Integrated Natural Resources Management Plan For Kirtland Air Force Base

(Final Year Revision-October 2012)

Prepared for:
377th Air Base Wing
Air Force Materiel Command

2012 Update

UNITED STATES AIR FORCE
Kirtland Air Force Base
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Agency Concurrence Letter

This Integrated Natural Resources Management Plan (INRMP), in effect from June 2012 to June 2017, has been prepared in accordance with applicable regulations, standards and procedures of the Department of Defense and the United States (U.S.) Air Force in cooperation with the U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish (NMDG&F), and U.S. Forest Service. The signatures below indicate the mutual agreement of these parties concerning the conservation, protection, and management of fish and wildlife resources presented in the plan.

NOV 1 2012

JOHN C. KUBINEC, Colonel, USAF Date
Commander, 377th Air Base Wing

Benjamin N. Tuggle, Ph.D. Date
USAF Acting Regional Director
U.S. Fish and Wildlife Service

Ms. Nancy Rose Date
District Supervisor
U.S. Forest Service
Cibola Ranger District

As signatory to this INRMP, the NMDG&F acknowledges concurrence, as statutorily authorized by Chapter 17 of the New Mexico Statutes Annotated, with the wildlife management portions of the INRMP.

James S. Lane Jr. Date
Director
New Mexico Dept. of Game and Fish

FINAL
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
FOR
KIRTLAND AIR FORCE BASE

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ACRONYMS AND ABBREVIATIONS

ABW Air Base Wing
AFB Air Force Base
AFI Air Force Instruction
AFIA Air Force Inspection Agency
AFMC Air Force Materiel Command
AFNWCA Air Force Nuclear Weapons and Counter Proliferation Agency
AFPD Air Force Policy Directive
AFRL Air Force Research Laboratory
AICUZ Air Installation Compatible Use Zone
APZ Accident Potential Zone
AST aboveground storage tanks
BASH Bird Aircraft Strike Hazard
BCE Base Civil Engineer
CATEX Categorical Exclusion
CAWCO City of Albuquerque Water Conservation Office
CE Civil Engineer
CNF Cibola National Forest
CZ Clear Zone
DNL Day-Night Average Sound Level
DOD Department of Defense
DOE Department of Energy
DNL Day-Night Average Sound Level
EA Environmental Assessment
EIS Environmental Impact Statement USAF U.S. Air Force
EPA Environmental Protection Agency
ESOHC Environment, Safety, and Occupational Health Council
°F degrees Fahrenheit
GIS Geographic Information System
HERTF High Energy Research and Test Facility
HQ AFSC Headquarters Air Force Safety Center
INRMP Integrated Natural Resources Management Plan
IRP/ERP Installation/Environmental Restoration Program
JP-8 Jet Propulsion Fuel Grade 8
MOU Memorandum of Understanding
NEPA National Environmental Policy Act

NMDG&F New Mexico Department of Game and Fish
NMED New Mexico Environment Department
NPDES National Pollutant Discharge Elimination System
OSI Office of Special Investigations
PLO Public Land Order
RCRA Resource Conservation and Recovery Act
SNL Sandia National Laboratories
SOW Special Operations Wing
T&E Threatened and Endangered
U.S. United States
USACE U.S. Army Corps of Engineers
USDA U.S. Department of Agriculture
USC U.S. Code
USFS U.S. Forest Service
USFWS U.S. Fish and Wildlife Service
USGS U.S. Geological Survey
UST Underground Storage Tank

CHAPTER 1
EXECUTIVE SUMMARY

This Integrated Natural Resources Management Plan (INRMP) was developed to provide interdisciplinary strategic guidance for natural resources management on Kirtland Air Force Base (AFB) for a period of five years. The INRMP is integrated with other planning functions, including general planning, comprehensive range planning, cultural resources management planning, Bird Aircraft Strike Hazard (BASH) planning, and pest management planning. Natural resource categories addressed for program management in this INRMP are: geographic information systems (GIS) management, fish and wildlife management, threatened and endangered (T&E) species management, water resource protection, wetland protection, forest management, wildland fire management, integrated pest management, BASH, outdoor recreation, cultural resources protection, enforcement, and public outreach.

Natural resources management, as a result of implementation of this INRMP, will support the military mission. Natural resources managers will implement the principles of multiple use and sustained yield, using scientific methods and an interdisciplinary approach. The conservation of natural resources and the military mission shall not be mutually exclusive. Management of natural resources at Kirtland AFB will result in no net loss of the military mission and operational capability.

This INRMP is focused on the achievement of ten specific goals for the protection and improvement of the natural environment:

> Goal 1: Comply with the Sikes Act Improvement Act of 1997, Air Force Instruction (AFI) 32-7064, *Integrated Natural Resources Management*, as revised; Memoranda of Agreement concerning migratory birds and use of United States (U.S.) Geological Survey (USGS) land; and U.S. Air Force (USAF) and U.S. Forest Service (USFS) guidelines for managing natural resources, as well as other environmental rules, regulations, laws and procedures.
>
> Goal 2: Manage and protect natural resources in a manner that results in no net loss of the military mission and operational capability at Kirtland AFB.
>
> Goal 3: Conserve and enhance wildlife habitats to maintain and improve the sustainability and natural diversity of ecosystems on Kirtland AFB.
>
> Goal 4: Identify, conserve, and manage, if present, threatened, endangered, and candidate species listed for regulatory protection by federal and state agencies, in addition to critical habitat and wetlands.
>
> Goal 5: Manage wildlife habitat and populations to reduce the potential for bird and wildlife strikes during flying operations
> Goal 6: Increase the awareness, appreciation and conservation of natural resources on Kirtland AFB.

Goal 7: Manage pest in a manner that reduces impacts to natural resources, watersheds, landscapes, and the base mission.

Goal 8: Incorporate existing and future GIS information into a database that supports both mission and project planning and Natural Resources Management Program activities.

Goal 9: Support resource conservation through integrated land and ground maintenance programs and plans, when and where possible.

Goal 10: Provide opportunities for enjoyment and appreciation of the natural resources at the base.

These goals were formulated from a comprehensive analysis of regulatory requirements, the condition of the natural resources on Kirtland AFB, and a consideration of the value of these resources to the people who live and work on the installation. Chapter 8 identifies the specific objectives for each goal, and Appendix A provides the work plans necessary for implementation of these objectives.

Implementation of the INRMP will ensure that Kirtland AFB continues to support present and future mission requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, implementation of this and future revisions of the INRMP will help guide base staff in preserving and improving the sustainability of the ecosystem at Kirtland AFB while supporting military operations. Major revisions to the INRMP are completed every five years, but only if necessary. Significant changes in the base mission or federal environmental procedure may call for such revisions.

The National Environmental Policy Act (NEPA) analysis for the plan consists of an environmental assessment (EA) and is included in Appendix B. For the implementation of specific projects or actions included in the plan, the appropriate environmental impact analysis (Environmental Impact Statement [EIS]/Environmental Assessment [EA]/CATEX) will be performed, as required by NEPA.

Additionally, this plan incorporates by reference management direction for Management Area 17 in the Cibola National Forest (CNF) Land and Resource Management Plan (as amended).

CHAPTER 2
GENERAL INFORMATION

2.1 PURPOSE

All major commands of the USAF are directed to develop an INRMP to provide effective management of natural resources. Natural resources include plants, animals, land, water, and air. This plan outlines and assigns responsibilities, identifies concerns, and establishes goals for the management of natural resources for Kirtland AFB and 15,891 acres of CNF land withdrawn from public use for military purposes and known as the “Withdrawal Area.” This plan also assists USAF managers in planning, developing, and implementing a program that is designed for the specific requirements of Kirtland AFB. Resources covered include GIS, fish and wildlife, threatened and endangered (T&E) species management, water resource protection, wetland protection, forest management, wildland fire management, integrated pest management, BASH, outdoor recreation, cultural resources protection, enforcement, and public outreach.

The purpose of this INRMP is to provide guidance for the proper management of natural resources on Kirtland AFB while ensuring that military mission requirements are met. The INRMP content and need is driven by AFI 32-7064, *Integrated Natural Resources Management*, and the Sikes Act Improvement Act of 1997, whose focus is to conserve and enhance biodiversity while maximizing natural resources utilization. The goal of the INRMP is to support the USAF mission while providing sound natural resource management practices. This plan addresses the interrelationship between individual resources, mission activities, adjacent land uses and associated public concerns.

2.2 AUTHORITY

The Sikes Act (16 U.S. Code [USC]. 670a-670o), as amended, requires the preparation and implementation of INRMPs on military installations. The Act was amended in 1997 to require that all INRMPs be completed and current by November 2001 with a five-year update cycle. Air Force Policy Directive (AFPD) 32-70, *Environmental Quality* (20 July 1994), and Department of Defense (DOD) Instruction 4715.3, *Environmental Conservation Program* (3 May 1996), state that natural resources at military installations will be managed through effective planning. In AFPD 32-70, the Deputy Undersecretary of Defense (Environmental Security) states “ecosystem management of natural resources draws on a collaboratively developed vision of desired future ecosystem conditions that integrates ecological, economic, and social factors.” To effectively integrate ecological, economic, and social factors along with the military mission into an effective ecosystem management program, the policy directive further states: “On DOD installations, ecosystem management will be achieved by developing and implementing the Integrated Natural Resource Management Plan and insuring that it remains current.” AFI 32-7064, *Integrated Natural Resources Management* (17 September 2004) implements these directives by establishing the Installation INRMP as the primary planning document for natural resources at Air Force installations. The INRMP assures compliance with statutes, Executive Orders, DOD instructions, and AFPDs as detailed in AFI 32-7064.

Several federal wildlife laws have been enacted to conserve and protect wildlife resources in the U.S. Military installations, including Kirtland AFB are subject to the provision of these laws. The Migratory Bird Treaty Act of 1918 (16 USC 703) affirms the U.S. commitment to conventions with Canada, Mexico, Japan and Russia for protection of shared migratory bird resources. The Act establishes that all migratory birds and their parts (including eggs, nests, and feathers) are fully protected from actions including pursuit, killing, selling, taking, shipping, transporting or exporting. The Bald Eagle Protection Act of 1940 (16 USC 668), as amended, prohibits the take, possession and commerce of bald and golden eagles except under certain specified conditions.

Amendments to this Act have led to increased penalties for violations and have strengthened enforcement measures. The Endangered Species Act of 1973 (16 USC 1531-1544), as amended, implemented the Convention on International Trade in Endangered Species of Wild Fauna and Flora (T.I.A.S. 8249), signed by the U.S. on March 3, 1973, and the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (50 Stat. 1354), signed by the U.S. on October 12, 1940. This Act authorized the listing of species as threatened or endangered, sanctioned the acquisition of land and development of cooperative agreements to protect listed species, prohibited unauthorized take, possession, sale and transport of listed species, and instituted civil and criminal penalties for violating the law. Section 7 of the Endangered Species Act establishes that federal agencies must not authorize, fund or carry out actions to jeopardize threatened or endangered species or modify critical habitat.

2.3 RESPONSIBILITIES

The 377th Air Base Wing (ABW) is responsible for ensuring that base assigned and associate units comply with laws and requirements associated with the management of natural resources. The Wing Commander approves the INRMP and any necessary revisions, provides appropriate funding and staffing to ensure implementation of the INRMP, controls access to and use of installation natural resources, and signs cooperative agreements entered into between the installation and other entities pursuant to the Sikes Act.

The Base Civil Engineer (BCE) is responsible for the preparation, maintenance, and day to day implementation of the INRMP, and is the focal point for all plan actions and issues. The BCE also establishes mechanisms to review and analyze the impacts using the Environmental Impact Analysis Process for all proposed actions of the INRMP, and makes recommendations based on the analysis to the Environment, Safety, and Occupational Health Council (ESOHC) for approval or disapproval. Members of the ELC ensure that their areas of responsibility are considered in the interdisciplinary approach required to assure proper environmental quality.

Environmental Management at Kirtland AFB prepares, implements, and updates the INRMP. Environmental Management provides technical advice on natural resource matters to the Wing Commander, ESOHC, the BCE, and the Kirtland AFB community planner. In addition, Environmental Management is responsible for budgeting and advocating for natural resources conservation programs and for developing partnerships with other federal, state, tribal, local, academic and non-governmental organizations. Commanders of assigned and associate units are required to be familiar with the content of the INRMP and comply with its provisions. Natural

Resource Program Manager is required by AFI 132-7064 to attend the DoD Partners in Flight annual workshop, to reduce the risk to the military mission on Kirtland AFB.

2.4 MANAGEMENT PHILOSOPHY

The guiding principle behind the development of this INRMP is sound ecosystem management for the protection of biological diversity. The comprehensive goal of ecosystem management is to maintain and improve the sustainability and biological diversity of native ecosystems in supporting the Air Force mission and the needs of the military community. Managing ecosystems involves addressing the environment as a complex system of interrelated components rather than a collection of isolated units. Military operations and compliance with federal, state, and local requirements are essential components of the Kirtland AFB mission. Successful ecosystem management requires Air Force environmental managers to consider factors such as the military mission, state and federal laws, community values, socioeconomics, and adjacent land uses in addition to the biological environment. Management of natural resources on Kirtland AFB will result in no net loss of the military mission or operational capability.

In order to provide for effective ecosystems management as an integral part of the Base General Plan, all installations that encompass land and water suitable for the conservation and management of natural resources are directed to develop an INRMP. The INRMP is a natural resources management plan based on ecosystem management showing the interrelationships of the installation plans as well as mission and land use activities affecting the basic land management plans (AFI 32-7064). This plan outlines and assigns responsibilities, identified concerns, and establishes standard operating procedures for the management of natural resources on an installation.

The INRMP assists managers in the planning, development, and implementation of a program tailored to the requirements of specific facilities and land holdings. The INRMP will be integrated and coordinated with the Base General Plan, the Pest Management Plan, the BASH Plan, the Cultural Resources Management Plan, and other planning documents to assure that mission activities are conducted consonant with sound ecosystem management for the protection of biological diversity.

2.5 CONDITIONS FOR IMPLEMENTATION AND REVISION

According to AFI 32-7064, INRMPs are to be “living documents” incorporating all aspects of natural resources management and ensuring that they are compatible with each other and with the Kirtland AFB mission. This INRMP will be reviewed annually and updated as needed to maximize its usefulness to base natural resource personnel. Final approval authority for the INRMP at Kirtland AFB rests with the Wing Commander. When planning projects or mission changes, Kirtland AFB must consider the goals and objectives of this INRMP. This INRMP has been approved by the Wing Commander, BCE, Kirtland AFB’s Natural Resources Manager, Headquarters Air Force Materiel Command (AFMC), and reviewed by 377 MSG/CEANC, 377 MSG/CEANR, and 377 MSG/CEANQ. This INRMP will be effective for five years after the last required signature has been endorsed. Annually, this INRMP will be reviewed to determine if any revisions are required. Mission realignment, transfer of lands, and land acquisition are examples of actions that would require updates or revisions.

2.6 ENVIRONMENTAL DOCUMENTATION

The NEPA analysis for the plan resulted in an EA included in Appendix B. For the implementation of specific projects or actions included in the plan, the appropriate environmental impact analysis will be performed, as required by NEPA and 32 CFR 989, Environmental Impact Analysis Process. .

CHAPTER 3
INSTALLATION OVERVIEW

3.1 Location and Area

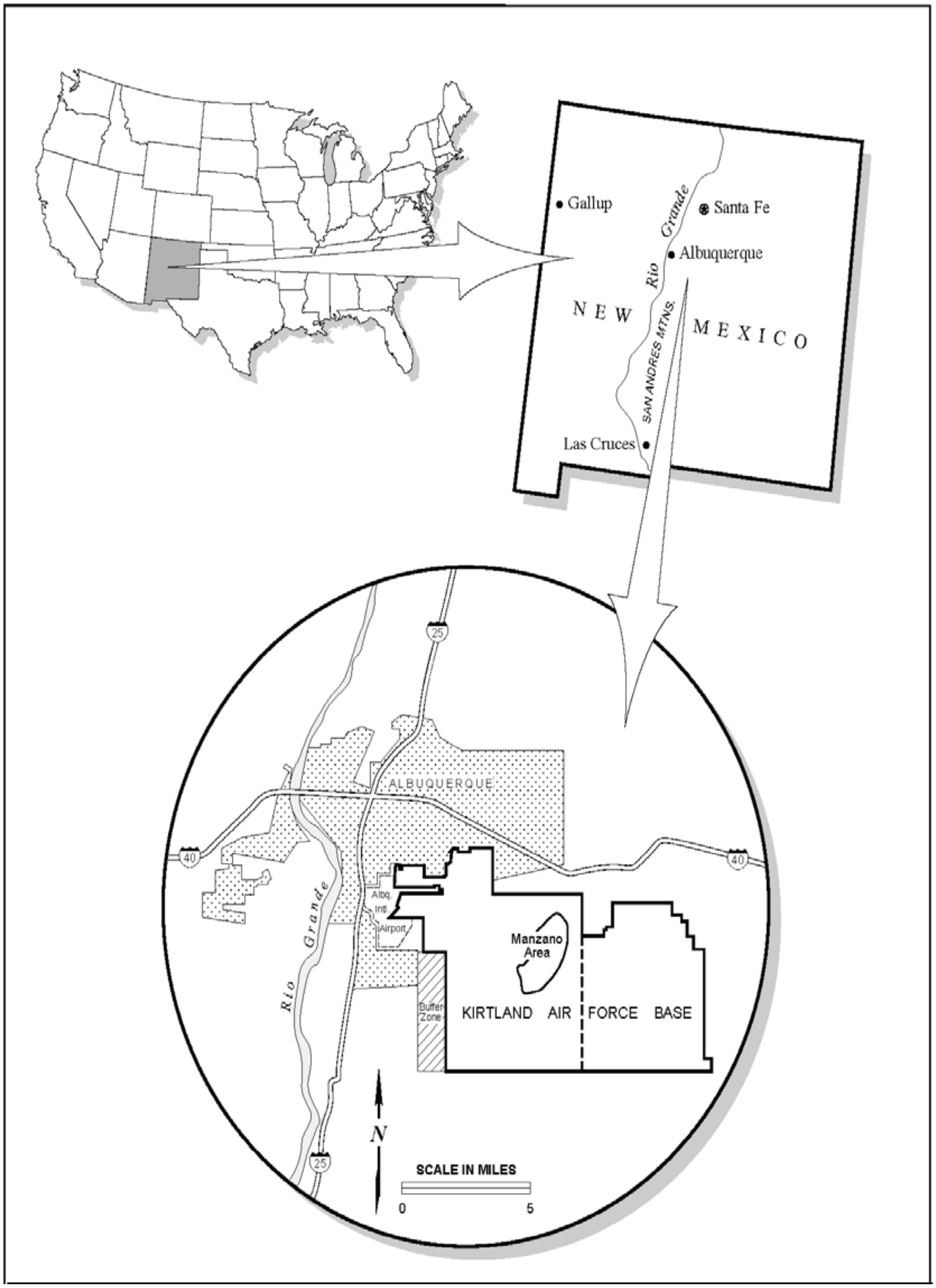
Kirtland AFB is located just southeast of Albuquerque, New Mexico, at the foot of the west side of the Manzanita Mountains (Figure 3-1). These mountains rise to over 10,000 feet and define the eastern boundary of an area locally known as East Mesa. Kirtland AFB encompasses more than 52,000 acres of the East Mesa with elevations ranging from 5,200 to almost 8,000 feet above mean sea level (USGS 1990a, b, c; 1991a, b, c). Land uses adjacent to the base include the CNF to the northeast and east, the Isleta Reservation to the south, and residential and business areas of the City of Albuquerque to the west and north.

The airfield complex serving Kirtland AFB is shared with the Albuquerque International Sunport, located adjacent to the northwest corner of the base. Airfield operations and aircraft support facilities are concentrated in the airfield complex area. The remaining intensive development at the base (e.g., administrative, housing, medical, and commercial services) is located east of the airfield complex, also in the northwest corner of the base. The base golf course and landfill are located southeast of the developed area. The remaining areas of the base (approximately 80 percent of the base land area) are largely dedicated to military training and operational facilities. Sandia National Laboratories also operates and maintains several facilities on base for research, testing and evaluation of various weapons, communication and energy systems. DOE permitted areas, as well as SNL permitted areas are managed outside of the INRMP.

3.2 Installation History

In late 1939, the U.S. Army leased 2,000 acres from the City of Albuquerque adjacent to the Municipal Airport. A small number of aviation mechanics used this property to service and repair Army aircraft being flown across the country. In January 1941, the Army decided to establish a permanent presence in Albuquerque and construction began on the Albuquerque Army Air Base. Designers planned the initial project to house and supply quarters and workspace for the 225 officers and 1,970 enlisted men of the 19th Bombardment Group, as well as the associated squadron, quartermaster, signal, ordnance, medical, chemical warfare, chapel, and finance units. In February 1942, Albuquerque Army Air Base was renamed Kirtland Field, in honor of Colonel Roy Carrington Kirtland (1874-1941) (USAF 2000).

As the U.S. entered World War II, the Army Air Force had a need to increase its training schools. Kirtland Field was expanded by the addition of 1,100 acres to the east of the existing base boundary, an area that included the adjacent Oxnard Field. On May 12, 1942, transfer of Oxnard Field to the Army Air Force was completed. Renamed the Albuquerque Air Depot Training Station, and unofficially referred to as Sandia Base, the field became a facility of the Air Service Command of the U.S. Army Air Force. The primary mission of the new base was the training of military personal in aircraft service, repair, and maintenance (USAF 2000).



Aug 2012 | Figure

INRMP | Kirtland AFB Location | **3-1**

In 1943, the Army reached the saturation point for personnel trained in the above disciplines and a period of relative inactivity followed on the base. During this time, many of the base buildings were abandoned and training equipment was moved to storage. In 1944 and 1945, the base was used as a convalescent center for wounded aviators (USAF 2000).

In 1945, Sandia Base came under the control of the Manhattan Engineer District (named after the Manhattan Project at Los Alamos) of the U.S. Army Corps of Engineers (USACE). Separation of the military functions at Sandia Base from the functions of Los Alamos Laboratory was desirable by mid-1946. Around that time, Sandia Base became an ordnance activity, used for the development of high explosives, that included two areas (technical areas 1 and 2) administered by the Department of the Army. U.S. Army Colonel Gilbert M. Dorland became the first Commanding Officer of Sandia Base on July 29, 1946. On January 1, 1947, the Atomic Energy Commission activated the USAF Special Weapons Project. A portion of the Los Alamos staff, called the “Z Division” after its leader Dr. Jerrold Zacharias, was the forerunner of the Sandia National Laboratories. On April 1, 1948, the Z Division became the Sandia Branch of the Los Alamos Scientific Laboratory. On November 1, 1949, Sandia Corporation, a wholly owned subsidiary of Western Electric, assumed the management of Sandia National Laboratories. On July 1, 1971, both Sandia Base and the adjacent nuclear weapons storage facility, Manzano Base, were incorporated into Kirtland AFB. Many other organizational changes occurred from 1974 to 1992. In June 1992, Kirtland AFB became an AFMC Base and has been operated by the 377 ABW since that time.

The 1985 CNF Land and Resource Management Plan, as amended in 1987, 1991, and 1996, acknowledged the closure of 20,486 acres of the Sandia Ranger District to public entry for security and safety purposes. Public Land Order (PLO) 133 first withdrew 4,667 acres of National Forest land in 1943 for use in connection with the prosecution of the war. In 1949, PLO 595 withdrew an additional 13,948 acres for experimental purposes to be used by the Department of Navy. In 1954, the Navy determined that it no longer had use for the withdrawn land. PLO’s 133 and 595 were turned over to the Department of Army for use with Sandia Base and were reissued as PLO 995. In 1980, a 2,400 acre portion of PLO 995 (encompassing David Canyon) was revoked and returned to public entry. PLO 995 is now with the DOD. In 1969, PLO 4569 withdrew a 4,595 acre tract north of PLO 995 for research and development by the Atomic Energy Commission. PLO 4569 is with the Department of Energy (DOE).

The existing withdrawn lands are established for purposes of tactical training, research, and military developments by both agencies [DOD and DOE] and their contractors. The Cibola National Forest Plan identifies the withdrawn lands as Management Area 17 which specifies that management will remain under the joint control of the USFS, USAF, and DOE. The Forest Service’s management emphasis in this area is “…to improve wildlife habitat diversity and decrease the threat of an escaped wildfire from either entity within the intent established Memorandums of Agreement. All public use of the area will be restricted and enforced by personnel of the DOD and DOE.”

The impact of Kirtland AFB on the economy of Albuquerque and New Mexico has been substantial. Kirtland AFB continues to play an important role in the economy of the Albuquerque metropolitan area and the base is the largest employer in New Mexico. The goods and services purchased by base employees in the local area create secondary jobs and wages, further adding to the base's total economic importance to the local area. The economic contribution of Kirtland AFB to the Albuquerque area has been estimated to exceed $3.3 billion annually (USAF 2004a).

3.3 MILITARY MISSION

3.3.1. 377th Air Base Wing

The 377 ABW (the Wing), the host organization at Kirtland AFB, was activated under the AFMC on January 1, 1993. The mission of the Wing is to provide world-class munitions maintenance, readiness and training, and base operating support to approximately 76 federal government and 384 private sector tenants and associate units. Munitions maintenance is the primary mission of the Wing and is provided at the depot level by two squadrons. The squadrons perform in-depth maintenance on Air Force and DOE assets from around the world. Their objective is to deliver all munitions and support to the correct location on time and in prime operating condition.

In addition to munitions maintenance, the 377 ABW provides operating support for over 100 associate units in over 2000 buildings. To support this mission, the 377 ABW has the largest security forces group in AFMC. Trained personnel are in constant state of readiness to deploy to any location worldwide in support of contingency operations. The Wing also provides quality and professional support services to the Kirtland AFB community, active duty, retirees, dependents and civilians-with services such as security, medical, housing, fire protection and transportation support.

3.3.2 Tenant Units

The host unit at Kirtland AFB is the 377 ABW, which reports to Headquarters AFMC at Wright-Patterson AFB in Dayton, Ohio. Major groups within 377 ABW include the Maintenance, Mission Support and Medical groups, as well as associate units. Listed below are a few major tenants and organizations.

3.3.2.1 Space Development and Test Wing

The Space Development and Test Wing (SD&TW) is a 215-person government organization activated on August 1, 2006 that performs development, test and evaluation of Air Force space systems and executes advanced space development and demonstration projects to exploit new concepts and technologies and rapidly migrate capabilities to the warfighter

3.3.2.2 150th Fighter Wing, New Mexico Air National Guard, encompassing the 188th Fighter Squadron

The New Mexico Air National Guard provides unsurpassed aerospace combat capability and combat support forces to meet any contingency in the world (USAF 2000) (Air National Guard 1995).

3.3.2.3 58th Special Operations Wing, Air Education and Training Command

The primary mission of the 58th Special Operations Wing (SOW) is to train all USAF helicopter crews and MC-130H, MC-130P, and HC-130 transport crews for worldwide combat rescue and special operations (Kirtland AFB 2006a). This includes identifying facility-related projects to accommodate current and future functions of special operations and rescue training within the Kirtland AFB complex. The training complex covers approximately 40 acres of academic, technical training, and administrative space, as well as 70 acres of ramp space. There are several low-level training routes and remote landing zones in the surrounding area (USAF 2000). The 58 SOW is also responsible for implementing and maintaining the BASH Plan (Appendix C). This plan establishes procedures to minimize aircraft exposure to the hazards associated with both birds and terrestrial animals in the Kirtland AFB flying area (Kirtland AFB 2002).

3.3.2.4 Air Force Inspection Agency

The Air Force Inspection Agency (AFIA), headquartered at Kirtland AFB, New Mexico, is a Field Operating Agency that reports to the Secretary of the Air Force Inspector General. AFIA is the primary action arm of the Air Force inspection system. The Agency provides independent and timely assessments of acquisition, operations, logistics, support and health care to Air Force Major Commands and Secretary of the Air Force level organizations. AFIA identifies critical deficiencies and recommends improvements for accomplishing peacetime and wartime missions. The Agency evaluates Air Force activities, personnel and policies. In addition, AFIA provides by-law and compliance oversight of all Air Force-level field operating agencies and direct reporting units.

3.3.2.5 Air Force Office of Special Investigations, Detachment 116

The mission statement for the Air Force Office of Special Investigations (OSI) is to provide professional special investigative services for the protection of Air Force and DOD people, operations, and materiel worldwide. Command priorities for the Air Force OSI are to exploit counterintelligence activities for force protection, resolve violent crime impacting the Air Force, combat threats to our information systems technologies, and defeat and deter acquisition fraud.

3.3.2.6 Air Force Operational Test and Evaluation Center

The Air Force Operational Test and Evaluation Center’s (AFOTEC) mission is to plan and conduct realistic, objective, and impartial operational testing and evaluation to determine the operational effectiveness and suitability of USAF systems and their ability to meet mission needs. Systems are tested under operationally realistic conditions to determine their operational effectiveness in terms of performance, survivability, organization, doctrine, safety, tactics, and threat. Testing is also conducted to determine operational suitability in terms of reliability, maintainability, availability, supportability, compatibility, safety, and realistic environment (Kirtland AFB 2002).

