USAADACENFB
FORT BLISS

Fort Bliss
Integrated Natural Resources Management Plan

McGregor Range

Doña Ana Range -
North Training Areas

South Training
Areas

November 2001

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

U.S. ARMY
AIR DEFENSE ARTILLERY CENTER
FORT BLISS

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November 2001

The cover features a shaded relief GIS product of Fort Bliss overlaid on a Landsat 7 satellite image. The three main training areas of Fort Bliss are visible and named.

The four center photographs represent the focus of Fort Bliss, providing realistic training for our Nation's soldiers, and those of allied nations. Two of the photographs show different types of missiles utilized by air defense artillery. Fort Bliss is the home of the United States Army Air Defense Artillery Center (USADACEN). The center right photograph shows a Patriot Missile firing, and the lower photograph shows a Bradley Linebacker system in use. The center left photograph shows an M-1 tank conducting maneuvers, and the top center photo shows soldiers defending a fighting position.

The photographs surrounding the mission photographs illustrate samples of the ecological diversity of Fort Bliss. The top left photo shows a canyon of coniferous trees high in the Organ Mountains. The top right photograph shows the juniper woodlands of the Sacramento Mountains. The lower right shows a doe pronghorn on Otero Mesa grasslands, and the lower left photograph shows the rocky desert shrub lands of the Hueco Mountains.

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

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AIR DEFENSE ARTILLERY CENTER
FORT BLISS

APPROVAL

This *Integrated Natural Resources Management Plan* meets the requirements of the *Sikes Act* (16 USC 670a *et seq*.), as amended.

Stanley E. Green
Major General,
Commanding

15 Nov 01
Date

Robert H. Reardon, Jr.
Colonel, GS
TRADOC Engineer

6 NOV 01
Date

Nancy Kaufman
Regional Director
Southwest Region
U.S. Fish and Wildlife Service

ACTING
11/6/01
Date

As signatory to this Integrated Natural Resource Management Plan (Plan), the New Mexico Department of Game and Fish acknowledges concurrence, as statutorily authorized by Chapter 17 of the New Mexico Statutes Annotated, with the wildlife management portions of the Plan that occur in New Mexico.

Larry G. Bell
Director
New Mexico Department of Game and Fish

11/09/01
Date

Andrew Sansom
Executive Director
Texas Parks and Wildlife Department

11-17-01
Date

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EXECUTIVE SUMMARY

Purpose

This *Integrated Natural Resources Management Plan* guides the implementation of the natural resources program on Fort Bliss from 2001 through 2006. The plan guides compliance with environmental laws, supports the military mission, and conserves and protects the diverse natural resources on Fort Bliss. Fort Bliss has instituted a land use plan which integrates natural resources management requirements with the maintenance of quality training lands needed to provide realistic military training. Sections 7 and 8 explain how this integration is accomplished.

The priorities of the program will change to meet the requirements of the military mission. However, this plan assumes Fort Bliss will continue to receive funds designated for the planning and management of natural resources. If funding required to accomplish this plan is not available and Fort Bliss and the United States Army Training and Doctrine Command find that continued implementation is not possible, Fort Bliss will prepare a modification to this *Integrated Natural Resources Management Plan*. Fort Bliss will ensure that signatory agencies are aware of the required modifications and that fiscal constraints made implementation of this plan impossible. Modifications to this plan may also be needed with significant changes to the military mission, or significant changes in issues affecting natural resource management (natural processes or regulatory changes). The primary management goals, approaches, and issues are presented in Section 8, and the 5-year plan for specific projects is presented in Section 9.

This plan will not resolve all existing and/or future environmental issues. It does, however, provide the philosophy and means to minimize and work toward resolution of such issues. This plan is a "living document" and by law must be reviewed by signatory parties not less than every 5 years (*Sikes Act* [16 United States Code 670a *et seq.*]).

Environmental Compliance

Preparation and implementation of this *Integrated Natural Resources Management Plan* are required by the *Sikes Act* (16 USC 670a *et seq.*), Department of Defense Directive 4700.4, and Army Regulation 200-3. In addition, this *Integrated Natural Resources Management Plan* helps ensure that Fort Bliss complies with federal and state laws, most notably those associated with environmental documentation, wetlands, endangered species, water quality, and management of wildlife in general.

This *Integrated Natural Resources Management Plan* provides programmatic guidance for compliance with laws and regulations pertaining to natural resources. Specific habitat manipulations may require specific compliance actions, including assessments mandated by the *National Environmental Policy Act*, *Endangered Species Act*, and others. This programmatic plan was analyzed as part of the *Fort Bliss Mission and Master Plan Programmatic Environmental Impact Statement*. Section 8 and Section 15 discuss compliance with specific laws.

Scope

This plan applies to organizations internal and external to Fort Bliss that are involved with or interested in the management and use of Fort Bliss natural resources. This application includes active duty units, Fort Bliss directorates, state and federal agencies, private groups, and individuals. This *Integrated Natural Resources Management Plan* is an integral part of the Fort Bliss *Real Property Master Plan*.

Relationship to the Military Mission

The vast acreage of Fort Bliss (more than 1 million acres) provides high-quality, realistic training for the Army, Air Force, Marine Corps, and military forces of allied nations. This *Integrated Natural Resources Management Plan* is designed to support the military mission by protecting and enhancing the training lands upon which the mission is critically dependent. This *Integrated Natural Resources Management Plan* also provides for recreational opportunities associated with natural resources.

Partnerships

Fort Bliss alone cannot implement this *Integrated Natural Resources Management Plan*. As in the ecosystem management philosophy, Fort Bliss is forging partnerships with various agencies to manage its natural resources. Major partners in the implementation of this plan are the U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish, and Texas Parks and Wildlife Department, all of whom have signatory approval authority of the Integrated Natural Resources Management Plan.

The Las Cruces Field Office of the Bureau of Land Management (BLM) is also a significant partner. On the McGregor Range portion of Fort Bliss, the BLM manages natural resources on the withdrawn public acreage (about 87 percent of McGregor Range) per the *Military Lands Withdrawal Act of 1999* (PL 106-65). Fort Bliss has management authority for Army fee-owned lands (10 percent) and natural resource compliance and management associated with military use of McGregor Range. Appendix A lists current responsibilities of the BLM and Fort Bliss on McGregor Range. A new agreement between Fort Bliss and the BLM will be completed after the BLM finishes their resource management plan amendment (FY 2002). The agencies cooperated on the planning effort leading to this *Integrated Natural Resources Management Plan*, and are cooperating in development of the new BLM resource management plan amendment required by the 1999 withdrawal.

Other partners in this effort include universities, other federal and state agencies, private contractors, and private citizens. As this next 5-year period progresses, Fort Bliss will become involved in regional management initiatives, probably as a supporting agency.

Planned Major Initiatives

This *Integrated Natural Resources Management Plan* includes a description of ongoing natural resources programs and projects. Important new initiatives within this *Integrated Natural Resources Management Plan* also include the following:

- Implement an ecosystem management philosophy that supports the military mission
- Establish ecosystem management partnerships
- Implement and improve endangered species management plans
- Continue to protect areas of special significance
- Continue comprehensive landscape monitoring using satellite imagery
- Implement the forest management plan, including fuels and fire management
- Develop and implement a Land Rehabilitation and Maintenance plan for all lands impacted by military activities on Fort Bliss
- Continue to protect cultural resources while implementing *Integrated Natural Resources Management Plan*

- Improve natural resources law enforcement
- Maintain staffing level and acquire personnel to fill necessary positions

Plan Components

Ecosystem management will continue to allow the use of natural resources at Fort Bliss for military and other human-related values and purposes. However, ecosystem management has a goal of protecting the properties and functions of natural ecosystems. Since these ecosystems extend beyond installation boundaries, management of the natural resources at Fort Bliss will include more emphasis on partnerships with its neighbors.

This *Integrated Natural Resources Management Plan* is organized to promote ecosystem integrity and stability and integrate these with military training and other appropriate uses of natural resources. Sections 8 to 14 of the *Integrated Natural Resources Management Plan* deal with aspects of overall natural resources management including Inventory and Monitoring, Research and Special Projects, Enforcement, Environmental Awareness, Outdoor Recreation, and Cultural Resources Protection.

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1.0 GOALS AND POLICIES

In part, Army Environmental Vision Statement reads:

> The Army will be a national leader in environmental and natural resource stewardship for present and future generations as an integral part of our mission (Department of the Army, [DA] 1994).

The Army's environmental vision statement communicates its commitment to the environment and defines its leadership role in environmental management. The vision statement is intended to inspire, direct, and empower soldiers at all levels to participate in managing change to ensure the future success of the Army and nation.

The Army's *Unit Leader's Handbook for Environmental Stewardship* (DA, 1994) provides all unit leaders with a ready reference and general source of guidance for decision making. It also provides leaders with information on how to effectively integrate the Army's environmental program at the unit level.

1.1 REGULATIONS AND DIRECTIVES

This *Integrated Natural Resource Management Plan* (INRMP) is prepared and implemented under authority of the *Sikes Act* (16 United States Code [USC] 670a *et seq*.), U.S. Department of Defense (DoD) Directive 4700.1 (*Natural Resources Management Programs*), DoD Instruction 4715.3 (*Environmental Conservation Program*), Army Regulation (AR) 200-3 (*Natural Resources - Land, Forest, and the Wildlife Management*), which is used to implement and insure compliance with AR 200-1 (*Environmental Protection and Enhancement*), AR 200-2 (*Environmental Effects of Army Actions*), AR 210-20 (*Master Planning for Army Installations*) as well as other DoD and Army regulations. This plan also insures implementation and compliance with various memoranda of understanding and agreement (MOU, MOA) between the DoD and the U.S. Departments of Agriculture (USDA) and Interior (USDI) (USDA, 1971; 1988; USDI, 1990a).

Of particular importance is the May 1994 memorandum from Deputy Under Secretary of Defense Goodman (1994a) to the assistant secretary of each of the military services. In this memorandum, Deputy Under Secretary Goodman asked the assistant secretaries for their support of an initiative on biodiversity. She hoped this initiative would lead to the formulation of policy recommendations and practical guidance for installation commanders and natural resource managers. In August 1994, Deputy Undersecretary Goodman released a memorandum, the DoD's 1994 *Ecosystem Management Policy Directive*, (Goodman, 1994b) to the assistant secretaries of the Army, Navy, and Air Force. This memorandum provided guidance for implementing an ecosystem approach for management of DoD lands.

As part of its biodiversity initiative, the DoD participated in the *Keystone Center Policy Dialogue on DoD Biodiversity Management*, which was convened and facilitated by the Keystone Center (Keystone Center, 1996). The goal of the dialogue group was to obtain input from diverse and knowledgeable individuals to develop policy guidance for enhancing and protecting biodiversity on DoD lands in a way that is integrated with the military mission. The result of the dialogue was the *Keystone Center Policy Dialogue on a Department of Defense Biodiversity Management Strategy, Final Report* (1996), which covers three aspects of biodiversity conservation: policy framework, model framework, and measures of success. Where possible, these aspects and other recommendations are incorporated into this INRMP.

This INRMP also ensures that Fort Bliss complies with other federal and state laws, especially those associated with natural resources including, but not limited to, environmental documentation, wetlands, threatened and endangered species, air and water quality, and wildlife management. State laws pertinent to preparation and implementation of this INRMP include regulations of the New Mexico Environmental Department (NMED); the New Mexico Water Quality Control Commission (NMWQCC); New Mexico Department of Game and Fish (NMDGF); New Mexico Department of Energy, Minerals, and Natural Resources (NMDEMNR); Texas Natural Resources Conservation Committee (TNRCC); and Texas Parks and Wildlife Department (TPWD). Table 1-1 lists some state and federal laws and regulations that should be considered when implementing this INRMP.

1.2 GOALS

Following are the Fort Bliss INRMP goals:

1. Military Readiness
   To assure military readiness by providing quality natural resources upon which to accomplish the military mission of Fort Bliss

2. Stewardship
   To assure good stewardship of public lands entrusted to the care of the Army by managing natural resources on Fort Bliss in a responsible manner consistent with the DoD's ecosystem management approach

3. Quality of Life
   To improve the quality of life of the Fort Bliss community by providing high quality natural resources-based recreational opportunities

4. Compliance
   To comply with laws and regulations that pertain to the management of the natural resources on Fort Bliss

5. Integration
   To integrate the elements of natural resources management into a single program to be incorporated into the Fort Bliss mission.

1.3 POLICIES

The following policies are specific to Fort Bliss and are intended to assure achievement of the goals listed above (some are associated with more than one goal and are listed where they are most pertinent).

1.3.1 Military Readiness Policies

- Ensure no net loss in the capability of installation lands to support existing and projected military missions on Fort Bliss

- Maintain quality training lands through damage minimization, restoration, and mitigation

- Provide timely environmental reviews of uses of Fort Bliss training lands.

Table 1-1. Major Federal and State Environmental Regulations Applicable to Implementation of this INRMP

Environmental Parameter	*Federal/State Laws/Regulations*
General	*National Environmental Policy Act* (NEPA) (USC 4321 *et. seq*.)
	President's Council on Environmental Quality (CEQ) Regulations, 40 Code of Federal Regulations (CFR) 1500-1508
	Resource Conservation and Recovery Act (RCRA), (Public Law [PL] 94-580)
	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
	Memorandum from Deputy Under Secretary of Defense on Support of a Biodiversity Initiative for the Formulation of Policy Recommendations and Practical Guidance for Installation Commanders and Natural Resources Managers (May 3, 1994) (DoD, 1994a)
	Memorandum from Deputy Under Secretary of Defense on Implementation of Ecosystem Management in the DoD (August 8, 1994) (DoD, 1994b)
	DoD Instruction 4715.3, *Environmental Conservation Program*
Fish and Wildlife Resources	*Migratory Bird Treaty Act of 1918* (16 USC 703-712; 40 stat. 755)
	Bald and Golden Eagle Protection Act of 1940 (16 USC 668-668d; 54 stat. 250)
	Fish and Wildlife Coordination Act of 1958 (PL 79-732)
	Fish and Wildlife Act (PL 85-624)
	Fish and Wildlife Conservation Act of 1980 (PL 96-366)
	Sikes Act as amended through 1997
	Endangered Species Act (ESA) of 1973 (PL 93-205) and Amendments of 1988 (PL 100-478)
	Lacey Act and Amendments of 1981 (PL 97-79)
	Executive Order (EO) *13186* Responsibilities of Federal Agencies to Protect Migratory Birds
	EO 11987 Exotic Organisms
	EO 13112 Invasive Species
	New Mexico Endangered Plant Species Act (9-10-10 New Mexico Statutes Annotated [NMSA]) and attendant regulation NMFRCD Rule No. 91-1
	New Mexico Wildlife Conservation Act of 1974 (NMSA 17-2-37 through 17-2-46, 1978 compilation)
	Texas Parks and Wildlife Code, Chapter 67 Nongame Species, Chapter 68 Endangered Species, Chapter 88 Endangered Plants, Chapter 61 *Uniform Wildlife Regulatory Act*
Wetlands	Section 10 of *River and Harbor Act* (RHA) of 1899 (33 USC 403; 52 Stat. 802)
	Section 404 of *Federal Water Pollution Control Act* (FWPCA) of 1972 (PL 92-500)
	EO 11988, Floodplain Management-1977
	EO 11990, Protection of Wetlands-1977
	Emergency Wetlands Resources Act (EWRA) *of 1986* (PL 99-645)
	North American Wetlands Conservation Act of 1989 (PL 101-233)
Cultural/Native American Resources	*National Historic Preservation Act* (NHPA) *of 1966* (PL 89-665) and Amendments through 1992 (PL 96-515)
	EO 11593, Protection and Enhancement of the Cultural Environment-1971
	Archeological and Historic Preservation Act (AHPA) of 1974 (PL 93-291)
	American Indian Religious Freedom Act (AIRFA) of 1978 (PL 95-341)
	Archeological Resources Protection Act (ARPA) of 1979 (PL 96-95)
	Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (PL 101-601)
Land	*Military Lands Withdrawal Act* (MLWA) *of 1999* (Title XXX of PL 106-65)
	Military Lands Withdrawal Act (MLWA) *of 1986* (PL 99-606)
	Federal Land Policy and Management Act (FLPMA) *of 1976* (PL 94-579)
	Public Rangelands Improvement Act (PRIA) *of 1978* (43 USC 1901 et seq.)
	43 CFR 3000 Series
	Wilderness Act of 1964 (PL 88-577)

Table 1-1. Major Federal and State Environmental Regulations Applicable to Implementation of this INRMP (Continued)

Environmental Parameter	*Federal/State Laws/Regulations*
Water	*FWPCA of 1972* (PL 92-500) and Amendments: *Clean Water Act* (CWA) *of 1977* (PL 95-217) and *Water Quality Act* (WQA) *of 1987* (PL 100-4)
	Safe Drinking Water Act (SDWA) *of 1972* (PL 95-523) and Amendments of 1986 (PL 99-339)
	EO 12088, Federal Compliance with Pollution Control Standards (1978)
	New Mexico WQA of 1967 (74-6-1 et seq., NMSA 1978)
	Texas Water Code
Air	*Clean Air Act* (CAA) *of 1970* and Amendments of 1977 (PL 95-95) and 1990 (PL 91-604)
	New Mexico Air Quality Control Act (AQCA) *of 1967* (74-2-1 through 74-2-17 NMSA)
	Texas Clean Air Act of 1995
Noise	*Noise Control Act of 1972* (PL 92-574)
	EO 12088, Federal Compliance with Pollution Control Standards (1978)
	Quiet Communities Act of 1978 (PL 95-609)

1.3.2 Stewardship Policies

Stewardship policies involve the following:

- Restore and protect biodiversity where possible using ecosystem management philosophies to protect, conserve, and insure integrity and stability of ecosystems
- Monitor and manage Fort Bliss soils, vegetation, and wildlife with a consideration for all biological communities and human values associated with these resources
- Provide economic and other human-related products of renewable natural resources when such products can be produced in a sustainable fashion without significant negative impacts on the military training mission
- Provide adequate numbers of professionally trained natural resource personnel and natural resource law enforcement personnel necessary to carry out this plan.
- Ensure the Fort Bliss natural resources program is coordinated with other agencies and conservation organizations with similar interests
- Involve the surrounding community in the Fort Bliss natural resources programs.

1.3.3 Quality of Life Policies

Quality of Life Policies involve the following:

- Provide high-quality natural resources to enrich quality of life activities, such as outdoor recreation, including hunting
- Provide conservation education opportunities
- Support and enhance the Community of Excellence Program at Fort Bliss.

1.3.4 Compliance Policies

Compliance Policies include the following:

- Implement this INRMP within the framework of Army policies and regulations
- Manage natural resources within both the spirit and letter of environmental laws in accordance with AR 200-3, and with emphasis on the *Sikes Act* which requires the development of INRMPs
- Ensure protection, restoration, and management of threatened and endangered species and wetlands
- Use procedures within the NEPA to make informed decisions that include natural resources considerations and mitigation, when applicable
- Ensure the natural resources program of Fort Bliss is consistent with the protection of cultural and historic resources.

1.3.5 Integration Policies

Integration Policies include the following:

- Ensure all renewable natural resources and areas of critical or special concern are adequately addressed from both technical and policy standpoints
- Ensure the natural resources management methodologies will sustain the capabilities of the renewable resources to support military requirements
- Ensure the integration of, and consistency among, the various activities identified within this INRMP by including other interested parties
- Ensure this INRMP is compatible with, and supports the *Installation Master Plan*, *Integrated Pest Management Plan*, and *Master Training Schedule* at Fort Bliss
- Provide command elements with the information needed to make decisions that involve natural resources-related values
- Coordinate the implementation of this INRMP with the operation of the overall Fort Bliss environmental program
- Use the natural resources program to support and enhance other elements within the Fort Bliss Environmental Program
- Minimize any conflict between the ecosystem management approaches at Fort Bliss and management on the extensions of the ecosystems beyond its boundaries.

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2.0 LOCATION AND BACKGROUND

2.1 LOCATION

Fort Bliss is located in portions of Texas and New Mexico. Twelve percent of the installation's total land area is in El Paso County in west Texas, and the remaining 88 percent is in south-central New Mexico in Doña Ana and Otero counties (Figure 2-1). The cantonment area of Fort Bliss is adjacent to El Paso, Texas, near the international boundary with Mexico. The remainder of the installation extends to the north, and is generally surrounded by mountain ranges on three sides by the Organ, Franklin, Hueco, and Sacramento mountains.

2.2 INSTALLATION HISTORY

On November 7, 1848, in an attempt to better protect area residents, the War Department issued General Order Number 58, which established a post at El Paso. Ten months later, six companies of the 3rd U.S. Infantry arrived at the post to become the first soldiers stationed in the Fort Bliss area. This first post remained until 1851 (Jamieson, 1993).

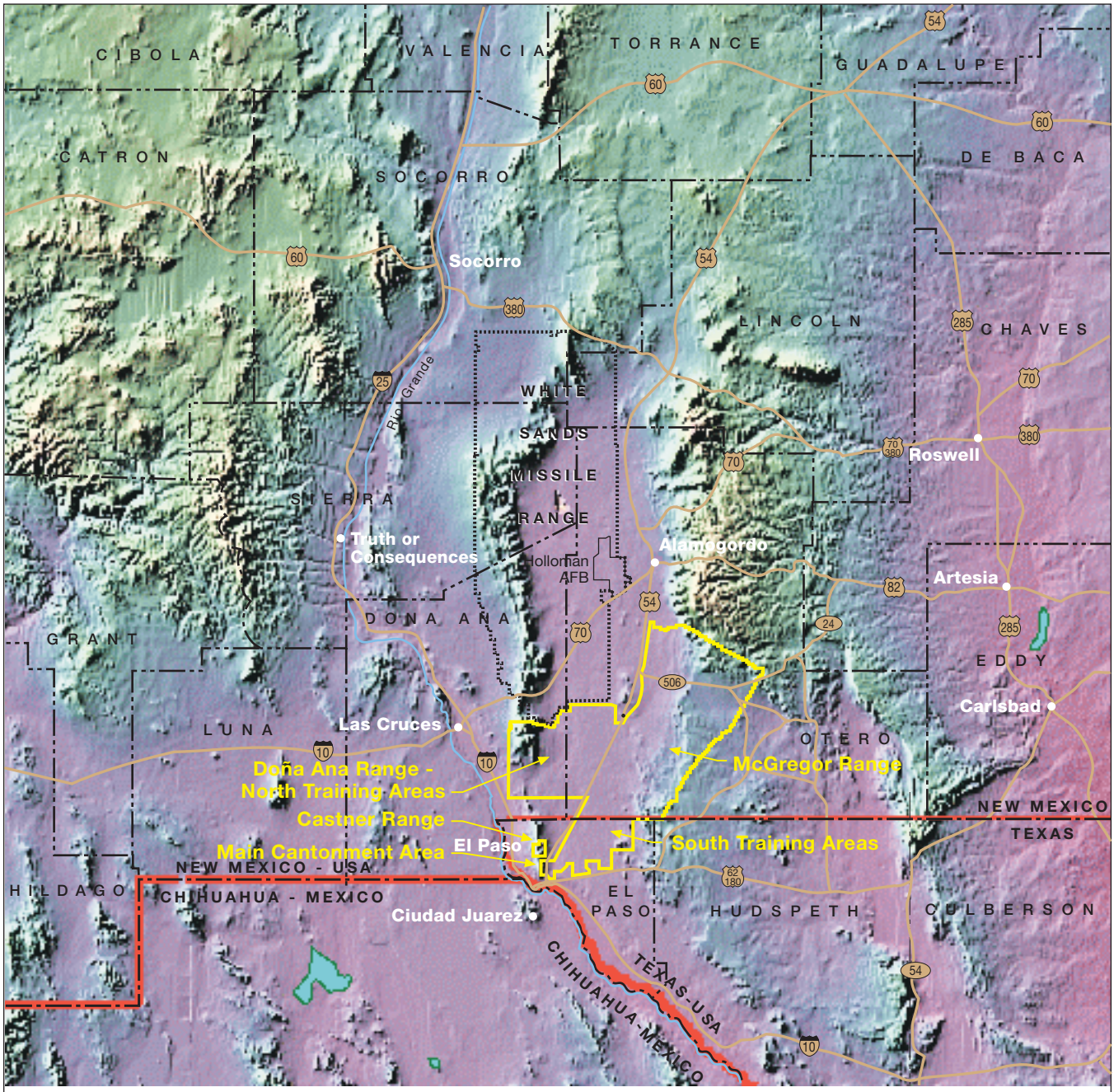
The post was then abandoned until 1854 when Indian raids prompted re-establishment of the El Paso post at Magoffinsville. In 1854, the post was renamed Fort Bliss in honor of William Wallace Smith Bliss, the adjutant general of the Western Division. Fort Bliss prospered for the next few years until the start of the Civil War (Jamieson, 1993).

Major General David E. Twiggs, commander of the Department of Texas, surrendered the fort to the Confederacy in March 1861. The post was utilized by the Confederacy until they were driven out in August 1862. During the Confederacy's retreat, they burned all buildings and took all supplies from the post, and Fort Bliss was abandoned until after the Civil War. In 1865, the U.S. Army reoccupied the fort (Jamieson, 1993).

Fort Bliss was moved to Concordia in 1868 due to the erosion of the parade ground and undercutting of the building foundations by the Rio Grande. It was called Camp Concordia until March 1869 when orders were issued to restore the name Fort Bliss. In 1877, Fort Bliss was once again abandoned because the area had become peaceful, and soldiers stationed at Fort Bliss were sent north to fight various Indian tribes (Jamieson, 1993).

In January 1878, elements of the 9th Cavalry and the 15th Infantry were sent back to Fort Bliss. They set up a temporary post in rented quarters near the original site at Coons Ranch until 1879, when a site near Hart's Mill, west of El Paso, was purchased to establish a new post. Fort Bliss used this site until Congress approved the Rio Grande and El Paso Railroad Company placing tracks wherever they wished in 1881. The company chose to lay tracks through the middle of Fort Bliss' parade grounds and once again, Fort Bliss had to be moved. In 1893, a tract of land on La Noria Mesa was purchased, and on this site Fort Bliss was established and has remained (Jamieson, 1993).

The number of soldiers stationed at Fort Bliss varied from seven to a full battalion until the early 1900s. When the United States entered World War I, Fort Bliss became a major training center for the National Guard. From 1916 to 1917, thousands of guardsmen were stationed at Fort Bliss to help protect the



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INRMP 111a.dg.2.3.99

Figure 2-1. Fort Bliss, Texas and New Mexico.

border while the regular Army was involved in the Punitive Expedition, which was pursuing Pancho Villa in Mexico. After World War I, Fort Bliss was still primarily a cavalry post and acted as the center for border control in the Southwest. The Army's Antiaircraft Training Center was created in 1940 at Fort Bliss to train soldiers in the operation of antiaircraft weapons for World War II. In February 1943, Fort Bliss ended its use of horses and the days of the horse-mounted cavalry were over.

In April 1944, Fort Bliss became the Army's Antiaircraft Replacement Training Center. In November 1945, the Antiaircraft Replacement Training Center was deactivated and the first Antiaircraft and Guided Missile Battalion was formed. In 1957, the current mission was developed and Fort Bliss became the U.S. Army Air Defense Artillery (ADA) Center for training U.S. and Allied soldiers in the use of all types of air defense weapons.

2.3 ACREAGE AND ACQUISITION

Fort Bliss currently encompasses approximately 1.12 million acres and comprises five major areas: Doña Ana Range–North Training Areas, McGregor Range, South Training Areas, Castner Range, and the cantonment area (Figure 2-1). Table 2-1 summarizes the relative area of the major components of the installation. The bulk of the installation is comprised of three areas used for training and testing. McGregor Range comprises about 62 percent of the installation, the Doña Ana Range–North Training Areas covers about 27 percent, and the South Training Areas cover about 9 percent of total acreage occupied by Fort Bliss. The cantonment area covers only about 1 percent of the acreage, but it is the location of the post headquarters and most of the troops and accompanying equipment.

Table 2-1. Fort Bliss Installation Components

Area	*Acres*
Main Cantonment Area including Biggs Army Air Field (AAF)	10,965
Doña Ana Range–North Training Areas	297,006
McGregor Range[1]	697,472
South Training Areas	104,042
Castner Range	7,040
Castner Recreation Area	70
Actual Installation Total	*1,116,595*

[1.] Includes 19,364 acres in Lincoln National Forest.

In 1893, the City of El Paso donated 1,000 acres for construction of Fort Bliss (Faunce, 1997). Following several years as a cavalry post, the Army acquired part of the Doña Ana Range–North Training Areas Target Range in 1911, primarily for artillery practice. This area included the southern Organ Mountains in the Boulder Canyon area and the land around Doña Ana Range–North Training Areas Camp.

Fort Bliss expanded in 1925 and 1926 with the combined purchases of 1,058 acres for Biggs AAF, and 3,473 acres for Castner Range. An additional 2,700 acres of municipal land were acquired in 1931 to expand the cantonment area (Faunce, 1997). The remainder of the cantonment area and Castner Range were acquired over time from ranchers and the City of El Paso.

Through the 1930s, several Army officers pursued the expansion of training lands at Fort Bliss for cavalry training, bombing ranges, and antiaircraft artillery training. The area around Fort Bliss was ideal for

antiaircraft training as the weather allowed year-round training. Also, large areas nearby in New Mexico were primarily public domain land and sparsely populated.

Additional ranchland was acquired in 1940 for antiaircraft training (primarily Doña Ana Range–North Training Areas), and was initially leased on a co-use basis; of this land, 75 percent was public domain, 20 percent was state owned, and 5 percent was privately owned. A portion of this leased land base was later declared surplus and is now under private ownership or managed by the Bureau of Land Management (BLM) (Faunce, 1997). Some of this land is now included in White Sands Missile Range (WSMR) (Faunce, 1997).

The land purchased by the military for the formation of the various ranges included property owned by the various ranchers as well as the grazing leases held by the ranchers on public land. While exceptions do exist, the land the ranchers owned was usually the main ranch sites with structures and important water sources. Areas used only for grazing contained minor improvements, such as earth stock tanks, and were usually leased by the rancher (Faunce, 1997).

From 1941 to 1945, Fort Bliss began to grow quickly as a result of the Second World War. During World War II, Fort Bliss acquired the needed land by lease, purchase, or in cases where an agreement could not be reached with the landowner, by condemnation. The three main areas acquired were portions of Doña Ana Range–North Training Areas, McGregor Range, and the South Training Areas. Fort Bliss was linked early on to new rocket and missile development and the formation of WSMR.

In 1948, the need for another antiaircraft artillery firing range was identified. The land was leased, a transaction that required USDI approval since the majority of the land was public domain. During the following 8 years, McGregor Range expanded as land was purchased from various ranchers, either through negotiations or condemnation proceedings (Faunce, 1997). McGregor Range has continued to be used for military training. The Military Withdrawal Act (MLWA) of 1999 withdrew 608,385 acres of public land for military use. An additional 69,723 acres of Army fee-owned land are located within the area covered by the MLWA of 1999.

Approximately 18,004 acres of Lincoln National Forest are used by Fort Bliss as a secondary danger zone in connection with military missions. This land is managed specifically under an MOU between the USDA, U.S. Forest Service (USFS) and the DA, U.S. ADA Center, dated November 11, 1971, and generally by a MOA between the USDA and DoD, dated September 30, 1988. Additionally, 1,360 acres of Army fee-owned land are located within the borders of the Lincoln National Forest (see Appendix A).

2.4 NEIGHBORS

Fort Bliss land uses are compatible with the surrounding communities or neighboring properties. The land surrounding Fort Bliss can be characterized by six different uses, which are listed below.

2.4.1 U.S. Department of Defense (DoD)

2.4.1.1 White Sands Missile Range (WSMR)

WSMR adjoins Fort Bliss and comprises the majority of the northern boundary of Doña Ana Range–North Training Areas. WSMR consists of approximately 1.9 million acres and has a primary purpose as a national missile range to test and evaluate U.S. Army missiles and rockets (DA, 1983). WSMR uses the Fort Bliss training areas for limited military tests (U.S. Army, 1998a). Additionally, tactical units use

fixed points on WSMR land during exercises such as Roving Sands, as well as WSMR airspace (U.S. Army, 1998a). The combination of WSMR and Fort Bliss creates a vast arena of over 3 million acres of dedicated land and exclusive use airspace. This allows testing of warhead-bearing missiles up to 100 miles and realistic tests involving the simultaneous engagement of missiles, drone aircraft, and land vehicles.

2.4.1.2 Holloman Air Force Base

Holloman Air Force Base (AFB), located near Alamogordo, New Mexico, does not border Fort Bliss, but utilizes the airspace of Fort Bliss. Additionally, Holloman AFB uses a small Class-C bombing range north of New Mexico Highway 506 on McGregor Range.

The United States Air Force (USAF) also operates air-to-ground USAF tactical target complex on Otero Mesa. The description of the proposed activity is presented in the EIS for *Proposed Expansion of the German Air Force Operations at Holloman AFB* (USAF, 1998).

2.4.2 Bureau of Land Management (BLM)

The Organ Mountains Recreation Area and Organ Needles Wilderness Study Area (WSA), managed by the BLM under the *Mimbres Resource Area Resource Management Plan* (USDI, 1993), comprise the western and part of the northern boundaries of Doña Ana Range–North Training Areas. Specific management is outlined for the Organ Mountains Recreation Area via the *Organ Mountains Coordinated Resource Management Plan* (USDI, 1989). Additional BLM parcels adjoin the eastern boundary of Fort Bliss on Otero Mesa. These parcels were not included in the land withdrawn under PL-106-65 and are managed by the Caballo Resource Area of BLM.

2.4.3 U.S. Forest Service (USFS)

Within the north section of McGregor Range are approximately 18,000 acres of the Lincoln National Forest. These lands are under a cooperative agreement between the USFS and the DA, which permits military use with concurrence of the USFS. These lands are considered part of the secondary safety zone of the primary firing fans on McGregor Range (U.S. Army, 1996c). This area comprises less than 3 percent of the entire Lincoln National Forest, and approximately 25 percent of the USFS's Sacramento Grazing Allotment.

2.4.4 State

State land adjacent to Fort Bliss, including many areas on Otero Mesa, is primarily used for grazing leases.

2.4.5 Municipal

The City of El Paso and the El Paso International Airport (EPIA) surround the cantonment area on three sides. Currently, there are no conflicts between military activities at Fort Bliss and the planning and growth of the city or the airport.

Other cities near by Fort Bliss include Las Cruces, Timberon, and Chaparral, New Mexico, and Ciudad Juárez, Chihuahua, Mexico. Las Cruces is located northwest of the cantonment area along Interstate 10 (I-10), Alamogordo is north of McGregor Range on U.S. Highway 54, and Timberon is just north of McGregor Range in the Sacramento Mountains. Chaparral is located south of Doña Ana Range–North

Training Areas and north of El Paso, and Ciudad Juárez is south of the cantonment area, across the Rio Grande and international border (see Figure 2-1).

2.4.6 Private

Several private ranches and residences are located adjacent to the ranges on Fort Bliss. Private land surrounding Fort Bliss is primarily undeveloped and is generally used for ranching, land investment, or residential establishments.

3.0 MISSION OVERVIEW

Fort Bliss is one of 16 installations under the management of the U.S. Army Training and Doctrine Command (TRADOC). It is the home of the U.S. Army Air Defense Artillery Center and Fort Bliss (USAADACENFB), the United States Army ADA School, and more than 30 partner units and organizations. It is the largest Army training installation and is the only troop training installation in the continental United States capable of supporting long-range overland missile firings. Fort Bliss comprises 4.4 percent of all DoD lands, 9 percent of Army lands, and 59 percent of TRADOC lands.

Fort Bliss currently administers, trains, and deploys active Army, National Guard, Army Reserves, and other uniformed service personnel and units. In addition, federal, state, and local law enforcement agencies train on Fort Bliss. Periodic exercises presently involve units stationed at other installations and from other uniformed services, law enforcement agencies, and allied nations.

Currently, four ADA Brigades assigned to the U.S. Army Forces Command (FORSCOM) are stationed at Fort Bliss. These are the 11th ADA Brigade, the 108th ADA Brigade, the 31st ADA Brigade, and the 35th ADA Brigade. Fort Bliss Garrison Command operates under the USAADACENFB to oversee, maintain, and operate this multi-mission installation. Fort Bliss Garrison Command accomplishes this through its public works and logistics, master and engineering planning, material maintenance, supply and services support, transportation, and environmental compliance, scheduling, and management activities. U.S. Army Combined Arms Support Battalion (USACAS BN) provides the management, control, maintenance, and operation of Fort Bliss training areas: the South Training Areas, Doña Ana Range–North Training Areas, and McGregor Range Training Areas. The organization's responsibilities also include airspace (Restricted Areas R-5103 and R-5107A), range camps (Doña Ana, McGregor, and Orogrande) and associated facilities and equipment. Throughout this document, the USACAS BN refers to the training area operational organization.

The U.S. Army ADA School on Fort Bliss educates and trains U.S. military students (active and reserve component), civilians, and selected allied forces students in air defense artillery and other subjects that support the air defense mission.

Biggs AAF provides full airfield services for all U.S. military services, Department of Justice, and other government flight detachments. As an integral part of the ability of Fort Bliss to support national power projection, Biggs AAF is an aerial departure point for all deployable units at Fort Bliss, as well as approximately 115 Army Reserve and National Guard units.

Other major organizations currently located on the installation include:

- The Test and Experimentation Command's (TEXCOM) ADA Test Directorate, an independent organization capable of conducting air defense weapons experimentation, force development, and operational testing.

- Joint Task Force 6 (JTF-6), a military command stationed at Fort Bliss that provides support to various law enforcement agencies with drug interdiction missions.

- The U.S. Army Sergeants Major Academy, which prepares Army noncommissioned officers (NCOs) for assignments as battalion, brigade, and division staff NCOs and first sergeants. Selected NCOs from the Army, other U.S. services, and allied nations attend courses in preparation for assignments as sergeants major and command sergeants major.

- The William Beaumont Army Medical Center (WBAMC), a part of the U.S. Army Medical Command, which provides full-service (inpatient and outpatient), medical treatment for all military services in Arizona, New Mexico, and west Texas. Medical air evacuation services throughout its service area are provided from Biggs AAF.

- The German Air Force (GAF) Command in the United States and Canada and the German Air Defense School, which administers a home station on Fort Bliss.

The most recent Fort Bliss authorized strength data available are from the *Army Stationing and Installation Plan* (ASIP) for Fiscal Year (FY) 1996 through FY 2002 dated September 17, 1996 (U.S. Army, 1996a). The data are planning guidance that changes frequently, but generally in small increments. Therefore, they have been rounded to the nearest ten authorized positions (Table 3-1).

Table 3-1. Peacetime Authorized Strength, FY 1990 and FY 1996 through FY 2002

	FY 96	*FY 97*	*FY 98*	*FY 99*	*FY 00*	*FY 01*	*FY 02*
Military							
Officers	1,470	1,520	1,520	1,540	1,510	1,470	1,520
Warrant Officers	190	250	250	250	240	240	250
Enlisted	8,980	9,670	9,520	9,790	9,440	9,190	9,820
Total Military	*10,640*	*11,430*	*11,280*	*11,580*	*11,190*	*10,890*	*11,590*
Nonmilitary Employees							
U.S. Civilians	4,120	3,990	3,930	3,980	3,980	3,980	3,980
Other Civilians	3,400	3,430	3,430	3,430	3,430	3,430	3,430
Total Civilians	*7,520*	*7,420*	*7,350*	*7,400*	*7,400*	*7,400*	*7,400*
Total Population	*18,160*	*18,860*	*18,640*	*18,980*	*18,590*	*18,300*	*18,990*

Notes: The data is rounded to the nearest ten, therefore totals may not add.
Source: U.S. Army, 1990 through 1996.

During FY 1996, units and organizations assigned to Fort Bliss had both tactical and commercial vehicles authorized through their Table of Organization and Equipment (TOE), Table of Distribution and Allowances (TDA) and commercial vehicles authorized or leased by the General Services Administration (GSA) motor pool that serves the units and organizations located on Fort Bliss. This equipment included approximately 70 tracked vehicles; 3,200 wheeled vehicles; 560 trailers; 560 generators; and 2 helicopters (assigned to WBAMC). Additional equipment may be located on the post awaiting authorization, deployment, or maintenance, or may be authorized equipment for one of the tenant organizations located on the installation. As a result of the relocation of the Military Intelligence Battalion (Low Intensity) (MIBN[LI]), by 1999 the equipment authorizations would change to approximately 7 tracked vehicles; 3,250 wheeled vehicles; 580 trailers; 580 generators; 2 helicopters; 16 Unmanned Aerial Vehicles (UAVs); and 13 fixed-wing aircraft. During the year 2002, the assigned equipment could change slightly to 7 tracked vehicles; 3,360 wheeled vehicles; 610 trailers; 640 generators; 2 helicopters; 16 UAVs; and 13 fixed-wing aircraft.

The main components of this installation include the Main Cantonment Area, which houses most support facilities and includes Biggs AAF; Castner Range; and the Fort Bliss Training Complex, which includes the South Training Areas, the Doña Ana Range–North Training Areas, and the McGregor Range. Castner Range is no longer used for training activities. Much of this range contains ordnance and explosive hazards and is being restored as funding becomes available.

Activities supported by Fort Bliss include troop and equipment maneuvers as well as air defense and air-to-ground training. Fort Bliss comprises a complex of facilities, training areas, and ranges to support training and test activities of the U.S. Army and other organizations. The types of training conducted on the Fort Bliss Training Complex that might impact natural resources are shown by Table 3-2. For additional detail on the size, location, and uses of the Fort Bliss Training Complex, refer to the *Training Area Development Concept* (TADC) (U.S. Army, 1998a) and ASIP (U.S. Army, 1996a).

Table 3-2. Fort Bliss Training Activities

Training Category/Other Uses	*Activities*
1. Mission Support Facility	Test facilities; landing zones/pads; drop zones; radar facilities
2. Weapons Firing	Firing areas for short range and High- and 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 and laser use
5. Off-Road Vehicle Maneuver	Use of track or wheeled vehicles that is not confined to roads
6. On-Road Vehicle Maneuver	Use of wheeled or tracked vehicles on existing roads
7. Controlled Access field training exercise (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, Integrated Cultural Resources Management Plan (ICRMP)
PA. Public Access	Areas available for public use for grazing and recreation

3.1 ENVIRONMENT NEEDED TO SUPPORT THE MILITARY MISSION

Fort Bliss provides several different environments for units to conduct military training and maintain operational readiness. Natural vegetation supported by stable soil in training areas provides opportunities for realistic ground training in a desert setting, and the large land base is ideal for conducting tactical vehicle exercises. Vertical topography of the mountains affords a backstop for lasers and projectiles, as well as a rugged location for certain types of troop training.

Training for missile firings and other air defense artillery activities, the most common training at Fort Bliss, requires a large land base with open areas such as the Tularosa Basin. The land base must include adequate acreage for impact areas and safety zones. The large acreage encompassed by Fort Bliss further provides restricted airspace for aircraft operations as well as safety purposes during weapons firings. With the adjacent WSMR, the land base is capable of supporting missiles and artillery that may accompany future mission changes. Table 3-3 shows amount of land available for the different training activities on Fort Bliss.

3.2 EFFECTS OF THE MILITARY MISSION ON NATURAL RESOURCES

Some of the best-preserved land in the southwestern United States is on military lands. These lands are often large unfragmented areas protected from development and with minimal grazing. Limited access

minimizes off-road travel and disturbance of vegetation and wildlife. Large blocks of land, such as those at Fort Bliss, provide an opportunity for an ecosystem-based management plan. The military's policy of natural resource management includes minimization or avoidance of adverse impacts caused by the military mission (AR 200-2). Management of the land on Fort Bliss is consistent with Army policy

Table 3-3. Approximate Acreage in Different Categories on Fort Bliss

Training Category	*Acres*	*Percentage of Fort Bliss*
1. Mission Support Facility	388,971	34.8 %
2. Weapons Firing	553,507	49.6%
3 Surface Impact	53,466	4,8%
4. SDZ/Safety Footprint	913,167	81.8%
5. Off-Road Vehicle Maneuver	334,212	29.9%
6. On-Road Vehicle Maneuver	4,182	0.4%
7. Controlled Access FTX Areas	5,614	0.5%
8. Dismounted Training	1,048,169	93.9%
9. Aircraft Operations	1,116,595	100.0%
10. Built-up Areas	10,368	0.9%

*Many training activities can take place in more than one location, therefore sum of acreages is greater than size of installation.

(AR 200-3) and ensures sustained resources for the future. The military mission of Fort Bliss has a positive effect on the natural resources found on the installation.

Training is the installation's primary mission. The training activities categorized on Table 3-2 may have detrimental impacts on some natural resources. The most significant of these impacts may result from off-road vehicle maneuver and the use of ordnance in training. The movement of large vehicles, either tracked or wheeled, over the landscape may cause vegetation to be crushed, broken, or uprooted, and soils to be mixed or compacted. These impacts become more severe in areas where large numbers of the vehicles are used, and in areas that are subjected to these activities on a regular basis, such as tactical operations centers, staging areas, firing points, and bivouac sites. In areas where these activities are most intense, soil erosion due to wind may become a significant problem. On-road vehicle maneuver also occurs throughout the installation. However, these activities have little effect on the resources unless the roads are improperly maintained, or are improperly sited relative to the soils, resulting in wind erosion and deposition of soils down-wind.

The use of ordnance, including missiles, artillery rounds, small arms rounds, or bombs, may affect natural resources in or near-surface impact areas by impacting vegetation, soils, and wildlife. Wildfires are an integral part of many ecosystems, such as grasslands, shrublands, and forests. It has been observed that most shrubs and perennial grasses are only crown-killed by fire. These plants resprout from root systems even within the same season. Open spaces created by fire when debris is burned offer the possibility for annual grasses and herbaceous species establishment. Therefore fires support biodiversity on Fort Bliss, as in most other ecological systems. Fires may also prevent shrub encroachment into desert grasslands.

However, fires may produce short-term losses of cover for wildlife, reduced biomass for consumption of ungulates, and expose soil to increased erosion by wind and water. At high frequencies fire may alter community structure and change species composition.

Other activities may result in soil or vegetation disturbances. FTXs range in size from 35 to 1,000 personnel typically and up to 18,000 in the region for large-scale exercises such as Roving Sands. The training on Fort Bliss may include off-road maneuvering and associated mobile/temporary facilities, including temporary camps (bivouacs), kitchen facilities, vehicle parking areas, communications and control. Berms and anti-vehicle ditches may be constructed in some areas for training in defensive operations. Dismounted training (foot traffic, rock climbing, repelling, etc.) has little potential to have substantial affects on natural resources except when large groups are used. Damage in maneuver and training areas is most prominent where concentrated activities such as command posts, staging areas, and firing points have been located. Soil and vegetation disturbance also occurs in mission support facilities, built-up areas, and weapons firing areas when people and equipment operate in a generally, fixed, routinely used site.

In addition to soil and vegetation disturbance, mission activities may result in noise and aircraft operations. The impacts of noise and overflights on natural resources, and wildlife in particular, has been evaluated extensively with results indicating impacts vary among the types of activities and the species potentially affected.

3.3 EFFECTS OF NATURAL RESOURCES MANAGEMENT ON THE MISSION

Positive effects of natural resource management at Fort Bliss include maintaining or improving ecological conditions and capability of natural landscapes required to support military training and readiness; the quality of life of military personnel and their families; expediting the compliance process and helping avoid conflicts; and reducing littering, pollution, and poaching of wildlife and vegetation by limiting access (Keystone Center, 1996).

Maintaining compliance with the numerous laws, policies, and regulations that provide protection of environmental elements and guidance for management of natural and cultural resources may affect the military mission. Some of these laws include the ESA, FWPCA, and NHPA. Effects may include limitation of access to areas or limitation of activities in areas. To minimize environmental impacts, the amount and type of permitted training activities may be limited in areas with steep and erodable soils. Military training may increase rates of erosion through soil compaction and destruction of vegetation. Livestock grazing on Otero Mesa does not prevent Fort Bliss from conducting military actions, nor does it limit access to the area (USDI, 1990a). Natural resource management may temporarily preclude use of areas to prevent damage to soils and wildlife during periods required for vegetation recovery or during breeding seasons. Military training and nonmilitary use is restricted in red zones to preclude damage to important cultural and natural resources. Without management of natural resources, military use could degrade the land and decrease the ability of the land to support the training mission of the installation.

3.4 FUTURE MILITARY MISSION IMPACTS ON NATURAL RESOURCES

The Fort Bliss Training Complex will continue to be a valuable training area for U.S. military units and for U.S. allies from around the world. Future use and development needs will be driven by the installation mission, which is to provide high-quality training resources designed to protect forces and world-wide geopolitical assets from aerial attack, missile attack, and surveillance. Since this mission revolves around the training of personnel, the major objective of future development of the Fort Bliss Training Complex is to ensure those range uses and functions that directly support the mission are available and efficient.

Any future missions for Fort Bliss in addition to the present ones may require changes in existing facilities on the installation. The TADC (U.S. Army 1998a) lists potential future activities that could be located at Fort Bliss. The extent and nature of the changes would depend on the nature of the future mission, the ability to serve the mission requirements with existing facilities, and the magnitude of the change (U.S. Army, 1996b). Significant changes in the military mission will cause revision of this plan. Development of new facilities, ranges, or impact areas, if necessary to meet goals of changing military training requirements, could cause negative impacts to natural resources. However, during all phases of development, impacts would be avoided, if possible, or mitigated in accordance with AR 200-2.

4.0 FACILITIES

4.1 OVERVIEW

Fort Bliss can be divided into separate areas: (1) Doña Ana Range–North Training Areas, (2) McGregor Range, (3) South Training Areas, (4) Castner Range, and (5) cantonment area (see Figure 2-1). These areas are described in Chapter 2. For more detail see the *Real Property Master Plan (RPMP)* (U.S. Army, 1996b) and the TADC (U.S. Army, 1998a). Major facilities of Fort Bliss and supporting infrastructure, the majority of which are located in the cantonment area, are described in the following sections.

4.1.1 Biggs Army Air Field (AAF)

Biggs AAF is the largest active army airfield in the world. It has a 13,572-foot long, Class B concrete runway and is capable of handling and facilitating the largest civilian and military aircraft. The runway is suitable for all landing gears with a bearing strength of 800,000 pounds per square inch (U.S. Army, 1996b).

Total fuel storage at Biggs is 533,000 gallons, which is available 24 hours daily through a civilian contractor. Fuel resources are sufficient to dispense 75,000 gallons per hour on a sustained basis, with a maximum on-site fueling rate of two C5s per hour, however, this capability can be increased with advanced notice (U.S. Army, 1996b).

Biggs AAF handles a large portion of military air traffic in the southwestern United States (U.S. Army, 1996b) as a result of the combination of size, geographic location, and proximity to major training areas, and refueling capabilities.

In addition to being the center of air operations for Fort Bliss, Biggs AAF is home to the U.S. Army Sergeants Major Academy, a federal prison, a Drug Enforcement Agency office, JTF-6, and several smaller agencies and tenants (U.S. Army, 1996b).

4.1.2 William Beaumont Army Medical Center (WBAMC)

WBMAC provides medical support for Fort Bliss. The 12-story facility opened in 1972 and contains over 500,000 square feet. The normal daily inpatient operating capacity is approximately 500 beds, and on average, approximately 2,800 people are served daily by the outpatient clinics and more than 2,000 military and civilian staff members at WBAMC (U.S. Army, 1996b).

4.1.3 Logan Heights

Logan Heights comprises family and troop housing, with a small area dedicated to administrative services. There are also training facilities, community service facilities, and shops for maintenance of equipment and vehicles.

4.1.4 U.S. Army Air Defense Artillery School (USAADASCH)

The primary mission of the USAADASCH is to train U.S. military and civilian students and select foreign students in air defense artillery and other subjects to support the air defense mission. The USAADASCH

facilities, classrooms, barracks, administrative space, and simulator facilities are located on the main post (U.S. Army, 1996b).

4.2 TRANSPORTATION SYSTEM

4.2.1 Highways and Roads

Fort Bliss is situated in an area where several highways intersect (see Figure 2-1). I-10 passes east-west through El Paso near the cantonment area and within 10 miles of the southwest corner of Doña Ana Range. U.S. Highway 54 separates McGregor Range from Doña Ana Range–North Training Areas and is adjacent to the west boundary of the South Training Areas. Numerous smaller, mostly unpaved roads transect McGregor Range, Doña Ana Range–North Training Areas, and the South Training Areas.

The City of El Paso maintains major primary and secondary streets to ensure adequate circulation of vehicular traffic around Fort Bliss. Several major roadways serve Fort Bliss.

4.2.2 Railway Services

Railway service to El Paso is provided by two railroads that interconnect Las Cruces and Alamogordo, New Mexico, and El Paso, Texas. They provide freight and military transport.

4.2.3 Airports

Three commercial airports serve the Fort Bliss area: EPIA, Las Cruces Municipal, and Alamogordo-White Sands Regional airports. Horizon City and Santa Teresa airports are minor facilities located in the area. EPIA is the largest of the three major airports, being serviced by a number of commercial airlines. Fort Bliss uses Biggs AAF for training and other military air traffic. There are also small landing strips, helipads, and drop zones located on the ranges.

4.3 WATER SUPPLY

Water is supplied to Fort Bliss by military wells in the Hueco Bolson, with less than 10 percent of its potable water is supplied by the City of El Paso. Wells on Doña Ana Range–North Training Areas supply part of the water for WSMR. From 1980 to 1990, the water consumption at Fort Bliss averaged approximately 2.30 billion gallons per year. The water quality at Fort Bliss is very good and requires only chlorination (U.S. Army, 1996b).

The Army controls the rights to 50,000 and 60,000 gallons per day from Carrisa Springs and the Sacramento River, respectively, and 600 gallons per hour from Prather Ranch well. This water is used to support wildlife and BLM grazing contracts on McGregor Range (USDI, 1990b).

4.4 PROJECTED CHANGES IN FACILITIES

Future changes at Fort Bliss will be achieved through a combination of increased utilization and development of facilities and ranges. Development of new facilities will require detailed planning that includes environmental, archaeological, economic, and social considerations, in full compliance with NEPA regulations (AR 200-2). In the future, Fort Bliss should be able to accommodate a variety of

additional uses with advanced planning to ensure compliance and identify viable alternatives (U.S. Army, 1996b).

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5.0 RESPONSIBLE AND/OR INTERESTED PARTIES

5.1 INSTALLATION ORGANIZATIONS

5.1.1 Commanding General

The commanding general is directly responsible for the operation and maintenance of Fort Bliss to include implementation and enforcement of this INRMP.

5.1.2 Garrison Commander

The garrison commander directs overall management of Fort Bliss and coordinates activities of installation directorates. The garrison commander will ensure that installation-wide support is provided for implementation of this plan.

5.1.3 Directorate of Environment (DOE)

The Fort Bliss DOE is aligned under the garrison commander, and has three divisions: Multimedia Compliance; Conservation; and Program Management. The DOE is responsible for management of natural resources controlled by Fort Bliss. This directorate assists in managing land to support training, conserve flora and fauna, and ensure the installation complies with federal and state environmental laws and regulations. The DOE is the primary organization responsible for implementing this plan. The Conservation Division manages cultural and natural resources and is the principal branch of this directorate involved with this INRMP. The DOE reviews each Range and Maneuver Area Request [Fort Bliss (FB) Form 88] for all military activities to ensure the activity is consistent with existing land use planning, and to avoid or mitigate potential impacts to protected or sensitive resources.

