land (BLM, 1980). The *McGregor Grazing Management EIS* states that basal cover was greater on moderately grazed grassland pastures than on pastures that experience less utilization. The greater basal cover occurred because the grasses tended toward sod formation; in lightly used areas the grasses occurred in distinct upright clumps (BLM, 1980).

In a study in semiarid shrub-grassland in south-central Utah, perennial grass percent cover was 2.5 to 6.4 times higher in areas that had been ungrazed for 30 years than grazed areas. The percent shrub cover and density were similar in both treatments (Rosenstock, 1996). In moderately grazed sagebrush range, grass cover was higher outside livestock enclosures while shrub cover was higher inside the enclosures in the upland sites and higher outside the enclosures in lowland sites (Holechek and Stephenson, 1983). This indicates that grazing in the previously ungrazed shrubland plant communities may result in a reduction in percent ground cover under heavy grazing but increase under moderate grazing. In addition, shrub cover may remain fairly stable. Heavy grazing has the potential to adversely affect vegetation that has been previously grazed, as well as in currently ungrazed areas in the Tularosa Basin. Under moderate to light grazing, impacts to vegetation may be negligible.

Wetlands and Arroyo-riparian Drainages. The impacts of livestock on vegetation in currently grazed probable Waters of the U.S. on McGregor Range are described under *Wetlands and Arroyo-riparian Drainages* in Section 4.8.7. Under the No Action Alternative, grazing has the potential to impact Waters of the U.S. in previously ungrazed areas in the Tularosa Basin. Livestock grazing has a negative effect on unprotected wetlands: It can result in the reduction in wetlands herbaceous species such as grasses and sedges (*Carex* sp.); and rushes (*Juncus* sp.); an increase in the amount of bare ground; the eventual reduction and damage to wetland shrubs such as willow (*Salix* sp.); the trampling of banks around the wetlands; and possibly, the reduction of surface water. BLM management, as described in the RMPA (BLM, 1990a), is intended to ensure that grazing and other activities have a minimum negative impact on wetlands. Stock tanks provide artificial wetland resources. These are, by their intended purpose, heavily used by livestock. The surrounding vegetation in currently grazed portions of McGregor Range are heavily grazed by livestock (BLM, 1980). These artificial wetlands also provide habitat for vegetation and biological species that otherwise would not be present. This effect can be enhanced by using fencing to exclude cattle from portions of the stock tank impoundments.

There are an estimated 2,475 miles of probable Waters of the U.S. that are ephemeral washes on McGregor Range and many of these waters occur in the currently ungrazed areas in the Tularosa Basin (Figure 3.7-1). Livestock grazing could have negative impacts on vegetation in these dry washes by reducing grass cover, increasing the amount of bare ground, reducing shrub cover, and promoting an increase in surface runoff and erosion. Observations in New Mexico showed that there was only a trace of grass in many washes that were overgrazed, and that washes that had been protected from grazing for

Table 4.8-3. Comparisons Between Grazed and Nongrazed Areas

A. Grazed plot (slight utilization) in Pasture 7; adjacent nongrazed plot in black grama exclusion, north of New Mexico Highway 506. Values represent herbage production in grams, from a 4.8 square foot quadrant. Litter cover was 35.8 percent in the nongrazed area, 6.3 percent in the grazed area.		
Plant Species	*Nongrazed Area*	*Grazed Area*
Forbs	16.9	4.9
Black grama	16.9	8.0
Blue grama	8.2	9.1
Ring muhly	–	.8
Sideoats grama	–	Tr
Vine mesquite	–	Tr
Tobosa grass	–	2.6
Sand dropseed	.4	–
Threeawn	.4	–
Burrograss	.4	–
Hall's panicum	–	Tr
Curlyleaf muhly	3.5	–
Broom snakeweed	4.6	1.2
Winterfat	7.2	–
Creosotebush	1.2	–
Total (excluding creosote)	*58.5 (1,168 pounds/acre)*	*24.6 492 pounds/acre)*
B. Grazed plot in Pasture 9 (light utilization); nongrazed area in black grama exclusion to west. Litter cover was 9.8 percent in nongrazed plot; 11.1 percent in grazed plot.		
Species	*Nongrazed*	*Grazed*
New Mexico feathergrass	3.3	14.1
Black grama	22.9	.4
Blue grama	4.3	1.0
Sideoats grama	5.4	.4
Hairy grama	3.4	3.5
Threeawn	1.4	–
Forbs	2.3	6.1
Broom snakeweed	6.5	2.3
Total (excluding snakeweed)	*43.0 (860 pounds/acre)*	*22.5 (510 pounds/acre)*

Source: BLM, 1980: 1979 field studies.

many years were recovering as indicated by the return of giant sacaton and side-oats grama (Gardner, 1951). Sacaton forms dense stands around some stock tanks and along some washes in the currently ungrazed portions of the Tularosa Basin on McGregor Range. These sacaton grasslands are disappearing from the southwest and overgrazing may be the reason (Bock and Bock, 1978). However, sacaton has been observed growing next to many cattle troughs on Otero Mesa and may be tolerant to grazing in this area (BLM, 1998a).

Grazing could have an impact on woody species that occur in the washes. As discussed in Appendix D, little leaf sumac, Apache plume, desert willow, and cutleaf bricklebush are common shrubs in the washes in the Tularosa Basin. These species were also common in the washes of the Hueco Mountains (U.S. Army, 1997h). In New Mexico, percent shrub cover was similar in grazed and ungrazed washes. However, the species composition was markedly different; creosotebush comprised 57 percent of the shrub cover in grazed washes and 16 percent in ungrazed washes. Desert willow, Apache plume, little

leaf sumac, and bricklebush comprised over 50 percent of the cover in ungrazed washes. The first three species were absent from the grazed washes and bricklebush was equally abundant in grazed and ungrazed washes. Desert willow, Apache plume, and little leaf sumac had reinvaded washes that were protected from grazing (Gardner, 1951).

The removal of vegetation by heavy grazing in washes and surrounding uplands would likely result in erosion and surface runoff. Species such as desert willow and Apache plume form islands in the channels of washes as well as growing along the banks. These islands and shrubs along the banks break up and slow down the flow of water in the washes. The removal of these plants by heavy grazing could result in increases in surface water runoff along unobstructed channels (Gardner, 1951). However, light to moderate grazing would be expected to result in less damage to vegetation in washes.

Grazing in the currently ungrazed washes in the Tularosa Basin may result in a reduction in vegetative cover and plant species diversity. However, BLM grazing management practices would reduce this risk to a negligible level. In addition, it is BLM's policy to "minimize disturbance to arroyo-riparian habitats for endangered species and nongame birds" (BLM, 1990a).

Wildlife. Based on the analysis under *Wildlife* in Section 4.8.7, the implementation of grazing on currently ungrazed lands in the Tularosa Basin could result in a reduction in reptile and small mammal abundance and species richness. The impacts of grazing in upland habitats on birds would be mixed, in that it would favor some species and have a negative effect on others. In addition, there could be general reduction in grassland bird species diversity and density if the grasslands are replaced by shrublands. Species such as horned larks, meadowlarks, lark sparrows, and Cassin's sparrows would decrease in abundance, while the black-throated sparrow, western kingbird, and pyrrhuloxia would likely increase. The impacts of grazing in wetlands on birds would likely be negative. Wetlands such as Mack Tanks, (see Figure D.3-3 in Appendix D) with its permanent water supply and vegetative cover, are used extensively by birds year round. Impacts from cattle use can be managed to ensure that negative impacts are minimized.

As discussed in Section 3.8.3.3 and Appendix D, washes on McGregor Range are an important habitat for nesting and neotropical migrant birds traveling through the Chihuahuan Desert. The degradation of these washes from livestock grazing would reduce the cover and, potentially, the food supply of birds using these areas for nesting and migration corridors. In addition, shrubs such as little leaf sumac, desert willow, and Apache plume that are important for nesting could be replaced by creosotebush, which is rarely used by birds for nesting (Kozma and Mathews, 1997).

Therefore, heavy grazing would likely have impacts on reptiles and small mammals, negligible to adverse impacts on birds in upland habitats, and significantly adverse impacts to birds at wetlands and arroyo-riparian drainages. Under BLM's light to moderate grazing management practices, impacts to reptiles would be negligible and impacts to birds and mammals, mixed.

Sensitive Species. As indicated under *Sensitive Species* in Section 4.8.7, grazing would likely result in negative, positive, or no impacts, depending on the sensitive species (Table 4.8-4). Based on information regarding the distribution of sensitive species, or sensitive species habitat, and species-specific reactions to grazing, 12 species of plants and animals, bats, and potential habitat for two additional species have the potential to occur in the area to be opened for grazing under the No Action Alternative (Table 4.8-4). Grazing would have neutral or unknown impacts on 5 species of plants, positive impacts on 6 species of wildlife or potential habitat, a negative impact on 3 species of wildlife or potential habitat, and positive and unknown impacts to bats.

Table 4.8-4. Effects of Grazing on Sensitive Species or Sensitive Species Habitat That Have the Potential to Occur on Lands Opened to Grazing Under the No Action Alternative

Species	*Effects of Grazing*			
	Positive	*Negative*	*Neutral*	*Unknown*
Sneed pincushion cactus (P)[a]			●	
Night blooming cereus (P)				●
Grama grass cactus (P)				●
Hueco Mountain rock daisy (P) [a]				●
Alamo beard tongue (P)[a]			●	
Texas horned lizard (K)[b]	●			
Ferruginous hawk (K) [b]	●			
Aplomado falcon potential habitat (K)[c]		●		
Mountain plover potential habitat (K) [b]	●			
Burrowing owl (K) [b]	●			
Loggerhead shrike (K) [b]	●			
Bairds's sparrow (K) [b]		●		
Black-tailed prairie dog (K) [b]	●			
Bats (K) [b]	● (more water)			●

[a] = potentially occurring in area.
[b] = known to occur in area.
[c] = based on preliminary results (see Section 3.8.3.4).

43

4.8.6 Alternative 6

Under Alternative 6, the elimination of military activities in an NCA would reduce the potential for wildfire and disturbance from training and test activities such as missile debris impacts. In addition, no additional military training and construction activities would occur on Otero Mesa. There would continue to be grazing impacts, as described in Section 4.8.7, if grazing is part of the NCA management plan. It is assumed that land management would remain similar to that currently occurring under the RMPA (BLM, 1990a). Because the precise nature and extent of the congressional action cannot be determined at this time, detailed biological resource analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.8.7 Cumulative Impacts

Activities in the ROI on and around McGregor Range that could contribute to cumulative impacts to biological resources include (1) Army-related training and testing elsewhere on Fort Bliss; (2) current grazing on and in the area of McGregor Range; (3) recreational activities such as hunting and hiking on and near McGregor Range; (4) development of natural resources such as oil and gas and mineral deposits on and near McGregor Range; and (5) BLM habitat management activities such as prescribed burns in various habitats and tree thinning in the pinyon pine-juniper woodlands on McGregor Range. (See Section 4.0 and Appendix G for general information regarding cumulative impacts analysis.) For a cumulative impact to occur, a specific biological resource must be subject to direct impacts from the LEIS alternatives, and also be subject to an impact from one of the sources listed above. For example,

cumulative impacts to grasslands and associated wildlife would occur because the LEIS alternatives would result in the direct impacts to these resources and impacts to these resources would also occur from military activities elsewhere on Fort Bliss, and grazing on and in the area of McGregor Range. Alternately, pinyon-juniper woodlands on McGregor Range are being impacted by grazing, and in the past have been impacted by fire on the Doña Ana Range–North Training Areas. However, no cumulative impact would occur because there would be little if any direct impact to this plant community type on McGregor Range from the LEIS alternatives.

Based on the impacts analysis in Sections 4.8.1 through 4.8.6, military activities on McGregor Range could have direct impacts on vegetation and wildlife habitat in the mesquite-sand sage coppice dunes shrublands, creosotebush-tarbush shrublands, grasslands, and arroyo-riparian drainages as well as on sensitive species. Therefore, the focus of this cumulative impacts analysis is on these biological resources. This cumulative impacts analysis also includes a summary of the Fort Bliss National Aeronautics and Space Administration (NASA) LANDSAT Thematic Imagery monitoring, which a new program being implemented to assess cumulative impacts of military and nonmilitary activities on Fort Bliss. This program is described in greater detail in Appendix G. This section presents a summary of the NASA LANDSAT Thematic Imagery study, a summary of potential impacts of nonmilitary activities such as grazing on biological resources, and ends with an assessment of the cumulative impacts to biological resources listed above.

4.8.7.1 Effects of Military Activities

Cumulative impacts of military and nonmilitary activities on vegetation on Fort Bliss over a 10-year period is being monitored by Fort Bliss through NASA LANDSAT Thematic Imagery. This system will be used to monitor the entire landscape of Fort Bliss at high spatial resolution to capture variability in land cover on training areas. Validation will occur through the use of LCTA. This capability will allow positioning of monitoring plots to provide an accurate sample of impacts on the training landscape. Additional post sampling analysis using plot data, monitoring data, and GIS themes will allow analysts to map the extent and impact of training activities on a landscape scale.

This analysis reflects the process being implemented at Fort Bliss to evaluate cumulative impacts of military training, grazing, and natural events on training lands. To this end, Fort Bliss has acquired satellite imagery from 1972 to 1997. These images will be used to establish long-term trends in landscape change on Fort Bliss including changes in percent vegetation cover (changes in plant species composition generally cannot be determined). For this LEIS, the data from 1986 and 1996 were used to illustrate the developing process for evaluating change in natural and man-induced change (Figure 4.8-1). Change occurred from drought (1994 and 1995 were particularly dry years) and fire (more frequent or larger fires occurred during 1989 and 1994) as well as from training activity that occurred during the 10 years. The results from this analysis must be interpreted with some qualifications. The model was generated from plot data in grassland and desert shrub communities where vegetation cover ranged from 15 percent to 53 percent of the total covered area. Extrapolation of the model to other vegetation types or to vegetation cover outside of the range of the model cannot be evaluated for accuracy. Therefore, comparisons made in other vegetation types or outside of the model's range should be viewed as preliminary comparisons. The images used in the analysis represent a snapshot view of conditions for 2 days 10 years apart, and do not represent trends in vegetation cover. Because only two observations were used, the reliability of the trend analysis is not very high.

Precipitation and fires are important factors affecting vegetation cover. These factors can produce change in short and long time-frames depending on their duration and intensity. Data from precipitation

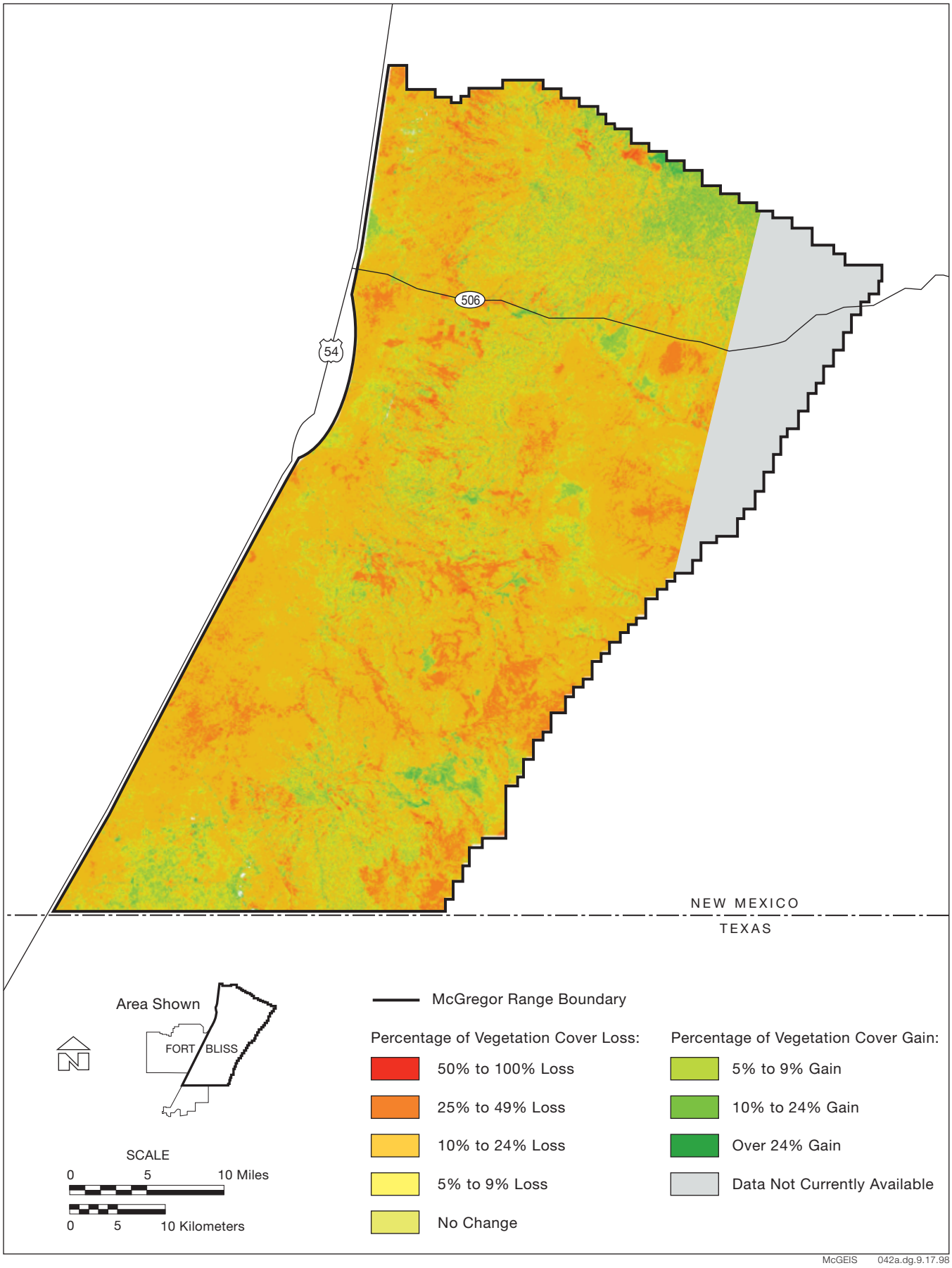


Figure 4.8-1. LANDSAT Derived Vegetation Change on McGregor Range, 1986 to 1996.

monitoring indicates that during the 30 months preceding the 1986 image there was a total 33.15 inches of precipitation on WSMR, approximately 37.60 at Oro Grande, and 29.00 at EPIA. There were 16.69 inches of precipitation on WSMR, 27.55 inches at Oro Grande, and 29.00 at EPIA in the 30 months preceding the 1996 image. The average of these stations for the 30 months prior to July 1996, was 20.31 inches. Fire data indicate low fire frequency prior to the 1986 image and relatively high fire frequency prior to the 1996 image. There were significant fires on Otero Mesa in 1993 and 1994. Natural causes were responsible for 31 fires and 7 fires were attributed to man-made causes. These data suggest that vegetation cover would generally decline from 1994 to 1996 as a result of below normal precipitation and that cover would be drastically reduced in areas that were affected by fires. Results from change analysis of cover maps suggest that there is generally less vegetative cover in 1996 in all cover types than there was 1986 (Figure 4.8-2, Table 4.8-5, Figure 4.8-3). Areas impacted by fire suffered greater losses in cover (e.g. conifer forests in the Organ Mountains) than relatively undisturbed areas.

These results indicate that woody vegetation at high elevations was not affected as severely by drought, most cover loss was associated with fires in these vegetation types. The most severe drought effects were at lower elevations in mesquite coppice dune and sandscrub vegetation. Vegetation cover in grazed grasslands (Table 4.8-6) is lower than in ungrazed grasslands (Table 4.8-7) for both dates. Vegetation cover in Roving Sands controlled access FTX sites is similar to vegetation cover in grazed areas. More data are needed to assess plant cover response to drought years and moist years in desert environments, which would require analysis of long-term data sets that represent a series of wet and dry years.

An example of cumulative vegetation cover change in areas used for specific military activities may be estimated from the controlled access FTX sites. The dynamics of vegetation cover change in the Roving Sands controlled access FTX sites are shown in Table 4.8-8. The vegetation cover change at the Roving Sands FTX sites is similar to surrounding grazed areas indicating that military activities at the FTX sites has little impact on vegetation cover. However, as indicated above, LANDSAT imagery provides little information on changes in plant species composition.

4.8.7.2 Effects of Nonmilitary Activities

The principal nonmilitary activity on and in the area of McGregor Range that could contribute to cumulative impacts is grazing. In addition, the effects of grazing may interact synergistically with drought and fire to change ecosystems, even when each alone could only have a transitory effect. The impacts of grazing on biological resources appear below. It is assumed that these impacts apply to all LEIS alternatives. In addition, grazing would result in direct impacts to biological resources on McGregor Range for LEIS Alternative 5 because lands that have not been grazed for many years would potentially be available for grazing if this alternative were implemented. These direct impacts of Alternative 5 appeared previously in Section 4.8.5.

Vegetation**.** As indicated in Section 3.8.1, historic records show that much of the approximately 350,000 acres of shrublands on McGregor Range may have been grasslands, before climatic changes and the advent of livestock grazing in the 1800s. Most of these shrublands are dominated by creosotebush (157,500 acres) and mesquite coppice dunes (136,700 acres) and are in the Tularosa Basin of McGregor Range (Figure 3.8-1). Once established, mesquite coppice dunes persist and the return to grasslands, even where livestock have been excluded, is highly unlikely (Gardner, 1951; Buffington and Herbel, 1965; Hennessy et al., 1983). This is borne out on McGregor Range where the mesquite coppice dune plant community has not been grazed for many years on much of the range and there has been no apparent shift in plant species composition from mesquite to a grassland plant community. To the contrary, studies have shown that mesquite will continue to expand into and replace grassland plant communities even in areas that are not grazed (Hennessy et al., 1983; Glendening, 1952).

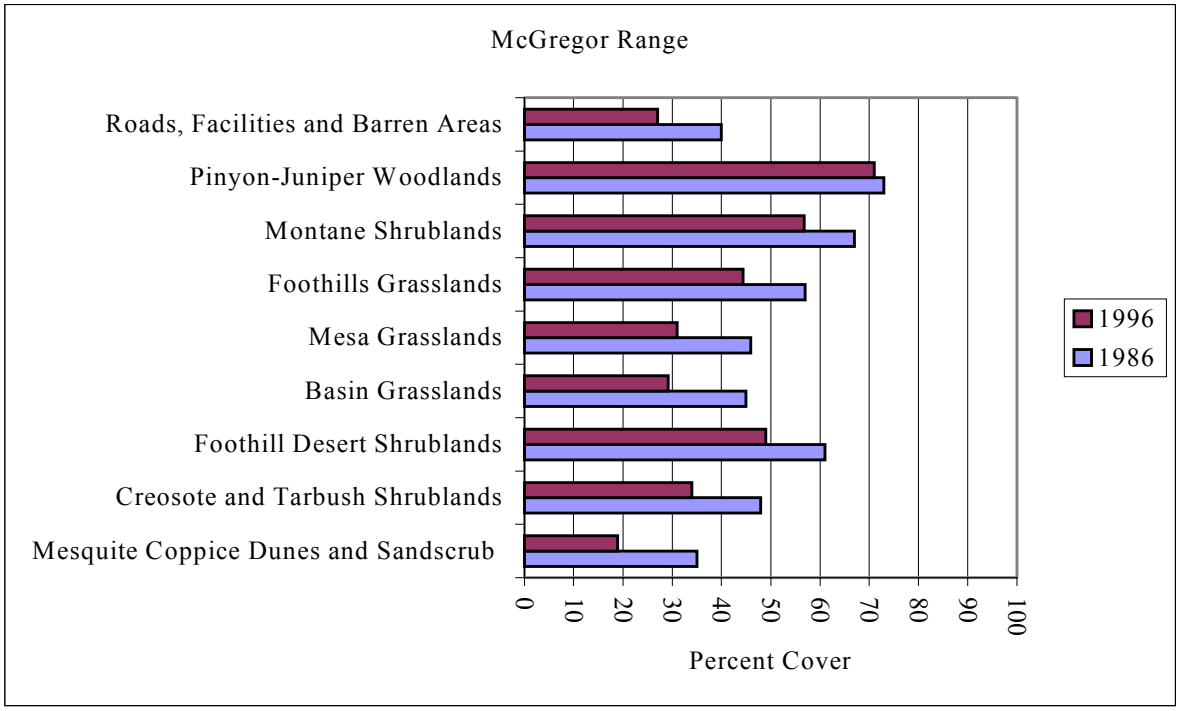


Figure 4.8-2. Percent Vegetation Cover on McGregor Range, 1986 and 1996.

Table 4.8-5. Vegetation Cover and Dynamics on McGregor Range, 1986 and 1996

Mapping Unit	*% Total Vegetation Cover*[1]		*Average Change*	*Mapping Unit*	*Mapping Unit Area Change*[3]		
	1986	*1996*			*% Area with Loss*	*No Change*	*% Area with Gain*
Mesquite Coppice Dunes and Sand Scrub	35	19	-16.14%	Mesquite Coppice Dunes and Sand Scrub	94	6	0
Creosote and Tarbush Shrublands	48	34	-14.00%	Creosote and Tarbush Shrublands	91	8	1
Foothill Desert Shrublands	61	49	-12.00%	Foothill Desert Shrublands	90	10	0
Basin Grasslands	45	29	-15.82%	Basin Grasslands	94	6	0
Mesa Grasslands	46	31	-15.00%	Mesa Grasslands	94	6	0
Foothills Grasslands	57	44	-12.57%	Foothills Grasslands	84	14	2
Montane Shrublands	67	57	-10.20%	Montane Shrublands	55	37	8
Pinyon-Juniper Woodlands	73	71	-2.00%	Pinyon-Juniper Woodlands	38	41	17
Roads, Facilities and Barren Areas[2]	40	27	-13.00%	Roads, Facilities and Barren Areas	85	13	2

(1) Total vegetation cover is the indicator of ecological conditions used in the modeling.
(2) Mapping unit includes vegetated areas such as disturbed natural vegetation, vegetation surrounding facilities such as the El Paso Water Treatment Lagoons and McGregor Range Camp.
(3) The ranges indicated are 5-100 percent–Loss, ±5 percent–No Change, and 5- over 24 percent–Gain as shown by Figure 4.8-1.

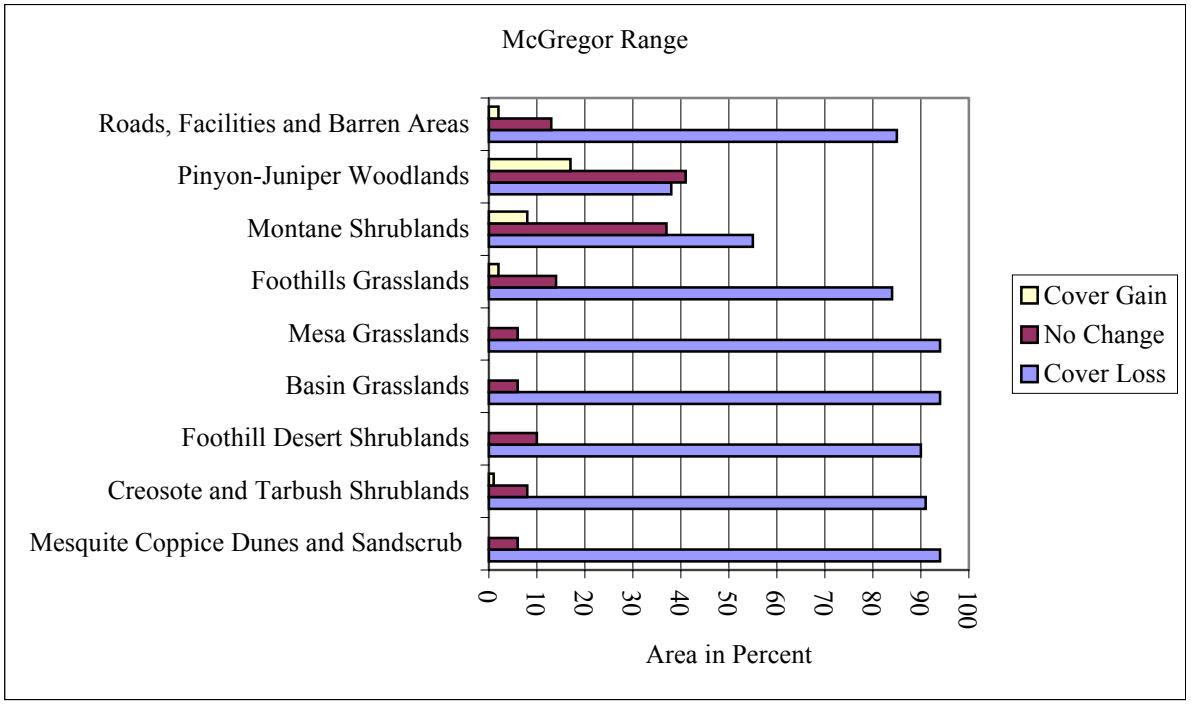


Figure 4.8-3. Percent Change in Vegetation Cover on McGregor Range, 1986 through 1996.

Table 4.8-6. Vegetation Cover and Dynamics of Grazed Areas on McGregor Range, 1986 and 1996

Mapping Unit	*% Total Vegetation Cover*[1]		*Average Change*	*Mapping Unit*	*Mapping Unit Area Change*[3]		
	1986	*1996*			*% Area with Loss*	*No Change*	*% Area with Gain*
Mesquite Coppice Dunes and Sand Scrub	33	18	-15.00%	Mesquite Coppice Dunes and Sand Scrub	94	6	0
Creosote and Tarbush Shrublands	42	27	-15.00%	Creosote and Tarbush Shrublands	93	7	0
Foothill Desert Shrublands	51	41	-10.00%	Foothill Desert Shrublands	81	17	2
Basin Grasslands	41	24	-17.00%	Basin Grasslands	96	4	0
Mesa Grasslands	44	29	-15.00%	Mesa Grasslands	95	5	0
Foothills Grasslands	55	45	-10.00%	Foothills Grasslands	77	20	3
Montane Shrublands	65	60	-5.00%	Montane Shrublands	50	42	8
Pinyon-Juniper Woodlands	70	66	-4.00%	Pinyon-Juniper Woodlands	42	48	10
Roads, Facilities and Barren Areas[2]	41	28	-13.00%	Roads, Facilities and Barren Areas	86	12	2

[1] Total vegetation cover is the indicator of ecological conditions used in the modeling.
[2] Mapping unit includes vegetated areas such as disturbed natural vegetation, vegetation surrounding facilities such as the El Paso Water Treatment Lagoons and McGregor Range Camp.
[3] The ranges indicated are 5-100 percent–Loss, ±5 percent–No Change, and 5- over 24 percent–Gain as shown by Figure 4.8-1.

Table 4.8-7. Vegetation Cover and Dynamics of Ungrazed Areas on McGregor Range, 1986 and 1996

Mapping Unit	*% Total Vegetation Cover*[1]		*Average Change*	*Mapping Unit*	*Mapping Unit Area Change*[3]		
	1986	*1996*			*% Area with Loss*	*No Change*	*% Area with Gain*
Mesquite Coppice Dunes and Sand Scrub	36	20	-16.00%	Mesquite Coppice Dunes and Sand Scrub	98	2	0
Creosote and Tarbush Shrublands	50	36	-14.00%	Creosote and Tarbush Shrublands	90	9	1
Foothill Desert Shrublands	61	49	-12.00%	Foothill Desert Shrublands	90	9	1
Basin Grasslands	51	35	-16.00%	Basin Grasslands	92	7	1
Mesa Grasslands	52	36	-16.00%	Mesa Grasslands	91	7	2
Foothills Grasslands	58	44	-14.00%	Foothills Grasslands	88	10	2
Montane Shrublands	74	64	-10.00%	Montane Shrublands	67	25	8
Pinyon-Juniper Woodlands	75	76	1.00%	Pinyon-Juniper Woodlands	33	34	32
Roads, Facilities and Barren Areas[2]	43	29	-14.00%	Roads, Facilities and Barren Areas	89	9	2

[1] Total vegetation cover is the indicator of ecological conditions used in the modeling.
[2] Mapping unit includes vegetated areas such as disturbed natural vegetation, vegetation surrounding facilities such as the El Paso Water Treatment Lagoons and McGregor Range Camp.
[3] The ranges indicated are 5-100 percent–Loss, ±5 percent–No Change, and 5- over 24 percent–Gain as shown by Figure 4.8-1.

Table 4.8-8. Vegetation Cover Dynamics of Roving Sands Controlled Access FTX Sites on McGregor Range, 1986 through 1996

Mapping Unit	*% Total Vegetation Cover*[1]		*Average Change*	*Mapping Unit*	*Mapping Unit Area Change*[3]		
	1986	*1996*			*% Area with Loss*	*No Change*	*% Area with Gain*
Mesquite Coppice Dunes and Sand Scrub	35	19	-16.00%	Mesquite Coppice Dunes and Sand Scrub	82	14	2
Creosote and Tarbush Shrublands	46	29	-17.00%	Creosote and Tarbush Shrublands	78	21	1
Basin Grasslands	44	28	-16.00%	Basin Grasslands	98	2	0
Mesa Grasslands	42	27	-15.00%	Mesa Grasslands	92	8	0
Foothills Grasslands	49	27	-22.00%	Foothills Grasslands	98	2	0
Roads, Facilities and Barren Areas[2]	39	23	-16.00%	Roads, Facilities and Barren Areas	90	8	2

[1] Total vegetation cover is the indicator of ecological conditions used in the modeling.
[2] Mapping unit includes vegetated areas such as disturbed natural vegetation, vegetation surrounding facilities such as the El Paso Water Treatment Lagoons and McGregor Range Camp.
[3] The ranges indicated are 5-100–percent Loss, ±5 percent–No Change, and 5- over 24–percent Gain as shown by Figure 4.8-1.

Grazing currently occurs on approximately 271,000 acres of McGregor Range, Otero Mesa, the Chihuahuan Desert shrublands, mostly north of New Mexico Highway 506, and in the montane shrubland and pinyon pine/juniper of the Sacramento Mountains foothills (Figure 3.1-2). The portion of Otero Mesa that is grazed covers about 161,400 acres or about 23 percent of McGregor Range. The predominate plant community types that are grazed are mesa grasslands (86,000 acres) and a mixture of basin, lowland, and foothill grasslands (82,000 acres) most of which are on Otero Mesa (Table 4.8-9). The total number of acres of grasslands grazed on McGregor Range is about 168,600 acres or 60 percent of the grasslands on McGregor Range. Approximately 76 percent of the mesa grasslands on McGregor Range are grazed.

Table 4.8-9. Number of Acres of Plant Community Types in Grazed Land on McGregor Range

Disturbed land	*Basin grassland*	*Mesa grassland*	*Mesquite dunes*	*Creosote bush*	*Foothill desert shrubland*	*Montane shrubland*	*Pinyon/ juniper*	*Total*
10,000	82,000	86,000	48,000	24,000	4,000	14,000	3,000	*271,000*

Source: U.S. Army, 1996d.

LCTA data were collected in 1991 through 1993 for the Otero Mesa (grazed by livestock) and the East Buffer Zone (ungrazed, grass dominated areas at and below the Otero Mesa escarpment). Comparison of the two areas showed that Otero Mesa had higher percent bare ground and the recovery of vegetation after the dry year of 1992 was slower. These differences were due in part to grazing (O'Regan et al., 1995).

In addition, Otero Mesa has the highest density of snakeweeds (*Gutierrezia* sp.) per plot in areas sampled on Fort Bliss. There were about 200 percent more snakeweed per plot on Otero Mesa than in the East Buffer Zone (O'Regan et el., 1995). This species may be indicative of heavy grazing but climatic and other factors may also cause an increase in snakeweed stand density (O'Regan et al., 1995). In addition, areas of heavy grazing were observed around stock tanks and troughs on Otero Mesa. These areas typically had much bare ground, short grass, and numerous cow droppings and trails (USAF, 1997h, i).

In general, the grass cover on Otero Mesa is likely less than it would be with reduced or no grazing (BLM, 1980). In addition, in grasslands where blue and black grama grass are dominant, the proportion of black grama decreases as the utilization increases. According to BLM data collected in 1979, approximately 240,400 acres or 89 percent of grazed lands on McGregor Range is lightly or slightly grazed while the remaining 30,600 acres are moderately to heavily grazed. Areas of heavy grazing occur primarily near watering facilities and along drainage in the hilly terrain in the foothill grasslands and mountain shrublands plant communities in the Sacramento Mountains foothills north of New Mexico Highway 506 (see Figure 3.8-1) (BLM, 1980). Transect data indicated that utilization is very heavy near water and decreases about 20 percent per mile away from the tanks; most cattle stayed within 1.5 to 2 miles of stock tanks while grazing (BLM, 1980).

The following discussions of the potential impacts of grazing on wetlands and arroyo-riparian drainages, wildlife, and sensitive species provides information on the effects of heavy grazing and light to moderate grazing where appropriate.

Wetlands and Arroyo-riparian Drainages. Given that the number of acres of wetlands on the grazed portion of McGregor Range is limited, the effects of grazing on wetlands is considered negligible. This assessment is preliminary because the number of acres of naturally occurring wetlands is not known and grazing affects on the naturally occurring wetlands, if any, has yet to be determined. Cattle concentrate

around stock tanks to obtain water, more succulent vegetation, and shade, if available. Observations indicate that the herbaceous vegetation around stock tanks is very heavily grazed and bare ground is in evidence in many areas. Shrubs growing around these areas are also heavily grazed and some stock tanks have scattered large cottonwood trees (USAF, 1997h, i). Impacts from grazing as it relates to distance from water is evaluated in the *McGregor Grazing EIS* (BLM, 1980). The amount of land affected by heavy grazing around stock tanks is typically 25 to 50 acres and 100 to 200 acres are typically affected in the elongated valley bottoms in the Sacramento Mountains foothills. Based on data from 1979, approximately 4,500 acres of land at stock tanks and in valley bottoms are subject to heavy livestock grazing (BLM, 1980).

The grassland plant communities on Otero Mesa contain swales that are grass dominated, as well as shrub-dominated arroyos. Many of these drainages have been identified as probable waters of the U.S. (U.S. Army, 1998h). The impacts on these swales would be similar to that described for grasslands, above under *Vegetation*. Evidence of heavy grazing in some shrub-dominated (mostly little sumac) drainages on Otero Mesa consisting of more than 50 percent of the annual vegetation growth removed and bare ground on banks due to livestock trampling was observed (USAF, 1997a, b). Therefore, grazing has the potential to have adverse effects on these drainages.

Wildlife**.** Studies have shown that grazing can affect wildlife species richness and abundance. Jones (1981) sampled lizards in seven lightly and seven heavily grazed desert habitats in Arizona. Except for the Sonoran Desert shrublands, all lightly grazed sites had greater lizard species richness and abundance than heavily grazed sites. Jones (1981) determined that heavy grazing resulted in vegetation structural changes that resulted in an overall reduction in lizard abundance except in the Sonoran Desert where grazing did not alter the shrub vegetation structure although it did reduce grass cover. Comparison of lizard species richness and abundance based on foraging guilds (Pianka, 1966) showed that widely foraging species (foraging guild 1) such as skinks and whiptails that sit and wait in open spaces for foragers (foraging guild 2) such as the horned and earless lizards, were more common in lightly grazed areas. Species that sit and wait on rocks and logs (foraging guild 3) such as the side-blotched, tree, spiny, and northern prairie lizards were more common in heavily grazed areas (Jones, 1981). The bunchgrass lizard (*Sceloporus sclaria)* was once thought to be restricted to higher altitudes in southeastern Arizona but it was found during surveys of ungrazed bunchgrass habitats at lower elevations, indicating that it avoids grazed areas where bunchgrass escape habitat is lacking (Bock et al., 1990). Overall, it appears that moderate to light grazing can result in higher abundance and species richness of foraging guilds 1 and 2, and reduced abundance of foraging guild 3 when compared to overgrazed sites.

Studies of breeding birds in southeastern Arizona have shown that the lark sparrow and horned lark are more common in grazed areas while the grasshopper and Cassin's sparrows are much more common in lightly grazed or ungrazed sites (Bock and Webb, 1984). Other species that respond positively to grazing are the common nighthawk, northern mockingbird, and black-throated sparrow. Other species that responded negatively to grazing were the savannah and Henslow's sparrows (Bock et al., 1993). Grazing can influence raptors by (1) reducing available substrate for nesting, (2) reduce prey diversity and some cases abundance, and (3) increase prey vulnerability to raptor predation by removing cover (Kochert, 1989). Raptors such as the prairie falcon, American kestrel, northern harrier, various species of *Buteos* sp.*,* and the great horned owl have been observed to forage more frequently in open areas during the summer. Studies of the red-tailed hawk and American kestrel showed that they tended to nest more frequently in grazed than ungrazed locations. During the winter, the northern harrier, rough-legged hawk, red-tailed hawk, and golden eagle were more apt to be observed foraging in ungrazed or lightly grazed habitat (Kochert, 1989). In a summary of the impacts of grazing on birds, Bock et al., (1993) determined that the raptors that probably respond positively to grazing include the golden eagle and burrowing owl while the northern harrier, Swainson's hawk, and short-eared owl may show a negative response to grazing.

Studies of small mammals in grazed and ungrazed grasslands in southeastern Arizona showed that rodents were significantly more abundant in ungrazed areas. The hispid pocket mouse, western harvest mouse, white-footed mouse, grasshopper mouse, and hispid cotton rat were trapped significantly more in ungrazed than grazed habitats. Merriam's kangaroo rat was the only species recorded more from grazed habitats. The silky pocket mouse and deer mouse were equally abundant in grazed and ungrazed habitats (Bock et al., 1984). In a study of the effects of grazing on small mammals in semiarid shrub-grassland habitats in south-central Utah, ungrazed habitats had 50 percent greater species richness and 80 percent higher abundance than grazed sites (Rosenstock, 1996).

Therefore moderate to light grazing on McGregor Range would have negligible effects on reptiles. Continued grazing would have mixed effects on birds and mammals in that some species would benefit while populations of other species would be reduced as a result of grazing. Overall, continued grazing would have positive, negligible, or adverse impacts on wildlife depending on the species.

Sensitive Species. Grazing, as with fire, can have varying effects on sensitive species depending on the species. The potential impacts of grazing on sensitive species appears in Table 4.8-10.

4.8.7.3 Summary of Cumulative Effects

As indicated above, implementation of the LEIS alternatives could result in cumulative impacts to four habitat types and sensitive species. The following provides an assessment of cumulative impacts to these biological resources based on the direct impacts resulting from the implementation of the LEIS alternatives plus impacts from other activities including grazing (see Section 4.8.7.2) and military activities elsewhere on Fort Bliss.

Mesquite-sandsage Coppice Dune Shrublands. For all LEIS alternatives except Alternative 5, the direct effects of military activities have the potential to result in the disturbance of 27,168 acres of this shrubland type on McGregor Range. Under Alternative 5, the direct effects of grazing in previously ungrazed areas of McGregor Range could affect 88,700 acres of this type (Table 4.8-11). Military activities on Fort Bliss outside McGregor Range as well as grazing on current grazing units on McGregor Range have the potential to affect 307,400 more acres of the mesquite-sandsage coppice dune type (Table 4.8-11). Military activities could result in wildfires, which could affect additional acreage of this type. However, given the low fuel loads that generally occur in this type, it is assumed that fires would be confined to the areas currently being disturbed by military activities and would not affect additional land. Therefore, implementation of LEIS Alternatives 1, 2, 3, 4, and 6 have the potential to have cumulative effects on about 334,600 acres of this type while LEIS Alternative 5 could potentially affect 396,100 acres.

The cumulative impacts to the mesquite-sandsage coppice dune shrublands would be negligible because (1) off-road vehicle maneuvers generally occur in the interdunal areas which, as indicated in Section 4.8.1, have very sparse vegetative cover weather or not they are being use for maneuvers; (2) cattle grazing would be light in this type due to lack of forage; and (3) mesquite is a dominant plant in an estimated 93,000,000 acres of land in the southwest (Buffington and Herbel, 1965) and is currently expanding into grasslands (Hennessy et al., 1983).

Creosotebush-tarbush Shrublands. For all the LEIS alternatives except Alternative 5, the direct affects of military activities on the creosotebush-tarbush shrublands have the potential to disturb 2,550 acres while Alternative 5 could disturb 132,700 acres of this type that have not been previously grazed on McGregor Range (Table 3.8-11). Military activities elsewhere on Fort Bliss have the potential to disturb 13,200 acres of this type in off-road vehicle maneuver areas and 7,000 acres could be affected by fire at the Doña Ana Range–North Training Areas firing range and impact areas. An additional 24,000 acres of this type

Table 4.8-10. Potential Effects of Grazing on Sensitive Species on McGregor Range

Species	*Potential Grazing Effects*	*References*
Sneed pincushion cactus	Not known from McGregor Range but has the potential to occur. Effects of grazing on this species unknown. Sneed pincushion occurs in rocky terrain with sparse grass cover, which may make it less susceptible to impacts from grazing.	Bunting et al., 1980; U.S. Army, 1980b
Night blooming cereus	Not known to occur on McGregor Range but has the potential to occur. May not be susceptible to grazing impacts due to its habit of growing inside the canopy of larger shrubs.	
Hueco Mountain rock daisy	This species grows in mesic slopes protected from direct sunlight. Its habitat of growing on slopes may protect it from grazing. In addition, grazing does not occur at any known locations or potential habitat in the Hueco Mountains.	U.S. Army, 1991a
Alamo beard tongue	This species grows in rocky canyon bottoms and on cliffs, which would likely limit its susceptibility to grazing. In addition, grazing does not presently occur at any known locations or in potential habitat in the Hueco Mountains.	U.S. Army, 1991a
Texas horned lizard	This species was equally common in grazed and ungrazed habitat in Texas and tended to be more common in lightly grazed versus heavily grazed habitat in Arizona.	Fair and Henke, 1997; Jones, 1981
Black tern	The black tern is an occasional migrant on McGregor Range and grazing is not expected to affect this species.	
Bald eagle	Grazing occurs in the pinyon pine/juniper habitat but is not expected to affect bald eagle use of this habitat.	
Ferruginous hawk	Grazing may benefit migratory and wintering ferruginous hawks on McGregor Range by making prey more accessible. Studies in the Northern Great Plains have shown that this species responded positively to grazing. Other studies have shown that this species does not respond positively or negatively to grazing.	Lehman and Allendorf, 1987; Saab et al., 1995; Bock et al., 1993
Aplomado falcon	Studies comparing potential aplomado falcon habitat on Otero Mesa with occupied territories in the Chihuahuan Desert in Mexico show that the percent grass cover and prey species biomass are less on Otero Mesa. This reduced cover and prey base and, therefore, reduced capacity to support the aplomado falcon may be the result of heavier livestock grazing on Otero Mesa, but could be related to other factors such as different soils at the two sites or precipitation patterns.	U.S. Army, 1997k; Montoya et al., 1997
American Peregrine falcon	This species occurs only as a sporadic migrant on McGregor Range so grazing would not affect it.	U.S. Army, 1980a
Mountain plover	Although the mountain plover is not known to breed on Fort Bliss, grazing in its potential grassland habitat on Otero Mesa may improve the habitat since this species prefers open areas such as created by fires, prairie dogs, or over grazing in sacrifice areas such as around stock tanks.	Knopf and Miller, 1994; Miller and Knopf, 1993; Sager, 1996
Mexican spotted owl	Given the marginal nature of Mexican spotted owl habitat on McGregor Range and the apparent infrequent use of this area, grazing is not expected to affect this species.	U.S. Army, 1996d; U.S. Army, 1991b
Loggerhead shrike	This species is common and widespread on McGregor Range including grazed areas. Other studies indicate that this species has a positive response or no response to grazing.	Saab et al., 1995
Willow flycatcher	The willow flycatcher is an occasional migrant on McGregor Range and grazing would not affect this species.	
Bell's vireo	Bell's vireo is an occasional migrant on McGregor Range and grazing would not affect this species.	

Table 4.8-10. Potential Effects of Grazing on Sensitive Species on McGregor Range (Continued)

Species	*Potential Grazing Effects*	*References*
Piping plover	The piping plover is a very rare migrant on McGregor Range and grazing would not affect this species.	
Burrowing owl	Grazing may benefit burrowing owls by increasing prey availability and reducing litter in its grassland habitat. Studies have shown that this species responds positively to grazing including heavy grazing.	Bock et al., 1993; Saab et al., 1995
Gray vireo	This species is not known to nest on McGregor Range although potential breeding habitat occurs in the pinyon pine/juniper habitat in the Sacramento Mountains foothills. If this species were to breed in this habitat, grazing is not expected to affect it.	
Baird's sparrow	This species occurs in dense tall grasslands swales on Otero Mesa dominated by tobosagrass and black and blue grama. It was not observed in grassland swales that had been heavily grazed so heavy grazing may have a negative impact on this species.	U.S. Army, 1997m
Varied bunting	The varied bunting is an occasional migrant on McGregor Range and grazing would not be expected to affect this species.	
Black-tailed prairie dog	Grazing may be a positive influence for the black-tailed prairie dog because it maintains the open habitat preferred by this species.	
Gray-footed chipmunk	Current levels of grazing in the wooded habitat used by this species in the Sacramento Mountains foothills is not expected to affect this species.	
Bats	Areas such as cracks and crevices in the Otero Mesa escarpment used by bats would not be accessible to livestock. The effects of grazing on areas used by bats is not clear. The development of stock tanks has likely benefited bats by increasing the quantity and distribution of water for bats in arid environments.	Chung-MacCoubrey, 1996

is currently being affected by grazing on current grazing units on McGregor Range. In addition, to the 7,000 acres mentioned above, fire could affect additional creosotebush-tarbush shrublands. Based on this analysis, implementation of LEIS alternatives 1, 2, 3, 4, and 6 could have a cumulative effect on about 47,750 acres of this type while Alternative 5 could affect 176,900 acres.

Off-road vehicle maneuvers in creosotebush-tarbush shrublands may result in a reduction in percent ground cover and a change in ground cover species diversity as indicated in Section 4.8.1.1 and grazing may also result in a reduction in percent ground cover. However, the cumulative impacts of the LEIS alternatives to this type would be negligible because (1) this type would continue to exist in the impact areas although in a somewhat degraded form; (2) there are an estimated 58,750,000 acres of creosotebush and tarbush-dominated lands in the southwestern U.S. (Buffington and Herbel, 1965); and (3) this type has greatly expanded into grasslands during the last century (see Section 3.8.1).

Grasslands. For all the LEIS alternatives except Alternative 5, the direct affects of military activities have the potential to disturb about 7,000 acres of grasslands while Alternative 5 could potentially result in the disturbance of 110,600 acres of grasslands that are currently not grazed on McGregor Range (Table 4.8-11). Military activities elsewhere on Fort Bliss could affect 14,200 acres due to off-road vehicle maneuvers and fire while grazing on existing grazing units on McGregor Range has affected approximately 168,000 acres of grasslands. In addition, current military activities on McGregor Range have resulted in fires in grasslands although the number acres is not known. Fires from military activities elsewhere on Fort Bliss could also affect grasslands. It is assumed that the 6,000 acres of grasslands at the Doña Ana Range–North Training Areas firing range and impact areas is susceptible to fires. However, the number of acres susceptible to fire elsewhere on Fort Bliss can not be quantified. Based on

Table. 4.8-11. Cumulative Impacts to Habitat Types From Implementing the LEIS Alternatives

Impact	*Habitat type*		
	Mesquite shrublands (ac)	*Creosotebush shrublands (ac)*	*Grasslands (ac)*
Direct Impacts			
Off-road vehicle	26,800	0	0
FTX	368	850	3,593
GAF	0	1,700	3,400
Fire	UNA[a]	UNB[b]	UNC[c]
Grazing (Alternative 5 only)	88,700	132,700	110,600
Totals: *Alternatives 1, 2, 3, 4, 6* *Alternative 5*	 *27,168* *88,700*	 *2,550* *132,700*	 *6,993* *110,600*
Other Activities			
Off-road vehicle - South Training Areas	73,900	5,700	2,100
Off-road vehicle - Doña Ana Range–North Training Areas	185,500	7,500	6,100
Fire	UNA[a]	7,000 +[d]	6,000 +[d]
Grazing [e]	48,000	24,000	168,000
Total	*307,400*	*44,200*	*182,200*
Total Cumulative Impacts			
Alternatives 1, 2, 3, 4, 6	*334,568*	*46,750*	*189,193*
Alternatives 5	*396,100*	*176,900*	*292,800*

[a] UNA–Number of acres burned not known; fire not likely to disturb additional habitat because of low fuel loads.
[b] UNB–Number of acres burned not known; fires not likely to disturb additional habitat in areas of low fuel loads but could spread to new areas under high fuel loads.
[c] UNC–Number of acres burned not known; fires likely to spread to undisturbed areas due to high fuel loads.
[d] Represents number of acres of habitat in Doña Ana Range–North Training Areas firing range and impact areas. Fires elsewhere on Fort Bliss outside McGregor Range could result in more habitat burned.
[e] Represents habitats that are currently grazed in existing grazing units on McGregor Range.

this analysis, implementation of LEIS Alternatives 1, 2, 3, 4, and 6 could result in cumulative affects to about 189,200 acres of grasslands while Alternative 5 could have cumulative affects on 292,800 acres of grasslands.

Implementation of LEIS Alternative 1, 2, 3, 4, and 6 would have a negligible cumulative impact of grasslands because (1) the impacts of the FTX sites on grasslands is minimal as indicated in Section 4.8-1; (2) approximately 10 to 20 percent of the 3,400 acres of grassland that would be used for the GAF tactical target complex would be disturbed and the remainder with continue as grasslands (USAF, 1998); (3) grazing on 168,000 acres on current grazing units on McGregor Range would continue to be managed by the BLM which would ensure the continued existence of the grasslands; and (4) grasslands on Fort Bliss typically recover from military-related and natural fires. Implementation of LEIS Alternative 5 has the potential to result in adverse cumulative impacts to grasslands because approximately 110,600 acres of grasslands that have not been grazed for decades could be grazed under this alternative. This adverse cumulative impact would occur because (1) grazing could result in the conversion of grasslands to

shrublands as indicated in Section 4.8.5; (2) grazing could result in an overall reduction in vegetative cover and a decrease in percent cover of black grama as indicated previously in Section 4.8.7.2; and (3) grazing could have a negative impact on a 123,500-acre tract of black grama/blue grama grassland on and below the Otero Mesa escarpment that has made a significant recovery from grazing (U.S. Army, 1997c); this tract is important because black grama grasslands have been much reduced since the 19th century (see Section 3.8.1).

Arroyo-riparian Drainages. For all LEIS alternatives except Alternative 5, 9.5 miles of arroyo-riparian drainages (Waters of the U.S.) would be potentially affected by military activities while under Alternative 5, hundreds of miles of arroyo riparian drainages in the previously ungrazed portion of McGregor Range could be affected by grazing. Military activities elsewhere on Fort Bliss could affect arroyo-riparian drainages in the off-road vehicle maneuver area on the South Training Areas and Doña Ana Range–North Training Areas as well as on the Doña Ana Range–North Training Areas firing ranges and impact areas. In addition, livestock grazing on the current grazing units on McGregor Range has affected hundreds of miles of additional arroyo-riparian drainages and swales. Also, military activities on McGregor Range and elsewhere on Fort Bliss would result in fires that could affect additional arroyo-riparian drainages. This includes swales in the grasslands of Otero Mesa and arroyo-riparian drainages in the firing ranges and impact areas on Doña Ana Range–North Training Areas. Based on this analysis, the implementation of the LEIS alternatives would result in the cumulative affects to hundreds of miles of arroyo-riparian drainages.

Implementation of LEIS Alternatives 1, 2, 3, 4, and 6 would have adverse cumulative impacts on arroyo-riparian drainages because, as indicated in Section 3.8 and Appendix D, these drainages provide important wildlife habitat that is (1) used by neotropical migrants moving across the Chihuahuan Desert; (2) used to a greater degree by breeding birds than adjacent uplands; (3) harbors a greater abundance and diversity of rodents then the surrounding uplands; and (4) is important for some sensitive bird species that migrate through and winter on McGregor Range. Implementation of Alternative 5 would have significantly adverse impacts on arroyo-riparian drainages because many more miles of arroyo-riparian drainages would be impacted when compared to the other alternatives. In addition, these drainages have not been grazed for many years and provide excellent wildlife habitat.

Sensitive Species. The determination of species to include in the sensitive species cumulative impacts analysis followed the same criteria used for the vegetation/wildlife habitat cumulative impacts analysis. That is, if a sensitive species occurred or had the potential to occur in habitats that would be directly impacted by military activities on McGregor Range, and if other activities had the potential to impact these species, then it was assessed in this cumulative impacts analysis. For example, as indicated above, implementation of the LEIS alternatives have the potential to result in cumulative impacts to grasslands so sensitive species (e.g., Baird's sparrow and prairie dog) or potential sensitive species habitat (e.g., aplomado falcon and mountain plover) that occur in this habitat type on McGregor Range were included in the cumulative impacts analysis. Conversely, sensitive species that occur in habitats not impacted on McGregor Range (e.g., wintering bald eagles in the pinyon pine-juniper habitat in the Sacramento Mountains foothills) or species that occur elsewhere on Fort Bliss in habitats not affected on McGregor Range (e. g., potential peregrine falcon nesting habitat and Mexican spotted habitat in the conifer habitats in the Organ Mountains) are not considered in this impacts analysis. Other sensitive species that occur on Fort Bliss that are not considered were species endemic to the Organ Mountains on the Doña Ana Range–North Training Areas or species that occur very sporadically on McGregor Range during migration.

Also, certain species that have the potential to occur but have not been recorded on McGregor Range are not included in this analysis. Based on this, 11 sensitive species may be affected by cumulative impacts (Table 4.8-12).

Table 4.8-12. Sensitive Species Status Regarding Cumulative Impacts Analysis

Species	*Habitat*
Species Not Included in Cumulative Impacts Analysis	
Bald eagle Gray-footed chipmunk	Known to occur on McGregor Range but principal habitat not directly impacted.
Sneed pincushion cactus Alamo beard tongue Hueco Mountain rock daisy Los Olmos tiger beetle Mottled rock rattlesnake Mexican spotted owl	Species not known to occur on McGregor Range. Potential habitat occurs but unlikely to be directly impacted.
Mountain short-horned lizard Bats	Status and/or habitat unknown.
Interior least tern Peregrine falcon Willow flycatcher Piping plover Black tern White-faced ibis Northern goshawk Costa's hummingbird Varied bunting Bells' vireo Gray vireo	Known to occur on McGregor Range as rare to occasional migrants.
Species Included in the Cumulative Impacts Analysis	
Night blooming cereus Sand prickly pear Northern aplomado falcon Mountain plover	Not confirmed on McGregor Range but potential habitat occurs in direct impact areas.
Texas horned lizard Ferruginous hawk Western burrowing owl Loggerhead shrike Baird's sparrow Arizona black-tailed prairie dog	Known to occur on McGregor Range in direct impact areas.

Species Not Confirmed From McGregor Range. The night blooming cereus and sand prickly pear occur in the Chihuahuan Desert Shrublands on or near the Doña Ana Range–North Training Areas and have the potential to occur in this habitat type on McGregor Range (see Section 3.8.4). The potential for cumulative impacts to these species for all LEIS alternatives is negligible because (1) there is only one known population of the night blooming cereus on Fort Bliss and the sand prickly has not been observed on Fort Bliss, (2) these species are not known to occur in areas of military activities on McGregor Range, (3) these species were not been observed during recent sensitive species surveys on Fort Bliss (U. S. Army, 1998h), and (4) the night blooming cereus was not observed during surveys at the alternate tactical target complex in the Tularosa Basin (USAF, 1998).

There have been no confirmed observations of the northern aplomado falcon on Fort Bliss although excellent to good potential grassland habitat occurs on McGregor Range (see Section 3.8.4) (U. S. Army, 1997j). Implementation of the LEIS alternative has the potential to result in adverse cumulative impacts to aplomado potential habitat on McGregor Range because (1) an increase in military activities in terms of weapons firing may result in an increase in fires in potential falcon habitat (see Section 4.8.1); (2) grazing in current grazing units on McGregor Range may have reduced to capacity of the potential

habitat to support aplomado falcons (see Section 3.8.4 and Section D.4 in Appendix D); and (3) under LEIS Alternative 5, approximately 110,600 acres of previously ungrazed grasslands may be grazed which could reduce its capacity to support aplomado falcons (see Section 3.8.4 and Section D.4 in Appendix D).

The mountain plover has not been observed on Fort Bliss in recent years although potential habitat occurs principally on Otero Mesa on McGregor Range (see Section 3.8.4). Implementation of the LEIS alternatives would not have a negative cumulative impact and may possibly have a positive cumulative impact on the mountain plover potential habitat on McGregor Range because (1) the potential for increased fire frequency from increased military activities may create more open and short-grass habitat preferred by this species (see Sections 3.8.4 and D.4 in Appendix D); (2) heavy grazing around stock tanks in current grazing units has created open ground preferred by the mountain plover; (3) grazing elsewhere in current grazing units creates more open habitat preferred by this species; and (4) under LEIS Alternative 5, grazing in 110,600 acres of currently ungrazed grasslands on McGregor Range may improve this habitat for the mountain plover.

Species Recorded From McGregor Range. Seven sensitive species occur on McGregor Range in habitats potentially subject to cumulative impacts (Table 4.8-12). Of these species, the Texas horned lizard, ferruginous hawk, western burrowing owl, loggerhead shrike, and Arizona black-tailed prairie dog would be subject to negligible negative cumulative impacts or, possibly, positive cumulative impacts from implementation of the LEIS alternatives. This is so because (1) the potential for an increase in the frequency of fire due to an increase in military activities may open up the habitat or make prey species more accessible (see Table 4.8-1) and (2) these species respond positively or have no response to grazing (see Table 4.8-10).

The grama grass cactus occurs in the grasslands of Otero Mesa and as indicated in Section 3.8.4, recent studies have shown that it is much more common on Otero Mesa then once thought. Implementation of the LEIS alternatives would result in no cumulative impact to this species because (1) it is much more common then originally thought and (2) it appears to be compatible with grazing because it occurs in currently grazed lands on Otero Mesa. As indicated on Table 4.8-1, this species would be susceptible to mortality from fire and its ability to recover from fire is not known. However, since this species is common on Otero Mesa, the potential cumulative affects of fire would likely be negligible.

Baird's sparrow is associated with grassland swales on McGregor Range which it uses as winter and migration habitat (see Sections 3.8.4 and D.4 in Appendix D). Implementation of the LEIS alternatives would result in adverse cumulative impacts to the Baird's sparrow because (1) the potential increase in the frequency of fires due to increased military activities on McGregor Range may have a negative impact on the thick grassland habitat used by this species; (2) current grazing on Otero Mesa on McGregor Range has reduced the ability of some swales to support this species (see Table 4.8-4) (U. S. Army, 1997m); and (3) under LEIS Alternative 5, grazing may reduce to ability of swales in currently ungrazed portions of McGregor Range to support the Baird's sparrow.

4.8.8 Mitigation

No mitigation measures are required for the effects of the congressional decision regarding alternative configurations of this withdrawal action on biological resources.

No mitigation measures other than those that are already in place would be required for Alternatives 1, 2, 3, 4, and 6. These measures include the identification and protection of sensitive species and their habitats, the determination of the distribution of sensitive species through monitoring, the repair of damaged land through the LRAM Program, prohibition of certain types of military activities such as off-road vehicle maneuvers in sensitive areas such as the Otero Mesa, Hueco Mountains, the Sacramento

Mountains foothills and the Otero Mesa escarpment, the rotation of grazing cattle to preserve the grasslands on Otero Mesa, and other measures. If Alternative 5 were implemented, numerous mitigation measures would likely be in effect in areas that are currently ungrazed. This could include measures such as protection of sensitive habitats such as wetlands from livestock, conduct of surveys for sensitive species and habitats, rotational grazing, monitoring the effects of grazing, and other measures.

4.8.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of biological resources would occur.

Cultural Resources

4.9

4.9 CULTURAL RESOURCES

This section of the LEIS describes the potential impacts to cultural resources on McGregor Range from each alternative. Section 4.9.1 describes the impact assessment process for archaeological resources, architectural resources, TCPs, and historic landscapes. Section 4.9.2 discusses the types and sources of potential impacts common to all six alternatives. Sections 4.9.3 through 4.9.8 examine specific impacts under each of the alternatives. Impacts to cultural resources on withdrawn lands are similar to those described for Alternative 1, while impacts to cultural resources on lands returned to the public domain under Alternatives 2, 3, 4, and 6 are similar to Alternative 5. Section 4.9.9 describes cumulative impacts that would occur when nonmilitary uses, such as grazing, mineral development, and recreation, are considered in addition to impacts from military uses on the withdrawn area of McGregor Range.

4.9.1 Impact Assessment Process

Impacts to cultural resources are typically assessed by (1) identifying the nature and location of all elements of the proposed action and alternatives; (2) comparing those locations with identified cultural resources, sensitive areas, and surveyed locations; (3) determining the known or potential significance of cultural resources that could be affected; and (4) assessing the extent and intensity of the effects.

The impact assessment process for cultural resources centers on the concept of significance. Various federal laws and regulations, including the NHPA, ensure consideration of cultural resources that are significant. In addition, AR 200-4 integrates compliance with all laws and regulations associated with cultural resources management. A summary of NRHP eligibility for archaeological and architectural cultural resources in the areas affected by the proposed action was presented in Section 3.9.

For this LEIS, impact analysis for cultural resources uses guidelines and standards set forth in the Section 106 process defined under the NHPA, and cultural resource management procedures at Fort Bliss. The Section 106 process requires identifying significant cultural resources potentially affected by a federal undertaking; determining the effect of that undertaking; and implementing measures to avoid, reduce, or otherwise mitigate those effects.

An action results in adverse effects to a cultural resource eligible for nomination to the NRHP when it alters the resource's characteristics, including relevant features of its environment or use, in such a way that it no longer qualifies for inclusion in the NRHP (36 CFR 800.9[b]). Potential adverse effects could include the following:

- Physical destruction, damage, or alteration of all or part of the property;
- Isolation of the property from, or alteration of the character of, the property's setting, when that character contributes to the property's qualification for the NRHP;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting if setting is integral to the property's significance;
- Neglect of a property resulting in its deterioration or destruction; and
- Transfer, lease, or sale of the property if this alters land use or protection for a resource.

4.9.2 General Sources of Impacts

Potential impacts to NRHP-eligible archaeological and architectural resources, TCPs, and historic landscapes on McGregor Range can be categorized according to the source of the impact. Potential sources of impacts considered for this LEIS are:

- Ground disturbance resulting from:
  - Military actions (e.g., construction, operation, and maintenance of facilities) and
  - Nonmilitary actions (e.g., grazing, recreation, and mineral exploration are presented as incremental impacts contributing to cumulative impacts in Section 4.9.9);
- Alteration or demolition of buildings, structures, or facilities;
- Noise, vibration, and visual impacts resulting from military and nonmilitary construction, operations, or maintenance;
- Access-related impacts resulting in increased vandalism and unintentional damage due to improved public access; and
- Changes in land status that result in reduced legal or *de facto* protection for significant cultural resources.

4.9.2.1 Ground Disturbance

Ground-disturbing activities on McGregor Range could potentially impact any class of cultural resources. Because integrity is key for determining a cultural resource's eligibility for nomination to the NRHP, ground disturbance is a particularly important impact. Ground disturbance can cause direct effects to cultural resources such as breakage or other damage to artifacts and features, or can disturb their physical integrity by moving them from their original location. Ground disturbance can reduce the integrity of a cultural resource by affecting its ability to convey significant scientific information. Ground disturbance can also result in indirect effects. For example, erosion caused by vehicle tracks could result in damage to a cultural resource not directly affected by the vehicle.

Activities that could result in ground disturbance include: construction, maintenance and operation of facilities, vehicle maneuvers and associated activities; missile testing, targeting, and training; use of drop zones; small arms, gunnery and artillery activities; ordnance delivery; and firefighting. These potentially ground-disturbing activities are generally limited to clearly defined areas. For example, ordnance delivery only occurs on a target; off-road vehicle maneuvers occur on approved terrain in specific locations such as TA 8 in the southern part of McGregor Range.

Construction, Operations, and Maintenance. Military activities associated with construction, operation, and maintenance of training areas, ranges, and facilities may include excavating, grading, scraping, brush clearing, filling, plowing, trenching, and tunneling. Such activities at the location of a cultural resource have the potential to significantly impact it.

Vehicle Maneuvers and Associated Activities. Tracked vehicles, wheeled vehicles, foot traffic, trenches, trash disposal pits, and bulldozed tank emplacements have the potential to adversely affect cultural resources through ground disturbance. The Fort Bliss cultural resource database indicates that many prehistoric archaeological sites on McGregor Range have observable impacts from wheeled and tracked vehicles.

Missile Testing, Targeting, and Training. Missile training and testing constitutes a part of the activities undertaken on McGregor Range. Although the impact of missile fragments and target drone debris falling to the ground has the potential to impact of cultural resources, the fragments are generally small and are unlikely to cause damage. Infrequently, larger fragments, intact missiles, or target drones have fallen on archaeological sites (Beckes et al., 1977), but this is rare due to the infrequency of missile fragments and drone debris of this size.

Use of Drop Zones. Several small drop and landing zones are on McGregor Range. No specific observations relating to impacts to cultural resources are available.

Small Arms, Gunnery, and Artillery Use. Cultural resources within the firing arc of small arms, gunnery, and artillery can be disturbed (Beckes et al., 1977; Ludowski and Mauldin, 1995). The extent of the disturbance depends on the concentration over time and on actions associated with the EOD process.

Ordnance Delivery. Repeated ordnance delivery can cause considerable ground disturbance but is typically concentrated near targets. Observations made at other desert ranges in the western U.S. using nonexplosive ordnance (Peter, 1988) indicate that the greatest amount of damage occurs within 300 feet of a target (or in an area of about 6.5 acres). Less damage occurs between 300 and 1,000 feet of a target (i.e., in an area smaller than 75 acres). Although the impact of missile fragments and target drone debris has a small potential to cause ground disturbance and to damage cultural resources, such damage is unlikely. Only sporadic instances of ground disturbance were observed in the study more than 1,000 feet from a target. Larger fragments or intact missiles and target drones can fall on archaeological sites (Beckes et al., 1977), but such occurrences are infrequent. A small area in the northern portion of McGregor Range is used as a Class C bombing target range. The only ordnance used on this range is inert and weighs 25 pounds. Inert ordnance of this size can cause about 4 square feet of damage to the ground. Similarly, ordnance delivery at the USAF tactical target complex would result in ground disturbance. Inert/subscale ordnance will be used in this training (USAF, 1998).

Firefighting. Fires could occur from missile firings, other military activities, and the use of inert ordnance and flares at the USAF tactical target complex to be constructed but there is a low probability of occurrence. Such fires would not be expected to damage archaeological sites or artifacts. Architectural resources such as historic ranch buildings and features on McGregor Range could potentially be damaged by fire either from natural or man's activities. Thirty-eight fires occurred throughout the Fort Bliss Training Complex, including McGregor Range, from 1982 to 1996. Seven fires were categorized by the BLM as man-made; the other 31 were from natural causes (BLM, 1998).

The effect of fire on archaeological resources is generally minor. However, the effect of necessary and unavoidable fire suppression activities can be more damaging. In particular, the bulldozing of fire lines can cause significant impacts to archaeological resources. Other fire fighting activities such as the use of flame-retardant chemicals have the potential to alter or destroy archaeological residues such as charcoal, pollen, and food residues. Slurry drops by fire bombers can harm rock art sites (Marshall, 1998).

4.9.2.2 Noise, Vibrations, and Visual Intrusions

Vibration effects to cultural resources on McGregor Range can originate from a variety of sources, including ground sources such as construction and blasting, as well as military overflights. McGregor Range is currently overflown by military aircraft, but overflights are infrequent and generally at a high altitude. No supersonic flights are permitted over McGregor Range.

Archaeological resources are unlikely to experience adverse effects from aircraft overflight on McGregor Range. No data exist that would indicate that surface artifact scatters and subsurface archaeological deposits are affected by vibrations resulting from subsonic aircraft overflight.

Architectural resources can be susceptible to impacts from vibrations, depending on a number of factors (cf. King, 1987; Konon and Schuring, 1985; Nichols et al., 1971; Richart and Woods, 1970; Siskind et al., 1980). Studies have established that subsonic noise-related vibration damage to structures, even historic buildings, requires high decibel levels generated at close proximity to the structure and in a low frequency range (USFS, 1992; cf. Battis, 1983, 1988; cf. Sutherland, 1990). Aircraft must generate at least 120 dB at a distance of no more than 150 feet to potentially result in structural damage (Battis, 1988) and, even at 130 dB, structural damage is unlikely.

Studies conducted by the USAF at a prehistoric standing adobe structural remnant in Arizona evaluated the impact of low-level subsonic, B-52, and fighter aircraft overflights of the area. This study concluded that such overflights had no adverse effect (Battis, 1988). The probability of vibration damage to buildings from low-level subsonic airplane flights is very low (less than 0.3 percent). This probability applies even to fragile, poorly constructed wood-frame buildings. Vibration studies at the adobe and beam museum building at White Sands National Monument indicate that "the general continuous induced vibrations from highway traffic and jet aircraft in the normal takeoff pattern are probably causing no detrimental structural effects to the building" (King et al, 1988).

Although noise and vibrations from helicopters can be 30 to 40 times higher than ambient levels, as compared to a high of 60 times ambient for low-flying jet aircraft (King et al., 1988), the duration of noise and vibration is considerably longer from helicopter overflight. Close approach helicopter flights have been demonstrated to damage archaeological architectural structures (USAF, 1992). Similarly, low overflights (50 feet) by heavy helicopters have a high probability of damaging architectural resources (Sutherland, 1990).

The effects of noise and visual intrusions on cultural resources may also be related to setting. Noise that affects setting may be caused by construction and maintenance, machines, and aircraft. To be adversely affected, the setting of a cultural resource must be an integral part of the characteristics that qualify that resource for listing in, or eligibility for, the NRHP. Because of modern development, this is often not the case for significant cultural resources. Even in rural areas, noise intrusions from vehicles and machinery can create a noise environment inconsistent with the original setting of the cultural resources. If, however, the audible and visible aspects of the setting are fundamental to the resource's significance, audible or visual intrusions sufficient to alter the setting can adversely affect the cultural resource. The nature and magnitude of the impacts depend upon the characteristics of the affected cultural resource, the amount by which the sound level exceeds baseline levels, the other types of noise sources in the vicinity of the cultural resource, and the frequency with which people visit the resource.

The setting of TCPs can be impacted by audible intrusions. For example, traditional ceremonies and rituals by Native Americans may depend in part on isolation, solitude, or silence. An aircraft flying overhead, even at high altitudes, could be deemed an auditory or visual intrusion if it occurs during a ceremony or at another inappropriate time.

Visual impacts may be of less importance to resources whose NRHP eligibility rests primarily on their scientific importance, such as archaeological sites. However, for cultural resources where integrity of setting is an important significance criterion, such as TCPs and historic landscapes, changes in setting can affect the resource's NRHP eligibility. Actions that could potentially impact a resource's setting include: the addition of new roads, buildings, or features; removal of fences and other features; changes in native

vegetation; or changes in land use out of character with traditional military and nonmilitary uses of McGregor Range.

4.9.2.3 Access

Improved ground access to cultural resources can result in impacts such as vandalism. Vandalism often affects the types of cultural resources (e.g., historic buildings, large pueblos, rock shelters, or rock art) most likely to be determined eligible for listing on the NRHP because these are typically the most visible. When these resources are located near roads, they become even more vulnerable to vandalism. A study of vandalism on federal lands in southwestern Colorado, for example, found that ease of access was one of the major factors contributing to vandalism. Cultural resources located within a quarter mile of roads suitable for two wheel drive were most heavily impacted (Nickens et al., 1981).

Unauthorized excavation and artifact theft, defacement, and illegal ORV use, are the most destructive adverse impacts linked to ground access. In addition, architectural resources (e.g. historic buildings and structures) can be impacted by use as campsites (increasing fire danger), trash accumulation, and salvage of materials from the structure. The Fort Bliss cultural resource database indicates that more than 40 cultural resources on McGregor Range have observable vandalism. Some of the sites, such as Escondido Pueblo, have been extensively vandalized (Beckes et al., 1977).

4.9.2.4 Land Status

If a historic property (i.e., a NRHP-eligible archaeological, architectural, traditional, or landscape cultural resource) is transferred from one federal agency to another the resource is still managed under NHPA and other applicable federal laws. The receiving agency then becomes responsible for compliance. While a land status change does not, itself, affect impacts, it can lead to changes in the numbers and kinds of impacts to historic properties as land use and management change under the receiving agency. For example, military impacts could be replaced by impacts from mining or recreation.

4.9.3 Alternative 1

Under Alternative 1, the current boundaries of McGregor Range would remain the same. Use of the range could either continue at its current levels, or could include additional uses or increased use levels as range capabilities are more fully utilized (see Section 2.1.1, *Military Activities on Withdrawn Lands*). Current range activities include:

- Short-range and medium- and high-altitude missile firing;
- Annual Roving Sands combined forces exercises;
- Annual live FIREX for Hawk, Patriot, Stinger, and Roland missiles;
- Helicopter gunnery and Hellfire training; NOE tactical training;
- Laser operations;
- Fixed-wing aircraft bombing practice at Class C Range;
- Airborne personnel, equipment drops, and Special Operations Force ground troop maneuvers;
- Small arms training at Meyer Range Complex; and
- Limited tracked vehicle operations in southern-most portion of McGregor Range.

Future activities, as outlined in Section 2, might include:

- Designation of additional FTX sites;
- Addition of heavy brigade for training;

- Construction of a geothermal facility;
- Construction of an USAF tactical training complex on Otero Mesa;
- Construction of a MOUT training complex;
- Additional facilities at McGregor Range Camp;
- Additional facilities at Meyer Range;
- Road upgrades and improvement;
- Increased missile firings;
- TBM and/or ATACMS firing; and
- Increased use of, and additional facilities at the Cane Cholla and Hellfire training areas.

Future activities would be concentrated in the Tularosa Basin portion of McGregor Range, with some activities extending onto Otero Mesa and north of New Mexico Highway 506.

The USAF tactical target complex to be constructed on McGregor Range could result in disturbance to cultural resources on Otero Mesa.

At the tactical target complex location, construction or ordnance delivery could occur in areas where there are archaeological resources. There are nine archaeological sites within this location that are either eligible for listing on the NRHP or have undetermined eligibility. In all cases, as part of the Section 106 compliance process, measures would be implemented to avoid, reduce, or eliminate potential impacts to those archaeological resources that are determined eligible for listing on the NRHP. Under an MOA being developed by HAFB, Fort Bliss, the New Mexico SHPO, and the Advisory Council on Historic Preservation (ACHP), the USAF would formally evaluate all archaeological sites within the selected area for NRHP eligibility.

4.9.3.1 Archaeological Resources

More than 3,600 archaeological resources (both historic and prehistoric) have been identified on McGregor Range. Of these, 94 have been evaluated as eligible for the NRHP; 189 have been evaluated as not eligible for the NRHP; and 3,396 have not been evaluated for NRHP eligibility. Potential impacts to NRHP-eligible archaeological resources could occur from ground disturbance and access.

Ground Disturbance. Approximately 900 of the prehistoric sites on McGregor Range have been evaluated by recorders for degree and source of disturbance. Sites have been or could be impacted by current or future military activities such as the establishment of additional controlled access FTX locations on McGregor Range. Training activities on additional controlled access FTX sites would be concentrated, and have the potential to impact archaeological resources through ground disturbing activities (mainly relating to target acquisition), communication, and command and control activities. These activities could result in direct impacts to cultural resources, or could lead to impacts through accelerated erosion. Site-specific NEPA documentation is required prior to establishment of FTX locations.

Noise, Vibration, and Visual Impacts. Archaeological resources are unlikely to experience adverse effects from aircraft overflight on McGregor Range. No data exist that would indicate that surface artifact scatters and subsurface archaeological deposits are affected by vibrations resulting from subsonic aircraft overflight. Impacts to resource setting by noise or visual intrusion could result from training activities, military construction, and aircraft and helicopter overflights. However, setting is not a critical component of any known archaeological resource on McGregor Range, making impacts to archaeological resources unlikely.

Access. Although general access to the range would not change, there is currently public access to more than 38 percent of McGregor Range. Ongoing access could be a source of impacts to archaeological

resources, especially near roads. Vandalism has been noted on about 5 percent (approximately 45) of the cultural resource sites on McGregor Range. However, existing limitations to public access to the range reduce the likelihood of increasing impacts from access.

Land Status. No changes in land status are expected to occur under this alternative. Management of the land would continue as it presently exists. Therefore, no impacts to archaeological resources are expected to occur from this source.

4.9.3.2 Architectural Resources

More than 200 architectural resources, both historic and Cold War-era, have been identified on McGregor Range. Under Alternative 1, architectural resources potentially could experience impacts from ground disturbance, noise/vibration, and access.

Ground Disturbance. The possible construction of additional facilities at both Meyer Range and McGregor Range Camp has the potential to impact architectural structures relating to the Cold War. More than 150 Cold War-era structures are present at the McGregor Range Camp. At present none of these has been evaluated for NRHP significance. Meyer Range includes some 28 Cold War-era structures, none of which has been evaluated for NRHP significance. Compliance with Section 106 of NHPA would take place before facilities construction would begin.

Noise, Vibration, and Visual Impacts. Impacts to architectural resources by brief and short-lived noise and vibration or by visual intrusion could potentially result from training activities, military construction, or aircraft overflights on McGregor Range. As discussed in Section 4.9.2.2, vibration from aircraft overflight has the potential to impact architectural resources when it consists of high decibel levels at close proximity to the structure and in a low frequency. However, given the present and projected frequency of overflights on McGregor Range, it is unlikely that significant historic structures would be impacted. Because setting is not a critical component of any known architectural resources on McGregor Range, impacts to the setting of architectural resources from noise or visual intrusions is unlikely.

Access. Many of the architectural resources on McGregor Range are located adjacent to, or near, an existing road, increasing the likelihood of vandalism. The public currently has access to more than one third of McGregor Range, including some rural architectural resources. However, existing limitations to public access to the range reduce the likelihood of increasing impacts from access.

Land Status. No changes in land status are expected to occur under this alternative. Management of the land would continue as it presently exists. Therefore, no impacts to architectural resources are expected to occur from this source.

4.9.3.3 Traditional Cultural Properties

Although no TCPs have been identified on McGregor Range, their existence is not precluded. Some prehistoric archaeological sites could potentially be viewed as TCPs by the Mescalero Apache, Tigua, and possibly the Comanche or Kiowa. TCPs were suggested in a letter from the Mescalero Apache to the USAF (USAF, 1998). Under Alternative 1, TCPs could potentially be impacted by ground disturbance, noise, visual setting, or access.

Ground Disturbance. TCPs, if identified, could potentially be impacted by military activities when they result in ground disturbance (refer to Section 4.9.4.1). Ground disturbance from these sources could result in direct impacts to traditional properties, or lead to impacts through accelerated erosion.

Noise, Vibration, and Visual Impacts. Impacts to the setting of TCPs, if identified, by noise or visual intrusion could result from training activities, military construction, and aircraft and helicopter overflights on McGregor Range. For example, audible or visual intrusions could have potentially adverse impacts to the setting of a traditional ceremony or ritual that depends on isolation, solitude, or silence. An aircraft flying overhead, even at high altitudes, could be deemed an auditory or visual intrusion if it occurs during a ceremony or at another inappropriate time. The setting of a TCP could also potentially be impacted by limited recreational noise. However, no TCPs have been identified on McGregor Range.

Access. Access to potential traditional cultural resource locations by road could result in impacts from unauthorized off-road activities by military users. Improved local public access, through improvement of an access road to the USAF tactical target complex, will be offset by construction of a barbed wire fence around the impact area. This would be likely to discourage an increase in vandalism to cultural resources. However, existing limitations on public access to the range reduce the likelihood of increasing impacts.

Land Status. No changes in land status are expected to occur under this alternative. Management of the land would continue as it presently exists. Therefore, no impacts to potential TCPs are expected to occur from this source.

4.9.3.4 Historic Landscapes

McGregor Range has the potential for the presence of historic rural or military landscapes. Under Alternative 1, a NRHP-eligible historic landscape potentially could be impacted by ground disturbance, noise/vibration, visual impacts, and access. Continuing or compatible land uses and activities may not be considered impacts to a historic landscape if the general character and feeling of the historic period is retained during the maintenance and repair of landscape features.

Ground Disturbance. Existing and future use of McGregor Range could impact architectural, archaeological, or topographic components of NRHP-eligible historic landscapes through demolition, construction, road building, or other military activities. Potential impacts to archaeological and architectural components of a landscape would be similar to those described in Sections 4.9.4.1 and 4.9.4.2. Activities that significantly change the terrain could also impact the setting of a historic landscape.

Noise, Vibration, and Visual Impacts. An identified rural historic or military landscape could have as part of its setting the existing noise, vibration, and view shed conditions of McGregor Range. If these conditions are present at the time the landscape is evaluated, they might not be considered an impact to the landscape. However, potential future increases in levels of activity producing increased noise/vibrations or changes in the visual setting, such as new construction out of character with the historic environment, could impact a NRHP-eligible historic landscape.

Access. On McGregor Range, historic landscape components, such as architectural resources located near an existing road, potentially could be impacted by vandalism. The public currently has access to more than one third of McGregor Range, including some rural architectural resources that could be components of a historic landscape. Existing ground access opportunities at McGregor Range could potentially impact a historic landscape if they lead to vandalism of components of a landscape. However, existing limitations to public access to the range reduce the likelihood of increasing impacts from access.

Land Status. No changes in land status are expected to occur under this alternative. Management of the land would continue as it presently exists. Therefore, no impacts are expected to occur from this source.

4.9.4 Alternative 2

Under Alternative 2, training areas in the Sacramento Mountains foothills would be returned to the public domain. Army in-holdings in TAs 12, 13, 14, and 16 would be retained for specialized training. Grazing would continue on both withdrawn and land returned to the public domain. There would be unrestricted access to 40,000 acres on returned lands for recreation. On the returned lands, exploration for locatable minerals could take place on 29,000 acres (see Alternative 5 and Section 4.9.9, *Cumulative Impacts*). The returned lands would continue to be managed in accordance with the White Sands RMP (BLM, 1986a) as amended by the McGregor Range RMPA. In the areas remaining on McGregor Range, ongoing actions, both military and nonmilitary, would continue.

4.9.4.1 Archaeological Resources

The training lands that would return to the public domain under Alternative 2 include at least 168 known prehistoric and historic archaeological sites. Additional sites, not yet part of the existing database, may exist. Under Alternative 2, archaeological resources on returned lands and on McGregor Range potentially could experience impacts from ground disturbance, access, and changes in land status.

Ground Disturbance. Ground disturbance impacts under Alternative 2 could include military activities described under Alternative 1. However, any ground disturbance attributable to military training activities would no longer be a factor on the lands returned to the public domain. The primary existing military use of the training areas in the returned lands is for SDZ, in which ground impacts have been infrequent.

Potential impacts to archaeological resources on the remaining McGregor Range lands would remain similar to those under Alternative 1. Future actions that could make use of the capabilities of McGregor Range also include possible facilities development. Compliance with Section 106 of NHPA would take place before facilities construction would begin.

Noise, Vibration, and Visual Impacts. Archaeological resources are unlikely to experience adverse effects from aircraft overflight on either the returned lands (Alternative 2 does not include changes to existing military airspace) or on McGregor Range. No data exist that would indicate that surface artifact scatters and subsurface archaeological deposits are affected by vibrations resulting from subsonic aircraft overflight. Impacts to the setting of archaeological resources by noise or visual intrusion could result from training activities, construction, and aircraft overflights. However, setting is not a critical component of any known archaeological resource on either the proposed returned lands or on McGregor Range, making impacts to the setting of archaeological resources unlikely.

Access. Return of lands to the public domain would end all military monitoring and security activities there. Monitoring and enforcement would become the responsibility of the BLM. At present, Fort Bliss limits access to McGregor Range by requiring that all users obtain authorization. Military patrols of McGregor Range currently check users for proper authorization and location within the prescribed use area. Termination of these security measures is likely to result in increased, unmonitored use of the returned lands, including increased access to prehistoric and historic archaeological sites during recreational use or mineral exploration. Increased access could result in increased impacts, both accidental and intentional, to some archaeological resources.

Land Status. Under this alternative the Sacramento Mountains foothills would be returned to the public domain. The lands consist of grazing units 4, 5, 8, and approximately one half of unit 3. Sole management responsibility for archaeological resources on the returned lands would be assumed by the BLM. The BLM has implemented *Cultural Resources Management Plans* and complies with the cultural resource protection laws, including NHPA and associated regulations. Returned lands would be managed

in accordance with the White Sands RMP, as amended. However, the use levels and activities allowed on the returned lands could change, leading to potentially different impacts to the resources.

4.9.4.2 Architectural Resources

Under Alternative 2, NRHP-eligible architectural resources potentially could be impacted by ground disturbance, noise, vibration, and access and land status issues.

Ground Disturbance. Military activities on the withdrawn land would remain similar to Alternative 1 while military activities would cease on the returned lands.

Noise, Vibration, and Visual Impacts. The likelihood of impacts from noise, vibration, or visual impacts from military aircraft overflights would remain the same on the returned lands as described for Alternative 1 because Alternative 2 does not include changes in airspace use.

Access. Both the returned lands and portions of McGregor Range would continue to be open to the public. However, fewer road closures and less stringent monitoring of returned lands could result in increased public use for recreation and mineral exploration, and potentially increased impacts to rural architectural resources.

Land Status. Impacts to architectural resources would be the same as described as impacts to archaeological resources under this alternative.

4.9.4.3 Traditional Cultural Properties

Although no TCPs have been identified on McGregor Range, including the proposed returned lands, their existence is not precluded, as discussed under Alternative 1. Some prehistoric archaeological sites could potentially be viewed as TCPs by the Mescalero Apache, Tigua, and possibly the Comanche or Kiowa. If TCPs were identified, they could potentially be impacted in by ground disturbance, noise/vibration, visual impacts, and access.

Ground Disturbance. If TCPs are identified on the withdrawn lands, they could be impacted by military activities when these activities result in ground disturbance. Ground disturbance could result in direct impacts to TCPs, or could lead to impacts through accelerated erosion.

Noise, Vibration, and Visual Impacts. Because Alternative 2 does not include airspace changes, impacts to the setting of potential TCPs by military noise, or visual intrusion from aircraft overflights would be similar to those of Alternative 1.

Access. Increased ground access to TCPs, if identified on the returned lands, could make it easier for Native Americans to practice certain traditions.

Land Status. Impacts to TCPs would be the same as described for impacts to archaeological resources under this alternative.

4.9.4.4 Historic Landscapes

McGregor Range has the potential for the presence of historic rural or military landscapes. Under Alternative 2, a NRHP-eligible historic landscape on the returned lands or on McGregor Range could potentially be impacted by ground disturbance, noise/vibration, visual impacts, and changes in access or land status.

Ground Disturbance. Impacts to a historic landscape would be the same as described under Alternative 1 but would be limited to the lands withdrawn under Alternative 2.

Noise, Vibration, and Visual Impacts. The likelihood of impacts to architectural components of a historic landscape from noise or vibration would be the same on the returned lands as those described for Alternative 1 because Alternative 2 does not include changes in airspace use.

Access. Both the returned lands and portions of McGregor Range would continue to be open to the public. However, fewer road closures and less stringent monitoring of returned lands could result in increased public use for recreation and mineral exploration, and potentially increased impacts to rural architectural resources in a historic landscape.

Land Status. Impacts to a historic landscape would be the same as described for impacts to archaeological resources under this alternative.

4.9.5 Alternative 3

Under Alternative 3, training areas in the Sacramento Mountains foothills and Otero Mesa would be returned to the public domain. On the withdrawn lands, military activities would be further constrained from Alternative 2. Army in-holdings in TAs 12 through 23 would be retained for specialized training. Training use could change in TAs 8 to 12 and 24 to 32 as military uses and exercises are redistributed over the remaining McGregor Range lands.

Grazing would continue on all 271,000 acres currently grazed and there would be unrestricted access to 180,000 acres of returned lands for recreation. Locatable mineral exploration could be permitted on 169,000 acres of returned land. Road closures would be reduced, providing increased access to the Sacramento Mountains foothills, Otero Mesa, and Culp Canyon WSA. No change is proposed for existing restricted airspace. The returned lands would be managed in accordance with the White Sands RMP (BLM, 1986a). Impacts to cultural resources on returned lands would be similar to those described under Alternative 5.

4.9.5.1 Archaeological Resources

The training lands that would return to the public domain under Alternative 3 include at least 255 prehistoric and historic archaeological sites. Additional sites, not yet part of the existing database, may have been recorded under ongoing projects. Alternative 3 could include potential impacts to NRHP-eligible archaeological resources from ground disturbance, access, and changes in land status.

Ground Disturbance. On withdrawn lands, ground disturbance impacts under Alternative 3 could result from military activities as described for Alternative 1. The primary existing military use of the training areas in the Sacramento Mountains foothills and Otero Mesa is for SDZ, in which ground impacts have been infrequent.

Noise, Vibration, and Visual Impacts. Archaeological resources are unlikely to experience adverse effects from aircraft overflight on either the returned lands or on McGregor Range. No data exist that would indicate that surface artifact scatters and subsurface archaeological deposits are affected by vibrations resulting from subsonic aircraft overflight. Impacts to the setting of archaeological resources by noise or visual intrusion on the returned lands could result from aircraft overflights, mineral exploration, or recreation. However, setting is not a critical component of any known archaeological resource on either the proposed returned lands or on McGregor Range, making impacts to the setting of archaeological resources unlikely.

Access. Return of lands in the Sacramento Mountains foothills and on Otero Mesa to the public domain would result in the termination of all military monitoring and security activities on the returned lands. Potential ground access impacts resulting from recreational and mineral use could increase under Alternative 3, compared to Alternative 2, as the public gains access to larger land parcels. This could provide increased access to prehistoric and historic archaeological sites on the range, potentially resulting in inadvertent damage or vandalism to some cultural resources.

Land Status. Impacts to archaeological resources under Alternative 3 from a land status change would be the same as described under Alternative 2.

4.9.5.2 Architectural Resources

Under Alternative 3, NRHP-eligible architectural resources potentially could be impacted by ground disturbance, noise, vibration, access, and land status issues.

Ground Disturbance. Ground disturbance from military activities on withdrawn lands would be similar to that described under Alternative 1. While military activities would cease on the returned lands, impacts to architectural resources potentially could occur as the result of potential mineral exploration and recreational use compared to Alternative 2. The effects of grazing on resources in the returned lands are likely to remain the same as described for Alternative 5 and under cumulative effects on withdrawn lands.

Noise, Vibration, and Visual Impacts. The likelihood of impacts from noise, vibration, or visual impacts from aircraft overflights would remain the same on the returned lands as described for Alternative 1, because Alternative 3 does not include changes in airspace use. The potential for mineral exploration under Alternative 3 could result in increased noise or vibration impacts to architectural resources on the returned lands compared to Alternative 2.

Access. Both the returned lands and portions of McGregor Range would continue to be open to the public. However, fewer road closures and less stringent monitoring of returned lands could result in increased public use, potentially impacting rural architectural resources. Increased public access could result in increased public use and vandalism in the areas returned to the public domain.

Land Status. Impacts to architectural resources from a land status change would be the same as described under Alternative 2.

4.9.5.3 Traditional Cultural Properties

Although no TCPs have been identified on McGregor Range, including the proposed returned lands, their existence is not precluded, as discussed under Alternative 1. Some prehistoric archaeological sites could potentially be viewed as TCPs by the Mescalero Apache, Tigua, and possibly the Comanche or Kiowa. If TCPs were identified, they could potentially be impacted by ground disturbance, noise, vibration and visual impacts, access, and land status.

Ground Disturbance. Potential military impacts to TCPs, if any are located on withdrawn lands, would remain the same as described under Alternative 1. If TCPs were identified on the returned lands under Alternative 3, they could be impacted by grazing, mineral exploration, or recreation when these activities result in ground disturbance. Ground disturbance could result in direct impacts to TCPs, or could lead to impacts through accelerated erosion.

Noise, Vibration, and Visual Impacts. Because Alternative 3 does not include airspace changes, impacts to the setting of potential TCPs by noise or visual intrusion could result from military aircraft overflights.

Noise or visual impacts on returned lands could also result from increased recreational use under this alternative. However, no TCPs have been identified on either withdrawn or lands to be returned to the public domain under Alternative 3.

Access. Increased access to TCPs, if identified on the returned lands, could make it easier for Native Americans to practice certain traditions. At the same time, increased access could lead to increased impacts to TCPs by recreational users and vandals.

Land Status. Impacts to TCPs would be the same as described under Alternative 2.

4.9.5.4 Historic Landscapes

McGregor Range has the potential for the presence of historic rural or military landscapes. Under Alternative 3, a NRHP-eligible historic landscape on the returned lands or on McGregor Range could potentially be impacted by ground disturbance, noise, vibration or visual impacts, and changes in access or land status.

Ground Disturbance. Potential military impacts to a historic landscape would be similar to those described under Alternative 1. A historic landscape on the returned lands potentially could be impacted by mineral exploration or increased recreation use as described under Alternative 2.

Noise, Vibration, and Visual Impacts. The likelihood of impacts to architectural components of a historic landscape from noise or vibration would be the same on the returned lands as those described for Alternative 1 because Alternative 3 does not include changes in airspace use.

Access. Return of lands to the public domain would end military monitoring and security activities on the returned lands. Monitoring and enforcement would become the sole responsibility of the BLM. At present, Fort Bliss limits access to McGregor Range by requiring that all users obtain authorization. Termination of these security measures is likely to result in increased, unmonitored use of the returned lands, including increased access to components of a historic landscape. Increased access could result in increased impacts, both accidental and intentional, to some landscape components.

4.9.6 Alternative 4

For Alternative 4, training areas in the Sacramento Mountains foothills, Otero Mesa, and Tularosa Basin north of New Mexico Highway 506 would be returned to the public domain. On the remaining McGregor Range lands, only some of the current military missions could continue under this alternative. Army in-holdings in TAs 10 through 23 and 29 would be retained. Grazing would continue on the 271,000 acres currently grazed, and there would be unrestricted access to 244,000 acres of returned lands for recreation. Locatable mineral exploration could occur on 233,000 acres of returned lands. There would be fewer road closures and the returned lands would be managed under the White Sands RMP (BLM, 1986a).

4.9.6.1 Archaeological Resources

The training lands proposed for return under Alternative 4 include at least 469 prehistoric and historic archaeological sites. Additional sites, not yet part of the existing database, may have been recorded under ongoing projects. Under Alternative 4 military activities could potentially affect NRHP-eligible archaeological resources through ground disturbance, access, and changes in land status.

Ground Disturbance. Potential impacts on the withdrawn lands would be similar to Alternative 1. Any ground disturbance attributable to military training activities on withdrawn land as described under Alternative 1 would no longer be a factor on the lands returned to the public domain.

Noise, Vibration, and Visual Impacts. As described under Alternative 2, archaeological resources are unlikely to experience adverse effects from aircraft overflight on either the withdrawn or returned lands. Potential impacts on the withdrawn lands would be similar to Alternative 1.

Access. The return of large parcels of land to the public domain under Alternative 4 will result in the termination of all military monitoring and security activities on the returned lands. Potential impacts resulting from vandalism could increase under Alternative 4 as the public gains access to land currently available only through permits. This could provide increased opportunity and access to prehistoric and historic archaeological sites on the range, potentially resulting in inadvertent damage or vandalism to some cultural resources. Potential recreational access to the returned lands by the public could increase impacts as the size of the lands open to recreation increases compared to Alternatives 2 and 3.

Land Status. Impacts to archaeological resources would be the same as described under Alternative 2.

4.9.6.2 Architectural Resources

Under Alternative 4, NRHP-eligible architectural resources potentially could be impacted by ground disturbance, noise, vibration, access, and land status issues.

Ground Disturbance. On the withdrawn lands, potential military impacts would be similar to Alternative 1. While military activities would cease on the returned lands, impacts to architectural resources potentially could occur as the result of mineral exploration and recreational use. The effects of grazing on resources in the returned lands are likely to remain the same as described for Alternative 5.

Noise, Vibration, and Visual Impacts. The likelihood of impacts from noise, vibration, or visual impacts from military aircraft overflights would remain the same on the returned lands as described for Alternative 1, because Alternative 4 does not include changes in airspace use. The potential for mineral exploration under Alternative 4 could result in noise or vibration impacts to architectural resources on the larger parcel of returned lands compared to Alternative 3.

Access. On the withdrawn lands, public access would be limited to TAs 8 and 9, reducing potential access impacts to the resources. The return of large parcels of land to the public domain under Alternative 4 will result in the termination of all military monitoring and security activities on the returned lands. Potential impacts resulting from vandalism could increase under Alternative 4 as the public gains access to land currently available only through permits. This could provide increased access to prehistoric and historic archaeological sites on the range, potentially resulting in inadvertent damage or vandalism to some cultural resources.

Land Status. Impacts to architectural resources would be the same as described for impacts to archaeological resources.

4.9.6.3 Traditional Cultural Properties

Although no TCPs have been specifically identified on McGregor Range, including the proposed returned lands, their existence is not precluded, as discussed under Alternative 1. Some prehistoric archaeological sites could potentially be viewed as TCPs by the Mescalero Apache, Tigua, and possibly the Comanche or

Kiowa. If TCPs were identified, they could potentially be impacted by ground disturbance, noise/vibration, visual impacts, access, and land status changes.

Ground Disturbance. Potential military impacts on the withdrawn lands would be similar to Alternative 1. If TCPs were identified on the returned lands under Alternative 4 they could be impacted by grazing, mineral exploration, or recreation when these activities result in ground disturbance. Ground disturbance could result in direct impacts to TCPs, or could lead to impacts through accelerated erosion.

Noise, Vibration, and Visual Impacts. Because Alternative 4 does not include airspace changes, impacts to the setting of potential TCPs by noise or visual intrusion could result from aircraft overflights. However, no TCPs have been identified on the returned lands. On the withdrawn lands, the potential for noise or visual recreational impacts could decrease as fewer military lands are open to public access. The potential for military noise impacts to TCPs, if identified under Alternative 4, would be similar to Alternative 1.

Access. Potential military access impacts on the withdrawn lands would be similar to Alternative 1. Increased access to TCPs, if identified on the returned lands, could make it easier for Native Americans to practice certain traditions. At the same time, increased access could lead to increased impacts to TCPs by recreational users and vandals.

Land Status. Impacts to TCPs would be the same for Alternative 2.

4.9.6.4 Historic Landscapes

McGregor Range has the potential for the presence of rural historic or military landscapes. Under Alternative 4, a NRHP-eligible historic landscape on the returned lands or on McGregor Range could potentially be impacted by ground disturbance, noise/vibration, visual impacts, and changes in access or land status.

Ground Disturbance. Potential military impacts on the remaining McGregor Range lands would be similar to Alternative 1. A historic landscape on the returned lands potentially could be impacted by mineral exploration or increased recreational use. Potential recreational impacts to the archaeological and architectural components of a historic landscape (e.g. buildings, fences, refuse locations) could increase on the returned lands as military monitoring ceases. The expansion of mineral exploration opportunities in the returned lands under Alternative 4 could also increase the potential for impacts to landscape components if the terrain is altered, or if archaeological or architectural components are affected.

Noise, Vibration, and Visual Impacts. A historic landscape on the returned lands could be impacted if the setting changes (e.g. by a significant increase in noise or vibration or a change in the terrain). However, there are no changes in airspace under Alternative 4; therefore potential impacts to architectural components of a historic landscape on the returned lands from overflights would remain the same as described for Alternative 1.

Access. Return of lands to the public domain would end military monitoring and security activities on the returned lands. Monitoring and enforcement would become the responsibility of the receiving federal agency. Increased access could result in increased impacts, both accidental and intentional, to some landscape components.

Land Status. Impacts to a historic landscape would be the same as described for Alternative 2.

4.9.7 Alternative 5 – No Action

Under Alternative 5, 608,385 acres of withdrawn military land on McGregor Range would be returned to the public domain. The land in TA 8, part of TA 32, and TA 33 would be transferred to DoD in exchange for Army fee-owned land elsewhere on McGregor Range, and would provide infrastructure for McGregor Range Camp, McGregor ASP, and the Meyer Range Complex. Restricted airspace above the former McGregor Range could continue to be used for some aircraft training. Existing grazing areas would continue to be open to multiple use. BLM could also open areas for minerals exploration (geothermal, oil and gas), and some cultural resources could be opened up for interpretive recreational opportunities.

4.9.7.1 Archaeological Resources

The training lands proposed for return under Alternative 5 include at least 1,188 prehistoric and historic archaeological sites. Many additional sites, not yet part of the existing database, have been recorded under ongoing projects. Alternative 5 could include potential impacts to NRHP-eligible archaeological resources from ground disturbance, noise/vibration, visual impacts, access, and changes in land status.

Ground Disturbance. The decrease in ground disturbance related to the end of military activities in areas previously closed to the public could be offset by an increase in nonmilitary activities throughout the area. Ground disturbance impacts to the returned lands under Alternative 5 could include grazing, recreation, and mineral exploration.

- Grazing: Introduction of grazing to the Tularosa Basin could impact cultural resources by increasing erosion, creating trails to and from watering points, and trampling near watering points (BLM, 1980). However, these impacts can be minimized by constructing watering points in areas that do not contain cultural resources.

- Recreation: Potential recreational impacts to archaeological resources are likely to increase on the returned lands as military monitoring ceases. In addition, the opening of some cultural resources to interpretive recreational opportunities could result in impacts to the resources.

- Mineral Exploration: Increased mineral exploration opportunities on the returned lands is likely to increase the potential for impacts to archaeological resources from such activities as drilling, and pad and road construction.

Potential impacts to the few remaining military holdings under Alternative 5 are expected to be similar to those under Alternative 1 except that grazing and recreation impacts in these lands would decrease due to restricted access.

Noise, Vibration, and Visual Impacts. Because no data exist that would indicate that surface artifact scatters and subsurface archaeological deposits are affected by vibrations resulting from subsonic aircraft overflight, including overflights by military helicopters and low-level overflights, would have no effect on archaeological resources. Under Alternative 5, potential impacts to the setting of archaeological resources by noise, vibration, or visual intrusion on the returned lands could result from aircraft overflights, from mineral exploration, or from recreation. However, setting is not a critical component of any known archaeological resource on the returned lands, making impacts to the setting of archaeological resources unlikely.

Potential impacts to the few remaining military holdings under Alternative 5 are expected to be similar to those under Alternative 1.