3.3.2.7 Air Force Research Laboratory

The Air Force Research Laboratory (AFRL) mission is to create technologies for the warfighter to control and exploit space. AFRL is headquartered at Wright-Patterson AFB, Ohio, and is responsible for research and technology development in support of the USAF's future and existing aerospace and space weapons systems. Two of the Laboratory's directorates are located at the northwest corner of on Kirtland AFB (Kirtland AFB 2002).

The Directed Energy Directorate develops lasers, imaging, microwaves, and other forms of radiation. It is involved in the development of high-energy plasmas and microwave technologies, electromagnetic pulse hardening, and advanced techniques and computer simulations for weapon effects. This directorate consists of four technical divisions including Starfire Optical Range, Advanced Optics and Imaging, Laser, and High-Power Microwave (Kirtland AFB 2002).

The Space Vehicles Directorate develops spacecraft and ballistic missile technologies, focusing on structures, power and thermal management, sensors, electronics, and geophysics (including effects on systems and operations). The directorate also plans, manages, and conducts space experiments. Three technical divisions form the directorate's core operations, two of which are located at Kirtland AFB. The Battlespace Environment Division, which detects threats in the aerospace environment to warfighting systems across the full range of natural and man-made sources, is located at Hanscom AFB, Massachusetts. At Kirtland AFB, the Integrated Experiments and Evaluation Division develop, incorporate, and demonstrate vital developing military space concepts. The division also manages and executes a portfolio of space and new space trials, as well as experimental projects such as complex, ground-based, balloon-borne, airborne and orbital missions. Also at Kirtland AFB is the Spacecraft Technology Division, which provides technology to revolutionize space capabilities for global awareness and control of space. In addition, it operates the Centers of Excellence in space-based infrared technologies, as well as in advanced power, structures, and controls research and development (Kirtland AFB 2006).

Potential effects on natural resources include the Starfire Optical Range and the High Energy Research and Test Facility (HERTF) operations, both of which are in the Withdrawal Area within the CNF. These activities entail the use of lasers. The HERTF is located in a canyon, where high-power microwave testing is done. High-power systems explosive testing is conducted at the Chestnut site. Some outdoor laser propagation to targets (south of Building 761 and Hangar 760) also occurs.

3.3.2.8 Headquarters Air Force Safety Center

The mission of the Headquarters Air Force Safety Center (HQ AFSEC) is to manage the USAF Mishap Prevention Program and the USAF Nuclear Surety Program. The USAF Safety Agency, a field operating agency, develops regulatory guidance, provides technical assistance in all safety disciplines, and maintains the USAF database for all safety issues (Kirtland AFB 2002).

HQ AFSC provides state-of-the-art information and communications support. The agency comprises a command section and eight directorates. The command section provides legal, budget, personnel, and administrative support. The agency has four mission directorates: flight safety, ground safety, weapons and space safety, and nuclear surety. The agency also has four support directorates: system safety and engineering, life sciences, safety education, and data operations and analysis (Kirtland AFB 2002).

3.3.2.9 Missile Defense Agency

The mission of the Missile Defense Agency is to develop a cost-effective, flexible, airborne high-energy laser system to provide a credible deterrent and lethal defensive capability against boosting theater ballistic missiles.

3.3.2.10 Defense Threat Reduction Agency

The mission of the Defense Threat Reduction Agency is to maintain the accountability database on all nuclear weapons in the national stockpile; to conduct Nuclear Weapons Effects Tests using high explosives; thermal, electromagnetic pulse, and radiation simulation facilities; to conduct Joint Nuclear Surety Inspections of all Armed Services' nuclear capable units; to provide arms control and counter-proliferation support; to provide Cooperative Threat Reduction (Nunn-Lugar) program support; and to operate the Interservice Nuclear Weapons School (Kirtland AFB 2002).

3.3.2.11 Department of Energy

The DOE mission is to maintain a safe, reliable nuclear weapons stockpile; manage nuclear materials awaiting disposition; achieve a restored environment; and to support these goals with a strong science and technology base. The DOE mission is achieved through innovative leadership; safe, environmentally responsible operations; teaming with laboratories and plants; best business practices; results-oriented approaches; responsiveness to customers; and continuous improvements (Kirtland AFB 2002). DOE activities on DOE fee-owned or DOE withdrawn land is not a part of this INRMP.

3.3.2.12 Pararescue and Combat Officer Training School

The Pararescue School supports the combatant commands by training Air Force personnel for deployment into both combat and humanitarian environments to recover personnel and equipment, performance of life-saving medical care, and providing for the security and survival of personnel (Kirtland AFB 2002). All pararescue training on Kirtland AFB is conducted in the central training area. A new training campus is currently proposed for the school that would increase student throughput and decrease required time at the school if constructed.

Sandia National Laboratories

As a DOE national laboratory, Sandia National Laboratories (SNL) works in partnership with universities and industry to enhance the security, prosperity, and well-being of the nation. Operated by Lockheed Martin Corporation, SNL provides scientific and engineering solutions to meet national needs in nuclear weapons and related defense systems, energy security, and environmental integrity, and to address emerging national challenges for both government and industry (Kirtland AFB 2002).

3.4 SURROUNDING COMMUNITIES

The region surrounding Kirtland AFB encompasses both urban and rural areas. The City of Albuquerque, with a population of 484,246 people, lies directly north and west of the base. Other surrounding communities are considerably smaller, most being located along the Rio Grande River. Table 3-1 describes these communities and provides the latest population data. The Isleta Indian Pueblo is located directly south of the base, and the two entities share a common border. East of the base is a mixture of National Forest lands and small mountain villages.

Table 3-1. Surrounding Communities

Location	Description	Population (2004 USCB; 2010 USCB)
Albuquerque	Largest municipal jurisdiction adjacent to Kirtland AFB	494,236; 545,852
City of Rio Rancho	Adjacent to northwestern Albuquerque; second largest community regional	66,599; 87,521
Village of Corrales	Located in the Middle Rio Grande Valley north of Albuquerque	7,638; 8,329
Village of Los Ranchos de Albuquerque	Located in the Middle Rio Grande Valley about seven mile from downtown Albuquerque completely within the city limits	5,396; 6,024
*Pueblo of Isleta	Borders Kirtland AFB to the south	*3,166; 3,400
Village of Tijeras	Located east of Kirtland AFB in the Manzanita Mountains	499; 541
Chilili	Located east of Kirtland AFB and south in the Manzanita Mountains	137
Carnuel	Located northeast of Kirtland AFB	1,232
Cedar Crest	Located east of the Kirtland AFB boundary	958

Source: U.S. Census Bureau (UCSB) 2004; UCSB 2010
*U.S. Census Bureau 1990

3.5 REGIONAL LAND USE

Kirtland AFB encompasses over 52,000 acres in Bernalillo County and is the third largest base within the AFMC (AFMC 2007). Some of these lands (7,525 acres) are under the jurisdiction of the DOE and will not be included in the following discussions. Lands managed by the USAF are grouped into three categories: improved, semi-improved, and unimproved grounds (Maps representing grounds can be found in the drafting department through base civil engineering).

Improved Grounds are those areas where government or contractor personnel perform annual, planned intensive or frequent maintenance activities. These are developed areas such as lawns, golf courses and landscaped plantings requiring continual maintenance. Improved grounds also include impervious surfaces such as buildings, roads, and parking lots, and areas that have been extensively altered, like the active landfill or stormwater catchment basins. The acreage of Kirtland AFB improved grounds is provided in Table 3-2.

Table 3-2. Ground Category Acreage on Lands Maintained by Kirtland Air Force Base*

Area	Category	Size (Acres)	General Description
Kirtland AFB (36,787 acres)	Improved	2,045	Athletic areas, housing areas, commercial and industrial areas; administrative areas, golf course, riding stables, Fam camp, active landfill, storm water catchment basin
	Semi-improved	2,700	Dirt roads and low maintenance administrative areas, storage areas, heliport, safety zones, training sites and obstacle course, burn pits, road sides, closed landfill cells
	Unimproved	46,901	Areas containing native or naturalized vegetation with no roads or other structures present.
Withdrawal Area (15,891 acres)	Improved	65	Buildings and Paved Areas
	Semi-improved	305	Areas around buildings, and graded areas such as the M-60 Firing Range and dirt roads
	Unimproved	15,521	Areas containing native or naturalized vegetation with no roads or other structures present.

Source: Memorandum of Understanding between USDA and USAF for total acres on the base and in the Withdrawal Area; areas calculated using Natural Resources Activity Management Plans (2012).
* Acreage includes DOE Lands

The majority of improved grounds at Kirtland AFB are located in the developed area in the northwest portion of the base. Most of the buildings on base that support the USAF and associated missions are located here. The developed area also consists of schools, parks, a fire station, the commissary and residential areas that house military personnel. These buildings are supported by a complete utility infrastructure that includes electricity, water, gas, sanitary sewer, and steam. Runways shared with Albuquerque International Sunport are also present in this portion of the base. A golf course is located southeast of the developed area. Improved lands provide little opportunity for natural resources management.

Semi-Improved Grounds are grounds where personnel perform periodic maintenance primarily for operational and aesthetic reasons (such as erosion and dust control, weed control, bird control, and visual clear zones). These locations are typically serviced by minimal utilities and dirt roads. In support of weapons-testing operations and personnel training, some areas on

Kirtland AFB are semi-improved. These locations are used as ammunition and explosive storage areas, runway safety zones, training sites, closed landfill cells and the obstacle course. Semi-improved areas, such as the heliport and Coyote Test Range Headquarters, are located in the southern grassland areas of the base. Manzano Base, in the Manzanita Mountains located east of the developed area, has semi-improved areas mostly on the western slope of the mountains. Some natural resources management can be carried out on semi-improved lands

Unimproved Grounds are those areas not classified as improved or semi-improved and usually not requiring maintenance more than once per year, if at all. Unimproved areas are typically managed by Kirtland AFB's Natural Resources Manager or by the USFS. Unimproved areas of Kirtland AFB can be found in all habitat types outside of the developed area. Most of the unimproved lands on Kirtland AFB are located in the eastern portion of the base within the ponderosa pine and pinyon-juniper habitats of the Withdrawal Area, and in the grasslands in the southern portion of the base. Most of Manzano Base is also unimproved. These locales are not typically serviced by roads or utilities, although some USFS roads are located throughout the Withdrawal Area. Unimproved grounds provide the greatest opportunity for natural resources management.

3.6 Local and Regional Natural Areas

Kirtland AFB is within the Arizona/New Mexico Plateau and Arizona/New Mexico Mountains Level III Ecoregions of New Mexico as well as the Albuquerque Basin, Conifer Woodlands and Savannas, and Rocky Mountain Conifer Forests Level IV Ecoregions of New Mexico (EPA 2006). The base is located near three regional natural areas: Sandia Mountain Wilderness Area, Sandia Foothills Open Space, and the Rio Grande Valley State Park, also locally known as The Bosque. The Sandia Mountain Wilderness Area is located approximately 5 miles north of the withdrawn portion of the base. This wilderness area, encompassing 37,877 acres, is administered by the Sandia Ranger District and receives an estimated two million person visits a year (USFS 2005).

A variety of ecosystems occur in this wilderness area including mountain scrub, montane forest, aspen glades, and spruce/fir forest. The area is home to many species plants and animals such as mule deer, black bears, cougars, and coyotes. It is also located on an important raptor migration route with local groups monitoring annual raptor migrations. The Sandia Foothills Open Space contains approximately 2,650 acres of steep, sloped hills intersected by gravelly drainages at the base of the Sandia Mountains. This preserve provides local recreational opportunities including hiking, horseback riding, and mountain biking. Trailheads provide access to the Foothills Trails as well as the Sandia Mountain Wilderness Area, managed by the USFS. Typical vegetation includes cholla, apache plume, three-leaf sumac, various oak species, one seeded juniper, and pinyon pine (City of Albuquerque 1998). Wildlife here is typical of a desert environment with coyotes, lizards, and rattlesnakes regularly encountered.

The Rio Grande Valley State Park was established by the State Legislature in 1983, this park is managed cooperatively by the City of Albuquerque's Open Space Division and the Middle Rio Grande Conservancy District. The 4,300-acre park extends from Sandia Pueblo in the north through Albuquerque and south to Isleta Pueblo. The park preserves a large stand of Rio Grande cottonwood trees that are located along the Rio Grande River. . This deciduous forest ecosystem is unique in an otherwise treeless environment.

Other tree species include Russian olive, salt cedar, and various willow species. Besides the river, numerous ponds and drainage ditches provide additional aquatic habitat. Many of the species found here don’t occur in the surrounding arid environment. Some of these species include, ducks, geese, herons, kingfishers, grebes, red-winged blackbirds, muskrats, beavers, soft-shelled turtles, painted turtles and various species of fish (City of Albuquerque 1998).

CHAPTER 4
PHYSICAL ENVIRONMENT

4.1 CLIMATE

The climate at Kirtland AFB is characterized by low precipitation; wide temperature extremes; frequent drying winds; and short, but heavy, rains. Average temperatures and precipitation by month for Albuquerque are presented in Table 4-1.

Table 4-1. Average Climate Data for Albuquerque

Month	30-Year Avg. Temp. (°F)	Average Max Temp. (°F)	Average Min Temp (°F)	30-Year Avg. Precipitation (in.)
Jan	36.5	47.0	22.0	0.5
Feb	41.6	53.0	26.0	0.6
Mar	47.9	61.0	32.0	0.6
Apr	56.0	71.0	40.0	0.6
May	65.2	80.0	49.0	0.6
June	75.0	90.0	58.0	0.6
July	78.8	92.0	64.0	1.3
Aug	76.4	89.0	63.0	1.7
Sept	69.6	82.0	55.0	1.1
Oct	57.2	71.0	43.0	0.9
Nov	44.7	57.0	31.0	0.6
Dec	36.6	47.0	23.0	0.4
Year	**57.2**	**70.0**	**42.0**	**9.4**

Source: National Climatic Data Center 2006, Weather Underground 2006.

The average annual temperature in Albuquerque is 57 degrees Fahrenheit (ºF), with an average daily fluctuation of 28ºF. In summer, high temperatures in the vicinity of Kirtland AFB average 90ºF and low temperatures average 62ºF. During the winter, temperature inversions occur when colder, heavier air stagnates beneath warmer air due to the lack of wind and the presence of the Sandia Mountains, a physical barrier to air flow. Because of these inversions, winter months (December to February) are quite cool, with an average daily low of 38ºF and an average daily high of 58ºF. Sunshine occurs nearly 3,400 hours a year and is evenly distributed in all seasons (U.S. Department of Agriculture [USDA] 1977).

Annual precipitation is variable in the area surrounding Kirtland AFB. West facing slopes generally receive more precipitation than the plateaus between the mountains and the Rio Grande. The average annual precipitation in Bernalillo County ranges from 8 inches in the county's arid valley and mesa areas to 30 inches in the Sandia Mountains east of Albuquerque. Precipitation occurs primarily during the summer months, and more precipitation falls at higher elevations. Half of the average annual precipitation events occur from July to October, during heavy thunderstorms. Annual snowfall averages range from approximately 10 inches in the valley to 3 feet in the foothills. In the higher mountain areas, snowfall averages can reach as high as 10 feet. In the valley, which has an elevation similar to much of Kirtland AFB, the snow season extends from November to early April, but snow seldom stays on the ground for more than a day (USDA 1977).

Prevailing winds in the area are from the north in the winter and from the south along the river valley in the summer. The average annual wind speed is 9 miles per hour. Gusts up to 50 miles per hour can occur in the vicinity of Tijeras Canyon due to the release of heavy, cold air held back by the Sandia and Manzanita Mountains (USDA 1977). Strong winds occur primarily in late winter and early spring.

4.2 LANDFORMS

Most of Kirtland AFB is situated on a relatively flat mesa. This mesa is cut by the east/west trending Tijeras Arroyo, which drains into the Rio Grande. Elevations at Kirtland AFB range from 5,200 feet in the west to almost 8,000 feet in the Manzanita Mountains. Kirtland AFB is located along the eastern margin of the Albuquerque basin. This basin is a major structural feature of the Rio Grande rift, which is approximately 620 miles long. The Albuquerque basin is one of the largest of a series of northtrending basins and is about 90 miles long and 31 miles wide (NMED 2007). The basin extends from the gently sloping area near the Rio Grande to the steep foothills and slopes of the Sandia and Manzanita Mountains. Several canyons (Lurance, Sol se Mete, Bonito, Otero and Madera) are located in the Withdrawal Area; a few smaller canyons occur on Manzano Base.

4.3 GEOLOGY AND SOILS

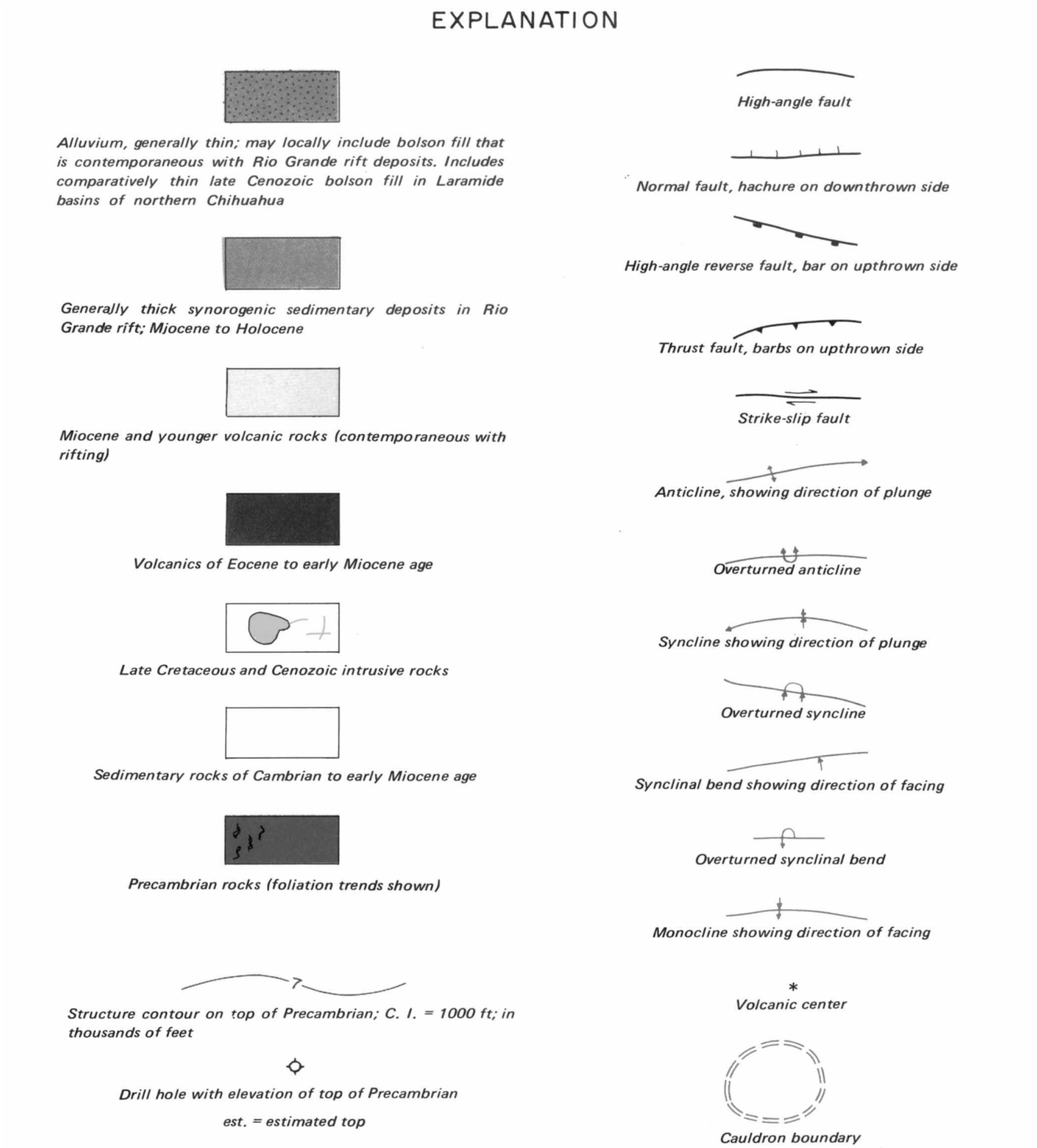
The Albuquerque Basin is demarcated to the south by the Socorro Channel, to the north by the Nacimiento Uplift, to the west by the Puerco Plateau and Lucero Uplift, and to the east by the Sandia and Manzanita Mountains. The Albuquerque Basin is at its widest point in the Kirtland AFB area and tapers off at its north and south ends (Figures 4-1a and 4-1b [legend]).

Three major faults traverse Kirtland AFB and converge near Tijeras Arroyo (USAF 1999). Large-scale faulting between 11.2 and 5.3 million years ago deepened the Albuquerque Basin and tilted the local mountains. As a result, basin deposits (including those at Kirtland AFB) are a mixture of volcanic and sedimentary rocks (Energy Research and Development Administration 1977). Different landforms within the basin include mesas, benches, stream terraces, low hills, ridges, and graded alluvial slopes (Lozinsky, et al. 1991, Kelley 1977, Kelley and Northrup 1975).

Source: New Mexico Bureau of Mines and Mineral Resources 1975.

Oct 2006 | Figure

INRMP	Tectonic Map of the Albuquerque/Kirtland Air Force Base Region (Refer to Figure 4-1b for Legend)	4-1a



Source: New Mexico Bureau of Mines and Mineral Resources 1975.

Oct 2006 Figure

INRMP	Legend for Tectonic Map of the Albuquerque/Kirtland Air Force B Region (Refer to Figure 4-1a for Map)	4-1b

Most of the Albuquerque Basin consists of poorly consolidated sediments that eroded from the surrounding mountains following previous faulting and geologic activity. These sediments, known as the Santa Fe Group, are overlain in places by the 5.3 to 1.6-millionyear- old Ortiz gravel deposits. In certain places, Rio Grande soil types and volcanic deposits are interspersed. A description of each soil type, its characteristics, and the common native vegetation associated with it is included in Appendix D (USDA 1977).

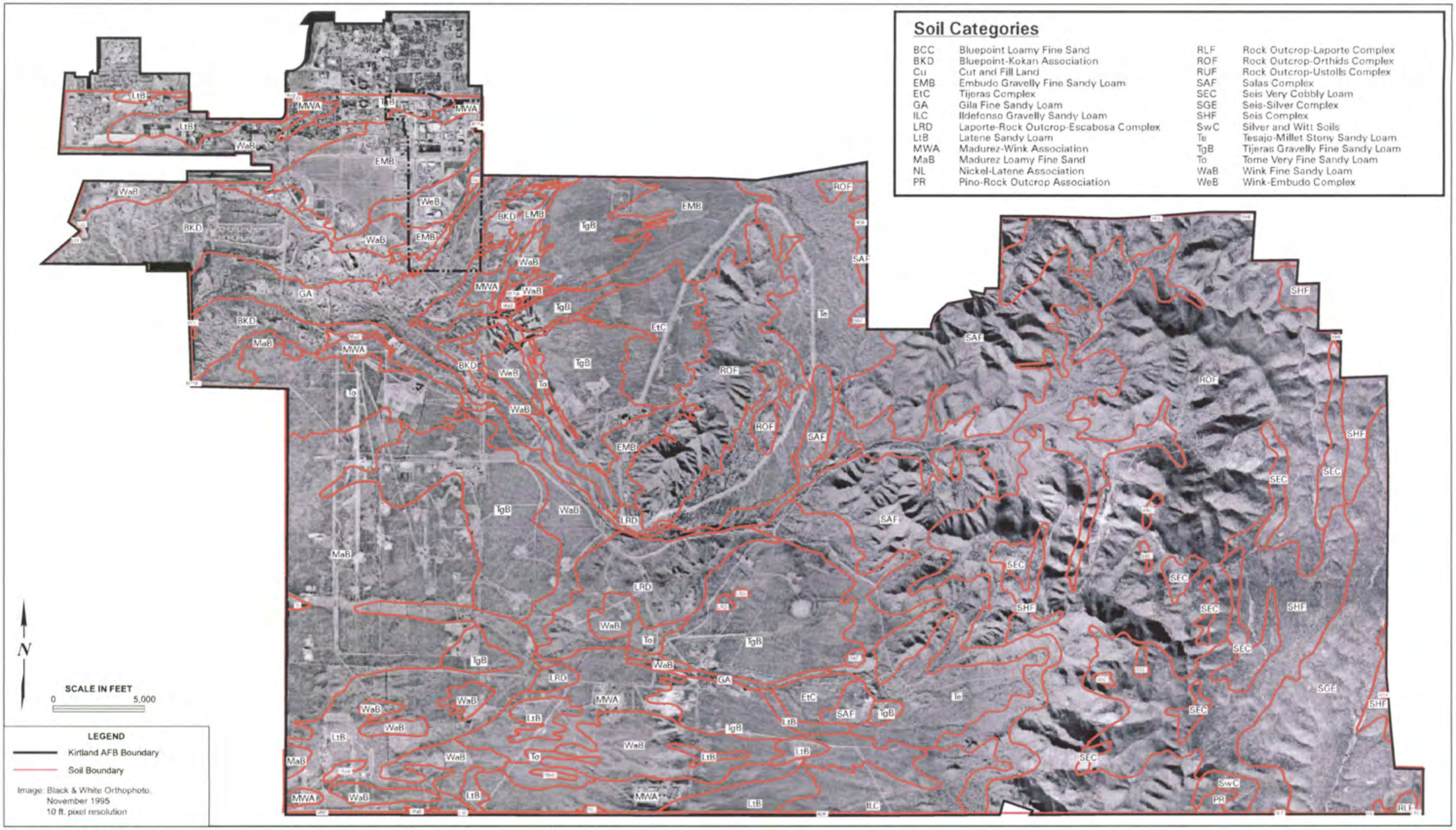
In the eastern half of the installation, bedrock is exposed in a series of northeast trending geologic structures. This area consists primarily of granite, metamorphic rock, and marine carbonate rocks that are approximately 570 million years old (USAF 1999). The dominant soils of the Albuquerque Basin are well drained and loamy, with minor amounts of gravelly and stony soils along the mountains and arroyos. Twenty-six soil types have been identified on Kirtland AFB and in the Withdrawal Area (Figure 4-2).

4.4 HYDROLOGY

Kirtland AFB is located within the Rio Grande watershed (see Figure 4-1a). The Rio Grande is the major surface hydrologic feature in central New Mexico. It flows from north to south through Albuquerque, approximately 5 miles west of Kirtland AFB. The East Mesa, on which Kirtland AFB is located, has a west southwest ground surface slope from about 250 feet per mile near the mountains to 20 feet per mile near the Rio Grande.

The mesa’s width is variable, ranging from 3 miles across in its northern section to 9 miles across in its southern portion. East Mesa surface water occurs in the form of stormwater sheet flow that drains into small gullies during heavy precipitation. Tijeras Arroyo, which is dry for most of the year, is the primary surface channel that drains surface water from Kirtland AFB to the Rio Grande (Figure 4-3). Precipitation reaches Tijeras Arroyo through a series of storm drains, flood canals and small, mostly unnamed arroyos. Tijeras Arroyo flows intermittently during heavy thunderstorms and spring snowmelt draining eventually into the Rio Grande River (USACE 1979a, USAF 1991). However, nearly 95 percent of the precipitation that flows through Tijeras Arroyo evaporates before it reaches the Rio Grande River. The remaining 5 percent is equally divided between groundwater recharge and runoff (USAF 1991). Arroyo del Coyote and numerous other smaller arroyos found in the Withdrawal Area represent other watershed features of the area.

There are no natural lakes or rivers on Kirtland AFB or in the Withdrawal Area (USAF 1999). Six man-made ponds are located on Tijeras Golf Course (Fogel 2000). At least 12 naturally occurring springs have been found on the installation, including four in the Withdrawal Area (USACE 1995).