5.1.4 Directorate of Plans, Training, Mobilizations, and Security (DPTMS)

DPTMS has responsibility for management of military training, and ITAM. ITAM is a management and decision-making process to integrate Army training and other mission requirements for land use with sound natural resource management.

5.1.5 Range Commander, USACASBN

The range commander manages, controls, and operates all Fort Bliss training areas, firing ranges, restricted airspace, and base camps. All activities must be coordinated with the range commander to ensure proper integration among the various land uses. Access to the training ranges is managed by USACASBN, including access needed to accomplish natural resources management and recreation opportunities.

5.1.6 Morale, Welfare, and Recreation (MWR)

MWR promotes organization and development of clubs and plans and promotes the development of recreational facilities such as picnic areas. This directorate is also responsible for the management of George V. Underwood golf course.

5.1.7 Other Installation Organizations

Implementation of this INRMP requires assistance of other directorates and organizations on the installation in a more general way. Such support organizations include Directorate of Public Works and Logistics (DPWL) (supply and transportation), Directorate of Resource Management (budget, personnel, and equipment authorizations), Directorate of Contracting (purchasing), Public Affairs Office (public awareness programs), and Office of the Staff Judge Advocate (legal assistance).

5.1.8 Unit Commanders Requesting Use of the Fort Bliss Training Complex

Commanders of units proposing to conduct field training on Fort Bliss are instructed to exert all reasonable efforts to ensure DOE personnel brief their subordinate commanders and operations officers on environmental and historic resources requirements before their deployment to the training areas. Commanders also ensure that their subordinate commanders and operations officers down to, and including, individual soldier level are familiar with the requirements (U.S. Army 1996p).

Commanders ensure that FTXs are conducted in a manner that cause minimum damage to natural and historic resources. Commanders of units proposing to conduct FTXs consult with DOE as early as possible to determine if their proposed training may require either an environmental assessment (EA) or environmental impact statement (EIS). The consultation should occur as early as possible to preclude delays in the proposed training caused by regulatory requirements. Most training areas on the Fort Bliss Range Complex have been cleared for on-going training. If an area outside pre-approved areas is required for training, an EA/EIS may be required (U.S. Army 1996p).

5.1.9 Unit Environmental Compliance Officer (ECO)

The Unit ECO is appointed by the unit commander and is trained and certified by the DOE per Fort Bliss policy No. J-1, dated January 1, 1999, and Commanding General memorandum. ECOs serve as the points-of-contact for environmental compliance and have day-to-day oversight responsibilities at the unit level.

5.2 OTHER DEFENSE ORGANIZATIONS

5.2.1 U.S. Army Training and Doctrine Command (TRADOC)

This major command (MACOM) headquarters will, per AR 200-3, assist Fort Bliss with development and implementation of conservation programs. TRADOC has review and approval authority for this INRMP. TRADOC is the major agency for natural resource management of Fort Bliss and provides guidance and funding for staff positions and conservation activities.

5.2.2 Air Combat Command (ACC), USAF

The USAF manages an air-to-ground USAF tactical target complex on McGregor Range (USAF, 1998). On May 29, 1998, the USAF selected the Otero Mesa option located in Training Areas (TAs) 17 and 21. Agreements concerning management and conservation practices are being developed.

5.2.3 Army Material Command/White Sands Missile Range (WSMR)

WSMR adjoins the northern boundary of Doña Ana Range–North Training Areas and consists of 1.8 million acres of permanently withdrawn land under *Public Land Order* (PLO) *833*. Its 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 share land area to expand their capabilities to support specific missions.

5.2.4 Army Environmental Center (AEC)

AEC has the mission of providing technical environmental support to Army installations. AEC also has support capabilities in INRMP guidance, NEPA, endangered species planning, ITAM, and related areas.

5.3 OTHER FEDERAL AGENCIES

5.3.1 U.S. Fish and Wildlife Service (USFWS)

The USFWS is a signatory cooperator in implementation of this plan in accordance with the *Sikes Act*. The USFWS is the agency responsible for regulating compliance with the ESA, *Migratory Bird Treaty Act*, and *Bald Eagle Protection Act*, among others.

5.3.2 Bureau of Land Management (BLM)

The BLM has natural resources management responsibilities on withdrawn public lands on McGregor Range under guidance of the MLWA of 1999 (PL-106-65) and an MOU between the USDI and the DA (USDI, 1990b) (Appendix A). Specific responsibilities of the BLM and Fort Bliss can be found in Appendix A. As required by the MLWA of 1999, the BLM is currently revising its resource management plan for McGregor Range. Upon completion of that plan, a new MOU between USDI and the DA will be written. The BLM has management objectives for the following resources: minerals, livestock grazing, wildlife habitat, recreation (limited), visual resources, wilderness, and fire (USDI, 1990b). Additionally, the BLM manages land on the western, northern, and eastern boundaries of Fort Bliss, thereby having an interest in land management activities occurring elsewhere in the New Mexico portions of Fort Bliss. Coordination with the BLM will be necessary for continued implementation of this plan.

5.3.3 U.S. Forest Service (USFS)

Fort Bliss utilizes approximately 18,000 acres of the Lincoln National Forest as a secondary safety zone. This land is under a cooperative agreement between the USFS and the DA (Appendix A). This MOU establishes the USFS as the administrating agency for all nondefense land uses, that uses of these lands will be coordinated with Fort Bliss, and that these lands will be open to all forest users when not in use by the military.

5.3.4 Natural Resources Conservation Service (NRCS)

NRCS is anticipated to be a major cooperator in the Fort Bliss natural resources program. This role supports both the *ITAM Land Rehabilitation and Management Program* (LRAM) and other natural resource activities. An Interagency Agreement between Fort Bliss and NRCS exists to enable NRCS to assist in implementation of training area land rehabilitations (Appendix A).

5.4 STATE AGENCIES

5.4.1 New Mexico Department of Fish and Game (NMDGF)

The NMDGF is a signatory cooperator in implementation of this plan in accordance with the *Sikes Act*. It is also the primary state agency regarding fish and wildlife management, including enforcement of state

hunting regulations, on Fort Bliss lands in New Mexico. This department also publishes state listings for sensitive animals in New Mexico.

5.4.2 Texas Parks and Wildlife Division (TPWD)

The TPWD is a signatory cooperator in implementation of this plan in accordance with the *Sikes Act*. This agency is the primary state agency regarding fish and wildlife management, including enforcement of state hunting regulations, on Fort Bliss lands in Texas. TPWD establishes state listings for sensitive plants and animals in Texas.

5.4.3 New Mexico Department of Environment, Minerals and Natural Resources (NMDEMNR)

The Forestry and Resources Conservation Division of this department provides input regarding state listings of sensitive flora of the New Mexico portions of Fort Bliss.

5.5 UNIVERSITIES

Various universities have cooperative research interests in Army lands. Expertise from universities is very valuable, especially in providing specialized knowledge needed to initiate management plans. Additionally, research conducted by universities often provides baseline information about natural resources on the installation. This information can be tracked over long time periods to identify trends.

Universities conducting surveys on Fort Bliss include New Mexico State University, University of Texas at El Paso, Texas Tech University, Colorado State University, and the University of Wisconsin. These institutions have provided invaluable information to Fort Bliss. New Mexico State University, the BLM, and Fort Bliss have signed a cooperative Agreement for the management of Areas of Critical Environmental Concern (ACEC) on McGregor Range (Appendix A).

5.6 CONTRACTORS

Fort Bliss uses contractors for many programs associated with natural resources including INRMP preparation, NEPA documentation, natural and cultural resource surveys, and similar projects.

5.6.1 New Mexico Natural Heritage Program (NMNHP)

The NMNHP has conducted extensive natural resource surveys and developed monitoring protocols for some species of concern. This agency developed the latest Fort Bliss vegetation classification (U.S. Army, 1996c).

5.7 OTHER INTERESTED PARTIES

Nongovernmental conservation organizations (NGOs) such as the Sierra Club, Audubon Society, and the Nature Conservancy are interested in Fort Bliss because of the large acreage, unique and sensitive areas, endangered species, and the potential for military impact. Other groups that have concerns about implementation of this INRMP may include local environmental interest groups based in El Paso, Las Cruces, and Alamogordo. Additionally, persons who utilize the installation for recreation, such as Southwest Consolidated Sportsmen, may also be interested in the plan.

6.0 NATURAL RESOURCES AND CLIMATE

6.1 SETTING

6.1.1 Geographic Description

Fort Bliss is located in the northern Chihuahuan Desert, which is typically classified as semiarid (U.S. Army 1993b). Portions of the Chihuahuan Desert occur in the states of Arizona, New Mexico, and Texas in the United States, and most of this desert is located in the Mexican states of Chihuahua, Durango, Coahuila, Zacatecas, Nuevo Leon, and San Luis Potosi. The Chihuahuan Desert is one of the highest North American deserts in terms of both maximum and mean elevation above sea level (Wells, 1977). Physiographically, it is a high plateau between the two great mountain ranges of Mexico, the Sierra Madre Occidental and the Sierra Madre Oriental, both of which attain elevation in excess of 10,000 feet. These major mountain ranges partially intercept rain-bearing air masses from the oceans, decreasing rainfall on the central plateau of northern Mexico. This plateau extends into the southwestern U.S. Topography of the Chihuahuan Desert consists of closed basins, isolated mountains, pediments, and basal plains. Elevations range from 3,000 to over 8,000 feet above sea level (Wells, 1977). Elevations in this desert generally decrease from the Continental Divide to the Gulf of Mexico and increase as you move south along the central plateau into Mexico.

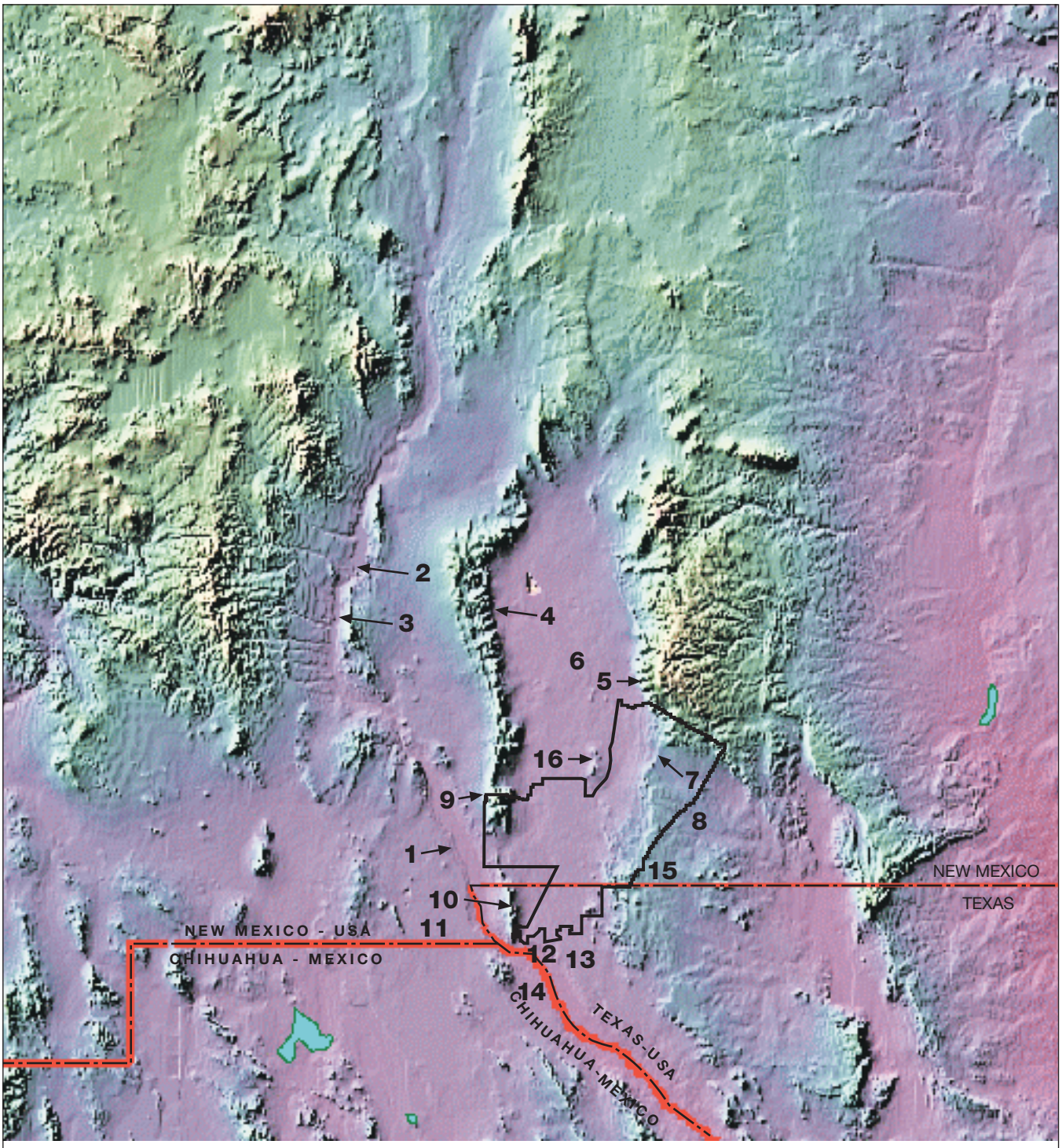
Different physiographic features found on Fort Bliss are the Tularosa Basin, Otero Mesa, and the Sacramento, Hueco, Organ, and Franklin mountains (Figure 6-1). The Tularosa Basin is the central feature with the Sacramento and Hueco mountains, and Otero Mesa, located on the east side of the Tularosa Basin; and the Organ and Franklin mountains found on the west side. The mountain ranges and Tularosa Basin have a north-south orientation. All of these landforms extend beyond Fort Bliss boundaries.

6.1.2 Climate

The climate across Fort Bliss can be characterized as having low relative humidity, hot summers, and moderate winters. Some higher elevation areas of the installation have semi- and sub-humid climatic zones due to higher precipitation. Springtime is normally moderate in temperature with high winds and blowing dust (USDA, 1980; 1981).

Temperatures at Fort Bliss are highly variable, ranging from -8 to 114°F with a daily average of 64°F. The maximum and minimum daily averages are 76 and 51°F, respectively. The first killing frost of the year occurs around November 15 and the last killing frost is expected about March 20, which allows approximately 235 frost-free days per year. Temperatures typically drop below freezing on an average of 34 days per year and rise above 90°F an average of 87 days per year. Average relative humidity ranges from 51 percent at 6 A.M. to 26 percent at 6 P.M. local standard time. Evaporation rates are very high, averaging a 97-inch precipitation deficit each year (USDA, 1980; 1981).

Annual precipitation at Fort Bliss averages from 8 inches in the valley to 20 inches in the mountains (USDA, 1980; 1981). Thunderstorms usually follow an inflow of warm, moist air from the Gulf of Mexico, and less frequently from the Pacific Ocean. Snow typically falls each winter with accumulations averaging 4.6 inches annually and seldom lasts for more than 1 day. The majority of rainfall occurs from July to September resulting from intense thunderstorm activity, with a dry season occurring from winter to early summer (USDA, 1980; 1981).



Fort Bliss 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

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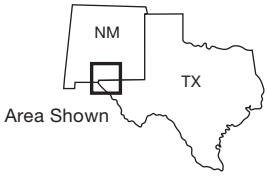

INRMP 111.vb.2.26.99

Figure 6-1. Physiographic Features of the Area Surrounding Fort Bliss.

Wind speeds at Fort Bliss average 9 to 12 miles per hour (mph) with gusts over 60 mph in March and April. Dust and sandstorms occur in March and April due to these stronger winds and lack of precipitation. Spring winds are typically from the west while summer and winter usually bring a more southerly and northerly flow, respectively (USDA, 1981).

6.2 TOPOGRAPHY

Topographic relief on Fort Bliss is substantial and provides a diverse array of physical environments. Elevations range from about 3,900 feet above mean sea level (MSL) in the cantonment area to approximately 8,825 feet MSL in the Organ Mountains. Otero Mesa located on the east side of Fort Bliss, features broad, gently rolling grasslands. The Sacramento Mountains, bordering Fort Bliss to the northeast, are composed of steep terrain ascending from the lower slopes to an altitude of more than 7,600 feet MSL within the Fort Bliss boundary. The Organ Mountains are also composed of steep terrain and reach the highest altitudes within the Fort Bliss boundary. The northernmost reaches of the Franklin Mountains that extend into Fort Bliss are composed mostly of lower slopes and alluvial fans, which range from 4,265 to slightly over 5,000 feet. Portions of the Hueco Mountains included within Fort Bliss range from 4,500 to approximately 6,000 feet MSL. The lower slopes of the mountains containing the transition zone between the higher elevations and the Tularosa Basin feature steep slopes that eventually flatten out into alluvial fans and outwashes. Similarly, the escarpment for Otero Mesa consists of steep slopes that grade into alluvial fans.

6.3 GEOLOGIC HISTORY AND SEISMICITY OF FORT BLISS

Fort Bliss and the surrounding area were essentially a stable, relatively shallow marine shelf from late Cambrian (500 to 600 million years before present [MYBP]) through early Pennsylvanian (280 to 310 MYBP) time. The oldest sedimentary deposits in this area are approximately 400 million years old, and they consist chiefly of dolomite beds that range in age from late Cambrian to late Ordovician (425 to 500 MYBP) (U.S. Army, 1984). Deposition during Devonian (325 to 405 MYBP) time consisted mainly of marine shales and shaly limestones. A relatively thin sequence of upper Mississippian age limestone and shale disconformably overlies the Devonian rocks. Unconformably overlying the Mississippian deposits are approximately 3,000 feet of Pennsylvanian age sediments. These strata consist of limestone, sandstone, dolomite, and shale, which were deposited in a shallow marine environment. Tectonic disturbances in Virgilian time (late Pennsylvanian) altered the sedimentation origin from marine to terrestrial. The tectonic movement resulted in the subject area becoming a large depression with landmasses developed to the east, west, and southwest. In later Pennsylvanian and early Permian time, the Tularosa Basin received a thick sequence of land-derived sediments. Most sedimentary rocks in the area consist of limestone strata of the San Andres formation. These sediments mark the return of marine shelf deposition in the area (U.S. Army, 1984).

Broad regional uplift that occurred between 80 to 40 MYBP (Cenozoic Era) and differential drift within the North American Plate, which occurred 30 MYBP (Miocene), created fault patterns in the region. The result was a physiographic province characterized by down-dropped basins (grabens) bounded by tilted faultblock mountains (Seager, 1981). These grabens have been filled with heterogeneous, unconsolidated to poorly consolidated sediments, which cover underlying sediments.

By middle Cenozoic time (present to 65 MYBP), the Hueco and the Mesilla bolsons, respectively on the east and west of the Franklin Mountains, were the prominent basins of deposition. The northern boundary of the Hueco Bolson in the Tularosa Basin is obscure; however, lacustrine deposits near Culp Canyon possibly are of the Fort Hancock type, and the overlaying alluvial fan deposits are probably

coeval with the Camp Rice. There is evidence that the Tularosa Basin has had a history of continuous, closed basin deposition, with Kansas playa complexes possibly united with Lake Cabeza de Vaca and/or Lake Lucero to the north (U.S. Army, 1984).

Eroded petrocalcic horizons, braided stream deposits alternating with poorly sorted mudflows, relic and Paleozoic horizons, topographic expressions of old sediment surfaces and terrace-strand lines, and multiple superimposed petrocalcic (caliche) horizons demonstrate several periods of alternatively wetter and drier climatic trends during and since the Pleistocene (0.01 to 2 MYBP). These are probably related to pluvial-interpluvial episodes and post-Pleistocene climatic instability (Wells, 1977).

The southern portion of the Tularosa Basin contains more than 6,000 feet of valley fill, stream sand, and gravel, rock slides, alluvial fans from mountains on either side, and lake deposits rich in salt and gypsum derived from sedimentary rocks of the adjacent ranges. Any rainfall or melted snowfall that occurs in the valley either seeps into the porous valley deposits or evaporates from small pools leaving behind deposits of gypsum, salt, or other minerals. Fault lines along the edge of the Tularosa Basin may still be active, although no movement has been recorded in recent time (U.S. Army, 1984).

The mountain ranges adjacent to Fort Bliss developed during separate geologic time periods and comprise a variety of minerals and soils. These geologically different mountain ranges generally contain site-specific substrates, creating areas of unique communities. The Organ Mountains were formed as light-colored, craggy outcrops of vertically jointed tertiary granite, 27 MYBP (Miocene). The southern portion of these mountains is made up of tilted blocks of stratified, mostly Paleozoic rock. The Sacramento Mountains contain Paleozoic sedimentary rocks underlain by Precambrian granite. The Hueco Mountains are made of marine limestones deposited in the Pennsylvanian and Permian seas. These Paleozoic limestones dip steeply along chevrons on ridges (U.S. Army, 1984).

The Fort Bliss region lies in an area considered to be of moderate seismic activity (Sandford et al., 1972). Earthquake data estimate that the strongest earthquake in a 100-year period lies between a magnitude of 4.8 and 6.0 on the Richter Scale (U.S. Army, 1984).

6.4 NATURAL RESOURCES OF COMMERCIAL VALUE

Fort Bliss contains various types of mineral deposits of commercial quality. These include dolomite, sand and gravel, and limestone. In addition, geologic settings in known mining districts north and west of the range bear similarity to geologic environments on the range, especially near the Organ Mountains and portions of McGregor Range. This suggests that the range may contain base and precious metals. There also is a possibility of some oil and gas drilling opportunities and geothermal energy development on Fort Bliss. Geothermal exploration began in 1997.

There are no known deposits of other minerals such as coal, sodium, or potassium located on Fort Bliss (USDI, 1990b).

6.4.1 Fuel Oils

Five shallow petroleum exploration tests, two that reported multiple oil and gas shows, were drilled on McGregor Range prior to military occupation. At least 4,800 and 6,400 feet of potential oil-bearing rocks remain untested in the Tularosa Basin and Otero Mesa areas.

The BLM has the responsibility for permitting, inspecting, and enforcing Notices of Intent to conduct oil and gas exploration; surface management responsibilities associated with Applications for Permit to Drill;

and monitoring all "down hole" work such as ensuring aquifer protection, blowout prevention, and approved well completions, recompletions, and abandonments (USDI, 1990b).

6.4.2 Minerals

Many gypsum beds of commercial quality are located on the gentle slopes of the small cuestas (ridges or plateaus cut away by erosion from the mesa escarpment) below and west of Otero Mesa. They also occur on the steep slopes of the Otero Mesa escarpment in a varied pure form. In addition, the Hueco Mountains contain a gypsum deposit of commercial value 25- to 75-feet thick.

High-purity dolomite deposits outcrop near the base of the Sacramento escarpment. These strata contain more than 20 percent magnesium. Sand and gravel deposits, valued for use in construction, are present throughout the range including deposits near the base of the Sacramento-Otero escarpments and in the arroyos in the northern part of Otero Mesa. Limestone and sandstone strata, suitable for crushed stone for concrete aggregate, base course material, and building stone, are present near the surface over a large part of Fort Bliss.

Mineral exploration on McGregor Range is managed by the BLM in accordance with the objectives of the *Mining and Minerals Policy Act of 1970* and the *Research and Development Act of 1980*. These policies require the Federal Government to facilitate the development of mineral resources to meet national, regional, and local needs for domestic and defensive purposes while minimizing environmental damage in the process and rehabilitating any affected lands (USDI, 1990b).

6.5 SOILS

Nearly all of the 1.12 million acres of Fort Bliss is included in three, second- and third-order surveys conducted and published by the NRCS. The survey areas include Otero (USDA, 1981) and Doña Ana (USDA, 1980) county areas in New Mexico, and El Paso County, Texas (USDA, 1971). Surveys were mapped to the series, association, or complex levels. An effort is currently underway to resurvey the entire Fort Bliss area in New Mexico and Texas. The purpose of the new survey is to update and refine the current surveys, and to map soils that were not previously surveyed to the series level at a scale of 1:24,000.

The majority of soils in the Fort Bliss area are classified as either aridisols or entisols, although a few mollisols are also found in the area. Aridisols are soils with well-developed pedogenic horizons, which 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, young soils with little or no development of soil horizons, are 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). A few mollisols occur in the mountains of the Fort Bliss area. These soils are distinguished by a deep, dark-colored surface horizon, rich in organic matter and saturated with bases.

Soils in the Fort Bliss area 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, igneous, and metamorphic rocks. Windblown sediments from exposed lakebeds occur widely. Wind is an important soil forming agent in the Fort Bliss area. Wind-blown sand is common, with the greatest accumulations in the basins, often forming dunes.

The soils of the Fort Bliss area can be separated into two general categories based upon the following physiographic positions: (1) valleys and basin floors; (2) and mountains, mountain foot slopes, and

escarpments. Soils in 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, 1971; 1980; 1981). Most of the basin floors are covered by coppice dunes (eolian deposits trapped by mesquite thickets) and eolian sheet deposits. These soils are found mainly in the Tularosa Basin and Hueco Bolson. Major soil units in this category include Bluepoint, Caliza-Bluepoint-Yturbide, Pajarito-Onite-Pintura, Pintura-Wink, Berino-Doña Ana, Mimbres-Stellar, Nickel-Upton, Tome-Mimbres, Philder-Armesa-Reyab, Nickel-Tencee, Bluepoint-Onite-Wink, and Pintura-Doña Ana, Hueco-Wink, and Turney-Berino. These soil units are combinations of soil associations and series that are described in greater detail in Tables 6-1 and 6-3. Table 6-2 summarizes miscellaneous landform types found in soil associations. Figures 6-2, 6-3, and 6-4 show the distribution of soil associations on the Main Cantonment Area and South Training Areas, Doña Ana Range–North Training Areas, and McGregor Range respectively. Soils in valleys and basins are used mainly for grazing, wildlife habitat, and watershed. Military uses include ground troop training, wheeled and tracked vehicle maneuvering, and missile launching.

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, 1971; 1980; 1981). These soils are found mainly in the Sacramento, Hueco, and Organ mountains, and on Otero Mesa. Major soil units in this category include: Rock outcrop-Torriorthents, Deama-Tortugas-Rock outcrop, Ector-Rock outcrop, Delnorte-Canutio, and Lozier Rock outcrop. (See Tables 6-1 and 6-2 for a description of the distribution of soil series within associations, and more details about the soil series that make up the above general soil units.) These soils are used mainly for grazing, wildlife habitat, and watershed. Military uses are limited because of steep slopes and rough terrain, although some vehicle maneuvering, ground-troop training, and missile launching does occur on these soils.

Wind and water erosion are currently the most significant processes affecting soils in the Fort Bliss area. 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.

Erodibility of soils varies considerably across the Fort Bliss area. Figure 6-5 shows the erodibility of soils as well as the location of steep slopes in the Fort Bliss area. In general, soil erodibility is a function of soil type, slope, and vegetative cover. Sandy soils are extremely wind erodible (USDA, 1981). Loamy sands are highly erodible and capable of supporting a protective vegetative cover. Soils with large amounts of clay are moderately erodible and capable of supporting vegetation. Loamy soils are generally more erodible than sands or clays because the particle size is smaller than sand, but not small enough to be cemented by chemical attraction, like a claysoil. Stony or gravelly soils and rock outcrops are not generally subject to erosion.

The majority of the steep rocky hills and mountains in the Fort Bliss area have only slight erosion potential, although during periods of severe thunderstorm activity, large volumes of runoff can build up rapidly, causing flash floods that can produce large gullies (BLM, 1988). 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 due to the large amounts of exposed soil between shrubs.

Table 6-1. Description of Soil Series that Occur Within the Fort Bliss Area

Soil Series	*Description*
Agustin	Deep, pale-brown, gravelly soils at the base of limestone and igneous mountains and on alluvial fans, generally near gravelly arroyos.
Aladdin	Deep, well-drained soils that formed in mixed alluvium along mountain fronts and on fans and terraces. Slopes are from 2–10 percent.
Arizo	Deep, excessively drained soils formed in mixed alluvium on valley floors or wide arroyos. Slopes are 0–5 percent.
Argids	Shallow to deep, well-drained soils on hills and dry mountains. Slopes are 15–80 percent.
Armesa	Deep, well-drained soils formed in medium textured alluvium and eolian sediment that are high in carbonate. They are on old alluvial fans and terraces. Slopes are 0–5 percent.
Berino	Deep, well-drained soils formed in medium textured upland alluvium and eolian deposits. They are on nearly level to undulating sandy plains and side slopes of pediments. Slopes are 0–5 percent.
Bluepoint	Deep, somewhat excessively drained soils formed in coarse textured eolian deposits. They are on coppice dunes on sandy uplands. Slopes are 0–5 percent.
Brewster	Very shallow, stony soils on igneous mountains generally developed over granite rock. They are friable, noncalcareous, and mildly alkaline. Slopes are usually greater than 20 percent.
Bucklebar	Deep, well-drained soils formed in alluvium modified by wind on fans and coalescent fan piedmonts. Slopes are 1–5 percent.
Cacique	Moderately deep, well-drained soils formed in alluvium on level basin floors. Slopes are 0–3 percent.
Cale	Deep, well-drained soils formed in highly calcareous fine and medium textured sediment derived from weathered limestone. They are on broad dissected upland valleys. Slopes are 0–5 percent.
Caliza	Deep, well-drained soils formed in gravelly alluvium on fans or river deposits of Pleistocene age. Slopes are 15–40 percent.
Canutio	Deep, very gravelly soils formed in recently deposited gravelly, loamy sediments having high lime content, in and near the active parts of arroyos and alluvial fans. Slope is 1–8 percent.
Casito	Shallow, well-drained soils formed in very gravelly sediments on fans and terraces. Slopes are 1–8 percent.
Cave	Shallow, well-drained soils formed in gravelly alluvium in old valley fill. Slopes are 1–5 percent.
Coxwell	Moderately deep, well-drained soils formed in gravelly alluvium overweathered granitic bedrock. They are on ridges along mountain toe slopes. Slopes are 5–15 percent.
Crowflats	Deep, well-drained soils formed in calcareous mixed alluvium. They are on basin floors. Slope is 0–2 percent.
Deama	Shallow, well-drained soils formed in residuum from limestone bedrock. They are on steep limestone hills. Slopes are 0–50 percent.
Delnorte	Shallow or very shallow to hard caliche. Very gravelly soils formed over outwash material of sand and gravel. They occur on foot slopes and outwash plains of igneous and limestone mountains. Slopes are 1–8 percent.
Doña Ana	Deep, well-drained soils formed in medium and coarse textured eolian material and alluvium. They are on toe slopes of pediments and sandy uplands. Slopes are 0–5 percent.
Ector	Shallow, well-drained soils formed in material weathered from limestone bedrock. They are on sides of steep limestone hills and mesas and plateaus dissected by narrow drainage ways. Slopes are 20–50 percent.
Espy	Shallow, well-drained soils formed in mixed alluvium. They are over indurated caliche on alluvial fans and terraces. Slopes are 0–5 percent.
Harrisburg	Moderately deep, well-drained soils that formed in residuum of sandstone and eolian material from sandstone and from sandstone, volcanic ash, and shale. They are on desert mesas. Slopes are 1–10 percent.

Table 6-1. Description of Soil Series that Occur Within the Fort Bliss Area (Continued)

Soil Series	*Description*
Holloman	Shallow, well-drained soils over gypsum that formed in gypsiferous sediment of eolian and alluvial origin. They are on nearly level to gently sloping uplands. Slopes are 0–5 percent.
Hueco	Sandy, noncalcareous, and mildly or moderately alkaline soils that formed over outwash sediments from nearby mountains. Hueco soils are underlain by an indurated caliche layer at a depth of 20 to 40 inches. Slopes are 0.5–1.5 percent.
Jerag	Shallow, well-drained soils formed in medium textured eolian and alluvial sediment. They are over indurated caliche. They are on broad slightly concave uplands. Slopes are 0–3 percent.
Kerrick	Moderately deep, well-drained soils that formed in mixed alluvium. They are over indurated caliche. They are in upland valleys. Slopes are 0–2 percent.
Lozier	Shallow, well-drained soils formed in material weathered from limestone. They are on hillsides, ridgetops, benches, and escarpment caps. Slopes are 0–50 percent.
Mimbres	Deep, well-drained soils formed in silty calcareous alluvial sediment weathered from limestone. They are on broad flood plains on the lower parts of long, gently sloping alluvial fans terminating on valley floors. Slopes are 0–3 percent.
Nickel	Deep, well-drained soils formed in very gravelly alluvium mainly from limestone. They are on middle and upper parts of side slopes of pediments and on alluvial fans. Slopes are 1–30 percent.
Nolam	Deep, well-drained soils formed in very gravelly alluvium on the sides of strongly dissected terraces and ridges. Slopes are 3–15 percent.
Onite	Deep, well-drained soils formed in mixed alluvium. They are on broad alluvial fans. Slopes are 0–5 percent.
Pajarito	Deep, loamy soils that formed on alluvial fans or old terraces. They are calcareous and moderately alkaline. Slopes are 0–3 percent.
Pena	Deep, well-drained soils formed in mixed alluvium. They are in broad, dissected upland valleys. Slopes are 0–10 percent.
Pinaleno	Deep, well-drained soils formed in alluvium on fans, fan piedmonts, and terraces. Slopes are 1–0 percent.
Philder	Shallow, well-drained soils formed in alluvium influenced by eolian sediment. They are over indurated caliche and are found on upland fans on pediments. Slopes are 0–15 percent.
Pintura	Deep, somewhat excessively drained soils formed in coarse textured eolian material. They are on coppice dunes on uplands with 0–5 percent slopes. The dunes have slopes of 20 percent to more than 80 percent.
Reagan	Deep, well-drained soils formed in alluvium on fans and basin floors. Slopes are 1–3 percent.
Reakor	Deep, well-drained soils formed in mixed alluvium weathered from limestone bedrock. They are found on uplands. Slopes are 1–5 percent.
Reeves	Deep, well-drained soils formed in medium textured calcareous and gypsiferous alluvium. They are on broad valley floors and alluvial toe slopes. Slopes are 0–2 percent.
Reyab	Deep, well-drained soils formed in alluvium weathered mainly from limestone. They are on alluvial bottoms, terraces, and fans on broad uplands. Slopes are 0–5 percent.
Shanta Variant	Deep, well-drained soils formed in mixed alluvium. They are on drainage ways of dissected terraces and valley bottoms. Slopes are 0–2 percent.
Simona	Gravelly, loamy soils that formed in outwash material and are calcareous and moderately alkaline. They have a layer of indurated caliche within a depth of 20 inches.
Stellar	Deep, well-drained soils formed in sediments derived from igneous rock on basin floors and on toe slopes of fans. Slopes are 0–3 percent.
Tencee	Shallow, well-drained soils formed in gravelly calcareous alluvium. They are over indurated caliche, mainly on side slopes of pediments and the upper parts of older alluvial fans at the base of limestone hills and escarpments. Slopes are 0–10 percent.
Terino	Shallow, well-drained soils in gravelly alluvium on fans and terraces. Slopes are 1–8 percent.

Table 6-1. Description of Soil Series that Occur Within the Fort Bliss Area (Continued)

Soil Series	*Description*
Tome	Deep, well-drained soils formed in mixed alluvium. They are on broad valley floors. Slopes are 0–5 percent.
Turney	Moderately deep to weakly cemented caliche formed over outwash material from the nearby mountains. They are calcareous and moderately alkaline Slopes are 0–2 percent.
Upton	Shallow, well-drained soils formed on piedmont slopes and ridges in gravelly alluvium derived from limestone. Slopes are 3–15 percent.
Wink	Deep, well-drained soils formed in calcareous eolian sediment. They are on upland pediments. Slopes are 0–3 percent.
Yturbide	Deep, excessively drained soils formed in alluvium along side and on terminal fans of arroyos and old river deposits. Slopes are 1–5 percent.
Lithic Argiborolls	Moderately deep cobbly loams. Slopes are 16–18 percent.
Lithic Argiustolls	Shallow loams to shallow gravelly loams. Slopes are 0–80 percent.
Lithic Torriorthents	Shallow gravelly to very gravelly loams. Slopes are 0–80 percent.
Rock Outcrop	Slopes are 0–80 percent.
Typic Argiborolls	Moderately deep cobbly loams. Slopes are 16–80 percent.
Typic Argiustolls	Moderately deep gravelly to very gravelly loams. Slopes are 16–80 percent.
Typic Calciorthids	Very deep gravelly loams. Slopes are 0–10 percent.
Typic Camborthids	Moderately deep very gravelly to extremely gravelly loams. Slopes are 16–80 percent.

Sources: USDA, 1971; 1980; 1981.

Table 6-2. Miscellaneous Land Types Found in Soil Associations

Land Type	*Description*
Badlands	Heavy, plastic clay stratified with layers of calcareous very fine sandy loam. Also includes caliche ridgetops and gravelly sand overlying clay. Slopes are convex and range from 5–0 percent.
Dune land	Active sand dunes formed by noncalcareous fine sand.
Igneous rock land	Exposed, stratified igneous rocks, mostly granite, andesite, syenite, and rhyolite. Slopes range from 30 percent to almost vertical escarpments several hundred feet thick.
Limestone rock land	Exposed, stratified limestone bedrock. Slopes range from 30 percent to almost vertical escarpments.
Rock outcrop	Rough extensions and escarpments, ledges, ridges, and cliffs. Slopes are 15–90 percent.

Sources: USDA, 1971; 1980; 1981.

Table 6-3. Series Composition of Soil Associations Within the Fort Bliss Area

Association	*Series*
AGB – Agustin, undulating	65 percent Agustin, 35 percent Simona, Pajarito, Delnorte, Wink
AM – Aladdin-Coxwell	35 percent Aladdin, 30 percent Coxwell, 25 percent Rock outcrop
AMC – Armesa very fine sandy loam	20 to 90 percent Armesa, 10 to 20 percent Philder, Reyab, Lozier, Rock outcrop
BJ – Berino-Bucklebar	35 percent Berino, 25 percent Bucklebar, 25 percent Doña Ana, 15 percent Pintura, Pajarito, Onite
BK – Berino-Doña Ana	50 percent Berino, 30 percent Doña Ana, 20 percent Reagan, Stellar, Bucklebar, Cacique, Simona
B/L – Berino-Pintura complex	50 percent Berino, 25 percent Pintura, 25 percent Doña Ana, Buckelbar, Onite, Pajarito
BOA – Bluepoint-Onite-Wink	35 percent Bluepoint, 25 percent Onite, 20 percent Wink, 20 percent Pintura, Berino, Holloman
BP – Bluepoint-Caliza-Yturbide complex	25 percent Bluepoint, 25 percent Caliza, 20 percent Yturbide, 30 percent Arizo, Canutio, Tencee, Nickel
DCB – Delnorte-Canutio, undulating	75 percent Delnorte, 25 percent Canutio, and small amounts of Bluepoint and Badlands
DCD – Delnorte-Canutia, hilly	55 percent Delnorte, 18 percent Canutia, 27 percent Bluepoint, Agustin, Pajarito
DRF – Deama-Rock outcrop complex	70 percent Deama, 15 percent Rock outcrop, 15 percent Ector, Pena, Kerrick, Cale
DTB – Doña Ana-Berino	40 percent Doña Ana, 35 percent Berino, 25 percent Pintura, Bluepoint, Onite, Wink, Nickel
ECF – Ector-Rock outcrop	60 percent Ector, 25 percent Rock outcrop, 15 percent Deama, Lozier
ESB – Espy-Shanta Variant	55 percent Espy, 20 percent Shanta Variant, 25 percent Lozier
HPB – Holloman-Reeves, nearly level	60 percent Holloman, 30 percent Reeves, 10 percent Tome, Crowflat
HW – Hueco-Wink	42 percent Hueco, 38 percent Wink, 20 percent Turney, Berino, Duneland, Limestone rock land
IN – Igneous rock land-Brewster	50 to 75 percent Igneous rock land, 15 to 50 percent Brewster
JEC – Jerag-Philder, gently rolling	40 percent Jerag, 40 percent Philder, 20 percent Reyba, Shanta Variant, Lozier, Tencee,
LOB – Lozier-Rock outcrop complex	75 percent Lozier, 15 percent Rock outcrop, 10 percent Tencee, Reakor
LOD – Lozier-Rock outcrop	60 percent Lozier, 25 percent Rock outcrop, 15 percent Tencee, Nickel
MO – Mimbres silty clay loam	80 percent Mimbres silty clay loam, 20 percent Reagan, Stellar, Berino, Bucklebar, Doña Ana
MTA – Mimbres-Tome, nearly level	45 percent Mimbres, 40 percent Tome, 15 percent Nickel, Reyab
NTD – Nickel-Tencee	50 percent Nickel, 35 percent Tencee, 15 percent Lozier, Tome, Reakor
NU – Nickel-Upton	50 percent Nickel, 25 percent Upton, 25 percent Tencee, Cave, Simona

Table 6-3. Series Composition of Soil Associations Within the Fort Bliss Area (Continued)

Association	*Series*
PAA – Pajarito, level	75 percent Pajarito, 25 percent Agustin, Simona, Bluepoint, Turney, Wink, Mimbres
PCB – Penta-Cale-Kerrick	35 percent Penta, 30 percent Cale, 15 percent Kerrick, 20 percent Ector, Deama
PEC – Philder very fine sandy loam	85 percent Philder, 15 percent Reyba, Tencee, Armesa
PFB – Philder-Armesa, undulating	45 percent Philder, 40 percent Armesa, 15 percent Reyab, Tome, Tencee, Lozier
PGB – Pintura-Doña Ana complex	45 percent Pintura, 35 percent Doña Ana, 20 percent Berino, Onite, Bluepoint, Mimbres, Holloman
PHB – Pintura-Tome-Doña Ana complex	30 percent Pintura, 25 percent Tome, 20 percent Doña Ana, 25 percent Holloman, Wink, Berino
PN – Pinaleno-Nolam	45 percent Pinaleno, 35 percent Nolam 20 percent Casito, Terino
RAB – Reaker-Tome-Tencee	35 percent Reaker, 30 percent Tome, 20 percent Tencee, 15 percent Lozier
RFA – Reyab-Armesa	60 percent Reyab, 30 percent Armesa, 5 percent Philder, Lozier, Rock outcrop
RG – Rock outcrop-Argids	40 percent Rock outcrop, 30 percent Argids, 20 percent Argids, cool, 10 percent alluvium and alluvial soils
RH – Rock outcrop-Argids, cool	45 percent Rock outcrop, 35 percent Argids, cool, 20 percent colluvial and alluvial soils
RL – Rock outcrop-Lozier	45 percent Rock outcrop, 30 percent Lozier, 25 percent Sandstone, Shell and small Igneous dikes
ROG – Rock outcrop	80 percent Rock outcrop, 20 percent Lozier, Tencee
RRF – Rock outcrop-Lozier complex	50 percent Rock outcrop, 35 percent Lozier, 15 percent Reakor, Tome, Tencee
TBB – Turney-Berino, undulating	75 percent Turney, 20 percent Berino, 5 percent Pajarito, Hueco
TDB – Tome silt loam	85 percent Tome, 15 percent Crowflats, Tencee, Nickel
TE – Tencee-Upton	35 percent Tencee, 20 percent Upton, 45 percent Nickel, Cave, Simona
TF – Terino-Casito	40 percent Terino, 30 percent Casito, 10 percent Hard surface soils

Sources: USDA, 1971; 1980; 1981.

Currently, there are several areas where accelerated erosion is a problem on Fort Bliss. Soils in the coppice dunes area of the Tularosa Basin are subject to wind erosion. The acceleration of these erodible dunes is caused by a breakdown of surface crusts on the soils between dunes, caused in part by the maneuvering of tracked vehicles (Marston, 1984). 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, 1988). This process could significantly lower air quality. On maneuvering 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, 1988). 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.

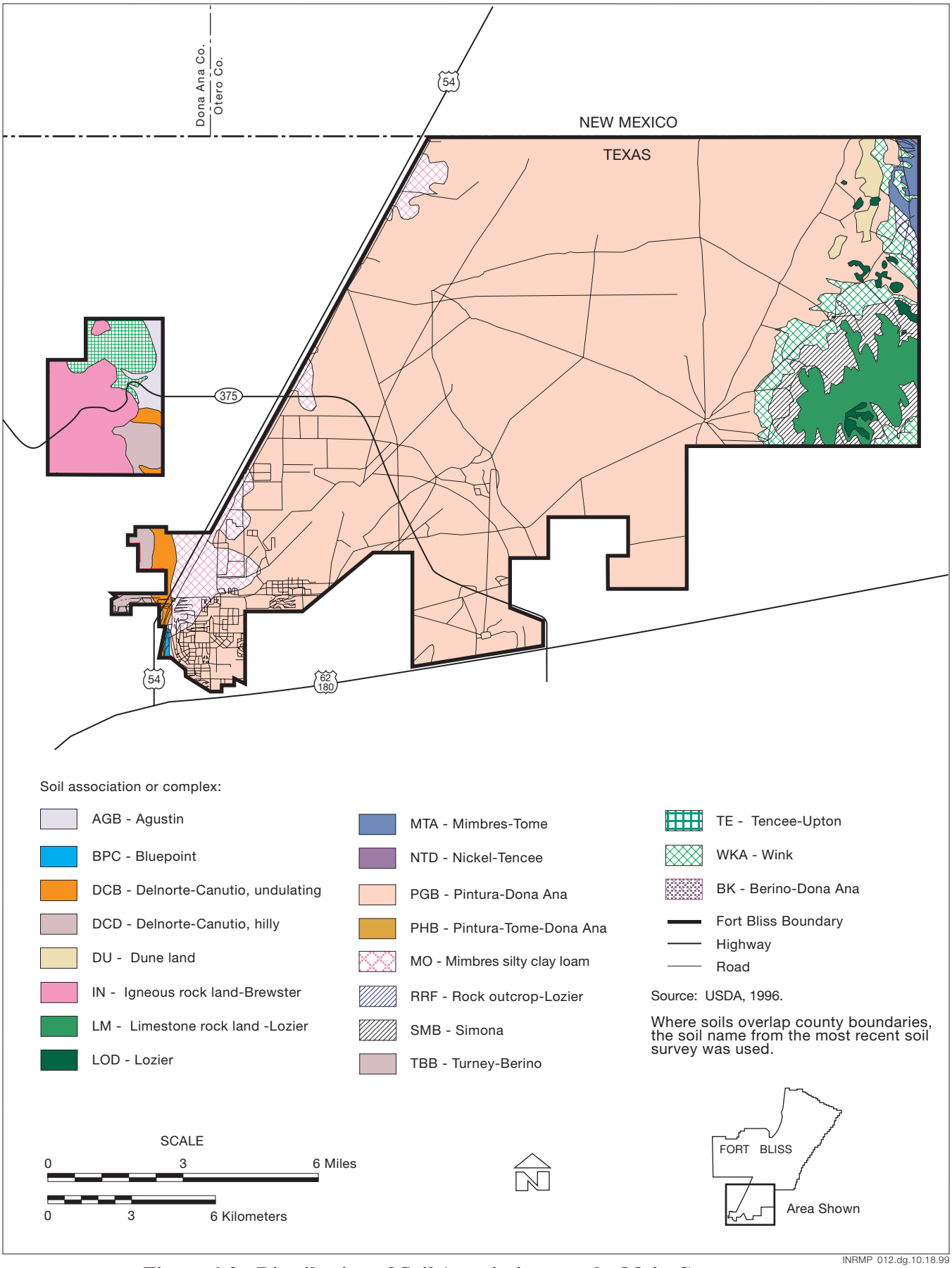

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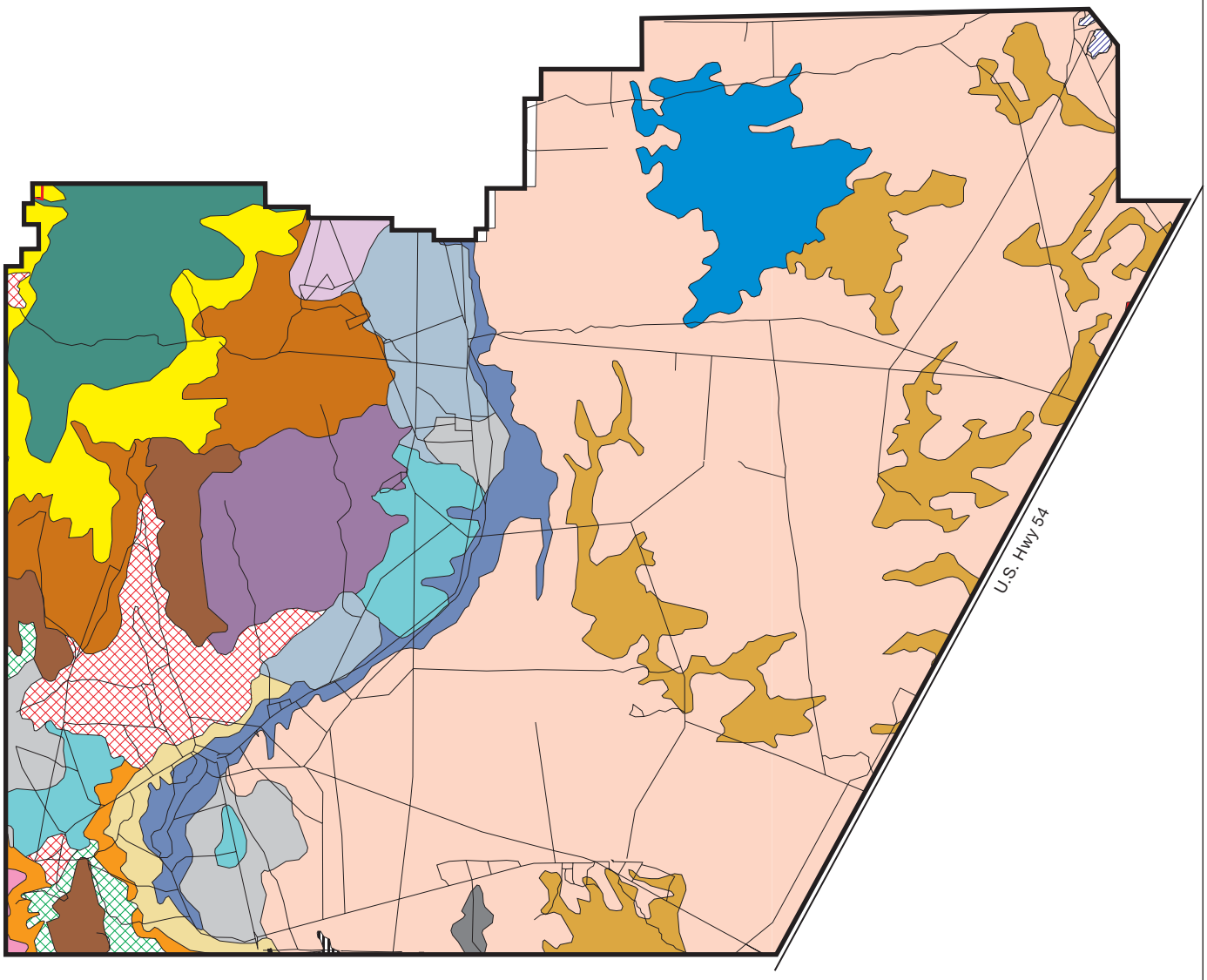
Figure 6-2. Distribution of Soil Associations on the Main Cantonment, Castner Range and South Training Areas.



Soil association or complex:

- AM - Aladdin-Coxwell
- BJ - Berino-Bucklebar
- BK - Berino-Dona Ana
- BL - Berino-Pintura
- BO - Bluepoint loamy sand
- BOA - Bluepoint-Onite-Wink
- BP - Bluepoint-Caliza-Yturabide
- DTB - Dona Ana-Berino
- LOD - Lozier-rock outcrop
- MTA - Mimbres -Tome
- MO - Mimbres silty clay
- NU - Nickel-Upton
- OP - Onite-Pajarito
- PGB - Pintura-Dona Ana
- PHB - Pintura-Tome-Dona Ana
- PN - Pinaleno-Nolam
- RG - Rock outcrop-argids
- RH - Rock outcrop-argids, cool
- RL - Rock outcrop-Lozier
- RRF - Rock outcrop-Lozier
- SH - Simona-Harrisburg
- TDB - Tome silt loam
- TE - Tencee-Upton
- TF - Terino-Casito

Fort Bliss Boundary
Highway
Road

Source: USDA, 1996

Where soils overlap county boundaries, the soil name from the most recent soil survey was used.

SCALE
0 2.5 5 Miles
0 2.5 5 Kilometers

Area Shown
FORT BLISS

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Figure 6-3. Distribution of Soil Associations in the Doña Ana Range–North Training Areas.

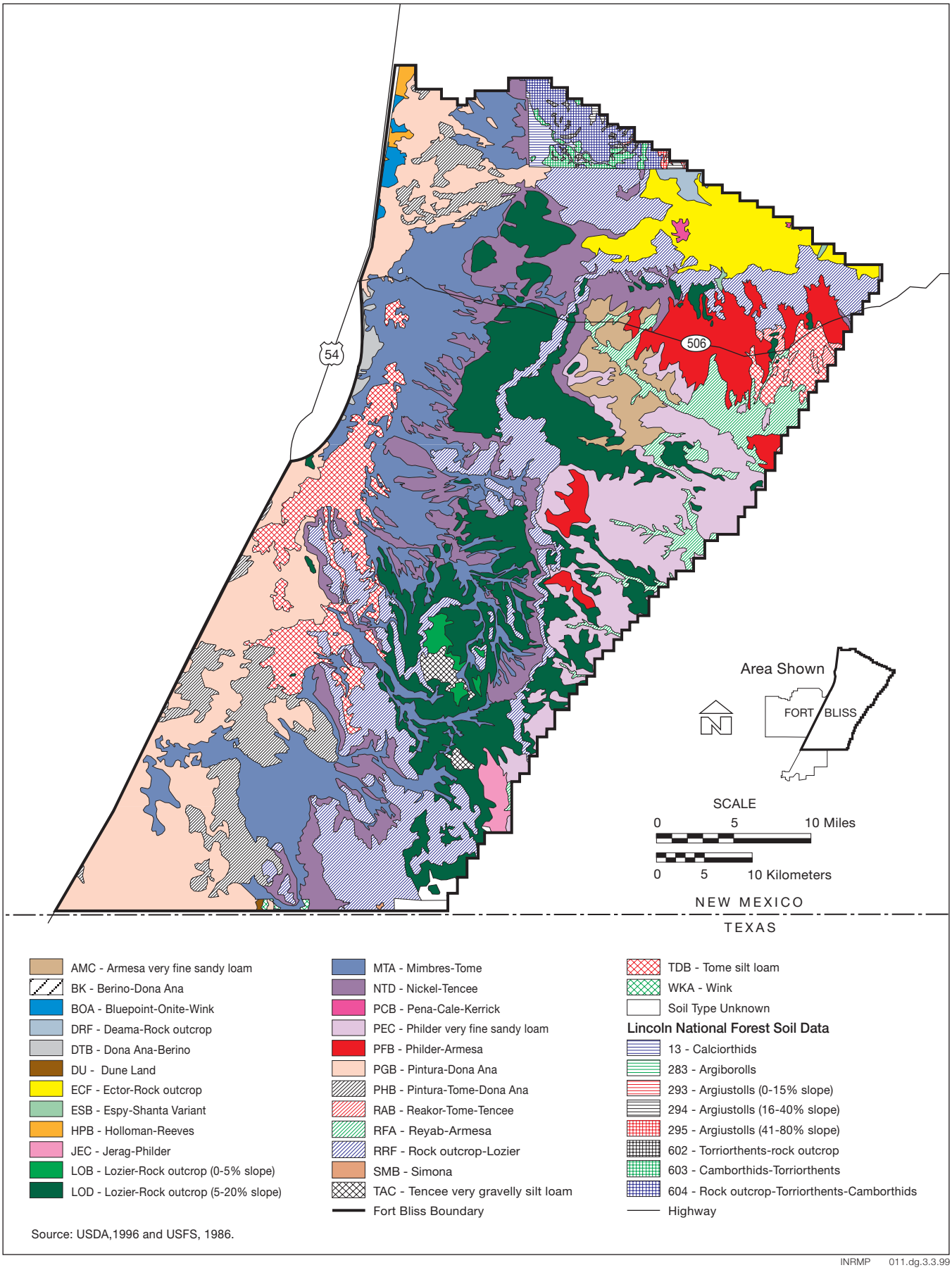

Figure 6-4. Distribution of Soil Associations on McGregor Range.