Access. Return of all lands to the public domain would end military monitoring and security activities on the returned lands. Monitoring and enforcement would become the responsibility of the BLM. Termination of these security measures is likely to result in increased use of the returned lands, including increased access to archaeological resources. Increased access could result in increased impacts, both accidental and intentional, to archaeological resources.

Potential access impacts to the few remaining military holdings under Alternative 5 would be likely to decrease in these areas as public access is restricted.

Land Status. Under this alternative, the military land withdrawal would not be renewed. Army fee-owned lands would be exchanged for lands in TAs 8 and 32, and lands comprising most of the range would be returned to the public domain, specifically, grazing units 1 through 15, and the northern portion of TA 29. The ACEC areas underlie restricted airspace, are within SDZs, and are fenced. General access by the public is not presently allowed. If the lands are returned to the public domain, management responsibility for archaeological resources in these areas would be assumed by the BLM. The BLM has implemented *Cultural Resources Management Plans* and complies with the cultural resource protection laws, including NHPA and associated regulations. While the land status change does not, itself, affect impacts, it can lead to changes in the numbers and kinds of impacts to historic properties as land use and management change under the receiving agency. The land status change appears unlikely to enable significant impacts to the management of archaeological resources if BLM funding levels are adequate to cover the increased area of public domain lands.

4.9.7.2 Architectural Resources

Architectural resources identified on the proposed returned lands under Alternative 5 include some that are part of the Cold War military landscape of the region. Since McGregor Range Camp and Meyer Range would be retained by the Army, the Cold War-era structures at these locations would not be affected by a return to the public domain under Alternative 5. NRHP-eligible architectural resources potentially could be impacted by ground disturbance, noise, vibration, access, and land status issues.

Ground Disturbance. While military activities would cease on the returned lands, impacts to architectural resources potentially could increase as the result of increased mineral exploration and recreational use, including the opening of some cultural resources to interpretive use.

Potential impacts to the few remaining military holdings under Alternative 5 are expected to be similar to those under Alternative 1.

Noise, Vibration, and Visual Impacts. Potential military noise impacts to architectural resources on the returned lands under Alternative 5 could occur because restricted airspace could continue to be used for some aircraft training. Increased mineral exploration on the returned lands could also result in increased potential for noise or vibration impacts compared to Alternative 4.

Potential impacts to the few remaining military holdings would be similar to those described for Alternative 1.

Access. The cessation of military activities under Alternative 5 would result in increased public use of the returned lands, potentially impacting ranching and military architectural resources. Increased public access is likely to result in increased impacts from recreational activities and mineral exploration and development.

Potential impacts to the few remaining military holdings under Alternative 5 are expected to be similar to those under Alternative 1 except that grazing and recreation impacts would decrease in these areas due to restricted access.

Land Status. Impacts to architectural resources would be the same as described for impacts to archaeological resources with one exception. The return of McGregor Range to the public domain has the potential to result in impacts to historic architectural structures, particularly from the Cold War, as well as architectural components of potential military landscapes. The likely impacts could result from reuse of the structures, vandalism, or degradation of condition and setting as land use in the area changes.

4.9.7.3 Traditional Cultural Properties

Although no TCPs have been identified on the lands that would be returned under Alternative 5, their existence is not precluded, as discussed under Alternative 1. Some prehistoric archaeological sites could potentially be viewed as TCPs by the Mescalero Apache, Tigua, and possibly the Comanche or Kiowa. If TCPs were identified, they could potentially be impacted by ground disturbance, noise, vibration and visual impacts, access, and land status.

Ground Disturbance. If TCPs were identified on the returned lands under Alternative 5 they could be impacted by grazing, mineral exploration and development, or recreation when these activities result in ground disturbance. Ground disturbance could result in direct impacts to TCPs, or could lead to impacts through accelerated erosion.

Potential impacts to TCPs, if any are identified, on the few remaining military holdings under Alternative 5 would be similar to those under Alternative 1 except that grazing and recreation impacts would decrease in these areas due to restricted access.

Noise, Vibration, and Visual Impacts. Impacts to the setting of potential TCPs by noise or visual intrusion could result from high-level aircraft overflights. Audible or visual intrusions could potentially impact the setting of a traditional ceremony or ritual that depends on isolation, solitude, or silence. An aircraft flying overhead, even at high altitudes, could be deemed an auditory or visual intrusion if it occurs during a ceremony or at another inappropriate time. Increased noise or visual impacts to potential TCPs could also result from increased recreational use or mineral exploration and development under Alternative 5. However, no TCPs have been identified on the returned lands.

Potential impacts to the few remaining military holdings under Alternative 5 are expected to be similar to those under Alternative 1 except that potential recreation impacts would decrease in these areas due to restricted access.

Access. Increased access to TCPs, if identified on the returned lands, could facilitate some Native American traditional practices. However, increased access for recreation and mineral exploration could result in increased impacts to TCPs by other users.

Potential impacts to TCPs, if identified on the few remaining military holdings under Alternative 5, are expected to be similar to those under Alternative 1 except that grazing and recreation impacts would decrease in these areas due to restricted access.

Land Status. Impacts to architectural resources would be the same as described as impacts to archaeological resources.

4.9.7.4 Historic Landscapes

McGregor Range has the potential for the presence of rural historic or military landscapes. Under Alternative 5, a NRHP-eligible historic landscape on the returned lands could potentially be impacted by ground disturbance, noise, vibration or visual impacts, and changes in access or land status.

Ground Disturbance. A historic landscape on the returned lands potentially could be impacted by increased mineral exploration and development or increased recreational use. Potential recreational impacts to the archaeological and architectural components of a historic landscape (e.g., buildings, fences, refuse locations) could increase on the returned lands as military monitoring ceases. The introduction of mineral exploration opportunities in the returned lands could also increase the potential for impacts to landscape components if the terrain is altered, or if archaeological or architectural components are affected.

Potential impacts to a historic landscape on the few remaining military holdings under Alternative 5 are expected to be similar to those under Alternative 1 except that potential recreation and grazing impacts would decrease in these areas due to restricted access.

Noise, Vibration, and Visual Impacts. A historic landscape on the returned lands could be impacted if the setting changes compared to the setting on McGregor Range at the time it was identified (e.g., by a significant increase in noise or vibration or a change in the terrain). Noise, vibration, or visual impacts could result from increased mineral exploration.

Potential impacts to a historic landscape on the few remaining military holdings under Alternative 5 are expected to be similar to those under Alternative 1.

Access. The termination of military activities on the returned lands would result in increased access for recreation and mineral exploration and potential increased impacts, both accidental and intentional, to some landscape components.

Potential impacts to a historic landscape on the few remaining military holdings under Alternative 5 are expected to be similar to those under Alternative 1 except that potential recreation and grazing impacts would decrease in these areas due to restricted access.

Land Status. Impacts to architectural resources would be the same as described as impacts to archaeological resources.

4.9.8 Alternative 6

Alternative 6 would designate Culp Canyon WSA as a wilderness area and create an NCA. This alternative could be combined with Alternatives 3, 4, or 5. Effects for each resource type would be the same as discussed under each alternative, with some additions or exceptions. However, this alternative requires congressional action for implementation. Because the precise nature and extent of the congressional action cannot be determined at this time, detailed cultural resource analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.9.9 Cumulative Impacts

As with the direct and indirect impacts from military actions, incremental impacts from nonmilitary actions contribute to cumulative impacts to NRHP-eligible archaeological and architectural resources,

TCPs, and historic landscapes on McGregor Range. The incremental and cumulative impacts also can be categorized according to the source of the impact.

4.9.9.1 Ground Disturbance

Nonmilitary activities that could result in ground disturbance include: construction, maintenance and operation of facilities, firefighting, grazing, recreation, and mineral exploration. These potentially ground-disturbing activities are generally limited to clearly defined areas. For example, grazing is limited to permitted areas; and mineral exploration usually occurs only in certain geologically appropriate locations.

Construction, Operations, and Maintenance. Nonmilitary activities associated with construction, operations, and maintenance of grazing support infrastructure or mineral and energy resource development may include excavating, grading, scraping, brush clearing, filling, plowing, trenching, and tunneling. Such activities at the location of a cultural resource have the potential to significantly impact it.

Firefighting. Fires could occur from nonmilitary activities such as mineral and energy development and recreation as well as from natural causes. Architectural resources such as historic ranch buildings and features on McGregor Range could potentially be damaged by fire from any source. The effect of fire from nonmilitary activities on archaeological resources is generally minor. However, as discussed in Section 4.9.2.1, the effect of necessary and unavoidable fire suppression activities can be more damaging.

Recreation. Unauthorized off-road recreation in portions of McGregor can lead to inadvertent disturbance to cultural resources, particularly archaeological sites.

Grazing. Nonmilitary activities, in particular stock grazing, can also cause a significant amount of ground disturbance, particularly in erosion prone areas (Nielsen, 1991; Shea and Klenck, 1993). The proposed area of the NCA is currently grazed by livestock. Studies in areas similar to McGregor Range have shown that reduction of the vegetation by grazing causes significant erosion (Trimble and Mendel, 1995). Cattle also break the surface crust with their hooves, create trails to and from watering points, and remove vegetation in wallows. These activities can impact cultural resources unless actions are taken to avoid disturbance, such as placement of water improvements away from known cultural resources (BLM, 1980).

Mineral Exploration. Mineral exploration activities such as drilling, pad construction, and road construction can impact cultural resources, particularly archaeological sites.

4.9.9.2 Noise, Vibrations, and Visual Intrusions

Vibration effects to cultural resources on McGregor Range can originate from a variety of sources, including ground sources such as nonmilitary construction and blasting associated with minerals and energy resources development or grazing infrastructure improvements.

The effects of noise and visual intrusions on cultural resources may also be related to setting. Noise that affects setting may be caused by nonmilitary construction and maintenance, vehicles, and machines. To be adversely affected, the setting of a cultural resource must be an integral part of the characteristics that qualify that resource for listing in, or eligibility for, the NRHP. Because of modern development, this is often not the case for significant cultural resources. Even in rural areas, noise intrusions from vehicles and machinery can create a noise environment inconsistent with the original setting of the cultural resources. The effects on cultural resources would be similar to those described for military activities.

Cultural resources where integrity of setting is an important significance criterion, such as TCPs and historic landscapes, changes in setting from nonmilitary as well as military activities can affect the resource's NRHP eligibility. Actions that could potentially impact a resource's setting include: the addition of new roads, buildings, or features; removal of fences and other features; changes in native vegetation; or changes in land use out of character with traditional uses (e.g., locatable mineral development).

4.9.9.3 Access

Improved ground access to cultural resources for nonmilitary purposes also can result in impacts such as vandalism. Vandalism often affects the types of cultural resources (e.g., historic buildings, large pueblos, rock shelters, or rock art) most likely to be determined eligible for listing on the NRHP because these are typically the most visible. Unauthorized excavation and artifact theft, defacement, and illegal ORV use, are the most destructive adverse impacts linked to ground access. In addition, architectural resources (e.g., historic buildings and structures) can be impacted by use as campsites (increasing fire danger), by recreational target shooting, graffiti, trash accumulation, and salvage of materials from the structure.

4.9.9.4 Land Status

As with cultural resources on public land withdrawn for military purposes, if a historic property (i.e., a NRHP-eligible archaeological, architectural, traditional, or landscape cultural resource) is transferred from one federal agency to another the resource is still managed under NHPA and other applicable federal laws. The receiving agency then becomes responsible for compliance. While a land status change does not, itself, affect impacts, it can lead to changes in the numbers and kinds of impacts to historic properties as land use and management change under the receiving agency. For example, military impacts could be replaced by impacts from mining or recreation.

4.9.9.5 Cumulative Impacts of the Land Withdrawal Alternatives

Under Alternative 1, the current boundaries of McGregor Range would remain the same. Use of the range for nonmilitary activities could continue at current levels (see Section 2.1.2, *Nonmilitary Use of Withdrawn Lands*) with Army concurrence. Since the land status does not change under Alternative 1, no cumulative impacts from this source would occur to archaeological or architectural resources nor to TCPs or historic landscapes.

As stated previously, more than 3,600 archaeological resources (both historic and prehistoric) have been identified on McGregor Range. Of these, 94 have been evaluated as eligible for the NRHP; 189 have been evaluated as not eligible for the NRHP; and 3,396 have not been evaluated for NRHP eligibility. Potential cumulative impacts to NRHP-eligible archaeological resources could occur from nonmilitary ground disturbance and access.

Approximately 900 of the prehistoric sites on McGregor Range have been evaluated by recorders for degree and source of disturbance. Some sites have been cumulatively impacted by military activities and nonmilitary activities such as grazing and recreation.

- Grazing: Archaeological resources are present within existing grazing units and may be subject to incremental impacts from cattle. More than 70 water tanks, troughs, and wells are indicated on USGS topographic maps for McGregor Range. Fort Bliss records indicate that some 125 cultural resources are present at these watering points or within a quarter mile, where they could experience the greatest incremental impact from grazing animals. Almost all of the watering points were visited and inspected for historic cultural resources by the U.S. Army (1997r). Eighty historic sites and 45

prehistoric sites lie at, or near, the watering points. Twenty-one of the resources identified are eligible for the NRHP; 36 are potentially eligible; and 68 are not eligible.

- Recreation: Recreational use can result in ground disturbance through unauthorized off-road activities. Some vandalism relating to recreational use has been noted at about 5 percent of cultural resource sites on McGregor Range. Existing limitations to public access to the range reduce the likelihood of increasing cumulative impacts to archaeological resources from recreation.

Archaeological resources are unlikely to experience adverse incremental noise, vibration, or visual impacts from nonmilitary activities on McGregor Range under Alternative 1. However, impacts to resource setting by noise or visual intrusion could result from leasable or saleable mineral development and construction. Since setting is not a critical component of any known archaeological resource on McGregor Range cumulative impacts to archaeological resources unlikely.

Public access would continue to TAs 8 through 23, part of 29, and Culp Canyon WSA, or more than 38 percent of McGregor Range under Alternative 1. General access to the range grazing, hunting, and dispersed recreational use such as hiking and observing nature would not change. Ongoing access could be a source of cumulative impacts to archaeological or architectural resources as well as to TCPs or historic landscapes, especially near roads. Vandalism has been noted on about 5 percent (approximately 45) of the cultural resource sites on McGregor Range.

More than 200 architectural resources, both historic and Cold War-era, have been identified on McGregor Range. Under Alternative 1, architectural resources potentially could experience cumulative impacts from nonmilitary ground disturbance, noise/vibration, and access.

Possible construction associated with leasable and salable mineral development on McGregor Range under Alternative 1 has the potential to incrementally affect cultural resources. Architectural resources located within grazing areas could also potentially be impacted by cattle rubbing against structures and trampling architectural features; or by recreational use resulting in vandalism to structures.

Impacts to architectural resources by brief and short-lived noise and vibration or by visual intrusion could potentially result from nonmilitary construction on McGregor Range. Because setting is not a critical component of any known architectural resources on McGregor Range, cumulative impacts to the setting of architectural resources from noise or visual intrusions is unlikely.

Although no TCPs have been identified on McGregor Range, their existence is not precluded. Some prehistoric archaeological sites could potentially be viewed as TCPs by the Mescalero Apache, Tigua, and possibly the Comanche or Kiowa. Under Alternative 1, TCPs could potentially be subjected to cumulative impacts from nonmilitary activities resulting in ground disturbance, noise, visual setting, or access limitations.

McGregor Range has the potential for the presence of historic rural or military landscapes. Under Alternative 1, a NRHP-eligible historic landscape potentially could be incrementally impacted by ground disturbance, noise/vibration, and visual impacts from nonmilitary actions as well as public access. Continuing or compatible land uses and activities may not be considered impacts to a historic landscape if the general character and feeling of the historic period is retained during the maintenance and repair of landscape features.

Nonmilitary use of McGregor Range could impact architectural, archaeological, or topographic components of NRHP-eligible historic landscapes through demolition of infrastructure such as sections of pipeline, construction, road building, recreation, or other nonmilitary activities. Potential impacts to

archaeological and architectural components of a landscape would be similar to those described in Sections 4.9.4.1 and 4.9.4.2. Activities that significantly change the terrain could also add to cumulative impacts to the setting of a historic landscape.

An identified rural historic or military landscape could have as part of its setting the existing noise, vibration, and view shed conditions of McGregor Range. If these conditions are present at the time the landscape is evaluated, they might not be considered an impact to the landscape. However, under Alternative 1 nonmilitary activity producing increased noise/vibrations or changes in the visual setting, such as new construction out of character with the historic environment, could have cumulative impacts on a NRHP-eligible historic landscape.

Under Alternatives 2, 3, 4, 5, and 6 varying amounts of land would be returned to the public domain. The returned lands would be managed in accordance with the White Sands RMP (BLM, 1986a). The BLM, without the current requirement for Army concurrence, would set the level of use on all lands returned. Grazing would continue on the presently grazed 271,000 acres regardless of alternative. Increased exploration for and development of locatable, leasable and saleable minerals could take place on the lands returned to the public domain. Unrestricted access to lands returned to the public domain would facilitate recreational use.

The training lands that would return to the public domain under Alternative 2 include at least 168 prehistoric and historic archaeological sites, under Alternative 3 include at least 255 prehistoric and historic archaeological sites, under Alternative 4 include at least 469 prehistoric and historic archaeological sites, and under Alternative 5 include at least 1,188 prehistoric and historic archaeological sites. Additional sites, not yet part of the existing database, may have been recorded under ongoing projects. Under each of these alternatives, archaeological resources on returned lands and on McGregor Range potentially could experience impacts from ground disturbance, access, and changes in land status.

Ground disturbance cumulative impacts to archaeological resources under Alternatives 2, 3, 4, and 6 could include grazing, recreation, and mineral exploration.

- Grazing: Potential impacts associated with cattle grazing on both returned lands and on the remaining McGregor Range lands would remain the same as under Alternative 1 if current grazing practices continue.

- Recreation: Potential recreational impacts to archaeological resources could increase on the returned lands as military monitoring ceases.

- Mineral Exploration: The introduction of mineral exploration opportunities on the returned lands under Alternatives 2, 3, and 4 is likely to introduce the potential for new impacts to archaeological resources from such activities as drilling and pad construction. Alternative 6 would not open the area designated as an NCA for locatable mineral exploration and development.

Cumulative impacts to the setting of archaeological resources by noise or visual intrusion could result from nonmilitary construction, mineral exploration, or recreation. However, setting is not a critical component of any known archaeological resource on either the proposed returned lands or on McGregor Range, making cumulative impacts to the setting of archaeological resources unlikely.

Return of lands to the public domain under Alternatives 2, 3, 4, 5, and 6 would end all military monitoring and security activities there. Monitoring and enforcement would become the responsibility of the BLM. At present, Fort Bliss limits access to McGregor Range by requiring that all users obtain authorization. Military patrols of McGregor Range currently check users for proper authorization and

location within the prescribed use area. Termination of these security measures is likely to result in increased, unmonitored use of the returned lands, including increased access to prehistoric and historic archaeological sites during recreational or mineral exploration use. Increased access could result in increased cumulative impacts, both accidental and intentional, to some archaeological or architectural resources as well as to TCPs or historic landscapes.

Under each alternative, other than Alternative 1, currently withdrawn land would be returned to the public domain. Management responsibility for archaeological resources on the returned lands would be solely by the BLM. The land status change appears unlikely to result in significant cumulative impacts to the archaeological or architectural resources and TCPs or historic landscapes.

Under Alternatives 2, 3, 4, and 6 NRHP-eligible architectural resources potentially could be exposed to cumulative impacts by nonmilitary ground disturbance, noise, vibration as well as access and land status issues. While military activities would cease on the returned lands, impacts to architectural resources potentially could occur as the result of mineral exploration and increased recreational use. The effects of grazing on architectural resources in the returned lands are likely to remain the same as described for Alternative 1 as grazing practices continue.

The likelihood of cumulative impacts to architectural resources from noise, vibration, or visual impacts from nonmilitary activities would remain the same on the returned lands as described for Alternative 1. The introduction of locatable mineral exploration under Alternatives 2, 3, 4, and 5 could result in cumulative impacts from increased noise or vibration to architectural resources on the returned lands.

Both the returned lands and portions of McGregor Range would continue to be open to the public under each alternative. However, under alternatives other than Alternative 1, fewer road closures and less stringent monitoring of returned lands could result in increased public use for recreation and mineral exploration, and potentially increased cumulative impacts to rural architectural resources.

Although no TCPs have been identified on McGregor Range, including the proposed returned lands, their existence is not precluded. Some prehistoric archaeological sites could potentially be viewed as TCPs. If TCPs were identified by the Mescalero Apache, Tigua, and possibly the Comanche or Kiowa, they could potentially receive cumulative impacts under each alternative from nonmilitary activities that cause ground disturbance, noise/vibration, visual impacts, and changes in access to the public lands. Cumulative impacts to TCPs from nonmilitary activities could result under each alternative.

McGregor Range has the potential for the presence of historic rural or military landscapes. Under Alternatives 2, 3, 4, and 6 a NRHP-eligible historic landscape on the returned lands or on McGregor Range could potentially have cumulative impacts from nonmilitary activity resulting in ground disturbance, noise/vibration, visual impacts, and changes in access or land status. Significant cumulative impacts to the management of historic landscapes is unlikely if BLM funding levels are adequate to cover the increased area.

4.9.10 Mitigation

The congressional decision to establish the boundaries for McGregor Range and withdrawal, in and of itself, causes no impacts to cultural resources that require mitigation.

4.9.11 Irreversible and Irretrievable Commitment of Resources

Certain training activities proposed under the alternatives have the potential for irreversible or irretrievable impacts to cultural resources such as Native American TCPs. Training activities such as

tracked and wheeled vehicle maneuvering, emplacement excavation, and bivouacs, constitute the greatest source of direct and indirect impacts to prehistoric and historic cultural resources. Cultural resources are nonrenewable; once they are destroyed or altered, they cannot be replaced. Activities, such as ground disturbance from training activities, can irreparably damage artifacts and intact features, destroy data, and disturb site integrity. While implementation of data recovery or other measures under existing or proposed management plans can reduce adverse effects, the loss of any significant cultural resource can be considered irreversible and irretrievable.

Socioeconomics

4.10

4.10 SOCIOECONOMICS

The majority of impacts on socioeconomic resources associated with implementation of the McGregor Range withdrawal alternatives are directly related to changes in the number of personnel assigned, and procurement levels at Fort Bliss. With variations in these two attributes, changes in personnel consumption expenditures (based on the payroll of personnel) and purchases of goods and services in the local economy can be expected. These factors, associated with activities on the installation, are termed "direct effects." Through the use of the concept of the "multiplier effect," there will be "secondary effects" generated. These are changes in the local economy (i.e., additional activity that can be expressed in terms of employment, earnings, or output) attributable to changes in the final demand for goods and services, required by changes in spending by post personnel and for post procurements. The total effect is the sum of direct and secondary effects.

Additional impacts can be expected from changes in the manner in which the natural resources of McGregor Range are utilized; specifically, mineral, energy, and grazing resources. Mineral commodities within McGregor Range are gypsum, limestone, and sand and gravel. However, these resources are currently undeveloped, and unlikely to be developed in the immediate future due to their remoteness from points of demand, because adequate supplies exist from other sources in the region, and demand is low. Preliminary investigations indicate low to moderate potential for oil and gas resources, and petroleum exploration and development on the range appears unlikely. An exploration program for geothermal resources is currently underway and preliminary findings indicate that a 3-megawatts electricity facility, capable of powering a desalination plant producing drinking water from a saline aquifer, is feasible. Management and leasing of grazing units would continue as described in Section 3.10.2.3.

4.10.1 Alternative 1

As described in Section 2.1.1, military activities could vary from the same as currently conducted to an expanded range of capabilities and intensified use. Under Alternative 1 (current boundaries), negligible changes in permanent personnel levels and procurement activity at Fort Bliss are expected to occur and, thus, no measurable impacts to socioeconomic resources are anticipated.

In addition, the current boundaries of the range would remain unchanged and, thus, no impacts would occur to mineral, energy, and grazing resources.

4.10.2 Alternative 2

Under Alternative 2, negligible changes in personnel levels and procurement activity at Fort Bliss are expected to occur and, thus, no measurable impacts to socioeconomic resources are anticipated.

The current boundaries of McGregor Range would be revised through the removal of the Tularosa Basin and Otero Mesa portions from military use. The area removed from military use (about 40,000 acres) would include grazing units 4 and 5 and portions of units 3 and 8. This area would return to the direct control of the BLM. It is assumed that the current management practices as specified in the RMPA would continue. However, this administrative change could be accompanied by changes in the manner in which the grazing authorizations are conducted.

Currently, the grazing units on the range support between 2,000 and 3,500 head of cattle annually (between 20,000 and 35,000 AUMs). The grazing unit contracts are issued by competitive bid at public auction with values ranging between $11.00 and $16.75 per AUM. Through this bidding process, contracts generate between $150,000 and $300,000 annually. Should the bidding process be replaced by a price mechanism dictated under the terms of the Taylor Grazing Act, the fees received by BLM could

fall from an average current bid of $12.50 per AUM to $1.35 per AUM. Although this would result in a substantial drop in revenues accruing to the BLM, it is unlikely that the number of cattle supported on the grazing lands in question would change. No measurable impacts to socioeconomic resources would occur.

A substantial portion of the value of the range grazing is attributable, however, to the availability of water currently provided by the Army. The Army would continue to provide water, therefore, the capacity of the rangeland would remain as currently exists.

No measurable impacts would occur to mineral and energy resources. The exploration program for geothermal resources currently underway is located on land that would remain under control of the Army.

4.10.3 Alternative 3

Under Alternative 3, negligible changes in personnel levels and procurement activity at Fort Bliss are expected to occur and, thus, no measurable impacts to socioeconomic resources are anticipated.

The current boundaries of the range would be revised through the removal of 180,000 acres from military use. The area removed from military use would include grazing units 4, 5, and 7 through 15, and about half of unit 3. This area would return to the direct control of the BLM. It is assumed that the current management practices under the RMPA would continue. However, this administrative change could be accompanied by changes in the manner in which the grazing authorizations are conducted. The Army would continue to provide water for wildlife and grazing as currently exists. As in the case of Alternative 2, no measurable impacts to socioeconomic resources would occur.

No measurable impacts would occur to mineral and energy resources. The exploration program for geothermal resources currently underway is located on land that would remain under control of the Army.

4.10.4 Alternative 4

Under Alternative 4, negligible changes in personnel levels and procurement activity at Fort Bliss are expected to occur and, thus, no measurable impacts to socioeconomic resources are anticipated.

Under Alternative 4, the current boundaries of McGregor Range would be revised through the return by the Army of all portions of the range north of New Mexico Highway 506 and on Otero Mesa. This area would encompass about 244,000 acres. The area removed from military use would return to the direct control of the BLM. As with Alternatives 2 and 3 the grazing and water management practices are anticipated to remain as currently exist. No measurable impacts to socioeconomic resources would occur.

No measurable impacts would occur to mineral and energy resources. The exploration program for geothermal resources currently underway is located on land that would remain under control of the Army.

4.10.5 Alternative 5 – No Action

The withdrawal of McGregor Range would not be renewed and the land would return to the public domain. The lands owned in-fee by the Army would be used for exchange for public lands in TAs 8 and 32. Should these fee-owned lands be exchanged, Fort Bliss would no longer have the capability to support its current air defense mission. Installation facilities (Orogrande Range, SHORAD Range, and the McGregor Range Firing Complex) located on McGregor Range would have to be relocated. The loss of these facilities would result in the loss of several activities and units at Fort Bliss. It is estimated that there would be a loss of approximately 128 military and 182 civilian authorizations. It is further assumed

that there would be reductions the level of procurements conducted by the post. There would also be a reduction in payroll associated with these military and civilian personnel.

With changing mission requirements, changes in procurements as well as payrolls can be expected. In the absence of details describing such likely changes in procurement activity associated with decreased personnel levels, estimates are made. These estimates are based on the statistical relationship between personnel levels and the value of local and nonlocal purchases and contracts, utilities, and non-U.S. expenditures exhibited over the period FY 94 through FY 96. Payroll and expenditure levels for the following categories are derived from changes solely in the number of military personnel: military payroll, Post Exchange (PX) local purchases, nonappropriated fund local purchases, commissary local purchases, and student impact aid. Expenditure levels for the following categories are derived from the aggregate numbers of military and civilian personnel: local procurements, military construction projects, and utilities. Civilian payroll levels are derived solely from projected civilian personnel levels. It is estimated that 112 secondary jobs in the local economy would be lost because of reduced payroll expenditures and post procurements. The total (direct and secondary) employment loss would be 422 jobs.

With a decreased training capability under Alternative 5 it is likely that a smaller number of military units and personnel will spend time at Fort Bliss. It is highly probable, also, that decreased support will be required. Such support would include the procurement of fewer goods and services, mostly from the local economy.

It is not possible at this time to predict the exact magnitude of these potential reductions in personnel on temporary duty (TDY) for exercises. Nor is it possible to predict the likely reduction in value of procurements needed to support this reduced level of training activity. In the absence of such activity-specific information, a programmatic approach to quantifying the direct and secondary effects is adopted. The direct and secondary employment effects associated with the spending of both TDY expenditures (for lodging and meals) and for procurements are expressed in a standard manner, i.e., for each additional million dollars of expenditures.

Regarding TDY expenditures, it is assumed that prevailing Federal Government per diem rates apply ($102 per day in the El Paso area). Of this per diem amount, two thirds ($68) is allocated to lodging with the remaining $34 for meals. One million dollars of expenditure is the equivalent of about 9,800 TDY days or almost 2,000 persons, each having a stay with a duration of 5 days. A withdrawal from the local economy of $1 million for such TDY expenses could create a reduction of about 22 full-time secondary jobs, 15 of which would be in the hotel and food and beverage sectors of the local economy.

If lodging expenses at contract quarters are paid for directly by the Army, then expenditures by personnel are for meals only. The withdrawal from the food and beverage sectors of the local economy of $1 million for such TDY expenses would reduce secondary employment by about 22 full-time jobs, 17 of which would be in the food and beverage sectors of the local economy.

In the case of the procurement of goods and services required to support training activities, expenditures are made for a variety of items. Based on information contained in an Army analysis of the economic effects associated with Roving Sands exercises, it is possible to estimate the employment effects resulting from the spending of $1 million on goods and services in the local economy that support such activities. The major items procured include hotel rooms (27 percent of total expenditures) and van rentals (23 percent). Other items, such as cellular phones, diesel fuel, temporary office trailers, copiers, business connection fees, and water service, represent smaller shares of the total expenditures. These purchases are made from the following economic sectors: hotel, wholesale trade, business services, and miscellaneous services. The withdrawal from the local economy of $1 million dollars for the purchase of goods and services required to successfully conduct training activities, would reduce secondary employment by about 21 full-time jobs, 14 of which would be directly in the four mentioned sectors of the local economy.

Utilizing the programmatic approach presented above, the employment effects associated with exercises can be estimated. Using as an example, an exercise involving 10,000 personnel for a duration of 2 weeks and assuming that procurements made by the installation in the local economy in support of the exercise have a value of $2 million, there would be a total of 43 jobs generated in the local economy. This expenditure includes the provision of contract quarters for personnel. There would be, in addition, TDY expenditures by the personnel participating in the exercise. Assuming that lodgings in the private sector are procured through contracting, expenditures would be for meals. With 10,000 persons each remaining for 10 days, expenditures would amount to about $3.4 million. This level of spending would support 75 full-time jobs, 57 of which would be in the food and beverage sectors of the local economy over the duration of the training activity.

Construction of facilities also generates employment (both direct in the construction sector of the economy and secondary in sectors supporting the construction industry). It is estimated that the expenditure of $1 million supports 15 jobs in the local economy (8 of which would be in the construction industry).

Under Alternative 5, the withdrawal of McGregor Range would not be renewed and the land would return to the public domain. The lands owned in-fee by the Army would be used for exchange of public lands in TAs 8 and 32. The area removed from military use would return to the direct control of the BLM. The Army would transfer its water rights to the BLM. Although it is assumed that grazing management would remain as specified in the RMPA, it is possible that this administrative change would be accompanied by changes in the manner in which the grazing authorizations are conducted. The additional land in the Tularosa Basin for potential grazing activities would have negligible effect on the regional economy.

No measurable impacts would occur to mineral and energy resources. The exploration program for geothermal resources currently underway would likely continue.

4.10.6 Alternative 6

Potential impacts associated with implementation of Alternative 6 would not differ from those described for the previous alternatives. However, this alternative requires congressional action for implementation. Because the precise nature and extent of the congressional action cannot be determined at this time, detailed socioeconomic analysis of this alternative is deferred at this time until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.10.7 Cumulative Impacts

Only in the case of Alternative 5 (No Action Alternative) would there be noticeable impacts to socioeconomic resources. Were these impacts to materialize, they are of minor importance when compared to the overall effects that the presence and operation of Fort Bliss have on the local and regional economies. Further, when compared to the size and magnitude of the three-county economy, any such impacts would not be noticeable.

4.10.8 Mitigation

In the absence of significant impacts to socioeconomic resources, mitigation measures to offset any adverse impacts are not required.

4.10.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of socioeconomic resources would occur.

Environmental Justice

4.11

4.11 ENVIRONMENTAL JUSTICE

For resource areas identifying potentially adverse impacts in Chapter 4, an analysis was performed to identify whether there would be disproportionately high and adverse effects on minority populations and low-income populations (see Section 3.11.1).

In addition, targeted outreach to minority and low-income groups and organizations was conducted as part of the LEIS process to expand participation of potentially affected populations.

In accordance with *EO 12898*, Section 3.11 addresses the existing locations of minority populations and low-income populations living in the three counties affected by the proposed alternatives. The LEIS public participation process was expanded to include identification of organizations representing and serving members of minority and low-income populations. Scoping letters were sent to approximately 75 organizations and individuals identified through this process. In addition, scoping letters in English and Spanish were sent to all recipients.

4.11.1 Alternative 1

As described in Section 2.1.1, military activities could vary from the same as currently conducted to an expanded range of capabilities and intensified use. Noise from expanded aviation and training activities has been assessed in Section 4.12. Assuming the same relative combination of aircraft, operations on North and South McGregor could be expanded by a factor of 6.3 and 7.9, respectively, and still not exceed L_{dnmr} 55. Other activities such as the proposed expansion of the GAF activities at HAFB and the associated new air-to-ground training range; the potential development of a helicopter training range; and the designation of additional controlled access FTX sites would either increase noise levels solely within the training ranges and restricted airspace boundaries, or would be located within areas where capacity still exists to increase activity levels without exceeding noise thresholds. Therefore, if elevated noise levels remain within the training ranges and restricted areas, there would be no significant adverse noise effects and no potential for disproportionately high and adverse noise effects on minority or low-income populations.

Alternative 1 would not cause environmental health or safety risks that would disproportionately affect children.

4.11.2 Alternative 2

Under Alternative 2, aircraft-related noise would be the same as under Alternative 1, with some increased potential for noise impacts due to increased recreation access on public lands. The extent of recreation activities is not currently known. As under Alternative 1, if elevated noise levels remain within the training ranges and restricted areas, noise level increases would occur, but there would be no significant adverse noise effects and no potential for disproportionately high and adverse noise effects on minority or low-income populations.

Increased ground access to TCPs, if identified on the returned lands, could make it easier for Native Americans to practice certain traditions.

Alternative 2 would not cause environmental health or safety risks that would disproportionately affect children.

4.11.3 Alternative 3

Under Alternative 3, elevated noise levels on Otero Mesa would not occur. Missile firings would become more directionally constrained, reducing noise dispersion, and noise from ground training would be reduced. Depending upon the specific location, noise would be similar to or less than Alternative 1. As under Alternative 2, if noise levels remain within the training ranges and restricted areas, noise level increases would occur, but there would be no significant adverse noise effects and no potential for disproportionately high and adverse noise effects on minority or low-income populations.

Increased ground access to TCPs, if identified on the returned lands, could make it easier for Native Americans to practice certain traditions.

Alternative 3 would not cause environmental health or safety risks that would disproportionately affect children.

4.11.4 Alternative 4

Under Alternative 4, depending upon the specific location, noise would be similar to or less than Alternative 1. As under Alternative 3, if elevated noise levels from military training activities remain within the training ranges and restricted areas, increases would occur, but there would be no significant adverse noise effects and no potential for disproportionately high and adverse noise effects on minority or low-income populations.

Increased ground access to TCPs, if identified on the returned lands, could make it easier for Native Americans to practice certain traditions.

Alternative 4 would not cause environmental health or safety risks that would disproportionately affect children.

4.11.5 Alternative 5 – No Action

Under Alternative 5, aircraft noise would be similar to or less than current levels. Noise associated with resource management and nonmilitary activities (i.e., increased public access, recreation, and grazing) would not be expected to result in significant noise effects. Intensive development such as extraction of mineral resources, would be expected to undergo individual assessment of noise levels at the time the proposal is submitted. There would be no disproportionately high and adverse noise effects on minority or low-income populations.

Increased ground access to TCPs, if identified on the returned lands, could make it easier for Native Americans to practice certain traditions.

If lands owned in-fee by the Army were exchanged for facilities in TAs 8 and 32, Fort Bliss would have a reduced capability to support its current air defense mission, and many installation facilities located on McGregor Range would have to be relocated. The loss of these facilities would result in the loss of several activities at Fort Bliss, and would result in a potential loss of military, civilian, and secondary jobs in the local economy, as well as, potential reductions in TDY personnel and expenditures related to training exercises (Section 4.10.5). The magnitude of the potential job loss would not be considered significant, given the projected future job growth in the ROI of more than 114,000 jobs between 2000 and 2015. There would be no disproportionately high and adverse socioeconomic impacts on minority or low-income populations from the No Action Alternative.

Alternative 5 would not cause environmental health or safety risks that would disproportionately affect children.

4.11.6 Alternative 6

Under Alternative 6, the returned area would be the same as described for Alternative 3, but the land would be designated as a NCA. Military uses would be the same as those described for Alternatives 3, 4, or 5, depending upon the extent of the defined returned area. Some shifting of range activities could occur that could modify patterns and sources of noise. However, this alternative requires congressional action for implementation. Because the precise nature and extent of the congressional action cannot be determined at this time, detailed environmental justice analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.11.7 Cumulative Impacts

There would be no disproportionately high and adverse health or environmental effects on minority or low-income populations from cumulative effects of the project alternatives.

4.11.8 Mitigation

No mitigations are recommended for environmental justice.

4.11.9 Irreversible and Irretrievable Commitment of Resources

No irreversible and irretrievable commitment of resources would occur.

Noise

4.12

4.12 NOISE

The noise analysis considers A-weighted and C-weighted noise resulting from military operations, transportation and construction activities, aviation, and the impulsive noise from the use of high explosives. Additional specific information on noise and its assessment methods was presented in Appendix F.

4.12.1 Alternative 1

Under Alternative 1, potential military activities on McGregor Range would provide continued support to overall mission requirements at Fort Bliss. These activities could range from a continuation of activities at their current level (maintenance of the *status quo*) to an increase in the level of use and possibly the introduction of varied new activities (see Section 2.1.1, *Military Activities on Withdrawn Lands*).

Current missions that would continue include: missile firings, fixed- and rotary-wing aviation flight and air-to-ground training, major joint combined forces exercises, laser operations, and small arms training. Potentially expanded or new activities include: expanded missile firings from new sites, additional fixed- and rotary-wing aviation activity which would expand air-to-ground training, construction of new roads and facilities to support training, and increased support for brigade-size Heavy Division training exercises.

If mission activities continue at current levels, those with the potential to create some noise involve ongoing activities in the training areas and continued missile firings. However, these specific activities are sporadic, highly transient, and of relatively short duration. Therefore, aviation-related noise on McGregor Range is considered to remain the dominant noise source influencing the acoustic environment. At current activity levels, noise resulting from aircraft operations results in a uniformly distributed noise level of L_{dnmr} 43 and 40 on north and south McGregor Range, respectively, and L_{dnmr} 44 on the two areas combined (Lucas and Calamia, 1994). Noise levels resulting at specific locations throughout the McGregor Range area were shown in Table 3.12-3, and ranged from L_{dnmr} 35 to L_{dnmr} 52. All of these noise levels remain within the confines of the restricted airspace. Furthermore, all noise levels are well below the Noise Zone II threshold (L_{dnmr} 65).

Although detailed operational data on potentially expanded aviation activities are not available, it is still possible to assess the potential capacity of specific airspace elements to accommodate increased operations while still remaining at or below a given noise threshold. If aviation activities are assumed to continue using the same relative combination of aircraft, it is possible to mathematically scale the number of current operations producing a known noise level to an increased noise level. This scaling provides a multiplier that can be used to assess the capacity of the airspace to support an expanded level of operations. Application of this process to the restricted airspace over McGregor Range indicates that operations could be expanded by a factor of 6.3 and 7.9 on RA5103B/C and RA5103A/D, respectively, and still not exceed a noise level of L_{dnmr} 55.

If a new air-to-ground training range is constructed on Otero Mesa on McGregor Range, localized noise increases would occur in the immediate vicinity of the air-to-ground training range. Noise levels directly over the targets would reach L_{dnmr} 80. However, at other locations on McGregor Range, away from the air-to-ground range, noise would be significantly less (USAF, 1998). Since this noise is localized on a training range, and does not extend past the boundaries of the restricted airspace, no land use incompatibilities would result. Therefore, this elevated noise is not considered to be significant.

Another potential use would develop a helicopter training range. To assess this, a hypothetical 12.4- by 12.4-mile geographic area was described for use by the MR_NMAP noise model. The Kiowa Warrior

(OH-53D) and Longbow (Apache) (AH-64D) were modeled in this airspace. Each type of aircraft flew 600 annual sorties, with one-half being day sorties and one-half being night. The resultant uniformly distributed noise level was L_{dnmr} 49. If the same capacity assessment described above were performed for this scenario, the total 1,200 annual sorties modeled could be increased by a factor of approximately 4, and still not exceed L_{dnmr} 55.

Other expanded uses of McGregor Range would include the designation of additional controlled access FTX. However, the noise associated with these operations would remain dispersed and transitory. Noise associated with these sources would be compatible with existing land uses (weapons range), and no elevated noise levels would be expected to occur outside of McGregor Range boundaries.

Potential increases in unit training, which could include developing a Heavy Division and National Guard training center, would also increase noise levels. However, these noise levels would be transient, dispersed, and would only occur during the period of each individual unit's training. Noise sources would be localized within TA 8 on McGregor Range, which is already used for this type of training, and elevated noise levels would not be expected to occur beyond McGregor Range boundaries.

Some facility construction and demolition would also be expected to occur under this alternative. However, noise associated with these activities would be localized, temporary in nature, and of relatively short duration. Operation of heavy vehicles around construction and/or demolition sites would probably be the greatest noise source, and this would not be significant.

Nonmilitary uses of McGregor Range would continue to support multiple use objectives. Levels of nonmilitary use would be expected to remain at current levels, and would not create any significant noise impacts.

4.12.2 Alternative 2

Under Alternative 2, some of the extreme northern portions of McGregor Range would be proposed for return to public use. Although some ground areas would no longer be available for military use, the lateral boundaries of the restricted airspace are proposed to remain unchanged. Therefore, those aviation activities described in Section 4.12.1 would occur, and aircraft-related noise levels would be as described above. In general, military uses of the range would be as described for Alternative 1, with the exception of some constraints on Patriot missile firings due to some reduction in lands available for SDZs, and the need to discontinue dismounted training exercises in the Sacramento Mountains foothills. However, these alterations are not expected to significantly alter the regional acoustic environment.

Due to the projected ultimate return of some lands to BLM management, some nonmilitary land uses would be expected to change. In addition to grazing, the nonwithdrawn lands may reasonably be expected to provide the potential for increased recreation and provide opportunities for exploration and possible extraction of mineral resources. The extent of these potential activities is not sufficiently defined at this time to assess noise impacts that may result. BLM management policies could influence recreation-related noise. Possible noise resulting from any mining proposals (e.g., blasting, rock crushing, etc.) would be assessed by the proponent of the proposed mining operation at the time of proposal submission.

4.12.3 Alternative 3

Under Alternative 3, the lateral boundaries of the restricted airspace are not proposed to change. Therefore, in general, noise related to both fixed- and rotary-wing aircraft would remain generally as discussed in Section 4.12.1. However, some air defense test programs would have to be modified or

curtailed. Another notable exception involves the possible expanded air-to-ground training proposed to be conducted by the USAF operating from HAFB. Since Otero Mesa would be returned to public use under this alternative, the possibility of developing a new range in that location would no longer exist. Therefore, the elevated noise levels that would be localized in that area were the range to be sited there would not occur. Furthermore, since the land area potentially available to provide SDZs for missile firings becomes less and less available, these firings become more and more directionally constrained resulting in less dispersion of that noise.

With the reduced geographic area available for other possible ground training activities on McGregor Range, potential noise from these sources is either significantly reduced, or entirely eliminated. For example, training for some JTXs, and operations from some controlled access FTX sites would no longer be possible.

Anticipated nonmilitary activities on the lands returned to the public domain would be as described in Section 4.12.2. Potential noise sources would be associated with increased access, expanded recreational activities, and opportunities for mineral exploration and extraction.

4.12.4 Alternative 4

Under Alternative 4, additional lands in the northern portion of McGregor Range would be returned for public use. In general, while live firing of missiles could continue, the potential launch points would be limited and the possible trajectories of these weapons would be severely constrained. Noise from missile firings would continue to be random and of very short duration, but would be localized into fewer areas and would be more concentrated in limited firing corridors.

While the lateral boundaries of the restricted airspace are not forecast to change, some aviation training and air defense test programs will be modified, or completely curtailed. Aviation noise in general will remain as described in Section 4.12.1. However, some aspects of training that resulted in localized elevated noise levels would be changed. For example, the current Class C Bombing Range in the northern portion of McGregor Range would no longer be available, and aerial gunnery would be limited to a small portion of Tularosa Basin.

4.12.5 Alternative 5 – No Action

Under the No Action Alternative, the lateral boundaries of the restricted airspace are not forecast to change, and air-to-air training activities could continue to be conducted in this region. Under this alternative, aircraft noise would not be expected to exceed current levels (L_{dnmr} 40 to 44), and would probably be less, since some current aviation noise results from aircraft supporting other McGregor Range activities. All air-to-ground, ground-to-ground, and ground-to-air activities on McGregor Range would cease, thus eliminating noise from these sources. Nonmilitary activities would be based on future determined land uses.

4.12.6 Alternative 6

Alternative 6 would result in changes in designation for some special land use categories presently on McGregor Range. These differing land use designations could result in some shifting and alteration of range activities that could modify patterns and sources of noise. While this alternative requires congressional action for implementation, it is assumed that management practices associated with the NCA would be similar to those currently under the RMPA. Because the precise nature and extent of the congressional action cannot be determined at this time, detailed noise analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.12.7 Cumulative Impacts

No significantly adverse cumulative noise impacts would be expected to occur.

Under Alternatives 1, 2, 3, and 4, McGregor Range is an integral component of military activities conducted by Fort Bliss. As such, it comprises one element of a military complex consisting of Fort Bliss, Biggs AAF, and other training areas, such as the South Training Areas, the Doña Ana Range–North Training Areas, and WSMR. Some activities associated with activities on McGregor Range have the potential to result in noise impacts in these areas, as well.

At Biggs AAF, noise levels could increase either as a result of increased airlift support for expanded troop training or from direct mission support for expanded combat aviation training. However, none of these potential increases are expected to surpass the intensity of the surge of operations that would be associated with mobilization. The Noise Zone II and III areas associated with full mobilization operations do not impact current land uses, the potentially increased noise levels associated with expanded mission activity would not be considered significant.

Other mission activities include training in the training areas, aerial gunnery, air-to-ground training, and continued missile and artillery firing on other ranges. However, these activities remain sporadic, highly transient, and of relatively short duration. In general, aviation noise will continue to constitute the primary noise source in these areas. Although elevated noise levels do occur in some specific areas (e.g., directly at the target on air-to-ground ranges, in artillery impact areas, etc.) no excessive noise levels extend beyond range boundaries. Therefore, no incompatible land uses result.

4.12.8 Mitigation

Since no significantly adverse noise impacts are expected to occur, no mitigations are required.

4.12.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources would occur.

Safety

4.13

4.13 SAFETY

Safety issues considered include ground, flight, and explosive safety on McGregor Range. The elements of each alternative that have a potential to affect safety, are evaluated relative to the degree to which the activity increases or decreases safety risks to military personnel, the public, and property.

4.13.1 Alternative 1

As described in Section 2.1.1, military activities could vary from the same as currently conducted to an expanded range of capabilities and intensified use. Under Alternative 1, safety considerations associated with mission activities result from increased human presence, use of ordnance, live firing of missiles, and aircraft overflight. As discussed in Section 3.13, all training and firing exercises are conducted in accordance with detailed SOPs documented for each range used and each specific event conducted. Responsibilities for fire detection and suppression are clearly defined. SDZs associated with live firing events are evacuated prior to the event, and, if applicable, any remaining ordnance and explosive hazards are properly disposed after the event. All ordnance, including malfunctioned ordnance, is handled, stored, processed, and disposed in accordance with approved SOPs. In general, changes in the levels of use of specific ranges, or in the number of live firing events do not necessarily increase safety risks. Scheduling prevents incompatible range-use conflicts. In terms of risk management, each live fire event can be considered a discreet event. For each event, ground, fire, and explosive safety risks are managed by conducting the operation in accordance with established safety procedures. Therefore, if each event is so conducted, no single event poses any more risk than any other.

Possible upgrades and improvements on McGregor Range include upgrades to missile launch sites, and developing a law enforcement range complex and a multi-purpose small arms range. Upgrades at the missile launch and firing points would enhance safety for these operations. If developed, the law enforcement range would be located in the Meyer Range complex. These ranges currently support extensive small-arms training. Safety procedures governing these operations would remain in effect and be applicable for any new activities. There are no significantly increased risks associated with this expansion.

Additional controlled access FTX sites may also be established under this alternative. Selected sites will be free of any ordnance or explosive hazards.

Two initiatives resulting in increased aviation activity may also occur under this alternative. A comprehensive helicopter training complex may be developed on McGregor Range, and the USAF plan to develop a new air-to-ground tactical target complex on McGregor Range.

An attack helicopter gunnery range could be developed in the southern area of the range. All training areas developed would incorporate safety and buffer areas to accommodate whatever ordnance would be used. Adequate land area and restricted airspace are available to satisfy these requirements. While this increase in rotary-wing flight would increase flight hours on the range, and create some increase in the risk of Class A mishaps, these increases are not considered significant.

As part of the USAF's support of GAF training at HAFB, the USAF selected the Otero Mesa on McGregor Range for a new air-to-ground range. The increased use of the airspace associated with McGregor Range will have some safety impacts. The construction and use of the range will have the potential to increase fire risk. Construction, use of, and maintenance on the range conducted by the USAF, coupled with Army training and live fire activities in the area, indicate the potential for a safety impact resulting from ordnance and explosive hazards. However, close coordination between all users and clean-up will minimize this potential risk.

Another potential initiative involves developing TBM targets for ADA training. However, if flight and safety data are applied to the target missile's proposed trajectory, and these are combined with the Patriot's range safety data, and the comprehensive SDZs remain within range boundaries, no significant safety issues should be associated with this operation. This potential proposal will require extensive safety analyses, and a separate environmental analysis, prior to implementation.

An initiative by WSMR with safety implications involves the proposal to launch an ATACMS from Fort Wingate, New Mexico, to impact on McGregor Range. WSMR currently conducts such launches that terminate in impact areas on WSMR. The safety implications of these activities were assessed in the *Theater Missile Defense Extended Test Range EIS* completed in November 1994. When the launch occurs, coordination is affected with the FAA, landowners potentially impacted are notified, and some residents are evacuated.

72

Under this alternative, it is possible that the ASP on McGregor Range could be extended. This project, with its supporting infrastructure, will enhance explosive safety.

Initiatives to explore and develop geothermal resources create little risk in themselves. However, the potential presence of ordnance and explosive hazards in areas must be considered, and any necessary clean-up must be completed prior to project initiation.

Other possible facility-related projects create no unusual construction requirements, and pose little risk. Some proposals, such as developing new water supplies and additional water storage capability, will enhance fire safety in remote areas.

Some developmental, restoration, or survey activities may create new ground disturbances, or rehabilitate already disturbed ground. Restorative measures should, to the maximum extent practicable, attempt to re-establish native species of vegetation. This will minimize the potential for the invasion of exotic, weedy species of vegetation that may have the potential to create or exacerbate fire risk. During restoration activities, in some cases it is likely that fuel-powered equipment and vehicles will be used. Operators of this equipment should be attentive to the risks associated with sparks, hot exhaust systems, and mufflers coming into contact with vegetation during periods of high fire risk. In range areas that support concentrated low-altitude aviation activity, natural resource management actions dealing with vegetation management or restoration should consider potential bird-aircraft strike risks. To the maximum extent practicable in those specific areas, actions that would produce habitat particularly attractive to birds should be minimized from a safety viewpoint. Anything that would discourage birds from congregating in these specific areas would enhance flight safety, and minimize risk of bird mortality.

There are other elements of the environmental resource management programs that introduce the potential for increased joint-use of portions of the range areas. Increased access requires increased surveillance and control, to ensure clearing of areas that may be involved in military range use. Personnel conducting ground-truthing or surveys under the these programs must be sensitive to the possible presence of ordnance and explosive hazards. However, if proper procedures are established, ground and explosive safety risks will remain low.

4.13.2 Alternative 2

For Alternative 2, some of the northern portions of McGregor Range would be proposed for return to public use. All required ordnance and explosive hazards removal must be accomplished prior to return of the lands to the public domain. Safety considerations pertaining to activities that may be conducted on these lands would be managed by BLM, and any processes or procedures associated with use of these lands would be documented in the area's management plan.

Although the loss of some land area would necessitate some constraints on Patriot missile firings due to reduction in land available for SDZs, all other mission activities and safety issues associated with them remain as identified and discussed in Section 4.13.1.

Resource management activities, and the safety issues associated with them would remain as described in Section 4.13.1.

4.13.3 Alternative 3

Under Alternative 3, additional lands along the northern and eastern borders of the current range would cease to be withdrawn for military use, and would be proposed for return to public use. All required ordnance removal must be accomplished prior to return of the lands to the public domain. Safety considerations pertaining to activities that may be conducted on these lands would be managed by BLM, and any processes or procedures associated with use of these lands would be documented in the area's management plan.

In general, the majority of Fort Bliss' missions could still be supported under this alternative. However, as the geographic area of the withdrawn lands constituting McGregor Range decreases, some mission aspects are lost. For example, training for some JTXs and operations from some controlled access FTX sites would no longer be possible. Additionally, land areas available for SDZs associated with live firings are also reduced. Nevertheless, since the majority of the overall missions at Fort Bliss would still occur, the safety issues associated with them remain as discussed in Section 4.13.1. Otero Mesa would be returned to public use under this alternative; therefore, the USAF's proposed new air-to-ground range could no longer be located there. The safety issues associated with all other mission activities remain as discussed in Section 4.13.1.

Resource management activities, and the safety issues associated with them would remain as described in Section 4.13.1.

4.13.4 Alternative 4

Under this alternative, additional lands (in addition to those lands proposed under Alternatives 2 and 3) in the northern portion of McGregor Range would be returned for public use. All required ordnance and explosive hazards removal must be accomplished prior to return of the lands to the public domain. Safety considerations pertaining to activities that may be conducted on these lands would be managed by BLM, and any processes or procedures associated with use of these lands would be documented in the area's management plan.

In general, while live firing of ADA missiles would continue, the potential launch points would be limited and the land area available to support SDZs would severely constrain operations. Flight risks would be somewhat reduced inasmuch as the current Class C air-to-ground range in the northern portion of McGregor Range would no longer be available, and other aerial gunnery would be limited to a small portion of Tularosa Basin. Safety issues associated with all other mission activities remain as discussed in Section 4.13.1.

Resource management activities, and the safety issues associated with them would remain as described in Section 4.13.1.

4.13.5 Alternative 5 – No Action

Under the No Action Alternative, the withdrawal of the lands currently comprising McGregor Range would not be renewed, and all lands except the TAs 8 and 32 for which Army fee-owned land would be exchanged would revert to the public domain. All required clean-up must be accomplished prior to return of the lands to the public domain. Safety considerations pertaining to activities that may be conducted on these lands would be managed by BLM, and any processes or procedures associated with use of these lands would be documented in the area's management plan.

The lateral boundaries of the restricted airspace are not forecast to change under this alternative, and air-to-air training activities could continue to be conducted in this region. Under this alternative, aircraft flight risks would not be expected to change, and would probably be less since some current aviation flight risks result from aircraft supporting other McGregor Range activities. All air-to-ground, ground-to-ground, and ground-to-air activities on the range would cease, thus eliminating risk from these sources. Nonmilitary activities would be based on future land uses.

4.13.6 Alternative 6

Alternative 6 would result in changes in designation for some special land use categories presently on McGregor Range. These differing land use designations could result in some shifting and alteration of range activities that could influence safety risks. It is assumed that land management actions associated with the NCA would be similar to those under the current RMPA. However, because the precise nature and extent of the congressional action cannot be determined at this time, detailed safety analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.13.7 Cumulative Impacts

Overall, no significant adverse cumulative safety impacts would be expected to occur. Nonmilitary uses of McGregor Range withdrawn lands would continue under Alternatives 1, 2, 3, 4, and 6. Levels of nonmilitary use would be expected to vary little from present, creating little or no safety risks beyond those associated with the current potential for mineral and energy development.

Under Alternatives 1, 2, 3, and 4, McGregor Range is an integral component of military activities conducted by Fort Bliss. As such, it comprises one element of a military complex consisting of Fort Bliss, Biggs AAF, and other training areas such as the South Training Areas, the Doña Ana Range–North Training Areas, and WSMR. Some interrelated activities in these areas have the potential to result in safety impacts.

No representative activities proposed to be accomplished in the Fort Bliss Main Cantonment Area or on Biggs AAF indicate any potential for creating significant cumulative safety impacts. Potential cumulative effects could arise from other military activities in the region.

Many activities conducted on WSMR are very similar to those conducted on the Fort Bliss Training Complex (i.e., ordnance testing and development, missile live firings, etc.). When conducted, these activities occur over land and within restricted airspace that is controlled by WSMR. As with ordnance use on the Fort Bliss Training Complex, ordnance use on WSMR is governed by detailed safety procedures that apply similar criteria for developing safety and clear zones applicable to the ordnance or weapon being fired. These safety zones ensure that no person is exposed to risk at the firing or impact point, along the ground/air flight track, or trajectory of the weapon. Flight paths used, ensure that the ordnance will always be contained within the installation's borders. As previously discussed, each ordnance firing event is discreet. Therefore, if each is conducted in accordance with all prescribed safety

procedures, there is no cumulative safety risk. On those rare occasions when both WSMR and the Fort Bliss Training Complex are involved in the same test (e.g., live fire of the ATACMS), coordination between the two agencies ensures that there is no airspace or land-area conflict.

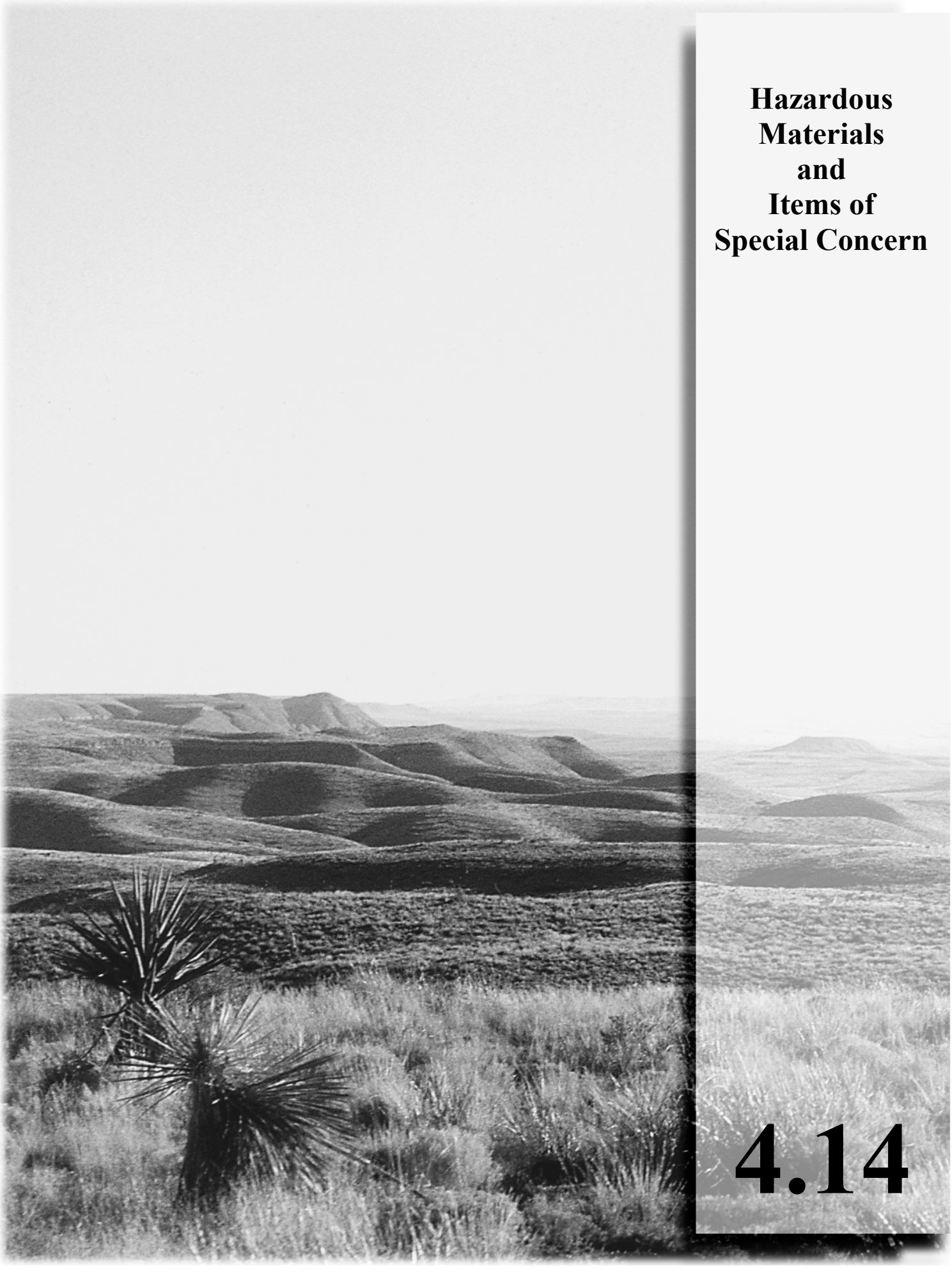
At HAFB, the recent termination of flight training for the Taiwanese Air Force has significantly reduced the number of T-38 aircraft sorties using McGregor Range airspace and the Class C bomb circle located in its northern portion. This action reduces flight risk in the area, and reduces the number of training bombs dropped on the Class C range. Overall, fire and flight safety are improved, since fewer aircraft will be using the airspace, and fewer training bombs will be dropped resulting in less exposure of vegetation to the high heat generated by the spotting charges in the bombs. Additionally, since fewer training bombs will be dropped, there will be less potential for spotting charge malfunction, thus improving explosive safety. However, a second activity associated with HAFB involves a USAF tactical target complex to be constructed on McGregor Range on Otero Mesa, which will partially offset the cumulative effects of the decline in T-38 flights. Although safety statistics indicate that the Tornado is a very safe aircraft, and only training bombs will be dropped, the increased use of the regional restricted airspace will have some safety impacts. Flight safety risks will increase slightly (USAF, 1998). The construction and use of the range will have the potential to increase fire risk. Use of the range may also slightly increase the risk of the presence of ordnance and explosive hazards in the range's impact area. However, regular ordnance removal and clean-up by qualified personnel will reduce these risks.

4.13.8 Mitigation

Since no significantly adverse safety impacts are expected to occur, no mitigations are recommended.

4.13.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources would occur.



Hazardous Materials and Items of Special Concern

4.14

4.14 HAZARDOUS MATERIALS AND ITEMS OF SPECIAL CONCERN

The impacts resulting from the alternatives for renewal of the military land withdrawal are discussed in this section. For each alternative, potential impacts are presented as related to: hazardous chemicals, hazardous waste, medical and biohazardous waste, asbestos, lead, pesticides, low-level radioactive waste, the IRP**,** petroleum storage tanks, and pollution prevention.

4.14.1 Alternative 1

As described in Section 2.1.1, *Military Activities on Withdrawn Lands*, military activities could vary from the same as currently conducted, to an expanded range of capabilities and intensified use. Mission activities take place throughout McGregor Range, and include training through field exercises.

The most potential for impacts from hazardous materials and items of special concern on McGregor Range are lubricants and fuels in vehicles, equipment, and aircraft associated with maintenance and field exercises; chemicals used in routine facility operations and maintenance; and chemicals used during training area maintenance. The potential impacts to the environment from hazardous materials and items of special concern, resulting from Alternative 1, are discussed in this section.

4.14.1.1 Hazardous Chemicals

Storage and use of hazardous chemicals would continue on McGregor Range during training exercises, and facility and training area maintenance. The amounts of hazardous chemicals used may increase due to an increase in the intensity of future training activities that take advantage of currently unused installation capabilities. The amount of ordnance expended on McGregor Range may increase if the development of the existing Cane Cholla and Hellfire Training Area into a state-of-the-art Helicopter Training Complex in southern McGregor Range, and the Heavy Division Training Center that supports additional brigade-size training exercises, were to occur. However, the types of ordnance would remain essentially the same as described in Section 3.14.1.1. The types of hazardous chemicals used would remain approximately the same.

4.14.1.2 Hazardous Wastes

Hazardous wastes may continue to be generated on McGregor Range during the use of some hazardous chemicals. The amount of hazardous waste generated could increase because of the increase in the use of hazardous chemicals associated with the potential training activities described above. The types of hazardous waste would remain essentially the same as described in Section 3.14. Collection, storage, and disposal procedures for other hazardous wastes would be the same as described in Section 3.14.

4.14.1.3 Medical and Biohazardous Wastes

Medical and biohazardous wastes would continue to be generated under this alternative. The types of waste would remain essentially the same, but the amount may increase slightly due to medical support of the potential training activity described above. The increase would not be significant, and waste collection, storage, and disposal procedures would be the same as those described in Section 3.14.1.2. The slight increase in waste generation would not result in adverse impacts.

4.14.1.4 Low-level Radioactive Waste

Low-level radioactive waste is generated from the disposal of items that contain low-level radioactive sources (e.g., medical equipment and various pieces of equipment containing small amounts of

radioactive materials used in nuclear, biological, and chemical [NBC] training). The amount generated may increase because of the medical support of the potential training activity described above. Waste collection, storage, and disposal processes would be the same as those described in Section 3.14. The increase in waste would not result in adverse environmental impacts.

4.14.1.5 Asbestos

Asbestos abatement conducted prior to facility renovation or demolition on McGregor Range could continue to generate asbestos wastes. ACM disposal procedures would be the same as those described in Section 3.14.2.2. Asbestos waste materials would continue to be disposed of in the Fort Bliss sanitary waste landfill. Since total planned landfill capacity is adequate, there would be no adverse impacts.

4.14.1.6 Lead-based Paint

Lead wastes generated from demolition of facilities on McGregor Range would continue to be characterized to determine if it is a hazardous waste. Disposal procedures for hazardous lead wastes would be the same as described in Section 3.14.2.3. The generation of lead wastes would result in no adverse impacts because the wastes would be managed in accordance with applicable standards and regulations.

4.14.1.7 Pesticides

There may be an increase in the amount of pesticides that are applied if the number of facilities increases due to initiatives to more fully use the Fort Bliss Training Complex. The types of pesticides would remain approximately the same as those currently used. The applicators would continue to be periodically recertified, and the program would be conducted in accordance with the *Pesticide Management Plan* (U.S. Army, 1997q). The increased management and use of pesticides would not result in adverse environmental impacts.

4.14.1.8 Petroleum Storage Tanks

Both USTs and ASTs would continue to be used on McGregor Range. Additional tanks could be installed at new training locations if required. These new tanks would meet environmental regulations and fire protection codes in affect at the time of construction. The four-phase system to upgrade the underground storage tanks to meet federal and state requirements would continue to be implemented. The environmental impact from petroleum storage tanks would be insignificant.

4.14.1.9 IRP

Current IRP activities and public interaction would continue, as described in Section 3.14.3.1. Restoration of previously identified sites on McGregor Range would continue and any new sites that are identified would be included in the program. Contaminated wastes removed from IRP sites would result in long-term adverse impacts. However, the overall impact of the program would be beneficial, since contaminated sites would be restored.

4.14.1.10 Pollution Prevention

Pollution prevention initiatives to reduce the amount and types of hazardous chemicals materials used, and the amount and types of hazardous waste that are generated from the use of these chemicals, on McGregor Range would continue to be identified and implemented. The IPPP and the *Hazardous Substance Management System* (U.S. Army, 1996n), described in Section 3.14.3.2, would be

implemented to address pollution prevention and waste minimization issues, and to provide an automated tracking system for hazardous materials. The environmental impacts from the pollution prevention program would be beneficial.

There may be an increase in the use of petroleum products by military training and construction vehicles, and equipment participating in or supporting the potential training activity and installation initiatives described in Section 2.1.1. The potential for hazardous chemical spills during servicing of the vehicles and equipment always exists. However, existing spill prevention and control plans would be adequate to deal with any incidents. Any adverse environmental impacts from facility construction would be short-term.

Asbestos and lead wastes may be generated during facility demolition on McGregor Range. The removal and disposal of these wastes would be the same as those described in Section 3.14. The generation of asbestos and hazardous lead wastes would have adverse environmental impacts.

Natural resource management practices may involve the use of hazardous chemicals such as pesticides on McGregor Range. Measures to preclude impacts from applicable methods of environmental conservation are described throughout this section.

When ROWs or leases on McGregor Range are proposed by third parties, a screening process is required to determine if:

- no hazardous material storage, release into the environment or structures, or disposal will occur on the subject property;
- the release of hazardous material into the environment is not considered probable; or
- the existence, or potential for release, of hazardous materials into the environment or structures exists.

If there was a release, or a potential for release, the proponent must carry out investigation procedures. If there was not a release, or the potential for a release, there would be no adverse impact.

4.14.2 Alternative 2

4.14.2.1 Hazardous Chemicals

There would be a slight decrease in the use of hazardous chemicals because of the curtailment or reduction in current mission activities such as special forces operations training in the foothills environment. The use of hazardous chemicals during training at Tularosa Basin and Otero Mesa would continue at approximately the same rate as described for Alternative 1.

4.14.2.2 Hazardous Wastes

There would be a slight decrease in hazardous waste generation because some training activities would be reduced or curtailed, resulting in a slight decrease in the amount of hazardous chemicals that would be used. Hazardous waste disposal processes would be the same as those described in Section 3.14.1.2. The decreased generation of hazardous wastes would have slight, long-term beneficial environmental impacts.

Ordnance removal from the Sacramento Mountains foothills portion of McGregor Range could generate hazardous wastes in the form of ordnance and explosives hazards, toxic, or other hazardous chemicals.

The amount of hazardous waste would depend on results of studies to determine the degree of contamination, and decisions regarding what ordnance removal and clean-up activities are economically feasible.

4.14.2.3 Medical and Biohazardous Wastes

Under this alternative, the environmental impacts from activities that generate medical and biohazardous wastes would be the same as those described for Alternative 1.

4.14.2.4 Low-level Radioactive Waste

Under this alternative, the environmental impacts from the use of low-level radioactive commodities would be the same as those described for Alternative 1.

4.14.2.5 Asbestos

Since there are no mission facilities in the Sacramento Mountains foothills portion of McGregor Range, environmental impacts from the generation of ACM wastes would be the same as those described for Alternative 1.

4.14.2.6 Lead-based Paint

Because there are no mission facilities in the Sacramento Mountains foothills portion of McGregor Range, environmental impacts from the generation of hazardous lead wastes would be essentially the same as those described for Alternative 1.

4.14.2.7 Pesticides

Under this alternative, the environmental impacts from the use of pesticides would be the same as those described for Alternative 1.

4.14.2.8 Petroleum Storage Tanks

Under this alternative, the environmental impacts from the use of petroleum storage tanks would be the same as those described for Alternative 1.

4.14.2.9 IRP

Under this alternative, the environmental impacts from the IRP would be the same as those described for Alternative 1.

4.14.2.10 Pollution Prevention

Under this alternative, the environmental impacts from the pollution prevention program would be the same as those described for Alternative 1.

4.14.3 Alternative 3

4.14.3.1 Hazardous Chemicals

Under this alternative, the adverse environmental impacts from the use of hazardous chemicals may be reduced, because of the potential reduction in the use of hazardous chemicals due to reduced and/or

curtailed training activities. There would be fewer controlled access FTX sites available for training, training for special forces would be limited because of the loss of the Sacramento Mountains foothills and Otero Mesa training areas, and Roving Sands exercises would be severely limited. There would be a slight decrease in the amount of hazardous chemicals used by the Army in the lands returned to the public domain.

4.14.3.2 Hazardous Wastes

Under this alternative, the adverse environmental impacts from hazardous wastes during training would be reduced because of the reduction in the use of hazardous chemicals and subsequent reduction in the generation of hazardous wastes. There could be long-range beneficial impacts from reduced hazardous waste generation.

The adverse impacts from ordnance removal and clean-up of the Sacramento Mountains foothills and Otero Mesa portions of McGregor Range would be similar to those described under Alternative 2. However, the amount of waste generated could be larger, since Otero Mesa contains impact areas for weapons testing on McGregor Range and no cleanup activities have been carried out in these areas.

4.14.3.3 Medical and Biohazardous Wastes

Under this alternative, the environmental impacts from medical and biohazardous wastes would be similar to those described for Alternative 1, reduced only by the number of personnel supported by WBAMC.

4.14.3.4 Low-level Radioactive Waste

Under this alternative, the environmental impacts from the generation of low-level radioactive wastes would be similar to those described for Alternative 1, reduced only by the number of personnel supported by WBAMC and any reduction in NBC training.

4.14.3.5 Asbestos

There are no mission facilities in the Sacramento Mountains foothills and Otero Mesa portions of McGregor Range. Environmental impacts from the generation of ACM wastes would be essentially the same as those described for Alternative 1.

4.14.3.6 Lead-based Paint

Since there are no mission facilities in the Sacramento Mountains foothills and Otero Mesa portions of McGregor Range, environmental impacts from the generation of hazardous lead wastes would be essentially the same as those described for Alternative 1.

4.14.3.7 Pesticides

Under this alternative, the environmental impacts from use of pesticides would be the same as those described for Alternative 1.

4.14.3.8 Petroleum Storage Tanks

Under this alternative, the environmental impacts from use of petroleum storage tanks would be the same as those described for Alternative 1.

4.14.3.9 IRP

Under this alternative, the environmental impacts from the IRP would be the same as those described for Alternative 1.

4.14.3.10 Pollution Prevention

Under this alternative, the environmental impacts from the pollution prevention program would be the same as those described for Alternative 1.

4.14.4 Alternative 4

4.14.4.1 Hazardous Chemicals

The use of hazardous chemicals would be further reduced, from that described under Alternative 3, because the training scenarios that use hazardous chemicals would be curtailed or limited. For example, the capability to employ a TBM target would be lost, live fire training capability of other missiles would be significantly reduced, aerial gunnery by both fixed- and rotary-wing aircraft would be limited, and siting options for additional controlled access FTX sites would be extremely constrained within the remaining withdrawn area. The use of hazardous chemicals would be severely limited, and would occur during training on that portion of the Tularosa Basin south of New Mexico Highway 506 and on the Army fee-owned in-holdings within the returned area. There would be a decrease in the amount of hazardous chemicals used by the Army.

4.14.4.2 Hazardous Wastes

Under this alternative, the adverse environmental impacts from the generation of hazardous wastes would be further reduced from those described for Alternative 3. The reduction in the amount of hazardous waste generated would result from the curtailment and/or limitations on training activities and the subsequent reduction in the use of hazardous chemicals. Hazardous waste disposal procedures would remain the same as those described in Section 3.14.1.2. Long-term benefits from the reduction in the generation of hazardous wastes would be beneficial.

The adverse impacts from the ordnance removal and clean-up of land to be returned to the public are similar to those described for Alternative 3. Portions of the Tularosa Basin contain impact areas for weapons testing on McGregor Range, and these areas could be contaminated with debris from missile firings and ordnance and explosive hazards.

4.14.4.3 Medical and Biohazardous Wastes

Under this alternative, the environmental impacts from medical and biohazardous wastes would be essentially the same as those described for Alternative 1, reduced only by the number of personnel supported by WBAMC.

4.14.4.4 Low-level Radioactive Wastes

Under this alternative, the environmental impacts from the use of commodities containing low-level radioactive wastes would be similar to those described for Alternative 1, reduced only by the number of personnel supported by WBAMC and any reduction in NBC training.

4.14.4.5 Asbestos

An asbestos survey of mission facilities in the Tularosa Basin portion of McGregor Range, north of New Mexico Highway 506, would be required if the Secretary of the Interior, in consultation with the Secretary of the Army, decides to decontaminate the facilities. Asbestos abatement, if required, could generate asbestos wastes. ACM disposal procedures would be the same as those described in Section 3.14.2.2. The generation of ACM wastes would cause long-term adverse impacts.

4.14.4.6 Lead-based Paint

If it is decided to demolish mission facilities in the Tularosa Basin portion of McGregor Range north of New Mexico Highway 506, any lead waste generated during demolition would be characterized to determine if it is a hazardous waste. Disposal procedures for hazardous lead wastes would be the same as those described in Section 3.14.2.3. The generation of hazardous lead wastes would cause long-term adverse impacts.

4.14.4.7 Pesticides

Under this alternative, the environmental impacts from the use of pesticides would be essentially the same as those described for Alternative 1.

4.14.4.8 Petroleum Storage Tanks

If the Secretary of the Interior, in consultation with the Secretary of the Army, decides to decontaminate ASTs and/or USTs, hazardous petroleum wastes could be generated. Disposal of these wastes would be conducted using the procedures described in Section 3.14.2.7. The generation of hazardous petroleum wastes would cause adverse impacts.

4.14.4.9 IRP

Under this alternative, the environmental impacts from the IRP would be the same as those described for Alternative 1.

4.14.4.10 Pollution Prevention

Under this alternative, the environmental impacts from the pollution prevention program would be the same as those described for Alternative 1.

4.14.5 Alternative 5 – No Action

Under this alternative, military activities would be limited to areas within TAs 8 and 32. Nonmilitary activities on the returned land would include grazing management and potentially, minerals and energy development; both activities that could use hazardous materials. Such new activities would be governed by federal laws and agency policies covering hazardous material use and hazardous waste management.

4.14.5.1 Hazardous Chemicals

Under this alternative, the use of hazardous chemicals by the Army would be reduced substantially, due to the cessation of training on all areas except TAs 8 and 32 on McGregor Range. Hazardous chemicals could be used in these training areas on land obtained in exchange for fee-owned land. Hazardous chemical handling and storage procedures would remain as described in Section 3.14. There could be

long-range beneficial impacts from reduced use of hazardous chemicals by the Army in the lands returned to the public domain.

4.14.5.2 Hazardous Wastes

Under this alternative, the adverse environmental impacts from hazardous wastes generated from the use of hazardous chemicals would be substantially reduced. The hazardous waste resulting from activities conducted at McGregor Range Complex, Meyer Range, and the McGregor ASP would be disposed using the procedures described in Section 3.14.1.2 and would not cause significant adverse impact. Overall, there could be long-range beneficial environmental impacts.

The adverse environmental impacts from ordnance removal and clean-up of land to be returned to the public could be significantly greater than those described for Alternative 4, because all of the Tularosa Basin impact areas may contain debris from missile firings and ordnance and explosive hazards. The amount and composition of the hazards has not been determined, and no cleanup activities have been carried out in these areas.

4.14.5.3 Medical and Biohazardous Wastes

Under this alternative, the environmental impacts from medical and biohazardous wastes would be similar to those described for Alternative 1, reduced only by the number of personnel supported by WBAMC. Any adverse environmental impacts from the generation of medical and biohazardous wastes, attributable to activities on McGregor Range, would be substantially reduced because of the elimination of training on McGregor Range outside of TAs 8 and 32. The portions of Roving Sands conducted on McGregor Range would not be held, eliminating the need to collect, store, and dispose of these wastes, resulting in a long-range beneficial environmental impact.

4.14.5.4 Low-level Radioactive Waste

The adverse environmental impacts from the use of commodities containing low-level radioactive materials would be reduced by reductions in personnel supported by WBAMC, and any reduction in NBC training, because of the elimination of training activities on McGregor Range. A limited number of commodities could be used during training in TAs 8 and 32, but they would not cause a significant adverse impact. Disposal procedures would be the same as described in Section 3.14.2.6. The long-range environmental impacts would be beneficial.

4.14.5.5 Asbestos

Under this alternative, mission facilities scheduled for demolition would have to be surveyed for asbestos. Asbestos abatement prior to demolition of the facilities could result in large quantities of ACM wastes. Disposal of the wastes could be conducted using the procedures described in Section 3.14.2.2, or in an off-post, privately-owned and -operated asbestos disposal facility, depending on contractual arrangements. There would be adverse environmental impacts from asbestos wastes until the disposal efforts are completed. The long-range environmental impact would be beneficial, since the potential for exposure to hazardous asbestos would be eliminated.

4.14.5.6 Lead-based Paint

Lead wastes from the demolition of mission facilities on McGregor Range would be characterized to determine if they are hazardous. There could be an increase in the amount of lead waste generated, since the number of facilities involved would be much larger than under other alternatives. Lead waste disposal

procedures would be the same as those described in Section 3.14.2.3. There would be adverse environmental impacts from lead wastes until the disposal efforts are completed. The long-range environmental impact would be beneficial, since the potential for exposure to hazardous lead would be eliminated.

4.14.5.7 Pesticides

Under this alternative, the Army would retain essential infrastructure in TAs 8 and 32. The environmental impacts from the use of pesticides by the Army on McGregor Range would be the same as those described for Alternative 1, because most pesticide use occurs in and around the mission support facilities in TAs 8 and 32.

4.14.5.8 Petroleum Storage Tanks

If the Secretary of the Interior, in consultation with the Secretary of the Army, decides to decontaminate ASTs and/or USTs, hazardous petroleum wastes could be generated. Disposal of these wastes would be conducted using the procedures described in Section 3.14.2.7. The generation of hazardous petroleum wastes would cause adverse impacts.

4.14.5.9 IRP

Current IRP activities and public interaction would continue, as described in Section 3.14, until the range was returned to the public domain. IRP actions beyond that time would depend on consultations and agreements between the Army and the DOI. Restoration of previously identified sites on McGregor Range would continue, and any new sites that are identified would be included in the program. Contaminated wastes removed from IRP sites would result in long-term adverse impacts, but the overall impact of the program would be beneficial, because contaminated sites would be restored.

4.14.5.10 Pollution Prevention Program

Under this alternative, there would not be any facility construction on McGregor Range outside of TAs 8 and 32 and, therefore, no adverse environmental impacts related to construction would occur on lands returned to the public domain. There would be limited beneficial impacts, since the potential for leaks of hazardous chemicals during construction by the Army would not occur on returned lands.

There could be significant adverse impacts, because quantities of hazardous wastes such as asbestos-containing materials and lead, could be generated during demolition of mission facilities. Disposal procedures for these wastes would be the same as those described in Section 3.14.3.2. The adverse impacts would continue until all demolition and waste disposal was completed. The long-term environmental impacts would be beneficial.

4.14.6 Alternative 6

It is assumed that management practices on the NCA would be similar to the current practices under the RMPA. However, because the precise nature and extent of the congressional action cannot be determined at this time, detailed hazardous materials and items of special concern analysis of this alternative is deferred until the proposal is specified for this type of nonmilitary withdrawal by the DOI.

4.14.7 Cumulative Impacts

The cumulative impacts of activities at McGregor Range, resulting from the use of hazardous materials and items of special concern that might be anticipated on withdrawn land to occur under the five alternatives, were evaluated. Nonmilitary activities on withdrawn lands would not change under Alternatives 1, 2, 3, 4, or 6. The extent of mission activities and impacts would be highest under Alternative 1, in which the land area of the withdrawal would not change. Under Alternative 1, there were a number of activities identified that would use, contain, or produce hazardous materials and items of special interest, but the resulting impacts are expected to be insignificant, occurring on a short-term basis over a localized area. Because these impacts are insignificant, there are not expected to be any cumulative air quality impacts.

Under Alternatives 2, 3, 4, and 5, impacts resulting from the use of hazardous materials and items of special interest are expected to be similar to, or lower than, those of Alternative 1. Consequently, no cumulative effects would be expected if one of the other alternatives were implemented.

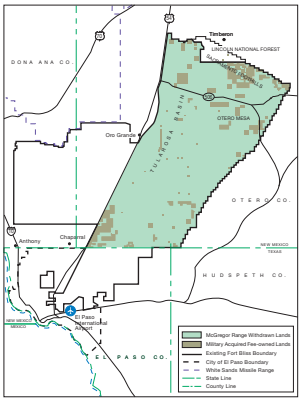
4.14.8 Mitigation

Hazardous chemicals and hazardous wastes are managed in accordance with applicable federal, state, local, and Army rules and regulations. Installation hazardous waste management plans and spill prevention and control plans provide additional mitigation of the impacts. The IPPP and the *Hazardous Substance Management System* will address pollution prevention and waste minimization issues. The use of hazardous chemicals and the generation of hazardous waste are expected to decrease, as pollution prevention initiatives are implemented. A beneficial impact will be attained and the adverse impacts will be further mitigated.

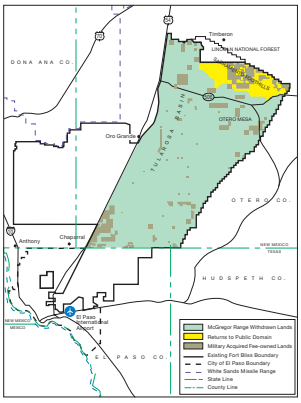
4.14.9 Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable commitment of resources would occur.

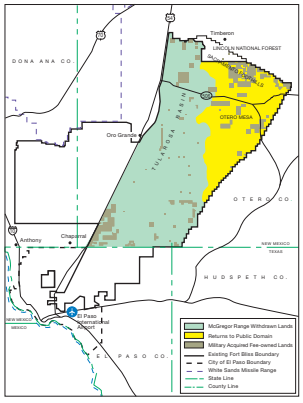
Alternative 1:
Current boundaries of McGregor Range remain the same.



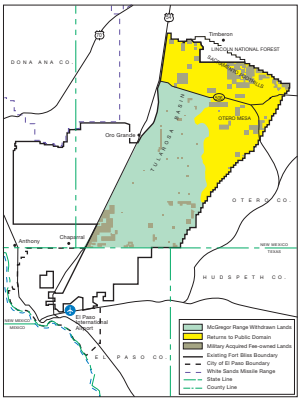
Alternative 2:
Withdraw Tularosa Basin and Otero Mesa portions of McGregor Range for continued military use. Sacramento foothills and Culp Canyon Wilderness Study Area return to public domain.



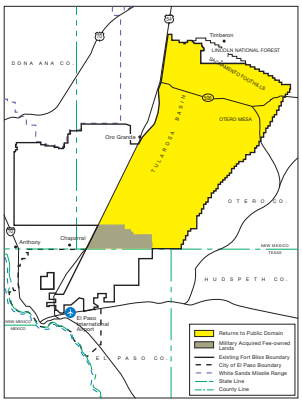
Alternative 3:
Withdraw Tularosa Basin portion of McGregor Range for continued military use.
Otero Mesa and Sacramento foothills return to public domain.



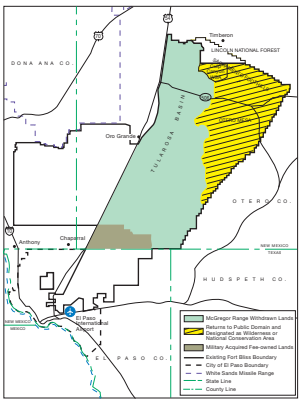
Alternative 4:
Tularosa Basin portion of McGregor Range south of NM Highway 506 withdrawn for continued military use. Otero Mesa, Sacramento foothills, and portion of Tularosa Basin north of NM Highway 506 return to public domain.

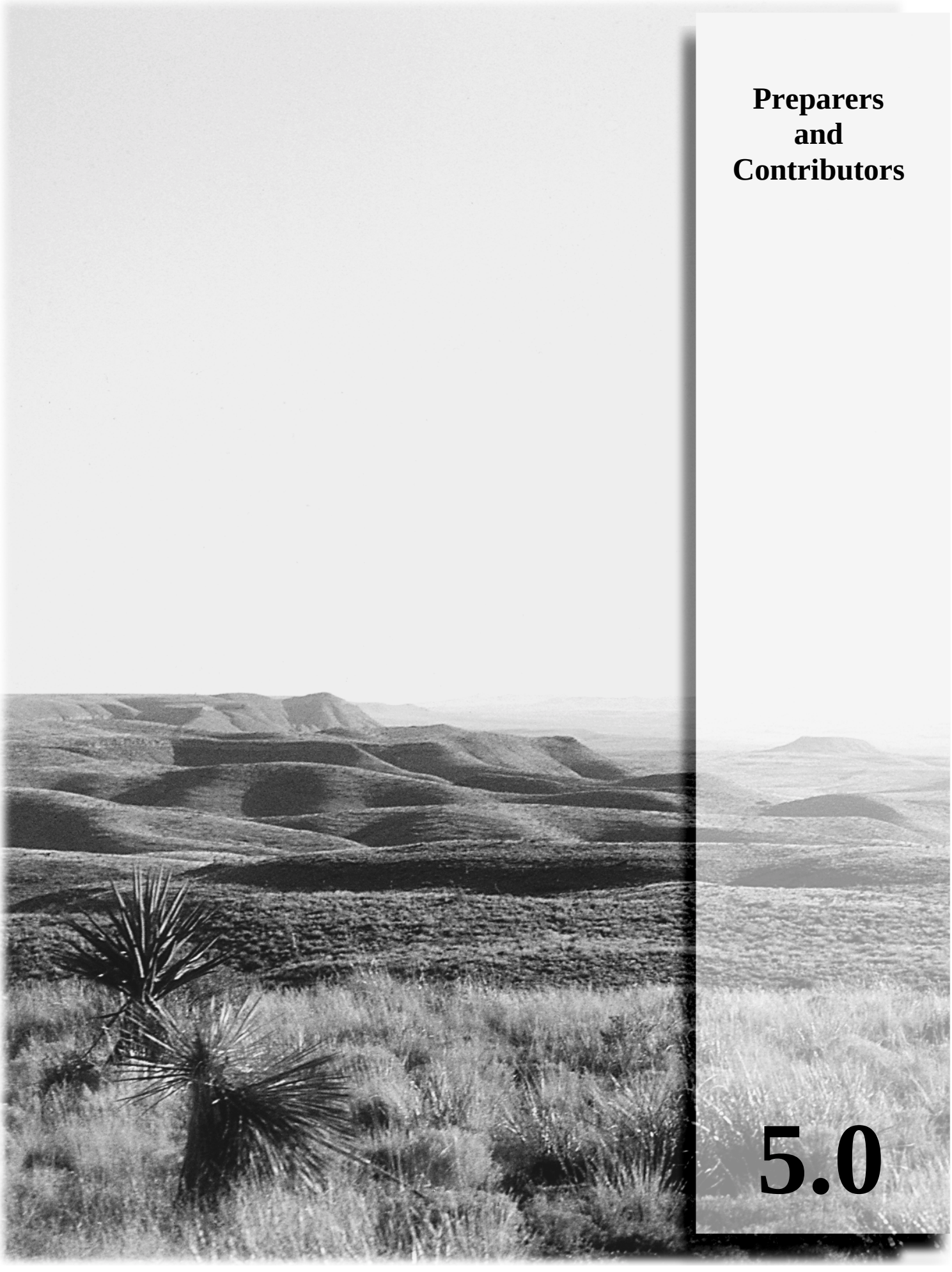


Alternative 5,
No Action:
No renewal of McGregor Range land withdrawal, returning entire range to public domain.



Alternative 6:
Congress could designate Culp Canyon WSA as a Wilderness Area. Congress could designate the Otero Mesa and Sacramento Mountains foothills portion of McGregor Range as a National Conservation Area.





Preparers and Contributors

5.0

5.0 PREPARERS AND CONTRIBUTORS

The following individuals were primarily responsible for the content of the LEIS, or for providing senior management leadership during the development and production phases of this document.

Bankston, George, Fort Bliss, USACASB
Years Experience: 24
LEIS Contribution: Range Development

Bentley, Craig, Hydrogeologist, Science Applications International Corporation (SAIC)
M.A. Geology
B.S. Geology
Years Experience: 30
LEIS Contribution: Water Resources, Utilities

Bertolin, Gary E., Senior Air Quality Specialist, SAIC
Ph.D. Meteorology and Air Quality
M.S. Atmospheric Science
B.S. Chemistry
Years Experience: 20
LEIS Contribution: Air Quality

Blakely, Robert W., Environmental Scientist, SAIC
B.S. Aviation Management
Years Experience: 35
LEIS Contribution: Airspace

Bousema, Veronica, Graphic Designer, SAIC
A.A.S. Drafting Technology
Years Experience: 19
LEIS Contribution: Development and Production of Graphics

Bowman, James, Fort Bliss, DOE
M.S. Archaeology
M.A. Anthropology
Years Experience: 19
LEIS Contribution: Cultural Resources

Brandin, Robin, Division Manager, SAIC
M.C.R.P. City and Regional Planning
B.A. History of Art
Years Experience: 23
LEIS Contribution: Deputy Project Manager

Burt, Charles J., Senior Biologist, SAIC
M.S. Forest Zoology
B.S. Biology
Years Experience: 24
LEIS Contribution: Biological Resources

Call, Bruce, Soil Scientist, BLM
B.S. Agricultural (Range and Soil Science)
Years Experience: 20 years
LEIS Contribution: Reviewer: Soil and Water Resources

Clayton, Christopher, Principal Analyst, SAIC
Ph.D. Geography
M.A. Geography
B.A. Geography
Years Experience: 26
LEIS Contribution: Socioeconomics

Christensen, James, Rangeland Management Specialist, BLM
B.S. Range Science
Years Experience: 9
LEIS Contribution: Reviewer: Range Issues and Grazing Operations

Dell 'Orco, Georgette, Word Processor, SAIC
Years Experience: 10
LEIS Contribution: Word Processing

Doerr, Tedd, Senior Environmental Specialist, SAIC
Ph.D. Wildlife & Fisheries Sciences
M.S. Range Science
B.S. Wildlife & Fisheries Sciences
Years Experience: 18
LEIS Contribution: Biological Resources

Dougherty, Jerry P., Environmental Engineer, SAIC
M.S. Civil Engineering
B.S. Civil Engineering
Years Experience: 34
LEIS Contribution: Waste Management/Pollution Prevention

Estes, Howell, Environmental Scientist, SAIC
B.A. Biology
Years Experience: 7
LEIS Contribution: Hazardous Materials, Hazardous Waste Management

Farrel-Hale, Beth, Senior Public Affairs Specialist, SAIC
B.S. Liberal Arts
Years Experience: 17
LEIS Contribution: Public Involvement Support

Gallegos, Cherrie, Document Specialist, SAIC
Years Experience: 7
LEIS Contribution: Production Coordinator, Editing, Word Processing

Goodan, Susan, Environmental Planner, SAIC
M.A. Architecture
B.A. Ethics/Archaeology
Years Experience: 9
LEIS Contribution: Land Use; Aesthetics and Visual Resources

Gunter, Diane, Graphic Artist, SAIC
Years Experience: 20
LEIS Contribution: Development and Production of Graphics

Gwinn, Leslie J., Environmental Scientist, SAIC
M.S. Interdisciplinary Studies - Environmental Science
B.S. Computer Science
Years Experience: 12
LEIS Contribution: SAIC-Fort Bliss Liaison, Public Involvement Support

Hall, David, Fort Bliss Directorate, Plans, Training, Mobilization, and Security, Chief, ITAM
M.S. Business Administration/Human Relations
B.A. Geology
Years Experience: 30
LEIS Contribution: Document Review

Hamilton, Vicki, Fort Bliss, Mission and Master Plan PEIS Project Manager, Fort Bliss, DOE
M. ARCH
B. ARCH
Years Experience: 25
LEIS Contribution: Cultural Resources

Hanley, Theresa, Land Use Planner, BLM
M.A. Anthropology
B.A. Anthropology
Years Experience: 11
LEIS Contribution: Reviewer: Cultural Resources

Howard, Mike, Wildlife Management Biologist, BLM
M.S. Wildlife Management
B.S. Range Animal Science
A.S. Wildlife Management
Years Experience: 19
LEIS Contribution: Reviewer: Biology, Grazing

Hutson, Eric, System Analyst, SAIC
M.A. Political Science
B.A. Political Science
Years Experience: 8
LEIS Contribution: SAIC – Fort Bliss Liaison, Public Involvement Support

Jackson, Terry, Production Manager and Senior Technical Editor, SAIC
B.S. Technical Communication
Years Experience: 14
LEIS Contribution: Document Production, Editing

Jentgen, Russell, Geologist, BLM
B.S. Geology
Years Experience: 29
LEIS Contribution: Reviewer: Geology and Minerals

Locke, Brian, Fort Bliss, Mission and Master Plan PEIS Deputy Project Manager, Fort Bliss, DOE
Ph.D. Biology
M.S. Forest Wildlife
B.S. Fisheries and Wildlife Sciences
Years Experience: 20
LEIS Contribution: Biological Resources

Luna, David, Staff JAG Environmental Attorney
LEIS Contribution: Environmental Law Review

Luna, Ronald, Fort Bliss, Energy Coordinator, Directorate of Public Works and Logistics
LEIS Contribution: Geothermal Resources

Marshall, Amy K., Fort Bliss, DOE, Archeological Resources Team
M.A. History and Archeology
Years Experience: 19
LEIS Contribution: Archeological Resources

Mathis, Joe E., Fort Bliss, Energy Coordinator,
Directorate of Public Works and Logistics
M.E. Mechanical Engineering
Years Experience: 34
LEIS Contribution: Utilities, Water Resources

McCreary, Janet, Work Processor, SAIC
Years Experience: 6
LEIS Contribution: Word Processing

McDonald, Bob, Fort Bliss, USACASB
LEIS Contribution: Range Operations, Airspace

Morris, Robert W., Transportation Analyst, SAIC
M.S. Management Science/Operations Research
B.S. Mathematics
Years Experience: 5
LEIS Contribution: Transportation/Traffic Analysis

Niveson, Michael, Land Use Planner, Otero County

Oakes, Edward, Senior Geologist, SAIC
M.S. Geology
B.S. Geology
Years Experience: 21
LEIS Contribution: Earth Resources

Offutt, Jean, Fort Bliss, Public Affairs Officer
LEIS Contribution: Public Involvement

Page, Scott, Senior Environmental Scientist, SAIC
B.S. Physical Geography
Years Experience: 20
LEIS Contribution: Coordination of PEIS Data

Paul, John R., Fort Bliss, USACASB
M.A. Human Resource Development
B.A. Psychology
Years Experience: 12
LEIS Contribution: Range Safety and Support

Phillips, Tom, Rangeland Management Specialist, BLM
Years Experience: 14
LEIS Contribution: Reviewer: Grazing and Vegetation

Raines, John, Project Manager, SAIC
M.S. Economics
M.S. Management Engineering
B.S. General Engineering
Years Experience: 34
LEIS Contribution: Project Manager, Description of the Proposed Action and Alternatives

Rea, Robert, Senior Engineer, SAIC
M.B.A. Business Administration
C.E. Civil Engineer
M.S. Aeronautical Engineering
B.S. Civil Engineer
Years Experience: 25
LEIS Contribution: McGregor Range Economic Report

Reece, Jeff, Senior Chemical Engineer, SAIC
M.S. Civil/Sanitary Engineering
B.S. Chemical Engineering
Years Experience: 23
LEIS Contribution: Socioeconomic Modeling

Roach, Wilson D., Fort Bliss, USACASB
Years Experience: 13
LEIS Contribution: Description of the Proposed Action and Alternatives, Range Operations

Rudolph, James L., Senior Archaeologist, SAIC
Ph.D. Anthropology
M.A. Anthropology
B.A. Anthropology
Years Experience: 22
LEIS Contribution: Cultural Resources

Sanchez, Joe, Natural Resource Specialist, BLM
B.S. Range Management
Years Experience: 23
LEIS Contribution: Reviewer: Recreation, Visual Resources, and Wilderness

Sanders, Tim, Acting Assistant Field Manager, BLM
M.S. Agricultural Economics
B.S. Wildlife Biology
Years Experience: 20
LEIS Contribution: Reviewer and Management Oversight

Smith, Robert W., Senior Program Manager, SAIC
B.A. Psychology
Years Experience: 30
LEIS Contribution: Quality Assurance

Springer, Lisbeth A., Senior Planner, SAIC
M.C.R.P. Planning
B.A. Sociology
Years Experience: 16
LEIS Contribution: Environmental Justice

Stewart, Carrie E., Environmental Scientist, SAIC
B.S. Geology
Years Experience: 9
LEIS Contribution: Document Integration/Coordination

Stewart, John E., Fort Bliss, Chief, Transportation Division, Directorate of Public Works and Logistics
LEIS Contribution: Transportation

Stovall, Rusty, Geographer, BLM
M.S. Geography
B.S. Geography
B.S. Planning
Years Experience: 5
LEIS Contribution: Reviewer: Remote Sensing/GIS

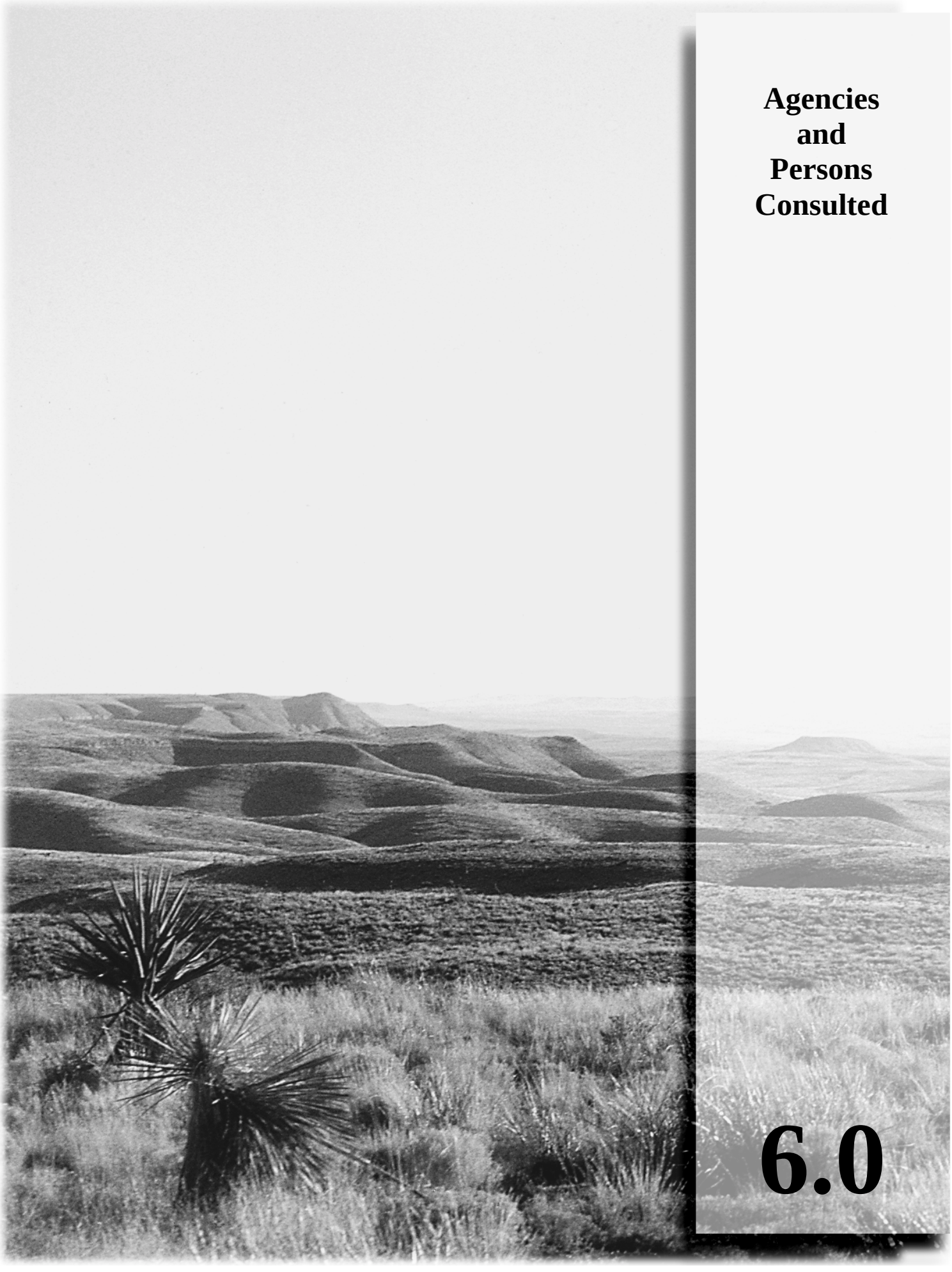
Tipton, William, Fort Bliss, Chief, Real Property Branch, Directorate of Public Works and Logistics
B.S. Management
Years Experience: 30
LEIS Contribution: Land Use and Realty

Vliet, Andrew J., Program Manager, Fort Bliss, McGregor Range Renewal
DPhil. Zoology
B.SC. Wildlife Biology
Years Experience: 12
LEIS Contribution: Program Management, Description of the Proposed Action and Alternatives

Winkle, Von, Range Scientist, SAIC
Ph.D. Range Management
M.S. Wildlife and Range Resources
B.S. Wildlife and Range Resources
Years Experience: 13
LEIS Contribution: Earth Resources

Wuest, William A., Senior Environmental Scientist, SAIC
M.A. Public Administration
B.S. Political Science
Years Experience: 34
LEIS Contribution: Noise and Safety

Zierleinn, Richard, Otero County Commissioner



Agencies and Persons Consulted

6.0

6.0 AGENCIES AND PERSONS CONSULTED

Consultation meetings and correspondence with agencies of federal, American Indian, state, and local government, beginning with notification of the scoping meetings and continuing through an on-going process, are a part of this legislative environmental impact analysis process. Section 6.1 lists agencies notified or contacted during the LEIS process. Sections 6.2 and 6.3 discuss cooperating agencies and other consultation meetings. Section 6.4 lists persons contacted during the development of this LEIS.