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Kirtland Air Force Base Soils

FIGURE 4-2

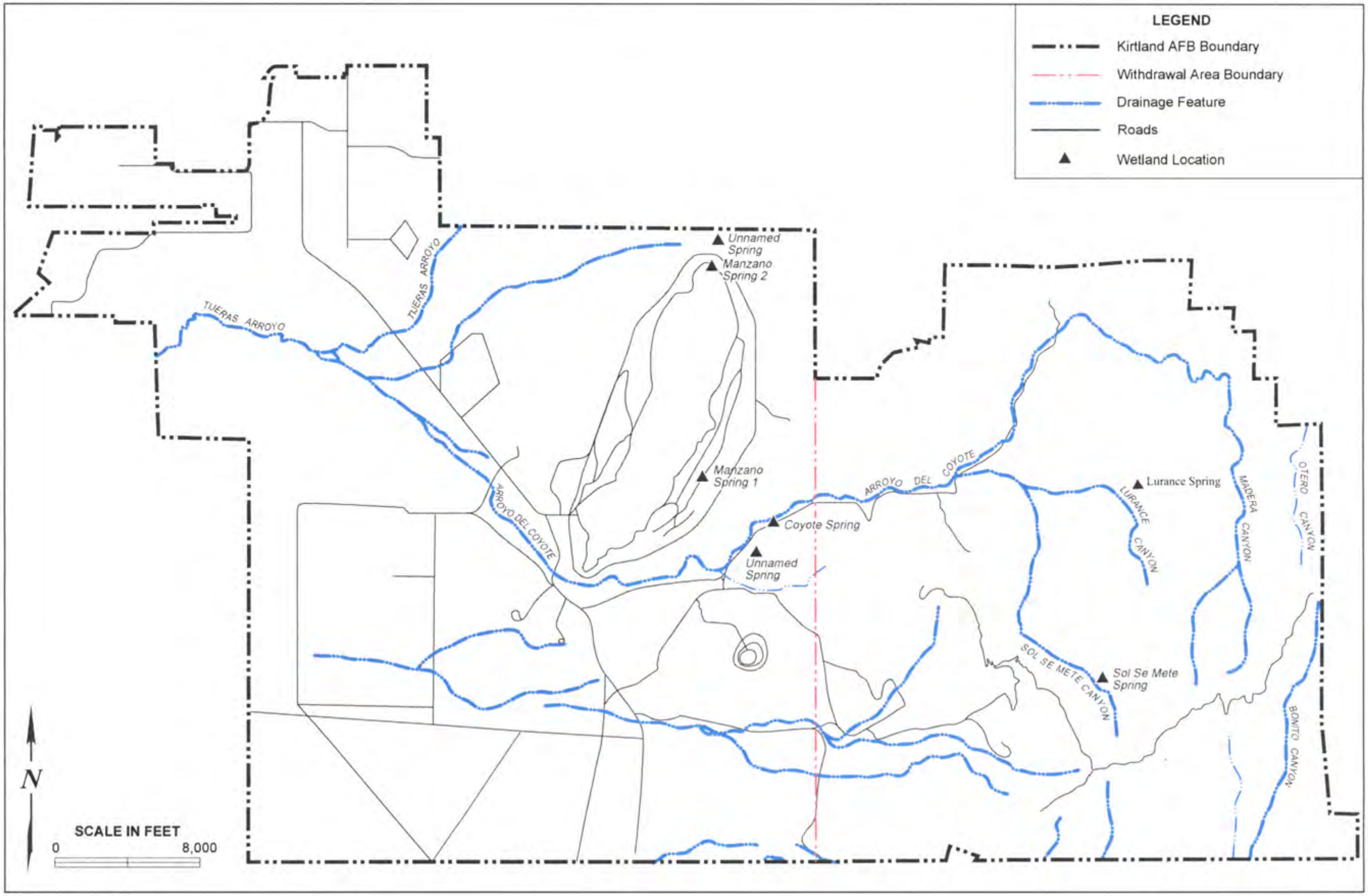

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FIGURE

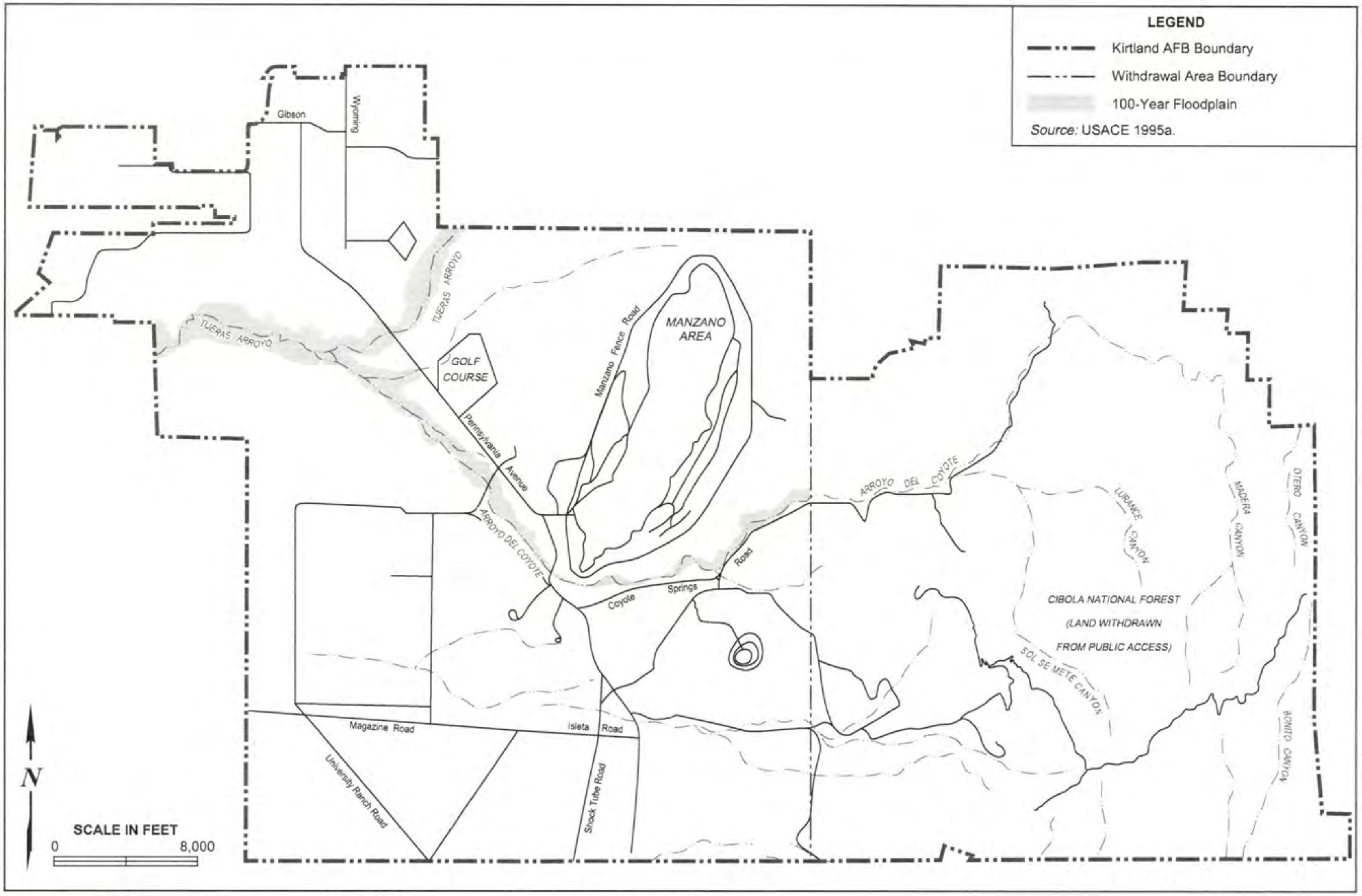
INRMP

Drainages and Wetland Locations at Kirtland Air Force Base

4-3

Seven small wetlands occur on Kirtland AFB. Most only occupy a few hundred feet or less of land. The Coyote Springs Complex is the largest wetland, covering several hundred square feet, and is located along Arroyo del Coyote. Kirtland AFB is located within the limits of the Rio Grande Underground Water Basin, which is defined as a natural resource area and is designated a “declared underground water basin” by the State of New Mexico. The Basin is regulated by the state as a sole source of potable water, although the Albuquerque area will be supplemented in the future with surface water diverted from the San Juan and Chama Rivers to the Rio Grande (USAF 1999). The average depth to groundwater beneath Kirtland AFB is 450 to 550 feet. The Rio Grande Underground Water Basin is fed by the Santa Fe Aquifer, which has an estimated 2.3 billion acre-feet of recoverable water. This aquifer is most likely recharged east of the installation in the Manzanita Mountains where the sediment soils materials favor rapid infiltration (USAF 1991).

A 100-year floodplain encompasses Tijeras Arroyo and Arroyo del Coyote, following their paths. These are the only two arroyos with a floodplain on the base (Figure 4-4). Arroyo del Coyote joins Tijeras Arroyo about one mile west of Tijeras Golf Course. These arroyos run intermittently after heavy rains (USAF 1999). Vegetation can encroach on the Tijeras Arroyo channel and obstruct the flow of water; this obstruction can cause flooding, especially during high intensity thunderstorms between May and October (USACE 1979b). Tijeras Arroyo and Arroyo del Coyote floods occur infrequently and are characterized by high peak flows, small volumes, and short duration.



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100-Year Floodplain on Kirtland Air Force Base and the Withdrawal Area

FIGURE

4-4

CHAPTER 5
ECOSYSTEMS AND THE BIOTIC ENVIRONMENT

5.1 ECOSYSTEM CLASSIFICATION

Kirtland AFB lies in a region that represents the intersection of four major North American physiographic and biotic provinces: the Great Plains, Great Basin, Rocky Mountains, and Chihuahuan Desert. Biotic communities in the region developed under the influence of each of these provinces.

5.2 VEGETATION

5.2.1 Historic Vegetative Cover

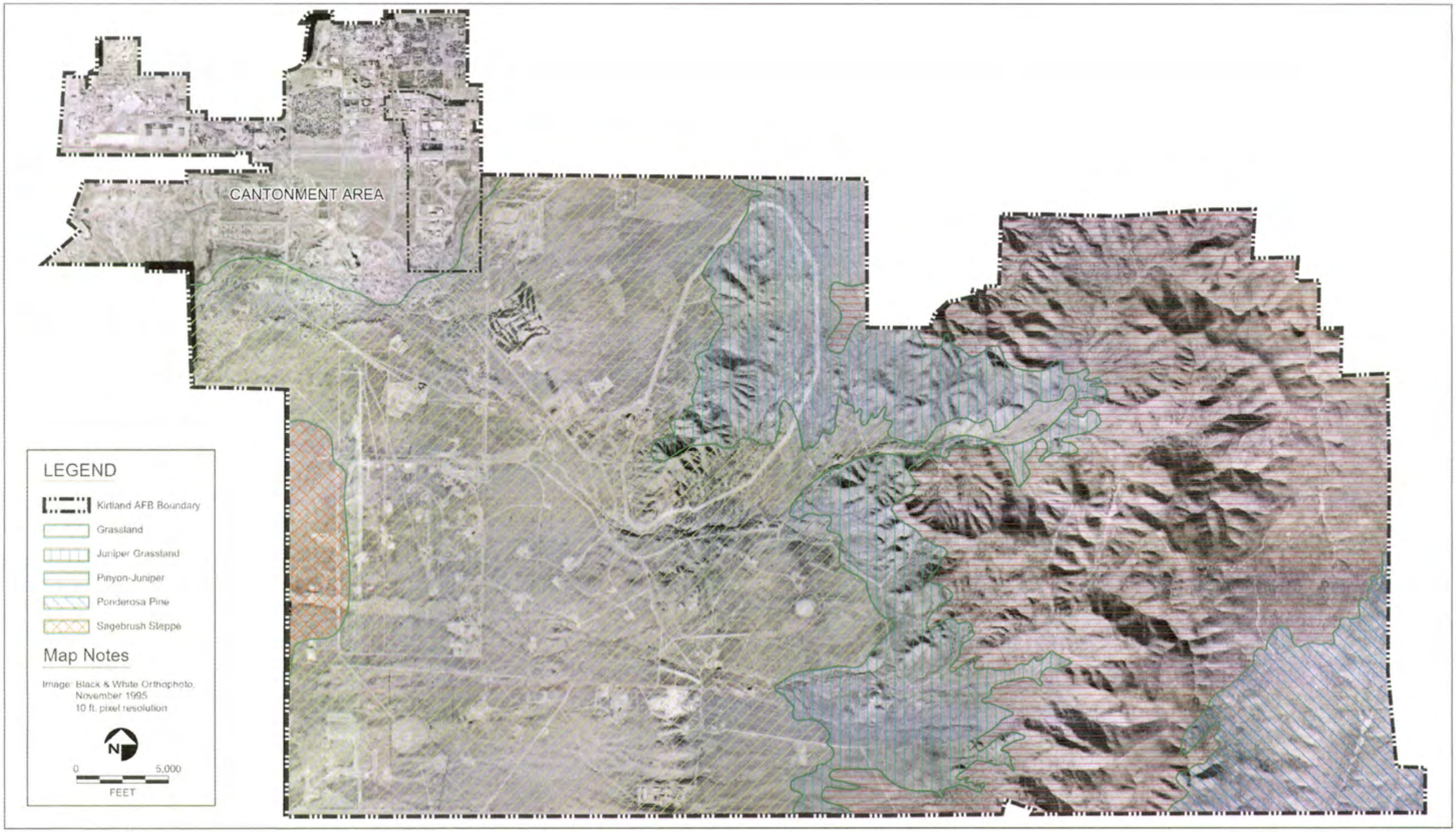
As previously stated, Kirtland AFB lies within the Arizona/New Mexico Plateau and Arizona/New Mexico Mountains Level III Ecoregions of New Mexico as well as the Albuquerque Basin, Conifer Woodlands and Savannas, and Rocky Mountain Conifer Forests Level IV Ecoregions of New Mexico (EPA 2006). Before the acquisition of land for what is now Kirtland AFB, the area was range land used for livestock grazing and typical ranching as well as mining operations. These operations ceased, for the most part, when Kirtland AFB occupied the land in the mid-1940s. Since then, some of the vegetation has been cleared for operational developments, such as the use of the Explosive Ordinance Disposal area, while the remainder, particularly within the Withdrawal Area, has remained primarily undisturbed.

5.2.2 Current Vegetative Cover

Four main plant communities are found on Kirtland AFB and in the Withdrawal Area (Figure 5-1):

- Grassland (includes sagebrush steppe and juniper woodlands),
- Pinyon-Juniper Woodlands,
- Ponderosa Pine Woodlands, and
- Riparian/Wetland/Arroyo.

Transitional areas are found between these communities and contain a mixture of representative species from the bordering areas. Grassland and pinyon-juniper woodlands are the dominant vegetative communities at Kirtland AFB. The riparian/wetland/arroyo community is confined to drainages and isolated areas inundated by surface water during at least some part of the year (see Figure 4-3). The ponderosa pine woodland community is found along the eastern boundary of the Withdrawal Area. Flora known to occur on base are listed in Appendix E.



Vegetation Communities on Kirtland Air Force Base and the Withdrawal Area

FIGURE 5-1

5.2.2.1 Grassland Community

This community is found between elevations of 5,200 and 5,700 feet at Kirtland AFB. In the foothills of the Manzanita Mountains, grasslands are found as high as 6,900 feet. Before the land was acquired by the military, the area was rangeland. Since grazing has been eliminated for the past sixty years, much of these grasslands are in good condition.

Primary grass species here include ring muhly, Indian ricegrass, blue grama, black grama, six-weeks grama, and spike dropseed (Kirtland AFB 2000). Shrubs commonly found in the grassland community include sand sage brush, winter fat, and broom snakeweed. Other species encountered include red three-awn, purple three-awn, six-weeks three-awn, hairy grama, mesa dropseed, four-wing saltbush, Apache plume, plains prickly pear, and great plains yucca. Transitional shrublands can be found between the grassland and pinyon-juniper woodland communities, with many species from both communities inhabiting these areas.

The grassland community at Kirtland AFB was further delineated into two more community types during a baseline biological survey (Kirtland AFB 2001). Sagebrush steppe is found along the western boundary of the base. Sand sagebrush is the dominant cover species, with the understory being similar to that of the adjacent grasslands. However, in the sagebrush steppe the understory is less dense, with cryptogamic crust covering areas of exposed ground. Juniper woodlands occur along the eastern edge of Kirtland AFB proper and the western portion of the withdrawn lands. This community type is similar to the grasslands to the east except for the greater abundance of one seeded juniper. The presence of this shrubby tree creates a savanna like habitat in an otherwise treeless area. Juniper woodlands are found at a slightly higher elevation then the surrounding grassland. This habitat type provides a transition into pinyon-juniper woodlands.

5.2.2.2 Pinyon-Juniper Woodland Community

The pinyon-juniper woodland community ranges in elevation from 6,300 to 7,500 feet. This plant community is composed of primarily Colorado pinyon pine and one seeded juniper, with an understory of shrubs and grasses. At most elevations, this community consists of open woodland with blue grama and, to a lesser degree, side-oats grama dominating the understory. Other species associated with this plant community are Rocky Mountain juniper, broom snakeweed, rubber rabbitbrush, threadleaf groundsel, and alderleaf mountain mahogany.

5.2.2.3 Ponderosa Pine Woodland Community

The ponderosa pine woodland community is found in the highest elevations of the Withdrawal Area. It is typically found between 7,600 to 7,988 feet (USGS 1991c). Primary species include ponderosa pine, Colorado pinyon pine, Rocky Mountain juniper and Gambel oak. Intermingled with these species are creeping barberry, New Mexican locust, and snowberry (Elmore 1976). One-seeded juniper is also present, as well as hoptree and alderleaf mountain mahogany. It is relatively undisturbed, although tree thinning for fuels reduction operations do take place within the USFS Withdrawal Area (USAF 2004).

5.2.2.4 Riparian/Wetland/Arroyo Community

The riparian/wetland/arroyo community consists of species that have a greater moisture requirement than species common to the other communities on the base. These plant communities are found along Tijeras Arroyo, Arroyo del Coyote, and at the various springs located throughout Kirtland AFB. Species here include cottonwood, hop tree, Apache plume, yerba mansa, three-square sedge, wire rush, orchard grass, cattail, and the salt cedar. Most of the small, scattered wetlands on Kirtland AFB are in good condition and occur in conjunction with other plant communities. Coyote Springs has had three phases of wetland restoration completed: removal of man-made structures and debris; removal of salt cedar; and construction of a pond.

5.2.3 Turf and Landscaped Areas

Landscape is defined as "the composite of natural and human features that characterize the surface of the land, including spatial, textural, compositional and dynamic aspects of the land" (Marsh 1991). Landscaping is often used to improve the visual aesthetics of an area to promote a pleasing atmosphere. Kirtland AFB promotes water conservation landscaping by using xeriscape methods combined with native plant materials. Landscaping may be a very involved process, or something as simple as the upkeep of natural vegetation through weeding and or mowing. Land areas that are maintained/landscaped in some way are referred as improved areas.

5.3 FISH AND WILDLIFE

Native fauna includes terrestrial and aquatic vertebrates and invertebrates. Terrestrial vertebrates include species groups such as large and small mammals, birds, amphibians, and reptiles. The only aquatic habitats on lands managed by Kirtland AFB are the small ponds at the golf course and isolated wetlands. Wildlife falls under the jurisdiction of the New Mexico Department of Game and Fish (NMDG&F) and the U.S. Fish and Wildlife Service (USFWS) for migratory birds and federally threatened and endangered species, which categorizes species as game, non-game, threatened, or endangered. T&E species are addressed in this document under Section 5.4. Other laws protecting wildlife include, but are not limited to, the Bald Eagle Protection Act of 1940 (protects bald and golden eagles), the Migratory Bird Treaty Act (protects neotropical migrants), and the Endangered Species Act. Refer to Section 2.1 for additional laws and regulations.

Wildlife communities at Kirtland AFB are typical of those in woodland and grassland habitats in the central New Mexico region. The following provides information on the wildlife found or expected to be found on Kirtland AFB and in the Withdrawal Area by vegetation community. Species may be transient and travel or inhabit several communities, or exist in transitional areas between vegetation communities.

In developing this section, numerous survey reports, as well as visual confirmation accounts, were taken from various sources to achieve the most complete and accurate data possible. Complete species lists can be found in Appendix F.

5.3.1 Grassland Community

Common birds associated with the grasslands at Kirtland AFB include the horned lark, scaled quail, mourning dove, greater roadrunner, American crow, northern mockingbird, Crissal thrasher, lark sparrow, black-throated sparrow, western meadowlark, brown-headed cowbird, and house finch.

Raptor species known or expected to be found in the grassland habitat include the northern harrier, red-tailed hawk, Swainson's Hawk, Ferruginous Hawk, American kestrel, Prairie Falcon, Great Horned Owl, and Burrowing Owl. Additionally, Turkey Vultures are common scavengers in this habitat. Raptors use the Kirtland AFB grassland areas for hunting throughout the year, but the lack of nesting sites (e.g., trees and cliffs) in these areas limits the use of this habitat for breeding. However, manmade structures may occasionally be used by some species for nesting.

Rabbits, hares, and rodents dominate the mammal community in the grasslands. These include Desert Cottontail, Black-tailed Jack Rabbit, Spotted Ground Squirrel, Gunnison's Prairie Dog, Silky Pocket Mouse, Ord's Kangaroo Rat, Banner-tailed Kangaroo Rat, Merriam's Kangaroo Rat, Western Harvest Mouse, Deer Mouse, White-footed Mouse, and Northern Grasshopper Mouse. Mammalian predators in the grassland community include the coyote, kit fox, badger, striped skunk, and bobcat.

A variety of reptiles and amphibians are found within Kirtland AFB grasslands. Many of these species have extensive periods of dormancy during dry conditions, and rapid breeding cycles when temporary ponds appear after rains. Reptiles and amphibians found on Kirtland AFB and in the Withdrawal Area include the Woodhouse's Toad, Red-spotted Toad, New Mexico Spade Foot Toad, Western Box Turtle, Little-striped Whiptail Lizard, Short-horned Lizard, Lesser Earless Lizard, Bull Snakes, Western Rattlesnakes, and Glossy Snakes.

5.3.2 Pinyon-Juniper Woodland Community

Most of the species described in the grassland communities extend into the pinyonjuniper woodland community, at least in the open savannas of the lower elevations. Among the reptiles and amphibians present in the woodlands are the tiger salamander, Chihuahuan spotted whiptail lizard, tree lizard, and eastern fence lizard. Snakes in this habitat include the diamondback rattlesnake, mountain patchnose snake, and the desert striped whip snake.

Birds found in this community include the Cooper's Hawk, Common Poorwill, Black-chinned Hummingbird, Northern Flicker, Ladder-backed Woodpecker, Cassin's Kingbird, Ash-throated flycatcher, western wood-pewee, scrub jay, common raven, juniper titmouse, mountain Chickadee, Bushtit, Bewick's Wren, Rock Wren, Western Bluebird, Townsend's Solitaire, American Robin, Yellow-rumped Warbler, Grace's Warbler, MacGillivray's Warbler, Western Tanager, Black-headed Grosbeak, Rufous-sided Towhee, and Chipping Sparrow.

Mammal communities also gradually change with the transition between grassland and woodland vegetation. This transition often corresponds to an increase in the coarseness of the soil and greater amounts of rock outcrops, which are essential elements in the habitat of some mammal species. Mammals found primarily in the woodland include the Colorado Chipmunk, Rock Squirrel, Rock Pocket Mouse, Brush Mouse, Pinyon Mouse, Rock Mouse and White-throated woodrat. Other mammals that might occur in more densely wooded areas are the Porcupine, Black Bear, Mountain Lion, and Gray Fox.

5.3.3 Ponderosa Pine Woodland Community

Many of the same mammals, birds, reptiles, and amphibians that are found in pinyonjuniper woodlands also exist within the ponderosa pine woodland community. Additional species include Abert's Squirrel, nut hatches, Western Screech Owl, Steller's Jay and Ruby-crowned Kinglet.

5.3.4 Riparian/Wetland/Arroyo Community

Wetlands are attractive to wildlife as water sources and areas of forage. The presence of ephemeral or permanent water sources and the greater diversity of trees and shrubs in these habitats provide microhabitats that are unique in comparison to the surrounding landscape.

Canyons that contain riparian or wetland habitat are important to wildlife, providing food, water, and cover to many species. Lurance Spring, Sol se Mete Spring, and Coyote Springs are permanent sources of water in the canyon areas. Additional man-made water sources for wildlife have been placed near the Burn Site, in Sol se Mete Canyon, in the Fourhills area and near the Facility for Acceptance, Calibration & Testing Site.

In general, the wildlife communities of the arroyos and canyons are derived from the adjacent grassland and woodland communities. In addition to those listed in Sections 5.3.1, 5.3.2, and 5.3.3, amphibian and reptile species in the riparian and wetland habitats include the Tiger Salamander and the Great Plains Skink. Birds found in these habitats include the Western Screech Owl, Broad-tailed Hummingbird, Plumbeous Vireo, Western Tanager, Northern Oriole, Rufous-sided Towhee, and the Song Sparrow. Most large mammal species of the area will use the canyons and arroyos for feeding, water, travel corridors, or shelter. Species with affinities for this habitat are the Gray Fox, Ringtail Cat, and skunks.

5.3.5 Landscaped Areas

This environment can be very appealing to many species for several reasons. Rabbits and rodents frequent grassy areas. Increases in the populations of rabbits and rodents will draw coyotes and other species that prey upon them. Coyotes have been known to feed on prairie dogs in the base campground and are often found around the golf course and riding stables. Bull Snakes and Western Rattlesnakes have also been observed at the riding stables, golf course, and other semi-improved lands.

Common bird species include starlings, robins, pigeons, grackles and Burrowing Owls. Fish species occurring on Kirtland AFB only consist of those that were relocated to the golf course ponds from Christian Lake when the lake was drained in December 1999, and include catfish, sunfish, and carp.

5.3.6 Critical Habitat

Critical habitats are those areas of land, air, or water that are essential for maintaining or restoring threatened or endangered plant or animal populations. Neither the NMDG&F nor the U.S. Fish and Wildlife Service (USFWS) has designated or identified any critical habitat on Kirtland AFB. Surveys and literature indicate that important habitats on the base and in the Withdrawal Area include the wetlands, which are rare in this region, providing water in an otherwise arid environment. Other important habitats on base include prairie dog towns, which provide nesting habitat for the Burrowing Owl, and areas between 5,900 and 6,600 feet containing open juniper woodlands, which are used as nesting habitat by the Gray Vireo.

5.4 THREATENED AND ENDANGERED SPECIES

The species of concern potentially occurring on Kirtland AFB and in Bernalillo County are listed in Appendix G. The Gray Vireo, a state threatened species, as listed by the NMFG&F, is the only federally or state-listed species known to occur on the base or in the Withdrawal Area. The USFS considers the Gray Vireo a sensitive species. In 2003, a base-wide Gray Vireo survey was conducted in which 53 territories were mapped (Kirtland AFB 2004a). This survey identified more than twice as many Gray Vireo locations as previous surveys conducted in the early 1990’s. Territories were found throughout the juniper woodland community in an elevational belt of 5,850 to 6,600 feet. Gray Vireos occupied areas with an open canopy (i.e. less than 25 percent) with oneseeded juniper as the dominate tree/shrub species. During the summer, the Withdrawal
Area has the largest Gray Vireo colony in New Mexico (Schwarz 1998). Potential Gray Vireo habitat based on the 2003 survey is presented in Figure 5-2. A Gray Vireo Management Plan was developed in 2007.