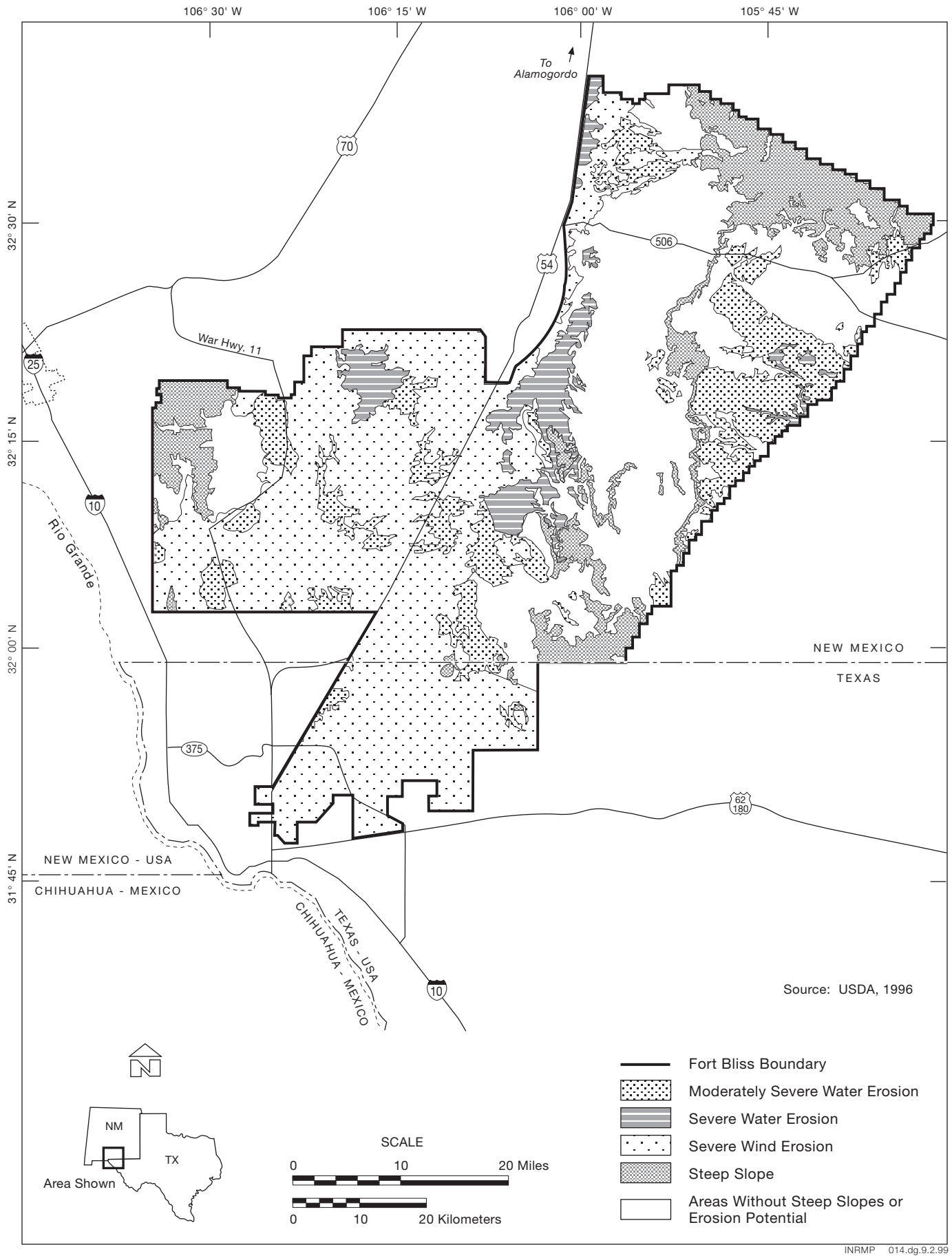

Figure 6-5. Steep Slopes and Erodible Soils within Fort Bliss.

Soil contamination is not a major problem in the Fort Bliss area, although the potential for releases of reportable soil contaminants does exist.

6.6 WATER RESOURCES

Although military water use is only about 3 percent as large as municipal use in the El Paso area, including Ciudad Juárez, factors that affect El Paso water supplies also affect military supplies. As the population and water use of El Paso continue to expand, and water supplies in the Hueco Bolson approach depletion, municipal water may become more expensive or result in indefinite deliveries to customers. Contingency plans, including the current water conservation policy, are considered for future water shortages. Water conservation is beneficial even when water supplies are plentiful. Fort Bliss already has a residential water conservation policy in effect that limits outdoor watering during the summer (Costello, 1997).

6.6.1 Surface Water

The only significant surface water body near Fort Bliss is the Rio Grande. The Rio Grande is used by local municipalities and industries to partially fulfill their water needs.

Water from the Rio Grande is part of a U.S. Bureau of Reclamation (USBR) irrigation project that regulates and administers the flow of the Rio Grande below Elephant Butte Reservoir in New Mexico. The reservoir stores and releases water for power generation. Caballo Reservoir, downstream of Elephant Butte Reservoir, regulates releases to meet downstream demands through the January to October irrigation season. Five diversion dams on the river divert flows to the Elephant Butte Irrigation District, New Mexico; the El Paso County Water Improvement District #1 (EPCWID), Texas; and to Mexico (Cushing, 1996).

The Rio Grande Compact Commission apportions water from the river among Colorado, New Mexico, and Texas by interstate agreement. The compact provides for normal releases of 790,000 acre feet per year (afy) to the irrigation districts, including 60,000 afy to Mexico. In a normal water year the EPCWID allotment is 43 percent of the available U.S. project water, or about 310,000 afy (El Paso County, 1992). Return flows and other water entering the system below Caballo Reservoir increase the amount delivered to the EPCWID in a normal year to about 360,000 afy. In years when Rio Grande flows are below normal, less than full allotments are released, and the deliveries are decreased proportionately. Provisions of the contract allow Colorado and New Mexico to incur debits in their deliveries to Texas and to cancel accrued debits when reservoir spills occur during years of high flow (Cushing, 1996). Currently, almost all of the agricultural production in El Paso County occurs within the irrigated area of the EPCWID and areas contiguous to the district that irrigate with groundwater. The EPCWID has an area of 76,114 acres, and the contiguous areas irrigated by pumping on an additional 8,600 acres (USBR, 1973).

El Paso is an EPCWID customer. Municipal and industrial supplies are obtained through water rights owned, leased, and assigned through the USBR and through purchased rights. Municipal and industrial waters are diverted at river plants in El Paso and Zaragosa, Texas, during the irrigation season. Diversions, which represent approximately 43 percent of El Paso's total municipal and industrial supply (Cushing, 1996), amounted to 46,166 acre feet (af) in 1996 (Sperka, 1997).

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The quality of the Rio Grande water, which generally is of the sodium sulfate type, varies greatly during the year because of return flows of irrigation water between Caballo Dam and El Paso. Concentrations of sulfates and total dissolved solids (TDS) increase during the irrigation season until, near the end of the season, the water quality reaches a point where it no longer meets federal drinking water standards after

treatment. The quality remains below standards until the following irrigation season. Shortly after irrigation releases begin in late winter, water quality improves sufficiently to be utilized by the treatment plants (EPWU, 1995).

Surface water is preferred over groundwater for irrigation because of its lower cost and, in the Hueco Bolson, the superior quality of the river water. However, during years of inadequate surface-water supply, shallow wells in the Rio Grande alluvium are pumped to augment the diversions. In 1985, 99 percent of the water used for irrigation was diverted from the Rio Grande. In that year almost 164,000 af, 57 percent of water used for all purposes in El Paso County, was used for irrigation (Texas Water Development Board [TWDB], 1988).

The Army controls the rights to 50,000 and 60,000 gallons per day from Carrisa Springs and the Sacramento River, respectively, (USDI, 1990b). This diverted water is transported, via three pipelines; one crosses the northwest quarter of McGregor Range to Oro Grande, New Mexico, and the other two supply water to numerous storage tanks and water troughs across Otero Mesa (Figure 6-6).

The McGregor pipeline system (exclusive of the Oro Grande system) is a large gravity-fed water network operated and maintained by the BLM for wildlife and livestock use. 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 (sources) 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 use gravity flow from this reservoir, or bypass it (or a combination of both), 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 (BLM, 1985). A smaller system, the El Paso line, runs through El Paso Canyon to the east boundary of McGregor Range in the north part of Otero Mesa.

Wetlands and arroyo-riparian drainages have been studied on Fort Bliss. The U.S. Army Corps of Engineers (USACE) Waterways Experiment Station has mapped and characterized all Waters of the U.S., including wetlands on Fort Bliss (U.S. Army, 1996d; 1997a). 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 within 12 inches of 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]). These probable Waters of the U.S. are shown in Figure 6-7. 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 are not jurisdictional wetlands and therefore not regulated by the USACE. However, abandoned stock tanks and other man-made features may be regulated if they conduct and/or hold surface water (U.S. Army, 1996d).

Observations were made at 226 locations on McGregor Range and the South Training Areas, including dry washes, 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 the collection of data on plant species and percent cover, hydrology, soils, and surrounding upland vegetation. Based on this analysis, the Waters of the U.S. on McGregor Range and the South Training Areas included 1,291 dry washes with distinct stream beds and stream banks covering 2,475 miles. In addition, 13 natural dry lakes with distinct ordinary high water marks totaling 134 acres, and 110 artificial bodies

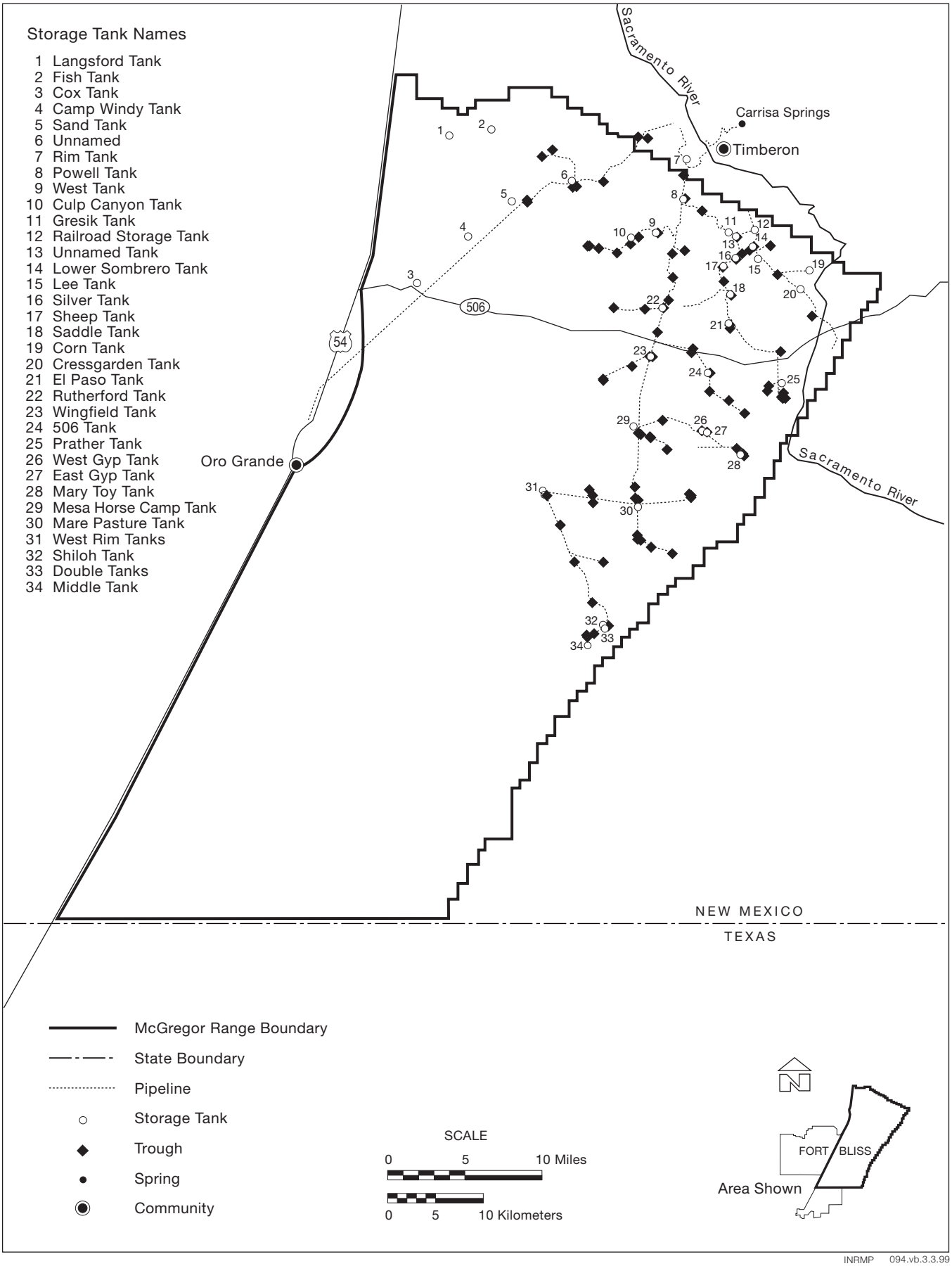

Figure 6-6. Water Pipelines, Storage Tanks, and Watering Troughs on McGregor Range.

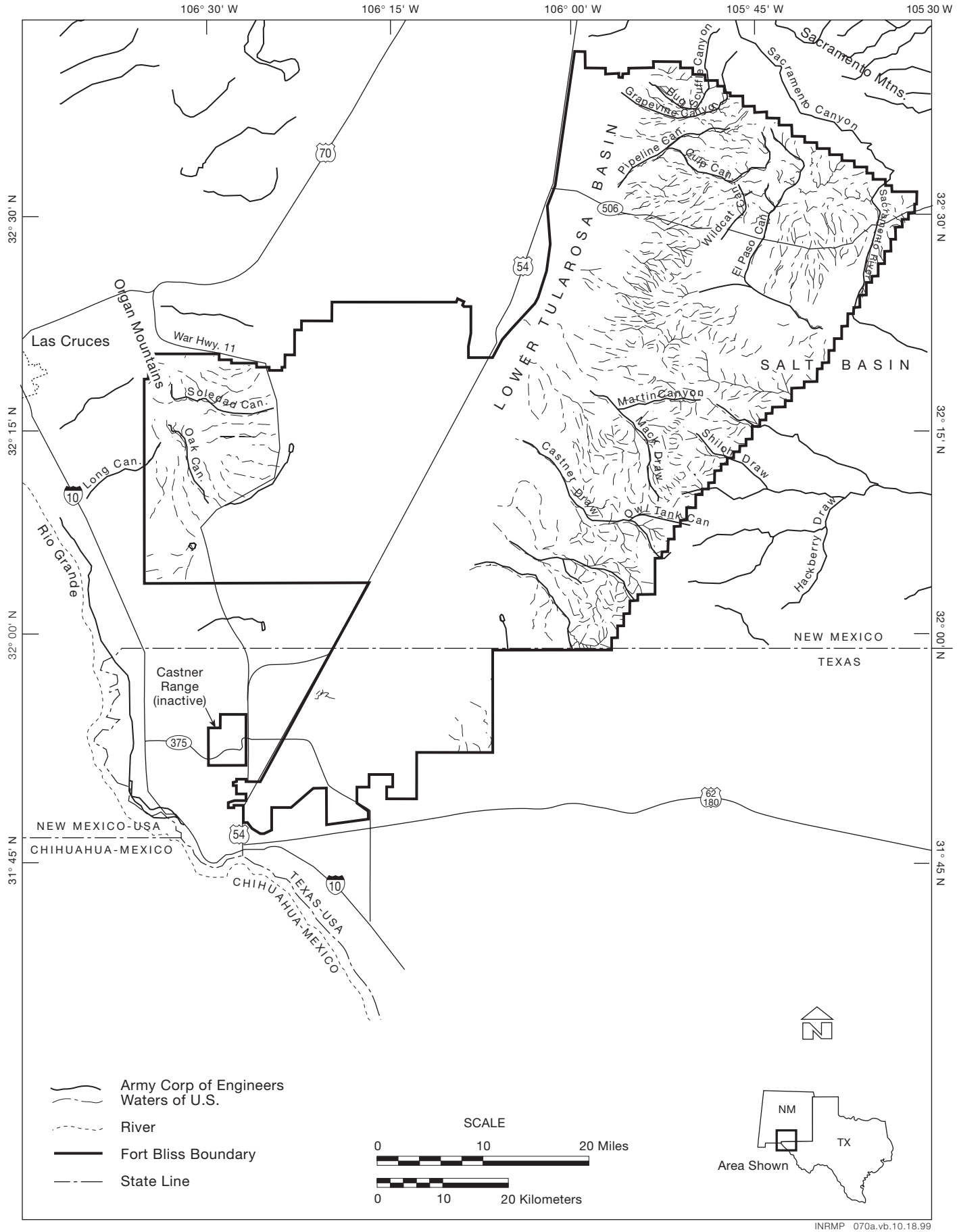

Figure 6-7. Probable Waters of the U.S. on Fort Bliss.

of water such as sewage treatment ponds, storm water retention basins, and stock tanks totaling 691 acres were mapped (U.S. Army, 1996d). Data was collected from 117 observation points and 21 sample locations on Doña Ana Range–North Training Areas and based on this, 105 dry washes with distinct stream beds and stream banks comprising 532 miles were mapped. Nine dry lakes and ponds with distinct ordinary high water marks totaling 159 acres were also mapped. In addition, 21 artificial water resources including sewage treatment ponds, storm water retention basins, and stock tanks comprising 19 acres were mapped (U.S. Army, 1997a).

The vast majority of arroyo-riparian drainages on Fort Bliss do not qualify as USACE jurisdictional wetlands but, as indicted 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 have been determined. However, the flora and fauna of arroyo-riparian drainages on Fort Bliss and elsewhere have not been fully studied (Cockman, 1996; Kozma, 1995).

Playa lakes are also present on Fort Bliss in the Tularosa Basin and Hueco Bolson. Playas are depressional areas in the central portions of closed drainage basins that receive surface water flow from surrounding areas. Playas are dry for most of the year; however, fine-grained sediments, mostly sand, silt, and clay are deposited in thin horizontal layers after seasonal heavy rains. Since water permeability is slow and shallow, standing water may remain up to a few weeks following heavy rains. Playas have a higher content of silt and clay soils (more stable soils) than surrounding areas. This factor enables them to contain a higher diversity of grasses and shrubs, which increases habitat diversity and increases water-holding capacity in the arid environment. However, playas are subject to greater vegetational losses through soil compaction than adjacent areas.

6.6.2 Groundwater

Groundwater is obtained from both fluvial and lacustrine deposits, although fluvial aquifers are the primary source for the area. Groundwater at Fort Bliss comes from two major basins, the Hueco Bolson and the Mesilla Bolson, which are separated by the Franklin Mountains. Thirty-nine deep wells from the Hueco Bolson aquifer provide most of the water used at Fort Bliss. The Hueco Bolson is located in the southern half of the Tularosa Basin paralleling the eastern base of the Franklin Mountains. It contains fill material consisting primarily of fluvial and lacustrine deposits with a maximum thickness of 9,000 feet. Groundwater recharge is provided by the runoff of precipitation percolating through alluvial deposits at nearby mountain bases. The fresh water aquifers in the Hueco Bolson are of very high quality and require only chlorination. Chemical analyses (EPWU, 1990) showed that TDS, chloride, sulfate, and nitrate concentrations do not meet state and federal standards.

The Mesilla Bolson lies on the west side of the Franklin Mountains, extending along the Rio Grande Valley through New Mexico and Mexico. The geology in the Mesilla Bolson is similar to that of the Hueco Bolson, with basin fills that are contemporaneous formations of Recent and Sante Fe geologic periods. Fort Bliss uses only limited water resources from Mesilla Bolson.

6.6.3 Water Quality

6.6.3.1 Intrusion of Saline Water

Increasing dissolved solids concentrations in fresh-water zones of both the Hueco and Mesilla bolsons are attributed mainly to downward leakage of brackish water from shallow zones and possible upconing of brackish water from below as a result of pumpage. Water analyses from wells completed in the Hueco Bolson show an average annual increase in dissolved solids of about 10 milligram per liter (mg/L) since

the 1950s and 1960s in Texas, and about 30 mg/L since the 1970s in Ciudad Juárez. In parts of downtown El Paso and Ciudad Juárez, the dissolved solids concentration in groundwater has increased at rates of 40 to 60 mg/L per year during these periods. Concentrations of dissolved solids have increased also in groundwater produced from the intermediate zone of the Mesilla Bolson, at an average rate of about 9 mg/L per year (White, 1983).

In 1993, 20 city wells in the Lower Valley, Town, and Water Plant well fields produced water that exceeded the maximum contaminant level (MCL) for TDS or chloride, and were shut down. Many of those wells were being recharged with treated surface water in 1994 to extend their lives. Chloride concentrations are increasing at the Eastwood well field and the East Airport well field (adjacent to Fort Bliss wells), where water from as many as 11 wells exceeds the 300 mg/L limit. Blending of water in the Montana reservoir has been satisfactory, but it is a temporary solution (EPWU, 1995). By 1997, the water from four wells in the East Airport well field was too saline to be blended, and the wells were not being used (Sperka, 1998). The water from seven high-salinity wells was being blended successfully. The maximum field capacity of 34.38 million gallons per day (mgd) had decreased to 24.26 mgd because of salinity, and without blending, only 13.14 mgd could be produced. Projections for the East Airport well field indicate that by 2005, maximum field capacity will decrease to 7.05 mgd with blending and 8.24 mgd without blending (Orr and Risser, 1992), and by 2015 the respective quantities will be 12.48 mgd and 6.37 mgd (Sperka, 1998).

Recent analyses of water from the Fort Bliss well fields indicate a range of 300 to 500 mg/L TDS (Mathis, 1997). Evaluation of water quality data from 1992 to 1995 did not show any problems with the Fort Bliss water supply. All constituents were below regulated MCLs. Maximum concentrations of arsenic at Biggs AAF, Site Monitor, and Main Base wells are 0.0062, 0.0056, and 0.0032 mg/L, respectively. If the MCL remains at 0.05 mg/L no treatment will be necessary, but if the MCL is reduced to less than 0.0032 mg/L, as proposed, treatment will be required at all three water systems (U.S. Army, 1996d). Future declines of water levels in the Hueco Bolson can be expected to result in increasing salinity in the Fort Bliss area.

6.6.3.2 Fort Bliss Municipal Solid Waste Landfill

Domestic solid waste generated on Fort Bliss is collected and disposed of by a private contractor at a 106-acre landfill 3 miles north of the intersection of Fred Wilson Avenue and Chaffee Road. Investigations by the U.S. Geological Survey (USGS) (Abeyta, 1995) examined hydrogeologic conditions in the area and potential contamination of the local aquifer due to the landfill. The investigation determined a 200-year travel time for leachate to reach the aquifer, in the event of a leak through the engineered barrier system. No evidence was found to indicate that the landfill is causing any water-quality deterioration of the aquifer in that part of the Hueco Bolson.

6.6.3.3 Old Mesa Well Field

In the early 1900s, the Old Mesa well field, a high-density municipal well field, was located on parts of the main cantonment and Biggs AAF and on city land. The general area is bounded on the west by Railroad Drive, on the east by Airport Road, and centered on Fred Wilson Drive. Before abandonment of the field in 1926, a private company, predating EPWU, drilled 100 to 200 small-diameter wells. The firm subsequently went out of business, and most of the wells were left uncapped (Cushing, 1997). A USGS investigation (White, 1983) located nine of the Old Mesa wells, four of which had shallow groundwater seeping into them. The investigation concluded that a "substantial amount" of inferior-quality groundwater with high TDS and nitrate concentrations is being recharged into the Hueco Bolson aquifer through the abandoned wells. The seepage is believed to originate from urban runoff and possibly by deep percolation of lawn irrigation water. Fort Bliss is aware of the situation, and is planning an

investigative survey to determine the nature and extent of any contamination and to locate and cap abandoned wells in accordance with state and federal regulations (Cushing, 1997).

6.7 BIOLOGICAL RESOURCES

As a result of its large size (1.11 million acres) and varied topography, Fort Bliss exhibits a high degree of biodiversity. The vegetation mirrors this diversity in that plant communities on post range from the Chihuahuan Desert plant communities in the Tularosa Basin to Rocky Mountain conifer forests in the Organ Mountains (U.S. Army, 1996c; 1997b). Of the approximately 4,000 plant species in New Mexico, an estimated 300 nonvascular (lichen, mosses, liverworts) and 1,200 vascular (ferns, fern allies, ephedras, conifers, flowering plants) species occur on Fort Bliss, with over 800 taxa in the Organ Mountains alone (Corral, 1997; Worthington et al., 1997). Table B-1 includes an account of known and expected plants on Fort Bliss. There are several endemic plant species in the Organ (four species) and Hueco, (one species) mountains of Fort Bliss. Most of the known populations of these plant species in the Organ Mountains and the entire population in the Hueco Mountains occur on the installation.

Wildlife species diversity is also high where, 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). There are an estimated 768 species of birds in New Mexico and 335 species (43 percent) have been recorded on Fort Bliss (U.S. Army, 1996e; 1996c; 1997d).

From a regional perspective, Fort Bliss supports some of the most important examples of southwestern ecosystem types such as black grama grasslands on McGregor Range and relatively undisturbed forests and woodlands in the Organ Mountains. The Organ Mountains are an exceptionally important area in terms of quality and diversity in the Southwest. Numerous endemic and sensitive species occur in these mountains, and they support Rocky Mountain forests and woodlands that have been left relatively undisturbed for the last 50 years with some higher elevation areas probably undisturbed since the 1880s. Other areas such as WSMR, Carlsbad Caverns National Park, Big Bend National Park, and various preserves and national parks in Arizona also support important examples of southwestern ecosystem types. However, these areas do not support the same type and mix of ecosystems as Fort Bliss, which indicates that some of the ecosystems on Fort Bliss are important from a regional perspective (U.S. Army, 1997b).

6.7.1 Vegetation Diversity of Fort Bliss

The varied and uplifted geology of the Southwest and the resulting variation in climate and soils has created a mosaic of abiotic and biotic environments. The great biodiversity of this region is the result of the interaction of several factors, including topographic relief and the associated heterogeneity of climate, influence from several biogeographic realms, variation in vegetation structure, dynamic climate, and periodic disturbance (Van Devender, 1986). Additionally, climatic and temperature gradients have long been recognized as central factors influencing distribution of habitats in the Southwest (Parmenter et al., 1995).

The major plant community types in the area of Fort Bliss 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 of Fort Bliss was characterized and mapped (U.S. Army, 1996c; 1997b) and this section is based on those reports. The vegetation on Fort Bliss is diverse, ranging from Chihuahuan Desert scrub in the Tularosa Basin to Rocky Mountain conifer forests in the Organ Mountains (Figures 6-8, 6-9, and 6-10).

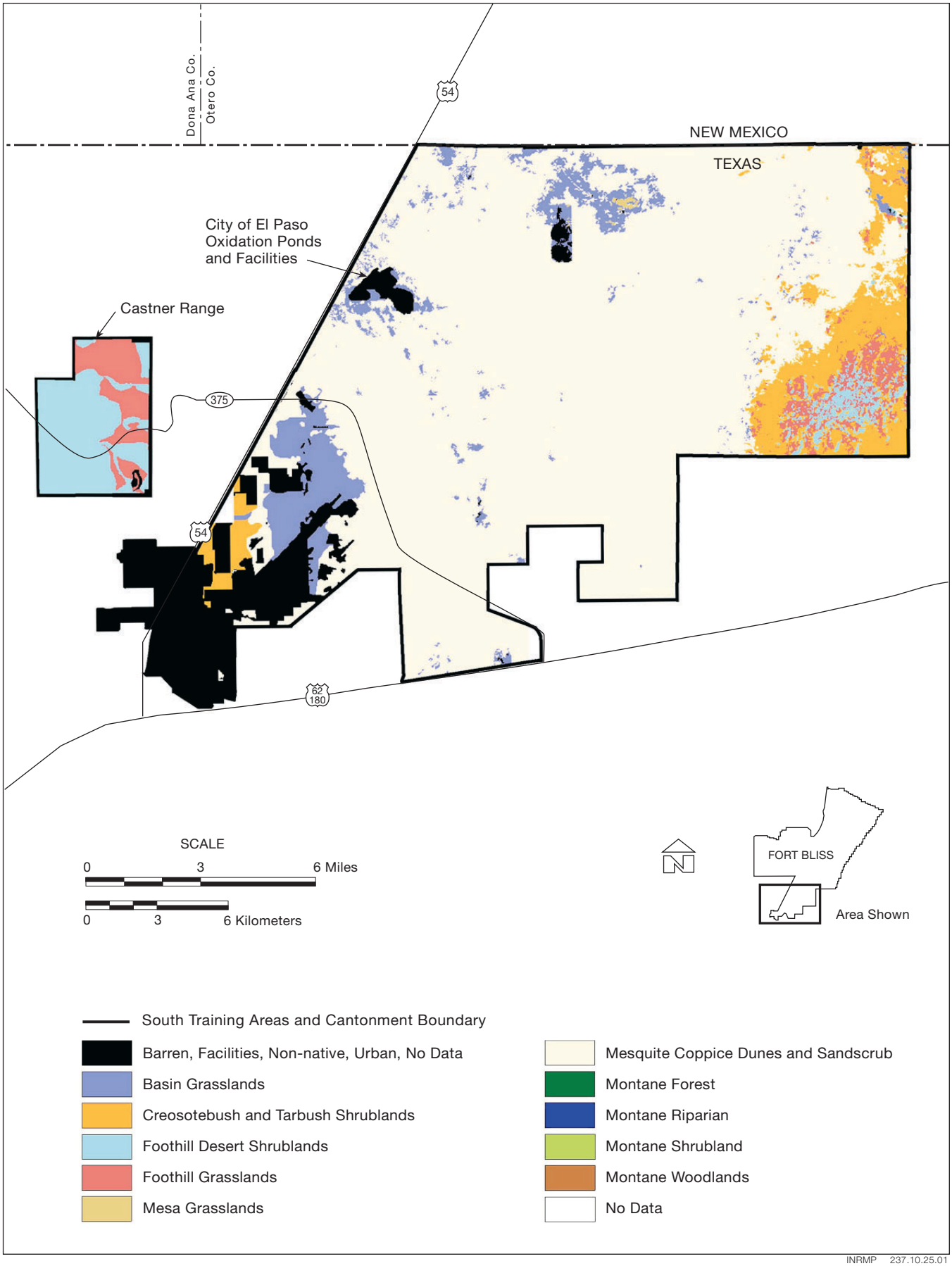

Figure 6-8. South Training Areas and Cantonment Vegetation.

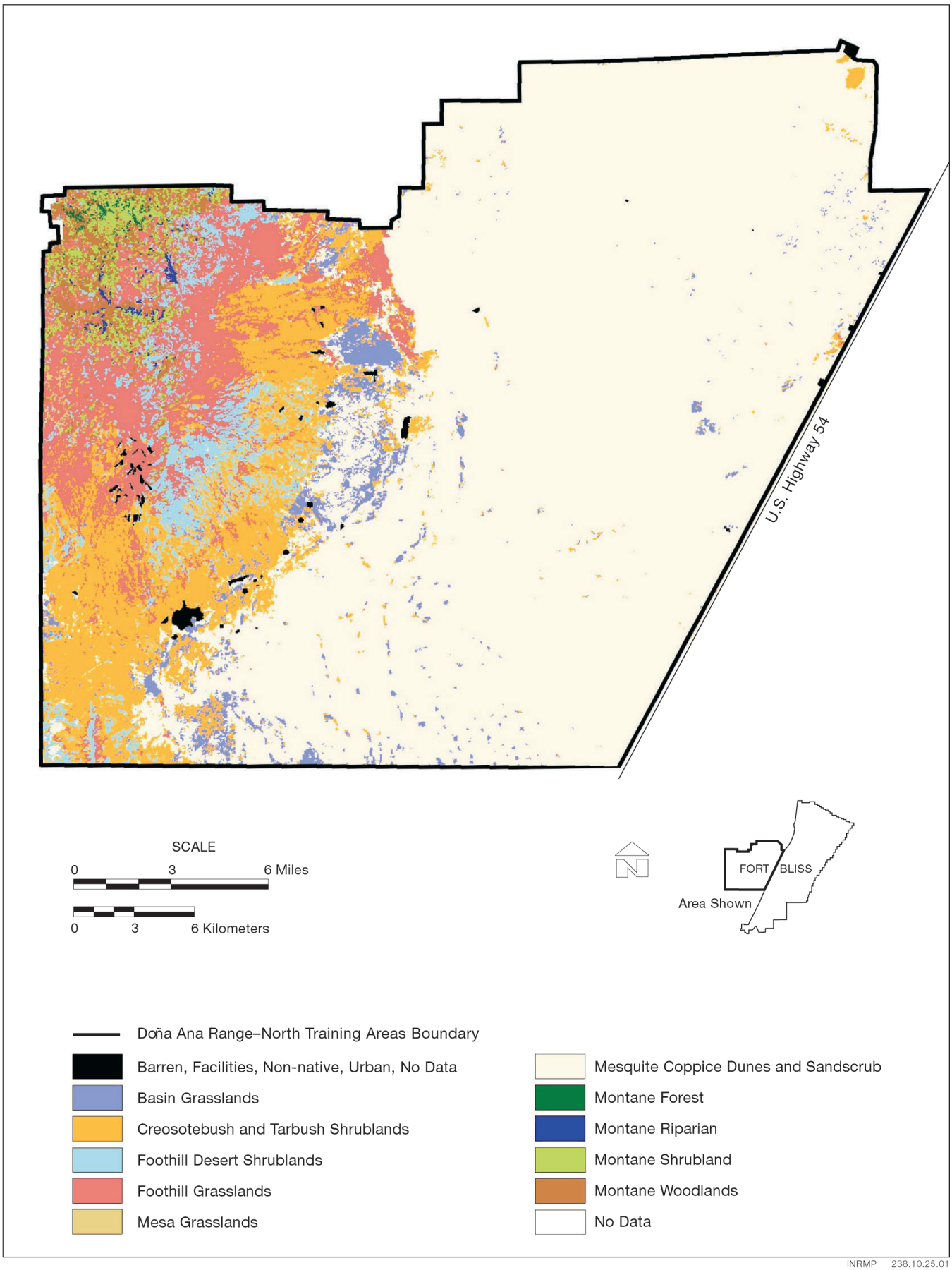

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Figure 6-9. Doña Ana Range–North Training Areas Vegetation.

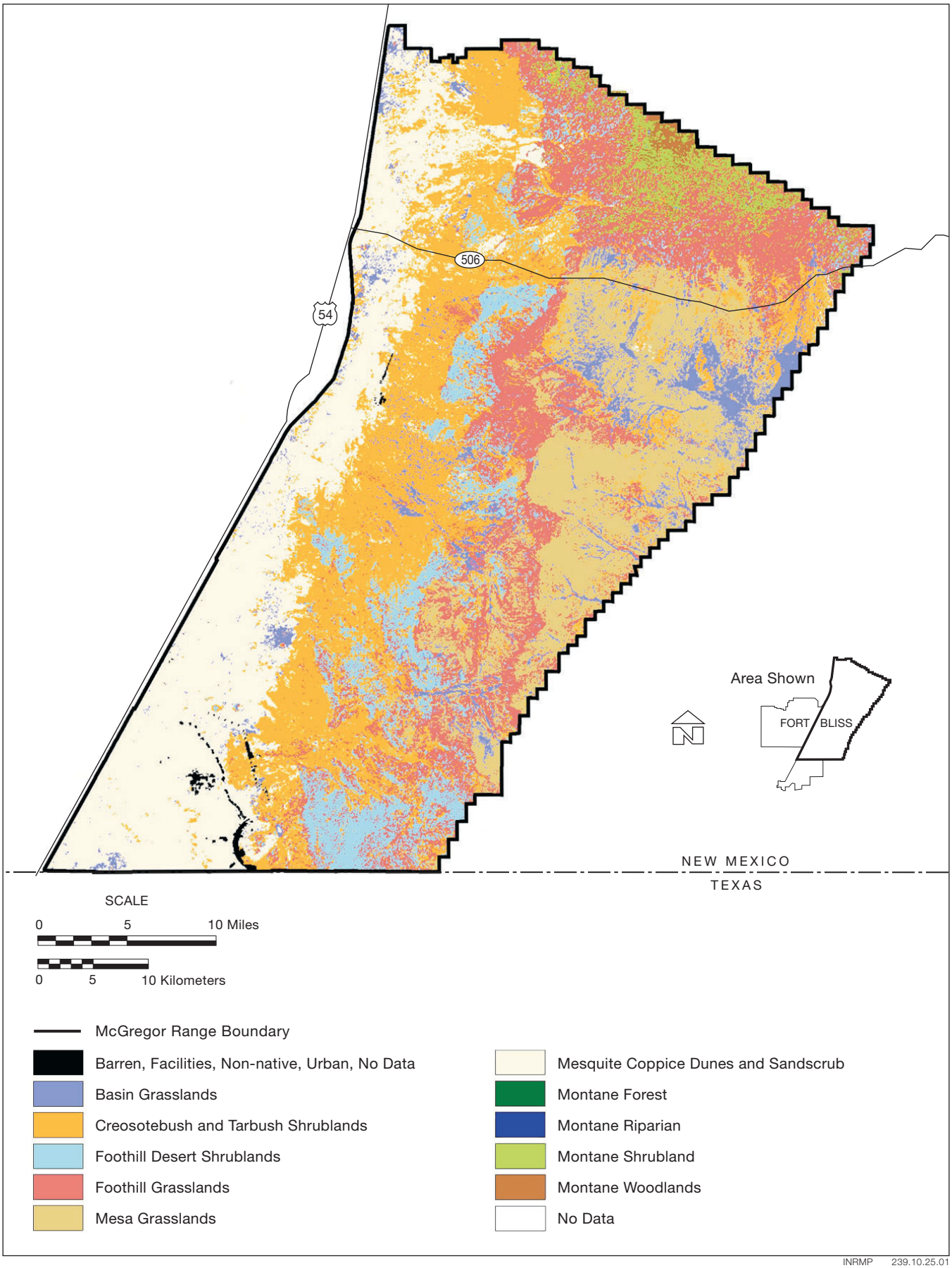

Figure 6-10. McGregor Range Vegetation.

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*). This woodland type also occurs in the Organ Mountains as well as oak woodlands and Rocky Mountain montane conifer forest.

The plant communities and other areas on the main cantonment, the South Training Areas, Doña Ana Range–North Training Areas, and McGregor Range were mapped using satellite imagery (U.S. Army, 1996c). Table 6-4 lists the 36 mapping units, a description of each unit, and the approximate acreage and proportion of Fort Bliss mapped in each unit. Five of the 36 mapping units are not actual vegetation communities. Three have to do with human use; urban, non-native vegetation of golf courses, parade fields and parks, and military facilities such as the infrastructure associated with firing ranges and assembly areas. Less than 2 percent of the installation is mapped as military facilities, non-native vegetation, or urban settings. The 36 mapping units were lumped into 11 categories (Table 6-5) and mapped (Figures 6-8 through 6-10). The various types of shrubland total 746,049 acres (67.04 percent), 342,576 acres of grasslands (30.78 percent), and 10,184 acres of woodland (1 percent) (Table 6-5).

As indicated in tables above, about 67 percent of Fort Bliss is desert shrublands, mostly in the Tularosa Basin (see Figures 6-8, 6-9, and 6-10). About 438,850 acres of the shrublands (39 percent of Fort Bliss) are covered with mesquite-dominated plant communities most of which are coppice dunes. Creosote-dominated plant communities cover 209,708 acres or 18 percent of the total land. 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, more than 86,000 acres of a 144,500-acre study area on the Jornada Experimental Range were grasslands with no shrubs in 1858; no such habitat remained by 1963. 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. Mesquite-dominated areas have continued to expand even after livestock have been removed from the range for many years. Long-term studies in permanent enclosures at the Jornada Experiment Station from 1935 to 1980 showed that black grama grass had totally disappeared by 1980, even in areas where it was the dominant 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 cattle grazing and drought. 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 Herbal, 1965). Openings created by the reduction in grass cover were occupied by mesquite and 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 re-established (Hennessy et al., 1983).

Table 6-4. Number of Acres and Description of 36 Mapping Units at Fort Bliss

Plant Community (Mapping Units)	*Number of Acres (% of Total)*	*Description*
	Shrublands	
Basin desert shrublands (coppice dunes) (1)	342,429 (30.72)	Consists of 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.

Table 6-4. Number of Acres and Description of 36 Mapping Units at Fort Bliss (Continued)

Plant Community (Mapping Units)	*Number of Acres (% of Total)*	*Description*
	Shrublands	
Plains/coppice dunes sandscrub (2)	39,773 (3.57)	Sandsage (*Artemisia filifolia)* common with some mesquite and mesa dropseed. Occurs at north and south end of coppice dune fields.
Plains sandscrub (3)	48,741 (4.37)	Sandsage/mesa dropseed common plants. Located on sandy areas mostly in Tularosa Basin with small amounts on Otero Mesa
Basin desert shrubland (4)	7,907 (0.71)	Dominated by honey mesquite and alkali sacaton (*Sporobolus airoides*) in broad clay depressions at northern edge of coppice dunes.
Basin/lowland desert shrubland (5)	40,793 (3.66)	Bottomland tarbush (*Flourensia cernua*) dominant 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)	94,614 (8.49)	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.
Lower piedmont desert shrubland–creosotebush and honey mesquite (7)	7,770 (0.70)	Creosotebush and honey mesquite are dominant. Occurs on gravely or silty soils on eastern piedmont of the Organ Mountains
Upper piedmont desert shrubland–creosotebush and bush muhly (8)	66,531 (5.97)	Dominated by creosotebush and bush muhly. Occurs on gravely soil of the upper piedmont and Sacramento Mountains foothills
Foothill desert shrubland–white thorn acacia (9)	42,895 (3.85)	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–mimosa/sideoats grama (10)	2,373 (0.21)	Dominated by mimosa (*Mimosa aculeaticarpa*) and sideoats grama. Occurs on gravely slopes in canyons on the east side of the Organ Mountains
Foothill desert shrubland–ocotillo - mariola (11)	9,977 (0.89)	Ocotillo and mariola (*Parthenium incanum*) are common plant species. Occurs on the rocky foothills of the Sacramento, Organ, and Franklin Mountains.
Foothill desert shrubland–Lechugilla /sideoats grama (12)	13,978 (1.25)	Dominated by lechugilla (*Agave lechuguilla)* and sideoats grama. Occurs on all aspects of the Hueco Mountains and unnamed hills.
Montane shrubland–mountain mahogany (13)	22,921 (2.06)	Mountain mahogany (*Cercocarpus montanus)* , curlyleaf muhly, and New Mexico needlegrass are dominant. Occurs predominantly on rocky south facing slopes at mid-elevation in the Organ and Sacramento Mountains.
Montane shrubland–Gambel's oak (14)	716 (0.06)	Gambel's oak (*Quercus gambelii)* and whortleleaf snowberry (*Symphoricarpos oreophilus)* are dominant. Occurs in dense stands on north facing slopes at mid- to high- elevation in the Organ Mountains
	Grasslands	
Sandy plains desert grassland (15)	12,780 (1.15)	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 (16)	40,882 (3.67)	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 and Organ Mountains.
Basin/lowland desert grassland–burrograss (17)	2,881 (0.26)	Monotypic growth of burrograss. Occurs in drainages on Otero Mesa and broad alluvial depressions in the basin.
Upper piedmont desert grassland (18)	7,307 (0.66)	Codominants are black grama, Torrey's jointfir (*Ephedra torreyana)*, and honey mesquite in the gravely upper piedmont of the Organ Mountains

Table 6-4. Number of Acres and Description of 36 Mapping Units at Fort Bliss (Continued)

Plant Community (Mapping Units)	*Number of Acres (% of Total)*	*Description*
Foothills piedmont desert grassland (19)	32,854 (2.95)	Black and sideoats grama dominant with soaptree yucca and creosotebush. Occurs on gravely footslopes and piedmont of the Sacramento, Hueco, and, Franklin Mountains.
Foothills grassland (20)	58,269 (5.23)	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 (21)	7,694 (0.69)	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 (22)	89,233 (8.00)	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.
Mesa grassland–black and blue grama/banana yucca (23)	5,867 (0.53)	Black and blue grama plus banana yucca are dominant. Occurs on shallow soils on southern Otero Mesa
Mesa/foothills grassland (24)	18,026 (1.62)	New Mexico needlegrass (*Stipa neomexicana),* sideoats grama, black grama, banana yucca common. Occurs on rocky ridges of slopes of the southern Otero Mesa
Foothills grassland–sideoats grama, curlyleaf muhly (25)	55,639 (4.99)	Sideoats grama, curleyleaf 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.
Foothills grassland–sideoats grama/sotol (26)	5,136 (0.46)	Dominated by sideoats grama, common sotol, and hairy grama (*Bouteloua hirsuta)*. This type found on low to mid elevation slopes in canyons of the Organ Mountains
Piedmont grassland (disturbed) (27)	3,898 (0.35)	Streambed bristlegrass (*Setaria leucopila)* and Arizona cottontop (*Digitaria californica)* are common species. Occur in areas disturbed by exploded ordnance on the piedmont east and west of Rattlesnake Ridge in the Organ Mountains
Woodlands		
Montane riparian (28)	405 (0.04)	Composed of forested and shrub dominated riparian plant communities; coyote willow (*Salix exigua)*, box elder (*Acer negundo)*, and velvet ash (*Fraxinus velutina)* are common species. Occurs in mountain valley drainages in the Organ Mountains
Woodland–oneseed juniper (29)	2,878 (0.26)	Oneseed juniper, curlyleaf muhly, and hairy grama are dominant. Occurs on rocky, gravely slopes at moderately high elevation in the Sacramento and Organ Mountains.
Woodland–pinyon pine (30)	6,532 (0.59)	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 and Organ Mountains.
Conifer forest (31)	369 (0.03)	Ponderosa pine (*Pinus ponderosa)*, Douglas fir (*Psuedotsuga menziesii)*, Gambel's oak, and mountain muhly (*Mulenbergia montana)* are common species. Occurs on the upper elevation of the Organ Mountains generally on steep slopes.

Table 6-4. Number of Acres and Description of 36 Mapping Units at Fort Bliss (Continued)

Plant Community (Mapping Units)	*Number of Acres (% of Total)*	*Description*
Other Categories		
Barren lands (32)	1,377 (0.12)	Areas with less than 10% vegetation cover, including rock outcrops.
Military facilities (33)	2,551 (0.23)	Permanent infrastructure such as found at firing ranges and assembly areas.
Non-Native Vegetation (34)	2,225 (0.20)	Parade grounds, golf courses, former farmlands, storm water catchments, and other areas.
Urban (35)	7,808 (0.70)	Buildings and paved areas.
No Data (36)	8,739 (0.78)	Areas not mapped to this level of vegetation classification, mainly Castner Range, but includes recent boundary adjustments in GIS.
Total	*1,114,768*	

U.S. Army, 1996c

Table 6-5. Summary of Desert Shrubland, Grassland, and Woodland Plant Communities and Disturbed Ground on Fort Bliss

General Plant Community Type	*Mapping Units* [a]	*Acres* [a]	
		Number	*Percent*
Shrublands			
Mesquite coppice dunes and sandscrub	1, 2, 3, 4	438,850	39.40
Creosotebush and tarbush shrublands	5, 6, 7, 8	209,708	18.08
Foothill desert shrublands	9, 10, 11, 12	73,854	6.20
Montane shrublands	13, 14	23,637	2.10
Total shrublands		*746,049*	*67.04*
Grasslands			
Basin grasslands	15, 16, 17	56,543	5.10
Mesa grasslands	21, 22, 23, 24	120,820	10.80
Foothill grasslands	18, 19, 20, 25, 26, 27	165,213	14.80
Total grasslands		*342,576*	*30.78*
Woodlands			
Montane riparian	28	405	0.04
Pinyon/juniper woodlands	29, 30	9,410	0.84
Conifer forest	31	369	0.03
Total woodlands		*10,184*	*0.91*
Other			
Barren, Facilities, Non-Native, Urban, and No Data	32, 33, 34, 35, 36	15,959	1.43
Total		*1,114,768*	*100.00*

[a] From Table 6-2.
Source: U.S. Army, 1996c.
Note: Mapping units renumbered from those presented in the source document.

Once established, coppice dunes persist. The return to grasslands, even in areas where livestock have been excluded for many years, is highly unlikely (Buffington and Hebler, 1965; Hennessy et al., 1983). Chemical treatment has proven successful in reducing mesquite growth over the short-term (about 3 years). Satellite imagery data over a several-year period was used to track photosynthetic activity on the mesquite canopy. No ground transects were sampled. The satellite data indicated that during the first 3 years of 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 342,576 acres, which accounts for over 30 percent of the land on Fort Bliss (Table 6-5). Within Fort Bliss, Otero Mesa covers about 152,706 acres (U.S. Army, 1996c) and most of this area is covered by grassland plant communities. The remainder of the grassland plant communities occur in the Tularosa Basin and in the foothills of the Organ Mountains.

Woodland plant communities cover about 10,184 acres or about 1 percent of Fort Bliss (Table 6-5); these plant community types are in the Organ Mountains and Sacramento Mountains foothills. Pinyon pine-juniper woodlands occur in both mountain ranges. The montane riparian and montane conifer forest occur only in the Organ Mountains. In addition, montane shrublands dominated by mountain mahogany occur in both mountain ranges, while montane shrublands dominated by Gambel's oak occur in the Organ Mountains only (U.S. Army, 1996c).

The South Training Areas are located in Texas, and Chihuahuan Desert shrublands dominate this area. Figure 6-8 shows a triangular area of roads, facilities and barren areas in the southwest corner of the South Training Areas along U.S. Highway 54. Basin desert shrublands dominated by honey mesquite coppice dunes and sandscrub are common here; four-winged saltbush is also evident in this type and mesa dropseed is in the sparse understory. In some areas, sandsage is common along with mesquite. Basin and mesa grasslands occur in the north central portion of these training areas. The mesquite dunes give way to the creosotebush plant community on the east side of the South Training Areas (Figure 6-8). Bush muhly and tarbush are common in some areas. Creosotebush gives way to foothills desert shrublands dominated by lechugilla and creosotebush on the shallow rocky slopes of the Hueco Mountains. Grasslands are supported on the alluvial deposits of these mountains and sideoats grama and black grama are common (U.S. Army, 1996c).

On the Doña Ana Range–North Training Areas the dominant plant community type in the eastern two-thirds is mesquite coppice dunes (Figure 6-9). The dunes give way to creosotebush-dominated areas which grade into foothill desert shrublands and grasslands on the Organ Mountains piedmont. The dominant shrubs in the foothill desert shrublands are creosotebush and mimosa, while black, sideoats, and hairy grama are common in the grassland plant communities. In the Organ Mountains, steep elevation gradients and diverse geological substrate combine to support the highest vegetation diversity on Fort Bliss. The mountains support Rocky Mountain conifer forests and woodlands and montane shrublands. Canyons support diverse woodland and grassland riparian plant communities (U.S. Army, 1996c).

On McGregor Range, coppice dunes and sandscrub plant communities dominate the western one-fifth of the range; honey mesquite is the dominant plant in some areas and sandsage is dominant in others (Figure 6-10). These types give way to creosotebush-dominated plant communities where tarbush and lowland 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 eastern part of McGregor Range is dominated by the Otero Mesa. Otero Mesa extends southeast off of McGregor Range. Vegetation on Otero Mesa is predominately basin and mesa grasslands dominated by black and blue grama with tobosa grass and burrograss in the broad drainages. New Mexico needlegrass and various shrubs can be found on rocky ridges. The Sacramento

Mountain 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 creosote and tarbush along other foothill desert shrublands at lower elevations (U.S. Army, 1996c).

The exclusion of grazing over much of Fort Bliss for as many as 86 years has resulted in large areas of land that have made significant recovery from grazing earlier in the century; some of the plant communities are approaching presettlement conditions such as the black grama/blue grama grassland, sand sagebrush, and mesa dropseed communities. One such area is a 123,500-acre black grama-blue grama grassland tract on and below southern Otero Mesa. 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. The black grama grasslands in this area are particularly important because they had been much reduced starting in the 19th century, as indicated above. Three high-quality sand sagebrush communities are also found on Fort Bliss. These communities are on the east side of the Jarilla Mountains in the central Tularosa Basin, on the Sacramento Mountains foothills, and on the northern Otero Mesa. The nearest known sand sagebrush plant community of the type found on northern Otero Mesa of similar high quality is 150 miles north on WSMR (U.S. Army, 1996c). Mesa dropseed grasslands occur on isolated patches within the mesquite coppice dune fields. One of the largest grasslands of this type (1,230 acres) is located along the New Mexico/Texas border near Newman, and another dropseed grassland 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. These high-quality vegetation types plus the Organ Mountains comprise about 15 percent of Fort Bliss, while about 45 percent of Fort Bliss is built-up areas, grazed lands, or training areas. The remaining 40 percent are mostly rocky shrublands or grasslands that are used infrequently by the military (U.S. Army, 1996c).

Exotic plant species have become established on some areas on Fort Bliss. African rue has become established on Otero Mesa. It invades disturbed sites and once successfully established, it can spread and outcompete the native grasses. Russian thistle is another species that becomes established on disturbed ground and this species can be found throughout Fort Bliss. Salt cedar has become established at some stock tanks and at other widely scattered locations on Fort Bliss. Another potential problem plant is malta thistle, which is currently known to grow along U.S. Highway 54 and may occur along other roadways on Fort Bliss. Another exotic species of concern is Johnson grass, which occurs in some drainages on Fort Bliss. Bermuda is found on some abandoned farmland that is no longer irrigated.