6.1 AGENCIES NOTIFIED OR CONTACTED

The following agencies were notified or contacted during the LEIS process**:**

Federal Government
Advisory Council on Historic Preservation
National Radio Astronomy Observatory
U.S. Border Patrol
U.S. Bureau of Land Management
U.S. Bureau of Reclamation
U.S. Department of Agriculture
U.S. Department of the Air Force
U.S. Department of Interior
U.S. Environmental Protection Agency
U.S. Federal Aviation Administration
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. Geological Survey
U.S. National Park Service
U.S. Soil Conservation Service

American Indian
Mescalero Apache Tribe
Jicarilla Apache Tribe
Tigua Tribal Government
Piro-Manso-Tiwa Indian Tribe

State of New Mexico
New Mexico Department of Health
New Mexico Economic Development Department

State of New Mexico
New Mexico Department of Game and Fish
New Mexico Energy, Minerals and Natural Resources Department
New Mexico Environment Department
New Mexico Highway and Transportation Department
New Mexico State Engineer's Office
New Mexico State Historic Preservation Officer
New Mexico Department of Tourism

County Governments
Doña Ana County, NM
Otero County, NM
El Paso, County, TX

City Governments
City of Alamogordo, NM
City of Las Cruces, NM
City of El Paso, TX
Dell City, TX

Councils of Governments
South Central New Mexico Council of Governments, Las Cruces, NM

61

6.2 COOPERATING AGENCIES

The Army contacted two federal agencies regarding service as cooperating agencies in accordance with Title 40 CFR parts 1501.5, *Lead Agencies*, and 1501.6, *Cooperating Agencies*. The Army sought their cooperation and expertise to help identify potential impacts as a result of renewing the military land withdrawal for McGregor Range. Lands comprising McGregor Range are currently withdrawn and/or

administered under MOAs for co-use by the Army and these agencies. The Las Cruces Field Office, BLM and Lincoln National Forest, USFS requested cooperating agency status. In January 1997, the BLM entered into a cooperating agency agreement with Fort Bliss. During a meeting between the Army and the Lincoln National Forest on February 10, 1998, the USFS stated it would not seek cooperating agency status. Both agencies provided land use plans, NEPA documents, other documents and maps and data to assist in the analysis throughout the process.

6.3 OTHER MEETINGS

Throughout the LEIS process, the Army has consulted and coordinated with the Otero County, New Mexico, County Commission. Otero County was afforded the same opportunities for coordination and document review as the federal cooperating agencies and internal Army reviewers. Informal consultation (Section 7 of the *Endangered Species Act*) with the USFWS for the LEIS began with receipt of a list of endangered, candidate species, and species of concern that may be found in Otero County. Fort Bliss will consult with the USFWS before the LEIS is finalized. In addition to data collection efforts with organizational elements of many of those agencies listed above, on-going coordination on the day-to-day missions and programs on McGregor Range described in this LEIS continues through letters, e-mail, telephone conversations, and meetings.

6.4 PERSONS CONSULTED

Alarcron, Waldo, 1997. Personal Communication with Waldo Alarcron, El Paso County Clerk's Office, El Paso, Texas.

Ball, Josephine, 1997. Personal Communication with Josephine Ball, New Mexico Air Quality Bureau, Environment Department, Santa Fe, New Mexico.

Bash, Dallas, 1997. Personal Communication with Dallas Bash, Fort Bliss, Texas.

Blough, K., 1997. Personal Communication with K. Blough, Compliance Division, DOE, Fort Bliss, Texas.

Bowman, James E., 1998. Personal Communication with James Bowman, Chief, Cultural Resources, Fort Bliss, Texas.

Chudnoff, M., 1997. Personal Communication with M. Chudnoff, Hydrologist, New Mexico State Engineer's Office.

Collins, Tom, 1997. Personal Communication with Capt. Tom Collins, Public Affairs Office, Fort Bliss, Texas.

Corral, R., 1997. Personal Communication with R. Corral, Botanist, DOE, Fort Bliss Military Reservation, Fort Bliss, Texas.

Crawford, Ron, 1997. Personal Communication with Ron Crawford, Director of Military Personnel/Adjutant General, Directorate of Military Personnel/Adjutant General, Fort Bliss, Texas.

Crisler, Jane, 1998. Personal Communication with Jane Crisler, Historic Preservation Specialist, ACHP, Denver Office.

DePlata, John, 1997. Personal Communication with John DePlata Housing Engineer, Housing Division, Directorate of Public Works and Logistics, Fort Bliss, Texas.

Dominguez, Martha, 1997. Personal Communication with Martha Dominguez, Ysleta Independent School District, El Paso, Texas.

Escobar, 1997. Personal Communication with Mr. Escobar, Family Housing Branch, Housing Division, Directorate of Public Works and Logistics, Fort Bliss, Texas.

Goodwin, Max, 1997. Personal Communication with Max Goodwin, Sacramento Ranger Station District Manager, Lincoln National Forest.

Goodwin, Warden W., 1997. Personal Communication with Warden Goodwin, Deputy Provost Marshal, Provost Marshal Office, Fort Bliss, Texas.

Hardgrove, Wally, 1997. Personal Communication with Wally Hardgrove, El Paso County Auditor, El Paso, Texas.

Howell, D., 1997. Personal Communication with D. Howell, Biologist, DOE, Fort Bliss Military Reservation, Fort Bliss Texas.

Hughes, Marion, 1997. Personal Communication with Marion Hughes, Directorate of Resource Management, Fort Bliss, Texas.

Hunter, Carol, 1997. Personal Communication with Carol Hunter, City Clerk, City of El Paso, Texas.

Joy, Ron, 1997. Personal Communication with Ron Joy, Public Affairs Office, WBAMC, Fort Bliss, Texas.

Kemp, Jim, 1997. Personal Communication with Jim Kemp, Engineering Plans and Services Division, Directorate of Public Works and Logistics, Fort Bliss, Texas.

Kern, J., 1997. Personal Communication with J. Kern, Chief, Fort Bliss Fire Department, Fort Bliss, Texas.

Killebrew, N.C., 1997. Personal Communication with N.C. Killebrew, Head, Housing Division, Directorate of Public Works and Logistics, Fort Bliss, Texas.

King, D., 1997. Personal Communication with D. King.

Landis, M., 1998. Personal Communication with M. Landis, Chief, Water Programs, DOE, Fort Bliss, Texas.

Lenhart, R., 1997. Personal Communication with Robert Lenhart, Team Leader, Compliance Division, DOE, USAADACENFB, Fort Bliss, Texas.

Lenhart, L., 1998. Personal Communication with L. Lenhart, Alternate Team Leader, Multimedia Division, DOE, Fort Bliss, Texas.

Litzau, Jim, 1997. Personal Communication with Jim Litzau, Directorate of Public Works and Logistics, Fort Bliss, Texas.

Marquez, A., 1997. Personal Communication with A. Marquez, Compliance Division, DOE, Fort Bliss, Texas.

McKenzie, W., 1997. Personal Communication with W. McKenzie, DOE, Compliance Division, Hazardous Waste Team, USAADACENFB, Fort Bliss, Texas.

McKernan, Pat, 1997. Personal Communication with Pat McKernan, DOE, USAADACENFB, Fort Bliss, Texas.

Navarro, Irma, 1997. Personal Communication with Irma Navarro, El Paso County Sheriff's Office, El Paso, Texas.

Ontiveros, Jose, 1997. Personal Communication with Jose Ontiveros, Assistant Superintendent, El Paso Independent School District, El Paso, Texas.

Ortega, Ramon, 1997. Personal Communication with Ramon Ortega, Assistant Fire Chief, Fort Bliss, Texas.

Pino, J., 1997. Personal Communication with J. Pino, Safety Office (Aviation Safety), Fort Bliss, Texas.

Price, Judith, 1997. Personal Communication with Judith Price, Director of Community Development, Doña Ana County, New Mexico.

Price, Helen, 1997. Personal Communication with Helen Price, City of El Paso Police Department, El Paso, Texas.

Rivera, 1997. Personal Communication with Mr. Rivera, Operations Branch, Directorate of Public Works and Logistics, Fort Bliss, Texas.

Sepulveda, Shawn, 1997. Personal Communication with Shawn Sepulveda, Chief Controller, Biggs AAF ATCT.

Shahrijar, S., 1997. Personal Communication with S. Shahrijar, Compliance Division, DOE, Fort Bliss, Texas.

Sims, P., 1997. Personal Communication with P. Sims, Environmental Services Division, Department of Logistics, Directorate of Health Services, WBAMC, Fort Bliss, Texas.

Tarango, Raul, 1997. Personal Communication with Raul Tarango, City of El Paso Fire Department, El Paso, Texas.

Tressler, P., 1997. Personal Communication with P. Tressler, Safety Office (Explosive Safety), Fort Bliss, Texas.

U. S. Air Force Flying Safety Office, Kirtland AFB, New Mexico, 1997. Personal Communication with William Wuest, SAIC.

U. S. Army Flying Safety Office, Fort Rucker, Alabama, 1997. Personal Communication with William Wuest, SAIC.

U.S. Army, Navy, Air Force Flying Safety Centers, 1997. Personal Communication with William Wuest, SAIC.

U.S. Navy Flying Safety Office, Norfolk, Virginia, 1997. Personal Communication with William Wuest, SAIC.

Upton, Pauline, 1997. Personal Communication with Pauline Upton, Housing Officer, Housing Division, Directorate of Public Works and Logistics, Fort Bliss, Texas.

Wachtel, Bill, 1997. Personal Communication with Bill Wachtel, El Paso Independent School District, El Paso, Texas.

Ybarra, Richard, 1997. Personal Communication with Richard Ybarra, Billeting Officer, Housing Division, Directorate of Public Works and Logistics, Fort Bliss, Texas.

References

7.0

7.0 REFERENCES

7.1 REGULATION, ORDER, LAW

29 Code of Federal Regulations (CFR) 1926.52(e). 1979. Occupational Safety and Health Administration (OSHA); "Occupational Noise Exposure, Exposure to Impulsive or Impact Noise". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

33 CFR 328.3(a)(3). 1997. U.S. Army Corps of Engineers (USACE), Department of the Army (DA); "Navigation and Navigable Waters: Definition of the Waters of the United States". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

36 CFR 60.4. 1997. Department of the Interior (DOI); "Parks, Forests, and Public Property: National Register of Historic Places". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 800.5(e). 1997. Advisory Council on Historic Preservation; "Protection of Historic and Cultural Properties, Assessing Effects". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 800.9. 1986. Advisory Council on Historic Preservation; "Protection of Historic and Cultural Properties, Criteria of Effect and Adverse Effect". In *Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

40 CFR 52-99. 1996. Environmental Protection Agency (EPA); "Subchapter C-Air Programs". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 81.421 and 81.429. 1979. EPA; "Identification of Mandatory Class I Federal Areas where Visibility is an Important Value, New Mexico and Texas". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 100-140. 1995. EPA; "Subchapter D-Water Programs". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 100-149. 1995. EPA; "Subchapter D-Water Programs". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 141-149. 1997. EPA; "National Drinking Water Regulations and Underground Injection Control Program". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 162-180. 1995. EPA, "Subchapter E-Pesticide Programs". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 201-211. 1986. EPA; "Subchapter G-Noise Abatement Programs". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 240-280. 1997. EPA; "Subchapter I-Solid Wastes". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 261. 1997. EPA; "Identification and Listing of Hazardous Waste". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 263. 1997. EPA; "Standards Applicable to Transporters of Hazardous Waste". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 280.20. 1977. EPA; "Upgrading of Existing UST Systems". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 300-399. 1997. EPA; "Subchapter J-Superfund, Emergency Planning, and Community Right-to-Know Programs". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 372.38. 1997. EPA; " Toxic Chemical Release Reporting: Community Right-To-Know". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 401-471. 1995. EPA; "Subchapter N-Effluent Guidelines and Standards". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 702-799. 1996. EPA; "Subchapter R-Toxic Substances Control Act". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 1500 through 1508. 1993. Council on Environmental Quality (CEQ); "Regulations for Implementing the National Environmental Policy Act". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 1508.7. 1978. EPA; "Regulations for Implementing the National Environmental Policy Act, Cumulative Impact" in *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 1508.8. 1978. EPA; "Terminology and Index, Effects". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

43 CFR 2300. 1981. DOI; "Land Withdrawals". In *Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 4100. 1996. DOI; "Grazing Administration - Exclusive of Alaska". In *Code of Federal Regulations,* Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

_____. 4130.8-1. 1996. DOI; "Authorizing Grazing Use, Payment of Fees". In *Code of Federal Regulations*, Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office, Washington, DC

43 United States Code (USC) 315a-r. 1976. "Taylor Grazing Act of June 28, 1934". In *United States Code Annotated*, Title 43-Public Lands, West Publishing Company, St. Paul, Minnesota.

_____. 1725.3-1. "Factors in Evaluating Use of Public Lands." In *United States Code Annotated*, Title 43-Public Lands, West Publishing Company, St. Paul, Minnesota.

_____. 1725.3-3. "Objectives and Management of Public Lands". In *United States Code Annotated*, Title 43-Public Lands, West Publishing Company, St. Paul, Minnesota.

Executive Order (EO) 11593. 1971. Protection and Enhancement of the Cultural Environment, Office of the President, Washington, DC

_____. 11988. 1977. Floodplain Management. Office of the President, Washington, DC

_____. 11990. 1977. Protection of Wetlands. Office of the President, Washington, DC

_____. 12898. 1994. Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations. Office of the President, Washington, DC

_____. 13007. 1996. Indian Sacred Sites. Office of the President, Washington, DC

_____. 13045. 1997. Protection of Children from Environmental Health Risks and Safety Risks. Office of the President, Washington, DC

Public Law (PL) 85-654. 1958. Fish and Wildlife Coordination Act.

_____. 86-797. 1960. Sikes Act.

_____. 88-577. 1964. Wilderness Act.

_____. 89-665. 1966. National Historic Preservation Act (NHPA).

_____. 91-604. 1990. Amendments to the Clean Air Act (CAA) (PL 95-95).

_____. 92-500. 1972. Federal Water Pollution Control Act (FWPCA).

_____. 92-574. 1972. Noise Control Act.

_____. 93-205. 1973. Endangered Species Act.

_____. 94-579. Federal Land Policy and Management Act (FLPMA) of 1976, 43 USC 1701-1784.

_____. 94-588. 1976. National Forest Management Act.

_____. 94-5800. 1976. Resource Conservation and Recovery Act (RCRA*)*.

_____. 95-95. 1970. Clean Air Act (CAA).

_____. 95-609. 1978. Amendments to the Noise Control Act (PL 92-574).

_____. 95-217. 1977. Clean Water Act, amendment to PL 92-500.

_____. 95-341. 1978. American Indian Religious Freedom Act (AIRFA*)*.

_____. 95-523. 1972. Safe Drinking Water Act.

_____. 96-95. 1979. Archaeological Resources Protection Act (ARPA).

_____. 96-366. 1980. Fish and Wildlife Conservation Act.

_____. 96-515. 1980. Amendments to the National Historic Preservation Act (PL 89-665).

_____. 97-79. 1981. Amendments to the Lacey Act.

_____. 99-339. 1986. Amendments to the Safe Drinking Water Act.

_____. 99-561. 1986. Amendments to the Sikes Act.

_____. 99-606. Military Lands Withdrawal Act (MLWA) of 1986, 16 USC 460ff.

_____. 99-645. 1986. Emergency Wetlands Resources Act.

_____. 100-4. 1987. Water Quality Act.

_____. 100-478. 1988. Amendments to the Endangered Species Act (PL 89-665).

_____. 100-582. 1986. Amendments to the Resource Conservation and Recovery Act.

_____. 101-233. 1989. North American Wetlands Conservation Act.

_____. 101-601. 1990. Native American Graves Protection and Repatriation Act (NAGPRA*)*.

_____. 102-575. 1992. Amendments to the National Historic Preservation Act (PL 89-665).

_____. 105-85, Title XXIX. Sikes Act Improvement Act of 1977 as amended in 1997.

American Indian Religious Freedom Act of 1978, 42 USC 1996 et seq., enacted by PL 95-341.

Antiquities Act of 1906. 16 USC 1 Subchapter LXI – "National and International Monuments and Memorials."

Archaeological and Historic Preservation Act of 1974. (PL 86-523; 16 USC 469-469c).

Archaeological Resources Protection Act of 1979, 16 USC 470aa-47011, enacted by PL 96-95 as amended.

Bald and Golden Eagle Protection Act of 1940. 16 USC 5A Subchapter II.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 42 USC 9601, enacted by PL 96-510, also known as Superfund: Amended in 1986 by the Superfund Amendments and Reauthorization Act, PL 99-499.

Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986, 42 USC 11001, enacted by PL 99-499.

Engle Act of 1958, 43 USC 155 et seq.

Fish and Wildlife Act of 1956. (PL 85-624). 16 USC 9.

Migratory Bird Treaty Act of 1918. 16 USC 7 Subchapter II.

National Environmental Policy Act (NEPA) of 1969, 42 USC 4321-4347, enacted by PL 91-190 as amended.

National Historic Preservation Act of 1966, 16 USC 470 et seq., enacted by PL 04-422 as amended.

Native American Graves Protection and Repatriation Act of 1990, 25 USC 3001, enacted by PL 101-601.

Public Rangelands Improvement Act of 1978. 43 USC 37.

Public Land Order (PLO) 1470. 1957. Withdrawal of 687,643 Acres in Otero County for Missile Range. 21 August.

Section 10 of River and Harbor Act of 1899. (33 USC 403; 52 Stat. 802).

Taylor Grazing Act. 43 USC 315a-r (as amended) (See 43 CFR 4100).

U.S. Army Regulation (AR) 200-1. 1997. Environmental Protection and Enhancement. 21 February.

_____. 200-2. 1988. Environmental Effects on Army Actions. 23 December.

_____. 200-3. 1995. Natural Resources – Land Forest, and Wildlife Management.

_____. 200-4. 1998. Cultural Resources Management. 7 July.

7.2 GENERAL

Abbott, J. T., R. Mauldin, P. E. Patterson, N. Trierweiler, R. J. Hard, C. R. Lintz and C. L. Tennis. 1996. Significance Standards for Prehistoric Archaeological Sites at Fort Bliss: A Design for Further Research and the Management of Cultural Resources. USACE, Fort Worth, Texas.

Acoustical Society of America. 1987. Community Reactions to Helicopter Noise: Results from an Experimental Study. Journal of Acoustical Society of America, 82: 479-492, August.

Aguirre, J. 1996. Personal communication with S. Goodan, Science Applications International Corporation (SAIC). Julie Aguirre, Range Clerk; Bureau of Land Management (BLM), Las Cruces Field Office.

_____. 1997. Personal communication with S. Goodan, SAIC. Julie Aguirre, Range Clerk; BLM, Las Cruces Field Office.

Ahlstrand, G. M. 1982. Response of Chihuahuan Desert Mountain Shrub Vegetation to Burning, *Journal of Range Management* 35:62-65.

Aid, C. S. 1990. Changes in Breeding Bird Density after Prescribed Burning in an Arizona Semidesert Grassland. M.S. Thesis. Boulder, Colorado: University of Colorado.

American National Standards Institute (ANSI). 1980. Sound Level Descriptors for Determination of Compatible Land Use. ANSI S3.23-1980.

_____. 1988. Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1. ANSI S12.9-1988.

Anderson, D. E., O. J. Rongstad, and W. R. Mytton. 1990. Home-range Changes in Raptors Exposed to Increased Human Activity Levels in Southeastern Colorado. *Wildlife Society Bulletin* 18: 134-142.

Bankston, G. 1997. Personal communication with S. Goodan, SAIC. George Bankston, Chief of Range Development and Enforcement, McGregor Range.

Barton, H., W. G. McCully, H. M. Taylor, and J. E. Box. 1966. Influence of Soil Compaction on Emergence and First-year Growth of Seeded Plants. *Journal of Range Management* 19:118-121.

Bash, D.W., 1992. A Classification of Canopy Architecture Types in Desert Rangeland, Using Satellite Imagery. Masters Thesis. Las Cruces, New Mexico: New Mexico State University.

Battis, J. C. 1983. Seismo-Acoustic Effects of Sonic Booms on Archaeological Sites, Valentine Military Operations Area. Air Force Geophysical Laboratory, Report AFGL-TR-83-0304. November.

_____. 1988. The Effect of Low Flying Aircraft on Archaeological Sites, Kayenta, Arizona. AFGL Technical Memorandum No. 146. Air Force Geophysics Lab, Hanscom Air Force Base (AFB), Massachusetts. January.

Beck, A. M. and R. J. Vogl. 1972. The Effects of Spring Burning on Rodent Populations in a Brush Prairie Savanna. *Journal of Mammalogy*. 53:336-346.

Beckes, M. R., D. S. Dibble, and M. D. Freeman. 1977. A Cultural Resource Inventory and Assessment of McGregor Guided Missile Range, Otero County, New Mexico. Texas Archaeological Survey Report 65, Part I and II. Austin, Texas: University of Texas.

Bentley, M. T. 1991. Early Salt Mining Activity in the El Paso Region. *The Artifact* 29(2): 43-55.

Bigham, S. R., J. L. Hepworth, and J. P. Martin. 1965. A Casualty of Wildlife Following a Fire. In *Proceedings of the Oklahoma Academy of Science* 45:47-50.

BISON-M. 1997. Species: Los Olmos Tiger Beetle (*Cocindela nevadica olmsa*). Santa Fe, New Mexico: New Mexico Department of Game and Fish (NMDGF). Web site: http://wwwfw.vt.edu/fishex/m/nmex_main/species/080130.htm.

Black, B. A. 1975. Geology and Oil and Gas Potential of the Northeast Otero Platform Area, Otero and Chaves Counties, New Mexico. New Mexico Geological Society Guidebook 26, 323-334.

Blough, K. 1997. Personal communication with Jerry Dougherty, SAIC. K. Blough, Compliance Division, Directorate of the Environment (DOE), Fort Bliss, Texas and New Mexico. 20 May.

Bock J. H. and C. E. Bock. 1978. Responses of Birds, Small Mammals, and Vegetation to Burning Sacaton Grasslands in southeastern Arizona. *Journal of Range Management*. 31:296-300.

_____. 1983. Responses of Birds and Deer Mice to Prescribed Burning in Ponderosa Pine. *Journal of Wildlife Management*. 47:836-840.

_____. 1990. Effects of Fire on Wildlife in Southwestern Lowland Habitats. In *Effects of Fire Management of Southwestern Natural Resources*. General Technical Report (GTR) RM-191. Fort Collins, Colorado: U. S. Forest Service (USFS) Rocky Mountain Forest and Range Experiment Station.

_____. 1992. Vegetation Responses to Wildfire in Native Versus Exotic Arizona Grassland. *Journal of Vegetation Science* 3:439-446.

Bock, C. E. and B. Webb. 1984. Birds as Grazing Indicator Species in Southeastern Arizona. *Journal of Wildlife Management* 48:1045-1049.

Bock, C. E., J. H. Bock, W. R. Kenney, and V. M. Hawthorne. 1984. Responses of Birds, Rodents, and Vegetation to Livestock Exclosure in a Semidesert Grassland Site. *Journal of Range Management* 37(3): 239-242.

Bock, C. H., H. M. Smith, and J. H. Bock. 1990. The Effect of Livestock Grazing Upon the Abundance of the Lizard, *Sceloporus scalaris,* in Southeastern Arizona. *Journal of Herpetology* 24: 446-448.

Bock, C. E., V. A. Saab, T. D. Rich, and D. S. Dobkin. 1993. Effects of Livestock Grazing on Neotropical Landbirds in Western North America. In *Status and Management of Neotropical Migratory Birds.* GTR RM-229. Fort Collins, Colorado: USFS, Rocky Mountain Forest and Range Experiment Station.

Bonhert, A. G., B. S. Enscore, S. McCarthy, and P. Nolan. 1996. Final Draft Inventory and Evaluation of Historic Structures and Landscapes at Fort Bliss, Texas. Champaign, Illinois: U.S. Army Construction Engineering Research Laboratories, Tri-Services Cultural Resource Research Center.

Bowman, J. 1997. Archaeologist, Cultural and Natural Resources Division, DOE, U.S. Army Air Defense Center & Fort Bliss (USAADCENFB), Texas and New Mexico. Personal communication with Tim Church, SAIC.

Brattstrom, B. H. and M. C. Bondello. 1983. Effects of Off-Road Vehicle Noise on Desert Vertebrates In *Environmental Effects of Off-Road Vehicles: Impacts and Management in Arid Areas*. R. H. Webb and H. G. Wilshore, eds. New York: Springer-Verlag.

Brooks, B. L. and S. A Temple. 1990. Dynamics of a Loggerhead Shrike Population in Minnesota. *Wilson Bulletin* 102(3): 441-450.

Brown, D. E. and R. A. Minnich. 1986. Fires and Changes in Creosote Bush Scrub of the Western Sonoran Desert, California. *The American Midland Naturalist* 116: 411-422.

Browning, C. B., V. Gibbs, R. Phippen, R. Giese, and T. Church. 1997. New Tactical Target Complex Cultural Resource Survey, Fort Bliss, McGregor Range, Otero County, New Mexico. Cultural Resource Report 1997-004, Holloman AFB (HAFB), Alamogordo, New Mexico.

Buffington, L. C. and C. H. Herbel. 1965. Vegetational Changes on a Semidesert Grassland Range from 1858 to 1963. *Ecological Monographs* 35(2): 139-164.

Bunting, S. C., H. A. Wright, and L. F. Neuenschwander. 1980. Long-term Effects of Fire on Cactus in the Southern Mixed Prairie of Texas. *Journal of Range Management* 33:85-88.

Bureau of Business and Economic Research (BBER). 1994. New Mexico County Files. University of New Mexico.

Bureau of Land Management, 1980. Environmental Impact Statement (EIS), Grazing Management McGregor EIS Area, New Mexico. Las Cruces, New Mexico. September.

_____. 1985. Unpub. Engineer's Report on the McGregor Range Pipeline System.

_____. 1986a. Resource Management Plan (RMP). White Sands Resource Area, Las Cruces, New Mexico. October.

_____. 1986b. Visual Resource Inventory. BLM Handbook 8410-1. January.

_____. 1987. Interim Management Policy and Guidelines for Lands under Wilderness Review.

_____. 1988a. New Mexico Statewide Wilderness Study. Four volumes. Santa Fe, New Mexico. January.

_____. 1988b. White Sands Resource Management Plan Amendment (RMPA) for the EIS for McGregor Range. September.

_____. 1989. Proposed RMPA/Final EIS for McGregor Range. Las Cruces, New Mexico. May.

_____. 1990a. RMPA, McGregor Range. Caballo Resource Area, Las Cruces, New Mexico. September.

_____. 1990b. Memorandum of Understanding (MOU) between DOI – BLM New Mexico and U.S. Department of the Army Headquarters, USAADACENFB, Fort Bliss, Texas, Concerning Policies, Procedures, and Responsibilities Related to Land Use Planning and Resource Management of McGregor Range.

_____. 1994. New Mexico Resource Geographic Information System (GIS) Map. Santa Fe, New Mexico.

_____. 1996a. Environmental Assessment (EA) for Exploration of Geothermal Resources at Davis Dome, Otero County, New Mexico. Las Cruces, New Mexico. December.

_____. 1996b. Grazing Statistics for McGregor Range and Otero County. Las Cruces, New Mexico.

_____. 1997a. Grazing Statistics for Otero County. Las Cruces, New Mexico.

_____. 1997b. A Cultural Resources Inventory of Particular Fence Lines. Pipelines and Trap Fences on McGregor Range, and Rural Historic Landscape National Register Evaluation, Otero County, New Mexico. Report 030-97-65. Las Cruces, New Mexico. November.

_____. 1998. Comments on the Interim Preliminary Draft of the McGregor Range Land Withdrawal Renewal Legislative Environmental Impact Statement (LEIS). Las Cruces, New Mexico. May.

Cable, D. R. 1967. Damage of Mesquite, Lehmann Lovegrass, and Black Grama by a Hot June Fire. *Journal of Range Management* 18: 326-329.

Cable, D. R. 1972. Fire Effects on Southwestern Semidesert Grass-Shrub Communities. In *Proceedings Annual Tall Timbers Fire Ecology Conference*, Lubbock, Texas, No 12:109-127.

Call, M. W. 1978. Nesting Habitats and Surveying Techniques for Common Western Raptors. Technical Note TN-316. Denver, Colorado: BLM.

Carmichael, D. L. 1994. Places of Power: Mescalero Apache Sacred Sites and Sensitive Areas. In *Sacred Sites, Sacred Places*, edited by D.L Carmichael, J. Hubert, B. Reeves, and A. Schanche, 89-98. Routledge, New York.

CHABA. 1981. Assessment of Community Response to High Energy Impulsive Sounds. National Research Council Committee on Hearing, Bioacoustics and Biomechanics (CHABA). UG 84.

Chenoweth, W. L. 1976. Uranium Resources of New Mexico. In *Tectonics and Mineral Resources of Southwestern North America*, 138-143. Special Publication No. 6. New Mexico Geological Society.

Chesser, R. K., R. S. Caldwell. and M. J. Harvey. 1975. Effects of Noise on Feral Populations of *Mus musculus. Physiol. Zoology* 48: 323-325.

Chew, R. M., B. B. Butterworth, and R. Grechman. 1959. The Effects of Fire on the Small Mammal Populations of Chaparral. *Journal of Mammalogy* 40: 253.

Christensen, J. 1996. Personal communication with S. Goodan, SAIC. James Christensen, Range Management Specialist, McGregor Range Grazing Program Manager, BLM, Las Cruces, New Mexico.

_____. 1997. Personal communication with S. Goodan, SAIC. James Christensen, Range Management Specialist, McGregor Range Grazing Program Manager, BLM, Las Cruces, New Mexico.

_____. 1998. Personal communication with C. Bentley, SAIC. James Christensen, Range Management Specialist, McGregor Range Grazing Program Manager, BLM, Las Cruces, New Mexico.

Chudnoff, M. 1997. Hydrologist, New Mexico State Engineer's Office. Personal communication with Dale Altshul and Jeff McCann. 27 August.

Chung-MacCoubrey, A. L. 1996. Grassland Bats and Land Management in the Southwest. In *Ecosystem Disturbance and Wildlife Conservation in Western Grasslands,* D. A. Finch ed. GTR RM-GTR-285. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Cockman, J. S. 1996. Identification of Classification Parameters for Ephemeral Drainages in the Sacramento Mountains of Southern New Mexico: Vegetation Diversity. Ph.D. Thesis. Las Cruces, New Mexico: New Mexico State University.

Cockman, J. S., R. Pleper, and D. Clason. 1996. Arroyo-riparian Shrub Diversity Along a Transition Zone Between the Sacramento Mountains and Tularosa Basin, New Mexico. *In Proceedings: Shrubland Ecosystem Dynamics in a Changing Environment*. GTR INT-GTR-338. Ogden, Utah: USFS Intermountain Research Station.

Collins, J. 1997. Directorate of Health Services, Fort Bliss, Texas and New Mexico. Personal communication with Jerry Dougherty, SAIC. 19 November.

Cornelius, J. M. 1988. Fire Effects on Vegetation of a Northern Chihuahuan Desert Grassland. Ph.D. Dissertation. Las Cruces, New Mexico: New Mexico State University.

Corral R. 1997. Botanist, DOE, Fort Bliss, Texas and New Mexico. Personal communication with Chuck Burt, SAIC.

_____. 1998. Botanist, DOE, Fort Bliss, Texas and New Mexico. Personal communication through comment process.

Cosgrove, C. B. 1947. Caves of the Upper Gila and Hueco Areas in New Mexico and Texas. *Papers of the Peabody Museum of American Archaeology and Ethnology* 24(2).

Creager, B. 1996. Personal communication with S. Goodan, SAIC. Bernie Creager, Real Estate Specialist, BLM, Las Cruces, New Mexico.

_____. 1998. Personal communication with S. Goodan, SAIC. Bernie Creager, Real Estate Specialist, BLM, Las Cruces, New Mexico.

Crist, F. P. and R. J. Kauth. 1986. The Tasseled Cap De-mystified. *American Society for Photogrammetry and Remote Sensing* 52 (1): 81-86.

Dalton and Dalton, 1993. Dalton, V. M. and D. C. Dalton. 1993. Assessment of the Impacts of Low Level Military Aircraft on *Leptonycteris curasoae*, an Endangered Bat at Organ Pipe Cactus National Monument, Arizona. Final Technical Report. Prepared for Organ Pipe Cactus National Monument, Ajo, Arizona and 58th Civil Engineering Squadron, Luke AFB, Arizona.

Day, K. S. 1994. Observations on Mountain Plover (*Charadrius montanus*) Breeding in Utah. *The Southwestern Naturalist* 39(2): 298-300.

Degenhardt, W. G., C. W. Painter, and A. H. Price. 1996. Amphibians and Reptiles of New Mexico. Albuquerque, New Mexico: University of New Mexico Press.

DeSmet, K. D. and M. P. Conrad. 1989. Status, Habitat Preferences and Management of the Baird's Sparrow in Manitoba, 1987-1988. Winnipeg, Manitoba: Manitoba Department of Natural Resources.

Dick-Peddie, W. A. 1993. New Mexico Vegetation, Past, Present, and Future. University of New Mexico Press.

Dix, R. L. 1960. The Effects of Burning on the Mulch Structure and Species Composition of Grasslands in Western North Dakota. *Ecology* 41: 49-56.

Doña Ana County. 1994. Doña Ana County Comprehensive Plan.

Donahue, R. L., R. W. Miller, J. C. Shickluna. 1977. Introduction to Soils and Plant Growth. Englewood Cliffs, New Jersey: Prentice-Hall.

Dubose, M. Personal communication with S. Goodan, SAIC. 1977. Mary Dubose, Grazing Statistician. New Mexico State Land Office, Surface Management Division. 12 December.

DuFour, P. A. 1980. Effects of Noise on Wildlife and Other Animals, Review of Research since 1971. EPA 550/9-80-100, Washington, DC

Duncan, et al. 1993. Assessing the Relationship between Spectral Vegetation Indices and Shrub Cover in the Jornada Basin, New Mexico. *International Journal of Remote Sensing* 14: 3395-3416.

Dwyer, D. D. and R. D. Pieper. 1967. Fire Effects on Blue Grama-Pinyon-Juniper Rangelands in New Mexico. *Journal of Range Management* 20: 359-362.

El Paso (City). 1988. The Plan for El Paso, Technical Report V - Economic Development. El Paso, Texas.

El Paso International Airport (EPIA), 1996. El Paso International Airport Comparative Operation Statistics, December 1996.

Environmental Protection Agency. 1972. Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety. EPA Report 550/9-74-004. March.

_____. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. EPA Report 550/9-74-004.

Erwin W. J. and R. H. Stasiak. 1979. Vertebrate Mortality during the Burning of a Reestablished Prairie in Nebraska. *The American Midland Naturalist* 101: 247-249.

Eve, M. D. and A. J. Peters. 1995. Using High Temporal Resolution Satellite Data to Assess Shrub Control Effectiveness. In *Proceedings: Shrubland Ecosystem Dynamics in a Changing Environment, Las Cruces, New Mexico*. Ogden, Utah: USFS Intermountain Research Station.

Fair, W. S. and S. E. Henke. 1997. Effects of Habitat Manipulation on Texas Horned Lizards and Their Prey. *Journal of Wildlife Management* 61(4): 1366-1370.

Federal Interagency Committee on Noise (FICON). 1992. Federal Agency Review of Selected Airport Noise Analysis Issues. August.

Federal Interagency Committee on Urban Noise (FICUN). 1980. Guidelines for Considering Noise in Land Use Planning and Control. Washington, DC NIIS PB83-184838.

Felix, D. 1997. Compliance Division, DOE, Fort Bliss, Texas and New Mexico. Personal communication with Jerry Dougherty, SAIC. 19 May and 1 December.

Fidell, S., D. S. Barger, and T. J. Schultz. 1991. Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise. *Journal of the Acoustical Society of America* 89: 221-233. January.

Finburg, K. O. 1994. Community Structure Changes in a Grassland After a Wildfire and a Dry Season. M.S. Thesis. Tucson, Arizona: Arizona State University.

Finch, D. M. 1992. Threatened, Endangered, and Vulnerable Species of Terrestrial Vertebrates in the Rocky Mountain Region. GTR RM-215. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Finegold, L. S., C. S. Harris, and H. E. von Gierke. 1994. Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People. *Noise Control Engineering Journal* 42(1).

Fischer, D. L., K. L. Ellis, and R. J. Meese. 1984. Winter Habitat Selection of Diurnal Raptors in Central Utah. *Raptor Research* 18: 98-102.

Flather, C. H. and J. R. Sauer. 1996. Using Landscape Ecology to Test Hypotheses About Large-Scale Abundance Patterns in Migratory Birds. *Ecology* 77(1): 28-35.

Flemming, S. P., R. D. Chiasson, P. C. Smith, P. J. Austin-Smith, and R. P. Bancroft. 1988. Piping Plover Status in Nova Scotia Related to its Reproductive and Behavior Responses to Human Disturbance. *Journal of Field Ornithology* 59(4): 321-330.

Ford, P. L. and G. R. McPherson. 1996. Ecology of Fire in Shortgrass Prairie of the Southern Great Plains. In *Ecosystem Disturbance and Wildlife Conservation in Western Grasslands*, 20-39. GTR RM-GTR-285. Fort Collins, Colorado: USFS Rocky Mountain Range and Experiment Station.

Foster, R. W. 1978. Oil and Gas Evaluation of White Sands Missile Range (WSMR) and Fort Bliss Military Reservation, South-central New Mexico. Open-File Report 92. New Mexico Bureau of Mines and Mineral Resources (NMBMMR).

Fowler, J. M., L. A. Torell, and G. Gallacher. 1994. Competitive Pricing for the McGregor Range: Implications for Federal Grazing Fees. *Journal of Range Management* 47: 155-158. March.

Franklin, J. and D. L. Turner. 1992. The application of a geometric optical canopy reflectance to semiarid shrub vegetation. IEEE Trans Geosci. Remote Sens. 30:292-301.

Franzreb, K. E. 1987. Endangered Status and Strategies for Conservation of the Least Bell's Vireo (*Vireo bellii pusillus*) in California. *Western Birds* 18: 43-49.

Fuller, William W. 1987. Guide For Wind Erosion Control. Agronomy Technical Note Number 27. U.S. Department of Agriculture (USDA), Soil Conservation Service, New Mexico.

Gaines, E. P. and M. R. Ryan. 1988. Piping Plover Habitat Use and Reproductive Success in North Dakota. *Journal of Wildlife Management* 52(2): 266-273.

Gamougoun, N. D., R. P. Smith, M. K. Wood, and R. D. Pieper. 1984. Soil, Vegetation, and Hydrologic Responses to Grazing Management at Fort Stanton, New Mexico. *Journal of Range Management* 37(6): 538-541.

Ganey, J. L. and R. P. Balda. 1989. Home-Range Characteristics of Spotted Owls in Northern Arizona. *Journal of Wildlife Management* 53:1159-1165.

Gardner, J. L. 1951. Vegetation of the Creosote Bush Area of the Rio Grande Valley in New Mexico. *Ecological Monographs* 21(4): 379-403.

Garner, L. E., A. E. St. Clair, and T. J. Evans. 1987. Mineral Resources of Texas. Austin, Texas: Texas Bureau of Economic Geology, University of Texas (reprinted 1987).

Gerald, R. E. 1974. Aboriginal Use and Occupation by Tigua, Manso, and Suma Indians. In *Apache Indians III*. New York and London: Garland Publishing Inc.

Glendening, G. E. 1952. Some Quantitative Data on the Increase of Mesquite and Cactus on a Desert Grassland in Southern Arizona. *Ecology* 33: 319-328.

Goodwin, M. 1997. Personal communication with S. Goodan, SAIC. Max Goodwin, Sacramento Ranger District Manager, Lincoln National Forest.

_____. 1998. Personal Communications with S. Goodan, SAIC.

Gore, J. A., and M. J. Kinnison. 1991. Hatching Success in Roof and Ground Colonies of Least Terns. *The Condor* 93: 759-762.

Griffen, W. B. 1983. Southern Periphery: East. In *Handbook of North American Indians, Volume 10, Southwest*, 329-342. Washington, DC: Smithsonian Institute Press.

Griffin, D. R., J. J. McCune and A. D. Grinnell. 1963. The Resistance of Bats to Jamming. *Jounal of Experimental Zoology* 152: 229-250.

Griffiths, G. H. and W. G. Collins. 1983. Mapping the Greenness of Semi-arid Rangeland Vegetation in Northern Kenya from LANDSAT Digital Data. In *Remote Sensing for Rangeland Monitoring and Management*, 108-122. Remote Sensing Society.

Grossenheim. 1997. Personal communication with S. Goodan, SAIC. Captain Grossenheim, McGregor Range, Range Control, U.S. Army Combined Arms Support Battalion (USACASB).

Grubb, T. G., S. J. Nagiller, W. L. Eakle, and G. A. Goodwin. 1989. Winter Roosting Patterns of Bald Eagle (*Haliaeetus leucocephalus*) in North-Central Arizona. *Southwestern Naturalist* 34: 453-459.

Grubb, T. G. and C. E. Kennedy. 1982. Bald Eagle Winter Habitat on Southwestern National Forests. Research Paper RM-237. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Haig, S. M. and L. W. Oring. 1985. Distribution and Status of the Piping Plover throughout the Annual Cycle. *Journal of Field Ornithology* 56(4): 334-345.

Hannon, R. 1997. Personal communication with S. Goodan, SAIC. Ron Hannon, Land Management Planner, Lincoln National Forest.

Hargrove, S. 1997. Personal communication with S. Goodan, SAIC. Stephanie Hargrove, Mimbres Resource Area Manager. BLM, Las Cruces, New Mexico.

Harrison, R. T. 1973. Forest Background Sound. Report to Record, ED&T 2428, USDA Forest Service, Technology and Development Center, San Dimas, California. In *Annoyance from Aircraft Overflights in Wilderness*, R. T. Harrison, L. A. Hartmann and W. J. Makel eds., 1990. NOISE-CON 90, University of Texas. Austin, Texas. October.

Hart, Jeannie. 1997. A Cultural Resources Inventory of Particular Fence Lines, Pipelines, and Trail Fences in McGregor Range, and Rural Historic Landscape Register Evaluation. BLM Cultural Report 030-97-65.

Hatton, K. S., J. M. Barker, M. Mansell, D. Sivils, K. Glesener, and L. Memenway. 1995. Mines, Mills and Quarries in New Mexico. Socorro, New Mexico: NMBMMR.

Hector, D. P. 1987. The Decline of the Aplomado Falcon in the United States. *American Birds* 41(3): 381-389.

Hennessy, J. T., R. P. Gibbens, J. M. Trombel, and M. Cardenas. 1983. Vegetation Changes from 1935 to 1980 in Mesquite Dunelands and Former Grasslands of Southern New Mexico. *Journal of Range Management* 26(3): 370-374.

Henry, C. D. and Glock, J. K. 1981. A Preliminary Assessment of the Geologic Setting, Hydrology, and Geochemistry of the Hueco Tanks Geothermal Area, Texas and New Mexico. Geological Circular 81-1. Austin, Texas: Texas Bureau of Economic Geology.

Hickerson. 1994. The Jumanos: Hunters and Traders of the Southern Plains. Austin, Texas: University of Texas Press.

Hofman, J. L., R. L. Brooks, J. E. Hays, D. W. Owsley, R. L. Jantz, M. K. Marks, and M. H. Manheim. 1989. From Clovis to Comanchero: Archaeological Overview of the Southern Great Plains. Arkansas Archaeological Survey Research Series 35. Fayetteville, Arkansas.

Holechek, J. L. and T. Stephenson. 1983. Comparison of Big Sagebrush Vegetation in North-central New Mexico under Moderate Grazing and Grazing Excluded Conditions. *Journal of Range Management* 36: 455-456.

Houston, C. S. and M. J. Bechard. 1984. Decline of the Ferruginous Hawk in Saskatchewan. *American Birds* 38(2): 166-170.

Howard, J. L. 1996. *Speotyto cunicularia.* In *The Fire Effects Information System (Data Base*), W. C. Fisher comp. Missoula, Montana: USFS, Intermountain Research Station, Intermountain Fire Science Laboratory.

Howell, D. 1992. Noise Effect Assessment on *Leptonycteris curasoae* at Fort Huachuca, Arizona. Draft EA. DA, Fort Huachuca Garrison, Test and Experiment Command.

Huenneke, L. F. 1995. Shrublands and Grasslands of the Jornada Long-term Ecological Research Site: Desertification and Plant Community Structure in the Northern Chihuahuan Desert. In *Proceedings: Shrubland Ecosystem Dynamics in a Changing Environment*, Las Cruces, New Mexico. Ogden, Utah: USFS Intermountain Research Station.

Jackson, R. D. 1983. Spectral Indices in N-Space. *Remote Sensing of the Environment* 13: 409-421.

Jentgen, Russell. 1998. Personal communication with C. Stewart, SAIC. Russ Jentgen, Geologist, BLM, Las Cruces, New Mexico.

Johnson, T. H. 1996. The Peregrine Falcon in New Mexico - 1996. Santa Fe, New Mexico: NMDGF.

Jones, K. B. 1981. Effects of Grazing on Lizard Abundance and Diversity in Western Arizona. *The Southwestern Naturalist* 26(2): 107-115.

Kern, J. 1997. Chief, Fort Bliss Fire Department, Fort Bliss, Texas and New Mexico. Personal communication with William Wuest, SAIC.

Kerry, G. and R. D. Ford. 1994. Bandwidth Limitation Effects on Low Frequency Impulsive Noise Prediction and Assessment. Paper presented to Symposium on Aircraft Noise Abatement Receiver Technology; Baltimore, Maryland.

King, D. 1997. Airspace Manager, HAFB, New Mexico. Personal communication with Robert Blakely, SAIC. 30 April.

King, W. E. and V. M. Harder. 1985. Oil and Gas Potential of the Tularosa Basin, Otero Mesa Platform Salt Basin Graben Area, New Mexico and Texas. Circular 198. NMBMMR.

King, K. W. 1987. A Vibration Study of Archaeological Ruins, Hovenweep National Monument, Utah-Colorado. Open-File Report 87-181. U.S. Geological Survey (USGS).

King, W. K., D. L. Carver, and D. M. Worley. 1988. Vibration Investigation of the Museum Building at White Sands National Monument, New Mexico. Open-File Report 88-544. USGS.

Kirsch, E. M. 1996. Habitat Selection and Productivity of Least Terns on the Lower Platte River, Nebraska. *Wildlife Monographs* No. 132.

Knight, R. L. and K. J. Gutzwiller, eds. 1995. Wildlife and Recreationists - Coexistence through Management and Research. Washington, DC: Island Press.

Knopf, F. L. 1994. Avian Assemblages on Altered Grasslands. *Studies in Avian Biology* 15: 247-257.

Knopf, F. L. and B. J. Miller. 1994. *Charadrius montanus* - Montane, Grassland, or Bare-ground Plover? *The Auk* 111(2): 504-506.

Knopf, F. L. and J. R. Rupert. 1995. Habits and Habitats of Mountain Plovers in California. *The Condor* 97(3): 743-751.

Knowles, D. B. and R. A. Kennedy. 1956. Ground-Water Resources of the Hueco Bolson, Northeast of El Paso, Texas. Bulletin 5615. USGS.

Kochert, M. N. 1989. Responses of Raptors to Livestock Grazing in the Western United States. Western Raptor Management Symposium and Workshop, Boise, Idaho. Scientific and Technical Series No. 13. Washington, DC: National Wildlife Foundation.

Konan, W. and Schuring. J. R. 1985. Vibration Criteria for Historical Buildings. *Journal of Construction Engineering and Management* 111 (3): 208-215.

Kozma, J. M. 1995. Neotropical Migrant and Chihuahuan Desert Bird Community Use of Arroyo-riparian Habitat and Adjacent Upland. M.S. Thesis. Texas Tech. University.

Kozma, J. M. and N. E. Mathews. 1997. Breeding Bird Communities and Nest Plant Selection in Chihuahuan Desert Habitats in South-central New Mexico. *Wilson Bulletin* 109(3): 424-436.

Krone, M. 1975. A Report on Folsom Points in the El Paso Area. *The Artifact* 13(4): 1-19.

Krueper, D. J. 1993. Effects of Land Use Practices on Western Riparian Ecosystems. In *Status and Management of Neotropical Migratory Birds*. GTR RM-229. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Lamp, R. E. 1989. Monitoring the Effects of Military Air Operations at the Fallon Naval Air Station on the Biota of Nevada. Nevada Department of Wildlife.

Landis, M. 1997. Personal Communication with L. Gorman, SAIC. M. Landes, Chief, Water Programs, DOE, Fort Bliss, Texas and New Mexico.

_____. 1998. Personal Communication with Eric Hutson, SAIC. M. Landes, Chief, Water Programs, DOE, Fort Bliss, Texas and New Mexico. 4 February.

Larson, H. 1993. Linear Regression for Canopy Cover Estimation in Acacia Woodlands Using LANDSAT-TM, -MSS, and SPOT HRV XS Data. *International Journal of Remote Sensing* 14: 2129-2136.

Lehman, R. N. and J. W. Allendorf. 1987. The Effects of Fire, Fire Exclusion and Fire Management on Raptor Habitats in the Western United States. Western Raptor Management Symposium and Workshop, Boise, Idaho. Scientific and Technical Series No. 13. Washington, DC: National Wildlife Foundation.

Lehmer, D. J. 1948. The Jornada Branch of the Mogollon. Bulletin 17. Tucson, Arizona: University of Arizona Social Science.

Lenhart, L. 1998. Personal communication with Dale Altshul, SAIC. L. Lenhart, Alternate Team Leader, Multimedia Division, DOE, Fort Bliss, Texas and New Mexico.

Lenhart, R. 1997. Personal communication with Howell Estes, SAIC. Robert Lenhart, Team Leader, Compliance Division, DOE, USAADACENFB, Texas and New Mexico. 21 May.

Lenhart, R. 1999. Personal communication with Carrie Stewart, SAIC. Robert Lenhart, Team Leader, Compliance Division, DOE, USAADACENFB, Texas and New Mexico. 5 May.

Ligon, J. S. 1961. New Mexico Birds and Where to Find Them. Albuquerque, New Mexico: University Press.

Locke, B. 1999. Wildlife Ecologist, Fort Bliss DOE, Fort Bliss, Texas. Personal communication with Chuck Burt, SAIC.

Loechl, S. K., S. A. Batzli, and S. I. Enscore. n.d. Guidelines for Documenting and Evaluating Historic Military Landscapes: An Integrated Approach. An AEC Technical Guideline prepared by the U.S. Army Construction Engineering Research Laboratory (CERL).

Lucas, M. J. and P. T. Calamia. 1994. Military Operating Area and Range Noise Model MR_NMAP Users Manual. Wyle Research Report WR 94-12. Prepared for Systems Research Laboratories, Inc. Wyle Laboratories, Arlington, Virginia. May.

Ludowski, Paul D., and R. P. Mauldin. 1995. Archaeological Investigations in Boulder Canyon. Historic and Natural Resources Report No. 11. Cultural Resources Branch, DOE, USAADACENFB, Texas and New Mexico.

Luna, R. 1997. Written correspondence with the DOE, Fort Bliss, Texas and New Mexico. Ronald Luna, Renewable Energy Development Manager, Directorate of Public Works and Logistics, Fort Bliss, Texas and New Mexico. 6 November.

Luz, G. A. and J. B. Smith. 1976. Reactions of Pronghorn Antelope to Helicopter Overflight. *Journal of the Acoustical Society of America* 59: 1514-1515.

MacKay, W. P., J. Oliver, V. Mendosa, L. Lenart, R. Guerrero, H. Navarro M. Gaglio, and J. Herrick. 1996. The Impact of Wheeled Vehicle Maneuvering on the Flora and Fauna of the Chihuahuan Desert. Preliminary Report. El Paso, Texas: University of Texas Laboratory for Experimental Biology.

Madsen, M. 1997. Personal communication with S. Goodan, SAIC. Mark Madsen, Wildlife Biologist, NMDGF.

Mardirosian. 1977. Mining Districts and Mineral Deposits of New Mexico. Socorro, New Mexico: NMBMMR.

Marshall. 1998. Personal communication with L. Gross, SAIC.

Marston, R. A. 1984. Assessment of Maneuver-Caused Erosion Impacts - Fort Bliss Military Reservation. El Paso, Texas: University of Texas Department of Geological Sciences.

_____. 1986. Maneuver-caused Wind Erosion Impacts, South-central New Mexico. In *Aeolian Geomorphology*, W. G. Nickling ed., 274-290. Boston, Massachusetts: Allen and Unwin Inc.

Martin, S. C. 1983. Responses of Semi-desert Grasses and Shrubs to Fall Burning. *Journal of Range Management* 36: 604-610.

Mathis, J. 1998. Written correspondence with the DOE, Fort Bliss, Texas and New Mexico. Mathis, Joe, Energy Coordinator and Utility Sales Officer, Fort Bliss, Texas and New Mexico. 10 March.

McCarthy, J. K. and P. H. S. Jens. 1983. Bats, *Eptesicus fuscus,* Reject Clutter Interference for Moving Targets More Successfully Than for Stationary Ones. *Journal of Comparative Physiology* 152(4): 447-454.

McClean, J. S. 1970. Saline Ground-Water Resources of the Tularosa Basin, New Mexico. Research and Development Progress Report, no. 561. USGS.

McClelland, L. F. and J. T. Keller. 1995. Guidelines for Evaluating and Documenting Rural Historic Landscapes. National Register Bulletin 30. Washington, DC: DOI, National Park Service.

McKenzie, W. 1997. Personal communication with Howell Estes, SAIC. Wayne McKenzie, DOE, Compliance Division, Hazardous Waste Team. USAADACENFB. 20 May.

McKernan, P. 1997. Personal communication with Howell Estes, SAIC. Pat McKernan, DOE, USAADACENFB. 20 May.

McLaughlin, S. P. and J. E. Bowers. 1982. Effects of Wildfire on a Sonoran Desert Community. *Ecology* 63: 246-248.

McLemore, V. T. and W. C. Chenoweth. 1989. Uranium Resources in New Mexico. Resource Map 18. Socorro, New Mexico: NMBMMR.

Miller, B. J. and F. L. Knopf. 1993. Growth and Survival of Mountain Plovers. *Journal of Field Ornithology* 64(4): 500-506.

Mojave Desert Air Quality Management District. 1998.

Montoya. A. B. 1995. Habitat Characteristics, Prey Selection, and Home Ranges of the Aplomado Falcon in Chihuahua, Mexico. M. S. Thesis. Las Cruces, New Mexico: New Mexico State University.

Montoya, A. B., P. J. Zwank, and M. Cardenas. 1997. Breeding Biology of Aplomado Falcons in Desert Grasslands of Chihuahua, Mexico. *Journal of Field Ornithology* 68(1): 135-143.

Moore, K. R. and C. J. Henny. 1983. Nesting Site Characteristics of Three Coexisting *Accipiter* Hawks in Northeastern Oregon. *Raptor Research* 17(3): 65-76.

Moore, F. R., S. A Gauthreaux, P. Kerlinger, and T. R. Simons. 1993. Stopover Habitat: Management Implications and Guidelines. In *Status and Management of Neotropical Migratory Birds*. GTR RM-229. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Mora, M. A., M. C. Lee, J. P Jenny, T. W. Schultz, J. L. Sericano, and N. J Clum. 1997. Potential Effects of Environmental Contamination on Recovery of the Aplomado Falcon in South Texas. *Journal of Wildlife Management* 61(4): 1288-1296.

Muffler, L. J. P. et al. 1978. Assessment of Geothermal Resources of the United States. Circular 790. USGS.

Naranjo, L. G. and R. J. Raitt. 1993. Breeding Bird Distribution in Chihuahuan Desert Habitats. *Southwest Naturalist* 38: 43-51.

National Oceanic and Atmospheric Administration (NOAA). 1996. El Paso Sectional Aeronautical Chart. Washington DC: U.S. Department of Commerce.

_____. n.d.. National Climate Data Center, http://www.ncdc.noar.gov/ol/climate/climatedata.html.

National Research Council. 1977. Guidelines for Preparing Environmental Impact Statements on Noise. Committee on Hearing, Bioacoustics, and Biomechanics, The National Research Council, National Academy of Sciences.

New Mexico Department of Game and Fish. 1996. Threatened and Endangered Species of New Mexico, 1996 Biennial Review and Recommendations. Santa Fe, New Mexico: NMDGF.

_____. 1997. Rifle Harvest Data and Aerial and Ground Survey Data for McGregor Range, 1983 through 1995. Santa Fe, New Mexico: NMDGF.

New Mexico Environmental Department. 1994. New Mexico Air Quality, 1991-1993. Santa Fe, New Mexico: Air Quality Bureau.

_____. 1997. New Mexico Air Quality, 1994-1996. Santa Fe, New Mexico: Air Quality Bureau.

Newcomb Jr., W. W. 1993. The Indians of Texas: From Prehistoric to Modern Times. Austin, Texas: University of Texas Press.

Newman, R. 1998. Personal communication with S. Goodan, SAIC. Rick Newman, Grazing Specialist. Lincoln National Forest, Sacramento District.

Nichols, H. R., C. F. Johnson, and W. I. Duvall. 1971. Blasting Vibrations and their Effects on Structures. Bulletin 656. U.S. Bureau of Mines.

Nickens, P. R., Larralde, S. L., and Tucker, G. C., Jr. 1981. A Survey of Vandalism to Archaeological Resources in Southwestern Colorado. Cultural Resources Series No. 11. Denver, Colorado: BLM.

Nielsen, A. E. 1991. Trampling the Archaeological Record: An Experimental Study. *American Antiquity* 56(3): 483-503.

O'Leary, B., T. Kludt, T. Church, and R. Mauldin. 1997. The McGregor Guided Missile Range Survey Project, New Mexico (draft), Volume 1-The Archaeology of Landscape-General Survey. Technical Report 14. El Paso, Texas: University of Texas, Anthropology Research Center.

Olson, K. 1984. Estimating Canopy Cover in Dry Land with LANDSAT MSS Data. *Advanced Space Research* 4:161-164.

O'Regan, E. B., C. M. Bern, and P. R. Block. 1995. Land Condition-Trend Analsys at Fort Bliss, Texas 1991-1993. Fort Collins, Colorado: Colorado State University, Department of Forest Services, Center for Ecological Management of Military Lands.

Opler, M. E. 1983. Mescalero Apache. In *Handbook of North American Indians: Southwest (Volume 10)*. Washington, DC: Smithsonian Institution.

Orodho, A. B., M. J. Trlica, and C. D. Bonham. 1990. Long-term Heavy-Grazing Effects on Soil and Vegetation in the Four Corners Region. *Southwestern Naturalist* 35(1):9-14.

Orr, B. R. and R. G. Meyers. 1986. Water Resources in Basin-Fill Deposits in the Tularosa Basin, New Mexico. Water-Resources Investigations Report 85-4219. USGS.

Orr, B. R. and D. W. Risser. 1992. Geohydrology and Potential Effects of Development of Fresh Water Resources in the Northern Part of the Hueco Bolson, Doña Ana and Otero Counties, New Mexico, and El Paso County, Texas. Water-Resources Investigations Report 91-4082. USGS.

Orr, B. R. and R. R. White. 1985. Selected Hydrologic Data from the Northern Part of the Hueco Bolson, New Mexico and Texas. Open File Report 85-696. USGS.

Otero County. n.d. *Interim Land Use Policy Plan.* Otero County, New Mexico.

Parker, P. L. 1993. Traditional Cultural Properties: What You Do and How We Think. *Cultural Resources Management* 16: 1-5.

Parker, Patricia, and Thomas F. King. 1992. Guidelines for Evaluating and Documenting Traditional Cultural Properties. National Register Bulletin 38. DOI, National Park Service, Interagency Resources Division.

Peter, K. 1988. Archaeological Reconnaissance of the Exclusive Use Area within the Saylor Creek Range, Idaho. Prepared for the U.S. Air Force (USAF).

Phillips, Tom. 1998. Personal communication at meeting with BLM, Las Cruces Field Office and Army. Tom Phillips, BLM Field Office. May.

Pianka, E. R. 1966. Convexity, Desert Lizards, and Spatial Heterogeneity. *Ecology* 47: 1055-1059.

Pino, J. 1997. Safety Office (Aviation Safety), Fort Bliss, Texas and New Mexico. Personal communication with William Wuest, SAIC.

Pippin, W. F. and B. Nichols. 1996 Observations of Arthropod Populations Following the La Mesa Fire of 1977. In *Proceedings of the Second La Mesa Fire Symposium.* GTR RM-GTR-286. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Price, Judith. 1997. Director of Community Development. Doña Ana County. Personal communication with S. Goodan, SAIC.

Quimby, B. and V. R. Brook. 1967. A Folsom Site Near El Paso, Texas. *The Artifact* 5(4): 31-47.

Raitt, R. J. and R. L. Maze. 1968. Densities and Species Composition of Breeding Birds of a Creosote Bush Community in Southern New Mexico. *Condor* 70: 193-205.

Rapp, J. R. 1958. Summary of Test Drilling and Groundwater Conditions in the McGregor Range Area, Otero and Doña Ana Counties, New Mexico, and El Paso County, Texas. USGS Open-File Report.

Reynolds, H. G, and J. W, Bohning. 1956. Effects of Burning on a Desert Grass-Shrub Range in southern Arizona. *Ecology* 37:769-777.

Richart, F. E. and R. D. Woods. 1970. Vibrations of Soils and Foundations. Englewood Cliffs, New Jersey: Prentice-Hall.

Robbins, C. S., J. R. Sauer, and B. G. Peterjohn. 1993. Population Trends and Management Opportunities for Neotropical Migrants. In *Status and Management of Neotropical Migratory Birds*. GTR RM-229. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Robert, M. and P. Laporte. 1991. History and Current Status of the Loggerhead Shrike in Quebec. Progress Note 196. Quebec, Canada: Canadian Wildlife Service.

Roberts, R. 1996. Personal communication with S. Goodan, SAIC. Ruby Roberts, realtor and resident, Timberon, New Mexico.

Robinove, C. J. 1982. Computation with Physical Values from LANDSAT Digital Data. *American Society of Photogrammetry and Remote Sensing* 48(5): 781-784.

Root, T. 1988. Atlas of Wintering North American Birds, An Analysis of Christmas Bird Count Data. Chicago, Illinois: University of Chicago Press.

Rosenberg, K. W., R. D. Ohmart, W. C. Hunter, and B. W. Anderson. 1991. Birds of the Lower Colorado River Valley. Tucson, Arizona: University of Arizona Press.

Rosenstock, S. S. 1996. Shrub-Grassland Small Mammal and Vegetation Responses to Rest From Grazing. *Journal of Range Management* 49(3): 199-203.

Saab, V. A., C. E. Bock, T. D. Rich, and D. S. Dobkin. 1995. Livestock Grazing Effects in Western North America. In *Ecology and Management of Neotropical Migratory Birds: A Synthesis and Review of Critical Issues*, T. E. Martin and D. M. Finch eds., 311-353. New York, NY: Oxford University Press.

Sager, L. 1996. A 1995 Survey of Mountain Plovers (*Charadrius montanus*) in New Mexico. Santa Fe New Mexico: NMDGF Endangered Species Program.

Sanders, T. 1998. Personal communication with S. Goodan, SAIC. Tim Sanders, Caballo Resource Area Manager. BLM, Las Cruces, New Mexico.

Sauer, J. R., J. E. Hines, G. Gough, I. Thomas, and B. G. Peterjohn. 1997. The North American Breeding Bird Survey Results and Analysis, Version 96.3. Laurel, Maryland: Patuxent Wildlife Research Center.

Schlesinger, W. H., J. F. Reynolds, G. L. Cunningham, L. F. Huenneke, W. M. Jarrell, R. A. Virginia, and W. G. Whitford. 1990. Biological Feedbacks in Global Desertification. *Science* 247: 1043-1048.

Schmidt, U. and G. Joermann. 1987. The Influence of Acoustical Interference on Echolocation in Bats. *Mammalia* 50(3): 379-390.

Schmutz, J. K. 1984. Ferruginous and Swainson's Hawk Abundance and Distribution in Relation to Land Use in Southwestern Alberta. *Journal of Wildlife Management* 48(4): 1180-1187.

Schultz, T. J. 1978. Synthesis of Social Surveys on Noise Annoyance. *Journal of the Acoustical Society of America* 64: 377-405. August.

Schroeder, A. H. 1973. The Mescalero Apache. Technical Manual: 1973 Survey of the Tularosa Basin. Tularosa, New Mexico: Human Systems Research.

Scott, N. J. 1996. Evolution and Management of the North American Grassland Herpetofauna. In *Ecosystem Disturbance and Wildlife Conservation in Western Grasslands,* 40-53. GTR RM-GTR-285. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Senseman, G.M., S.A. Tweddale, A.B. Anderson, and C.F. Bagley. 1996. Correlation of Land Condition Trend Analysis (LCTA) rangeland cover measures to satellite-imagery-derived vegetation indices. U.S. Army CERL Technical Report 97/07 October.

Sepulveda, Shawn. 1997. Chief Controller, Biggs Army Air Field (AAF) Air Traffic Control Tower (ATCT). Personal communication with R. Blakely. 29 April.

Sferra, S. J., T. E. Corman, C. E. Paradzick, J. W. Rourke, J. A. Spencer, and M. W. Summer. 1997. Arizona Partners in Flight Southwestern Willow Flycatcher Survey: 1993-1996 Summary Report. Nongame and Endangered Wildlife Program Technical Report 113. Phoenix, Arizona: Arizona Game and Fish Department.

Shahrijar, S. 1997. Compliance Division, DOE, Fort Bliss, Texas and New Mexico. Personal communication with Jerry Dougherty, SAIC. 3 November .

Shea, J. J. and J. D. Klenck. 1993. An Experimental Investigation of the Effects of Trampling on the Results of Lithic Microwear Analysis. *Journal of Archaeological Science* 20(2): 175-194.

Sheery, T. W. and R. T. Holmes. 1996. Winter Habitat Quality, Population Limitation, and Conservation of Neotropical-Nearctic Migrant Birds. *Ecology* 77(1): 36-48.

Sherfy, Marcella, and W. Ray Luce. n.d. Guidelines for Evaluating and Nominating Properties that have Achieved Significance within the Last Fifty Years. National Register Bulletin 22. Washington, DC: DOI, National Park Service, Interagency Resources Division.

Simmons, J. A., W. A. Lavender, and B. A. Lavender. 1974. Quantitative Effects of Noise on Sonar Performance in Bats. *Journal of the Acoustical Society of America* 56(S): S38-S38 (abstract only).

Simons, L. H. 1989. Vertebrates Killed by Desert Fire. *The Southwestern Naturalist* 34: 144-145.

Sims, P. 1997. Environmental Services Division, Department of Logistics, Directorate of Health Services, William Beaumont Army Medical Center (WBAMC), Fort Bliss, Texas and New Mexico. Personal communication with Jerry Dougherty, SAIC. 20 May.

Sire, David. 1998. Environmental Coordinator, Southwest Region, USFS, Albuquerque, Regional Office. Personal communication with S. Goodan, SAIC. 13 April.

Siskind, P. E., M. S. Staggs, J. W. Kopp, and C. H. Dowding. 1980. Structure Response and Damage Produced by Ground Vibration from Surface Mine Blasting. U.S. Bureau of Mines Report of Investigations 507.

Sivinski, R. and K. Lightfoot. 1995. Inventory of Rare and Endangered Plants of New Mexico. 3rd edition. Miscellaneous Publication No. 4. Santa Fe, New Mexico: New Mexico Department of Energy, Minerals, and Natural Resources (NMDEMNR), Forestry and Resources Conservation Division.

Skaggs, R. W. and R. J. Raitt. 1988. A Spotted Owl Inventory on the Lincoln National Forest Sacramento Division. Santa Fe, New Mexico: NMDGF.

Smartt, R. 1980. Wildlife Support Document, McGregor Range Grazing EIS. Las Cruces, New Mexico: BLM.

Smith, J. A., J. K. Luers, and M. A. Dietenberger. 1991. User's Reference Guide for Noise Assessment Prediction System (NAPS*)*. University of Dayton Research Institute. Dayton, Ohio. U.S. Army Atmospheric Sciences Laboratory, WSMR, New Mexico. September.

Smith, J. W. and R. B. Renken. 1991. Least Tern Nesting Habitat in the Mississippi River Valley Adjacent to Missouri. *Journal of Field Ornithology* 62(4): 497-504.

Sogge, M. K., R. M. Marshall. S. J. Sferra, and T. J. Tibbitts. 1997. A Southwestern Willow Flycatcher Natural History Summary and Survey Protocol. Technical Report NPS/NAUCPRS/NRTR-97/12, USGS Colorado Plateau Research Station/Northern Arizona State University.

Soil and Water Conservation Society. 1995. Revised Universal Soil Loss Equation (RUSLE), version 1.04. Soil and Water Conservation Society.

Spencer, D. A. 1976. Wintering Bald Eagle. National Agricultural Chemicals Association, Washington, DC

Steenhof, K, S. S. Berlinge, and L. H. Frederickson. 1980. Habitat Use by Wintering Bald Eagles in South Dakota. *Journal of Wildlife Management* 44: 798-805.

Stewart, J. H. 1978. Basin-Range Structure in Western North America: A Review. In *Cenozoic Tectonics and Regional Geophysics of the Western Cordillera*, 1-32. Memoir 152. Geological Society of America.

Stoddart, L. A., A. D. Smith, and T. W. Box. 1975. Range Management. 3rd Edition. New York: McGraw-Hill.

Sutherland, L. 1990. Assessment of Potential Structural Damage from Low-altitude Subsonic Aircraft. Wyle Laboratories Research Report WR 89-16 R. Prepared for Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee.

Tagg, M. D. 1996. Early Cultigens from Fresnal Shelter, Southeastern New Mexico. *American Antiquity* 61(2): 311-324.

Texas A&M University. 1996. Projections of the Population of Texas and Counties in Texas by Age, Sex, and Race/Ethnicity for 1990-2030. Texas Agriculture Experiment Station, Texas State Data Center, and Texas A&M University System, Department of Rural Sociology.

Texas Parks and Wildlife. 1996. Texas Threatened and Endangered Species. Austin, Texas.

Thal, A. J. 1997a. Assessment of Potential Problems with Agricultural Locus to the Livestock Ranching Community: A Community Reinvestment Act Special Report. Final Draft. March.

_____. 1997b. Personal communication with R. Brandin, SAIC. A. J. Thal, Director, Southwest Center for Resource Analysis, Western New Mexico University.

Thomas, A. B. 1974. The Mescalero Apache, 1653-1874. In *Apache Indians XI, American Indian Ethnohistory, Indians of the Southwest*, D. A. Horr ed. New York: Garland Publishing.

Thompson, S. 1976. Tectonic and Igneous Effects on Petroleum Accumulations in Southwestern New Mexico. In *Tectonics and Mineral Resources of Southwestern North America*, 122-126. New Mexico Geological Society Special Publication No. 6.

Thornhill, L. 1998. Personal communication with S. Goodan, SAIC. Lee Thornhill, Grazing Specialist, Lincoln National Forest, Guadalupe District.

Tibbett, J. 1998. Personal communication with J. Raines, SAIC. March.

Tressler, P. 1997. Safety Office (Explosive Safety), Fort Bliss, Texas and New Mexico. Personal communication with William Wuest, SAIC.

Trimble, S. W. and A. C. Mendel. 1995. The Cow as a Geomorphic Agent – A Critical Review. *Geomorphology* 13: 233-253.

Troest, N. and B. Mohl. 1986. The Detection of Phantom Targets in Noise by Serotine Bats. *Journal of Comparative Physiology (A)* 159: 559-568.

U.S. Air Force. 1992. Final EIS: Proposals for the Air Force in Idaho. Volumes I and II. January.

_____. 1997a. Unpublished Field Notes (breeding bird surveys) prepared by SAIC. Prepared for the USAF dated 6 through 9 May.

_____. 1997b. Unpublished Field Notes (breeding bird surveys) prepared by SAIC. Prepared for the USAF dated 4 through 6 and 11 June.

_____. 1997c. Unpublished Field Notes (raptor surveys) prepared by SAIC. Prepared for the USAF dated 25 through 28 March.

_____. 1997d. Unpublished Field Notes (raptor surveys) prepared by SAIC. Prepared for the USAF dated 21 through 23 May.

_____. 1997e. Unpublished Field Notes (bat surveys) prepared by SAIC. Prepared for the USAF dated 28 through 31 May.

_____. 1997f. Unpublished Field Notes (bat surveys) prepared by SAIC. Prepared for the USAF dated 26 through 31 August.

_____. 1997g. Vegetation of the Tularosa Valley and Otero Mesa Study Sites. Prepared by SAIC for the USAF.

_____. 1997h. Unpublished Field Notes (mountain plover and burrowing surveys) prepared by SAIC. Prepared for the USAF dated 31 March through 3 April.

_____. 1997i. Unpublished Field Notes (mountain plover and burrowing owl surveys) prepared by SAIC. Prepared for the USAF dated 27 through 30 May and 11 June.

_____. 1997j. Final EA for the Drawdown of AT-38 Aircraft and Deactivation of the 435 Fighter Squadron at HAFB, New Mexico.

_____. 1998. Proposed Expansion of German Air Force Operations at HAFB, New Mexico, Final EIS. Air Combat Command (ACC), Langley AFB, Virginia.

U.S. Army. 1977. Land Use Withdrawal McGregor Range, Fort Bliss, Texas, EIS. Headquarters, Training and Doctrine Command (TRADOC), Fort Monroe, Virginia. August.

_____. 1980a. A Survey for Breeding Peregrine Falcons on Fort Bliss Military Reservation, New Mexico. Prepared by Skaggs, R. W and K. E. Skaggs. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1980b. Report on a Survey for Sneed Pincushion Cactus, *Coryphantha snedii (Britton and Rosa) Berger var. Sneedii*, on the Doña Ana Range, Doña Ana County, New Mexico. Prepared by Worthington, R. D. and C. E. Freeman. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1985. Comprehensive Engineering Analysis and General Water System Plan for Future Development, Fort Bliss, Texas, Master Planning and Construction Programming. Prepared by Bohannan-Huston Inc. Prepared for USACE. July.

_____. 1987. USACE Wetlands Delineation Manual. Technical Report Y-87-1, Waterways Experiment Station, Vicksburg, Mississippi. Prepared for USACE.

_____. 1988. Environmental Effects of Army Actions. (AR 200-2).

_____. 1990. Project Report for: *Peniocerceus greggi* Survey, Range 49. Prepared by Scarbrough, L. L. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1991a. Rare Plant Survey of the Limestone Hills East of Nations East Well and West of Hueco Tanks State Historical Park, Fort Bliss Military Reservation, El Paso County, Texas. Prepared by Worthington, R. D. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1991b. A Spotted Owl Inventory in the Organ Mountains of South-central New Mexico, 1991. In *A Survey of Sensitive Species and Vegetation Communities in the Organ Mountains of Fort Bliss*. Prepared by R. W. Skaggs, New Mexico Natural Heritage Program, Albuquerque, New Mexico. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1992. A History of Otero Mesa: the Last 5,000 Years. Prepared by J. B. Sanders. Manuscript on file. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1993a. Local Provisions and Flying Rules for Biggs Army Airfield (USAADACENFB Regulation 95-1*)*. Headquarters, USAADACENFB, Texas and New Mexico. June.

_____. 1993b. Survey History of Fort Bliss, 1890-1940. Historic and Natural Resources Report 5. Prepared by P. Jamieson. Prepared for the DOE, USAADACENFB, Texas and New Mexico.

_____. 1993c. The Divad Archaeological Project. Historic and Natural Resources Report 8. Prepared by Mauldin, R. Prepared for the Cultural Resources Management Branch, DOE, USAADACENFB, Texas and New Mexico.

_____. 1993d. EA of the Joint Task Force Six (JTF-6) Drag Road Construction Project JT 221C-93 Otero County, New Mexico. Finding of No Significant Impact. Prepared by the USACE, Albuquerque District. August 16.

_____. 1994a. Final Programmatic Environmental Impact Statement (PEIS) for the Joint Training Exercise Roving Sands at Fort Bliss, Texas and New Mexico and WSMR, New Mexico. Headquarters, U.S. Armed Forces Command, Fort McPherson, Georgia. February.

_____. 1994b. Draft Aplomado Falcon Survey Report, Spring, 1994. Prepared by R. A. Tafanelli and B. Montoya. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1994c. Application for a RCRA Part B Permit Modification. Proposed Modifications to the Container Storage Facility Building 11614 Area Fort Bliss Military Reservation El Paso, Texas. Permit No. HW-50296 Texas SWR No. 63003. DOE, Fort Bliss, Texas and New Mexico. November.

_____. 1994d. Effects of Fire on Four Desert Plants: *Dasylirion wheeleri, Ferocactus weslizeni, Yucca baccata*, and *Yucca torreyi*. M.S. Thesis. University of Texas at El Paso. Prepared by T. A. McGoldrick. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1995a. EA, Military Intelligence Battalion (Low Intensity) (MIBN [LI]) Relocation from Naval Training Center, Orlando, FL, to Fort Bliss, Texas and New Mexico. October.

_____. 1995b. EA for Theater High-altitude Area Defense (THAAD) System Activation of Objective Battalions, Fort Bliss, Texas and New Mexico. February.

_____. 1995c. Long-term Monitoring of Neotropical Migrant and Chihuahuan Desert Arroyo-Riparian Habitat and its Adjacent Upland. A Year End Report for the 1995 Field Season. Texas Tech. University. Prepared by J. M. Kozma and N. E. Mathews. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1995d. Wintering Bald Eagles on Fort Bliss, New Mexico, 1994-1995, Status Report. Prepared by R. Tafanelli and R. Meyer. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1995e. Collections Summary for Fort Bliss, Texas. Technical Report 32, U.S. Army NAGPRA Compliance Project. Prepared for the USACE.

_____. 1995f. Project 92-02: An Inventory Survey of Selected Quadrants of McGregor Range for RS JTX and the Ranger Training Battalion. Miscellaneous Report of Investigations 49. Prepared by Peter, D. E. and S. Mbutu. Prepared for the Cultural Resources Program, DOE, Fort Bliss, Texas and New Mexico.

_____. 1995g. Catalog of Atmospheric Acoustic Prediction Models (Document 383-95). Meteorology Group Range Commanders Council, Secretariat Range Commanders Council, WSMR, New Mexico. June.

_____. 1996a. Army Stationing and Installations Plan (ASIP) Station Reports dated 9 September and 17 September. Fort Bliss, Texas and New Mexico.

_____. 1996b. Standard Operating Procedures (SOPs) for Weapons Firing and Maneuver Area Use. Headquarters, USAADACENFB. 1st USACASB. Fort Bliss, Texas and New Mexico. July.

_____. 1996c. DA Form 3479-6-R. Monthly Traffic Record. Biggs Army Airfield. January through December.

_____. 1996d. Vegetation of Fort Bliss Texas and New Mexico, Final Report Volume II Vegetation Map. New Mexico Natural Heritage Program, Albuquerque, New Mexico. Prepared by P. Mehlhop and E. Muldavin. Prepared for the DOE, Fort Bliss, Fort Bliss Texas and New Mexico.

_____. 1996e. Effects of Range Fire on Reptile Populations at McGregor Range, Fort Bliss. Texas Tech. University, Lubbock, Texas. Prepared by M. E. Vogel, S. Demarias, and J. M. Mueller. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1996f. Checklists of Birds, Fort Bliss, Texas. DOE, Fort Bliss, Texas and New Mexico.

_____. 1996g. Avian Productivity and Diversity in Seven Habitats within the Northern Chihuahuan Desert, New Mexico, Baseline and Predictions for the McGregor Range and Surrounding Area. A Year End Report for the 1996 Field Season. University of Wisconsin, Madison, Wisconsin. Prepared by A. Pidgeon and N. Mathews. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1996h. Long-term Monitoring of Neotropical Migrant and Chihuahuan Desert Arroyo-Riparian Habitat and its Adjacent Upland. A Year End Report for the 1996 Field Season. University of Wisconsin, Madison, Wisconsin. Prepared by L. M. Myers and N. E. Mathews. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1996i. Wintering Bald Eagles on Fort Bliss, New Mexico, 1994-1996. Draft Report. Prepared by R. Tafanelli, R. Meyer, A. Day, and M. Livingston. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1996j. Mexican Spotted Owl Inventory and Habitat Assessment on Fort Bliss, New Mexico, 1995-1996. Prepared by R. Meyer, New Mexico State University, Las Cruces, New Mexico. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1996k. Baseline Survey of Black-Tailed Prairie Dog Towns on Otero Mesa and Adjacent Areas on McGregor Range, Fort Bliss. Final Report. Prepared by S. Demarais, K. Launchbaugh, and E. E. Jorgensen, Texas Tech. University, Lubbock, Texas. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1996l. Range Utilization Report (FB Form 0088a). January through December.

_____. 1996m. Installation Hazardous Waste Management Plan. USAADCENFB, Texas and New Mexico. January.

_____. 1996n. Ordnance and Explosive Usage, McGregor Range, Fort Bliss, Texas and New Mexico. Archive Search Report, Findings Volume. USACE, St. Louis, Missouri. December.

_____. 1996o. Small Mammal and Herpetofauna Habitat Associations and Communities on the McGregor Range, Fort Bliss; Sacramento Mountain Foothills, Final Report. Texas Tech. University, Lubbock, Texas. Prepared by Jorgensen, E. E. and S. Demarais. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1996p. Final Report, Kit Fox Behavior and Food Habitat on the Northern McGregor Range, Fort Bliss Military Reservation. Prepared by N. E. Mathews, P. J. Rodrick and M. L. Jones. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1996q. Cultural Resources Research Design for the McGregor Guided Missile Range Withdrawal EIS: Fort Bliss Project 95-03. Prepared by Burgett, G. R., T. Church, and K. Faunce. Manuscript on file. DOE, Fort Bliss, Texas and New Mexico.

_____. 1997a. The Fort Bliss Pre-Acquisition Project: A History of the Southern Tularosa Basin. Prepared by K.V. Faunce, Univ. Texas at El Paso, Anthropology Research Center, Archeological Technical Reports No. 11 for the U.S. Army.

_____. 1997b. Long Range Component for the Real Property Master Plan (RPMP) for Fort Bliss, Texas. GEC, Inc., Baton Rouge, Louisiana.

_____. 1997c. Vegetation of Fort Bliss, Texas and New Mexico, Volume I, Vegetation Communities. Prepared by P. Mehlhop and E. Muldavin, New Mexico Natural Heritage Program, Albuquerque, New Mexico. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1997d. Phase I: Study of Species Composition, Diversity and Relative Abundance of Reptiles and Amphibians from Six Vegetative Community Associations on Otero Mesa, McGregor Range, Fort Bliss. Draft. Prepared by T. M. Bashore. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1997e. Amphibians and Reptiles of Fort Bliss, Texas, Species List. Prepared by T. M. Bashore. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1997f. Avian Diversity and Productivity in Seven Habitats in the Northern Chihuahuan Desert. 1997 Year End Report. Prepared by A. Pidgeon and N. Mathews, University of Wisconsin, Madison, Wisconsin. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1997g. Long-term Analysis of Avian Population Trends in Arroyo-riparian Habitat in the Chihuahuan Desert. 1997 Year-end Report. Prepared by L. M. Myers and N. E. Mathews, University of Wisconsin, Madison, Wisconsin. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1997h. Unpublished field notes (breeding bird surveys, Hueco Mountains). Prepared by SAIC for the U.S. Army. 9 through 12 June.

_____. 1997i. Summary of Results of First Trapping Period at Fort Bliss Military Reservation. Prepared by R. J. Baker and R. D. Bradley, Department of Biological Sciences, Texas Tech. University, Lubbock, Texas. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1997j. The McGregor Guided Missile Range Survey Project, New Mexico, Volume II: Otero Mesa Escarpment Survey. Prepared by T. Graves, S. Hall, J. Arias, J, Sirianni, and S. Mbutu. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1997k. Aplomado Falcon Survey and Habitat Evaluation on Fort Bliss Military Reservation 1995-1996. Draft. Prepared by R. Meyer, New Mexico State University, Las Cruces, New Mexico. Prepared for the DOE, Fort Bliss, Texas and New Mexico.

_____. 1997l. Western Burrowing Owl Survey Interim Status Report. Prepared by TRC, Austin, Texas. Prepared for the USACE, Fort Worth, Texas.

_____. 1997m. Baird's Sparrow Survey Interim Status Report. Prepared by TRC, Austin, Texas. Prepared for the USACE, Fort Worth, Texas.

_____. 1997n. The Fort Bliss Preacquisition Project: A History of the Southern Tularosa Basin. Archaeological Technical Report 11. Prepared by K. V. Faunce. Prepared for the Conservation Division, DOE, USAADCENFB, Texas and New Mexico.

_____. 1997o. Annual Waste Summary Report. Prepared by Roy F. Weston. Prepared for the DOE, Fort Bliss, Texas and New Mexico. January.

_____. 1997p. Open Detonation Pit Sampling Report. DOE, Fort Bliss, Texas and New Mexico. February.

_____. 1997q. Pest Management Plan for Fort Bliss, Texas. DOE, Fort Bliss, Texas and New Mexico. February.

_____. 1997r. Fort Bliss Cultural Resource Database. 5 February.

_____. 1998a. Draft Fort Bliss Mission and Master Plan PEIS. Prepared for the USACE.

_____. 1998b. Integrated Natural Resource Management Plan (INRMP). USAADCENFB, Texas and New Mexico.

_____. 1998c. The Integrated Cultural Resources Management Plan (ICRMP) for Fort Bliss through Fiscal Year 2000, February 1997.

_____. 1998d. Fort Bliss, Texas and New Mexico, Training Area Development Concept (TADC). USAADCENFB. May.

_____. 1998e. McGregor Range, New Mexico, Land Withdrawal Renewal Land Use Study.

_____. 1998f. McGregor Range, New Mexico, Land Withdrawal Renewal Water Requirements and Resources Assessment.

_____. 1998g. Mineral and Energy Resources Assessment of the McGregor Range, New Mexico. (Draft). Prepared by the NMBMMR, New Mexico State University and TRC Mariah Associates, Inc. Prepared for the USACE, Fort Worth, Texas. February.

_____. 1998h. Delineation and Characterization of "Waters of the United States" at Fort Bliss, Texas and New Mexico. Prepared by Robert Lickvar and Steven Sprecher, USACE Waterways Experiment Station.

_____. 1998i. Unpublished field notes (raptor survey). Prepared by SAIC for the DOE, Fort Bliss, Texas and New Mexico. 13 through 17 April.

_____. 1998j. Unpublished field notes (bat survey, Otero Mesa Escarpment and Sacramento Mountains foothills). Prepared by SAIC for the DOE, Fort Bliss, Texas and New Mexico. June 27 through July 1.

_____. 1998k. 1996-1997 Post-wide Survey of Federally Listed and Other Species of Concern at Fort Bliss. Prepared by TRC Mariah Associates. Prepared for the USACE, Fort Worth, Texas.

_____. 1998l. Unpublished field notes (gray vireo survey in the Sacramento Mountains foothills). Prepared by SAIC for the DOE, Fort Bliss, Texas and New Mexico. 23 through 26 June.

_____. 1998m. McGregor Range, New Mexico, Land Withdrawal Renewal, Economic Report. USACE Fort Worth Texas. October.

_____. 1998n. WSMR, Range-wide EIS. DOE and Safety, Environmental Services Division, WSMR, New Mexico. January.

_____. 1999. U.S. Army, Summary Report of Field Surveys conducted on McGregor Range for the McGregor Range LEIS. Prepared for the USAADACENFB Manager, McGregor Renewal Fort Bliss, Texas and New Mexico by the USACE, Fort Worth District, Fort Worth Texas.

U.S. Army Center for Health and Preventative Medicine. 1994.

U.S. Department of Agriculture. 1981. Soil Survey of Otero Area, New Mexico: Parts of Otero, Eddie, and Chaves Counties.

_____. 1995. Wear Tolerance of Six Components of the Fort Bliss Military Reservation, Otero Mesa Ecosystem. Progress Report. Natural Resource Conservation Service (NRCS).

_____. 1996. Wear Tolerance of Six Components of the Fort Bliss Military Reservation, Otero Mesa Ecosystem. Progress Report. NRCS.

U.S. Department of Commerce. 1992a. 1990 Census of Population and Housing Summary Tape File 3 on CD-ROM Technical Documentation. U.S. Bureau of the Census. May.

_____. 1992b. 1990 Census of Population and Housing Summary Tape File 3A. Texas: Anderson County–Dimmit County. Data User Services Division, U.S. Bureau of the Census. CD90-3A-54. November.

_____. 1992c. 1990 Census of Population and Housing Summary Tape File 3A. Colorado, New Mexico. Data User Services Division, U.S. Bureau of the Census. CD90-3A-09. September.

_____. 1993. County and City Data Book, 1993. Bureau of the Census, CD-ROM. June.

_____. 1994. County and City Data Book, 1994. Bureau of the Census, CD-ROM.

_____. 1996a. Bureau of Economic Analysis, Regional Economic Information System, 1969-1994, CD-ROM. Table CA25 Full-Time and Part-Time Employees by Major Industry for Counties and Metropolitan Areas. June.

_____. 1996b. Bureau of Economic Analysis, Regional Economic Information System, 1969-1994, CD-ROM. Table CA25, Personal Income by Major Source and Earnings by Major Industry for Counties and Metropolitan Areas. June.

U.S. Department of Defense (DoD). 1997. Flight Information Publication Area Planning, Military Training Routes North and South America, AP/IB. 22 May.

U.S. Department of Energy. 1980. An Assessment Report on Uranium in the United States of America: U.S. Department of Energy, Grand Junction Operations, Report GJO-111(80).

U.S. Department of Interior. 1986. RMP. White Sands Resource Area. October.

_____. 1989. Organ Mountains Coordinated RMP and Record of Decision (ROD). BLM, Las Cruces District, Mimbres Resource Area. May.

_____. 1993. Mimbres RMP. BLM, Las Cruces, New Mexico.

_____. 1995. Mimbres Resource Area. December.

U.S. Fish and Wildlife Service (USFWS). 1990. Interior Population of the Least Tern (*Sterna antillarum*) Recovery Plan. USFWS, Grand Island, Nebraska.

_____. 1996. Survey Methodology for the Northern Aplomado Falcon (*Falco femoralis septentrionalis*) in New Mexico. USFWS, New Mexico Ecological Services State Office, Albuquerque, New Mexico.

_____. 1997. U.S. Fish and Wildlife Service Species of Concern for New Mexico. USFWS, Albuquerque, New Mexico.

U.S. Forest Service. 1986. Lincoln National Forest Plan.

_____. 1992. Overview, Report to Congress, Potential Impacts of Aircraft Overflights of National Forest System Wilderness. Report to Congress. Prepared pursuant to Section 5, PL 100-91, National Park Overflights Act of 1987. January.

_____.1998. Visual Quality Objective. Sacramento River District. Map. GIS-98-15-SO.

U.S. Geological Survey. 1981. Energy Resources Map of New Mexico. USGS, Miscellaneous Investigations Series Map I-1327.

Valentine, J. F. 1971. Range Developments and Improvements. Provo, Utah: Brigham Young University Press.

Vallejos, R. 1997. Personal communication with S. Goodan, SAIC. Ramona Vallejos, Doña Ana County, Grants Administration.

Von Gierke, M. R. 1990. The Noise-induced Hearing Loss Problem. NIH Consensus Development Conference on Noise and Hearing Loss, Washington, DC 22 to 24 January.

Weigel, J. R., C. M. Britton, and G. R. McPherson. 1990. Trampling Effects from Short-duration Grazing on Tobosa-grass Range. *Journal of Range Management* 43(2): 92-95.

Weisenberger, M. E., P. R. Krausman, M. C. Wallace, D. W. De Young, and O. Eugene Maughan. 1996. Effects of Simulated Jet Aircraft Noise on Heart Rate and Behavior of Desert Ungulates. *Journal of Wildlife Management* 60: 52-61.

Weltz, M. M., K. Wood, and E. E. Parker. 1989. Flash Grazing and Trampling: Effects on Infiltration Rates and Sediment Yield on a Selected New Mexico Range Site. *Journal of Arid Environments* 16: 95-100.

Wesler, J. E., 1977. Concorde Operations at Dulles International Airport. NOISEXPO '77, Chicago, IL, March.

Western Regional Climate Center. 1998. Wind Speed Data in Vicinity of HAFB, Five Year Wind Speed Values, 1992-1996.

Whalen, Michael E. 1981. An Investigation of Pithouse Village Structure in Western Texas. *Journal of Field Archaeology* 8(3): 303-311.

_____. 1986. Small-site Analysis in the Hueco Bolson of Western Texas. *Journal of Field Archaeology* 13(1): 69-81.

White, C. M. and T. L. Thurow. 1985. Reproduction of Ferruginous Hawks Exposed to Controlled Disturbance. *The Condor* 87: 14-22.

Whitman, P. L. 1988. Biology and Conservation of the Endangered Interior Least Tern: A Literature Review. Biology Report 88(3). Washington, DC: USFWS.

Williams, S. O. 1997. The Willow Flycatcher in New Mexico: History and Current Status. Santa Fe, New Mexico: NMDGF.

Wilshire, H. G. 1977. Study Results of 9 Sites Used by Off-road Vehicles that Illustrate Land Modifications. Open-File Report 77-601. Desert Protective Council, Inc.

Woodruff, C. M., Jr., L. C. Dwyer, and C. Gever. 1982. Geothermal Resources of Texas. Austin, Texas: Texas Bureau of Economic Geology, University of Texas.

Wright, H. W. 1974. Effects of Fire on Southern Mixed Prairie Grasslands. *Journal of Range Management* 27: 417-419.

Wright, H. A. and A. W. Bailey. 1982. Fire Ecology: United States and Southern Canada. New York: John Wiley and Sons.

Wright, H. A., S. C. Bunting, and L. F. Neuenschwander. 1976. Effect of Fire on Honey Mesquite. *Journal of Range Management* 29: 467-471.

Yang, J. and S. D. Prince. 1997. A Theoretical Assessment of the Relationship between Woody Canopy and Red Reflectance. *Journal of Remote Sensing of Environment* 59: 428-439.

Zwank, P. J., K. W. Kroel, D. M. Levin, G. M. Southward, and R. C. Romme. 1995. Habitat Characteristics of Mexican Spotted Owls in Southern New Mexico. *Journal of Field Ornithology* 65: 324-334.

7.3 REFERENCES CONSULTED, BUT NOT CITED

Acoustical Society of America. 1987. Community Reactions to Helicopter Noise: Results from an Experimental Study. *Journal of the Acoustical Society of America* 82: 479-492.

Adams, D. C. and G. R. Keller. 1994. Crustal Structure and Basin Geometry in South-central New Mexico. In *Basins of the Rio Grande Rift: Structure, Stratigraphy, and Tectonic Setting*, G. R. Keller and S. M. Cather eds., 241-255. Special Paper 291. Geological Society of America.

Beckett, P. H. 1983. The Paleoindian Prehistory of the Tularosa Basin. In *The Prehistory of Rhodes Canyon, New Mexico*, P. L. Eidenbach ed. Human Systems Research, Tularosa, New Mexico.

Brady, W. W., M .R. Stromberg, E. F. Aldon, C. D. Bonham, and S. H. Fenry. 1989. Response of a Semidesert Grassland to 16 years of Rest from Grazing. *Journal of Range Management* 42: 284-288.

Bureau of Land Management. 1996. McGregor Range Recreation Permits by Activity for August 16 through October 21.

Collins, W. E. and Raney, J. A. 1991. Tertiary and Quaternary Structure and Paleotectonics of the Hueco Basin, Trans-Pecos Texas and Chihuahua, Mexico. Geological Circular 91-2. Austin, Texas: Texas Bureau of Economic Geology, University of Texas.

Covington, W. W. and M. M. Moore. 1992. Change in Forest Conditions and Multi-resource Yields from Ponderosa Pine Forests since European Settlement. *Journal of Forestry* 92: 39-47.

Davis, S. D., W. P. Pennington, and S. M. Carlson. 1989. A Compendium of Earthquake Activity in Texas. Geological Circular 89-3. Austin, Texas: Texas Bureau of Economic Geology, University of Texas.

Drewes, H. 1978. The Cordilleran Orogenic Belt between Nevada and Chihuahua. *Geological Society of America Bulletin* 89: 641-657.

Edmonds, L. D. et al. 1979. Airport Noise and Teratogenesis. *Archives of Environmental Health* July/August: 243-247.

Elias, S. A. and T. R. Van Devender. 1992. Insect Fossil Evidence of Late Quaternary Environments in the Northern Chihuahuan Desert of Texas and New Mexico: Comparisons with the Paleobotanical Record. *The Southwestern Naturalist* 37(2): 101-116.

Ellis, D. H., C. Ellis, and D. Mindell. 1991. Raptor Response to Low Level Jet Aircraft and Sonic Booms. *Environmental Pollution* 74: 53083.

El Paso Water Utilities Public Service Board. 1995. Water Resources Report 1993. Prepared by E. C. Rebuck, S. M. Jorat, and R. Sperka.

Fields, J. M. and C. A. Powell. 1985. A Community Survey of Helicopter Noise Annoyance Conducted Under Controlled Noise Exposure Conditions. NAS TM-86400. March.

Freeman, M. D. 1977. The Historic Resources on McGregor Range. In A Cultural Resource Inventory and Assessment of McGregor Guided Missile Range, Otero County, New Mexico, Part I: The Cultural Resource Base. Texas Archaeological Survey Research Report No. 65. Austin, Texas: University of Texas.

Frericks, R. R. 1980. Los Angeles Airport Noise and Mortality: Faulty Analysis and Public Policy. *American Journal of Public Health* April: 357-362.

Gifford-Gonzalez, D. P., D. B. Damrosch, D. R. Damrosch, J. Pryor, and R. L. Thunen. 1985. The Third Dimension in Site Structure: An Experiment in Tramping and Vertical Dispersal. *American Antiquity* 50(4): 803-818.

Gile, L. H. 1987. Late Holocene Displacement along the Organ Mountains Fault in Southern New Mexico. Circular 196. NMBMMR.

_____. 1994. Soils, Geomorphology, and Multiple Displacements along the Organ Mountains Fault in Southern New Mexico. Bulletin 133. NMBMMR.

Gross, F. A. and W. A. Dick-Peddie. 1979. A Map of Primeval Vegetation in New Mexico. *The Southwestern Naturalist* 24(1): 15-122.

Grubb, T. G. and R. M. King. 1991. Assessing Human Disturbance of Breeding Bald Eagles with Classification Tree Models. *Journal of Wildlife Management* 55: 501-512.

Gustavson, T. C. 1991. Arid Basin Depositional Systems and Paleosols: Fort Hancock and Camp Rice Formations (Pliocene-Pleistocene), Hueco Bolson, west Texas and adjacent Mexico. Report of Investigations No. 198. Austin, Texas: Texas Bureau of Economic Geology, University of Texas.

Hall, S. A. 1985. Quaternary Pollen Analysis and Vegetational History of the Southwest. In Pollen Records of Late Quaternary North American Sediments, 95-123. *American Association of Stratigraphic Palynologists*.

_____. 1997. Paleoecology of Otero Mesa, New Mexico: Assessment and Potential. In *The McGregor Guided Missile Range Survey Project, New Mexico, Volume II: Otero Mesa Escarpment Survey* (draft), T. Graves, S. Hall, J. Arias, J. Sirianni and S. Mbutu, eds., 41-55. Archaeological Technical Report 14. El Paso, Texas: Anthropology Research Center, University of Texas.

Hansen, D. 1977. Taxonomic Status of the Prairie Dog Subspecies *Cynomys ludovicianus ludovicianus* (Ords and *Cynomys ludovicianus arizonensis*) Mearns. M. S. Thesis. Eastern New Mexico University.

Harbour, R. L. 1972. Geology of the Northern Franklin Mountains. Bulletin 1298. USGS.

Harris, C. H. 1979. Handbook of Noise Control. New York: McGraw-Hill Book Co.

Hawley, J. W. 1993. Geomorphic Setting and Late Quaternary History of Pluvial-lake Basins in the Southern New Mexico Region. Open File Report 391. Socorro, New Mexico: NMBMMR.

Haynes, Jr., C. V. 1991. GeoArchaeological and Paleohydrological Evidence for a Clovis-age Drought in North America and its Bearing on Extinction. *Quaternary Research* 35: 438-450.

Jones, F. N., and Tauscher, J., 1978. Residence under an Airport Landing Pattern as a Factor in Teratism. *Archives of Environmental Health* January/February: 10-12.

Kenmotsu, R. D. 1977. Vegetation Changes during the Past One Hundred Years. In *A Cultural Resource Inventory and Assessment of McGregor Guided Missile Range, Part III, Botanical and Geological Studies*, R. D. Kenmotsu and J. D. Pigott, eds., 39-87. Research Report 65. Austin, Texas: Texas Archaeological Survey, University of Texas.

Kirkpatrick, D. T. and R. H. Weber. 1996. Quaternary Geology and Archaeology of Lake Trinity Basin, WSMR, New Mexico. In *La Jornada: Papers in Honor of William F. Turney*, M. S. Duran and D. T. Kirkpatrick, eds., 109-127. Albuquerque, New Mexico: Archaeological Society of New Mexico.

Kluth, C. F. and Coney, P. J. 1981. Plate Tectonics of the Ancestral Rocky Mountains. *Geology* 9: 10-15.

Kryter, K. D. 1984. Physiological, Psychological, and Social Effects of Noise. NASA Reference Publication 1115, 446. July.

Lovejoy, E. M. P. and J. W. Hawley. 1978. El Paso to New Mexico-Texas State Line. In *Guidebook to Rio Grande Rift in New Mexico and Colorado*, 57-68. Circular 163. NMBMMR.

Machette, M. N. 1987. Preliminary Assessment of Paleoseismicity at WSMR, Southern New Mexico: Evidence for Recency of Faulting, Fault Segmentation, and Repeat Intervals for Major Earthquakes in the Region. Open-File Report 87-444. USGS.

Meacham, W. C., and N. Shaw. 1979. Effects of Jet Noise on Mortality Rates. *British Journal of Audiology* August: 77–80.

Moulton, C. L. 1990. Air Force Procedure for Predicting Aircraft Noise Around Airbases: Noise Exposure Model (NOISEMAP) Users Manual (AAMRL-TR-90-011). Biodynamics and Bioengineering Division, Harry G. Armstrong Aerospace Medical Research Laboratory, Air Force Systems Command. Ohio: Wright-Patterson AFB. February.

Muehlberger, W. R. 1980. Texas Lineament Revisited. New Mexico Geological Society Guidebook, 31st Field Conference, 113-121.

National Park Service. 1997. Introduction. In *Cultural Landscape Bibliography.* www.cr.nps. gov/phad/introbib.html/

Neal, J. T., R. E. Smith, and B. F. Jones. 1983. Pleistocene Lake Trinity, An Evaporite Basin in the Northern Jornada del Muerto, New Mexico. New Mexico Geological Society Guidebook, 34th Field Conference, Socorro Region II, Socorro.

New Mexico Ornithological Society. *Fieldnotes* 18(2): 32.

Northrop, S. A. 1976. New Mexico's Earthquake History, 1849-1975. In *Tectonics and Mineral Resources of Southwestern North America*, 77-87. New Mexico Geological Society Special Publication No. 6.

Otero County Commissioners. 1993. Ordinance No. 93-04.

Pearsons, K. S., Barber, D. S., and B. G. Tabachick. 1989. Analyses of the Predictability of Noise-Induced Sleep Disturbance. USAF Report HSD-TR-89-029. October.

Plotkin, K. J. Sutherland, L. C., and J. A. Molino. 1987. Environmental Noise Assessment for Military Aircraft Training Routes, Volume II: Recommended Noise Metric. Wyle Research Report WR 86-21. January.

Pryor, J. H. 1988. The Effects of Human Trample Damage on Lithics: A Consideration of Crucial Variables. *Lithic Technology* 17(1): 45-18.

Sackett, S. S. and S. M. Haase. 1996. Fuel Loading in Southwestern Ecosystems of the United States. In *Effects of Fire on Madrean Province Ecosystems*, 187-192. GTR RM-GTR-289. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Sackett, S. S., S. M. Haase, and M. G. Harrington. 1996. Prescribed Burning in Southwestern Ponderosa Pine. In *Effects of Fire on Madrean Province Ecosystems*, 178-186. GTR RM-GTR-289. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Sandford, A. R., A. J. Budding, J. P. Hoffman, O. S. Alptekin, C. A. Rush, and T. R. Toppozada. 1972. Seismicity of the Rio Grande rift in New Mexico. Circular 120. NMBMMR.

Schmidt, P. G. and Craddock, G. 1964. The Geology of the Jarilla Mountains, Otero County, New Mexico. Bulletin 82. NMBMMR.

Seager, W. R. 1981. Geology of the Organ Mountains and southern San Andres Mountains, New Mexico. Memoir 36. NMBMMR.

Seager, W. R. and G. H. Mack. 1986. Laramide Paleotectonics of Southern New Mexico. Memoir 41, 669-685. American Association of Petroleum Geologists.

Skelton, Duford W., M. D. Freeman, N. K. Smiley, J. D. Pigott and David S. Dibble. 1981. A Cultural Resource Inventory and Assessment of Doña Ana Range, New Mexico. Texas Archaeological Survey Research Report No. 69. Austin, Texas: University of Texas.

Smith, R. B. 1978. Seismicity, Crustal Structure, and Intraplate Tectonics of the Interior of the Western Cordillera. In *Cenozoic Tectonics and Regional Geophysics of the Western Cordillera*, 111-114. Memoir 152. Geological Society of America.

Stusnick, E., K. A. Bradley, J. A. Molino, and G. DeMiranda. 1992. The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Own-home Experiment. Wyle Laboratories Research Report WR 92-3(R). March.

Stusnick, E., K. A. Bradley, M. A. Bossi, and D. G. Rickert. 1993. The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 3: Hybrid Own-home Experiment. Wyle Laboratories Research Report WR 93-22. December.

T. W. and C. H. Baisan. 1996. Historical Fire Regime Patterns in the Southwestern United States Since AD 1700. In *Proceedings of the Second La Mesa Fire Symposium.*. GTR RM-GTR-286. Fort Collins, Colorado: USFS Rocky Mountain Forest and Range Experiment Station.

Tester, J. R. 1965. Effects of a Controlled Burn on Small Mammals in a Minnesota Oak-Savanna. *American Midland Naturalist* 74: 240-243.

Texas Natural Resource Conservation Commission (TNRCC), Office of Air Quality. 1996. Air Quality in Texas: El Paso. TNRCC Internet Home Page.