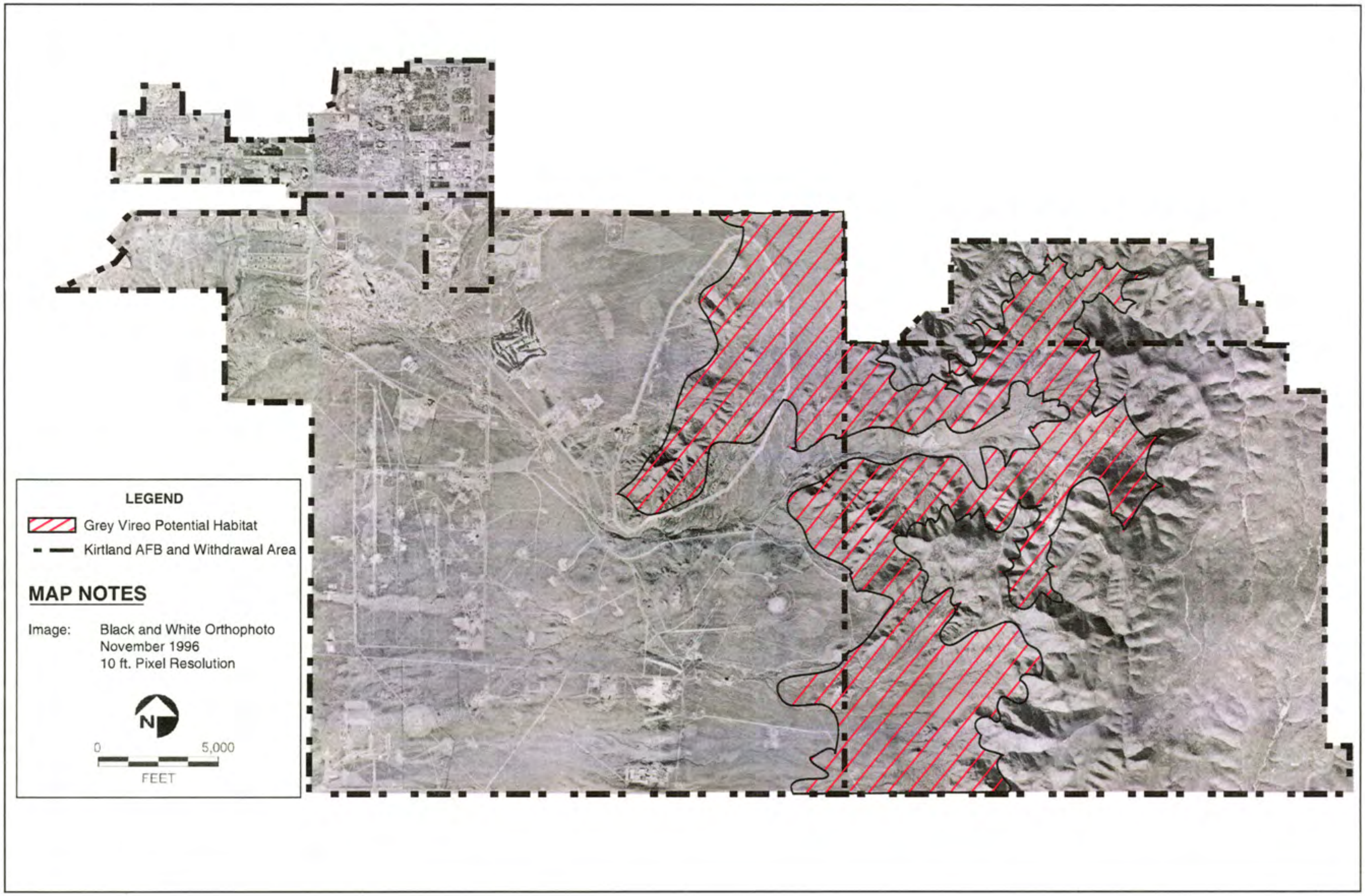
The Western Burrowing Owl, a federal species of concern, is a common resident at Kirtland AFB. It is very closely associated with the prairie dog colonies on base, as they use abandoned prairie dog burrows for nesting. Owls generally occur on base between March through October before migrating south, although a few birds may occur on base during mild winters. Burrowing Owl inventories and monitoring of the population have been conducted every year since 1994, and in 2005 a migration study was initiated to identify where nesting owls at Kirtland AFB go to winter. Since Burrowing Owls use old prairie dog burrows for nesting, a Prairie Dog Management Plan (Appendix C) was developed for the base, which takes into account Burrowing Owl habitat requirements.

The Loggerhead Shrike is also a federal species of concern. It has been observed on the base and in the Withdrawal Area and is found in the area throughout the year. Loggerhead Shrikes occupy grassland, pinyon-juniper woodlands, and riparian habitats. Loggerhead Shrike inventory and monitoring have been conducted since 2007. Mountain Plovers, a federal species of concern, are not known to occur on base. However, in 2003, an adult with two chicks was observed just south of the base on the Isleta Pueblo Indian Reservation (Kirtland AFB 2004a). Appropriate nesting habitat for this species is limited on base, therefore, it is unlikely that the Mountain Plover uses Kirtland AFB during the nesting season. However, the southern grasslands of the base may potentially be used as brood-rearing habitat or during migration.

The Texas Horned Lizard is another federal species of concern. A base wide reptile and amphibian survey was conducted the summer of 2003 and in 2011. During the 2003 survey no Texas Horned Lizards were found. Results of the 2011 survey have not yet been documented. Surveys conducted by SNL indicate that individuals were found near the intersection of Lurance and Sol se Mete Canyons as well as the North Thunder Range (Sullivan 1994). However, regional herpetofauna experts believe that individuals found in Bernalillo County, which includes Kirtland AFB, may be escaped or liberated pets as the nearest known population of Texas horned lizards is found 80 miles south of Kirtland AFB (Degenhardt et al. 1996).

5.5 WETLANDS

Known wetland locations were mapped in 2006 using the Global Positioning System and are shown on Figure 4-3. The USACE previously determined which springs were wetlands, gave a description of waters of the U.S. regulated pursuant to Section 404 of the Clean Water Act, and prepared a restatement of the location of the 100-year floodplain determined in a 1979 study (USACE 1995) (Appendix C). Table 5-1 provides a summary of the wetland delineations on Kirtland AFB and the Withdrawal Area made during the 2006 survey.



INRMP

Potential Gray Vireo Habitat on
Kirtland Air Force Base and the Withdrawal Area

FIGURE

5-2

Table 5-1. Wetland Determinations at Springs Occurring on Kirtland AFB and the Withdrawal Area

Site Name	Number of Springs	Wetland
Coyote Springs	1-4	Yes
Unnamed Spring	1	No (riparian area)
Unnamed Spring	2	Yes
Unnamed Spring	1	Yes
Sol se Mete Spring	1	Yes
Lurance Spring	1	Yes
G Spring	1	No (riparian area)
Manzano Spring 1	1	Yes
Manzano Spring 2	1	Yes
Manzano Spring 3	1	No (rock seep)
Manzano Spring 4	1	No (probable rock seep)

Source: USACE 1995.
Notes: a = Located in the Kirtland AFB Withdrawn Area, not on Kirtland AFB proper.
B = Not visited; assumed a wetland.

5.6 OTHER NATURAL RESOURCE INFORMATION

Several biological surveys have been completed during the last INRMP period. Ferruginous Hawk survey, Wetland Delineation, baseline natural resources inventory delineated vegetation communities, areas where erosion is occurring, vegetation reconnaissance points, and Western Burrowing Owl Migration study. Monitor Western Burrowing Owl, Pinyon Jay survey, Gray Vireo, Migratory Song Birds, bat surveys, and a prairie dog survey, predator survey, loggerhead shrike survey, monitor Coyote Springs Wetland, Desert Massasauga survey, base wide reptile and amphibian survey are currently being conducted. weed invasion, and areas in need of revegetation. Prairie dog colonies have been delineated for the base, and a predator survey is currently being conducted to identify the habitats and distribution of these species.

CHAPTER 6
MISSION IMPACTS ON NATURAL RESOURCES

This section describes the mission impacts on natural resources and related issues and concerns relevant to the protection and management of natural resources on Kirtland AFB. Emphasis is placed on identifying impacts and issues that would result in adverse impacts to natural resources or issues that may have the potential to affect future development or mission expansion.

6.1 CURRENT MAJOR IMPACTS

Current mission impacts that have the greatest potential to affect natural resources on Kirtland AFB include aircraft and mission training and research and development. Impacts resulting from mission activities include aircraft noise, bird-aircraft strikes, restoration sites, water pollution, and air pollution.

6.1.1 Land Use

Kirtland AFB is approximately 5 miles southeast from downtown Albuquerque. Total land area of Kirtland AFB is 52,000 acres. Land use varies from developed urban in the northwest portion of the base from aircraft operations/maintenance, airfield (runway, taxiways, apron), community, housing, industrial, medical, administrative/research, open space, associate owned, and outdoor recreation. In the vicinity of Kirtland AFB, land use varies from urban to open rangeland. Immediately north of the installation, land use is predominantly urban and suburban. Open spaces and National Forest System land are present northeast and east of the base. West of Kirtland AFB, land use is a mixture of urban areas and open space. South of the installation, the Isleta Pueblo lands are generally open spaces and forest or vacant land.

Improved lands make up 2,045 acres (4 percent of the installation), semi-improved lands consist of 2,730 acres (5 percent of the installation), and unimproved lands make up 40,378 acres (76 percent of the installation). The DOE controls 7,525 acres.

. The 1995/1996 Draft Albuquerque International Sunport Part 150 Study and supplemental reports represent noise impact/analysis the base (Kirtland AFB 2002). New noise contours were included in the Environmental Assessment for the Closure of Runway 17/35 of the Albuquerque Sunport, but there is no update of the Part ISO Study. The Clear Zone (CZ) begins at the end of a runway and extends out for 3,000 feet. Only limited agricultural land uses are allowed within the CZ and all other uses are not permitted. Currently, there are no incompatible land uses within the CZs (Albuquerque 2003). Accident Potential Zone (APZ) I extends from the CZ an additional 5,000 feet. Land uses permitted within APZ I include agricultural, industrial, and limited commercial and recreational uses. APZ II extends from APZ I an additional 7,000 feet. Land uses within APZ II include all agricultural, commercial, industrial, public, limited
recreational and limited residential uses. There are no incompatible land uses within either APZ I or APZ II.

Noise contours associated with land uses are based on the Day-Night Average Sound Level (DNL) or average sound level measured in decibels over a 24-hour period. The DNL 65 Contour, DNL 70 contour, and DNL 75 contour represent acceptable and unacceptable noise levels for various land uses.

Air Force Manual 91-201, *Explosives Safety Standards*, represents the Air Force guidelines for complying with explosives safety. Defined distances called quantity/distance arcs must be maintained between explosive storage areas. Development is restricted within these arcs for personnel and property safety. Explosive Safety Zones on Kirtland AFB occur mostly in the central and southwestern portions of the base with some large areas located in the Withdrawal Area (Kirtland AFB 2001). These areas are listed below:

- Chestnut Site,
- G.R.A.B.S. Site
- AFRL Laser Firing zone,
- Munitions storage areas, 750, 740, 26000, 29000, Manzano Mnt.
- 3,750 foot radius USAF Explosive Ordnance Disposal Range,
- 3,000 foot radius Sol Se Mete Aerial Cable Test Site,
- 10,000 foot buffer zone radius Lurance Canyon Test Site,
- Thunder Ranger Area,
- Complex 9920,
- Explosive Test Facility
- Old 377 SFS ABD Training Area
- B.O.P. Site
- 58th SOW Isleta Training Drop Zone
- 377 ABW Training Area Bldg. 29015
- DTRA Training Sites TS-8, TS-4, TS-1 TS-2, TS-3
- 377 SFS Training Area MUNS HAUL ROAD
- 377 ABW Training Area "P" Hill
- 377 SFS Training Area Old Obstacle Course
- 377 SFS Training Area – CATM Range East
- Starfire Optical Range (SOR)
- AFRL HERTF
- DOE Training Area – No Sweat Blvd
- 377 SFS Training Pad 5
- AFRL Laser Range (2K – 7.5KM Sites)
- DOE/NNSA Firing Range
- DOE/Sandia Burn Site

- 58th SOW Helicopter Training Areas (1-4)
- DOE/Sandia Tech Area III
- 377 MSG/CEF Fire Training Facility
- Auxiliary Helicopter Training Field (AUX Field)
- 377 ABW Training Area: Bivouac Area 3 old Training Siten

6.1.2 Water Resources

Water on base is supplied by six installation water wells and two separate, but interconnected distribution systems. These systems were developed separately for Sandia Base and Kirtland AFB before they were combined into a single installation. Water is also purchased from the City of Albuquerque. Water purchased from the city is primarily for use in meeting peak demands for providing water when wells are out of service.

The Water Management Policy and Action Plan for Kirtland AFB was an agreement between the USAF, State of New Mexico, and the DOE to reduce 1994 per capita water usage by 30 percent by 2004. It was developed in 1995 and adopted by Kirtland AFB in 1996. It expired in December 2004 and Kirtland AFB has not discussed any new water conservation goals with the City of Albuquerque (Kirtland AFB 2005b).

Storm water in the developed area drains into small culverts toward Gibson Boulevard along the Kirtland AFB/City of Albuquerque boundaries. There are also four detention ponds in the area. Stormwater discharge in the industrial/laboratory areas discharges through surface runoff or three large culverts that drain toward the Tijeras Arroyo on the south (Kirtland AFB 2002).

Kirtland AFB does not have separate industrial and municipal wastewater systems. The City of Albuquerque treats all of the sanitary sewage produced by Kirtland AFB. By the end of 2001, the base contributed 2.5 million gallons per day of wastewater to the city facility (Kirtland AFB 2002). An industrial pretreatment program administered by the City of Albuquerque regulates industrial discharges from the base to sewer lines. A City of Albuquerque Wastewater Permit was reissued to Kirtland AFB in 2010 under the Sewer Use and Wastewater Control Ordinance. Kirtland AFB's permit is issued by the City of Albuquerque's publicly owned treatment works, which is currently regulated by a National Pollutant Discharge Elimination System (NPDES) Permit. Kirtland AFB has an NPDES General Storm Water Permit for industrial activities, an active program for construction projects that requiring a NPDES General Stormwater Permit for Construction Activities, and a Municipal Separate Storm Sewer System for residential/non-industrial areas of the base.

6.1.3 Traffic

Traffic congestion at the base is consistent with the current mission involving operational activities at existing facilities. Traffic at Kirtland AFB includes vehicle, pedestrian, and aircraft traffic. Traffic flows relatively smoothly in the western portion of the developed area due to light traffic volumes and favorable intersection operations. A greater portion of the base population is located in the eastern portion of the developed area and many signalized intersections have been installed to control traffic. Traffic problems on Kirtland AFB generally occur during peak traffic periods early in the morning and later afternoon. Areas that are unacceptably congested during peak hours tend to be Pennsylvania Street (south of Gibson Boulevard.), Wyoming Boulevard (north of M Avenue), and Truman Street (south of Truman Gate). Pedestrian traffic includes walking between facilities as well as pedestrian recreation activities such as walking or jogging.

6.1.4 Bird Aircraft Strike Hazard

BASH is concerned with aircraft collisions with birds and other wildlife. The 377 Maintenance Group/Chief of Airfield Management monitors bird/wildlife populations, maintains grass height and drainage ditches, and reports any problems. Grass must be mowed within 15 feet to a height of 4-8 inches along edges of runways, taxiways and airfield lighting.

During fiscal year 2000 through fiscal year 2005 there were 51 BASH incidents (AFSC 2006). Species included the sage thrasher, American warblers, chestnut-collared longspur, horned lark, perching birds, plumbeous vireo, thrushes and forktails, barn swallow, American rock wren and bats (AFSC 2006).

The 377 MSG/Civil Engineer (CE) responds to requests to eliminate or reduce environmental conditions that may attract birds or wildlife to the airfield. Dead birds and other animals are removed from the airfield by the CE to avoid collision with aircraft or to prevent attracting raptors. The CE is also responsible for controlling pests on the airfield using Pest Management Plan practices and eliminating roosting sites. Other responsibilities include bird proofing buildings and hangars by screening windows, closing doors, blocking entry holes as well as netting, trapping and removal.

The Bird Hazard Working Group is a group consisting of various representatives that collect data on bird strikes and make recommendations to reduce hazards as well as operational procedures. They serve as the point of contact for all off base BASH issues (Kirtland AFB 2004b).

6.1.5 Fuel Storage Tanks

There are POL aboveground storage tanks (ASTs) basewide on Kirtland AFB storing gasoline, diesel, jet propulsion fuel grade 8 (JP-8), and other POLs. They range in size from several hundred to 1.8 million gallons in size. Kirtland AFB no longer has any regulated underground storage tanks (USTs). All regulated USTs were removed during 1998 and 2002. (Kirtland AFB 2006b).

The installation Spill Prevention, Control, and Countermeasures Plan documents tank construction, secondary containment and spill control measure for all POL storage containersgreater than 55 gallons in size. The Kirtland AFB Hazardous Materials Emergency Planning and Response Plan set policies and prevention measures regarding spills.

6.1.6 Installation/Environmental Restoration Program

Kirtland AFB began its Installation/Environmental Restoration (IRP/ERP) Program in. They operate under the Resource Conservation and Recovery Act (RCRA), as amended permit.

Currently, there are 287 IRP/ERP sites (September 2010) and 6 Areas of Concern (Kirtland AFB 2005b). Forty two of these sites (September 2010) are solid waste management units that are waiting for Final No Further Action Approval through the NMED. These sites are under the control of the Environmental Restoration Program and the Environmental Compliance Program at Kirtland AFB and address contamination from past installation operations in accordance with the Comprehensive Environmental Response, Compensation, and Liability Acts, as amended and if applicable, the RCRA.

Sites in the IRP/ERP program include landfills, sewage lagoons, radioactive holding tanks, oil/water separators, drainage areas, septic systems, spill areas, fire-training areas, and others. Major contaminants to the soil and water on Kirtland AFB are associated with fuels, waste solvents, dissolved phase fuels and solvents, and low-level radiation waste (Kirtland AFB 2005c). The Bulk Fuels Facility site has impacted the underground aquifer, and contamination has migrated beyond installation boundaries.

6.1.7 Solid and Hazardous Waste Materials

Non-Hazardous solid waste on Kirtland AFB is collected by a contractor, and is hauled off-base for landfill disposal within Bernalillo, Sandoval, or Torrance Counties. Various entities on the installation are responsible for collection and disposal of their own solid waste, including Sandia National Laboratories and privatized businesses such as McDonald’s. All solid wastes are disposed of in accordance with USAF, Kirtland AFB, and applicable federal, state and local regulations

Construction and demolition wastes (C&D) are generally disposed of in the Kirtland AFB C&D Landfill. The landfill site hosts a series of roll-offs for collection of recyclable material. Some contractors recycle C&D debris independently of installation’s recycling efforts.

There are five closed/abandoned landfills on Kirtland AFB that date back to the 1940’s. These sites are currently monitored as solid waste management units and will eventually be placed on the No Further Action list by the NMED (Kirtland AFB 2006b).

Hazardous waste on Kirtland AFB is managed under the Kirtland AFB Hazardous Waste Management Plan (Kirtland AFB 2004c). Kirtland AFB operates as a large-quantity generator of hazardous waste; Kirtland does not have a permitted hazardous waste storage facility. Wastes are transferred to the Defense Reutilization and Marketing Office 90-day accumulation site in Building 1025 and are stored until transportation and final disposal at a permitted off-site treatment, storage and disposal facility (Kirtland AFB 2004c).

Asbestos and asbestos-containing material wastes, as well as other special wastes, are managed in accordance with state and Federal regulations.

Kirtland AFB operates a Qualified Recycling Program (QRP) that serves primarily offices and shops on the installation. The QRP captures mixed, white and shredded papers; plastic beverage containers #1 and #2; aluminum beverage containers; toner cartridges; and scrap metal for recycling. The QRP also works with the Defense Logistics Agency Disposition Services (DLA DS, formerly DRMO) to recycle other materials, such as expended brass munitions, vehicle tires, used oil, antifreeze, and Icad-acid batteries.

6.1.8 Air Quality

Air quality at Kirtland AFB is a function of several factors, including the quantity and dispersion rates of pollutants in the region, temperature, the presence or absence of inversions, and topographic and geographic features of the region. The Albuquerque Environmental Health Department performs air quality functions in Albuquerque, and the Albuquerque-Bernalillo County Air Quality Control Board governs them. The 1990 amendments to the Clean Air Act (CAA) require federal agencies to conform to the affected State Implementation Plan (SIP) with respect to achieving and maintaining attainment of National Ambient Air Quality Standards and addressing air quality impacts. The CAA General Conformity Rule states that nonattainment and maintenance areas must conform to the applicable SIP. Kirtland AFB is covered by a Carbon Monoxide Maintenance Plan.

Kirtland AFB also obtains air emission source registrations, construction permits, open burning permits, and soil disturbance permits; all of which include operating or emission limits to ensure compliance with the CAA. Title V of the CAA requires operating permits by states for major stationary sources of air pollution. The permits identify pollutants emitted by a source and identify emission limits and standards. Kirtland AFB received CAA Title V permit application in December 2011. Kirtland AFB is considered a synthetic minor source of hazardous air pollutants under Title I, Section 112 of the CAA.
Kirtland AFB’s air emissions are from training exercises, aircraft engine testing, activities related to aircraft refueling and maintenance, fuel storage and distribution, corrosion control activities, external combustion, internal combustion engines, and vehicle refueling and maintenance (USAF 2005b).

6.2 POTENTIAL FUTURE IMPACTS

6.2.1 Land Use

Currently, many mission related activities are distributed throughout the developed portion of the base. In order to increase accessibility and improve traffic flow, changes to land use at Kirtland AFB would come mainly from consolidation mission related activities to the same area of the base. Airfield related activities including industrial, airfield operations, and maintenance are to be located on the flight line. Administrative and research facilities will continue to be located in the northeast portion of the base creating a “town site.” New industrial development and research will be located south and east of the present airfield. Abandoned housing areas, open lots, and demolition of existing facilities would be required. However, these changes would improve the mission and operational activities on base, thus constraints to the mission from land use do not appear to be an issue.

6.2.2 Water Resources

Current water resource systems including water supply and sanitary sewer are currently sufficient to accommodate growth and new facilities on base. Planned improvements include wastewater projects associated with Kirtland’s Five-Year Utility Improvement Plan. Water supply improvements include the upgrading of two distribution systems.. The sanitary sewer system is being upgraded through a systematic replacement of sewer lines as well as repairing lines and lift stations. (Kirtland AFB 2002).

6.2.3 Traffic

In order to improve and meet current and future traffic issues as well as provide for the increase in operational activities, many future transportation improvements are planned for the installation. Improvements include providing an east-west corridor within the developed area, constructing a new Wyoming Gate to improve traffic flow, and extension of Eubank Boulevard to Pennsylvania Street at the east boundary.

6.2.4 Bird Aircraft Strike Hazard

BASH is not expected to change as aircraft operations should continue at a level similar to historical conditions. Monitoring and control measures have been implemented to reduce hazards. Land management practices will continue such as; maintaining grass height, pruning trees and removing vegetation which attract birds and other wildlife.

6.2.5 Fuel Storage Tanks

Fuel storage tanks which have an increased risk of potential to contaminate soils and water will be modified or replaced. All fuel storage tanks will continue to be monitored and maintained in accordance with the Kirtland AFB Spill Management Plan, the Spill Prevention, Control, and Countermeasure Plan, and comply with state and federal spill prevention requirements.

6.2.6 Installation and Environmental Restoration Program

The presence of IRP/ERP sites on Kirtland AFB does not present a significant constraint to present or future development on base. The NMED requires the cleanup of IRP sites to residential standards for No Further Action approval. Kirtland AFB is actively cleaning up all IRP sites to these standards. Three landfills on base are not part of these standards and will eventually be prepared for post-closure within approximately 30 years (Kirtland AFB 2002). These sites will continue to be monitored and be recommended for No Further Action approval.

6.2.7 Solid and Hazardous Waste and Materials

No adverse impacts to natural resources would result from the solid waste disposal processes on base. Current and future hazardous waste will be managed and handled in accordance with the Kirtland AFB Hazardous Waste Management Plan (Kirtland AFB 2004c) and state and Federal regulations. No Significant increase in waste streams is anticipated, therefore there should be no constraints to the base mission or natural resources.

6.2.8 Air Quality

All proposed missions are evaluated for air quality impacts and assessed against Title V permit requirements and non-attainment/maintenance plans. The area is currently in maintenance or attainment status for all pollutants, and current air quality resources are sufficient to support mission growth.

6.3 NATURAL RESOURCES NEEDED TO SUPPORT THE MILITARY MISSION

Open areas are required to support the military mission at Kirtland AFB. Current missions that require open areas include training at various helicopter landing zones, firing ranges, and low vegetation around runways and airfields. The steep topography in the Withdrawal Area is also necessary as it provides a natural backstop for firing ranges and the Starfire Optical Range, and provides natural concealment of military operations from the general public.

6.4 NATURAL RESOURCES CONSTRAINTS TO MISSIONS AND MISSION PLANNING

6.4.1 Soils

Soils on the eastern half of Kirtland AFB are located on level to moderate slopes and consist of well drained loamy and gravelly soils. These soils present a minor constraint to development in these areas. The western half of the base (i.e. Manzano Mountain and the Withdrawal Area) contain soils lying on level to steep slopes, being well drained, very cobbly, stony, or containing rocky outcrops. Construction or use in these areas is generally confined to areas of relatively level terrain as the threat of erosion is high on moderate to steep slopes.

6.4.2 Wetlands

There are nine USACE jurisdictional wetlands supplied by 15 active springs that occur on base. Most are located in rocky drainages and as a result have little impact on future missions. The Coyote Springs wetland complex, by far the largest wetland on base, consists of several springs and is located primarily south of Coyote Springs Road. The area was once a recreational site for military personnel, but has since undergone restoration and enhancement. This level of effort on the restoration of the wetland indicates that the area is not slated for any future military missions.

6.4.3 Floodplains

Floodplains occur along Arroyo del Coyote and Tijeras Arroyo. These arroyos run intermittently after heavy rains (USACE 1979b). Although occurring infrequently, flooding in these channels is characterized by high peak flows, small volumes, and over short durations. The 100-year floodplain encompasses anywhere from 100 feet to nearly ½ mile across along these drainages, depending on the surrounding terrain.

6.4.4 Threatened and Endangered Species

The state threatened Gray Vireo is known to occur and breed on base. It utilizes the juniper woodland habitat on base. Future construction or alteration of this specific habitat would require consultation with the NMDG&F. constraints to the mission would generally be minor as construction or alteration of the habitat would be required outside of the nesting season. (i.e. May – September).

The Loggerhead Shrike is a federal species of concern and a state threatened species known to occur and breed on base. It utilizes the juniper woodland habitat, grasslands, and any other open areas on base. Future construction or alteration of these habitats would require consultation with the NMDG&F. Avoidance to nesting Loggerhead Shrikes is required and generally causes minor constraints to the mission.

Table 6-2: Kirtland AFB Species with Special Status

Species	Federal Status	State Status
Gray Vireo		Threatened
Loggerhead Shrike	Species of Concern	Threatened
Peregrine Falcon	Species of Concern	Threatened
Northern Goshawk	Species of Concern	
Mountain Plover	Species of Concern	Sensitive
Burrowing Owl	Species of Concern	
Townsend' Big Eared Bat	Species of Concern	
Gunnison's Prairie Dog		Sensitive
Slate Millipede	Species of Concern	
Gramma Grass Cactus	Species of Concern	

The Peregrine Falcon is a federal species of concern and a state threatened species known to occur and breed on base. It utilizes every habitat found on base and can also be found in the urban environments. Normally, it breeds on rocky cliffs, but has been known to breed in hangers near the airport. There is no plan setup for monitoring of this species so direct mission impact is unknown at this time.

The Western Burrowing Owl is a federal species of concern and is found on base. It utilizes urban areas as well as the grasslands in association with the Gunnison's Prairie Dog, which is a state sensitive species. Kirtland AFB already has a program in place that identifies locations of nesting Burrowing Owls and has developed procedures to relocate owls if necessary. Since this program has been implemented successfully for several years, protection of this species does not constrain development on base.

Several other federal species of concern occur on Kirtland AFB. They are the Northern Goshawk, Slate Millipede, Townsend's Big Eared Bat, and Gramma Grass Cactus. The Mountain Plover is not known to occur on base, although it has been observed 50m of base on the Isleta Pueblo. Currently, there are no plans for these species so mission constraints are unknown.

6.4.5 Bird Aircraft Strike Hazard

Bird activity near the airfield could negatively impact base missions due to BASH. The expansion of prairie dog colonies on base would create an increased BASH potential. Mission impacts from BASH incidents include delayed operations, damage to aircraft, and hazards to flight crews.

CHAPTER 7
NATURAL RESOURCES PROGRAM MANAGEMENT

This section describes the natural resources and land management programs at Kirtland AFB. Current issues associated with each resource as raised by base personnel, state and federal authorities are also discussed. Development and implementation of this INRMP is the responsibility of the Kirtland AFB Wing Commander with the 377th MSG/CEANQ leading the effort. Table 7-1 includes a list of various plans related to the natural resources program at Kirtland AFB with the office of primary responsibility and contact information. Region 2 of the USFWS, NMDG&F, and the Sandia Ranger District of the CNF are signatories for this plan, and provide technical support and input.

Table 7-1. Resources Program Management Related Plans

Plan	Office	Telephone
Kirtland AFB General Plan	377th MSG/CE	(505) 846-7911
Natural Resources Management Plan	377th MSG/CEANQ	(505) 846-0053
Stormwater Pollution Prevention Plan	377th MSG/CEANC	(505) 846-8546
Integrated Pest Management Plan	377th MSG/CEO	(505) 846-5650
Grounds Maintenance Plan	377th MSG/CEO	(505) 846-1803
Kirtland BASH Plan	58th SOW	(505) 853-5838
Cultural Resources Management Plan	377th MSG/CEANQ	(505) 846-8840

7.1 Geographic Information Systems

GIS is a computer-based system designed to capture, store, manipulate, analyze, and display geo-referenced map data on a computer. GIS differs from Computer Aided Drafting Design systems in the fact that GIS can also correlate non-spatial data with spatial map data for analysis purposes. In a GIS system, an unlimited array of tabular data can be correlated with map features for analysis purposes. GIS is a multi-use tool that supports the INRMP, General Plan, BASH management, Cultural Resources Management Plan, planning, project site selection, and other decision-making actions.

Environmental Management at Kirtland AFB uses the Geographic Environmental Management System, which is an ArcView 8.0 application for generating different layers. The Air Force uses GeoBase, an ArcIMS application. Several natural resource layers have been generated from these programs including gray vireo nest locations, burrowing owls, wetlands, roads, cultural resource sites, and floodplains.

Issues:

- Cohesion between different GIS departments within the Air Force is not occurring; thus GIS information is not being distributed efficiently.