Montane riparian plant communities have a distinct mix of species, while the ephemeral drainages or dry arroyos that cross each of the other communities are less distinct. Montane riparian plant communities cover 395 acres in the Organ Mountains and include forested and shrub-dominated types. Forested riparian areas dominated by box elder and velvet ash occur in Fillmore and Soledad canyons and forested riparian type dominated by netleaf hackberry (*Celtis reticulata)* and river walnut (*Juglans microcarpa)* occur in Long Canyon. Shrub-dominated montane riparian plant communities include a coyote willow dominated type along the perennial streams in Rucker Canyon and a black cherry (*Prunus serotina)* and mountain leaftail (*Pericome caudata)* type on rock-covered slopes in North Canyon (U.S. Army, 1994b). Cockman (1996) and U.S. Army (1991c) studied and characterized ephemeral drainages on McGregor Range and Doña Ana Range–North Training Areas. The drainages were characterized by shrub, tree, and forb cover that was higher than in the surrounding area; species richness of shrubs, trees, grasses, and forbs that was higher in the main channel than in adjacent areas; and obligate species such as desert willow tended to be taller than nondrainage species.

6.7.2 Faunal Diversity on Fort Bliss

The borderlands region of New Mexico/Texas is a center of biodiversity in temperate North America for birds, mammals, amphibians and reptiles (Parmenter et al., 1995; Parmenter and Van Devender, 1995), so the diversity of terrestrial vertebrates on Fort Bliss is high. However, few warm-blooded vertebrates are centered in or limited in distribution to the Chihuahuan Desert (Brown, 1994). Many of the birds and mammals (and a good proportion of the herpetofauna) found on Fort Bliss are those generally found in the intermountain west, with a substantial great plains influence (Parmenter et al., 1995; Parmenter and Van Devender, 1995). Approximately 335 species of birds (Appendix B), 58 species of mammals (Appendix B), 39 species of reptiles, and 8 species of amphibians (Appendix B) are known to occur on Fort Bliss lands. Although invertebrates play a crucial role in the trophic structure of desert ecosystems, no thorough inventories of invertebrates have been conducted on Fort Bliss. However, the highest known arthropod diversity in North America is found in the Southwest (Danks, 1994), and several groups of arthropods have their centers of diversity for North America in the borderlands region (Parmenter et al., 1995).

6.7.2.1 Invertebrates

Fort Bliss is home to a number of invertebrates that are of special interest for various reasons (such as endemics or species prized by collectors), including but not limited to a number of grasshoppers (Lightfoot, 1997), beetles, flies and butterflies (Forbes, 1997). It is important to note also that endemic snail species *(Ashmunella)* exist in the Organ Mountains and on Bishop's Cap (Metcalf, 1984; Metcalf and Smartt, 1997).

Ants and termites are the most numerous invertebrates in arid ecosystems (Whitford et al., 1995). Invertebrates are abundant and diverse, yet relatively unknown as their roles are not thoroughly understood. Termites play important roles in desert ecosystem. They affect soil properties, consume vegetation, and are prey for many species (Whitford, 1986; Whitford et al., 1982; MacKay, 1991; Zak and Freckman, 1991) in desert ecosystems. Ants are recognized as being diverse and dominant in the Chihuahuan Desert (Parmenter et al., 1995), they move subsurface soil to the surface (Whitford et al., 1995) and are also important for water infiltration into soil (Whitford, 1991). Termites can be very important in the breakdown of cattle dung. In some areas termites consume 50 percent or more of all photosynthetically fixed carbon. Their biomass exceeds that of cattle (Whitford, 1991).

During the monsoon season in the Chihuahuan Desert an assortment of ephemeral invertebrates (primarily larvae and small shrimp-like crustaceans) hatch in the playas, and reproduce before the water dries up. In turn, this invertebrate fauna provides important food for adult and larval toads, salamanders, and some birds (MacKay et al., 1990).

6.7.2.2 Amphibians and Reptiles

Surveys for amphibians and reptiles were conducted on Otero Mesa and in the Tularosa Basin on the McGregor Range in 1996 and 1997. Based on these surveys and other information, 8 species of amphibians and 39 species of reptiles have been observed on Fort Bliss; an additional 19 species of amphibians and reptiles have the potential to occur (U.S. Army, 1996f; 1997c; 1997e) (see Table B-1 in Appendix B). 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 communities on the Otero Mesa although it has been regularly observed in the desert shrubland communities in the Tularosa Basin (U.S. Army, 1996f; 1996g; 1997c; 1997e).

The most diverse group of reptiles are the lizards; 20 species have been recorded from Fort Bliss including 6 species of whiptails (see Table B-1 in Appendix B) (U.S. Army, 1997c). The largest number of lizard species occurs in the grassland habitat (17 species) followed by the desert shrublands (13), Sacramento Mountains foothills (10), and Organ Mountains (6) (U.S. Army, 1997c). Some species such as the western marbled whiptail (*Cnemidophorus marmoratus)* and Texas horned lizard (*Phrynosoma cornutum*) are found in essentially all areas on Fort Bliss 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 and Organ Mountains (U.S. Army, 1997d). Common species encountered on Otero Mesa were the northern earless lizard (*Holbrookia maculata)*, Southern prairie lizard (*Sceloporus undulatus)*, and striped whiptail (*Cnemidophorus inornatus)* and common species in the desert shrublands in the Tularosa Basin were the striped whiptail, side-blotched lizard (*Uta stansburiana)*, and marbled whiptail (U.S. Army, 1997c; 1996f; 1996g).

Eighteen species of snakes have been recorded from Fort Bliss (U.S. Army, 1997c; 1996f) (see Table B-1 in Appendix B). The largest number of species occurs in the grassland habitat on Otero Mesa (13 species) followed by the desert shrubland and Sacramento Mountains foothills (11) and the Organ Mountains (6). Species such as the western diamondback rattlesnake (*Crotalus atrox)* and bull snake (*Pituophis catenifersayi)* 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, 1997c) and the desert shrubland habitat of the Tularosa Basin (U.S. Army, 1996g).

6.7.2.3 Avifauna

A total of 335 species of birds have been recorded from Fort Bliss (see Table B-3 in Appendix B). Eighty species occur throughout the year, 129 species are seen only during migration, 42 species are spring and summer residents, and the remaining species occur principally during the winter. Thirty-two species are common, 89 fairly common, 72 uncommon, and 141 rare to very rare (see Table B-3 in Appendix B).

In recent years, detailed studies of the bird life on Fort Bliss have focused on describing the breeding bird communities in various habitats, documenting the occurrence of neotropical migrants, and assessing the status of raptors and other sensitive species. This section summarizes the results of those studies, and the findings of other efforts, and presents the information based on the general topographic regions of the installation. A more thorough review of these studies and the bird communities on the installation is provided in Appendix B.

Tularosa Basin and other Desert Shrublands

More information is available on the avian communities in the Tularosa Basin than other areas of the installation, primarily due to its size and the number of studies conducted in that area. During 1996 through 1998, bird breeding surveys were conducted in the Tularosa Basin in desert shrub habitats dominated by sandsage, mesquite, creosotebush, and whitethorn (U.S. Army, 1996h). The black-throated sparrow (*Amphispiza bilineata)* was the most common species recorded in all four habitats (U.S. Army, 1996h; 1997g; 1998g). The western kingbird (*Tyrannus verticalis),* Scott's oriole (*Icterus parisorum),* and ash-throated flycatcher (*Myiarchus cinerascens)* also were common.

Breeding bird surveys in arroyo and upland habitats in the Chihuahuan Desert indicated that the most common species were the black-throated sparrow, northern mockingbird, verdin (*Auriparus flaviceps)*, brown-headed cowbird (*Molothrus ater)*, mourning dove (*Zenaida macroura)*, and ash-throated

flycatcher. More species were observed in arroyos and riparian habitats than in the adjacent uplands, and the black-throated sparrow and Scott's oriole were more common in the uplands while species such as the mourning dove, ash-throated flycatcher, western kingbird, and northern mockingbird were more abundant in the arroyos (U.S. Army, 1996i; 1997f; Kozma, 1995; Kozma and Mathews, 1997). A total of 1,214 nests of 32 species were found from 1993 through 1997 (U.S. Army, 1997f). The number of nests observed in 1997 was about 2.0 to 2.8 times greater than the previous 4 years, likely due to greater than average precipitation during the 1996 rainy season and during the spring of 1997 (U.S. Army, 1997f). Nest density was about twice as high in arroyo habitats than the adjacent uplands. Banana yucca, 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).

Neotropical migrants are bird species that breed in North America and winter in Central and South America, and many of these species began 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 Saure, 1996; Sheery and Holmes, 1996; Moore et al., 1993).

In the West, more than 60 percent of the neotropical migrants use riparian areas for stopover habitat during migration or for breeding (Krueper, 1993). These studies focused on mesic riparian areas dominated by species such as willow *(Salix)* and cottonwoods *(Populus)*, which are found on Fort Bliss only in the Organ Mountains. However, the arroyo-riparian drainages throughout Fort Bliss seem to have a similar attraction to neotropical migrants (Kozma, 1995; Kozma and Mathews, 1997; U.S. Army, 1996i). During a 5-year mist netting study, 290 neotropical migrants (comprising 24 species) were captured in arroyos, while 52 neotropical migrants (comprising 14 species) were captured in adjacent upland habitat. Neotropical migrants captured all 5 years included the Virginia's (*Vermivora virginiae),* orange-crowned (*Vermivora celata)*, and Wilson's (*Wilsonia pusilla)* warblers; these species were much more common in arroyos than the adjacent uplands.

Raptors also are rather common on the installation, including some rare and protected species. The Swainson's hawk (*Buteo swainsonii)* and turkey vulture *(Cathartes aura)* were the most common raptors observed during breeding bird surveys in 1996 and 1997 in the desert shrublands (U.S. Army, 1996h; 1997g). Surveys along the Otero Mesa escarpment in 1997 revealed nesting pair of falcons consisting of a prairie falcon (*Falco mexicanus)* and a possible prairie/peregrine falcon (*Falco peregrinus)* hybrid near Rough Canyon (U.S. Army, 1998b; 1998d). In 1997, numerous stick nests and a number of golden eagles (*Aquila chrysaetos*) were observed but nesting was not confirmed. However, during raptor surveys conducted in 1998 along additional sections of the escarpment and Hueco Mountains, an active golden eagle nest was observed on the Otero Mesa escarpment just north of Pendejo Wash, and a golden eagle, but no nest, was observed along the Hueco Mountain escarpment (U.S. Army, 1998b). Relatively common raptors were observed nesting in tha area as well, including the red-railed hawk (*Buteo jamaicensis)*, American kestrel (*Falco sparverius)*, great horned owl (*Bubo virginianus),* and barn owl (*Tyto alba*), which were found nesting near the escarpment in 1997 (U.S. Army, 1998b). During the raptor surveys, an unconfirmed sighting of an immature aplomado falcon (*Falco femoralis)* was reported in the desert shrubland habitat south of Martin Canyon on May 23, 1997 (U.S. Army, 1998b); it was not seen in this area during subsequent surveys in June 1997 and is assumed to have left the area (U.S. Army 1998b). The golden eagle and the red-tailed hawk were the most common wintering raptors observed during the wintering bald eagle (*Haliaeetus leucocephalus*) surveys conducted during the winters of 1994 to 1995 and 1995 to 1996 in the desert shrubland habitat (U.S. Army, 1995b; 1996j).

Otero Mesa and Other Grasslands

During 1996 through 1998, breeding bird surveys were conducted in the black grama grasslands and the mesa grasslands (dominated by blue grama grass) on Otero Mesa, and in the black grama grasslands of the Tularosa Basin (U.S. Army, 1996h; 1997g; 1998g). As in the desert shrubland habitats, the number of birds observed was greatest in the grassland habitats in 1997; approximately double the number of birds observed in 1996. Of the 54 bird species recorded in these grasslands, 27 (excluding raptors) were likely to nest in the grasslands, and the other species were probably still migrating. During the dry 1996 season, more birds were observed during surveys in the mesa grasslands and the black grama grasslands on the Otero Mesa, which had been grazed, than during surveys in the black grama grasslands on the ungrazed land in the basin. The horned lark (*Ereophila alpestres*) was the most abundant species in the mesa grasslands, the eastern meadowlark (*Sturnella magna*) and black-throated sparrow were most common in the grazed black-grama grasslands, and the eastern meadowlark was the most common species in the ungrazed black grama grasslands. During the relatively wet 1997 season, an increase in the number of birds and species was noted including a substantial increase in the number of eastern meadowlarks and Cassin's sparrows. The northern mockingbird increased at all locations while the horned lark showed a substantial increase in the black-grama grasslands.

The turkey vulture was the most common raptor observed during breeding bird surveys in 1996 and 1997 (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. Swainson's hawks are the most common buteo, but red-tailed hawks also nest on portions of Otero Mesa. The ferruginous hawk (*Buteo regalis)* has been observed on the mesa in the winter and spring (U.S. Army, 1998c). During surveys for wintering bald eagles, the red-tailed hawk was the most common raptor observed, and the golden eagle and American kestrel were also fairly common (U.S. Army, 1995b; 1996j).

Hueco Mountains

Few surveys have been conducted in the Hueco Mountains on the McGregor Range, therefore little is known about the avian community in that area. Reconnaissance surveys for breeding birds were conducted in the Hueco Mountains in June 1997 (U.S. Army, 1997i). Six routes totaling about 28 miles were traversed along arroyos and in uplands within an approximately 6,700-acre area. A total of 40 species comprising 737 individuals were recorded during six surveys on June 10 and 12. Almost 200 black-throated sparrows were recorded (27 percent of total) and was the most common species encountered. Other common species were the northern mockingbird (10 percent of total observations), cactus wren (7 percent), canyon towhee (*Pipilo fuscus)* (6 percent), house finch (6 percent), and mourning dove (6 percent). 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, 1997j). The red-tailed hawk and the American kestrel were the most common raptors observed during the surveys, but a golden eagle was also observed.

Sacramento Mountains

The Sacramento Mountains foothills occur within Fort Bliss, and breeding bird surveys were conducted in the pinyon pine/juniper woods during 1996 through 1998. The most common breeding birds recorded during these surveys were the northern mockingbird, bushtit (*Psaltriparus minimus)*, spotted towhee (*Pipilo maculatus)*, and black-chinned sparrow (*Spizella atrogularis)* (U.S. Army, 1996h; 1997g; 1998g). Turkey vultures were the most common raptors observed during the surveys. The red-tailed hawk was observed occasionally during the surveys, and the golden eagle and sharp-shinned hawk (*Accipiter striatus)* were seen once (U.S. Army, 1996h). The bald eagle winters in small numbers in the foothills,

but the only known roost site in the vicinity of Fort Bliss is located approximately 4 miles outside the installation boundary, in the Lincoln National Forest (U.S. Army, 1996j). During surveys for this species during the winters of 1994 to 1995 and 1995 to 1996, the golden eagle was the most common species observed. The red-tailed hawk was also commonly observed especially during the winter of 1995 to 1996; the American kestrel was also common (U.S. Army, 1995b; 1996j). The great horned owl and western screech owl (*Otus kennicottii)* were detected during spotted owl (*Strix occidentalis)* surveys during the winter of 1995 to 1996, however, no spotted owls were observed (U.S. Army, 1996n).

Organ Mountains

Breeding bird surveys were conducted in the Organ Mountains in 1991 and 1992, and 53 species were recorded in 6 habitat types (U.S. Army, 1994b). Common species in the oak/juniper habitat were the mourning dove, house finch, bushtit, Bewick's wren, (*Thryomanes bewickii)* and canyon wren (*Catherpes mexicanus)*. The gray vireo (*Vireo vicinior)*, a State of New Mexico threatened species, was also observed in this habitat type (see Section 4.8.4) (U.S. Army, 1994b).

The canyon wren was the most common species encountered in the montane shrubland habitat, which is dominated by mountain mahogany (U.S. Army, 1994b). Other common species in this habitat were the house finch, rock wren (*Salpinctes obsoletus)*, and rufous-crowned sparrow (*Aimophila ruficeps)*. The riparian forest habitat is dominated by velvet ash, gray oak, box elder, and narrow-leaf cottonwood. Plumbeous vireo *(Vireo plumbeus)*, black-headed grosbeak (*Pheucticus melanocephalus)*, western wood-pewee (*Contopus sordidulus)*, black-chinned sparrow, and black-chinned hummingbird (*Archilochus alexandri)* were the most common species recorded in this habitat. Within the mesic shrubland habitat (box elder and aspen are dominant), Virginia's warbler was the most common species noted followed by the bushtit, house finch, canyon wren, and spotted towhee.

The mixed conifer forest is dominated by Douglas fir and ponderosa pine, and spotted towhee, Virginia's warbler, and Cassin's vireo were the most common species. Within the ponderosa pine forest, the house finch, and bushtit were common. Other common species were the canyon wren, spotted towhee, Bewick's wren, western wood-pewee, rock wren, and plumbeous vireo.

A survey of all potential peregrine falcon habitat in the Organ Mountains in 1980 resulted in the identification of four prairie falcon and three golden eagle eyries (U.S. Army, 1980a). Other raptor species observed included the American kestrel, red-tailed hawk, and Cooper's hawk (*Accipiter cooperii)*. All these species plus the turkey vulture and sharp-shinned hawk were observed during breeding bird surveys in 1991 and 1992 (U.S. Army, 1994b). In 1991, territorial great-horned owls and western screech owls were recorded in the Organ Mountains; the turkey vulture, red-tailed, hawk, golden eagle, and prairie falcon were also observed (U.S. Army, 1991a).

Urban or Developed Areas

Bird life in the built-up cantonment area is typical for such areas and species such as the house sparrow (*Passer domesticus*), great-tailed grackle (*Quiscalus mexicanus*), house finch (*Carpodacus mexicanus*), and Rock Dove (*Columba livia*) are common. The El Paso Oxidation Ponds occur near the cantonment area and many of the 101 species of diving birds, wading birds, waterfowl, shorebirds, gulls, and terns observed on Fort Bliss have been observed at these ponds. These bird species also have been observed on playa lakes and stock tanks on the South Training Areas, Doña Ana Range–North Training Areas, and McGregor Range.

6.7.2.4 Mammals

A total of 58 species of mammals are known to occur and an additional 20 species have the potential to occur on Fort Bliss including 17 species of bats (see Table B-14 in Appendix B) (does not include domesticated species such as dogs, cats, cattle, or horses). A maternity colony of pallid bats (*Antrozous pallidus*) currently resides at the Orogrande Range Camp and two maternity colonies of the fringed myotis (*Myotis thysanodes*) were observed in 1979 in the Sacramento Mountains foothills (Howell, 1997; Smartt, 1980). Surveys for bats along the Otero Mesa escarpment and nearby stock tanks 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* sp.) were observed emerging from the escarpment and at some stock tanks (USAF, 1997d; 1997i).

Fort Bliss conducted small mammal surveys at 24 sampling sites in 12 grazed and ungrazed habitat types on McGregor Range in 1997 and 1998 (U.S. Army, 1997k)**.** Based on capture rates, small mammals were most abundant in swales and acacia scrub habitat (48 to 75 percent capture rate) and least abundant in mesquite coppice dunes (5 to 17 percent). The largest numbers of species were in the sandy arroyo scrub (14) and *Chilopsis* arroyo (14) and the smallest number (7) was in the mesquite dunes (U.S. Army, 1997k). In 1997, the most abundant species were the silky pocket mouse (*Perognathus flavus)* and Merriam's kangaroo rat (*Dipodomys merriami*). The silky pocket mouse was the only species captured or observed in all of the vegetation communities surveyed.

Generally, Merriam's kangaroo rat was the only species captured in all of the desert shrubland habitats, and was common in all of them, regardless of presence of grazing. The Chihuahuan pocket mouse, rock pocket mouse, and the cactus mouse were common in ungrazed acacia scrub habitat and the Ord's kangaroo rat was common in grazed nonstabilized areas. Comparing small mammal abundance between grazed and ungrazed grasslands is difficult because of the limited number of ungrazed grasslands. Generally, the only abundant species in the grazed grasslands were Merriam's kangaroo rat and the silky pocket mouse. The silky pocket mouse also was the most common species in grazed areas, and Merriam's kangaroo rat was rare in the grazed areas. The white-footed mouse, deer mouse, and short-tailed grasshopper mouse were somwhat common in grazed areas. Small mammal abundance and species diversity was greatest in the swale and arroyo-riparian habitats as compared to any of the other vegetation communities. The number of species and individuals captured in grazed and ungrazed areas were similar. Merriam's kangaroo rat was the most abundant species captured, and the hispid cotton rat, the western harvest mouse, the white-footed mouse, and the silky pocket mouse also were common. The hispid cotton rat was relatively more common in the ungrazed compared to the grazed areas, and the rock pocket mouse was more common in the grazed areas than the ungrazed areas.

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*), and the porcupine (*Erethizon dorsatum*). In addition, coyote (*Canis latrans)*, badger (*Taxidea taxus*), and bobcat (*Lynx rufus*) were observed (U.S. Army, 1997k).

Jorgensen and Demarais (U.S. Army, 1996g) studied rodents in arroyos and associated adjacent upland habitats in the Chihuahuan Desert for 2 years on the McGregor Range and found the relative abundance was greater in the arroyos than the adjacent uplands. 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*) were more common in the arroyos than the adjacent habitats. Merriam's kangaroo rat, and the desert plains pocket mouse (*Perognathus flavescens*) were more abundant in the uplands. The relative abundance of rodents was over six times greater in the lower elevation arroyos than the adjacent upland habitats (U.S. Army, 1996g).

Small mammal trapping took place at 27 sampling locations on TA 9 on the Doña Ana Range–North Training Areas and 21 species were recorded (U.S. Army, 1992a). The banner-tailed kangaroo rat (*Dipodomys spectabilis)*, Merriam's kangaroo rat, plains pocket mouse, silky pocket mouse, and spotted ground squirrel (*Spermophilis spilosoma)* showed a strong preference for grasslands and uplands. The white-throated woodrat, cactus mouse, white-footed mouse, and hispid cotton rat were more common in arroyos (U.S. Army, 1992a).

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 these two species in the desert shrublands of theTularosa Basin ranged from 22 in 1995 to 13 per square mile in 1994 (U.S. Army, 1996k).

The coyote, kit fox (*Vulpes macrotis*), badger, and bobcat are predators in the desert shrubland and grassland habitats. The kit fox on Fort Bliss is morphologically indistinguishable from its close relative the swift fox (*Vulpes velox)*; Fort Bliss is within the area where the ranges of these two species overlap (U.S. Army, 1996k). Mountain lions (*Puma concolor*) occur in much of Fort Bliss including the Sacramento Mountains, foothills and canyons of the Otero Mesa escarpment. Black bears occur only in the Sacramento Mountains portion of Fort Bliss, the Organ Mountains, and have been observed in locations of the Tularosa Basin.

The mule deer (*Odocoileus hemionus*) occurs throughout Fort Bliss and is most common in the mountainous portions including the foothills of the Sacramento and Organ mountains. The number of mule deer in the Sacramento Mountains foothills on McGregor Range ranged from 587 in 1984 to 206 in 1995 (NMDGF, 1997). In addition, the number of deer observed north of the New Mexico Highway 506 was substantially greater than the number observed south of this route. Data from aerial surveys of the Hueco Mountains in Texas from 1985 through 1990 indicate that the number of mule deer ranged from 1.2 to 6.1 per 1,000 acres except for 1986 when there were an estimated 23.1 per 1,000 acres (Cantu, 1990).

The pronghorn (*Antilocapra americana*) occurs mostly in the grassland communities of the Otero Mesa and adjoining grasslands 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 was observed in the area of Mack Tanks in the Tularosa Basin, while sign was common at New Tank in the Hueco Mountains (U.S. Army, 1997i; USAF, 1997g). Oryx have become common in Doña Ana Range–North Training Areas in desert shrubland communities and in the Tularosa Basin portions of McGregor Range. Javelina (*Dicotyles tajacu*) are widely dispersed but uncommon in the Tularosa Basin portions of Fort Bliss and have been observed infrequently in many locations.

6.7.3 Sensitve Species

Various species of flora and fauna occur, or have the potential to occur, on Fort Bliss are listed as threatened, endangered, or species of concern by the USFWS and the states of New Mexico and Texas (Table 6-6). Of the nine species federally listed, two species are found on Fort Bliss year around (Sneed pincushion cactus, black-tailed prairie dog), one species is a seasonal resident (bald eagle), and potential but unoccupied habitat exists for two species that have been sighted (aplomado falcon and mountain plover). Habitat for the remaining four federally listed species in Table 6-6 does not exist or is of insufficient amount to maintain a population (piping plover, interior least tern, Mexican spotted owl, southwest willow flycatcher), but these species have or may pass through portions of Fort Bliss. Table 6-6 also lists 34 species that are considered species of concern by the New Mexico Ecological Services Field Office (USFWS, 2000), and some have state designations of threatened or endangered. The

remaining 15 species have state designations of threatened or endangered, or are considered sensitive by Fort Bliss.

The ESA [16 USC 1531 *et. seq.*] of 1973 as amended was enacted to provide a program for the preservation of endangered and threatened species and to provide protection for the ecological units upon which these species depend for their survival. All federal agencies are required to implement protection programs for these designated species and to use their authorities to further the purposes of the act.

The USFWS is the primary agency responsible for implementing the ESA. The USFWS is responsible for birds and terrestrial and fresh water species. The USFWS responsibilities under the ESA include: (1) the identification of threatened and endangered species; (2) the identification of critical habitats for listed species; (3) implementation of research on, and recovery efforts for, these species; and (4) consultation with other federal agencies concerning measures to avoid harm to listed species.

An endangered species is in danger of extinction throughout all or a significant portion of its range [16 USC 1531 *et. seq.*]. A threatened species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range [16 USC 1531 *et. seq.*]. Proposed species are those which have been formally submitted to Congress for official listing as threatened or endangered [16 USC 1531 *et. seq.*].

Table 6-6. Sensitive Species Known to or Having the Potential to Occur on Fort Bliss

Species	*Status* [a]			*Location on Fort Bliss*
	Federal	*New Mexico*	*Texas*	
FEDERALLY LISTED, PROPOSED FOR LISTING, AND CANDIDATE SPECIES				
Sneed pincushion cactus *(Coryphantha sneedii var. sneedii)*	E	E	E	Limestone Hills, Doña Ana Range–North Training Areas
Interior least tern *(Sterna antillarum athalassos)*	E	E	E	Not known to occur on Fort Bliss. Could occur as very rare migrant at sewage lagoon on Fort Bliss
Northern aplomado falcon *(Falco femoralis septentrionalis)*	E	E	E	One unconfirmed sighting in 1997, two confirmed sightings in 1999. Best potential habitat in grasslands on Otero Mesa, McGregor Range
Southwestern willow flycatcher *(Empidonax trailii extimus)*	E	E	E	Occasional migrants of the species on McGregor Range; subspecies not determined
Bald eagle *(Haliaeetus leucocephalus)*	T	T	T	Winters in foothills of Sacramento Mountains McGregor Range
Piping plover *(Charadrius melodus)*	T	E	T	Rare migrant on McGregor Range observed once in 1987 at sewage lagoon on Fort Bliss
Mexican spotted owl *(Strix occidentalis lucida)*	T	—	T	Very rare on Fort Bliss Not known to breed on site, best potential habitat in Organ mountains, Doña Ana Range–North Training Areas
Mountain plover *(Charadrius montanus)*	PT	—	—	One migrant sighted in 1999. Best potential habitat is grasslands on Otero Mesa
Black-tailed prairie dog *(Cynomys ludovicianus)*	C	—	—	Occurs on Otero Mesa, McGregor Range

Table 6-6. Sensitive Species Known to or Having the Potential to Occur on Fort Bliss (Continued)

Species	*Status* [a]			*Location on Fort Bliss*
	Federal	*New Mexico*	*Texas*	
FEDERAL SPECIES OF CONCERN				
Alamo beardtongue *(Penstemon alamosensis)*	SC	SC	—	Hueco Mountains South Training Areas
Organ Mountains evening primrose *(Oenothera organensis)*	SC	SC	—	Organ Mountains Doña Ana Range–North Training Areas
Organ Mountains figwort *(Scrophularia laevis)*	SC	SC	—	Organ Mountains Doña Ana Range–North Training Areas
Standley whitlowgrass *(Draba standleyi)*	SC	SC	—	Organ Mountains Doña Ana Range–North Training Areas
Night blooming cereus *(Peniocereus greggii* var. *greggii)*	SC	E	—	Desert shrublands, Doña Ana Range–North Training Areas
Hueco Mountains rock daisy *(Perityle huecoensis)*	SC	—	—	Hueco Mountains South Training Areas
Nodding cliff daisy *(Perityle cernua)*	SC	SC	—	Organ Mountains Doña Ana Range–North Training Areas
Sand prickly pear (*Opuntia arenaria*)	SC	E	—	Not observed during species-specific or other surveys. Low potential to occur on Fort Bliss
Franklin Mountain talussnail (*Sonorella metcalfi)*	SC	—	—	Talus slopes in the Franklin Mountains and possible in the Organ Mountains, Doña Ana Range–North Training Areas
Anthony blister beetle (*Lytta mirifica)*	SC	—	—	Not known to occur on Fort Bliss, but habitat occurs in sand dunes
Los Olmos tiger beetle (*Cicindela nevadica*)	SC	—	—	Not known to occur on Fort Bliss. Could occur in areas of limestone soil
Texas horned lizard *(Phrynosoma cornutum)*	SC	—	T	Widespread throughout post
Black tern *(Chlidonias niger)*	SC	—	—	Regular migrant through McGregor Range at perennial water sources
White-faced ibis *(Plegadis chihi)*	SC	—	T	Potential regular migrant through Fort Bliss; observed at sewage lagoons and on cantonment on McGregor Range
Peregrine falcon *(Falco peregrinus anatum)*	SC	T	E	Nests in the Organ Mountains on Doña Ana Range–North Training Areas, occasional migrant elsewhere on post
Northern goshawk (*Accipiter gentiles*)	SC	—	T	Uncommon migrant on Fort Bliss
Ferruginous hawk *(Buteo regalis)*	SC	—	—	Wintering and migrant species; mostly on Otero Mesa McGregor Range
Western burrowing owl *(Athene cunicularia)*	SC	—	—	Occurs throughout Fort Bliss in desert shrubland and grassland communities
Loggerhead shrike *(Lanius ludovicianus)*	SC	—	—	Winter and breeding bird from Otero Mesa and Tularosa Basin
Baird's sparrow *(Ammodramus bairdii)*	SC	T	—	Migrates through and winters in dense grasslands
Small-footed myotis *(Myotis ciliolabrum)*	SC	—	—	Distribution unknown
Long-eared myotis *(Myotis eyotis)*	SC	—	—	Distribution unknown
Eastern small-footed bat *(Myotis leibii)*	SC	—	—	Distribution unknown

Table 6-6. Sensitive Species Known to or Having the Potential to Occur on Fort Bliss (Continued)

Species	*Status* [a]			*Location on Fort Bliss*
	Federal	*New Mexico*	*Texas*	
FEDERAL SPECIES OF CONCERN				
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	T	Distribution unknown
Townsend's pale big-eared bat *(Plecotus townsendii pallescens)*	SC	—	—	Distribution unknown
Big free-tailed bat *(Nyctinomops macrotis)*	SC	—	—	Distribution unknown
Greater western mastiff bat *(Eumops perotis californicus)*	SC	—	—	Distribution unknown
Gray-footed chipmunk *(Tamias canipes)*	SC	—	—	Occurs in woodland and forest habitats in the Sacramento Mountains foothills on McGregor Range
Organ Mountain Colorado chipmunk *(Eutamias quadrivittatus australis)*	SC	T	—	Occurs in Organ Mountains, Doña Ana Range–North Training Areas
STATE PROTECTED AND OTHER SENSITIVE SPECIES				
Organ Mountains pincushion cactus *(Coryphantha organensis)*	—	E	—	Organ Mountains Doña Ana Range–North Training Areas
Crested coral-root *(Hexalectris spicata)*	—	E	—	Organ Mountains Doña Ana Range–North Training Areas
Boulder woodlandsnail *(Ashmunella anriculata)*	—	—	—	Organ Mountains Doña Ana Range–North Training Areas
Maple Canyon woodlandsnail *(Ashmunella todseni)*	—	—	—	Organ Mountains Doña Ana Range–North Training Areas
Organ Mountains woodlandsnail *(Ashmunella organensis)*	—	—	—	Organ Mountains, Doña Ana Range–North Training Areas
Beasley's woodlandsnail *(Ashmunella beasleyi)*	—	—	—	Organ Mountains, Doña Ana Range–North Training Areas
Mountain short-horned lizard (*Phrynosoma douglasii hernandezii*)	—	—	T	Species observed on Doña Ana Range–North Training Areas, and McGregor Range; status unknown in South Training Areas in Texas
Mottled rock rattlesnake (*Crotalus lepidus lepidus*)	—	T	—	Species documented from the Organ Mountains; subspecies not recorded on post
Texas lyre snake (*Trimorphodon biscutatus vilkinsonii*)	—	—	T	Castner Range in Texas
Zone-tailed hawk (*Buteo albonotatus*)	—	—	T	Uncommon migrant on Fort Bliss
Costa's hummingbird (*Calypte costae*)	—	T	—	Uncommon migrant in arroyo-riparian habitat on Fort Bliss

Table 6-6. Sensitive Species Known to or Having the Potential to Occur on Fort Bliss (Continued)

Species	*Status* [a]			*Location on Fort Bliss*
	Federal	*New Mexico*	*Texas*	
STATE PROTECTED AND OTHER SENSITIVE SPECIES				
Varied bunting *(Passerina versicolor)*	—	T	—	Very rare on Fort Bliss
Bell's vireo *(Vireo bellii)*	—	T	—	Occasional on Fort Bliss
Gray vireo *(Vireo vicinior)*	—	T	—	Nests in the Organ Mountains, Doña Ana Range–North Training Areas; potential habitat on McGregor Range
Desert bighorn sheep *(Ovis canadensis mexicana)*	—	E	—	Does not occur on Fort Bliss. Previously existed in Organ Mountains on Doña Ana Range–North Training Areas

[a] SC = federal and state species of concern; C = candidate species; E = endangered species; T = threatened species; — = not listed; PT = proposed threatened species.
Sources: NMDGF, 2000; Sivinski and Lightfoot, 1995; TPWD 2001; USFWS, 2000a; USFWS, 2001, NM Rare Plant Technical Council, 1999.

Additionally, the USFWS maintains candidate and species of concern categories. Candidates are those species for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened, but for which issuance of a proposed rule is precluded by work on higher priority species (Fowler-Propst, 1996). Species of concern include those for which further biological research and field study are needed to resolve their conservation status (Fowler-Propst, 1996). Candidate species and species of concern have no legal protection under the ESA.

6.7.3.1 Federally Listed, Proposed for Listing, and Candidate Species

Sneed pincushion cactus. The Sneed pincushion cactus is a federal endangered species and is also considered endangered in New Mexico and Texas. This species is known only from steep limestone rocky slopes in the Franklin Mountains in El Paso County, Texas, and Doña Ana County, New Mexico (U.S. Army, 1980b). Three populations of this species are known to exist on separate rocky limestone hills on the Doña Ana Range–North Training Areas (U. S Army 1991b; 1998c). Surveys for this species were conducted in the Hueco Mountains in seemingly good habitat and none were observed (U.S. Army, 1991b). The vegetative cover in Sneed pincushion cactus habitat is typically very sparse due to the rocky nature if the habitat. Chihuahuan desert shrubland plant species such as ocotillo (*Fouquiera splendens*), sotol (*Dasylirion wheeleri*), mariola (*Parthenium incanum*), and prickly pear (*Opuntia* sp.) are common in Sneed pincushion cactus habitat. Long-term monitoring plots have been established within three population and 22 of these plots have been sampled from 1997 through 2000 (U. S. Army, 1997b). Monitoring data indicates the populations of Sneed pincushion cactus are in good health and the numbers appear stable.

Interior least tern. The interior least tern was listed as an endangered species in 1985 (USFWS, 1997a) and is also listed as endangered in New Mexico and Texas. The California (*Sterna antillarum brownii*) and eastern subspecies (*S. a. antillarum*) occur along the coasts of the United States and the interior least tern occurs principally along the Missouri and Mississippi river systems, although some nest along the Rio Grande drainage in the western United States. Historically, this species was abundant along the Missouri and Mississippi river systems and nested on sandbars along low gradient portions of these river systems.

The interior least tern has undergone a marked reduction and the estimated population in 1990 was 5,000 birds (USFWS, 1997a). Factors that have contributed to this reduction include habitat destruction from 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 and human disturbance; and water pollution. With the disappearance of its natural nesting habitat, the interior least tern now also nests on man-made structures such dikes, dredge material islands, sand pit mines, construction fill sites, and roofs of buildings (Gore and Kennison, 1991; Whitman, 1988).

In New Mexico, the interior least tern nests at the Bitter Lakes National Wildlife Refuge on the Pecos River 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 to four to seven pairs from 1990 to 1999. Productivity has been poor for that last 10 years (NMDGF, 2000).

Northern aplomado falcon. The northern aplomado falcon is listed as an endangered species by the federal government and the states of New Mexico and Texas. 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 Fort Bliss. The reasons for this species' decline are unclear. Habitat loss (e.g., grassland habitat converted to shrubland due to livestock grazing) and pesticide contamination likely contributed to this decline (Hector, 1987).

Sporadic observations of the northern aplomado falcon have been reported since 1991 in areas near Fort Bliss and on WSMR. In addition, breeding populations were discovered in 1992 in grassland habitat in the State of Chihuahua, Mexico (Montoya et al., 1997) and the nearest population to the United States is about 125 miles south of the New Mexico border. Surveys for this species have been conducted on Fort Bliss in the Grasslands of Otero Mesa from 1994 through 1999 (U.S. Army, 1994a; 1997h; 1998c; 2000a). More than 1,900 miles were surveyed during this period, and the only northern aplomado falcon observed was seen on September 11, 1999, when a juvenile female was observed perched on a fence post on Otero Mesa. The bird had been banded as a nestling during the spring of 1999 in Chihuahua, Mexico, about 190 miles south of Fort Bliss (USAF, 2000). This bird was observed again on September 18 during aplomado falcon surveys conducted for the USAF. An unconfirmed sighting of an aplomado falcon occurred in May of 1997 during raptor surveys along the Otero Mesa escarpment. The bird was in foothill grassland habitat below the escarpment south of Martin Canyon (U. S. Army, 1998b). It was also an immature and was feeding on a lizard; no bands were noted.

In 1996, the northern aplomado falcon survey was expanded to include habitat evaluation and avian prey base studies (U.S. Army, 1997h) for comparison with the habitats occupied by aplomado falcons in Chihuahua, Mexico (Montoya et al., 1997). The grasslands with scattered yuccas and shrubs found on Otero Mesa are similar to the open habitat found in occupied habitats in Mexico and considered necessary to support a breeding population of northern aplomado falcons. The area also had an abundance of large stick nests constructed by ravens or other raptors, which the falcons use for nesting. However, mean basal grass cover on Otero Mesa was less than half that observed on the Mexican habitat, and the biomass of potential prey species was about 60 percent of that observed in Mexico (U.S. Army, 1997h; Montoya et al., 1997). The Tularosa Basin had shrub densities much higher than on Otero Mesa or in Mexico (U.S. Army, 1997h). 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. The potential cause of this difference is not confirmed, but historically heavy grazing has been implicated. Further study is needed to investigate these differences.

Southwestern willow flycatcher. The southwestern willow flycatcher is a federal and State of New Mexico listed endangered species. This flycatcher is a neotropical migrant that breeds in the southwestern United States 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). There is no such habitat on Fort Bliss. The southwestern willow flycatcher has not been observed on Fort Bliss, nor have any breeding willow flycatchers.

The southwestern willow flycatcher populations have experienced significant declines, and breeding populations are known from only about 75 locations and there are an estimated 300 to 500 pairs in existence, though new populations are being found (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). There are likely less then 200 breeding pairs of southwestern willow flycatchers in New Mexico based on recent surveys (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, 1997f). This species has also been recorded in arroyos during breeding bird surveys in 1996 and 1997 (U.S. Army, 1996i; 1997g). These birds are also assumed to be migrants. The particular subspecies of willow flycatcher observed on McGregor Range was not determined, so they could have been one of the nonlisted subspecies. Appropriate nesting habitat for the southwestern willow flycatcher does not exist on McGregor Range. There are stands of willows at some stock tanks, but these stands are likely too small to support nesting southwestern willow flycatchers. For example, a stand of willows 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, 1997g), which is assumed to be too small to support nesting willow flycatchers. Willow flycatcher surveys have been conducted in some riparian areas in the Organ Mountains and the species has not been recorded (U.S. Army, 1997o). Therefore, it is assumed that the willow flycatcher does not breed on Fort Bliss and birds observed on post were migrants.

Bald eagle. The bald eagle is a federal and state threatened species. The bald eagle winters along lakes and rivers in large numbers (Steenhof et al., 1980) and uses terrestrial habitat well away from aquatic habitat (Fischer et al., 1984; Grubb and Kennedy, 1982; and Grubb et al., 1989). A small population (20 to 30 individuals) of bald eagles winters in the Sacramento Mountains. One of the known roost sites is about 4 miles from the northern border of Fort Bliss (U.S. Army, 1995b). Given that bald eagles are known to travel up to about 22 miles from roost sites to feeding sites (Grubb et al., 1989), the northern portion of Fort Bliss is within the range of eagles wintering in the Sacramento Mountains.

Surveys for wintering bald eagles in the Sacramento Mountains foothills on Fort Bliss were conducted during the winters of 1994 to 1995 through 1997 to 1998 (U.S. Army, 1995b; 1996j; 1998c). Surveys were conducted in the wooded habitat of the foothills, in the desert shrubland habitat, and in the adjacent grassland habitat on Otero Mesa. During these surveys, the bald eagles were observed 71 times, ranging from 8 sightings during the winter of 1997 to 1998 and 28 observations during the winter of 1994 to 1995. Based on plumage characteristics, it was determined that 42 observations were of adults and 29 were immature. During both winters, most bald eagles were observed along the northern boundary of the 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, 1995b). Only one bald eagle was observed over the grasslands of Otero Mesa. Most birds were in flight when first observed and in many cases bald and golden eagles were observed together. There were no observations of eagles feeding or hunting. Food sources on Fort Bliss may include deer carrion and rabbits.

Observations indicate that bald eagles using the northern portion of McGregor Range roost off post, most likely at a known roost site about 5 miles north of Fort Bliss. Surveys were conducted at this roost site during the winters of 1994 to 1995 through 1998 to 1999, and the eagles were most abundant during January of 1998 (26 eagles) and January of 1999 (22 eagles).

Piping plover. The piping plover is an endangered species in the Great Lakes region and threatened elsewhere in the United States. This species is considered endangered in New Mexico and threatened in Texas. 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 United States (Haig and Oring, 1985). This species is a very rare migrant in New Mexico, having been observed six times (NMDGF, 2000). It was observed once on Fort Bliss at sewage lagoons in 1987 (U.S. Army, 1997l) and is considered a very rare migrant on Fort Bliss.

Mexican spotted owl. The Mexican spotted owl is a federal threatened species, is not listed by New Mexico, and is considered a threatened species in Texas. Its range includes southern New Mexico where it occurs in suitable habitat in isolated mountain ranges (U.S. Army, 1996n). 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 pine and pinyon pine-juniper forests are used to a lesser degree (Skaggs and Raitt, 1988; Ganey and Balda, 1989; and Zwank et al., 1995). The Sacramento Mountains just to the north of Fort Bliss contains a breeding population of Mexican spotted owls and the closest known breeding pair is 10 miles from the Fort Bliss boundary (U.S. Army, 1996n).

The Mexican spotted owl has been observed in the past on or near Fort Bliss on two occasions. In June 1979 an adult spotted owl and young were photographed in the Organ Mountains on BLM land near Fort Bliss boundary (New Mexico Ornithological Society, 1979, as cited in U.S. Army, 1991a); this represents the only known sighting of the spotted owl in the Organ Mountains. More recently, two spotted owls were observed on McGregor Range during the winter of 1989 to 1990 (U.S Army, 1996p). Given that mixed conifer plant communities occur in the Organ Mountains and the spotted owl has been observed on Fort Bliss, a survey for this species was conducted on 5 square miles of land in the Organ Mountains in the spring and summer of 1991 (U.S. Army, 1991a). Three complete surveys of the area using nocturnal call counts were conducted. The spotted owl was neither heard nor observed during these surveys. Three-day time call surveys in the area of the 1979 sighting also failed to detect spotted owls. Searches for roost sites in the historic location also took place and no sign of spotted owl activity was observed.

Since spotted owls had been observed on McGregor Range during the winter, surveys for this species were conducted in the Sacramento Mountains foothills on the McGregor Range from December 12, 1995, to February 21, 1996, and the Organ Mountains in March 1996. No spotted owls were heard or observed during these surveys (U.S. Army, 1996n). No mixed conifer habitat and only a few isolated ponderosa pine occur in the Sacramento Mountains foothills on McGregor Range. Studies elsewhere in New Mexico showed that the Mexican spotted owl rarely roost and does not nest in pinyon pine-juniper habitat (Seamans and Gutierrez, 1995; Zwank et al., 1995). 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 are only used by spotted owls on an occasional basis during the winter or dispersal (U.S. Army, 1996n).

Skaggs (U.S. Army, 1991a) estimated that about 10 square miles of the Organ Mountains contain potential spotted owl habitat and within this area, suitable habitat is highly fragmented. Most of this habitat is outside Fort Bliss boundaries. Recent fires may have reduced the amount of available habitat. Based on work in the Sacramento Mountains (Skaggs and Raitt, 1988), it is estimated that the Organ

Mountains could support a maximum of two or three spotted owl territories (U.S. Army, 1991a). The spotted owl may occasionally occur in the Organ Mountains given the existence of suitable habitat. However, its occurrence will likely be sporadic given the small amount of potential habitat and the high potential for local extinction (U.S. Army, 1991a).

Mountain plover. The mountain plover is a federal proposed threatened species 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 Utah in habitat dominated by low growing shrubs such as sagebrush (*Artemesia* sp.) and rabbitbrush (*Chrysothamnus* sp.) (Day, 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). 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 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. 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 Fort Bliss provides the best potential habitat for this species, especially in the sacrifice areas around stock tanks and troughs, and at prairie dog towns. Mountain plover surveys have been conducted on Otero Mesa on Fort Bliss from 1997 through 2000 and they consisted of ground transects, road surveys, and observations at prairie dog towns and heavily grazed areas at some stock tanks. The mountain plover was not recorded during these surveys but one individual was observed on April 5 and 6, 1999, near Mesa Horse Camp on Otero Mesa (U. S. Army, 1999a). This bird was in breeding plumage and was observed foraging in the area of a corral. This area is heavily grazed by livestock and a large prairie dog town is also in the area. The mountain plover was not observed in the Mesa Horse Camp area or at any other location on Fort Bliss during subsequent observations. It is assumed that this bird was probably migrating through the area. It is also assumed that given all the biological surveys that have been conducted on Otero Mesa in recent years and the fact that only one migrant has been observed; the mountain plover is not a breeding bird species on the mesa or elsewhere on Fort Bliss (Locke, 1999).

Black-tailed prairie dog. The black-tailed prairie dog is a federal candidate species but is not listed by the states of New Mexico or Texas. The USFWS has found there to be sufficient information to list the black-tailed prairie dog as a threatened species throughout its range but a proposed rule on this species is precluded at this time because of work on higher priority species (Fed. Reg. 2000, Vol. 65, No., 24, pp. 5476-5488) (USFWS, 2000b). It is estimated that this species inhabits less then 0.5 percent of its historic range and has undergone a 98 percent reduction in population reduction. This reduction is mirrored in New Mexico where about 0.5 percent of the historic range is occupied (Fed Reg., 2000). 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, 1996o; 1998c; 2001b). The number of active prairie-dog towns ranged from 10 in 1996 to 17 in 1999 while the number of adults also showed an increase from 399 in 1996 to 686 in 1999. Prairie dog densities were low throughout this period (3.6 to 5.3 prairie dogs per acre of

active prairie-dog town). Overall, there was an increase in the prairie dogs on Otero Mesa from 1996 to 1999, but densities are an order of magnitude less than densities reported elsewhere. The reasons for the low populations on the Otero Mesa are not clear (U.S. Army, 1998c). Sensitive species observed at the prairie-dog towns on Otero Mesa were the burrowing owl, mountain plover, and ferruginous hawk.

6.7.3.2 Federal Species of Concern

Alamo beardtongue. The Alamo beardtongue is a federal and State of New Mexico species of concern. The taxonomic status of this species is currently in question and it may be part of the more widespread *Penstemon harvardii* but a final determination on its status has not been made and for the purposes of this discussion, it will be assumed it is still a separate species. This species is known from the Sacramento and San Andres mountains, and was discovered in the Hueco Mountains on Fort Bliss in 1991 (U.S. Army, 1991b). Surveys in 1991 revealed that this species was growing on rocky canyon bottoms and on cliffs in two canyons in the Hueco Mountains; a total of 105 plants were observed (U.S. Army, 1991b). A follow-up survey was conducted in 1997 to determine the current status of the species. A total of ten canyons in the Hueco Mountains were inspected and populations totaling 363 plants were found only in the two canyons where this species were observed in 1991 (U.S. Army, 1998c). Thirteen monitoring plots were established in two canyon systems in 1997. However, these plots were not monitored in 1998 due to the likelihood of this species being lumped with the widespread *P. harvardii*. Overall, the population of Alamo beardtongue appears to be healthy.

Organ Mountains evening primrose. The Organ Mountains evening primrose is a federal and State of New Mexico species of concern. This species is known only from the Organ Mountains (U.S. Army, 1994b). This plant is found only in streambeds or adjacent hillside seeps where surface water is present for at least part of the growing season. This primrose typically grows in open, sunny areas in riparian woods dominated by mountain mahogany, box elder, and willow (U.S. Army, 1994b).

A total of 24 plots were sampled from 1996 through 1999 (only 14 plots sampled in 1998) to monitor population size, density, and reproductive status as well as the effects of the 1994 fire. Results indicate that the number of stems and seed capsules per plant are similar in the burned and unburned population (U.S. Army, 1996l) and the number of plants per plot fluctuated widely from year to year apparently in response to variations in the amount of precipitation (U. S. Army, 1997o).

Organ Mountains figwort. The Organ Mountains figwort is a federal and State of New Mexico species of concern. This species occurs only in the Organ Mountains and grows at higher elevations in dark organic soil in canyon bottoms in the oak woodland plant community. This species may be palatable to livestock and if the area were opened to grazing, it could be negatively impacted (U.S. Army, 1994b).

Populations of the Organ Mountains figwort are being monitored at 11 locations for population size, density, height, and reproductive status. In addition, the impacts of the 1994 fire were analyzed. Results from the plots in 1996, 1997, and 1999 show an increase in the number of plants from 135 in 1996 to 289 in 1999. A similar increase in the number of reproductive plants from 1997 to 1999 was also noted (U.S. Army, 2000b). Preliminary results indicate that the plants in the burn site had higher number of flowers, buds, and seed capsules per plant than plants in unburned sites. In addition, the mean number of plants in the burn site was similar to unburned sites (U.S. Army, 1996l; 1997o). Fire frequently promotes flowering in herbaceous plants although the reasons for this are not clear. In addition, it is concluded that the reduction of canopy cover from the fire has not had a detrimental effect on the Organ Mountains figwort at least in the short term (U.S. Army, 1997o).

Standley whitlowgrass. Standley whitlowgrass is a federal and State of New Mexico species of concern. This species is known from isolated locations in Arizona, Texas, Mexico, as well as the Organ Mountains

on Fort Bliss. It grows at elevation 6,000 to 9,400 feet in the mixed conifer zone on cliffs and large boulders typically in mesic sites on north-facing shaded locations. There are no apparent threats to this species: it survived a low intensity burn in the Chiricahua Mountains in Arizona (U.S. Army, 1994b). Seven monitoring locations were established and 110 plants were counted in 1996 and 118 in 1997. There was no statistically significant difference in the number of plants per plot for both years (U.S. Army, 1998d).

Night blooming cereus. The night blooming cereus is a federal species of concern and an endangered 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, 1990a). 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. A survey of a 15.6-square-mile area of potential habitat on the Doña Ana Range–North Training Areas failed to identify any additional populations. Five of the seven plants from the original population were located (U.S. Army, 1998c). Subsequent surveys on Fort Bliss documented over 30 individuals in Desert Shrublands (U.S. Army, 2001a).

Hueco Mountains rock daisy. The Hueco Mountains rock daisy is a federal species of concern. This species was first collected in 1977. Surveys in 1991 revealed the presence of 652 plants of this species in two canyon systems in the Hueco Mountains in the South Training Areas on Fort Bliss and these are the only known locations of this species. The species is endemic to 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, 1991b). A 1997 follow-up survey conducted in ten canyons in the Hueco Mountains indicated that this species was found only in the areas where it was previously observed; 1,083 plants were counted in one canyon, and the number of plants in the other canyon was not provided (U.S. Army, 1998c). In addition, apparently suitable habitat was surveyed for this species in Hueco Mountains on McGregor Range and in the mountains off Fort Bliss and this species was not encountered.

Twelve long-term monitoring plots were established in 1998 and the condition of all plants in both canyons was healthy and robust and there was no sign of insect browsing (U. S. Army, 1998c). Monitoring results from 1999 indicated that there were four fewer plants then in 1998. Two plants had died and the other two disappeared. Species monitoring has continued through 2001 and populations appear to be healthy.

Nodding cliff daisy. Nodding cliff daisy is a federal and State of New Mexico species of concern. This species is found only in the Organ Mountains and all but one small population occurs on Fort Bliss. It grows on shaded cliffs at elevations 5,412 to 7,806 feet and most of the populations are inaccessible to humans and grazing livestock so there is little potential threat to the species at this time (U.S. Army, 1994b).

Sand prickly pear. The sand prickly pear is a federal species of concern and State of New Mexico endangered species. This is a cactus that typically stands less the 1-foot high but can grow in clumps up to 5 feet in diameter. This species grows in sand dunes, flood plains, and foothills of the Rio Grande corridor between Las Cruces, New Mexico, and El Paso, Texas (USFWS, 1997b). In 1988, a small population 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 took place in potential habitat on the Doña Ana Range–North Training Areas in close proximity to the known population on BLM land. The sand prickly pear was not found during this survey or during other extensive vegetation surveys that have taken place at numerous locations on Fort Bliss. The sandy areas surveyed on Fort Bliss had more grass cover than in occupied habitat on BLM land which may detract from the suitability of this habitat on Fort Bliss (U. S.

Army, 1998c). Also, most known populations of this species are in mesquite coppice dunes in the vicinity of the Rio Grande well away from Fort Bliss. Therefore, the possibility of this species occurring on Fort Bliss is low.

Franklin Mountain talussnail. The Franklin Mountain talussnail is a federal species of concern and is not listed by the states of New Mexico or Texas. This species is known from the Franklin Mountains and has the potential to occur in the Organ Mountains on Fort Bliss. It occurs in rock talus slopes in the Franklin Mountains but has not been encountered during surveys for rock talus slope snails in the Organ Mountains.

Anthony blister beetle. The Anthony blister beetle is a federal species of concern and is not listed by New Mexico or Texas. It is found on flowers and foilage of various plant species including those that grow in sand dunes and agricultural fields (BISON-M, 1997a). Potential habitat includes sandy areas along arroyos and mesquite coppice dunes. It occurs in New Mexico including Doña Ana County but the USFWS is not aware of any sightings in New Mexico since 1963 (BISON-M, 1997a). Although the Anthony blister beetle has not been observed on Fort Bliss, it has the potential to occur in appropriate habitat.