U. S. Air Force. 1997. EA for the Proposed Airspace Modifications to Support Units at HAFB, New Mexico.

U.S. Army. 1984. Fort Bliss Ongoing Mission EIS. Headquarters, TRADOC Fort Monroe, Virginia. June.

_____. 1986. Construction Engineering Research Laboratory; MicroBNOISE, A User's Manual; Technical Report #N86-12.

_____. 1988. The Effect of Helicopter Vibrations on the Point Sublime Anasazi Site, Grand Canyon National Park, Arizona. Archaeological Sites Protection and Preservation Notebook. Prepared by the USACE Waterways Experiment Station, Vicksburg, Mississippi.

_____. 1989. Effects of Forest Fires and Burn Programs on Archaeological Resources. Archaeological Sites Protection and Preservation Notebook. Prepared by the USACE Waterways Experiment Station, Vicksburg, Mississippi.

_____. 1992. Noise Effect Assessment on *Leptonycteris curasoae* at Fort Huachuca, Arizona. Draft EA. Prepared by D. Howell. Prepared for U.S. Army, Fort Huachuca Garrison, Test and Experimentation Command.

_____. 1994. A Survey of Sensitive Species and Vegetation Communities in the Organ Mountains. Prepared by New Mexico Natural Heritage Program, Albuquerque, New Mexico. Prepared for the DOE, Fort Bliss Texas and New Mexico.

_____. 1995. EPA Hazardous Waste Permit (Hazardous and Solid Waste Amendments, 1984). U.S. Army. USAADCENFB. DOE, Fort Bliss, Texas and New Mexico. June 8.

_____. 1996. EA for the Fort Bliss Site 10 Road Repair, Upgrade, and New Road Construction on McGregor Missile Range, Otero County, New Mexico. DOE, USAADCENFB, Texas and New Mexico.

_____. 1996. Final Report for Simulated Tracking Project. Prepared by T. Turner and M. Turner. Cultural/Natural Resources Division, DOE, Fort Bliss, Texas and New Mexico.

_____. 1997. Threatened and Endangered Species Survey of 44 Potential Antenna Pad Locations, Fiber Optic and Electric Lines at Fort Bliss, El Paso County Texas, and Otero and Doña Ana Counties, New Mexico. Prepared by TRC, Austin, Texas. Prepared for the USACE, Fort Worth, Texas.

_____. 1997. McGregor Range, New Mexico, Land Withdrawal Renewal: Project Management Plan. USACE, Fort Worth, Texas.

_____. 1997. PCB Fact Sheet for Fort Bliss, Texas. DOE, Fort Bliss, Texas and New Mexico. 15 January.

_____. 1997. PCB Annual Document Log Sheet. DOE, Fort Bliss, Texas and New Mexico. February.

U.S. Army. n.d. SOP: Curatorial and Collection Management Plan for the Archaeological Collection, Historical Photography Collection, and Associated Records, Fort Bliss, Texas. Manuscript on file. Prepared by Marshall, A. K. Prepared for the DOE, USAADACENFB, Texas and New Mexico.

U.S. Department of Transportation (DOT). 1982. Noise Barrier Cost Reduction Procedure STAMINA 2.0/OPTIMA (PB 82-2187). Arlington, Virginia: Federal Highway Administration.

Van Devender, T. R. 1980. Holocene Plant Remains from Rocky Arroyo and Last Chance Canyon, Eddy County, New Mexico. *The Southwestern Naturalist* 25(3): 361-372.

Van Devender, T. R. and D. H. Riskind. 1979. Late Pleistocene and Early Holocene Plant Remains from Hueco Tanks Historical Park: The Development of a Refugium. *The Southwestern Naturalist* 24(1): 127-140.

Van Devender, T. R. and W. G. Spaulding. 1979. Development of Vegetation and Climate in the Southwestern United States. *Science* 204: 701-710.

Van Devender, T. R. and R. D. Worthington. 1977. The Herpetofauna of Howell's Ridge Cave and the Paleoecology of the Northwestern Chihuahuan Desert. In *Transactions of the Symposium on the Biological Resources of the Chihuahuan Desert, United States and Mexico*, R. H. Wauer and D. H. Riskind, eds., 85-106. Washington, DC: National Park Service.

Van Devender, T. R., J. L. Betancourt, and M. Wimberly. 1984. Biogeographic Implications of a Packrat Midden Sequence from the Sacramento Mountains, South-Central New Mexico. *Quaternary Research* 22: 344-360.

Whalen, Michael E. 1977. Settlement Patterns of the Eastern Hueco Bolson. Anthropological Paper No. 4. El Paso, Texas: El Paso Centennial Museum, University of Texas.

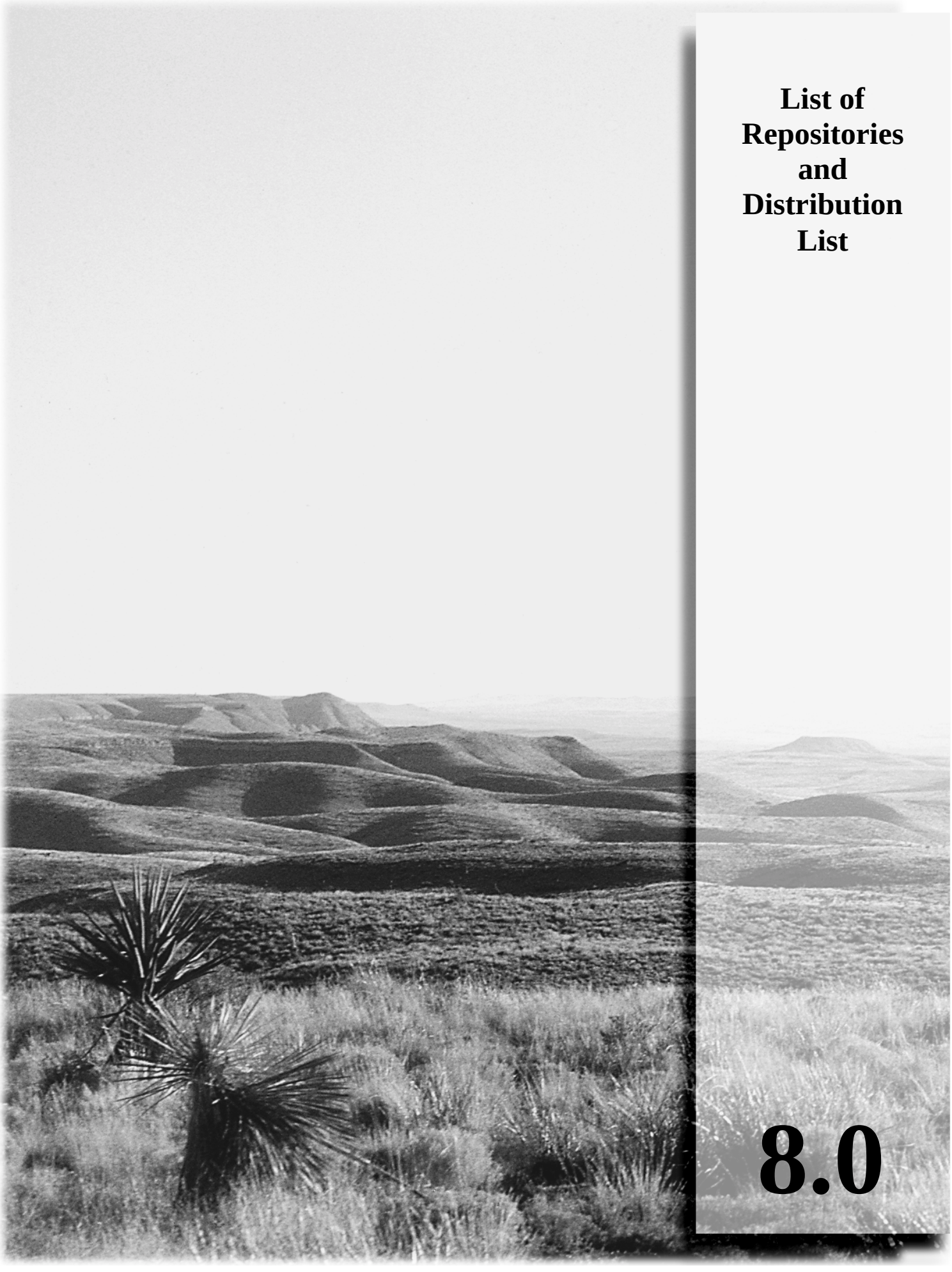
White, L. D. 1969. Effects of a Wildfire on Several Desert Grassland Shrub Species. *Journal of Range Management* 22: 284-285.

Workman, G. W. and T. D. Bunch. 1991. Cardiac and Febrile Response of Bighorn Sheep (*Ovis canadensis)* to Various Aircraft Disturbances. Conducted by Utah State University for the USAF.

World Climate. 1998. www.worldclimate.com/climate/index.htm.

York, J. C. and W. A. Dick-Peddie. 1969. Vegetation Changes in Southern New Mexico during the Past Hundred Years. In *Arid Lands in Perspective*, W. G. McGinnies and B. J. Goldman, eds., 157-166. Tucson, Arizona: University of Arizona Press.

Zeidler, J. A., M. L. Hargrave, and D. Haag. 1996. Predictive Locational Modeling of Archaeological Resources on the McGregor Range, Southern Tularosa Basin, New Mexico. Draft. Tri-Services Cultural Resources Research Center, U.S. Army CERL, Champaign, Illinois.



List of Repositories and Distribution List

8.0

8.0 LIST OF REPOSITORIES AND DISTRIBUTION LIST

8.1 LIST OF REPOSITORIES

This section lists repository libraries and agency offices where the public may have access to this LEIS.

8.1.1 Libraries

Alamogordo Public Library	El Paso Public Library - Westside Branch
Artesia Public Library	El Paso Public Library - Ysleta Branch
Branigan Memorial Library	Farmington Public Library
Carlsbad Municipal Library	Grace Grebing Public Library
Cloudcroft Public Library	Hobbs Public Library
Clovis-Carver Public Library	Mickelsen Library
Doña Ana Branch Community College	New Mexico Institute of Mining and Technology Library
Eastern New Mexico University Library	New Mexico State University Library
Eastern New Mexico University at Roswell	New Mexico State University–Alamogordo
El Paso CC–Northwest Center Library	Roswell Public Library
El Paso CC–Rio Grande Campus Library	Ruidoso Public Library
El Paso CC–Transmountain Campus Library	Santa Fe Public Library
El Paso CC–Val Verde Campus Library	Sierra Blanca Public Library
El Paso Public Library	Silver City Public Library
El Paso Public Library - Cielo Vista Branch	Truth or Consequences Public Library
El Paso Public Library - Irving Schwartz Branch	University of Texas at El Paso, University Library
El Paso Public Library - Lower Valley Branch	

8.2 PUBLIC AGENCIES, PRIVATE ORGANIZATIONS, PRIVATE INDIVIDUALS, AND OTHER INTERESTED ORGANIZATIONS

8.2.1 Public Agencies

8.2.1.1 U.S. Congress

The Honorable Jeff Bingaman United States Senate	The Honorable Bill Redmond House of Representatives
The Honorable Henry Bonilla House of Representatives	The Honorable Silvestre Reyes House of Representatives
The Honorable Pete V. Domenici United States Senate	The Honorable Joe Skeen House of Representatives
The Honorable Phil Gramm United States Senate	Kelly Smyer Office of Senator Jeff Bingaman
The Honorable Kay Bailey Hutchison United States Senate	The Honorable Heather Wilson House of Representatives

8.2.1.2 U.S. Department of Agriculture

Mike Baca Lincoln National Forest, Guadalupe Ranger Dist.	Lincoln National Forest
Linda Barker Lincoln National Forest	Robert Schiowitz, Forest Archaeologist USFS, Gila National Forest
Abel Camarena USFS, Gila National Forest	Soil Conservation Service Albuquerque Office
John Connors, Dist. Manager Lincoln National Forest, Guadalupe Ranger Dist.	USDA
Max Goodwin USFS, Sacramento Ranger Dist.	

8.2.1.3 U.S. Department of Defense

John Abrams HQ TRADOC	S. Habit HQ, DA - Office of the Asst. Chief of Staff Installation Management
Bob Andreoli WSMR	J. Michael Jones U.S. Army Aviation and Missile Command
Maj. Bobrick HQ, TRADOC	Maj. Brad Jorgensen Army National Guard Bureau Readiness Center
Bob Burton WSMR	T. Julius HQ, DA - Office of the Asst. Chief of Staff, Installation Mgmt.
Capt. Cabala HQ, USAF	Sheryl Parker HQ, USAF ACC
Stuart Cannon Personnel and Installation Management	Maj. Polchek HQ, DA - Office of the Judge Advocate General
Commander HAFB	T. Rekas HQ, DA - Office of the Deputy Chief of Staff Operations and Plans
Jack Damron HQ TRADOC	William Russell Aberdeen Proving Ground
Sam Davis Naval Facilities Command - West	Thomas Schwartz HQ FORSCOM
Mr. Duck HQ AMC	U.S. Army CERL
Harry D. Gatanas, Commanding General WSMR	Samuel Q. Vasquez, Commanding General WSMR
T. Gray U.S. Army Training Support Center	Wagner FORSCOM Personnel & Installation Mgmt

8.2.1.4 U.S. Department of the Interior

Branch of Federal Activities Division of Habitat Conservation	Roy Perez, NEPA Regional Coordinator USFWS
Larry Brown USDA Natural Resources	Linda S. C. Rundell, District Manager BLM, Las Cruces Field Office
Bureau of Indian Affairs	Tim Sanders BLM, Las Cruces Field Office
Bureau of Reclamation El Paso Field Div.	Patrick Shea Washington, D.C.
M. J. Chávez BLM	Clark Taylor BLM, Roswell Resource Area
James Christensen BLM, Las Cruces Field Office	U.S. Department of the Interior Office of Environmental Affairs Albuquerque, NM
Bill Conrad National Park Service	U.S. Department of the Interior Office of Environmental Policy and Compliance Washington, D.C.
Joe F. Drift BLM - Retired	U.S. Forest Service Regional Office Albuquerque, NM
Jennifer Fowler-Propst, State Supervisor USFWS, Ecological Services	USFWS San Andres Refuge
Dwight Hempel BLM, Washington D.C.	USGS Water Resources Division
Larry Henderson, Superintendent Natl. Park Service, Guadalupe Mtns. Natl. Park	White Sands National Monument Alamogordo, NM
Bruce Malloy Natl. Park Service, Guadalupe Mtns. Natl. Park	Superintendent White Sands National Monument Alamogordo, NM
Jim C. McCormick BLM, Las Cruces Field Office	

8.2.1.5 U.S. Environmental Protection Agency

Robert D. Lawrence EPA Region 6 Dallas, TX	Oscar Ramirez EPA, Region 6 Dallas, TX

8.2.1.6 Independent Federal Agencies

Clyde M. DeHart US DOT, FAA	

8.2.2 Native American Organizations

Kim Baca Piro-Manso-Tiwa Tribe	Joe (Tito) Rivera Piro-Manso-Tiwa-Tribe
Glenda Brusuelas Mescalero Apache Tribe	Andrew Roybal, Coordinator Piro-Manso-Tiwa Tribe
Chairman Jicarilla Apache Tribe	Frank Roybal Sanchez Piro-Manso-Tiwa Tribe
Wendell Chino Mescalero Apache Tribe	Louis Roybal, Governor Piro-Manso-Tiwa Tribe
Ellen DeGrope Mescalero Apache Tribe	Donna Stern-McFadden Mescalero Apache Tribe
Holly Houghten Mescalero Apache Tribe	Tigua Tribal Government
Keith Miller Mescalero Apache Tribe	Thora Walsh-Padilla Mescalero Apache Tribe

8.2.3 State of New Mexico

Cecilia Abeyta Lieutenant Governor's Office	Ed Ketley NMED
Letty Belin New Mexico Attorney General's Office	The Honorable Don Kidd State Senator
Michael Cerletti New Mexico Tourism Dept.	The Honorable Richard T. Knowles State Representative
Calvin Chavez, Supervisor NMSEO, Las Cruces Dist. 4	Karen S. Lightfoot NMDEMNR
Chief of Staff New Mexico State Capitol	The Honorable Terry T. Marquardt State Representative
Robert Concha, NMAG-AEN-EV New Mexico Natl. Guard	Eluid Martinez NMSEO
Frank A. DuBois, Secretary New Mexico Dept. of Agriculture	Michael Massey NMDGF
The Honorable Dianna J. Duran State Senator	Virginia McLemore NMBMMR
Robert Gallegos New Mexico Surface Water Bureau	Andrew Sandoval NMDGF
Benito J. Garcia HRMB, NMED	The Honorable G. X. McSherry State Representative
The Honorable Mary Helen Garcia State Representative	The Honorable Cynthia Nava State Senator
The Honorable Mary Jane Garcia State Senator	NMDGF
The Honorable Timothy Z. Jennings State Senator	New Mexico Economic Development Department
The Honorable Gary Johnson Governor of New Mexico	New Mexico Highways and Transportation Dept.

State of New Mexico (Continued)

Ray Powell, Commissioner New Mexico State Land Office	Philip Shelley, SHPO New Mexico SHPO
Dan Pursley NMDGF	Ken Smith NMED, Dist. III Field Office
The Honorable Leonard Lee Rawson State Senator	The Honorable Joe M. Stell State Representative
Kitty Richards New Mexico Border Health Office	The Honorable J. Paul Taylor State Representative
The Honorable Benjamin B. Rios State Representative	The Honorable Gloria C. Vaughn State Representative
Paul Saavedra New Mexico State Engineer	Ron White New Mexico Dept. of Agriculture
Jennifer Salisbury NMDEMNR	Cecelia Williams, Chief Air Quality Bureau, NMED
Ernie Sandoval NMDGF	The Honorable W. C. "Dub" Williams State Representative
Marchell Schuman NMED	The Honorable Delores C. Wright State Representative
Lynne Sebastian, SHPO New Mexico SHPO	

8.2.4 State of Texas

The Honorable George W. Bush Governor of Texas	Terry McMillan TNRCC Region 60
The Honorable Norma Chavez Texas State Representative	The Honorable Paul Moreno Texas State Representative
Skip Clark Texas Historical Commission	The Honorable Joseph C. Pickett Texas State Representative
Director Office of the Governor of Texas	Carolina Ramos Texas Parks and Wildlife Department
The Honorable Pat Haggerty Texas State Representative	The Honorable Gilbert Serna Texas State Representative
Joe Janica TNRCC Region 6	The Honorable Eliot Shapleigh Texas State Senator
Mary Kelly Texas Center for Policy Studies	Texas Parks and Wildlife Department

8.2.5 County Agencies

Carlos Aguilar El Paso County Commission	Tim McGinn Otero County Commission
Gilbert Apodaca Doña Ana County Commission	Eduardo Medina Doña Ana County Commission
Sean Baker Otero County	Ken Muyagishama Doña Ana County Commission

County Agencies (Continued)

Larry Brewton Hudspeth County Commission	Michael Nivison, Public Land Use Planner Otero County Public Land Use Advisory Council
Daniel A. Bryant County Attorney	Otero County Board of Commissioners
Joseph Cervantes Doña Ana County Commission	Otero County Health Dept.
Bob Fisk Otero County Public Land Use Advisory Committee	Otero Public Health Office
Carlos Garza Doña Ana County Commission	Mary Quintana Otero County Commissioner's Office
Dan Haggerty El Paso County Commission	Ronny Rardin, Chairman Otero County Commission
Ruth Hooser, Administrator Otero County	Larry Shannon Doña Ana County Planning Dept.
Charles Hooten El Paso County Commission	Miguel Teran El Paso County Commission
Lee Loney, Acting Director Otero County Extension	Richard Zierlein Otero County Commission
The Honorable Chuck Mattox El Paso County Judge	

8.2.6 City Agencies

Martha Alvarado City of Alamogordo Housing Authority	Joe Gomez Ruidoso Council Member
Roberto Alvarado, Executive Director City of El Paso Housing Authority	Jim R. Griggs Alamogordo City Commission
Nat Campos, Director of Planning City of El Paso	John D. Gross Airport Board Member
The Honorable Donald E. Carroll Mayor of Alamogordo	Henry Gustafson Las Cruces Council Member
Eddie Chacon Dell City Council Member	John Halton Las Cruces Council Member
Bill Chance Ruidoso Council Member	Elvia Hernandez City of El Paso
City of Las Cruces Housing Authority	Jorge Magana El Paso City – County Health Dist.
Pete Connelly City of Las Cruces	Pat McCourt City of Alamogordo
Leon Eggleston Ruidoso Council Member	Larry Medina, City Rep. East/Central City of El Paso
Sharon L. Few, Zoning Administrator City of Alamogordo	Inez M. Moncada Mayor Pro-Tem of Alamogordo
Jose Frietze Las Cruces Council Member	Lee Morton Alamogordo City Commission

City Agencies (Continued)

Raul Munoz, Associate Director El Paso City-County Health and Environment Dist.	The Honorable Gerry Shaw Mayor of Ruidoso
Presi Ortega, City Representative East City of El Paso	The Honorable Ruben Smith Mayor of Las Cruces
Jesus Papa, Zoning Administrator City of El Paso	Jan Sumrall, City Rep. West City of El Paso
Barbara Perez, City Rep. East-Valley City of El Paso	Jesus Terrazas, City Rep. West/Central City of El Paso
Roger B. Powell Alamogordo City Commission	John Van Doren Alamogordo City Commissioner
The Honorable Carlos Ramirez Mayor of El Paso	The Honorable David C. Venable Mayor of Cloudcroft
Stan Roberts, City Rep. Northeast City of El Paso	The Honorable Bill Williams Mayor of Dell City
Kenneth Rohrback Dell City Council Member	Joe Weismiller Airport Board Member
Luis Sarinana, City Rep. East/Mid-Valley City of El Paso	

8.2.7 Villages

Jeni Alexander Village of Tularosa	Janie Portillo Village of Tularosa
Henry Dorame Village of Tularosa	Barbara Springer Village of Cloudcroft
Demetrio Montoya Village of Tularosa	Margaret Trujillo Village of Tularosa
Gilbert Neal Village of Cloudcroft	

8.2.8 Schools and Colleges

David Carmichael Dept. of Sociology and Anthropology Univ. of Texas at El Paso, Univ. at Hawthorne	V. W. Howard, Jr. New Mexico State University
Julie K. Cirmeents New Mexico State University – Alamogordo	New Mexico Environmental Law Center
Gary Donart New Mexico State University	S. D. Schemnitz New Mexico State University
H. Paul Friesema, Professor Inst. for Policy Research, Northwestern University	Judy Smith Colorado State University

8.2.9 Private Organizations

Phelps Anderson Sun Valley Energy Corporation	Charles A. Easton New Mexico Wildlife Federation
Arturo Bastidos Southern New Mexico Legal Services	Mike Egan Government Contractor
Jim Bates Southwest Consolidated Sportsmen	Steve Eichenauer PSW, Inc
Joe Beidron Greater Las Cruces Chamber of Commerce	El Paso – Trans Pecos Audubon Society
Gary Bell Nature Conservancy	Leland L. Fellows Roadrunner Ranches, Inc.
Mark T. Bentley El Paso Archaeological Society	Beatriz Ferreira Hispano Chamber of Commerce de Las Cruces
Darryl Bishop Southwest Consolidated Sportsmen	George E. Fettinger Fettinger, Bloom & Quinlan, P.C.
Kevin Bixby Southwest Environmental Center	Karen Gardner Council of Texas Archeologists
Cheryll Blevins Sierra Club Southern New Mexico Group	Pam Goddard Sierra Club
Richard Boren International Environmental Alliance of the Bravo	David Gottula Texas New Mexico Power Company
John Buscher Sierra Club - Rio Grande Chapter	Gregory Green Green & Associates
George Bussing, Executive Director United Way of Otero County	Mark Griffin Van Winkle's IGA Supermarkets
Len H. Carpenter, Field Representative Wildlife Management Institute	J.A. Groff LWV, CDWR
Nancy Clopton Victorio Ranch	Hat Ranch, Inc.
Committee of Wilderness Supporters	David Henderson National Audubon Society
Community Action Agency of Southern New Mexico	Dolores Herrera San Jose Community Awareness Council
Conrad Conde Conde, Inc.	Hispanic and Business Alliance for Education
Pete Cook 1st National Bank	R. B. Holmes, President and CEO Norwest Bank New Mexico, N.A.
Noel Cooley Doña Ana County Associated Sportsmen, Inc.	R. B. Holmes, Chairman Alamogordo Committee of Fifty
Cooper Cattle Company	Bill Hornback NM Justice Council
Cooperative Extension Service	John C. Horning Forest Guardians, Watershed Protection Program
Eileen Danni Dey, Regulatory Compliance Super. Burlington Resources Oil & Gas Company	Larry Hughes Sierra Club Southern New Mexico Group
Jean Dodd Native Plant Society	C. W. Hurd, Jr. Hurd Enterprises
Jonathan D. Eason MIB 2340	Joe Janica Tierra Exploration, Inc.

Private Organizations (Continued)

Chester Jordan, President and CEO El Paso Black Chamber of Commerce	Daniel Peterson Southwest Center for Biological Diversity
Wes Jurey Greater El Paso Chamber of Commerce	Anthony V. Popp Doña Ana County Associated Sportsmen, Inc.
LULAC National Office	Public Land Council
Fernando Macillas Greater Las Cruces Economic Dev. Council	Melissa Randall Harvey Yates Co.
Michael R. Madden All American Pipeline Co.	Maude O. Rathgeber Eagle Forum of New Mexico
James Magee Cornudas Mountain Foundation	Paul Robinson, Research Director Southwest Research and Information Center
Barbara J. Mangan Public Land Use Consultant	Gus Rodriquez El Paso (8) Association
Norm Martin Sierra Club	Raymond Rodriquez EPEC
Jack W. McCaw Yates Petroleum Corp.	David Rubenson Rand Arroyo Center
Colin McMillan Three Rivers Cattle Ltd., Co.	Al Rucks NAACP
Patricia Mehlhop, Director New Mexico Natural Heritage Program	San Augustine Ranch
Mesilla Valley Audubon Society	Lisa D. Schultz Defense Expansion Oversite Network
Mexican-American Legal Defense and Education Fund	Jim Selman Independent Cattlemen's Assoc. of Texas
Richard Moore Southwest Network for Env. and Economic Justice	Margaret Shekell Ultra Systems Environmental
Chuck Moran Yates Petroleum Corp.	Soil Conservation Service
NAACP	John Sproul Franklin Mountain Wilderness Coalition
National Assoc. for Hispanic Elderly	Roger Steeb Sierra Club
National Radio Astronomy Observatory	Kathleen P. Stroud Horne Engineering Services, Inc.
Nony Navar Hot Wells Cattle Company	Wayne Suggs, Jr. Sierra Club Rio Grande Chapter
New Mexico Cattle Growers' Association	Marianne Thaeler Sierra Club Rio Grande Chapter
G. Nicholson People of New Mexico	The United Way
Justin Ormsby, Director Human Systems Research Rio Grande Council of Governments	Elizabeth Valdez EPISO
Otero County Community Action Agency	Colene Van Winkle, Executive Director Alamogordo Chamber of Commerce
P.B. Parraz El Paso Hispanic Chamber of Commerce	Don P. Van Winkle Van Winkle's IGA

Private Organizations (Continued)

Steve West Chihuahuan Desert Conservation Alliance	Tom Wootten T&E, Inc.

8.2.10 Area Media–Newspapers

Defensor Chieftan Socorro, New Mexico	Osdalzo Rodriquez El Paso Hispanic
Las Cruces Bulletin	Steve Ramirez Las Cruces Sun-News
Daniel Perez El Paso Times	Lisa Turner Alamogordo Daily News
Tom Reeves Alamogordo Daily News	Gary Wood Mountain Monthly

8.2.11 Area Media–Radio and Television

KBNA and KAMA Radio	KTSM - TV Channel 9
KDBC - TV Channel 4	KVBA – TV-63
KINT - TV Channel 26	KVIA - TV Channel 7
KRWG - TV	KZIA – TV
KSVE Que Suave Radio and La Caliente Tejano Radio	Michael Shinaberry KZZX/KINN Radio

8.2.12 Private Individuals

Ken Anderson	Nancy Cookson
Jennifer Atchley	Craig Cranston
S. Wyatt Atkins	Don Cooper
Pat Baca	Quinton E. Daniel
Andy and Dyanne Balcom	Linnie Davis
Frederick Beaudry	Jim Dawson
Wilson Bennett	Sonia Deras
Michael Berman	Dorothy Dockray
Bryan Bird	Stephanie L. Dubois
Roosevelt A. Boyer	Greg Duggar
Ken Boykin	Aubrey L. Dunn, Jr.
Walter Bradley	Gerald Fitzgerald
Michael Bromka	Celestino Gachupin
Mary Helen Brunt	Charles Galt
Marian Brownfield	Karen Gentry
Ed Buck	Joseph Gerrdron
Tom Byers	Andrew R. Gomolak
Danny Charlie	Antonio Gonzalez
John W. Cherry	Marjorie Frances Graham
Jim and Martha Coody	Gregory Green

Private Individuals (Continued)

John L. Green	Ted Mertig
John W. Green	Cliff Milburn
Michael S. Greeson	Anna J. Millican
Robert Guerrero	Marty Mills
Mark Hakkila	Ofelia Moreno
H.G. Hanawalt	Dorian Nabors
Jerry N. Harrell	Harols Naylor
John A. Hedrick	Jamie Newlin
Kenneth Heil	Bob Nordstrom
Cindy Hendrick	Neil D. Nusz
T.J. Hines	G. B. Oliver
Shari Hodges	Israel Palma
Phillenore Howard	Larry Paul
Gene Hunt	Grady M. Pearson
Dir. of Public Works Johnson	Robert Pepper
Robert Johnson	Michelle Perry
Martha & Fritz Jones	Shawna Perry
Robert E. Jones	Roger Peterson
John C. Karlsruher	John Poland
Kaye Kelley	Jacob H. Poole, Jr.
Mr. and Mrs. Arnold E. Keskulla	Al Poroz
Paul Kniekamp	Gene A. Porter
Danny Laclair	Grace Potorti
David Lane	Brian Prather
John F. Lang	Joseph Quintana
Bob Langsenkamp	Mrs. Jack O. Rathgeber
Bonnie L. Larreau	Hildy Reiser
Charlie Lee	Maj. Patrick Reiter
Morton Lee	Jean Reynolds
Scott P. Lerich	Dawn Roderique
Rick and Kim Lessentine	Joe Romero
Innis and Pearl Lewis	Patricia Roybal
Pat Lisowski	Tom W. Runyan
Dan Lopez	Sandra Sage
James Arthur Lyle	Frank N. Sage
Harvey Manuel	Gove Sandifer
Don R. Manzanares	Sally Savage
Dennis P. Marks	Sanford Schemnitz
Michael A. Maros	Buddy Shaw
Cliff McDonald	Damly Sayles
T. McKimmie	Ed Schmidt
Dale McLane	Phillip M. Schreiber
Bill McNew	Jack K. Shearman
Raymond Melendrez	Pete Shockey
Joyce Mendel	Solomon Starks, Jr.
Erin Menzdorf	Gary Simpson
Don and Margaret Merritt	Terry and Marsha Slane

Private Individuals (Continued)

R. Wayne Slaughter	Gary Vequist
Frank Smith	Russell Virden
Glenn Stone	Charles & Thelma Walker
Bob Swead	Sally Walker
Daison Taylor	Jim Walters
A.R. Torres	Marvin Lee Watts
Nick Trierweiler	Brent and Jen Waver
Dennis Turnbull	Richard L. Wessel
Cassie Tyler	Naomi J. Wheeler
Winnie Van Cleave	Margaret Wilson
Robert Van Tassel	Josalyn Yancey
James M. Vaughn	Lois Ziler

Glossary

9.0

9.0 GLOSSARY

Acre-foot. A measure of water volume. The amount of water it would take to cover one acre of land to a depth of 1 foot; 325,851 gallons; 43,560 cubic feet.

Alluvial fan. A pattern of sediment deposit caused by running water.

Alluvium. Any stream-laid sediment deposit.

Ambient. Surrounding or background conditions in the absence of an identifiable source.

Ambient air. That portion of the atmosphere, outside of buildings, to which the general public has access.

Ambient Air Quality Standards. Standards established on a state or federal level that define the limits for airborne concentrations of designated criteria pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter with aerodynamic diameters less than 10 microns [PM_{10}], ozone, and lead) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Animal unit. Considered to be 1 mature (1,000 pound) cow, or its equivalent, based on average daily forage consumption of 26 pounds of dry matter per day.

Animal unit month. The amount of forage required to sustain the equivalent of 1 cow, 1 horse, 1 elk, 5 sheep, 5 goats, 17 deer, or 19 antelope for one month.

Aquifer. A body of rock that contains enough saturated permeable material to transmit groundwater and to yield significant quantities of groundwater to wells and springs.

Army-After-Next. Follow-on concept for Army doctrine and weapon systems to Army Force XXI.

Army Force XXI. The Army has a long history of developing innovative approaches to future warfighting challenges. The future Army Force XXI and its follow-on, Army-After-Next, is being designed with organizations and capabilities that will allow it to be rapidly tailored, strategically deployable, and effectively employable in joint and multinational operations. Army Force XXI provides rapid and effective response to changing situations and local conditions. Mission planning and rehearsal will be conducted simultaneously with the build-up of decisive forces, as automated systems and simulations, capable of operating from ships and aircraft, provide the capability to plan, coordinate, and war game possible courses of action while forces are en route.

Vastly improved capabilities of long-range missiles with smart submunitions, precision weapons delivered throughout the battlespace, and attack helicopters capable of operations deep within enemy forces, integrated with an air campaign, are critical to ensuring that national objectives are met. Army Force XXI operations must be fully integrated as the land force commander draws from a suite of complementary capabilities of each service, our allies, and other government and nongovernment organizations.

Attainment area. A region that meets the NAAQS for a criteria pollutant under the CAA.

Average annual daily traffic. For a 1-year period, the total volume passing a point or segment of a highway facility in both directions divided by the number of days in the year.

Basal area. The area of ground surface covered by the stem or stems of a range plant, usually measured 1 inch above the soil, in contrast to the full spread of forage.

Baseline. The initial environmental conditions against which the environmental consequences of various alternatives are evaluated.

Candidate species. Species for which the USFWS has on file sufficient information on biological vulnerability and threat(s) to support the issuance of a proposed rule to list but issuance of the proposed rule is precluded.

Capacity (traffic). The maximum rate of flow at which vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions.

Census block. Cluster of blocks within the same census tract. Census blocks do not cross county or census tract boundaries and generally contain between 250 and 550 housing.

Controlled access FTX sites. Field training sites where military access is subject to increased control and restricted to activities with limited ground-disturbing effects.

Criteria pollutants. The CAA required the EPA to set air quality standards for common and widespread pollutants after preparing criteria documents summarizing scientific knowledge on their health effects. Today there are standards for six criteria pollutants: sulfur dioxide, carbon monoxide, particulate matter less than 10 micrometers in diameter (PM_{10}), nitrogen dioxide, ozone, and lead.

Cumulative impact. Cumulative impact is the environmental impact resulting from the incremental impact from a particular activity when added to other past, present, or future activities. Cumulative impacts may be individually insignificant, but collectively, the individually insignificant activities may become significant.

Day-night average sound level. A-weighted SPLs averaged over a 24-hour period with 10 dBA added for events occurring between 10 p.m. and 7 a.m.

Decibel. A standard unit of measuring SPLs based on a reference sound pressure of 0.0002 dynes per square centimeter. This is the smallest sound a human can hear.

Decibel, A-weighted. Adjusted unit of sound measurement that corresponds to the relative sensitivity of the human ear at specified frequency levels. This represents the loudness as perceived by humans.

Direct effects. Beneficial or deleterious impacts that are caused by an action and occur at the same time and place.

Direct impact. Effects resulting solely from the proposed alternative(s).

Effluent. A gas or fluid discharge into the environment.

Endangered species. A plant or animal species that is threatened with extinction or serious depletion in its range and is formally listed as such by the USFWS.

Environmental Impact Statement. A detailed written statement that helps public officials make decisions that are based on understanding of environmental consequences and to take actions that protect, restore, and enhance the environment.

Eolian. Applied to deposits arranged by the wind. Wind blown.

Ephemeral. Lasting only a brief period of time.

Ephemeral stream. A stream or portion of a stream which flows only in direct response to precipitation.

Equivalent sound level. A single number representing the fluctuating sound level in decibels over a specified period of time. The average of a fluctuating level of sound energy.

Evapotranspiration. The loss of water from the soil both by evaporation and by transpiration from the plants growing there.

Firing Fan. The fan-shaped area encompassing all firing scenario directions and their associated surface danger zones.

Fugitive dust. Particulate matter composed of soil. Fugitive dust may include emissions from haul roads, wind erosion of exposed soil surfaces, and other activities in which soil is either removed or redistributed.

Geologic. Any natural process acting as a dynamic physical force on the earth; i.e. faulting, erosion, and mountain-building resulting in rock formations.

Grazing use – light. Indicates that 20 to 40 percent of current year's forage production has been eaten or destroyed by grazing animals.

Grazing use – heavy. Indicates that 60 to 80 percent of current year's forage production has been eaten or destroyed by grazing animals.

Groundwater. Subsurface water within the zone of saturation.

Groundwater recharge. Water that infiltrates the land surface and is not lost to evaporation or consumed by plants can percolate downward and replenish the groundwater aquifers. This deep percolation is called recharge.

Hazardous waste. Wastes that are designated as hazardous by the EPA or state regulations. Hazardous waste, defined under the RCRA, is waste from production or operation activities that poses a potential hazard to human health or the environment when improperly treated, stored, or disposed. Hazardous wastes that appear on special EPA lists or possess at least one of the four following characteristics: ignitability, corrosivity, reactivity, and toxicity.

Hydric soils. Soils that are saturated to the surface sometime during the growing season.

Hydrology. A science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere.

Impact. The terms "impacts" and "effects" are synonymous as used in the NEPA. Impacts may be beneficial or adverse, and may apply to the natural, aesthetic, historic, cultural, and socioeconomic resources of the installation and the surrounding communities. Where applicable, impacts may be classified as direct or indirect.

Indirect impact. An indirect impact is caused by a proposed activity but is later in time or farther removed in distance, but still reasonably foreseeable. Indirect impacts may include land use changes or population density changes and the related effects these changes will have on air, water, and other natural or social systems.

Infiltration. Water that falls on the land surface that does not runoff but percolates into the ground. Some of this water evaporates, some is used by plants, and some percolates downward to the groundwater.

Infrastructure. Utilities and other physical support systems needed to operate a laboratory or test facility. Included are electric distribution systems, water supply systems, sewage disposal systems, roads, and so on.

Intermittent stream. A stream that flows only at certain times when it receives water from springs or from a surface source.

Leasable minerals and energy resources. Coal, sodium, and potassium; oil and gas, and geothermal resources.

Level of service (public services). A measure describing the amount of public services (e.g. fire protection and law enforcement services) available to community residents, generally expressed as the number of personnel providing the services per 1,000 population.

Level of service (traffic). A qualitative measure describing operational conditions within a traffic stream and how they are perceived by motorists and/or passengers.

Locatable minerals. Traditional "hard rock" minerals such as gold, silver, lead, copper, zinc, and industrial minerals such as fluorspar, barite, and high-calcium limestone.

Long-term impacts. Long-term impacts are neither temporary nor reversible. They may occur either during the construction or operational phases of an activity. For example, the construction of a new building may create long-term impacts during both the construction and operational phases. Draining of a wetland for the construction of a new building will create long-term and permanent impacts on biological resources. Likewise, once operational, the new building may create additional long-term impacts such as increased population density, waste generation, etc.

Low-altitude flight. Flight at less than 300 feet above the ground.

Military training route. A route developed for the high-speed (greater than 250 knots) low-altitude training of tactical aircrews. Instrument flight rules military training routes are mutually developed by the FAA and the DoD. Visual flight rules military training routes are developed by the DoD. Military training routes are published on aeronautical charts. Each military training route has its own unique number consisting of either three or four digits. Three digits indicate that at least one segment of the route is 1,500 feet above ground level, and four digits indicate that the entire route is at or below 1,500 feet above ground level. The number is preceded by either IR or VR, specifying instrument flight rules or

visual flight rules, respectively. Since routes are one way, the same route flown the opposite direction will have a separate, distinct number.

Mitigation. Mitigation generally includes: avoiding the impact altogether by stopping or modifying the proposed action; minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; compensating for the impact by replacing or providing substitute resources or environments.

Nap-of-the-earth. Flight as close to the ground surface as possible.

National Ambient Air Quality Standards. Section 109 of the CAA requires the EPA to set nationwide standards for widespread air pollutants. Currently, six pollutants are regulated: sulfur dioxide, carbon monoxide, PM_{10}, nitrogen dioxide, ozone, and lead.

Nitrogen dioxide. Gas formed primarily from atmospheric nitrogen and oxygen when combustion takes place at high temperature. Nitrogen dioxide emissions contribute to acid deposition and formation of atmospheric ozone. See *Criteria Pollutants*.

Nitrogen oxide. Gases formed primarily by fuel combustion, which contribute to the formation of acid rain. Hydrocarbons and nitrogen oxides combine in the presence of sunlight to form ozone, a major constituent of smog.

No impact. "No impact" implies that a particular activity creates neither a direct nor indirect impact, does not have long- or short-term implications, and is neither beneficial nor negative.

Noise. Any sound that is undesirable because it interferes with speech and hearing or is intense enough to damage hearing.

Nonattainment area. An area that has been designated by the EPA or the appropriate state air quality agency as exceeding one or more national or state AAQS.

Nonpotable. Water that is unsafe or unpalatable to drink because it contains pollutants, contaminants, minerals, or infective agents.

Off-road vehicle. Any motorized vehicle designated for cross-country travel over any type of natural terrain.

Ozone (ground level). A major ingredient in smog. Ozone is produced from reactions of hydrocarbons and nitrogen oxides in the presence of sunlight and heat.

Particulate. Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.

Peak hour (traffic). The hour of highest traffic volume on a given section of roadway.

Playa. A dry, vegetation free, flat area at the lowest point of an undrained basin.

Radiation. The emissions, either electromagnetic or particulate, resulting from the transformation of an unstable atom or nucleus.

Record of Decision. A public document that explains which alternative will be selected for the area of concern.

Riparian. The banks of a body of water.

Salable minerals. Common variety mineral materials such as sand, gravel, cinders, and building stone, that are sold on a permit basis.

Short-term impacts. Short-term impacts are temporary and either direct or indirect. Short-term impacts usually occur during the construction phase of the activity.

Significance. Significance requires consideration of the context and intensity of the impact or effect, under consideration. Significance can vary in relation to the context of the proposed action. At Fort Bliss, the significance of the proposed actions may include consideration of the effects on a national, regional, and local basis. Both short- and long-term effects may be relevant. Impacts may also be evaluated in terms of their intensity or severity.

Sortie. A sortie represents a flight of a single military aircraft from take-off through landing.

Stakeholder. Interested and/or affected people or groups.

Stratigraphic. Division of geology dealing with the definition and description of rocks and soils, especially sedimentary rocks.

Subsurface. A zone below the surface of the earth whose geologic features are principally layers of rock that have been tilted or faulted and are interpreted on the basis of drill hole records and geophysical (seismic or rock vibration) evidence. Generally, it is all rock and solid materials lying beneath the earth's surface.

Surface danger zone. The safety area required for a single missile trajectory.

Swale. A low-lying or depressed and often wet stretch of land.

Threatened species. A species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Trip generation. A determination of the quantity of trip ends associated with a parcel of land.

Unemployment rate. The number of civilians, as a percentage of the total civilian labor force, without jobs but actively seeking employment.

Vegetative cover. Living vegetation, which covers a point on the ground surface, when viewed from directly overhead. Includes canopies of trees and shrubs within 20 feet or less of the ground surface, and lichens and mosses 1/16 of an inch or more in thickness.

Waters of the U.S. "Water such as intrastate lakes, rivers, streams (including intermittent streams)."

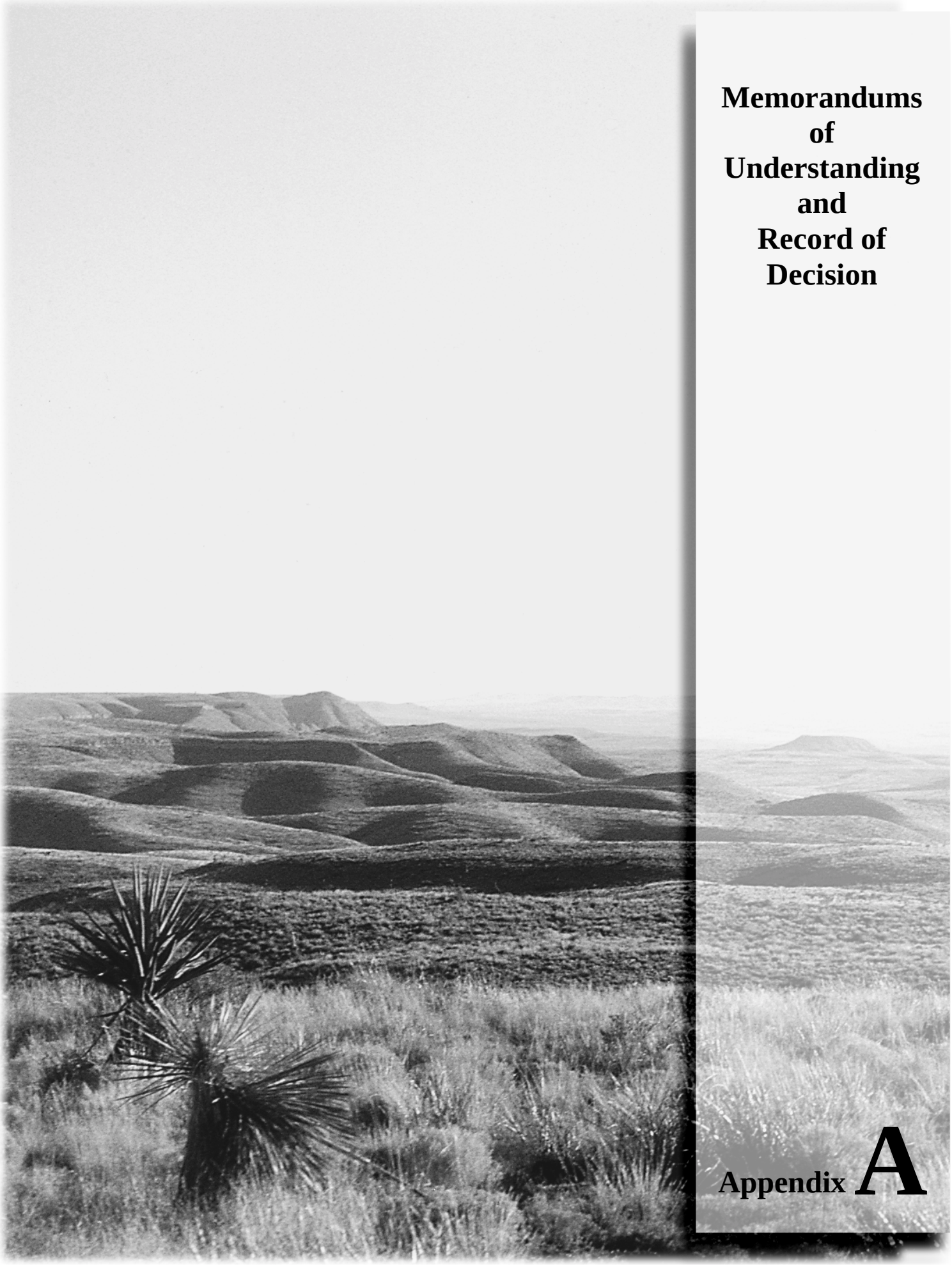
Wetlands. An area that is regularly saturated by surface water or groundwater and subsequently supports vegetation that is adopted for life in saturated soil conditions. To qualify as a USACE jurisdictional wetland, it must have hydric soil, be saturated to the surface sometime during the growing season, and contain wetland plant species.

Index

10.0

10.0 INDEX

wildlife	ES-1, ES-9, ES-10, 1-16, 1-19, 2-13, 2-18, 2-19, 2-23, 2-26, 2-30, 2-31, 2-32, 2-36, 2-37, 3.1-1, 3.1-2, 3.1-6, 3.1-7, 3.1-11, 3.1-12, 3.1-14, 3.1-16, 3.1-17, 3.1-21, 3.4-1, 3.5-11, 3.7-2, 3.7-6, 3.7-7, 3.8-1, 3.8-8, 4-4, 4.1-1, 4.1-4, 4.1-5, 4.1-8, 4.1-9, 4.1-10, 4.1-11, 4.1-12, 4.1-14, 4.1-16, 4.1-18, 4.5-10, 4.8-1, 4.8-8, 4.8-10, 4.8-11, 4.8-13, 4.8-16, 4.8-17, 4.8-18, 4.8-19, 4.8-23, 4.8-25, 4.8-31, 4.8-32, 4.8-33, 4.8-37, 4.10-2, 9-6, D-3, D-4, D-44, D-52, F-3, F-9, F-10, G-7, G-8, I-6



Memorandums of Understanding and Record of Decision

Appendix A

APPENDIX A

MEMORANDUMS OF UNDERSTANDING AND RECORD OF DECISION

This Page Intentionally Left Blank

MEMORANDUM OF UNDERSTANDING

BETWEEN

U,S. DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT

NEW MEXICO

AND

U.S. DEPARTMENT OF THE ARMY

HEADQUARTERS, US ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS

FORT BLISS, TEXAS

CONCERNING

POLICIES, PROCEDURES, AND RESPONSIBILITIES RELATED TO LAND USE PLANNING AND RESOURCE MANAGEMENT OF MCGREGOR RANGE

I. PURPOSE

This Memorandum of Agreement (MOU) establishes the basic principles and responsibilities of the Department of the Interior, Bureau of Land Management (BLM) and Department of the Army, Fort Bliss (Ft Bliss) for implementation of BLM's 1990 Resource Management Plan for the McGregor Range (Range) as mandated by Public Law 99-606. The plan was developed by BLM in consultation with Ft Bliss.

II. AUTHORITIES

Public Law 99-606, Military Lands Withdrawal Act of 1986
National Environmental Policy Act (P.L. 91-90, 42 U.S.C. Section 4321 et seq.).
Federal Land Policy and Management Act (P.L. 94-579, 43 U.S.C. Section 1701 et seq.).

III. PROCEDURES

A. GENERAL OPERATING PRINCIPLES

BLM will recognize Ft Bliss missions have priority of use on the Range and will secure Ft Bliss concurrence before authorizing any nonmilitary uses. At all times, the Army, through Fort Bliss,

reserves the right to close any or all of McGregor Range in accordance with Section 3(b), Public Law 99-606.

1. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

Both agencies are responsible for complying with the NEPA of 1969. As a part of the environmental assessment process, each Agency shall provide the other Agency the opportunity to comment on all proposed actions on the Range that require an environmental assessment or environmental statement.

2. COMMENT

When one Agency requests the review and comment by the other Agency, the requesting Agency will state a requested time period for review, depending on the urgency of the action. Upon receipt of a review request, the reviewing Agency will make every effort possible to meet the other's requested time frame.

3. ACCESS

a. BLM ACCESS TO THE RANGE. BLM employees may have access to portions of the Range that are not hazardous. To avoid interference with Ft Bliss missions and to ensure safety, BLM employees will call the Range Commander or his designee for a clearance. Prior to entry into a hazardous area, BLM employees will notify the Range Commander to make escort and other safety arrangements.

b. PUBLIC ACCESS TO THE RANGE. With the exception of State Road 506 and associated County Roads F052, F037, and E001 north of 506, when not closed by the military, the Range is closed to public use except for authorized activities.

BLM will serve as the processing agency and lead agency for public use of the withdrawn public land on the Range. BLM will provide a description of the activity to the Range Commander, the installation commander's designee for range activities for Ft Bliss. No authorizations will be granted by BLM if Ft Bliss determines they conflict with Ft Bliss use of the Range. Providing the activity is approved, the BLM will require authorized users to comply with Ft Bliss security and safety procedures and regulations when gaining access to the range.

4. MILITARY USE OF THE RANGE. The Range Commander or the appointed representative will serve as BLM's primary point

of contact for coordination involving military use of the Range. It is understood that the military has primary authority of the Range. It is understood that the BLM has managerial responsibilities for the public uses as enumerated in Public Law 99-606 of the withdrawn land, but that the daily uses are subordinate to military missions and uses of the Range.

5. INCOME RECEIVED FROM PUBLIC USE OF THE RANGE. When BLM receives income from the use of the Range, the income will be placed in a fund which can be drawn upon for management of the Range unless otherwise directed by law.

When BLM authorizes an activity that will occur on both withdrawn public land and Army fee-owned land, cost of administration will be allocated to BLM from the Army fee-owned land portion. Ft Bliss will be provided the opportunity to direct the use of the net income in proportion to the amount of income generated from Army fee-owned land for the specific activity that generated the funds.

6. REAL PROPERTY. Within two years, jointly the agencies will develop an inventory of real property (rangeland improvements, buildings, and structures) on the grazing area of the Range. The inventory will identify Army property, BLM property, and jointly owned property. In cases where no records are available showing the ownership of the real property, ownership will be determined by the Ft Bliss Real Property Management Branch and the Area Manager. Unless otherwise agreed to, Ft Bliss will be responsible for the maintenance of its real property and BLM will be responsible for maintenance of its real property irrespective of the location.

In cases where rangeland improvements, buildings, and structures are no longer useable or beyond repair, they may be removed or reconstructed with mutual concurrence unless otherwise directed by law or regulations.

B. SPECIFIC ACTIVITY COORDINATION

1. LANDS

a. BLM RESPONSIBILITIES. BLM will be the lead agency for NEPA compliance for proposed projects that involve both withdrawn public land and Army fee-owned land that meet the criteria for the designation of lead agency defined in Council of Environmental Quality (CEQ) Regulation 1505.1. The BLM will issue all public demand nonmilitary leases, easements, rights-of-way, and other land use authorizations on withdrawn public land. (Nonmilitary is defined as projects that are not owned by the

U.S. Government, not under administration or under contract to, a military agency.) The BLM will send a copy of the land use application to the Ft Bliss Real Property Management Branch for a review and concurrence of the proposed action.

b. FT BLISS RESPONSIBILITIES. Ft Bliss will review all land use applications submitted by BLM and determine if the applications conflict with military uses of, and responsibilities to, the Range.

Ft Bliss will issue all land use authorizations needed on or across Army fee-owned land.

2. MINERALS

a. SALABLE MINERALS (sand, gravel, fill dirt, borrow, caliche, and building stone).

(1) BLM RESPONSIBILITIES. The BLM is responsible for authorizing and managing salable materials for the Range, but all activities will be with the concurrence of Ft Bliss. Sales will be limited to those areas that are identified in the Proposed Resource Management Plan Amendment/Final EIS for McGregor Range, May 19, 1989, page 3 (hereinafter referred to as BLM's Proposed 1989 Resource Management Plan). Upon receiving an application for materials, BLM will provide the Ft Bliss Real Property Management Branch, a description of the proposal and request Ft Bliss review for consistency with military missions and public safety. If Ft Bliss does not concur with the application, BLM will not authorize or approve such a request.

(2) FT BLISS RESPONSIBILITIES. Ft Bliss will review applications for consistency with military missions, safety, and security requirements. Upon completion of the review and concurrence with Ft Bliss, Ft Bliss, will notify BLM if it concurs with the application and provide stipulations or modifications required.

b. LEASABLE MINERALS

(1) BLM RESPONSIBILITIES. The BLM will manage the oil and gas, and geothermal programs for the Range. Oil and gas, and geothermal programs will be limited to those areas identified as suitable in BLM's Proposed 1989 Resource Management Plan. Prior to offering a parcel or parcels for lease, BLM will provide Ft Bliss Real Property Management Branch a description of each parcel and request the appropriate surface management stipulations. The description of each parcel will include a real estate map showing range, township, and section(s).

Prior to processing pre-lease notices/permits or lease operations, BLM, in consultation with Ft Bliss and applicants, will schedule a field examination for each action.

In concurrence with Ft Bliss, BLM will determine every five years which land on the Range is suitable for opening. If areas are found to be suitable for opening to leasable minerals, BLM will comply with Section 12 of Public Law 99-606.

(2) FT BLISS RESPONSIBILITIES. Ft Bliss, through the Albuquerque District, Corps of Engineers, will provide stipulations to BLM for oil and gas, geothermal exploration and leasing operations. Ft Bliss will notify BLM of changes in security and safety requirements. Ft Bliss will assist BLM with inspection and enforcement and field examinations access, times of entry, and safety and security requirements. Additional administrative costs if necessary will be paid by BLM or the lessee.

Every five years, Ft Bliss will review military programs and determine which areas would be compatible with opening for leasable minerals.

c. LOCATABLE MINERALS

(1) BLM RESPONSIBILITIES. The BLM will conduct inventories for locatable minerals. In concurrence with Ft Bliss, BLM will determine every five years which land on the Range is suitable for opening for locatable minerals. If areas are found to be suitable for opening, BLM will comply with Section 12 of Public Law 99-606.

(2) FT BLISS RESPONSIBILITIES. Every five years, Ft Bliss will review military programs and determine which areas would be compatible for locatable minerals.

3. VEGETATION MANAGEMENT

a. BLM RESPONSIBILITIES. BLM will be responsible for vegetation on the withdrawn public land on the Range and will coordinate management with Ft Bliss. The special status species section of this MOU discusses management of special status plant species.

The BLM will be the lead agency for management of the Black Grama Area of Critical Environmental Concern (ACEC), sales of plant products, and prescribed burns. The actions will be limited to those areas identified in BLM's Proposed 1989 Resource Management Plan. Prior to authorizing activities, BLM will provide Ft Bliss with a description of the proposal and

request a Ft Bliss review for compatibilty with military missions, security, and safety. If Ft Bliss does not concur, BLM will not authorize such an activity. Administrative costs will be paid by BLM or the contractor/lessee.

The ACEC will be managed according to the existing cooperative agreement between the BLM, Ft Bliss, and New Mexico State University.

The BLM will be responsible for monitoring vegetation conditions on withdrawn public land and may assist on Army fee-owned land on the Range. The BLM will develop and implement a monitoring plan in consultation with Ft Bliss. BLM will coordinate monitoring methodology and results with Ft Bliss Environmental Management Office so that 1) data can be collected, if possible, in a way usable in natural resources/NEPA programs; and 2) monitoring activities are not duplicated by both agencies.

b. FT BLISS RESPONSIBILITIES. Ft Bliss will be responsible for vegetation management on Army fee-owned land.

Ft Bliss will review BLM proposals for vegetation management for consistency with military missions, safety, and security requirements. Upon completion of the review, Ft Bliss will notify BLM if Ft Bliss concurs with the proposal and provide stipulation or modifications.

4. RANGELAND MANAGEMENT

a. LIVESTOCK GRAZING

(1) BLM RESPONSIBILITIES. The BLM is responsible for management of the livestock grazing program on the Range and will continue the existing livestock grazing program on McGregor Range. Livestock grazing will be limited to the grazing area identified in the Draft White Sands Resource Management Plan and EIS, McGregor Range, September 88, page 3-15 and map 3-4, incorporated in BLM's Proposed 1989 Resource Management Plan.

Livestock grazing levels will be established annually and based on the principles of multiple use and sustained yield. BLM will continue to utilize the existing stipulations as needed by Ft Bliss and if changes are proposed, they will be coordinated with Ft Bliss. The current stipulations are attached as Appendix A.

Livestock use will be authorized through contracts and based on competitive bidding at public auction. Minimum bids will be established as a result of feasibility cost studies which will

determine the cost for continuing operation of the grazing program. The contracts will contain the terms and conditions as necessary to meet the requirements of BLM's Proposed 1989 Resource Management Plan and Ft Bliss requirements.

The revenues from livestock grazing contracts will be placed in a special account and generally be used for the management of the livestock grazing program which includes all administrative costs, construction, and maintenance of rangeland improvements. Ft Bliss will be provided the opportunity to direct expenditure of 10 percent of the revenues based on 10 percent Army fee-owned land within the withdrawn area. However, BLM may use a portion of the 10 percent revenue, with Army concurrence, for maintenance of rangeland improvements that are owned by Ft Bliss and where BLM has accepted maintenance responsibility. BLM will provide Ft Bliss an annual accounting of the revenues and expenditures generated from the livestock contracts.

BLM will ensure grazing use will be limited to cattle and horses and is responsible for livestock trespass abatement in nonimpact areas.

The BLM will keep Ft Bliss Provost Marshal's Office and Range Commander informed as to the name and address of each grazing contractor and will ensure the grazing contractors comply with Ft Bliss security and safety requirements.

(2) FT BLISS RESPONSIBILITIES. The Range Commander is responsible for issuing appropriate passes for grazing contractors. Additionally, Ft Bliss will provide firing schedules to BLM and a check out system to ensure grazing contractors comply with Ft Bliss security and safety requirements.

Ft Bliss will gather and remove livestock from impact areas at the request of BLM or for trespass abatement.

b. RANGELAND IMPROVEMENTS

(1) BLM RESPONSIBILITIES. The BLM will be responsible for the construction and maintenance of livestock control fences within and bordering the livestock grazing area with the exception of fences in impact areas.

The BLM will be responsible for providing livestock and wildlife water on the Range in concurrence with Ft Bliss. The primary source of water for the wildlife will be the Ft Bliss owned water rights out of the Sacramento River and Carrizo Spring. The Army, in cooperation with BLM, will retain and exercise complete

control of distribution and use of allocated water rights from the Sacramento River and Carrizo Spring. It is understood by both parties that the use of the water is for the benefit of wildlife.

The BLM has maintenance and construction responsibility to maintain and improve pipelines, tanks, tubs, wells, windmills, wildlife waters, etc, necessary to provide for wildlife and rangeland management. Prior to the construction of new rangeland improvements, maintenance of Ft Bliss owned improvements, or changes that affect water resources on the Range, BLM will submit the construction or maintenance plans and specifications to the Range Commander for concurrence.

(2) FT BLISS RESPONSIBILITIES. Ft Bliss will control construction and maintenance of rangeland improvements in impact and military use areas. Ft Bliss will construct and maintain firebreaks on those parts of the McGregor Range boundary which enclose land upon which grazing use will be authorized and at such other locations as may be determined to be necessary by Ft Bliss.

Firebreaks will usually be maintained contiguous with perimeter fences.

Personnel of Ft Bliss, in pursuit of their official functions, or other authorized purposes, will continue to have unlimited access to the land covered by this agreement. Ft Bliss may open gates and, if necessary, lower fences in order to accomplish missions or duties. However, Ft Bliss will leave gates as found (open or closed) and reposition any fences lowered, but Ft Bliss assumes no responsibility with a third party should gates not be left as found or should fences not be re-positioned. If routine utilization and/or modification of rangeland improvements are needed to accomplish military operations, Ft Bliss will coordinate with BLM, in advance when possible and practicable.

The Range Commander will review BLM's rangeland inprovement plans on withdrawn land for consistency with military missions, safety, security requirements, and for approval. Upon completion of the review, Ft Bliss will notify BLM if Ft Bliss concurs with the proposal and provide stipulations or modifications it requires.

5. WILDLIFE

a. GAME SPECIES POPULATION MANAGEMENT

(1) BLM RESPONSIBILITIES. BLM recognizes New Mexico Department of Game and Fish (NMDGF) as the agency

responsible for game species population management on all land on the Range.

BLM will be the lead agency in coordination of all recommendations with NMDGF on matters concerning wildlife population management as they affect BLM resource management and protection of wildlife on withdrawn public land on the Range.

Prior to making a recommendation to the NMDGF on game species population management, BLM will consult with Ft Bliss to coordinate respective management objectives for withdrawn public land and Army fee-owned land to ensure its activities are consistent with military missions, safety and security requirements.

(2) FT BLISS RESPONSIBILITIES. Ft Bliss recognizes NMDGF as the agency responsible for game species population management on all land on the Range.

Prior to making a recommendation to the NMDGF on game species population management, Ft Bliss will consult with BLM to coordinate respective management objectives for Army fee-owned land and withdrawn public land.

b. HABITAT MANAGEMENT.

(1) BLM RESPONSIBILITIES. The BLM will be responsible for wildlife habitat management on withdrawn public land and will coordinate such monitoring on Army fee-owned land.

The BLM will establish and conduct wildlife habitat management activities in accordance with BLM planning decisions, applicable laws and regulations.

The BLM will coordinate all habitat management activities with the Range Commander for consistency with military missions, safety and security requirements to obtain Ft Bliss concurrence.

The BLM is responsible for monitoring wildlife and wildlife habitat on withdrawn public land. BLM may conduct such activity on Army fee-owned land with the concurrence of the Range Commander. The BLM will develop and implement a monitoring plan in coordination with Ft Bliss. The monitoring studies would include coordination with Ft Bliss for annual field trips, flights, use of approved aerial photography, and Ft Bliss objectives for Army fee-owned land. BLM will coordinate monitoring, methodology and results with Ft Bliss Environmental Management Office so that, when possible, data can be collected in a way usable in Ft Bliss Natural Resources/NEPA Programs. The

objective of both agencies is to avoid duplicating each other's efforts.

(2) FT BLISS RESPONSIBILITIES. Ft Bliss will be responsible for wildlife habitat management on Army fee-owned land to the extent of resource availability.

Ft Bliss will establish and conduct wildlife habitat management activities in accordance with applicable laws and regulations.

Ft Bliss will coordinate all habitat management activities with BLM to ensure harmony in management direction for the Range as a whole.

c. SPECIAL STATUS SPECIES MANAGEMENT

(1) BLM RESPONSIBILITIES. The BLM will be responsible for compliance with the Federal and State laws affecting endangered, threatened, candidate or sensitive plants and animals with regard to all actions on withdrawn public land.

The BLM will also manage federal candidate and proposed species, state-listed species, and BLM sensitive species on withdrawn public land according to BLM policy.

The BLM will be responsible for implementation of recovery plans on withdrawn public land on the Range. Prior to implementation of recovery plans, BLM will request concurrence from the Range Commander to ensure consistency with military missions, safety, and security requirements.

The BLM will provide Ft Bliss data on inventories, consultation proceedings, and other information with regard to special status species on McGregor Range.

(2) FT BLISS RESPONSIBILITIES. Ft Bliss will be responsible for compliance with the Endangered Species Act and New Mexico endangered plant and animal laws with regard to its actions on withdrawn public land and for Army fee-owned land on the Range.

Ft Bliss will be responsible for implementation of recovery plans on Army fee-owned land on the Range. Prior to implementation of recovery plans, Ft Bliss will coordinate with BLM to ensure consistent management direction for the Range.

Where possible and practicable, Ft Bliss will support BLM management programs for federal candidate, proposed, state-listed, and BLM sensitive species on the Range.

Ft Bliss will provide BLM data on inventories, consultation proceedings, and other information with regard to special status species on the Range.

d. SIKES ACT STAMP PROGRAM

A Sikes Act Stamp Program will be established under Section 1 (military reservations) of the Sikes Act as amended (16 U.S.C. Title 670). Stamp fees and program specifics will be set by an additional Memorandum of Agreement between NMDGF, Ft Bliss, and BLM.

e. ANIMAL DAMAGE CONTROL

(1) BLM RESPONSIBILITIES. The BLM will be responsible for authorizing animal damage control (ADC) activities on withdrawn public land and Army fee-owned land.

Each year when the New Mexico ADC Program presents BLM with a proposed district wide ADC Plan, BLM will provide the Range Commander an opportunity to review and approve the draft to coordinate respective management objectives for withdrawn public land, Army fee-owned land, and to ensure consistency with military missions, safety, and security requirements prior to approval. The BLM will be responsible for monitoring predator populations, and other potentially damaging species as required by BLM planning decisions.

Requests from grazing contractors for ADC will be handled by the New Mexico ADC Program. Routine requests for control work received by ADC from the grazing contractors will be incorporated into the annual ADC plan. Requests for emergency control work received by ADC from the grazing contractors will be authorized by BLM on a case-by-case basis.

(2) FT BLISS RESPONSIBILITIES. Ft Bliss will review and comment on the draft district ADC plan for consistency with military missions, safety, and security requirements.

Ft Bliss will request ADC activities needed (except in the vicinity of military structures) on withdrawn public land through BLM prior to development of the district ADC plan. Ft Bliss will coordinate all Army initiated ADC activities on Army fee-owned land with the BLM to ensure consistent management direction for the Range.

6. CULTURAL RESOURCES:

a. The term "cultural resources" is understood to

have the same meaning as the term "historic resources" used in the Historic Preservation Act and in its implementing regulation 36 C.F.R. Section 800.

b. BLM's RESPONSIBILITIES:

(1) The BLM will comply with Section 106 of the Historic Preservation Act and 36 C.F.R. Section 800 for undertakings for which the BLM or third parties are the proponent.

(2) The BLM will be the lead agency for permits required by the Archaeological Resources Protection Act (ARPA) for survey, research, excavation, data recovery, and other cultural resources projects for which the BLM is the proponent and for all third party activities on withdrawn public lands.

(3) The BLM will mitigate the effects caused to cultural resources for activities conducted under BLM's administration.

(4) The BLM may be a consulting party in military undertakings involving cultural resources on withdrawn public lands. The BLM and Ft Bliss jointly will identify classes of undertakings for which the BLM will be a consulting party.

(5) Upon request, the BLM will provide Ft Bliss with draft, review copies of research proposals, survey and other field project reports, and with the results of analytical studies for which the BLM is the proponent. Additionally, the BLM will provide Ft Bliss with final copies of such proposals, reports, and studies.

(6) The BLM will meet with Ft Bliss on an annual basis, or more frequently as appropriate, to share information about planned cultural resources projects. Other topics to be discussed will include means to:

(a) Standardize field survey, recording techniques, and artifact classification criteria and codes to the maximum practical extent.

(b) Identify ways to make site and artifact file data compatible for interagency use to the maximum practical extent.

(c) Develop procedures to permit review of the design(s) of cultural resources projects and to incorporate

Ft Bliss analytical needs into those designs to the maximum practical extent.

c. FT BLISS RESPONSIBILITIES:

(1) Ft Bliss will comply with Section 106 of the Historic Preservation Act and 36 C.F.R. Section 800 for those undertakings for which the military is the proponent.

(2) Ft Bliss will be the lead agency for permits required by the Archaeological Resources Protection Act (ARPA) for survey, for research/excavation/data recovery, and for other cultural resources for which the military is the proponent on withdrawn public lands and all activities on Army fee-owned land.

(3) Ft Bliss will mitigate the effects caused to historic resources by military activities.

(4) Ft Bliss may be a consulting party in the BLM's undertakings involving cultural resources. Ft Bliss and the BLM jointly will identify classes of undertakings for which Ft Bliss will be a consulting party.

(5) Upon request, Ft Bliss will provide the BLM with draft, review copies of research proposals, survey and other field project reports, and with the results of analytical studies for which Ft Bliss is the proponent. Additionally, Ft Bliss will provide the BLM with final copies of such proposals, reports, and studies.

(6) Ft Bliss will meet with the BLM on an annual basis, or more frequently as appropriate, to share information about planned cultural resources projects. Other topics to be discussed include means to:

(a) Standardize field survey, recording techniques, and artifact classification criteria and codes to the maximum practical extent.

(b) Identify ways to make site and artifact file data compatible for interagency use to the maximum practical extent.

(c) Develop procedures to permit review of the design(s) of cultural resources projects and to incorporate BLM's analytical needs into those designs to the maximum practical extent.

7. RECREATION

a. GENERAL

(1) BLM RESPONSIBILITIES. The BLM is responsible for managing recreational use of the withdrawn public land on the Range.

Prior to authorizing a recreational use on the Range, BLM will provide the Range Commander with a description of the proposed action for review for consistency with military missions, safety, and security requirements, and obtain Ft Bliss concurrence.

The BLM will be responsible for developing a sign location plan and information plan that will provide the public reasonable information on locations and restrictions. Prior to approval of the plan, BLM will provide the Range Comander with a draft for approval so that the plan will be consistent with military missions, safety, and security requirements.

The BLM will limit recreational vehicle use on withdrawn public land to designated roads and trails. BLM will identify designated roads on a case-by-case basis with Ft Bliss concurrence. The designation will consider the need for access for the activity involved.

(2) FT BLISS RESPONSIBILITES. Ft Bliss will be responsible for establishing a safety and security program needed to provide for military security and public safety.

Ft Bliss will install and maintain signs for areas that are hazardous because of unexploded ordnance.

b. HUNTING

(1) BLM RESPONSIBILITIES. The BLM will be responsible for managing the recreational use of the Range by hunters in accordance with the Rescource Management Plan requirements. Each year BLM, in concurrence with the Range Commander and the NMDGF, will develop a McGregor Range hunting plan that will prescribe proposed recreational use of the Range by hunters. The plan shall be consistent with guidelines from the BLM's 1989 Proposed Resource Management Plan, recreation management capability of the agencies, multiple use mandates, and natural resource management objectives. Prior to approval of the plan, BLM will provide the Range Commander with a draft for review for consistency with military missions, safety, and security requirements. If the plan is not consistent with military missions, safety, and security, then BLM will not adopt

it as its hunting plan and will then so modify the plan to make it consistent with military missions.

(2) FT BLISS RESPONSIBILITIES. Ft Bliss will be responsible for providing BLM with information concerning the Ft Bliss Safety and Security Program prior to BLM approval of the Annual Hunting Plan. Hazardous areas and those areas that the public are not allowed to enter will be identified on maps. This in no way affects the Range Commander's right to later deny access to an area that has become a hazardous area.

8. WILDERNESS STUDY AREA MANAGEMENT

a. BLM RESPONSIBILITIES. The BLM will manage the Culp Canyon Wilderness Study Area (WSA) under the Interim Management Policy and Guidelines Under Wilderness Review (1987) until the area is either added to the National Wilderness Preservation System or removed from further wilderness consideration.

b. FT BLISS RESPONSIBILITIES. Ft Bliss will be responsible for compliance with the Interim Management Policy and Guidelines for Lands Under Wilderness Review (1987) until area is either added to the National Wilderness Preservation System or removed from further wilderness consideration.

Ft Bliss will generally limit surface use of the WSA to ground forces military maneuvers. All military activities which cause impairment to wilderness values will require reclamation prior to September 30, 1990. All vehicles should utilize existing vehicle ways. Ft Bliss will notify the Las Cruces District Manager 30 days prior to conducting any activities within the WSA whenever possible or immediately following the activity.

9. WATERSHED

a. BLM RESPONSIBILITIES. The BLM will be responsible for management of watershed resources on withdrawn public land on the Range. The BLM will develop and implement a monitoring plan in coordination with Ft Bliss. Monitoring studies for watershed will be conducted on withdrawn public land over the entire McGregor Range in coordination and concurrence with Ft Bliss. The monitoring studies will include coordination with Ft Bliss for annual field trips and use of approved ground and aerial photography.

The BLM will cooperatively develop and implement watershed management plans for the Grapevine, El Paso Canyon, and Cockleburr Watershed areas. Prior to approval of the watershed management plans, BLM will provide Ft Bliss with a draft for

concurrence for consistency with Army fee-owned land management objectives, military missions, safety, and security requirements.

b. FT BLISS RESPONSIBILITIES. Fort Bliss will be responsible for the management of watershed resources on Army fee-owned land.

10. FIRE

a. BLM RESPONSIBILITIES. The BLM will be responsible for monitoring and suppressing all nonmilitary fires on withdrawn public land and Army fee-owned land.

The BLM will initiate the most cost effective suppression or modified suppression tactics available on all nonmilitary fires except those designated as impact or military use areas.

Upon receiving a report of a fire and prior to beginning suppression actions, BLM will notify the Ft Bliss Fire Chief to establish fire control responsibility and hazards that may restrict control measures.

Agency jurisdiction will be assigned upon determining the ignition source. The BLM may initiate aerial suppression (air tanker/helicopter drops) on those military fires deemed threatening to life upon completion of an escaped fire analysis and coordination with the Ft Bliss Fire Chief. The BLM may, at its own expense, initiate aerial suppression on the military fires which are not deemed threatening to life.

The BLM will notify the Ft Bliss Fire Chief of its suppression actions within 24 hours of suppression actions being taken on the Range. Such notification will include when possible, but not be limited to, the following:

Date and time of action
Location and size of fire
Type and extent of suppression activities
Resources/structures damaged (if any)

1. Facilities
2. Structures (livestock, wildlife, or cultural)
3. Private or State property
4. Cultural resources
5. Livestock
6. Endangered species/habitat
7. Critical natural resource area

The BLM may use prescribed burning to improve rangeland condition and wildfire habitat on areas identified in the BLM's 1989

Proposed Resource Management Plan. The prescribed burn plans will meet all required BLM formats and regulations. Prior to approval of the plans, BLM will provide Ft Bliss Real Property Management Branch, for staffing to appropriate Ft Bliss activities) with a draft for concurrence for consistency with Army fee-owned land management objectives, military missions, safety, and security requirements.

b. FT BLISS RESPONSIBILITIES. Ft Bliss will have responsibility for suppressing and monitoring fires caused by military activities on withdrawn public land and Army fee-owned land.

Ft Bliss will serve as lead agency for monitoring or suppressing all fires in the impact and military use areas. Each year Ft Bliss will update BLM of the hazardous areas at the annual coordination meetings.

Ft Bliss will initiate suppression or modified suppression (monitoring) tactics on all fires caused by military actions on McGregor Range.

Consistent with P.L. 99-606, Section 3(d) Ft Bliss will request a transfer of funds from the Department of Army to the Bureau of Land Management as compensation for assistance on fire suppression actions of fires that resulted from a military activity.

Upon receiving a report of a fire, the Ft Bliss Fire Chief will notify the BLM of the fire. The Fire Chief will provide BLM with as much information as available at that time and of its suppression actions. Within 24 hours of suppression actions being taken on the Range, the Fire Chief will provide additional information if available. Such final report will include, when possible, but not be limited to, the following:

Date and time of report
Location and size of fire
Type and extent of suppression activities
Resources/Structures damaged (if any)

1. Facilities
2. Structures (livestock, wildlife or cultural)
3. Private or State property
4. Cultural resources
5. Livestock
6. Endangered species/habitat
7. Critical natural resource area

11. LAW ENFORCEMENT.

a. BLM RESPONSIBILITIES. The BLM will be responsible for enforcement of the federal laws that pertain to the use, management, and development of withdrawn public land on the Range.

Law enforcement personnel may exercise their enforcement authority over nonmilitary activities within the Range to the extent that such activities are consistent with BLM's 1989 Proposed Resource Management Plan. The BLM will exercise its enforcement authority over military personnel on the Range in coordination with the Provost Marshal's Office.

After BLM takes enforcement action on the Range, it will notify the Ft Bliss Provost Marshal's Office.

BLM will notify the Ft Bliss Provost Marshal's Office if persons are found on the Range with Ft Bliss authorizations but not conducting authorized activities.

b. FT BLISS RESPONSIBILITIES. Ft Bliss will be responsible for enforcing laws pertaining to military activities, public safety, and security on the Range.

Ft Bliss will notify the BLM if persons not on a military mission are found causing resource damage.

12. ROADS

a. BLM RESPONSIBILITIES. The BLM will share road maintenance responsibilities with Ft Bliss. Roads will be maintained to a standard that is consistent with levels of use, environmental factors, safety requirements, level of funding, and resource conditions.

The BLM will develop a road plan for the Range in consultation with the Range Commander. The plan will specify agency responsibilities for maintenance and maintenance standards. Prior to approval of the plan by Ft Bliss, BLM will provide the Range Commander with a draft for review for consistency with military missions, safety, security requirements, and Army fee-owned land management objectives.

b. FT BLISS RESPONSIBILITIES. Ft Bliss will share road maintenance responsibilities. Roads will be maintained to the standard that is consistent with levels of use, environmental factors, safety requirements, level of funding, and resource conditions.

Ft Bliss will assist in the development of a Road Plan for the Range.

IV. GENERAL PROVISIONS

A. TERMS OF AGREEMENT. The need for this MOU is expected to continue for 15 years from the date of enactment of the Military Lands Withdrawal Act of 1986 (November 6, 1986 until November 6, 2001). At the end of this period, the MOU will expire, unless it is cancelled or renewed before then.

B. DEFINITIONS.

1. CONCURRENCE. As utilized in this MOU, concurrence is the agreement of the other party involved. If there is no such agreement then no authorization can be given for such activity.

2. NONMILITARY USE. As utilized in this MOU, a nonmilitary use of the range is one which is an activity, not under administration of, or under contract to, a military agency.

3. RANGE COMMANDER. Wherever Range Commander is used in this MOU, Range Commander serves as the installation commander's designee and primary point of contact.

C. PERIODIC REVIEW. In addition to the reviews required under Section 12 of Public Law 99-606, the participants will review this MOU at least once every five years to determine its adequacy, effectiveness, and need for updating.

D. AMENDMENTS. Either participant may propose changes to this MOU during its term. Any change will be in the form of an amendment and will not take effect until both participants have agreed and signed the amendment. Any amendment must be within the framework of Public Law 99-606.

E. RENEWAL. Section 8(a) paragraphs (1) and (2) and Section 5(b) of Public Law 99-606 establish guidelines for renewal and continued use of the withdrawal as follows:

No later than three years prior to the termination of the withdrawal, Ft Bliss shall advise the BLM as to whether Ft Bliss will have a continuing military need for any of the land withdrawn after the termination date.

- If Ft Bliss concludes that there will be a continuing military need for any such land after the termination date, Ft Bliss shall

file an application for extension of the withdrawal and reservation of such needed land in accordance with regulations and procedures of the Department of the Interior applicable to the extension of withdrawal of land for military uses.

- No later than 12 years after the date of enactment of Public Law 99-606, Ft Bliss shall publish a draft Environmental Impact Statement (EIS) concerning continued or renewed withdrawal of any portion of the land withdrawn on the Range for which Ft Bliss intends to seek such continued or renewed withdrawal. Section 5(b) (1) of Public Law 99-606 establishes the guidelines for preparation of the EIS.

F. CANCELLATIONS. Section 8(2)(3) of Public Law 99-606 establishes guidelines for cancellation or relinquishment of the withdrawal as follows:

- If during the period of withdrawal and reservation, Ft Bliss decides to relinquish any or all of the land withdrawn and reserved by Public Law 99-606, Ft Bliss shall file a notice of intention to relinquish with the BLM following the procedures set forth in Section 8(b) through (f) of Public Law 99-606.

- In addition to the above, Section 12(e) of Public Law 99-606 provides that in the event of a national emergency or for purpose of national defense or security, the BLM at the request of Ft Bliss, shall close any land that has been opened to mining or to mineral or geothermal leasing. If the closure becomes necessary, a determination of the effect on any ongoing operations will be made at that time.

G. DECONTAMINATION. Decontamination of withdrawn public land on the Range will be in accordance with Section 7 and 8 of Public Law 99-606.

H. MEETINGS AND COORDINATION. The agencies shall meet at least annually prior to August 1 to review the MOU and expected issues. The meeting host shall alternate between the agencies.

The topics discussed at the meeting should include:

1. Enforcement issues
2. Fire
3. NEPA documents
4. BLM activities planned for next period
5. Army activities planned for next period
6. Setting hunting and recreation dates
7. Cultural resource reports during past period
8. Problems

9. Monitoring
10. Budget/accounting
11. Natural resources management projects
12. Water/water management/water monitoring

I. EFFECT ON OTHER MOU'S. Unless a specific provision of an existing MOU is specifically superseded by any part of this MOU, the remaining terms of the MOU's are still in effect until that MOU is wholly superseded. These MOU's are dynamic documents and both parties agree to work together to reach new updated MOU's.

- WO-19 MOU between the Departments of the Interior and Army dated September 9, 1966, which provides co-use grazing on the Range, New Mexico.

- NMSO-30 MOU dated July 22, 1976, on the proposed agreed upon changes to the MOU between the Departments of Interior and Army to provide for co-use grazing on the Range, New Mexico.

- NMSO-36 MOU signed in October 1972, is a Cooperative Plan Agreement for conservation and development of fish and wildlife resources on the Range (Ft Bliss) between BLM, Ft Bliss, New Mexico Department of Game and Fish and Wildlife Service. Also includes the July 22, 1976 MOU between BLM and Ft Bliss on proposed changes to the October 1972 MOU.

In order to fully implement the MOU required by Public Law 99-606 between BLM and Ft Bliss, it is anticipated that additional MOU'S will be required to implement specific resource management programs on the Range. Both BLM and Ft Bliss will sign these MOU'S along with the cooperating agency(ies).

J. PRINCIPAL CONTACTS

- BLM Caballo Resource Area Manager, (505) 525-8228, 1800 Marquess, Las Cruces, NM 88005

- Ft Bliss McGregor Range Commander, (915) 569-9206, ATZC-B-CO, Ft Bliss 79916-7400

K. DISPUTE RESOLUTION. In any and all disputes, the participants in this MOU shall exercise good faith and shall endeavor to resolve all problems amicably and quickly. In the event of any unresolved conflicts the next higher agency/headquarters shall attempt resolution. Final resolution rests with the Secretary of Interior and Secretary of Army.

L. RESERVATION OF RIGHTS. This MOU does not waive any rights or responsibilities the BLM or Ft Bliss may have except as provided by this MOU.

M. BINDING EFFECTS. This MOU is binding on BLM and Ft Bliss and their agents, successors, and assigns.

N. NONDISCRIMINATION. During the performance of this MOU, participants agree to abide by the terms of Executive Order 11246 and will not discriminate against any person because of race, color, religion, sex, or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to race, color, religion, sex or national origin.

O. OFFICIALS. No member or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this MOU if made with a corporation for its general benefit.

P. EFFECTIVE DATE. This MOU shall take effect on the date when all parties have signed and will continue until November 6, 2001, unless terminated as described in Section E of this MOU.

APPROVED:

By Larry L. Woodard Date 2-22-90
Larry L. Woodard
State Director, New Mexico
Bureau of Land Management

APPROVED:

By Richard J. Galliers Date 22 February 1990
Richard J. Galliers
Colonel, U.S. Army
Chief of Staff

APPROVED:

By Donald N. Satz Date 3-1-90
Donald N. Satz
Chief, Real Estate Division
Albuquerque District, Corp of Engineers
Albuquerque, New Mexico

APPENDIX A

MCGREGOR RANGE GRAZING
TERMS AND CONDITIONS

The following are made a part of this invitation and of the contract and are fully binding on the successful bidder.

Bidding Grazing Contracts and Payment

1. An individual may bid on and be awarded more than one grazing unit. If a bidder bids high on more than one unit and wishes to default; i.e., decline to graze the unit, he may do so on the date of sale; however, the Terms and Conditions in No. 4 below shall apply.

BLM reserves the right to reject any or all bids or to withdraw any unit from consideration.

2. Successful bidders will be required to furnish a deposit of 15 percent of total bid price of each unit successfully bid on at the conclusion of the bidding. Personal checks will be acceptable.

3. The successful bidder will be required to furnish, within 10 days from the date of sale, acceptable surety in the amount of 20 percent of the total bid/bids as a guarantee of faithful performance under the terms of the contract. The performance bond or bonds may be: bond of a corporate surety shown on the approved list of the U.S. Treasury Department and executed on approved standard form, cash, cashiers check, money order, certified. The bond or bonds will be released following an inspection of the unit at the termination of the grazing period.

4. Failure of a bidder to furnish required bonds or other acceptable surety will result in forfeiture to the BLM, as liquidated damages, the deposit submitted at the bidding. The award of grazing use will be made to the next highest bidder.

5. If the bidder is a group, association, or corporation, evidence of the authority of the individual signing for the group must accompany the deposit. Failure to include this evidence of authority will result in disqualification of the bid.

6. Payment for grazing use will be made in full by cash, certified check, cashier's check, personal check, or postal money order payable to the BLM within 10 days from receipt of the notice of award.

The full use of purchased AUMs is the sole responsibility of the successful bidder. Refunds for unused AUMs will not be made, except in cases where the loss is required by the Bureau of Land Management (BLM).

7. The purchaser, on the performance of the contract, will not discrimintae against any employee or applicant for employment because of sex, age, race, creed, or national orgin.

8. If the purchaser should default in the performance or observance of any of the terms, conditions, or stipulations contained in the contract and attachments, then the BLM may terminate the contract and the rental paid will be considered as liquidated damages.

9. The purchaser may not assign any contract or any interest therein without the written approval of the Authorized Officer. An assignment shall contain all the terms and conditions agreed upon by the parties thereto. No extension of grazing use period or increase in set numbers of livestock will be approved if an assignment of a grazing contract is approved.

10. Only cattle that are owned or controled by the purchaser will be authorized on the Range. All brands used on the livestock must be recorded with BLM.

11. Convenant against contingent fees: The purchaser warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement of understanding for a commission, percentage, brokerage, or contingent fee, except bonafide employees or bonafide agencies maintained by the purchaser for the purpose of securing business.

COORDINATION WITH FT. BLISS

The primary use of the McGregor Range is for the use of the military to carry out missions. A secondary use of certain portions of the Range is livestock grazing. Grazing contracts will not prevent Ft. Bliss from establishing launching sites, erecting fire towers, radar sites, or other similar construction and fencing of same when required by any military actions.

Personnel of Ft. Bliss, in pursuit of their official functions or other authorized purposes, will have unlimited access to the land covered by this contract.

Purchaser Access

1. A Range Pass for all successful bidders and their employees, who will be caring for the livestock through the season, must be

obtained from the Provost Marshal's Office. All vehicles are required to be registered, proof of vehicle registration and insurance will be required.

2. Each time prior to entry upon McGregor Range for any reason, each purchaser, his family, agents, or guests, must obtain permission from the Commanding General, United States Army Air Defense Center (Ft. Bliss), or his designated agent. Such persons may remain on McGregor Range only during the hours and/or days which permission to enter has been so granted. Under no circumstances will they be granted permission to enter or remain on McGregor Range when their access will interfer with military activities.

3. Contacts with Ft. Bliss regarding access and firing schedules should be made by writing the Provost Marshal, Bldg. 116, Attn: Pete Atkins, Ft. Bliss, Texas, 79916, or by phone at (915) 568-1898, 568-4103, or 568-5433.

4. Projected increases in missile firings over the next several years means an increase in the number of days the range will be closed off to public access. During these times, the range could be closed for several days straight per week.

5. Should security or safety considerations or the assignment of any particular mission require such action, Ft. Bliss reserves the right to deny access for an extended period of time. Ft. Bliss may exercise this right without prior notice to the purchaser.

Safety

Purchaser, his family, agents, or guests are prohibited from touching, tampering with, or disturbing any shell, shell casing, missile target or components thereof which may be found on the lands covered by this contract. Upon discovery of such items, purchaser will report the discovery to the Provost Marshal's Office, Ft. Bliss.

Impact Area

Portions of grazing Unit 9 and grazing Unit 13 are an impact area for laser explosive ordinance and may contain highly dangerous unexploded ordinance. The impact area is identified by a firebreak road with bilingual danger warning signs placed at 200-meter intervals. Entrance into the impact area by purchasers and their representatives is prohibited.

FIRES

Natural and military caused fires occur on the Range.

Firefighting is hazardous and is the responsibility of the US Government. Purchasers should report fires that they see to BLM but purchasers must not attempt to control them. The grazing purchaser waives any and all rights of action which might accrue due to damage to persons or property resulting from fires.

RANGE IMPROVEMENTS

Wells and Pipelines

1. Rights for water which flows through pipelines from the Sacramento River and Carrizo Springs is retained by Ft. Bliss. The Bureau of Land Management (BLM) will manage the day-to-day use and distribution of the water.

2. Wells and pipeline systems are maintained by BLM. The BLM will attempt to make repairs as soon as possible, but in the event of a delay in securing a well contractor, repair parts, or equipment, the provisions of the Terms and Conditions below in No.1. Liability/BLM will apply.

3. It will be the purchaser's responsibility to check the troughs and pipelines periodically and to inform BLM if problems are found. To prevent pipeline breaks, freezeups, etc., the purchaser will refrain from regulating or tampering with water valves and the pipeline system in any way. Minor cleansing of watering troughs, such as removal of trash, weeds, and dead animals will be the responsibility of the purchaser.

4. Grazing Unit 8. In the event that Dagger Tank dries up prior to the end of the grazing season, it will be necessary for the purchaser to haul or otherwise provide water in the upper Sacramento and Chatfield areas of Unit 8.

When water is hauled, drinking troughs may be requested from BLM.

Fences

All fences will be maintained by the purchaser, except in impact areas. In impact areas, the BLM will maintain the fences. Fences are expected to be maintained by the purchaser at no expense to the government, in as good a condition as when received. In maintenance of the fences, the purchaser is expected to use due care to prevent soil erosion, fire, and other damage.

Cattle Handling Facilities

1. Corrals, portable chutes, and portable loading ramps are available for purchaser use. They are expected to be maintained

by the purchaser in as good a condition as when received. The BLM may supply material for needed repairs.

2. Arrangements will also be made at least 3 days in advance for the use of the portable loading chutes and portable squeeze chutes. When the purchaser has completed use of the portable squeeze chutes and loading chute(s), they shall be immediately returned to McGregor Range Camp (old Prather Ranch) unless other arrangements have been made with the BLM representative. Purchasers using pastures with inadequate loading and branding facilities will receive priority for use of the portable chutes.

Purchaser Constructed Range Improvements

1. The grazing purchaser may construct range improvements necessary for the proper care and management of livestock for which this contract is issued. Authorization will be issued under a Cooperative Agreement. Temporary range improvements must be removed by purchaser within 60 days after his grazing contract has expired or within 60 days of the written notice that the contract has been cancelled for other cause. The purchaser, will restore the area to such condition as existed prior to the improvement. Failure to remove an improvement will result in the improvement being removed by the government at the expense of the purchaser with no claim for damages against the BLM or any agent thereof.

2. With the approval of BLM, the purchaser may leave authorized improvements intact. The U.S. Government will gain title to any permanent improvement authorized to be left on the range.

Removal or Use of Resources on the Range

1. The awarding of this livestock grazing contract does not allow the purchaser to remove either by mechanical means or manual labor any forage, seed, firewood, trees, soil, sand, gravel, etc., from the McGregor Range. Specific written authorization must be obtained from the BLM for the removal of such material.

2. The removal and/or use of materials, supplies or equipment such as posts, wire, gates, pipe, signs, etc., without authorization from BLM, is prohibited.

Movement of Livestock

1. Cattle may be moved on or off McGregor Range only during hours authorized by BLM, normally between dawn and dusk, and only when permission for access is granted by Ft. Bliss.

All livestock will be counted on and off the grazing units on McGregor Range by BLM representatives. The Unit purchaser must notify the representatives as specified on the contract by telephone or letter at least 3 days prior to moving cattle on or off the range, specifying the time and place on McGregor Range when cattle will be loaded or unloaded.

2. Contact the BLM by letter at 1800 Marquess Street, Las Cruces, New Mexico, 88005, or phone at (505) 525-8228.

Contact with Ft. Bliss regarding access and firing schedules should be made by writing the Provost Marshal, Bldg. 116, Attn: Pete Atkins, Ft. Bliss, Texas, 79916, or by phone at (915) 568-1898, 568-4103, or 568-5433.

Contact with the NM Livestock Board should be made with the District Livestock Inspector, Bruce McLaughlin. He may be contacted at Route 1, Box 212, Alamogordo, New Mexico, 88310, telephone (505) 434-2447.

3. Under no circumstances will livestock be turned out on grazing units with out being counted by BLM. Under emergency situations, livestock may be placed in corrals while waiting to be counted by BLM.

4. Holding traps will be used only when cattle are being gathered or worked. Use will be allowed for no more than 1 week at a time. At all other times, traps will not have any cattle or horses in them and gates will be kept closed. Traps are not part of the grazing units.

Dead livestock will be moved at least 300 yards from corrals and watering troughs.

Arrangements will also be made at least 3 days in advance for the use of the portable loading chutes and portable squeeze chutes.

GRAZING MANAGEMENT

Five Year Contracts

All 5 year contracts, have deferment built into the grazing season schedules. Livestock must be removed from the units during their scheduled periods of nonuse.

On all 5 year contracts, the BLM reserves the right to make adjustments on livestock numbers prior to the start of the next grazing season. Coordination with the contractor will be made before any adjustments are made.

All Contracts

1. In order that proper utilization of forage be obtained, BLM reserves the right to designate the periods of time and areas to be grazed within each unit (such as moving cattle to dirt tanks for trampling purposes and placing of supplemental feed and salt). BLM reserves the right to require salt or supplemental feed to be placed away from the waters as needed. If certain areas of a unit show obvious overgrazing, the purchaser may be asked to relocate their cattle to other areas within the unit as specified by BLM. Failure to keep cattle scattered (away from the overgrazed area) may result in an automatic reduction in stocking rate.

2. Holding traps are not part of the grazing units. Traps may be used only when cattle are being gathered or worked. Use must be for no more than 1 week at a time. At all other times, traps must not have any cattle or horses in them and gates must be kept closed.

3. The grazing period for the units shown in the Specifications and Bid Schedule will be strictly adhered to. A refund will not be made for AUMs not utilized.

4. Purchasers are authorized to remove livestock for a period of 7 days following termination dates as long as animal unit months (AUMs) of forage consumed are not in excess of the contracted number of AUMs.

5. At no time during the term of the contract, will livestock numbers exceed those shown on the bid information sheet, unless written approval is obtained from BLM. With written authorization, purchasers may recieve a 10 percent increase in numbers in order to utilize AUMs purchased; however, AUMs of forage utilized may not exceed contracted numbers.

6. Contractors may be required to remove livestock prior to termination of grazing season in order to insure that utilization does not exceed the AUMs of forage purchased.

Class of Livestock

Those Units specified as cattle or yearlings may be stocked with either one or the other, but not in combination of the two.

Cattle

a. Cow with suckling calf that is less than 6 months of age. Suckling calves born on a 9-month unit will be considered to be less than 6 months of age.

b. Suckling calves born prior to the date of arrival on any unit when they have been on the unit for 6 months.

c. Weaned animal.

Yearling

a. Weaned animal weighing less than 550 pounds upon entering the Unit. The Contractor must provide BLM with a written copy of the scale weights to receive the conversion.

b. A conversion factor of .8 to 1 AU will be allowed on yearlings provided yearling weights do not exceed 550 lbs. upon entering McGregor Range.

If the maximum authorized number of AUs is exceeded, as a result of calves becoming AUs, the excess must be removed within 4 nonfiring days upon receipt of written notification.

Adjustment of Livestock Numbers

BLM reserves the right to reduce stocking rate on any unit when it is deemed necessary due to natural disaster, such as fire or drought, or due to obvious overgrazing.

In the event such a reduction in livestock numbers is necessary, the contractor will be given a least 3 weeks notice to arrange for removal of cattle.

A refund will be made for AUMs not utilized.

Ear Tagging

Should two or more units be successfully bid on by an individual and these units are contiguous, ear tagging of all cattle by unit will be required. BLM will provide ear tags.

Horse Use

Horse grazing use on the units will be allowed only upon written request of the purchaser. No more than three horses per unit will be allowed. Only saddle horses used for operation of the unit will be authorized. If horses are grazed on the unit, the cattle usage authorized must be reduced by the number of horses grazed.

UNAUTHORIZED USE

Unauthorized livestock shall be defined as those animals in excess of authorized numbers or AUMs whichever is the greater,

animals ear tagged or branded other than with purchasers tag or brand or a brand which the purchaser has no written authorization to use.

BLM reserves the right to gather and impound any unauthorized livestock within any grazing unit on McGregor Range. Purchaser shall bear all expenses incurred by BLM including those incurred in gathering, impounding, caring for, and disposing of livestock in cases which necessitate impoundment.

If livestock stray into adjoining units, the purchaser will be notified in writing by BLM and allowed 4 nonfiring days from receipt of such notice to remove livestock before unauthorized use action shall be initiated.

OFF ROAD VEHICLE USE

No driving off established roads will be allowed. Any type of livestock gathering or checking away from established roads will be by horseback.

VIOLATIONS

The excavation of archaeological sites and gathering of objects of antiquity upon lands subject to this contract is prohibited.

Violators will be subject to prosecution with potential fines of up to $10,000.00 and cancellation of their grazing contract.

Discovery of any such sites or items will be reported to the BLM.

LIABILITY/U.S. GOVERNMENT

1. The U.S. Government assumes no obligation whatsoever with respect to the security of livestock or other property of the purchaser from theft, loss, or damage of any kind.

2. BLM will not be liable for any damage from loss of livestock or inconvenience to the purchaser in the event water is not available through the pipeline systems, wells, or tanks.

3. Ft. Bliss will not be responsible for damage to any improvement or for any injury to persons or livestock caused directly or indirectly by military activities impact or fallout of missiles, targets, or components thereof.

4. Military personnel may open gates, and if necessary, lower fences in order to accomplish their assigned mission or duty. Ft. Bliss will require personnel to leave gates as found (opened

or closed) and to reposition fences lowered. However, Ft. Bliss assumes no responsibility should gates not be left as found or should fences not be repositioned.

PREDATOR CONTROL

All requests for animal damage control (coyotes) will be made to the APHIS/NMADA Program. APHIS/NMADA will coordinate predator control with Ft. Bliss and the BLM.

NEW MEXICO LIVESTOCK BOARD

This grazing contract is subject to all New Mexico State laws and regulations. These regulations are to be strictly adhered to and failure to comply may be considered a breach of contract. Under normal circumstances, cattle will not be quarantined on McGregor Range. In addition, all livestock leaving McGregor Range will generally require inspection by the New Mexico State Livestock Board.

Contact with the NM Livestock Board should be made with the District Livestock Inspector, Bruce McLaughlin. He may be contacted at Route 1, Box 212, Alamogordo, New Mexico, 88310, telephone (505) 434-2447.

CONTRACT TERMINATION

This grazing contract may be terminated should the purchaser breach any of the terms or conditions stated herein.

This grazing contract may be terminated after thirty (30) days written notice by the BLM, should Ft. Bliss be assigned new, additional, or different missions which, in the opinion of the Commanding General, Ft. Bliss, cannot be accomplished while such grazing contract is in effect.

Any purchaser who is convicted of violating on the McGregor Range any Federal Endangered Species Rules and Regulations may be subject to prosecution and cancellation of their contract. Endangered species on McGregor Range include but are not limited to eagles.

MASTER AGREEMENT
BETWEEN
DEPARTMENT OF DEFENSE
AND
DEPARTMENT OF AGRICULTURE

CONCERNING

THE USE OF NATIONAL FOREST SYSTEM LANDS FOR MILITARY ACTIVITY

I. PREFACE

A. National Forest System lands provide for the use and enjoyment of the public and are managed under multiple use and sustained yield concepts. The use of these lands for military training activities is within the statutory authority of the Act of June 4, 1897.

B. The availability of National Forest System lands to the Department of Defense provides a variety of geographic and topographic settings to conduct training activities. This is an important resource for developing a strong National defense.

C. Therefore, training activities on National Forest System lands will be authorized when compatible with other uses and in conformity with applicable forest plan(s), provided the Department of Defense determines and substantiates that lands under its administration are unsuitable or unavailable.

D. This agreement does not apply to the use of airspace over National Forest System lands unless directly associated with the land based training.

II. PURPOSE

The purpose of this Master Agreement is to establish procedures for planning, scheduling and conducting authorized military activities on National Forest System lands. It also establishes policies and procedures for supplemental agreements and special use authorizations which are required for all Department of Defense activities (including National Guard and Reserve activities) using National Forest System lands. This agreement replaces the Joint Policy Statements between the Department of Agriculture and (a) the Department of the Army signed July 3, 1951; the Department of the Navy, signed February 19, 1952; and the Department of the Air Force, signed September 12, 1951, which are hereby rescinded.

III. COORDINATION AND COOPERATION

To facilitate the orderly development, management, and administration of National Forest System lands and to provide suitable and appropriate lands to further the National defense effort, the Department of Defense and the Department of Agriculture jointly agree:

A. Availability of Department of Defense Lands - Prior to requesting use of National Forest System lands, the Department of Defense will determine if lands administered by the Department of Defense are available and suitable. In all cases where a special use authorization or supplemental agreement to use National Forest System lands is proposed, Department of Defense will forward its analysis and determination as to the unsuitability or unavailability of DoD land to the affected Forest Supervisor.

B. Planning For the Use of National Forest System Lands - Military training activities on National Forest System lands are actions which require the analysis of environmental impact in conformance with the National Environmental Policy Act (NEPA) and other statutory and regulatory requirements. The Department of Defense and the Department of Agriculture, Forest Service, will cooperate to accomplish appropriate NEPA compliance. The lead agency concept in 40 CFR 1501.5 will be applied to the process except in cases involving classified activities. In such cases, the Department of Defense Component will be the lead agency.

C. Management

1. Periodically conduct joint reviews of selected activities for the purpose of: (a) determining the effectiveness of supplemental agreements so that the management and mission of both agencies are accomplished; (b) identifying and recommending solutions to existing and potential problems; and (c) monitoring the implementation and effectiveness of environmental mitigation measures.

2. Jointly identify rights-of-way or other authorizations required to implement supplemental agreements or special use authorizations.

3. Have their respective agents mutually refer unresolved points of disagreement to the next higher management level for resolution.

IV. DEPARTMENT RESPONSIBILITIES

IT IS AGREED THAT:

A. The Department of Defense Components will:

1. Provide to the affected Forest Supervisor the analysis and determination as to the unsuitability or unavailability of Department of Defense lands.

2. Involve the Forest Service designated representative in the initial planning stages of activities proposed on National Forest System lands.

3. During initial planning, provide an unclassified description of proposed activities to the affected Forest Supervisor and cooperate in fulfilling requirements of the National Environmental Policy Act and conducting appropriate environmental analyses.

4. For each training activity, identify a representative of the Department of Defense to serve as liaison to the Forest Service.

5. Cooperate with Forest Service representatives to comply with the terms of this Master Agreement, supplemental agreements, and special use authorizations.

6. Reimburse the Forest Service for costs directly attributable to military training activities, subject to the availability of appropriated funds. This may include, but is not limited to, the preparation and processing of applications, preparation of environmental documents, administration of special use authorizations, and Forest Service liaison officers' time.

7. Explore land interchange as an alternative or mitigating measure when military training activities are not in conformance with the affected Forest Plan.

8. Make every effort to avoid degradation of National Forests and provide for restoration as agreed in the special use authorization.

9. Provide for mitigation measures identified in the environmental analysis and agreed in the special use authorization.

B. The Department of Agriculture, Forest Service will:

1. Make National Forest System lands available for military training activities when such activities can be made compatible with other uses and conform with applicable forest management plans, provided the Department of Defense determines and substantiates that lands under its administration are unsuitable or unavailable.

2. Cooperate with the Department of Defense to expedite decisions associated with military training activities on National Forest System lands.

3. Fully consider all proposals and, when necessary, develop alternatives that may meet the needs of the Department of Defense and the Department of Agriculture, Forest Service.