7.2 FISH AND WILDLIFEMANAGEMENT

Kirtland AFB is a Category I installation. Category I installations are required to develop an INRMP and are defined as having natural resources requiring protection and management (AFI 32-7064). Wildlife species found at Kirtland AFB are representative of the species diversity common to the regional ecosystem (grassland, juniper woodland, pinyon-juniper woodland, and ponderosa pine woodlands) and species common to semi-developed grassland areas. Examples of this species diversification include Gunnison's prairie dog, Black-tailed jackrabbit, coyote, bobcat, mule deer, black bear, Red-tailed hawk, Western Burrowing Owl, Northern Mocking Bird, Canyon Towhee, bull snake, Western Diamondback rattlesnake, cougar, Desert Massasauga, bat species, and spadefoot toads. Fish habitat on base is limited to the man-made ponds located at the Tijeras Arroyo Golf Course. Several small wetlands on base provide a unique habitat in an otherwise arid environment. These wetlands provide a water resource for the local wildlife as well as breeding sites for local amphibians such as the Tiger salamander and Red-spotted toad.

Natural resource personnel provide technical support to the 377 ABW and associate organizations for all wildlife related concerns. Fish and wildlife program management on Kirtland AFB has been largely directed by the 2007 INRMP. Various plans and programs have been developed/implemented including prairie dog relocation, plant and wildlife inventories, Burrowing Owl monitoring, Loggerhead Shrike survey, and habitat improvements such as the construction of raptor nesting platforms and wetland restoration. Specific plans, reports and programs resulting from implementation of the 2007 INRMP can be found in Appendix A. Kirtland AFB has been identified as an Important Bird Area by Audubon Society due to the large urban colony of burrowing owls that nest on base. Hunting, trapping, and fishing are not allowed on the base, as these activities would conflict with mission objectives.

Kirtland AFB works cooperatively with other agencies on an as-needed basis including the USFWS, NMDG&F, USFS, and the USACE. Since Kirtland AFB is a closed base, enforcement of wildlife laws are not a routine part of the security forces on base. In the event that wildlife laws are violated, appropriate local, state, and federal authorities are contacted to deal with the matter.

Issues:

- Long-term monitoring of birds, bats, predators, reptiles, and amphibians have not been done for the base.
- Free standing water for wildlife is limited on base, thus restricting species distributions.
- Enforcement of wildlife laws and regulations from illegal enter/hunting on base.
- Power lines pose an electrocution risk to raptors and have not been raptor proofed.
- Prairie dogs continue to occupy areas identified as prairie dog exclusion zones.
- Kirtland AFB vegetation manual does not include all species occurring on base.
- Communication between the DOE and DOD needs to continue, otherwise natural resource management would be negatively affected.

7.3 Management of Threatened and Endangered Species and Habitats

Observations throughout base have found there are two state threatened species on base; Gray Vireo and Peregrine Falcon, A survey conducted in 2003 revealed 53 gray vireo territories occurring in juniper woodland habitat (Appendix C). Another survey was completed in 2005 that focused on brown-headed cowbird nest parasitism on the Gray Vireo (Appendix C). Any proposed thinning treatments of pinyon-juniper stands for habitat improvement for the state-listed Gray Vireo will be coordinated with the NMDG&F's Conservation Services Division of the Santa Fe office.

The Western Burrowing Owl populations, breeding success, predation, and habitat use. A migration study was performed to determine where these owls winter. Bat surveys are being conducted to determine species present, roost locations, hibernacula sites, and reproductive status. Currently, bat species are being attacked by the fungus (***Geomyces destructans)*** causing White Nose Syndrome, which is fatal to bats. Due to this fungus that has spread across the United States, and is likely to come to the Western States, new surveys and decontamination protocols will need to be conducted. No surveys have been conducted for Slate Millipede, Peregrine Falcon, Northern Goshawk, or Gramma Grass Cactus.

Loggerhead Shrikes are relatively common on base and currently surveys are being done on base to determine its distribution. Mountain Plovers, a former federal candidate species, have not currently been found on Kirtland AFB, but may potentially be found in the southern grasslands of the base. A 2003 survey for this species revealed its presence on the Isleta Pueblo. A Mountain Plover with chicks was observed approximately 50 meters south of the base (Appendix C).

Issues:

- Mountain Plovers, a former federal candidate species, may potentially be found in the southern grasslands of the base.
- Long-term monitoring of the Gray Vireo has not been done. A management plan has been developed for this species.
- Habitat improvements for the Gray Vireo have not been performed.
- Gray Vireos are nest parasitized by Brown-headed Cowbirds.
- Long-term monitoring of the Loggerhead Shrike has not been performed.
- The Western Burrowing Owl population at Kirtland AFB has declined over the past several years. Reasons for the decline are not clearly understood, although vandalism and harassment of nests during the nesting season is of concern. The current management plan needs to be updated.
- Development on base occasionally disturbs nesting Burrowing Owls.
- No monitoring management plan has been setup for the Peregrine Falcon
- Current surveys need to be done in the grasslands to determine if the Mountain Plover occurs on base.
- Surveys for White Nosed Syndrome need to be conducted annually to determine if the fungus has infected the bats on Kirtland

7.4 WATER RESOURCE PROTECTION

Kirtland AFB has a Storm Water Pollution Prevention Plans, for both industrial and municipal areas on the installation that protects surface and ground water from pollution issues associated with runoff from the base.

7.4.1 Floodplains

Flooding on Kirtland AFB generally occurs between May and October during high intensity thunderstorms (USACE 1979b). Tijeras Arroyo and Arroyo del Coyote floods are characterized by high peak flows, small volumes, and short duration. Although flooding occurs infrequently, vegetation can encroach into the arroyos' channels, obstructing the flow of water and causing flooding. A 100-year floodplain encompasses these arroyos and follows their path.

7.4.2 Groundwater

Kirtland AFB is located within the limits of the Rio Grande Underground Water Basin, which has been defined by the State of New Mexico as a natural resource area and has been designated as a "declared underground water basin." The state regulates it as a source of potable water. The average depth to groundwater beneath Kirtland AFB is 450 to 550 feet. The Rio Grande Basin's source of groundwater is the Santa Fe Aquifer. The volume of recoverable fresh groundwater in the Rio Grande Basin is estimated at 2.3 billion-acre feet.

Albuquerque relies on groundwater and purified surface water as its potable water sources. Annually, the City of Albuquerque supplies 19.9 billion gallons of drinking water from the ground and 13.6 billion gallons of drinking water via purified surface water (2012 Water Quality Report). The municipal water system of Albuquerque has a total city system capacity of 289 million gallons per day; the current city usage is less than 40 percent of the total city system capacity. A localized change in the direction of flow of the regional groundwater flow beneath Kirtland AFB has occurred towards Albuquerque because of Albuquerque's extensive water pumping.

Recharge of the Santa Fe Aquifer is most likely to occur east of the installation in the Manzanita Mountains where the sediment material favors rapid infiltration (USAF 1991). The USGS performed a study in 1993-1994 to provide an understanding of the Albuquerque basin groundwater supply. Public supply, industrial, and military requirements (Kirtland AFB) in the Albuquerque area are primarily met by groundwater supply. Recent studies indicate that the most productive zone of the aquifer system is much less extensive than was formerly assumed. Water level declines, greater than those predicted by hydrologic investigations in the early 1960s have occurred in the basin. The City of Albuquerque Water Conservation Office (CAWCO) cites the USGS 1993 study and notes that non-pumping water levels in production wells in Albuquerque have dropped as much as 160 feet since 1960 (CAWCO 1997). Kirtland AFB is currently reducing potable water by 2%/yr based upon FY 07 usage base level.

Issues:

- Use of herbicides and fertilizers on grounds could affect water resources if used excessively.

- Floodplains may be affected by vegetation, especially tamarisk that has encroached into arroyo channels.
- Stormwater pollution sources' (e.g. fuel spills, excessive erosion) could affect water resources if not managed.

7.5 Wetland Protection

Wetlands have been defined as areas that are "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE 1987). Wetlands are considered waters of the U.S. if the wetland is located "adjacent" (generally within 500 feet) to or are part of tidal waters, navigable waterways, lakes, rivers, streams, intermittent streams, mudflats, sloughs, wet meadows, natural ponds, playa lakes, and other wetlands. For regulatory purposes, wetlands are defined by three factors: vegetation, hydrologic regime, and soil characteristics. The USACE Wetland Delineation Manual is the governing guide to wetland identification.

The USACE, U.S. Environmental Protection Agency (EPA), and the USFWS regulate activities, which impact wetland resources. The USACE and EPA regulate and permit dredge and fill activities within the waters of the U.S., including wetlands under the authority of Section 404 of the Clean Water Act. The USFWS reviews and provides input to the permit applications. Most of the small, scattered wetlands on Kirtland AFB are in good condition and occur in conjunction with other plant communities. For the most part, these wetlands provide very little in the way of habitat other than they provide a reliable source of water in an otherwise arid environment.

The Coyote Springs wetland complex, which is comprised of several springs and seeps, covers an area of approximately one acre. This area has been used extensively over the years. A hotel was built at the springs in the mid 1800's. In the 1880's the Coyote Springs Mineral Water Company bottled water from the springs. Beginning around the 1960's through the late 1990's the area was used as a recreational area for military personnel. Over the last five years, several restoration and enhancement projects have been undertaken at the Coyote Springs wetland complex. Beginning in December 2000, selected dead trees, numerous concrete slabs, barbeque pits, tables, benches, rubble piles, metal racks and trash were removed. Then a large salt cedar stand was cut and removed from Arroyo del Coyote. Currently, an enhancement project is underway involving the construction, lining, filling and vegetating of a small pond in the complex as well as removing the salt cedar stand. A security gate has also been constructed to prevent access to the restoration area.
Issues:

- Restoration of the Coyote Springs wetland complex is not complete.
- Yearly salt cedar control methods need to continue and replacement native vegetation needs to be planted.
- The banks along Coyote arroyo below Coyote Springs need to be stabilized.

7.6 GROUNDS MAINTENANCE

Land Management and Grounds Maintenance are maintained by the 377th Civil Engineer, Division and Base Maintenance contract,. Land management and grounds maintenance planning on Kirtland AFB is conducted to protect and preserve natural and manmade resources on the installation. Land classifications include:

- **Improved Grounds**: Grounds maintained as high quality lawn with no more than 2 to 4 inches of length. Improved grounds are free of bald spots, weeds, dead patches, raked, leafless, and without trash. All edges are neat and swept. Areas include the developed area, parade grounds, drill fields, athletic areas, golf courses (excluding roughs), cemeteries, and housing areas.
- **Semi-Improved Grounds**: Grounds maintained as grass ground cover with no more than 5 to 10 inches of length. These areas are mowed less often. They are raked, leafless, and without trash. Areas include those where periodic maintenance is performed and areas adjacent to runways, taxiways, and aprons; runway clear zones; lateral safety zones; rifle and pistol ranges; weapons firing and bombing ranges; picnic areas; ammunition storage areas; antenna facilities; and golf course roughs.
- **Unimproved Grounds**: These grounds consist of grasslands; woodlands; shrublands; lakes; ponds and wetlands; and any areas where natural vegetation is allowed to grow unimpeded by maintenance activities.

The Kirtland AFB Land Management Plan addresses land management practices that protect natural resources for and minimize impact from military activities. Current ecosystems, landscaping, irrigation, erosion and drainage issues are discussed in the plan. The USAF Landscape Design Guide also provides guidelines for landscaping while the Kirtland AFB Revegetation Manual (Appendix C) describes acceptable techniques for revegetating disturbed lands.

Urban forestry practices are utilized to ensure the health and protection of trees from pollution, vandalism, storm damage, pests and diseases. DOD natural resource managers are responsible for tree resources in developed areas. Guidelines are provided in the DOD Urban Forestry Manual.

The National Arbor Day Foundation and USDA Forest Service's Tree City USA program is a program that promotes urban and community forestry programs throughout the U.S. They provide technical assistance, guidelines, and public attention for forestry programs in cities and towns. Kirtland AFB has been designated as a Tree City USA community since 2002.

A Golf Course Management Plan was developed in October 2008 (Appendix L). The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Engineering & the Environment (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide. Armed with the support and approval of the Air Force Services Agency golf program, AFCEE's goal is to facilitate the creation of an environmentally friendly golf course facility while supporting the installation mission. Air Force Installation (AFI) 32-7064, Chapter 11, requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

The golf course environmental baseline assessment (GCEBA), or the Draft Golf Course Environmental Management (GEM) Plan is the initial step in creating a successful ecosystem-based comprehensive GEM Plan. The intent of the GEM Plan is to provide an efficient management tool that will enable course managers to devote more of their efforts to caring for their customers and the golf course. Properly designed and implemented, the GEM Plan will keep the entire golf facility in compliance with the constantly changing environmental requirements while contributing to the local community.

Along with the newly established baseline, the GEM Plan consists of a map and description of the final environmental challenges and the prescribed approach to their management. In addition, the GEM Plan includes a comprehensive list of future environmental management goals, objectives and a course-specific set of best practices.

The following potential environmental challenges were identified in compiling this Final GEM Plan:

- Nuisance species
- Migratory birds
- Energy conservation
- Installation Restoration Program (IRP) sites
- Proposed improvement projects
- Air quality
- Natural resource conditions on base have changed since the 2001 Baseline Natural Resources Inventory was completed, thus making it outdated. • Long-term documentation of changes in landscapes, vegetation, and other natural resources has not been performed by the base.

Issues:

- The Revegetation Action Plan, Land Management Plan, and Brush Control Plan will need to be reviewed. These plans were written in 2004 and need to be updated in 2009.

- Long-term documentation of changes in landscapes, vegetation, and other natural resources need updates.

7.7 FOREST MANAGEMENT

Currently, 15,891 acres of CNF are within the Kirtland AFB Withdrawal Area, this does not include DOE withdrawn lands, and is part of the Sandia District. The Sandia District manages this area under their *Ecosystem Management Plan for National Forest Systems Lands In and Adjacent to the Military Withdrawal*. The land was withdrawn from public use by a series of Public Land orders beginning in the 1940s (Kirtland AFB 2004d).

Kirtland AFB utilizes the CNF Land Management Guidelines and the USFS minimum standards, guidelines, and policies in forest management practices. The USAF is responsible for construction and maintenance of all roads, trails, pads, ramps, experimental sites, and storage or auxiliary areas. The area is currently unavailable for routine forest management activities but the USFS has timber management rights and responsibilities (USDA 1985). There are no commercial forestry operations on base.

Forest types found on the installation are predominately pinyon-juniper woodland. Other types include ponderosa pine woodland (lower southeast corner), mixed conifer, juniper woodland (far western portion), grassland meadows and mountain shrub.

Existing forest access trails and roads include 14.5 miles of trail and 55.1 miles of roads within the Kirtland AFB Withdrawal Area. Many of these roads have been identified as candidates for closure, obliteration, or rehabilitation.

USFS management guidelines and forest management include reforestation, brush control, protection of riparian areas, and seeding barren areas. The CNF land management practices that can be utilized by Kirtland AFB and can go towards achieving INRMP goals include:

- Reforestation for mixed conifer and ponderosa pine
- Brush control within pinyon-juniper, grasslands, mountain shrub, and ponderosa pine communities could use mechanical treatments to reestablish ecosystem.
- Thinning of woodland overstory in pinyon-juniper habitat utilizing mechanical treatments and firewood harvest.
- Planting riparian-dependent species to protect riparian areas. Utilizing protective fencing to reduce future impacts from wildlife, persons or vehicles.
- Barren areas, primarily old dirt roads no longer in use, could be pitted and seeded to increase ground cover and reduce soil loss.

Issues:

- Fuels such as dense trees and brush have been allowed to increase (see Wildland Fire Management, Section 7.9)

7.8 WILDLAND FIREMANAGEMENT

Fire is a natural part of an ecosystem, which has shaped the composition of regional plants and animals. Fire has the potential to set back ecological succession and create a mosaic of habitat that supports a diverse assemblage of plants and animals. Kirtland AFB contains over 52,000 acres, most of which can be categorized as unimproved lands.

Wildfires on base are controlled by Kirtland AFB Fire Department. Wildfire suppression on base has lead to a heavy fuel load, especially in the withdrawn lands portion of the base. The 1941 East Mountain Complex Fire, reduced fuel loads on base to an average of 20 percent. While wildfires that have occurred on base since 1941 have been relatively infrequent, they have been suppressed immediately. By 2001, the estimated fuel load had reached 90 percent capacity. Due to the high fuel loads, mechanical methods are being suggested as a means to reduce fuel densities in several areas, including the Withdrawal Area.

In 2008, a Wildland Fire Management Plan (WFMP) (Appendix K) was written, but not yet implemented for the base. This (WFMP Plan) outlines actions that will be taken by Kirtland AFB fire personnel and natural resource personnel to meet the fire management goals for the installation. The WFMP will be incorporated into or consistent with the INRMP as a component plan." The natural resources component of the Kirtland AFB Integrated Natural Resources Management Plan (INRMP) addresses the issue of wildland fire management in a general manner. This specific action plan implements fire related management actions from the INRMP.

This plan implements current interagency fire management policies and legislation. It helps achieve resource management and fire management goals as defined in:

- AFI 32-7064 Integrated Natural Resource Management
- The Federal Wildland Fire Management Policy and Program Review (2007)
- Managing Impacts of Wildfires on Communities and the Environment and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (also known as the National Fire Plan, Congressional legislation delivered to USDI/USDA 2007)
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan (an adjunct to the National Fire Plan 2007)

The goal of wildland fire management is to plan and make decisions that help accomplish the mission of the Air Force, which is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

KAFB will deploy the full toolbox of alternative strategies that are available to wildland fire managers. This will include full suppression where necessary, wildland fire use when authorized by the Base Commander, and manual fuel reduction where necessary. KAFB will endeavor to manage all aspects of wildland fire in concert with neighbors and interagency cooperators. An interagency wildland fire plan for the East Mountain/Withdrawn areas is being discussed with cooperators and will continue to be developed as a concept.

INRMP Goals:

- Mechanical thinning to reduce fuel loads
- Work with Collaborative Forest Restoration Program to create a landscape scale model of how the forest should look and to help improve fire danger between neighboring agencies.
- A complete fuel load and tree density survey needs to be done to fully assess the fire danger and aid in helping restore forest.
- Restore the ponderosa pine forest ecosystem
- Decrease fuel loads to prevent spread of fire.
- Decrease fuel loads from 90 percent capacity to between 20-50 percent
- Create fire breaks in concurrence with Cibola National Forest Resource Management Plan along roads and boundaries to better protect Kirtland AFB from fires becoming unmanageable or coming onto base from neighboring properties."

Issues:

- Communication and cooperation with Sandia Ranger District needs to occur.
- A complete survey needs to be done to fully assess fuel loads and tree density
- Road improvements need to be done to get equipment into more remote areas of base, only about 10 percent of the area is accessible by road.
- Cultural resources could be damaged by a severe fire or a stand replacing fire.
- Funding of projects

7.9 INTEGRATED PESTMANAGEMENT PROGRAM

The Pest Management Program at Kirtland AFB is concerned with preventing pests and disease from adversely affecting the military mission and operation of the base. The Pest Management Plan is managed by the 377th Mission Support Group Civil Engineer Division and the Base Maintenance Contractor. The Golf Course Management Plan describes how pests associated with the golf course are managed, while the Prairie Dog Management Plan addresses prairie dogs. The Prairie Dog Management Plan provides both lethal and non-lethal (relocation) alternatives. The U.S. EPA and the DOD agreed in a MOU in 1996 to reduce human exposure and environmental impacts to pesticide use. Kirtland AFB's goal has been to reduce pesticide use by 50 percent from 1993 baseline usage and has been continuing to find alternatives to reduce chemical use.

Pests such as insects, birds and mammals may carry diseases such as the plague, hantavirus, rabies, west nile virus, and bacterial and fungal diseases. Kirtland's Pest Management Plan identifies pests by category and control methods including: 1) *indirect strategies* such as proper ways to store food, sealing cracks, removing woodpiles, stones, trash and debris etc; 2) mechanical controls such as removing branches or weeds; 3) *physical controls* such as using water, soaps or detergents to remove pests; 4) *biological controls* such as using predators, and 5) *chemical controls* that involve the use of insecticides, pesticides and herbicides. Pests identified in the Pest Management Plan include the following:

1) *General household and nuisance pests*. These pests include ants, yellow jackets, hornets, wasps, cockroaches, spiders, ticks, silverfish, firebrats, scorpions, centipedes, millipedes, clover mites, crickets, earwigs and fleas.
2) *Structural pests*. These pests include termites and carpenter ants.
3) *Stored product pests*. These include lesser grain borer and the Mediterranean flour moth
4) *Weed control*. Weeds that are frequently encountered on base include Dallas grass, crabgrass, Bermuda grass, Johnson grass, yellow foxtail, green foxtail, annual bluegrass, puncture vine, Russian thistle, broadleaf plantain, dandelion, annual sowthistle and redroot pigweed.
5) *Pests of ornamental plants and turf*. These pests infect trees and other plants on base and are mostly monitored for natural controls. Horticulture methods may be used such as pruning leaves and stems from infected trees and using nitrogen fertilizer. Pests include the Elm leaf beetle, scale, fall webworm, tent caterpillar, sod webworms, and white grubs.
6) *Golf course pests*. Mosquitoes represent a particular problem on the Golf Course and are controlled through physical, biological and chemical means. Other Golf Course pests include coontail, anthracnose foliar blight, gray snow mold or typhula blight, puncture vines, broadleaf plantain, and common mallow.
7) *Miscellaneous pests*. These pests include rodents such as mice or rates. Steps used to control rodents involve inspection, sanitation, exclusion and reduction. Other miscellaneous pests include prairie dogs, pocket gophers and skunks. Control of these pests usually involves indirect strategies, physical and chemical controls.

Issues:

- Prairie dogs continue to inhabit areas of the base where they pose a safety risk, cause damage, or interfere with the military mission.
- Pigeon’s loaf and nest on hangers causing a health concern from their accumulated droppings.
- A noxious week inventory for the base has not been completed. As a result, no weed management plan has been written.

7.11 BIRD/AIRCRAFT STRIKE HAZARD (BASH)

The Kirtland AFB BASH Plan identifies procedures to decrease the potential for bird and wildlife aircraft strike hazards. The 58 SOW Flight Safety is responsible for the BASH Plan. Existing conditions include flying areas that are located near a major migratory flyway along the Rio Grande River. BASH incidences at Kirtland AFB are currently very low but migratory birds and other wildlife hazards do exist. The Bird Hazard Working Group was established to coordinate activities for all agencies involved in the BASH Program and includes representatives from flight safety, airfield management, CE, natural resource representatives, and the New Mexico Civil Air Patrol Liaison.

The 377 ABW/CE uses land management practices such as pruning trees and other vegetation management to make the airfield less attractive to birds and wildlife. Pest Management Program practices are also utilized to control pests on and around the airfield to reduce BASH hazards.

The largest threat to flying units on Kirtland AFB are migratory and non-migratory birds such as migrating waterfowl (ducks, geese, swans), raptors (hawks, falcons, kites, eagles, vultures), cranes, pigeons and doves, owls, horned larks, swallows and pratincoles, crows and ravens, blackbirds, grackles, cowbirds and starlings, meadowlarks, house sparrows, warblers and fringillids (sparrows, finches, grosbeaks and buntings). Other wildlife including coyotes, rabbits and prairie dogs also pose a threat.
Issues:

- Prairie dogs continue to be a problem near the airfield adding to the BASH potential.
- Tall vegetation around the airfield can attract raptors and other wildlife which lead to an increase in the BASH potential.

7.12 NUSIANCE MANAGEMENT PLAN

The Nuisance Management Plan (Appendix J) created for Kirtland AFB is concerned with preventing pest animals and plants from adversely affecting the military mission and operations on base. The plan is concerned with preventing pest animals and plants from adversely affecting the military mission and operations on base. Nuisance animals, such as coyotes, have come in contact with base personnel and this plan gives advice on what not to do and phone numbers to contact Natural Resources in the event an animal gets injured or has become a nuisance."

The following guidelines should be adhered to in efforts to reduce nuisance wildlife problems at KAFB:

- Do not transport wild and domestic animals from off-site onto the Reservation.
- Do not release nuisance wildlife trapped at KAFB to other areas outside of Kirtland AFB.
- Contact the Natural Resources Manager to evaluate all nuisance animals. If require Natural Resources Manager will contact New Mexico Department of Game and Fish for assistance. Any trapped feral cats should be taken to the animal shelter.
- Do not feed resident wildlife and feral cats.
- Secure all dumpsters and other garbage receptacles to avoid providing a steady food supply to potential nuisance animals.
- Keep building maintenance informed of problems to prevent entry of animals through holes, broken windows, etc.
- Use building maintenance and construction techniques that will minimize the potential for entry by wildlife.

Issues: Lack of support from the installation and off-base organization for sick and injured wildlife.

7.13 OUTDOOR RECREATION

The Sikes Act requires military installations to promote public use of outdoor recreational resources that do not conflict with the installation mission. Outdoor recreation activities are grouped into three classes:

- **Class I – Developed Recreation Areas**: Areas that are suitable for recreational activities such as sport fields, campgrounds, picnic areas, paved walking/jogging/cycling trails, winter sports and water sports.
- **Class II – Dispersed Recreation Areas**: These areas include hunting, fishing, bird watching, boating, hiking and sightseeing.
- **Class III – Special Interest Areas**: These areas may contain valuable archeological, botanical, ecological, geological, historic, zoological, scenic or other features that require protection and access control.

Outdoor recreation is managed by the 377 Force Support Squadron. Outdoor recreational areas on Kirtland AFB consist of all three classes. Class I and II recreational areas on the base include softball, football and soccer athletic fields, tennis courts, three parks, three picnic areas, an outdoor swimming pool, a 5-acre family camping area with 55 sites, an 18-hole golf course, archery range, and jogging track. Fishing and hunting are not allowed on Kirtland AFB. Class III areas include archaeological sites (302 have been identified on base but only some are eligible or have been added to the National Register), 17 historical buildings, a scenic lookout at the fire tower and wetland springs. Off-road vehicles used to be allowed on a 120-acre off road area but has since been closed.

Issues:

- Base personnel who recreate on the base often do so in areas that conflict with the military mission.

7.14 CULTURAL RESOURCES PROTECTION

There are 661 archeological sites located on Kirtland AFB land, all of which receive some form of protection. Of the 661 archaeological sites on Kirtland AFB, 251 are eligible to the National Register of Historic Preservation, 237 are not eligible and therefore are not significant resources for Kirtland AFB to protect, and 173 are currently being evaluated for eligibility. Sites include historic buildings, structures, and sites dating from European contact, ca. AD 1540, through the Cold War, ca. AD 1945-1991. Prehistoric sites dating from the Paleo-Indian Period to the Pueblo Period also have been recorded.

Section 110 of the National Historic Preservation Act (NHPA) requires the Air Force to complete an inventory of historic properties located on its land (36 Code of Federal Regulations 60, 63, 78, 79, and 800). The entire base has been surveyed via a series of cultural resource studies ranging from the 1990s to 2005.

Section 106 of NHPA requires Kirtland AFB to evaluate and assess any action that could impact cultural resources prior to commencing work. Therefore, natural resource projects must go through the proper coordination to ensure no resources are adversely impacted.

Currently, there is a Cultural Resources Management Plan (July 2006) in place that inventories and protects cultural resources on Kirtland AFB. An Integrated Cultural Resources Plan (2006) has been prepared and will be in place by 2011. It is possible that not all cultural resources have been identified and that subsurface construction or ground maneuver training activities may inadvertently disturb such resources. It is also possible that natural resources management activities such as forest management (e.g. construction and maintenance of brush control and other forms of fire threat reduction) or revegetation of disturbed areas may reveal previously unidentified cultural resources.

Issue:

- Implementation of base programs, including natural resources, may unearth or expose previously unknown cultural resources.

7.15 ENFORCEMENT

A Natural Resources Law Enforcement program at Kirtland AFB does not currently exist. Security police at Kirtland AFB are responsible for maintaining law and order on the base.

Issues:

- Recurrent trespassing from hikers, mountain bikers, horseback riders, and all terrain vehicles occurs along the eastern boundary of the Withdrawal Area
- Lack of a Conservation Law Enforcement Officer (CLEO) Program
- Mule deer, coyotes, and other wildlife are hit by vehicle traffic on base
- Mule deer are occasionally poached on base
- Unauthorized feeding of wildlife occurs on base conflicting with the military mission
    - Whether security procedures are in place or not, it is against INRMP policy to feed any wildlife on Kirtland AFB
- Security personnel do not know wildlife enforcement as it pertains to INRMP and DOI

7.16 PUBLIC OUTREACH

Partnerships with agencies such as the NMDG&F, USFS and the USFWS currently exist with natural resources personnel at Kirtland AFB. Additionally, non-profit youth organizations provided services for the Coyote Springs Wetland Restoration Project by constructing a wildlife blind, wildlife brush piles, a walking path, an overflow rock stream bed, and planting cotton wood trees. Also, local Eagle Scouts have built burrowing owl “soft release” cages and burrowing owl nest site perches. Still, there are abundant public outreach opportunities at the base, for example, signs identifying natural resources including animals, trees and vegetation types along running trails, at the Coyote Springs wetland and in the vicinity of prairie dog colonies could be installed to educate base personnel about natural resources on base.