Los Olmos tiger beetle. The Los Olmos tiger beetle is a federal species of concern but is not listed by New Mexico or Texas. It occurs in limestone soil often down slope from limestone rubble. The population trends for this species are not known and it is listed as a possible species for New Mexico (BISON-M, 1997b). The Los Olmos tiger beetle has not been observed on Fort Bliss although it has the potential to occur in areas of limestone soil.

Texas horned lizard. The Texas horned lizard is a federal species of concern and is threatened in Texas and is not listed in New Mexico. This species is common and widespread on Fort Bliss and is found in grassland and desert shrublands habitat throughout the area of the post (U.S. Army, 1997e). It was commonly found along dirt roads in areas of loamy-sandy soil and this type of soil is conducive to its burrowing and foraging activities as well as to harvester ants which are its main prey item (U. S. Army, 1998c).

Black tern. The black tern is a federal species of concern and is not listed by New Mexico or Texas. This species breeds in wetlands greater than 12 acres in size in the central and western United States. 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 United States (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 (U.S. Army, 1997l).

White-faced ibis. The white-faced ibis is a federal species of concern and a threatened species in Texas. 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 migration at playas, ponds, and man-made water bodies in the Tularosa Basin and on Otero Mesa. This species is likely a regular migrant on Fort Bliss (U. S. Army, 1997l).

Peregrine falcon. The peregrine falcon was recently delisted by the federal government after being on the endangered species list since 1970 (Fed. Reg. 1999, Vol. 64, No. 164, PP 56541-56558; USFWS, 1999). Beginning in the 1980s, this species made a substantial recovery from a low of 324 nesting pairs in the United States and Canada in 1975 to over 1,600 pairs 1998. The major factors contributing to this recovery were the banning of Dichlorodiphenyltrichloroethane (DDT) and other organochlorine pesticides, as well as management activities including the reintroduction of captive-bred and relocation of wild peregrine falcons hatchlings. As part of the delisting process, federal agencies are required to monitor this species on their lands for 5 years, and such a monitoring program will take place on Fort Bliss. The American peregrine falcon is still listed as an endangered species by the State of Texas and threatened in New Mexico. Nesting peregrine falcons have been monitored extensively in New Mexico from 1979 through 1996 and less extensive monitoring data are 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 on territory 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).

Surveys for peregrine falcons and their potential nesting habitat were conducted in the Organ Mountains and foothills of the Sacramento Mountains on Fort Bliss in 1979 and 1980. It was determined that the habitat in the Organ Mountains with its large cliffs, intermittent stream flow, and the mosaic of conifer forest and mountain shrub habitat represented the best potential habitat and potential habitat in the Sacramento's was inferior to the Organ Mountains because of the much drier nature of this area (U.S. Army, 1980a). One peregrine falcon nest fledged two young in 1998.

Northern goshawk. The northern goshawk is a federal species of concern and a threatened species in Texas. 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 but this species has not been recorded during breeding bird and raptor surveys of this area (U. S. Army, 1980a; 1991a; 1994b; 1997o). The northern goshawk is considered a rare migrant on Fort Bliss.

Ferruginous hawk. The ferruginous hawk is a federal species of concern and is not listed by the states of New Mexico or Texas. 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 Fort Bliss 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, 1995b; 1996j). This hawk's 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; Schmultz, 1984).

Systematic surveys have been conducted for the ferruginous hawk along 162 miles of routes on Otero Mesa and in the grassland and desert shrubland habitats below the mesa from 1997 through 1999. It was recorded 37 times during the fall, winter and spring during these surveys and most were in the northern part of Otero Mesa (U. S. Army, 1998c; 1999a). The ferruginous hawk was observed during other studies on Fort Bliss also during the fall, winter, and spring (U.S. Army, 1996o; 1994a; 1995b; 1996j). This species was not observed on Fort Bliss during the breeding season during any of these studies nor during intensive breeding bird surveys on Otero Mesa from 1996 through 1998 (U.S. Army, 1996h; 1997g;

1998g). Therefore, this species is considered a migrating and winter resident on Fort Bliss but not a nesting species.

Western burrowing owl. The western burrowing owl is a federal species of concern and is not listed by New Mexico or Texas. This species nests in desert grasslands such as occur on Otero Mesa and in desert shrublands as occur in Tularosa Basin. It also nests in prairie, mesquite coppice dune/sand scrubs, 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).

Fort Bliss had been conducting surveys and monitoring activities for this species from 1996 through 2001. The burrowing owl nests on Otero Mesa where it was observed at 20 of the active and inactive prairie-dog towns observed on Otero Mesa (U.S. Army, 1996o). 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, 1998c). 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 occur 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, 1998c). In 1997, one burrowing owl was repeatedly observed along a road in the Tularosa Basin between Short-Range Air Defense (SHORAD) and Mack Tanks; it was living in some kangaroo rat holes (USAF, 1997g).

Loggerhead shrike. The loggerhead shrike is a federal species of concern and is not listed by New Mexico or Texas and it breeds throughout much of New Mexico including the Fort Bliss area. 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 in northern states are 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 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).

The loggerhead shrike populations north of New Mexico migrate south to New Mexico, Texas, and Arizona to winter (Root, 1988). Loggerhead shrike presence on Fort Bliss consists of wintering and resident birds. Surveys on Fort Bliss revealed that the species is fairly common and widespread on the installation (Appendix B). For example during several surveys it was found that eight loggerhead shrikes were in the Hueco Mountains. One hundred thirty-seven were recorded at 24 survey sites in the Chihuahuan Desert shrublands and 114 were recorded from 12 grassland survey locations (U. S. Army, 1996h; 1997g). In addition, 32 shrikes were tallied in 8 arroyo/upland transects sampled in 1997 (U. S. Army, 1997f). This data indicate that the loggerhead shrike comprises about 1 percent of the breeding bird fauna in the desert shrublands and grasslands on McGregor Range. Long-term monitoring data are unavailable for McGregor Range, so it is not known if the loggerhead shrike population on the range has declined as observed in the state and nationally.

Baird's sparrow. Baird's sparrow is a federal species of concern and a threatened species in New Mexico. It is a threatened species in Canada and population declines in the United States have been documented. This species 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 during migration and the winter, but in recent years is very rarely reported (NMDGF, 2000).

Baird's sparrow was observed on McGregor Range during migration and is believed to winter on the post (Smartt, 1980; U.S. Army, 1998c). Surveys for this species were conducted at 22 sites on McGregor Range in the winter and spring of 1997 through 1999 (U.S. Army, 1998c; 1999a). It was observed 27 times and 89 percent of the observations were in swales on Otero Mesa. This species was observed most frequently in 1997 and was not recorded in 1997 or 1998. The largest number of birds recorded were *Ammodramus* sp. and it is assumed that many of these were also Baird's sparrows (U. S. Army, 1999a). No *Ammodramus* sparrows were recorded during the 1997 to 1998 sampling period and although the reasons for this are not known, it is known that wintering sparrows are highly mobile and areas used can change quickly depending on food availability and weather conditions (U. S. Army, 1999a). Baird's sparrow was observed in the winter and an influx of individuals was noted in April coinciding with spring migration. Preferred habitats 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, 1998c).

Bats. Twelve species of bats that may occur on Fort Bliss are federal species of concern including the small-footed myotis, long-eared myotis, eastern small-footed bat, occult little brown bat, fringed myotis, cave myotis, long-legged myotis, Yuma myotis, spotted bat, Townsend's pale big-eared bat, big free-tailed bat, and greater western mastiff bat. The spotted bat is also considered threatened by the states of Texas and New Mexico. No installation-wide surveys have been conducted to evaluate the bat community 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). Observations at one of these locations in 1998 showed that a maternity colony of *Myotis* sp. still existed and based on bat behavioral characteristics, it appeared to be a fringed myotis colony but this could not be verified (U. S. Army, 1999b). Surveys for bats along the Otero Mesa escarpment took place during the late spring and summer of 1997 and 1998. No large roost sites were observed along the Otero Mesa and sensitive species that can be heard, such as the spotted bat, were not detected. *Myotis* sp. were observed and could have represented sensitive species but species determinations were not made (U. S. Army, 1999b).

Gray-footed chipmunk. The gray-footed chipmunk is a federal species of concern. This species occurs in the woodland and forested habitats in the Sacramento Mountains foothills on McGregor Range. A specimen collected from Rim Tank is in the University of Texas, El Paso, (UTEP) vertebrate museum (Harris, 1996).

Organ Mountain Colorado chipmunk. The Organ Mountain Colorado chipmunk is a federal species of concern and a State of New Mexico threatened species. Based on morphological features, the Organ Mountain chipmunk was determined to be a new subspecies in 1980 (Patterson, 1980). The Colorado chipmunk (*E. quadrivittatus)* likely colonized the Organ Mountains during the last glacial period and due to small population size, total isolation, and the influence of the Chihuahuan Desert climate, the rapid evolution of this subspecies occurred (Patterson, 1980). The Colorado chipmunk differs from other species in that it is smaller and more brown in color (Patterson, 1980).

This subspecies is known from the Organ Mountains (Sullivan, 1996). During surveys conducted by Fort Bliss, 99 chipmunks were detected along transects sampled in 1996 in 6 habitat types in the Organ Mountains; chipmunks were detected most frequently in montane shrub (23 percent), oak woodlands (34 percent), and mixed conifer forest (12 percent) (U.S. Army, 1997o). Chipmunks were found in rocky

areas with mean percent rock ranging from 34 to 49 percent. Vegetation canopy coverage was low, ranging from 9 to 24 percent. Chipmunks were found more often in habitat burned during the 1994 fire than in unburned plots. The Organ Mountain Colorado chipmunk may be selecting burned areas because fire opened up the canopy, creating preferred habitat for this species (U.S. Army, 1997o).

6.7.3.3 State Protected and other Sensitive Species

Organ Mountains pincushion cactus. The Organ Mountains pincushion cactus is a state endangered species in New Mexico. This species is known only from the Organ Mountains in Doña Ana County (U.S. Army, 1994b). This species is found growing among rocks at elevations to 5,707 to 8,495 feet in the pinyon pine-juniper and mixed conifer plant communities. Plants are found most frequently in mesic microhabitats with strong light and often are seen on the north side of boulders. Plants of this species are scattered throughout rugged terrain and the major portion of its range is inaccessible to humans thereby minimizing the potential for collection. It is believed that fire would damage only a small number of individuals (U.S. Army, 1994b).

Twenty-six monitoring plots were established for the Organ Mountains pincushion cactus and data collected at these plots show that clumps of this species range from 0.05 square centimeters to 425 square centimeters and that there are 1 to 80 stems per cluster (U.S. Army, 1996m). Data from cacti in burned and unburned plots indicate there are no differences in important parameters such as number of stems, average plant size, and mean number of reproductive stems per plant. Some cacti were scorched by the fire and were alive. However, delayed mortality in small cactus from 1 to 3 years after a fire has been reported, so continued monitoring of these plants is required (U.S. Army, 1997j).

Crested coral-root. Crested coral-root is an endangered species in the state of New Mexico, where it is widespread but rare. This orchid is found only in the Organ Mountains. It grows in shaded organic soil in the oak woodland plant community. The removal of the tree canopy would probably result in the elimination of this species (U.S. Army, 1994b).

Woodland snails. The boulder woodland snail, Maple Canyon woodland snail, Organ Mountains woodland snail, and Beasley's woodland snail are found in the Organ Mountains on Fort Bliss and have no federal or state government status. However, they are critically imperiled or imperiled globally because of “extreme rarity, narrow endemism, and vulnerability to extinction” (U.S. Army, 1994b). These large land snails range from 11 to 15 millimeters in diameter and can be distinguished from each other by shell characteristics (U.S. Army, 1994b). The woodland snails are found in a variety of canyons in the Organ Mountains at elevations ranging from 5,297 to 7,400 feet.

The woodland snails occur in rock-covered slopes. Rocks provide a relative cool and moist environment necessary for the snails’ survival. During periods of hot and or cold conditions, the snails will move deeper into the soil among the rocks for protection. During warm rains they may be found near the surface feeding on leaf litter. Recent surveys have verified that populations observed in the 1960s continue to persist (U.S. Army, 1994b). Continued monitoring of the woodland snails in the Organ Mountains has resulted in the identification of additional populations as well as a new species, the Beasley’s woodland snail (U.S. Army, 1997j).

Mountain short-horned lizard. The mountain short-horned lizard is a threatened species in Texas and is not listed by the federal government or New Mexico. It is the most widespread of the horned lizards and occurs throughout the western two thirds of New Mexico. It is found in a wide variety if habitats from semi-arid shrublands through shortgrass prairie and pinyon pine-juniper woodlands (Degenhardt et al., 1996). According to Degenhardt et al., (1996) *Phrynosoma douglasii hernandezii* is the only subspecies of the short-horned lizard found in New Mexico.

The short-horned lizard was captured in the grasslands on Otero Mesa but not in the Chihuahuan Desert shrublands in the Tularosa Basin (U. S. Army, 1997e; 1996f; 1996g). This species is also likely to occur in the pinyon pine-juniper woodlands and montane shrublands in the Sacramento Mountains foothills and the Organ Mountains as well as the conifer forests in the Organ Mountains.

Mottled rock rattlesnake. The mottled rock rattlesnake is a New Mexico threatened species. It is typically found in rocky canyons and hillsides and in New Mexico is known only from the Guadalupe Mountains in Eddy County and extreme eastern Otero County (Degenhardt et al., 1996). This rock rattlesnake has been documented from Fort Bliss, but the mottled rock rattlesnake has not. Potential habitat occurs in the Hueco and Organ mountains as well as along the Otero Mesa escarpment.

Texas lyre snake. The Texas lyre snake is a threatened species in Texas. This snake inhabits a variety of plant communities from desert shrublands and grasslands to montane woodlands and forests. Natural outcrops and deep fissures provide good habitat for this species. In New Mexico, it occupies the southern desert and foothills ranging north along the Rio Grande to Truth or Consequences (Degenhardt et al., 1996).

The Texas lyre snake has been observed in rocky Chihuahuan desert of the Franklin Mountains north of El Paso Texas (Degenhardt et al., 1996). It has been observed on the Castner Range of portion of Fort Bliss.

Zone-tailed hawk. The zone-tailed hawk (*Buteo albonotatus*) is a threatened species in Texas and is not listed by the Federal Government or the State of New Mexico. This species occurs in southeastern Arizona, central New Mexico, and west Texas. This species has a preference for mountainous steep canyons and other areas of steep topography. It nests in riparian forests and woodlands, as well as montane conifer forests and to a lesser extent, in oak woods. The zone-tailed hawk forages widely over open habitat such as desert shrublands and grasslands and open pinyon pine-juniper woods, woodlands along rivers, and in canyons. Fort Bliss is within the breeding range of this species; it has nested in the Guadalupe and Capital mountains, along the Gila River valley and as far north as Los Alamos (Palmer, 1988). Fort Bliss has no nesting potential habitat for the species. Migrant zone-tailed hawks have been observed on rare occasions over the Otero Mesa escarpment and the Sacramento Mountains foothills.

Costa's hummingbird. Costa's hummingbird is a threatened species in New Mexico. It lives in arid habitats in the southwestern United States and northwestern Mexico. It typically occurs in the extreme southwestern New Mexico and is considered a warm season migrant and occasional breeder, particularly in Guadalupe Canyon (NMDGF, 2000). This species has been observed in the Organ Mountains and is a nonbreeding migrant on Fort Bliss.

Varied bunting. The varied bunting is a State of New Mexico threatened species. It is primarily a Mexican species but does occur in southern New Mexico in Hidalgo and Eddy counties, has been found breeding in Doña Ana County, and has been observed in Otero County (NMDGF, 2000). 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, 2000). This species is very rare on Fort Bliss and is not known to nest on the installation (U.S. Army, 1995a).

Bell's vireo. Bell's vireo is a State of New Mexico threatened species and is not listed by the Federal Government or Texas. In New Mexico, this species summers primarily in the Gila River Valley, Guadalupe Canyon, and the lower Rio Grande and Pecos valleys (NMDGF, 2000). 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, 2000). Loss and fragmentation of the dense riparian shrub-nesting habitat from various human activities and brown-headed cowbird parasitism appear to be the principle reasons for the decline of this species.

Bell's vireo is very rare 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. One bird was observed in the acacia habitat on McGregor Range in July 1997 (U.S. Army, 1997g). Breeding bird surveys in various habitats in and near the Organ Mountains in 1991 and 1992 failed to detect this species.

Gray vireo. The gray vireo is a State of New Mexico threatened species. It nests in arid juniper woodlands on foothills and mesas usually in habitat with well-developed grass cover (NMDGF, 2000) as well as arroyo-riparian habitat**.** 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 May 27 and 28, 1992 (U.S. Army, 1994b). 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. It was also recorded as a breeding species in the Organ Mountains in 1996 (U. S. Army, 1997o). Potential habitat for this species also occurs in the Sacramento Mountains foothills. However, this species was not recorded from six intensively surveyed locations within the pinyon-juniper woods in the foothills in 1996, 1997, and 1998 (U.S. Army, 1996h; 1997g). During another study on Fort Bliss, Boykin et al., (U.S. Army, 1997p) reported a gray vireo at Wildboy Tank in the Lincoln National Forest portion of McGregor Range. In addition, reconnaissance surveys specifically for this species took place in other locations in the foothills of these mountains during the 1998 breeding season. One possible but unconfirmed gray vireo was recorded (U. S. Army, 1999b).

Desert bighorn sheep. The desert bighorn sheep is a State of New Mexico endangered species. Historically, up to 16 areas in New Mexico supported this species; it currently occupies seven areas including one captive population and three recently reintroduced populations (NMDGF, 2000). This species previously existed in the Organ Mountains and these mountains are still considered potential habitat for the desert bighorn sheep.

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7.0 LAND USE AND MANAGEMENT UNITS

7.1 MILITARY LAND USE

Most of the land area within Fort Bliss is defined as training areas, maneuver areas, impact areas, or safety zones. Castner Range is no longer used for training activities. Much of this range contains ordnance and explosive hazards and is being restored as funding becomes available. Other land uses on Fort Bliss, including maintenance, industrial, supply/storage, troop housing, and administrative facilities, are located within the cantonment area, or to a smaller scale at range camps on Doña Ana Range–North Training Areas and McGregor Range. Family housing (e.g., Logan Heights), community facilities, Biggs AAF, and WBAMC are located within the cantonment area. General descriptions of each land use at army installations are shown on Table 7-1.

Table 7-1. Standard Land Use Definitions for Army Installations

Land Use	*Definition*
I. Airfield	Airfield-related facilities including landing and takeoff areas, aircraft maintenance areas, airfield operations and training facilities, and navigational traffic aids
II. Maintenance	Facilities and shops for maintenance and repair of all types of Army equipment found at the depot, installation, and TOE levels
III. Industrial	Facilities to house activities for manufacturing Army equipment and material, utility plants, and waste disposal facilities; includes DPWL repair shops and facilities engineering shops
IV. Supply/storage	Depot, terminal, and bulk-type storage for all classes of Army supplies
V. Administrative	Headquarters and office buildings to accommodate offices, professional and technical services, records, files, and administrative supplies
VI. Training/ranges	Academic training areas required to support entry level and continuing education, and fire and movement/maneuver areas
VII. Troop housing	Unaccompanied enlisted and officer personnel barracks, including dining, administration, supply, outdoor recreation, and community retail and service facilities
VIII. Family housing	Facilities to house military families along with support and recreational facilities
IX. Community facilities	Commercial and service facilities, the same as associated with towns in the civilian community
X. Medical	Facilities providing for both inpatient and outpatient medical and dental care for active duty and retired personnel
XI. Outdoor recreation	Outdoor athletic and recreational facilities of all types and intensities of use
XII. Open space	Safety clearances, security areas, utility easements, water areas, wetlands, conservation areas, forest stands, and grazing areas

Source: U.S. Army Master Planning Instructions.

7.1.1 Land Use of the Fort Bliss Training Complex

A numbering system used at Fort Bliss divides the major land management units (Doña Ana Range–North Training Areas, McGregor Range, South Training Areas, Cantonment Area, and Castner Range) into smaller, more manageable training areas. Division of these large land management units allows for greater access control, improves management of land uses, and helps ensure safety. Safety requirements and precautions are paramount for the firing of guided missiles, automatic weapons, tank weapons, conventional artillery, aerial gunnery, and small arms; launch and control of aerial targets; and explosive ordnance activities at the McGregor, Meyer, and Doña Ana range complexes.

Table 7-2 presents training area land use categories, designated A through I. This color-coded table shows nine mapable land use categories and the permitted uses compatible with each category (uses may not be concurrent). The individual training activities are defined in Table 3-2 of Chapter 3. Each land use category, while a discreet map unit, carries with it a number of permitted training uses that are compatible from a mission standpoint. Certain groups of training areas within the Fort Bliss Training Complex contain designated special uses, such as mission facilities or public access. The entire range complex contains three over-arching activities that occur everywhere: aircraft operations, training complex maintenance, and environmental management and conservation. Figure 7-1 illustrates how the training land use is applied to the training areas of Fort Bliss (U.S. Army, 1998a).

7.1.2 Military Land Use Access

Military units that request time on firing ranges and training areas submit FB Form 88 (Appendix C) to Range Scheduling, USACAS BN at least 45 days prior to desired use. The FB Form 88 used for Range Scheduling is available on the Fort Bliss website. All land use requests must be accompanied by an approved Environmental and Archeological Assessment form (Appendix C), which is also available on the Fort Bliss website.

The Range Facility Management Support System (RFMSS) is an automated tool designed to enhance the management of training lands and facilities located on Fort Bliss. RFMSS allows events to be tracked from the time of initial request through completion reporting. It is also the designated reporting system of training assets, utilization, and inventory for the Army and National Guard. As such, RFMSS serves as the database of record and provides the primary interface with various other DA and DoD systems (i.e., facilities engineering, airspace management, and environmental databases). Units that request a firing range or training area for a specific date and time are required to be prepared to commence operations at the requested time. FB Form 88 is accepted up to 24 months prior to the date that the scheduled training is to take place. Upon receipt of a completed FB Form 88 and approved Environmental and Archeological Form the Range Scheduling Branch furnishes the requester confirmation of approval. All units entering the training areas or ranges are required to establish and maintain FM communications with McGregor Range Control for the duration of their stay in the training areas and ranges.

7.2 NONMILITARY LAND USES

The Fort Bliss Training Area Complex 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). The public has limited access to some areas for recreation, hunting, and cattle grazing, to the extent that it does not conflict with military uses. Access is managed by USACAS BN through the training area numbers shown in Figure 7-1.

Table 7-2. Fort Bliss Training Area Land Use Categories.

Training Area Land Use Category	Fort Bliss Training Categories											
	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	●			●		●			●	●	●	●

INRMP 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

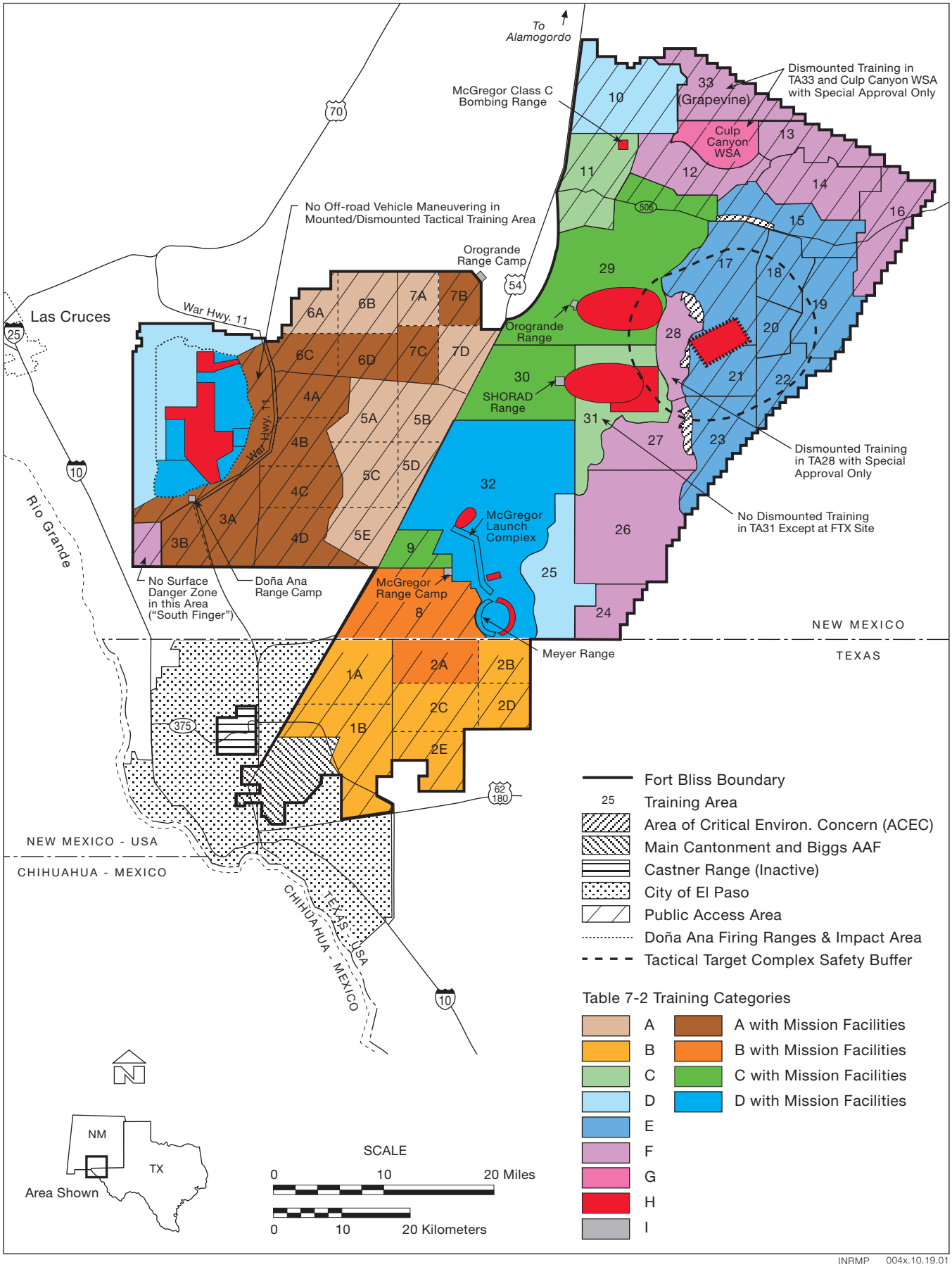

Figure 7-1. Training Area Land Use for Fort Bliss.

7.2.1 Nonmilitary Land Use Access

All activities and access on the Fort Bliss Training Complex are controlled in accordance with the *SOPs for Weapons Firing and Maneuver Area Use* (U.S. Army, 1996p). The SOP prescribes the general safety requirements and procedures for users of the training areas and ranges. Some portions of the training complex are available for public recreation and grazing. Use of the installation on weekends and after-duty hours will be reviewed on a case-by-case basis. These recreational activities may include hunting, sightseeing, hiking, camping (for special hunts only), picnicking, bird watching, and photography.

Members of the public must obtain annual Fort Bliss Training Complex Recreation Access Permits for access to the Doña Ana Ranges–North Training Areas, the South Training Areas, or McGregor Range. Permit holders are responsible for complying with specific procedures for entry, use, and exiting of the training complex. Current access procedures allow concurrent use of certain activities. Compatible military activities such as range maintenance and resource survey activities can occur along with recreational use. When military activities are incompatible with public use, the entire training area is closed to public access. These access permits may be obtained from either the Range Development and Enforcement Division of USACAS BN, or the Las Cruces Field Office of BLM. This procedure applies to government employees, members of the military, contractors, and the public at large wishing to use Fort Bliss training lands for nonmilitary activities.

7.3 ECOSYSTEM MANAGEMENT UNITS (EMUs)

Using the individual training areas as land management units, as shown in Figure 7-1, works well for managing the military and nonmilitary uses of Fort Bliss. These land management units are well recognized and used by all Army personnel in their planning efforts. However, these training areas were created to safely and efficiently meet the land requirements of the different military training needs. These units are based on training needs and geopolitical boundaries without regard to ecosystem components and do not facilitate ecosystem management, as required by DoD memorandum *Ecosystem Management Policy Directive* (Goodman, 1994a; 1994b). Therefore, for this plan, eight EMUs are described for Fort Bliss.

The eight EMUs described in detail in Section 8.2 were selected with emphasis on physiographic regions of Fort Bliss (Figure 7-2). These units provide manageable systems for several reasons, including: (1) EMUs are based on soil differences and are largely dependent on topography; most vegetation on Fort Bliss follows a topographic gradient; (2) many EMUs contain endemic species resulting in unique systems; (3) EMUs encompass areas large enough to warrant specific management objectives; (4) plant assemblages characterizing the ecosystem units are easily distinguished; and (5) each EMU is composed of areas of similar topography, soil, vegetation, and other natural components, the various portions of each should respond similarly to the same management and mitigation actions.

Table 7-3 shows the approximate acreage and the different EMUs illustrated in Figure 7-2. Fort Bliss is dominated by the Tularosa Basin. Basin aeolian and basin alluvial together comprise just over 50 percent of Fort Bliss. The foothill-bajada complex is the interface between the Tularosa Basin and the four different mountain ranges that occur on Fort Bliss, and occupies about 25 percent of Fort Bliss. The mountain ranges are significant from both the military mission and ecological viewpoints, but together occupy slightly less than one-tenth of the installation. Otero Mesa occupies 11.5 percent of the installation, but also has importance that may outweigh its relative size on Fort Bliss (U.S. Army, 1999c).

Table 7-3. Approximate Acreage and Percent of Fort Bliss in the different Ecosystem Management Units

Ecosystem Management Unit	*Acres*	*Percentage of Fort Bliss*
Basin Aeolian	445,726	39.9%
Basin Alluvial	153,635	13.8%
Foothill-Bajada Complex	284,716	25.5%
Organ Mountains	24,998	2.2%
Hueco Mountains	21,846	2.0%
Franklin Mountains	1,365	0.1%
Otero Mesa	128,068	11.5%
Sacramento Mountains	56,239	5.0%
Total, Fort Bliss	*1,116,595*	*100 %*

7.3.1 Basin Aeolian

Major landforms of the aeolian basin EMUs are wind-driven shifting sands, coppice dunes, sandsheets, and playa lakes. Elevation ranges from 3,900 to 5,200 feet. Vegetation is sandscrub dominated by mesquite on the coppice dunes, and creosotebush, four-wing saltbush, sandsage, and mesa dropseed increasing as the shifting sands increase. Sandy soils on the piedmont to basin bottom transition support sandscrub, mesquite, and a mix of mesa dropseed, four-wing saltbush, and creosotebush. Small depressions are scattered, and infrequent. Sparse desert grasslands occupy sandy flats.

7.3.2 Basin Alluvial

Major land forms of the alluvial basin EMU are alluvial fans (material deposited by flowing water) with broad interfan and intermountain depressions that drain into the basin bottom.

Elevation ranges from 3,900 to 5,200 feet. Desert scrub with scattered inclusions of desert grassland occurs on the shallow rocky soils, and tarbush is found on the lower, gently grading to flat bottom areas with siltier soils. Sandy soils support mesquite, sandsage, and a mix of mesa dropseed, four-wing saltbush, and creosotebush.

7.3.3 Foothill – Bajada Complex

The foothill-bajada complex EMU is located in two separate areas of Fort Bliss: (1) near the western boundary on the east and south slopes of the Organ Mountains, and (2) running north to south along the western edge of the Sacramento Mountains, Hueco Mountains, and Otero Mesa (see Figure 7-2). Elevation is between 4,000 and 5,500 feet. This area comprises a gently sloping piedmont dissected by drainages originating from the Organ, Franklin, Sacramento, and Hueco mountains and Otero Mesa. This unit grades into alluvial and aeolian basins. Soils are derived from granite, rhyolite, limestone, and sandstone alluvium that support a mix of desert scrub and grassland. Sandier soils near the basin support increasing numbers of mesquite in transitional communities mixed with creosotebush and grama grasses (U.S. Army, 1996c).

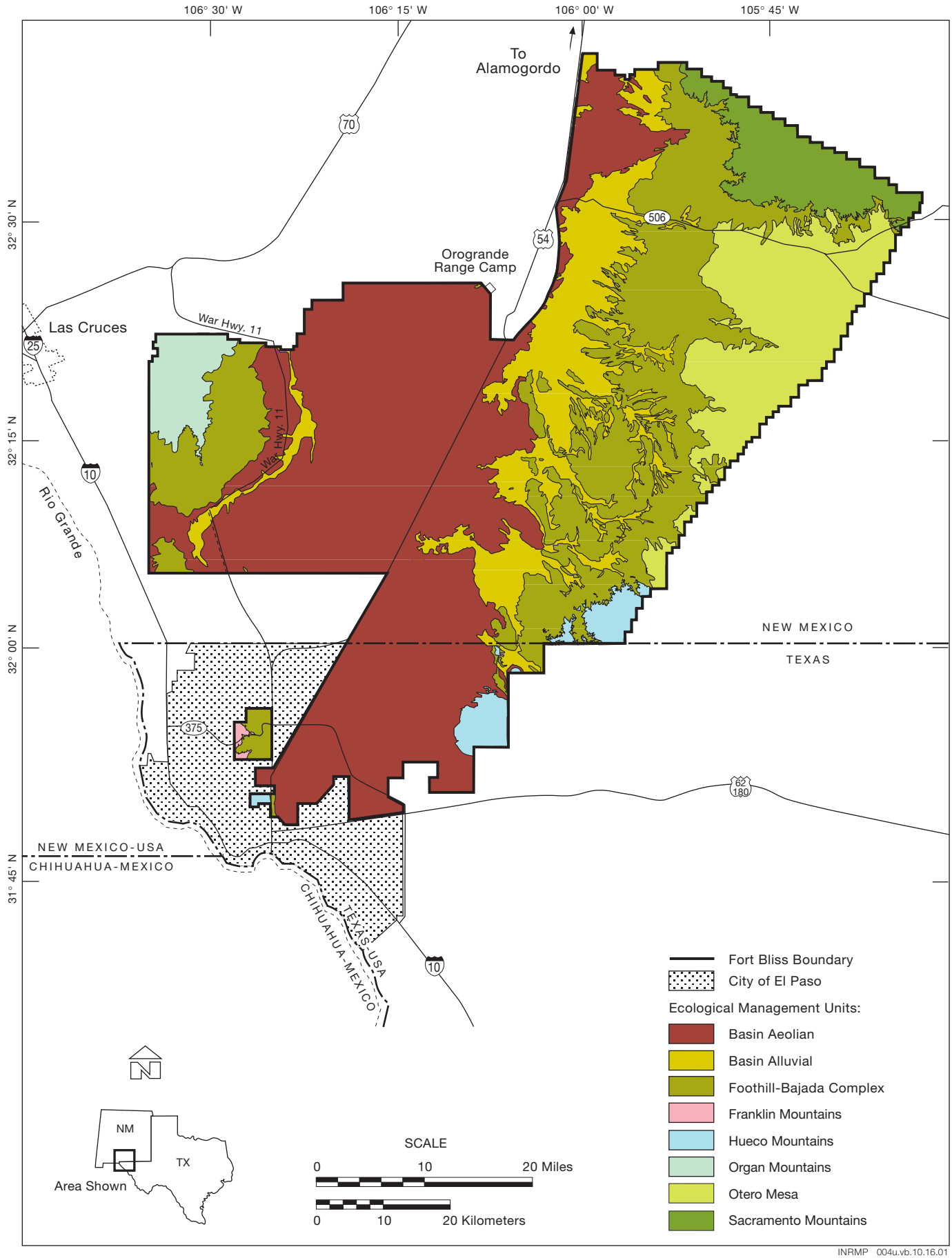

Figure 7-2. Ecosystem Management Units on Fort Bliss.

7.3.4 Franklin Mountains

The Franklin Mountains are a relatively small EMU located within Castner Range (see Figure 7-2). Elevation ranges from 4,300 to 5,500 feet. Vegetation is a mix of desert scrub with some riparian vegetation (U.S. Army, 1996c).

7.3.5 Hueco Mountains

The Hueco Mountains EMU is at the southeastern border of Fort Bliss (see Figure 7-2). Elevation is from 4,500 to 6,000 feet. Steep, limestone mountain and hill slopes with shallow soils alternate with narrow to broad mountain valleys that drain northwest through alluvial piedmonts to the basin floor. Lechugilla, creosotebush, and mariola dominate the shallow soils on the steep, rocky limestone slopes. Sideoats and occasionally black grama desert grasslands occupy gentler slopes as well as gravelly, somewhat deeper soils on the footslopes of the upper piedmont. The lower piedmont often supports creosote communities (U.S. Army, 1996c).

7.3.6 Organ Mountains

The Organ Mountains EMU encompasses the slopes and peaks of the Organ Mountains, which are at the northwest border of Fort Bliss (Figure 7-2). Elevation ranges from 4,500 to 8,600 feet. Topographic relief is high with steep, precipitous slopes alternating with deep canyons. Steep elevation gradients combine with diverse geologic substrates to support the highest vegetation diversity of any EMU on Fort Bliss. The mountains support Rocky Mountain coniferous forest and woodlands, montane scrub, and meadows. Canyons support diverse woodland and grassland riparian communities, while Chihuahuan Desert grassland and scrub are at lower elevations (U.S. Army, 1996c).

7.3.7 Otero Mesa

The Otero Mesa unit is located between the Sacramento Mountains and the foothill-bajada complex (see Figure 7-2). Elevation is between 4,550 and 5,950 feet. This area is tableland with a broad drainage system that originates in the Sacramento Mountains to the east and north and the higher area near McGregor escarpment to the west (U.S. Army, 1996c).

The area north of the mid-mesa uplift consists of gently rolling hills with deep, medium- to fine-textured soils. Piedmont is a minor landform limited to the northern boundary of the site near the Sacramento Mountains. Vegetation is predominately grama grasses that occur in a transitional zone between Chihuahuan Desert and basin grasslands. Swale grasslands with tobosa and burro grass occur in depressions and broad drainage systems near the piedmont, often with a tarbush component (U.S. Army, 1996c).

The area south of the mid-mesa uplift consists of rocky, rolling limestone hills with shallow soils and shallow upland valleys. Grama grasses dominate here also. The shallower soils, however, favor a slightly different mix of species. In addition, New Mexico needlegrass frequently occurs on rocky slope ridges, while blue grama and tobosa grass are often restricted to mesic areas in depressions (U.S. Army, 1996c).

7.3.8 Sacramento Mountains

This EMU comprises the southern end of the Sacramento Mountains, which occur at the northeastern border of Fort Bliss (see Figure 7-2). The elevation range is 4,450 to 7,700 feet. This area is made up of

a complex of limestone foothills of diverse aspects alternating with steep-sided canyons and narrow to moderately wide valleys. Vegetation is predominantly conifer woodland and Rocky Mountain deciduous scrub in the upper elevations and sandscrub and Chihuahuan Desert scrub at lower elevations.

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8.0 NATURAL RESOURCES MANAGEMENT

This INRMP uses an integrated, adaptive, ecosystem management approach that is designed to sustain and be consistent with the military missions on Fort Bliss and to protect and enhance natural resources for multiple use, sustainable yield, and biological integrity (AEC, 1997). Integrating management actions in an ecosystem framework will promote water quality, soil productivity, recreational and other uses of natural resources, and protection of biological diversity while allowing access to the resources needed to maintain a high quality of military readiness. Effective sustainable use of natural resources accomplishes no net loss in the capability of an installation to support the military mission of that installation (*Sikes Act*).

Section 8.1 describes how this INRMP will be implemented based on the various principles of ecosystem management. In summary, goals have been established for the conservation of biodiversity and the use of natural resources on several scales (e.g., installation-wide, within EMUs, for individual resources), and management actions, restrictions, and monitoring plans have been developed to achieve those goals. Those goals, management actions, and restrictions are then incorporated into land use and mission planning to integrate military and nonmilitary use of the installation with conservation goals to identify and avoid conflicts early in the planning process.

Section 8.2 presents the primary management goals, attributes, military and nonmilitary activities, and an overview of the natural resources for each EMU. Sections 8.3 through 8.15, in accordance with USACE guidelines (1997), summarize the management objectives and activities for a number of natural resources disciplines and areas of concern, and then describe how the objectives and actions for those disciplines are integrated into management for the installation.

8.1 ECOSYSTEM-BASED NATURAL RESOURCES MANAGEMENT

Ecosystem management recognizes the need to include sustainable human activities in a management program and provides a means to conduct Army missions as well as use the land for other human activities while accomplishing conservation goals (AEC, 1997). Described simply, ecosystem management is accomplished in this INRMP by (1) identifying EMUs that have similar vegetation, fauna, topography, soils, and climate; (2) establishing clearly stated goals or preferred conditions for the resources in each EMU; (3) identifying proposed human activities for each management unit; (4) identifying or developing management or conservation actions to be taken to achieve the goals based on the best available scientific information; (5) identifying scientific information that must be collected to achieve conservation goals; (6) implementing the management or conservation actions; (7) monitoring to ensure goals are achieved; and (8) adapting the conservation and management actions based on the results of monitoring to achieve the goals.

Effective natural resources management planning using an ecosystem management approach results in an integration of the various goals and management needs for the land and other natural resources with the military mission and the nonmilitary uses of the installation. The resulting integration also ensures that management actions for one resource that may be detrimental to another resource are replaced with more compatible actions. To minimize impacts on both resource and military missions, land use planning, resource planning, and daily installation management must be implemented in a manner that includes military personnel and natural resource managers.

Principles and concepts of ecosystem management have been described in many publications (e.g., Grumbine, 1994; Meffe and Carroll, 1994; USFWS, 1994; AEC, 1997). The following is a discussion of principles and concepts of ecosystem management that are most applicable to the integrated management of natural resources of Fort Bliss and a description of how these concepts are implemented as part of this plan.

8.1.1 Goal-oriented Management

Ecosystem management is a goal-oriented approach to resource management (AEC, 1997). Goals for the conservation of biodiversity and military and nonmilitary use of resources should be developed based on an understanding of the ecological properties of the system (Meffe and Carrol, 1994). In contrast to traditional resource management, goals should focus on maintaining habitat or ecosystem quality, including ecological processes important for maintaining the characteristic biodiversity of an area, rather than focusing on individual species or resources.

The DoD has an overall goal with regard to ecosystem management: to preserve, improve, and enhance ecosystem integrity (DoD, 1994b). Over the long term, this approach will maintain and improve the sustainability and biological diversity of terrestrial and aquatic ecosystems while supporting sustainable economies and communities (AEC, 1997). The basic overall goal of ecosystem management is the preservation of biodiversity. This broad goal can be broken down into specific goals including protection of enough habitats for viable populations of all native species in a given region. Management must occur at regional scales large enough to accommodate natural disturbances (i.e., fire, wind, etc.). Planning must consider periods of centuries not just a few years so that species and ecosystems may continue to evolve, and allow for human use and occupancy at levels that do not result in significant ecological degradations (Grumbine, 1994).

Within this INRMP, goals are identified for three scales of management. First, overall goals for integrated resource management on Fort Bliss are listed at the beginning of Section 8.2. Second, to ensure that these goals are achieved, goals are developed for the conservation of the resources within each EMU. Finally, goals are developed for management of specific resources such as rare or endangered species, timber, game, water quality, and soil. Management actions needed to achieve these goals also are identified and integrated into land use planning and mission activities.

8.1.2 Conservation of Biodiversity

Biodiversity has been defined by the USFWS (1994) as the variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur. Wilson (1992) defined biodiversity as the variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families, and still higher taxonomic levels, including the variety of ecosystems, which comprise both communities or organisms within particular habitats and the physical conditions under which they live.

It is an Army goal to systematically conserve biological diversity on Army lands within the context of its mission (AR 200-3). The Army also recognizes that habitat management is the key to effective conservation of biological diversity, and the protection of listed, proposed, and candidate species. Conserving native species in numbers and distributions that provide a high likelihood of persistence is also a crucial element of management (AR 200-3). Conserving and restoring biological diversity minimizes the number of species that must be protected by listing them as threatened and endangered species. Thus, ARs state that installation commanders and natural resources planners and managers, in

cooperation with other landowners, will develop and implement policies and strategies to achieve the following objectives (AR 200-3):

- Maintain viable populations of the nation's native plants and animals throughout their geographic range.
- Maintain natural genetic variability within and among populations of native species.
- Maintain functioning representative examples of the full spectrum of ecosystems, biological communities, habitats, and their ecological processes.
- Implement management solutions, which integrate human activities with the conservation of biological diversity.
- Increase scientific understanding of biological diversity and conservation.
- Increase public awareness and understanding of biological diversity.
- Encourage private sector development and application of innovative approaches to the conservation of biological diversity.

Fort Bliss is home to a wide variety of plants, animals, and other forms of life. To integrate conservation of this high amount of biological diversity with mission planning and natural resource management on Fort Bliss, the level of biodiversity within and specific goals for each EMU have been identified and described in Section 8.2. Those goals focus on preserving rare habitats and viable populations of rare, threatened, and endangered native species, and preserving large enough representative areas of all ecosystem types present to allow normal ecosystem functioning. Meeting these goals will result in the conservation of biodiversity on the installation.

8.1.3 Ecological Scale of Management

Because the distribution of species, their habitats, and other resources are not bound by political or training area boundaries, and may extend across ecological units or ecosystems, management strategies in this plan were developed at the EMU level rather than within single species or resource disciplines (AEC, 1997). This form of planning facilitates identification of areas of overlap among resources and encourages integration of resource-specific plans towards increasing the health of the regional ecosystem.

The EMUs described in Section 8.2 were developed based on natural, ecological boundaries, not political or training area boundaries. To achieve the resource and biodiversity management goals listed in that section, resource management personnel on Fort Bliss will have to consider and incorporate management actions and natural events that occur beyond the installation and work with surrounding land and resource management agencies.

Although the goals listed in this INRMP are for a 5-year planning period, they were developed based on long-term ecological time frames. These time frames incorporate life cycles, recovery from major disturbances, changes due to land uses, etc., rather than following set timetables. Additionally, the adaptive nature of this ecosystem management scheme allows for flexibility and facilitates modifying schedules and goals as necessary to maintain functioning ecosystems.

8.1.4 Integrate with Mission Activities

Integration of natural resources management with military activities is accomplished primarily through the land use planning process discussed in Section 7.0 (see Appendix A of U.S. Army, 2000c). During this planning process training organizations identify their scheduling, environmental, and spatial needs

and areas that meet these requirements are assigned specific types of training activities. Natural resources managers review the proposed activities and determine if those activities are likely to impact the natural environment to the extent that (1) future use of the area for training is jeopardized, (2) biodiversity of the EMU or the region is substantially reduced, or (3) goals and management actions in the EMU are no longer attainable. The managers then identify areas containing sensitive or important resources (e.g., endangered plants) that must be protected from mission activities. During this planning, mitigation or conservation measures are identified based on the type of activity planned in an area and the particular natural resources of the area (e.g., actions required to avoid wildfires in grasslands). Similarly, nonmilitary uses, such as grazing, hunting, and bird watching, can be affected and can affect natural resources management.

Table 8-1 summarizes the current military mission land use in terms of approximate acreage and proportion of total training category acreage that is located within each EMU. For example, the table shows that 93 percent of the area that can be used for off-road maneuvers is located in the basin aeolian EMU. The total amount of acreage available for off-road maneuvers on Fort Bliss is approximately 334,212 acres, or roughly 30 percent of Fort Bliss (see Table 3-3 and Figure 7-1). The acreages and proportions in Table 8-1 relate to the land use planning illustrated in Figure 7-1, with one exception. The controlled access FTX acreages and proportion represents the total area on which FTXs can currently occur, as opposed to the total acreage of training areas, which are zoned for FTX as illustrated in Figure 7-1 (U.S. Army, 1998a). Aircraft operations can occur over the entire installation, therefore the acreage and percentage shown for aircraft operations also equals the total acreage in each EMU, and the proportion of Fort Bliss occupied by that EMU (see also Tables 7-2 and 7-3).

Natural resources management is integrated into the daily functioning of the installation through the area access and activity approval process. Using the FB Form 88 process (see Section 7.1.2), the DOE reviews each proposed activity, including the planning and conducting of military training, construction, maintenance, repair, and real property and/or land use decisions, to assess the potential impact on natural resources and propose measures to mitigate those impacts. For activities that are substantially different from previously reviewed projects, the new missions or actions must undergo a NEPA review, in which the potential impacts of the new activities are identified and additional mitigation measures may be identified to achieve the goals described for the affected natural resources.

8.1.5 Use Best Available Information

The knowledge upon which this INRMP is based is the best available scientific information available. This information has been collected by installation personnel and contractors, obtained from other land and resource management agencies, university personnel, or other sources. In some cases, information or data on particular resources or the potential impacts of an activity are not available or are not reliable. In these cases, the information that is available from comparable situations was used to establish goals or management actions. Additional information needs currently identified for each EMU are listed in Section 8.2. This information will be incorporated as it becomes available through funding specific studies or other by other opportunities.

8.1.6 Partnerships

Regional planning for biodiversity will require extensive communication and close cooperation among concerned citizens, private landowners, scientists, and government land managers (Parmenter et al., 1995).

Table 8-1. Approximate Acreage And Proportion Of Training Category Within Each Ecosystem Management Unit

Training Category[a]	*Ecosystem Management Unit*								*Fort Bliss Total*
	Basin Aeolian	*Basin Alluvial*	*Foothill-Bajada Complex*	*Organ Mountains*	*Hueco Mountains*	*Franklin Mountains*	*Otero Mesa*	*Sacramento Mountains*	
Mission Support Facility	224,891 57.8%	92,067 23.7%	71,452 18.4%	507 0.1%	54 0.0%	0 0.0%	0 0.0%	0 0.0%	388,971 100%
Weapons Firing	313,420 56.6%	125,798 22.7%	111,750 20.2%	505 0.1%	2,000 0.4%	35 0.0%	0 0.0%	0 0.0%	553,507 100%
Surface Impact	2,483 4.6%	13,670 25.6%	31,185 58.3%	2,116 4.0%	0 0.0%	0 0.0%	4,011 7.5%	0 0.0%	53,466 100%
SDZ/Safety Impact	316,853 34.7%	138,596 15.2%	244,053 26.7%	22,881 2.5%	11,617 1.3%	32 0.0%	122,895 13.5%	56,239 6.2%	913,167 100%
Off-Road Vehicle Maneuver	312,903 93.6%	8,834 2.6%	2,491 0.7%	0 0.0%	9,984 3.0%	0 0.0%	0 0.0%	0 0.0%	334,212 100%
On-Road Vehicle Maneuver	2,156 51.5%	750 17.9%	638 15.3%	7 0.2%	35 0.8%	0 0.0%	500 12.0%	96 2.3%	4,182 100%
Controlled Access FTX Areas	249 4.4%	1,132 20.2%	210 3.7%	0 0.0%	0 0.0%	0 0.0%	4,023 71.7%	0 0.0%	5,614 100%
Dismounted Training	428,698 40.9%	139,965 13.4%	253,361 24.2%	22,881 2.2%	21,846 2.1%	1,367 0.1%	124,058 11.8%	56,239 5.4%	1,048,414 100%
Built-up Areas	9,143 88.2%	1,073 10.3%	153 1.5%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	10,368 100%
Aircraft Operations	445,726 39.9%	153,635 13.8%	284,716 25.5%	24,998 2.2%	21,846 2.0%	1,365 0.1%	128,068 11.5%	56,239 5.0%	1,116,595 100%

[a] Training categories overlap, acreages total within training categories, not EMU.

Partnerships are probably the most critical element of an ecosystem approach because, by increasing cooperation and pooling resources, the partnerships can enable the participants to accomplish more with fewer dollars (Henne, 1994). Experience has shown that successful biodiversity management programs involve both the people who must make management decisions and those who will be affected by those decisions (Keystone Center, 1996). Groups that should be considered for involvement in partnerships include, at a minimum: units, offices, and personnel using the installation; local citizens; commodity program users (grazing lessees); state, local, and federal agencies; property owners and managers whose holdings may affect, or be affected by DoD activities; and relevant public-interest groups (Keystone Center, 1996). By getting involved in partnerships, decision-makers throughout the partnerships will be able to make better-informed decisions on biodiversity conservation.

Other agencies are involved in natural resource management on Fort Bliss. The USFWS, NMDGF, and TPWL are signatory cooperators, and their signatures reflect mutual agreement concerning the conservation, protection, and management of fish and wildlife resources (*Sikes Act*). The BLM has management authority for natural resources management on those lands withdrawn under PL 106-65, about 87 percent of McGregor Range (see Appendix A), and the USFS has natural resource management authority for nonmilitary actions on that part of McGregor Range (about 2.6 percent) in the Lincoln National Forest (see Appendix A). These agencies have special expertise, which may be very useful in development and implementation of goals and actions throughout the planning and management process.

8.1.7 Adaptive Management

Adaptive ecosystem or resource management is an on-going process where management decisions, approaches, and actions are revisited as new information is gathered through the results of monitoring, from scientific studies, or as society's needs and priorities change. The extensive realignment and closures of defense installations across the country require that military missions on remaining installations adopt the roles previously fulfilled by the closed installations. Likewise, both the legal and conservation status of species change (listing and delisting of species as threatened or endangered), demands to harvest some resources change, our understanding of the relationship among resources improves, natural stochastic events occur (fires, floods, drought, disease infestations), and resources respond to mitigation measures and conservation actions in ways other than intended or expected. Because of these changes, a management plan with rigid goals, guidelines, and actions becomes obsolete rapidly. Management plans designed to adapt to the constantly changing environment and goals can establish some consistency in natural resources management and conservation on an installation.

The adaptive aspects of the ecosystem management approach taken in this INRMP are imbedded in the description of ecosystem management in the first paragraph of Section 8.1. First, measurable goals are established for the various resources or users of the resources within the system. Management and conservation actions are then identified that will achieve the goals based on the best data available to the managers. Information that is not available but needed for effective decision-making and management is identified for future research or monitoring efforts. The parameters associated with the established goals are monitored to determine if the actions are achieving intended objectives. Progress toward conservation goals and effectiveness of conservation actions are reviewed on a regular basis (e.g., annually) in light of the monitoring results and new findings from research activities on and off the installation. If negative results are identified from this monitoring for individual resources, management and conservation actions may be modified to better achieve goals. Unless monitoring results indicate more frequent review is necessary, the entire INRMP is reviewed every 5 years to assess the status of the resources, and to determine if management actions were implemented and if conservation goals were attained. If necessary, goals are then modified, actions and current monitoring are adjusted, new information needs

are identified, and the process moves forward. If necessary, the INRMP is modified and a NEPA review is conducted in accordance with laws and regulations.

8.2 ECOSYSTEM MANAGEMENT OBJECTIVES

Many of the Fort Bliss resource management objectives are broad in scope; others pertain to discrete ecosystem units. Comprehensive goals are:

- Preserve, improve, and enhance integrity of existing ecosystems in support of sustainable training and other human activities.
- Maintain connectivity between ecosystem management units on and off Fort Bliss.
- Maintain viable populations and functioning habitat for native plants and animals.
- Prevent deterioration of highly erodible soil resources.
- Protect wetland resources from degradation, enhance existing wetlands, and ensure no net loss of wetland resources.
- Identify and protect unique and sensitive areas within each EMU.
- Implement ITAM Program and all of its components to assure continued protection and use of the land resources on Fort Bliss.
- Manage exotic species to control and prevent expansion of these species.
- Consider prescribed burning as a management tool; consider wildlife suppression where necessary.