4. Ensure that applicable forest management plans include military training activities. Requirements for these activities should be coordinated with the Department of Defense during formulation and development of those plans.

V. SPECIAL USE AUTHORIZATION

The special use authorization for a Department of Defense activity on National Forest System lands requires, but need not be limited to, the following:

1. Identification of National Forest System lands required for the activity.

2. Duties and responsibilities of each agency in the planning process.

3. Procedures for resolving issues, misunderstandings, or disputes.

4. Identification of rights-of-way and other authorizations which may be needed outside the activity area.

5. Incorporate, develop, or reference a basic plan covering monitoring, fire protection and control, public health and safety, recreation, watershed, minerals, timber, grazing, fish, wildlife, public notification, and other appropriate features.

6. Assign responsibilities for restoration of the site. Restoration shall be subject to the availability of appropriated funds.

7. Provide procedures for emergency cessation of military activities where necessary to protect public health, safety or the environment.

VI. SUPPLEMENTAL AGREEMENTS

For recurring Department of Defense activities on Forest Service lands, supplemental agreements to this master agreement may be developed. Within 12 months following the effective date of this agreement, representatives of the Departments of Defense and Agriculture, Forest Service, shall agree upon a schedule for the revision of any existing supplemental agreement which requires modification to conform with this master agreement.

VII. DELEGATION

Authorized representatives of the Forest Service and the Department of Defense may execute special use authorizations and enter into supplemental agreements within the scope of this document.

VIII. MODIFICATION AND TERMINATION

This agreement may be modified or amended upon request of either Department and the concurrence of the other. This agreement may be terminated with 60-day notice of either party.

IX. IMPLEMENTATION

This agreement becomes effective when signed by both parties.

Secretary of Defense

Date: 22 SEP 1988

Secretary of Agriculture

Date: Sept 30, 1988

(102)

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103

SWARE-A

21 June 1974

SUBJECT: Memorandum of Understanding With Forest Service, McGregor Range, Fort Bliss, Texas

Commanding General
US Army Air Defense Center
ATTN: AKBAAF
Fort Bliss, Texas 79906

1. In connection with the Memorandum of Understanding between the Forest Service and the Department of the Army, dated 11 November 1971, copy of a letter from the Acting Forest Supervisor of the Lincoln National Forest, dated 14 June 1974, is furnished.

2. It is recommended that a firing schedule be furnished to this office for transmittal to the Forest Service, in accordance with Section B, Paragraph 2 of the Memorandum of Understanding.

3. Concerning the question raised by the Forest Service about the deer hunt, attention is invited to Section A, Paragraph 5 of the Memorandum of Understanding, providing that the harvest of wildlife will not conflict with the firing schedules set by the Center. Advice is requested as to the schedule for the upcoming hunting season, which information will be communicated to the Forest Service.

FOR THE DISTRICT ENGINEER:

H. A. Holt

2 Incl
1. Ltr FS 14 Jun 74
2. Memo of Understanding

H. A. HOLT
Acting Chief, Real Estate Division

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103

SWARE-A 21 June 1974

SUBJECT: Memorandum of Understanding With Forest Service, McGregor Range, Fort Bliss, Texas

Commanding General
US Army Air Defense Center
ATTN: AKBAAF
Fort Bliss, Texas 79906

1. In connection with the Memorandum of Understanding between the Forest Service and the Department of the Army, dated 11 November 1971, copy of a letter from the Acting Forest Supervisor of the Lincoln National Forest, dated 14 June 1974, is furnished.

2. It is recommended that a firing schedule be furnished to this office for transmittal to the Forest Service, in accordance with Section B, Paragraph 2 of the Memorandum of Understanding.

3. Concerning the question raised by the Forest Service about the deer hunt, attention is invited to Section A, Paragraph 5 of the Memorandum of Understanding, providing that the harvest of wildlife will not conflict with the firing schedules set by the Center. Advice is requested as to the schedule for the upcoming hunting season, which information will be communicated to the Forest Service.

FOR THE DISTRICT ENGINEER:

2 Incl
1. Ltr FS 14 Jun 74
2. Memo of Understanding

H. A. HOLT
Acting Chief, Real Estate Division

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Lincoln National Forest
Fed. Bldg. 11th & New York Avenue
Alamogordo, New Mexico 88310

2740
June 14, 1974

Mr. Wendall Heygood
Chief of Real Estate
U.S. Army Corps of Engineers
Box 1580
Albuquerque, New Mexico 87101

Dear Mr. Heygood:

Our memorandum of understanding concerning management of the Lincoln National Forest portion of the McGregor Missile Range provides for public access to the area on days when no firing is scheduled. It also states that you will furnish us a firing schedule.

Please furnish us with a current firing schedule, so that we may better plan the use of this National Forest land.

Each year at our annual game management meeting, we discuss the upcoming deer hunt with the State Game Department and the BLM. At your request this year, the game department recommended a weekend only hunt. Is this because of scheduled firing during the week?

The memorandum of understanding states that wildlife management will be in accordance with laws and regulations of the Forest Service and the New Mexico Department of Game and Fish. The only valid reason for managing this area differently than the rest of the Sacramento Mountains would be a conflict with your firing schedule or public safety considerations.

We are concerned with public safety and wish to cooperate fully with your use of this land for national defense purposes. However, we feel strongly that game management on the area must be based on sound biological principles, and the public must not be denied the use of their land without just reason.

RICHARD L. JOURDEN
Acting Forest Supervisor

MEMORANDUM OF UNDERSTANDING
Between
UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
And
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

This memorandum of understanding is made by and between the United States Department of Agriculture, Forest Service, acting through the Regional Forester, Southwestern Region, hereinafter called the SERVICE and the United States Department of Defense, Corps of Army Engineers, acting for the United States Army Air Defense Center, hereinafter called the CENTER.

WHEREAS, Public Land Order No. 1470, dated August 21, 1957, as amended by Public Land Order No. 1547, dated November 7, 1957, issued under the provisions of Executive Order 10355, withdrew certain lands, hereinafter called the LANDS, within the Lincoln National Forest from all forms of entry, for use by the Department of the Army as a part of the McGregor Missile Range, and

WHEREAS, the Department of the Army and the Department of Agriculture on July 3, 1951, entered into a Joint Policy Statement relating to use of National Forest lands for defense purposes, and

WHEREAS, Public Land Orders 1470 and 1547 expired August 21, 1967, except that application for renewal was timely made, and publication of an Extension Order in the Federal Register has not been done, and

11 Nov 71

WHEREAS, the laws, regulations, and policies governing the multiple use management of National Forests contemplates use of the lands and resources to produce the greatest benefits in goods and services to the people, and

WHEREAS, it has been mutually determined that grazing use by livestock and wildlife is compatible with the use of the land for missile training purposes, and

WHEREAS, it is desirable that the Service continue to administer all National Forest resources in keeping with the Center's requirements for its missile program,

NOW, THEREFORE, the Service and the Center mutually agree as follows:

Section A. The Center agrees:

1. The Service will administer the Lands for all non-defense purposes and all activities which are not related to the use of the Lands for missile range purposes, HOWEVER, the Service will coordinate all uses and activities on the lands with the Center in a manner consistent with the needs of the Center.

2. The Lands will be open to all Forest users on days when no firing is scheduled.

3. The Service will not authorize uses of those lands purchased by the Army within the area without the concurrence of the Center, EXCEPT, for those uses not separable from the area as a whole. There are approximately 1,360 acres of purchased and 18,004 acres of withdrawn Lands out of the total of 19,364 acres of missile range within the National Forest boundary. Uses such as livestock

grazing will be authorized on the area as a whole and the Service will issue a permit for all Government owned lands with fees to be handled as specified in Subsection 4, below.

4. All fees for use of National Forest lands shall be assessed and collected by the Service in accordance with the regulations of the Secretary of Agriculture and deposited into the National Forest Fund, miscellaneous receipts, EXCEPT, those fees earned on lands purchased by the Defense Department shall be transferred to the U. S. Corps of Engineers for deposit where such fees are collected by the Service.

The basis for apportioning fees between the Service and the Center will be the proportion of use attributable to the purchased lands to the proportion of use attributable to the withdrawn lands.

The collection of use fees does not pertain to licenses or permits required by State law.

5. That management of wildlife and its habitat shall conform to the regulations of the Secretary of Agriculture; to all applicable laws, and to existing agreements between the Service and the New Mexico Department of Game and Fish.

Harvest of wildlife will be accomplished in a manner covered by the proclamations and regulations of the New Mexico Department of Game and Fish, EXCEPT, the harvest will not conflict with public safety or the firing schedules set by the Center.

6. That improvements constructed and maintained by the Service, its contractors, or permittees, for resources management purposes will remain in the Lands unless the sites so used are needed for missile range installations. These improvements include, but are not limited to livestock control fences, range and wildlife water catchments, and watershed structures.

7. The Service will administer all archeological and paleontological activities on the Lands in conformance with the Uniform Rules and Regulations prescribed by the Secretaries of the Interior, Agriculture, and Army; and the Antiquities Act (34 Stat. 225; 16 U.S.C. 432-433).

Section B. The Center will therefore:

1. Take action to prevent and suppress fires resulting from the Center's operations and also suppress any fire on the Lands; check for fires after completion of each daily scheduled firing; and report all fires to the Service as soon as possible.

2. Furnish the Service with firing schedules on a regular basis so that the Service may keep its employees, contractors, and permittees advised when entry to the Lands is allowed or denied. The Center will also furnish the Service with the names, addresses, and telephone numbers of the Commanding General and his designated representatives.

3. Take all necessary precautions to minimize damage to soil and vegetative resources in connection with the conduct of defense oriented activities. The Center will coordinate with the Service the development of launching sites, fire towers, radar sites, and other similar construction within the Lands.

4. Submit to the Forest Supervisor, Lincoln National Forest, for his concurrence all proposals for constructing roads prior to undertaking construction.

5. Assume the responsibility for the actions of its employees and contractors in the conduct of Center Activities on the Lands.

The Center will require said personnel to leave gates as found (open or closed) and will not be responsible should gates or fences be left as found.

Section C. The Service agrees:

1. The Center will administer the Lands for all defense purposes and all activities which are directly related to the use of the Lands for missile range purposes, HOWEVER, the Center will coordinate those activities having a permanent impact on the soil and vegetative resource with the Service.

2. That personnel of the Center, in pursuit of their official functions, will continue to have unlimited access to the Lands. Said personnel may open gates, and if necessary, lower fences in order to accomplish their assigned missions or duties. Gates will be left as found (open or closed) and lowered fences will be repositioned by the Center.

3. That the Center reserves the right to deny access to the Lands to anyone should security or safety considerations of the assignment of any mission require such action. The Center may exercise this right without prior notice to the Service, EXCEPT, that the Service will be notified at the earliest opportunity when such a closure is in conflict with previously announced firing schedules. Under no circumstances will persons be granted permission to enter or remain on McGregor Range during periods when firing is being conducted, or scheduled, even should they be willing to assume any and all risks inherent in such activities.

coordinate construction of such facilities with the Service.

Section D. The Service will therefore:

1. Furnish the Commanding General of the Center as to the name of the District Ranger who is currently responsible to the Service for the management of the Lands, and the names and addresses of all permittees and contractors, if any.

2. Assume the responsibility for the actions of its employees, permittees, and contractors authorized by the Service to conduct business on the Lands.

3. In pursuit of range management objectives, issue grazing permits for livestock numbers limited to the grazing capacity as determined by the Service.

4. Coordinate all uses and activities on the Lands in a manner consistent with the needs of the Center.

5. Refrain from touching, tampering with, or disturbing any shell, casing, missile, target, or components thereof which may be found upon the Lands. Upon discovery of any of these items, Service employees, permittees, or contractors will report said discovery to the Commanding General, United States Army Air Defense Center, or his designated agent.

6. Issue all permits and contracts for uses and activities which are not related to defense purposes. Said permits and contracts will contain stipulations consistent with the needs of the Center. Permits may be terminated by the Service, and by request of the Center, should

permittees breach any of the terms or conditions outlined in this MEMORANDUM OF UNDERSTANDING.

7. Protect the Lands and resources from destruction by fire and other forms of depredation including trespass, not incident to military use.

Section E. General

1. This Memorandum of Understanding shall serve to guide the administration of the Lands herein described under the proposed new Public Land Order and shall remain in full force and effect until terminated by mutual agreement or expiration of the new Land Order.

2. The Forest Supervisor, Lincoln National Forest, or his designated representative, will represent the Forest Service in the administration of this Memorandum of Understanding.

3. If amendments to this agreement are needed, a meeting may be called by either party.

4. The legal description of National Forest lands contained within the McGregor Missile Range are shown on Exhibit 1, attached hereto.

UNITED STATES ARMY AIR DEFENSE CENTER
and FORT BLISS, TEXAS

11 Nov. 1971
(Date)

By: L. A. Guenther
Chief, Real Estate Division,
Albuquerque District, Corps of
Engineers, Department of the Army

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

11/5/71
(Date)

By: W. D. Hurst

Regional Forester

EXHIBIT I

Acreage within Lincoln National Forest, McGregor Range, N.M.

New Mexico Principal Meridian

PLO 1547	Acres	
T. 19 S., R. 10 E:		
Section 1 - $S\frac{1}{2}$, $W\frac{1}{2}W\frac{1}{2}SE\frac{1}{4}$	200.00	(Called $S\frac{1}{2}$ sec. 1 in Ord
*Section 12 - $W\frac{1}{2}W\frac{1}{2}E\frac{1}{2}$	80.00	(Probably $E\frac{1}{2}$)
PLO 1470		
T. 19 S., R. 11 E:		
Section 6 - Lots 6,7, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$	324.56	
Section 7 - Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$	648.00	
Section 8 - All	640.00	
Section 9 - $S\frac{1}{2}$	320.00	
Section 14 - $SW\frac{1}{4}$	160.00	
Section 15 - All	640.00	
Section 16 - All	640.00	
Section 17 - All	640.00	
Section 18 - Lots 1,2,3,4, $E\frac{1}{2}$, $E\frac{1}{2}W\frac{1}{2}$	647.60	
Section 19 - Lots 1,2,3,4, $E\frac{1}{2}$, $E\frac{1}{2}W\frac{1}{2}$	647.20	
Section 20 - All	640.00	
Section 21 - All	640.00	
Section 22 - All	640.00	
Section 23 - All	640.00	
Section 24 - $S\frac{1}{2}$	320.00	
Section 25 - $E\frac{1}{2}$, $NW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$, $S\frac{1}{2}SW\frac{1}{4}$	600.00	
Section 26 - All	640.00	
Section 27 - All	640.00	
Section 28 - All	640.00	
Section 29 - All	640.00	
Section 30 - Lots 1,2,3,4, $E\frac{1}{2}$, $E\frac{1}{2}W\frac{1}{2}$	645.12	
Section 31 - Lots 1,2,3,4, $E\frac{1}{2}$, $E\frac{1}{2}W\frac{1}{2}$	644.32	
Section 32 - All	640.00	
Section 33 - All	640.00	
Section 34 - $N\frac{1}{2}$	320.00	
Section 35 - $E\frac{1}{2}$, $NW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$, $S\frac{1}{2}SW\frac{1}{4}$	600.00	
Section 36 - All	640.00	
T. 19 S., R. 12 E:		
Section 29 - $S\frac{1}{2}$	320.00	
Section 30 - Lots 1,2,3,4, $E\frac{1}{2}$, $E\frac{1}{2}W\frac{1}{2}$	642.08	
Section 31 - Lots 1,2,3,4, $E\frac{1}{2}$, $E\frac{1}{2}W\frac{1}{2}$	645.18	
Section 32 - All	640.00	
Acres in Withdrawals	17,924.06	
*Not in withdrawals	- 80	
Total	18,004.06	

*PLO 1470 withdrew only $W\frac{1}{2}$ of sec. 12 on Public Domain. No reference to these 80 acres of National Forest land in either of the PLO's

MEMORANDUM OF AGREEMENT
BETWEEN
FORT BLISS, U.S. ARMY
AND
NEW MEXICO STATE OFFICE,
BUREAU OF LAND MANAGEMENT, U.S.D.I.
FOR THE
RENEWAL APPLICATION FOR THE WITHDRAWAL OF
MCGREGOR RANGE, NEW MEXICO

I. Statement of Purpose

Under provisions of Public Law 99-606, known as the Military Lands Withdrawal Act of 1986, Congress established military use as the priority purpose of McGregor Range, New Mexico for a period of 15 years beginning November 6, 1986. The Act specified that if the Secretary of the Army determined that McGregor Range would continue to be required for military purposes beyond November 6, 2001, that the U.S. Army Air Defense Artillery Center and Fort Bliss (Fort Bliss) would be required to notify the Bureau of Land Management (BLM) of its determination and to have completed a Draft Environmental Impact Statement no later than November 6, 1998. Fort Bliss must also provide an application for continued withdrawal, which will be processed by the BLM and decided on by Congress prior to expiration of the present withdrawal. To determine what will be required as part of this application, and what environmental documentation is appropriate, BLM and Fort Bliss have entered into this Memorandum of Agreement (MOA).

II. Environmental Impact Statement

1. Introduction and Purpose

Fort Bliss and the BLM recognize that an environmental impact statement (EIS) must be prepared by November 6, 1998 in support of Fort Bliss's renewal application for the withdrawal of McGregor Range, New Mexico. The renewal EIS must comply with the provisions of the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. Sec. 4321, and all subsequent regulations implementing the Act (See Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500-1508), and fulfill applicable legal requirements.

It is the purpose of this section of the MOA to establish an agreement between Fort Bliss and BLM regarding the conditions and procedures to be followed in preparing an EIS to comply with

applicable laws and regulations through a joint Fort Bliss and BLM effort. Fort Bliss will be the lead Federal agency for the project and BLM will be a cooperating agency.

To meet its requirement for a renewal EIS on McGregor Range withdrawal, Fort Bliss has determined, and the BLM agrees, that the analysis in the renewal EIS covers the proposed action of continued withdrawal, the alternative of no withdrawal, and all other reasonable alternatives which may include boundary and time adjustments to the existing withdrawal. BLM agrees that Army activities shall be analyzed in a separate EIS on Fort Bliss's Ongoing Missions and Master Plan that will be incorporated into the renewal EIS. The BLM will also be a cooperating agency on the Ongoing Missions and Master Plan EIS, although this MOA addresses only the renewal EIS. Both parties to this MOA agree that the renewal EIS for continued withdrawal will focus on whether Congress should continue the withdrawal of McGregor Range for military purposes and under what conditions the withdrawal should continue.

2. General Provisions

a. Fort Bliss will select the contractor to perform as the third-party contractor for the renewal EIS. Factors Fort Bliss will consider in selecting the contractor will include the following general criteria:

1) Expertise in the areas of environmental concern, including water quality, ground water resources, biology, soils, land uses, air quality, archaeology, and socioeconomic values.

2) Expertise in preparing EISs for defense activities.

3) Ability to produce environmental analyses, demonstrated through experience or expertise.

4) Ability to produce thorough, concise, readable, and informative documents.

5) Evidence of a good working knowledge of NEPA, corresponding Federal and State regulations and applicable local ordinances, and other statutory requirements.

6) Ability to complete work in a timely manner.

b. The EIS contractor shall execute a disclosure statement specifying that it has no financial or other interest in the outcome of the project.

c. Fort Bliss will be the lead Federal agency in the joint, cooperative effort to prepare the EIS, and ultimately will be

responsible for assuring compliance with the requirements of NEPA.

d. Fort Bliss and the EIS contractor will be responsible for identifying and complying with Federal, State, and local laws, regulations, and other authorities that are applicable to completion of the project.

e. Fort Bliss will ensure that the EIS contractor will provide any technical and environmental information, data, and reports required for EIS preparation in a format suitable to both agencies.

f. Fort Bliss and BLM shall:

1) Designate a single point of contact on all matters concerning the McGregor Range EIS preparation.

2) Actively participate in all phases of EIS preparation.

3) Establish a mutually acceptable time schedule for the EIS process.

4) Develop an acceptable time schedule for the review of significant parts of the EIS as it is being developed.

5) Attend regular and other meetings with Federal, State, regional, and local agencies and interested individuals and groups for the purpose of increasing communication and receiving comments on the EIS.

6) Ensure cooperative coordination of efforts and exchange of information with the EIS contractor.

g. BLM will use its own funds to carry out its role as a cooperating agency.

3. Procedures

a. Prior to beginning EIS preparation, Fort Bliss will require the EIS contractor to prepare a "project management plan," which shall be provided to the BLM for coordination. The preparation plan will be used by Fort Bliss and the EIS contractor as an outline for EIS preparation along with Army Regulation 200-2 and the CEQ NEPA guidelines. The preparation plan may be modified only by Fort Bliss in the event that action or policy changes occur that affect project scope, or as response to the public participation process. BLM will be notified when significant modifications occur.

b. Fort Bliss and the EIS contractor will share the

responsibility for scoping meetings. The EIS contractor and Fort Bliss will make meeting arrangements and prepare all materials necessary for the meetings. BLM will attend as an agency representative. The EIS contractor will prepare a comment analysis after the scoping meetings. Fort Bliss will provide the comment analysis to the BLM prior to approval.

c. Fort Bliss and its EIS contractor will have primary responsibility for writing or rewriting all sections, parts, or chapters of the EIS and for establishing a schedule for completion of chapters consistent with the overall time schedule developed in the preparation plan.

d. Fort Bliss and its EIS contractor will provide the BLM with opportunities to review, comment on, and suggest changes to the EIS prior to public review of the document. The BLM will provide comments within a mutually agreed time period, not to exceed 30 calendar days.

e. Generally, joint meetings between the BLM, Fort Bliss and the EIS contractor shall be held to coordinate the EIS preparation.

f. Fort Bliss, assisted by its EIS contractor, is responsible for printing and distributing the EIS. Fort Bliss will release the draft EIS to the public and to Federal, State, and local agencies for review and comment. Fort Bliss will be responsible for filing the document with the Environmental Protection Agency (EPA). A public comment period of no less than 45 calendar days will be initiated when the Environmental Protection Agency publishes the "Notice of Availability" of the draft EIS in the Federal Register.

g. Fort Bliss will be the recipient of all comments on the draft EIS resulting from the review and comment period. Fort Bliss will provide copies of all comments to the BLM. As appropriate, Fort Bliss and the BLM will consider and address any comments on the draft EIS.

h. After the close of the Draft EIS review and comment period, Fort Bliss and BLM will discuss what issues and comments submitted by the public and Federal, State, and local agencies will require response in the final EIS. Fort Bliss and BLM will determine through consultation if any modifications to the text will be required. Any such modifications will be incorporated in the final EIS by Fort Bliss and the EIS contractor.

i. Upon revision of the text, which will include responses to the comments on the draft EIS, the Fort Bliss and the BLM will review the final EIS. Fort Bliss will file the final EIS with the EPA.

j. After the final EIS is completed and reviewed, an official designated by the Army will sign the Record of Decision (ROD).

III. Application Requirements

1. General Provisions

a. The requirements outlined in 43 C.F.R. Parts 2300-2310 (as of October 1, 1992) shall be followed, but discretion will be applied as appropriate and where provided for by regulation.

b. Information developed as part of the last renewal (1986) and currently available information shall be evaluated and utilized to the maximum extent to fulfill requirements.

c. The McGregor Range Land Withdrawal Management Plan, dated April 12, 1996, will serve as the basis for development of application requirements.

d. Fort Bliss will use the BLM's 1991 Resource Management Plan for McGregor Range as a guide in identifying which aspects of 43 C.F.R. Parts 2300-2310 are appropriate requirements for the McGregor Range withdrawal renewal application.

e. Any information the BLM will request to be included in the renewal application that is not identified in 43 C.F.R. Parts 2300-2310 must be communicated to Fort Bliss before January 31, 1997. The BLM and Fort Bliss will then negotiate any such requests for information to mutually determine what information will be required.

IV. Dispute Resolution

Both parties agree that if a dispute regarding the provisions of this MOA or responsibilities or requirements for the withdrawal application arises, efforts will be made to settle them amicably at the lowest possible level. If efforts to settle at the lowest level are unsuccessful, then the dispute will be elevated to the next higher level of management within each agency. If the next higher level of management for each agency is unable to resolve the dispute, then the dispute will be elevated to the next higher level still, and will continue to be elevated within the agencies until the dispute is resolved.

V. Termination

Each party to this MOA may terminate this agreement after 30 days prior notice, in writing, to the other party. During the intervening 30 days, the parties agree to actively attempt to resolve any disputes or disagreements.

VI. Duration of Agreement

This MOA is effective on the date all parties have signed and will terminate when a ROD is issued, unless terminated earlier pursuant to Section V above.

FOR FORT BLISS:

DATE: 20 Dec 96

SIGNED: _____
Commanding General
U.S. Army Fort Bliss, Texas

FOR THE BUREAU OF LAND MANAGEMENT:

DATE: 1-13-97

SIGNED: _____ Acting
New Mexico State Director
Bureau of Land Management

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE BUREAU OF LAND MANAGEMENT
AND THE
UNITED STATES AIR FORCE AIR COMBAT COMMAND

It is the desire of the Bureau of Land Management and the United States Air Force Air Combat Command that this Memorandum serve as the basis for and beginning of a cooperative and coordinated effort to maintain and enhance the environment and resources in which they share a joint interest. In particular, this Memorandum focuses on the activities related to the Air Force's Proposed Expansion of German Air Force Operations at Holloman AFB, New Mexico on the United States Army's McGregor Range, New Mexico. This memorandum documents the commitment of both agencies to a continued and productive relationship with respect to activities on the range. Its purpose is to describe and provide greater focus and detail to those commitments generally described in the Environmental Impact Statement and subsequently discussed by agency representatives.

Both parties understand and agree that the terms of this agreement are contingent on a number of events. First, a Record of Decision in the Air Force Proposed Expansion of German Air Force Operations at Holloman AFB, New Mexico which selects the West Otero Training Option for implementation. Second, to the degree that any of the terms included herein are inconsistent with current ARMY/BLM MOU, US Fish and Wildlife Service Biological Opinions or any other current Agency to Agency or Government to Government agreements the terms of the current agreement shall prevail and be considered incorporated by reference into this agreement. Further it is understood that any agreement contained herein applies only to the United States Air Force and its proposed operations under the referenced EIS and that the Air Force is without authority to bind or speak for the United States Army or in any way limit Army operations on McGregor Range.

Additionally, both parties agree that in the event any of the terms of this agreement lead to or would result in, a violation of federal law those terms would be void and not binding on either agency.

1. Public Access: The Air Force and BLM are resolved to protect public access for multiple use activities. Air Combat Command agrees to the following:

a. Provide routine public access on weekends from 1:00 p.m. Friday thorough Sunday 9:00 p.m.

b. Provide access 24 hours before and after New Mexico Fish and Game scheduled big game hunts.

c. Provide BLM with a tentative 30-day schedule of operations and final two-week schedule to facilitate scheduling of BLM administrative access. (This might be included as part of the Fort Bliss Master Range Schedule.)

d. Discuss with the U.S Army at Fort Bliss and the BLM the possibility of coordinating a 1-800 number and/or a joint website that will post hours of public access and other range notes of public interest.

e. Comply with existing access permitting procedures in accordance with the existing Memorandum of Understanding (MOU) between the U.S Army at Fort Bliss and the BLM.

f. Once the impact area design is completed, the exact target location determined, and the accompanying weapons safety footprints, discuss the possibility of using existing roads for the safety buffer boundary, particularly along the eastern side.

2. Grazing Program Management: The Air Force and BLM will work together to ensure continuation of an effective grazing program. Air Combat Command agrees to the following:

a. Move the existing pipelines and stock tanks to outside of the impact area.

b. Relocate existing range improvements (fences, traps, etc.) from inside to outside the safety buffer where necessary.

c. Coordinate range closing for cleanup/cattle work. Restrict operations as necessary to meet BLM maintenance requirements.

d. Provide support in the form of forty man-hours per week to perform routine range management tasks.

e. Reimburse, replace, repair BLM range improvements damaged as a result of USAF activities on the range.

f. Agree to discuss the possibility of additional technology devices which may be added if needed, including such items as trough water-heaters, monitor cameras, pressure sensors, etc.

3. Wildlife: The BLM and the Air Force desire to continue to facilitate an effective wildlife management program. Air Combat Command agrees to:

a. Ensure water availability by moving existing infrastructure outside impact area.

b. Discuss expanding the charter of the multi-agency threatened and endangered species working group to include working cooperatively with other federal and state agencies with surveys and studies on big game and other natural resource issues.

c. Work cooperatively with other federal and state agencies with surveys and studies on the habitat/recovery of the Aplomado falcon.

4. Cultural Resources: The BLM and the Air Force are concerned about National Historic and Cultural Preservation. Air Combat Command will:

a. Continue good faith government to government consultations with the Mescalero Apache in face to face meetings with the goal of ascertaining impacts of the proposed action to Traditional Cultural Properties and Resources (to include view studies etc.).

b. Make inventory reports and mitigation plans available to the BLM so their comments may be considered in the course of consultations with the State Historic Preservation Office.

c. Discuss necessity of mitigations, if any, of potential historic landscape, if and when it is designated as such by the SHPO.

5. Areas of Critical Environmental Concern (ACEC): The Air Force and BLM desire to protect the resources within the ACECs. Air Combat Command will:

a. Allow for scheduled activities consistent with the Memorandum of Understanding (MOU) with New Mexico State University (NMSU).

b. In accordance with the Fort Bliss Integrated Natural Resources Management Plan monitor the impacts to the ACECs within the safety buffer.

6. Culp Canyon Wilderness Study Area (WSA): The Air Force and BLM are concerned about the natural aesthetic value of WSA. Air Combat Command will:

a. Design flight patterns to avoid overflights of the Culp Canyon WSA.

b. It is the Air Force intent to avoid low level (below 2000 feet AGL) overflight of Culp Canyon WSA. Exceptions would include events such as aircraft emergencies.

7. Fire: The Air Force and BLM are concerned with the impacts of fires caused by military flight operations. Air Combat Command will:

a. Cease military operations, on range, to allow for fire suppression.

b. Arrange for air-space use for fire suppression aircraft during a fire emergency.

c. Repair fire damage in accordance with the Integrated Natural Resource Management Plan (to include re-vegetation of indigenous plants).

Signed this 26th Day of May 1998,

MICHELLE J. CHAVEZ,
State Director,
Bureau of Land Management,
New Mexico

RONALD G. OHOLENDT, Colonel
Chief, Airfield, Airspace and Range
Management Division

PROPOSED EXPANSION OF GERMAN AIR FORCE (GAF) OPERATIONS AT HOLLOMAN AIR FORCE BASE (AFB), NEW MEXICO

INTRODUCTION

Pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA) of 1969 and regulations promulgated by the President's Council on Environmental Quality (CEQ) at Title 40 Code of Federal Regulations (CFR) Part 1500 et seq., and Air Force Instruction (AFI) 32-7061, Environmental Impact Analysis Process, the United States Air Force has prepared an Environmental Impact Statement (EIS) evaluating the potential environmental effects of the proposed expansion of German Air Force Operations at Holloman Air Force Base, New Mexico. This Record of Decision (ROD) identifies my decisions for this proposed action. These decisions have been made in consideration of the information contained in the EIS which was filed with the United States Environmental Protection Agency (US EPA) and made available to the public by announcement in the Federal Register on April 17, 1998.

PUBLIC PARTICIPATION

Public participation is one of the cornerstones of NEPA and is reflected in CEQ NEPA regulations, which require an early and open process for determining the scope of issues to be addressed in the EIS. The objective of the scoping process is to determine the range of issues to be addressed and to identify significant issues related to the proposed action.

The first step of scoping for this EIS was publication of the Notice of Intent (NOI) in the Federal Register on May 8, 1996. The NOI announced the dates, times, and locations of the proposed scoping meetings and alerted the public of the Air Force's intent to publish an EIS.

The scoping period was from May 8 to August 15, 1996. The Air Force placed announcements in local and state newspapers to advertise scoping meetings and solicit public comments. The scoping meetings were held between July 7 and 12, 1996 in El Paso, Texas and Carlsbad, Carizozo, Las Cruces, and Alamogordo New Mexico. In addition, public comments were accepted throughout the public scoping period, as well as during preparation of the Draft EIS (DEIS), the public comment period following the release of the DEIS, and the preparation of the Final EIS (FEIS).

A Notice of Availability for the Draft EIS was published in the Federal Register on June 20, 1997. The notice started the 45-day public review and comment period, which concluded on August 4, 1997. Announcements were placed in local and state newspapers to notify the public of the Draft EIS availability and to solicit comments on the document. Copies of the Draft EIS were mailed to agencies, organizations, and individuals on the mailing list for their review and comment. In addition, copies of the Draft EIS were placed in several libraries in the area for public review. Comments received during the public review and comment period were considered in preparation of the Final EIS (FEIS). Modifications were made to the Final EIS based upon the input received during the public review and comment period for the Draft EIS to provide further clarification of the proposed action, alternatives, impact assessment, and proposed mitigation measures.

BACKGROUND

Changes in international requirements and in the United States military budgets have established a need to foster combined action capabilities for the military forces of many nations to work together to meet specific threats. Combined action capabilities permit each nation to substantially reduce their military force, while concurrently creating the larger force necessary to permit response to international requirements. The current U.S. National Military Strategy emphasizes peacetime engagement by way of military-to-military contacts through international training and military exchanges. This strategy requires military personnel from different nations to achieve a uniformly high standard of training and proficiency, and forge the strongest possible team. The goal is to build mutual trust, effective communications, interoperability, and doctrinal familiarity.

Germany is an important ally of the United States and has provided aircrews to support recent combined force missions. The United States government, following discussions with the German government, recognized a need to provide training with enhanced realism and quality for German Air Force (GAF) Tornado aircrews. Holloman AFB had the capacity, Military Training Routes (MTRs), Military Operations Areas (MOAs), and ranges to provide the requested training. A Memorandum of Agreement was signed between the United States and German governments in May 1994, establishing the GAF Tactical Training Establishment (TTE) at Holloman AFB. The potential environmental effects of that action were assessed under NEPA and U.S. Air Force Regulations (Air Force, 1993. Proposed Beddown of the German Air Force PA-200 and an Additional AT-38 Training Unit at Holloman Air Force Base, New Mexico).

In May 1996, 12 Tornado aircraft were relocated to Holloman AFB. This action resulted in economies of scale, logistics, and cross training since it resulted in collocation of the German Tornadoes and the German F-4 training (conducted by the U.S. Air Force 20th Fighter Squadron) at Holloman AFB.

In 1995, two years after the beddown decision on the original 12 Tornadoes, discussions were held between the two countries about the potential expansion of GAF Tornado training in the United States. Because of the need to optimize use of previous infrastructure investments (e.g., maintenance facilities and aircraft hangars), Holloman AFB was considered to be the only feasible location for the Tornado beddown. On this basis, the U.S. Air Force is considering a proposed action under which the GAF TTE for GAF Tornado aircrews would be expanded at Holloman AFB.

PURPOSE AND NEED

In the international arena, the purpose of the proposed action is to further support a bilateral agreement between the governments of the United States and Germany. The proposed action demonstrates continued U.S. commitment to NATO allies, which is crucial as the U.S. military presence is reduced in Europe. The proposed GAF military training would serve to maintain cooperation between our countries and interoperability among our military forces. It provides a desert/mountainous terrain training location not otherwise available to GAF aircrews in Germany. The implementation of this action for the GAF capitalizes on the substantial infrastructure investments the GAF has already made at Holloman AFB. Collocating the initial, continuation, and advanced training programs at one location will allow Tornado expertise to be shared among students in different courses, which would enhance the training environment and produce better-trained students.

Implementation of the proposed action would serve to meet the need to protect U.S./German post-Cold War bilateral relations from possible degradation as a result of U.S. military force reductions in Europe. The proposed action would serve to meet the need to promote international agreements and demonstrate U.S. resolve to support internationally cooperative defense initiatives. The proposed action would provide GAF a consolidated Tornado training establishment capable of supporting needed new training, continuation of existing training requirements, and desert/mountainous terrain training. It would also provide means to improve logistics efficiency and enable economy of scale for the GAF by collocating these additional aircraft with existing GAF operations at Holloman AFB.

PROPOSED ACTION

A Final Environmental Impact Statement (FEIS) entitled "Proposed Expansion of German Air Force Operations at Holloman AFB, New Mexico" was prepared by the Air Force to analyze the potential impacts and aid in the decision of expanding the TTE to include the beddown of 30 additional GAF Tornado aircraft with associated operations and support personnel at Holloman AFB.

Expansion of the TTE would involve the beddown of an additional 30 Tornado aircraft and 640 personnel at Holloman AFB. Under the TTE expansion at Holloman AFB, five different training courses ranging from basic conversion training to the Fighter Weapon Instructor Course would be conducted. The Tornado aircrews would receive training in takeoffs and landings, the use of terrain-following radar for low-level navigation on Military Training Routes (MTRs), air-to-ground training on air-to-ground ranges, air-intercept training in Military Operations Areas (MOAs) and restricted airspace, and aerial refueling. Existing ranges and airspace would be used to achieve a majority of the training; however, current range capacity and capabilities provide a minimally acceptable level of training. These limitations led to three "training options" being considered as part of this action.

To support this beddown, construction affecting approximately 96 acres at the base would be required. The proposed action would result in changes in use of airspace and munitions. Airspace use would increase in most affected airspace. The training, would require installing a Television Ordnance Scoring Systems (TOSS) at the Oscura and Red Rio target complexes on White Sands Missile Range (WSMR) and also at the selected training option site (see Training Options and Decision discussions below). Live munitions deliveries would be restricted to the existing Red Rio Live Drop Target (LDT). Supersonic operations, limited to approximately 24 sorties per year for "maintenance check" purposes, would be conducted in designated WSMR supersonic airspace (above 10,000 feet mean sea level [MSL]). The proposed action would make use of the airspace modifications to the existing Air Launched Cruise Missile (ALCM) routes, the Talon MOA expansion, and the aerial refueling anchor, AR-X652, in southern New Mexico and west Texas if these modifications are approved by the Federal Aviation Administration (FAA). If these airspace modifications are not implemented, existing airspace would be used. Differences in airspace availability and use are taken into account in the FEIS which analyzes the environmental impacts of using the proposed modified airspace, as well as the impacts of using existing airspace if the proposed modifications are not approved by the FAA.

TRAINING OPTIONS

Under the proposed action, three training options were considered and evaluated in the FEIS:

West Otero Mesa Training Option. Under this, the preferred training option, a new target complex (NTC) would be established on the West Otero Mesa portion of McGregor Range. The NTC would be used for air-to-ground training in the delivery of inert/subscale munitions. This option would include the installation of a TOSS at the NTC.

Tularosa Basin Training Option. Under this option, an NTC would be established in the Tularosa Basin portion of McGregor Range. This NTC would be used for air-to-ground training in the delivery of inert/subscale munitions. This option would also include the installation of a TOSS at the NTC.

Existing Range Training Option. Under this option, all air-to-ground training would occur on existing ranges.

NO ACTION ALTERNATIVE.

Under the no action alternative, no change in TTE aircraft and personnel at Holloman AFB would occur. No construction would be required to support this alternative. In addition, no change in airspace use or munitions use would occur.

DECISION

The CEQ regulations implementing NEPA require RODs to specify the alternative or alternatives considered to be environmentally preferable. As between the proposed action and the no action alternative, the no action alternative is environmentally preferable in the sense that the no action alternative would result in no environmental impacts beyond the baseline conditions. However, pursuant to the CEQ regulations, this ROD also identifies and discusses preferences among alternatives based on relevant factors including economic and technical considerations and, agency statutory missions, including any essential considerations of national policy balanced by the agency in making its decision. After considering the preferences associated with the proposed action and its training options, as well as the no action alternative, and their potential environmental consequences, I have decided to implement the proposed action with the preferred West Otero Mesa training option (this combination is referred to hereafter as the selected action). In making this decision, I have considered the economic and technical factors associated with the proposed action, the various training options, and the no action alternative, the mission of the U.S. Air Force and the national policy matters discussed above. I have also considered the opinions and suggestions that were offered by the public, state and federal agencies and other government representatives from the affected communities in making this decision. I decided on this selected action for a number of operational and environmental reasons.

The West Otero Mesa training option provides the maximum training opportunity for both the GAF and U.S. Air Force. In addition to the greater opportunity for training, this option also provides for the greatest training versatility and efficiency. Finally, NTC construction on the West Otero Mesa will disturb a significantly smaller geographical area compared to the Tularosa Basin training option and will involve a fraction of the cost.

The Tularosa Basin training option was not selected because the layout of the terrain would result in a 20 percent reduction in training efficiency compared to the West Otero Mesa training option. This alternative would also require extensive site disturbance to prepare for and construct the NTC, which would increase costs by several million dollars.

The Existing Range training option provides only minimally adequate training for GAF aircrews and does not have the training benefits and efficiencies of the other options. In addition, the increased range use from this option has the potential to significantly degrade current U.S. Air Force operations and training.

The No Action alternative would not provide the training, proficiency, and combined action capabilities needed to achieve the military-to-military strategy and goals.

The FEIS provides analyses of the potential environmental consequences of the proposed action and the training options considered, as well as the No Action alternative. All practical means to avoid or minimize environmental harm from the alternative selected have been evaluated and are being adopted. The findings, as discussed below, indicate that potential environmental impacts would include increased aircraft-related noise in some portions of the affected airspace, overflight disturbance to land use, and slight to moderate impacts to biological resources. I believe the FEIS-specified mitigation measures will avoid or adequately minimize these potential impacts.

SELECTED ACTION IMPACTS

The following summarizes the anticipated impacts from the selected action:

Airspace Use and Management: The selected action does not require any modifications to existing airspace. However, the training would use the airspace modifications considered under the previously assessed ALCM/Talon action, if approved by the FAA. Overall, assessment of each affected airspace unit found that the projected number of sorties will result in little change to the FY00 daily average sortie levels for each area. Implementation of the selected action will have little effect on use and will not affect management of this airspace.

Noise: Implementation of the selected action will result in an increase in noise levels in the vicinity of Holloman AFB, compared to the FY00 projected baseline. The area contained within the 65 decibel (dB) day-night average sound level contour around the base will increase by about 12 percent. The average noise levels in areas underlying MTRs and MOAs will range from 35 dB to 59 dB. Higher average noise levels will prevail beneath restricted airspace, particularly in the vicinity of target complexes within WSMR, McGregor, and Melrose Range. Overall average noise levels in these areas will be 63 dB or less, although average noise levels will reach 80 dB at the individual target complexes. Average noise levels will be 62 dB along the centerline of flight patterns used during routine training on the target complexes. Noise levels will drop off rapidly with distance from the centerline of these flight patterns, falling to levels under 45 dB within one mile of the centerline.

In most areas, average noise levels will change by 2 dB or less from the baseline levels that would otherwise prevail in FY00. This difference will not be perceptible to most people. Noticeable changes in average noise levels between 5 and 7 dB will be limited to areas under IR-192/194, portions of IR-134/195, and in a portion of IR-113 underlying Pecos MOA.

Land Use: Land use patterns at Holloman AFB and the surrounding vicinity will remain unchanged under the selected action. Projected increases in noise exposure at the base will not result in an appreciable increase in noise exposure for on-base housing and community services. The use of surrounding off-base areas that are undeveloped or used for livestock grazing will be unaffected. The White Sands National Monument area exposed to 65 dB or higher will increase less than two square miles.

In general, areas under the affected airspace will receive less than one additional sortie a day, resulting in imperceptible or minor increases in day-night average sound levels of 1 to 3 dB. Some areas (in Eddy and Otero counties in New Mexico, and Hudspeth County in west Texas) will experience noticeable increases in sound levels of 5 to 7 dB. Average noise levels will not exceed 62 dB outside of restricted airspace. Typical low-level overflights will be short in duration. Some wilderness users may be startled by aircraft noise. These projected changes in the noise environment are not expected to result in any changes in land use.

The 5,120-acre NTC will be located on the currently withdrawn public land on McGregor Range. Construction of the NTC will disturb 1,104 acres. 1,024 of those acres will remain disturbed through continued use of the NTC (i.e., bombing and maintenance). Portions of McGregor Range are currently open to the public for grazing and recreation. However, under the selected action the 5,120 acres comprising the impact area of the NTC will no longer be accessible to the general public. In addition, training activities on the NTC will require that portions of areas south of State Road 506 be closed to the public for approximately 60 hours per week, from Monday through Friday. State Road 506 itself would not be closed. Access by ranchers to grazing area and by the public for recreation will generally be unconstrained by air-to-ground activity from Friday afternoon through Sunday each week and early mornings on weekdays. Licensed deer and antelope hunting will continue to be scheduled on the Range through coordination between New Mexico Department of Game and Fish and the U.S. Army. Establishment of the NTC on West Otero Mesa will reduce available grazing land by about two percent. Noise levels in areas beyond the NTC impact area are considered compatible with existing grazing activities on McGregor Range. Noise levels at the nearest residence, which is east of the NTC, will be about 43 dB, a level compatible with residential use.

Air Quality: Implementation of the selected action will result in temporary, construction-related emissions at Holloman AFB, the Red Rio target complex on WSMR, and the West Otero Mesa NTC on McGregor Range. The annual cleanup and routine maintenance operations at the existing ranges and at the selected NTC will result in emissions related to temporary, construction-type activities. These emissions will be short-term and controlled through common construction practices. Changes will occur in emissions from vehicle operations and stationary sources at Holloman AFB, but are not expected to result in significant air quality impacts. The proposed increase in airspace use for the selected action will result in increased emissions; however these increases will be well below criteria pollutant limit levels. None of these air emission changes will lead to nonconformance with the U.S. Environmental Protection Agency's (EPA's) Conformity Rule or noncompliance with the Clean Air Act.

Biological Resources: Implementation of the selected action will affect biological resources through facilities construction, changes in aircraft operations in affected airspace, and delivery of ordnance against existing and proposed targets.

On-base facility construction will result in the disturbance of 96 acres within or immediately adjacent to the developed area of Holloman AFB. Most of this area has been previously disturbed. About 15 acres of relatively undisturbed habitat immediately adjacent to the existing munitions area will be disturbed. This area has burrows that may be used by burrowing owls for nesting. Burrowing owl nests are also present in areas that will be disturbed by construction near the runway apron. No impact to jurisdictional wetlands will occur at Holloman AFB. Waters of the U.S. on Holloman AFB may be disturbed during improvement of the stormwater drainage system.

Construction of the TOSS at Red Rio and Oscura impact areas and use of Red Rio, Oscura, and Melrose Range will result in low adverse impact to biological resources. Less than 10 acres will be disturbed on Red Rio from installation of the TOSS components and fiber-optic cable. Most of this area will be a narrow linear disturbance for the fiber-optic cable immediately adjacent to existing roads. Therefore, a narrow strip of vegetation will be lost; much of which has been previously modified from construction, use, and maintenance of the existing roads. Once construction is complete, animal use of the area should be similar to pre-construction levels. Use of the existing targets and ranges will result in loss of an additional 3.4 acres of vegetation on Red Rio and a very limited amount of vegetation on Oscura and Melrose Range. Overflights, ordnance use, and flare use on Red Rio, Oscura, and Melrose Range will result in continued low impact to wildlife. No impacts to protected and sensitive species or to wetlands are expected from use of the existing ranges.

Construction and use of the selected NTC under the West Otero Mesa training option will likely result in impacts to some biological resources and habitat due to the disturbance of 1,104 acres of shortgrass and desert scrub habitat. Habitat in the immediate vicinity of the NTC may be reduced due to startle from ordnance delivery and overflights. Protected and sensitive species may be affected by construction and use of the West Otero Mesa NTC. The U.S. Fish and Wildlife Service issued a Biological Opinion on 8 May 1998 relating to threatened or endangered species impacts from the proposed action. The Biological Opinion determined that the action is not likely to adversely affect or will have no effect on the Interior least tern, Piping plover, Whooping crane, Swift fox, Mexican gray wolf, Jaguar, and Black footed ferret. In addition the Opinion specified that the proposed action may adversely affect the American peregrine falcon, the Mexican spotted owl, the southwestern willow flycatcher, the Northern aplomado falcon, and the bald eagle. A non-jeopardy opinion was issued contingent upon the U.S. Air Force implementing reasonable and prudent measures. These measures are outlined in the Mitigations Section of the ROD. The Air Force is committed to implementing these measures to ensure that potential adverse impacts will be minimized.

Up to 46,000 linear feet of dry streambeds tentatively delineated by the Corps of Engineers as Waters of the U.S. could be disturbed by construction or ordnance delivery on the NTC. Some water developments, which support domestic animals grazing on Otero Mesa as well as wildlife, exist within the NTC impact area. Final design of the NTC would include moving these water developments out of the impact area avoiding potential Waters of the U.S. as much as possible. If necessary, permitting under Section 404 of the Clean Water Act would be accomplished.

Archaeological, Cultural, and Historical Resources: One archaeological resource, a prehistoric artifact scatter with features (HAR-361), has been identified in the selected action on-base construction. This resource has not been determined to be potentially eligible for listing on the National Register of Historic Places. No prehistoric or historic archaeological resources have been identified within the remainder of the disturbed area on Holloman AFB. No Native American traditional cultural properties (e.g., sacred sites) have been identified on Holloman AFB, and no potentially significant historic buildings on Holloman AFB will be adversely affected by the selected action.

Installation of TOSS components at the Red Rio target complex will require earth disturbance. The U.S. Air Force is in the process of completing a cultural resources survey in the potentially affected area. Preliminary observations suggest that cultural resources may exist in the affected area, but that these resources could be avoided through project redesign.

The West Otero Mesa NTC construction area contains a total of nine archaeological sites that are considered eligible for listing on the National Register or have undetermined eligibility. No historic architectural resources or Native American traditional cultural properties have been identified within the West Otero Mesa NTC area.

Noise-induced vibration as a result of the increased number of subsonic flights within the affected airspace is unlikely to result in significant physical damage to cultural resources. It is highly unlikely that surface or subsurface prehistoric and historic archaeological sites will be adversely affected. Physical damage to historic architectural resources also is not expected.

The U.S. Air Force has consulted with Native American groups who live beneath the affected airspace. This consultation is intended to elicit the tribes' concerns and comments regarding potential adverse impacts that would result from subsonic flights associated with the selected action. This consultation is continuing as part of Air Force government to government relationship with those group.

Supersonic flight will be conducted for "maintenance check" flights, and confined to supersonic airspace within White Sands Missile Range restricted airspace. The number of additional supersonic flights (approximately 24 per year, all above 10,000 feet MSL) is small compared to existing use of this airspace, and is unlikely to result in any impact to archaeological, cultural, or historic resources.

Water Resources: Project-related construction will result in earth disturbance that could affect water resources. Increased use of inert munitions on the existing ranges will not substantially increase soil disturbance. Increased use of live munitions at the Red Rio live drop target (LDT) will result in additional soil disturbance in that area. The potential for impact is limited due to the small amount of surface water in this area. The use of inert/subscale munitions, and periodic maintenance of the target areas, firebreak roads, and access roads will result in continuing soil disturbance at the NTC. Past experience on existing ranges is that soil disturbance from the use of inert/subscale munitions is small, and localized around individual targets. The ephemeral washes draining the selected NTC site are not significant contributors to local surface water supply. As a result, no effect on surface water quality is expected to result from implementation of the selected action.

Hazardous Materials and Waste Management: Implementation of the selected action will result in increased use of hazardous materials, as well as increased medical and hazardous waste disposal requirements at Holloman AFB. The only hazardous materials generated by range operations will be spent batteries from the proposed TOSS components and batteries removed from target vehicles. Batteries will be recycled by the Defense Reutilization and Marketing Office (DRMO) at Holloman AFB. No significant impact on hazardous materials and waste management practices is expected.

Implementation of the selected action will result in soil disturbances in the vicinity of a site at Holloman AFB which has been identified under the Installation Restoration Program (IRP). Past activities in the vicinity of this site (IRP Site 59) have resulted in soil contamination from spilled fuel. Prior to construction, the specific work area will be over- excavated and backfilled with clean soil. The excavated soil will be contained and transported to an off-base, permitted disposal facility.

Munitions use will increase at the Oscura, Red Rio, McGregor, and Melrose Ranges. Nonhazardous ordnance residue and target area scrap will be collected and recycled through

DRMO at Holloman AFB. Approximately 150,000 additional pounds of nonhazardous ordnance residue and target area scrap generated each year will be disposed by DRMO.

Socioeconomics: Increases in personnel levels and construction expenditures will have a generally positive impact on local socioeconomic conditions by increasing the number of households and reducing the unemployment rate. It is anticipated that after construction is complete, Otero County will have increased employment by an estimated 730 jobs, with 640 direct GAF personnel and 90 additional secondary jobs. The GAF jobs will be at Holloman AFB. Consistent with existing location patterns; it is anticipated that almost all of the secondary job growth would be in Alamogordo.

In accordance with Executive Order 12,898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, February 11, 1994, the FEIS identifies and analyzes the effects of the proposed action and alternatives on minority and low-income populations. The selected action will not result in disproportionately high and adverse environmental effects on minority or low-income populations.

Under the selected action, cattle grazing will be excluded from 5,120-acre impact area on the West Otero Mesa. It is estimated that this loss represents a decline in annual agricultural production of approximately $50,000, with a loss of employment of about 0.5 jobs annually.

A broad area beyond Holloman AFB will experience changes in overflight due to implementation of the selected action. These changes in overflight will not directly affect socioeconomic resources. Given the rural nature of the areas and the relatively sporadic nature of overflights, the changes in overflight frequency that will result under the selected action are not expected to produce measurable impacts on the economic value of the underlying land.

Transportation: Implementation of the selected action will result in increased traffic near Holloman AFB and the City of Alamogordo. However, the level of service for all roadway segments will be unchanged

Utilities: Under the selected action, the demand on water supply, wastewater treatment, solid waste disposal, electrical supply, and natural gas supply will be within existing levels of service.

Soils: Impacts to soils will arise primarily through earth disturbance during construction at Holloman AFB, the Red Rio target complex, and at the selected action West Otero Mesa NTC. The on-base existing munitions storage area addition will disturb 15 acres of previously undisturbed soils. Construction associated with the other on-base areas and the Red Rio target complex will occur in previously disturbed soils; therefore, little additional impact to soils is expected.

The increase in use of inert/subscale munitions at existing target complexes (Red Rio and Oscura on WSMR, and the target complex on Melrose Range) will be a fraction of existing use. Increased inert/subscale munitions use at these locations will not substantially increase soil disturbance. Use of the Red Rio LDT will increase substantially, and is expected to increase the area of vegetation loss. This will increase soil erosion in the area. Also, past use of the LDT has led to trace amounts of residue from uncombusted explosive ordnance. The increased use of live ordnance on the LDT could lead to additional trace amounts of soil contamination.

Use of the selected NTC will disturb soil by the use of inert/subscale munitions, as well as periodic maintenance of the surface. During construction, the net combined wind and water soil loss, in the

absence of mitigation measures, could reach 14 tons/acre/year at the West Otero Mesa NTC site, depending on erosion-control measures that may be applied. Following site development and stabilization, net soil loss is projected to be approximately six tons per year.

Safety: Implementation of the selected action will not adversely affect safety. The increased number of flying hours associated with the selected action will not result in a statistically significant increase in the overall risk of an aircraft mishap. Data on bird-aircraft strike hazards indicate no significant change in bird-aircraft strike risk. There will be an increase in munition use and handling over current conditions. Range operating procedures that have ensured safe operation in the past will continue to do so in the future, and no significant impact to safety is expected to occur due to implementation of the selected action.

CUMULATIVE IMPACTS

The Air Force evaluated the potential net environmental impacts due to the incremental impacts of the action when added to other past, present, currently planned and reasonably foreseeable future actions that overlap the selected action geographically and temporally. Training flight activities associated with the selected action are expected to commence in the first quarter of FY00, and thus, FY00 is used as the projected "baseline" from which to analyze environmental impacts. However, because Holloman AFB is an active military installation that undergoes continuous change in mission and in training requirements, and because changes in U.S. Air Force missions unrelated to the selected action are anticipated to occur in the region of influence (ROI) between FY 95 and FY00, FY95 conditions were used as a point of reference for purposes of analyzing cumulative impacts. The FY95 point of reference represents a "snapshot" of the environmental resources associated with Holloman AFB and areas affected by activities and training flights from the base. This comparison indicates that for most resources, no significant cumulative impacts are expected following implementation of the proposed action. These resources are: airspace management, air quality, archaeological, cultural and historical resources, water resources, hazardous material and waste management, safety, utilities, transportation, and soils. The comparison indicates that cumulative impacts are expected for noise, land use, biological resources, and socioeconomic resources. These impacts include a cumulative increase in aircraft overflights and increased noise levels on coincident route IR-178. This will in turn, increase the chance of disturbance and annoyance in residential and recreational areas underlying affected airspace. It will also increase potential for overflight of federally listed species and other sensitive resources. Positive cumulative socioeconomic impacts will arise from various deployment projects being considered for Otero County. The local economy is expected to be able to provide for and benefit from the services needed for the construction personnel and the level of growth associated with these projects.

MITIGATION MEASURES

The Air Force is committed to implementing all practicable means to avoid or minimize environmental harm resulting from the TTE expansion at Holloman AFB. For the selected action, the following mitigations have been identified:

Noise

a) FAA, U.S. Air Force, and GAF regulations specify minimum altitudes and avoidance distances aircraft must adhere to when flying over specific types of structures, settlements, or categories of land. For example, U.S. Air Force regulations require aircrews flying over sparsely populated areas to avoid persons, vessels, vehicles and structures by at least 500 feet. GAF regulations increase some of these avoidance distances further. Even with these avoidance distances, it is

possible that there may be perceptible increases in noise levels for some rural residents. Typical low-level overflights will be short in duration, and in accordance with applicable regulations.

b) The Air Force maintains a process to identify and avoid noise-sensitive areas as identified by affected individuals. Areas identified under this process are avoided by greater distances than the prescribed minimum avoidance criteria to minimize noise levels. These avoidance areas include those currently agreed to involving National Park Service lands.

Biological Resources

a) Field evaluations of the specific site construction areas will be performed to avoid or minimize impacts.

b) The Air Force will evaluate the location of the existing and potential burrowing owl nest sites in relation to construction activities and implement appropriate mitigations (e.g., construct artificial nest burrows).

c) Water developments on the NTC will be moved to an area immediately outside of the impact area to ensure continuity of water supply for grazing stock and wildlife.

d) In addition, construction and operational restrictions identified and mitigations agreed to during the Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) will be implemented to ensure that potential adverse impacts will be minimized. These mitigations are outlined in detail in the Final Biological Opinion, issued by the U.S. Fish and Wildlife Service on 8 May 1998.

1. Over a ten-year period, the Air Force will coordinate an endangered species interagency survey and monitoring team. The team will focus its attentions on the lands overflown by MTRs, VR 176, IR-134/195, IR-192/194, and IR-102/141. Not all lands under the subject MTRs will necessarily be field surveyed, but will be initially considered by the interagency team to determine which locations require what level of survey/monitoring effort 9If any) for the subject species. The interagency team will reevaluate and redirect (as necessary) the project every two years, and refocus the survey and monitoring effort (as necessary) to accommodate changing conditions and new information.

2. The U. S. Air Force will restrict aircraft operations from March 1 to July 1 each year on specific portions of VR 176 to a single reduced-width corridor laid out within the MTR's existing lateral boundaries. During this time, aircraft will not fly lower than 500 feet AGL within this corridor. In addition, known peregrine falcon and bald eagle nest sites that are within the reduced-width corridor will be avoided 1 mile laterally and 1600 feet AGL. Outside of this corridor and within all other MTRs identified in the USFWS biological opinion, threatened and endangered species habitat will be avoided as described in the Terms and Conditions of the biological opinion and listed herein.

    a) The Air Force will restrict Low-level flights over peregrine falcon nest sites from March 1 - August 15 of each year. All known nest habitat will be avoided by 1 mile laterally and 1600 feet AGL during the March 1 - August 15 breeding season

    b) The Air Force will restrict low-level overflights during the Mexican spotted owl breeding season (March 1 - August 31 of each year) over known PACs and identified

nest/roost habitat. All known PACs and owl nest sites once they are adequately surveyed and defined, will be avoided by 2900 feet laterally (which is equivalent to 600 acres) and 1600 feet AGL.

c) The Air Force will restrict low-level overflights over known bald eagle nest sites, roost and wintering sites by (a) re-routing aircraft on MTRs 1 mile laterally or 2000 feet AGL during the bald eagle breeding season; (b) avoiding large water bodies and bald eagle winter concentration areas by 2000 feet AGL from October 1 through March 1 of each year; (c) avoid known roost sites by a minimum of 1000 feet AGL from October 1 through March 1 of each year.

d) The Air Force will restrict low-level overflights over known flycatcher sites and critical habitat from April 15 through September 1 of each year.

3. The Air Force will participate in a study to monitor the occupancy of a sufficient number of Mexican spotted owl protected activity centers (PAC) under VR-176. The purpose of this study will be to determine if occupancy by owls or nest success of PACs is adversely impacted by overflights.

4. The Air Force will, within one year of construction of the new target complex) survey the NTC site, including the safety area to determine the presence of Aplomado falcons.

It is understood that the restrictions described in the Biological Opinion's Terms and conditions will be applied to new sites if discovered, or removed if the characterization of existing sites change. If these restrictions combine to impose unacceptable mission constraints, the U.S. Air Force reserves the right to re-approach the U.S. Fish and Wildlife service to seek resolution.

Archaeological, Cultural, and Historical Resources.

a) If the proposed construction at Holloman AFB cannot avoid the archaeological resource identified, the resource's significance will be formally evaluated. If the resource is eligible for listing on the National Register of Historic Places, appropriate mitigation will be performed, in consultation with the New Mexico State Historic Preservation Office (SHPO) and in accordance with the National Historic Preservation Act (NHPA).

b) For any off-base sites eligible for listing on the National Register that would be impacted by the selected action, mitigation will be implemented in accordance with the NHPA, in consultation with the New Mexico SHPO, and in accordance with a Memorandum of Understanding between the U.S. Air Force and Fort Bliss.

c) Although no Native American traditional cultural properties have been identified within the West Otero Mesa NTC area, the U.S. Air Force will continue to conduct government-to-government communication with the Mescalero Apache.

d) The Air Force will continue to conduct government-to-government communication with the Mescalero Apache, Acoma, Ramah Navajo, Alamo Navajo, Laguna, and Zuni concerning the effects of aircraft overflights on traditional cultural properties of concern to these Native American reservations.

Soils and Water Resources

a) Construction activities at Holloman AFB, the Red Rio impact area, and the selected NTC will employ standard practices for control of runoff and infiltration as required by Federal and State

laws, regulations, and permits. Appropriate erosion control measures will be used to minimize sediment loading in the vicinity of the LDT and NTC.

b) Portions of the existing wildlife and livestock water supply distribution system at the West Otero Mesa NTC site will be relocated. This will facilitate construction and avoid negative impacts on this water resource. Any relocation will be coordinated with the Bureau of Land Management.

In addition to above the Air Force is committed to cooperation and coordination with the Bureau of Land Management (BLM) as set for the in the May 26, 1998, Memorandum of Understanding (MOU) between the BLM and the Air Force with regard to activities and impacts associated with the West Otero Mesa training option.

CONCLUSION:

I have considered the potential environmental consequences of the proposed action, the No Action alternative, and cumulative effects that overlap with the proposal in schedule and geography. I have taken into consideration these environmental factors as well as economic and technical considerations, national policy, and the U. S. Air Force mission in reaching my decision to proceed with the TTE expansion at Holloman AFB.

This record of decision is made in consideration of the matters discussed herein, the Final Environmental Impact Statement for the Proposed Expansion of German Air Force (GAF) Operations at Holloman Air Force Base (AFB), New Mexico, and the Council on Environmental Quality National Environmental Policy Act Regulations, 40 CFR Part 1505.

5/29/98
DATE

PHILLIP P. UPSCHULTE
Acting Assistant Secretary
(Manpower, Reserve Affairs,
Installations & Environment)

30-19

MEMORANDUM OF UNDERSTANDING

Between

THE DEPARTMENT OF THE INTERIOR

and

THE DEPARTMENT OF THE ARMY

To Provide For

CO-USE GRAZING ON THE McGREGOR RANGE IN NEW MEXICO

WHEREAS Public Land Order No. 1470 of August 21, 1957 withdrew public lands in McGregor Range for use by the Department of the Army as a missile testing range and whereas Section 4(e) of said Public Land Order provided that grazing use of the lands, if determined by the Contracting Officer in charge to be compatible with their use for military purposes, shall be administered by the Department of the Interior, Bureau of Land Management, hereinafter referred to as BLM, under the provisions of the Taylor Grazing Act of June 28, 1934 (48 Stat. 1269, 43 U.S.C. 315, et. seq.), as amended. Whereas there are intermingled with the withdrawn public domain lands tracts of lands acquired by the Department of the Army aggregating approximately 12,000 acres which are subject to the provisions of law and policy governing the Secretary of the Army leasing within military reservations, and

WHEREAS the Secretary of the Army has determined that grazing use can be allowed on McGregor Range, provided such grazing use is authorized subject to certain provisions as set forth in this Memorandum of Understanding and

and the Department of the Interior, BLM, has indicated its willingness to assume responsibility for administration of such grazing use subject to such provisions.

WHEREAS the law and policy which governs the administration for grazing purposes of lands acquired within military areas contemplates that such lands will be offered for use by competitive bid leasing at not less than fair value in reasonably economical tracts or areas and for periods and under conditions which will assure the ready availability of such lands for required military purposes.

It is agreed that the grazing program to be administered hereunder by the Bureau of Land Management will be consistent insofar as practicable with the Army leasing laws and policies. To this end any grazing procedure to be prescribed by the BLM will be submitted to the Chief of Engineers, Department of the Army, for prior concurrence and major changes therein found necessary in the public interest, including special rules of the Department of the Interior will be likewise coordinated.

Therefore, it is mutually agreed that:

SECTION A. The Department of the Army agrees to the following:

(1) Subject to special stipulations expressed herein, the BLM will license grazing use on lands withdrawn by Public Land Order 1470, excluding lands in the Lincoln National Forest and lands in the southern part of Hueco Bolson Range generally referred to as the former Maple, Warner, Davis, Hammonds and Gray allotments, but including the aforesaid Army acquired lands.

(2) The Department of the Army will continue fire control responsibilities in accordance with Section 4(f) of Public Land Order 1[illegible].

(3) All grazing fees collected by the BLM will be subject to BLM accountability. A division of grazing funds receipts from the BLM administration of the McGregor lands will be made on the basis of the proportion which the "acquired" Army lands in the Range bear to the "withdrawn public domain lands" in the area. This agreement presently includes approximately 52,000 acres of "acquired land" out of the total of 515,[illegible] acres covered by the agreement. The portion of such funds represented by Army acquired lands will be transferred by the BLM to the U. S. Army District Engineer, Albuquerque, in accordance with established fiscal procedures on an annual basis.

(4) The Department of the Army will allow [illegible] days following written notice or agreement for the removal of any ra[illegible] improvement placed on the lands by any grazing licensee pursuant to a range improvement permit issued by the BLM for such range improvement.

(5) The Department of the Army acting through the United States Army Air Defense Center, hereinafter referred to as the Center, in cooperation with the BLM, will retain and exercise complete control over distribution and use of water which flows through pipelines from the Sacramento River and Carrizo Springs.

(6) The Center will upon request furnish firing schedules in order that grazing licensees authorized to use lands in McGregor Range for grazing can be timely advised when entry to the Range is allowed or denied.

(7) BLM agrees it is responsible for control and action relative to livestock trespass; however, that the Center will be responsible for the control of trespass committed by any person into the area.

SECTION B. The BLM agrees to the following conditions for licensing grazing use on lands in McGregor Range:

(1) Personnel of the Center, in pursuit of their official functions or other authorized purposes, will continue to have unlimited access to the land covered by this agreement. Said personnel may open gates, and, if necessary, lower fences in order to accomplish their assigned missions or duties. The Center will require said personnel to leave gates as found (open or closed) and to re-position any fences lowered. However, the Center assumes no responsibility should gates not be left as found or should fences not be re-positioned.

(2) Each grazing license which authorizes grazing use of lands in McGregor Range shall contain and be subject to the stipulations listed below in Section C.

(3) Grazing use of lands in McGregor Range will be limited to cattle and horses, and the numbers of these animals will also be so limited as to assure proper use of the land. No one will be authorized to graze sheep and/or goats on any land in McGregor Range.

(4) Range improvements will include but not be limited to:

(a) The construction and maintenance by the BLM of a livestock control fence on those parts of the McGregor Range boundary which enclose land covered by grazing licenses. Prior to the construction of livestock control fences, the BLM will submit the construction plans and specifications

to the Commanding General of the Center for his approval. Provision for fencing fence along practical fence lines shall be worked out and agreed to in writing by the BLM and the Center.

(b) The construction and maintenance by the BLM of firebreaks on those parts of McGregor Range boundary which enclose land upon which grazing use will be authorized and at such other locations as may be determined to be necessary by the Center. Prior to the construction of firebreaks, the BLM will submit the construction plans and specifications to the Commanding General of the Center for his approval. Firebreaks will usually be constructed contiguous with perimeter fences.

(c) The maintenance and improvement by the BLM of the pipelines which bring water from the Sacramento River and Carrizo Springs to McGregor Range. The BLM will also construct, maintain and improve from such grazing revenues as can possibly be made available, tanks, tubs, wells, windmills, etc., necessary to provide water for range management. Prior to new construction or making any major improvement or change that affects water resources on McGregor Range, the BLM will submit the construction plans and specifications to the Commanding General of the Center for his approval.

(5) The Center, in cooperation with the BLM, will retain and exercise complete control of distribution and use of water which flows through pipelines from the Sacramento River and Carrizo Springs.

(6) Any range improvement constructed with Government funds will remain on the property.

(7) No grazing license issued under this agreement will in any way affect the existing agreement between the Center and the Department of Fish and Game, State of New Mexico, concerning the control, conservation and maintenance of wildlife on McGregor Range. Each grazing licensee is bound by all terms and conditions of said agreement to the same extent that the Center is bound. BLM will establish grazing capacity limits annually to determine numbers of domestic livestock to be grazed on the range and will reserve adequate forage for wildlife, especially big game animals now on the range or subsequently to be released on the range. Therefore, Center will cooperate with the BLM for development and maintenance of wildlife habitat on the McGregor Range, including the determination of specific areas, if any, on which domestic livestock grazing will be excluded in favor of wildlife.

(8) The District Manager, BLM, will keep the Commanding General of the Center currently informed as to the name and address of each grazing licensee.

SECTION C. STIPULATIONS: The following stipulations will be attached to and made a part of each grazing license issued by the BLM to authorize grazing use of lands in McGregor Range under this co-use agreement between the Department of the Army and the Department of the Interior:

(1) Prior to entry upon McGregor Range for any reason, each licensee, his family, agents, or guests must obtain permission from the Commanding General, United States Army Air Defense Center, or his designated agent. Such persons may remain on McGregor Range only during the hours and/or days during which permission to enter has been so granted. Permission to

enter McGregor Range will be granted when firing is not being conducted or scheduled; however, under no circumstances will the licensee, his family, agents, or guests be granted permission to enter or remain on McGregor Range during periods when firing is being conducted, or scheduled, even should they be willing to assume any and all risks inherent in such activities.

(2) Should security or safety considerations or the assignment of any particular mission require such action, the Center reserves the right to deny access to McGregor Range to licensee, his family, agents, or guests for extended periods of time. The Center may exercise this right without prior notice to licensee.

(3) Personnel of the Center, in pursuit of their official functions or other authorized purposes, will have unlimited access to the land covered by this license. Said personnel may open gates, and, if necessary, lower fences in order to accomplish their assigned mission or duty. The Center will require said personnel to leave gates as found (opened or closed) and to re-position fences lowered. However, the Center assumes no responsibility should gates not be left as found or should fences not be re-positioned.

(4) The Center is responsible for fire control as set forth in Section 4(f) of Public Land Order 1470, and will suppress fires after completion of the daily or other scheduled firing program. Grazing licensee waives any and all rights of action which might accrue due to damage to to persons or property if said damages are directly or indirectly cause by fire resulting from military operations or other causes on McGregor Range.

(5) The United States will not be responsible for damage to any improvement or for any injury to persons or livestock caused directly or indirectly by impact or fallout of missiles, targets or components thereof.

(6) Licensee, his family, agents, or guests are prohibited from touching, tampering with, or disturbing any shell, shell casing, missile, target, or components thereof which may be found upon the lands covered by this license. Upon discovery of any of the items mentioned in the preceding sentence, licensee will report said discovery to the Commanding General, United States Army Air Defense Center, or his designated agent.

(7) This grazing license may be terminated after thirty (30) days written notice should the United States Army Air Defense Center be assigned new, additional, or different missions which, in the opinion of the Commanding General, United States Army Air Defense Center, cannot be accomplished while such grazing license is in effect.

(8) This grazing license may be summarily terminated should the licensee breach any of the terms or conditions stated herein.

(9) This grazing license is subject to all New Mexico State Game laws and regulations.

(10) Complete control of distribution and use of water which flows through pipelines from the Sacramento River and Carrizo Springs is retained and exercised by the United States Army Air Defense Center, in cooperation with the Bureau of Land Management.

(11) Grazing licenseemay construct temporary range improvements necessary for the proper care and management of livestock for which this

license is issued, after approval of the United States Army Air Defense Center and subsequent to the issuance of an improvement permit by the Bureau of Land Management. Such temporary range improvements must be removed by licensee within 60 days after his grazing license has expired and has not been renewed or within 60 days of the written notice that the license has been cancelled for other cause.

(12) This grazing license will in no way prevent the United States Army Air Defense Center from establishing launching sites, erecting fire towers, raiar sites, and other similar construction and fencing of same, when required by military necessity.

(13) This grazing license will in no way affect the existing right of the Secretary of the Army to grant permits for the examination of ruins, the excavation of archaeological sites, and the gathering of objects of antiquity upon land subject to this license. The licensee, his family, agents, or guests will refrain from the excavation of archaeological sites and gathering of objects of antiquity upon lands subject to this license. Discovery of any such sites or items will be reported to Commanding General, U. S. Army Air Defense Center, or his designated agent.

SECTION I. GENERAL. This Memorandum of Understanding shall remain in full force and effect until terminated by mutual agreement between the parties hereto, or upon ninety-day written notice served by either party on the other.

If terminated by mutual agreement, the then current and existing grazing licenses will be allowed to extend to expiration of existing billing period shown on such existing grazing licenses.

This Memorandum of Understanding is subject to immediate termination if, in the opinion of the Commanding General of the Center, military operations make such termination imperative.

If amendments are needed to this agreement, a meeting may be called by either party, preferably 60 days or more prior to expiration date of grazing licenses in effect, so that necessary changes can be incorporated in any new offers for grazing licenses.

In witness whereof I have hereunto set my hand by direction of the Assistant Secretary of the Army (I&L) this 18 day of March, 1966.

Sherry B. Myers
Staff Asst (Real Property)
Mil Const and Real
Property, CASA(I&L)

Approved:

Director
Bureau of Land Management

SEP 9 1966

PROPOSED AGREED UPON CHANGES TO THE
JUNE 7, 1974 MEMORANDUM OF UNDERSTANDING
BETWEEN THE DEPARTMENT OF THE INTERIOR AND THE
DEPARTMENT OF THE ARMY TO PROVIDE FOR CO-USE GRAZING
ON THE McGREGOR RANGE IN NEW MEXICO

Section A

(2) The DOA will have fire control responsibility on McGregor Range. DOA will take reasonable fire suppression measures immediately upon discovery of fires on Otero Mesa or contiguous areas, where such fire threatens Otero Mesa and related grazing units. BLM will be notified immediately upon detection of fire on/or threatening Otero Mesa as well as other designated grazing units.

(3) All grazing contract fees collected by BLM will be subject to BLM accountability.

The portion of such funds being a ratio of Army acquired lands to total grazing lands will be maintained by the BLM to support projects on that portion of McGregor Range covered by this Memorandum of Understanding. These funds will be maintained in a 1920 reimbursable funds account by the BLM and used to support the programs as approved by the Commanding Officer for which the BLM has responsibility on McGregor Range. These programs are livestock forage, wildlife habitat and maintenance of range improvements but do not include maintenance or project work outside the grazing program on McGregor Range. Projects developed with the contributed funds normally will be limited to fence repair, firebreak maintenance, road maintenance relating to grazing use, perimeter signs, wildlife habitat and water developments. These projects will be performed in-house or contracted by BLM for Fort Bliss at the discretion of BLM. A maximum of 20% of Army contributed funds can be used for BLM overhead and administration costs. It is understood that this agreement is subject to the availability of BLM funds and manpower to perform the duties set forth herein.

(4) The Bureau of Land Management will at their discretion ascertain whether improvements constructed by grazing contractors under range improvement permits should be removed or left for future management needs on livestock grazing units. The Bureau of Land Management will have approving authority for all projects constructed by grazing contractors on grazing units within McGregor Range. The DOA will have approving authority for all projects outside grazing units on McGregor Range, and shall have authority to have BLM remove such range improvements anywhere on McGregor Range where mission requirements dictate and alternatives to removal are not feasible.

(8) The BLM recognizes and will comply with all cultural resource statutes and regulations for all BLM initiated or participating projects, wherever situated. The DOA recognizes and will comply with all cultural resource statutes and regulations for all DOA initiated or participating projects, wherever situated. Additionally, the BLM will have primary cultural resource management responsibility over Otero Mesa and other grazing areas as shown on Exhibit ___, attached. The DOA will retain primary cultural resource management responsibility over all other withdrawn lands, with the exception of National Forest lands which shall be managed by the Forest Service.

(9) Any new grazing units developed within the co-use area will be coordinated with, and subject to, the approval of the commanding General of the Center.

(10) The Department of the Army shall prohibit vehicular traffic off existing roads on Otero Mesa, and grazing units except in case of emergencies. No field training exercises utilizing vehicular traffic will be conducted on grazing units.

Section B

(4) Range improvements will include but not be limited to:

(b) Maintenance of exterior fire breaks for McGregor Range grazing units will be the joint responsibility of the center and BLM. Maintenance of fire breaks will be coordinated between the center and BLM during February of each year. Interior fire breaks for McGregor Range Grazing units will be maintained by the Bureau of Land Management. Coordination will be initiated by BLM.

Section C. Stipulations

(4) DOA will have fire control responsibility on McGregor Range. DOA will take reasonable fire suppression measures immediately upon discovery of fires on Otero Mesa or contiguous areas, where such fire threatens Otero Mesa and related grazing units. Grazing contractors waive any and all rights of action which might accrue due to damage to persons or property if said damages are directly or indirectly caused by fire resulting from military operations or other causes on McGregor Range.

(7) Delete in total.

(11) Any range improvements constructed by grazing contractors will require approval by the Bureau of Land Management in the form of a range improvement permit. Prior to termination of the grazing contract the Bureau of Land Management will at their discretion ascertain whether improvements constructed should be removed or left for future management needs on grazing units.

(12) This grazing license will in no way prevent the United States Army Air Defense Center from establishing launching sites, erecting fire

towers, radar sites, and other similar construction and fencing of same, when required by military necessity. Any such necessity will be coordinated with BLM.

William A Anderson — 22 July 76

Colonel William A. Anderson (Date)
Director of Facilities Engineering
Fort Bliss

Arthur W. Zimmerman — 22 July 76

Mr. Arthur Zimmerman (Date)
New Mexico State Director
Bureau of Land Management

NM50-36
Oct 72
Amendment

COOPERATIVE PLAN-AGREEMENT FOR CONSERVATION AND DEVELOPMENT OF FISH AND WILDLIFE RESOURCES ON THE McGREGOR RANGE (FORT BLISS)

A. Preamble. In accordance with the authority contained in Title 10, United States Code, Section 2671, approved February 28, 1958, and in Public Law 86-797, approved September 15, 1960, the Department of Defense, the Department of Interior, and the State of New Mexico, through their duly designated representatives whose signatures appear below, approve the following Cooperative Plan-Agreement for the protection, development and management of fish and wildlife resources on that portion of the McGregor Range (Fort Bliss) in the State of New Mexico.

This Cooperative Plan-Agreement does not include land in McGregor Range (Fort Bliss) covered under a Memorandum of Understanding dated November 11, 1971, between The United States Department of Agriculture, Forest Service and Department of The Army, Corps of Engineers.

B. Definitions. Hereafter in the agreement the following will apply:

1. The Commanding General, United States Army Air Defense Center, Fort Bliss, Texas, representing the Department of Defense and the military authority for portions of the Fort Bliss military reservation in the State of New Mexico, will be referred to as the "Center."

2. The Bureau of Sport Fisheries and Wildlife, acting for the Department of Interior, will be referred to as the "Bureau."

3. The Department of Game and Fish of the State of New Mexico, represented by the Director of said Department, will be referred to as the "Department."

4. The Bureau of Land Management acting for the Secretary of the Interior under Paragraphs C. 2. d. and C. 8. below will be referred to as "BLM."

C. Provisions. Whereas the United States Government has acquired possession of water rights on certain lands located in the State of New Mexico, delineated in a map heretofore furnished the parties to this agreement and hereinafter referred to as McGregor Range (Fort Bliss).

Whereas the Center, the Bureau, BLM, and the Department have a mutual desire and interest that the wildlife populations of the said McGregor Range (Fort Bliss) in the State of New Mexico be properly managed; and

Whereas it is necessary that the Center, the Bureau, BLM, and the Department agree upon certain matters to the end that this area may best be managed from the standpoint of wildlife management consistent with the military mission and the responsibilities of the BLM on those lands in McGregor Range (Fort Bliss) (PLO 1470) contained in the Memorandum of Understanding between the Department of Interior and the Department of the Army, dated 18 March 1966, now, for and in consideration of the mutual promises of one party to the other, it is agreed:

2. That an annual wildlife program for management, development and/or search be developed.

a. That an annual survey be made to determine range condition and trend and wildlife abundance between March 1 and May 1. The Department will, each spring, initiate this survey and establish dates satisfactory to those parties wishing to attend.

b. An annual meeting of all parties to the agreement shall be held subsequent to the survey each year for the purpose of developing the annual program of research and future development and management of wildlife resources. The BLM will be responsible for calling said meeting.

c. All appropriate parties to this agreement will be advised of proposals, plans, and expenditures involving any of the above matters by any single party to this agreement.

d. Nothing herein will operate to interfere with the responsibilities of BLM on those lands in McGregor Range (Fort Bliss) (PLO 1470) under the Memorandum of Understanding between the Department of the Interior and the Department of the Army, dated 18 March 1966. With respect to those lands, BLM will exercise the authority of the Secretary of the Interior under P. L. 86-797 with liaison between BLM and the Bureau.

3. That hereafter during the term of this agreement the Center will furnish the Department at the specified time below a statement of dates during which it appears that portions of McGregor Range (Fort Bliss) can be opened for the following activity.

Statement by	Activity	Normal Season Occurs:
May 1	Antelope	October
May 1	Deer	November
May 1	Game Birds	Oct. - Jan.
May 1	Non-game Animals Management Program	Year round

4. The Center and the Department may open portions of McGregor Range (Fort Bliss) through mutual agreement to regulated hunting to military and public license holders provided that the open dates are authorized for federally regulated species. In the event the Center should cancel through necessity a hunting and fishing period, a new period, if possible, will be scheduled by mutual agreement.

5. The Department will determine annual regulations pertaining to taking of all wildlife species consistent with Federal regulations for migratory species.

6. It is mutually to the benefit of the Center and the Department to harvest annually the surplus wildlife crop; therefore, the following conditions shall herein become a condition for the hunts held on that portion of McGregor Range (Fort Bliss) lying within the State of New Mexico.

b. Check stations will be jointly maintained by the Center and Department if a check station shall be deemed necessary for these parties. When a check station is designated, each person entering or leaving the hunting area for any purpose must check in and out in person at the location so designated. The Center and the Department representatives at the check station shall have authority and shall assign hunters to specified hunting areas and areas where camping may be allowed. Hunters shall hunt only on the area designated by the permit and shall not in any case trespass upon or enter into prohibited areas designated by the Center. Maps showing such prohibited areas shall be posted for the information of all concerned at each check station.

c. For the purpose of license purchase while hunting that portion of McGregor Range (Fort Bliss) lying in the State of New Mexico any military personnel officially assigned to Fort Bliss shall be recognized as a resident and subject to purchase of a resident hunting and/or fishing license.

d. No portion of McGregor Range (Fort Bliss) will be kept open for hunting or fishing at a time when it will interfere with the military mission. During the time that the portions of McGregor Range are open for hunting or fishing such portions and places which are not open for hunting or fishing for military or security reasons shall be posted or designated by the Center. Further, nothing herein shall be construed as giving representatives of the Department or Bureau, or BLM the right to be on the portions of McGregor Range at any time or place which shall interfere with the military missions thereof nor as granting them authority to be in the prohibited areas.

7. No property of the United States shall be subject to forfeit by laws of the State of New Mexico.

8. Any questions concerning cooperation in wildlife management shall be resolved by conference between the representatives of the Center and the Department and by BLM representatives on those lands in McGregor Range contained in the Memorandum of Understanding between the Department of Interior and the Department of the Army, dated 18 March 1966, and by Bureau representatives on military lands under Fort Bliss jurisdiction in the State of New Mexico exclusive of the lands specified in PLO 1470 and referenced Memorandum of Understanding, when responsibilities of the Department of Interior are involved.

9. No rodent or predator control programs will be initiated on these lands where BLM has responsibilities without the concurrence of the Las Cruces BLM District Office, the Bureau, the Center and the Department.

10. This cooperative plan will be in full force upon its adoption until such time that any one member of the cooperative group shall render it terminated by so stating to the other members in writing thirty (30) days in advance of the date of desired termination. This plan is subject to amendment or revision which shall be accomplished by written proposal to the parties for their mutual agreement. Request for amendment, change or termination may originate with any one party.

Lloyd D. Godfrey — 17 NOV 1972

Date

HAMPTON J. GODFREY, COL, GS, DIO
U. S. Army Air Defense Center & Fort Bliss
Fort Bliss, Texas 79916
Representing the Department of Defense

W O Nelson Jr — 10/25/72

Date

Regional Director
Bureau of Sport Fisheries and Wildlife
Fish and Wildlife Service
Department of the Interior

K. J. Anderson — October 11, 1972

Date

State Director
Bureau of Land Management
Department of the Interior

9-21-72 — Judd A. Gordon

Date

Director
Department of Game and Fish
State of New Mexico

Approved as to form and legal sufficiency this 19th day of September, 1972.

OFFICE OF THE ATTORNEY GENERAL
STATE OF NEW MEXICO

By: James H. Russell

James H. Russell, Jr.
Assistant Attorney General

OCT 74

COOPERATIVE PLAN-AGREEMENT FOR CONSERVATION AND DEVELOPMENT OF FISH AND WILDLIFE RESOURCES ON THE McGREGOR RANGE (FORT BLISS)

A. Preamble. In accordance with the authority contained in Title 10, United States Code, Section 2671, approved February 28, 1958, and in Public Law 86-797, approved September 15, 1960, the Department of Defense, the Department of Interior, and the State of New Mexico, through their duly designated representatives whose signatures appear below, approve the following Cooperative Plan-Agreement for the protection, development, and management of fish and wildlife resources on that portion of the McGregor Range (Fort Bliss) in the State of New Mexico.

This Cooperative Plan-Agreement does not include land in McGregor Range (Fort Bliss) covered under a Memorandum of Understanding dated November 11, 1971, between The United States Department of Agriculture, Forest Service and Department of The Army, Corps of Engineers.

B. Definitions. Hereafter in the agreement the following will apply:

1. The Commanding General, United States Army Air Defense Center, Fort Bliss, Texas, representing the Department of Defense and the military authority for portions of the Fort Bliss military reservation in the State of New Mexico, will be referred to as the "Center."

2. The Bureau of Sport Fisheries and Wildlife, acting for the Department of Interior, will be referred to as the "Bureau."

3. The Department of Game and Fish of the State of New Mexico, represented by the Director of said Department, will be referred to as the "Department."

4. The Bureau of Land Management acting for the Secretary of the Interior under Paragraphs C. 2. d. and C. 8. below will be referred to as "BLM."

C. Provisions. Whereas the United States Government has acquired possession of water rights on certain lands located in the State of New Mexico, delineated in a map herefore furnished the parties to this agreement and hereinafter referred to as McGregor Range (Fort Bliss).

Whereas the Center, the Bureau, BLM, and the Department have a mutual desire and interest that the wildlife populations of the said McGregor Range (Fort Bliss) in the State of New Mexico be properly managed; and

Whereas it is necessary that the Center, the Bureau, BLM, and the Department agree upon certain matters to the end that this area may best be managed from the standpoint of wildlife management consistent with the military mission and the responsibilities of the BLM on those lands in McGregor Range (Fort Bliss) (PLO 1470) contained in the Memorandum of Understanding between the Department of Interior and the Department of the Army, dated 18 March 1966, now, for and in consideration of the mutual promises of one party to the other, it is agreed:

1. The Bureau, BLM, and the Department will provide the Center with technical advice and assistance in matters pertaining to fish and wildlife management in their respective areas of responsibility as outlined herein.

2. That an annual wildlife program for management, development, and/or research be developed.

a. That an annual survey be made to determine range condition and trend and wildlife abundance between March 1 and May 1. The Department will, each spring, initiate this survey and establish dates satisfactory to those parties wishing to attend.

b. An annual meeting of all parties to the agreement shall be held subsequent to the survey each year for the purpose of developing the annual program of research and future development and management of wildlife resources. The BLM will be responsible for calling said meeting.

c. All appropriate parties to this agreement will be advised of proposals, plans, and expenditures involving any of the above matters by any single party to this agreement.

d. Nothing herein will operate to interfere with the responsibilities of BLM on those lands in McGregor Range (Fort Bliss) (PLO 1470) under the Memorandum of Understanding between the Department of the Interior and the Department of the Army, dated 18 March 1966. With respect to those lands, BLM will exercise the authority of the Secretary of the Interior under P. L. 86-797 with liaison between BLM and the Bureau.

3. That hereafter during the term of this agreement the Center will furnish the Department at the specified time below a statement of dates during which it appears that portions of McGregor Range (Fort Bliss) can be opened for the following activity.

Statement by	Activity	Normal Season Occurs:
May 1	Antelope	October
May 1	Deer	November
May 1	Game Birds	Oct. - Jan.
May 1	Non-game Animals Management Program	Year round

4. The Center and the Department may open portions of McGregor Range (Fort Bliss) through mutual agreement to regulated hunting to military and public license holders provided that the open dates are authorized for federally regulated species. In the event the Center should cancel through necessity a hunting and fishing period, a new period, if possible, will be scheduled by mutual agreement.

5. The Department will determine annual regulations pertaining to taking of all wildlife species consistent with Federal regulations for migratory species.

6. It is mutually to the benefit of the Center and the Department to harvest annually the surplus wildlife crop; therefore, the following conditions shall herein become a condition for the hunts held on that portion of McGregor Range (Fort Bliss) lying within the State of New Mexico.

a. During the season both civilian and military personnel will adhere to military regulations, regulations of the State Game Commission, and Federal Game Laws.

b. Check stations will be jointly maintained by the Center and Department if a check station shall be deemed necessary for these parties. When a check station is designated, each person entering or leaving the hunting area for any purpose must check in and out in person at the location so designated. The Center and the Department representatives at the check station shall have authority and shall assign hunters to specified hunting areas and areas where camping may be allowed. Hunters shall hunt only on the area designated by the permit and shall not in any case trespass upon or enter into prohibited areas designated by the Center. Maps showing such prohibited areas shall be posted for the information of all concerned at each check station.

c. For the purpose of license purchase while hunting that portion of McGregor Range (Fort Bliss) lying in the State of New Mexico any military personnel residing on McGregor Range 90 days prior to purchasing a license shall be recognized as a resident and subject to purchase of a resident hunting and/or fishing license.

Personnel not residing on the McGregor Range (Fort Bliss) 90 days prior to purchasing a license can purchase the military license good only on McGregor Range only, or a non-resident hunting or fishing license that would be valid state-wide.

d. No portion of McGregor Range (Fort Bliss) will be kept open for hunting or fishing at a time when it will interfere with the military mission. During the time that the portions of McGregor Range are open for hunting or fishing such portions and places which are not open for hunting or fishing for military or security reasons shall be designated by the Center. Further, nothing herein shall be construed as giving representatives of the Department or Bureau, or BLM the right to be on the portions of McGregor Range at any time or place which shall interfere with the military missions thereof nor as granting them authority to be in the prohibited areas.

7. No property of the United States shall be subject to forfeit by laws of the State of New Mexico.

8. Any questions concerning cooperation in wildlife management shall be resolved by conference between the representatives of the Center and the Department and by BLM representatives on those lands in McGregor Range contained in the Memorandum of Understanding between the Department of Interior and the Department of the Army, dated 18 March 1965, and by Bureau representatives on military lands under Fort Bliss jurisdiction in the State of New Mexico exclusive of the lands specified in PLO 1470 and referenced Memorandum of Understanding, when responsibilities of the Department of Interior are involved.

9. No rodent or predator control programs will be initiated on those
is where BLM has responsibilities without the concurrence of the Las
ces BLM District Office, the Bureau, the Center, and the Department.

10. This cooperative plan will be in full force upon its adoption until
a time that any one member of the cooperative group shall render it
minated by so stating to the other members in writing thirty (30) days in
ance of the date of desired termination. This plan is subject to amendment
revision which shall be accomplished by written proposal to the parties
their mutual agreement. Request for amendment, change, or termination
originate with any one party.

John G. Gaddie
JOHN G. GADDIE Col, GS, DIO — 8 OCT 1974 Date

S. Army Air Defense Center & Fort Bliss
Bliss, Texas 79916
esenting the Department of Defense

William A. Hartke — JUN 26 1974 Date

ional Director
eau of Sport Fisheries & Wildlife
and Wildlife Service
artment of the Interior

[signature] — 5-30-74 Date

e Director
eau of Land Management
artment of the Interior

[signature] — 6/7/74 Date

ector
artment of Game and Fish
e of New Mexico

Approved as to form and legal sufficiency this 7th day of June, 1974.

OFFICE OF THE ATTORNEY GENERAL
STATE OF NEW MEXICO

By: [signature]
Special Assistant Attorney General

Road Closures Affecting McGregor Range

Appendix **B**

APPENDIX B

ROAD CLOSURES AFFECTING McGREGOR RANGE

This Page Intentionally Left Blank

B.0 ROAD CLOSURES AFFECTING McGREGOR RANGE

Access to these areas is provided by U.S. Highway 54 and New Mexico Highway 506 (Dell City Cutoff). Access may be restricted during certain times of the year and/or at certain times of the day because of road closures implemented to protect public safety during military operations, exercises, or other training events. Tables B-1 and B-2 detail McGregor Range road closures based on available 1996 data. Closures of New Mexico Highway 506 at the Dell City Cutoff (Table B-1), on McGregor Range, were in place on 57 days. Closures of U.S. Highway 54 (Table B-2), which is the boundary between Doña Ana Range–North Training Areas and McGregor Range, were in effect for 8 days. These data indicate that 1996 road closures were never in effect for an entire 24-hour period. The number of closure hours for all areas ranged from 1 hour on U.S. Highway 54 to 14 hours on New Mexico Highway 506 (Dell City Cutoff).

With the USAF tactical target complex on McGregor Range, training activities on the Otero Mesa could restrict access to areas south of New Mexico Highway 506 for up to 60 additional hours each week. Access to New Mexico Highway 506 would not be changed by operation of the tactical target complex (USAF, 1998).

Table B-1. 1996 McGregor Range Road Closures: Del City Cutoff and New Mexico Highway 506

Dates Open	*Dates Closed*	*Hrs Open*	*Times Closed*	*Hours*	*% Time*
1-7 Jan 96	none	168		0	0.00%
8-14 Jan 96	none	168		0	0.00%
15-21 Jan 96	none	168		0	0.00%
22-28 Jan 96	none	168		0	0.00%
29 Jan - 4 Feb 96	none	168		0	0.00%
5-11 Feb 96	none	168		0	0.00%
12-18-Feb 96	none	168		0	0.00%
19-25 Feb 96	none	168		0	0.00%
26 Feb - 3 Mar 96	none	168		0	0.00%
4-10 Mar 96	none	168		0	0.00%
11-17 Mar 96	none	168		0	0.00%
18-24 Mar 96	none	168		0	0.00%
25-31 Mar 96	none	168		0	0.00%
1-7 Apr 96	none	168		0	0.00%
8-14 Apr 96	none	168		0	0.00%
15-21 Apr 96	none	168		0	0.00%
22-28 Apr 96	none	168		0	0.00%
29 Apr - 5 May 96	none	168		0	0.00%
6-12 May 96	none	168		0	0.00%
13-19 May 96	none	168		0	0.00%
20-26 May 96	none	168		0	0.00%
27 May-2 June 96	none	168		0	0.00%
3 - 9 June 96	none	168		0	0.00%
10-16 June 96	none	168		0	0.00%
Total		*4,200*			
17-23 June 96	17-Jun-96		0900-1600	7	
	19-Jun-96		1130-2000	8.5	
	20-Jun-96		0700-2100	14	
Weekly Total		*138.5*		*29.5*	*17.56%*

Table B-1. 1996 McGregor Range Road Closures: Del City Cutoff and New Mexico Highway 506 (Continued)

Dates Open	*Dates Closed*	*Hrs Open*	*Times Closed*	*Hours Closed*	*% Time Closed*
24-30 June 96	24-Jun-96	160	0700-1500	8	4.76%
1-7 July 96	none	168		0	0.00%
8-14 July 96	none	168		0	0.00%
15-21 July 96	none	168		0	0.00%
22-28 July 96	24-Jul-96	158.5	0730-1700	9.5	5.65%
29 July - 4 Aug 96	none	168		0	0.00%
5-11 Aug 96	none	168		0	0.00%
12-18 Aug 96	none	168		0	0.00%
19-25 Aug 96	none	168		0	0.00%
Total		*1,494.5*			
26 Aug - 1 Sep 96	26-Aug-96		1200-1800	6	
	27-Aug-96		1200-1800	6	
	28-Aug-96		1200-1800	6	
	29-Aug-96		1200-1800	6	
Weekly Total		*144*		*24*	*14.29%*
2-8 Sep 96	3-Sep-96		1200-1800	6	
	4-Sep-96		0900-1800	8	
	5-Sep-96		0900-1800	8	
	6-Sep-96		1200-1800	6	
Weekly Total		*140*		*28*	*16.67%*
9-15 Sep 96	9-Sep-96		1200-1800	6	
	10-Sep-96		1200-1800	6	
	11-Sep-96		0900-1800	9	
	12-Sep-96		0900-1800	9	
Weekly Total		*138*		*30*	*17.86%*
16-22 Sep 96	16-Sep-96		1200-1800	6	
	17-Sep-96		1200-1800	6	
	18-Sep-96		0900-1800	9	
	19-Sep-96		0900-1800	9	
Weekly Total		*138*		*30*	*17.86%*
23-29 Sep 96	23-Sep-96		1200-1800	6	
	24-Sep-96		1200-1800	6	
	25-Sep-96		0900-1800	9	
	26-Sep-96		0900-1800	9	
Weekly Total		*138*		*30*	*17.86%*
30 Sep - 6 Oct 96	30-Sep-96		1200-1800	6	
	1-Oct-96		1200-1800	6	
	2-Oct-96		0900-1800	9	
	3-Oct-96		0900-1800	9	
Weekly Total		*138*		*30*	*17.86%*
7-13 0ct 96	9-Oct-96		0900-1700	8	
	10-Oct-96		0900-1700	8	
Weekly Total		*152*		*16*	*9.52%*
14-20 Oct 96	14-Oct-96		1200-1800	6	
	15-Oct-96		1200-1800	6	
	16-Oct-96		0900-1800	8	
	17-Oct-96		0900-1800	8	
Weekly Total		*140*		*28*	*16.67%*

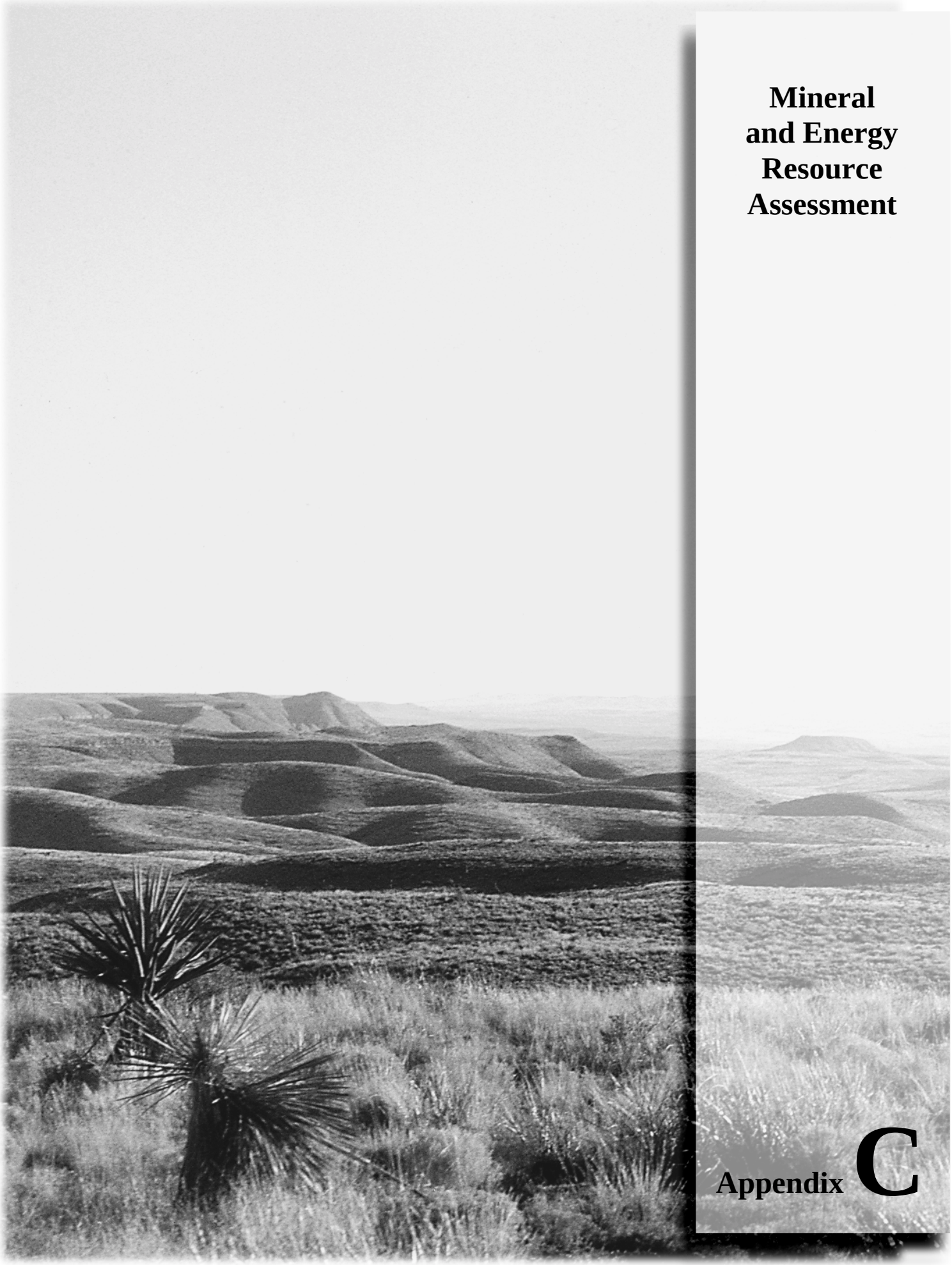
Table B-1. 1996 McGregor Range Road Closures: Del City Cutoff and New Mexico Highway 506 (Continued)

Dates Open	*Dates Closed*	*Hrs Open*	*Times Closed*	*Hours Closed*	*% Time Closed*
21-27 Oct 96	21-Oct-96		1200-1800	6	
	22-Oct-96		1200-1800	6	
	23-Oct-96		0900-1800	9	
	24-Oct-96		0900-1800	9	
	25-Oct-96		0900-1700	8	
	26-Oct-96		0900-1700	8	
Weekly Total		*122*		*46*	*27.38%*
28 Oct - 3 Nov 96	28-Oct-96		1200-1800	6	
	29-Oct-96		1200-1800	6	
	30-Oct-96		0900-1800	9	
	31-Oct-96		0900-1800	9	
Weekly Total		*138*		*30*	*17.86%*
4-10 Nov 96	4-Nov-96		1200-1800	6	
	5-Nov-96		1200-1800	6	
	6-Nov-96		0900-1800	9	
	7-Nov-96		0900-1800	9	
Weekly Total		*138*		*30*	*17.86%*
11-17 Nov 96	11-Nov-96		1200-1800	6	
	12-Nov-96		1000-1800	8	
	13-Nov-96		0900-1800	9	
	14-Nov-96		1200-1800	6	
	15-Nov-96		1200-1800	6	
	16-Nov-96		1200-1800	6	
Weekly Total		*127*		*41*	*24.40%*
18-24 Nov 96	18-Nov-96		1200-1800	6	
	19-Nov-96		1200-1800	6	
Weekly Total		*156*		*12*	*7.14%*
25 Nov - 1 Dec 96		168		0	0.00%
2-8 Dec 96		168		0	0.00%
9-15 Dec 96		168		0	0.00%
16-22 Dec 96		168		0	0.00%
23-29 Dec 96		168		0	0.00%
Total		*8,482*		*826.5*	*9.28%*

Table B-2. 1996 Closures of Highway 54

Dates Open	*Dates Closed*	*Hrs Open*	*Times Closed*	*Hrs Closed*	*% Time Closed*
5-11 Feb 96	8-Feb-96	166	0800-1000	2	1.19%
12-18-Feb 96	none	168		0	0.00%
19-25 Feb 96	none	168		0	0.00%
26 Feb - 3 Mar 96	none	168		0	0.00%
4-10 Mar 96	7-Mar-96	166	0800-1000	2	1.19%
11-17 Mar 96	none	168		0	0.00%
18-24 Mar 96	none	168		0	0.00%
25-31 Mar 96	none	168		0	0.00%
1-7 Apr 96	none	168		0	0.00%
8-14 Apr 96	none	168		0	0.00%
15-21 Apr 96	none	168		0	0.00%
22-28 Apr 96	none	168		0	0.00%
29 Apr - 5 May 96	none	168		0	0.00%
6-12 May 96	10-May-96	166	0800-1000	2	1.19%
13-19 May 96	16-May-96	167	0800-0900	1	0.60%
20-26 May 96	none	168		0	0.00%
27 May-2 June 96	none	168		0	0.00%
3 - 9 June 96	none	168		0	0.00%
10-16 June 96	none	168		0	0.00%
17-23 June 96	none	168		0	0.00%
24-30 June 96	none	168		0	0.00%
1-7 July 96	none	168		0	0.00%
8-14 July 96	none	168		0	0.00%
15-21 July 96	none	168		0	0.00%
22-28 July 96	none	168		0	0.00%
29 July - 4 Aug 96	1-Aug-96		0800-0930	1.5	
	2-Aug-96		0800-0930	1.5	
5-11 Aug 96	none	168		0	0.00%
12-18 Aug 96	none	168		0	0.00%
19-25 Aug 96	none	168		0	0.00%
26 Aug - 1 Sep 96	none	168		0	0.00%
2-8 Sep 96	none	168		0	0.00%
9-15 Sep 96	none	168		0	0.00%
16-22 Sep 96	19-Sep-96	166	0800-1000	2	1.19%
23-29 Sep 96	26-Sep-96	166	0800-1000	2	1.19%
30 Sep - 6 Oct 96	none	168		0	0.00%
7-13 Oct 96	none	168		0	0.00%
14-20 Oct 96	none	168		0	0.00%
21-27 Oct 96	none	168		0	0.00%
28 Oct - 3 Nov 96	none	168		0	0.00%
4-10 Nov 96	none	168		0	0.00%
11-17 Nov 96	none	168		0	0.00%
18-24 Nov 96	none	168		0	0.00%
25 Nov - 1 Dec 96	none	168		0	0.00%
2-8 Dec 96	none	168		0	0.00%
9-15 Dec 96	none	168		0	0.00%
16-22 Dec 96	none	168		0	0.00%
23-29 Dec 96	none	168		0	0.00%
Total		*7,882*		*17*	*0.22%*

Mineral and Energy Resource Assessment



Appendix C

APPENDIX C

MINERAL AND ENERGY RESOURCE ASSESSMENT OF THE McGREGOR RANGE, NEW MEXICO

This Page Intentionally Left Blank

C.0 MINERAL AND ENERGY RESOURCE ASSESSMENT OF McGREGOR RANGE, NEW MEXICO

C.1 DEFINITIONS OF LEVEL OF RESOURCE POTENTIAL

NO (N) mineral resource potential is a category reserved for a specific type of resource in a well-defined area.