Issues:

- Prairie dog colonies could spread off base, causing conflicts with Kirtland AFBs neighbors. Various natural resource projects exist where non-profit organizations can provide support .

CHAPTER 8
MANAGEMENT GOALS AND OBJECTIVES

The natural resources management goals and objectives described in this section are based on the issues and concerns addressed in the previous chapter. Goals reflect the values of the installation by expressing a vision of a desired condition for the installation's natural resources for the period of this plan. Each goal is supported by one or more objectives, which specifies how it will be obtained.

Objectives may support more than one goal. Projects are individual work plans required to achieve an objective, which describe the specific methods, and procedures that will be used to achieve the objective.

This INRMP is focused on the achievement of ten specific goals for the protection of the Military Mission and improvement of the natural environment at Kirtland AFB. These goals were formulated from a comprehensive analysis of regulatory requirements, the condition of the natural resources, and consideration of the value of these resources to the people who live and work on the installation.

Goal 1: Comply with the Sikes Act Improvement Act of 1997, AFI 32-7064, Integrated Natural Resources Management, as revised, Memoranda of Agreement concerning migratory bird and use of USGS land, and USAF and USFS guidelines for managing natural resources, as well as other environmental rules, regulations, laws, and procedures.

Goal 2: Manage and protect natural resources in a manner that result in no net loss of the military mission and operational capability at Kirtland AFB.

Goal 3: Conserve and enhance wildlife habitats to maintain and improve the sustainability and natural diversity of ecosystems on Kirtland AFB.

Goal 4: Identify, conserve, and manage, if present, threatened, endangered, and candidate species listed for regulatory protection by federal and state agencies, in addition to critical habitat and wetlands.

Goal 5: Manage wildlife habitat and populations to reduce the potential for bird and wildlife strikes during flying operations.

Goal 6: Develop and implement an education program for base personnel and the public to increase the awareness, appreciation and conservation of natural resources on Kirtland AFB.

Goal 7: Manage pest in a manner that reduces impacts to natural resources, watersheds, landscapes, and the base mission.

Goal 8: Incorporate existing and future GIS information into a database that supports both mission and project planning and Natural Resources Management Program activities.

Goal 9: Support resource conservation through integrated land and ground maintenance programs and plans, when and where possible.

Goal 10: Provide opportunities for enjoyment and appreciation of the natural resources at the base.

Chapter 7 Identified specific management issues for components of the Natural Resources Management Program. The remainder of this Chapter 8 identifies specific objectives that will be implanted to achieve the ten goals of the INRMP and address identified natural resources management issues.

Appendix A contains specific projects that will be implemented to achieve the goals and objectives set forth in this chapter. Implementation of the INRMP will ensure that Kirtland AFB continues to support, present and future, mission requirements while preserving, improving, and enhancing ecosystem integrity. Over the long term, implementation of this and future revisions of the INRMP will help guide base staff in preserving and improving the sustainability of the ecosystem at Kirtland AFB while supporting the military mission.

The following are objectives and projects to be implemented, when possible, to achieve the goals listed above. Objectives and projects may support more than one goal.

GIS

OBJECTIVES

- Promote cohesion of GIS data between different GIS departments at Kirtland AFB.

FISH AND WILDLIFE

OBJECTIVES

- Use the Monitoring Avian Productivity and Survivorship Program to conduct long-term land bird surveys.
- Continue communication between the DOD, USFS and DOE concerning natural resources issues.
- Continue monitoring predator distribution and populations.
- Maintain, repair, and install wildlife guzzlers throughout the base.
- Identify power lines that pose an electrocutions risk to raptors and raptor-proof these structures.
- Survey for and update the base’s reptile and amphibian inventory.
- Continue prairie dog relocation from exclusion zones to a relocation site on base.
- Update the vegetation manual for the base by conducting additional flora surveys.
- Survey for White Nosed Syndrome in bats

Implement the October 2007 signed "Memorandum of Understanding" – Tijeras Arroyo Wildlife Corridor' between the DoD, DOE and City of Albuquerque."

Implement the signed (October 11, 2006) MOU between DoD and Bat Conservation International

THREATENED AND ENDANGERED SPECIES

OBJECTIVES

- Conduct Mountain Plover surveys once every five years.
- Monitor Gray Vireo populations on base.
- Implement the Gray Vireo Management Plan
- Monitor Gray Vireo nesting success and nest parasitism by Brown-headed cowbirds.
- Conduct long-term monitoring of the Loggerhead Shrike, with emphasis on nesting success and population trends.
- Continue annual monitoring of nesting Burrowing Owls.
- Implement a Burrowing Owl Management Plan.
- Continue installing artificial burrows on base to replace Burrowing Owl nesting habitat that has been disturbed by development.
- Develop and implement management plans for Peregrine Falcon, Northern Goshawk, Townsend's Big Eared Bat, Slate Millipede (if found during surveys) and Grama Grass Cactus
- Conduct long-term monitoring of the Desert Massasauga with emphasis on distribution on base and population trends.

WATER RESOURCE PROTECTION

OBJECTIVES

- Minimize fertilizer and herbicide use on improved and semi-improved grounds.

WETLAND PROTECTION

OBJECTIVES

- Continue the wetland restoration and enhancement at the Coyote Springs wetland complex.
- Identify the function and values, as well as inventorying the flora and fauna of the bases wetlands.
- Monitor flora and fauna at the Coyote Springs wetland complex.

GROUNDS MAINTENANCE AND LAND MANAGEMENT

OBJECTIVES

- Implement a Golf Course Management Plan.
- Review and update, if conditions change, the Revegetation Action Plan.
- Review and update, if conditions change, the Land Management Plan.
- Develop a long-term photographic monitoring program that documents changes in landscape and vegetation on base.
- Review and update, if conditions change, the Brush Control Plan.

FOREST MANAGEMENT

OBJECTIVES

- Continue working with the Sandia Ranger District in joint management of forests in the Withdrawal Area to restore conditions and reduce fuels loads.

WILDLAND FIRE MANAGEMENT

OBJECTIVES

- Implement the Wildland Fire Management Plan.

INTEGRATED PEST MANAGEMENT PROGRAM

OBJECTIVES

- Continue to manage prairie dog populations on base to minimize BASH potential, damage to infrastructure, and health and safety concerns by following the procedures outlined in Kirtland AFBs Prairie Dog Management and Relocation Plan.
- Implement a Pigeon Management Plan for aircraft hangers on base where pigeons are causing health concerns.
- Survey for noxious weeds and develop a management plan.

BIRD/AIRCRAFT STRIKE HAZARD

OBJECTIVES

- Continue to monitor and remove prairie dogs around flight lines to reduce foraging raptors in the area.
- Maintain the mowing program around flight lines in order to reduce attracting prey species for raptors and other wildlife.

OUTDOOR RECREATION

OBJECTIVES

- Educate base personnel on locations of running, walking, and biking paths.

CULTURAL RESOURCES PROTECTION

OBJECTIVES

- Maintain communication between cultural and natural resource personnel to ensure protection of cultural resources discovered during INRMP implementation.

ENFORCEMENT

OBJECTIVES

- Ensure that Kirtland AFB security personnel, DOE security personnel, and the NMDG&F work together when poaching of wildlife or collision with vehicles occur on base.
- Support two positions for Conservation Law Enforcement Officers (CLEO) Program. Officers will patrol the Withdrawn area for trespassers and poachers of wildlife and cultural resources.
- Ensure that new security personnel are aware that unauthorized feeding of wildlife is prohibited on base.

PUBLIC OUTREACH

OBJECTIVES

- Prevent spread of prairie dog colonies off Kirtland AFB.
- Organize conservation projects with non-profit organizations such as Scout Troops and the Youth Conservation Corp.

CHAPTER 9
IMPLEMENTATION

The Sikes Act, as amended, requires the preparation and implementation of an INRMP on military installations. This INRMP is a five-year rewrite and revision of the 2001 INRMP as directed by AFI 32-7064. This INRMP will be implemented by actions to achieve the goals and objectives stated in Chapter 8, and will result in no net loss of the military mission or operational capability. Projects, focused on the accomplishment of these goals and objectives, will form the foundation for budget request. As the INRMP is implemented, NEPA compliance for projects will be assured through appropriate analysis pursuant to AFI 32-7071, including CATEXs, EAs, or EISs.

Work plans are presented in Appendix A. These plans are separated by resource area and indicate the goal and objective being meet, as well as a project description. The work plan provides the necessary information for building a budget within the Air Force framework by including a timeframe and estimated cost. Projects have been given a Priority of 1-3. Priority 1 projects are the most critical to the military mission, therefore funding for these projects will be requested first. As Priority 1 projects are completed, funding for less critical projects (i.e. Priority 2 and Priority 3), will be requested next.

Projects may be accomplished by contractors, in-house staff, volunteers, or through cooperative agreements with state and federal agencies or other private organizations. The Air Force programming procedures will be followed by Kirtland AFB to request funding for these projects. Base organizations responsible for implementing each of these projects are identified in the work plans. The current CE transformation has reduced the base level environmental support staff by more than half. All support staff are expected to cross train, so that project output is still met.

As required by AFI 32-7064, annual review and updates of this INRMP are required by Kirtland AFB, USFWS, NMDG&F, and the Sandia Ranger District. Kirtland AFB will be responsible for informing each of these cooperating agencies about the progress, successes and/or issues with the implementation of this INRMP. Monitoring the implementation of this INRMP will note which projects have been completed, which ones are ongoing, which ones have had funding requested, and which ones have not been implemented to date. Table 9-1 is a shortened version of Appendix A and can be used as a quick reference during the annual review. A brief annual summary of the success, progress, and/or issues resulting from monitoring the implementation of this INRMP will be sent to each of the cooperating agencies. Each agency will then send a formal response to Kirtland AFB. These annual agency coordination and review letters will be kept in Appendix H of this INRMP. Any issues that arise will be addressed in a timely manner with all affected agencies getting involved.

Table 9-1. Integrated Natural Resource Management Plan Implementation INRMP Objectives/Projects

INRMP Objectives/Projects	Status	Priority (1-2)	Lead Organization
Geographic Information Systems			
Promote cohesion of GIS data between different GIS departments at Kirtland AFB	In progress	2	377 MSG/CEANQ
Fish and Wildlife			
Conduct a base wide bat survey, especially around wetland and abandoned mines to determine which species are present on base	In progress	1	377 MSG/CEANQ
Implement the recently signed MOU between the DoD and Bat Conservation International	In progress	2	377 MSG/CEANQ
Use the Monitoring Avian Productivity and Survivorship Program to conduct long-term land bird surveys	In progress	1	377 MSG/CEANQ
Continue communication between DoD and DOE concerning natural resource issues	In progress	2	377 MSG/CEANQ
Continue monitoring predator distribution and populations	In progress	1	377 MSG/CEANQ
Maintain, repair, and install wildlife guzzlers throughout the base	In progress	2	377 MSG/CEANQ
Identify power lines that pose an electrocution risk to raptors and raptor-proof these structures	2012 Funding	1	377 MSG/CEANQ
Survey for and update the bases reptile and amphibian inventory	In progress	1	377 MSG/CEANQ
Continue prairie dog relocation from exclusion zones to a relocation site on base.	In progress	1	377 MSG/CEANQ
Update the vegetation manual for the base by conduction additional flora surveys	2013 Funding	1	377 MSG/CEANQ
Implement MOU for the Tijeras Arroyo Wildlife Corridor signed in 2007 between DoD, DOE, and City of Albuquerque	In Progress	2	377 MSG/CEANQ
Survey bats for White Nosed Syndrome	In Progress	1	377 MSG/CEANQ
Threatened and Endangered Species			
Conduct mountain plover surveys once every five years	2013 Funding	1	377 MSG/CEANQ
Develop and implement a Gray Vireo Management Plan	Completed	1	377 MSG/CEANQ
Monitor Gray Vireo nesting success and nest parasitism by brown-headed cowbirds	In Progress	1	377 MSG/CEANQ
Conduct long-term monitoring of the Loggerhead Shrike, with emphasis on nesting success and population trends.	In Progress	1	377 MSG/CEANQ
Continue Kirtland AFBs Burrowing Owl migration study	Completed	1	377 MSG/CEANQ
Develop and implement a Burrowing Owl Management Plan	Completed Update 2012	1	377 MSG/CEANQ
Continue annual monitoring of nesting Burrowing Owls	In Progress	1	377 MSG/CEANQ
Continue installing artificial burrows on base to replace Burrowing Owl nesting habitat that has been disturbed by development.	In Progress	1	377 MSG/CEANQ

Table 9-1. Integrated Natural Resource Management Plan Implementation INRMP Objectives/Projects

INRMP Objectives/Projects	Status	Priority (1-2)	Lead Organization
Water Resource Protection			
Minimize fertilizer and herbicide use on grounds	In Progress	1	377 MSG/CEANQ
Remove seedling tamarisk from arroyos and drainages	2012 Funding	1	377 MSG/CEANQ
Wetland Protection			
Continue the wetland restoration and enhancement at the Coyote Springs Wetland Complex	2012 Funding	1	377 MSG/CEANQ
Complete and update of the wetland delineation for Kirtland AFB to reflect current conditions	Completed	1	377 MSG/CEANQ
Identify the function and values, as well as inventorying the flora and fauna of the bases wetlands.	1012 Funding	1	377 MSG/CEANQ
Monitor flora and fauna at the Coyote Springs Wetland Complex	In Progress	1	377 MSG/CEANQ
Grounds Maintenance and Land Management			
Develop and implement a Golf Course Management Plan	Complete	1	377 MSG/CEANQ
Review and update, if conditions change, the Revegetation Action Plan.	When needed	1	377 MSG/CEANQ
Review and update, if conditions change, the Land Management Plan	When needed	1	377 MSG/CEANQ
Develop a long-term photographic monitoring program that documents changes in landscape and vegetation on base	2013 Funding	1	377 MSG/CEANQ
Review and update, if conditions change, the Brush Control Plan	2014 Funding	1	377 MSG/CEANQ
Update the bases natural resources inventory, which delineates vegetation communities, identifies areas of erosion, and identifies areas in need of revegetation, noxious weed invasions, and vegetation reconnaissance points. Integrate this information into other various management programs.	2014 Funding	1	377 MSG/CEANQ
Forest Management			
Continue working with the Sandia Ranger District in joint management of forests in the Withdrawal Area.	In Progress	1	377 MSG/CEANQ
Wildland Fire Management			
Finalize and implement the Wildland Fire Management Plan	In Progress	1	377 MSG/CEANQ
Integrated Pest Management Plan			
Continue to manage prairie dog populations on base to minimize BASH potential, damage to infrastructure, and health and safety concerns by following the procedure outlined in Kirtland AFBs Prairie Dog Management Plan	In Progress	1	377 MSG/CEANQ
Implement a Pigeon Management Plan for aircraft hangers on base where pigeons are causing health concerns	Ongoing	1	377 MSG/CEANQ
Develop a noxious weed management plan	2014	1	377 MSG/CEANQ
BASH			
Continue to monitor and remove prairie dogs around flight lines to reduce foraging raptors in the area	In Progress	1	377 MSG/CEANQ
Maintain the mowing program around flight lines in order to reduce attracting prey species for raptors and other wildlife	In Progress	1	377 MSG/CEANQ

Table 9-1. Integrated Natural Resource Management Plan Implementation INRMP Objectives/Projects

INRMP Objectives/Projects	Status	Priority (1-2)	Lead Organization
Outdoor Recreation			
Implement a program on base that educates personnel where recreation walking, running, and biking are allowed, to prevent conflicts with military missions and incidents with unexploded ordinance	Ongoing	2	377 MSG/CEANQ
Cultural Resources Protection			
Maintain communication between cultural and natural resource personnel to ensure protection of cultural resources discovered during INRMP implementation	In Progress	1	377 MSG/CEANQ
Enforcement			
Ensure that Kirtland AFB security personnel, DOE security personnel, and the NMDG&F work together when poaching of wildlife occurs in the Withdrawn area of the base	In Progress	1	377 MSG/CEANQ
Support Conservation Law Enforcement Officer Program	2013 Funding	1	377 MSG/CEANQ
Ensure that new security personnel are aware that unauthorized feeding of wildlife is prohibited on base	In Progress	1	377 MSG/CEANQ
Public Outreach			
Prevent spread of prairie dog colonies off Kirtland AFB	In Progress	1	377 MSG/CEANQ
Organize conservation projects with non-profit organizations such as Scout Troops and the Youth Conservation Corps	In Progress	1	377 MSG/CEANQ

CHAPTER 10
AMENDMENTS TO THE INRMP

Page iii, add: Appendix I, Environmental Assessment for Kirtland Air Force Base Prairie Dog Management Program, Appendix J, Nuisance Management Plan, Appendix K, Wildland Fire Management Plan, and Appendix L, Tijeras Arroyo Golf Course Environmental Management Plan (GEM)

Sec 6.1.7, page 6-6, Paragraph 2, second sentence, delete: "and as a treatment, storage and disposal facility" add: "while Kirtland is a large generator of hazardous waste; Kirtland does not have a permitted storage facility. Kirtland does hold a hazardous waste operating permit for its open detonation unit."

Sec 6.4.4, **page 6-10, THREATENED AND ENDANGERED SPECIES (ADD)**

The state threatened gray vireo is known to occur and breed on base. It utilizes the juniper woodland habitat on base. Future construction or alteration of this specific habitat would require consultation with the NMDG&F. Constraints to the mission would generally be minor as construction or alteration of the habitat would be required outside of the nesting season (i.e. May-September).

The loggerhead shrike is a federal species of concern and a state threatened species known to occur and breed on base. It utilizes the juniper woodland habitat, grasslands, and any other open areas on base. Future construction or alteration of these habitats would require consultation with the NMDG&F. Avoidance to nesting loggerhead shrikes is required and generally causes minor constraints to the mission.

Table: Kirtland AFB SPECIES WITH SPEACIAL STATUS

Species	Federal Status	State Status
Gray Vireo		Threatened
Loggerhead Shrike	Species of Concern	Threatened
Peregrine Falcon	Species of Concern	Threatened
Northern Goshawk	Species of Concern	
Mountain Plover	Species of Concern	Sensitive
Burrowing Owl	Species of Concern	
Townsend's Big Eared	Species of Concern	

Bat		
Gunnison's Prairie Dog		Sensitive
Slate Millipede	Species of Concern	
Grama Grass Cactus	Species of Concern	

The Peregrine Falcon is a federal species of concern and a state threatened species known to occur and breed on base. It utilizes every habitat found on base and can also be found in the urban environments. Normally it breeds on rocky cliffs, but has been known to breed in hangers near the airport. There is no plan setup for monitoring of this species so direct mission impact is unknown at this time.

The Western Burrowing Owl is a federal species of concern and is found on base. It utilizes urban areas as well as the grasslands in association with the Gunnison's Prairie Dog, which is a state sensitive species. Kirtland AFB already has a program in place that identifies locations of nesting burrowing owls and has developed procedures to relocate owls if necessary. Since this program has been implemented successfully for several years, protection of this species does not constrain development on the base.

Several other federal species of concern occur on Kirtland AFB. They are the Northern Goshawk, Millipede, Townsend's Big Eared Bat, and Granma Grass Cactus. The Mountain Plover is not known to occur on base, although it has been observed 50m of base on the Isleta Pueblo. Currently, there are no plans in place for these species so mission constraints are unknown.

Section 7.3 FISH AND WILDLIFE MANAGEMENT

Paragraph 2, sentence 5, Remove "Partners in Flight" Add: "Audubon Society"

Issues:

- Enforcement of wildlife laws and regulations from illegal hunting on base.

Section 7.4, page 7-3 MANAGEMENT OF THREATENED AND ENDANGERED SPECIES AND HABITATS

Paragraph 1, first sentence, remove "Past T&E species surveys have only revealed the presence of one federally or state listed species, the state threatened Gray Vireo."

Replace with: "Observations throughout base have found there are three state threatened species on base; they are Gray Vireo, Peregrine Falcon and Loggerhead Shrike."

Second paragraph, first sentence, remove "The Western Burrowing Owl, Loggerhead Shrike, and Mountain Plover, are federal species of concern that are either found on or near Kirtland AFB." Base wide survey of Rare Amphibian and Reptiles. The last base wide survey was in 2001.

Add: "The Western Burrowing Owl, Mountain Plover, Millipede, Northern Goshawk, Townsend's Big Eared Bat, and Grama Grass Cactus are federal species of concern found on or near Kirtland AFB."

Add: to second paragraph: No surveys have been conducted for Slate Millipede, Peregrine Falcon, Northern Goshawk, or Grama Grass Cactus.

Issues: add,

No-monitoring management plan has been setup for the Peregrine Falcon.

- Current surveys need to be done in the grasslands to determine if the Mountain Plover occurs on base.
- Surveys need to be done on all federally and state listed species to determine population dynamics and habitat use.

Issues: Remove bullet 6 "A management plan has not been developed for this species."

Section 7.7; page 7-6 GROUND MAINTENANCE

Add new paragraphs: "A Golf Management Plan was developed October 2008 (Appendix I). The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Engineering & the Environment (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide. Armed with the support and approval of the Air Force Services Agency golf program, AFCEE's goal is to facilitate the creation of an environmentally friendly golf course facility while supporting the installation mission. Air Force Installation (AFI) 32-7064, Chapter 11, requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

The golf course environmental baseline assessment (GCEBA), or the Draft Golf Course Environmental Management (GEM) Plan is the initial step in creating a successful ecosystem-based comprehensive GEM Plan. The intent of the GEM Plan is to provide an efficient management tool that will enable course managers to devote more of their efforts to caring for their customers and the golf course. Properly designed and implemented, the GEM Plan will keep the entire golf facility in compliance with the constantly changing environmental requirements while contributing to the local community.

Along with the newly established baseline, the GEM Plan consists of a map and description of the final environmental challenges and the prescribed approach to their management. In addition, the GEM Plan includes a comprehensive list of future environmental management goals, objectives and a course-specific set of best practices.

The following potential environmental challenges were identified in compiling this Final GEM Plan:
• Nuisance species
• Migratory birds
• Energy conservation
• Installation Restoration Program (IRP) sites
• Proposed improvement projects
• Air quality

• Natural resource conditions on base have changed since the 2001 Baseline Natural Resources Inventory was completed, thus making it outdated.
• Long-term documentation of changes in landscapes, vegetation, and other natural resources has not been performed by the base.

Section 7.9, page 7-8, WILDLAND FIRE MANAGEMENT

Add: new paragraphs, "In 2008, a Wildland Fire Management Plan (WFMP) (Appendix K) was written, but not yet implemented for the base. This (WFMP Plan) outlines actions that will be taken by Kirtland AFB fire personnel and natural resource personnel to meet the fire management goals for the installation. The plan meets the requirement in AFI 32-7064 that states "Installations with unimproved lands that present a wildfire hazard, and installations which utilize prescribed burns as a land management tool, will develop and implement a Wildland Fire Management Plan (WFMP). The WFMP will be incorporated into or consistent with the INRMP as a component plan." The natural resources component of the Kirtland AFB Integrated Natural Resources Management Plan (INRMP) addresses the issue of wildland fire management in a general manner. This specific action plan implements fire related management actions from the INRMP.

This plan implements current interagency fire management policies and legislation. It helps achieve resource management and fire management goals as defined in:
- AFI 32-7064 Integrated Natural Resource Management
- The Federal Wildland Fire Management Policy and Program Review (2008)
- Managing Impacts of Wildfires on Communities and the Environment and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (also known as the National Fire Plan, Congressional legislation delivered to USDI/USDA 2007)

- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan (an adjunct to the National Fire Plan 2007)

The goal of wildland fire management is to plan and make decisions that help accomplish the mission of the Air Force, which is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

KAFB will deploy the full toolbox of alternative strategies that are available to wildland fire managers. This will include full suppression where necessary, prescribed fire where needed and when approved by the Base Commander, and manual fuel reduction where necessary. KAFB will endeavor to manage all aspects of wildland fire in concert with neighbors and interagency cooperators. An interagency wildland fire plan for the East Mountain/Withdrawn areas is being discussed with cooperators and will continue to be developed as a concept.

INRMP Goals:

- Work with Collaborative Forest Restoration Program to create a landscape scale model of how the forest should look and to help improve fire danger between neighboring agencies.
- Restore the ponderosa pine forest ecosystem
- Create a stable fire regime within the pinyon juniper woodland. Decrease fuel loads to prevent spread of catastrophic fire.
- Decrease fuel loads from 90 percent capacity to between 20-50 percent
- Use fire to help with invasive plant species

Issues: Add

- Communication and cooperation with Sandia Ranger District needs to occur.
- A complete survey needs to be done to fully assess fuel loads and tree density
- Road improvements need to be done to get equipment into more remote areas of base, only about 10 percent of the area is accessible by road.
- Cultural resources could be damaged by a severe fire or a stand replacing fire.
- Funding of projects

Sect. 7.11, page 7-9, Remove “Bird/Aircraft Strike Hazard (BASH)”, Replace with “Nuisance Management Plan”

First paragraph add: “The Nuisance Management Plan (Appendix I) created for Kirtland AFB is concerned with preventing pest animals and plants from adversely affecting the military mission and operations on base. Nuisance animals, such as coyotes, have come in contact with base personnel and this plan gives advice on what not to do and phone numbers to contact Natural Resources in the event an animal gets injured or has become a nuisance."

Sect/ 7/11. Page 7-11, CULTURAL RESOURCE PROTECTION

Paragraph 4, remove "there is a Cultural Resources Management Plan (July 2000) in place that inventories and protects cultural resources on Kirtland AFB" –Add: "an", remove "(2006)", add "(2008)", remove "and will be in place by 2006."

Sect. 7.12, page7-10, remove "Outdoor Recreation" and replace with "Bird/Aircraft Strike Hazard (BASH)

Sect. 7.13, page 7-10, add "Outdoor Recreation" **and** all paragraph's below.

Fourth paragraph, page 7-10, remove "riding stables and a 14-mile trail around Manzano base", remove "hiking around Manzano Base"

Remove paragraph 2, 3rd sentence, page 7-10: "riding stables and a 14-mile trail around Manzano base" and "hiking around Manzano Base"

Section 7.14, add "Enforcement" and below issues:

Add:

- Frequent trespassing from hunters, hikers, mountain bikers, horseback riders, and all terrain vehicles occurs along the eastern boundary of the Withdrawal Area.
- Security personnel do not know wildlife enforcement procedures as it pertains to the INRMP and DOI

CHAPTER 8

FISH AND WILDLIFE

Sect 8, page 8-2 Objectives,

add:"Implement the October 2007 signed "Memorandum of Understanding" – Tijjeras Arroyo Wildlife Corridor' between the DoD, DOE and City of Albuquerque."

- Add: the MOU to Table 9-1 with a priority rating of 3.

THREATENED AND ENDANGERED SPECIES

Sect 8, page 8-3 Objectives, add:

- Thin out the pinyon juniper woodland habitat on base to encourage use by the state threatened Gray Vireo. Proposed thinning treatments of pinyon juniper stands for habitat improvements using mechanical treatments and prescribed burning. Will be coordinated with NMDG&F Conservation Services Division, Santa Fe office.
- Develop and implement management plans for Peregrine Falcon, Northern Goshawk, Townsend's Big Eared Bat, Slate Millipede, and Grama Grass Cactus.