Specific attributes, impact, and management objectives for each of the eight ecosystem units are discussed below: More specific training actions can be seen in Chapter 7 and in the TADC (U.S. Army, 1998a).

Figure 8-1 represents a first attempt to understand how the EMUs defined for Fort Bliss extend beyond the boundaries of Fort Bliss (U.S. Army, 2001c). This information is important in attempting to meet the primary goal of maintaining ecological connectivity between Fort Bliss and the surrounding lands. This also represents a first attempt to view the Fort Bliss EMUs in a more regional context. The regional ecosystem management units were developed using the same types of information used to delineate the Fort Bliss ecological management units; soil type, landform, and elevation. The regional EMUS convey the same general ecological values as the Fort Bliss EMUs. However, because of the extensive nature of the project, the regional ecological management units were based on less detailed information than the Fort Bliss EMUs.

Table 8-2 shows the approximate proportions of the regional EMUs that are found within Fort Bliss. For example, approximately 20 percent of Otero Mesa is found on the McGregor Range portion of Fort Bliss. The determination of the boundaries of regional EMUs is problematic, and obviously can lead to very different impressions of ecological context. Differences in the resolution of local versus more regional GIS information leads to problems in creating any type of continuous management units over the landscape. Obvious differences relate to which criteria to use to draw specific boundaries (U.S. Army, 2001c). For example, Figure 8-1 illustrates the Organ and San Andres mountains as one continuous unit.

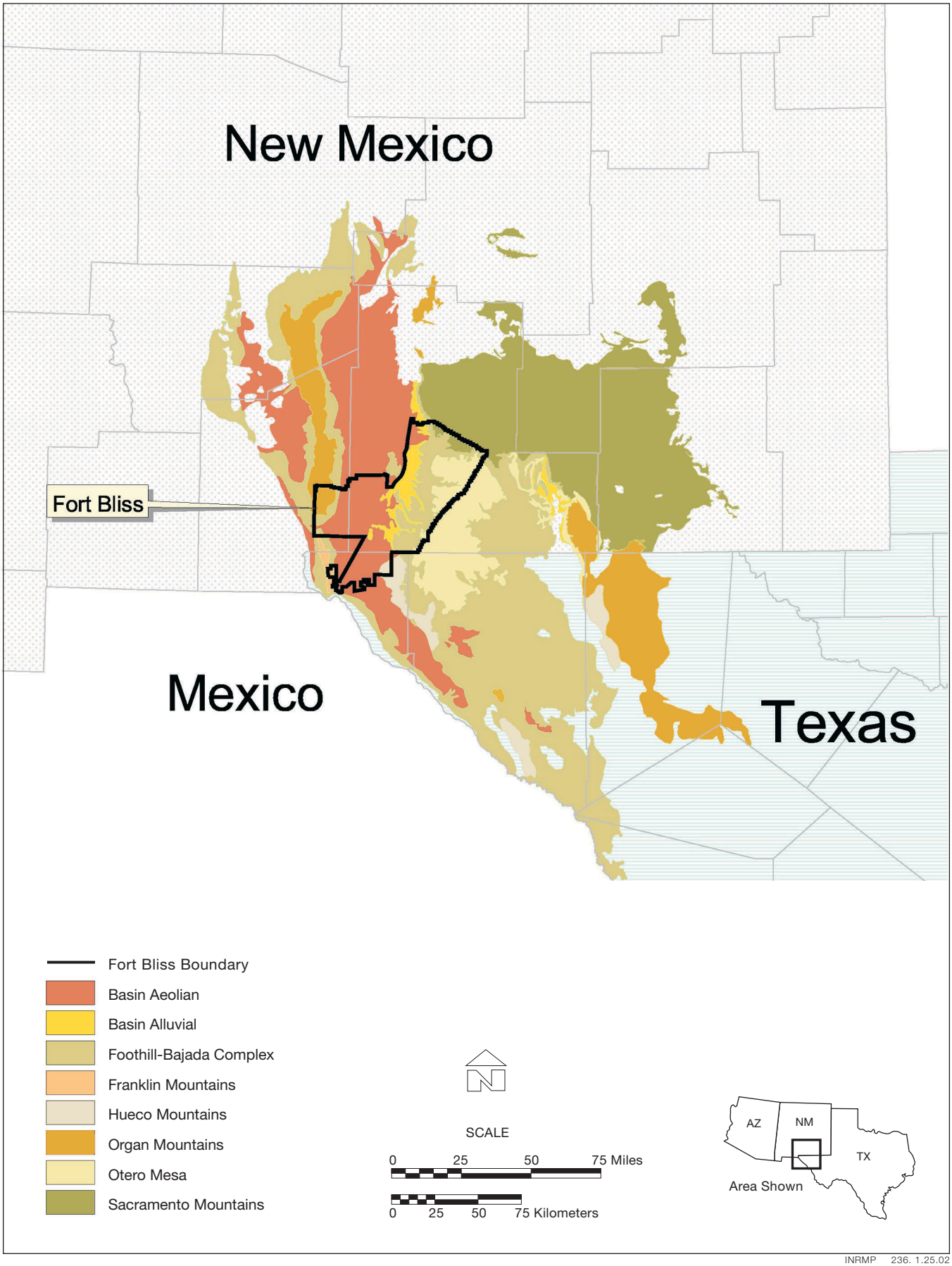


Figure 8-1. Regional Ecosystem Management Units.

Table 8-2. Percentage of Regional EMUs within Fort Bliss

EMU	*Percentage of Regional EMU in Fort Bliss*
Basin Aeolian	18.5%
Basin Alluvial	84.8%
Foothill-Bajada Complex	8.1%
Franklin Mountains	15.4%
Hueco Mountains	6.4%
Organ & San Andres Mountains	9.6%
Otero Mesa	19.5%
Sacramento Mountains	1.3%

U.S. Army, 2001c

However, if you segregate the Organ Mountains from the San Andres Mountains, then Fort Bliss contains approximately 59 percent of the Organ Mountains, as opposed to approximately 10 percent of the Organ and San Andres Mountain Complex listed in Table 8-2. In this particular comparison the difference in proportion may be relatively meaningless in terms of maintaining ecological connectivity, but may be very important in terms of putting regional context to floral or faunal components endemic to the Organ Mountains. There are a variety of perspectives that can, and should be gained from attempting to put Fort Bliss EMUs into an ecological context. Figure 8-1 represents a starting point and will be reevaluated and modified as Fort Bliss managers and surrounding land management partners gain more perspectives and better information.

Table 8-3 lists the proportion of each EMU that is currently zoned for a particular training category. The acreage values shown in Figure 8-1 apply here, so they are not duplicated. However, Table 8-3 lists the proportion of EMU available for a particular training category, rather than the proportion of the total training category acreage in a particular EMU. Table 8-3 gives an EMU perspective, compared to the training category perspective provided by Table 8-1. For example, Table 8-3 shows that approximately 70.2 percent of the basin aeolian EMU is zoned for off-road maneuver. Comparison with Figure 7-1 show that off-road training areas occur primarily in the Doña Ana Range–North Training Areas, and South Training Areas. Similarly, Table 8-3 shows that there are no off-road maneuver areas on Otero Mesa, but 96 percent of the EMU is zoned as a safety danger zone (see table 3-2 for definitions), based on the use of McGregor Range for training. These percentages, and those of Table 8-1 quantify the relationship between Figures 7-1 and 7-2 and help give management perspective for the development of the specific EMU management goals.

8.2.1 Basin Aeolian

Dunes formed around and stabilized by shrubby coppices of mesquite dominate this unit. These dunes formed before the Army began to utilize this land for training (U.S. Army, 1995f). Interdunal areas are low in nutrients and scarcely vegetated. In some areas within these coppice dunes are older unstabilized dunes that are characterized by a unique assemblage of sand-obligate species including sensitive briar (*Mimosa quadrivalvis*), pink plains penstemon *(Penstemon ambiguus*), sand reverchonia (*Reverchonia arenaria*), bindweed heliotropium *(Heliotropium convolvulaceum*), hoary rosemarymint (*Poliomintha incana*), shinnery oak (*Quercus havardii*), and others. The shinnery oak occurs in the northern portions of McGregor Range and represents one of the westernmost outlier stands for the species geographic distribution (Peterson and Boyd, 1998). These unstable dunes are protected by the restriction of no off-road traffic on McGregor Range and are virtually vehicle traps, as opposed to mesquite coppice dunes.

Table 8-3. Proportion of Ecosystem Management Units Zoned for the Different Training Categories

Training Category[a]	*Ecosystem Management Unit*							
	Basin Aeolian	*Basin Alluvial*	*Foothill-Bajada Complex*	*Organ Mountains*	*Hueco Mountains*	*Franklin Mountains*	*Otero Mesa*	*Sacramento Mountains*
Mission Support Facility	50.5%	59.9%	25.1%	2.0%	0.2%	0.0%	0.0%	0.0%
Weapons Firing	70.3%	81.9%	39.2%	2.0%	9.2%	2.6%	0.0%	0.0%
Surface Impact	0.6%	8.9%	11.0%	8.5%	0.0%	0.0%	3.1%	0.0%
SDZ/Safety Impact	71.1%	90.2%	85.7%	91.5%	53.2%	2.4%	96.0%	100%
Off-Road Vehicle Maneuver	70.2%	5.7%	0.9%	0.0%	45.7%	0.0%	0.0%	0.0%
On-Road Vehicle Maneuver	0.5%	0.5%	0.2%	0.0%	0.2%	0.0%	0.4%	0.2%
Controlled Access FTX Areas	0.1%	0.7%	0.1%	0.0%	0.0%	0.0%	3.1%	0.0%
Dismounted Training	96.2%	71.1%	89.0%	91.5%	100%	100%	96.9%	100%
Built-up Areas	2.1%	0.7%	0.1%	0.0%	0.0%	0.0	0.0%	0.0%
Aircraft Operations	100%	100%	100%	100%	100%	100%	100%	100%

[a] Training categories overlap, percentage of EMU do not total to 100%.

Primary Attributes

- Large areas of coppice dunes in stable disclimax
- Playas with unique biotas
- Scattered patches of grassland
- Unstabilized dunes (nondisturbance generated) with sand-obligate plants including some with shinnery oak
- Public access for hunting and recreation

Primary Mission Impacts

- Off-road vehicle maneuver in Doña Ana Range–North Training Areas and South Training Areas
- Field artillery firing points (Doña Ana Range–North Training Areas only)
- Obscurants
- Possible digging of gun emplacement and anti-tank ditches

Other Impacts

- Recreation
- Grazing

Primary management objectives

- Prevent expansion of coppice dunes
- Protect natural sand communities (shinnery oak and sand-obligates)
- Protect included playa and grassland areas and maintain unique biotas

Research Potential

- Investigations of geochronologic and paleoclimatic events
- Dune behavior, genesis of dunes, redistribution of nutrients by vehicles, role in groundwater recycling
- Resource limitations to vertebrate communities

8.2.2 Basin Alluvial

This ecosystem unit, spanning south to north over 40 miles, is found north and west of the Hueco Mountains, southwest of the Sacramento Mountains, east and south of the Organ Mountains, and west of the Otero Mesa escarpment. It comprises fans of materials deposited by distant streams or streambeds descending from the mountain ranges. These fans are dissected by arroyos. Vegetation is typically shrubby; common elements are creosote, acacia, snakeweed, tarbush, yucca, and various species of cacti. Playas are located on the basin floor and occasionally flood.

Primary Attributes

- High structural diversity in vegetation
- Arroyo riparian habitat, and corridors for neotropical migrant birds and other wildlife
- Playa depressions
- Soil type low weight bearing, highly erodible
- Good game bird habitat

Primary Mission Impact

- Limited off-road wheeled vehicle maneuver at Controlled Access FTX sites
- Obscurants
- Overflight

Other Impacts

- Grazing
- Recreation

Primary Management goals

- Protect and maintain arroyo riparian communities in natural functioning conditions
- Preserve natural integrity of shrub communities
- Maintain or enhance migratory bird corridors
- Monitor and prevent erosion

Research Potential

- Erosion studies
- Cryptogam response to maneuvers

8.2.3 Foothill Bajada Complex

Two separate areas of this unit occur on Fort Bliss, one near the western boundary of the installation, east and south of the Organ Mountains; and west and south of the Sacramento Mountains, including the Otero Mesa escarpment and portions of the Hueco Mountains.

Foothills support a diversity of shrubs such as; beargrass, sotol, feather pea bush, mormon tea, mariola, javelina bush, acacia, mesquite, grasses such as *Sporobolus,* gramas, and muhlies, and numerous cacti. Deep unstabilized sand dunes also occur within this unit in northern McGregor Range, just at the edge of the BLM Culp Canyon Wilderness Study Area. The dunes contain the typical sand-obligate plant species (see Section 8.2.1 for examples) including the shinnery oak (*Q. havardii*).

There are high quality grama grasslands in potions of the foothill bajada EMU. Some of these grama grasslands are mapped as “mesa grasslands” in Figure 6-10. These particular grasslands are not in areas currently grazed, and include black grama grasslands which are rated as globally important by The Nature Conservancy (TNC) (Leslie et al., 1996).

Primary Attributes

- High vegetation diversity provides high structural diversity
- Highest density of arroyo riparian habitat; arroyos provide framework of conduits for watershed and corridors for animals, particularly migrant birds
- Important ecotonal area between grasslands and woodlands
- High biotic diversity, high cactus diversity and abundance
- Good game bird habitat
- Relatively pristine grassland areas (portions ungrazed for decades)

Primary Mission Impacts

- Erosion of roads with faulty design
- Unlimited use by ground troops
- Firing range impact areas
- Overflights
- Fire

Other Impacts

- Grazing on McGregor Range
- Recreation
- Lightning-caused fires

Primary management objectives

- Protect and maintain arroyo riparian habitats in natural functioning condition as conduits for watersheds and corridors for wildlife, including neotropical birds
- Protect and maintain grasslands
- Maintain diversity of naturally functioning native shrub communities at current or better conditions as reflected in part by the presence of Sneed pincushion cactus
- Prevent erosion
- Support fire management

Research Potential

- Baseline for ungrazed blue/black grama grassland
- Erosion studies
- Effects of fire on vegetation
- Cryptogam recovery on simulated maneuver sites
- Paleoclimate reconstruction from packrat middens

8.2.4 Franklin Mountains

This north-south mountain range is south of the Organ Mountains and also straddles the New Mexico/ Texas border. Castner Range and a limited portion at the extreme north end of the Franklin Mountains are within this MEU.

Primary Attributes

- High diversity of cacti and other succulent plants
- Raptor nest sites

Primary Mission Impacts

- Overflight
- Dismounted training, including special operations and special forces

Other Impacts

- Trespass recreation, dumping (Castner Range)

Primary management objectives

- Maintain diversity of cacti and succulent plants
- Protect raptor nest sites

Research Potential

- Cacti survey

8.2.5 Hueco Mountains

These mountains straddle the New Mexico/Texas state line. Within the installation boundary the high-test elevation is about 5,700 feet. Succulent communities with agave, sotol, yucca, beargrass, and cacti populate the lower elevations; juniper grows sparsely on the higher slopes and in canyons. Although there are mesic canyons, there is no montane riparian or perennial water. The Hueco Mountains State Park is just outside Fort Bliss.

The Hueco Mountains of Fort Bliss contain the entire population of the Hueco Mountain rock daisy (*Perityle huecoensis*), and a regionally rare plant, the Alamo beardtongue (*Penstemon alamosensis*) (U.S. Army, 1998c). The Hueco Mountain rock daisy and the Alamo beardtongue occur on cliff faces within this EMU.

Primary Attributes

- High biodiversity
- Arroyo riparian habitat
- Unique succulent communities, high succulent diversity
- Cliff habitat important for raptors, bats, and plants
- Mesic conditions in canyons support regionally uncommon plants

Primary Mission Impacts

- Helicopter tactics overflight
- Ground troops
- Reconnaissance sites for units using lower terrain

Other Impacts

- Trespass
- Dumping
- Recreation

Primary management objectives

- Protect, maintain, and enhance high diversity of plant communities as reflected by arroyo-riparian, succulent, and endemic flora
- Protect and maintain cliffs as habitat for bats, raptors, and endemic plants

Research Potential

- Ecology of endemics
- Packrat middens
- Survey available water for wildlife
- Surveys of biodiversity

8.2.6 Organ Mountains

These steep, rugged mountains form a portion of the western boundary of Fort Bliss. Fort Bliss controls most of the mountain range. They contain the highest elevation within the installation, at 8,820 feet. Pinyon and juniper are dominant forest types, but ponderosa pine and Douglas fir stands occur at the higher elevations. Oak woodlands are found on the middle slopes along with montane grasslands. The BLM has established other WSA's adjacent to Fort Bliss in the Organ Mountains. Most of the Fort Bliss portion of the Organs is rugged, lacks roads, and is used only as a safety buffer zone, and less than 10 percent of the EMU is used as impact area (Table 8-3). Recent surveys (U.S. Army, 1997o) show training has had minimal impacts on endemic species. Should training plans change, management should emphasize preserving integrity and connectivity across the boundary and maintaining endemic diversity. The Organ Mountains ecosystem management unit also contains examples of rare cryptogamic plants including a rare lichen (*Omphalora arizonica)* and a sparsely distributed fern (*Phanerophlebia auriculata*) (U.S. Army, 1997o).

These mountains also harbor several endemic and sensitive animal species including the Organ Mountains chipmunk (*Eutamias quadrivittatus australis*), and several species of land snails (*Ashmunella* spp.) (U.S. Army, 1997o). The Organ Mountains chipmunk is an endemic. A similar form *E. quadrivittatus oscuraensis*, occurring in the nearby Oscura Mountains, is genetically different (Sullivan, 1996). The Organ Mountains chipmunk was thought to occur primarily in the highly restricted and fragmented mixed-conifer forest habitat. However, a study by the NMNHP revealed that this chipmunk is actually found in a variety of habitats in the Organ Mountains though populations are not large (U.S. Army, 1997o). Additionally, three species of endemic land snails (*Ashmunella* sp.) occur within talus slopes throughout the Organ Mountains and recent studies by the NMNHP suggest that some

populations of these snails may be declining or failing to reproduce (U.S. Army, 1997o). A fourth new, *Ashmunella* species has also been discovered in Ash Canyon (U.S. Army, 1997o).

The Organ Mountains also are home to endemic plant species including the Organ Mountains evening primrose (*Oenothera organensis*), Organ Mountain pincushion cactus (*Escobaria organensis*), smooth figwort (*Scrophularia laevis*), the nodding cliff daisy (*Perityle cernua*), and the whorled giant hyssop (*Agastache pringlei*) (U.S. Army, 1997o). An Indian paintbrush, (*Castilleja organorum)*, is currently under review and may be found to be a true endemic to the Organ Mountains (U.S. Army, 1997o). Additionally, many plants that are rare elsewhere are found in the Organ Mountains EMU including a rare mustard (*Draba standleyi*) found only in two other mountain ranges; (the Chiricahua and Davis mountains). An orchid (*Hexalectris nitida*) rare in New Mexico; and Plank's catchfly (*Silene plankii*) which is endemic to the mountains along the Rio Grande of New Mexico and the Franklin Mountains of Texas (U.S. Army, 1997o).

Primary Attributes

- High vegetation diversity
- Desert island unique biotic assemblage
- Endemic biota (Organ mountain chipmunk, snails, four plant species)
- Springs and perennial water
- Wide elevational range
- Diversity of cliff habitats and associated plants, raptor nesting sites
- Only igneous substrate on Fort Bliss

Primary Mission Impacts

- Surface Danger Zone
- Safety footprint
- Impact area in eastern 10 percent
- Ordnance and explosive hazards

Other Impacts

- Trespass cattle
- Trespass recreation

Primary management objectives

- Maintain and enhance high biodiversity as reflected in maintaining populations of endemic biota
- Maintain and enhance montane riparian communities, monitor water flow and quality
- Control trespass grazing
- Maintain remnant conifer stands
- Monitor fuel load for fire potential/fire management plan, suppress fires near talus slopes with endemic snail populations
- Protect cliffs as habitat for animals and endemic plants

Research Potential

- Ecology of endemic species
- Soil erosion
- Effects of fire on communities
- Tree ring chronology, Paleoclimate research

8.2.7 Otero Mesa

The Otero Mesa EMU is a large expanse of relatively intact grasslands including black grama grasslands. The TNC rates black grama grasslands as globally important (Leslie et a1, 1996). Otero Mesa is an uplifted fault block primarily covered by grasslands including *Bouteloua* (grama), *Muhlenbergia* (muhly) and *Aristida* (three-awn). Swale areas have coarser grasses such as Hilaria (tobosa). *Yucca* and *Opuntia* species are common in certain areas. It is located south of the Sacramento Mountains. An escarpment on its western edge drops off sharply to the Tularosa Basin. Elevations on the mesa range from 4,756 to 5,248 feet. Average temperatures are cooler and rainfall several inches higher than adjacent lowlands.

This unit is part of a grassland ecosystem that extends east past the Fort Bliss boundaries. Fort Bliss holds about 20 percent of this ecosystem (Table 8-2). Grasslands and savannahs can be considered the most endangered terrestrial ecosystems in the United States, with major impacts coming from agricultural activities (including grazing), fire suppression and invasion of exotic species (Noss and Cooperrider, 1994). Many historic grasslands in New Mexico have been heavily grazed and are now dominated by desert shrubs (Dick-Peddie, 1993). Ungrazed sections of southern Otero Mesa are important avian habitats.

Four separate plots of land on Otero Mesa are designated by the BLM as Areas of Critical Environmental Concern (ACEC). These were established by New Mexico State University, Fort Bliss, and the BLM. Like the majority of Otero Mesa, they are off limits to ORV traffic. ACECs were established to ensure some portions of black grama remained intact.

Prairie-dog towns occur on Otero Mesa. This species on Fort Bliss is limited to the mesa grasslands on McGregor Range in the Otero Mesa EMU (see Figure 7-2), and is a key species because it provides holes important for burrowing owls and prey for ferruginous hawks and other raptors. Both the burrowing owl and the ferruginous hawk are USFWS species of concern. Additionally, prairie-dog towns provide habitat for a variety of vertebrate and invertebrates (Degenhardt et al., 1996; Scott, 1996), and are important components of the natural biodiversity of the grasslands of western North America. The *Resource Management Plan Amendment for McGregor Range* (USDI, 1990a) identifies objectives of the *BLM Habitat Management Plan* for prairie dogs on McGregor Range. Objectives include providing stable habitat and populations of black-tailed prairie dogs for ecosystem maintenance and wildlife research purposes, and nominating prairie-dog populations in Otero County as BLM sensitive (USDI, 1990a; U.S. Army, 1993a).

Primary Attributes

- Intact grama grassland
- High diversity of grassland biota: prairie-dog towns, ferruginous hawks, Baird's sparrows, possible aplomado falcon habitat, huntable pronghorn population
- ACECs
- Recreational use (hunting, bird-watching)

Primary Mission Impacts

- Erosion due to military traffic on dirt roads with faulty design
- Limited off-road maneuver by wheeled vehicles at controlled FTX sites
- Ground troop unlimited foot travel
- Fires
- Low flying aircraft

Other Impacts

- Cattle grazing
- Recreation
- Natural fires

Primary management objectives

- Maintain integrity of grassland systems, especially black grama communities by minimizing military impacts to those grasslands and associated fauna
- Optimize road networks
- Provide easier access for hunting and bird watching

Research Potential

- Long-term monitoring of vegetation change; grassland response to stresses (training, grazing, drought), grassland response to fire, effects of training and grazing on cryptogams
- Road revegetation experiments
- Habitat requirements of wintering grassland birds
- Prairie dog population monitoring

8.2.8 Sacramento Mountains

These mountains bound the northern extent of Fort Bliss. The entire mountain range includes coniferous forest, riparian zones and springs; however, Fort Bliss occupies only a small portion of this mountain range which is primarily pinyon-juniper and mountain mahogany. The highest elevation in this Fort Bliss EMU is about 7,400 feet. There are no montane riparian, and very little ponderosa pine forest on McGregor Range. There are some ponderosa pine stands on the Lincoln National Forest portion of this EMU.

The Culp Canyon WSA is located in this EMU. The BLM management of this area is guided by the *Interim Management Policy and Guidelines for Lands Under Wilderness Review* (USDI, 1995), which require lands under wilderness review be managed so as not to impair their suitability for preservation as wilderness. Fort Bliss does not allow ORV travel or military weapons firing within this WSA. This management emphasis will continue until the area is either added to the national Wilderness Preservation System or removed from further wilderness consideration (U.S. Army, 1993a; USDI, 1995).

Primary Attributes

- Bald Eagle winter range
- Golden Eagle nesting area
- Major block of woodland savannah
- Ecotonal area between foothill and coniferous forest areas outside Fort Bliss
- Huntable deer population

Primary Mission Impacts

- Overflight
- Range impact safety fan for missiles
- Dismounted training

Other Impacts

- Cattle grazing
- Fire
- Recreation

Primary management objectives

- Maintain and enhance pinyon juniper woodland and associated sensitive fauna.
- Maintain and enhance woodland and forest areas through fuel load management

Research Potential

- Paleoclimate studies from packrat middens
- Vertebrate species baseline surveys

8.3 FOREST MANAGEMENT

Fort Bliss has three major objectives for management of forested and nonforested montane areas: fire management, habitat improvement, and watershed management. Fire management is concerned with management of fuel loading and stand structure to reduce the probability of catastrophic fire events on Fort Bliss and adjacent areas. Habitat improvement will involve vegetation manipulation to improve conditions for game and nongame species, primarily through thinnings and prescribed burns. Watershed management will concentrate on maintenance of vegetative cover to prevent erosion and excessive runoff. The Fort Bliss *Forest Management Plan* has identified priorities and specific actions to accomplish these goals.

Within the Organ and Sacramento mountain EMUs are 11,224 acres classified as forest (Table 8-4). None of these stands are suitable for commercial timber production because of poor access and/or low productivity. Therefore, the emphasis of the forest plan is concentrated on wildlife habitat improvement, watershed management, and fire management. For the purpose of this plan, these are forest (ponderosa pine) or woodland (pinyon or juniper) sites containing a crown cover of at least 10 percent of ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziessii*), pinyon pine (*Pinus edulis*), and/or

Table 8-4. Acreage of Forest Stands on Fort Bliss

McGregor Range Portion of Fort Bliss		*Organ Mountains*	*Total*
DoD	Withdrawn Public		
6,269	3,016*	1,939	**11,224**

*Does not include withdrawn Lincoln National Forest Lands.
Acreages are approximate.

alligator juniper (*Juniperus deppeana*). Though not listed as a species of concern, one-seed juniper (*Juniperus monosperma*) was also included in the inventory. Various species of oak (*Quercus*), if occurring as a component in a designated stand, were recorded during the inventory for descriptive purposes but not included in the volume computations.

Fort Bliss currently has partnerships with other landowners in the area, primarily the BLM and USFS, both of which were consulted during the preparation of the forest management plan. Both the BLM and USFS have primary management responsibilities for portions of forested sections of McGregor Range. The BLM is responsible for vegetation management on the withdrawn public land on McGregor Range (see Appendix A). Therefore the withdrawn public lands are not considered for management under this forest management plan.

Approximately 18,000 acres of the Lincoln National Forest are within the northerly portion of the McGregor Range. Use of this land by the Army is covered by an MOU between the USFS and the DA, dated November 5, 1971, and amended May 3, 1979 (Appendix A). This area is used by the Army primarily as a secondary buffer zone in connection with military missions on the main portion of the range. All land management activities are the responsibility of the USFS. Therefore, these lands are not considered for management under the Fort Bliss *Forest Management Plan*.

8.3.1 Integration

Forest management is very limited at Fort Bliss, therefore, conflicts with training are minimal. One of the primary integration needs on forested lands is the use of prescribed burning. Agency coordination is necessary, because virtually all other activities such as hunting, grazing, recreation, and military training are noncompatible at the time of burning. Fort Bliss has already conducted some initial coordination with the BLM, USFS, New Mexico State Forestry, and the community of Timberon concerning forest management plans for the Sacramento Mountains EMU. Forest management practices will be integrated with mission goals. Primary uses of forests are safety fan areas, airspace, and dismounted training.

8.4 GRAZING OUTLEASE MANAGEMENT

Fort Bliss does not currently lease any land for grazing. The only livestock grazing program on Fort Bliss occurs on McGregor Range and is managed by the BLM, per PL 106-65, and an MOU between the Army and BLM (Appendix A). The USFS manages grazing in TA 33, which is the portion of McGregor Range in the Lincoln National Forest.

Should Fort Bliss decide to lease a portion of Fort Bliss (other than McGregor Range), Army regulations require that a management plan be coordinated with the NRCS for each lease established (U.S. Army, 1995c). These regulations require the management plan to be coordinated with other natural resources management, including management for threatened and endangered species. Any grazing management plan will be coordinated with installation and MACOM natural resource professionals.

Livestock grazing occurs on portions of McGregor Range through a yearly competitive auction of grazing contracts for 14 grazing management units. Grazing units extend from U.S. Highway 54 east along New Mexico State Road 506 south of Lincoln National Forest, and continue south along the eastern edge of McGregor Range (Figure 8-2). These grazing units cover approximately 270,000 acres of McGregor Range (USDI, 1990a).

BLM's objectives for the grazing program on McGregor Range (Figure 8-2) are to: (1) maintain desired range land vegetation; (2) maintain the stable or improving trend on acres having good to excellent ecological condition; (3) stabilize or improve the trend in other areas; and (4) increase forage production to raise animal units per month (AUMs) from about 50,000 to about 60,000. This will also benefit deer and pronghorn antelope (USDI, 1990a). Range conditions will be assessed annually and "grazing levels will be established, based on the principles of multiple use and sustained yields of both wildlife and livestock."

Revenues from grazing contracts, are used for administrative, construction, and fence and pipeline maintenance costs. Fort Bliss is allowed direct expenditure of up to 10 percent of annual revenues based on 10 percent Army fee-owned land within McGregor Range. BLM is responsible for livestock trespass abatement in nonimpact areas on McGregor Range (USDI, 1990b).

BLM is responsible for construction and maintenance of pasture fences. Fort Bliss, in cooperation with BLM, retains complete control of water rights and distribution. When necessary, BLM maintains and improves pipelines and other water structures (e.g., tanks, tubs). BLM submits proposed water resources improvements/changes to Fort Bliss for approval prior to construction (USDI, 1990b). A more detailed list of additional BLM responsibilities related to grazing is located in Appendix C of the *Resource Management Plan Amendment* (USDI, 1990a).

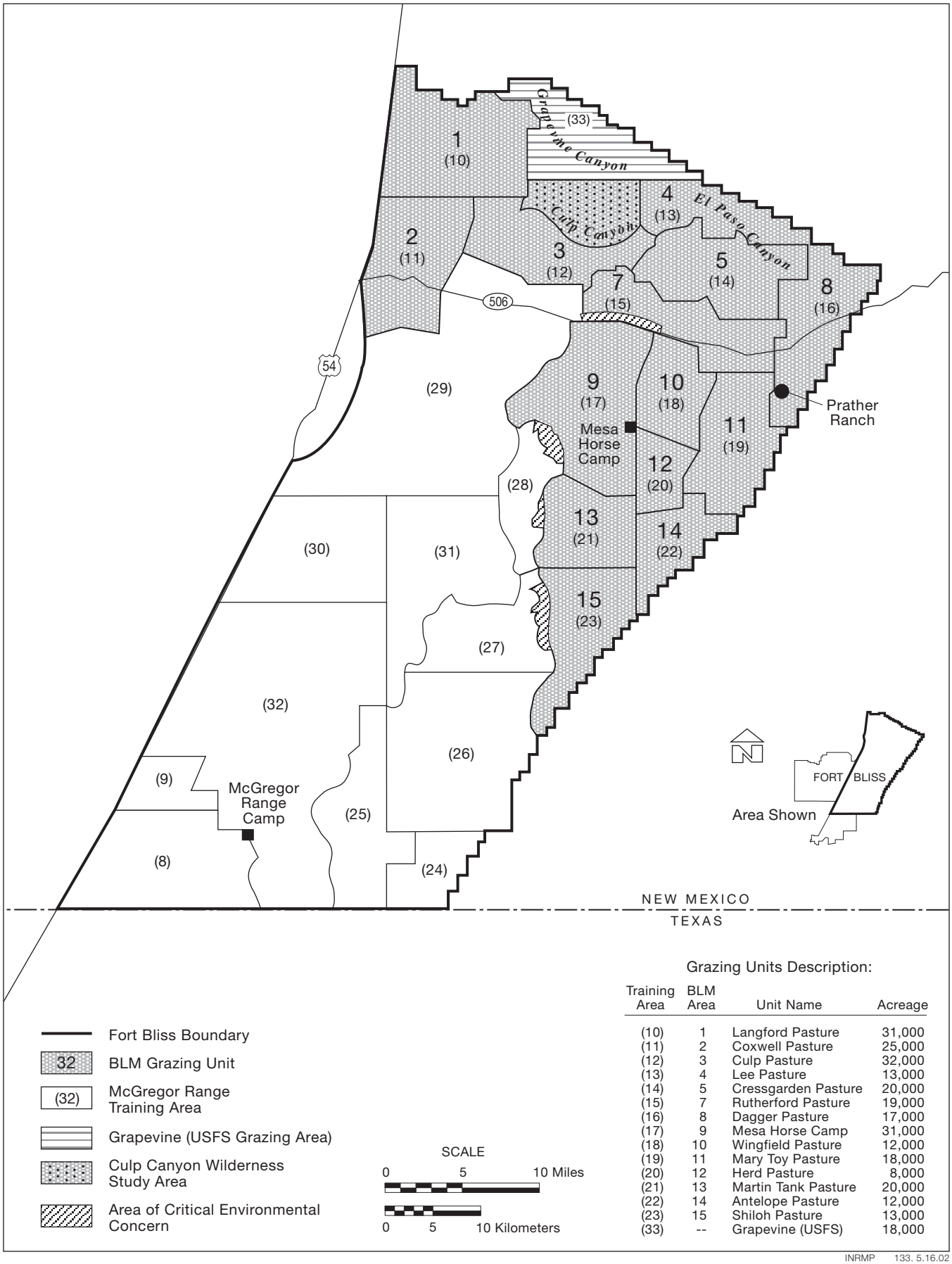
Fort Bliss controls construction and maintenance activities within impact and military use areas. Fort Bliss also constructs and maintains firebreaks on the Fort Bliss boundaries that enclose grazing land. The range commander is responsible for issuing access passes to grazing contractors. Fort Bliss also provides firing schedules and a check out system to BLM to ensure security and safety requirements (USDI, 1990b).

8.4.1 Integration

Grazing and rangeland management practices on McGregor Range must be coordinated with military training needs in addition to other natural resources management activities. The BLM and Fort Bliss meet quarterly to discuss any issues that arise. Should Fort Bliss begin to manage grazing, Army regulations provide for integration of grazing management with other natural resource management activities, as noted above.

8.5 HABITAT PROTECTION AND MANAGEMENT

Fort Bliss' Form 88 Process is required for all potential users of the ranges. A briefing in which unit commanders are informed of restricted areas is mandatory. Additionally, the Fort Bliss SOP (U.S. Army, 1996p) specifies military unit and individual responsibilities and measures required for protection of the environment and historic resources on Fort Bliss. Commanders of units using Fort Bliss firing ranges and maneuver areas are responsible for ensuring personnel observe all restrictions associated with



Grazing Units Description:

Training Area	BLM Area	Unit Name	Acreage
(10)	1	Langford Pasture	31,000
(11)	2	Coxwell 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 (USFS)	18,000

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Figure 8-2. BLM Grazing Units on McGregor Range.

"limited use" areas, which are so designated because of natural and cultural resources considerations. Commanders are responsible for ensuring personnel are not involved in artifact collecting or any other forms of vandalism of resources located on Fort Bliss. They must also ensure personnel observe all restrictions imposed as measures to prevent unnecessary damage to the natural environment of Fort Bliss (see Section 7.1.2 and 8.1.4). The Form 88 process allows DOE to ensure training complies with the land use planning shown in Figure 7-1 and Table 7-1. This review process allows DOE an opportunity to review activities in relation to the ecosystem management objectives shown in Section 8.2.

The most expansive habitat protection measures are integrated in the training area land use on Fort Bliss, which determines what training activities take place in each EMU (see Figure 7-1). Approximately 70 percent of Fort Bliss is zoned for training activities which are confined to existing roads and trails (see Tables 3-3, 8-1, and 8-3). Figure 8-3 shows the areas of Fort Bliss in which off-road maneuvers are and are not conducted. Although 70 percent of Fort Bliss is zoned for on-road maneuvers, roads and trails account for less than 1 percent of the total acreage of Fort Bliss (Table 3-3). Large portions of Fort Bliss of the Organ, Hueco, Franklin, and Sacramento mountains EMUs have few or no roads. Almost all of the roads outside of the training areas utilized for off-road maneuvers are roads that were utilized by ranchers before Fort Bliss acquired those areas.

Certain areas have additional restrictions, most shown in Figure 8-4. Red zones and green zones are areas with restrictions to traverse during on road and off-road maneuvering. "Green zones" may be traversed during on-road and off-road maneuvering, but no radical maneuvering or digging is allowed. "Red zones" are closed to vehicular maneuvers and digging, even those within training areas that are utilized for off-road maneuver areas are closed (Figures 8-3 and 8-4). The ACECs on McGregor Range are not utilized for dismounted training, but areas adjacent to them may be. These ACECs are fenced off from adjacent grazing areas, the BLM maintains these and other cattle fences in those areas utilized for grazing on McGregor Range. The Culp Canyon WSA, and the Lincoln National Forest portion of McGregor Range are only used for dismounted training after special permission from USA CAS BN, and review from DOE (see Figure 7-1). The SOP also provides protections for grasslands within the off-road maneuver areas. These grasslands are off-limits to concentrations of vehicles and personnel, or any other activity that may be destructive to these grasslands.

8.5.1 Protection for Specific Habitats or Habitat Features

Wetlands are fairly rare on Fort Bliss, consistent with an area dominated by the Chihuahuan Desert. Wetlands are avoided and screened for during Form 88 reviews. There are approximately 1,200 acres of wetland habitats documented in the DOE GIS. Almost all of these are ephemeral wetlands, commonly known as playas, that occur mostly in the basin aeolian and basin alluvial EMUs, but some exist in the foothill bajada and Otero Mesa EMUs. Playas are off-limits for concentrations of vehicles and personnel, or any other activities that would be destructive to these sensitive and easily damaged areas (U.S. Army, 1996p).

There are a few springs in the Organ Mountains EMU, and at least one in the foothill bajada EMU. The springs are in locations where off-road maneuvers do not occur. Trespass cattle have impacted these areas in the past, however, coordination with the BLM, and some fence rebuilding has resulted in better protection for these areas (primarily Soledad and Fillmore Canyon in the Organ Mountains).

U.S. Army regulations (U.S. Army, 1995a) state policy for wetlands management as "no net loss," Fort Bliss complies with that policy and will continue to periodically monitor these habitats for condition. Fort Bliss DOE coordinates with the USACE to ensure compliance with section 404 of the CWA.

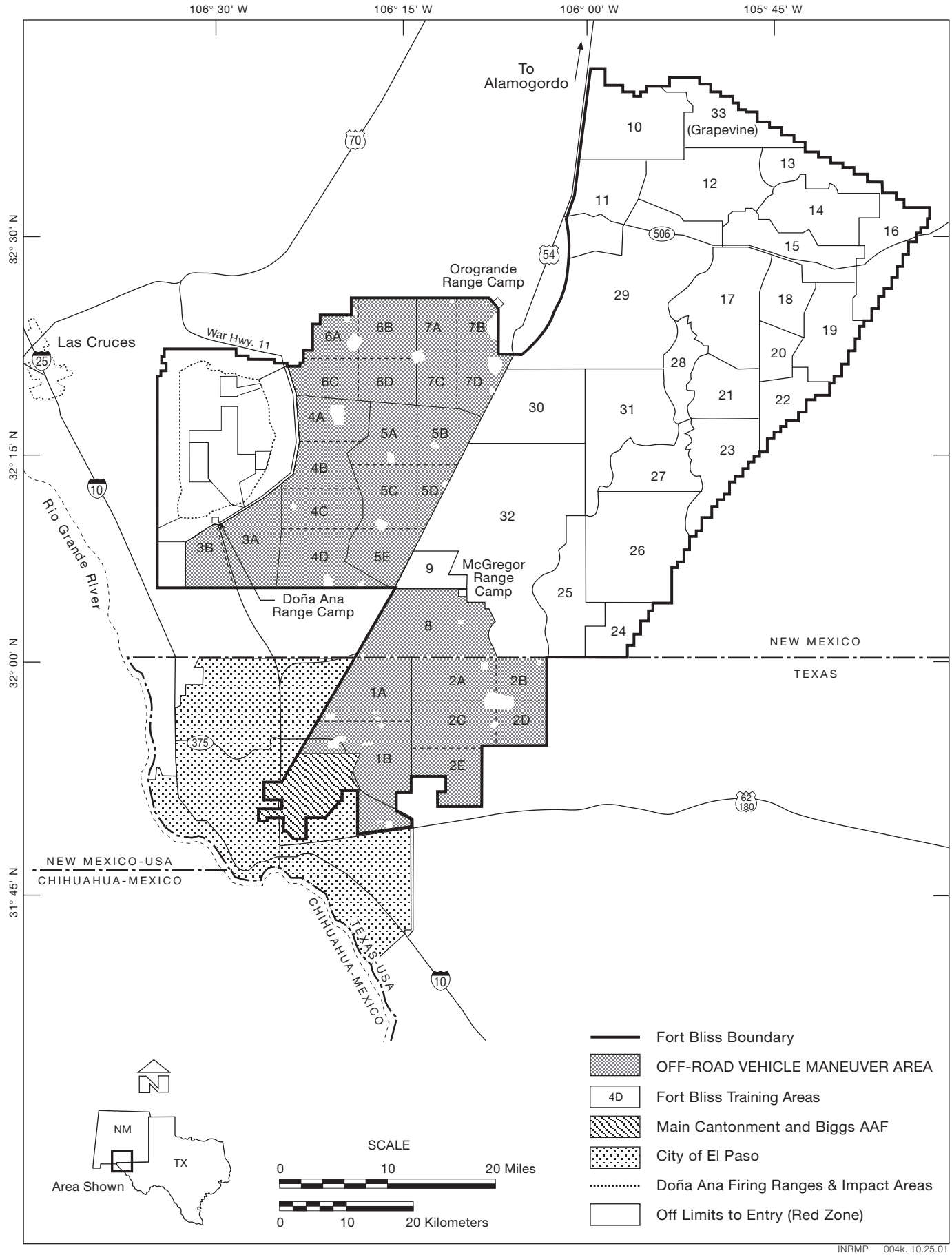

Figure 8-3. Off-Road Vehicle Maneuver Training Areas on Fort Bliss.

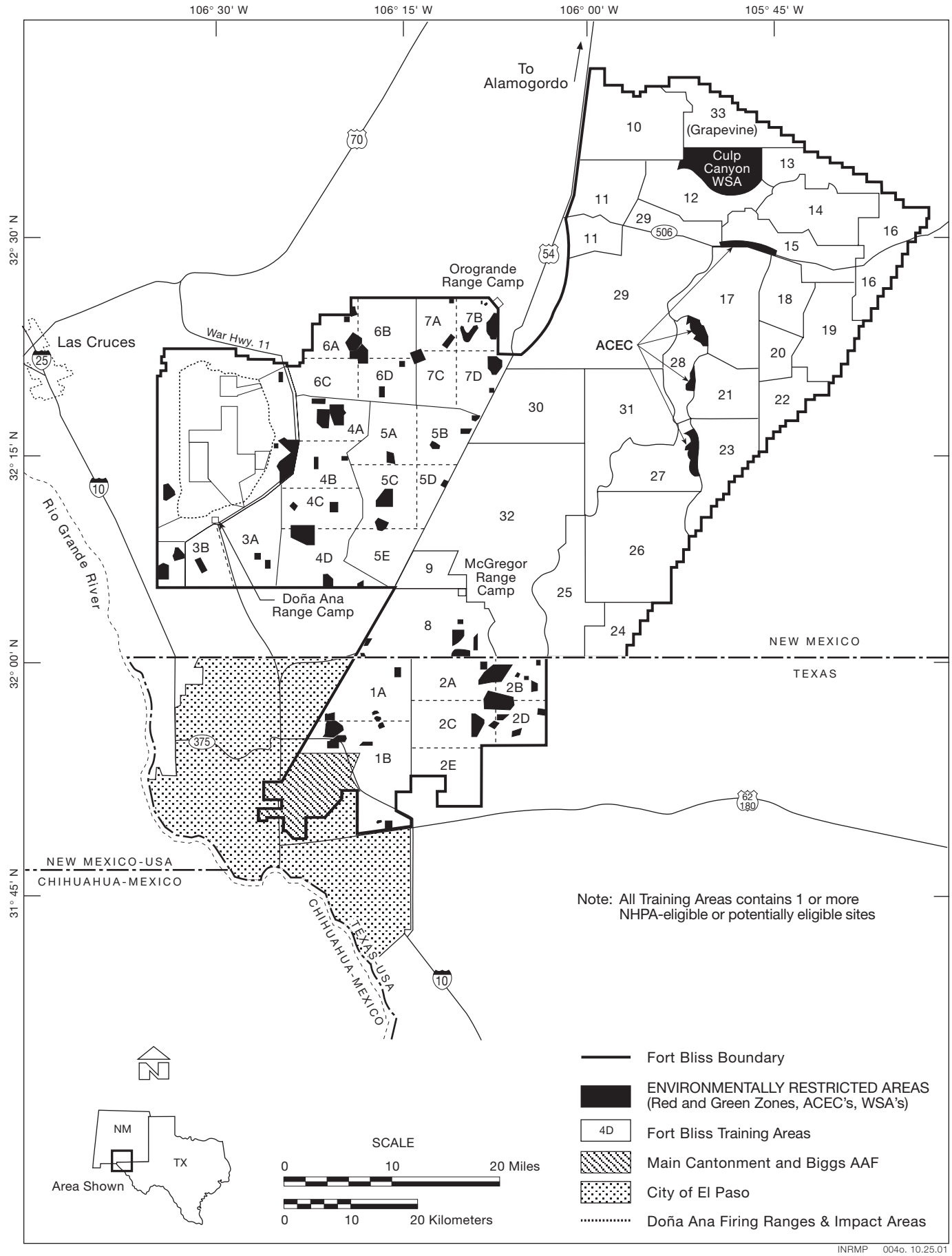

Figure 8-4. Environmentally Restricted Areas on Fort Bliss.

However, the vast majority of these wetland habitats are in the watershed of the Tularosa Basin, a closed basin with no connection to jurisdictional waters of the U.S. All of the wetland habitats on Fort Bliss are regarded as important habitats for wildlife and protected accordingly.

Earthen water collecting tanks are located throughout the installation and some have become sources of water for desert wildlife. According to the Fort Bliss SOP, these areas are off-limits to all vehicular traffic and static positions are not to be established within 100 meters of them (U.S. Army, 1996p).

Arroyo and riparian areas are habitats that receive special considerations during FB Form 88 reviews. Arroyos have been shown to be particularly important to neotropical migrant birds (Kozma and Mathews, 1997). Wildlife use arroyos as travel corridors and maintenance of arroyos helps to distribute wildlife populations to other available habitat. Figure 6-7 in Section 6.6.1 shows a map of arroyos on Fort Bliss. Arroyos are common in most EMUs except basin aeolian, and basin alluvial. The majority of arroyos (>95 percent) occur in places where off-road maneuvers do not occur.

Cliffs occur in the Organ, Sacramento and Hueco mountains and along the Otero Mesa escarpment. They provide important habitat for raptors, other birds, bats, and certain rare plants. The inaccessible nature of these areas provides a natural protection except from overflight noise and possibly debris from falling missiles or missile targets. Further protection is found in the SOP restriction against training on steep slopes (U.S. Army, 1996p). There are some caves located on Fort Bliss, primarily in the foothill bajada and Organ Mountain EMUs though a complete survey of them has not been completed. These caves are in locations protected from weapon firing. A formal survey of the known caves on the installation needs to be initiated and should include biological monitoring. Results of biological surveys of many of these cliff areas is reported in Appendix B. Wildlife surveys of caves will be undertaken if future training activities are scheduled in the vicinity.

Earthen water collecting tanks are located throughout the installation and some have become sources of water for desert wildlife. According to the Fort Bliss SOP, these areas are off-limits to all vehicular traffic and static positions are not to be established within 100 meters of them. Deliberate harassment and disturbance of wildlife near these and permanent water sources is prohibited (U.S. Army, 1996p).

8.5.2 Protections for Wildlife and Plants

Fort Bliss has several policies to directly protect wildlife and the vegetation they rely on. Fort Bliss complies with the MBTA, and the recent Army policy (U.S. Army, 2001d) released to provide guidance for compliance with the MBTA, and EO 13186. This INRMP acknowledges the great ecological and economic value of migratory birds and other wildlife to this country and to other countries. As such, Fort Bliss supports the conservation of migratory birds, to include habitat conservation, restoration, and enhancement as well as the prevention and abatement of pollution, which can be detrimental to migratory birds and other wildlife. One of the policies used to comply with the MBTA is to conduct landscaping activities during the fall and winter to avoid impacts to nests and nesting birds. The SOP for use of the training areas requires that birds nest will not be disturbed or destroyed, and if nests are encountered in work areas, the DOE will be contacted for assistance (U.S. Army, 1996p).

Appendix B of the INRMP has extensive data concerning the work done on migratory birds on Fort Bliss. Fort Bliss has funded important research that shows the importance of arroyos to migratory birds, and they receive protection priority in the landscapes (Kozma and Mathews, 1997) and other stuff from here. The vast majority (over 90 percent) of these arroyos are at small risk because they are in areas were travel is restricted to roads.

An important management practice for protection of raptors and other wildlife is compliance with guidelines for power line construction that minimize electrocution of raptors (Avian Power Line Interaction Committee, 1996). Fort Bliss will be installing insulated wire and transformer bushing covers to reduce the chances of electrocutions at transformers (Harness and Wilson, 2001). Compliance with these guidelines is conducted as part of the normal DOE review of projects during the Form 88 process.

Fort Bliss has a proactive Installation Restoration (IR) program in place to identify, evaluate, and when appropriate, remediate contaminated sites on the installation. This comprehensive IR program was established to identify and remediate previously contaminated sites that could negatively impact human health and the environment. Additional programs have been established to preclude future degradation of the environment through prevention of pollution. The IR program includes provisions for the assessment of the ecological risk associated with cleanup actions to protect wildlife. The Fort Bliss IR program is funded and run independently of the conservation programs associated with this INRMP. However, natural resources staff routinely coordinate with the personnel in the Multimedia Division of DOE and provide technical support for issues dealing with wildlife and other natural resources. Remediation activities are reviewed by the NEPA review board to insure compliance, minimize impacts, and increase the rate of revegetation. Compliance with CERCLA, RCRA, the IR program, and other compliance issues dealing with pollutants is managed by the Multi-Media Division of DOE.

The SOP (U.S. Army, 1996p) describes several protection measures instituted to protect wildlife and vegetation on Fort Bliss. These procedures are enforced by USA CAS BN and DOE personnel while monitoring training activities, as well as looked for during the Form 88 review process. Protective measures included in the SOP include:

- No vegetation, live or dead, will be used as camouflage.
- Do not dig up or collect any plants, even for camouflage. It is illegal to collect or remove cacti.
- All excavations will be backfilled by the unit making the excavation. No excavations will be made unless cleared by DOE, and annotated on the Fort Bliss Form 88.
- Hunting by personnel engaged in field training exercises is absolutely prohibited.
- Do not destroy or disturb bats or bird nests. If nests are encountered in work areas, contact the S-3 who will contact DOE.
- Do not collect or harm animals. Leave all wildlife alone, even snakes. It is illegal to collect wildlife without a state and DOE permit.
- Police all trash on a regular basis. Dispose of it in dumpsters at designated sites on the range areas.
- Burning or burying of trash is prohibited.
- Fill in and mound all excavations areas. No excavations on Otero Mesa.
- Commanders will ensure that smoke grenades, trip flares, or any other fire-causing devices are not used in an area that could cause a range or brush fire. Live devices will not be abandoned or discarded anywhere on Fort Bliss.
- USA CAS BN clearance is required prior to using tracers or pyrotechnics.

- Units must check-in with McGregor Range Control prior to occupation of training areas.
- Remove all wire and tactical obstacles after training is completed.
- Remove all ammunition, simulators, explosives, and pyrotechnics.
- Fort Bliss Form 88 clearance, completed and approved by USA CAS BN and coordinated with DOE is required prior to training.
- Contact McGregor Range Control and conduct a clearance inspection before leaving the range.

8.5.3 Habitat Management Practices

The emphasis of habitat management will be to conserve biodiversity by protecting habitats and the natural ecosystem processes that maintain them. The main focus is to minimize impacts through land use planning processes. This section describes practices that have been used by Fort Bliss and may be used in the future.

One habitat management practice utilized at Fort Bliss is the stock piling of surface soils whenever large excavations are made, such as a new borrow pit to provide material for roads or highways. The surface is pulled off and stockpiled, and then used as the last layer after the borrow pit is filled. This ensures that natural seeds and natural biota important in ecological processes are present to reestablish vegetative cover in the area.

Section 8.3 gives an overview of forestry management practices that will be implemented in portions of the Sacramento Mountains EMU. These practices will start with mechanical thinnings to reduce opportunities for catastrophic fire to move across our boundary. The first priority will be to create some firebreaks in appropriate places by removing trees and the low lying branches. Similar practices will be used in other areas to reduce crown closure in some of the thick stands of juniper. Fort Bliss will coordinate with other agencies, particularly the NMDGF to help make these manipulations beneficial for mule deer, which have been at relatively low levels in recent years. There is also potential for prescribed burns in the future. This project has been discussed with personnel from the BLM, USFS, New Mexico State Forestry, and NMDGF. More input will be sought before this project is implemented.

Fencing projects have been completed to help protect some wetland habitats in the Organ Mountains and one on the main cantonment. These fences were built to protect the habitats from trespass cattle, and off-road vehicle traffic. Fences will be used in the future, as required. All fences will be built to standards that allow wildlife to pass through or over them (USDA FS and USDI BLM, 1988). The majority of fencing on Fort Bliss is maintained by BLM as part of the management grazing activities on McGregor Range (see Section 8.4).

One habitat management practice that has dogmatically been assumed to be a beneficial practice in desert situations is water development (Broyles, 1995). At least one study conducted in the Chihuahuan Desert has failed to show significant differences in density of animals adjacent to water developments (Buckett and Thompson, 1994). Burkett and Thompson (1994) point out that there are positive as well as potentially negative aspects (Broyles, 1995) and that water developments should be carefully planned. Water inventories are not yet complete but completion of these GIS data layers will facilitate planning of any future water developments.