LOW (L) mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics define a geologic environment in which the existence of resources is unlikely. This broad category embraces areas with dispersed but insignificantly mineralized rock, as well as areas with few or no indications of having been mineralized.

MODERATE (M) mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a reasonable likelihood of resource accumulation, and (or) where an application of mineral deposit models indicates favorable ground for the specified type(s) of deposits.

HIGH (H) mineral resource potential is assigned to areas where geologic, geochemical, and geophysical characteristics indicate a geologic environment favorable for resource occurrence, where interpretations of data indicate a high degree of likelihood for resource accumulation, where data support mineral deposit models indicating presence of resources, and where evidence indicates that mineral concentration has taken place. Assignment of high resource potential to an area requires some positive knowledge that mineral-forming processes have been active in at least part of the area.

UNKNOWN (U) mineral resource potential is assigned where information is inadequate to assign low, moderate, or high levels of resource potential.

C.2 DEFINITIONS OF LEVEL OF CERTAINTY

A Available information is not adequate for determination of the level of mineral resource potential.
B Available information suggests the level of mineral resource potential.
C Available information gives a good indication of the level of mineral potential.
D Available information clearly defines the level of mineral resource potential.

C.3 RELATIONSHIPS BETWEEN LEVELS OF RESOURCE POTENTIAL AND CERTAINTY

Increasing Level of Resource Potential

U/A	H/B High Potential	H/C High Potential	H/D High Potential
	M/B Moderate Potential	M/C Moderate Potential	M/D Moderate Potential
Unknown Potential	L/B Low Potential	L/C Low Potential	L/D Low Potential
			N/D No Potential

Increasing Level of Certainty

C.4 RESOURCE POTENTIAL AND MINING DISTRICT SUMMARY INFORMATION

Table C-1. Summary of Mineral and Energy Resource Potential on McGregor Range

Resource	*Area*	*Potential*	*Certainty*	*Comments*
Metallic Mineral Resources				
Beryllium	Red Hills area	Low to moderate	B-C	Favorable alkaline host rocks
	Southern Otero Platform area	Low to moderate	C	Similar to topaz-rhyolites
	Martin-Hay Meadow Canyons area	Low	B	None
	Elsewhere on McGregor Range	None	D	None
Copper	Southern Jarilla Mountains area	Low to moderate	C	Great Plains Margin (GPM) deposits
	Red Hills area	Low to moderate	C	GPM deposits
	Martin-Hay Meadow Canyons area	Low to moderate	B-C	Sedimentary copper, GPM deposits
	Southern Otero Platform area	Low	C	Epithermal/mesothermal veins
	El Paso-Culp Canyons area	Low	B	Carbonate-hosted deposits
	Elsewhere on the McGregor Range	None	D	None
Gold	Southern Jarilla Mountains area	Low	C	GPM deposits
	Red Hills area	Low	C	Sedimentary copper, GPM deposits
	Martin-Hay Meadow Canyons area	Low to moderate	B	Epithermal/mesothermal veins
	Southern Otero Platform area	Low	C	Carbonate-hosted deposits
	El Paso-Culp Canyons area	Low	B	None
	Elsewhere on the McGregor Range	None	D	None
Iron	Entire McGregor Range	Low	C	Favorable host rocks
Lead-zinc	Southern Jarilla Mountains area	Moderate	C	GPM deposits
	Red Hills area	Low to moderate	C	GPM deposits
	Martin-Hay Meadow Canyons area	Low to moderate	B	Sedimentary copper, GPM deposits
	Southern Otero Platform area	Low	C	Epithermal/mesothermal veins
	El Paso-Culp Canyons area	Low	B-C	Carbonate-hosted deposits
	Elsewhere on the McGregor Range	None	D	None
Manganese	Central basin area	Low to moderate	B-C	Geochemical anomalies
	Elsewhere on the McGregor Range	Low	C	None
Molybdenum	Southern Jarilla Mountains area	Moderate	C	GPM deposits
	Red Hills area	Low	C	GPM deposits
	Martin-Hay Meadow Canyons area	Low to moderate	B	GPM deposits
	Southern Otero Platform area	Low	C	GPM deposits
	Elsewhere on the McGregor Range	None	D	None
Niobium	Red Hills area	Low	C	Favorable alkaline host rocks
	Elsewhere on the McGregor Range	None	D	None
PGE	Entire McGregor Range	None	C-D	Favorable host rocks
Silver	Southern Jarilla Mountains area	Moderate	C	GPM deposits
	Red Hills area	Low to moderate	C	GPM deposits
	Martin-Hay Meadow Canyons area	Low to moderate	B	Sedimentary copper, GPM deposits
	Southern Otero Platform area	Low	C	Epithermal/mesothermal veins
	El Paso-Culp Canyons area	Low	B	Carbonate-hosted deposits
	Elsewhere on the McGregor Range	None	D	None
Thorium and rare-earth elements	Red Hills area	Low	C	Favorable alkaline host rocks
	Elsewhere on the McGregor Range	None	D	None

Table C-1. Summary of Mineral and Energy Resource Potential on McGregor Range (Continued)

Metallic Mineral Resources (Continued)				
Tin	Southern Otero Platform area	Low	C	Similar to topaz-rhyolites
	Elsewhere on McGregor Range	None	D	None
Other metallic resources[1]	Entire McGregor Range	None	D	None
Industrial Mineral Resources				
Barite and Fluorite	All	Low	B-C	None
Borate	All	Low	D	None
Building Stone	All	Low-Moderate	B-D	Dimension stone has dark color, and decorative stone lacks distinctive colors or textures
Clay	All	Low	C	No specialty clay minerals are present
Construction Aggregate	All	None-High	D	Refer to Figures 3.5-1 through 3.5-4
Garnet	Hueco and Jarilla Mountains	Low	C	Possible near Tertiary intrusions
	Elsewhere on the McGregor Range	None	D	None
Gypsum	All	None-High	B-C	Refer to Figure 3.5-4
Halite	All	Low	C	None
Limestone and Dolestone	All	None-High	D	Refer to Figure 3.5-4, potential for limestone is rated as none to high and dolestone is rated as low
Nepheline Syenite	Red Hills area	Low	C	None
	Elsewhere on the McGregor Range	None	D	None
Silica	All	Low	D	None
Sulfur	All	Low	D	None
Energy Resources				
Coal	All	None	D	No Cretaceous rocks
Geothermal	Near McGregor Base Camp	High	D	Refer to Figure 3.5-5
	Western portion of McGregor Range	Moderate	B	Refer to Figure 3.5-5
	Elsewhere on the McGregor Range	Low	B	Refer to Figure 3.5-5
Petroleum	Otero Platform and Huecco Uplift area	Low-Moderate	C	Refer to Figure 3.5-6
	Sacramento Uplift area	Low	C	Refer to Figure 3.5-6
	Tularosa Basin area	Moderate	C	Refer to Figure 3.5-6
Uranium	Hueco Mountains and Martin-Hay Meadows area	Low	C	None
	Elsewhere on the McGregor Range	None	D	None

[1] Includes: bismuth, cadmium, cobalt, chromium, nickel, tantalum, vanadium, tungsten, and zirconium.
Source: U.S. Army 1998g.

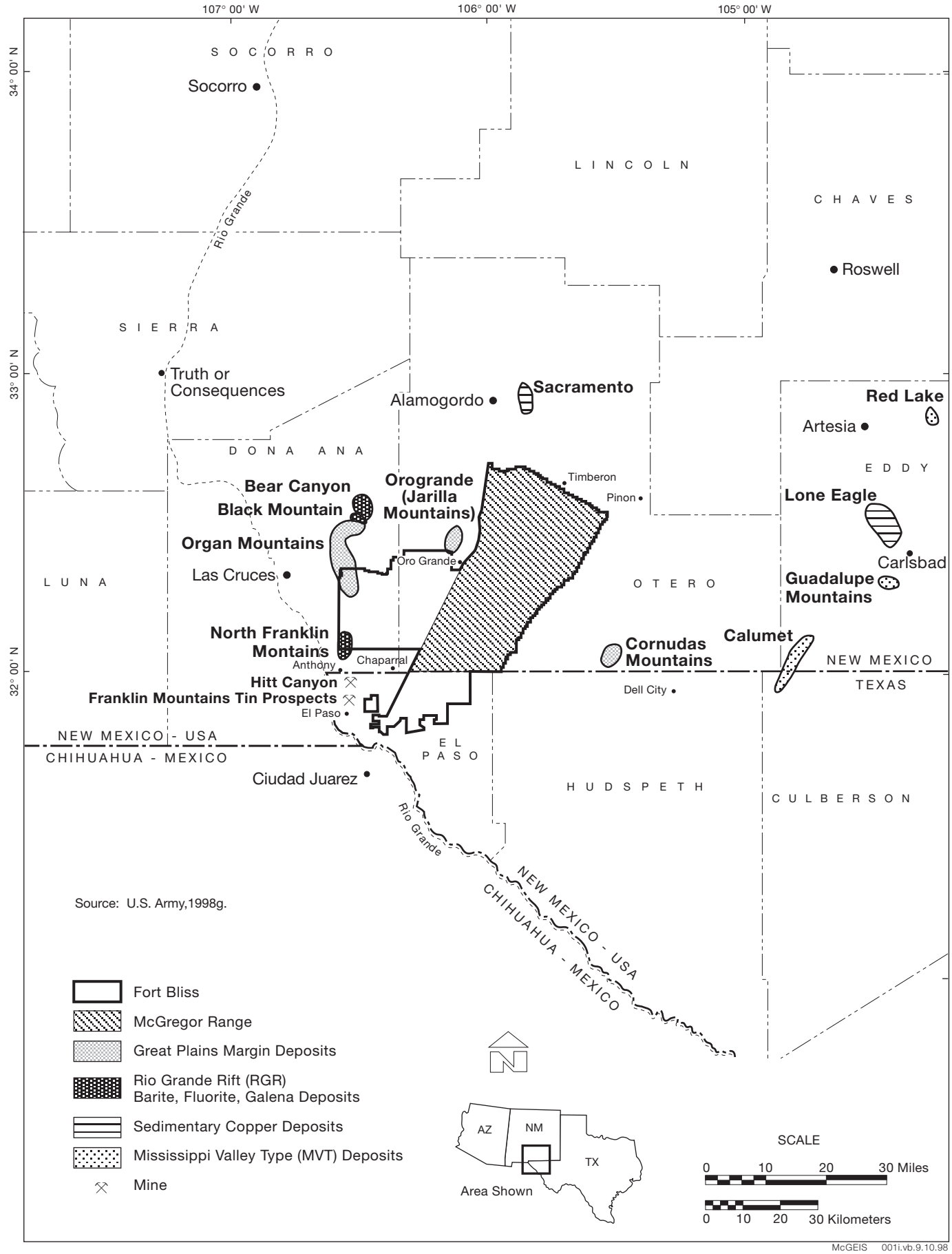


Figure C-1. Mining Districts Adjacent to the McGregor Range.

Table C.2. Summary Information on Mining Districts Adjacent to McGregor Range

District Name (Aliases)	*Year of Discovery*	*Production Years*	*Historically Produced Commodities*	*Estimated Cumulative Value[2] ($K)*	*Type of Mineral Deposit*
Bear Canyon (Stevens, San Augustin)	1883	Early 1900s	Copper, silver, lead, barite	< 5	Rio Grande Rift (RGR)
Black Mountain (Kent, Organ, Gold Camp)	1883	1883-1990s	Copper, gold, silver, fluorite, lead	< 78	RGR
Calumet	1900s	1914-1927	Copper, silver	0	Sedimentary copper
Cornudas Mountains	1950s	1995	Nepheline syenite	0	GPM
Franklin Mountains Tin Deposits	1900s	1900s	Tin	< 5	Tin vein
Guadalupe Mountains (Two Ladies)	1930s	None	None	< 1	Mississippi Valley Type (MVT)
Hitt Canyon	Unknown	None	None	0	Copper, lead, zinc skarn or carbonate-hosted deposits, iron contact-metasomatic and skarn
Lone Eagle (Golden Eagle, Lucky Strike, Great Eagle, Annon)	1905	1905-1956	Copper	8	Sedimentary copper
Northern Franklin Mountains	1914	1925-1928	Lead, silver, gypsum, jarosite, galena	< 1	RGR deposits, sedimentary
Organ Mountains (Mineral Hill, Biships Cap, Organ Gold Camp, Modac, South Canyon, Soledad Canyon, Texas Canyon)	1830s, perhaps as early as 1797	1849-1961	Copper, lead, gold, silver, barite, fluorite, uranium, vanadium, zinc, bismuth	4,000	Carbonate-hosted lead-zinc replacement, skarn, pegmatites, epithermal/mesothermal veins, porphyry-copper-molybdenum(?), copper breccia, RGR
Orogrande (Jarilla, Brice, Silver Hill)	1890	1890-1966	Copper, gold, lead, silver, iron, tungsten, turquoise	2,000	GPM, placer gold
Red Lake	Unknown	1900s	Copper, silver	< 1	MVT
Sacramento (High Rolls)	1900	1904-1962	Copper, lead, gold, silver, zinc	100	Sedimentary copper

[1] Refer to Figure 35 for approximate locations.

[2] Value of production in original dollars.

Source: U.S. Army, 1998g.

Biology

Appendix D

APPENDIX D

BIOLOGY

This Page Intentionally Left Blank

D.0 BIOLOGY

This appendix provides more detailed information for some of the topics covered in Sections 3.8 and 4.8, *Biological Resources,* of this LEIS. It provides a summary of some of the ecological studies conducted that describe existing biological resources on McGregor Range. These studies are being conducted to support the INRMP currently being prepared by the Army. In addition, a description of baseline biological resources on McGregor Range are required to adequately describe environmental impacts of the alternatives. This appendix is used in the impacts analysis for biological resources in Section 4.8.

The major focus of this appendix is to provide wildlife data (especially tabular data) that is too extensive to include in Section 3.8. The discussions of wildlife biological resources in Section 3.8 of the LEIS are summaries of the information presented in this appendix. The description of plant communities on McGregor Range, including vegetation maps, appears in Section 3.8, and there is not an expanded discussion of these resources in this appendix. There is a discussion of wetlands and arroyo-riparian drainages in this appendix that is summarized in Section 3.8.

D.1 VEGETATION

A description of plant communities on McGregor Range, including the number of acres of each type, as well as a vegetation map, appear in Section 3.8.

D.2 WETLANDS AND ARROYO-RIPARIAN DRAINAGES

Wetlands and arroyo-riparian drainages (Waters of the U.S.) have been mapped and characterized on McGregor Range and elsewhere on Fort Bliss (U.S. Army, 1998h, 1997d). Wetlands delineation follows the USACE protocol in the "Army Corps of Engineers Wetlands Delineation Manual" (U.S. Army, 1987). To qualify as a USACE jurisdictional wetland, it must have hydric soil, be saturated to the surface sometime during the growing season, and contain wetland plant species (U.S. Army, 1987). Waters of the U.S. include "water such as intrastate lakes, rivers, streams (including intermittent streams)" (33 CFR 328.3(a)(3). Probable Waters of the U.S. have been mapped on McGregor Range (see Figure 3.7-1 in Section 3.7). These inventories of wetlands and Waters of the U.S. are provided for planning purposes and the boundaries of the wetlands and Waters of the U.S. have not been determined. The boundaries of wetlands and Waters of the U.S. will be delineated for site-specific projects and a final determination by the USACE district engineer is needed before a delineation is confirmed. Actively maintained man-made features such as stock tanks may be nonjurisdictional. However, abandoned stock tanks and other man-made features may be regulated if they conduct and/or hold surface water (U.S. Army, 1998h).

Observations were made at 226 locations on McGregor Range and the South Training Areas including arroyo-riparian drainages, stock tanks, and other water resources. Data such as major plant species, and depth and width of channel, were recorded. A total of 49 sites were analyzed in greater detail including data on plant species and percent cover, hydrology, soils, and surrounding upland vegetation. Based on this analysis, arroyo-riparian drainages (probable Waters of the U.S.) on McGregor Range included 1,228 dry washes with distinct stream beds and stream banks covering 1,874 miles. In addition, 11 natural dry lakes, with distinct ordinary high water marks totaling 127 acres, and 79 artificial bodies of water, such as sewage treatment ponds, storm water retention basins, and stock tanks totaling 802 acres, were mapped on McGregor Range (U.S. Army, 1998h).

The vast majority of arroyo-riparian drainages on McGregor Range do not qualify as USACE jurisdictional wetlands but, as indicated above, thousands of miles of these waterways are probable Waters of the U.S. Perennial riparian corridors of the western U.S. have been studied extensively and the density and diversity of flora and fauna in many of these areas determined. However, the flora and fauna of arroyo-riparian drainages on McGregor Range and elsewhere have been partially investigated (Cockman, 1996; Kozma, 1995).

Cockman (1996) studied four arroyo-riparian drainages on McGregor Range in Culp Canyon; two were in the desert shrublands of the Sacramento Mountains foothills at elevations ranging from 5,900 feet at the headwaters to 5,480 feet at the tailwaters. The other two drainages were also in the desert shrublands in the submesa at elevations ranging from 4,920 feet (headwaters) to 4,500 feet (tailwaters). The dominant shrubs in the foothill drainages were skeletonleaf goldeneye (*Viguiera stenoloba)*, little leaf sumac (*Rhus microphylla)*, largeleaf sumac (*R. trilobata*), and Apache plume (*Fallugia paradoxa*). Cutleaf bricklebush (*Brickellia laciniata),* Mexican silktassel *(Garrya ovata),* and desert willow (*Chilopsis linearis*) were found only in the main channel (obligate species). The dominate shrubs in the submesa drainages were desert willow, Apache plume, four winged saltbush (*Atriplex canescens)*, little and big leaf sumac, and honey mesquite (*Prosopis glandulosa)*. Creosotebush (*Larrea tridentata)*, skeletonleaf goldeneye, and tarbush (*Flourensia cernua)* were also common. Desert willow and Apache plume were obligate in the main channel.

In the desert shrub plant communities at and near the Sacramento Mountains foothills, Cockman (1996) determined that the following vegetation parameters characterize arroyo-riparian drainages on McGregor Range:

- Shrub, tree, and forb cover are higher on the main channel than the surrounding area;
- Species richness of shrubs, trees, grasses, and forbs are higher in the main channel than all other locations;
- Heights of shrubs along the main channel are nearly twice that of shrubs in the uplands; and
- Obligate species such as desert willow tended to be taller than nondrainage species.

Obligate species at one elevation may occur outside of the drainage at another elevation. For example, Apache plume is obligate in the submesa drainages but occurs outside the drainages in the foothills. Species such as little and big sumac, which occur at many locations in the foothill and submesa drainages, may be obligate species in desert floor of the Tularosa Basin (Cockman et al., 1996). Little sumac has been observed in sandy soil in areas apparently outside of drainages in the Tularosa Basin.

D.3 WILDLIFE

D.3.1 Amphibians and Reptiles

A total of 8 species of amphibians and 39 species of reptiles have been observed on McGregor Range; an additional 19 species of amphibians and reptiles have the potential to occur (U.S. Army, 1997d, e,1996e) (Table D.3-1). Seven of the amphibian species are toads and the eighth species is the barred tiger salamander (*Ambystoma tigrinum mavortium)* which is found in stock tanks on the Otero Mesa and in the Tularosa Basin. Numerous Great Plains toads (*Bufo cognatus),* New Mexico spadfoot (*Spea*

Table D.3-1. Amphibians and Reptiles that Occur and Could Occur on McGregor Range, Otero County, New Mexico

Species		*Occurrence on McGregor Range*	
Common Name	*Scientific Name*	*Known*	*Possible*
Barred tiger salamander	*Ambystoma tigrinum mavortium*	●	
Great plains toad	*Bufo cognatus*	●	
Western green toad	*Bufo debilis insidior*	●	
Red spotted toad	*Bufo punctatus*	●	
Woodhouse's toad	*Bufo woodhousii*		
Southern woodhouse's toad	*B. w. australis*		●[a]
Woodhouse's toad	*B. w. woodhousii*	●	
Canyon tree frog	*Hyla arenicolor*		●
Bullfrog	*Rana catesbeiana*		●
Couch's spadefoot	*Scaphiopus couchii*	●	
Plains spadefoot	*Spea bombifrons*	●	
New Mexico spadefoot	*Spea multiplicata*	●	
Western painted turtle	*Chrysemys picta bellii*		●
Yellow mud turtle	*Kinosternon flavescens flavescens*		●
Box turtle	*Tarapene ornata*		
Desert box turtle	*T. o. luteola*	●	
Ornate box turtle	*T. o. ornata*	●	
Chihuahuan spotted whiptail	*Cnemidophorus exanguis*	●	
Trans-Pecos striped whiptail	*Cnemidophorus inornatus heptagrammus*	●	
Western marbled whiptail	*Cnemidophorus marmoratus marmoratus*	●	
New Mexico whiptail	*Cnemidophorus neomexicanus*	●	
Colorado checkered whiptail	*Cnemidophorus tesselatus*	●	
Desert grassland whiptail	*Cnemidophorus uniparens*	●	
Texas banded gecko	*Coleonyx brevis*	●	
Greater earless lizard	*Cophosaurus texanus scitulus*	●	
Chihuahuan collared lizard	*Crotaphytus collaris fuscus*	●	
Great Plains skink	*Eumeces obsoletus*	●	
Longnose leopard lizard	*Gambelia wislizenii wislizenii*	●	
Mediterranean gecko	*Hemidactylus turcicus*	●	
Earless lizard	*Holbrookia maculata*		
Speckled earless lizard	*H. m. approximans*		●[a]
Northern earless lizard	*H. m. maculata*	●	
Texas horned lizard	*Phrynosoma cornutum*	●	
Short-horned lizard	*Phrynosoma douglasii*		
Desert short-horned lizard	*P.d. ornatissimum*		
Mountain short-horned lizard	*P.d. hernandezii*	●	●
Roundtail horned lizard	*Phrynosoma modestum*	●	
Twin-spotted spiny lizard	*Sceloporus magister bimaculosus*	●	
Crevice spiny lizard	*Sceloporus poinsettii poinsettii*		●
Southern prairie lizard	*Sceloporus undulatus consobrinus*	●	
Tree lizard	*Urosaurus ornatus*		
Lined tree lizard	*U. o. linearis*	●	
Big bend tree lizard	*U. o. schmidti*		●[a]
Northern tree lizard	*U. o. wrighti*		●[a]

Table D.3-1. Amphibians and Reptiles that Occur and Could Occur on McGregor Range, Otero County, New Mexico (Continued)

Species		*Occurrence on McGregor Range*	
Common Name	*Scientific Name*	*Known*	*Possible*
Desert side-blotched lizard	*Uta stansburiana stejnegeri*	●	
Kansas glossy snake	*Arizona elegans elegans*	●	
Trans-Pecos rat snake	*Bogertophis subocularis*		●
Mexican racer	*Coluber constrictor oaxaca*		●
Western diamondback rattlesnake	*Crotalus atrox*	●	
Rock rattlesnake Banded rock rattlesnake Mottled rock rattlesnake	*Crotalus lepidus* *C. l. klauberi* *C. l. lepidus*	● 	 ●[a]
Blacktail rattlesnake	*Crotalus molossus molossus*		●
Mojave rattlesnake	*Crotalus scutulatus*	●	
Prairie rattlesnake	*Crotalus viridis viridis*	●	
Regal ringneck snake	*Diadophis punctatus regalis*	●	
Great Plains rat snake	*Elaphe gutatta emoryi*		●
Western hooknose snake	*Gyalopion canum*	●	
Hognose snake Mexican hognose snake Plains hognose snake	*Heterodon nasicus* *H. n. kennerlyi* *H. n. nasicus*	 	 ● ●
Texas night snake	*Hypsiglena torquata jani*	●	
Gray-banded kingsnake	*Lampropeltis alterna*		●
Desert kingsnake	*Lampropeltis getula splendida*	●	
New Mexico milksnake	*Lampropeltis triangulum celaenops*		●
New Mexico blind snake	*Leptotyphlops dulcis dissectus*	●	
Trans-Pecos blind snake	*Leptotyphlops humilis segregus*		●
Western coachwhip	*Masticophis flagellum testaceus*	●	
Striped whipsnake	*Masticophis taeniatus*	●	
Gopher snake Sonoran gopher snake Bullsnake	*Pituophis catenifer* *P. c. affinis* *P. c. sayi*	 ● ●	
Texas longnose snake	*Rhinocheilus lecontei tessellatus*	●	
Big bend patchnose snake	*Salvadora deserticola*		●
Mountain patchnose snake	*Salvadora grahamiae grahamiae*	●	
Desert massasauga	*Sistrurus catenatus edwardsii*		●
Ground snake	*Sonora semiannulata*	●	
Southwestern blackhead snake	*Tantilla hobartsmithi*		●
Plains blackhead snake	*Tantilla nigriceps*	●	
Western blackneck garter snake	*Thamnophis cyrtopsis cyrtopsis*		●
Checkered garter snake	*Thamnophis marcianus marcianus*		●
New Mexico garter snake	*Thamnophis sirtalis dorsalis*		●
Texas lyre snake	*Trimorphodon biscutatus vilkinsonii*	●	
Total species		*47*[b]	*19*[b]

[a] Not included in total because species is already included in Known Column.
[b] Total includes only the number of species.
Source: U.S. Army 1996e, g; 1997d, e.

multiplicata), and Couch's spadefoot (*Scaphiopus couchii)* were observed at stock tanks on Otero Mesa (U.S. Army, 1997d). A few red-spotted toads (*Bufo punctatus)* were also observed on the Otero Mesa (U.S. Army, 1997d); this species has also been observed in the desert shrub habitat of the Tularosa Basin (U.S. Army, 1996e). Sampling at 20 sites in the Chihuahuan Desert in the Tularosa Basin on McGregor Range (Figure D.3-1) resulted in the capture of 428 toads and the New Mexico spadefoot was the most common with 278 captures (65 percent of total) followed Couch's spadefoot with 103 captures (24 percent). All but one of the New Mexico spadefoot were from one sampling location while the Couch's spadefoot was much more widespread being captured at all 20 sampling sites. The Great Plains toad and western green toad (*Bufo delilis)* were each captured 18 times (4 percent) and occurred at over one-half of the sample locations. The red-spotted toad and plains spadefoot (*Spea bombifrons)* were captured infrequently (5 and 2 times respectively) (U.S. Army, 1996e).

The box turtle (*Terrapene ornata)* is the only species of turtle observed on McGregor Range and is most common in the grassland plant communities on the Otero Mesa although it has been regularly observed in the desert shrubland communities in the Tularosa Basin (U.S. Army, 1997d, e, 1996e, h). This species was recorded 11 times at six sampling sites (Figure D.3-1) on the Otero Mesa during baseline amphibian and reptile surveys in 1997 (U.S. Army, 1997d) (Table D.3-2). It was also recorded 11 times at 9 of 20 sample plots in the desert shrublands habitat in the Tularosa Basin (U.S. Army, 1996e).

The most diverse group of reptiles are the lizards; 20 species have been recorded from McGregor Range including 6 species of whiptails (Table D.3-1) (U.S. Army, 1997e). The largest number of lizard species occur in the grassland habitat (17 species) followed by the desert shrublands (13), Sacramento Mountains foothills (10), and Organ Mountains (6) (U.S. Army, 1997e). Some species such as the western marbled whiptail (*Cnemidophorus marmoratus)* and Texas horned lizard (*Phrynosoma cornutum*) are found in essentially all areas on McGregor Range, while others such as the leopard lizard (*Gambelia wislizenii*) have been reported only from the desert shrubland habitat and the lined tree lizard (*Urosaurus ornatus)* only in the wooded habitat of the Sacramento Mountains foothills (U.S. Army, 1997e). Eleven species of lizards were recorded 290 times and the most common species were the southern prairie lizard (*Sceloporus undulatus),* which was captured 89 times (31 percent of total lizard captures) and the northern earless lizard (*Holbrookia maculata)*, which was captured 85 times (29 percent). The side-blotched lizard (*Uta stansburiana)* and spotted whiptail (*Cnemidophorus exanguis)* were each recorded only once (U.S. Army, 1997d) (Table D.3-2). The most common lizards captured in the desert shrubland habitat were the striped whiptail (5,500 captures), side-blotched lizard (3,163 captures), and marbled whiptail (845 captures) (U.S. Army, 1996e). In a study of amphibians and reptiles in eight arroyos and adjacent upland sites in the Chihuahuan Desert shrubland plant communities on McGregor Range found that there was no statistical difference in the amphibian and reptile species richness and abundance between arroyo and upland habitats. The most common species captured were the side-blotched lizard (captured 249 times), the marbled whiptail (191 captures),and the little striped whiptail (78 captures) (U.S. Army, 1996e).

Eighteen species of snakes have been recorded from McGregor Range (U.S. Army, 1997e, 1996e) (Table D.3-1). The largest number of species occur in the grassland habitat on Otero Mesa (13 species) followed by the desert shrubland and Sacramento Mountains foothills (11). Species such as the western diamondback rattlesnake (*Crotalus atrox)* and gopher snake (*Pituophis catenifer)* are common and widespread throughout Fort Bliss. Other species such as the Mojave (*C. scutulatus)* and prairie (*C. viridis)* rattlesnakes have been reported only from the grassland habitat on Otero Mesa, and the Texas long-nosed snake (*Rhinocheilus lecontei)* was observed only in the Sacramento Mountains foothills (U.S. Army, 1997e) and the desert shrubland habitat of the Tularosa Basin (U.S. Army, 1996e). Surveys on Otero Mesa in 1997 yielded seven species of snakes (Table D.3-2). The western diamondback rattlesnake and western coachwhip (*Masticophis flagellum)* were the most common species observed. Other species observed include the hook-nosed snake (*Gyalopion canum),* Kansas glossy snake (*Arizona elegans)*, and

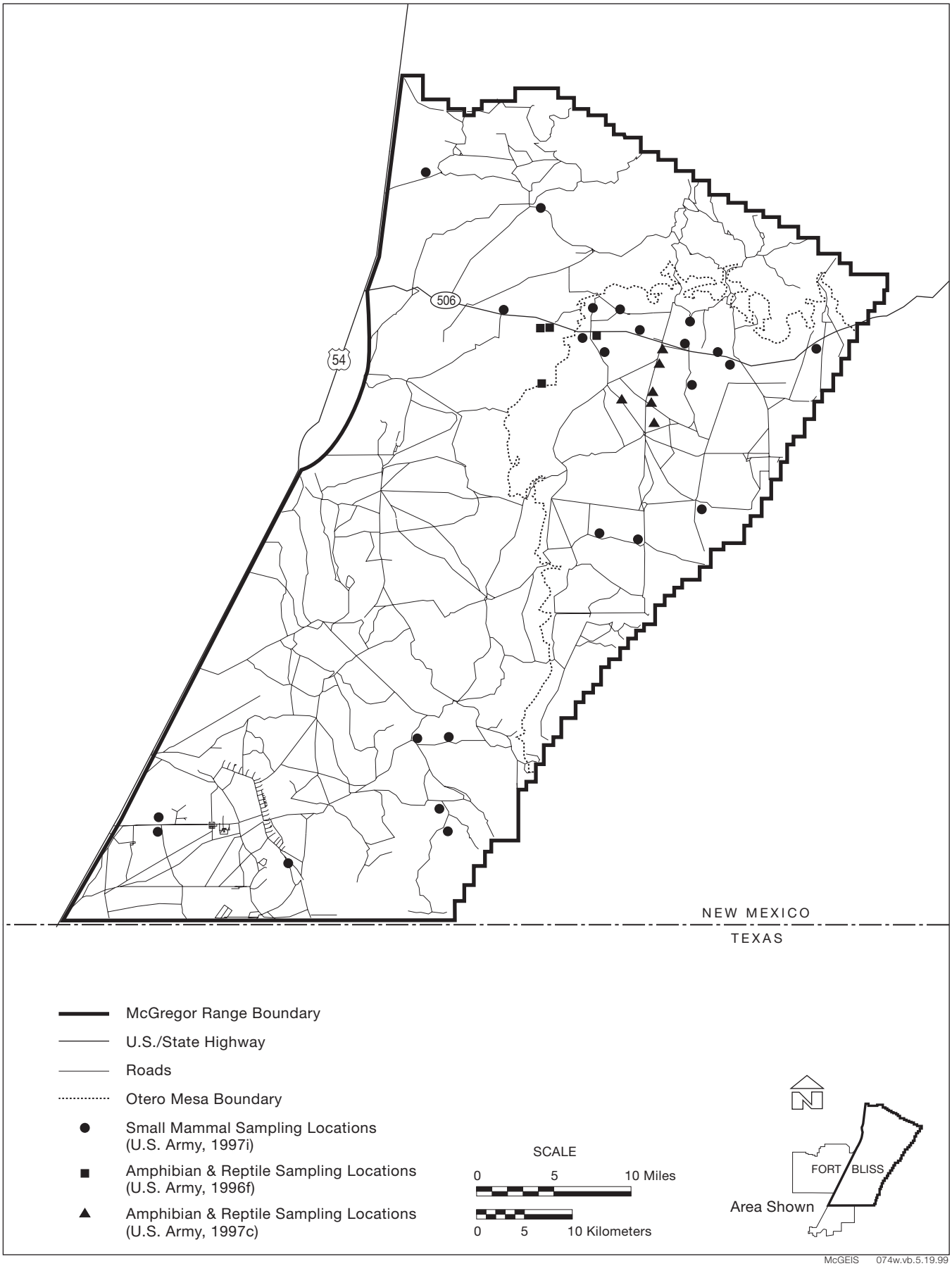


Figure D.3-1. Amphibian, Reptile and Small Mammal Sampling Locations on McGregor Range.

Table D.3-2. Amphibians and Reptiles Observed at Six Sampling Sites, Along Arroyos, Roads, and at Stock Tanks on McGregor Range in 1997

Species[a]	*Sampling Site*						*Arroyo*	*Tanks*	*Roads*	*Total*
	1	*2*	*3*	*4*	*5*	*6*				
New Mexico spadefoot	0	1	0	0	15	7	1	N[b]	0	*N(24)*[c]
Great Plains toad	0	0	0	0	0	0	0	N	0	*N*
Couch's spadefoot	0	0	0	0	0	0	0	N	1	*N(1)*[c]
Southern prairie lizard	15	1	4	41	0	22	6	0	0	*89*
Northern earless lizard	7	33	17	8	14	6	0	0	0	*85*
Striped whiptail	8	17	21	12	0	2	3	0	2	*65*
Short-horned lizard	0	10	3	0	2	1	2	0	2	*20*
Collared lizard	7	4	0	0	0	1	1	0	1	*14*
Western box turtle	0	0	0	0	1	0	0	2	8	*11*
Checkered whiptail	3	0	0	0	0	0	4	0	0	*7*
Western diamondback rattlesnake	1	0	0	0	0	0	4	0	2	*7*
Western coachwhip	0	0	0	0	0	0	2	0	3	*5*
Texas horned lizard	0	1	1	0	0	0	0	0	2	*4*
Sonoran gopher snake	0	1	0	0	0	0	0	0	2	*3*
Red-spotted toad	0	0	0	0	0	0	0	0	3	*3*
Round-tailed horned lizard	0	2	0	0	0	0	0	0	0	*2*
Hooknose snake	0	0	1	0	1	0	0	0	0	*2*
Greater earless lizard	0	0	0	0	0	0	0	0	2	*2*
Spotted whiptail	1	0	0	0	0	0	0	0	0	*1*
Kansas glossy snake	0	0	0	1	0	0	0	0	0	*1*
Side-blotched lizard	0	0	0	0	0	0	1	0	0	*1*
Prairie rattlesnake	0	0	0	0	0	0	0	0	1	*1*
Garter snake species	0	0	0	0	0	0	0	0	1	*1*
Total number of species	*7*	*9*	*6*	*4*	*5*	*6*	*9*	*4*	*13*	*23*
Total number of individuals	*42*	*70*	*47*	*62*	*33*	*39*	*24*	*2*[d]	*30*	*349*

[a] See Table D.2-1 for scientific names.
[b] "N" = numerous.
[c] Number observed at locations other than tanks.
[d] Numerous toads also observed.
Source: U.S. Army, 1997d.

prairie rattlesnake (U.S. Army, 1997d). In the desert shrubland habitat in the Tularosa Basin, the night snake (*Hypsiglena torquata*) (59 captures), plains black-headed snake (*Tantilla nigriceps)* (58 captures), and ground snake (*Sonora semiannulata*) (43 captures) were the most common. Five species were recorded fewer times including the western hook-nosed snake (18 captures), long-nosed snake (*Rhinocheilus lecontei)* (8 captures), desert kingsnake (*Lampropeltis gelula)* (3 captures), gopher snake, and western coachwhip (1 capture each) (U.S. Army, 1996e).

D.3.2 Avifauna

A total of 334 species of birds have been recorded from Fort Bliss (U.S. Army, 1996h) and 223 of these have been recorded from McGregor Range (Table D.3-3). Sixty-three of the species not recorded from McGregor Range were diving birds, wading birds, waterfowl, shorebirds, gulls, and terns that use aquatic habitats; appropriate aquatic habitat for these species either does not exist or is rare on McGregor Range. Many of these aquatic and wetlands species have been observed at the sewage lagoons and oxidation

Table D.3-3. Birds Observed on Fort Bliss, Otero and Doña Ana Counties, New Mexico, and El Paso County, Texas

Species		*Relative Abundance*[a]				
Common Name	*Scientific Name*	*A*	*C*	*FC*	*UC*	*R*
Common loon	*Gavia immer*					●
Pied-billed grebe[b]	*Podilymbus podiceps*			●		
Horned grebe	*Podiceps auritus*					●
Eared grebe	*Podiceps nigricollis*			●		
Western grebe	*Aechmophorus occidentalis*				●	
Clark's grebe	*Aechmophorus clarkii*					●
American white pelican	*Pelecanus erythrorhynchus*					●
Double-crested cormorant	*Phalacrocorax auritus*				●	
Neotropic cormorant	*Phalacrocorax brasilianus*				●	
Least bittern	*Ixobrychus exilis*					●
Great blue heron[b]	*Ardea herodias*			●		
Great egret[b]	*Ardea alba*				●	
Snowy egret[b]	*Egretta thula*				●	
Little blue heron	*Egretta caerulea*					●
Reddish egret	*Egretta rufescens*					●
Cattle egret[b]	*Bubulcus ibis*				●	
Green heron[b]	*Butorides virescens*				●	
Black-crowned night-heron	*Nycticorax nycticorax*				●	
Yellow-crowned night-heron	*Nyctanass violacea*					●
Glossy ibis	*Plegadis falcinellus*					●
White-faced ibis	*Plegadis chihi*			●		
Turkey vulture[b]	*Cathartes aura*		●			
Greater white-fronted goose	*Anser albifrons*					●
Snow goose[b]	*Chen caerulescens*			●		
Ross's goose	*Chen rossii*					●
Canada goose	*Branta canadensis*					●
Wood duck	*Aix sponsa*				●	
Gadwall[b]	*Anas strepera*			●		
Eurasian wigeon	*Anas penelope*					●
American wigeon[b]	*Anas americana*			●		
Mallard[b]	*Anas platyrhynchos*			●		
Blue-winged teal[b]	*Anas discors*			●		
Cinnamon teal[b]	*Anas cyanoptera*			●		
Northern shoveler[b]	*Anas clypeata*		●			
Northern pintail[b]	*Anas acuta*			●		
Green-winged teal[b]	*Anas crecca*		●			
Canvasback[b]	*Aythya valisineria*			●		
Redhead[b]	*Aythya americana*			●		
Ring-necked duck[b]	*Aythya collaris*			●		
Greater scaup	*Aythya marila*					●
Lesser scaup[b]	*Aythya affinis*			●		
Surf scoter	*Melanitta perspicillata*					●
White-winged scoter	*Melanitta fusca*					●
Bufflehead[b]	*Bucephala albeola*				●	
Common goldeneye	*Bucephala clangula*				●	
Hooded merganser	*Lophodytes cucullatus*					●
Common merganser	*Mergus merganser*				●	
Red-breasted merganser	*Mergus serrator*					●
Masked duck	*Nomonyx dominicus*					●
Ruddy duck[b]	*Oxyura jamaicensis*			●		
Osprey[b]	*Pandion haliaetus*			●		

Table D.3-3. Birds Observed on Fort Bliss, Otero and Doña Ana Counties, New Mexico, and El Paso County Texas (Continued)

Species		*Relative Abundance*[a]				
Common Name	*Scientific Name*	*A*	*C*	*FC*	*UC*	*R*
White-tailed kite[b]	*Elanus leucurus*					●
Mississippi kite[b]	*Ictinia mississippiensis*					●
Bald eagle[b]	*Haliaeetus leucocephalus*				●	
Northern harrier[b]	*Circus cyaneus*			●		
Sharp-shinned hawk[b]	*Accipiter striatus*				●	
Cooper's hawk[b]	*Accipiter cooperii*			●		
Northern goshawk[b]	*Accipiter gentilis*					●
Gray hawk	*Asturina nitidus*					●
Common black-hawk	*Buteogallus anthracinus*					●
Harris's hawk[b]	*Parabuteo unicinctus*					●
Swainson's hawk[b]	*Buteo swainsoni*		●			
Red-tailed hawk[b]	*Buteo jamaicensis*		●			
Rough-legged hawk[b]	*Buteo lagopus*					●
Ferruginous hawk[b]	*Buteo regalis*			●		
Zone-tailed hawk[b]	*Buteo albonotatus*					●
Golden eagle[b]	*Aquila chrysaetos*			●		
American kestrel[b]	*Falco sparverius*		●			
Merlin[b]	*Falco columbarius*					●
Prairie falcon[b]	*Falco mexicanus*				●	
Peregrine falcon[b]	*Falco peregrinus*					●
Wild turkey[b]	*Meleagris gallopavo*				●	
Montezuma quail[b]	*Cyrtonyx montezumae*				●	
Scaled quail[b]	*Callipepla squamata*		●			
Gambel's quail[b]	*Callipepla gambelii*		●			
Virginia rail	*Rallus limicola*					●
Sora	*Porzana carolina*					●
Common moorhen	*Gallinula chloropus*					●
American coot[b]	*Fulica americana*			●		
Sandhill crane[b]	*Grus canadensis*				●	
Black-bellied plover	*Pluvialis squatarola*					●
American golden-plover	*Pluvialis dominica*					●
Snowy plover	*Charadrius alexandrinus*				●	
Semipalmated plover	*Charadrius semipalmatus*				●	
Piping plover	*Charadrius melodus*					●
Killdeer[b]	*Charadrius vociferus*		●			
Black-necked stilt	*Himantopus mexicanus*				●	
American avocet[b]	*Recurvirostra americana*				●	
Greater yellowlegs[b]	*Tringa melanoleuca*				●	
Lesser yellowlegs[b]	*Tringa flavipes*				●	
Solitary sandpiper[b]	*Tringa solitaria*				●	
Willet[b]	*Catoptrophorus semipalmatus*				●	
Spotted sandpiper[b]	*Actitis macularia*				●	
Upland sandpiper[b]	*Bartramia longicauda*					●
Whimbrel	*Numenius phaeopus*					●
Long-billed curlew[b]	*Numenius americanus*					●
Marbled godwit	*Limosa fedoa*					●
Ruddy turnstone	*Arenaria interpres*					●
Red knot	*Calidris canutus*					●
Sanderling	*Calidris alba*					●
Semipalmated sandpiper	*Calidris pusilla*					●
Western sandpiper[b]	*Calidris mauri*			●		

Table D.3-3. Birds Observed on Fort Bliss, Otero and Doña Ana Counties, New Mexico, and El Paso County, Texas (Continued)

Species		*Relative Abundance*[a]				
Common Name	*Scientific Name*	*A*	*C*	*FC*	*UC*	*R*
Least sandpiper[b]	*Calidris minutilla*			●		
White-rumped sandpiper	*Calidris fuscicollis*					●
Baird's sandpiper	*Calidris bairdii*			●		
Pectoral sandpiper	*Calidris melanotos*				●	
Dunlin	*Calidris alpina*					●
Stilt sandpiper	*Calidris himantopus*				●	
Ruff	*Philomachus pugnax*					●
Short-billed dowitcher	*Limnodromus griseus*					●
Long-billed dowitcher	*Limnodromus scolopaceus*			●		
Common snipe[b]	*Gallinago gallinago*			●		
Wilson's phalarope[b]	*Phalaropus tricolor*			●		
Red-necked phalarope	*Phalaropus lobatus*			●		
Red phalarope	*Phalaropus fulicarius*					●
Laughing gull	*Larus atricilla*					●
Franklin's gull	*Larus pipixcan*					●
Bonaparte's gull[b]	*Larus philadelphia*				●	
Ring-billed gull[b]	*Larus delawarensis*				●	
California gull	*Larus californicus*					●
Herring gull	*Larus argentatus*					●
Western gull	*Larus occidentalis*					●
Sabine's gull	*Xema sabini*					●
Caspian tern	*Sterna caspia*					●
Common tern	*Sterna hirundo*					●
Forster's tern	*Sterna forsteri*				●	
Black tern	*Chlidonias niger*				●	
Rock dove[b]	*Columba livia*		●			
Band-tailed pigeon	*Columba fasciata*					●
White-winged dove[b]	*Zenaida asiatica*			●		
Mourning dove[b]	*Zenaida macroura*		●			
Inca dove[b]	*Columbina inca*					●
Yellow-billed cuckoo[b]	*Coccyzus americanus*				●	
Greater roadrunner[b]	*Geococcyx californicus*			●		
Groove-billed ani	*Crotophaga sulcirostris*					●
Barn owl[b]	*Tyto alba*				●	
Western screech-owl[b]	*Otus kennicotti*				●	
Great horned owl[b]	*Bubo virginianus*			●		
Northern pygmy-owl[b]	*Glaucidium gnoma*					●
Burrowing owl[b]	*Athene cunicularia*			●		
Spotted owl[b]	*Strix occidentalis*					●
Long-eared owl[b]	*Asio otus*				●	
Short-eared owl[b]	*Asio flammeus*					●
Lesser nighthawk[b]	*Chordeiles acutipennis*			●		
Common nighthawk[b]	*Chordeiles minor*				●	
Common poorwill[b]	*Phalaenoptila nuttallii*			●		
Whip-poor-will[b]	*Caprimulgus vociferus*					●
Black swift[b]	*Cypseloides niger*					●
White-throated swift[b]	*Aeronautes saxatilis*			●		
Black-chinned hummingbird[b]	*Archilochus alexandrinus*		●			
Costa's hummingbird	*Calypte costae*					●
Calliope hummingbird[b]	*Stellula calliope*					●

Table D.3-3. Birds Observed on Fort Bliss, Otero and Doña Ana Counties, New Mexico, and El Paso County, Texas (Continued)

Species		*Relative Abundance*[a]				
Common Name	*Scientific Name*	*A*	*C*	*FC*	*UC*	*R*
Broad-tailed hummingbird[b]	*Selasphorus platycercus*				●	
Rufous hummingbird[b]	*Selasphorus rufus*				●	
Belted kingfisher	*Ceryle alcyon*					●
Lewis' woodpecker	*Melanerpes lewis*					●
Acorn woodpecker[b]	*Melanerpes formicivorus*					●
Yellow-bellied sapsucker	*Sphyrapicus varius*					●
Red-naped sapsucker[b]	*Sphyrapicus nuchalis*				●	
Williamson's sapsucker[b]	*Sphyrapicus thyroideus*					●
Ladder-backed woodpecker[b]	*Picoides scalaris*			●		
Downy woodpecker	*Picoides pubescens*					●
Hairy woodpecker[b]	*Picoides villosus*				●	
Northern flicker[b]	*Colaptes auratus*				●	
Olive-sided flycatcher[b]	*Contopus cooperi*					●
Western wood-pewee[b]	*Contopus sordidulus*				●	
Willow flycatcher[b]	*Empidonax traillii*					●
Least flycatcher	*Empidonax minimus*					●
Hammond's flycatcher[b]	*Empidonax hammondii*					●
Dusky flycatcher[b]	*Empidonax oberholseri*			●		
Gray flycatcher[b]	*Empidonax wrightii*					●
Cordilleran flycatcher[b]	*Empidonax occidentalis*				●	
Black phoebe[b]	*Sayornis nigricans*			●		
Eastern phoebe	*Sayornis phoebe*					●
Say's phoebe[b]	*Sayornis saya*			●		
Ash-throated flycatcher[b]	*Myiarchus cinerascens*			●		
Cassin's kingbird[b]	*Tyrannus vociferans*					●
Western kingbird[b]	*Tyrannus verticalis*		●			
Eastern kingbird	*Tyrannus tyrannus*					●
Northern shrike[b]	*Lanius excubitor*					●
Loggerhead shrike[b]	*Lanius ludovicianus*		●			
Bell's vireo[b]	*Vireo bellii*					●
Gray vireo[b]	*Vireo vicinior*				●	
Hutton's vireo	*Vireo huttoni*					●
Warbling vireo[b]	*Vireo gilvus*					●
Philadelphia vireo	*Vireo philadelphicus*					●
Red-eyed vireo	*Vireo olivaceus*					●
Cassin's vireo[b]	*Vireo cassinii*			●		
Plumbeous vireo[b]	*Vireo plumbeus*					●
Steller's jay[b]	*Cyanocitta stelleri*					●
Western scrub-jay[b]	*Aphelocoma californica*				●	
Pinyon jay[b]	*Gymnorhinus cyanocephalus*				●	
American crow[b]	*Corvus brachyrhynchos*					●
Chihuahuan raven[b]	*Corvus cryptoleucus*			●		
Common raven[b]	*Corvus corax*				●	
Horned lark[b]	*Eremophila alpestris*		●			
Purple martin[b]	*Progne subis*					●
Tree swallow[b]	*Tachycineta bicolor*					●
Violet-green swallow[b]	*Tachycineta thalassina*				●	
Northern rough-winged swallow[b]	*Stelgidopteryx serripennis*			●		
Bank swallow[b]	*Riparia riparia*			●		
Barn swallow[b]	*Hirundo rustica*		●			
Cliff swallow[b]	*Petrochelidon pyrrhonota*			●		

Table D.3-3. Birds Observed on Fort Bliss Otero and Doña Ana Counties, New Mexico, and El Paso County Texas (Continued)

Species		*Relative Abundance*[a]				
Common Name	*Scientific Name*	*A*	*C*	*FC*	*UC*	*R*
Cave swallow	*Petrochelidon fulva*					●
Mountain chickadee[b]	*Poecile gambeli*				●	
Juniper titmouse[b]	*Baeolophus ridgwayi*				●	
Verdin[b]	*Auriparus flaviceps*			●		
Bushtit[b]	*Psaltriparus minimus*				●	
Red-breasted nuthatch	*Sitta canadensis*			●		
White-breasted nuthatch[b]	*Sitta carolinensis*			●		
Pygmy nuthatch	*Sitta pygmaea*					●
Brown creeper[b]	*Certhia americana*					●
Cactus wren[b]	*Campylorhynchus brunneicapillus*			●		
Rock wren[b]	*Salpinctes obsoletus*		●			
Canyon wren[b]	*Catherpes mexicanus*			●		
Bewick's wren[b]	*Thryomanes bewickii*		●			
House wren[b]	*Troglodytes aedon*				●	
Marsh wren	*Cistothorus palustris*					●
American dipper	*Cinclus mexicanus*					●
Golden-crowned kinglet[b]	*Regulus satrapa*				●	
Ruby-crowned kinglet[b]	*Regulus calendula*			●		
Black-tailed gnatcatcher[b]	*Polioptila melanura*		●			
Blue-gray gnatcatcher[b]	*Polioptila caerulea*			●		
Eastern bluebird[b]	*Sialia sialis*					●
Western bluebird[b]	*Sialia mexicana*			●		
Mountain bluebird[b]	*Sialia currucoides*		●			
Townsend's solitaire[b]	*Myadestes townsendi*			●		
Swainson's thrush[b]	*Catharus ustulatus*					●
Hermit thrush[b]	*Catharus guttatus*			●		
American robin[b]	*Turdus migratorius*			●		
Northern mockingbird[b]	*Mimus polyglottos*		●			
Sage thrasher[b]	*Oreoscoptes montanus*				●	
Brown thrasher	*Toxostoma rufum*					●
Curve-billed thrasher[b]	*Toxostoma curvirostre*				●	
Crissal thrasher[b]	*Toxostoma dorsalis*			●		
European starling[b]	*Sturnus vulgaris*			●		
American pipit[b]	*Anthus rubescens*			●		
Sprague's pipit[b]	*Anthus spraguei*				●	
Cedar waxwing[b]	*Bombycilla cedrorum*			●		
Phainopepla[b]	*Phainopepla nitens*				●	
Golden-winged warbler	*Vermivora chrysoptera*					●
Tennessee warbler	*Vermivora peregrina*					●
Orange-crowned warbler[b]	*Vermivora celata*			●		
Nashville warbler	*Vermivora ruficapilla*					●
Virginia's warbler[b]	*Vermivora virginiae*				●	
Lucy's warbler[b]	*Vermivora luciae*					●
Northern parula	*Parula americana*					●
Yellow warbler[b]	*Dendroica petechia*				●	
Chestnut-sided warbler[b]	*Dendroica pensylvanica*					●
Yellow-rumped warbler[b]	*Dendroica coronata*			●		
Black-throated gray warbler[b]	*Dendroica nigrescens*				●	
Townsend's warbler[b]	*Dendroica townsendi*				●	
Hermit warbler	*Dendroica occidentalis*					●
Black-throated green warbler	*Dendroica virens*					●

Table D.3-3. Birds Observed on Fort Bliss, Otero and Doña Ana Counties, New Mexico, and El Paso County Texas (Continued)

Species		*Relative Abundance*[a]				
Common Name	*Scientific Name*	*A*	*C*	*FC*	*UC*	*R*
Blackburnian warbler	*Dendroica fusca*					●
Grace's warbler[b]	*Dendroica graciae*					●
Palm warbler	*Dendroica palmarum*					●
Red-faced warbler	*Cardellina rubrifrons*					●
Blackpoll warbler	*Dendroica striata*					●
Black-and-white warbler	*Mniotilta varia*					●
Painted redstart	*Myioborus pictus*					●
American redstart	*Setophaga ruticilla*					●
Prothonotary warbler	*Protonotaria citrea*					●
Northern waterthrush	*Seiurus noveboracensis*			●		
MacGillivray's warbler[b]	*Oporornis tolmei*			●		
Common yellowthroat[b]	*Geothlypis trichas*			●		
Hooded warbler[b]	*Wilsonia citrina*					●
Wilson's warbler[b]	*Wilsonia pusilla*		●			
Yellow-breasted chat	*Icteria virens*					●
Hepatic tanager[b]	*Piranga flava*				●	
Summer tanager[b]	*Piranga rubra*					●
Western tanager[b]	*Piranga ludoviciana*				●	
Green-tailed towhee[b]	*Pipilo chlorurus*			●		
Eastern towhee[b]	*Pipilo erythrophthalmus*					●
Spotted towhee[b]	*Pipilo maculatus*			●		
Canyon towhee[b]	*Pipilo fuscus*		●			
Cassin's sparrow[b]	*Aimophila cassinii*				●	
Rufous-crowned sparrow[b]	*Aimophila ruficeps*		●			
Chipping sparrow[b]	*Spizella passerina*			●		
Clay-colored sparrow[b]	*Spizella pallida*			●		
Brewer's sparrow[b]	*Spizella breweri*			●		
Black-chinned sparrow[b]	*Spizella atrogularis*				●	
Vesper sparrow[b]	*Pooecetes gramineus*			●		
Lark sparrow[b]	*Chondestes grammacus*			●		
Black-throated sparrow[b]	*Amphispiza bilineata*		●			
Sage sparrow[b]	*Amphispiza belli*				●	
Lark bunting[b]	*Calamospiza melanocorys*			●		
Savannah sparrow[b]	*Passerculus sandwichensis*			●		
Baird's sparrow[b]	*Ammodramus bairdii*				●	
Grasshopper sparrow[b]	*Ammodramus savannarum*					●
Fox sparrow	*Passerella iliaca*					●
Song sparrow[b]	*Melospiza melodia*			●		
Lincoln's sparrow[b]	*Melospiza lincolnii*			●		
Swamp sparrow	*Melospiza georgiana*				●	
White-throated sparrow[b]	*Zonotrichia albicollis*					●
Harris's sparrow[b]	*Zonotrichia querula*					●
White-crowned sparrow[b]	*Zonotrichia leucophrys*		●			
Dark-eyed junco[b]	*Junco hyemalis*		●			
McCown's longspur[b]	*Calcarius mccownii*					●
Lapland longspur	*Calcarius lapponicus*					●
Chestnut-collared longspur[b]	*Calcarius ornatus*		●			
Pyrrhuloxia[b]	*Cardinalis sinuatus*			●		
Rose-breasted grosbeak[b]	*Pheucticus ludovicianus*					●
Black-headed grosbeak[b]	*Pheucticus melanocephalus*			●		
Blue grosbeak[b]	*Guiraca caerulea*			●		

Table D.3-3. Birds Observed on Fort Bliss, Otero and Doña Ana Counties, New Mexico, and El Paso County Texas (Continued)

Species		*Relative Abundance*[a]				
Common Name	*Scientific Name*	*A*	*C*	*FC*	*UC*	*R*
Lazuli bunting[b]	*Passerina amoena*			●		
Indigo bunting	*Passerina cyanea*					●
Varied bunting[b]	*Passerina versicolor*					●
Painted bunting	*Passerina ciris*					●
Dickcissel[b]	*Spiza americana*				●	
Bobolink	*Dolichonyx oryzivorus*					●
Red-winged blackbird[b]	*Agelaius phoeniceus*			●		
Eastern meadowlark[b]	*Sturnella magna*		●			
Western meadowlark[b]	*Sturnella neglecta*			●		
Yellow-headed blackbird[b]	*Xanthocephalus xanthocephalus*			●		
Rusty blackbird	*Euphagus carolinus*					●
Brewer's blackbird[b]	*Euphagus cyanocephalus*			●		
Great-tailed grackle[b]	*Quiscalus mexicanus*			●		
Bronzed cowbird	*Molothus aeneus*					●
Brown-headed cowbird[b]	*Molothrus ater*			●		
Hooded oriole	*Icterus cucullatus*					●
Baltimore oriole	*Icterus galbula*					●
Bullock's oriole[b]	*Icterus bullockii*			●		
Scott's oriole[b]	*Icterus parisorum*		●			
Purple finch[b]	*Carpodacus purpureus*					●
House finch[b]	*Carpodacus mexicanus*		●			
Cassin's finch[b]	*Carpodacus cassini*					●
Pine siskin[b]	*Carduelis pinus*			●		
Red crossbill[b]	*Loxia curvirostra*					●
Lawrence's goldfinch	*Carduelis lawrencei*					●
American goldfinch[b]	*Carduelis tristis*					●
Lesser goldfinch[b]	*Carduelis psaltria*				●	
House sparrow[b]	*Passer domesticus*		●			
Evening grosbeak[b]	*Coccothraustes vespertinus*					●
Total		*0*	*32*	*89*	*72*	*141*

[a] A = abundant, C = common, FC = fairly common, UC = uncommon, R = rare.
[b] Species recorded from McGregor Range.
The most abundant category is chosen for each species. For example, if a species is common in the summer but rare in the winter, it is given a "C" delineation on this table.
Source: U.S. Army, 1996f, g, h, 1997f, g, j, 1998k.

ponds near the Fort Bliss cantonment area in Texas. Another 16 species not recorded on McGregor Range were warblers that are rare to very rare migrants on Fort Bliss. These species may not occur on McGregor Range, but have been observed elsewhere on Fort Bliss due to more observers in the cantonment area and at the sewage lagoons and oxidation ponds.

In recent years, detailed studies of the bird life in various habitats on McGregor Range were conducted and some of these studies are still in progress. These studies have centered on determining existing conditions and have concentrated on documenting breeding bird communities in various habitats, the occurrence of neotropical migrants, and the status of sensitive species. This section discusses the results of the breeding bird, neotropical migrant, and raptor studies, while sensitive species are addressed in Section D.4. Breeding bird surveys have been conducted in numerous locations scattered throughout McGregor Range (Figure D.3-2) and the results of these studies are summarized below.

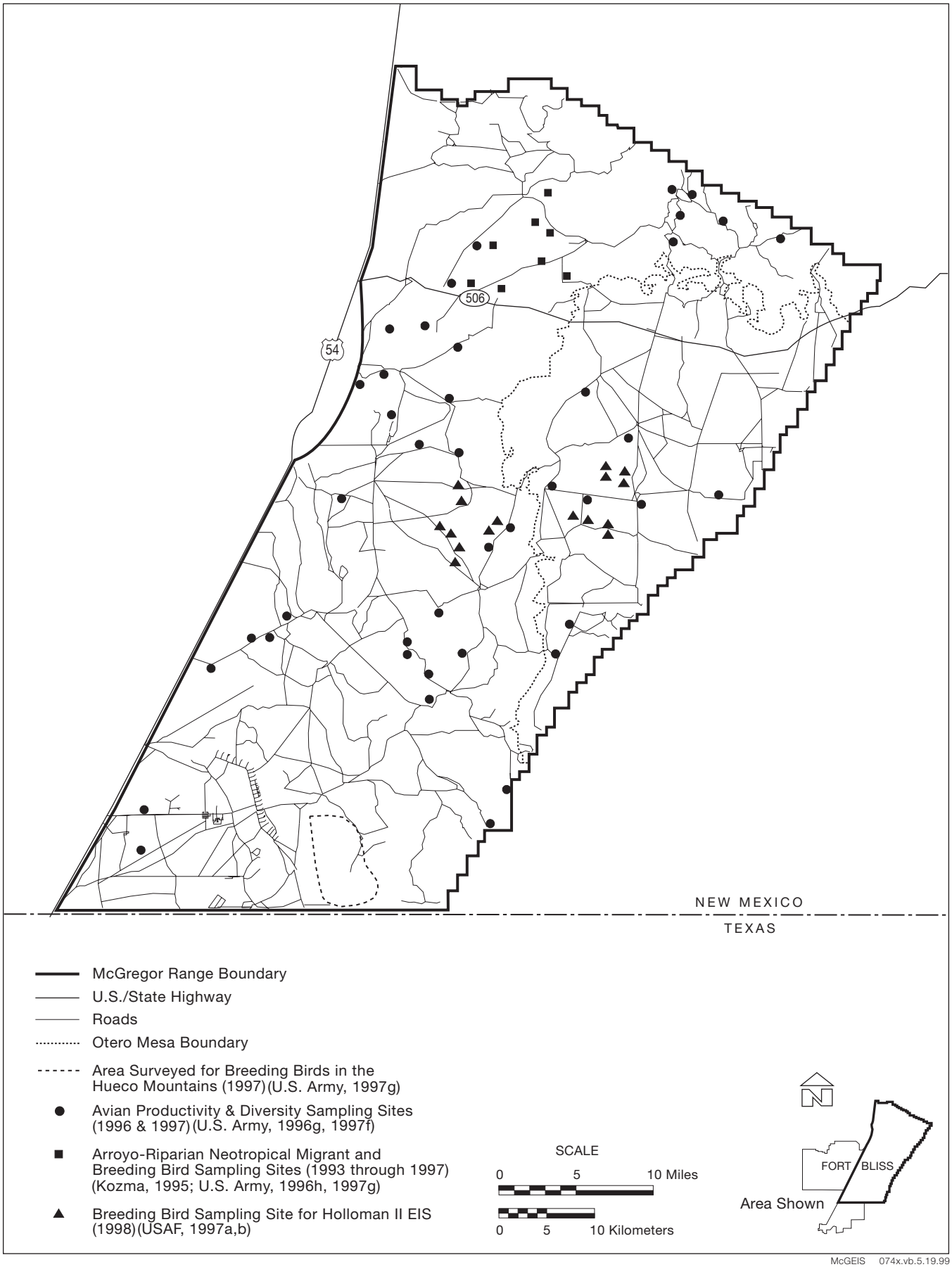


Figure D.3-2. Breeding Bird Survey Locations on McGregor Range.

Tularosa Basin

Breeding birds. In 1996 and 1997, 24 sites were sampled for breeding birds in the Tularosa Basin on McGregor Range in desert shrub habitats dominated by sandsage (*Artemisia filifolia)*, mesquite, creosote, and viscid acacia (*Acacia noevernicosa)* (U.S. Army, 1996g, 1997f). The total number of birds recorded at these four habitats increased 1.7 times from 6,092 in 1996 to 10,077 in 1997 (Table D.3-4). The number of species decreased from 75 in 1996 to 70 in 1997. Overall, 83 species have been recorded from these four habitats over the 2-year period. In 1996, the mesquite habitat had the largest number of species (53) and individuals (1,943) and the creosotebush habitat the least number of species (46) and individuals (1,337). In 1997, the viscid acacia habitat had the largest number of species (47) and individuals (2,743), while the creosotebush habitat had the least species (44) and the sandsage habitat the least number of individuals (2,315). The black-throated sparrow (*Amphispiza bilineata)* was by far the most common species recorded in all four habitats both years (2,372 in 1996 and 3,213 in 1997). In 1996, it ranged from 29 percent of the birds in the viscid acacia habitat to 44 percent of the birds in the sandsage habitat and 28 percent of the birds in the creosote and acacia habitat to 39 percent of the birds in the sandsage habitat in 1997. Other common species were the Scott's oriole (*Icterus parisorum),* western kingbird (*Tyrannus verticalis),* ash-throated flycatcher (*Myiarchus cinerascens),* mourning dove (*Zenaida macroura),* northern mockingbird (*Mimus polyglottes),* pyrrhuloxia (*Cardinalis sinuatus)*, cactus wren (*Campylorhynchus brunneicapillus)*, house finch (*Carpodacus mexicanus)*, and verdin (*Auriparus flaviceps)*. All these species showed substantial increases ranging from 1.3 to 2.4 times more birds in 1997 then 1996. Cassin's sparrow showed the greatest increase form 23 birds in 1996 to 380 in 1997 or 16.5 times more birds in 1997; most of this increase took place in the creosote habitat (Table D.3-4).

In 1997, 718 nests of 43 species were observed compared to 453 nests of 34 species in 1996 (U.S. Army, 1996g, 1997f). In the desert shrublands habitats, the largest number of nests found were for the black-throated sparrow followed by the western kingbird, cactus wren, and crissal thrasher (*Toxostoma dorsalis*). During both years, the greatest number of nests were found in the mesquite habitat; this habitat had almost twice as many nests as the next most abundant habitat in 1996 and 1.5 times more in 1997.

Breeding bird studies at eight sample locations in arroyo-riparian habitat and surrounding uplands in the Chihuahuan Desert biome have shown that black-throated sparrow, northern mockingbird, verdin, brown-headed cowbird *(Molothrus ater)*, mourning dove, and ash-throated flycatcher are the most common species. During 4 out of 5 years of this study, more species were detected in arroyos than uplands. Of the common species, the black-throated sparrow and Scott's oriole were detected more frequently in the uplands while the remaining species were detected more frequently in the arroyos. Data collected in 1996 showed that slightly more species were detected in the uplands than in the arroyos (U.S. Army, 1995c, 1996h, 1997g; Kozma, 1995). A total of 1,214 nests of 32 species were detected from 1993 through 1997 and nests of the black-throated sparrow, northern mockingbird, Scott's oriole, mourning dove, crissal thrasher, and house finch were most commonly encountered. Approximately twice as many nest were detected in 1997 than the other survey years and this may have been due to above average precipitation in 1996 and 1997 (Myers and Mathews, 1997). Rock wrens (*Salpinctes obsoletus)*, verdins and canyon towhees (*Pipilo fuscus*) nested most frequently in arroyos while black-throated sparrows, northern mockingbirds, and Scott's oriole nested more frequently in uplands. Nest density was about twice as high in arroyo habitat and Torrey yucca, javelina bush (*Condalia warnockii)*, and little-leaf sumac were most frequently used for nesting even though these shrubs were among the lowest in density (Kozma and Mathews, 1997).

Breeding bird surveys were conducted along transects at four arroyo/upland sites (a total of eight transects) in the Chihuahuan Desert below the Otero Mesa escarpment in 1997 (USAF, 1997a, b). A total of 40 species of birds comprising 689 individuals were recorded (Table D.3-5). For the combined

Table D.3-4. Number of Birds Observed in 24 Study Plots in Four Desert Shrublands Habitat Types on McGregor Range, Otero County, New Mexico

Species	*Plant Community Type*							
	Sandsage		*Mesquite*		*Creosote*		*Viscid acacia*	
	1996	*1997*	*1996*	*1997*	*1996*	*1997*	*1996*	*1997*
Black-throated sparrow	599	900	827	832	529	708	417	773
Western kingbird	106	215	159	206	47	81	48	56
Scott's oriole	84	185	118	142	91	152	128	157
Mourning dove	72	128	83	65	34	203	69	223
Northern mockingbird	45	29	64	40	43	48	102	388
Pyrrhuloxia	44	129	108	264	25	40	1	4
Cactus wren	40	139	74	169	62	171	61	87
Ash-throated flycatcher	33	125	85	100	82	118	126	146
Crissal thrasher	31	61	37	77	2	19	9	18
Brewers sparrow	28	26	9	52	3	53	6	7
House finch	27	18	39	34	45	48	91	163
Loggerhead shrike	21	51	7	8	17	17	9	7
Chihuahuan raven	17	57	9	26	28	38	0	2
Verdin	16	46	41	95	48	62	78	155
Scaled quail	14	61	15	51	8	79	14	133
Swainson's hawk	10	9	6	9	6	3	1	0
Green-tailed towhee	9	3	13	2	3	3	2	36
Black-tailed gnatcatcher	7	23	38	97	9	6	16	35
Brown-headed cowbird	7	16	41	108	13	30	36	86
Turkey vulture	7	11	1	6	2	6	9	13
Barn swallow	6	0	2	0	5	0	0	0
Cliff swallow	6	2	0	0	4	0	1	0
Eastern meadowlark	5	7	0	1	26	81	18	20
Bullock's oriole	5	5	4	2	0	5	0	0
Gambel's quail	5	9	15	13	4	11	4	7
Blue grosbeak	4	9	7	14	22	39	13	11
Lark bunting	4	0	0	0	0	0	0	3
Blue-gray gnatcatcher	3	0	3	5	0	1	0	0
Cassin's sparrow	3	3	0	0	20	353	0	24
Northern rough-winged swallow	3	2	0	0	0	0	0	0
Common nighthawk	2	3	4	6	36	64	63	81
Greater roadrunner	2	2	6	0	1	8	0	9
Lesser nighthawk	2	3	9	13	13	32	8	5
Pine siskin	2	0	2	2	0	1	0	0
Audubon's warbler	2	2	6	9	0	2	0	0
Black-chinned hummingbird	1	0	1	0	0	1	1	0
Burrowing owl	1	0	0	0	0	0	0	0
Cassin's' kingbird	1	0	0	0	2	0	1	0
Common poorwill	1	0	2	2	0	1	0	0
Curved billed thrasher	1	1	3	21	2	2	3	12
House wren	1	0	0	0	0	0	0	3
MacGillivray's warbler	1	0	3	3	0	0	0	0
Northern flicker	1	0	1	4	0	0	0	0
Northern harrier	1	1	1	0	0	1	0	0
Red-tailed hawk	1	1	5	3	0	2	1	1
Say's phoebe	1	4	3	1	1	1	1	2
Cassin's vireo	1	1	0	0	0	1	0	0

Table D.3-4. Number of Birds Observed in 24 Study Plots in Four Desert Shrublands Habitat Types on McGregor Range, Otero County, New Mexico (Continued)

Species	*Plant CommunityType*							
	Sandsage		*Mesquite*		*Creosote*		*Viscid acacia*	
	1996	*1997*	*1996*	*1997*	*1996*	*1997*	*1996*	*1997*
Song sparrow	1	0	2	0	0	0	0	0
Spotted towhee	1	0	3	0	1	0	1	1
Western flycatcher	1	0	3	0	0	0	0	0
Ladder-backed woodpecker	0	6	10	14	0	1	5	1
Brewer's blackbird	0	0	8	1	3	0	13	0
Vesper sparrow	0	0	4	0	0	0	0	0
Chipping sparrow	0	7	2	1	0	0	2	6
Western tanager	0	0	2	2	1	0	0	0
Lark sparrow	0	0	2	0	0	0	2	6
Bewick's wren	0	1	1	0	0	0	0	10
Wilson's warbler	0	2	2	3	0	0	2	1
Black-throated gray warbler	0	0	1	0	0	0	0	0
Orange crowned warbler	0	0	1	0	0	0	1	0
Western bluebird	0	0	1	0	0	0	2	0
Prairie falcon	0	0	1	0	0	0	0	0
White-crowned sparrow	0	0	0	2	8	0	0	0
American kestrel	0	0	0	1	1	0	5	4
White-throated swift	0	0	0	0	2	0	0	0
Hermit thrush	0	0	0	0	1	0	0	1
Horned lark	0	1	0	0	1	4	1	0
Virginia's warbler	0	0	0	0	1	0	0	0
Canyon towhee	0	0	0	0	0	1	8	11
Rufous-crowned sparrow	0	0	0	0	0	0	2	14
White-winged dove	0	0	0	0	0	0	2	2
Black-headed grosbeak	0	0	0	0	0	0	1	0
Great horned owl	0	1	0	0	0	0	1	0
Rock wren	0	0	0	0	0	0	1	5
Western meadowlark	0	0	0	0	0	0	1	2
Common raven	0	3	0	0	0	0	0	0
Western wood-pewee	0	0	0	0	0	0	0	10
Golden eagle	0	0	0	0	0	1	0	0
Sharp-shinned hawk	0	0	0	0	0	0	0	1
Broad-tailed hummingbird	0	7	0	5	0	3	0	1
Common yellow-throat	0	0	0	2	0	1	0	0
Ruby-crowned kinglet	0	0	0	1	0	0	0	0
Lesser goldfinch	0	0	0	3	0	0	0	0
Unidentified bird	77	0	49	0	85	0	62	0
Locations sampled	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Number of species	*50*	*44*	*53*	*46*	*46*	*44*	*47*	*47*
Number of individuals	*1,363*	*2,315*	*1,943*	*2,517*	*1,337*	*2,502*	*1,449*	*2,743*

Source: U.S. Army, 1996h, 1997f.

transects, 16 percent more species and 41 percent more individuals were recorded in the arroyos than the uplands. For combined results, the black-throated sparrow accounted for 25 percent of the birds recorded followed by the northern mockingbird (8 percent), turkey vulture (8 percent), ash-throated flycatcher (7

Table D.3-5. Birds Recorded During Breeding Bird Surveys in Arroyo and Upland Habitats in the Chihuahuan Desert Plant Communities on McGregor Range, Otero County, New Mexico

Species	*Little Mack Tank*		*Middle Tank*		*Javelina Wash*		*Upper Middle Tank*		*Total*	
	A[a]	*U*[b]	*A*	*U*	*A*	*U*	*A*	*U*	*A*	*U*
Mourning dove	8	4	2	0	4	0	15	8	*29*	*12*
Black-throated sparrow	26	42	12	24	13	14	22	21	*73*	*101*
Turkey vulture	16	1	2	1	15	1	10	7	*43*	*10*
Ash-throated flycatcher	17	3	7	6	2	3	5	7	*31*	*19*
Black-tailed gnatcatcher	5	3	0	0	0	0	0	0	*5*	*3*
Lesser nighthawk	6	0	2	1	0	1	0	0	*8*	*2*
Spotted towhee	1	0	0	0	0	0	0	0	*1*	*0*
Cactus wren	7	6	8	4	3	3	2	5	*20*	*18*
Western kingbird	6	7	13	2	5	0	0	1	*24*	*10*
Scaled quail	4	5	0	0	0	1	10	2	*14*	*8*
Gambel's quail	1	0	0	0	1	0	0	2	*2*	*2*
Brown-headed cowbird	9	5	5	1	1	0	3	0	*18*	*6*
Northern mockingbird	11	4	1	3	8	2	19	10	*39*	*19*
Northern harrier	1	0	0	0	0	0	0	0	*1*	*0*
Eastern meadowlark	8	7	0	2	1	3	7	1	*16*	*13*
Western meadowlark	1	0	0	1	0	`1	1	0	*2*	*2*
Bullock's oriole	2	0	0	2	0	0	0	1	*2*	*3*
Brewer's sparrow	5	0	0	0	0	0	0	0	*5*	*0*
Scott's oriole	2	5	7	9	2	2	5	4	*16*	*20*
House finch	2	1	0	3	1	0	12	3	*15*	*7*
Vesper sparrow	1	0	0	0	0	0	0	0	*1*	*0*
Crissal thrasher	1	0	1	0	0	0	1	0	*3*	*0*
Chihuahuan raven	0	3	0	0	0	0	0	0	*0*	*3*
Bewick's wren	0	1	0	0	0	0	0	0	*0*	*1*
Pyrrhuloxia	0	1	1	9	0	0	0	1	*1*	*11*
MacGillivray's warbler	0	0	0	0	0	0	1	0	*1*	*0*
Rock wren	0	0	0	0	0	0	2	0	*2*	*0*
Say's phoebe	0	0	0	0	0	0	2	1	*2*	*1*
Rufous-crowned sparrow	0	0	0	1	0	0	2	0	*2*	*1*
Canyon towhee	0	0	0	0	0	0	7	1	*7*	*1*
Green-tailed towhee	0	0	0	0	1	1	1	0	*2*	*1*
Verdin	0	1	0	0	0	0	1	0	*1*	*1*
Greater roadrunner	0	0	2	0	0	0	0	1	*2*	*1*
Loggerhead shrike	0	0	0	1	0	3	0	0	*0*	*4*
Ladderback woodpecker	0	0	1	0	0	0	0	0	*1*	*0*
Swainson's hawk	0	0	0	0	0	1	0	0	*0*	*1*
Cassin's sparrow	2	0	0	0	0	0	0	0	*2*	*0*
Common nighthawk	4	1	1	1	1	1	0	0	*6*	*3*
Black-headed grosbeak	1	0	0	0	0	0	3	1	*4*	*1*
Virginia warbler	0	0	0	1	0	0	0	0	*0*	*1*
Flycatcher	0	0	0	0	1	0	0	0	*1*	*0*
Unknown species	0	0	1	0	0	0	0	0	*1*	*0*
Total number of species	*25*	*18*	*15*	*18*	*15*	*14*	*21*	*18*	*36*	*31*
Total number of individuals	*147*	*100*	*66*	*72*	*59*	*37*	*131*	*77*	*403*	*286*

[a] A = arroyo.
[b] U = upland.
Source: USAF, 1997a, b.

percent), mourning dove (6 percent), cactus wren (5 percent), Scott's oriole (5 percent), and western kingbird (5 percent). The black-throated sparrow was the most abundant species in the arroyo (18 percent of total birds recorded form the arroyos) and upland (35 percent) habitats. The only other common species that was more abundant in the uplands was Scott's oriole (4 percent of the total birds in the arroyos and 7 percent of the birds in the uplands). The cactus wren was almost equally abundant in the two habitats while the mourning dove, ash-throated flycatcher, western kingbird, and northern mockingbird were more abundant in the arroyos (Table D.3-5).

Neotropical migrants. Many bird species that breed in North America, winter in Central and South America (called neotropical migrants). Breeding Bird Survey data for a 26-year period from 1966 through 1991 indicate that the population levels of the majority of neotropical migrants have remained stable or increased, some have declined throughout this period, and many other species started to decline in the early 1980s (Robbins et al., 1993). Fragmentation of the forest on the breeding grounds and the elimination of optimum tropical wintering habitat are likely the two major reasons for these declines (Flather and Saure, 1996; Sheery and Holmes, 1996). In addition, the loss of important stop-over habitat used during migration may affect the survival of neotropical migrants (Moore et al., 1993).

In the West, over 60 percent of the neotropical migrants use riparian areas for stop-over habitat during migration or for breeding, and the importance of riparian habitat for breeding birds has been well-documented (Krueper, 1993). Most of these and other studies have taken place in mesic riparian areas dominated by species such as willow and cottonwoods. This type of habitat is very limited on McGregor Range; occurring at widely scattered small plots at some stock tanks. Most riparian areas consist of arroyo-riparian habitat along dry washes (see Section D.2 for a description of these habitat types). Prior to recent studies on McGregor Range, little was known about the importance of arroyo-riparian habitat for neotropical migrants and breeding birds in the Chihuahuan Desert (Kozma, 1995).

A recent study of neotropical migrants in the Chihuahuan Desert on Fort Bliss has shown that the number of individuals and species using the arroyo-riparian habitat is substantially greater than in the surrounding upland habitats (Kozma, 1995; U.S. Army, 1995c, 1996h, 1997g) (Table D.3-6). During this 5-year study birds were mist netted in arroyo and upland habitats in the northern part of McGregor Range (see Figure D.3-2). A total of 26 species of neotropical migrants were captured 341 times; 290 or 85 percent of these captures were in the arroyos; all species recorded more than once were captured more frequently in arroyos than uplands. Neotropical migrants captured all 5 years included the Virginia's (*Vermivora virginiae)*, orange-crowned (*Vermivora celata)*, and Wilson's (*Wilsonia pusilla)* warblers along with the, green-tailed towhee (*Pipilo chlorurus)*, Brewer's sparrow (*Spizella breweri*), hermit thrush (*Catharus guttatus)*, and blue-gray gnatcatcher (*Polioptila caerulea*). The most frequently captured neotropical migrants were the green-tailed towhee (58 captures in arroyos and 3 in upland), Brewer's sparrow (27 and 21), Wilson's warbler (41 and 1), Virginia's warbler (22 and 5), ruby-crowned kinglet (*Regulus calendula*) (25 and 1), black-chinned hummingbird (*Archilochus alexandri*) (15 and 5), and MacGillivray's warbler (*Oporonis tolmei*) (12 and 1) (Table D.3-6).

During this 5-year study, 403 short-distance migrants and winter and permanent residents consisting of 25 species were captured in mist nets in arroyo and upland habitats (Table D.3-6). A total of 285 or 71 percent of these birds were captured in arroyos, which is 14 percent less than for neotropical migrants. Except for the sage sparrow (*Amphispiza belli*), all species were captured more frequently in arroyos than uplands. The black-throated sparrow was the most frequently netted species (100 captures) in this group and its captures were almost equally divided between arroyos (54 percent) and uplands (46 percent). Overall, 745 birds were mist netted during this 5-year study and 575 (77 percent) were captured in arroyos and 170 (23 percent) in uplands (Table D.3-6) (U.S. Army, 1995c, 1996h, 1997g).

Table D.3-6. Neotropical Migrant and Short Distance Migrants, Wintering, and Permanent Resident Birds Captured in Arroyos (A) and Adjacent Uplands (U) in the Chihuahuan Desert on McGregor Range, Otero County, New Mexico

Species	*1993*		*1994*		*1995*		*1996*		*1997*		*Total*	
	A	*U*	*A*	*U*	*A*	*U*	*A*	*U*	*A*	*U*	*A*	*U*
Neotropical Migrants[a]												
Green-tailed towhee	11	0	8	0	6	1	19	1	14	1	*58*	*3*
Wilson's warbler	10	0	5	0	9	0	6	1	11	0	*41*	*1*
Brewer's sparrow	4	1	0	1	2	1	6	0	15	18	*27*	*21*
Ruby-crowned kinglet	4	0	4	1	0	0	14	0	3	0	*25*	*1*
Virginia's warbler	2	0	7	5	1	0	6	0	6	0	*22*	*5*
Black-chinned hummingbird	4	1	1	0	0	0	1	0	9	4	*15*	*5*
MacGillivray's warbler	1	0	7	1	2	0	3	0	0	0	*13*	*1*
Orange-crowned warbler	5	0	2	0	1	0	1	0	4	0	*13*	*0*
Hermit thrush	2	0	3	0	1	0	2	0	3	0	*11*	*0*
Gray flycatcher	4	0	0	0	0	0	2	0	4	1	*10*	*1*
Blue-gray gnatcatcher	1	0	2	10	0	2	2	1	3	0	*8*	*4*
House wren	1	0	3	0	0	0	2	0	1	0	*7*	*0*
Dusky flycatcher	1	0	4	0	1	0	1	0	0	0	*7*	*0*
Lincoln's sparrow	0	0	0	0	0	0	1	0	5	0	*6*	*0*
Ash-throated flycatcher	2	2	0	0	0	1	3	0	0	1	*5*	*4*
Chipping sparrow	0	0	1	0	0	0	0	1	4	2	*5*	*3*
Western kingbird	2	0	0	0	0	0	1	0	1	0	*4*	*0*
Cordilleran flycatcher	1	0	0	0	1	0	1	0	0	0	*3*	*0*
Broad-tailed hummingbird	0	0	0	0	0	0	0	0	3	0	*3*	*0*
Hammond's flycatcher	1	0	0	0	1	0	0	0	0	0	*2*	*0*
Say's phoebe	0	0	1	0	0	0	1	0	0	0	*2*	*0*
Solitary vireo	0	0	0	0	0	0	1	0	0	0	*1*	*0*
Black-throated gray warbler	1	0	0	0	0	0	0	0	0	0	*1*	*0*
Warbling vireo	0	0	1	0	0	0	0	0	0	0	*1*	*0*
Audubon's warbler	0	0	0	0	0	0	0	1	0	0	*0*	*1*
Vesper sparrow	0	0	0	0	0	0	0	0	0	1	*0*	*1*
Lark bunting	0	1	0	0	0	0	0	0	0	0	*0*	*1*
Total	*57*	*4*	*49*	*9*	*25*	*5*	*73*	*5*	*86*	*28*	*290*	*52*
Short Distance Migrants and Winter and Permanent Residents												
Black-throated sparrow	9	7	9	13	2	2	14	18	20	6	*54*	*46*
White-crowned sparrow	9	1	10	9	7	0	4	0	22	3	*52*	*13*
Bewick's wren	7	1	10	1	1	0	22	7	8	1	*48*	*10*
Rufous-crowned sparrow	2	0	7	0	2	0	2	0	6	0	*19*	*0*
Canyon towhee	3	0	4	0	1	0	6	0	5	0	*19*	*0*
Verdin	3	0	4	0	0	1	11	2	0	0	*18*	*3*
Sage sparrow	0	1	0	1	0	0	2	5	11	12	*13*	*19*
Spotted towhee	0	0	0	0	1	0	3	0	8	0	*12*	*0*
Crissal thrasher	3	1	1	1	0	1	4	0	2	2	*10*	*5*
Cactus wren	2	0	1	2	0	0	1	1	4	2	*8*	*5*
Northern mockingbird	5	0	0	3	0	0	0	0	3	0	*8*	*3*
Black-tailed gnatcatcher	2	0	1	0	0	0	0	0	1	1	*4*	*1*
Pyrrhuloxia	0	0	1	0	0	0	0	0	2	0	*3*	*0*
Sage thrasher	2	0	0	1	0	0	0	0	1	1	*3*	*2*
House finch	0	1	0	0	2	0	0	1	0	0	*2*	*2*
Song sparrow	0	0	0	0	0	0	1	0	1	0	*2*	*0*
Rock wren	0	2	2	0	0	0	0	1	0	1	*2*	*4*

Table D.3-6. Neotropical Migrant and Short Distance Migrants, Wintering, and Permanent Resident Birds Captured in Arroyos (A) and Adjacent Uplands (U) in the Chihuahuan Desert on McGregor Range, Otero County, New Mexico (Continued)

Species	*1993*		*1994*		*1995*		*1996*		*1997*		*Total*	
	A	*U*	*A*	*U*	*A*	*U*	*A*	*U*	*A*	*U*	*A*	*U*
Short Distance Migrants and Winter and Permanent Residents (Continued)												
Loggerhead shrike	0	1	1	1	0	0	0	0	1	0	*2*	*2*
Northern flicker	0	0	0	0	0	0	1	0	0	0	*1*	*0*
Dark-eyed junco	0	0	0	0	0	0	1	0	0	0	*1*	*0*
Gambel's quail	0	0	0	2	0	0	0	0	1	0	*1*	*2*
Mountain chickadee	0	0	0	0	0	0	0	0	1	0	*1*	*0*
Sparrow	0	0	0	0	0	0	0	0	1	0	*1*	*0*
Mourning dove	0	0	1	0	0	0	0	0	0	0	*1*	*0*
Scaled quail	0	0	0	0	0	0	0	0	0	1	*0*	*1*
Total	*47*	*15*	*52*	*34*	*16*	*4*	*72*	*35*	*98*	*30*	*285*	*118*
Grand total	*104*	*19*	*101*	*43*	*41*	*9*	*145*	*40*	*184*	*58*	*575*	*170*

[a] From Finch, 1992.
Source: Kozma, 1995; U.S. Army, 1995c, 1996h, 1997g.

These studies of nesting and migratory birds at McGregor Range have demonstrated that arroyo-riparian areas are used more consistently then upland habitats for nesting birds and stop over habitat for neotropical migrants passing through the Chihuahuan Desert. As indicated in Section D.2, approximately 2,478 miles of arroyo-riparian drainages with well-developed channels and sides occur on McGregor Range. Many of these drainages likely provide habitat that is used to a greater extent than adjacent uplands by nesting and migrating birds on McGregor Range.

Raptors. Data collected at 24 breeding bird sample locations showed that the Swainson's hawk (*Buteo swainsoni)* and turkey vulture (*Cathartes aura)* were the most common raptors observed in the desert shrublands during spring and summer of 1996 and 1997 (Table D.3-7) (U.S. Army, 1996g, 1997f). Other species observed were the red-tailed hawk (*Buteo jamaicensis)*, American kestrel (*Falco sparverius)*, northern harrier (*Circus cyaneus)*, prairie falcon (*Falco mexicanus),* golden eagle (*Aquila chrysaetos),* and sharp-shinned hawk (*Accipiter striatus)*. During surveys of the Otero Mesa escarpment in March and May 1997, one breeding pair of falcons consisting of a prairie falcon and a possible prairie/peregrine falcon (*Falco peregrinus)* hybrid was reported along the escarpment in the area of Rough Canyon (USAF, 1997c, d). Observations of this pair in May 1997 indicated that the nesting attempt was apparently unsuccessful. Numerous stick nests and a number of golden eagles were also observed in 1997 but nesting was not confirmed. In 1998, one active golden eagle nest was observed along the Otero Mesa escarpment just north of Pendajo Wash. Golden eagles were observed along the Hueco Mountain escarpment in New Mexico, but no nest was observed (U.S. Army, 1998i). The red-railed hawk, American kestrel, great horned owl (*Bubo virginianus),* and barn owl (*Tyto alba)* nested in the area of the escarpment in 1997 (USAF, 1997h, i). During the raptor surveys, one ferruginous hawk (*Buteo regalis)* was reported as soaring over Otero Mesa above the escarpment south of Martin Canyon on March 28, 1997 (USAF, 1997c) and one immature aplomado falcon (*Falco femoralis)* was reported in the desert shrubland habitat and grassland below the escarpment south of Martin Canyon on May 23, 1997 (USAF, 1997d); these species are discussed in more detail in Section D.4. The aplomado falcon was not seen in the area during a subsequent survey on June 4, 1997 (USAF, 1997b) and it is assumed that the bird was no longer in the area. Data from 9 surveys during the winter of 1994 to 1995 and 18 surveys during the winter of 1995 to 1996 along a 14.9-mile route in the desert shrubland habitat showed that the golden

Table D.3-7. Raptors Observed During Breeding Bird Surveys on McGregor Range in 1996 and 1997

Species	*Location*							
	Tularosa Basin (24 sampling sites)		*Sacramento Mountains foothills (6 sampling sites)*		*Otero Mesa (12 sampling sites)*		*42 sample sites*	
	1996	1997	1996	1997	1996	1997	1996	1997
Turkey vulture	19 (0.8)	36 (1.5)	103 (17.2)	32 (5.3)	21 (1.8)	4 (0.3)	143 (3.40)	72 (1.7)
Swainson's hawk	23 (1.0)	21 (0.9)	0 (0.0)	0 (0.0)	4 (0.3)	5 (0.4)	27 (0.60)	26 (0.6)
Red-tailed hawk	7 (0.3)	7 (0.3)	6 (1.0)	1 (0.2)	8 (0.7)	10 (0.8)	21 (0.50)	18 (0.4)
American kestrel	6 (0.3)	5 (0.2)	0 (0.0)	0 (0.0)	2 (0.2)	3 (0.3)	8 (0.20)	8 (0.2)
Northern harrier	2 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	3 (0.10)	0 (0.0)
Prairie falcon	1 (0.04)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	2 (0.04)	0 (0.0)
Golden eagle	0 (0.0)	1 (0.04)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.02)	1 (0.02)
Coopers hawk	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.02)	0 (0.0)
Sharp-shinned hawk	0 (0.0)	1 (0.04)	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.02)	1 (0.02)

[a] Number observed per sampling site.
Source. U.S. Army, 1996g, 1997f.

eagle and red-tailed hawk were the most common wintering species (U.S. Army, 1995d, 1996i) (Table D.3-8). Eight species of raptors were recorded from the Tularosa Basin during aplomado falcon surveys during the winter and spring of 1996 and the red-tailed hawk, Swainson's hawk, and turkey vulture were the most common species observed. Other species observed were the merlin *(Falco columbarius)*, northern harrier (*Circus cyaneus*), American kestrel, and peregrine falcon (U.S. Army, 1997k).

Table D.3-8. Raptors Observed During Wintering Bald Eagle Surveys Along Four Routes on McGregor Range During the Winters of 1994-95 and 1995-96

Species	*Winter*					
	1994-95 (9 surveys along each route)			*1995-96 (18 surveys along each route)*[a]		
	Tularosa Basin (14.9mi)[b]	*Sacramento Mountains foothills (29.8 mi)*[c]	*Otero Mesa (34.8 mi)*[d]	*Tularosa Basin (14.9 mi)*[b]	*Sacramento Mountains foothills (28.9 mi)*[c]	*Otero Mesa (34.8 mi)*[d]
Golden eagle	35 (2.3)[e]	134 (4.5)	25 (0.7)	28 (1.9)	108 (3.7)	33 (0.9)
Red-tailed hawk	25 (1.7)	26 (0.9)	48 (1.4)	23 (1.5)	71 (2.5)	101 (2.9)
American kestrel	12 (0.8)	16 (0.5)	20 (0.6)	7 (0.5)	14 (0.5)	8 (0.2)
Bald eagle	1 (0.1)	26 (0.9)	1 (0.03)	0 (0.0)	13 (0.4)	1 (0.03)
Northern harrier	2 (0.1)	9 (0.3)	5 (0.1)	2 (0.1)	4 (0.1)	4 (0.1)
Prairie falcon	0 (0.0)	4 (0.1)	0 (0.0)	0 (0.0)	1 (0.03)	3 (0.1)
Sharp shinned hawk	0 (0.0)	4 (0.1)	0 (0.0)	1 (0.1)	5 (0.2)	0 (0.0)
Merlin	0 (0.0)	2 (0.1)	1(0.03)	0 (0.0)	0 (0.0)	0 (0.0)
Cooper's hawk	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)	0 (0.0)	0 (0.0)

[a] 17 surveys along the El Paso Route, 18 along the remainder.
[b] Grapevine Canyon route.
[c] El Paso and Culp Canyon routes.
[d] Mesa grassland route.
[e] Number seen per mile.
Source: U.S. Army, 1995d, 1996i.

Otero Mesa

Breeding birds. In 1996 and 1997, two sites were sampled for breeding birds in the black grama grasslands and six sites in the mesa grasslands (dominated by blue grama grass) on Otero Mesa (U.S. Army, 1996g, 1997f). An additional four sites were sampled in the black grama grasslands in the Tularosa Basin below the Otero Mesa. Results from these four sites are included in this section. In 1996, 36 species totaling 1,361 birds were tallied in the black grama grasslands and 40 species totaling 1,658 individuals were recorded from the mesa grasslands (Table D.3-9). As in the desert shrublands habitat, there was a substantial increase in the number of birds tallied in 1997 but a reduction in the number of species; approximately twice as many birds were recorded in 1997 than 1996. In 1996, the horned lark (*Eremophila alpestris)* was the most abundant species in the mesa grassland while the eastern meadowlark (*Sturnella magna)* was the most common species observed in the black grama grasslands (Table D.3-9). In 1997, the eastern meadowlark was the most common species in both grassland habitats. Other common breeding bird species were the black-throated sparrow, mourning dove, and northern mockingbird. Cassin's sparrow exhibited a large increase in numbers in 1997 as it did in the desert shrubland habitat. It more than doubled in the mesa grasslands and increased from 3 to 289 in the black grama grasslands.

Breeding bird surveys were conducted twice along transects at four swale/upland sites (total of eight transects) in the grassland habitat of Otero Mesa in 1997 (USAF, 1997a, b). Forty-five species comprising 720 individuals were recorded (Table D.3-10). For the combined transects, 83 percent more species were observed in the swales than uplands. To compare total birds recorded, only three swale/upland transect sets were used; the east swale was excluded because the upland transect was surveyed only once. A total of 345 and 262 birds were recorded on the swale and uplands respectively; there were 32 percent more birds in the swale. For the combined results for all eight transects, the eastern meadowlark was the most abundant species (17 percent of the total) followed by the northern mockingbird (13 percent), mourning dove (13 percent), black-throated sparrow (10 percent), horned lark (7 percent), lark sparrow (5 percent), and the cactus wren (5 percent). The eastern meadowlark, northern mockingbird, mourning dove, and cactus wren were more abundant in the swale while the black-throated sparrow, horned lark and lark sparrow were more abundant in the uplands (Table D.3-10).

Raptors. Data collected at 12 breeding bird sampling sites in grassland habitat in 1996 and 1997 on the Otero Mesa (eight sites) and Tularosa Basin (four sites) indicates that the turkey vulture was the most common species of raptor observed in 1996 and the red-tailed hawk was most common in 1997. Other species observed include the Swainson's hawk, American kestrel, northern harrier, and prairie falcon (see Table D.3-7) (U.S. Army, 1996g, 1997f). Additional species observed on Otero Mesa during the spring and summer were the golden eagle, merlin, burrowing owl (*Athene cunicularia)*, and great horned owl. The ferruginous hawk has been observed on the Mesa in the winter and spring (U.S. Army, 1994b). During surveys along a 34.8-mile route on Otero Mesa for wintering bald eagles (*Haliaeetus leucocephalus)*, the red-tailed hawk was the most common raptor observed (U.S. Army, 1995d, 1996i) (Table D.3-8). The golden eagle and American kestrel were also fairly common wintering species. The red-tailed hawk was also the most common raptor observed during aplomado falcon surveys on Otero Mesa during the winter and spring of 1996; the American kestrel and turkey vulture were other common species. Other species observed were the Swainson's hawk, northern harrier, golden eagle, and Ferruginous hawk (U.S. Army, 1997k).

Hueco Mountains

Breeding birds. Reconnaissance surveys for breeding birds were conducted in the Hueco Mountains on McGregor Range in June 1997 (U.S. Army, 1997h). Six routes totaling about 28 miles were traversed

Table D.3-9. Number of Birds Observed in 12 Study Plots in Two Grassland Habitat Types on McGregor Range, Otero County, New Mexico

Species	*Plant Communities*			
	Mesa grassland		*Black grama grassland*[a]	
	1996	*1997*	*1996*	*1997*
Horned lark	277	347	173	365
Eastern meadowlark	216	660	404	844
Black-throated sparrow	193	305	178	322
Mourning dove	191	487	41	201
Northern mockingbird	140	283	105	267
Ash-throated flycatcher	69	76	38	44
Scott's oriole	66	75	48	38
Lark sparrow	60	77	16	41
Common nighthawk	55	67	60	71
Cactus wren	45	105	25	56
Western meadowlark	45	9	2	12
Cassin's sparrow	43	112	3	289
Western kingbird	38	55	40	60
Loggerhead shrike	27	39	26	22
Brewers sparrow	15	17	8	1
Turkey vulture	15	3	6	1
Chihuahuan raven	14	10	2	6
House finch	11	26	10	11
Lark bunting	9	18	44	4
Barn swallow	7	4	1	0
Curved billed thrasher	6	11	0	7
Cliff swallow	5	2	2	0
Red-tailed hawk	5	9	3	1
Swainson's hawk	3	4	1	1
Audubon's warbler	3	0	0	0
Crissal thrasher	2	4	0	1
Bullock's oriole	2	0	0	0
Northern rough-winged swallow	2	0	1	0
Violet-green swallow	2	0	0	0
Pyrrhuloxia	1	0	1	0
Green-tailed towhee	1	0	1	0
Brown-headed cowbird	1	16	0	10
Cassin's' kingbird	1	1	1	0
Northern harrier	1	0	0	0
Say's phoebe	1	6	0	0
Spotted towhee	1	0	0	0
Prairie falcon	1	0	0	0
American kestrel	1	2	1	1
Common raven	1	6	0	0
Coopers hawk	1	0	0	0
Scaled quail	0	8	2	41
Black-tailed gnatcatcher	0	1	1	0
Gambel's quail	0	1	1	6
Lesser nighthawk	0	0	2	0
Song sparrow	0	0	1	0
Ladder-backed woodpecker	0	4	4	2
Vesper sparrow	0	3	3	0

Table D.3-9. Number of Birds Observed in 12 Study Plots in Two Grassland Habitat Types on McGregor Range, Otero County, New Mexico (Continued)

Species	*Plant Communities*			
	Mesa grassland		*Black grama grassland*[a]	
	1996	*1997*	*1996*	*1997*
Chipping sparrow	0	0	7	1
Wilson's warbler	0	0	0	1
Canyon towhee	0	0	0	1
Common bushtit	0	0	0	0
Broad-tailed hummingbird	0	9	0	1
Killdeer	0	2	0	0
Unidentified bird	81	0	99	0
Locations sampled	*6*	*6*	*6*	*6*
Number of species	*40*	*37*	*36*	*32*
Number of individuals	*1,658*	*2,864*	*1,361*	*2,729*

[a]Two sampling sites on Otero Mesa and four below Otero Mesa in the Tularosa Basin.
Source: U.S. Army, 1996g, 1997f.

Table D.3-10. Birds Recorded During Breeding Bird Surveys in Swale and Upland Habitats in the Otero Mesa Grassland Plant Communities on McGregor Range, Otero County, New Mexico

Species	*South Swale*		*North Swale*		*East Swale*		*Lower South Swale*		*Total*	
	S[a]	*U*[b]	*S*	*U*	*S*	*U*	*S*	*U*	*S*	*U*
Mourning dove	11	10	18	14	16	4	7	4	*52*	*38*
Black-throated sparrow	5	15	7	28	5	2	3	4	*20*	*49*
Turkey vulture	0	0	0	0	2	0	0	1	*2*	*1*
Ash-throated flycatcher	2	5	3	3	4	1	5	0	*14*	*9*
Spotted towhee	0	0	1	0	0	0	0	0	*1*	*0*
Cactus wren	7	0	8	5	4	1	7	5	*26*	*11*
Western kingbird	4	1	6	0	4	1	6	1	*20*	*3*
Scaled quail	0	0	11	4	0	0	0	0	*11*	*4*
Brown-headed cowbird	0	0	11	1	6	0	1	0	*18*	*1*
Northern mockingbird	29	4	18	10	14	5	7	5	*68*	*24*
Eastern meadowlark	33	19	26	13	4	4	12	14	*75*	*50*
Western meadowlark	0	0	0	0	0	0	0	1	*0*	*1*
Brewer's sparrow	0	0	6	0	6	0	0	1	*12*	*1*
Scott's oriole	0	1	0	2	1	0	2	1	*3*	*4*
House finch	0	0	6	0	6	0	0	0	*12*	*0*
Crissal thrasher	1	0	1	0	0	0	1	1	*3*	*1*
Pyrrhuloxia	0	0	0	0	0	1	0	0	*0*	*1*
Rock wren	0	0	1	0	0	0	0	0	*1*	*0*
Say's phoebe	0	0	1	0	1	0	2	1	*4*	*1*
Rufous-crowned sparrow	0	0	0	0	1	0	0	0	*1*	*0*
Canyon towhee	0	0	0	0	2	0	0	0	*2*	*0*
Green-tailed towhee	0	0	0	0	1	0	0	0	*1*	*0*
Dusky flycatcher	1	0	0	0	0	0	0	0	*1*	*0*
Killdeer	1	0	0	0	0	0	0	0	*1*	*0*

Table D.3-10. Birds Recorded During Breeding Bird Surveys in Swale and Upland Habitats in the Otero Mesa Grassland Plant Communities on McGregor Range, Otero County, New Mexico (Continued)

Species	*South Swale*		*North Swale*		*East Swale*		*Lower South Swale*		*Total*	
	S[a]	*U*[b]	*S*	*U*	*S*	*U*	*S*	*U*	*S*	*U*
Hermit thrush	1	0	0	0	0	0	0	0	*1*	*0*
Lark sparrow	6	16	3	0	0	0	8	5	*17*	*21*
Western wood pewee	2	0	1	0	3	0	0	0	*6*	*0*
Sage thrasher	1	0	0	0	0	0	0	0	*1*	*0*
Curve-billed thrasher	0	0	2	0	0	0	3	0	*5*	*0*
Loggerhead shrike	2	0	4	0	2	0	0	2	*8*	*2*
Ladderback woodpecker	2	0	0	1	0	0	0	0	*2*	*1*
Lark bunting	2	0	0	0	0	0	0	0	*2*	*0*
Horned lark	2	38	0	0	0	0	4	9	*6*	*47*
Broad-tailed hummingbird	0	1	0	0	0	0	0	0	*0*	*1*
White-crowned sparrow	0	0	1	0	0	0	0	0	*1*	*0*
Red-tailed hawk	0	0	2	0	0	1	0	0	*2*	*1*
Swainson's hawk	0	0	1	0	0	0	0	0	*1*	*0*
Cassin's sparrow	4	1	5	1	0	0	0	0	*9*	*2*
Common nighthawk	6	1	5	9	2	3	1	0	*14*	*13*
Eastern kingbird	1	0	0	0	0	0	0	0	*1*	*0*
Brewers' blackbird	0	0	0	0	0	0	2	0	*2*	*0*
American kestrel	0	0	0	0	0	0	1	0	*1*	*0*
Meadowlark	0	0	0	0	0	2	2	0	*2*	*2*
Black-headed grosbeak	0	0	0	0	1	0	0	0	*1*	*0*
Violet-green swallow	0	0	0	0	1	0	0	0	*1*	*0*
Cassin's kingbird	0	0	0	0	1	0	0	0	*1*	*0*
Unknown species	0	4	0	0	1	0	0	0	*1*	*4*
Number of species	*21*	*11*	*24*	*12*	*22*	*10*	*17*	*14*	*42*	*23*
Number of individuals	*123*	*116*	*148*	*91*	*88*	*25*	*74*	*55*	*433*	*287*

[a] S = swale.
[b] U = upland.
Source: USAF, 1997a, b.

along arroyos and in uplands within an approximate 6,700-acre area. The habitat traversed consisted principally of foothill desert shrub dominated by viscid acacia, creosotebush, agave (*Agave lechuguilla)*, and grama grass (U.S. Army, 1996d). Desert willow was common along the larger washes while little sumac, tarbush, mesquite, creosotebush, prickly pear, yucca, viscid acacia, and Apache plume were frequently observed along narrower drainages. No pinyon pine/juniper habitat or other tree-dominated areas were in the areas surveyed.