OUTDOOR RECREATION

Sect 8, page 8-4 Objectives:

Delete: "horseback riding, mountain biking, and"

AMMENDMENT TO FINAL PRAIRIE DOG EA

JULY 2011

1. **Changes to Proposed Action:**
    a. Soap and water method is no longer to be used as a way to remove prairie dogs. Only live trapping will be used as a method of non-lethal capture.
        i. Section 2.1.1.1 to be completely stricken from EA and any other parts of the document that refer to this method.
    b. There are now 31 areas on Kirtland AFB that are no tolerance zones.
        i. Fig 2-1, 2-2, and 3-2 will be updated to show the changes from the previous 11 areas.
    c. The prairie dog relocation site has been established in the north central grasslands.
        i. Fig 2-1 and 3-2 will be updated to show the actual location of the new relocation site.
        i. Section 1.3 remove "five" and update with "11" pg 1-6; add "horse stables" after "golf course" pg 1-6
        i. Section 2, 2.1 remove "11" and add " 31"; remove "from six of these"add "from designated" ; remove "a" and add "2" after "released in" pg 2-1

2. **Insert into the document:**
    a. Issue and Plan of Action KUMMSC Top-Cap Area-Prairie Dog Control, Burrowing Owl Mitigation-Appendix A

CHAPTER 11
PERSONS AND AGENCIES CONTACTED

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CHAPTER 12
LIST OF PREPARERS

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CHAPTER 13
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APPENDIX A
WORK PLANS

Resources Area: Grounds Maintenance and Land Management
Objective: Review and update, if conditions change, the Brush Control Plan
Applicable Primary Goal(s): 1,2,3, and 9
Project Description: Review the 2004 Brush Control Plan. If conditions or goals on base have changed significantly, then an update of the plan shall be completed.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: $55K
Estimated Project Schedule: 2015

Resources Area: Grounds Maintenance and Land Management
Objective: Develop a long-term photographic monitoring program that documents changes in landscape and vegetation on base.
Applicable Primary Goal(s): 1,2, 3, 8, and 9
Project Description: Long-term changes to the vegetation and landscape at Kirtland AFB have not taken place. In order to understand long-term changes to the land photographic monitoring will be developed and implemented. This project will establish photographic points in strategic locations that will be revisited every 10 years. Review of the photographs over a period of years will provide a record of landscape and vegetation changes on base.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: $35K
Estimated Project Schedule: 20013

Resources Area: Forest Management
Objective: Continue consulting with the Sandia Ranger District in cooperation on issue relating to the Withdrawn Area.
Applicable Primary Goal(s): 1,2,3,4,6,7,8,9, and 10
Project Description: Continue consulting with the Sandia Ranger District in cooperation on issues regarding wildlife and habitat suitability in the Withdrawn area on base.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost
Estimated Project Schedule: Immediate and ongoing

Resources Area: Wildland Fire Management
Objective: Implement the Fire Management Plan
Applicable Primary Goal(s): 1,2,3,7,8,9, and 10
Project Description: Implement the Fire Management Plan by securing funding and support.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: $820,887.00K
Estimated Project Schedule: 1012

Resources Area: Integrated Pest Management Program
Objective: Continue to manage prairie dog populations on base to minimize BASH potential, damage to infrastructure, and health/safety concerns by following procedures outlined in Kirtland AFB's Prairie Dog Management and Reallocation Plan.
Applicable Primary Goal(s): 1,2,5, and 7
Project Description: Continue to manage prairie dog populations on base to minimize BASH potiental, damage to infrastructure, and health and safety concerns by following the procedures outlined in Kirtland AFB's Prairie Dog Management and Relocation Plan.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost (Completed in House)
Estimated Project Schedule: Immediate and On going

Resources Area: Bird Aircraft Strike Hazard
Objective: Continue to monitor and remove prairie dogs around flight lines to reduce foraging raptors in the area.
Applicable Primary Goal(s): 1,2, 5, and 7
Project Description: Continue to monitor and remove prairie dogs, according to the Prairie Dog Management Plan, on an as need basis around the flight line to reduce the potential for foraging raptors.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost (To be completed in house)
Estimated Project Schedule: Immediate and Ongoing

Resources Area: Bird/Aircraft Strike Hazard
Objective: Maintain the mowing program around flightlines, according to the Bash Management Plan to reduce attracting prey species for raptors and other wildlife.
Applicable Primary Goal(s): 1,2, 5, and 7
Project Description: Maintain the mowing program around flightlines, according to the Bash Management Plan to reduce attracting prey species for raptors and other wildlife.
Priority: 1 Outdoor Recreation
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost (To be completed in house)
Estimated Project Schedule: Immediate and Ongoing

Resources Area: Outdoor Recreation
Objective: Educate base personnel on locations of running, walking, and biking paths.
Applicable Primary Goal(s): 1,6,8, and 10
Project Description: Educate (through fact sheets and New Comers Orientation) base personnel on locations of running, walking, and biking paths.
Priority: 2
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost (To be completed in house)
Estimated Project Schedule: 2011

Resources Area: Cultural Resources Protection
Objective: Protection of Cultural Resources
Applicable Primary Goal(s): 1 and 9
Project Description: Maintain communication between cultural and natural resources personnel to ensure protection of cultural resources discovered during INRMP implementation.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost
Estimated Project Schedule: Immediate and Ongoing

Resources Area: Enforcement
Objective: Ensure Kirtland AFB security personnel, DOE security personnel and state agencies work together on wildlife poaching issues.
Applicable Primary Goal(s): 1 and 2
Project Description: Continue to insure Kirtland AFB security personnel, DOE security personnel and New Mexico Department of Fish and Game work together when poaching of wildlife or wildlife/vehicle collisions occur.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost
Estimated Project Schedule: Immediate and Ongoing

Resources Area: Conservation Law Enforcement
Objective: Support a Conservation Law Enforcement Officer (CLEO) Program
Applicable Primary Goal(s): 1 and 2
Project Description: Support two positions through EQ for Conservation Law Enforcement Officers. Officers will patrol the Withdrawn area on Kirtland AFB for trespassers, and poachers of wildlife and cultural resources.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: $98K
Estimated Project Schedule: 2013

Resources Area: Law Enforcement
Objective: Ensure new security personnel are aware that unauthorized feeding of wildlife is prohibited on base.
Applicable Primary Goal(s): 1, 2, 5, and 7
Project Description: Base employees frequently feed wildlife on base, especially prairie dogs. Feeding of wildlife can conflict with the bases natural resources management objectives such as BASH and Human Health and Safety issues. Currently, security personnel are aware that feeding of wildlife on base is prohibited. However, no program is in place to ensure that new or future security personnel area aware of this issue. Natural resources personnel at Kirtland AFB shall coordinate with current security personnel to ensure new personnel are aware that unauthorized feeding of wildlife is prohibited.

Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost
Estimated Project Schedule: Immediate and Ongoing
Resources Area: Public Outreach
Objective: Prevent spread of prairie dog colonies off Kirtland AFB
Applicable Primary Goal(s): 1, 2, 6, and 7

Project Description: Continue following Kirtland AFB's Prairie Dog Management Plan to prevent prairie dog colonies from expanding off base.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost (In-House)
Estimated Project Schedule: Immediate and Ongoing
Resources Area: Public Outreach
Objective: Organize conservation projects with non-profit organizations and develop a program educating base personnel and the public about the importance of wetlands and other wildlife

species.
Applicable Primary Goal(s): 1, 2, 3, 6, and 10
Project Description: Organize conservation projects with non-profit organizations such as Scout Troops and the base Youth Group. Continue to develop wildlife and conservation Fact Sheets to educate base personnel and the public on the importance of ecosystem management.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: $5K
Estimated Project Schedule: 2012-2017
Resources Area: Threatened and Endangered Species
Objective: Develop and implement management plans for Peregrine Falcon, Northern Goshawk, Townsend's Big Eared Bat, Slate Millipede (if found during surveys) and Grama

Grass Cactus
Applicable Primary Goal(s): 1, 2, 3, 6, and 10
Project Description: Develop and implement management plans for Peregrine Falcon, Northern Goshawk, Townsend's Big Eared Bar, Slate Millipede and Gama Grass Cactus
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: $55K for each plan
Estimated Project Schedule: 2014-2017
Resources Area: Ground Maintenance and Land Management
Objective: Implement Golf Course Management Plan

Applicable Primary Goal(s): 1, 7, 8, 9, and 10
Project Description: Implement the Golf Course Management Plan that focuses on conservation of water, pest management, weed control, ground maintenance, and minimal use of pesticides and herbicides.
Priority: 1
Office of Primary Responsibility: Base Parks and Recreation
Estimated Cost: No Cost
Estimated Project Schedule: Immediate and Ongoing
Resources Area: Integrated Pest Management Program
Objective: Survey for noxious weeds and develop a management plan.

Applicable Primary Goal(s): 1, 2, 3, 6, 7, 8 and 9
Project Description: Conduct a base wide survey of invasive weeds as identified by the New Mexico Department of Agriculture. Tamarisk, although not considered an invasive weed, will also be surveyed for and identified as a species requiring management. Once the survey is completed, a management plan will be developed to aid the base in eliminating or managing the invasive species that do occur on base.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: $30K
Estimated Project Schedule: 2014-2017
Resources Area: Integrated Pest Management Program
Objective: Implement the Pigeon Management Plan for aircraft hangers where pigeons are

causing health concerns.
Applicable Primary Goal(s): 1, 2, 5, 7, and 7
Project Description: Implement the Pigeon Management Plan for aircraft hangers on base where pigeons are causing health concerns.
Priority: 1
Office of Primary Responsibility: 377th MSG/CEANQ
Estimated Cost: No Cost
Estimated Project Schedule: Immediate and Ongoing

APPENDIX B
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
ENVIRONMENTAL ASSESSMENT

FINDING OF NO SIGNIFICANT IMPACT FOR IMPLEMENTING AN INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR KIRTLAND AIR FORCE BASE, NEW MEXICO

Pursuant to the Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations Parts 1500-1508) for implementing the procedural provisions of the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321 et seq.) and the Air Force Instruction (AFI) 32-7061 (*Environmental Impact Analysis Process*), the United States (US) Air Force (USAF) has conducted an Environmental Assessment (EA) of the potential effects associated with implementing an Integrated Natural Resources Management Plan (INRMP) at Kirtland Air Force Base (AFB). The USAF has prepared this INRMP in accordance with the provision of the Sikes Act Improvement Act of 1997, *Conservation Programs on Military Reservations* (16 USC 670a-670o, 74 Stat. 1052) and AFI 32-7064 (*Integrated Natural Resources Management*).

Proposed Action. The USAF proposes to implement an INRMP, which supports the management of natural resources as described by the plan itself. The purpose of the action is to carry out the set of resource-specific management measures developed in the INRMP, which would enable Kirtland AFB to effectively manage the use and condition of natural resources located on the installation to protect the natural setting primarily for training purposes. Implementation of the proposed action would support the USAF's continuing need to ensure the safety and efficiency of the mission while practicing sound resource stewardship and complying with environmental policies and regulations.

The proposed action supports an ecosystem approach and includes natural resources management measures to be undertaken on Kirtland AFB, Bernalillo County, New Mexico. The proposed action focuses on a 5-year planning period, which is consistent with the timeframe for the management measures described in the INRMP. This planning period would begin in Fiscal Year (FY) 2002 and end in FY 2006. Additional environmental analysis may be required as new management measures are developed over the long-term (i.e., beyond 5 years).

Alternatives. The development of proposed management measures for the INRMP included a screening analysis of resource-specific alternatives. The screening analysis involved the use of accepted criteria, standards, and guidelines, when available, and best professional judgement, to identify management practices for achieving Kirtland AFB natural resources management objectives. The outcome of the screening analysis led to the development of the proposed action as described above. Consistent with the intent of National Environmental Policy Act (NEPA), this screening process focused on identifying a range of reasonable resource-specific management alternatives and, from that, developing a plan that could be implemented, as a whole, in the foreseeable future. Management alternatives deemed to be infeasible were not analyzed further. As a result of the screening process, the EA, made an integral part of the INRMP, formally addresses two alternatives: the proposed action (i.e., implementation of the INRMP) and the No-Action Alternative.

Implementation of the No-Action Alternative means that the proposed management measures set forth in the INRMP would not be implemented. Current management measures for natural resources would remain in effect, and existing conditions would continue. This document refers to the continuation of existing (i.e., baseline) conditions of the affected environment, without implementation of the proposed action, as the No-Action Alternative. Inclusion of a No-Action Alternative is prescribed by CEQ regulations and serves as a benchmark against which the proposed action could be evaluated.

Factors Considered in Determining that No Environmental Impact Statement is Required. The EA that is incorporated by reference into this Finding of No Significant Impact (FONSI) examines potential effects of the proposed action and the No-Action Alternative on resources that could be affected by implementing the INRMP. These include environmental setting, air quality, soils, geology, noise, water resources, wetlands, floodplains, vegetation, wildlife, sensitive species, cultural resources, transportation and circulation, socioeconomics, land use, visual resources, human health and safety, environmental justice (children, minority, or low-income populations), and management of hazardous materials or waste. Implementation of the proposed action would result in short- and long-term beneficial effects on identified resources.

ENVIRONMENTAL ASSESSMENT AND CONSEQUENCES

This section of the document assesses known, potential, and reasonably foreseeable environmental consequences relating to implementing the INRMP and managing natural resources at Kirtland AFB. Section 1.0 of this EA presents potential effects in the context of the scope of the proposed action and in consideration of the affected environment. The assessment presents resource areas adapted from the resources described in the INRMP, Sections 3 and 4, as well as resource areas requiring assessment pursuant to AFI 32-7061, *Environmental Impact Analysis Process* (i.e., socioeconomics and environmental justice). It also considers implementation of the selected management measures in their entirety (as presented in Sections 6 and 7 of the INRMP). Section 2.0 of this EA addresses implementation of the No-Action Alternative that reflects the continuation of existing baseline conditions as described in Sections 3 and 4 of the INRMP. Cumulative effects are discussed in Section 3.0 of this EA.

Implementing the INRMP (i.e., the proposed action) is Kirtland AFB's preferred alternative. A summary of the potential environmental consequences associated with the No-Action Alternative and the proposed action is also presented in Section 3.0 of this EA.

Other management alternatives were considered during the screening process, but were eliminated because they were not economically feasible, ecologically sound, or compatible with the requirements of the military mission. Section 7 provides a description of the goals and objectives used to develop management measures for each resource area's issues and concerns and the rationale for why certain management measures were selected. Therefore, the analytical framework supporting each resource area is not repeated in this section.

As discussed in Sections 1 and 6, the Kirtland AFB INRMP is a "living" document that focuses on a 5-year planning period based on past and present actions. Short-term management practices included in the plan have been developed without compromising long-range goals and objectives. Because the plan will be modified over time, additional environmental analyses may be required as new management measures are developed for the long-term (i.e., beyond 5 years).

1.0 PROPOSED ACTION (PREFERRED ALTERNATIVE)

Potential consequences associated with the proposed action are discussed in this section for each resource described in Sections 3 and 4. Section 1.3 summarizes the analysis of potential consequences for the proposed action and compares them to the No-Action Alternative (i.e., baseline or existing conditions). Potential environmental consequences associated with implementing the INRMP would result in either no effects or beneficial effects for the resource areas. Compared to the No-Action Alternative, environmental conditions at Kirtland AFB would improve as a result of implementing the proposed INRMP. Therefore, implementing the INRMP (i.e., the proposed action) is the preferred alternative.

Expected consequences of the preferred alternative for each resource area are presented in the following paragraphs:

- *Environmental Setting* – Beneficial effects on the general environmental conditions of Kirtland AFB would be expected from implementation of the INRMP (i.e., the proposed action). Implementation of the proposed action would have beneficial effects for many of Kirtland AFB's natural resources, which would result in overall improvement of the environmental setting.
- *Air Quality* – No effects would be expected. The primary concern regarding air quality and potential environmental effects pertains to increases in pollutant emissions; exceeding National Ambient Air Quality Standards and other federal, state, and local limits; and impacts on existing air permits.

Examples of activities that would result in potential adverse changes in air quality conditions include changes in military equipment, increase in the number or location of personnel, construction of new facilities or modification of existing facilities, or increase or change in military operations. However, potential effects on existing pollutant emissions are precluded by the fact that the proposed action does not involve any activities that would contribute to changes in existing air quality conditions. Only minor, temporary increases in particulates (i.e., dust) could be observed during ground disturbing activities such as recontouring disturbed or eroded areas. Therefore, there would be only minimal, short-term effects on air quality as a result of implementing the proposed action.

- *Soils* – Overall, beneficial effects would be expected. Implementation of certain projects described in the INRMP (e.g., Coyote Springs Phase II activities, prairie dog relocation, revegetation action plans, road closures, bike trail), could result in minor, but temporary, soil disturbance. In the long term, however, implementation of the INRMP will increase soil stabilization.
- *Geology* – Beneficial effects would be expected. By implementing projects that result in a reduction of soil erosion, impacts on geologic resources associated with erosion on Kirtland AFB would be minimized.

- *Noise* – No long-term effects would be expected. The primary concern regarding noise and potential environmental effects pertains to increases in sound levels, exceeding acceptable land use compatibility guidelines, and changes in public acceptance (i.e., noise complaints). However, potential effects are precluded by the fact that the proposed action does not involve any activities that would impact overall noise conditions, such as changes in military equipment (especially aircraft); increase in the number or location of personnel; construction of new facilities or modification of existing facilities; or increase or change in military operations. A short-term localized increase in noise could occur during ground-disturbing activities necessary to recontour disturbed areas or to repair erosion effects. These activities will typically take place in remote areas so should not affect any sensitive land uses, such as schools or hospitals. Therefore, there is expected to be no negative effects on noise levels or sound quality as a result of implementing the proposed action.
- *Water Resources* – Beneficial effects would be expected. Removal of salt cedars from Coyote Springs wetland would increase the amount of water available to the wetland. Repair and conversion of guzzlers could decrease or eliminate degradation of the springs that provide water to the guzzlers. The long-term reduction of soil erosion could reduce sedimentation of water resources on Kirtland AFB.
- *Wetlands* – Beneficial effects would be expected. In addition to enhancing the wetland itself, restoration of Coyote Springs wetland would provide a site where Kirtland AFB representatives could educate personnel and the public on the value of wetlands. The noxious weed inventory and management plan could work toward elimination of salt-cedars and other species that adversely impact area wetlands.
- *Floodplains* – No negative effects would be expected.
- *Vegetation* – Overall, beneficial effects would be expected. Implementation of certain projects described in the INRMP (e.g., prairie dog relocation and habitat enhancement, brush control, road closures, bike trail) could result in minor, but temporary, disturbance to vegetation. In the long term, however, implementation of the INRMP will result in improved habitat conditions. Completion of Coyote Springs restoration Phase II and the revegetation action plans would improve Kirtland AFB's vegetation. Other projects, such as the baseline natural resources inventory, noxious weed inventory and management plan, wetland flora inventory, and Phase II of the vegetation manual, would provide Kirtland AFB personnel with information that would facilitate proper management of base vegetation.
- *Wildlife* – Overall, beneficial effects would be expected. Several projects described in the INRMP consist of conducting surveys or inventories of Kirtland AFB's wildlife. Information obtained from these efforts would help base personnel properly manage wildlife resources. Habitat improvement projects would ultimately benefit wildlife species occupying those areas. Raptor-proofing power poles would reduce raptor mortality. Brush control may adversely impact some animals, depending upon the role of brush in their habitat.
- *Sensitive Species* – Beneficial effects on all special status species at Kirtland AFB would be expected. Implementation of the proposed action would provide security and management for species not protected under the Endangered Species Act (e.g., burrowing

owl, mountain plover, gray vireo), and could result in the discovery of federally threatened or endangered species not currently known to occupy the base.

- *Cultural Resources* – No adverse effects would be expected since the INRMP would be implemented in compliance with the Cultural Resources Management Plan for Kirtland AFB. Any ground disturbing activities would be cleared for cultural resources concerns prior to implementation.
- *Transportation and Circulation* – Beneficial effects would be expected. Implementation of the withdrawal area road closure plan would result in some inactive roads being closed in sensitive or damaged areas and the restoration and repair of roads that should be kept open. The plan would also include road maintenance activities that would improve existing transportation routes.
- *Socioeconomics* – No effects would be expected. The primary concern regarding potential effects on socioeconomic resources pertains to changes in population, housing, and economic conditions. Potential effects are precluded by the fact that the proposed action does not involve any activities that would contribute to changes in socioeconomic resources. Therefore, there would be no effects on socioeconomic resources as a result of implementing the proposed action.
- *Land Use* – Overall, beneficial effects would be expected. Prairie dog relocation and habitat enhancement would result in long-term benefits to land use. During installation of raptor-proof devises on power poles, there may be temporary power outages to protect the workers; however, these would be coordinated with base personnel so there would be no interference with missions.
- *Visual Resources* – No effects would be expected. The primary concern regarding potential effects on visual resources pertains to impacts to substantially altering a visually sensitive setting. Visual sensitivity is defined as the degree of public interest in a visual resource and concern over adverse changes in the quality of that resource. Potential effects are precluded by the fact that the proposed action does not involve any activities that would substantially change the quality of a visually sensitive setting. Therefore, there would be no effects on visual resources as a result of implementing the proposed action.
- *Human Health and Safety* – Beneficial effects would be expected. Prairie dog relocation and habitat enhancement would result in long-term benefits to human health and safety by separating areas high in human inhabitation from the prairie dogs that cause trip and fall hazards with their burrows, that could bite children playing nearby, and that could present a source of infection and disease (i.e., rabies or black plague). Brush control would reduce the likelihood of uncontrolled wildfires, which would also improve safety on base.
- *Environmental Justice (Children, Minority, or Low-Income Populations)* – No effects would be expected. The primary concern regarding environmental justice and potential environmental effects pertains to disproportionately high and adverse consequences to children or minority or low-income communities. Implementation of the proposed action in itself would not create any advantage or disadvantage for any group or individual. The proposed INRMP is not expected to create disproportionately high or adverse human health or environmental effects on children or on minority or lowincome populations or communities at or surrounding Kirtland AFB. The base would address, however, any project-specific issues regarding disproportionate adverse health or environmental effects

on children or minority or low-income groups, should they arise, and would use best environmental management practices to ensure compliance with applicable regulatory requirements. Therefore, there would be no effects as a result of implementing the proposed action.

- *Management of Hazardous Materials or Waste* – No effects would be expected. Hazardous and toxic materials would continue to be handled in accordance with federal laws and AFIs including the Resource Conservation and Recovery Act; Federal Insecticide, Fungicide, and Rodenticide Act; Toxic Substances Control Act; and AFI 32-4002. Therefore, no adverse effects regarding the generation of hazardous and toxic materials would be expected under the proposed action.

These findings are consistent with the goals of the natural resources management program to:

1. Use an integrated ecosystem, adaptive management approach to mission planning and management of natural resources;
2. Develop and implement for sensitive species management strategies in coordination with state and federal agencies;
3. Comply with the Sikes Act Improvement Act of 1997, AFI 32-7064, Memoranda of Agreement concerning migratory birds and use of US Forest Service (USFS) land, and USAF and USFS guidelines for managing natural resources
4. Conserve or enhance wildlife habitats;
5. Integrate project planning to conserve natural resources;
6. Support investigations into resource conservation;
7. Decrease bird-aircraft strike hazard impacts effects on flying missions;
8. Develop and implement an education program for on-base personnel and the public to increase the awareness, appreciation, and conservation of natural resources;
9. Develop, implement, and maintain recreational opportunities that are compatible with the mission and with natural resource conservation;
10. Control pest species with a natural resources conservation focus; and
11. Maintain a database of current natural resources information to support both mission and project planning and natural resources management program activities.

If implemented, the management measures recommended by the INRMP would directly and positively affect the health and condition of natural resources at Kirtland AFB.

2.0 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, Kirtland AFB's INRMP would not be implemented and current natural resources management practices would continue "as is." The outdated INRMP would continue to be used despite the fact that it has not been reviewed or revised to apply to current conditions on base. Existing management practices would continue, and no new initiatives would be established.

If the No-Action Alternative were adopted, Kirtland AFB would be out of compliance with the Sikes Act Improvement Act and AFI 32-7064. The INRMP content and need is driven by AFI 32-7064, *Integrated Natural Resources Management*, and the Sikes Act Improvement Act of

1997, *Conservation Programs on Military Reservations*, whose focus is to conserve and enhance biodiversity while maximizing natural resources utilization. The goal of the INRMP is to support the USAF mission while providing sound natural resources management practices. The INRMP must address the interrelationship between individual resources, mission activities, and adjacent land uses. The biggest noncompliance issue would be the lack of coordination with federal and state agencies regarding natural resources management. This lack of coordination could result in a break-down in management policies that could, in turn, adversely affect natural resources on and near the base.

Under the No-Action Alternative, the environmental conditions at Kirtland AFB would not benefit from the management measures associated with implementing the proposed INRMP. For example, if soils were not stabilized though the projects described in the INRMP, erosion would be expected to continue; this could adversely impact the vegetation, geological resources, and water resources on base. Without conducting inventory surveys, Kirtland AFB personnel cannot properly manage wildlife resources

In summary, although the analysis of existing (i.e., baseline) conditions identifies no significant adverse environmental concerns, Kirtland AFB would rely on an outdated INRMP for the conservation, management, or restoration of its natural resources. This conflicts with the Sikes Act Improvement Act, AFI 32-7064, and Kirtland AFB's own natural resources management goals. Section 1.3 summarizes the analysis of potential consequences for the No-Action Alternative and compares them to the proposed action.

3.0 CUMULATIVE EFFECTS

A cumulative effect is defined as an effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place locally or regionally over a period of time.

Implementation of the INRMP would result in a comprehensive natural resources management strategy for Kirtland AFB that represents compliance, restoration, prevention, and conservation; improves the existing management approach for natural resources on the base; and meets legal and policy requirements consistent with national natural resources management philosophies. Implementation would be expected initially to improve existing environmental conditions at Kirtland AFB, as described in Section 1.1. Over time, adoption of the proposed action would enable Kirtland AFB to achieve its goal of maintaining ecosystem viability and ensuring sustainability of military missions.

Although growth and development can be expected to continue outside of Kirtland AFB and within the surrounding natural areas, cumulative adverse effects on these resources would not be expected when added to the effects of activities associated with the proposed management measures contained in the INRMP.

APPENDIX C
KIRTLAND AIR FORCE BASE MANAGEMENT PLANS AND SURVEY REPORTS

The following Natural Resources Management Plans and Reports are on file and available at Kirtland AFB.

- Environmental Assessment for Kirtland AFB Prairie Dog Management Program, November 2003.
- Kirtland AFB Wetland Inventory Survey, 2006.
- Final Surveying Report for Mountain Plover and Gray Vireo Populations at Kirtland AFB, August 2005.
- Updated Report of Vegetation at Kirtland AFB, March 2004.
- Final Surveying Report for Mountain Plover and Gray vireo Populations at Kirtland AFB, February 2004.
- Work Plan for Surveying Mountain Plover and Gray Vireo Populations at Kirtland AFB, October 2002.
- Rare Amphibian and Reptile Survey Report for Kirtland AFB, February 2004.
- Kirtland AFB Coyote Springs Wetland Restoration Project, January 2006.
- Kirtland AFB Wetland Delineation Report, December 2006.
- Kirtland AFB Base Wide Raptor Survey, October 2003 – November 2004.
- Five year Report on the Population Status, Reproductive Success, and Site Fidelity of Western Burrowing Owls (*Athene cunicularia hypugaea*) on Kirtland AFB, 1998 – 2003.
- Population Status, Reproductive Success, Prey Delivery, and Site Fidelity of Western Burrowing Owls (*Athene cunicularia hypugaea*) on Kirtland AFB, 2011.
- Kirtland AFB Integrated Natural Resources Management Plan for Kirtland AFB, September 2007.
- Kirtland AFB Brush Control Plan for Kirtland AFB, July 2004.
- Kirtland AFB Hazardous Waste Management Plan, December 2004.
- Kirtland AFB Revegetation Action Plan for Kirtland AFB, September 2004.
- Kirtland AFB Road Closure and Maintenance Plan for Kirtland AFB, June 2004.
- Kirtland AFB Pest Management Plan, 2011.
- Kirtland AFB Land Management Plan, 2009.
- Kirtland AFB Integrated Wetland Restoration and Management Plan 2008
- Kirtland AFB Western Burrowing Owl Management Plan 2008
- Kirtland AFB Nuisance Management Plan 2010
- Kirtland AFB Wildland Fire Management Plan, July 2011.
- Kirtland AFB Bird Aircraft Strike Hazard Plan 92-212, April 2010
- Integrated Wetland Restoration and Management Plan, October 2008.