Potential habitat management practices in the future may include, but are not limited to:

- Plowing, disking, chemical treatment (herbicides, fertilizers) in preparation for planting of vegetation for wildlife food or cover (including disking or other soil management to prepare the seed bed), erosion control, or land rehabilitation.
- Construct water control management devices (earthen dam or structure to control or modify water run-off, terracing, check dams, drainage catchments, water diversion).
- Construct water units (above-ground, below-ground collection units and drinkers).
- Fire suppression chemicals, blading, backfires, and firebreaks.
- Brush cuttings (mowing, brush hog, other vegetation maintenance).
- Disking raking, burning, seeding, as a part of moist soil management.
- Weed and noxious plant control (burning, mowing, chemical treatments).
- Control burns for habitat management.
- Application of erosion blankets to disturbed areas.
- Construction of fences for security or to protect natural resources.

Any inquiries concerning habitat protections and management should be directed to the DOE, Conservation Division at (915) 568-2774.

8.5.4 Integration

Habitat management goals will be integrated with military training use of Fort Bliss and ecosystem management goals in Section 8.2, and with management of unique and sensitive areas. Habitat management actions must be integrated with ecosystem approach and not strictly on a basis for individual species, whether it is a game or nongame species.

On McGregor Range, the BLM is responsible for natural resource management on withdrawn public lands (per-PL 106-65), and such activities will be conducted in accordance with BLM natural resource planning decisions, and applicable federal, state, local, and military laws and regulations. These activities will be coordinated with Fort Bliss so that they will not conflict with the Fort Bliss mission. Thus, habitat management on Fort Bliss involves an interaction between Fort Bliss and BLM personnel.

Fort Bliss is responsible for habitat management on Army fee-owned lands on McGregor Range, as well as the other portions of Fort Bliss, and will conduct such activities in accordance with applicable laws, regulations, and this INRMP. Fort Bliss will continue to coordinate with the NMDGF on activities in NM, and with TPWD for any actions to be taken in Texas portion of Fort Bliss. To endeavor to ensure harmony in management direction for McGregor Range as a whole, Fort Bliss will coordinate with BLM and USFS.

8.6 GAME HARVEST MANAGEMENT

All hunting on Army installations must be carried out in accordance with federal and state regulations (U.S. Army, 1998c). Seasons and bag limits for harvesting game animals can be found in the New Mexico and Texas hunting proclamations. All persons wishing to recreate, including hunt, on Fort Bliss must obtain an annual recreation access permit from either the Army (Range Development and Enforcement Office of USA CAS BN), or BLM. Army Regulation 210-21 requires that all hunters must

also have passed a state certified or National Rifle Association hunter education class to hunt on Army controlled land. Recreation permit holders must check in and out with Range Control each time they use enter Fort Bliss, and are responsible for complying with specific Army and BLM procedures for use of the range.

When areas of Fort Bliss are open for hunting, Army personnel control access and assign hunters to specific hunting areas. According to 16 USC 670h, harvesting of wildlife from DoD installations or facilities shall be done according to the fish and game laws of the state or territory in which it is located and in accordance with 10 USC 2671. Persons hunting within the Fort Bliss ranges and training areas must have in their possession a current Texas or New Mexico state hunting license (depending on state in which hunting will occur). They also must have a current range access pass for hunting signed by the USA CAS BN Commander (CDR) or his designated representative. Army Regulation 200-3 provides a comprehensive review of all required licenses and exemptions. **Contact Range Development and Enforcement at 915-569-9211 for further information on gaining access.**

Currently, hunting is allowed on portions of Doña Ana Range–North Training Areas, McGregor Range, and the South Training Areas. No hunting is permitted within the cantonment area or Castner Range. Figure 8-5 shows areas on Fort Bliss where hunting is allowed for the general public and DoD personnel.

Army Regulation 200-3 states that no hunting, or any other recreational activity, is allowed in officially designated and marked impact areas and associated buffer zones. Personnel involved in training exercises (U.S. Army, 1996p) are not permitted to hunt. The NMDGF and TPWD publish hunting regulations yearly. The *McGregor Range Resource Management Plan* (USDI, 1990b) outlines specific periods for hunting to minimize conflict with military activities. **Contact Conservation Division for further information on hunting (915) 568-2774.**

8.6.1 Big Game Harvests

Big game species present on Fort Bliss include mule deer, antelope, javelina, turkey, oryx, and Barbary (Aoudad) sheep. Hunting in New Mexico portions of Fort Bliss occurs primarily through special entry permits for deer and antelope on of McGregor Range. The USFS portion of McGregor Range, TA 33 (Grapevine Canyon), is open for public hunting in accordance with NMDGF regulations. However, as stated in the MOU between the Army and the USFS, Fort Bliss has the right to close that area when required for safety or security reasons when conducting military missions (see Appendix A). The fall and early winter is usually a period of heavy use of McGregor Range for missile firings. The best deer habitat on Doña Ana Range–North Training Areas is the Organ Mountains, and no hunting is allowed there because of potential for unexploded ordnance (see Figure 8-5). There is interest and potential for oryx hunting on the New Mexico portions of Fort Bliss, but coordination necessary to begin these hunts has not been completed.

Currently mule deer is the only big game on the Texas portion of Fort Bliss. The population is currently low, and the South Training Areas have not been open recently for hunting. There is potential for oryx hunting in the South Training Areas. Necessary coordination has not been conducted, although formal surveys are planned. The oryx is considered an exotic species rather than a game species in Texas. A state hunting license is required to hunt exotic species in Texas, but there are no closed seasons or possession limits. If oryx hunts are approved by Fort Bliss, Fort Bliss can determine hunting dates.

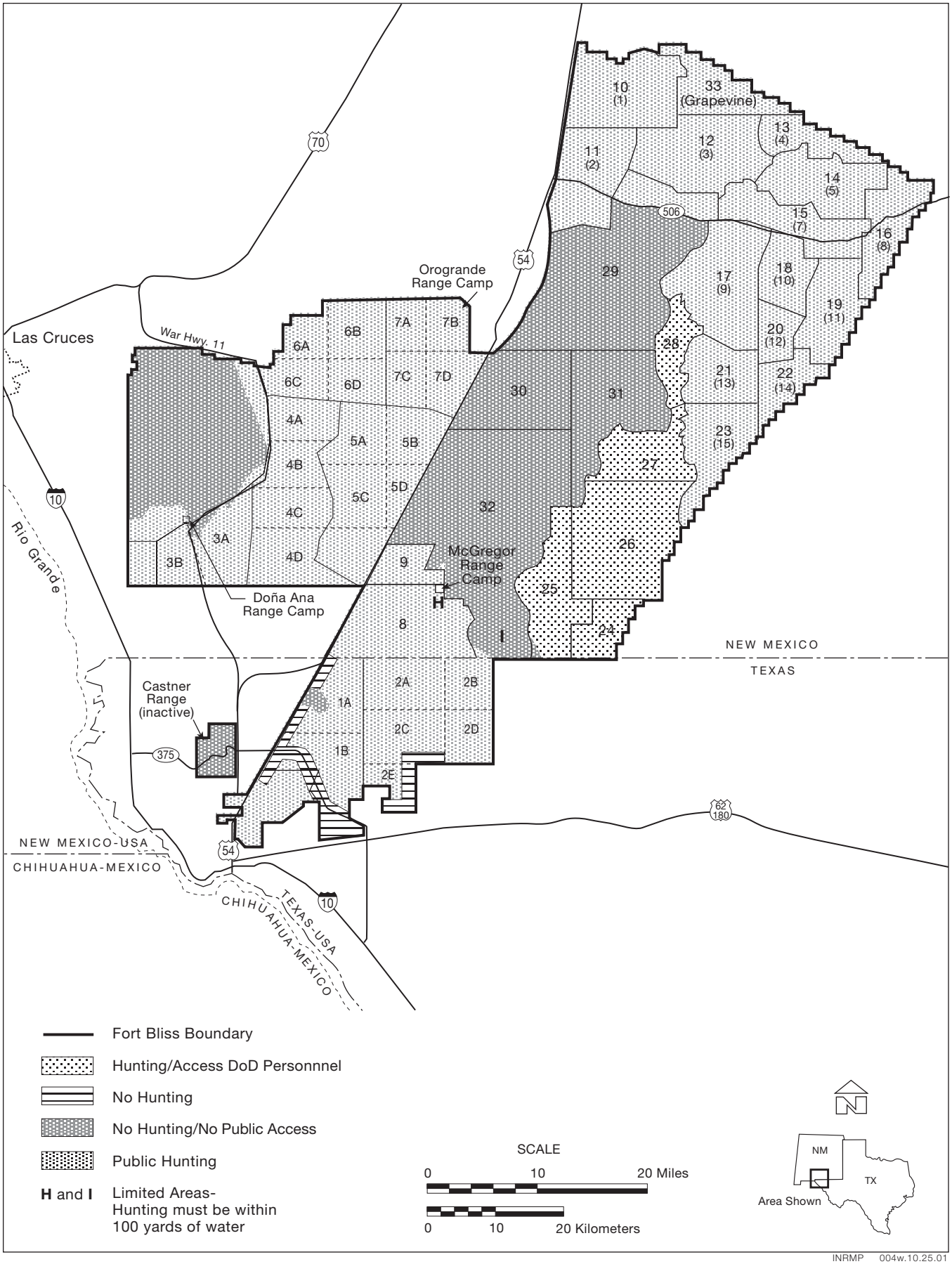

Figure 8-5. Hunting Areas on Fort Bliss.

8.6.2 Small Game Harvests

Small game species in huntable numbers include dove, quail, rabbits, and waterfowl. Seasons and bag limits are specified in the New Mexico and Texas proclamations. Quail and dove are common species over most of Fort Bliss. A compilation of small game hunting use of Fort Bliss is planned.

8.6.3 Integration

The primary issue with game harvesting is integration with the military mission. Availability of Fort Bliss training areas for hunting is subject to those areas not being used for training. Hunters have the same restrictions as any other users in terms of entry and exit onto Fort Bliss lands, protection of cultural and historic properties, and habitat protection measures stated in Section 8.5, and the SOP for use of Fort Bliss training areas (U.S. Army, 1996p). **Contact Conservation Division at (915) 658-2774 for further information.**

8.7 RARE, THREATENED, OR ENDANGERED SPECIES MANAGEMENT

Fort Bliss is responsible for compliance with all federal and state laws governing threatened and endangered species (AR 200-3). Fort Bliss is also responsible for implementation of recovery plans for these species on Army fee-owned land. BLM is responsible for compliance with federal and state laws concerning threatened and endangered species for all BLM actions on withdrawn land. BLM is also responsible for management of these species including implementation of recovery plans. Recovery plans are implemented after review by Fort Bliss to ensure compatibility with military missions, safety, and security requirements.

Section 6.7.3 lists the sensitive species, including threatened and endangered species that occur or have potential to occur on Fort Bliss. The primary mechanism for consideration of impacts to these species is accomplished through the range scheduling process, known on Fort Bliss as the Form 88 review process. This process is described in Section 8.5. The DOE reviews Form 88s for compliance with land use requirements. One of these compliance checks includes determining if the action will take place in potential habitat for rare or sensitive species. Natural resource professionals assess the potential impacts and work with the requesting unit to minimize impacts, including suggesting other locations to perform the action. Consultation under the *Endangered Species Act* will be conducted if there is potential for effect on any listed species or its habitat.

Interim management plans for sensitive species are contained in Appendix D. These plans will be reviewed and updated in FY 2002 to incorporate monitoring data acquired in FY 2001. Federally listed species will be the priority for this review and updating effort (Sneed pincushion cactus, aplomado falcon, and bald eagle) followed by endemic and state endangered taxa. Additional management plans will be prepared for endemic wood snails in the Organ Mountains and for the black-tailed prairie dog.

As noted in AR 200-3, the emphasis is to improve the conservation status of rare or sensitive species so they do not become candidates for listing under the ESA.

The primary management objective for the majority of species is to protect and maintain existing populations and their habitats. Surveys of habitat and populations are not the only positive conservation actions being undertaken by Fort Bliss. Fort Bliss has been conducting habitat investigations with sensitive species to better define what constitutes habitat for these species. Habitat and survey information is supplied to surrounding land managers and wildlife management agencies. Fort Bliss

cooperates in appropriate species working groups, and has helped to fund habitat investigations that have occurred off of the installation for species with potential to occur on Fort Bliss. One species that has received considerable attention is the Aplomado falcon. Appropriate portions of recovery plans for species listed under the ESA have, and will be incorporated into the management plans in Appendix D. Fort Bliss will continue to coordinate and partner with the USFWS, respective state agencies, surrounding land managers, and species experts with various universities in conservation of sensitive species. **Any inquires concerning rare, threatened and endangered species should be directed to the DOE, Conservation Division, at (915) 568-2774.**

8.7.1 Integration

The first step in integration of threatened and endangered species management occurs through the land use planning process described in Section 8.0. Most or all of the sensitive species occur in places with little impact from the military mission. However, the Fort Bliss Conservation Division must review and approve the scheduling requests (FB Form 88) military units must submit before their training activity may occur. This provides an additional check to prevent negative impacts to threatened, endangered, and other rare species.

8.8 TRANSPLANTS AND STOCKS

Transplants and stocking are techniques used to enhance existing populations or to introduce new species to an area. Transplanting implies moving wild animals while stocking implies putting pen-raised animals into an area. Translocation is recognized as a technique that can be used when native species have disappeared or declined from areas within their natural range (Leslie et al., 1996). If this situation were to arise with a wildlife species on Fort Bliss then translocation from nearby populations could be considered. This technique will serve to mitigate local extinction and mimic recruitment processes that occur with organisms distributed as metapopulations (reviewed by Leslie et al., 1996; Noss and Cooperrider, 1994). Fort Bliss has cooperated with BLM in project to transplant black-tailed prairie dogs from Otero Mesa to a location where black-tailed prairie dogs were no longer present.

Transplanting may also be a revegetation technique. Management direction is to avoid introduction of exotic species. Vegetation to be destroyed because of building or other projects is often salvaged for landscaping on the main cantonment.

8.8.1 Integration

Transplanting or stocking of wildlife will first be integrated with the training mission, ecosystem management goals, and management considerations for threatened, rare, or sensitive species. Coordination and permits may be required from the USFWS, NMDGF, or TPWD.

8.9 EXOTIC ANIMAL MANAGEMENT

A number of exotic species, such as oryx and Barbary sheep (*Ammotragus lervia*) have been introduced elsewhere and have expanded their range onto Fort Bliss. Feral populations of domestic animals also exist on the base. A single feral horse (*Equs caballus*), domestic cats (*Felis domesticus*), and dogs (*Canis familiaris*) occur on the base and their activities can interfere with healthy ecosystem function. Other species such as house (or English) sparrows (*Passer domesticus*), european starlings (*Sturnus vulgaris*), house mice (*Mus musculus*) and rats (*Rattus norwegicus*) are common inhabitants of cantonment and

other areas, and are not native to Fort Bliss ecosystems. Bullfrogs occur in some water catchments. Introduced species generally interfere with and are detrimental to native species (Leslie et al., 1996). While it is not feasible to manage established populations of sparrows or starlings, other organisms may need control. The oryx population has been growing in southern New Mexico over the past decade and are hunted on WSMR. An oryx survey on Fort Bliss has been funded for FY 02 to assess population size. Any mitigation programs and adaptive management procedures will involve an interaction between the Fort Bliss DOE, the BLM and NMDGF, and will be instated to minimize/prevent impacts on native plants and animals. Exotic and invasive species are addressed in EO 11987 and EO 13112.

8.10 WATER QUALITY MANAGEMENT

There is very little water on Fort Bliss, as noted in Section 8.5. Watershed management and protection is accomplished through the land use planning discussed in section 7.0, and habitat protection measures discussed in Section 8.5. The main management direction is to maintain vegetative cover in watersheds to keep water quality as high as possible. A *Storm Water Pollution Prevention Plan* does exist for the cantonment area.

BLM is responsible for management of watershed resources on withdrawn land on McGregor Range (USDI, 1990b). Fort Bliss is responsible for the management of watershed resources on Army fee-owned land. Details of joint responsibilities are outlined in the MOU (USDI, 1990b). **Any inquiries concerning watershed management should be directed to the DOE, Conservation Division at (915) 568-2774.**

8.10.1 Integration

Watersheds generally encompass a large area and, as a result, watershed management plans need to be integrated with many other land uses and users/owners. LRAM, vegetation, soil, and wetland management practices will overlap with watershed protection since each of these directly impacts soil stability/erosion and water quality. However, presence of cultural resources, threatened and endangered species, grazing, forestry management, outdoor recreation, and military training could also affect watershed management.

8.11 SOIL RESOURCES MANAGEMENT

AR 200-3 requires that installation sources of dust, runoff, silt, and erosion debris be controlled to prevent damage to land, water resources, equipment, and facilities, including adjacent properties. An erosion and sediment control plan must be implemented where appropriate. Maintenance of vegetative cover is consistent with ecosystem management goals expressed earlier. Other materials may be used including gravel, fabrics, riprap, and recycled concrete and pavement that are environmentally safe and compatible with the site. Where bare ground is necessary, other measures for dust, sedimentation, and erosion control should be implemented (check dams, wind breaks, diversions, etc.). To minimize land maintenance expenditures and help ensure environmental compliance, physically intensive activities should be located on those areas least susceptible to erosion. The potential erodibility of a site and adjacent water resources need to be identified and analyzed in preparing development, training, and land use plans.

A comprehensive soil survey has recently been conducted, the mapping is finished, but the final report has not yet been conducted. Sixty percent of Fort Bliss training areas are moderately to highly

susceptible to wind erosion; the remaining forty percent are low to highly susceptible to water erosion. Fort Bliss will continue to identify areas that are highly susceptible to erosion, activities that may have adverse impacts to the soil in these areas, mitigation measures, and alternate areas for conducting military activities

For example; a group of often overlooked organisms, cryptogamic crusts (composed of algae, lichens, mosses, fungi and liverworts alone or in combination), are important to the structure and function of soils in arid ecosystems (Ladyman and Muldavin, 1996; Fleischner, 1994). These crusts are involved in important ecosystem functions such as nutrient cycling and they add to soil stability, increase water infiltration and reduce run-off and erosion. Cryptogams are significant components of ecosystem biodiversity and are particularly sensitive to disturbance by fire and grazing (reviewed by Ladyman and Muldavin, 1996) and thus warrant consideration in the management of ecosystems. Indeed, cryptogamic crust cover can be used as an indicator of rangeland ecological condition (Herrick et al., 1996). **Any inquiries concerning soil resources management should be directed to the DOE, Conservation Division at (915) 568-2774.**

8.11.1 Integration

Soil management should be coordinated through the DOE and ITAM-DPTMS. Plans to control or mitigate water and/or wind erosion must consider on vegetative community, on grazing, on cultural and natural resources especially threatened and endangered species.

8.12 CANTONMENT AREA MANAGEMENT

The cantonment area is very different from the other ecosystem management units. The cantonment area is highly developed and does not contain many natural resources. The primary goal of cantonment area management is to provide an aesthetically pleasing environment. This is achieved through ground maintenance activities such as mowing, planting (e.g., grass, flowers, shrubs, trees), golf course upkeep, and pest control. Fort Bliss complies with EO 13148 (*Greening the Government through Leadership in Environmental Management, April 2000*) to reduce pesticide use and minimize water usage. Fort Bliss DOE maintains a list of appropriate plants for landscaping which minimize water requirements. A management plan for undedicated open areas (about 600 acres, areas not used as parks, ball fields, and parade grounds) has been implemented which encourages the establishment of native vegetation. These practices have reduced water and herbicide usage in these undedicated open areas, and significantly reduces blowing dust during windstorms.

The main concern of cantonment area management should be the protection of water resources. The cantonment area has been subject to sporadic flooding in the past, making it necessary to carefully monitor disposal to avoid pollution of surface runoff and groundwater. Chemicals are mainly used for lawn and golf course maintenance in controlling weeds and other pests. Wastes are compacted and covered in landfills on Fort Bliss property. Landfills are not highly susceptible to leaching due to the small amount of rainfall, and high evaporation rates; however, landfills are subject to wind erosion.

Storm water from the Main Cantonment Area is stored in a detention pond, so contamination of groundwater and other water resources is considered a minimal threat. However, the *Storm Water Pollution Prevention Plan* developed for Fort Bliss (U.S. Army, 1996r) provides training guidelines for the installation, such as spill prevention and response, to ensure that Fort Bliss complies with pollution regulation. Fort Bliss does not currently have a formal ground maintenance plan. **Any inquiries**

concerning cantonment area management should be directed to the DPWL at (915) 568-6885, or DOE at (915) 568-2774.

8.12.1 Integration

Since the cantonment area is developed, conflicts with other natural resources management are minimal. The primary concern is the effect of grounds maintenance practices on water quality due to chemical use and potential runoff. Current grounds maintenance practices and any future changes should be reviewed by DOE to assess the potential impacts of these activities to water resources on Fort Bliss.

8.13 PEST MANAGEMENT

Fort Bliss currently has a *Pest Management Plan* (U.S. Army, 1997o), which was completed in February 1997, and it is reviewed annually. An update is scheduled for FY 2002. This document establishes authority for pest management activities on Fort Bliss, in addition to providing guidelines for operating an effective pest management program. Specific aspects of the program include: health and environmental safety, pest identification, pesticide storage, transportation, and use and disposal.

Fort Bliss has nine DoD-certified pest controllers, including two pesticide applicators employed by the Underwood Golf Course. Major animal pests include mice, gophers, skunks, termites, mosquitoes, flies, cockroaches, crickets, ants, spiders, and ticks. The primary vegetative pests are Bermuda grass, silver nightshade, nut grass, sandbur, kochia, and Russian thistle. Pests must be controlled to maintain the military mission, prevent real property damage, decrease maintenance costs, and reduce injuries and disease in personnel. **Any inquiries concerning pest management should be directed to the DPWL at (915) 568-6885 or DOE at (915) 568-2774.**

8.13.1 Integration

If pests are located near threatened or endangered species, grazing land, water resources, or other sensitive areas, chemicals may not be feasible for controlling pests. Prescribed burning may be an option for controlling some plant species, but this must be coordinated with many activities such as outdoor recreation, training, and grazing. Urban pest species management should be coordinated with ground maintenance activities where appropriate (e.g., insects, rodents). Pest management practices need to be reviewed by the DOE to ensure safety of personnel and protection of natural resources, and compliance with environmental laws.

8.14 FIRE MANAGEMENT

Potential fire hazards to installation land and facilities are to be controlled to ensure safety of the installation and its natural and cultural resources (AR 200-3). Blading, discing, or herbiciding of firebreaks may increase soil erosion, so these measures should be avoided if possible. Vegetation control by mowing, prescribed burning, grazing or other means will be used as alternatives to bare ground firebreaks or herbicides where feasible and necessary.

Prescribed burning is an effective and efficient means to reduce or prevent the accumulation of hazardous fuel loads. The decision to use prescribed burning should be based on the safety hazard involved, the safety hazard if the specified areas aren't burned, the type of ecological unit involved, the impact on ecosystems, and applicable state and local regulations and coordination with installation fire departments.

Affected installation activities should be made aware of fire hazards and adjust their programs accordingly to avoid highly hazardous areas. Detailed management plans for each prescribed burn will be developed for each prescribed burn.

BLM is responsible for monitoring and suppressing all nonmilitary fires on McGregor Range and Army fee-owned land USDI/DOA (1990b). BLM should notify the Fort Bliss Fire Chief of all fires before suppression efforts begin. After fire suppression responsibility is decided, and danger potential is assessed, appropriate fire suppression efforts should be implemented. BLM should provide Fort Bliss with a report of suppression activities within 24 hours. BLM may use prescribed burning to improve rangeland conditions and wildlife habitat. Draft prescribed burn plans should be submitted to Fort Bliss for approval prior to implementation.

Fort Bliss will be responsible for monitoring and suppressing all fires caused by military activities on McGregor Range and Army fee-owned land. Fort Bliss will serve as lead agency for managing all fires in the impact and military use areas. Units causing range fires report to the Range Control, and when required, furnish twenty personnel to remain on call for 12 hours to extinguish reoccurring or ongoing fires. Between May and September units have at least eight soldiers with transportation and communication to control fires (U.S. Army, 1996p). Fort Bliss reports all fires to BLM.

Fort Bliss has a *Fire Suppression Plan*. This plan outlines procedures and protocol for fire control efforts and includes a prioritized list of persons or agencies to be notified in the event of a fire. Additionally, the plan establishes a response procedure, to be completed in the following order:

- Chief, Range Development and Enforcement evaluates the situation and makes recommendations regarding control procedures.
- Chief, Range Development and Enforcement proceeds to fire area with grader to ensure fire breaks are clear of weeds, grass, and debris.
- Range Riders proceed to fire site with fire-fighting equipment.
- Outside agency support may be requested by the USA CAS BN CDR.
- Fort Bliss Emergency Operation Center is activated.

Following fire suppression, an *After Action Report* is to be completed to evaluate the cause of the fire, fire damage, and injuries, and to make recommendation regarding changing the fire plan (if necessary). **Any inquiries concerning fire management should be directed to the USACASBN at (915) 569-9211.**

8.14.1 Integration

Wildfires and prescribed burning have to be carefully overseen due to their destructive potential. It is essential that Fort Bliss develop a wildfire response plan that addresses both suppression and safety issues. Prescribed burning will be more common than wildfires and precludes any training or outdoor recreation programs at the time a burn is initiated. Prescribed burning may also pose threats to cultural resource sites, threatened and endangered species, and grazing cattle. It is also possible that soil erosion would increase due to less vegetation, thereby affecting water quality. All prescribed burning efforts need to be coordinated through the DOE. Additionally, any outside agency wishing to have any type of burn or fire on Fort Bliss must coordinate through Range Development and Enforcement.

8.15 INTEGRATED TRAINING AREA MANAGEMENT (ITAM)

The ITAM program is a management and decision-making process to integrate Army training and other mission requirements for land use, with sound natural resource management (DA, 1995b). ITAM integrates four major elements to provide Army land managers with a comprehensive approach: (1) monitoring land and resource conditions to develop an understanding of the land's ability to withstand training stresses; (2) environmental awareness among soldiers to encourage stewardship and wise tactical use of natural resources (*Environmental Awareness,* see Section 12.0); (3) land rehabilitation and erosion control technologies to conserve resources and improve training realism (*Land Rehabilitation and Maintenance*); and (4) integration of training mission requirements with natural resource capability to optimize land use (*Training Requirements Integration*, DA, 1995b).

ITAM has multiple long-term benefits for Army installations (DA, 1995b). The program seeks to provide realistic training experiences that enhance Army readiness, fighting capabilities, and soldier safety and survival capability. It also works to avoid extreme environmental damage and loss of land through controlled land allocation and advanced rehabilitation techniques. A focus on management over the long-term reduces the costs related to compliance with environmental regulations. Finally, the program provides a credible foundation from which to make decisions about training requirements analyses, base realignments, and acquisition actions (DA, 1995b; Boice, 1996). Like all government programs, the level of ITAM activities is dictated by available funding.

8.15.1 Land Rehabilitation and Maintenance (LRAM)

LRAM is one of four components of ITAM. The purpose of LRAM is to repair damaged lands to facilitate military activities and to prevent further degradation of soil, water, and vegetation resources in areas designated for military activities. An important step in this process is to identify areas that are least susceptible to damage by various activities (e.g., bivouacking, ORV training). This step is extremely important at Fort Bliss because many of the soils support only sparse vegetation and are highly erodible.

The primary focus of LRAM includes the roads, impact, and maneuver areas. Areas that need to be rehabilitated have been and will continue to be identified and possible restoration methods assessed. Management direction is to maintain community integrity by avoiding introduction of exotic species and to use on-post sources for transplants or seeds.

The LRAM program uses the Site Rehabilitation Prioritization (SiteRep) System as a means to identify and prioritize degraded training sites/areas for potential rehabilitation based on the requirements of the training mission, environmental influences, and available resources.

Upon observing degradation of a training area, an assessor completes a survey sheet known as a SiteRep Form and sends the form to the ITAM coordinator. After receiving a SiteRep Form the ITAM team will investigate the site and complete data acquisition for that site. The data will be entered into digital format using Microsoft Office-Access data forms. The permanent digital record of the observation know as the SiteRep file can be used later in other applications such as assessment of cumulative impact analysis. A high score for a given site is an indicator of a potential need for rehabilitation.

The ITAM team will use a GIS to evaluate the digital data. The analysis includes locational relationships with training assets, threatened, endangered, or sensitive species, wetlands and riparian areas, soils, vegetation, terrain, regulatory conflicts, and national historic register issues. The sensitivity of protected locational data will be respected.

After the GIS analysis is complete the SiteRep data is returned to the ITAM coordinator for inclusion as a LRAM project. For those projects assigned high priority for action, the ITAM team, working with available expertise and resources, will develop a proposed rehabilitation prescription.

The DOE will review all proposed rehabilitation prescriptions to integrate with other natural resources and determine management activities and concurrences or further requirements. Concurred rehabilitation prescriptions will be briefed to the Commander, UAS CAS BN for input/feedback and prioritized by DPTMS for potential implementation (resource dependent). Rehabilitation of damaged sites will be in accordance with the NRCS field office technical guide.

8.15.2 Integration

Other activities that may be affected by LRAM include: cultural resources, threatened and endangered species, wetlands and watersheds, grazing, and outdoor recreation. ITAM and natural resource managers coordinate to minimize conflicts. The LRAM review process is conducted by DPTMS and DOE to properly assess the potential success of LRAM in repairing damaged lands, and to prevent noncompatible land uses.

8.16 TRAINING REQUIREMENT INTEGRATION (TRI)

The TRI component is a major land abuse prevention phase of ITAM and its main purpose is to support the mission while minimizing impacts to natural resources. The TRI objective is to site military missions and other land uses in areas capable of supporting specific land use missions. TRI relies on other ITAM phases such as GIS, LCTA, and the Range and Training Land Program (RTLP) to determine land capabilities. TRI includes rest or rotation of training lands and scheduling lands according to their carrying capacity and sustainment factors to support specific missions (DA, 1995b). TRI seeks to continuously balance training requirements with natural resource conditions by selecting options which will indefinitely sustain the use of lands to support training (DA, 1995b).

TRI integrates the installation's training requirements for land use derived from the RTLP, range operations and training land management process, and the installation's training readiness requirements, with the natural resource conditions of the installation's lands derived from LCTA and other natural resource management processes. The RTLP provides the means by which installations identify training land and range requirements based on doctrine. RTLP uses the installation's assigned units' Mission Essential Task List (METL) and Combined Arms Training Strategy (CATS) to determine land and range requirements and provides procedures by which range and training lands are managed on a day-to-day basis to support unit training requirements. Training requirements include events which must be scheduled and allocated to land parcels, as well as siting of training facilities (e.g., ranges) needed to conduct and support training (DA, 1995b).

Through TRI, the installation operations/training staff, supported by the natural resources management/environmental staff, identifies options for allocating specific training requirements to specific land parcels. This process is based on a concept of land carrying capacity/sustainment which in turn is based on actual training events and the effects they have on natural resources. Carrying capacity/sustainment factors also consider the environmental setting of the installation, including climatic factors (DA, 1995b).

At present, land carrying capacity is judged subjectively based on observed training impacts. In the future, land carrying capacity will be based on more objective measures to support decision-making. The

operations/training staff will use land carrying capacity and sustainment factors to reach decisions concerning use of land and to establish resourcing levels to sustain acceptable land conditions (DA, 1995b). **Any inquiries concerning TRI or the ITAM program should be directed to the ITAM Coordinator/TRI at (915) 568-2193.**

Major components of TRI are: (1) rotation of training lands, (2) mission sitings, (3) regulations and restrictions agreed upon by installation trainers, and (4) restoration by LRAM. Each of these components is briefly described below.

8.16.1 Rotation of Training Lands

Rotation of training lands is accomplished on the FTX sites on McGregor Range. The 16 FTX sites in the Otero Mesa EMU cover 4,023 acres (Table 8-1). During Roving Sands Exercises, the use of these sites has been rotated or rested over the years. Fort Bliss has used a Global Positioning System (GPS) to capture the perimeter of the areas used, and then analyzed with a GIS. Table 8-5 shows that FTX areas on Otero Mesa are rotated, are not of the same size, and those FTX sites are not used every year. The size of the largest site shows that the majority of the areas occupied are fairly small. For example, in 1996 the smaller seven sites occupied a total of 52 acres, an average of less than 8 acres per site. Otero Mesa FTX sites were not used during the 1998, 2000 or 2001 Roving Sands. These FTX sites are inspected before each exercise and use of one site or another is determined based on ecological condition of the area.

Table 8-5. Acreages utilized in FTX sites on Otero Mesa

Year	Total Acreage Occupied	Number of Sites Occupied	Acreage of Largest Site
1996	78	8	26
1997	138	6	105
1999	183	8	33

Rotation of training sites may also be needed in areas where off-road vehicle training occurs (Figure 8-3). Particularly sensitive areas within these training areas are protected by measures by the SOP (see Sections 7, and 8.5) (U.S. Army, 1996p). The mesquite coppice-dunes in this area appear to be in a stable disclimax, and rotation may not significantly improve the condition of those area. However, the deep sand obligate species mentioned in Section 8.2 for the Aeolian EMU could be impacted by training. If off-road maneuvers become more common than under current usage, implementation of a training lands rotation system should be evaluated.

8.16.2 Mission Sitings

New mission sitings are implemented through the NEPA process as required by law and AR 200-2. This process identifies any impacts of proposed actions, including sitings. This also assures sitings are in locations where natural resources are capable of supporting them on a long-term, sustainable basis. Fort Bliss, particularly DOE and ITAM, is developing environmental overlays as part of the natural resources management program. The information on the GIS overlays will allow installation planners to identify known environmental constraints associated with proposed sites.

DPTMS planners can also use the overlays along with ITAM, to identify and avoid special protection areas. If seasonal training limitations are identified, the environmental overlays can be used to track how such limitations impact training. Different types of training require different types of terrain, and the environmental overlays can and have aid DPTMS planners in locating wetlands, steep slopes, highly erodible soils, playas, arroyos, or other factors that might limit types of training. Because the overlays

also delineate buffer and restricted areas, they can also provide off-limits information for units conducting maneuver training (U.S. Army, 1996b).

Environmental managers in the DOE can use the environmental overlays as a graphic inventory of the locations of changing environmental attributes including endangered species, landfills, and underground storage tanks (USTs) (U.S. Army, 1996b). These overlays are also used to prepare maps of important or sensitive environmental features for distribution to troops utilizing Fort Bliss as part of their Environmental Awareness training, and to prepare maps on an as needed basis for special one-time-only training exercises or tentative construction projects. Many of these GIS overlays resulted from surveys directed by the DOE. DOE and DPTMS continue to put all relevant environmental data into GIS layers.

8.16.3 Training Restrictions and Regulations

In addition to Army-wide regulations, Fort Bliss training restrictions and regulations are provided in the SOP (U.S. Army, 1996p). Most of these restrictions are listed in Section 8.5. These training restrictions and regulations help protect natural resources on Fort Bliss held in public trust, and provide for continuation of mission activities.

8.16.4 Integration

Other areas of installation operations that could be impacted by or affect TRI at Fort Bliss include: actions of neighboring installations, government-owned land management practices, and area communities and entities; mission changes; and changes to supporting infrastructure, natural resources commercial values, current soil erosion patterns, water use and resources, floral and faunal assemblages, special interest or protected species designations, critical habitat designation, livestock management practices, land use, and other natural resources management practices.

Fort Bliss will utilize adaptive management approaches to continually enhance land use management plans. This will assure natural resources in each training area are not stressed or damaged by training activities beyond their ability to repair themselves. The DOE and DPTMS should be the primary participants in educating trainers, and developing, implementing, and ensuring compliance with land use plans.

Environmental data is gathered as part of Fort Bliss' resources management and efforts to support the GIS and TRI. Gathering and analyzing baseline data on natural resources in training areas, and determining which training activities could be allowed in each area and at what interval, will allow the ITAM program (DOE, trainers, and planners) to better determine possible impacts to resources and avoid or limit them. Adaptive management principles will be used to modify land use practices as necessary.

As more information is gathered, areas not currently designated "special protection areas" may be added and require cessation or alteration of training activities. These changes will, in turn, affect the Environmental Awareness training program. Any new training regulations and restrictions would need to be incorporated into the education program and maps, field cards, and educational modules would need to be updated and/or developed.

Implementation of a TRI program may also limit the amount of NEPA coordination required for current and proposed training activities, though new mission sitings are always implemented through the NEPA process. Development and implementation of a rest/rotation schedule for training lands based on their ability to support and sustain specific missions, may reduce the amount of NEPA documentation required for training activities.

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9.0 INVENTORYING AND MONITORING

9.1 OBJECTIVE

The objective of an inventorying and monitoring system is to create a method to inventory the natural resources on Fort Bliss and to regularly monitor indicators of overall ecosystem integrity, the capability of lands to support military mission, the renewable product surpluses, the status of imperiled species or communities, and other special interests.

9.2 GENERAL

A natural resource inventory is a periodic survey of all properties to record the presence and/or location of a specific resource, condition of that resource, or aggregate of resources in a specific area. Inventories ascertain the relative abundance and distribution of natural resources for structuring a management program.

Monitoring is designed to track populations, military impacts, or recovery trends, and/or associations of species such as communities. Monitoring is usually conducted systematically to develop a collection of specific categories of data. Monitoring often targets species with high economic or human use values or threatened or endangered species. Implementing the ecosystem management approach as outlined in this INRMP requires monitoring, including indicators of overall ecosystem health.

Inventorying and monitoring are imperative components of maintaining effective adaptive management and providing information describing current conditions. This information may show the need for change in management strategy. Evaluation of monitoring information (i.e., trend analysis) provides a description of how resources are responding to management strategies. Determination of the efficacy of those strategies should be based on the progress made toward established goals and objectives. Lack of noticeable progress or deterioration of resources requires a change in management (e.g., adaptive management).

9.3 PLANNING LEVEL SURVEYS (PLS)

Inventories required to allow management planning are specified in *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys* and *INRMP,* part of Assistant Chief of Staff for Installation Management (ACSIM) Memorandum for Distribution of March 21, 1997, signed by Major General Randolph W. House, ACSIM:

> Planning Level Surveys. Installations must conduct PLSs as the foundation for natural resources management planning, including preparation of the INRMP. For installations that have not completed their PLS (part or all), the INRMP shall be written or modified to include completion of these surveys. PLS include spatial products that can be hard-copy maps, GIS data layers, or both according to installation needs and capabilities.

The memorandum defines PLSs and specifies at least eight different surveys. They are discussed in the following eight sections including status and need for each.

9.3.1 Topography

At a minimum, this is a map that shows elevation, elevation contours, and associated data consistent with USGS standards and topographic map products.

Status: Completed. Digital elevation models exist in the installation's GIS. Additionally, the installation is covered by USGS and DoD topographic maps. Aerial photographic coverage is also available. A product of the most recent soil survey effort is digital orthophoto coverage for all of Fort Bliss, based on flights conducted during 1998.

Needs: None.

9.3.2 Wetlands

At a minimum, this survey shall describe and map the distribution and extent of wetlands consistent with the statement of work (SOW) as defined in the Army/USFWS MOA.

Status: Completed in 1998. Water Ways Experiment Station completed planning level survey for entire installation.

Needs: None. However, site-specific delineations will still be required for any actions impacting wetlands.

9.3.3 Surface Waters

At a minimum, this is a survey that describes and maps the distribution and extent of surface waters, consistent with USGS standards.

Status: Partially complete over installation. Springs and nonephemeral sources have been characterized (U.S. Army, 1997b). Consolidation of known water sources, and earthen tanks were put in GIS database. However, because of funding limitations, only springs were characterized. Most surface waters in Chihuahuan Desert are ephemeral, arroyos, and earthen tanks. Characterization of these is not done or incomplete.

Needs:
1. Complete survey and characterization of earthen tanks, or at least stratified sample of such.
2. Develop complete characterization of arroyos.

9.3.4 Soils

Soil associations present on Fort Bliss are summarized in Section 6.5, and can be found in county soil surveys (USDA, 1971; 1980; 1981).

Status: The surveys are complete. Data sets expected to be submitted in 2001. Project was conducted with involvement of Army Environmental Center (AEC) and U.S. Natural Resource Conservation Service (NRCS). The survey will be mapped at 1:24,000 scale and will include GIS files.

Needs: None anticipated.

9.3.5 Flora

At a minimum, this is an installation-wide vascular plant survey that produces a list of plant species with verified nomenclature, classification and annotation compatible with the USDA, NRCS's Plant List of Accepted Nomenclature, Taxonomy, and Symbols (PLANTS).

Status: More than 90 percent complete. Database of plant species is under review. Expect that about 1,200 species of plants exist on Fort Bliss. Current records confirm approximately 1,000.

Needs: Finish database updating to incorporate current plant nomenclature. The effort involves experts at Fort Bliss, New Mexico State University, and UTEP.

9.3.6 Vegetation Communities

At a minimum, this survey, including field data, shall describe and map the distribution and extent of plant alliances (alliances are characterized by a diagnostic species or group of diagnostic species usually occurring in the dominant and uppermost stratum; similar to cover type). Positional and classification accuracy shall be field checked.

Status: Complete. Vegetation communities classification has been reviewed and updated.

Needs: Refine characterization of arroyo-riparian communities.

9.3.7 Threatened and Endangered Species

At a minimum, this survey shall produce a map that shows the kinds and known distribution of federally endangered, threatened, proposed, and candidate species occurring in the installation.

Status: Essentially complete. Surveys for listed, candidate, and other sensitive species have been conducted. Monitoring efforts are underway using field methodologies appropriate for each of these species.

Needs: Prepare compendium of distribution maps and continue monitoring surveys for listed, candidate, and other selected sensitive species. A particular case is that of the aplomado falcon. Fort Bliss has been conducting surveys for the species, prey basis, and vegetation structure in potential habitat several times per year. Although potential habitat exists on Fort Bliss and one single immature bird was sighted in 1999, the species has not been found to nest on the installation. Apparently the species has experienced range contraction (Williams, 1996).

9.3.8 Fauna

At a minimum, this survey, including field data, shall describe and map the distribution and extent of sensitive species (e.g., locally rare and keystone).

Status: In progress. Field survey data exist for many species and taxa, but not all. Field data has covered most bird species over most habitat types, but certain areas still lack field checks. Similar work is in progress for small mammals. Data exists for many of the species, particularly relatively high profile (endemics, many species of concern), but not all.

Needs: 1. Consolidate data from different field studies into single database and conduct GIS mapping to establish status of effort.

2. Update list of expected species and conduct surveys to complete documentation and mapping for sensitive species. An overview of status and needs by taxonomic group is described below.

9.3.8.1 Invertebrates

Status: Snails in Organ Mountains (some of which are endemic) have been surveyed.

Needs: 1. Complete surveys in likely habitat and finish mapping habitat and species distributions.

2. Compile list of arthropods, with emphasis on species of conservation concern.

9.3.8.2 Amphibians and Reptiles

Status: Surveys on Otero Mesa grassland habitats completed.

Needs: Coordinate with state and local herpetologists to better determine potential for sensitive or unique species (mottled rock rattlesnake and mountain short-horned lizard). Rock rattlesnake known, but potential for mottled subspecies unknown. Similar for short-horned lizard and mountain subspecies.

9.3.8.3 Birds

Status: General baseline surveys completed in all representative vegetative communities and ecosystem management units.

Needs: Surveys for gray vireo and wintering Baird's sparrow, and habitat maps for each. Baird's sparrow work is in progress.

9.3.8.4 Mammals

Status: General baseline completed in most habitats, except Sacramento Mountains foothills, and Hueco and Organ mountains. Specific inventories of Organ Mountain chipmunk and black-tailed prairie dog have been completed.

Needs: Evaluate habitat for Organ Mountain chipmunk, determine periodic monitoring requirements, general baseline study for Organ and Hueco mountains, and Sacramento Mountains foothills. Continue to monitor black-tailed prairie dogs.

9.4 COMPREHENSIVE LANDSCAPE MONITORING

The Fort Bliss Training Complex landscape will be monitored to assess training 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 the entire land base to monitor seasonal trends, detect impacts, and focus field investigations on

high-priority areas. Field investigation will quantify intensity of impacts on natural and cultural resources. Distribution, frequency, and intensity of impacts will be stored in GIS database. This process will support enforcement of environmental laws and NEPA provisions, provide data for the ITAM program, and record cumulative impacts.

9.4.1 Components of Monitoring System

9.4.1.1 Advanced Very High Resolution Sensor (AVHRR) Time Series Imagery

The National Aeronautics and Space Administration (NASA) AVHRR is a satellite-mounted sensing system that has been used to monitor environmental conditions on a global scale. AVHRR normalized vegetation index has proved to be a 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 Fort Bliss. In this way, 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.

9.4.1.2 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. Fort Bliss DOE-C has developed a system of on-site monitoring that uses the Global Positioning System (GPS) and field data collection to develop a GIS database for each training exercise. The end result is a site-specific database for each training exercise.

9.4.1.3 LANDSAT Thematic Mapper (TM) Imagery

NASA LANDSAT TM Imagery is being used to monitor the entire landscape of Fort Bliss 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.

9.4.1.4 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 insures that control plots are positioned in areas that represent undisturbed conditions typical of the training area.

9.4.2 Methods of Analysis

9.4.2.1 Training Impacts

Coordinated analysis of on-site monitoring data, field plots, and satellite imagery will provide a synopsis of training impact intensity and extent.

9.4.2.2 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. Further development of this technique will be a valuable source of baseline data for future NEPA analysis.

9.4.2.3 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 will provide data on ecosystem response. GIS provides the means to record impacts and analyze their effects over time.

9.4.3 Monitoring Cover Change Using TM Satellite Imagery

9.4.3.1 General Approach

The general approach is to estimate actual cover values for total vegetative basal 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 multi-spectral viewing space such that the land cover classes can be most easily and completely observed. 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 GIS. 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.

9.4.3.2 Methods

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.

9.5 LAND CONDITION TREND ANALYSIS (LCTA)

LCTA is a major component of ITAM and was developed to target specific areas (special use plots) or overall installation-wide trends. LCTA uses a wide array of natural resources data to determine the condition of land and, over time, trends in that condition. Procedures include random sampling, which allows statistical inferences, and permits characterization of installation natural resources as a whole. Sampling is stratified on the basis of soils and land cover types, facilitating analysis of natural resource

status, and land capability by those spatial elements (U.S. Army, 1992b) describe procedures used for LCTA plot inventory.

Special use plots are used to deal with specific issues that cannot be addressed by core plots. These issues include determining the success of land rehabilitation efforts, documenting the effects of burning, characterizing and monitoring habitat of endangered species and wetlands, assessing natural recovery of degraded lands, and other site-specific special needs.

LCTA was initiated on Fort Bliss in the fall of 1991 (U.S. Army, 1995d). Field crews established 200 core and 10 special use plots throughout Fort Bliss properties. In the fall of 1992 six more special use plots were installed in conjunction with a tank tracking study. Four more special use plots and 10 core plots were installed in 1993. The number of plots allocated to each land cover/soil type category was proportional to the amount of land area represented by each category.

Other LCTA surveys were conducted on Otero Mesa in 1992, 1994, and 1995. In March and September 1992, eight special use plots were established (U.S. Army, 1993b). Results from this survey showed evidence of military and nonmilitary activities within the plots.

Continued use of LCTA at Fort Bliss will increase the ability of natural resources personnel to determine trends in general ecosystem health, ability of the land to support the military mission, production of renewable resources, and changes in species composition or population sizes. However, currently there are too few plots to conduct post-wide ecosystem monitoring. Additional floral inventories should be established as needed to supplement LCTA data. These LCTA plots should be sited to measure training impacts and support satellite imagery ground truthing.

9.6 DATA STORAGE, RETRIEVAL, AND ANALYSIS

Storage, retrieval, and analysis of natural resources data will enable better management decision-making. Fort Bliss has up-to-date hardware and software to aid in data accessibility and interpretation.

Fort Bliss has been active in digitizing collected data into an accessible GIS format. GIS allows users to manipulate spatial data (e.g., maps, aerial photos, satellite images) in a similar fashion as a data management program allows analysis and presentation of mathematical data. Fort Bliss has statistical capabilities and uses them to determine trends and associations. Data layers include soils, hydrology, vegetation, habitats, animal use or presence, and road access. LCTA plots, neotropical bird survey locations, habitat assessment data, and mammal study data have been digitized to contribute to ecosystem understanding and management.

9.7 FIVE-YEAR PLANS

For Fort Bliss to fully comply with required laws and regulations, the inventory and monitoring program should include sufficient numbers of inventories to (1) acquire baseline data for all natural resources; (2) assess direct, indirect, and cumulative impacts of all actions; (3) monitor resource status and impacts thereto; (4) develop, implement, and monitor mitigation programs and measures; and (5) develop and implement ecosystems management. Table 9-1 presents the inventory and monitoring projects identified for implementation during the duration of this INRMP (FY 2002 to FY 2006). These projections, when

Table 9-1. Inventorying and Monitoring Projects Identified for Implementation during this INRMP 5-year Cycle

PROJECTS	*FY02*	*FY03*	*FY04*	*FY05*	*FY06*
PLANNING LEVEL SURVEYS (PLS)					
Routine PLS (Trend Analysis Through Remote Sensing)	X	X	X	X	X
Routine PLS (Fauna)	X	X	X	X	X
Routine PLS (Oryx)	X	X	X	X	X
Routine PLS (Riparian Areas)	X	X			
Routine PLS (Plant Diversity)				X	
Routine PLS (Vegetation Communities)				X	
Routine PLS (Succulent Communities - Agave)		X			
Routine PLS (Determine Status of Grassland Areas in Eolian EMU)		X	X	X	X
PLANS IMPLEMENTATION					
Complete *Endangered Species Management Plan* (ESMP) and continue monitoring for listed and other sensitive species	X	X	X	X	X
Continue monitoring and control of invasive species	X	X	X	X	X
INRMP (Raptor-proofing Transformers)		X	X	X	X
INRMP (Forest Management)	X	X	X	X	X
INRMP (Develop & Maintain GIS Metadata)	X	X	X	X	X
Implement plan to protect/improve wetlands and wildlife waters		X	X	X	X
PLANS REVIEWS AND UPDATES					
Prepare/Update INRMP	X	X	X	X	X
Revise/Update the *Installation Pest Management Plan*	X	X	X	X	X
OTHERS					
Implement cantonment vegetation management for dust suppression, water conservation, and minimize herbicide use	X	X			
Monitor condition of selected firing ranges	X	X	X	X	X

completed, will enable trend analysis, facilitate adaptive management, promote ecosystem management, and fulfill all legal requirements at Fort Bliss.

Projects to monitor biodiversity will benefit from a direct relationship to long-term ecological research and a commitment to test hypotheses relevant to biological diversity conservation (Noss, 1990). Intensive research and monitoring can be directed to high-risk ecosystems and elements of biodiversity, while less intensive monitoring is directed to the total landscape. Implementation of a monitoring program is necessary in the adaptive management cycle that continuously refines regulations or management practices on the basis of data derived from monitoring and analyzed with an emphasis on predicting impacts (Noss, 1990). Noss (1990) describes a 10-step process that could be followed in developing a monitoring project:

1. Establish goals and objectives
2. Gather and integrate existing data
3. Determine the extent, distribution, and condition of existing ecosystem types
4. Delineate areas of concentrated biodiversity (i.e., centers of groups of endemics)
5. Formulate specific questions to be answered by monitoring
6. Identify indicators of structural, functional, and compositional biodiversity at several levels of organization
7. Identify control areas and areas subjected to different kinds and intensities of stress and management practices
8. Select monitoring sites for identified questions and objectives
9. Validate relationships between indicators and sub-end points
10. Analyze trends and recommend management actions.

If assessment following monitoring can be translated into positive changes in planning assumptions, management direction and practices, laws and regulations, or environmental policy, the monitoring project will have proved to be a powerful tool (Noss, 1990). Despite the end result, using adaptive management will facilitate progression toward biodiversity conservation.

The projected schedule of natural resources projects and priority for completion will be the basis for determining funding priority requests submitted by Fort Bliss to TRADOC. If Fort Bliss fails to receive funding for any projects included in the 5-year plan, projects will be deferred subject to availability of funding, or, to the extent practicable, will be performed with in-house capabilities. Potential funding options are outlined further in Section 17.0 *Implementation*.

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10.0 RESEARCH AND SPECIAL PROJECTS

Natural resources research is essential to developing management programs that are both effective and efficient. In some cases, a specific dilemma requires a more basic type of research to identify options available to resolve a problem. Regardless, research on Fort Bliss is oriented toward improving the installation's natural resources program, integrating the mission, and stewardship.

10.1 OBJECTIVES

To provide research and other studies to support Fort Bliss natural resources management program.

10.2 RESEARCH MECHANISMS

10.2.1 In-house Capabilities

The DOE has limited in-house research capabilities as a result of manpower restrictions and a management-oriented mission. The Conservation Division's main contribution to research is collection of standardized data on status of vegetation and wildlife populations and their attributes. The ability of this division to store, retrieve, and analyze data will assist other external research projects and studies.

10.2.2 Intergovernmental Personnel Act (IPA)

The *IPA of 1972* is a means to accomplish research or get other personnel assistance on Fort Bliss. IPA is a system where a federal (or state) agency utilizes personnel from a different agency for a limited time to do a specific task. Major advantages are that DOE directly supervises personnel, and manpower authorizations are not required. IPA agreements are commonly used throughout DoD for assistance with research, management, and even administration. If funds become available, this arrangement could be used to accomplish research or management on Fort Bliss.

10.2.3 University and Government Organizations

Fort Bliss has utilized the capabilities of several universities to accomplish special projects. These include the UTEP, New Mexico Fish and Wildlife Cooperative Research Unit at New Mexico State University, New Mexico Natural Heritage Program at the University of New Mexico, Texas Tech University, and the University of Wisconsin, among others.

Fort Bliss has also cooperated with other governmental organizations to accomplish projects involving the natural resources of Fort Bliss. Examples include cooperating with field validation of the New Mexico Gap Analysis, ecosystem integrity inventories by the U.S. Environmental Protection Agency (EPA) and New Mexico State University, wind and erosion modeling by the USDA, the USACE research into detecting military impacts and ecotones using satellite imagery research into the carrying capacity of training lands to off-road vehicle (ORV) use, and field validation of the Army Training and Testing Area Carrying Capacity (ATTACC) model for predicting training impact and recovery. The benefits of these cooperative interactions include gathering of data otherwise not available, and opportunities to discuss Fort Bliss needs and requirements with natural resource professionals from other agencies. Cooperation requiring input from Fort Bliss personnel are usually done on a reimbursable basis.

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11.0 ENFORCEMENT

11.1 OBJECTIVES

Objectives for the enforcement of environmental laws and regulations are:

- Establish authority for enforcing natural resource regulations
- Protect natural resources through cooperation with various state and federal agencies
- Establish training requirements for natural resources enforcement personnel

11.2 HISTORY AND AUTHORITY

Under the *Sikes Act of 1960* (as amended), the Secretary of Defense is authorized to carry out a program for development, maintenance, and coordination of fish and wildlife management on military reservations in cooperation with the Secretary of the Interior and appropriate state agencies in which the installation is located. In addition to the *Sikes Act*, the recent *Sikes Act Amendment* (1997) directed the Secretary of the Interior to develop comprehensive conservation and rehabilitation plans for public lands. This extension provides a means for cooperation between federal state agencies to manage natural resources on public lands.