A total of 40 species comprising 737 individuals were recorded during six surveys on June 10 and 12, 1997 (Table D.3-11). Almost 200 black-throated sparrows were recorded and this was the most common species encountered. Other common species were the northern mockingbird (10 percent), cactus wren (7

Table D.3-11. Birds Recorded During Breeding Bird Surveys in the Hueco Mountains, on McGregor Range, Otero County, New Mexico, June, 1977

Species	*10 June*				*12 June*				*Grand Total*
	S-1[a]	*S-2*	*S-3*	*Total*	*S-1*	*S-2*	*S-3*	*Total*	
Black-throated sparrow	31	48	22	*101*	34	51	13	*98*	*199*
Northern mockingbird	18	16	18	*52*	8	4	7	*19*	*71*
Cactus wren	12	1	7	*20*	17	3	10	*30*	*50*
Canyon towhee	7	10	11	*28*	5	6	4	*15*	*43*
House finch	17	7	2	*26*	10	6	0	*16*	*42*
Mourning dove	6	5	6	*17*	10	4	10	*24*	*41*
Scaled quail	5	10	15	*30*	1	3	5	*9*	*39*
Scott's oriole	6	3	4	*13*	9	6	1	*16*	*29*
Ash-throated flycatcher	3	5	7	*15*	8	5	0	*13*	*28*
Rock wren	1	0	11	*12*	2	7	1	*10*	*22*
Ladderback woodpecker	8	5	0	*13*	4	3	0	*7*	*20*
Rufous crowned sparrow	2	0	8	*10*	0	9	1	*10*	*20*
Gambel's quail	3	1	6	*10*	0	4	3	*7*	*17*
Pyrrhuloxia	4	3	3	*10*	2	1	0	*3*	*13*
Blue grosbeak	0	4	1	*5*	2	2	2	*6*	*11*
Turkey vulture	1	5	2	*8*	0	2	0	*2*	*10*
Loggerhead shrike	0	2	1	*3*	1	0	4	*5*	*8*
Red-tailed hawk	3	1	1	*5*	0	2	0	*2*	*7*
Crissal thrasher	3	1	1	*5*	0	1	0	*1*	*6*
Verdin	0	5	0	*5*	0	0	1	*1*	*6*
Say's phoebe	0	2	0	*2*	0	4	0	*4*	*6*
Hummingbird[b]	1	0	4	*5*	0	0	0	*0*	*5*
Western kingbird	0	1	0	*1*	3	1	0	*4*	*5*
Black-tailed gnatcatcher	0	4	0	*4*	0	0	0	*0*	*4*
Common nighthawk	0	1	1	*2*	0	2	0	*2*	*4*
Broad-tailed hummingbird	0	3	0	*3*	0	0	0	*0*	*3*
Lesser goldfinch	0	3	0	*3*	0	0	0	*0*	*3*
Brown-headed cowbird	2	0	0	*2*	1	0	0	*1*	*3*
Greater roadrunner	0	0	1	*1*	0	1	1	*2*	*3*
Lesser nighthawk	0	0	0	*0*	0	1	2	*3*	*3*
Common poorwill	1	0	1	*2*	0	0	0	*0*	*2*
White-winged dove	0	0	2	*2*	0	0	0	*0*	*2*
Swift	0	0	1	*1*	0	1	0	*1*	*2*
Empidonax	0	0	0	*0*	0	0	2	*2*	*2*
Thrasher[b]	1	0	0	*1*	0	0	0	*0*	*1*
Black-chinned sparrow	1	0	0	*1*	0	0	0	*0*	*1*
Curve-billed thrasher	0	1	0	*1*	0	0	0	*0*	*1*
American kestrel	0	1	0	*1*	0	0	0	*0*	*1*
Black-chinned hummingbird	0	0	1	*1*	0	0	0	*0*	*1*
Eastern meadowlark	0	0	0	*0*	0	0	1	*1*	*1*
Swainson's hawk	0	0	0	*0*	0	0	1	*1*	*1*
Bunting species[c]									*1*
Total number of species	*22*	*26*	*24*	*35*	*16*	*24*	*18*	*30*	*40*
Total number of individuals	*136*	*148*	*137*	*421*	*117*	*129*	*69*	*315*	*737*

[a] "S-1" refers to survey number.
[b] Not counted as separate species.
[c] Hybrid bunting observed at New Tank in the Hueco Mountains on June 9, 1997.
Source: U.S. Army, 1997h.

percent), canyon towhee (6 percent), house finch (6 percent), mourning dove (6 percent), scaled quail (*Callipepla squamata)* (5 percent), Scott's oriole (4 percent), and ash-throated flycatcher (4 percent). Scaled and Gambels quail (*Callipepla gambelli)* were fairly common and were most frequently associated with the larger washes (U.S. Army, 1997h).

The turkey vulture and red-tailed hawk were the most frequently observed raptors in the Hueco Mountains in June 1997, while the Swainson's hawk and American kestrel were infrequently detected. Raptor surveys were conducted along the east facing Hueco Mountain escarpment, as well as in the interior of these mountains. The red-tailed hawk, American kestrel, and golden eagle were observed along the escarpment. However, the surveys indicated that the golden eagle probably does not nest along the escarpment, although the red-tailed hawk and American kestrel may. Observations in the interior of the Hueco Mountains on McGregor Range showed that there were few cliffs that would support cliff-nesting raptors such as the golden eagle or prairie falcon, and these two species were not observed in this area. The turkey vulture, red-tailed hawk, and American kestrel were observed and these species likely nest in the Hueco Mountains (U.S. Army, 1999). There are no data regarding wintering raptors in the Hueco Mountains, but the same species that winter elsewhere in the desert shrubland and grassland habitats on McGregor range likely occur in these mountains.

Sacramento Mountains

Breeding birds. The Sacramento Mountains foothills occur on McGregor Range, and breeding birds were sampled in the pinyon pine/juniper woods. In 1996 and 1997, six locations were sampled for nesting birds in this habitat; 2,240 birds comprised of 65 species were recorded in 1996 and 2,986 birds form 62 species were recorded in 1997 (Table D.3-12). Although more birds were observed in 1997, the increase was less than observed in the desert shrublands and grasslands in 1997. The most common birds recorded in 1996 were the northern mockingbird, common bushtit (*Psaltriparus minimus)*, spotted towhee (*Pipilo maculatus)*, black-chinned sparrow (*Spizella atrogularis)*, black-headed grosbeak (*Pheucticus melanocephalus)*, mourning dove, and western scrub jay (*Aphelocoma californica)*. In 1997, the spotted towhee was clearly the most common species followed by the common nighthawk (*Chordeiles minor),* and the other species listed above for 1996 (U.S. Army, 1996g, 1997f) (Table D.3-12).

Raptors. Data collected from six breeding bird sampling locations in 1996 and 1997 in the pinyon pine/juniper habitat in the Sacramento Mountains foothills indicated the turkey vulture was the most common species of raptor observed. The red-tailed hawk was observed occasionally while the golden eagle and sharp-shinned hawk were seen once in 1996 (see Table D.3-7) (U.S. Army, 1996g, 1997f). The bald eagle winters in small numbers in the foothills (Table D.3-8) (U.S. Army, 1995d, 1996i). During the wintering bald eagle surveys, the golden eagle was the most common species observed both winters. The red-tailed hawk was also commonly observed especially during the winter of 1995 to 1996; the bald eagle and the American kestrel was also a fairly common wintering species (see Table D.3-8). The northern harrier, sharp-shinned hawk, prairie falcon, and merlin were also observed. The great horned owl and western screech owl (*Otus kennicotti)* were detected during spotted owl (*Strix occidentalis)* surveys during the winter of 1995 to 1996; no spotted owls were observed (U.S. Army, 1997k).

D.3.3 Mammals

A total of 58 mammal species are known to occur and an additional 19 species have the potential to occur on the Fort Bliss Training Complex (Table D.3-13). Seventeen species of bats occur or have the potential to occur on Fort Bliss. There have been few studies of bats on Fort Bliss. Two maternity colonies of the fringed myotis (*Myotis thysanodes)* were observed in the pinyon-juniper habitat in the Sacramento Mountains foothills on McGregor Range in 1979 (Smartt, 1980). The California myotis (*Myotis*

Table D.3-12. Number of Birds Observed in Six Study Plots in the Pinyon/Juniper Habitat Type on McGregor Range, Otero County, New Mexico

Species	*Pinyon Pine/Juniper Plant Community*	
	1996	*1997*
Northern mockingbird	250	220
Common bushtit	222	203
Spotted towhee	209	431
Black-chinned sparrow	185	166
Black-headed grosbeak	156	275
Mourning dove	111	58
Scrub jay	107	115
Turkey vulture	103	32
House finch	94	69
Ash-throated flycatcher	78	91
Bewick's wren	78	183
Pinyon jay	77	169
Common nighthawk	50	300
Cassin's' kingbird	40	122
Juniper titmouse	39	36
Rufous-crowned sparrow	30	103
Scott's oriole	22	25
Black-chinned hummingbird	22	6
Brown-headed cowbird	20	51
Green-tailed towhee	17	3
Western tanager	16	43
Common raven	12	22
Townsend's solitaire	12	0
Black-throated gray warbler	11	0
Audubon's warbler	10	5
Canyon towhee	10	20
Gray-headed junco	10	1
Western wood-pewee	10	10
Western kingbird	8	4
Cliff swallow	8	3
Red-tailed hawk	6	1
Plumbeous vireo	6	15
Hermit thrush	6	0
Chihuahuan raven	5	33
Wilson's warbler	5	2
Mountain chickadee	5	18
Gambel's quail	4	1
Northern flicker	4	2
White-crowned sparrow	4	0
American robin	4	3
Eastern meadowlark	3	10
Pine siskin	3	3
Virginia's warbler	3	3
Violet-green swallow	3	5
Cedar waxwing	3	0
Golden-crowned kinglet	3	0
Gray flycatcher	3	2
MacGillivray's warbler	2	1

Table D.3-12. Number of Birds Observed in Six Study Plots in the Pinyon/Juniper Habitat Type on McGregor Range, Otero County, New Mexico (Continued)

Species	*Pinyon Pine/Juniper Plant Community*	
	1996	*1997*
Western bluebird	2	3
Brewers sparrow	1	0
Loggerhead shrike	1	0
Barn swallow	1	0
Blue-gray gnatcatcher	1	1
Curved billed thrasher	1	5
Say's phoebe	1	12
Orange crowned warbler	1	1
White-throated swift	1	0
Rock wren	1	10
Coopers hawk	1	0
Golden eagle	1	0
Hairy woodpecker	1	0
Hepatic tanager	1	3
Rose-breasted grosbeak	1	0
Olive-sided flycatcher	1	0
Sharp-shinned hawk	1	0
Black-throated sparrow	0	4
Ruby-crowned kinglet	0	8
Crissal thrasher	0	1
Black-tailed gnatcatcher	0	7
Cassin's sparrow	0	1
Greater roadrunner	0	1
House wren	0	8
Ladder-backed woodpecker	0	19
Brewer's blackbird	0	1
Chipping sparrow	0	8
Lark sparrow	0	2
White-winged dove	0	3
Warbling vireo	0	4
Broad-tailed hummingbird	0	17
Summer tanager	0	1
Lesser goldfinch	0	1
Unidentified bird	133	0
Locations sampled	*6*	*6*
Number of species	*65*	*62*
Number of individuals	*2,240*	*2,986*

Source: U.S. Army, 1996g, 1997f.

californicus) was observed in the pinyon/juniper habitat in the Sacramento Mountains foothills, the creosotebush and the grassland habitats on Otero Mesa; this species was most common in the grassland habitat (Smartt, 1980). Surveys were conducted along the Otero Mesa escarpment and nearby stock tanks that contained water in May and August 1997and June 1998 (Figure D.3-3) (USAF, 1997e, f; U.S. Army, 1998j). During the May 1997 survey, numerous cracks, crevices, and caves were searched for bats with negative results. However, during August, surveys of selected cliff areas along the escarpment yielded small numbers of bats exiting the cliff face in numerous areas. The bats along the escarpment appear to

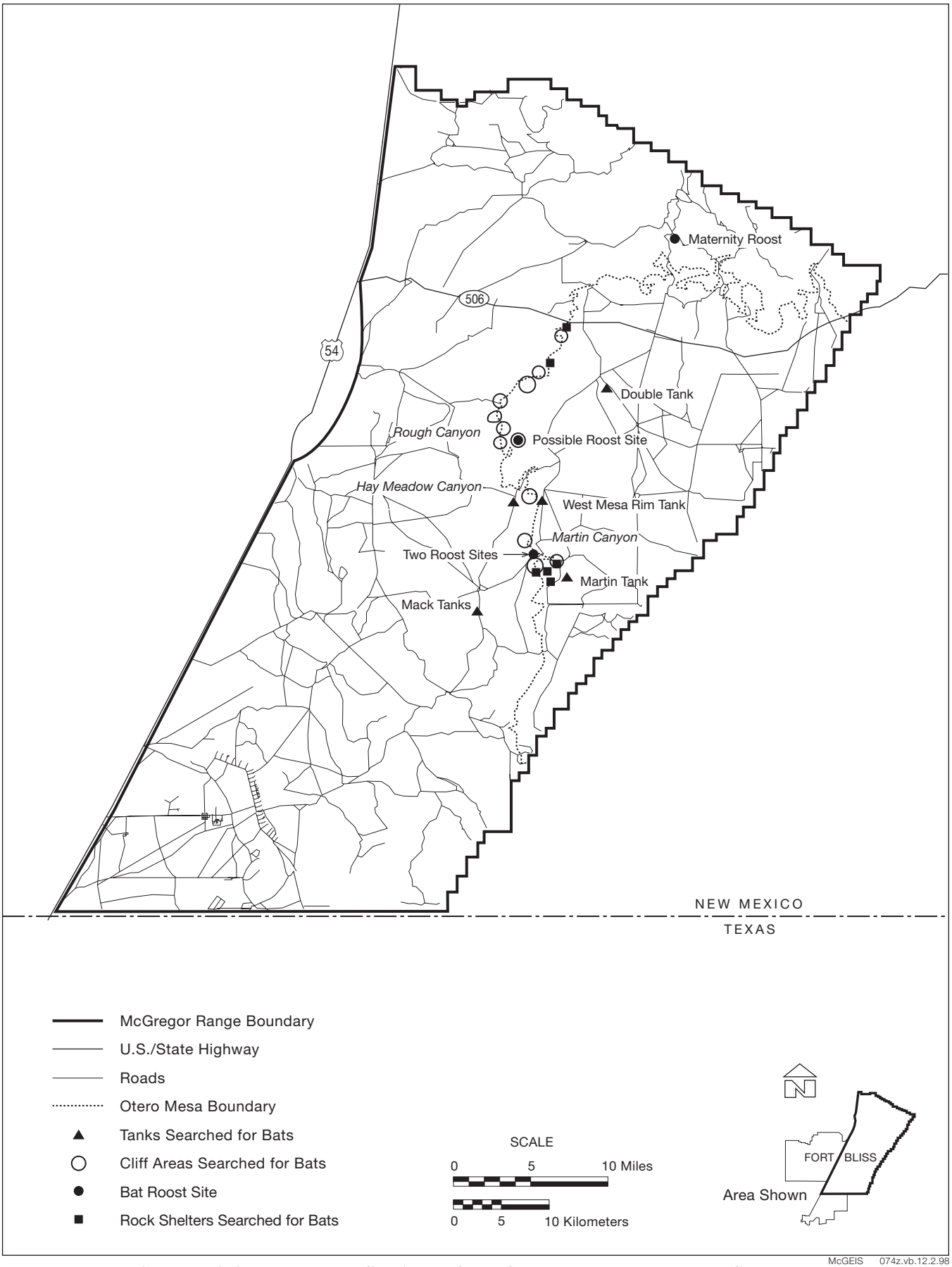
Table D.3-13. Mammals Known to Occur and Could Possibly Occur on McGregor Range, Otero County, New Mexico

Species		*Occurrence on McGregor Range*	
Common name	*Scientific name*	*Known*	*Possible*
Virginia opossum	*Didelphis virginianus*		●
Desert shrew	*Notiosorex crawfordi*	●	
Yuma Myotis	*Myotis yumanensis*		●
Cave Myotis	*Myotis velifera*		●
Little Brown Myotis	*Myotis lucifugus*		●
Long-legged Myotis	*Myotis volans*		●
Fringed Myotis	*Myotis thysanodes*	●	
California Myotis	*Myotis californicus*	●	
Small-footed Myotis	*Myotis leibii*		●
Spotted bat	*Euderma maculatum*		●
Silver-haired bat	*Lasionycteris noctivagans*	●	
Hoary bat	*Lasiurus cinereus*	●	
Western pipistrelle	*Pipistrellus hesperus*	●	
Big brown bat	*Eptesicus fuscus*	●	
Townsend's big-eared bat	*Corynorhinus townsendii*		●
Pallid bat	*Antrozous pallidus*	●	
Brazilian free-tailed bat	*Tadarida braziliensis*	●	
Pocketed free-tailed bat	*Tadarida femorosacca*		●
Big free-tailed bat	*Nyctinomops macrotis*		●
Desert cottontail	*Sylvilagus audubonii*	●	
Eastern cottontail	*Sylvilagus floridanus*		●
Black-tailed jack rabbit	*Lepus californicus*	●	
Least chipmunk	*Tamias minimus*		●
Gray-footed chipmunk	*Tamias canipes*	●	
Gray-collared chipmunk	*Tamias cinereicollis*	●	
Organ Mountain Colorado chipmunk	*Tamias quadrivittatus australis*	●	
Texas antelope squirrel	*Ammospermophilus interpres*	●	
Spotted ground squirrel	*Spermophilus spilosoma*	●	
Thirteen-lined ground squirrel	*Spermophilus tridecimlineatus*		●
Rock squirrel	*Spermophilus variegatus*	●	
Mexican ground squirrel	*Spermophilus mexicanus*		●
Black-tailed prairie dog	*Cynomys ludovicianus*	●	
Yellow-faced pocket gopher	*Cratogeomys castanops*	●	
Botta's pocket gopher	*Thomomys bottae*	●	
Plains pocket gopher	*Geomys bursarius aernarius*		●
Silky pocket mouse	*Perognathus flavus*	●	
Plains pocket mouse	*Perognathus flavescens*	●	
Apache pocket mouse	*Perognathus apache*		●
Chihuahuan pocket mouse	*Chaetodipus eremicus*	●	

Table D.3-13. Mammals Known to Occur and Could Possibly Occur on McGregor Range, Otero County, New Mexico (Continued)

Species		*Occurrence on McGregor Range*	
Common name	*Scientific name*	*Known*	*Possible*
Hispid pocket mouse	*Chaetodipus hispidus*	●	
Desert pocket mouse	*Chaetodipus penicillatus*	●	
Rock pocket mouse	*Chaetodipus intermedius*	●	
Banner-tailed kangaroo rat	*Dipodomys spectabilis*	●	
Ord's kangaroo rat	*Dipodomys ordii*	●	
Merriam's kangaroo rat	*Dipodomys merriami*	●	
Plains harvest mouse	*Reithrodontomys montanus*	●	
Western harvest mouse	*Reithrodontomys megalotis*	●	
Cactus mouse	*Peromyscus eremicus*	●	
Deer mouse	*Peromyscus maniculatus*	●	
White-footed mouse	*Peromyscus leucopus*	●	
Brush mouse	*Peromyscus boylii*	●	
Northern rock mouse	*Peromyscus nasutus*		●
Mearn's grasshopper mouse	*Onychomys arenicola*	●	
Short-tailed grasshopper mouse	*Onychomys leucogaster*	●	
Hispid cotton rat	*Sigmodon hispidus*	●	
Gray wood rat	*Neotoma micropus*	●	
White-throated wood rat	*Neotoma albigula*	●	
Mexican meadow mouse	*Microtus mexicanus*	●	
House mouse	*Mus musculus*	●	
Porcupine	*Erethizon dorsatum*	●	
Coyote	*Canis latrans*	●	
Kit fox	*Vulpes macrotis*	●	
Red fox	*Vulpes vulpes*		●
Gray fox	*Urocyon cinereoargenteus*	●	
Black bear	*Ursus americanus*	●	
Ringtail	*Bassariscus astutus*	●	
Raccoon	*Procyon lotor*		●
Long-tailed weasel	*Mustela frenata*	●	
Badger	*Taxidea taxus*	●	
Western spotted skunk	*Spilogale gracilis*	●	
Striped skunk	*Mephitis mephitis*	●	
Mountain lion	*Puma concolor*	●	
Bobcat	*Lynx rufus*	●	
Javelina or collared peccary	*Dicotyles tajacu*	●	
Mule deer	*Odocoileus hemionus*	●	
Pronghorn antelope	*Antilocapra americana*	●	
Oryx	*Oryx gazella*	●	
Total		*58*	*19*

Sources: U.S. Army, 1997i; Smartt, 1980.



McGEIS 074z.vb.12.2.98

Figure D.3-3. Tanks and Sections of the Otero Mesa Escarpment Surveyed for Bat Fauna in 1997 and 1998.

roost in small scattered groups and no large roost sites were observed. Western pipistrelles (*Pipistrellus hesperus)*, *Myotis*, and free-tailed bats (*Tadarida*) were observed emerging from the escarpment. Observation at four tanks in the area of the escarpment showed relatively high bat activity at Mack and Double tanks and low activity at Martin and West Mesa Rim tanks. Various species were noted including pipistrelles, *Myotis,* and free-tail bats (USAF, 1997e, f). Surveys in 1998 indicated that *Myotis* sp. still maintained a maternity colony at one of the 1979 sites. Behavioral characteristics indicated it was likely still a fringed Myotis colony (U.S. Army, 1998j).

Fort Bliss is conducting rodent surveys at 24 sampling sites in 12 habitat types on McGregor Range in 1997 and 1998. In 1997, trapping took place from May 12 through June 8, and 19 species comprising 941 animals were trapped during 3,600 census line trapnights (U.S. Army, 1997i) (Table D.3-14). The number trapped at the two census locations for each habitat were combined in Table D.3-14. The most abundant species were the silky pocket mouse (*Perognathus flavus)* which was captured 189 times (20 percent of total) and Merriam's kangaroo rat (*Dipodomys merriami)* 138 times (15 percent of total). Both these species were recorded from all but one habitat type and the silky pocket mouse was most common in the grassland habitats while Merriam's kangaroo rat was more common in the desert scrub and arroyo habitats. Other common species were the deer mouse (*Peromyscus maniculatus)*, hispid cotton rat (*Sigmodon hispidus)*, white-footed mouse (*Peromyscus leucopus)*, cactus mouse (*Peromyscus eremicus),* western harvest mouse (*Reithrodontomys megalotis),* and Ord's kangaroo rat (*Dipodomys ordii)*. The deer mouse and white-footed mouse were found in at least 10 of the 12 habitats; the deer mouse was most common in the acacia scrub habitat while the white-footed mouse was most common in the swale. The hispid cotton rat and western harvest mouse were also common in the swale where 57 of 75 and 34 of 61 of the animals captured were in this area respectively. Like the deer mouse, the cactus mouse was most common in the acacia scrub (27 of 62 captured in this area).

The largest number of animals were captured in the swale (151) and the acacia scrub (123). The largest number of species were in the sandy arroyo scrub (14), *Chilopsis* sp. arroyo (14), mixed desert scrub (13), acacia scrub (13), and creosote-grassland (84). The lowest number of individuals (15) and species (7) were recorded in the mesquite-coppice dunes. A relatively small number of individuals (41) and species (8) were also recorded in the grama grasslands (Table D.3-14) (U.S. Army, 1997i).

Other rodents observed were the Texas antelope squirrel (*Ammospermophilus interpres)*, rock squirrel (*Spermophilus variegatus)*, Botta's pocket gopher (*Thomomys bottae)*, and yellow-faced pocket gopher (*Cratogeomys castanops)*. The porcupine (*Erethizon dorsatum)*, coyote (*Canis latrans)*, badger (*Taxidea taxus),* and bobcat *(Lynx rufus)* were observed (U.S. Army, 1997i).

A study of rodents in eight locations in arroyos and associated upland habitats in the Chihuahuan Desert took place for 2 years on McGregor Range (U.S. Army, 1996h). Sampling took place along an elevation gradient in the upper, middle, and lower zones along the arroyos. The relative abundance of rodents was greater in the arroyos than the uplands and at the lower elevation sites than the upper elevation sites. A total of 5,127 individuals representing 18 species of nocturnal rodents were captured during the 69,120 trap nights. The white-footed mouse, deer mouse, western harvest mouse, white-throated woodrat (*Neotoma albigula),* hispid cotton rat, rock pocket mouse (*Chaetodipus intermedius),* and desert pocket mouse (*C. penicillatus)* had higher relative abundance in the arroyos than the uplands. Merriam's kangaroo rat, and the desert plains pocket mouse (*Perognathus flavescens)* were more abundant in the uplands than the arroyos. The pattern of higher rodent species richness and abundance in arroyos was consistent for both study years even though the number of rodents captured was 34 percent less in 1994 than 1993 (U.S. Army, 1996o).

Table D.3-14. Mammals Recorded from 12 Habitat Types on McGregor Range, Otero County, New Mexico

Species	*Habitat Type*												*Total*
	Desert Shrub					*Grassland*				*Arroyo/Swale*			
	DS1	*DS2*	*DS3*	*DS4*	*DS5*	*G1*	*G2*	*G3*	*G4*	*A1*	*A2*	*A3*	
Spotted ground squirrel	0	0	0[a]	0	0	1	1	0	0	0	0	0	*2*
Plains pocket mouse	0	0[a]	0[a]	0	0	0	0	0	0	1	0	0	*1*
Silky pocket mouse	16	10	0[a]	3	3	32	38	45	20	1	8	13	*189*
Chihuahuan pocket mouse	0	9	0[a]	5	13	0	0	0	2	7	0	2	*38*
Hispid pocket mouse	0	0	0	0	0[a]	2	2	7	0	0	0	0	*11*
Rock pocket mouse	0	1	0	1	24	0	0	0	19	11	3	0	*59*
Merriam's kangaroo rat	19	29	11	8	16	0	14	0	5	10	21	5	*138*
Ord's kangaroo rat	0	0[a]	3	42	0	0[a]	3	4	0	1	3	1	*57*
Banner-tailed kangaroo rat	0	0	0	0	0	0	2	0[a]	0	0	0	0	*2*
Western harvest mouse	7	0[a]	0	0[a]	1	0	2	7	0	1	9	34	*61*
Plains harvest mouse	0	0	0	0	0	0[a]	0	0[a]	0	0	12	3	*15*
Cactus mouse	1	7	0	6	27	0	0	0	10	9	2	0	*62*
White-footed mouse	7	0[a]	0	2	2	0	9	7	3	4	8	21	*63*
Deer mouse	8	10	0	9	27	0	4	2	4	9	5	13	*91*
Mearn's grasshopper mouse	3	0	0	0	1	3	5	0[a]	0	0	2	2	*16*
Short-tailed grasshopper mouse	0	2	0	9	0	3	1	0	2	1	1	0	*19*
Hispid cotton rat	11	0	0	0	1	0[a]	1	3	0	0[a]	2	57	*75*
White-throated wood rat	0	0[a]	1	4	7	0	0	0[a]	3	13	3	0	*31*
Gray wood rat	3	1	0	0	1	0	2	0	0	3	1	0	*11*
Total species	*9*	*13*	*7*	*11*	*13*	*8*	*13*	*11*	*9*	*14*	*14*	*10*	*19*
Total individuals	*75*	*69*	*15*	*89*	*123*	*41*	*84*	*75*	*68*	*71*	*80*	*151*	*941*

NOTES: See Table D.3-13 for scientific names. Habitat types are as follows; DS1 = creosote-tarbush scrub, DS2 = mixed desert scrub, DS3 = coppice dunes, DS4 = nonstabilized sand dune, DS5 = acacia scrub, G1 = grama grassland, G2 = creosote grassland, G3 = yucca grassland, G4 = yucca-nolina-sotol, A1 = sandy arroyo scrub, A2 = *Chilopsis* arroyo, A3 = swale.

[a] Species not taken along census line but observed in habitat and therefore is part total species.

Source: U.S. Army, 1997i.

Two lagomorphs, the desert cottontail (*Sylvilagus audubonii),* and black-tailed jackrabbit (*Lepus californicus)* are common on post. Smartt (1980) found these species to be more common in the desert shrubland habitat than the grassland habitat on Otero Mesa. The density of lagomorphs was estimated on McGregor Range from 85 transect lines totaling 141 miles in 1994 and 88 transect lines totaling 148 miles in 1995. Estimated density in 1994 was 22 lagomorphs per square mile and in 1995 and 13 per square mile in 1995. The reduction from 1994 to 1995 was not statistically significant (U.S. Army, 1996p).

The coyote, kit fox (*Vulpes macrotis*), badger, and bobcat are predators in the desert shrubland and grassland habitats. The mountain lion (*Puma concolor*) was observed in the Sacramento Mountains foothills and along the Otero Mesa escarpment in 1979 (Smartt, 1980) and in Rough Canyon along the Otero Mesa escarpment in 1996 (U.S. Army, 1997j).

The kit fox on McGregor Range is morphologically indistinguishable from its close relative the swift fox (*Vulpes velox)*; McGregor Range is within the area where the ranges of these two species overlap. Genetic studies are currently underway to determine which species or hybrid species occurs on McGregor Range (U.S. Army, 1996p). In 1994 and 1995, 20 kit fox were captured and the average home range size based on radio telemetry was 795 acres in 1994 and 1,390 acres in 1995. During the study, 10 animals died and the cause of death for 3 was a mammalian predator (probably coyote) and the remaining were

unknown; coyote tracks were observed around all carcasses. Coyotes have been reported as a major predator on the closely related swift fox. The largest number of kit fox dens were in the creosotebush habitat followed by grassland/tarbush and mesquite. Arthropods comprised the largest percent of the diet followed by mammals. The highest density of arthropods was sampled in the mesquite and sandsage/saltbush dune plant communities (U.S. Army, 1996p). Although the population densities of the coyote and kit fox on McGregor Range are not known, the coyote appears to be more common based on the collections of 1,812 canid scats during surveys of 1,525 miles of roads. Coyote scats were 2.2 and 3.6 times more common than foxes during 1994 and 1995 respectively (U.S. Army, 1996p).

The mule deer (*Odocoileus hemionus*) occurs throughout McGregor Range and is most common in the Sacramento Mountains foothills. Surveys in the Sacramento Mountains foothills on McGregor Range have occurred almost annually, and from 1983 through 1995 the number of deer ranged from a high of 587 in 1984 to a low of 206 in 1995 (Table D.3-15) (NMDGF, 1997). During this period, there has been a general decline in the mule deer population. The average number from 1983 through 1987 was 458 while the average number between 1989 and 1995 was 276. During the 1987 and 1992 surveys, the number observed north and south of New Mexico Highway 506 was determined and 79 and 90 percent of the deer recorded were north of New Mexico Highway 506 respectively. This indicates that the mule deer is more common in the Sacramento Mountains foothills than in the grasslands and shrublands to the south.

Table D.3-15. Mule Deer Census Data from the Sacramento Mountains Foothills (North of New Mexico Highway 506) and the Otero Mesa Grasslands and Desert Shrublands (South of New Mexico Highway 506) on McGregor Range, Otero County, New Mexico

Year	*Number of Mule Deer*		*Total*
	North of New Mexico Highway 506	*South of New Mexico Highway 506*	
1983	544	—	*544*
1984	587	—	*587*
1985	308	—	*308*
1986	442	—	*442*
1987	323	87	*410*
1988	226	—	*226*
1989	222	—	*222*
1990	350	—	*350*
1991	319	33	*352*
1992	249	—	*249*
1993	No Survey	No Survey	*No Survey*
1994	No Survey	No Survey	*No Survey*
1995	206	—	*206*

NOTE: "–" = Survey data not provided for below New Mexico Highway 506.
Source: NMDGF, 1997.

The pronghorn antelope (*Antilocapra americana*) occurs mostly in the grassland communities of the Otero Mesa and adjoining grasslands below the mesa. Pronghorns occasionally use the desert shrubland habitat in the Tularosa Basin on McGregor Range. An estimated 500 to 700 pronghorn inhabit the Otero Mesa of Fort Bliss. The oryx (*Oryx gazella)* is fairly common in the desert shrubland communities and was observed in the area of Mack Tanks in the Tularosa Basin while sign was common at New Tank in the Hueco Mountains (USAF, 1997g; U.S. Army, 1997h). The javelina (*Dicotyles tajacu*) is uncommon

on Fort Bliss and observations include one animal in an arroyo about 3 miles east of Hay Meadow Tank and sign about one mile east of Martin Canyon (USAF, 1997e, f).

D.4 SENSITIVE SPECIES

Various species of flora and fauna occur on McGregor Range that are listed as threatened, endangered, or species of concern by the USFWS and the State of New Mexico (sensitive species) (Table D.4-1). In addition, the diverse habitats on McGregor Range have the potential to support species that have not been confirmed. The following sections present brief summaries of selected sensitive species known to occur or have the potential to occur on McGregor Range. In addition, federally listed species will be addressed in greater detail in a biological assessment that will be prepared separately. The draft biological assessment is scheduled to be completed in 1999.

D.4.1 Plants

Sneed Pincushion Cactus. The Sneed pincushion cactus (*Coryphantha sneedii* var. *sneedii)* is a federally endangered species and is also considered endangered in New Mexico. This species is known only from limestone substrates in the Franklin Mountains in El Paso County, Texas, and Doña Ana County, New Mexico (U.S. Army, 1980b). Surveys for this species were conducted in the Hueco Mountains in Texas in seemingly good habitat and none were observed (U.S. Army, 1991a). Additional surveys for this species were conducted in 1997 in appropriate habitat and two additional populations were found on the Doña Ana Range (U.S. Army, 1998k).

Alamo Beardtongue. The alamo beardtongue (*Penstemon alamosensis)* is a federal species of special concern and a rare and sensitive species in New Mexico. This species is known from the Sacramento and San Andres mountains, and was discovered in the Hueco Mountains in Texas on Fort Bliss in 1981 (U.S. Army, 1991a). Surveys in 1991 revealed that this species was growing on rocky canyon bottoms and on cliffs in two canyons in the Hueco Mountains in Texas; a total of 105 plants were observed (U.S. Army, 1991a). A follow-up survey for this species was conducted in 1997 in ten canyons in the Hueco Mountains in Texas; it was only observed in previously recorded locations (U.S. Army, 1998j). This species has not been observed on McGregor Range, although limited potential habitat occur on the range.

Grama-grass Cactus. The grama-grass cactus (*Toumeya papyracantha*) is a federal species of special concern and is not listed by the State of New Mexico. Prior to 1995, it was considered endangered by the state but is now listed as L4, which indicates that the species was once listed but is no longer because it is more common than originally thought. Prior to 1992, there were only two records for this species from McGregor Range; both were in the grasslands of Otero Mesa. Surveys in 1993 and 1994 showed that this species was much more abundant in the grassland habitat on McGregor Range. This species is considered common on Otero Mesa (Corral, 1997).

Night Blooming Cereus. The night blooming cereus (*Peniocereus greggii)* is a federal species of special concern and a rare and sensitive species in New Mexico. This species occurs in the Chihuahuan Desert shrubland and is known to occur on Fort Bliss. Seven of these plants were located during a survey on the Doña Ana Range–North Training Areas (U.S. Army, 1990). No additional populations of this species were observed during 1997 surveys on McGregor Range in a 5,000-acre area in the Tularosa Basin below the Otero Mesa escarpment (USAF, 1997g), or in locations surveyed on Doña Ana Range–North Training Areas (U.S. Army, 1998k). This species has not been observed on McGregor Range, although limited potential habitat occur on the range.

Table D.4-1. Sensitive Species Known to or Having the Potential to Occur on McGregor Range

Species	*Status*[a]		*Location*
	Federal	*New Mexico*	
Plants			
Sneed pincushion cactus *(Coryphantha sneedii var. sneedii)*	E	E	Limestone Hills, Doña Ana Range–North Training Areas
Alamo beardtongue *(Penstemon alamosensis)*	SC	RS	Hueco Mountains, South Training Areas
Grama grass cactus *(Toumeya papyracantha)*	SC	—	Otero Mesa, McGregor Range
Night blooming cereus *(Peniocereus greggii)*	SC	RS	Desert shrublands, Doña Ana Range–North Training Areas
Hueco Mountain rock daisy *(Perityle huecoensis)*	SC	—	Hueco Mountains, South Training Areas
Nodding cliff daisy *(Perityle cernua)*	SC	RS	Organ Mountains, Doña Ana Range–North Training Areas
Sand prickly pear (*Opuntia arenaria*)	SC	E	Low potential to occur on McGregor Range
Invertebrates [b]			
Los Olmos tiger beetle (*Cicindela nevadica*)	SC	—	Not known to occur on Fort Bliss. Could occur in areas of limestone soil
Reptiles			
Texas horned lizard *(Phrynosoma cornutum)*	SC	—	Widespread throughout post
Mountain short-horned lizard (*Phrynosoma douglasii hernandezii*)	—	—	Species occur on McGregor Range; subspecies not recorded on post
Mottled rock rattlesnake (*Crotalus lepidus lepidus*)	—	T	Species documented from the Organ Mountains; subspecies not recorded on post
Birds			
Interior least tern *(Sterna antillarum athalassos)*	E	E	Not known to occur on Fort Bliss. Could occur as very rare migrant at aquatic habitat on McGregor Range
Peregrine falcon *(Falco peregrinus anatum)*	E	T	Occasional migrants observed on McGregor Range
Northern aplomado falcon *(Falco femoralis septentrionalis)*	E	E	One unconfirmed sighting, best potential habitat on Otero Mesa McGregor Range
Southwestern willow flycatcher *(Empidonax trailii extimus)*	E	E	Willow flycatcher subspecies on McGregor Range not determined. Occasional migrant on McGregor Range
Bald eagle *(Haliaeetus leucocephalus)*	T	T	Winters in Sacramento Mountains foothills, McGregor Range
Piping plover *(Charadrius melodus)*	T	E	Rare migrant on McGregor Range; observed once in 1987 at sewage lagoon on Fort Bliss
Mexican spotted owl *(Strix occidentalis lucida)*	T	—	Very rare on Fort Bliss. Not known to breed on site, best potential habitat in Organ Mountains, Doña Ana Range–North Training Areas. Marginal habitat in Sacramento Mountains foothills on McGregor Range
Mountain plover *(Charadrius montanus)*	PT	—	Has the potential to occur in grassland habitat on Otero Mesaon McGregor Range
Black tern *(Chlidonias niger)*	SC	—	Regular migrant through McGregor Range at perennial water sources

Table D.4-1. Sensitive Species Known to or Having the Potential to Occur on McGregor Range (Continued)

Species	*Status*[a]		*Location on McGregor Range*
	Federal	*New Mexico*	
White-faced ibis *(Plegadis chihi)*	SC	—	Regular migrant through Fort Bliss; observed at sewage lagoons and on cantonment on Fort Bliss. Could occur at aquatic habitat on McGregor Range
Northern goshawk (*Accipiter gentilis*)	SC	—	Uncommon migrant on McGregor Range
Ferruginous hawk *(Buteo regalis)*	SC	—	Wintering and migrant species; mostly on Otero Mesa, McGregor Range
Western burrowing owl *(Athene cunicularia)*	SC	—	Occurs throughout McGregor Range except the mountain areas. Most common at prairie-dog towns in the grassland habitat on Otero Mesa
Costa's hummingbird (*Calypte costae*)	—	T	Uncommon migrant in arroyo-riparian habitat on McGregor Range
Loggerhead shrike *(Lanius ludovicianus)*	SC	—	Winter and breeding bird from Otero Mesa and Tularosa Basin on McGregor Range
Baird's sparrow *(Ammodramus bairdii)*	SC	T	Migrates through and winters in dense grasslands on McGregor Range
Varied bunting *(Passerina versicolor)*	—	T	Very rare on Fort Bliss; occasional migrant on McGregor Range
Bell's vireo *(Vireo bellii)*	—	T	Occasional on McGregor Range
Gray vireo *(Vireo vicinior)*	—	T	Nests in the Organ Mountains, Doña Ana Range–North Training Areas. May occur on McGregor Range
Mammals			
Eastern small-footed bat *(Myotis leibii)*	SC	—	Distribution unknown
Occult little brown bat *(Myotis lucifugus occultus)*	SC	—	Distribution unknown
Fringed myotis *(Myotis thysanodes)*	SC		Reported from the Sacramento Mountains foothills, McGregor Range
Cave myotis *(Myotis velifera)*	SC	—	Distribution unknown
Long-legged myotis *(Myotis volans)*	SC	—	Distribution unknown
Yuma myotis *(Myotis yumanensis)*	SC	—	Distribution unknown
Spotted bat *(Euderma maculatum)*	SC	T	Distribution unknown
Townsend's pale big-eared bat *(Corynorhinus townsendii)*	SC	—	Distribution unknown
Big free-tailed bat *(Nyctinomops macrotis)*	SC	—	Distribution unknown
Gray-footed chipmunk *(Tamias canipes)*	SC	T	Occurs in woodland and forest habitats in the Sacramento Mountains foothills on McGregor Range
Arizona black-tailed prairie dog *(Cynomys ludovicianus arizonensis)*	SC	—	Occurs on Otero Mesa , McGregor Range

[a] RS = rare and sensitive species, SC = federal species of concern, E = endangered species, PT = proposed threatened, T = threatened species, — = not listed.
[b] No federal or state status but are globally imperiled (U.S. Army, 1994b).
Source: NMDGF, 1996; Sivinski and Lightfoot, 1995; TPW, 1996; U.S. Army, 1998b.

Hueco Mountain Rock Daisy. The Hueco Mountain rock daisy (*Perityle huecoensis)* is a federal species of special concern. This species was first collected in 1977. Surveys of the Hueco Mountains in Texas in 1991 revealed the presence of three populations of this species. The only known populations of this species are within the South Training Areas of Fort Bliss. It occurs on north facing slopes or on slopes protected from direct sunlight in relatively mesic canyons in these mountains (U.S. Army, 1991a). A 1997 follow-up survey in ten canyons in the Hueco Mountains in Texas showed that this species occurred only in the areas where it was previously observed (U.S. Army, 1998k). This species has not been observed on McGregor Range, although limited potential habitat occur on the range.

Sand Prickly Pear. The sand prickly pear (*Opuntia arenaria)* is a federal species of special concern and a State of New Mexico endangered species. This is a "cholla-type" cactus that typically stands less than 1 foot high but can form clumps up to 5 feet in diameter. The sand prickly pear grows in sandy dunes, flood plains, and foothills in the Rio Grande corridor between Las Cruces, New Mexico, and El Paso, Texas (USFWS, 1997). In 1988, a small population of sand prickly pear was discovered 0.8 mile from the western boundary of the Doña Ana Range–North Training Areas on BLM land. It was found in the mesquite coppice dune plant community with sparse grass cover. In December 1996, a 2-day survey for this species in potential habitat on the Doña Ana Range–North Training Areas took place in mesquite coppice dune plant community in proximity to the known population on BLM land. No populations of the sand prickly pear were found on Fort Bliss although there appears to be suitable habitat. However, extensive on-going vegetation surveys have taken place at numerous locations on Fort Bliss and this species has never been recorded. The mesquite coppice dunes surveyed on Fort Bliss had more grass cover than similar habitat on BLM land which may detract from the suitability of this habitat for the sand prickly pear (U.S. Army, 1998j). In addition, most known populations in the U.S, are in mesquite sand dunes in the vicinity of the Rio Grande, well away from Fort Bliss. Therefore, the probability of this species occurring on Fort Bliss is very low.

D.4.2 Invertebrates

Los Olmos Tiger Beetle. The Los Olmas tiger beetle (*Cicindela nevadica)* is a federal species of concern and is not listed by the State of New Mexico. This species has not been recorded from McGregor Range. The population trend of this species is unknown and it is listed as a possible species for New Mexico (BISON-M, 1997). The Los Olmos tiger beetle occurs in limestone soils often down slope from limestone rubble. It has the potential to occur in areas of limestone soil on Fort Bliss.

D.4.3 Reptiles

Texas Horned Lizard. The Texas horned lizard (*Phrynosoma cornutum)* is a federal species of special concern and is not listed in New Mexico. This species is common and widespread on McGregor Range and is found in grassland and desert shrublands habitat throughout the area (U.S. Army, 1997e). This species was captured 82 times at 20 sampling locations in the desert shrublands of the Tularosa Basin on McGregor Range. This represents less then 1 percent of the total captures during this study (U.S. Army, 1996e).

Mottled Rock Rattlesnake. The mottled rock rattlesnake (*Crotalus lepidus lepidus)* is a State of New Mexico threatened species; it is not listed by the Federal Government. It is typically found in rocky canyons or hillsides and in New Mexico is known only from the Guadeloupe Mountains in Eddy County and extreme eastern Otero County (Degenhardt et al., 1996). The mottled rock rattlesnake has not been documented from Fort Bliss although it has been recorded from the Organ Mountains near the post. Potential habitat occurs in the Hueco Mountains as well as the Otero Mesa escarpment on McGregor Range.

D.4.4 Birds

Interior Least Tern. The interior least tern (*Sterna antillarum athalassos*) was listed as an endangered species in 1985 (USFWS, 1990) and is also endangered in New Mexico. The California *(S. a brownii)* and eastern subspecies *(S. a. antillarum)* occur along the coasts of the U.S. and the interior least tern occurs principally along the Missouri and Mississippi River systems in the U.S. although some nest along the Rio Grande drainage in the western U.S. (Whitman, 1988). Historically, the interior least tern was abundant along the Missouri and Mississippi river systems; the estimated population in 1990 was 5,000 birds, which is much reduced from historic population levels (USFWS, 1990).

Whitman (1988) summarized the biology of the interior least tern and factors that have lead to the reduction of this species include habitat destruction caused by urbanization; construction of locks, dams, dikes, levees, and storage reservoirs; altered flow patterns in rivers resulting in the disappearance of sandbar nesting habitat; increased predation in disturbed habitats; human disturbance; and water pollution. The interior least tern has been eliminated from the Mississippi River and its tributaries north of the Missouri River junction due to habitat destruction (USFWS, 1990). In other areas where nesting habitat still exists along the river, predation can be the major cause in chick mortality (Kirsch, 1996).

Before human development, the interior least tern nested on sandbars along low gradient portions of major rivers such as the Mississippi and the Missouri. With the disappearance of this habitat, this species now also nests on man-made areas such as dikes, dredge material islands, sand pit mines, construction fill sites, and on roofs of buildings (Gore and Kinnison, 1991; Whitman, 1988). Kirsch (1996) studied nesting least terns on sandbar and sandpit sites along the lower Platte River in Nebraska and determined that the proportion of terns using each habitat was similar to the proportion of bare sand in each habitat. In addition, productivity did not differ between the natural sandbars and the sandpit areas. However, Kirsch (1996) determined that the estimated productivity during the 4-year study was insufficient to support the local population and that high chick mortality was he reason why. Smith and Renken (1991) studied nesting interior least terns along the Mississippi River where this species nests on sandbars. There was no difference between used and unused sandbars except that most terns nested on sandbars that were continuously exposed for at least 100 days during the breeding season.

In New Mexico, the interior least tern nests at Bitter Lake National Wildlife Refuge on the Pecos River Drainage in Chaves County (Whitman, 1988). In the 1960s, the breeding tern population was about 60; this number declined to only three nesting pairs per year from 1987 through 1990. There has been a slight increase of four to seven pairs per year from 1991 through 1995. Productivity has been poor during the last 10 years (NMDGF, 1997). The interior least tern has not been observed on McGregor Range. If it did occur, it would likely be only during migration near aquatic habitat.

Peregrine Falcon. The peregrine falcon (*Falco peregrinus anatum*) is a federal endangered species; it is threatened in New Mexico. Nesting peregrine falcons have been monitored extensively in New Mexico from 1979 through 1996 and less extensive monitoring data is available from 1960 to 1979 (Johnson, 1996). Long-term data indicate that adult pairs of peregrine falcons occupied about 85 percent of known territories in the early 1960s; this number decreased to below 40 percent beginning in the late 1960s. The number of adult pairs at known territories fluctuated around 40 percent until about 1985. Since 1985, the number of adult pairs occupying territories has steadily increased and has averaged 70 percent from 1992 through 1996. The increase in number of adult pairs occupying territories since 1985 is the result of increased productivity in the early 1980s. However, productivity has decreased 29 percent in the last 10 years and if this trend continues, the peregrine falcon population in New Mexico may start to decrease (Johnson, 1996).

The peregrine falcon has not been recorded as a breeding species at Fort Bliss although an unconfirmed peregrine/prairie falcon and a prairie falcon made a nesting attempt on the Otero Mesa escarpment in

1997 (USAF, 1997c, d). A survey for potential peregrine falcon nesting habitat was conducted during the fall of 1979 and it was determined that the large cliffs, intermittent stream flow, and the mosaic of conifer forest and mountain shrub habitat that occurred in some of the canyons of the Organ Mountains on Doña Ana Range–North Training Areas represented the best potential habitat for this species on Fort Bliss. This survey also included the Sacramento Mountains foothills on McGregor Range and it was determined that the potential habitat in this area was inferior to the Organ Mountains because of the lack of perennial water and the much drier nature of the area (U.S. Army, 1980a).

Ten canyons were intensively surveyed for peregrine falcons in the Organ Mountains in 1980. No peregrine falcons were observed during this study, although four prairie falcon and three golden eagle nest sites were found. It is believed that the relatively high density of prairie falcons and golden eagles may preclude the use of these mountains for nesting peregrine falcons (U.S. Army, 1980a). A 6.2-mile section of cliffs in the Sacramento Mountains foothills on McGregor Range was also searched for peregrine falcons and none were found. One prairie falcon nest site was found just north of the McGregor Range boundary (U.S. Army, 1980a). Single peregrine falcons were observed in the Tularosa Basin of McGregor Range in February and April 1996 during aplomado falcon surveys (U.S. Army, 1997k) and one was observed flying over mesquite habitat on McGregor Range in the spring of 1996 (U.S. Army, 1996k). This species was also observed flying over the sandsage habitat in the Tularosa Basin on McGregor Range on April 25,1997 (U.S. Army, 1997f). These observations indicate that the peregrine falcon may occur occasionally during the winter and as a migrant on McGregor Range.

Northern Aplomado Falcon. The northern aplomado falcon (*Falco femoralis septentrionalis)* is a federal and State of New Mexico endangered species. It once inhabited the grasslands of southern Texas, New Mexico, and Arizona; historic records show that it was common until about 1940 (Hector, 1987). Historic records from New Mexico show that this species occupied open yucca grasslands in southern New Mexico (Ligon, 1961) which includes the grasslands of Otero Mesa on McGregor Range. The reasons for this species' decline are unclear. Habitat loss and pesticide contamination likely contributed to this decline (Hector, 1987). The USFWS is currently releasing aplomado falcons into the wild in south Texas in an attempt to re-establish a breeding population in the United States. The first nesting pair of aplomado falcons was recorded in Cameron County, Texas, in 1995, which represents the first nesting aplomado falcons in Texas in the last 54 years. Two nesting pairs were observed in 1996 (Mora et al., 1997).

Sporadic observations of the northern aplomado falcon have been reported since 1991 in areas near McGregor Range. An unconfirmed sighting of this species on McGregor Range occurred in May 1997 when an immature bird was observed in the desert shrubland-grassland habitat in the Tularosa Basin (USAF, 1997d). In 1992, breeding populations were discovered south of the border in grassland habitat in the State of Chihuahua, Mexico. The nearest population to the United States is about 125 miles south of the New Mexico border (Montoya et al., 1997). Given the recent sighting of this species near McGregor Range and the existence of potential grassland habitat on Otero Mesa, surveys for this species were conducted in 1994 and 1996 on McGregor Range (U.S. Army, 1994b, 1997k). In 1994, 495 miles of survey routes were traversed over 23 days from February 2 through April 21. No northern aplomado falcons were observed although 13 other species of raptors were noted and the location of 30 nest structures were mapped (U.S. Army, 1994b). Based on these surveys, potential habitat for the northern aplomado falcon was mapped on Otero Mesa and part of the Tularosa Basin below the mesa. Potential excellent habitat consists of areas with an interspersion of open grassland and tall yucca and shrubs such as mesquite and Mormon tea. As the cover of shrubs increases, the suitability of the habitat for northern aplomado falcon decreases. The best potential habitat occurs in the grassland habitat on Otero Mesa and in a portion of the Tularosa Basin.

In 1996, the northern aplomado falcon survey was expanded to include habitat evaluation and avian prey base studies on Fort Bliss (U.S. Army, 1997k). Results of this study were compared to similar habitat and

prey base assessments conducted at occupied aplomado falcon territories in Chihuahua, Mexico (Montoya et al., 1997). Late February/March/April 1996 surveys for the northern aplomado falcon took place along six routes in marginal potential habitat in the Tularosa Basin and along six routes in marginal-to-good and good-to-excellent habitat on Otero Mesa; surveys followed the USFWS draft protocol (USFWS, 1996). No northern aplomado falcons were observed during these surveys (U.S. Army, 1997k).

Habitat and prey-base study results for McGregor Range showed some similarities and differences when compared to equivalent studies in Chihuahua, Mexico. The grasslands on Otero Mesa with its scattered yuccas and shrubs resemble the open habitat considered necessary to support a breeding population of northern aplomado falcons. Scattered woody plants provide the necessary perch and nesting sites for this species and the density of woody species on more than one-half the sites sampled on some portions of Otero Mesa is similar to that found in occupied territories in Mexico. The eight sites sampled in the Tularosa Basin had shrub densities much higher than on Otero Mesa or in Mexico. The northern aplomado falcon does not construct its own nest but uses abandoned nests built by hawks and ravens. Adequate potential nest sites were observed during the northern aplomado falcon survey on Otero Mesa in 1996. It is believed, therefore, that the number of woody species and potential nest sites would be adequate to support northern aplomado falcons on Otero Mesa (U.S. Army, 1997k). The Otero Mesa-1 habitat group consists of seven locations on Otero Mesa that were most similar to data from Mexico, and the Otero Mesa-2 habitat group represents eight locations that were somewhat less similar to data from Mexico (Table D.4-2). Comparison of percent grass cover and biomass of potential prey species showed that both were much less on Otero Mesa than in Mexico (Table D.4-2). Mean basal grass cover in two areas on Otero Mesa that provide the best potential northern aplomado falcon habitat ranged from 16.0 to 20.1 percent; cover at occupied territories in Mexico averaged 46.3 percent (Table D.4-2) (U.S. Army, 1997k; Montoya et al., 1997). Although such factors as differences in precipitation patterns and soil type may contribute to the observed differences between Otero Mesa and Mexico, it is believed that livestock grazing has had a greater impact on the grasslands on Otero Mesa than in Mexico. The number of birds detected at sampling locations on Otero Mesa and in Mexico were similar but the bird biomass in Mexico was substantially greater than on Otero Mesa (Table D.4-2). Higher densities of meadowlarks in Mexico account for this difference and meadowlarks were the most common prey item in the diet of northern aplomado falcons in Mexico (Montoya et al., 1997). These results indicate that the grassland habitat on Otero Mesa may have a reduced capacity to support northern aplomado falcons compared to occupied territories in Mexico and that the principal reason for this may be livestock grazing. However, further study is necessary, before a more definitive determination of northern aplomado falcon habitat and food requirements can be made (U.S. Army, 1997k).

Table D.4-2. Mean Percent of Grass Cover and Mean Number of Birds and Bird Biomass Per Site at Two Locations on Otero Mesa and at Occupied Aplomado Territories in Mexico

Habitat	*Number of Transects*	*Average Percent Grass Basal Cover*	*Potential Avian Prey*	
			Average Number of Birds	*Average Biomass of Birds (grams per site)*
Otero Mesa - 1	7	20.1 (± 2.11)[a]	13.0 (± 5.4)	507.8 (± 230.7)
Otero Mesa – 2	8	16.0 (± 2.42)	14.8 (± 5.5)	594.9 (± 222.5)
Mexico	10	46.3 (± 13.0)	12.1 (± 4.2)	816.8 (± 188.7)

[a] Numbers in parenthesis are standard deviations.
Source: U.S. Army, 1997k; Montoya, 1995; Montoya et al., 1997.

Southwestern Willow Flycatcher. The southwestern willow flycatcher (*Empidonax traillii extimus)* is a federal and State of New Mexico endangered species. This flycatcher is a neotropical migrant that breeds

in the southwestern U.S. and winters in Central and South America. The southwestern willow flycatcher breeds only in dense riparian vegetation near surface water or saturated soil in linear or irregularly shaped stands with patches of dense vegetation interspersed with small openings (Sferra et al., 1997; Sogge et al., 1997).

The southwestern willow flycatcher populations have experienced significant declines, and breeding populations are known from only about 75 locations. There are an estimated 300 to 500 pairs in existence (Sogge et al., 1997). The principal factors resulting in these declines are the extensive loss, modification, and fragmentation of riparian breeding habitat and brood parasitism by brown-headed cowbirds (Sogge et al., 1997). Based on recent surveys, there are likely less then 200 breeding pairs of southwestern willow flycatchers in New Mexico (Williams, 1997).

The willow flycatcher has been recorded occasionally on McGregor Range. Willow flycatchers were heard singing in an arroyo on McGregor Range in early June 1996. These birds were apparently migrants because they did not stay in the area (U.S. Army, 1997k). This species has also been recorded in arroyos during breeding bird surveys in 1996 and 1997 (U.S. Army, 1996i, 1997g). These birds are assumed to be migrants. The subspecies of willow flycatchers observed on McGregor Range was not determined, so it is not known if these observations represent the endangered southwestern willow flycatcher. Appropriate nesting habitat for the southwestern willow flycatcher does not exist on McGregor Range. There are stands of willow (*Salix* sp.) at some stock tanks but these stands are likely too small to support nesting southwestern willow flycatchers. For example, a stand of willow exists at Mack Tanks in the Tularosa Basin. This tank typically holds water all year and the stand of willows covers about 0.4 acre (USAF, 1997h), which is assumed to be too small to support nesting willow flycatchers. Therefore, it is assumed that the willow flycatchers that occur on McGregor Range are migrants.

Bald Eagle. The bald eagle *(Haliaeetus leucocephalus)* is a federal and State of New Mexico threatened species. It winters along lakes and rivers in large numbers (Spencer, 1976; Steenhof et al., 1980) and also in terrestrial habitat far from aquatic habitat (Fischer et al., 1984; Grubb and Kennedy, 1982; Grubb et al., 1989). A small population (25 to 30 individuals) of bald eagles winter in the Sacramento Mountains and one of the known roost sites is about 4 miles from the northern border of McGregor Range (U.S. Army, 1995d). Given that bald eagles are known to travel up to 22 miles from roost sites to feeding sites (Grubb et al., 1989), the northern portion of McGregor Range is within the range of eagles roosting in the Sacramento Mountains.

Surveys for wintering bald eagles in the Sacramento Mountains foothills on McGregor Range were conducted during the winters of 1994-95 and 1995-96 (U.S. Army, 1995d, 1996i) (see Table D.3-8). Two routes were surveyed in the wooded habitat of the foothills; one in the desert shrubland habitat, and one in the grassland habitat on Otero Mesa. During the winters of 1994-95 and 1995-96, bald eagles were observed 28 and 14 times, respectively, on McGregor Range (U.S. Army, 1995d, 1996i). Based on plumage characteristics, it was estimated that a minimum of five different eagles were in the study area during the winter of 1994-95. During both winters, most bald eagles were observed at the extreme northern boundary of McGregor Range, where high ridges and hills provide favorable perch sites and updrafts. Vegetation in this area is mainly grassland with varying amounts of shrubs (mountain mahogany and oak) and trees (pinyon pine and juniper) providing favorable foraging conditions (U.S. Army, 1995d). Only two bald eagles were observed over the grasslands of Otero Mesa. Most birds were in flight when first observed. In seven cases, bald and golden eagles were observed together; in three of these, golden eagles initiated aggressive interactions with bald eagles. There were no observations of eagles feeding or hunting. Food sources on Fort Bliss may include deer carrion and rabbits.

Piping Plover. The piping plover (*Charadrius melodus)* is an endangered species in the Great Lakes region and threatened elsewhere in the U.S. This species is considered endangered by the State of New Mexico. The piping plover has experienced range-wide declines (Haig and Oring, 1985) and the principal factors are habitat deterioration (Haig and Oring, 1985), human disturbance (Flemming et al., 1988), and

predation (Gaines and Ryan, 1988). The piping plover nests on beaches along the Atlantic coast and Great Lakes, and along lakes and rivers in the great plains in Canada and the U.S. (Haig and Oring, 1985). New Mexico is south of the piping plover breeding range. This species is a very rare migrant in New Mexico, having been observed six times (NMDGF, 1996).

The piping plover was observed once on Fort Bliss at sewage lagoons in 1987 (U.S. Army, 1997k) and is therefore considered a very rare migrant on Fort Bliss, including McGregor Range.

Mexican Spotted Owl. The Mexican spotted owl (*Strix occidentalis lucida)* is a federal threatened species and is not listed by New Mexico. Its range includes southern New Mexico where it occurs in suitable habitat in isolated mountain ranges (U.S. Army, 1996j). During the breeding season, the Mexican spotted owl inhabits mountain forests and canyons, and the most commonly used habitat types for nesting and roosting are mixed conifer (Douglas fir, white fir [*Abies concolor*], southwestern white pine [*Pinus strobiformis*], and ponderosa pine), while pinyon pine-juniper forests are used to a lesser degree (Skaggs and Raitt, 1988; Ganey and Balda, 1989; Zwank et al., 1995). The Sacramento Mountains just to the north of McGregor Range contain a breeding population of Mexican spotted owls, and the closest known breeding pair is 10 miles from the McGregor Range boundary (U.S. Army, 1996j).

The Mexican spotted owl has been observed on or near McGregor Range on two occasions. During the winter of 1989-90, one bird was found dead and the second moved out of the Sacramento Mountains to McGregor Range and then back into the mountians. Both birds were being followed by radio-telemetry (U.S. Army, 1996j). Surveys for this species were conducted in the Sacramento Mountains foothills on McGregor Range from December 12, 1995, to February 21, 1996. No spotted owls were heard or observed during these surveys (U.S. Army, 1996j). No mixed conifer habitat and only a few isolated ponderosa pine occur in the Sacramento Mountains foothills. Based on the habitat in the Sacramento Mountains foothills on McGregor Range and the ecology of the spotted owl, it seems likely that this area is only used by spotted owls on an occasional basis during the winter or fall dispersal (U.S. Army, 1996j).

Mountain Plover. The mountain plover (*Charadrius montanus)* is a proposed threatened species, is not listed by New Mexico, and has declined by 63 percent since 1966 (Knopf, 1994). This species is generally considered an associate of the short grass prairie dominated by blue grama and buffalo grass (*Buchloe dactyloides)* (Knopf and Miller, 1994) although it is known to nest in habitat dominated by low growing shrubs such as sagebrush (*Artemesia* sp.) and rabbitbrush (*Chryosthamnus* sp.) (Day, 1994). Various observers have noted that the mountain plover nests and forages in areas of disturbed ground in Utah, such as that which occurs at prairie-dog towns and areas heavily grazed by livestock (Knopf and Miller, 1994; Miller and Knopf, 1993; Sager, 1996). The bulk of the mountain plover population winters in the central valley of California and seems to have adapted to the conversion of much of the native habitat to agricultural fields in that area. The survival rate of mountain plovers on their wintering ground is high, so it appears that the declines noted for this species are attributable to factors on the breeding grounds (Knopf and Rupert, 1995).

In a recent survey, the mountain plover was observed at 35 sites in 11 counties during the breeding season in New Mexico. This species was observed in a variety of habitats, but bare ground was a common feature at all the sites and livestock grazing had created most of the bare ground. The bulk of the observations were in the northeast part of the state and none were from Otero County although there are two historic records of this species from Otero County (Sager, 1996). Based on its habitat requirements, Otero Mesa on McGregor Range provides the best potential habitat for this species, especially in the overgrazed areas around stock tanks and troughs. The mountain plover was not recorded during field surveys for this species in the 5,000-acre USAF proposed tactical target complex site in the grassland habitat on Otero Mesa or in grassland habitat in a second proposed tactical target complex site in the Tularosa Basin (USAF, 1997h, i). This species was also not recorded during surveys of other potential habitat in a 13,000-acre section

of Otero Mesa, such as along roads, at heavily grazed stock tanks, or prairie dog *(Cynomys ludovicianus arizonensis)* towns (U.S. Army, 1998k). However, one Mountain plover was observed at Mesa Horse Camp on Otero Mesa on April 4 and 6, 1999. This bird was not observed during subsequent observations and was assumed to be a migrating bird (Locke, 1999).

Black Tern. The black tern (*Chlidonias niger*) is a federal species of special concern and is not listed by the State of New Mexico. This species breeds in wetlands greater than 12 acres in size in the central and western U.S. Breeding bird studies have shown that this species is declining range-wide at 8.1 percent per year; these declines include the populations in the central and western U.S. (Finch, 1992).

The black tern has been observed on Fort Bliss during migration at playa lakes, ponds, and man-made water resources in the Tularosa Basin and on Otero Mesa. This species is likely a regularly occurring migrant on Fort Bliss including McGregor Range (U.S. Army, 1997k).

White-faced Ibis. The white-faced ibis (*Plegadis chihi*) is a federal species of special concern and is not listed by the State of New Mexico. This species nests in colonies in large fresh water marshes from California, east to Idaho and Wyoming. The current population is thought to be stable, but warrants protection because there are a limited number of breeding colonies and their disappearing wetlands habitat could be exposed to fluctuating water levels and pesticide poisoning (Finch, 1992).

The white-faced ibis has been observed on Fort Bliss during spring and fall migrations at sewage ponds. It could also occur during migration at playa lakes, stock tanks, and other water sources elsewhere on Fort Bliss including McGregor Range (U.S. Army, 1997k).

Northern Goshawk. The northern goshawk (*Accipiter gentilis)* is a federal species of concern and is not listed by New Mexico. This species is a rare migrant through McGregor Range. In the west, this species nests in mature conifer forests such as those dominated by Douglas fir and ponderosa pine (Call, 1978; Moore and Henny, 1983). The only potential nesting habitat for this species occurs in the Organ Mountains on the Doña Ana Range–North Training Areas. The northern goshawk has not been recorded from the Organ Mountains during raptor and breeding bird surveys and is assumed not to nest on Fort Bliss (U.S. Army, 1980a, 1991b, 1994b). On McGregor Range, this species may occasionally occur as a migrant in the Sacramento Mountains foothills.

Ferruginous Hawk. The ferruginous hawk *(Buteo regalis)* is a federal species of special concern and is not listed by the State of New Mexico. The hawks' decline in some areas is due to its intolerance to human disturbance and loss of habitat due to cultivation (White and Thurow, 1985; Houston and Bechard, 1984; Schmutz, 1984). It breeds from the Canadian provinces, south to Arizona and Oklahoma, and nests on trees, bushes, large rocks, and hillsides. It is a grassland species and typically feeds on prairie dogs and ground squirrels (Finch, 1992). Observations on McGregor Range confirm this because all but one ferruginous hawk, observed during wintering bald eagle surveys, were associated with the grassland habitat of Otero Mesa (U.S. Army, 1995d; 1996i).

The ferruginous hawk has been observed on McGregor Range during the fall, winter, and spring. This species was observed at prairie-dog towns on Otero Mesa three times in March of 1996 (U.S. Army, 1996k). During wintering bald eagle surveys, the ferruginous hawk was observed 21 times along nine survey routes from early December 1994 to late February 1995, and two times during 18 surveys in the winter of 1995-96 (U.S. Army, 1995d, 1996i). These observations indicate that the ferruginous hawk winters at and migrates through McGregor Range. This species is not known to nest on McGregor Range and was not observed during intensive breeding-bird surveys during 1996 and 1997 (U.S. Army, 1996g, 1997f), or during ferruginous hawk surveys conducted in April 1997 (U.S. Army, 1998i).

Burrowing Owl. The western burrowing owl is a federal species of concern and is not listed in New Mexico. This species nests in desert grasslands such as those that occur on Otero Mesa and desert shrublands such as those in the Tularosa Basin on McGregor Range. It also nests in prairie, mesquite coppice dune/sand scrub, basin, mesa foothill grasslands, desert shrublands, sagebrush, and pinyon/juniper habitat, as well as, disturbed areas such as prairie-dog towns, road cuts, airports, and other developed areas. Declines in this species are attributed to the loss of burrow nest sites resulting from the eradication of colonial burrowing rodents, particularly prairie dogs (Finch, 1992).

The burrowing owl was observed at 20 of the active and inactive prairie dog towns surveyed on Otero Mesa in 1996 (U.S. Army, 1996k). Burrowing owls were observed at nine of 16 prairie dog towns during a 1997 black-tailed prairie dog survey; young owls were observed at most of these towns. Field studies in 1997 showed that there were 18 to 22 pairs at 11 of 16 prairie-dog towns inspected on Otero Mesa on McGregor Range (U.S. Army, 1998k). All military facilities on McGregor Range were inspected in 1997, and 11 pairs of burrowing owls were observed nesting in concrete conduit boxes at radar tracking sites just east of McGregor Range Camp. Elsewhere in the Tularosa Basin, burrowing owls may occur occasionally in mesquite dunes habitat and along eroded arroyos. The extent of use of these habitat types in the desert shrublands habitat in the Tularosa Basin has not been determined (U.S. Army, 1998k). In 1997, one burrowing owl was repeatedly observed along a road in the Tularosa Basin between SHORAD and Mack Tanks; it was living in some kangaroo rat holes (USAF, 1997h).

Costa's Hummingbird. Costa's hummingbird (*Calypte costae)* is a threatened species in New Mexico; it is not listed by the Federal Government. This species occurs in arid habitats in the southwestern U.S. and northwestern Mexico. It typically occurs in extreme southwest New Mexico. In New Mexico, it is considered a warm season migrant and occasional breeder particularly in Guadalupe Canyon (NMDGF, 1996). This species has been observed in the Organ Mountains and is a nonbreeding migrant and it could occur on McGregor Range.

Loggerhead Shrike. The loggerhead shrike (*Lanius ludovicianus)* is a federal species of concern that breeds throughout much of New Mexico including McGregor Range. This species has declined over much of its range and is considered a threatened species in Canada and numerous states (Robert and Laporte, 1991). Breeding bird data from 1966 through 1995 show that this species has steadily declined throughout that period (Sauer et al., 1997). The reasons for the decline of this species in northern states is not clear. Robert and Laporte (1991) and Brooks and Temple (1990) have observed good nesting habitat in Canada and Minnesota that is currently not being used by this species. Brooks and Temple (1990) conclude that alteration of the shrikes' winter habitat in the Gulf Coast states may be partially responsible for the decline in this species.

The loggerhead shrike populations north of New Mexico migrate south to New Mexico, Texas, and Arizona to winter (Root, 1988). Loggerhead shrike presence on McGregor Range consists of wintering and resident birds. This species is fairly common in the desert habitat on McGregor Range during the breeding season; in 1996, 53 were recorded from 12 breeding bird sampling locations in the grasslands on Otero Mesa and Tularosa Basin, and 54 from 24 sampling locations in 4 desert shrubland habitats in the Tularosa Basin (U.S. Army, 1996g). In 1997, the number increased to 83 in the desert shrublands and 61 in the desert grasslands (U.S. Army, 1997f). The loggerhead shrike has also been recorded during breeding bird surveys from 1993 through 1997 in arroyo-riparian and upland habitats of the Tularosa Basin (Kozma, 1995; U.S. Army, 1995c, 1996h, 1997g). This species was also observed 19 times in the Tularosa Basin and 18 times from Otero Mesa during winter and spring 1996 surveys for the aplomado falcon (U.S. Army, 1997k). These results indicate that the loggerhead shrike is fairly common on McGregor Range, although there is no historic data to determine long-term trends. The long-term trend for the period 1968 through 1996 from breeding bird survey data in New Mexico, shows a decline throughout the period similar to that observed on a national scale (Sauer et al., 1997).

Baird's Sparrow. Baird's sparrow (*Ammodramus bairdii)* is a threatened species in Canada and population declines in the U.S. have been documented; it is a federal species of special concern and a threatened species in New Mexico (NMDGF, 1996). This species was once one of the most abundant nesting species in the northern prairie states and Canada. The species has declined in abundance by about 90 percent with cultivation and conversion of much of its mixed-grass prairie nesting habitat (DeSmet and Conrad, 1989). This species winters and migrates through New Mexico and the declines on the nesting grounds are evident in New Mexico. Although it was once relatively numerous and widespread in New Mexico, in recent years it has been very rarely reported (NMDGF, 1996).

Baird's sparrow was observed on McGregor Range during migration and is believed to winter on the Fort Bliss installation (Smartt, 1980; U.S. Army, 1998k). Surveys for this species were conducted at 28 sites on McGregor Range from late February to early April 1997, and it was observed 27 times. It was observed in the winter and an influx was noted in April, coinciding with spring migration. Preferred habitat on McGregor Range were swales on Otero Mesa with dense tall growth of tobosagrass along with black and blue grama grassland low shrub density. Bairds sparrows were not observed along swales that had been heavily grazed or had dense growth of tall grass such as dropseed (*Sporobolus* sp.) (U.S. Army, 1998k).

Varied Bunting. The varied bunting (*Passerina versicolor)* is a State of New Mexico threatened species and occurs primarily in Mexico. It occurs in southern New Mexico in Hidalgo and Eddy counties, was found nesting in Doña Ana County, and was observed in Otero County (NMDGF, 1996). The varied bunting nests in dense vegetation in arid canyons, and the loss of such habitat, is the principal threat to this species in New Mexico. Cowbird parasitism may also be a threat to this species (NMDGF, 1996).

This species is very rare on McGregor Range and is not a nesting species. The varied bunting was observed in an arroyo during breeding bird surveys in 1996 (U.S. Army, 1996k).

Bell's Vireo. Bell's vireo (*Vireo bellii)* is a State of New Mexico threatened species. In New Mexico, this species summers primarily in the Gila Valley, Guadalupe Canyon, and the lower Rio Grande and Pecos valleys (NMDGF, 1996). It nests in dense riparian vegetation and winters in western and central Mexico.

Bell's vireo has shown a steady decline based on breeding bird survey results from 1966 through 1996 (Sauer et al., 1997). It has suffered significant declines, especially in the lower Colorado River Valley and central and coastal California (Rosenberg et al., 1991; Franzreb, 1987 as cited in NMDGF, 1996). Loss and fragmentation of the dense riparian shrub-nesting habitat from various human activities and brown-headed cowbird parasitism appear to be the principal reasons for the decline of this species.

Bell's vireo is occasional on Fort Bliss and is not known to nest on the post. Two singing males established territories on McGregor Range in 1995 but no nests were found. This species was observed in an arroyo on McGregor Range in 1996 and in the acacia habitat on McGregor Range in July 1997 (U.S. Army, 1996g, 1997f). Based on its habitat requirements, potential habitat for this species on McGregor Range may occur in mesquite dominated areas such as coppice dunes or tall mesquite that grow around stock tanks. However, this species has not been recorded from breeding bird census locations in mesquite habitat in 1996 or 1997 (U.S. Army, 1996g, 1997f), nor have there been any records of it nesting at stock tanks.

Gray Vireo. The gray vireo (*Vireo vicinior)* is a State of New Mexico threatened species and nests in arid juniper woodlands on foothills and mesas, usually in habitat with well-developed grass cover (NMDGF, 1996). This neotropical migrant winters in northwest Mexico. Data from the breeding-bird survey indicate that this species has steadily increased in abundance from 1969 through 1995 (Sauer et al., 1997).

The gray vireo was heard singing, and was observed during breeding bird surveys in the South and Soledad canyons of the Organ Mountains on the Doña Ana Range–North Training Areas of Fort Bliss on

May 27 and 28, 1992 (U.S. Army, 1994d). One or two males were singing in oak habitat in South Canyon, while up to four individuals were heard in oak-juniper habitat in Soledad Canyon. This species was observed in the Sacramento Mountains foothills in 1979 (Smartt, 1980). However, this species was not recorded from six intensively surveyed locations within the pinyon-juniper woods in the foothills in 1996 or 1997 (U.S. Army, 1996g, 1997f) nor during gray vireo surveys elsewhere in the Sacramento Mountains foothills on McGregor Range in 1998 (U.S. Army, 1998l).

D.4.5 Mammals

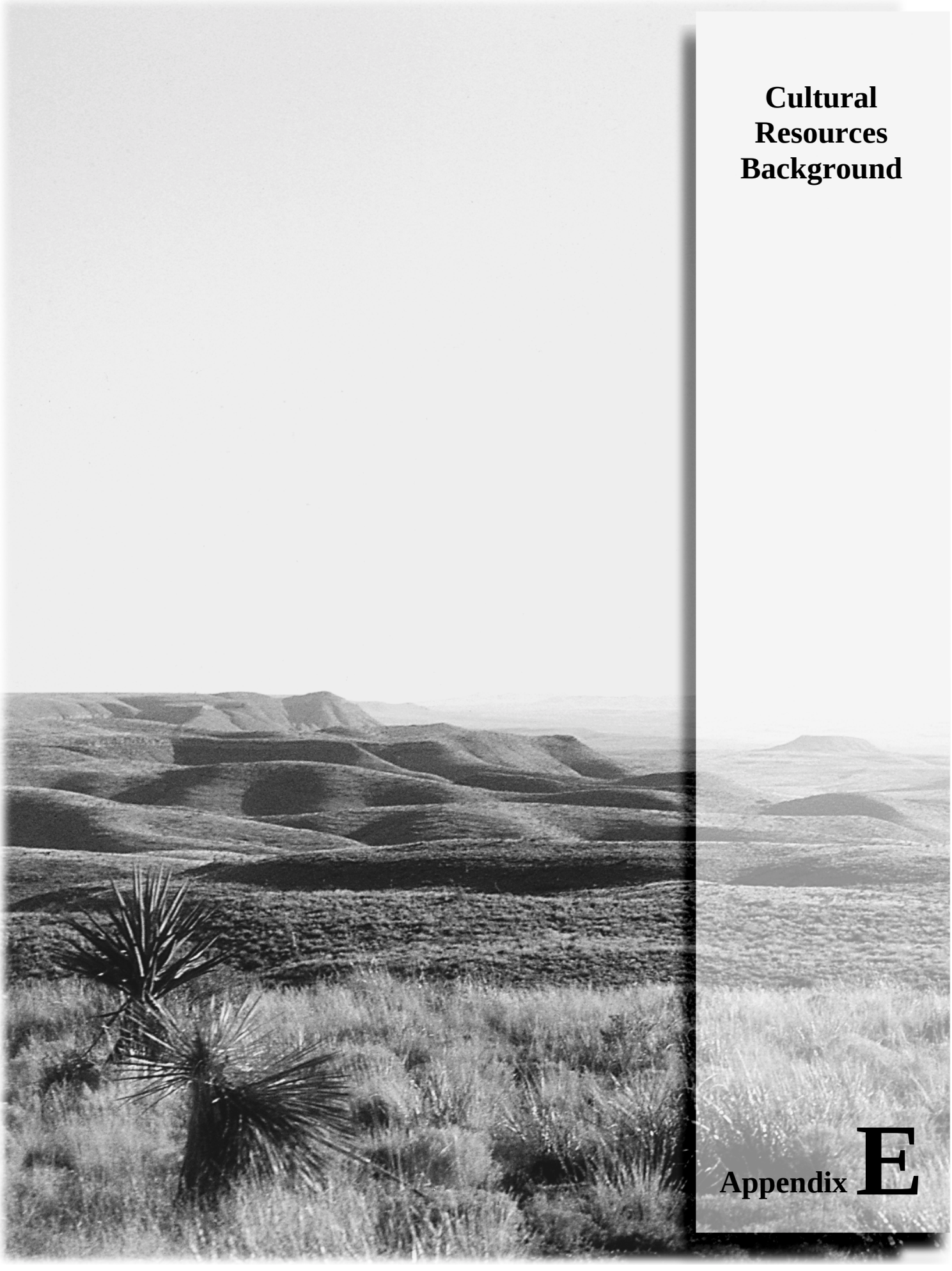
Bats. Seventeen species of bats may occur on McGregor Range and nine are federal species of concern, including: eastern small-footed bat (*M. leibii)*, occult little brown bat (*M. lucifugus occultus)*, fringed myotis, cave myotis (*M. velifera)*, long-legged myotis (*M. volans)*, Yuma myotis bat (*M. yumanensis)*, spotted bat (*Euderma maculatum)*, pale townsend's bat (*Corynorhinus townsendi)*, and big free-tailed bat (*Nyctinompos macrotis)*. The spotted bat is also considered threatened in New Mexico. There have been essentially no surveys for bats on Fort Bliss so the status of these species of special concern is not known. Two maternity colonies of several hundred fringed myotis were observed in abandoned buildings in the Sacramento Mountains foothills on McGregor Range in 1979 (Smartt, 1980); follow-up surveys in 1998 indicated that a *Myotis* sp. maternity colony still inhabited one of these abandoned buildings. Behavioral characteristics indicated this was a fringed *Myotis*, but this was not confirmed (U.S. Army, 1998j). Surveys for bats along the Otero Mesa escarpment on McGregor Range took place during the late spring and summer of 1997 and in June 1998 (see Section D.3.3). No large roost sites were observed along the escarpment and sensitive species that can be heard, such as the spotted bat, were not recorded. *Myotis* sp. were recorded and could have represented sensitive species but species determinations were not made (USAF, 1997f, g; U.S. Army, 1998j).

Gray-footed Chipmunk. The gray-footed chipmunk (*Tamias canipes*) is a federal species of special concern and is not listed by the State of New Mexico. This species occurs in the woodland and forested habitats in the Sacramento Mountains foothills on McGregor Range. It has also been collected from the Otero Mesa and may be a resident of the canyons in the Otero Mesa escarpment (U.S. Army, 1998k).

Arizona Black-tailed Prairie Dog. The black-tailed prairie dog (*Cynomys ludovicianus arizonensis)* is a federal species of concern and is not listed by the State of New Mexico. It is probably the subspecies *C. l. arizonensis* (U.S. Army, 1996k). This species is a unique resource on Otero Mesa and it provides habitat for sensitive species such as the burrowing owl and ferruginous hawk and other wildlife.

A combination of survey techniques were used to study black-tailed prairie dogs on Otero Mesa, including surveys on foot and vehicle, extended observations in some prairie dog towns, counts of burrows, and vegetation analysis (U.S. Army, 1996k). A total of 10 active and 12 inactive prairie dog towns were observed on Otero Mesa on McGregor Range. Prairie dog density was low (less than 4 per acre); there was an estimated 399 black-tailed prairie dogs in 10 towns in 1996. In 1997, black-tailed prairie dog surveys were conducted on Otero Mesa and 16 towns were observed; 12 were active. The number of prairie dogs recorded in 1997 was 482, which is a 17 percent increase over 1996. Overall, there appeared to be population increases in all towns in 1997 compared to 1996. However, prairie dog densities on Otero Mesa are an order of magnitude less then densities reported elsewhere. The reasons for the low populations on the Otero Mesa are not clear (U.S. Army, 1998k). Sensitive species observed at the prairie dog towns on Otero Mesa were the burrowing owl and ferruginous hawk.

Cultural Resources Background



Appendix E

APPENDIX E

CULTURAL RESOURCES BACKGROUND

This Page Intentionally Left Blank

E.0 CULTURAL RESOURCES BACKGROUND

A cultural resource study encompassing 10 percent of McGregor Range was undertaken as part of the environmental impact analysis process for this LEIS. Phase I of that survey has been completed; Phase II is near completion (refer to Section 3.9.4.1). Baseline conditions were assessed using the information generated from the Phase I investigations as well as the results of previous investigations.

E.1 PREHISTORY

The McGregor Range area lies within the cultural region known as the Jornada Mogollon (Lehmer, 1948). The prehistoric cultural chronology of the region and of the Tularosa Basin has been previously outlined by a number of authors, most recently by Abbott et al. (1996), which is used as a basis for this discussion. The chronology can be divided into three broad periods: Paleoindian (11,000 to 8,000 years ago), Archaic (8,000 to 1,700 years ago), and Formative (1,700 to 500 years ago).

Overall, prehistoric archaeological resources of southern New Mexico and west Texas are diverse, with many small, general-purpose sites; plant processing sites; rock middens; pueblos; specialized lithic procurement sites; and rock art sites. Prehistoric human burials, which are of particular concern to modern Native Americans and are considered under NAGPRA, also occur.

Paleoindian. The Paleoindian period (11,000 to 8,000 years ago) was characterized by small bands of highly mobile hunter-gatherers who followed herds of large animals such as bison and possibly mammoth. The oldest cultural complex of this period, Clovis, occurred at a time of rich, but declining resources. The beginning of a drying climate reduced and then eliminated many lakes, and some large game animals became extinct.

Paleoindian materials, and those of the late Paleoindian period especially, have been found in the region around Fort Bliss and El Paso (Krone, 1975; Quimby and Brook, 1967). Sites of this period are rare and usually identified solely on the basis of distinctive, highly crafted, fluted projectile points and other tools, often made of high-quality stone. The Fort Bliss cultural resource database lists seven sites on McGregor Range as dating from this period.

Archaic. The Archaic period began 8,000 years ago and continued until about 1,700 years ago. This period may correspond to the transition from a grassland environment to a drier, desert shrub environment. Use of the area by Native Americans during the Archaic period revolved around semi-permanent camps from which groups traveled into the desert, setting up short-term camps to exploit plants and animals (Whalen, 1986). Archaic period sites lack ceramics and therefore commonly consist of chipped stone and groundstone tools and debris. The large number of groundstone artifacts at Archaic sites suggests a growing reliance on plant resources and less use of game throughout this period. In the late Archaic period, there is evidence from the Fresnal rockshelter, near Alamogordo, of domesticated corn and beans from 2,000 and 3,000 years ago (Tagg, 1996).

Definite Archaic sites with diagnostic tools are relatively uncommon on Fort Bliss. The Fort Bliss cultural resource database contains 38 sites on McGregor Range with an Archaic component. However, many of the undated sites consisting only of nondiagnostic stone artifacts may date from this period. A recent survey on Otero Mesa identified 19 percent of the sites as Archaic (Browning et al., 1997). Another 32 percent were undated prehistoric sites, which may or may not be assignable to the Archaic period.

Formative. The Formative period, lasting from about 1,700 years ago to A.D. 1500, can be divided into the Mesilla, Doña Ana, and El Paso phases. The Fort Bliss cultural resource database identifies 348 sites as dating from the Formative period on McGregor Range.

The Mesilla phase represents mobile, perhaps seasonal, use of the Tularosa Basin. Mesilla phase inhabitants practiced agriculture, lived in small huts, and used undecorated ceramics. The Doña Ana phase was a brief transitional period when decorated pottery was first used in the Fort Bliss area. The El Paso phase is marked by more permanent, substantial structures (pueblos), agriculture, and locally produced undecorated ceramics (Whalen, 1981). Over time, and especially during the late Formative period, there was considerable and increasing interaction, such as trade, with Native American groups in northern New Mexico, western Arizona, Texas, and northern Mexico. Evidence from sites dating to the end of the Formative period suggest yet another transition, a general return to a mix of hunting, gathering, and agriculture by smaller groups.

E.2 HISTORIC NATIVE AMERICANS

Since the late 1600s, four Native American groups have lived in or near what is now McGregor Range. These were the Manso, the Suma, the Tigua, and the Mescalero Apache. Later, the Comanche and the Kiowa also traveled through and used the area.

While early accounts are confusing, at least two Native American groups occupied the region at the time of first Spanish contact. These were the Manso and the Suma. The Manso were present in the area around what are today El Paso and Las Cruces. They lived in huts made of branches and practiced a mix of farming and hunting. The Manso quickly joined the Tigua (see below) at missions set up by the Spanish at El Paso. Later, smallpox epidemics and inter-marriage with the Tigua effectively ended Manso culture.

The Suma are thought to have been related to the Jumano, who occupied lands further south along the Rio Grande (Hickerson, 1994). They were hunter-gatherers and farmers. Their fields were along the Rio Grande or near arroyos where runoff provided sufficient moisture for growing crops (Newcomb, 1993). Weakened by Spanish slave raids, drought, and Apache raids, the Suma gradually disappeared.

Between 1680 and 1682, the Tigua Indians were brought to the El Paso area from pueblos in northern New Mexico by Spanish fleeing the Pueblo Revolt. A royal land grant in 1682 set aside lands for the Tigua Indians in what is now the El Paso area. Eight hundred Tigua were settled near the Mission Nuestra Senora de Guadalupe del Paso del Norte. Several years later, the Tigua were moved a short distance to Mission Corpus Christi de la Ysleta del Sur. The conditions of these settlements prompted at least two abortive uprisings in 1681 and 1684 (Gerald, 1974). The reconquest of the Pueblos ended in 1692, and soon there were Spanish settlements along the Rio Grande north of El Paso. The Tigua at Mission Ysleta were moved again, after flooding of the Rio Grande damaged the buildings. A later fire damaged the mission but it was rebuilt and exists today on the Tigua Reservation. The Tigua practiced agriculture along the Rio Grande, but also hunted and gathered in the nearby Hueco Mountains (Gerald, 1974).

The other Native American group present in the region in the 1600s was the Mescalero Apache. The Mescalero lived in the area east of the Rio Grande, from the Sacramento Mountains south into Northern Mexico, and east onto the southern plains. Unlike the sedentary Suma, Jumano, and Tigua, the Mescalero Apache practiced a semi-nomadic life, moving from the mountains to the basins and plains in seasons when edible wild plants and game became available. Early Spanish contact generated a long-lived animosity between the two groups, and Apache raids on Spanish settlements were frequent. Finally, in

1810, a treaty was signed that promised the Mescalero a sizable portion of land (Thomas, 1974). The peace held until the Texas Revolution, when the Mescalero sided with the rebel Texans.

As a condition of joining the U.S., all lands remained Texan; no lands were taken over by the Federal Government. Thus, any lands set aside for tribes fell under Texas, rather than U.S., jurisdiction. Texas, despite the help the Apache had provided during the rebellion, viewed the Mescalero as a potential problem and refused to set aside land for them. This attitude, the rapid population increase from settlers and military, and establishment of military roads and forts heightened tension among the Mescalero (Opler, 1983). After the Mexican-American war and the Gadsden Purchase, when the U.S. acquired New Mexico and Arizona, the remainder of the Mescalero's traditional lands came under U.S. jurisdiction. Again, the rapid influx of settlers and miners and the establishment of roads and forts soon brought the Mescalero into conflict with the Americans as well. After several years of hostilities, a reservation for the Mescalero was established in the Sacramento Mountains, New Mexico. Title of the lands comprising the reservation was not formally transferred to the Mescalero until 1922 (Opler, 1983).

The Comanche occupied the area briefly beginning in early 1700; by the mid-1800s they had displaced the Apache and controlled the territory south of the Arkansas River to the Rio Grande settlements (Hofman et al., 1989). The Kiowa made only sporadic forays into the El Paso region during the same time the Comanche were dominant (Hofman et al., 1989).

E.3 EUROAMERICAN HISTORY

The Fort Bliss region has experienced more than 450 years of Euroamerican settlement and use, including ranching, mining, oil and gas exploration, and military activities. This era is represented on Fort Bliss by both archaeological and architectural resources, beginning with the establishment of the Salt Trail by Spanish explorers in the mid-17th century and extending to 20th century Cold War military architecture.

Spanish Exploration and Settlement. The region that is now New Mexico and west Texas was first visited by Europeans in 1528. Spanish expansion into the northern reaches of New Spain was motivated by mining, ranching, conscription of labor, and missionary activity (Griffen, 1983). The first permanent Spanish settlements in New Mexico date to 1598. Spanish explorers established the Salt Trail through the Tularosa Basin in 1647, as a salt supply route connecting Lake Lucero (now on WSMR) with the Camino Real at El Paso (Bentley, 1991). The Spanish discovered salt deposits within the Tularosa Basin in 1691 and shipped large quantities of salt to the silver mines in Mexico (Bentley, 1991). After Mexican independence, the Mexican government encouraged extensive use of the trail and salt beds (U.S. Army, 1997n), and the resource was used well into the 19th century. A portion of the Salt Trail is now a historical site within Fort Bliss (LA97672).

The Spanish also established a military presence in the Tularosa Basin in 1653, in response to Mescalero raids on Pecos Pueblo and the pueblos of the Tompiros (in what is now New Mexico) from base camps in the Sacramento Mountains (Schroeder, 1973). In 1682, a mission and presidio were established at El Paso del Norte. Repeated Apache raiding during the next century eventually resulted in a concerted effort by the Spanish military to fortify its northern frontier.

Mexico achieved independence from Spain in 1821, and El Paso area settlements were incorporated into the State of Chihuahua. However, no physical evidence of Mexican or Spanish use of grant lands for ranching has been identified on the installation (U.S. Army, 1997n).

Anglo-American Settlement. When the Texas Revolution began in 1835, Texas claimed all Mexican lands east and north of the Rio Grande, including the Fort Bliss area. These lands became part of the U.S.

in 1848, when the Treaty of Guadalupe-Hidalgo fixed the boundary between the U.S. and Mexico at the Rio Grande.

Railroads. The Southern Pacific Railroad reached El Paso from New Mexico in 1881 (U.S. Army, 1997n). Planning for a railroad line from El Paso north through the Tularosa Basin to White Oaks began in 1881, but the first 10 miles of track were not laid until 1888. Construction to Alamogordo was completed in 1898 and homesteaders immediately filed claims on 4,000 acres of public domain land (U.S. Army, 1997n).

A number of small communities, stations, and sidings grew up in association with the railway throughout the basin. These include locations that are now historical sites within McGregor Range: Newman Section Camp (FBH089); Escondida (FBH178); Paxton Siding (FBH179); Desert station and siding (FBH188); Alvarado (FBH 189); and Elwood (FBH286). Turquoise (FBH141) was a large station and siding that later became the primary shipping point on the line for local ranchers (U.S. Army, 1997n).

Mining. Mining in the Jarilla Mountains, just outside McGregor Range, began in the 1870s and, during the next decade, spurred local settlement, railroad use, and water control system development. Mining booms also took place in the Jarilla Mountains beginning in 1905. The town of Oro Grande grew to a population of between 2,000 and 2,500 by 1907 (U.S. Army, 1977n). Oro Grande provided area ranchers, including those on what is now Fort Bliss, with medical care and schools, and served as a supply station (U.S. Army, 1997n).

Ranching. Ranchers began moving into the southern Tularosa Basin and the western Organ Mountains during the late 1860s and early 1870s (U.S. Army, 1992). Although the basin was covered with thick grasses, the lack of surface water seriously affected land use. A series of wet years before 1885 resulted in ranchers overstocking area ranges. When conditions returned to normal, water became a problem. Ranchers turned their focus to developing the water resources, including building stock tanks, drilling wells, and piping water from the Sacramento River and Dog Canyon. Deep-well drilling and the use of windmills were important in the southern basin beginning in the 1880s (U.S. Army, 1992).

In 1886, Oliver M. Lee established a ranch (Lee Well) at the base of the Sacramento Mountains west of Dog Canyon. Lee formed the Sacramento Cattle Company in partnership with several other local ranchers and immediately began working on local water systems. In 1889, owners of the Sacramento Cattle Company began to sell off their holdings and dissolved the company. Lee continued to work some properties and to expand his control of area water. In 1893, Lee established a ranch in Dog Canyon, where he expanded the existing ditches and built several reservoirs. The following year, Lee and his partners began an 11-mile ditch to bring water from the Sacramento River onto the Tularosa Basin floor.

Lee continued to expand his ranching operations, with minor setbacks, throughout the late 1890s and early 1900s. He sold a large parcel of land to the El Paso and Northeastern Railroad for the townsite of Alamogordo. In 1905, he sold his ditch and reservoir rights to the Southwest Smelting and Refining Company, who needed the water for its mining operation in the Jarilla Mountains. The company built a pipeline, still in use today, along Lee's ditches to the town of Oro Grande. By 1916, Lee had an elaborate system extending from the Sacramento Mountains to Oro Grande and across Otero Mesa. He and two partners formed the Sacramento Valley Irrigation Company to encourage farmers to settle the basin. The company attempted to develop the community of Sacramento City (FBH203), an historical site on Fort Bliss, urging investors to buy town lots and turn the basin into farmland. Although the town had a few residents, it never attracted enough to survive and the promised water pipeline was not built (U.S. Army, 1997n). Lee eventually owned or controlled 300,000 acres of Otero County (U.S. Army, 1997n). He died in 1941, but his sons continued to operate ranches in the area until the land was acquired by the military (U.S. Army, 1997n).

Historical ranching sites within Fort Bliss include tanks, wells, reservoirs, camps, homesteads, ranches, and a school. Many of Lee's holdings (pipelines, camps, ranches, reservoirs, tanks, and wells) have been identified as historical sites on Fort Bliss and are components of a rural historic landscape potentially eligible to the National Register. The BLM recently completed a rural historic landscape National Register evaluation for a landscape base on Oliver Lee's historic sphere of influence (Hart, 1997). The potential boundary of the historic landscape encompasses McGregor Range.

Oil and Gas Exploration. Oil exploration ventures began in the area before 1919, following the discovery of Pennsylvanian-series fossils in the Sacramento Mountains and Tularosa Basin, and thick porous sands beneath the basin (U.S. Army, 1997n). Thousands of oil and gas claims were filed and a number of exploration companies were formed. However, the area did not become as rich an oil field as expected, and some individuals lost large sums of money on speculation.

U.S. Military. Military activities in the El Paso area, by the U.S. Government, began in 1846 when the Army entered the area after defeating the Mexican Army at the Battle of Brazito in the Mesilla Valley. American military expeditions regularly crossed the area in 1848 following the acquisition of the region by the U.S. The Army began active exploration of the Tularosa Basin and Otero Mesa in 1849 (U.S. Army, 1992). Fort Bliss remained a minor post throughout the Spanish-American War era and later fell into disrepair. This changed with the Mexican Revolution in 1910 when the fort became a major horse cavalry post (U.S. Army, 1993b).

During World War I, Fort Bliss served as an enlistment post, mobilization point, and site of several training schools. The 1920s saw Fort Bliss become home to missions to patrol the border with Mexico. During the 1930s, the Civilian Conservation Corps (CCC) worked from their camp at Fort Bliss on water control and erosion prevention systems across the Tularosa Basin (U.S. Army, 1997n).

During World War II, Fort Bliss served as a troop reception center. The last remaining U.S. horse cavalry unit was disbanded at Fort Bliss in 1943, and the fort became the national center for AAA (U.S. Army, 1993b). Fort Bliss administered World War II prisoner of war camps at Sunland Park and Logan Heights.

Fort Bliss grew quickly as the need for large parcels of training land became evident. The Doña Ana Range–North Training Areas and the Texas Training Areas (now the South Training Areas) were acquired during this period. In 1940, the Army leased more than 421,000 acres in Otero County, New Mexico, now part of the Doña Ana Range–North Training Areas, for an anti-aircraft training range (U.S. Army, 1997n). Seventy-five percent of the land was public domain, 20 percent was state-owned, and 5 percent was rancher-owned. The DoD approved purchase of the land after the co-use lease with area ranchers ran out in 1946 (U.S. Army, 1997n).

During the early Cold War era, Fort Bliss provided research facilities for the U.S. strategic missile program and was designated the nation's Army Air Defense Center in 1957 (U.S. Army, 1993b). The post played an important role in the development of the American missile program, including the V-2 rocket development headed by Werner von Braun and the AAA Replacement Training Center. In 1948, the 1st Guided Missile Regiment (later Brigade) was created at Fort Bliss to participate in missile launchings at WSMR. The AAA and Guided Missile Center was activated at Fort Bliss in 1946 to train units (U.S. Army, 1993b).

In 1950, the Army formed the Army Anti-aircraft Command (ARAACOM) and reactivated the AAA Replacement Training Center (AAARTC) at Fort Bliss to train anti-aircraft Nike-Ajax missile batteries and to train soldiers for assignments in atomic weapons, heavy AAA guns, computers and radar (U.S. Army, 1993b). The Nike Air Defense missile system training program for North Atlantic Treaty Organization (NATO) allies began at Fort Bliss in 1956.

Planning for the McGregor Guided Missile Range, an AAA firing range, began in 1948. Proposed lands covered 374,000 acres in Otero County. In 1949, the Army and most area landholders agreed to a 5-year exclusive-use lease on the range (U.S. Army, 1997n). Part of the range, the McGregor South Firing Corridor, was expanded in 1950. In 1952, expansion was proposed to meet training needs for the Nike missile program at WSMR. Plans were also made to purchase McGregor Range lands when the leases ran out in 1954. Over the next 2 years, the range was gradually extended, and by 1954, all remaining privately owned land within the original lease had been purchased. Lands on Otero Mesa were purchased from local ranchers beginning in 1956 to provide additional space for missile testing and training.

Prior to 1957, the Army acquired patented land and the BLM exchanged state and federal public domain land in Otero County to be used as McGregor Range. On August 21, 1957, public land was withdrawn in Otero County for use as a missile range for 10 years with provisions for a subsequent 10 years at the Army's request (PLO 1470).

Military defense strategy changed in the 1960s, as analysts began to push for a defense based on a strong offense (Bonhert et al., 1996) using surface-to-air missiles. Fort Bliss soon worked on these missiles. The Basic Combat Training Center was established at Fort Bliss in 1965 to meet the needs of the Vietnam War. AAA air defense battalions were also trained at Fort Bliss. Training began on the Redeye missile, the first portable, shoulder-fired air defense weapon, in 1967 (Bonhert et al., 1996). The U.S. Army Air Defense School provided training in Nike-Hercules, Hawk, Chaparral, and Safeguard missile systems (Bonhert et al., 1996).

Toward the end of the Cold War, during the 1980s, the Patriot missile system, used during the Persian Gulf War, came online and the Stinger missile replaced the Redeye (Bonhert et al., 1996). Schools at Fort Bliss continued to provide training on a range of air defense weapons including the Patriot, Stinger, and Hawk.

E.4 ARCHAEOLOGICAL RESOURCES

Archaeological investigations in the El Paso area began in the 1920s. During the period of the 1920s to 1940s, several museum-sponsored projects were undertaken at pueblos and caves of the region (e.g. Cosgrove, 1947). Shortly after World War II, the La Cueva rockshelter, a pueblo, and a pithouse village site were excavated. No major archaeological work was undertaken in the 1950s, although local amateur archaeologists continued exploring the area.

During the 1960s and 1970s a substantial amount of the archaeological work was undertaken by the El Paso Archaeological Society (EPAS). This work consisted of excavations and surveys within Fort Bliss, including McGregor Range. EPAS excavated portions of a number of pueblo sites, including Escondido pueblo in the northern part of McGregor Range. Much of the work before 1980 is not thoroughly documented by today's standards and provides less information than is usually required for National Register evaluations. Later work by professional archaeologists provided a foundation for understanding cultural resources on Fort Bliss. Much of this work was centered in the training areas of South Fort Bliss and Doña Ana Range–North Training Areas.

Surveys on McGregor Range resulted in relatively reliable estimates of the density of archaeological cultural resources in different portions of Fort Bliss. These are summarized in Table E-1.

Table E-1. Summary of Selected Archaeological Resource Inventories on McGregor Range

Archaeological Survey (date)	*Survey Acreage*	*Number of Archaeological Sites Recorded*	*Archaeological Site Density (sites per acre)*
Beckes et al., 1977	138,000*	300*	.002
U.S. Army, 1993a	9,000	69	.008
U.S. Army, 1995g	15,526	157	.006
O'Leary et al., 1997; U.S. Army, 1997j	57,820	678	.01
Browning et al., 1997	12,430	68	.005

* This includes only the systematic survey results; nonsystematic survey of various areas located another 114 sites.

McGregor Range was the subject of a large cultural resource inventory project in the mid 1970s by the University of Texas (Austin). This study was done in support of an EIS then being prepared. Six areas encompassing 138,000 acres, or 34 percent of the range, were identified as high-priority survey areas; 300 sites were found. Another 114 sites were found in additional areas that were spot surveyed for cultural resources (Beckes et al., 1977). Sites from these surveys ranged from isolated hearths to large village sites.

A cultural resource inventory of the area, for a proposed airstrip facility near Oro Grande, was undertaken in 1979. A total of 9,000 acres was examined and resulted in the documentation of 69 prehistoric sites (U.S. Army, 1993c). Of these sites, 27 did not contain enough information to provide dates, with the remaining 42 dating from the Formative period.