The original *Sikes Act* also grants authority to the Secretary of Defense to develop cooperative plans on military lands for wildlife, fish, and game conservation. In addition, previous *Sikes Act Extensions* stated that cooperative plans are supposed to provide at a minimum: (1) improved fish and wildlife habitat; (2) range rehabilitation where necessary for support of wildlife; and (3) control of off-road vehicle traffic (Bean, 1983). Authority is also granted to manage migratory game birds, threatened and endangered species, and to develop public outdoor recreation resources. The *Sikes Act Amendment of 1997* replaces the cooperative plan requirement with preparation of an INRMP in cooperation with the USFWS and the head of the appropriate state fish and wildlife agency in which the installation is located.

11.3 JURISDICTION

According to AR 200-3, enforcement of laws that protect natural resources should be an integral part of the installation's natural resources management program. It also states that laws must be implemented in accordance with state and federal laws, particularly referring to game species, and that enforcement is to be performed by natural resources law enforcement professionals and/or the Provost Marshal, if practicable.

Fort Bliss has exclusive federal jurisdiction within the Main Cantonment Area, South Training Areas, and throughout Doña Ana Range–North Training Areas. In these areas, the military police of the Provost Marshal's Office have jurisdiction to enforce state and federal natural resources laws.

Fort Bliss has exclusive use of certain geographical areas for military purposes, but does not have exclusive or concurrent federal jurisdiction to enforce civilian law in these areas. These areas of proprietary jurisdiction include (1) a portion of Logan Heights, which is government-owned, but within which the El Paso Police Department retains normal police jurisdiction; and (2) McGregor Range, which is government-owned, but within which New Mexico state and county authorities retain normal police jurisdiction.

BLM has primary authority for enforcement of federal natural resource laws on lands within McGregor Range. The MOU between BLM and Fort Bliss (Appendix A) states that "BLM will be responsible for enforcement of federal laws that pertain to the use, management, and development of withdrawn public land on McGregor Range." However, *Section 670e-1 of the Sikes Act*, as amended in 1997, does give the Secretary of Defense enforcement authority for federal laws on all military installations, including withdrawn public lands. Other federal agencies such as the USFWS and the EPA also have authority to enforce natural resource laws on military lands.

The MOU with the USFS (Appendix A) pertains only to 18,000 acres of the Lincoln National Forest that overlap McGregor Range. The MOU maintains the authority of the USFS to protect natural resources from fire, depredation, trespass, and illegal hunting activities within the Lincoln National Forest in cooperation with the NMDGF.

Fort Bliss is responsible for enforcement of natural resources laws on lands not covered under MOUs with BLM and the USFS. This includes Doña Ana Range–North Training Areas, Castner Range, the Main Cantonment Area, and South Training Areas. Fort Bliss is also responsible for enforcing laws pertaining to military activities, public safety, and security over the entire installation.

11.4 NATURAL RESOURCES ENFORCEMENT ACTIVITIES

Fort Bliss currently employs individuals that have completed training in Law enforcement at the Federal Law Enforcement Training Center, Glynco, GA, and the New Mexico Game Warden school at Raton, NM.

Fort Bliss coordinates with the NMDGF for enforcement activities associated with the hunting activities on New Mexico portions of Fort Bliss. Fort Bliss also maintains contact with law enforcement specialists with the U.S. Fish and Wildlife Service.

Military Police are also trained and authorized to perform law enforcement activities on Fort Bliss, however, their activities are centered on the cantonment area.

11.5 TRAINING

Fort Bliss will endeavor to keep trained people available for law enforcement activities.

11.6 INTEGRATION

Persons involved with the enforcement of natural resources laws will need to be aware of and coordinate with activities that may involve Fort Bliss, BLM, USFS, NMDGF, and TPWD. Hunting is the primary activity for enforcement, and coordination with NMDGF will continue to be common practice. **Any inquires concerning natural resources law enforcement on Fort Bliss should be directed to the Provost Marshal at (915-568-24-4, USA CAS BN at (915)-568-9211, or DOE, Conservation Division at (915) 568-2774.**

12.0 ENVIRONMENTAL AWARENESS TRAINING

Environmental awareness training is a multifaceted program with the primary goal to improve land users' understanding about the impacts of their activities, including mission training and recreational activities. The environmental awareness program applies to military personnel including tactical units, leaders, and soldiers assigned to or using Fort Bliss. It also covers tenant activities, installation staff, civilian employees, and other installation training land users such as local populations and military family members (DA, 1995a). **Environmental awareness training is a coordinated effort between DOE and DPTMS and any inquiries concerning this program should be directed to the Point of Contact, DOE, Director at (915) 568-3782.**

Environmental awareness training may also be used to promote other environmental programs such as endangered species habitat protection, spill prevention, cultural and historic resources protection, and requirements for NEPA documentation. An effective environmental awareness effort is essential to implementation of a range-oriented environmental program.

12.1 OBJECTIVES

The objectives of environmental awareness training are:

- To minimize damage to Fort Bliss lands and their natural resources by exposing land users to, and familiarizing them with, conservation themes and requirements.
- To enhance public relations with surrounding communities through education, involvement in area activities, and open communication.
- To improve working relationships between federal, state, and local regulatory agencies, nongovernmental groups, clubs and organizations, and Fort Bliss, particularly in environmental and conservation projects.

These objectives can be achieved through continued use and improvement of the current environmental awareness training program on Fort Bliss for military personnel, continued participation in area conservation activities, increased public awareness through implementation of a Restoration Advisory Board (RAB), and continued public forums including Good Neighbor Forums.

12.2 MILITARY PERSONNEL AWARENESS

Environmental awareness programs for military personnel typically consist of three elements: (1) training and educational materials, (2) *Awareness Training Implementation Plan*, and (3) command emphasis.

12.2.1 Training and Educational Materials

Training and educational materials include general and installation-specific multimedia materials such as posters, videotapes, buttons, stickers, maps, comic books, field handbooks, reference or soldier's field cards, and similar items.

At Fort Bliss, the DOE is responsible for creating training and education materials, which are distributed to military personnel via unit commanders. These materials are directed at all levels of the military,

including temporary and permanent military personnel, from trainees to commanders, stationed at or using Fort Bliss lands. Their purpose is to increase personnel awareness of environmental regulations pertaining to conservation of training lands. The training materials and courses of Fort Bliss include, but are not limited to, the New Unit Commanders Course, Sergeants Major Academy Training, Roving Sands Briefs and Training, and Hazardous Materials Incident Training.

One of the keys to effective environmental stewardship and compliance is the Fort Bliss Environmental Compliance Officer (ECO) training program. ECOs are appointed by the unit commanders and are trained and certified by the DOE. The ECO certification course established at Fort Bliss is a unique course that trains soldiers and civilian employees on the importance of environmental protection in their respective organizations. It is structured to provide an oversight of some generic issues, which should be of concern to all individuals working at protecting the environment. ECOs serve as the points of contact for environmental compliance and have day-to-day oversight responsibilities at the unit level. They are the commander's eyes and ears for environmental compliance in their respective units and activities. This 2-day training is offered monthly, and includes twelve environmental training modules each with high-quality instructor view graphics, student workbooks, and classroom exercises. The 12 environmental modules include: Spill Response Overview, Range Requirements, Wash Racks and Oil Water Separators, Pollution Prevention, Solid Waste Management, Tank Management, Asbestos Management, Recycling, Cultural Resources, NEPA and RCRA Overview, and Hazardous Material/Hazardous Waste Overview. A total of 249 ECOs were trained and certified by DOE between April 2000 and July 2001.

The Unit Commanders Course at Fort Bliss has expanded from a 1-hour environmental module to 8 hours and now includes student field trips. This course is taught by the DOE and DPTMS ITAM. Students receive the *Unit Leader's Handbook for Environmental Stewardship* (DA, 1994), various checklists, and handouts; in addition, they physically visit examples of key environmental sites in the field (Cushing, 1997).

Other environmental training is provided to units on request and follows the format established for the Unit Commanders Course. Training of this type is given at least once a quarter to directors, battalion commanders, command group members, and commanders' wives are also invited as part of their orientation. This training is normally given by the DOE or the DOE division chiefs.

Sergeants Major Academy class training is provided annually and is given by the DOE. Class size varies from 100 to 300 new sergeant majors. Students receive DOE Environmental Compliance field cards and the *Unit Leader's Handbook for Environmental Stewardship* (DA, 1994).

Fort Bliss is host to Roving Sands, a large air defense exercise with participants from around the world representing every branch of the service and including allied troops. Roving Sands Briefing and Range Training is provided to Roving Sands participants. The DOE developed a pocket environmental field card and distributed 30,000 copies over a 6-month period, the majority presented to Roving Sands 95 troops in conjunction with environmental briefings provided to visiting units.

The DOE funds and arranges Hazardous Materials Incident Training (OSHA, 1910.120) for spill team response members. This team includes Fort Bliss staff from DOE, DPWL, and Safety. DOE also provides quarterly mock spill exercises for this group.

12.2.2 Command Emphasis

Because environmental awareness training is the ITAM component that is currently most visible to units and soldiers in the field, command emphasis is necessary to convey the seriousness of environmental stewardship and to provide focus for installation-specific issues.

The Fort Bliss Command Group steadfastly supports the environmental program by initiating and conducting Environmental Quality Control Committee (EQCC) meetings, meetings with federal, state, and local regulators and nongovernment organizations, as well as routinely providing post news coverage of environmental activities. Additionally, Fort Bliss has established its own environmental awards program to recognize units, soldiers, and civilians.

12.3 PUBLIC AWARENESS

Fort Bliss has an active public awareness program designed not only to inform the public, civilian employees, and military personnel of current environmental and conservation events at the installation, but also to get them involved in various Fort Bliss and community activities. The Fort Bliss public awareness program provides professional talks and presentations at conferences and seminars; prepares talks and informal presentations for local clubs, societies, organizations, and schools; provides briefs to the media on upcoming events and environmental findings; and performs guided tours of environmental interest areas on base including various ecosystems, recycling centers, and wildlife viewing areas.

12.3.1 Conservation Education

Fort Bliss is a leader in area conservation education programs, sponsoring such programs as Good Neighbor Forums in El Paso, Texas, and Alamogordo and Las Cruces, New Mexico, and partnering sessions with federal, state, and local regulatory agencies. Fort Bliss is active in National Arbor Day activities, National Hunting and Fishing Day activities, and Keep El Paso Beautiful events including Desert Sweep, City Sweep, and Desert Cleanups. Another educational activity at Fort Bliss is the Earth Day Open House that includes poetry and art contests. This yearly event is attended by hundreds of students from schools on the installation and from the El Paso area.

12.3.2 Public Relations

Fort Bliss fosters good public relations with surrounding communities by having personnel active in both community boards and committees, conservation and educational programs, and professional and amateur conservation organizations. One example of this involvement is the director of DOE at Fort Bliss serving as a member of the Keep El Paso Beautiful board of directors. Additionally, the Public Affairs Office on Fort Bliss routinely informs the public of installation environmental and conservation activities, programs, and restoration updates through articles in area and installation newspapers, newsletters, and journals, as well as news releases to local and base television and radio stations**.**

In an attempt to better inform and involve the public and interested parties, Fort Bliss is currently implementing RAB. The Fort Bliss RAB was created in 1997 and is composed of ten members representing the surrounding communities. The RAB is chaired in tandem by the Garrison Commander (military Co-chair) and a civilian Board member who is elected by the Board and who serves a 1-year term. The RAB meets quarterly in a public setting at various venues located in El Paso, Texas, and Alamogordo and Las Cruces, New Mexico, or WMSR Head Quarters. Estimated meeting attendance by the Board Members is approximately 75 percent. Attendance by members of the public has ranged from 2 to a high of 18. Administrative support for the RAB is provided by the Center for Environmental Resource Management at UTEP. Fort Bliss also sponsors quarterly Good Neighbor Forums, which are open meetings dedicated to fostering awareness of Fort Bliss environmental programs. They also co-sponsor Household Hazardous Waste Collection Day, and Desert Sweep, a program coordinated with Keep America Beautiful.

12.4 INTEGRATION

Training, education, and involvement in conservation and environmental activities as part of the environmental awareness program will have a beneficial impact on sensitive areas as well as the land resources of the entire installation. By familiarizing military personnel and civilians with ecosystem management practices and theories, damage to existing habitats and ecosystems can be lessened.

Environmental data gathered as part of Fort Bliss' continuing inventory and monitoring program, can improve environmental awareness training. As new information becomes available, sensitive area management practices and corresponding training regulations can be refined so they are the most efficient, effective, and beneficial for each area. Environmental awareness training may also limit the amount of NEPA coordination required by increasing knowledge of potentially sensitive resources.

13.0 OUTDOOR RECREATION

13.1 OBJECTIVES

The objectives of developing and managing outdoor recreation opportunities are:

- Manage outdoor recreation consistent with needs of the Fort Bliss military mission
- Manage outdoor recreation while maintaining ecosystem integrity and function
- Ensure the protection of natural and cultural resources
- Ensure the continued availability of outdoor recreation opportunities not readily available from other sources
- Monitor visitor use to determine if the management of recreation resources is responsive to public needs and demands
- Continue to evaluate recreational resources on a case-by-case basis as a part of project level planning. Such evaluation will consider the significance of the proposed project and the sensitivity of recreation resources in the affected area
- Ensure that recreation is managed to protect the health and safety of users
- Provide opportunities for high-quality outdoor recreation to both the Fort Bliss community and the general public.

13.2 REGULATIONS

Development and management of outdoor recreation opportunities on military installations are regulated by DoD Instruction 4715.3, 16 USC § 670c, *DA Technical Manual 5-635*, and Army Regulation 200-3.

DoD Instruction 4715.3, *Environmental Conservation Program*, dated May 3, 1996, states, "The principal purpose of DoD lands and waters is to support mission-related activities. Those lands and waters shall be made available to the public for educational or recreational use of natural and cultural resources when such access is compatible with military mission activities, ecosystem sustainability, and with other considerations such as security, safety, and fiscal soundness."

16 USC § 670c, *Conservation Programs on Military Installations - Public Outdoor Recreation Resources*, states, "The Secretary of Defense is also authorized to carry out a program for the development, enhancement, operation, and maintenance of public outdoor recreation resources at military installations in accordance with an *Integrated Natural Resources Management Plan* mutually agreed upon by the Secretary of Defense and the Secretary of the Interior, in consultation with the appropriate state agency designated by the state in which such installations are located."

Chapter 1-1 of *Department of the Army Technical Manual 5-635* states, "Outdoor recreation activities on military installations will, insofar as possible, comply with the April 7, 1978, MOU between the DOI and the DoD for the development of public outdoor recreation resources on military installations. This MOU provides for cooperative plan agreements between the installation and appropriate state and federal

authorities. Public use of outdoor recreation activities will be consistent with the military mission and will comply with military land use and security requirements." Paragraph 7-1(a) of AR 200-3 states, "whenever practicable, Army lands with suitable natural resources will be managed to allow for outdoor recreational opportunities." Paragraph 7-1(d) continues, "Natural resources used for outdoor recreation on Army lands are considered part of the land and belong to the public. Therefore, outdoor recreation opportunities will be equitably distributed by impartial procedures, such as first-come first-served or drawing lots."

13.3 MILITARY MISSION CONSIDERATIONS

In applying the multiple use concept, special attention will be given to environmental factors, recreation, land use capability, and the incorporation of conservation measures in the development, design, construction, and maintenance of installations. The conservation of natural resources will not be mutually exclusive. Consideration will be given to all demands for use of the land and water resources with optimum use being made when consistent with the military mission and sound conservation and environmental concerns (DA, 1995a).

13.4 PUBLIC ACCESS

Paragraph 2-10(a) of AR 200-3 states that access by recreational users, "…will be within manageable quotas, subject to safety, military security, threatened and endangered species restrictions, and the capability of the natural resources to support such use."

Public access to Army properties for the purpose of outdoor recreation will be allowed whenever compatible with public safety and mission activities. Natural resources used for outdoor recreation on Army land are considered part of the land and belong to the public (DA, 1995a).

Public access to Fort Bliss is limited due to concerns of military mission, recreational trespass, grazing trespass, range maintenance, and public safety.

13.4.1 Current Legal Access

Section II-10a of the Standard Operating Procedures (SOPs) for *Weapons Firing and Maneuver Area Use* details visitor requirements. The SOP requires coordination for all visitors through the S1, USA CAS BN. Visitors that have not made prior coordination with USA CAS BN must report to building 9500 (U.S. Army, 1996p).

Privately owned vehicles (POV) of military, civilian DoD employees and contractors, as well as contractor-owned vehicles, must be registered in accordance with FB Regulation 109-7, *Motor Vehicle Registration* with the Provost Marshal. Vehicles must display the proper sticker to enter Fort Bliss. Requests for use of POVs or rental vehicles in training and range areas must be approved by commander, USA CAS BN. Written requests must be submitted listing vehicle operator, type, license number, duration of use in area, and purpose. Personnel requesting vehicle access for POV or rental vehicles must request a pass through USA CAS BN S-3, ATTN: Range Development and Enforcement Section. This pass must be displayed on left side of the vehicle's dashboard. Fort Bliss traffic regulations and posted speed limits will be observed and at no time will POVs be used to participate in training exercises or to transport military explosives, ammunition, or weapons (U.S. Army, 1996p).

Only those DA personnel and contractors whose performance of official duties requires entry into Fort Bliss ordnance impact areas will be allowed to enter. Requests to enter impact areas must include the purpose for access, number of personnel desiring access, specific location of the area, and duration. Once approval is granted, normal range scheduling procedures using FB Form 88 (FB 88) must be followed including the procedures for checking in and out. Personnel must obtain access clearance from S3, Range Development and Enforcement prior to entry to ensure ranges are clear for entry. Personnel who have been granted clearance to enter an impact area will check in and out with appropriate range control (U.S. Army, 1996p).

Requests for access into nonimpact area for other than military purposes will be forwarded to, USA CAS BN commander for evaluation and approval on a case-by-case basis. The only valid permits for recreation or hunting (not approved FB 88s) for weekends and after duty hours to McGregor down-range areas and Meyer Range is the USA CAS BN *Permit for Access to Certain Portions of Fort Bliss Areas*. This permit will be issued by the Range Development and Enforcement Section, Building 9406. Visitors must sign in and out with appropriate range control during duty hours or staff duty officer during nonduty hours. Information will be provided on specific areas requested, dates, times, and personnel involved (U.S. Army, 1996p).

ORV use, when access is authorized by the Army, will be limited to designated roads and trails. Designated roads will be identified on a case-by-case basis depending on the need for access. Impact areas are off-limits to all recreation. The Escondida Pueblo site will be closed to ORV use for the protection of cultural resources. This designation is primarily for public safety and the protection of watershed resources and cultural resources (USDI, 1990a).

13.4.2 Illegal Activities

Portions of the Organ Mountains within Fort Bliss serve as the Doña Ana Range–North Training Areas impact area and no recreation is permitted. Because the military land is adjacent to BLM land, recreational users occasionally trespass into potentially dangerous areas such as previously used impact areas (U.S. Army, 1993a). A number of trails begin on BLM land and cross the boundary onto Fort Bliss. These trails include Fillmore Canyon to Organ Peak, Fillmore Canyon to Pine Tree Trail at Aguirre Spring Campground, Ice Canyon to Organ Peak, Soledad Canyon, and Achenback Canyon.

Another area of concern is the Sacramento Mountains foothills that extend into the northern part of McGregor Range. There is a possibility that recreational users within Lincoln National Forest occasionally trespass into potentially dangerous areas on Fort Bliss.

Visible boundary markers or fences have been placed in the Organ Mountains along the BLM/Fort Bliss boundary line. Patrols, surveillance, and enforcement will be used to control unauthorized access on Fort Bliss. Chapter 11 of this INRMP provides a detailed description of authority, jurisdiction, and law enforcement on Fort Bliss lands.

13.5 HUNTING AND TRAPPING PROGRAMS

Paragraph 2-22 of AR 200-3, states "…game laws must be implemented in accordance with applicable state and federal laws and as approved by the commander in the INRMP." Currently, hunting is allowed on portions of Doña Ana Range–North Training Areas, McGregor Range, and the South Training Areas. No hunting is permitted within the cantonment area or Castner Range (see Figure 7-2). Persons hunting within the Fort Bliss ranges and training areas will have in their possession a current range pass for that

activity signed by the USA CAS BN Commander (CDR) or designated representative (U.S. Army, 1996p).

According to 32 CFR 265, harvesting of wildlife from DoD installations or facilities shall be done according to the fish and game laws of the state or territory in which it is located and under 10 USC 2671. Personnel hunting within the Fort Bliss ranges and training areas must have in their possession a current Texas or New Mexico state hunting license (depending on which state hunting will occur). Army Regulation 200-3 contains a comprehensive review of all required licenses and exemptions.

Hunting on McGregor Range is allowed only during times compatible with Army training, identified by the wildlife management program with the concurrence of the Army, and in accordance with state law (U.S. Army, 1993a). Hunting is allowed if and when it is consistent with resource management objectives, state regulations, and the military mission. Hunting is allowed only when adequate resources are present; in areas identified on an annual basis by the BLM, NMDGF, and Fort Bliss; and only during set time periods described in the Game and Harvest Management section of this INRMP.

In the past, hunts on McGregor Range have included deer, pronghorn, and small game species. The annual McGregor Range deer hunt has not been held recently due to low deer numbers. Currently, deer and pronghorn hunts on McGregor Range are conducted by permit only. The BLM may use authority under 43 CFR Part 24 to cancel hunts, in consultation with NMDGF and DOE, if a hunt would adversely affect management and protection of wildlife, habitat, recreation resources, or when the BLM is notified by the military that a hunt is in conflict with public safety or military missions (USDI, 1990a).

13.6 NONCONSUMPTIVE OUTDOOR RECREATION

Recreational uses other than hunting will be permitted only after Army concurrence. The uses include sightseeing, hiking, camping (during special hunts only), picnicking, bird watching, photography, and wildflower viewing, and will be coordinated with BLM according to the following management practices (USDI, 1990a):

- Adherence to required SOPs
- Adherence to Army check-in and check-out requirements
- All scientific activities must have DOE concurrence.

To promote nonconsumptive outdoor recreation, Fort Bliss will:

- Provide access to recreation areas by maintaining roads in passable condition.
- Cooperate with BLM to develop an information program to educate users.

13.6.1 Recreational Opportunities for Army Personnel

A variety of facilities in the Fort Bliss cantonment offer many outdoor recreation options to installation personnel (U.S. Army, 1996b).

The Omar Bradley softball complex has four softball fields and playgrounds. Biggs Park, located on Biggs AAF, consists of approximately 4 acres. The park has two covered pavilions with a seating capacity for 100 each. Facilities at the park include a soccer field, basketball courts, a football field, volleyball courts, and a playground. Kelly Park has picnic areas, a softball field, a football field, a soccer

field, miniature golf, and a playground area. The Underwood Golf Complex has two 18-hole courses, driving range, and club rental.

A recreational vehicle park near Jeb Stuart Road has 40 spaces with water and electrical hookups and a master dump station for recreational vehicles.

An outdoor pool is located just outside the Officer's Club and the Rod and Gun Club is available to qualified members. Several other open areas are spread through the main cantonment.

13.7 SAFETY AND SECURITY

All persons are cautioned not to pick up or handle artillery projectiles or any ammunition or fragment that may be found on the range. The removal of any material, component parts of projectiles, targets, or other objects from any range is prohibited (U.S. Army, 1996p). All nonessential personnel will stay clear of operating radar and associated equipment because of existing radiation hazards (U.S. Army, 1996p).

Personnel who have in their possession or who bring privately owned weapons or ammunition to Fort Bliss will comply with current USAADACENFB regulations regarding registration and security of firearms. Discharge of personal firearms within Fort Bliss is prohibited, unless authorized by the Fort Bliss commander, in coordination with the Provost Marshal. Military personnel not in compliance with these provisions are in violation of *Article 92*, *Uniform Code of Military Justice* (UCMJ) and will be prosecuted. Other weapons, such as hunting knives, bayonets, and sabers, are prohibited in billeting areas at Fort Bliss and will be confiscated unless properly stored in accordance with current USAADACENFB directives (U.S. Army, 1996p).

13.8 RECREATION AND ECOSYSTEM MANAGEMENT

Outdoor recreation activities such as hunting programs will be closely monitored for impacts on ecosystem integrity. Additionally, special consideration will be given to protection of critical areas (endangered species habitat, wilderness areas, highly erodible areas, etc.) from negative impacts due to outdoor recreation.

A large percentage of the Fort Bliss lands are designated as impact areas or impact area buffer zones; therefore, outdoor recreation opportunities are limited. After coordination through USA CAS BN, the public is allowed to access the South Training Areas, TAs 3 to 7 of Doña Ana Range–North Training Areas, and TAs 10 to 23 of McGregor Range (see Figure 7- 1 and Section 7.2.1). Outdoor recreation activities allowed in most areas include hunting, sightseeing, hiking, camping (during special hunts only), picnicking, photography, wildflower viewing, and bird watching. Currently, no legal outdoor recreational activities are available within Castner Range because of unexploded ordinance.

13.9 INTEGRATION

The range, safety, and natural resources office determines recreation use boundaries that are adjacent to impact areas (AR 200-3). **Any inquiries concerning outdoor recreation on Fort Bliss should be directed to the Range Development and Enforcement Division of USA CAS BN at (915) 569-9211.**

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14.0 CULTURAL RESOURCES PROTECTION

Cultural resources protection programs on Fort Bliss are provided in accordance with all pertinent federal and state legislation and laws and Army regulations. These include Sections 106 of the NHPA of 1996 (16 USC 470), as amended, the ARPA of 1979, 36 CFR 800, and AR-420-40.

14.1 OBJECTIVE

> Ensure implementation of this INRMP is consistent with the protection of historic properties (those determined to be eligible or potentially eligible for inclusion in the National Register of Historic Places [NRHP]) on Fort Bliss as directed by applicable laws and regulations.

To meet this objective, it is vital that the directives and SOPs as outlined in the *Integrated Cultural Resources Management Plan* (ICRMP) for Fort Bliss (U.S. Army, 1998e) are coordinated with natural resources management activities. Coordination of these activities is normally conducted through consultation with the Conservation Division Chief of the DOE, who functions as the Historic Preservation Officer (HPO) and oversees all cultural resources management activities on Fort Bliss.

Priorities relative to the cultural resources management program on the installation, including costs, personnel requirements, and a formal, 5-year work plan, are provided in the ICRMP for Fort Bliss (U.S. Army, 1998e).

14.2 CULTURAL AND HISTORIC RESOURCES

As of November 24, 1997, the Fort Bliss cultural resource database contained information on over 15,405 cultural resources sites. The number and management status of cultural resources in the different portions of the Region of Influence (ROI) are summarized in the database.

14.2.1 Fort Bliss Cantonment

The Fort Bliss cantonment contains a number of historic structures and the potential, in some areas, for historic archaeological resources. The earliest of the structures date to 1893 and include Victorian buildings originally used for medical purposes; barracks, mess halls, and recreational activities; officer's residences; and, stables, warehouses and magazines. Many of these buildings are still used today, but for other purposes. A total of 377 structures constitute the Fort Bliss Historic District. Whalen (1978) reports no prehistoric sites on the main post, Logan Heights, or WBAMC, but does note 30 small prehistoric sites on Biggs AAF. Prehistoric archaeological resources are uncommon within the cantonment area because of the extensive construction. Seventeen historic archeological sites have been identified in the cantonment. No traditional cultural properties (TCPs) have been identified to date on the Fort Bliss cantonment.

14.2.2 South Training Areas

The South Training Areas contain portions of the Hueco Mountains. These limestone deposits are conducive to the formation of caves and rockshelters, many of which were used by prehistoric people. Almost 4,090 prehistoric archeological sites have been recorded from this area. The South Training Areas were also used historically. Inventories of historic archaeological sites in the South Training Areas have recorded 125 sites, including a portion of the Butterfield Overland mail route (U.S. Army, 1997n).

No architectural resources or TCPs have been identified within the training areas, but both could potentially occur.

14.2.3 Doña Ana Range–North Training Areas

Portions of the Doña Ana Range–North Training Areas have been surveyed (Skelton et al, 1981; U.S. Army, 1995e; Stuart, 1997). These, and other surveys have resulted in the identification of more than 6,600 prehistoric sites, including Paleoindian (including a possible Clovis site), Archaic, and Formative Period sites. Historic resources totaling 93 sites include ranching, Civilian Conservation Corps (CCC), and military sites; a portion of the Spanish Salt Trail; historic mines; and the 1920s campsite of early paleontologists. Camp Hueco once contained World War II and Cold War architecture, but only a well house remains (Landreth, 1998). No TCPs have been identified within the Doña Ana Range–North Training Areas, although they could potentially occur.

14.2.4 McGregor Range

The McGregor Range contains a variety of environmental zones and landforms. Its cultural resources are similarly diverse and include scatters of Paleoindian, Archaic, and Formative materials, rockshelters, rock art sites, historic ranching sites, the townsite of Turquoise, several of Oliver Lee's pipelines, two reservoirs, a number of railroad related sites (U.S. Army, 1997n), and military sites, including Cold War era Nike test sites. Five pueblos have been identified on McGregor Range. The almost 100,000 acres inventoried for cultural resources to date contain over 3,600 historic and prehistoric sites. No TCPs have been identified within the range, but they could potentially occur.

14.2.5 Castner Range

Castner Range occupies 7,040 acres of land on the eastern flank of the Franklin Mountains in El Paso. The range contains numerous prehistoric and historic resources ranging from pueblos to ranching-related sites, a Spanish Salt Trail, and military training locations including a theodolite station from the 1800s and Vietnam War-era simulated village sites. The area also contains significant amounts of ordnance and explosive hazards from its use as a firing range since World War I. No architectural resources or TCPs have been identified within Castner Range, but both could potentially occur.

The results of the various projects completed on the installation indicate that the area was occupied in varying degrees of intensity from the earliest recognized prehistoric period to recent times. Fort Bliss currently has approximately 16,000 archaeological sites entered in its databases. Approximately 15,600 are prehistoric while 400 are historic. Sites currently considered eligible for inclusion in the NRHP number about 600. These numbers will continue to change as more areas are surveyed and evaluated for inclusion in the NRHP.

14.3 INTEGRATION

Any installation operations that involve ground-disturbing activities have the potential to adversely impact prehistoric and historic archaeological sites on Fort Bliss. These include land management practices, mission changes, changes to supporting infrastructure, and other natural resources management practices.

Limitation of such activities for the protection of cultural resources is dependent upon the level of archaeological investigation already conducted in the area of concern, and the decision on what areas,

districts, or sites require protection. The ICRMP for Fort Bliss outlines the required SOPs to ensure the protection of historic properties in conjunction with ground-disturbing activities (U.S. Army, 1998e).

In the interest of integrating the concerns of cultural resources management with those of the wider mission(s) of the installation, the Conservation Division Chief of the DOE has established cultural resources education and training as a priority. Such training will be for enforcement officers, range managers, estimators, planners, and craftsmen as part of an overall environmental awareness program (U.S. Army, 1998e). By exposing these personnel to the requirements of the cultural resources management program, the integration of these activities with the wider mission(s) of the installation will be facilitated. **Any inquiries concerning cultural resources protection on Fort Bliss should be directed to the DOE, Conservation Division, at (915) 568-3782.**

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15.0 NATIONAL ENVIRONMENTAL POLICY ACT IMPLEMENTATION

NEPA, established in 1969, created a national environmental policy for the protection, maintenance, and enhancement of the environment. NEPA requires that federal agencies use all practical means to maintain environmental quality, and stresses the need for environmental considerations in planning and development of federal lands. In addition, Fort Bliss operates under AR 200-2, which guides implementation of NEPA regulations on Army installations.

As a component plan of the RPMP, this INRMP is being evaluated in accordance with NEPA within the *Mission and Master Plan Programmatic EIS* (U.S. Army, 2000c).

15.1 OBJECTIVES

The objectives of NEPA implementation are:

- Identify the office or agency responsible for implementation of NEPA
- Identify projects and activities at Fort Bliss that may be regulated by NEPA
- Ensure that Fort Bliss complies with NEPA.

15.2 NEPA RESPONSIBILITIES AND IMPLEMENTATION

The proponent of an action is ultimately responsible for complying with NEPA requirements under AR 200-2. If an action is a joint effort between several federal agencies, a lead agency is designated to supervise preparation of the environmental document. Fort Bliss will be the lead agency for all military actions. However, the lead agency concerning a natural resource activity, such as burning, depends on the area in which the action will be performed. The BLM would be the lead agency for nonmilitary actions on withdrawn portions of McGregor Range under the authority of *PL 106-65*, whereas the USFS would be the lead agency for actions within the Lincoln National Forest used by Fort Bliss.

The Fort Bliss NEPA coordinator reviews incoming NEPA documentation. The DOE NEPA coordinator facilitates review of NEPA documents with resource professionals in DOE and other installation and MACOM personnel. EAs and EISs must be approved by a MACOM Commander, or designee, which can be no lower than installation commander (AR 200-2). After approval, the documentation is returned to the proponent of the implementation.

15.3 NEPA AND NATURAL RESOURCES MANAGEMENT

To protect natural resources, Fort Bliss personnel must first decide whether or not a proposed action will have a significant impact on natural resources. Proper scoping involving other agencies, and receiving public input will help identify needs and concerns regarding natural resources management. Overall, NEPA should provide more environmental protection in federal projects and may reduce costs to the government by eliminating fines or changes in projects due to improper planning and noncompliance.

Depending upon the proposed activity, there are three types of documents outlined by NEPA: categorical exclusions (CX), EAs, and EISs. If a proposed action has been previously determined to have no significant impact by other federal agencies, or of not completing the proposed action national security may be jeopardized, then a CX may be issued (AR 200-2).

If the environmental impacts of an activity are unknown, an EA is prepared. If the action doesn't significantly impact the environment, a "finding of no significant impact" (FONSI) is issued. However, if the action will potentially have significant impacts, an EIS must be completed that fully identifies impacts of the proposed action and provides alternative actions and associated impacts. If an action is expected to have significant environmental impacts, an EIS may be prepared without first completing an EA (AR 200-2). Project evaluation parameters for NEPA implementation and analysis are outlined in detail in Appendix A of the *Mission and Master Plan Programmatic EIS* (U.S. Army, 2000c).

15.4 INTEGRATION

Fort Bliss has many natural resource management needs identified in this INRMP. Management plans need to be developed for many of the natural resources on Fort Bliss, and implementation of these plans will have to be assessed through the NEPA process. The DOE will be responsible for NEPA compliance and developing the appropriate documentation. This will require review (by DOE) of all military and natural resource management activities performed on Fort Bliss to assess the need for NEPA documentation. **Any inquiries concerning NEPA on Fort Bliss should be directed to the DOE, Conservation Division Chief at (915) 568-2774.**

16.0 BIOPOLITICAL ISSUE RESOLUTION

This chapter describes the significant biopolitical issues that directly impact the implementation of this INRMP.

16.1 BIODIVERSITY PROTECTION

The primary goal of Fort Bliss natural resources management will be to preserve the diversity of the installation while sustaining the military mission. Included in the consideration of biodiversity protection is the need to survey Fort Bliss' flora and fauna, show that diversity has value to the installation, promote sustainable development, and protect or restore wild lands. The varied ecological units provide a unique array of fauna and flora within the installation. Management goals presented in this INRMP are oriented towards an ecosystem management approach (Chapter 8).

16.2 SPECIES OF SPECIAL INTEREST

Fort Bliss takes the lead role in management of species of special interest, including federally listed, state-protected, and endemic species when potentially affected by installation activities. Protected species occurring on Fort Bliss property will be managed under the *Endangered Species Management Plans*. Retaining species of special interest is important to sustaining biodiversity and is a primary issue addressed in the INRMP.

16.3 FOREST MANAGEMENT PLAN

Forested areas at Fort Bliss include the Organ Mountains and portions of the Sacramento Mountains foothills. The Organ Mountains contain numerous sensitive and endemic species of plants and animals. The proposed Fort Bliss *Forest Management Plan* will be an important tool in maintaining the biodiversity of the Organ Mountains. This management plan describes current stand and fire fuels loading conditions, and prescribes monitoring and management actions for the management of these forested areas.

16.4 AESTHETICS

The combination of the Organ and Sacramento mountains, various alluvial fans, and the expansive Chihuahuan broadleaf deciduous/evergreen desert scrub areas, create an aesthetically appealing area. Maintaining the uniqueness of this area, and thereby protecting the aesthetic value is possible through long-range planning. Consideration of all special areas is included in Chapter 8.

16.5 FENCING

Figure 16-1 shows the status of the existing perimeter fence for Fort Bliss. Although most of the boundary is fenced, certain key areas are left open. These include a large section along U.S. Highway 54, a section on the eastern boundary of the South Training Areas, a section on the northwest section of Doña Ana Range (in the Organ Mountains), two sections along the northern portion of McGregor Range, and a section separating Fort Bliss from the City of El Paso.

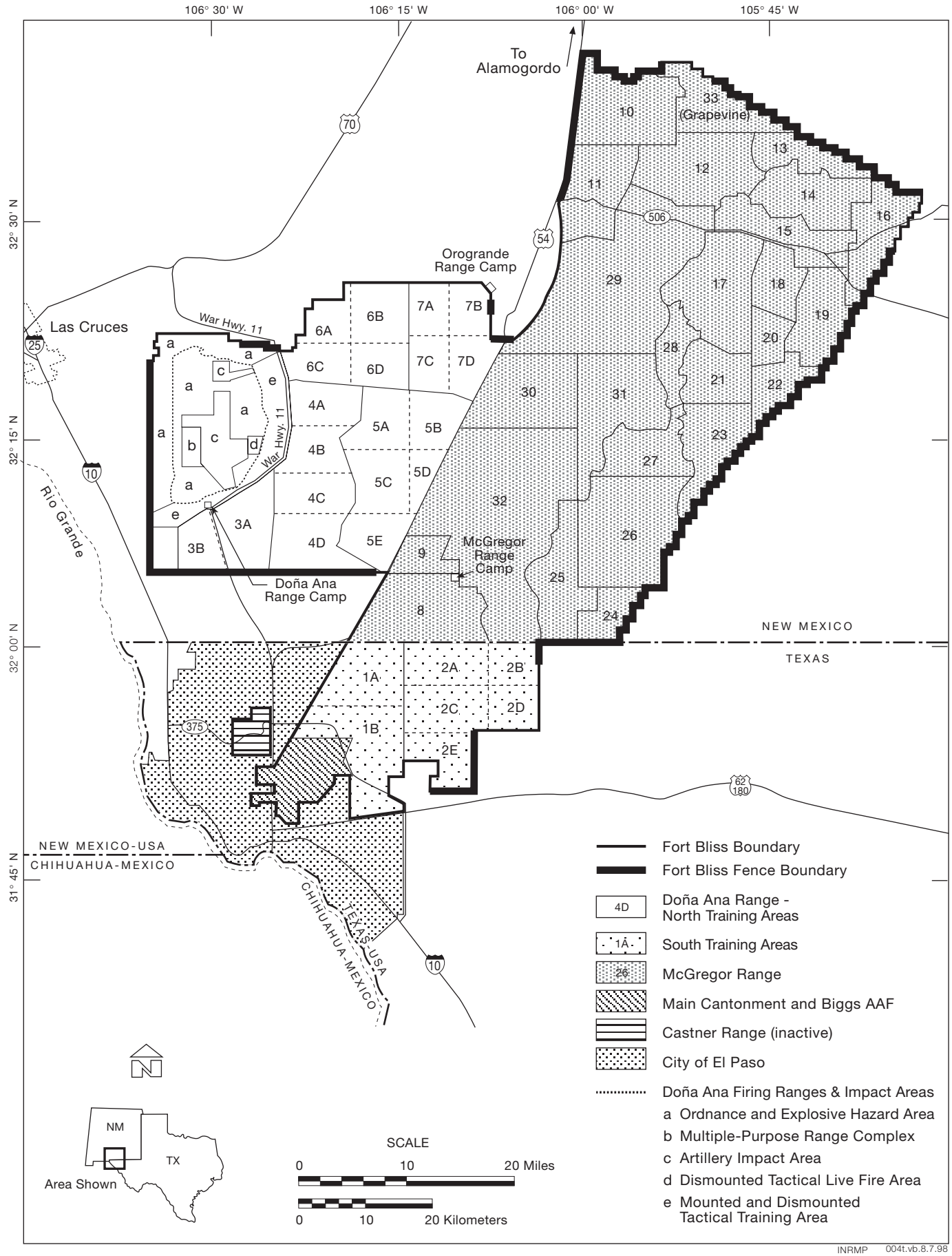

Figure 16-1. Fort Bliss Existing Fence Boundary.

16.5.1 Grazing Trespass

Fort Bliss and BLM have been coordinating on this issue. The BLM has planned to fence cattle out of the lower reaches of Fillmore Canyon, as part of the management of BLM lands in the area. Similarly, the BLM has recently traded for land adjacent to Fort Bliss in the Soledad Canyon area. The BLM has removed cattle from these particular areas.

16.5.2 Recreational Trespass and Safety

Illegal use of Fort Bliss property results in detrimental effects on natural resources and can be dangerous due to low-flying aircraft, overhead and underground utilities, ammunition storage and explosives, firing ranges, and hunting areas. Some outdoor areas will rapidly deteriorate as a result of poor drainage, unstable soils, or other negative attributes, even with only moderate use. All Fort Bliss property where outdoor recreation is allowed should be controlled to eliminate adverse impacts and as a safety precaution. Methods that provide control, including fees, patrols, and education, are addressed in Chapters 8, 11, and 13.

16.5.3 Illegal Dumping

Disposal of solid waste on Fort Bliss property is difficult to regulate as a result of the large area of the installation; therefore, certain areas are sites of frequent illegal dumping. These sites pose threats to human safety, cost money to clean, and are aesthetically unappealing. There is a problem with illegal dumping along U.S. Highway 54 and along the boundary between Fort Bliss and the City of El Paso. Illegal dumping on Fort Bliss could be reduced through construction and modification of perimeter and right-of-way fencing.

16.6 ROAD MAINTENANCE AND OTHER RANGE MAINTENANCE ACTIVITIES

Poor roads may prohibit fire control, limit training potential, increase soil erosion, and decrease availability of the area for recreation and grazing access. Additionally, general road maintenance can be increased to provide greater long-term benefits and to maintain the overall condition of the ranges. Such factors are included in LRAM program development and are considered in Chapter 8.

16.7 WILDERNESS DESIGNATION

Culp Canyon WSA, NM-030-152, is located in the northern portion of McGregor Range and includes 10,937 acres of withdrawn BLM land (USDI, 1991). Since 1957 the U.S. Army has controlled this area. The MLW (*PL 106-65*), withdrew McGregor Range for military purposes and included the land within the Culp Canyon WSA. The legislation (*PL 106-65*) also mandated the continued management of the Culp Canyon WSA under the wilderness review provisions of Section 603 of the FLPMA (USDI, 1991). The WSA excludes all forms of appropriation including mineral leasing, mining, and geothermal development. Like the whole of the McGregor withdrawal, the Culp WSA permits (1) the continuation of livestock grazing; (2) protection of wildlife and wildlife habitats; (3) control of predators; (4) recreation; and (5) prevention and suppression of wildfires resulting from military activity.

A complete description of the Culp Canyon WSA is contained in the *New Mexico Wilderness Study Report, Statewide Summary* (USDI, 1991), or the *New Mexico Statewide Wilderness Study, Final Environmental Impact Statement: Appendix 43 Culp Canyon Wilderness Analysis Report* (USDI, 1988). As stated by the BLM in the 1991 statewide summary, “the Culp Canyon WSA is not recommended for

wilderness designation. The recommendation for the WSA is based primarily on conflicts with military use of the area." The report also states that though no surface disturbing activities are projected for the WSA, continued use of the area for military activities including troop training and weapons testing may result in surface disturbance (USDI, 1991). BLM further notes that although the WSA has outstanding opportunities for solitude, these characteristics exist primarily as a result of the remoteness of the region; lack of special features to attract visitors; and the military restrictions on public access. The BLM concluded, "There are no known special features, habitats, or wildlife species in the WSA dependent upon wilderness designation. Other than military activities, there are no projected activities, no provisions for mineral exploration, and no valid rights of others in the WSA. There could be some impacts from military use of the area but the overall quality and level of values now found in the WSA is not expected to significantly change" (USDI, 1991).

16.8 AGREEMENTS WITH OTHER AGENCIES

Under *PL-99-606*, McGregor Range was withdrawn from all forms of appropriation and reserved for use by the Secretary of the Army for training, weapons testing, and other defense-related purposes. Nonmilitary uses on withdrawn lands of McGregor Range are to be managed under FLPMA by the BLM. Management of McGregor Range under the MLW includes the continuation of grazing pursuant to applicable law, protection of wildlife and wildlife habitat, control of predatory and other animals, recreation, and prevention and appropriate suppression of brush and range fires resulting from nonmilitary activities. Fort Bliss entered into a MOU with the BLM regarding management of resources and public access to McGregor Range. The existing MOU will be rewritten after the BLM finishes the new *Resource Management Plan*, as required by *PL 106-65*.

Additionally, Fort Bliss and the USFS have an MOU in which the USFS is responsible for administering its lands for nondefense purposes. This includes issuance of all permits for uses and activities that are not related to defense purposes, protection of lands and resources from destruction, and assessment and collection of fees for the use of lands. As a result of the expansive nature of McGregor Range and the extent of the management agreements, the INRMP includes policies for the continued co-management of these lands (Chapter 8).

16.9 CULTURAL RESOURCES

Extensive cultural resources exist on Fort Bliss. Although the INRMP is a natural resources document, the significance of cultural resources is recognized by Fort Bliss, and is, therefore, given consideration in the document by coordinating the INRMP with the ICRMP (Chapter 14).

16.10 INVASION OF NON-NATIVE SPECIES

Encroachment of exotic species into an area can have detrimental effects on native flora and fauna. Such effects could cause short-term (i.e., nuisances) and long-term problems (i.e., extinction of native species). Additionally, unique or sensitive areas could be affected as well as the ability of an area to support grazing at a level consistent with current use. Preventative and control measures are presented in the INRMP to reduce the possibility of exotic species invasions and the detrimental effects caused by those species (Chapter 8). Surveys to inventory exotic and noxious weed species on Fort Bliss have been conducted. Monitoring and control efforts are ongoing at selected localities. At this time, it is unknown if non-native oryx are causing detrimental impacts to flora and fauna at Fort Bliss. Oryx surveys have been proposed to determine the size of the population. Oryx hunts are currently under consideration.

16.11 ACTIVITY AND LAND USE CHANGES

Changes in land use could occur following changes to the Fort Bliss mission. Any changes in the military mission of Fort Bliss would require changes to this INRMP, as well as appropriate NEPA analyses and documentation.

16.12 PUBLIC USE OF FORT BLISS PROPERTY

Public access to Fort Bliss is limited. Primary reasons for restricted access are evident through above-mentioned concerns (i.e., military mission, human safety, range maintenance). However, limited access is allowed for legal activities when military activities are not being conducted, with the exception of areas with unexploded ordnance. Prior to approving public access, concerns such as scheduling, permitting, and control of use need to be addressed (see Section 7.2.1).

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17.0 IMPLEMENTATION

17.1 ORGANIZATION, ROLES, AND RESPONSIBILITIES

The DOE is divided into two divisions: Multimedia Compliance and Conservation, which are further structured into teams. The leading division in INRMP implementation, Conservation, is separated into four teams: Impact Analysis, Monitoring and Mitigation, Historic Resources, and Archaeological Resources. These teams are responsible for discipline-specific management; however, to facilitate implementation of this INRMP, teams will work together, including ITAM personnel with DPTMS.

Additionally, increased coordination with BLM, USFS, USFWS, TPWD, NMGFD, and other federal, state, and private agencies in obtaining objectives is outlined in this plan.

17.2 MANPOWER

17.2.1 Personnel

Implementation of this INRMP will require sufficient numbers of professionally trained natural resources management and enforcement personnel. Natural resources personnel will be professionally trained as required by AR-200-3 and the *Sikes Act* (16 USC Sec.670e-2). Professional staffing requirements include but are not limited to expertise in Geographic Information Systems (GIS), threatened and endangered species management, wildlife ecology, plant ecology, and ecologists experienced in NEPA analysis. Qualifications for natural resource positions are listed in Office of Personnel Management requirements for these types of positions. Specific personnel necessary will be based on available funds and completion of projects outlined in Section 17.3.

17.2.2 Training

The Conservation Division, as funding allows, regularly sends at least one person to each of the following annual workshops or professional conferences: National Military Fish and Wildlife Association annual workshop, North American Natural Resources Conference, ESA conferences, ITAM workshop, The Wildlife Society meetings, and Partners in Flight. Other conferences and workshops will be evaluated for their usefulness, and decisions will be made based on appropriateness to ongoing projects and funding availability. Personnel will also be trained in related environmental fields. NEPA training will be required for all supervisory personnel, as well as others who review or prepare NEPA documents.

17.2.3 Outside Assistance

Implementation of the INRMP will require active assistance from the Fort Bliss partners, both signatory and otherwise. Chapter 5 indicates agencies, organizations, and others in this category. Specific needs from organizations external to Fort Bliss will be addressed as they arise. Fort Bliss will also continue to utilize expertise from universities, agencies, and contractors to accomplish some tasks.

17.3 PROJECT/PROGRAMS PRIORITIES

This section lists the projects and programs identified within this plan that are proposed for accomplishment during the next 5 years. Projects listed under the high-priority category are generally required to maintain compliance with natural resources laws and regulations or are necessary to sustain

training and benefit the military mission. Those listed as important or less important, though generally not required for compliance, are necessary to provide data to continue to make informed decisions regarding natural resources at Fort Bliss, to continue in the effort to manage Fort Bliss following ecosystem management guidelines, to reduce impacts of military training on the natural and cultural resources of Fort Bliss, and/or to protect the various resources of the installation and improve the quality of life for Fort Bliss personnel.

17.3.1 High Priority

Projects and programs of high priority are:

- Implement an ecosystem management philosophy that supports the military mission
- Establish ecosystem management partnerships
- Implement endangered species management plans
- Identify and protect areas of special significance
- Continue comprehensive landscape monitoring using satellite imagery
- Develop and implement forest management plan, including fuels and fire management
- Develop and implement a LRAM plan for all lands impacted by military activities on Fort Bliss
- Continue Land Condition-Trend Analysis (LCTA), EA, and Training Requirements Integration (TRI) ITAM components
- Protect cultural resources while implementing INRMP
- Acquire personnel to fill necessary positions
- Cooperate with agencies conducting ecological research on Fort Bliss.

17.3.2 Important

Projects and programs considered to be important are:

- Support an outdoor recreation information program to educate users
- Continue to enforce outdoor recreation user requirements (i.e., check-in/out)
- Provide outdoor recreation opportunities
- Continue to implement reduced grounds maintenance plan (e.g., arid landscaping, reduced mowing)
- Improve installation boundary fencing
- Finish small mammal planning level survey in foothills and montane ecosystem units
- Vegetation community field verification and update
- Monitor and control exotic noxious weeds
- Complete desert riparian communities mapping
- Improve natural resource law enforcement
- Initiate database and analysis of hunting and other recreational use.

17.3.3 Less Important

Projects and programs of lesser importance are:

- Provide access in outdoor recreation areas by maintaining existing roads in passable condition
- Wildlife water enhancement
- Oryx survey
- Arthropod planning level survey.

17.4 IMPLEMENTATION FUNDING OPTIONS

This plan presents ambitious budget objectives and reflects the commitment of Fort Bliss and TRADOC to bring the installation into full compliance with the law. Fort Bliss, TRADOC, the USFWS, and the state wildlife agencies recognize that year-to-year congressional appropriations for the implementation of the Army's mission or changes in the Fort Bliss mission resulting from Base Realignment and Closure (BRAC) or Force Drawdown may reflect different priorities. If those priorities require deferral, redirection, or cancellation of planned projects or plans, Fort Bliss, in consultation with TRADOC, will determine which projects or plans should be implemented first. In every case Fort Bliss and TRADOC will ensure that constraints on the military training mission are minimized and avoided wherever possible.

It is understood that congressional budget constraints will require increased implementation by in-house staff. Current government-wide goals of reducing the number of federal employees indicate that the employment of additional permanent full-time natural resource professionals and paraprofessionals will be severely limited during the life of this plan. However, the *Sikes Act* and AR 200-3 require that the Army employ natural resources professionals to implement this plan.

It is therefore assumed that some of the professional work required by this plan will be accomplished by contract; through partnerships, including borrowed labor; with New Mexico and Texas universities and other public research institutions; or by limited term or temporary employees.

Management of biodiversity, following ecosystem management principles and practices, as outlined in this INRMP, is designed to be implemented within the context of existing programs and activities. However, natural resource management can also be integrated within operations and training programs, environmental impact assessment activities, and master plan development (Leslie et al., 1996). Each of these various disciplines can provide funding for natural resource management programs. Under this premise, the following sections provide an overview of major sources of funding available for such programs.

17.4.1 Environmental Conservation Compliance Program

The Environmental Compliance (EC) program or Conservation Compliance-Program Objective Memorandum (POM) funding focuses on compliance of current operations with all federal, state, and local environmental laws and regulations (Leslie et al., 1996). These funds fall into one of four levels of priority:

- Level 0 Recurring Costs to Ensure Compliance
- Level I Fixing Noncompliance
- Level II Preventing Noncompliance
- Level III Good Management practices (low priority or performed in-house).

Recurring activities to ensure compliance with NEPA, ESA, and other environmental protection requirements are given highest priority. These activities include threatened and endangered species monitoring, wetlands monitoring, updating plans and inventories, manpower, equipment, training, Section 7 Consultations under the ESA, permit acquisition, overhead costs, NEPA compliance, and nonpoint source pollution monitoring (Leslie et al., 1996). Funding for EC programs comes from many different sources, although the largest source comes from Operation and Maintenance (O&M) funds allocated to each service by the U.S. Congress.

17.4.2 Commodity Programs

Commodity programs, or programs that involve the sale of natural resources or the sale of rights to those resources to private interests outside the military, are an important source of funding for natural resources management programs (Leslie et al., 1996). The only commodity program on Fort Bliss involves grazing outleases. Although administration of outleases is the responsibility of the BLM, Fort Bliss is entitled to direct expenditure of 10 percent of the fees collected (USDI, 1990a). Revenues from outleases are to be used for covering administrative expenses associated with leases; initiation, improvement, and perpetuation of leases; and implementation of INRMPs. Priorities for expenditures are (Leslie et al., 1996):

- Priority 1: Outleasing administration and revenue investments
- Priority 2: Nonrevenue improvements
- Priority 3: Other multiple-use management projects.

17.4.3 Legacy Resource Management Program (LRMP)

The LRMP has been a special congressionally mandated initiative to fund military conservation projects. This program has funded several projects on Fort Bliss.

17.5 COMMAND SUPPORT

Many priority projects for natural resources management within the next 5 years require command support. The commanding general is liable for noncompliance with environmental laws such as those mentioned in the INRMP.

This plan has the support of the Fort Bliss commander and other personnel in command positions who are needed to implement this INRMP. The command is dedicated to implementation of this plan as required by the *Sikes Act* and other federal and state laws and Army regulations. The command is dedicated to maintaining and improving the military mission on Fort Bliss. Implementation of this INRMP is a means to that end.

17.6 GOING BEYOND COMPLIANCE

Fort Bliss will, with the assistance and concurrence of TRADOC and in compliance with DoD and Army ethics regulations, vigorously pursue other sources of funding and partnerships, such as the Department of Defense Legacy Program, that will complement and amplify the purpose of this plan.

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