In 1992, 50 locations (.39 square miles and .05 square miles in size, totaling 10,191 acres) were surveyed for potential locations of air defense unit exercise areas (U.S. Army, 1995f). In addition, 5,335 acres were surveyed as potential locations for other training needs. A total of 157 sites were located during these surveys. Of these, 6 are historic, with the remaining 151 prehistoric.

In support of the proposed McGregor Range land withdrawal renewal, a cultural resource inventory of McGregor Range was initiated in 1995. The inventory was to cover a 10 percent random, stratified sample (based on six topographic zones) of the lands on McGregor Range (Table E-2) (U.S. Army, 1996q). The inventory area did not include the USFS co-use lands in the extreme northern portion of the range. Each sampling unit covered 1.38 square miles. The sample portion of Phase I of the inventory, completed in 1997, covered over 44,000 acres, or 6.5 percent of McGregor Range (O'Leary et al., 1997). Another 13,341 acres surveyed at this time included a complete inventory of the Otero Mesa escarpment (U.S. Army, 1997j). Phase II of the inventory, begun in 1997, surveyed over 22,000 acres, or 3.5 percent of McGregor Range. The goal of both phases of the survey project was to develop archaeological and management information, based on the landscape, or topography, of McGregor Range and to provide a standard, consistent method for defining a site and its eligibility. The sample inventories included the recording of all surface materials from prehistoric artifacts to Cold War debris. In addition to identifying prehistoric archaeological sites, the sample survey emphasized historic architecture, historic archaeology, and the identification of Apache, Spanish, and Mexican-related sites.

The nonsample survey of the Otero escarpment was specifically tasked with the discovery and documentation of rockshelters, although all other cultural resources encountered were also documented.

Table E-2. Sampling Coverage of the McGregor Range Cultural Resource Surveys

Landform Zone	*Acres on McGregor Range*	*Percentage of Total McGregor Area*	*Acres Surveyed in Phase I (6.5 percent)*	*Acres Surveyed in Phase II (3.5 percent)*
Zone 1: Nearly flat tableland	101,313	15.1%	6,672	3,459
Zone 2: Nearly flat with shallow concave depressions, floodplains, playas and wide waterways	125,776	18.8%	8,402	4,201
Zone 3: Gently sloping outwash plains, relic lake beds, and coppice dunes	150,981	22.6%	10,131	4,942
Zone 4: Sloping alluvial fans, pediments, and terraces adjacent to the hills, mesa and mountains	75,861	11.3%	4,942	2,595
Zone 5: Moderately sloping areas, bedrock plateaus, rock outcrops and pediment slopes	97,853	14.6%	6,425	3,336
Zone 6: Extremely hilly to mountainous areas	116,880	17.5%	7,907	3,707
McGregor Range Total	*668,664 acres*	*100%*	*44,479 acres*	*22,240 acres*

Note: *Does not equal total McGregor Range area because it does not include military and USFS co-use lands in northern McGregor Range.
Source: U.S. Army, 1996q.

In all, 678 sites were identified during Phase I investigations: 535 during the sample survey and 143 during the Otero escarpment survey, including 33 rockshelters. Of the remaining 645 sites, 81 were historic (30 related to ranching and 50 related to military activities) and 1 was an Apache-related site; no Spanish or Mexican sites were identified. The remaining 563 sites date to the prehistoric period. Out of the 678 sites, 28 were recommended as eligible to the NRHP; 57 were recommended as not eligible; and the NRHP status of the remaining 593 sites remain unevaluated. Data from Phase II investigations is unavailable at this time.

An archaeological survey was undertaken to identify, document, inventory, and evaluate prehistoric and historic archaeological remains in two potential locations for a new tactical target complex located 11 to 18 miles southeast of Oro Grande, New Mexico. The survey area included a total of approximately 12,430 acres (Browning et al., 1997). Sixty-eight archaeological sites were documented during this project: 22 on Otero Mesa and 46 in the Tularosa Basin. The sites represent prehistoric and historic activities spanning 10,000 years of human occupation in the Tularosa Basin.

E.5 ARCHITECTURAL RESOURCES

Architectural inventories have been completed as part of two recent comprehensive cultural resource surveys; DOE's study of historic ranching and mining sites (U.S. Army, 1997n) and Phase I of the McGregor Range Survey (O'Leary et al., 1997). These two investigations assessed the architectural significance of various scattered, standing structures. Fort Bliss is planning specific architectural inventories for McGregor Range Camp as funds become available.

Actions that take place on the land may result in impacts that require mitigation by the agency managing the land. For Army-managed withdrawn and fee-owned land, the Fort Bliss ICRMP, (U.S. Army, 1998c) sets forth a series of proposed SOPs that comply with AR 200-4 and NHPA. When the NEPA process for the ICRMP is complete, these SOPs will have been reviewed and accepted by the New Mexico SHPO, and they will streamline Army compliance with historic preservation laws. By following the SOPs on McGregor Range, the Army will not need to have SHPO or ACHP review every undertaking prior to its implementation, as they will be developed in strict compliance with AR 200-4, the NRHP, and other applicable laws and regulations. The ICRMP provides for review of the SOPs by Fort Bliss, the SHPO, or the ACHP at any time. In addition, the SOPs include procedures for considering the concerns of the public. The titles of the SOPs are:

- **SOP #1A** *Archeological Site, Landscape, Native American, and Cultural Properties Clearance for Large-scale Operations and/or Exercises.*
- **SOP #1B** *Archeological Site, Landscape, Native American, and Cultural Properties Clearance ("Form 88 Review") for Training, Firing Impact, and Maneuver Areas.*
- **SOP #1C** *Archeological Site, Landscape, Native American, and Cultural Properties Clearance ("Dig Permits") for Areas NOT Located in Training, Firing Impact, or Maneuver Areas.*
- **SOP #2A** *National Historic Preservation Act Section 106 Compliance for Historic Structures, Landscapes, and Other Aboveground Properties.*
- **SOP #2B** *National Historic Preservation Act Section 106 Compliance for Historic Structures, Landscapes, and Other Aboveground Properties.*
- **SOP #3** *Archeological Survey Standards.*
- **SOP #4** *Identification of Historic Structures, Landscapes, and Other Aboveground Properties That Meet the Criteria of Eligibility for Inclusion in the National Register of Historic Places (the Register).*
- **SOP #5** *Reporting Damage to Historic Properties Buildings, Sites, Landscapes, Districts, Objects, etc.*
- **SOP #6** *Accidental Discovery of Archeological Properties.*
- **SOP #7** *National Historic Preservation Act Section 106 Compliance for Construction Modifications.*
- **SOP #8** *Mobilization and/or Military Training in Anticipation of Immediate Deployment.*
- **SOP #9** *Public Involvement in the Fort Bliss Cultural Resources Management Program.*
- **SOP #10** *Annual Report on the Status of Those Portions of This Integrated Cultural Resources Management Plan to which the National Historic Preservation Act Applies.*

Exceptions to following the SOPs and, instead, consulting with ACHP according to the procedures described in 36 CFR Part 800.5(e) are "if (1) Fort Bliss determines not to use the standard mitigation measures, (2) the SHPO withdraws from consultation, (3) the undertaking has known public opposition, (4) the undertaking will adversely affect a National Historic Landmark, (5) the undertaking may affect a facility containing human remains, or (6) the SHPO objects in writing within 30 calendar days after receipt of a notice from Fort Bliss that it will proceed with the Standard Mitigation Measures…."

The Standard Mitigation Measures are a basic set of mitigation priorities for architectural landscapes, summarized as follows:

1. Fort Bliss and the SHPO shall develop a written agreement that establishes recordation measures and provides for the salvage, storage, and reuse of significant architectural or landscape furnishings that may otherwise be demolished. The ACHP will not be a party to this agreement.

2. Fort Bliss shall ensure that the historic property is recorded prior to its demolition or alteration in accordance with a recordation plan developed in consultation with the SHPO. At a minimum this plan will establish methods and standards for recordation and designate the appropriate archives for the deposit of this material. Fort Bliss and the SHPO may mutually agree to waive the recordation requirement if the affected historic property will be repaired in substantial, although not complete, conformance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (rev.1992).

Although the ICRMP provides procedures to mitigate impacts to cultural resources, the focus of Fort Bliss cultural resource management, and thus of McGregor Range will be to avoid directly affecting cultural resources whenever possible. Procedures may include monitoring undertakings and developing alternatives. If cultural resources must be affected, then the effects are to be minimized, and adverse effects mitigated.

Noise

Appendix F

APPENDIX F

NOISE

This Page Intentionally Left Blank

F.0 NOISE

F.1 NOISE ANALYSIS

Appendix F presents a detailed discussion of noise and its effects on people and the environment. An assessment of noise requires a general understanding of how sound is measured and how it affects people in the natural environment. The purpose of this appendix is to address public concerns regarding noise impacts.

Section F.1.1 is a general discussion on the properties of noise. Section F.1.2 summarizes the noise metrics discussed throughout this LEIS. Section F.1.3 provides federal land use compatibility guidelines that are used in analyzing noise impacts. Section F.2 addresses public concerns on potential impacts such as hearing loss, nonauditory health effects, annoyance, speech interference, sleep interference, and noise effects on domestic animals and wildlife. Section F.3 addresses impulsive noise assessment.

F.1.1 General

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with military operations. Of course, aircraft overflight and the use of explosives are not the only sources of noise in an urban, suburban, or even rural environment. Interstate and local roadway traffic, rail, industrial, commercial activities, and neighborhood activities also are sources of noise and can intrude on the everyday quality of life. Nevertheless, noise resulting from military activities are often readily identifiable to those affected by it and are typically singled out for special attention and criticism.

Sound is a physical phenomenon consisting of minute vibrations which travel through a medium, such as air, and are sensed by the human ear. Whether that sound is interpreted as pleasant (for example, music) or unpleasant (for example, aircraft noise) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound. It is often true that one person's music is another person's noise.

The measurement and human perception of sound involves two basic physical characteristics: intensity and frequency. Intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic is sound frequency which is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.

The loudest sounds which can be detected comfortably by the human ear have intensities which are 1,000,000,000,000 times larger than those of sounds which can just be detected. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the dB is used to represent the intensity of a sound. Such a representation is called a sound level.

A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are

useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that what we are really doing when we add decibel values is first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

An important facet of decibel addition arises later when the concept of time-average sound levels is introduced to explain L_{dn}. Because of the logarithmic units, the time-average sound level is dominated by the louder levels which occur during the averaging period. As a simple example, consider a sound level which is 100 dB and lasts for 30 seconds, followed by a sound level of 50 dB which also lasts for 30 seconds. The time-average sound level over the total 60-second period is 97 dB, not 75 dB.

The minimum change in the time-average sound level of individual events which an average human ear can detect is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because of the nonlinear response of the human ear (similar to most human senses).

Sound frequency is measured in terms of cycles per second (cps), or Hz, which is the preferred scientific unit for cps. The normal human ear can detect sounds which range in frequency from about 20 Hz to about 15,000 Hz. All sounds in this wide range of frequencies, however, are not heard equally well by the human ear, which is most sensitive to frequencies in the 1,000 to 4,000 Hz range. In measuring community noise, this frequency dependence is taken into account by adjusting the very high and very low frequencies to approximate the human ear's generally lower sensitivity to those frequencies as well as the type, or characteristics of the noise. This is called "weighting" and is commonly used in measurements of environmental noise.

Sound levels do not represent instantaneous measurements but rather averages over short periods of time. Two measurement time periods are most common; one second and one-eighth of a second. A measured sound level averaged over one second is called a slow response sound level; one averaged over one-eighth of a second is called a fast response sound level. In general, noise resulting from transportation-type activities is termed "slow-response" type noise, and is measured on an "A-weighted" scale. Noise resulting from a phenomena such as an explosion is termed "fast-response," or impulsive noise, and is measured on a "C-weighted" scale.

F.1.2 Noise Metrics

A "metric" is defined as something "of, involving, or used in measurement." As used in environmental noise analyses, a metric refers to the unit or quantity which quantitatively measures the effect of noise on the environment. Noise studies have typically involved a confusing proliferation of noise metrics as individual researchers have attempted to understand and represent the effects of noise. As a result, past literature describing environmental noise or environmental noise abatement has included many different metrics. Recently, however, various federal agencies involved in environmental noise mitigation have agreed on common metrics for environmental impact analysis documents, and both the DoD and the FAA have specified those which should be used for federal aviation noise assessments. These metrics are as follows.

F.1.2.1 Maximum Sound Level

The highest A-weighted or C-weighted sound level measured during a single event in which the sound level changes value as time goes on is called the L_{max}. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleep, or other common activities.

F.1.2.2 Sound Exposure Level

Individual time-varying noise events have two main characteristics; a sound level which changes throughout the event, and a period of time during which the event is heard. Although the L_{max}, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The SEL combines both of these characteristics into a single metric.

SEL is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of the constant sound that would, in one second, generate the same acoustic energy as did the actual time-varying noise event. Since A-weighted noise events (e.g., an aircraft overflight) usually last longer than one second, an A-weighted SEL is usually greater than the L_{max}. Conversely, since a C-weighted noise event (e.g., an explosion) usually lasts less than one second, a C-weighted SEL is usually somewhat less than the L_{max}.

SEL is a composite metric which represents both the intensity of a sound and its duration. It has been well-established in the scientific community that SEL measures noise impacts much more reliably than just L_{max}.

F.1.2.3 Day-Night Average Sound Level

Time-average sound levels are the measurements of sound levels which are averaged over a specified length of time. These levels provide a measure of the average sound energy during the measurement period.

For the evaluation of community noise effects, the L_{dn} (ADNL or CDNL) is used. These metrics average sound levels at a location over a complete 24-hour period, with a 10-dB adjustment added to those noise events which take place between 10:00 p.m. and 7:00 a.m. This 10-dB "penalty" represents the added intrusiveness of sounds which occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

Ignoring the 10-dB nighttime adjustment for the moment, L_{dn} may be thought of as the continuous sound level which would be present if all of the variations in sound level which occur over a 24-hour period were smoothed out so as to contain the same total sound energy.

L_{dn} provides a single measure of overall noise impact, but does not provide specific information on the number of noise events or the individual sound levels which occur during the day. For example, a L_{dn} of 65 dB could result from a very few noisy events, or a large number of quieter events.

As noted earlier for SEL, L_{dn} do not represent the sound level heard at any particular time, but rather represent the total sound exposure. Scientific studies and social surveys which have been conducted to appraise community annoyance to all types of environmental noise have found the L_{dn} to be the best measure of that annoyance. Its use is endorsed by the scientific community (ANSI, 1980; ANSI, 1988; EPA, 1972; FICUN, 1980; FICON, 1992).

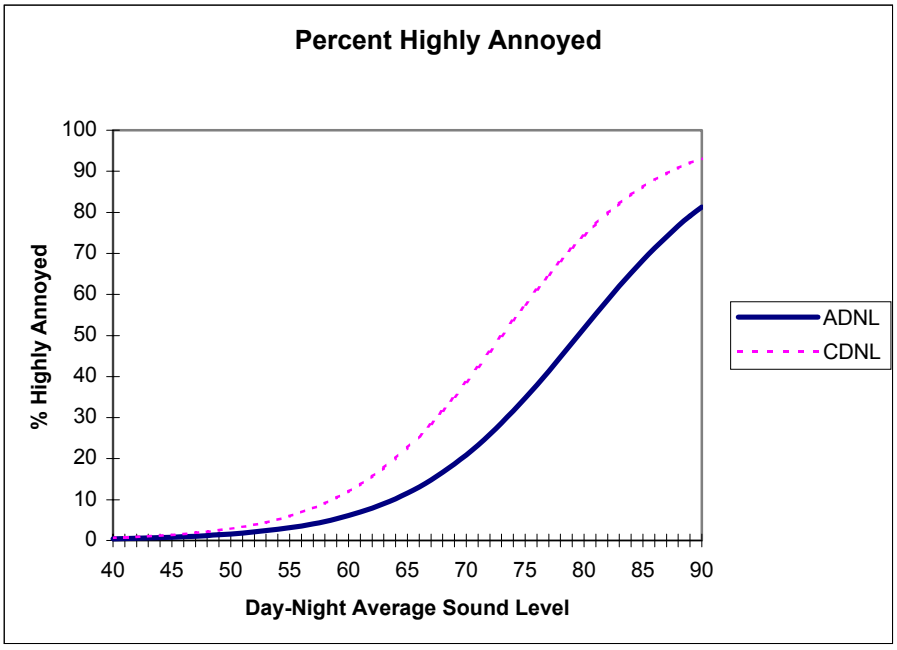
There is, in fact, a remarkable consistency in the results of attitudinal surveys about noise conducted in different countries to find the percentages of groups of people who express various degrees of annoyance when exposed to different levels of L_{dn}. Original studies on annoyance created by A-weighted noise were conducted by T. J. Schultz in 1978 (Schultz, 1978). More recent studies have reaffirmed this basic relationship (Fidell et al., 1991), and have resulted in the development of an updated form of the curve fit (Finegold et al., 1994). The updated fit, which does not differ substantially from the original, is the current preferred form. In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors which influence the manner in which individuals react to noise.

Similar attitudinal research has also been conducted on annoyance associated with C-weighted noise. Again, research has shown that L_{dn} are the most reliable predictors of levels of community annoyance resulting from impulsive noise events (CHABA, 1981). Probably due to the differences in physical characteristics associated with A- and C-weighted noise, it was found that more people became annoyed at lower L_{dn} of C-weighted noise as compared to A-weighted noise. Figure F-1 illustrates these differences.

The use of L_{dn} has been criticized recently as not accurately representing community annoyance and land-use compatibility with noise. Much of that criticism stems from a lack of understanding of the basis for the measurement or calculation of ADNL and CDNL. One frequent criticism is based on the inherent feeling that people react more to single noise events and not as much to “meaningless” time-average sound levels.

In fact, a time-average noise metric takes into account both the noise levels of all individual events which occur during a 24-hour period and the number of times those events occur. As described briefly above, the logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average.

As a simple example of this characteristic, consider a case in which only one noise event occurs in daytime during a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The L_{dn} for this 24-hour period is 65.5 dB. Assume, as a second example, that ten such 30-second events occur in daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The L_{dn} for this 24-hour period is



Calculated %HA Points											
DNL	40	45	50	55	60	65	70	75	80	85	90
ADNL	0.4	0.8	2	3	6	12	21	35	52	68	81
CDNL	0.6	1	3	6	12	23	39	57	74	86	93

ADNL % HA = 100/[1+exp(11.13 - 0.14*ADNL)]
CDNL % HA = 100/[1+exp(11.17 - 0.153 * CDNL)]

Figure F-1. Comparison of Persons Highly Annoyed by A- and C-Weighted Average Sound Levels.

75.4 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events. This is the basic concept of a time-average sound metric, and specifically the L_{dn}.

F.1.3 Land Use Compatibility

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is the L_{dn}.

In June 1980, an *ad hoc* FICUN published guidelines (FICUN, 1980) relating L_{dn} to compatible land uses. This committee was composed of representatives from the DoD, DOT, HUD, EPA, and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

In 1990, a new FICON was formed to review the manner in which noise effects are assessed and presented. This group released its report in 1992 and reaffirmed the use of L_{dn} as the best metric for this purpose (FICON, 1992).

The general guidelines associated with these committee reports have been incorporated into the U.S. Army's Installation Compatible Use Zone (ICUZ) program. Standards are based on L_{dn}, and thresholds where restrictions begin to be placed on land uses occur at ADNL 65 or CDNL 62.

F.2 NOISE EFFECTS

F.2.1 Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure) suggests a time-average sound level of 70 dB over a 24-hour period (EPA, 1972). Since it is unlikely that persons will be exposed to elevated noise levels 24 hours per day for extended periods of time, there is little possibility of hearing loss below a L_{dn} of 75 dB, and this level is extremely conservative.

F.2.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have never been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on January 22 to 24, 1990 in Washington, D.C., which states the following:

> The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an 8-hour day). At the 1988 International Congress on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous. Consequently, one comes to the conclusion that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place (von Gierke, 1990 [parenthetical wording added for clarification]).

Although these findings were directed specifically at noise effects in the workplace, they are equally applicable to noise effects in the community environment. Research studies regarding the nonauditory health effects of noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

F.2.3 Annoyance

The primary effect of noise on exposed communities is one of annoyance. Noise annoyance is defined by the EPA as any negative subjective reaction on the part of an individual or group (EPA, 1972). As noted in the discussion of L_{dn} above, community annoyance is best measured by that metric.

Because the EPA Levels Document (EPA, 1972) identified a DNL of 55 dB as ". . .requisite to protect public health and welfare with an adequate margin of safety," it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial and technical resources are generally not available to achieve that goal. Most agencies have identified ADNL 64 and CDNL 62 as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis.

F.2.4 Speech Interference

Speech interference associated with noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that the use of the SEL metric will measure speech interference successfully, and that a SEL exceeding 65 dB will begin to interfere with speech communication.

F.2.5 Sleep Interference

Sleep interference is another source of annoyance associated with noise. This is especially true because of the intermittent nature and content of transportation and impulsive noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat higher noise level than does a change in sleep stage.

Some guidance is available in judging sleep interference. The EPA identified an indoor L_{dn} of 45 dB as necessary to protect against sleep interference (EPA, 1972). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor L_{dn} of 65 dB as minimizing sleep interference.

F.2.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals

rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans—stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

There are available many scientific studies regarding the effects of noise on wildlife and some anecdotal reports of wildlife "flight" due to noise. Few of these studies or reports include any reliable measures of the actual noise levels involved. However, in the absence of definitive data on the effect of noise on animals, the Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council has proposed that protective noise criteria for animals be taken to be the same as for humans (National Research Council, 1977).

F.2.7 Noise Effects on Structures

Normally, the most sensitive components of a structure to noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonances. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (National Research Council, 1977).

A recent study, directed specifically at low-altitude, high-speed aircraft showed that there is little probability of structural damage from such operations (Sutherland, 1990). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects within the dwelling—hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus, assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

F.2.8 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Wesler, 1977). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning within the building itself.

F.3 IMPULSIVE NOISE ASSOCIATED WITH THE DETONATION OF HIGH EXPLOSIVES

McGregor Range supports the delivery of live ordnance. This section of this appendix discusses the methodology used to quantify these acoustic effects, and develop capacity assessments which indicate the levels of ordnance use that can be supported without creating environmental acoustic impacts outside the boundaries of the range.

The noise associated with the detonation of high explosives is impulsive in nature, and its main components emphasize very low frequencies, often equal to or less than 100 cps (Hz). Since the noise is impulsive, it is measured on the "C-weighted" scale.

The noise model used for this impact assessment is the NAPS developed for the U.S. Army's Atmospheric Sciences Laboratory, WSMR, New Mexico. The NAPS model is a single-event model that generates sound intensity contours based on meteorological conditions that influence the speed of sound and the propagation of sound. NAPS calculates SPL in dBP based on the amount of explosive material normalized to an equivalent weight of TNT. The model uses a ray trace approach that takes into account spherical spreading, atmospheric absorption, and refraction (Smith et al., 1991).

SPLs spread spherically in the absence of wind. This spreading is normally calculated so that for each doubling of distance from the noise source, the SPL decreases by 6 dB (U.S. Army, 1995g).

The atmosphere absorbs sound energy. However, this absorption is not a significant factor for sounds with frequencies of 500 Hz or less. For example, at 10 Hz, approximately 0.04 dB is lost to atmospheric absorption over a 10 kilometer (km) distance, and for a sound at 100 Hz, about 3.5 dB is attenuated over the same distance. Conversely, for a sound at 1,000 Hz, approximately 100 dB would be lost over the same 10 km. What is important is that when sound created by the detonation of high explosives is considered, since these sounds normally occur in the 5 to 10 Hz range or less, atmospheric absorption has little effect (U.S. Army, 1995g).

Ground impedance is a measurement of the extent to which an acoustic wave traveling through the atmosphere would be absorbed into the ground upon contact, or reflected back into the atmosphere. Soft sands, such as those found on beaches, and fresh, powdery snow are examples of ground with low impedance, where most of the acoustic energy is absorbed, and little is reflected. Medium impedance surfaces reflect a majority of the acoustic energy, and most lands within the United States are classified as medium impedance surfaces for sounds of 200 Hz or less. Surfaces such as water, concrete, and mountains with rock outcroppings are illustrative of high impedance surfaces which will reflect all, or almost all of the acoustic energy (U.S. Army, 1995g).

As previously discussed, actual SPLs are usually "weighted" to more closely approximate the response of the human ear to the sound. The most commonly used metrics for characterizing impulsive noise are based on the "C-weighting" protocol, which represses SPLs under 100 and over 3,000 Hz. Field measurements suggest that unweighted SPLs are 22 to 25 dB higher than C-weighted SPLs for high explosive events (Kerry and Ford, 1994).

The dBP metric utilized by the NAPS model does not reflect the cumulative effects from multiple noise events over time. The preferred metric for assessing the annoyance level associated with multiple impulsive noise events associated with use of high explosives in the CDNL. CDNL is calculated:

$$CDNL = CSEL + \left(10Log_{10}\left(N_D + 10N_N\right)\right) - 49.4$$

Equation 1

Where:

CSEL = C-weighted Sound Exposure Level for a single event.
ND = Number of events per 24-hour period occurring between 7:00 a.m. and 10:00 p.m. (daytime).
NN = Number of events per 24-hour period occurring between 10:01 p.m. and 6:59 a.m. (nighttime).
Multiplying the events by 10 assigns a 10 dB penalty for noise events at night.
49.4 = 10 Log 10 times 86,400 (the number of seconds in a 24-hour period).

Source: U.S Army, CERL, 1986.

Further, the relationship between dBP and CSEL is given by the following:

$$CSEL \cong dBP - 25$$

Equation 2

Source: Kerry and Ford, 1994.

Therefore, a dBP-dependent equation for CDNL may be written as follows, and, based on substitution:

$$CDNL \cong dBP - 25 + \left(10Log_{10}\left(N_D + 10N_N\right)\right) - 49.4$$

Equation 3a

and

$$CDNL \cong dBP + \left(10Log_{10}\left(N_D + 10N_N\right)\right) - 74.4$$

Equation 3b

For land use planning purposes, CDNL 62 is generally considered to be equivalent to ADNL 65. That is, residential development is normally compatible with noise levels below CDNL 62.

Although the NAPS model outputs contours in unweighted SPL, this output can be used to represent CDNL values. As shown above, if one noise event occurred during daytime in a 24-hour period, then the CDNL value would be 74.4 dB lower than the NAPS calculated SPL (Equations 3a and 3b). Therefore:

$$CDNL62 = 136.4dBP$$

Equation 4

As the number of events from the same source increase above one per 24-hour period, the value of:

$$10Log_{10}\left(N_D + 10N_N\right)$$

may be subtracted from 136.4 to obtain the SPL contour value from NAPS that is equivalent to CDNL 62. For multiple sources contributing different sound levels at given distances, source-specific CDNL values would be summed logarithmically to obtain total cumulative CDNL.

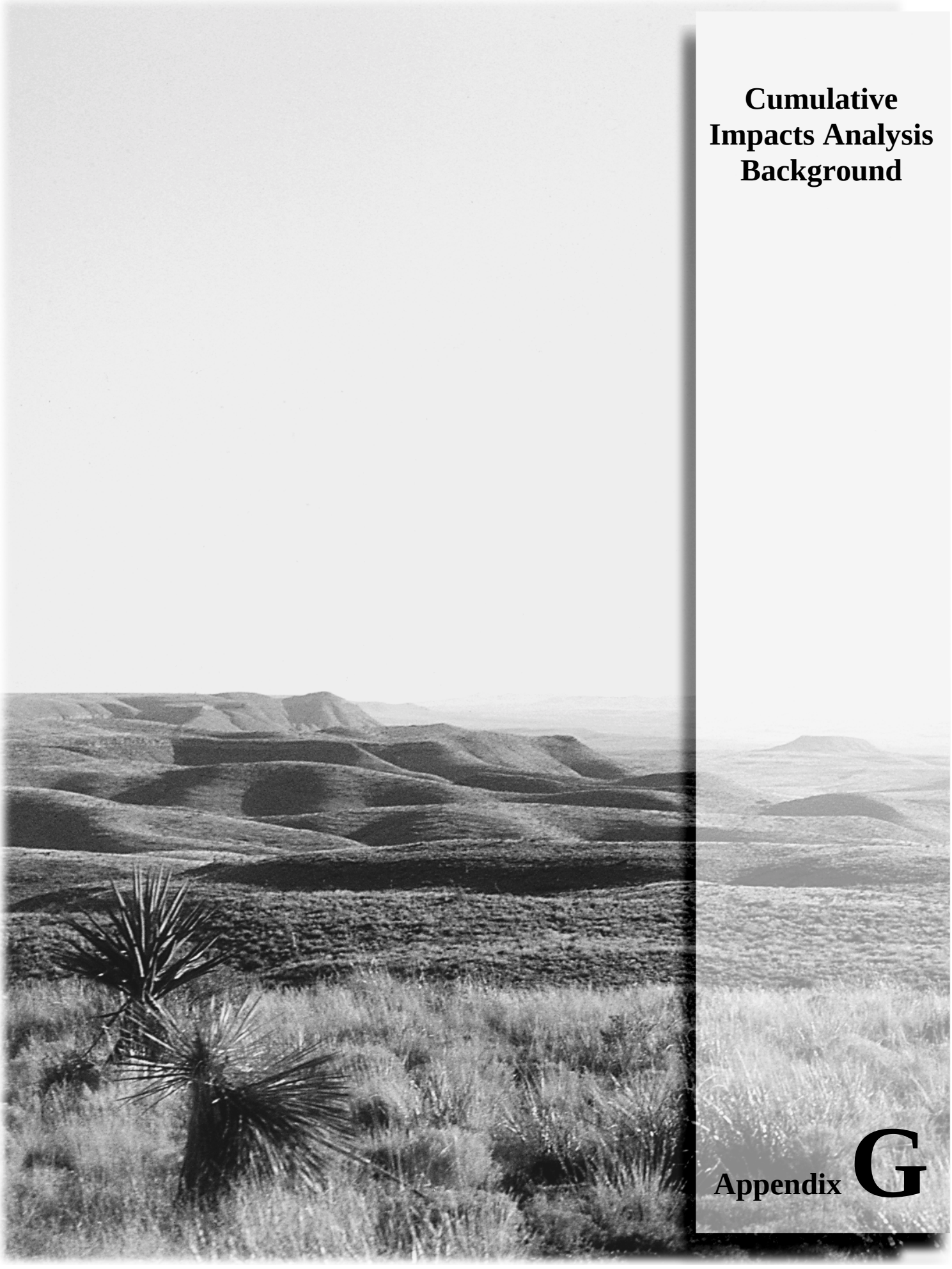
Alternatively, if it is desired to keep exposure of a given location at or below a specific CDNL value, and the unweighted SPL value is known for that location, the number of permissible day-equivalent events that can occur may be calculated by:

$$AntiLog_{10}\left(\frac{136.4 - SPL}{10}\right) = N_{DE}$$

Equation 5

As indicated, Equation 5 provides the number of day-equivalent events. Dividing the result by 10 would provide the number of night-permissible events. Mixed day and night events may be determined using a ratio of one night event to ten day events. For example, 30 day events would equal 3 night events, or 10 day events and 2 night events.

Cumulative Impacts Analysis Background



Appendix G

APPENDIX G

CUMULATIVE IMPACTS ANALYSIS BACKGROUND

This Page Intentionally Left Blank

G.0 CUMULATIVE IMPACTS ANALYSIS BACKGROUND

The CEQ regulations require the scope of an EIS to consider cumulative actions which, when viewed with the proposed action, may have significant impacts. Cumulative impacts are defined as impacts on the environment which result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions.

The ROI defined for the McGregor Range land withdrawal renewal in this LEIS varies by resource area and represents the geographic area established for the cumulative effect analysis.

For the purposes of this LEIS, three types of activities have been identified that, in combination with the proposed action, have the potential for contributing to cumulative impacts. They are:

- On-going or projected military activities in the ROI including activities at WSMR, HAFB, Doña Ana Range–North Training Areas, South Training Areas, and the Fort Bliss Main Cantonment Area.

- Nonmilitary activities and plans that affect areas or resources affected by proposed actions.

Section G.1 through G.3 describe activities in each of these areas that are included in the cumulative impact analysis from a regional viewpoint. Section G.4 describes changes in vegetation cover on Fort Bliss using June 1986 and June 1996 remote sensing reconnaissance scans. This is an installation program in its infancy, intended to develop methodologies for LCTA. Discussion of work to date is limited to available data covering only two observations from which conclusions cannot be drawn.

G.1 MILITARY ACTIVITIES ON THE FORT BLISS TRAINING COMPLEX (OTHER THAN McGREGOR RANGE)

Fort Bliss is a multi-mission, Army TRADOC installation located on approximately 1.12 million acres in Texas and New Mexico. The installation's principal mission is the USAADACENFB. However, ongoing peacetime force structure realignments and weapons system development continue to affect the composition of the Fort Bliss mission and, consequently, management actions necessary to meet mission requirements. The *Fort Bliss Mission and Master Plan* PEIS describes potential environmental impacts associated with land use and management proposed decisions regarding installation assets, capabilities, and infrastructure to support current and future missions. These proposed decisions are reflected in the RPMP, the INRMP, and the ICRMP, and activities envisioned in the TADC and other installation initiatives. Mission activities conducted on the South Training Areas and Doña Ana Range–North Training Areas that may contribute to cumulative impacts include:

- Weapons firing,
- SDZs,
- Off-road vehicle maneuvers,
- Dismounted training,
- Aircraft operations.

G.2 MILITARY ACTIVITIES AT WSMR

The WSMR is part of the DoD's Major Range and Test Facility Base and has, as its primary mission, the support of research, development, test and evaluation (RDT&E) of Army missile and rocket systems. The WSMR also supports RDT&E programs by the USAF, Navy, and NASA. The WSMR has a land area approximately 100 miles long and 40 miles wide that includes numerous laboratories, facilities, test areas, and missile launch sites (Figure G-1).

The *White Sands Missile Range Range-Wide Environmental Impact Statement* (U.S. Army, 1996o) identified ongoing and projected test programs and other missions anticipated at WSMR and within WSMR airspace. During the 5-year period from 1989 to 1993, WSMR completed an average of 4,366 scheduled missions per year. These include the following:

- Air-to-air and air-to-surface missile programs. These include projects that test missiles, such as the AMRAAM, launched from aircraft against targets in the air or on the ground. On average, about 200 missions are conducted annually. Typical tests include captive carry, during which the missile remains attached to a carrier aircraft, and hot firings.

- Surface-to-air missile programs. On average, about 700 surface-to-air missile missions are conducted at WSMR annually. These include development and flight testing of the Extended Range Intercept Technology (ERINT) interceptor missile, testing of Forward Area Air Defense System (FAADS) such as Stinger missiles, and test firing and tracking of Patriot missiles. THAAD missile program test activities are also conducted.

- Surface-to-surface missile programs. On average, 250 surface-to-surface missions are conducted at WSMR annually. These include test launches of the ATACMS solid-propellant missiles from MLRS launchers (including high explosives tests in approved areas), flight tests and fire control tests of the solid-propellant Line-of-Sight Anti-Tank (LOSAT) missile, and testing of new propulsion systems for 13 cm and 20 cm guns.

- Testing of drone target systems. On average, 400 missions are conducted annually of target systems for Stinger, Chaparral, and Hawk missile programs.

- Meteorological and Upper Atmosphere Probes. On average, 15 meteorological and upper atmosphere probes missions have been conducted each year.

- NASA and space program support. On average, 400 NASA and space program missions are conducted annually at WSMR, including the Space Shuttle program, shuttle training aircraft, and Single Stage Rocket Test program. The WSMR is an alternate landing site for the space shuttle. Laboratories at NASA's White Sands Test Facility (WSTF) test the compatibility of materials being considered for use in aerospace applications. The WSTF's tracking and data relay system station provides satellite data relay services to spacecraft such as the shuttle. NASA operates and maintains a shuttle training aircraft that provides a realistic simulation of the shuttle landing from 35,000 feet to touchdown. The Single Stage Rocket Test Program is a U.S. Army Ballistic Missile Defense Organization program to develop a vertically launched and recoverable suborbital rocket capable of lifting up to 3,000 pound payload and returning to the launch site for a precise soft vertical landing. The WSMR is providing preflight static testing, hover flight, and rotation flight tests for this program.

- Equipment components and subsystem tests. On average, 300 such tests are performed at WSMR annually and typically include flight testing on helicopter or fixed-wing aircraft.

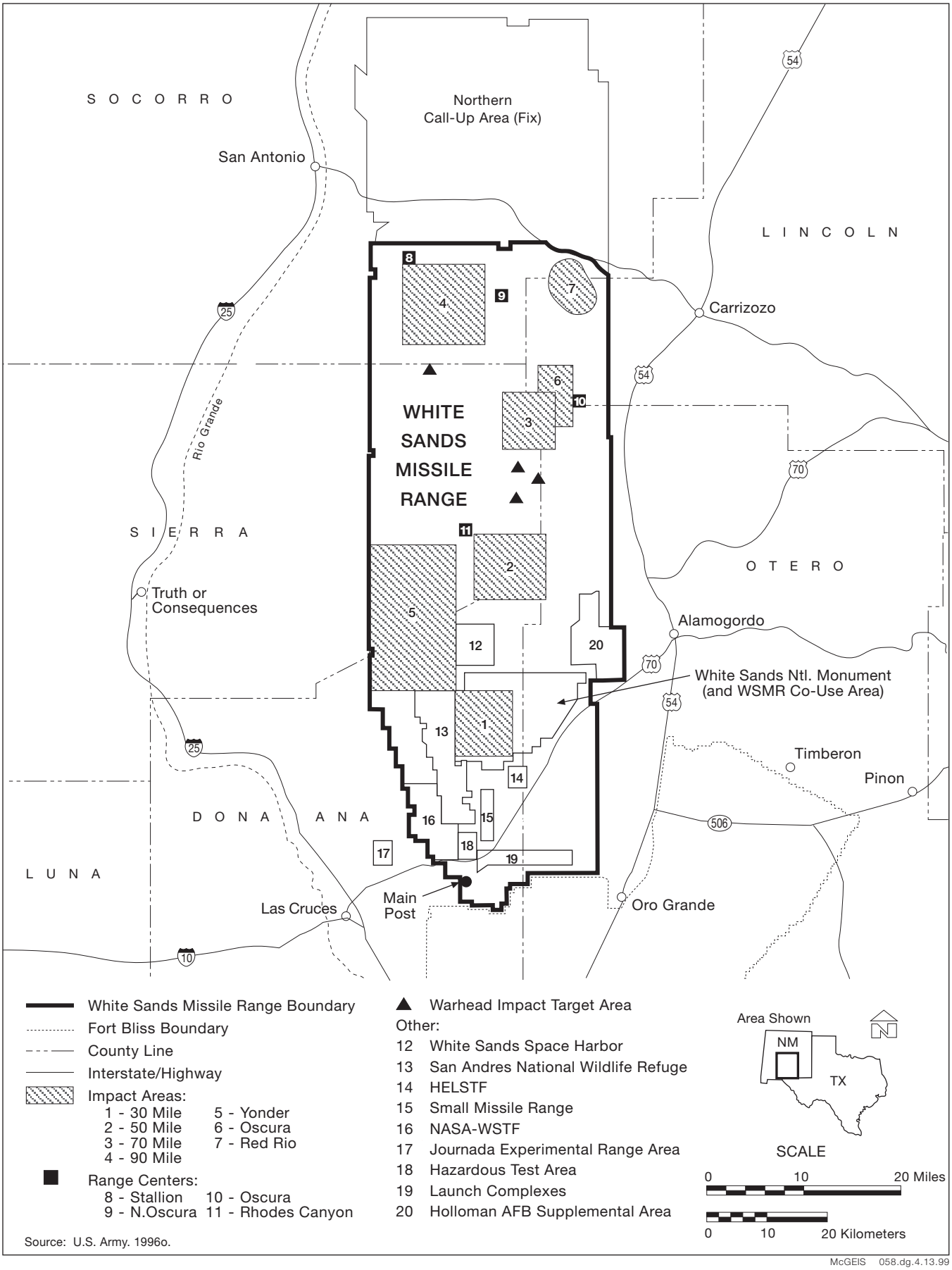


Figure G-1. White Sands Missile Range (WSMR) Operations and Land Use Area.

- High-energy laser missions. On average, 100 high-energy laser missions are conducted annually at various approved locations on WSMR.

- Research and development programs, primarily in nuclear effects (conducted in simulated environments) and research rockets (e.g., sounding rockets).

- Special tasks, normally consisting of small-scale training exercises, indoor testing, field tests, and explosives ordnance disposal.

In addition, WSMR supports air-to-ground training at Red Rio and Oscura Target Complexes and air-to-air training in its Restricted Areas.

G.3 MILITARY ACTIVITIES AT HAFB

HAFB is located approximately 7 miles west of Alamogordo in Otero County, New Mexico, and 85 miles northeast of El Paso, Texas. Ongoing and projected mission changes at HAFB that will affect airspace over, and land use on, the Fort Bliss Training Complex include completion of the Taiwanese Air Force Training program at HAFB. Deactivation of the 435th Fighter Squadron was analyzed in the *Final Environmental Assessment for The Drawdown of AT-38 Aircraft and Deactivation of the 435 Fighter Squadron at Holloman Air Force Base, New Mexico* (USAF, 1997j). During the second quarter of FY 97, it reduced T-38 operations at HAFB, McGregor Range (use of the existing Class C air-to-ground, unscored, inert bombing circle), WSMR, Beak and Talon MOAs, and several MTRs, including IR-133, IR-134, IR-195, and VR-125.

This reduction is partially offset by the establishment of an air-to-ground tactical target complex for use by USAF and GAF units. On May 29, 1998, the USAF selected Otero Mesa as the location for the tactical target complex which is incorporated into Alternative 1 of this LEIS.

G.4 ACTIVITIES AND PLANS IN AREAS AFFECTED BY THE PROPOSED ACTION

This section discusses the activities and plans in the vicinity of McGregor Range. BLM, USFS, state and county activities, and plans are discussed.

G.4.1 BLM

The McGregor Range ROI is within the New Mexico State Office of BLM (that includes New Mexico, Texas, Oklahoma, and Arizona). Within the New Mexico State Office are two relevant BLM district offices: the Las Cruces Field Office in New Mexico and the Tulsa Field Office that includes Texas. Although, the Main Cantonment Area and the South Training Areas are within the Tulsa District boundaries, there are no BLM lands in Texas adjacent to McGregor Range boundaries.

The DOI's overall philosophy is to manage public lands under a multiple-use and sustained yield concept. The Classification and Multiple Use Act of September 19, 1964 (43 USC 1411-1418) is referenced in 43 CFR Part 2300. No overall priority is assigned by the Classification and Multiple Use Act or by the Secretary of the Interior to any specific use. Section 1 of the Classification and Multiple Use Act lists ten objectives of public land and specifies the methods of management of the public lands will be governed by the provision of existing laws (43 USC 1725.3-3). The listed objectives as interpreted by the Secretary of Interior are as follows:

- Domestic livestock grazing;
- Fish and wildlife development and utilization;
- Industrial development;
- Mineral production;
- Occupancy;
- Outdoor recreation;
- Timber production;
- Watershed protection;
- Wilderness preservation;
- Preservation of public values.

The Secretary of the Interior or his delegate such as the BLM will authorize, under applicable authority, that use or combination of uses will best achieve the objectives of multiple use, taking into consideration all pertinent factors. These factors include, but are not limited to, ecology, existing uses, and the relative values of the various resources in particular areas (43 CFR Sec. 1725.3-1). The BLM may place special emphasis on specific requirements for Special Management Areas and ACEC. Land use and rangeland improvements are thoroughly analyzed to restrict new surface disturbance, reduce resource conflicts, and aid in the management of all resources. All proposals are subject to the NEPA process and especially to the mitigation of impacts.

The Las Cruces Field Office encompasses portions of the Fort Bliss Training Complex: the Doña Ana Range–North Training Areas and McGregor Range. The BLM has published *Resource Area Management Plans* that describes the agency's activities that could contribute to cumulative effects in the region.

G.4.2 USFS

The USFS manages lands of the Lincoln National Forest that are adjacent to the northeastern boundary of McGregor Range encompassing TA 33. There are no currently known actions on these lands that would contribute to cumulative effects of the proposed action. Activities currently occurring in this area include grazing, fuel-wood gathering, hunting, and recreation.

G.4.3 State of New Mexico

The New Mexico State Highway Department is evaluating plans to widen U.S. Highway 54 through portions of Otero County that pass through the Fort Bliss Training Complex. The demand for aggregate to support this activity could increase cumulative impact, if any, on this resource in the vicinity of the Fort Bliss Training Complex.

G.4.4 State of Texas

The Texas State Land Office and other State agencies administer nonprivate lands adjacent to Fort Bliss in Texas. There are no currently known actions on these lands that would contribute to cumulative effects of the proposed action.

G.4.5 Doña Ana County, New Mexico

The *Doña Ana County Comprehensive Plan* (Doña Ana County, 1994) provides a combination of goals, policies, and actions the county will use to make responsible decisions through the year 2015. Planning areas adjacent to the Fort Bliss Training Complex boundaries include the eastern portions of the Border Planning Area, the South Planning Area, and the southeastern portion of the Central Planning Area.

There are no currently known actions on these lands that would contribute to cumulative effects of the proposed action.

G.4.6 Otero County, New Mexico

Otero County adopted an *Interim Land Use Policy Plan* in 1993. A First Draft *Otero County Comprehensive Plan* (March, 1998) is currently being reviewed by the State of New Mexico. Following approval by the State, the Plan will be finalized by the county planning commission and the citizen working group. Then the county commission will vote on adopting the Plan. Once adopted, the Plan would reflect the county's official policy and recommended use of lands within its boundary (excluding municipalities). The plan would provide a basis for evaluating the effects of proposed activities on the public lands relative to the county's goals for land use and development. Public lands would continue to be managed by their appropriate state and federal land managers, in accordance with all applicable land management and environmental laws. The primary goal of the plan is to guide the use of public lands and resources in the county and to protect the rights of private land owners. The draft plan identifies areas of historic and customary use that are of value to county residents, including the use of water, agriculture, livestock grazing, timber and wood production, mineral production, cultural resources, recreation, hunting, federal and military activities, transportation and access, wilderness, wildlife, and threatened and endangered species. No specific management actions or priorities for land resource allocation have been identified at this time. Therefore, there are no currently known actions on these lands that would contribute to cumulative effects of the proposed action.

G.4.7 El Paso, County, Texas

General growth projected for the El Paso metropolitan area has raised groundwater availability issues. Regional water supply issues focus on two general topics: (1) the availability of long-term water supply from the Hueco Bolson aquifer, and (2) supplementing or reducing dependence on locally derived groundwater. The Fort Bliss Training Complex and its facilities are a subset of a greater issue of cumulative urban water availability and demand.

G.5 COMPREHENSIVE LANDSCAPE MONITORING

The Fort Bliss Training Complex landscape was assessed for cumulative effects from training, grazing, and natural impacts on natural and cultural resources. Monitoring will be a four-part process consisting of remote sensing reconnaissance, site inspections, plot sampling, and GIS analysis. Remote sensing reconnaissance will scan entire land base to monitor seasonal trends, detect impacts, and focus field investigations on high priority areas. Field investigation will validate remote sensing images/data and quantify intensity of impacts on natural and cultural resources. Distribution, frequency, and intensity of impacts will be stored in a GIS database. This process will support enforcement of environmental laws and NEPA provisions, provide data for the ITAM program, record cumulative impacts, and provide information to adjust training operations as needed (Adaptive Management Strategy).

G.5.1 Components of Monitoring System

The monitoring systems used in the vicinity of the Fort Bliss Training Complex are described in this section. The monitoring systems discussed include Advance Very High Resolution Radiometer (AVHRR) Time Series Imagery, mission specific monitoring, LANDSAT Thematic Mapper Satellite Imagery, and plot data collection.

G.5.1.1 AVHRR Time Series Imagery

The NASA AVHRR is a satellite-mounted sensing the system has been used to monitor environmental conditions on a global scale. AVHRR normalized vegetation index has proved to be a very robust measure of vegetation health, phenology, and production. AVHRR thermal and visible bands have been used to monitor temperature, cloud cover, soil moisture, transpiration, forest fires, and fuel build up. AVHRR provides regional context to environmental conditions on the Fort Bliss Training Complex. Therefore, plot data can be related to regional environmental conditions such as soil moisture, phenological status, and temperature. This capability will provide the ability to compare plots from different time periods. Fort Bliss is obtaining AVHRR satellite data on a daily basis from the Army Research Laboratory at WSMR.

G.5.1.2 Mission-specific Monitoring

Major training actions such as Roving Sands require on-the-ground monitoring to ensure compliance with NEPA provisions for monitoring and mitigation activities. Fort Bliss ITAM program, in conjunction with the USACASB, has a system of on-site monitoring that uses GPS and field data collection to develop a GIS data base for each training exercise. This consists of on-site visits to training units to ensure compliance with NEPA guidelines, recording the units position and "footprint" with GPS, and recording environmental damage in the Site Rep database. The end result is a site-specific database for each proponent's training exercise.

G.5.1.3 LANDSAT Thematic Mapper Imagery

NASA LANDSAT Thematic Imagery will be used to monitor the entire landscape of the Fort Bliss Training Complex at high spatial resolution to capture variability in land cover on training areas. This capability will allow positioning of monitoring plots to provide an accurate sample of impacts on the training landscape. Additional post sampling analysis using plot data, monitoring data, and GIS themes will allow analysts to map the extent and impact of training activities on a landscape scale.

G.5.1.4 Plot Data Collection

The objective of plot data collection is to record changes in species composition and ground cover at the observer level. The distribution of plots is designed to provide the highest level of confidence in data at the lowest cost. LANDSAT imagery and on-site monitoring are critical elements in the sampling procedure. On-site monitoring ensures that monitoring plots are located in areas that have received training impacts and LANDSAT image analysis ensures that control plots are positioned in areas that represent undisturbed conditions typical of the training area.

G.5.2 Methods of Analysis

The monitoring systems previously discussed will provide the following types of information.

G.5.2.1 Training Impacts

Coordinated analysis of on-site monitoring data, field plots, and satellite imagery will provide a synopsis of training impact intensity and extent.

G.5.2.2 Environmental Trends

Time series analysis of satellite imagery and control plot data will provide baseline data on the response of plant communities to climatic variation and natural disturbance. This will be a valuable source of baseline data for future NEPA analysis.

G.5.2.3 Cumulative Impacts

Environmental health of training lands is a product of training impacts and environmental trends. Time series analysis of training impacts and environmental trends provides data on ecosystem response. The GIS system provides a method to record impacts and analyze their effects over time.

G.5.3 Monitoring Cover Change Using Thematic Mapper Satellite Imagery

G.5.3.1 General Approach

The general approach is to estimate actual cover values for the total vegetative cover area, using the Gram-Schmidt process to produce optimal perspective for separation of land cover classes from multi-spectral satellite imagery (Crist and Kauth, 1986; Jackson, 1983). The fundamental basis of the Gram-Schmidt process involves finding data structures inherent to a particular sensor and land cover classes, and adjusting the axes of observation in multispectral viewing space such that the land cover classes can be most easily and completely observed. After the Gram-Schmit procedure, correlation analysis with ground truth data is implemented to produce a cover estimate based on a linear regression model. The cover estimate then becomes a thematic layer in the GIS system. This method allows comparison of land cover change over time by subtracting cover estimates made from imagery acquired from different dates. The use of correlation analysis and regression models provides statistical confidence estimates and error estimates for each thematic layer. This method makes it possible to assess the condition of the landscape synoptically and track changes in landscape condition over time.

G.5.3.2 Methods

Overview. There are four major steps involved in converting digital values obtained from satellite imagery to vegetation cover maps: geographic coding, image calibration, feature extraction, and cover modeling. Geographic coding ties the pixels in the satellite image to geographic coordinates. The satellite image becomes a map with scale, projection, and a coordinate grid. This allows direct comparisons between conventional maps and other geographically coded images. Image calibration converts the digital numbers recorded by satellite sensors into numbers with physical meaning, such as radiance and reflectance. Feature extraction uses spectral profiles of elements in a pixel to identify the composition of a pixel through statistical analysis. Cover modeling uses linear regression to establish relationship between ground plot data and spectral features.

Imagery. Two images were selected for use in this comparison: *LT503303703886163*, a LANDSAT Thematic Mapper 5 image, acquired June 12, 1986; and *LT50330370389696175*, a LANDSAT Thematic Mapper 5 image, acquired June 23, 1996.

Geographic Coding. Image to image registration was accomplished by selecting corresponding points on each image and performing a first order polynomial transformation to UTM zone 13 row S NAD27 coordinates. The accuracy obtained through this process is within one half of one pixel.

G.5.4 Image Calibration

LANDSAT digital images are commonly analyzed by using the digital numbers for each pixel. Although this procedure may be satisfactory for a single image used, it may produce incorrect results when more than one image is used in time sequence overlays. The digital numbers for each pixel should be converted to their dimensional equivalents; numbers with physical meaning. Radiance and reflectance are two values commonly used for time sequence analysis of imagery. These values vary depending on sensor calibration, sun angle, earth-sun distance, the state of the atmosphere, slope and angle of terrain, and surface cover. Radiance is measured at the satellite in milliwatts per square centimeter per steradian. Reflectance is the ratio of radiant energy reflected by a surface to incident energy and is calculated as a percentage of radiance at the sensor (Robinove, 1982). This conversion corrects for sun angle differences, sensor variability, and earth-sun distance. Calibration allows images from different dates to be compared directly. Reflectance values were used for this study because reflectance for various surfaces has been measured and catalogued by the USGS Spectral Laboratory, and is the standard parameter for use in image spectrometry and other methods used for identifying the composition of surfaces from remotely sensed imagery.

G.5.5 Feature Extraction

Vegetation indices, such as normalized vegetation index (NDVI), which are commonly used to measure vegetation biomass, leaf area index, or fractional cover in agricultural fields, grasslands, and forests, do not perform well in measuring cover in semi-arid range land. Brightness indices, or linear combinations of spectral bands, are more closely related to vegetative cover in semi-arid range land (Yang and Prince, 1997). The two-dimensional perpendicular vegetation index (PVI) and six dimensional greenness index for Thematic Mapper satellite imagery are examples. The method used here relies on the Gram-Schmidt (Jackson, 1983) procedure to produce brightness indices based on image measured soil reflectance, albedo, and the spectral profiles of dry grass and calcite acquired from the USGS Spectral Laboratory. This process mathematically reduces variation in a cover feature, from multiple spectral variables (bands) to one band. These bands represent variation in cover, but at this point, they are not expressed in meaningful units. Linear equations based on least squares regression are used to convert raw cover values to percent cover. These methods have been used extensively to measure cover in dry land situations (Duncan et al., 1993; Griffiths and Collins, 1983; Larson, 1993; Olson, 1984).

G.5.6 Cover Modeling

Thirty step-toe transects were established in grassland and shrub sites at sites selected for use in the aplomado falcon habitat evaluation. Percent cover for grasses, shrubs, litter, and soil were calculated using methods described by the U.S. Army (1997k). The transects were converted to raster thematic maps using field collected geographic positioning system (GPS) data to accurately position the plots in UTM zone 13 row S NAD27 coordinates. Cover values obtained from these transects were compared with spectral feature layers from satellite imagery using Pearson Product Moment correlation. This analysis indicated a strong linear relationship between plot data and spectral feature layers (Table G-1 and Figure G-2).

Albedo and Dry Grass Index had the best correlation with cover area measurements on the aplomado falcon transects. Results indicate that acceptable cover maps of shrub cover area, soil cover area, and total vegetation cover area can be created by developing least squares models using these indices. Total vegetation cover area was selected as an indicator of ecological condition, and maps of vegetation cover were created using formulas derived from least square regression analysis. The coefficient of correlation for this model is 0.79.

Table G-1. Correlation of Plot Data and Spectral Indices

Cover Area Measure	*Grass*	*Litter*	*Forb*	*Shrub*	*Soil*	*Total Vegetation*
Spectral Index						
Albedo	0.31	-0.62	-0.45	-0.69	0.71	*-0.73*
Greeness	-0.19	-0.03	0.01	-0.05	0.16	*-0.16*
NDVI	0.05	-0.08	-0.25	-0.12	0.12	*-0.14*
Dry Grass	-0.47	0.48	0.39	0.77	-0.58	*0.74*
Soil	*-0.04*	-0.22	-0.42	-0.23	0.32	*-0.34*
Calcite	*-0.19*	-0.03	0.01	-0.05	0.19	*-0.16*

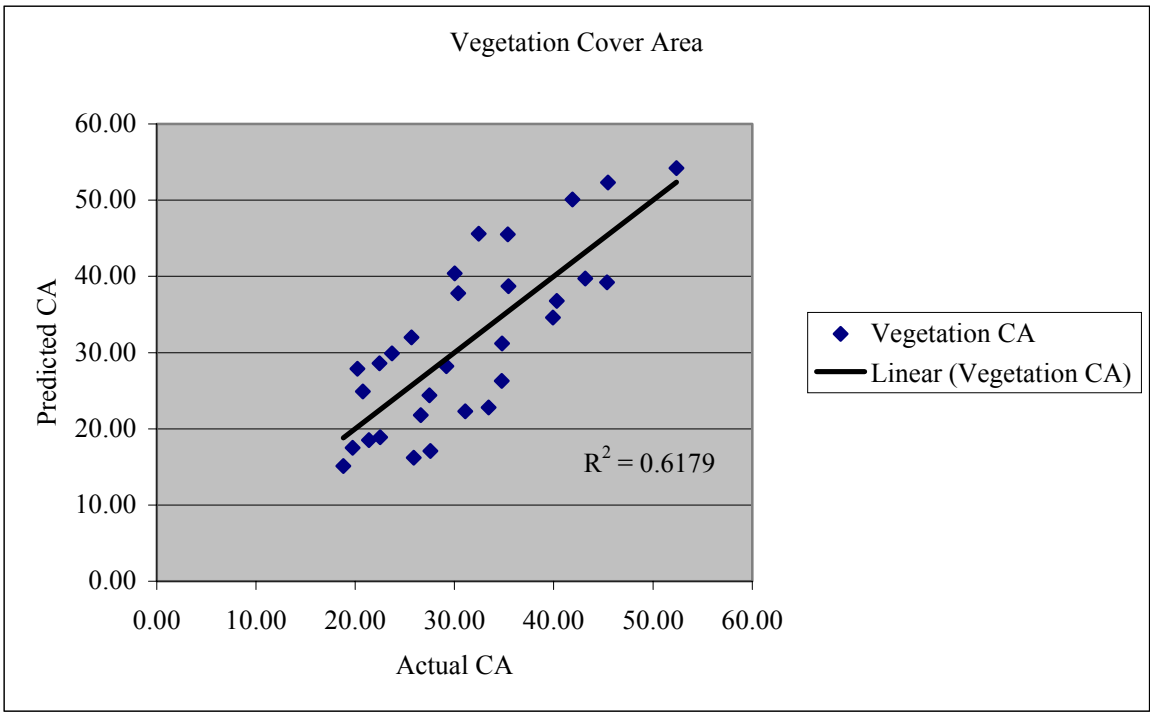


Figure G-2. Vegetation Cover Area and Linear Multiple Regression Model Prediction.

This model allows prediction of vegetation cover area (in percent) with a confidence interval of error of 3.27 percent at the .01 level.

G.5.7 Description of Changes 1986 through 1996

Maps and data produced by linear multiple regression models provide a valuable tool for extrapolation of plot data to the landscape scale. However, the results must be interpreted with some qualifications. The model was generated from plot data in grassland and desert shrub communities where vegetation cover area ranged from 15 to 53 percent of the total cover area. Extrapolation of the model to other vegetation types, or to cover area, outside of the range of the model cannot be evaluated for accuracy. Therefore, comparisons made in other vegetation types or outside of the model's range should be viewed as preliminary comparisons. The images used in the analysis represent a snapshot view of conditions for 2 days 10 years apart, and do not represent trends in vegetation cover area. Observational variations

represent changes that occur in both short- and long-term timeframes. Trend analysis is used to separate long-term change from short-term variation. The number of observations over time correlates to the reliability of the trend analysis. This analysis is an example of the process being implemented at Fort Bliss to evaluate cumulative impacts of military training, grazing, and natural events on training lands. To this end, Fort Bliss has acquired satellite imagery from 1972 to 1997. These images will be used to establish long-term trends in landscape change on Fort Bliss with the goal of publishing the results in a peer reviewed scientific journal.

G.5.7.1 Environmental Setting

Precipitation and fires are significant factors affecting vegetation cover area. These factors can produce change in short- and long-term timeframes, depending on their duration and intensity. Knowledge of environmental conditions that affect vegetative condition is necessary for interpretation of satellite derived vegetation cover maps. A summary of conditions from January 1984 to January 1986 and January 1994 to June 1996 is provided to aid in interpretation of the results (Tables G-2 and G-3).

In the 30 months preceding the 1986 image there was a total of 37.6 inches of precipitation at Oro Grande, 33.15 inches at WSMR, and 29.0 inches at EPIA, while there were 27.55 inches at Oro Grande and 16.69 inches at WSMR and EPIA, respectively, in the 30 months preceding the 1996 image.

These data indicate low fire frequency prior to the 1986 image and relatively high fire frequency prior to the 1996 image. There were significant fires in the Organ Mountains in 1994 and 1993, and on Otero Mesa in 1993 and 1994. Natural causes were responsible for 31 fires, and 7 fires were attributed to man-made causes. These data suggest that vegetation cover area would generally decline from 1994 to 1996 as a result of below normal precipitation, and that cover would be drastically reduced in areas that were affected by fires. Results from change analysis of cover maps suggest that there was generally less vegetative cover in 1996 than there was 1986, and that areas impacted by fire suffered greater losses in cover than relatively undisturbed areas.

G.5.7.2 Interpretation

The data should be interpreted with some qualifications because two data points are not sufficient to establish a trend and environmental conditions prior to the image dates were significantly different. There were over 33 inches of precipitation in the 20 months preceding the 1986 image, while there were only 16.79 inches in the 20 months before the 1996 image. Desert areas are known for having highly variable precipitation and frequent droughts. Cover response to drought depends on plant physiognomic characteristics. Annual plants avoid drought by seed dormancy; germination will not occur until there is adequate moisture. Perennial plants respond by reducing their leaf area. These effects would result in lower annual plant cover and reduced leaf areas in perennial vegetation.

Fires are another contributing factor. Twenty-five of 28 fires recorded on Fort Bliss from 1982 to 1996 occurred between 1986 and 1996. Vegetation cover area cover would be severely reduced in these areas. Despite these qualifications, some observations can be made:

- Woody vegetation at high elevations was not affected as severely by drought, most cover loss was associated with fires in these vegetation types;

- The most severe drought effects were at lower elevations in mesquite coppice dune and sand scrub vegetation;

Table G-2. Precipitation in Inches During 30 Months Preceding Image Dates

Station	*Year*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	
296435 Oro Grande, New Mexico	1984	0.75	0.0	0.0	0.0	1.31	4.72	1.08	6.38	0.48	3.1	0.87	2.16	30-month Total prior to Jul 86 37.6
	1985	1.13	0.34	0.29	0.42	0.8	0.83	0.82	2.75	3.45	3.45	0.05	0.07	
	1986	0.05	0.35	0.33	0.0	0.26	2.08							
	1994	0.61	0.38	0.27	0.32	0.92	0.09	2.67	2.58	1.01	0.77	0.79	1.1	30-month Total prior to Jul 96 27.55
	1995	0.76	0.69	0.26	0.0	0.0	5.57	1.46	0.87	2.8	0	0	0.29	
	1996	0.49	0.13	0.0	0.15	0.0	2.57							
299686 White Sands National Monument, New Mexico	1984	0.31	0.0	0.32	0.0	0.86	3.82	1.58	2.94	0.24	2.03	11.3	2.77	30-month Total prior to Jul 86 33.15
	1985	1.26	0.42	0.34	0.82	0.5	0.85	1.82	2.69	1.42	4.13	0.05	0.05	
	1986	0.02	0.57	0.35	0.01	0.37	1.48							
	1994	0.27	0.0	0.17	0.27	0.75	0.02	1.09	0.65	0.2	0.54	0.77	0.99	30-month Total prior to Jul 96 16.69
	1995	0.77	0.56	0.08	0.0	0.0	0.8	1.58	1.52	2.88	0	0.06	0.15	
	1996	0.45	0.06	0.0	0.31	0.0	1.75							
412797 EPIA, Texas	1984	0.31	0.0	0.44	0.01	0.59	3.18	0.69	5.57	0.58	3.12	0.51	1.17	30-month Total prior to Jul 86 29
	1985	0.95	0.19	0.59	0.07	0.01	0.1	1.32	1.46	1.47	1.82	0.13	0.05	
	1986	0.01	0.39	0.39	0.0	0.83	3.05							
	1994	0.03	0.23	0.37	0.65	0.8	0.67	0.18	0.02	0.03	0.35	0.54	1.61	30-month Total prior to Jul 96 16.69
	1995	0.26	0.88	0.42	0.04	0.01	1.74	0.28	0.76	3.18	0.0	0.26	0.23	
	1996	0.11	0.19	0.0	0.49	0.0	2.36							

Note: Missing data estimated by interpolation among months surrounding the data point over the 3-year period.
Source: NOAA, National Climatic Data Center, n.d.

- Vegetation cover in grazed grasslands is significantly lower than in ungrazed grasslands for both dates; and

- Vegetation cover in Roving Sands controlled access FTX sites is not significantly different from vegetation cover in grazed areas.

More data are needed to assess plant cover response to drought years and moist years in desert environments. This would require analysis of long-term data sets that represent a series of wet and dry years. The cumulative changes in vegetation cover from June 12, 1986, to June 23, 1996, are depicted on Figure G-3. Changes in the two LANDSAT images of the McGregor Range are portrayed in terms of percentage loss and percentage gain, as shown by the legend of Figure G-3.

Table G-3. Fires on Fort Bliss 1982 to 1996

Fire Name	*Discovery Date*	*Stated Cause*	*Total Acreage*
Aguirre Sprigs	8/8/82	Natural	*1.0*
Ladrone	6/17/85	Natural	*10.0*
South	1/14/86	Man-made	*0.1*
Oingo	6/21/89	Natural	*50.0*
Cli	6/21/89	Natural	*7.5*
Dry Peak	6/21/89	Natural	*250.0*
Cooper	6/22/89	Natural	*40.0*
Triangle	6/22/89	Natural	*340.0*
Hoot	7/9/89	Natural	*650.0*
Horse Camp	7/18/89	Natural	*25.0*
Mary Toy	6/21/90	Natural	*750.0*
Charlie R	5/14/92	Natural	*0.5*
Haymeadow	10/1/92	Man-made	*1.2*
Mackdraw	10/7/92	Man-made	*100.0*
Oterrell	5/24/93	Natural	*40.0*
Chatfield	5/31/93	Natural	*350.0*
Wind Mountain	5/31/93	Natural	*2.0*
Escondido	6/1/93	Natural	*8.9*
Mashed O	6/1/93	Natural	*1.4*
Martin	6/1/93	Natural	*4.1*
Cockleburr	6/1/93	Natural	*1.0*
West Mesa	6/1/93	Natural	*66.0*
Wildcat	6/1/93	Natural	*75.0*
Cristo Rey	6/14/93	Natural	*0.3*
Charlie	4/4/94	Man-made	*5.0*
Impact	4/20/94	Natural	*80.0*
Martin	4/22/94	Natural	*3.0*
Savage	4/22/94	Natural	*3.0*
Hat	6/29/94	Natural	*9.0*
Corner	6/29/94	Natural	*20.0*
Prather	6/30/94	Natural	*3.0*
Mw	7/13/94	Natural	*0.5*
Littledraw	8/21/94	Natural	*2.0*
Blacktank	9/27/94	Natural	*5.0*
Horsecamp	10/3/94	Natural	*350.0*
Unit 9	11/7/94	Man-made	*6.0*
West Tank	11/9/94	Man-made	*6.0*
Horse Mesa	5/10/95	Man-made	*5.5*

Source: Files, BLM, Las Cruces Field Office.

Tables G-4 through G-7 present the percent of total vegetation cover area or cover and dynamics between the 2 years for McGregor Range. Vegetation cover is described for various vegetation communities and developed or barren areas. Histograms portraying the data in each table are shown along with the tabular data.

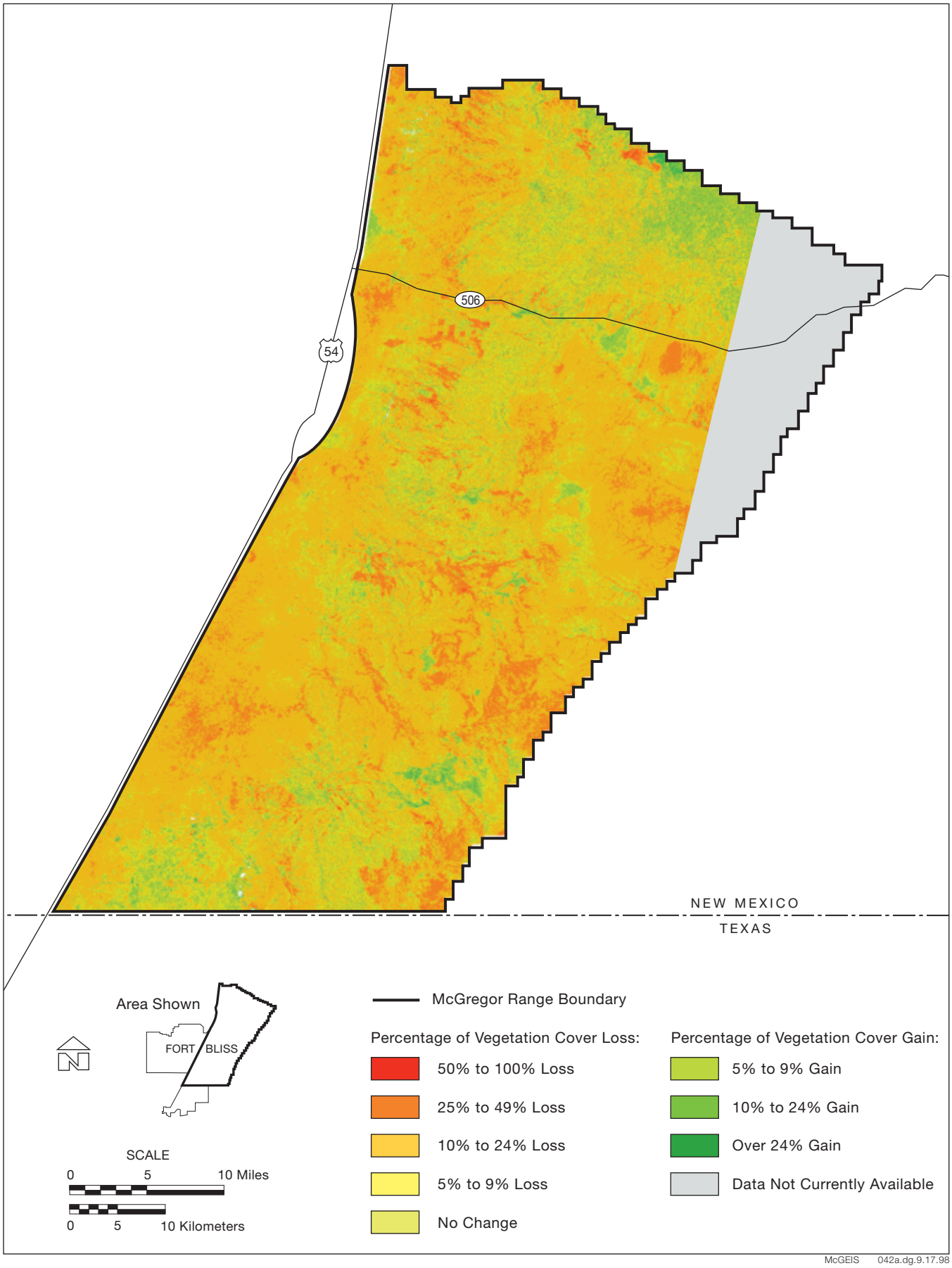
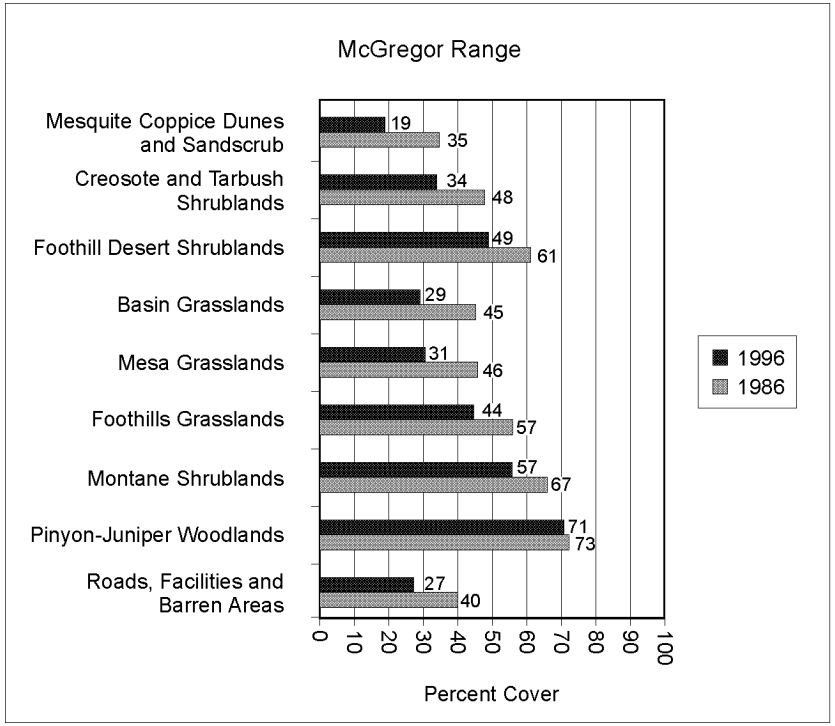


Figure G-3. LANDSAT Derived Vegetation Change on McGregor Range, 1986 to 1996.

Table G-4. Vegetation Cover and Dynamics on McGregor Range 1986 to 1996 (with Histograms)

Vegetation Cover				*Vegetation Dynamics*			
McGregor Range	*Percent of Total Cover Area*			*McGregor Range*	*Area Percent*		
	1986	*1996*	*Avg. Change %*		*Cover Loss*	*No Change*	*Cover Gain*
Mesquite Coppice Dunes and Sand Scrub	35	19	-16.14	Mesquite Coppice Dunes and Sand Scrub	94	6	0
Creosote and Tarbush Shrublands	48	34	-14.00	Creosote and Tarbush Shrublands	91	8	1
Foothill Desert Shrublands	61	49	-12.00	Foothill Desert Shrublands	90	10	0
Basin Grasslands	45	29	-15.82	Basin Grasslands	94	6	0
Mesa Grasslands	46	31	-15.00	Mesa Grasslands	94	6	0
Foothills Grasslands	57	44	-12.57	Foothills Grasslands	84	14	2
Montane Shrublands	67	57	-10.20	Montane Shrublands	55	37	8
Pinyon-juniper Woodlands	73	71	-2.00	Pinyon-juniper Woodlands	38	41	17
Roads, Facilities and Barren Areas	40	27	-13.00	Roads, Facilities and Barren Areas	85	13	2

Note: Total cover area is the indicator of ecological condition used in the vegetation cover modeling.



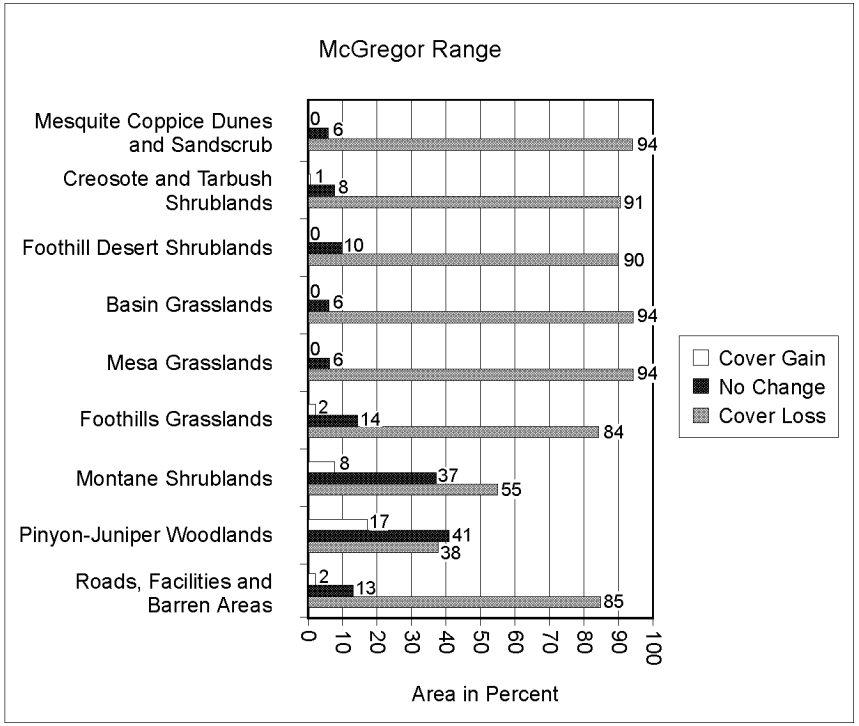
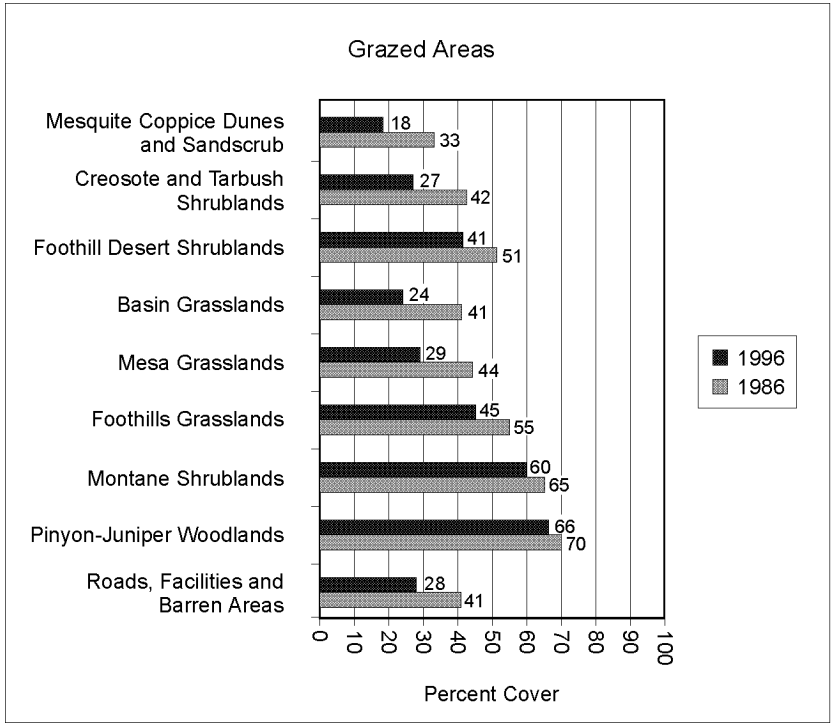


Table G-5. Vegetation Cover and Dynamics of Grazed Areas on McGregor Range 1986 to 1996 (with Histograms)

Vegetation Cover				*Vegetation Dynamics*			
Grazed Areas	*Percent of Total Cover Area*			*Grazed Areas*	*Area Percent*		
	1986	*1996*	*Avg. Change %*		*Cover Loss*	*No Change*	*Cover Gain*
Mesquite Coppice Dunes and Sand Scrub	33	18	-15.00%	Mesquite Coppice Dunes and Sand Scrub	94	6	0
Creosote and Tarbush Shrublands	42	27	-15.00%	Creosote and Tarbush Shrublands	93	7	0
Foothill Desert Shrublands	51	41	-10.00%	Foothill Desert Shrublands	81	17	2
Basin Grasslands	41	24	-17.00%	Basin Grasslands	96	4	0
Mesa Grasslands	44	29	-15.00%	Mesa Grasslands	95	5	0
Foothills Grasslands	55	45	-10.00%	Foothills Grasslands	77	20	3
Montane Shrublands	65	60	-5.00%	Montane Shrublands	50	42	8
Pinyon-juniper Woodlands	70	66	-4.00%	Pinyon-juniper Woodlands	42	48	10
Roads, Facilities and Barren Areas	41	28	-13.00%	Roads, Facilities and Barren Areas	86	12	2

Note: Total cover area is the indicator of ecological condition used in the vegetation cover modeling.



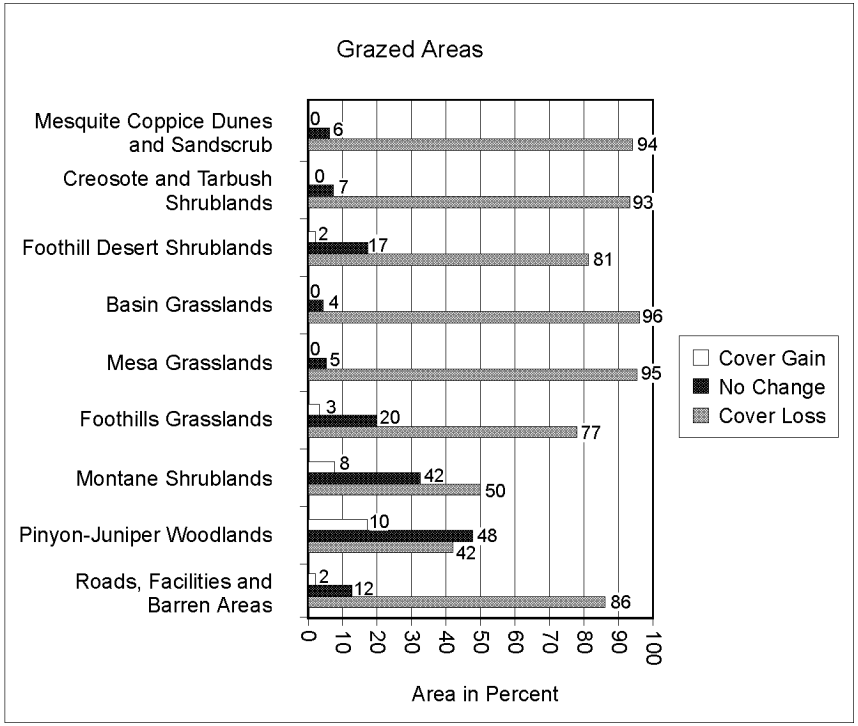
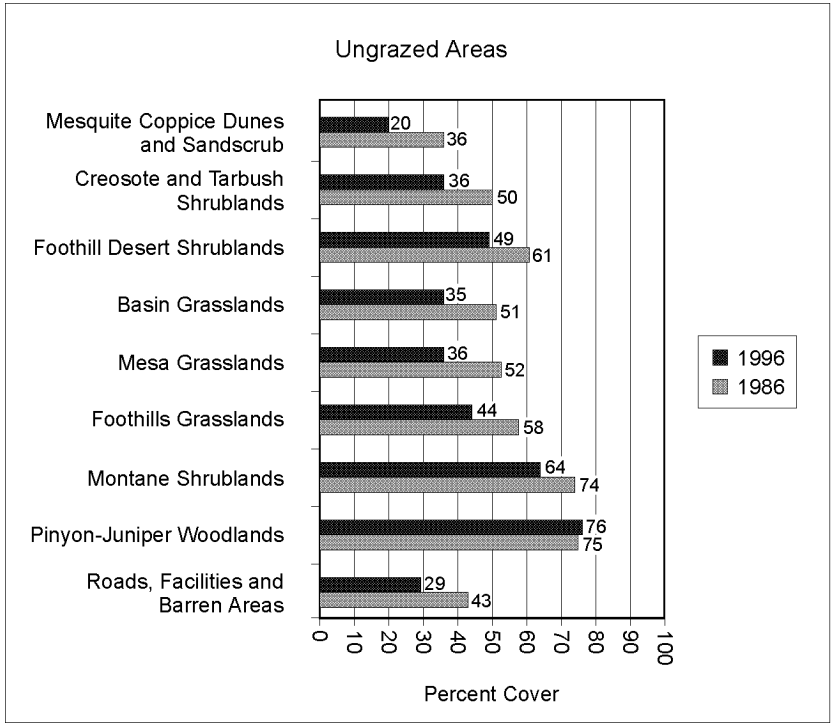


Table G-6. Vegetation Cover and Dynamics of Ungrazed Areas on McGregor Range 1986 to 1996 (with Histograms)

Vegetation Cover				*Vegetation Dynamics*			
Ungrazed Areas	*Percent of Total Cover Area*			*Ungrazed Areas*	*Area Percent*		
	1986	*1996*	*Avg. Change %*		*Cover Loss*	*No Change*	*Cover Gain*
Mesquite Coppice Dunes and Sand Scrub	36	20	-16.00%	Mesquite Coppice Dunes and Sand Scrub	98	2	0
Creosote and Tarbush Shrublands	50	36	-14.00%	Creosote and Tarbush Shrublands	90	9	1
Foothill Desert Shrublands	61	49	-12.00%	Foothill Desert Shrublands	90	9	1
Basin Grasslands	51	35	-16.00%	Basin Grasslands	92	7	1
Mesa Grasslands	52	36	-16.00%	Mesa Grasslands	91	7	2
Foothills Grasslands	58	44	-14.00%	Foothills Grasslands	88	10	2
Montane Shrublands	74	64	-10.00%	Montane Shrublands	67	25	8
Pinyon-juniper Woodlands	75	76	1.00%	Pinyon-juniper Woodlands	33	34	32
Roads, Facilities and Barren Areas	43	29	-14.00%	Roads, Facilities and Barren Areas	89	9	2

Note: Total cover area is the indicator of ecological condition used in the vegetation cover modeling.



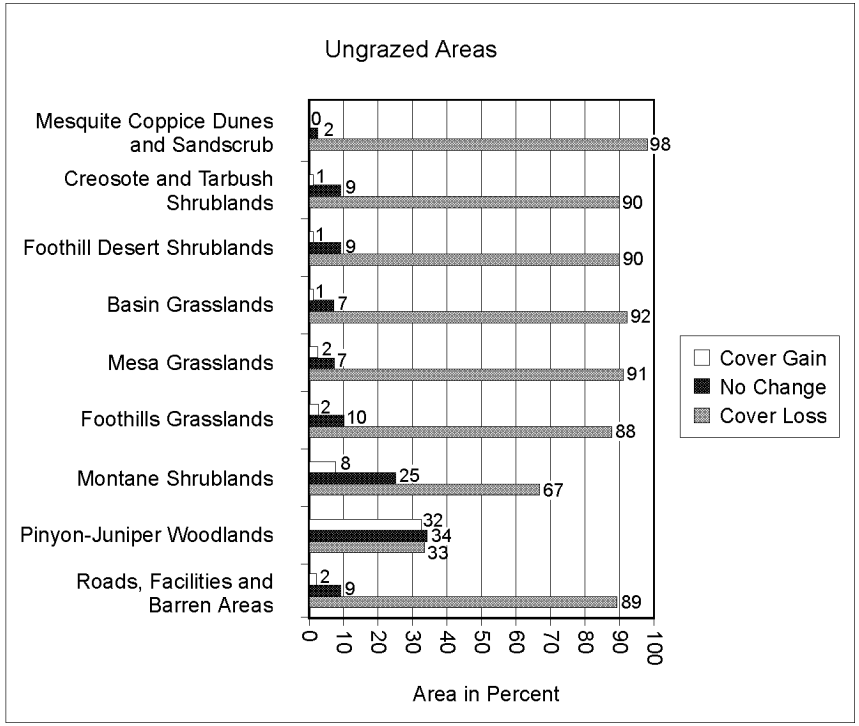
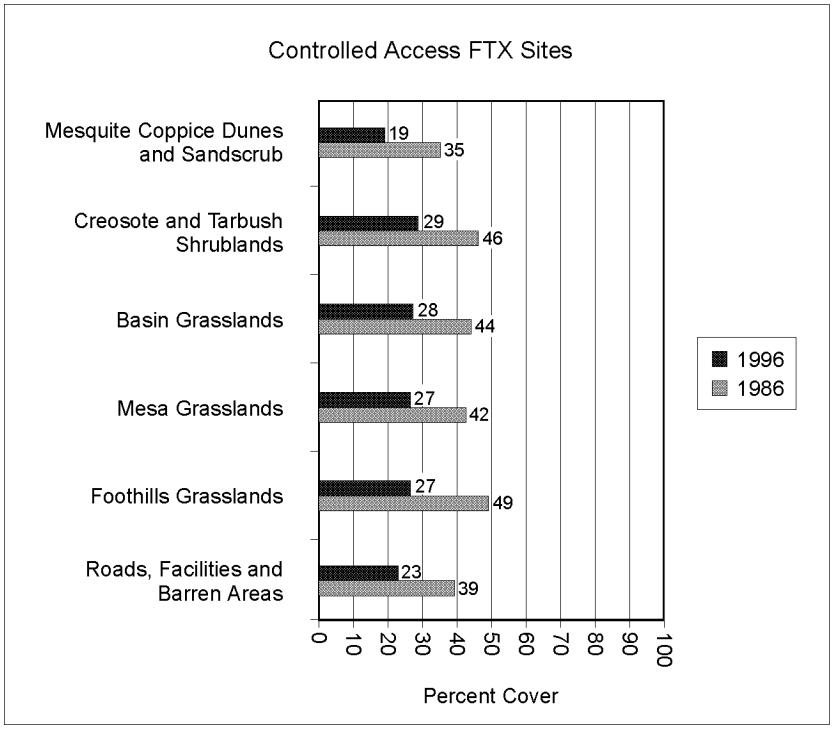
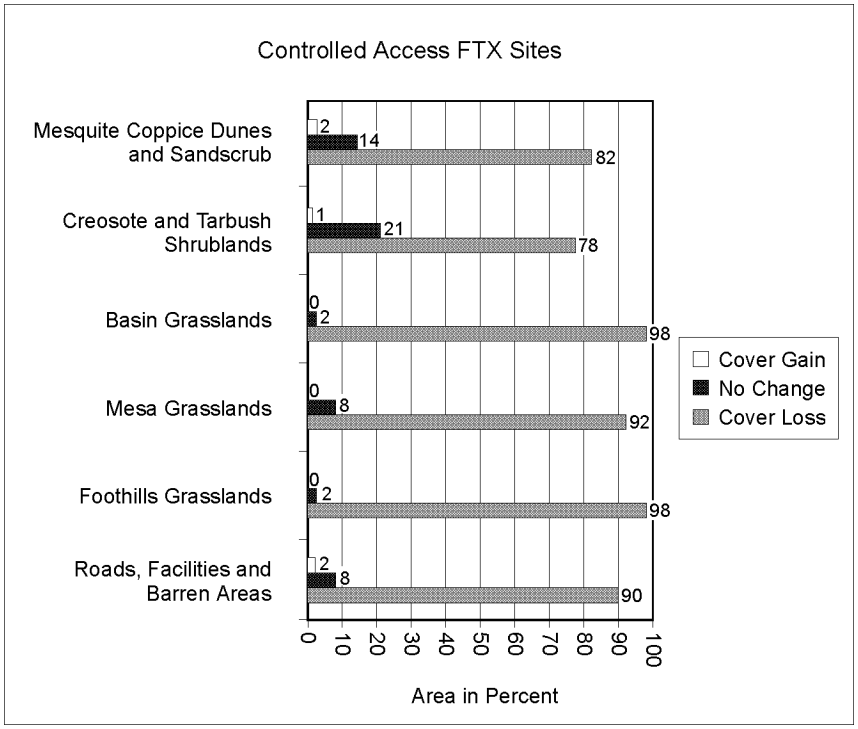


Table G-7. Vegetation Cover and Dynamics of Controlled Access FTX Sites on McGregor Range 1986 to 1996 (with Histograms)

Vegetation Cover				*Vegetation Dynamics*			
Controlled Access FTX Sites	*Percent of Total Cover Area*			*Controlled Access FTX Sites*	*Area Percent*		
	1986	*1996*	*Avg. Change %*		*Cover Loss*	*No Change*	*Cover Gain*
Mesquite Coppice Dunes and Sand Scrub	35	19	-16.00%	Mesquite Coppice Dunes and Sand Scrub	82	14	2
Creosote and Tarbush Shrublands	46	29	-17.00%	Creosote and Tarbush Shrublands	78	21	1
Basin Grasslands	44	28	-16.00%	Basin Grasslands	98	2	0
Mesa Grasslands	42	27	-15.00%	Mesa Grasslands	92	8	0
Foothills Grasslands	49	27	-22.00%	Foothills Grasslands	98	2	0
Roads, Facilities and Barren Areas	39	23	-16.00%	Roads, Facilities and Barren Areas	90	8	2

Note: Total cover area is the indicator of ecological condition used in the vegetation cover modeling.





G.5.7.3 Future Evaluations

The methods for estimating vegetation cover area from Thematic Mapper Imagery provide a robust means for estimating land condition and trend. The method could be improved by establishing plots in a wider variety of vegetation types and a greater range of cover. Current results indicate the method will be valuable in identifying impacted and undisturbed areas. Field plot sampling is crucial for providing the information needed to drive the cover models. The maps produced by the models will provide a sound basis for sample design in biological studies. Vegetation cover area maps are a valuable tool for land managers and scientists because they provide dynamic information at the landscape scale. A *Landscape Monitoring Plan* is being prepared that will provide a synoptic, repeatable method for identifying and recording impacts to training lands. The GIS system provides a platform for landscape scale analysis of impacts. Impact data will provide the basis for assessing training land readiness, scheduling training, and identifying rehabilitation needs. Portions of the plan are in place at the present time. Fort Bliss is archiving AVHRR satellite imagery for time series analysis of vegetation phenology and soil moisture. The installation has coordinated on-site monitoring, field plots and satellite imagery to measure training impact and extent for Roving Sands since 1996. Fort Bliss has developed methods and acquired imagery for cumulative impact assessment that can track changes in vegetation cover over time. A database is being developed for training and natural impacts that can be used to evaluate the effects of these factors on the natural environment.

Soils

Appendix H

APPENDIX H

SOILS

This Page Intentionally Left Blank

H.0 SOILS

H.1 WIND EROSION CALCULATIONS AND ASSUMPTIONS

The equation used to calculate soil loss by wind erosion was the Wind Erosion Prediction Equation (Fuller, 1987). The equation is expressed as:

$$E=(CIVKL)$$

Where E, the predicted soil loss expressed in tons per acre per year, is a function of:

C = Climate
I = Soil erodibility
V = Vegetative production
K = Surface roughness
L = the unsheltered distance across a field.

Assumptions:

1. Current conditions at McGregor Range reflect the soil and vegetative data found in the NRCS MUIR databases for the area.

2. Moderate impact areas consist of 50 percent of the area being undisturbed and having vegetative cover similar to that in the MUIR database. Of the remaining area, 17 percent would have unsheltered distances of 1,000 feet, 17 percent would have unsheltered distances of 100 feet and 16 percent would have unsheltered distances of 10 feet. These unsheltered distances would reflect disturbances created by staging/tank training areas, roads, and bomb craters, respectively. These disturbances would be denuded of vegetative production.

3. High impact areas would have soil data similar to that reported in the MUIR databases for the McGregor Range area, however, these areas would have no vegetative production.

4. Small grain equivalents were calculated as described in Fuller (1987) for the production amounts in the MUIR database for range sites. Litter amounts were considered to be 20 percent of the total production for the site.

H.2 WATER EROSION CALCULATIONS AND ASSUMPTIONS

The equation used to calculate soil loss by water erosion was the RUSLE, version 1.04) (Soil and Water Conservation Society, 1995). The equation is expressed as:

$$A=RK(LS)CP$$

Where *A*, the predicted soil loss expressed in tons per acre per year, is the product of:

R = climatic erosivity (rainfall and runoff)
K = soil erodibility
L = slope length
S = Slope gradient or steepness
C = soil cover and management
P = erosion-control practice.

Assumptions:

1. The *R* factor variable was estimated for McGregor Range, based on *R* factor isopleth maps from the NRCS and the Soil and Water Conservation Society (1995).

2. Data for the variables *K, S,* and *C* (specifically vegetative production in lbs/acre/year) were taken from the NRCS national MUIR database.

3. The average slope percentage for the soil association was used. The slope length variable (*L*) was assumed to be 50 feet for all soils since this length is usually the maximum length for most rangeland sites.

4. The *P* variable was held at 1 for all soil loss predictions since no erosion-control practices were anticipated.

5. Soil losses were calculated for the top soil horizon only.

6. The three disturbance severity scenarios, no disturbance, moderate impact and maximum impact, were calculated by changing values for vegetative cover, vegetative litter, and surface rock cover or pavement. These inputs were also used for calculation of the *C* variable.

7. These soils were assumed to produce grasslands, since the soil survey production data indicated that the most abundant species were grass species for a large percentage of the soils. The grass cover was assumed to be 35 percent for all soils with a litter cover of 20 percent for the no disturbance scenario.

8. Percent rock cover varied across soils and was based on the percent of the soil that was comprised of rocks greater than 0.25 inches.

9. The moderate impact scenario used 50 percent of the vegetative, litter, and rock cover of the no disturbance scenario.

10. The maximum impact scenario used 0 percent cover values for vegetation, litter, and rock.

List of Acronyms

Appendix I

APPENDIX I

LIST OF ACRONYMS

This Page Intentionally Left Blank

LIST OF ACRONYMS

AAA	anti-aircraft artillery
AADT	annual average daily traffic volume
AAARTC	Anti-aircraft Artillery Replacement Training Center
AAF	Army Air Field
AAM	annual arithmetic mean
AAQS	Ambient Air Quality Standards
AC	asbestos concrete
ACC	Air Combat Command
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACMs	asbestos-containing materials
ACR	Armored Cavalry Regiment
ADA	Air Defense Artillery
ADATD	Air Defense Artillery Test Directorate
ADATS	Air Defense Anti-tank System
ADNL	A-weighted day-night average sound level
af	acre feet
AFB	Air Force Base
afy	acre feet per year
AGL	above ground level
AGM	annual geometric mean
AIRFA	American Indian Religious Freedom Act
ALCM	Air-launched Cruise Missile
AMRAAM	Advanced Medium-range Air-to-air Missile
ANSI	American National Standards Institute
APM	Asbestos Program Manager
AR	Army Regulation
ARAACOM	Army Anti-aircraft Command
ARPA	Archaeological Resources Protection Act
ARTEP	Army Training and Evaluation Program
ASIP	Army Stationing and Installations Plan
ASP	Ammunition Supply Point
ASP	Annual Service Practice
AST	above-ground storage tank
ATACMS	Army Tactical Missile Systems
ATC	air traffic control
ATCT	air traffic control tower
AUM	animal unit per month
AVHRR	Advanced Very High Resolution Radiometer
BACT	Best Available Control Technology
BBER	Bureau of Business and Economic Research
BLM	Bureau of Land Management
BN	battalion
BN/SF	Burlington Northern/Santa Fe
BOD	biochemical oxygen demand
BSFV-E	Bradley Stinger Fighting Vehicle-enhanced
CAA	Clean Air Act
cal	caliber
CCC	Civilian Conservation Corps
CDNL	C-weighted day-night average sound level
CDR	Commander
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERL	U.S. Army Construction Engineering Research Laboratory
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CO	carbon monoxide
CONUS	Continental U.S.
CPO	Civilian Personnel Office
cps	cycles per second
CSEL	C-weighted sound exposure level
CY	calender year
DA	U.S. Department of the Army
DAC	Department of the Army Civilian
dB	decibels
dBA	A-weighted decibels
dBC	C-weighted decibels
dBP	peak unweighted sound pressure level
DoD	U.S. Department of Defense
DOE	Directorate of Environment
DOI	U. S. Department of the Interior

DOT	U.S. Department of Transportation
DRMO	Defense Reutilization and Marketing Office
DSERTS	Defense Site Environmental Restoration Tracking System
DSN	Defense Switched Network
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
EPAS	El Paso Archeological Society
EPCRA	Emergency Planning and Community Right-to-Know Act
EPEC	El Paso Electric Company
EPIA	El Paso International Airport
ERINT	Extended Range Intercept Technology
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FAADS	Forward Area Air Defense System
FAW	Forward Area Weapons
FDTE	Force Development Test and Experimentation
FFAR	folding-fin aircraft rocket
FICON	Federal Interagency Committee on Noise
FICUN	Federal Interagency Committee on Urban Noise
FIREX	firing exercise
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
FORSCOM	U.S. Army Forces Command
FOTE	Follow-on Operational Test and Experimentation
FTE	full-time equivalent
FTX	field training exercise
FWPCA	Federal Water Pollution Control Act
FY	fiscal year
GAF	German Air Force
GIS	Geographic Information System
GLAADS	Gun Low-altitude Air Defense System
gpd	gallons per day
gpm	gallons per minute
GPM	Great Plains Margin
GPS	Global Positioning System
GTR	General Technical Report
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HAFB	Holloman Air Force Base
HAP	high accident potential
HazMart	Hazardous Material Pharmacy
HAZMIN	hazardous substance minimization
HE	high explosive
HEI	high explosive incendiary
HIMAD	High-to-Medium-altitude Air Defense
HMMWVs	High Mobility Multi-purpose Wheeled Vehicle
HMX	High Melting Explosive or Octogen
HRMB	Hazardous and Radioactive Material Bureau
HSMS	Hazardous Substance Management System
HUD	U.S. Department of Housing and Urban Development
HUMRAAM	High Mobility Multi-purpose Wheeled Vehicle-mounted Advanced Medium Range Air-to-Air Missile
Hz	hertz
ICRMP	Integrated Cultural Resources Management Plan
ICUZ	Installation Compatible Use Zone
IFR	instrument flight rules
INRMP	Integrated Natural Resources Management Plan
IOTE	Initial Operational and Test Evaluation
IPPP	Integrated Pollution Prevention Plan
IRP	Installation Restoration Program
ISDN	Integrated Switch Digital Network
ITAM	Integrated Training Area Management
JSDF	Japanese Self-defense Force
JTF	Joint Task Force

JTIDS	Joint Tactical Information Distribution System
JTX	joint training exercise
KHz	kilohertz
km	kilometer
kV	kilovolt
LAW	Light Anti-tank/Anti-armor Weapon
LCTA	Land Condition Trend Analysis
L_{dn}	average day-night noise level
L_{dnmr}	adjusted monthly day-night average sound level
LEIS	Legislative Environmental Impact Statement
L_{max}	maximum sound level
LPG	liquid petroleum gas
LOSAT	Line-of-Sight Anti-tank
LWD	livestock water dams
MACT	Maximum Achievable Control Technology
MATC	Mobilization Army Training Center
$\mu g/m^3$	micrograms per cubic meter
mg/L	milligram per liter
mgd	million gallons per day
MIBN (LI)	Military Intelligence Battalion (Low Intensity)
MICOM	U.S. Army Missile Command
MLRS	Multiple Launch Rocket System
MLWA	Military Lands Withdrawal Act
mm	millimeter
MOA	Military Operations Area
MOU	Memorandum of Understanding
MOUT	Military Operations Urbanized Terrain
mph	miles per hour
MR_NMAP	MOA Range Noise Assessment Program
MSL	mean sea level
MTR	Military Training Route
MUIR	Map Unit Interpretation Record
MVT	Mississippi Valley Type
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAPS	Noise Assessment Prediction System
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, chemical
NCA	National Conservation Area
NDVI	normalized vegetation index
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
nm	nautical miles
NMBMMR	New Mexico Bureau of Mines and Mineral Resources
NMDEMNR	New Mexico Department of Energy, Minerals, and Natural Resources
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environmental Department
NMSEO	New Mexico State Engineer's Office
NMWQCC	New Mexico Water Quality Control Commission
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOE	nap-of-the-earth
NOI	Notice of Intent
NOTAM	Notice to Airmen
NO_x	nitrogen oxides
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NTC	National Training Center
O_3	ozone
OD	open detonation
ORV	off-road recreational vehicle
OSHA	Occupational Safety and Health Administration
OTD	Office of Test Directorate
PAC-3	Patriot Advanced Capability Level-3
Pb	lead
PCBs	polychlorinated biphenyls
PEIS	Programmatic Environmental Impact Statement

PL	Public Law
PLO	Public Land Order
PM_{10}	particulate matter less than 10 micrometers in diameter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
POLs	petroleums, oils, and lubricants
ppm	parts per million
PSD	prevention of significant deterioration
PVI	perpendicular vegetation index
PX	Post Exchange
QAM	quarterly arithmetic mean
RA	Resource Area
RCAT	Radio-controlled Aerial Target
RCRA	Resource Conservation & Recovery Act
RDX	Trinitrotrimethylenetriamine
RDT&E	Research, Development, Test and Evaluation
RGR	Rio Grande Rift
RMP	Resource Management Plan
RMPA	Resource Management Plan Amendment
RN	roaded-natural
ROD	Record of Decision
ROI	Region of Influence
ROW	right-of-way
RPMP	Real Property Master Plan
RUSLE	Revised Universal Soil Loss Equation
SAAD	Small Arms Air Defense
SAIC	Science Applications International Corporation
SDZ	surface danger zone
SEL	sound exposure level
SFG	Special Forces Group
SHORAD	Short-range Air Defense
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SO_2	sulphur dioxide
SOP	Standard Operating Procedure
SPL	sound pressure level
SPM	semiprimitive, motorized
SPNM	semiprimitive, nonmotorized
STRACNET	Strategic Rail Corridor Network
TA	Training Area
TAC	Tactical Air Control
TADC	Training Area Development Concept
TBM	Tactical Ballistic Missile
TCP	Traditional Cultural Property
TDS	total dissolved solids
TDY	temporary duty
TEXCOM	Test and Experimentation Command
THAAD	Theater High-altitude Air Defense
TNRCC	Texas Natural Resources Conservation Commission
TNT	trinitrotoluene
TOW	tube-launched, optically-tracked, wire-guided
TRADOC	U.S. Army Training and Doctrine Command
TRI	Toxic Release Inventory
TSP	total suspended particulates
U.S.	United States
UP	Union Pacific
UP/SP	Union Pacific/Southern Pacific
USAADACENFB	U.S. Army Air Defense Artillery Center and Fort Bliss
USACASB	U.S. Army Combined Arms Support Battalion
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USC	United States Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USJCS	U.S. Joint Chiefs of Staff
USMC	U.S. Marine Corps
UST	underground storage tank
VFR	visual flight rules
VOCs	volatile organic compounds
VQO	visual quality objective
VRM	visual resource management
WAPs	waste accumulation points
WBAMC	William Beaumont Army Medical Center
WSA	Wilderness Study Area
WSMR	White Sands Missile Range
WSTF	White Sands Test Facility