APPENDIX D
SOIL DESCRIPTIONS FOR KIRTLAND AIR FORCE BASE

APPENDIX D: SOIL DESCRIPTIONS FOR KIRTLAND AIR FORCE BASE

Table D-1. Soil series found at Kirtland Air Force Base and the Withdrawal Area

Soil Series	Description	Native Vegetation
Bluepoint loamy fine sand, 1-9% slopes	Deep, somewhat excessively drained soil that formed on alluvial fans and terraces. Nearly level to moderately sloping	Indian ricegrass Black grama Mesa dropseed
Bluepoint-Kokan Association, hilly	50% Bluepoint loamy fine sand with 5-15% slopes and 40% Kokan gravelly sand with 15-40% slopes.	Black grama Sand Sagebrush Fourwing Saltbush
Cut and Fill land	Sandy loam and very gravelly sand that has been mixed by filling for residential, industrial, and business developments	Black grama Blue grama Broom snakeweed
Embudo gravelly fine sandy loam, 0-5% slopes	Deep, well drained soils that formed in alluvium derived from decomposed, coarse grained, granitic rocks on old alluvial fans.	Black grama Blue grama Tree Cholla
Embudo-Tijeras complex, 0-9% slopes	50% Embudo gravelly fine sandy loam with 0-5% slopes and 35% Tijeras fine gravelly fine sandy loam with 1-9% slopes	Black grama Blue grama Apache plume
Gila fine sandy loam	Nearly level to level soil in at the mouth of the Tijeras arroyo. Deep, well drained soil that formed in alluvium along floodplains.	Black grama Three-awn Apache plume
Ildefonso gravelly sandy loam, 1-9% slopes	Deep, well-drained soils formed in gravelly, stratified, calcareous alluvium on alluvial fans. Found west of the Manzano Mtns.	Black grama Blue grama One-seeded juniper
Laporte-Rock Outcrop-Escabosa complex, 5-20% slopes	35% Laporte loam with 5-20% slopes, 20% Rock outcrop, and 15% Escabosa loam with 5-20% slopes	Pinyon pine One-seeded juniper Side-oats grama
Latene sandy loam, 1-5% slopes	Deep, well drained soils formed in old alluvium and Aeolian sediment on the mesas east and west of the Rio Grande	Mesa dropseed Blue grama Broom snakeweed
Madurez loamy fine sand, 1-5% slopes	Deep, well drained soil formed on piedmonts in old unconsolidated alluvium modified by the wind.	Black grama Indian ricegrass Sand sagebrush
Madurez-Wink Association, gently sloping	55% Madurez fine sandy loam with 1-5% slopes and 25% Wink fine sandy loam with 1-7% slopes. On	Black grama Three-awn Apache plume

	the east and west Mesas	
Soil Series	**Description**	**Native Vegetation**
Nickel-Latene Association	50% Nickel gravelly fine sandy loam with 5-30% slopes and 40% Latene sandy loam wit 1-5% slopes.	Black grama Fourwing saltbush Apache plume
Pajarito loamy fine sand 1-9% slopes	Deep, well drained soils formed in old alluvium and Aeolian deposits on the mesas along the Rio Grande	Indian ricegrass Galleta Sand dropseed
Pino-Rock outcrop Association	40% Pino silt loam and 30% Rock outcrop. Slopes are 3-15%.	Pinyon pine One-seeded juniper Ponderosa pine
Rock outcrop-Laporte complex, 30-80% slopes	55% Rock outcrop and 30% Laporte loam with 20-45% slopes. On the steep side of the Manzano Mountains	Pinyon pine One-seeded juniper Alderleaf mountain mahogany
Rock outcrop-Orthids complex, 40-80% slopes	40% Rock outcrop and 30% Orthids with 30-80% slopes. On the west face of the Manzanita Mountains.	Pinyon pine One-seeded juniper Big sagebrush
Rock outcrop-Ustolls complex, 15-70% slopes	55% Rock outcrop and 30%Ustolls. One the west face of the Manzano Mountains	Pinyon pine One-seeded juniper Side-oats grama
Salas complex, 20-80% slopes	55% Salas very gravelly loam and 30% similar extremely stony soils. Formed from residuum weathered from Manzanita Mountains	Pinyon pine One-seeded juniper Side-oats grama
Seis very cobbly loam 0-15% slopes.	Moderately deep, well drained soils formed in residuum weathered from limestone on the sides of mountains	Pinyon pine One-seeded juniper Side-oats grama
Silver and Witt soils, 5-9% slopes	55% Silver very fine sandy loam and 25% Witt very fine sandy loam. East of the Sandia and Manzano Mountains	Black grama Blue grama Galleta
Tesajo-Millet stony sandy loams	40% Tesajo stony sandy loam with 3-20% slopes and 40% Millet stony sandy loam with 3-15% slopes	Black grama One-seeded juniper Skunkbush
Tijeras gravelly fine sandy loam, 1-5% slopes	Deep, well drained soils formed in decomposed granitic alluvium on old alluvial fans. On the east mesa	Black grama Blue grama Apache plume
Tome very fine sandy loam	Deep, well drained soils formed in alluvial sediments derived from limestone and shale on broad alluvial fans.	Black grama Blue grama Apache plume

Soil Series	**Description**	**Native Vegetation**
Wink fine sand loam, 0-5% slopes	Deep, well drained soils formed in old unconsolidated alluvium modified by wind on piedmonts	Blue grama Broom snakeweed Sand dropseed
Wink-Embudo complex, 0-5% slopes	65% Wink fine sandy loam with 1-%5 slopes and 25% Embudo gravelly fine sandy loam with 0-5% slopes	Black grama Blue grama Apache plume

Source: USDA 1977.

APPENDIX E
FLORA LIST FOR KIRTLAND AIR FORCE BASE

APPENDIX E: FLORA LISTS FOR KIRTLAND AIR FORCE BASE

Common Name	Scientific Name
Grasses and Grass Like Plants	
Indian ricegrass	*Achnatherum hymenoides (syn. Oryzopsis hymenoides)*
Spike bent	*Agrostis exarata*
Six-weeks three-awn	*Aristida adscensionis*
Red three-awn	*Aristida purpurea var. longiseta*
Purple three-awn	*Aristida purpurea var. purpurea*
Cane bluestem	*Bothriochloa barbinodis (syn. Andropogon barbinodis)*
Sixweeks grama	*Bouteloua barbata*
Side-oats grama	*Bouteloua curtipendula*
Black grama	*Bouteloua eriopoda*
Blue grama	*Bouteloua gracilis*
Hairy grama	*Bouteloua hirsuta*
Fringed brome	*Bromus ciliatus*
Cheatgrass	*Bromus tectorum*
Windmill grass	*Chloris verticillata*
Fluff grass	*Dasyochloa pulchella (syn. Erioneuron pulchellum, Tridens pulchellus)*
Squirreltail	*Elymus elymoides ssp. Brevifolius (syn. Elymus longifolius, Sitanion hystrix)*
Needle-and-thread	*Hesperostipa comata ssp. comata (syn. Stipa comata)*
Foxtail barley	*Hordeum jubatum*
Smooth barley	*Hordeum murinum ssp. glaucum (syn. H. stebbinsii, H. glaucum)*
Mexican rush	*Juncus mexicanus*
Torrey rush	*Juncus torreyi*
Tall fescue	*Lolium arundinaceum (syn. Festuca elatior)*
Bush muhly	*Muhlenbergia porteri*
Ring muhly	*Muhlenbergia torreyi*
Galleta	*Pleuraphis jamesii (syn. Hilaria jamesii)*
Kentucky bluebrass	*Poa pratensis*
Rabbitfoot grass	*Polypogon monspeliensis*
Three-square bulrush	*Schoenoplectus americanus*
Green bristle grass	*Setaria viridis*
Spike dropseed	*Sporobolus contractus*
Sand dropseed	*Sporobolus cryptandrus*
Mesa dropseed	*Sporobolus flexuosus*
Cattail	*Typha latifolia*

Common Name	Scientific Name
Forbs	
Rock jasmine	*Androsace septentrionalis ssp. subulifera*
Yerba mansa	*Anemopsis californica*
Mesa daisy	*Aphanostephus ramosissimus var. humilis (syn. A. arizonicus)*
Antelope horns	*Asclepias asperula*
Broadleaf milkweed	*Asclepias latifola*
Poison milkweed	*Asclepias subverticillata*
Mottled locoweed	*Astragalus lentiginosus var. diphysus*
Missouri locoweed	*Astragalus missouriensis*
Desert marigold	*Baileya multiradiata*
Lyreleaf green eyes	*Berlandiera lyrata*
Hartweg's sundrops	*Calylophus hartwegii*
Southwestern paintbrush	*Castilleja integra*
Baby aster	*Chaetopappa ericoides (syn. Leucelene ericoides)*
Fendler spurge	*Chamaesyce chaetocalyx var. chaetocalyx (syn. Euphorbia fendleri var. chaetocalyx)*
Gray goosefoot	*Chenopodium incanum*
New Mexico thistle	*Cirsium neomexicanum*
Yellowspine thistle	*Cirsium ochrocentrum*
Field bindweed	*Convolvulus arvensis*
Golden smoke	*Corydalis aurea*
Buffalo gourd	*Cucurbita foetidissima*
Southwestern thorn apple	*Datura wrightii*
Tansy mustard	*Descurainia sophia*
Spectacle pod	*Dimorphocarpa wislizeni (syn. Dithyrea wislizenii)*
American dragonhead	*Dracocephalum parviflorum (syn. Moldavica parviflora)*
Antelope sage	*Eriogonum jamesii*
Simpson's buckwheat	*Eriogonum microthecum ssp. simpsonii (syn. E. simpsonii)*
Western wallflower	*Erysimum capitatum (syn. E. asperum)*
Alkali yellowtops	*Flaveria campestris*
Reddome blanketflower	*Gaillardia pinnatifida*
Scarlet gaura	*Gaura coccinea*
Velvety guara	*Gaura mollis (syn. Guara parviflora)*
Purple geranium	*Geranium caespitosum (syn. G. caespitosum var. caespitosum)*
Desert gilia	*Gilia sinuata*
Western pink vervain	*Glandularia bipinnatifida*
Wright's verbena	*Glandularia wrightii*
Curlytop gumweed	*Grindelia nuda (syn. G. squarrosa var. nuda)*
False pennyroyal	*Hedeoma drummondii*
Prairie sunflower	*Helianthus petiolaris*
Golden aster	*Heterotheca villosa (syn. Chrysopsis villosa)*
Alumroot	*Heuchera parvifolia*
Hogpotato	*Hoffmanseggia glauca*

Common Name	Scientific Name
Bitterweed	*Hymenoxys acaulis var. acaulis*
Winterfat	*Krascheninnikovia lanata (syn. Eurotia lanata)*
Common Name	**Scientific Name**
Prickly leaf lettuce	*Lactuca serriola*
Stickseed	*Lappula occidentalis var. cupulata (syn. L. texana var. coronata)*
Western peppergrass	*Lepidium montanum*
Fendler's bladderpod	*Lesquerella fendleri*
Lewis' flax	*Linum lewisii*
Plains flax	*Linum puberulum*
Narrow-leaved gromwell	*Lithospermum incisum*
Wayside gromwell	*Lithospermum multiflorum*
Wright's deer vetch	*Lotus wrightii*
Perennial goldenweed	*Machaeranthera pinnatifida (syn. Haplopappus spinulosus ssp. spinulosus)*
Tansy aster	*Machaeranthera tanacetifolia*
Creeping barberry	*Mahonia repens*
Fendler's desert dandelion	*Malacothrix fendleri*
Plains blackfoot daisy	*Melampodium leucanthum*
Yellow sweet clover	*Melilotus officinalis*
Rough menodora	*Menodora scabra*
Whitestem stickleaf	*Mentzelia albicaulis*
Blazing star	*Mentzelia multiflora*
Colorado four o'clock	*Mirabilis multiflora*
Wild four-o'clock	*Mirabilis nyctaginea (syn. Oxybaphus nyctagineus)*
Bear grass	*Nolina microcarpa*
Prairie evening primose	*Oenothera albicaulis*
New Mexico butterweed	*Packera neomexicana var. neomexicana (syn. Senecio neomexicanus)*
Juniper lousewort	*Pedicularis centranthera*
Southwestern penstemon	*Penstemon barbatus*
James penstemon	*Penstemon jamesii (syn. P. jamesii ssp. jamesii)*
Wandbloom penstemon	*Penstemon virgatus*
Scorpion weed	*Phacelia integrifolia*
Santa Fe phlox	*Phlox nana*
Woolly plantain	*Plantago patagonica (syn. P. purshii var. purshii)*
Clammyweed	*Polanisia dodecandra ssp. trachysperma (syn. P. trachysperma)*
White milkwort	*Polygala alba*
Mountain parsley	*Pseudocymopterus montanus*
Mexican hat	*Ratibida columnifera*
Short-rayed coneflower	*Ratibida tagetes*
Canaigre	*Rumex hymenosepalus*
Russian thistle	*Salsola tragus (syn. Salsola iberica)*
Pink windmills	*Schoenocrambe linearifolia (syn. Sisymbrium linearifolium)*
Threadleaf groundsel	*Senecio flaccidus var. flaccidus (syn. Senecio longilobus)*
Silverleaf nightshade	*Solanum elaeagnifolium*

Scarlet globemallow	*Sphaeralcea coccinea*
Fendler's globemallow	*Sphaeralcea fendleri*
Wrinkled globemallow	*Sphaeralcea hastulata (syn. S. subhastulata)*

Common Name	**Scientific Name**
Common dandelion	*Taraxacum officinale*
Navajo tea	*Thelesperma filifolium*
Hopi tea	*Thelesperma megapotamicum*
Prickly-leaf dogweed	*Thymophylla acerosa (syn. Dyssodia acerosa)*
Tall Townsend daisy	*Townsendia eximia*
Salsify	*Tragopogon dubius*
Goathead	*Tribulus terrestris*
Common mullein	*Verbascum thapsus*
New Mexico vervain	*Verbena macdougalii*
Canyon grape	*Vitis arizonica*
Banana yucca	*Yucca baccata*
Great Plains yucca	*Yucca glauca*
Prairie zinnia	*Zinnia grandiflora*
Cactus	
Cylinder bells	*Echinocereus chloranthus*
Fendler's hedgehog	*Echinocereus fendleri*
Clarets cup cactus	*Echinocereus triglochidiatus*
Green pitaya	*Echinocereus viridiflorus*
Spiny star	*Escobaria vivipara var. vivipara (syn. Coryphantha vivipara)*
Wright's fishhook cactus	*Mammillaria wrightii*
Beavertail cactus	*Opuntia basilaris*
Club Cholla	*Opuntia clavata*
Englemann cactus	*Opuntia engelmannii (syn. O. phaeacantha var. discata)*
Tree cholla	*Opuntia imbricata*
New Mexican prickly pear	*Opuntia phaeacantha*
Plains prickly pear	*Opuntia polyacantha*
Grama grass cactus	*Schlerocactus papyracanthus (syn. Pediocactus papyranthus)*
Shrubs and Trees	
Tree-of-heaven	*Ailanthus altissima*
Bigelow sage	*Artemisia bigelovii*
Carruth's sagewort	*Artemisia carruthii (syn. A. kansana)*
Sand sagebrush	*Artemisia filifolia*
Fringed sage	*Artemisia frigida*
Cudweed sagewort	*Artemisia ludoviciana*
Fourwing saltbush	*Atriplex canescens*
Mountain brickellbush	*Brickellia grandiflora*
Alderleaf mountain mahogany	*Cercocarpus montanus*
Indigobush	*Dalea formosa*
Southwestern thorn apple	*Datira wrightii*
Russian olive	*Elaeagnus angustifolia*

Mormon tea	*Ephedra trifurca*
Rubber rabbitbrush	*Ericameria nauseosa var. nauseosa (syn. Chrysothamnus nauseosus)*
Fendler spurge	*Euphorbia fendleri var. chaetocalyx*
Common Name	**Scientific Name**
Apache plume	*Fallugia paradoxa*
Cliff fendlerbush	*Fendlera rupicola var. rupicola*
Broom snakeweed	*Gutierrezia sarothrae*
One-seed juniper	*Juniperus monosperma*
Rocky Mountain juniper	*Juniperus scopulorum*
Pale wolfberry	*Lycium pallidum (syn. Physalis pallidum)*
Mock-orange	*Philadelphus microphyllus*
Pinyon pine	*Pinus edulis*
Ponderosa pine	*Pinus ponderosa*
Fremont cottonwood	*Populus fremontii*
Honey mesquite	*Prosopis glandulosa (syn P. glandulosa var. glandulosa and P. glandulosa var. torreyana)*
Hop tree	*Ptelea trifoliate*
Gambel oak	*Quercus gambelii*
Gray oak	*Quercus grisea*
Shrub live oak	*Quercus turbinella*
Wavyleaf oak	*Quercus x pauciloba (syn. Q. undulate)*
Smooth sumac	*Rhus glabra*
Squawbush	*Rhus trilobata*
Trumpet gooseberry	*Ribes leptanthum*
New Mexican locust	*Robinia neomexicana*
Wild rose	*Rosa woodsii (syn. R. woodsii var. fendleri)*
Bluestem willow	*Salix irrorata*
Arroyo willow	*Salix lasiolepis*
Snowberry	*Symphoricarpos rotundifolius*
Salt-cedar	*Tamarix chinensis (syn. T. pentandra and T. ramosissima)*
Prickly-leaf dogweed	*Thymophylla acerosa (syn. Dyssodia acerosa)*
Siberian elm	*Ulmus pumila*
Mexican squawroot	*Conopholis alpine var. mexicana (syn. C. mexicana)*
Multiple species	Cryptogamic crust
Fern	
Crustose, Fruticose, and Foliose Lichens	
Juniper mistletoe	*Phoradendron juniperinum*

APPENDIX F
FAUNA LIST FOR KIRTLAND AIR FORCE BASE

APPENDIX F: FAUNA LISTS FOR KIRTLAND AIR FORCE BASE

Common Name	Scientific Name
Mammals	
Texas Antelope Squirrel	*Ammospermophilus interpes*
Pallid Bat	*Antrozous pallidus*
Black-tailed Jack Rabbit	*Califonicus lepus*
Coyote	*Canis latrans*
Rock Pocket Mouse	*Chaetodipus intermedius*
Spotted Ground Squirrel	*Citellus spilosoma*
Gunnison’s Prairie Dog	*Cynomys gunnisoni*
Merriam’s Kangaroo Rate	*Dipodomys merriami*
Ord’s Kangaroo Rat	*Dipodomys ordii*
Banner-tailed Kangaroo Rat	*Dipodomys spectabilis*
Big Brown Bat	*Eptesicus fuscus*
Common Porcupine	*Erethizon dorsatum*
Spotted Bat	*Euderma maculatum*
Colorado Chipmunk	*Eutamias quadrivittatus*
Mountain Lion	*Felis concolor*
Silver-haired Bat	*Lasionycteris noctivagans*
Hoary Bat	*Lasiurus cinereus*
Bobcat	*Lynx rufus*
Striped Skunk	*Mephitis mephitis*
Long-tailed Weasel	*Mustela frenata*
Southwestern Myotis	*Myotis auriculus*
California Myotis	*Myotis californicus*
Small-footed Myotis	*Myotis ciliolabrum*
Little Brown Myotis	*Myotis lucifugus*
Fringed Myotis	*Myotis thysanodes*
Long-legged Myotis	*Myotis volans*
Yuma Myotis	*Myotis yumanensis*
White-throated Woodrat	*Neotoma albigua*
Southern Plains Woodrat	*Neotoma micropus*
Desert Shrew	*Notiosorex crawfordi*
Mule Deer	*Odocoileus hemionus*
New Mexico Grasshopper Mouse	*Onychomys arenicola*
Northern Grasshopper Mouse	*Onychomys leucogaster*
Silky Pocket Mouse	*Perognathus flavus*
Brush Mouse	*Peromyscus boylii*
Rock Mouse	*Peromyscus difficilis*
White-footed Mouse	*Peromyscus leucopus*
Deer Mouse	*Peromyscus maniculatus*
Pinyon Mouse	*Peromyscus truei*
Western Pipistrelle	*Pipistrellus hesperus*
Townsend’s Big-eared Bat	*Plecotus townsendii*
Common Raccoon	*Procyon lotor*
Western Harvest Mouse	*Reithrodontomys megalotis*

Plains Harvest Mouse	*Reithrodontomys montanus*
Spotted Ground Squirrel	*Spermophilus spilosoma*
Common Name	**Scientific Name**
Rock Squirrel	*Spermophilus variegates*
Western Spotted Skunk	*Spilogale gracilis*
Desert Cottontail	*Sylvilagus audubonii*
Mountain Cottontail	*Sylvilagus floridus*
Mexican Free-Tailed Bat	*Tadarida brasiliensis*
Badger	*Taxidea taxus*
Botta's Pocket Gopher	*Thomomys bottae*
Common Gray Fox	*Urocyon cinereoargenteus*
Black Bear	*Ursus americanus*
Kit Fox	*Vulpes macrotis*

Birds

Cooper's Hawk	*Accipiter cooperii*
Northern Goshawk	*Accipiter gentiles*
Sharp-shinned Hawk	*Accipiter striatus*
Spotted Sandpiper	*Actitis macularia*
White-Throated Swift	*Aeronautes saxatalis*
Cassin's Sparrow	*Aimophila cassini*
Rufous-crowned Sparrow	*Aimophila ruficeps*
Sage Sparrow	*Amphispiza belli*
Black-throated Sparrow	*Amphispiza bilineata*
Mallard	*Anas platyrhynchos*
Scrub Jay	*Aphelocoma coerulescens*
Golden Eagle	*Aquila chyrsaetos*
Black-chinned Hummingbird	*Archilochus alexandri*
Great Blue Heron	*Ardea herodias*
Long-Eared Owl	*Asio otus*
Burrowing Owl	*Athene cunicularia spp. hypugaea*
Juniper Titmouse	*Baeolophus griseus*
Bridled Titmouse	*Baeolophus wollweberi*
Cedar Waxwing	*Bombycilla cedrorum*
Canada Goose	*Branta Canadensis*
Great-horned Owl	*Bubo virginianus*
Red-tailed Hawk	*Buteo jamaicensis*
Ferruginous Hawk	*Buteo regalis*
Swainson's Hawk	*Buteo swainsoni*
Lark Bunting	*Calamospiza melanocorys*
Gambel's Quail	*Callipela gambelii*
Scaled Quail	*Callipepla squamata*
Cactus Wren	*Campylorhynchus brunneicapillus*
Whip-Poor-Will	*Caprimulgus vociferous*
Pine Siskin	*Carduelis pinus*
Lesser Goldfinch	*Carduelis psaltria*
Cassin's Finch	*Carpodacus cassinii*
House Finch	*Carpodacus mexicanus*

Turkey Vulture	*Cathartes aura*
Hermit Thrush	*Catharus guttatus*
Canyon Wren	*Catherpes mexicanus*
Common Name	**Scientific Name**
Brown Creeper	*Certhis americana*
Mountain Plover	*Charadrius montanus*
Killdeer	*Charadrius vociferous*
Lark Sparrow	*Chonedestes grammacus*
Common Nighthawk	*Chordeiles minor*
Northern Harrier	*Circus cyaneus*
Evening Grosbeak	*Coccothraustes vespertinus*
Northern Flicker	*Colaptes auratus*
Band-tailed Pigeon	*Columba fasciata*
Rock Dove	*Columba livia*
Olive-sided Flycatcher	*Contopus borealis*
Western Wood-Pewee	*Contopus sordidulus*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Chihuahuan Raven	*Corvus cryptoleucus*
Steller's Jay	*Cyanocitta stelleri*
Black Swift	*Cypseloides niger*
Yellow-rumped Warbler	*Dendroica coronata*
Grace's Warbler	*Dendroica graciae*
Black-throated Gray Warbler	*Dendroica nigrescens*
Yellow Warbler	*Dendroica petechia*
Dusky Flycatcher	*Empidonax oberholseri*
Cordilleran Flycatcher	*Empidonax occidentalis*
Gray Flycatcher	*Empidonax wrightii*
Horned Lark	*Eremophila alpestris*
Prairie Falcon	*Falco mexicanus*
Peregrine Falcon	*Falco peregrinus*
American Kestrel	*Falco sparverius*
Greater Roadrunner	*Geococcyx californianus*
Blue Grosbeak	*Guiraca caerulea*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Cliff Swallow	*Hirundo pyrrhonota*
Barn Swallow	*Hirundo rustica*
Bullock's Oriole	*Icterus bullockii*
Baltimore Oriole	*Icterus galbula*
Scott's Oriole	*Icterus parisorum*
Dark-eyed Junco	*Junco hyemalis*
Loggerhead Shrike	*Lanius ludovicianus*
Red Crossbill	*Loxia curvirostra*
Acorn Woodpecker	*Melanerpes formicivorus*
Lewis' Woodpecker	*Melanerpes lewis*
Wild Turkey	*Meleagris gallopavo*
Song Sparrow	*Melospiza melodia*
Northern Mockingbird	*Mimus polyglottos*
Brown-headed Cowbird	*Molothrus ater*

Townsend’s Solitaire	*Myadestes townsendi*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Macgillivray’s Warbler	*Oporornis tolmiei*
Sage Thrasher	*Oreoscoptes montanus*
Common Name	**Scientific Name**
Western Screech Owl	*Otus kennicottii*
House Sparrow	*Passer domesticus*
Savannah Sparrow	*Passerculus sandwichensis*
Common Poorwill	*Phalaenoptilus nuttallii*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Downy Woodpecker	*Picoides pubescens*
Ladder-backed Woodpecker	*Picoides scalaris*
Hairy Woodpecker	*Picoides villosus*
Green-tailed Towhee	*Pipilo chlorurus*
Rufous-sided Towhee	*Pipilo erythrophthalmus*
Canyon Towhee	*Pipilo fuscus*
Spotted Towhee	*Pipilo maculates*
Hepatic Tanager	*Piranga flava*
Western Tanager	*Piranga ludoviciana*
Whited-faced Ibis	*Plegadis chihi*
Black-capped Chickadee	*Poecile atricapillus*
Mountain Chickadee	*Poecile gambeli*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Bushtit	*Psaltriparus minimus*
Great-tailed Grackle	*Quiscalus mexicanus*
Ruby-crowned Kinglet	*Regulus calendula*
Golden-crowned Kinglet	*Regulus satrapa*
Bank Swallow	*Riparia riparia*
Rock Wren	*Salpinctes obsoletus*
Say’s Phoebe	*Sayornis saya*
Broad-tailed Hummingbird	*Selasphorus platycercus*
Rufous Hummingbird	*Selasphorus rufus*
Western Bluebird	*Sialia mexicana*
Red-breasted Nuthatch	*Sitta canadensis*
White-breasted Nuthatch	*Sitta carolinensis*
Pygmy Nuthatch	*Sitta pygmaea*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Williamson’s Sapsucker	*Sphyrapicus thyroideus*
Black-chinned Sparrow	*Spizella atrogularis*
Brewer’s Sparrow	*Spizella breweri*
Chipping Sparrow	*Spizella passerina*
Northern Rough-Winged Swallow	*Stelgidopteryx serripennis*
Eastern Meadowlark	*Sturnella magna*
Western Meadowlark	*Sturnella neglecta*
European Starling	*Sturnus vulgaris*
Violet-green Swallow	*Tachycineta thalassina*
Bewick’s Wren	*Thryomanes bewickii*
Crissal Thrasher	*Toxostoma crissale*
Curved-billed Thrasher	*Toxostoma curvirostre*

Brown Thrasher	*Toxostoma rufum*
House Wren	*Troglodytes aedon*
American Robin	*Turdus migratorius*
Western Kingbird	*Tyrannus verticalis*
Cassin's Kingbird	*Tyrannus vociferans*
Common Name	**Scientific Name**
Barn Owl	*Tyto alba*
Virginia's Warbler	*Vermivora virginiae*
Warbling Vireo	*Vireo gilvus*
Solitary Vireo	*Vireo solitarius*
Gray Vireo	*Vireo vicinior*
Wilson's Warbler	*Wilsonia pusilla*
White-Winged Dove	*Zenaida asiatica*
Mourning Dove	*Zenaida macroura*
White-crowned Sparrow	*Zonotrichia leucophrys*
Reptiles/Amphibians	
Tiger Salamander (Larvae)	*Ambystoma tiginum*
Glossy Snake	*Arizona elegans*
Great Plains Toad	*Bufo cognatus*
Red-spotted Toad	*Bufo punctatus*
Woodhouse Toad	*Bufo woodhousii*
Chihuahuan Spotted Whiptail	*Cnemidophorus exsanguis*
Little Striped Whiptail	*Cnemidophorus inornatus*
New Mexico Whiptail	*Cnemidophorus neomexicanus*
Whiptail Lizard	*Cnemidophorus spp.*
Western Diamondback Rattlesnake	*Crotalus atrox*
Black-tailed Rattlesnake	*Crotalus molossus*
Western Rattlesnake	*Crotalus viridis*
Common Collard Lizard	*Crotaphytus collaris*
Many-lined Skink	*Eumeces multivirgatus*
Great Plains Skink	*Eumeces obsoletus*
Long-nosed Leopard Lizard	*Gambelia wislizenii*
Western Hognose Snake	*Heterodon nasicus*
Lesser Earless Lizard	*Holbrookia maculata*
Night Snake	*Hypsiglena torquata*
Coachwhip Snake	*Masticophus flagellum*
Striped Whipsnake	*Masticophus taeniatus*
Texas Horned Lizard	*Phrynosoma cornutum*
Short-horned Lizard	*Phrynosoma douglasii*
Roundtail Horned Lizard	*Phrynosoma modestum*
Bull/Gopher Snake	*Pituophis melanoleucus*
Texas Longnosed Snake	*Rhinocheilus lecontei*
Mountain Patchnosed Snake	*Salvadora grahamiae*
Couch's Spadefoot Toad	*Scaphiopus couchii*
Prairie Lizard/Eastern Fence Lizard	*Sceloporus undulatus*
Desert Massasauga	*Sistrurus catenatus spp. edwardsii*
New Mexico Spadefoot Toad	*Spea multiplicata*

Desert/Western Box Turtle	*Terrapene ornate spp. luteola*
Tree Lizard	*Urosaurus ornatus*
Side-blotched Lizard	*Uta stansburiana*

Common Name	**Scientific Name**
Fish	
Catfish	*Ictalurus spp.*
Carp	*Cyprinus spp.*
Goldfish	*Carassius auratus*

APPENDIX G
SPECIES OF CONCERN FOR BERNALILLO COUNTY

APPENDIX G: SPECIES OF CONCERN FOR BERNALILLO COUNTY

Common Name	Scientific Name	Federal Status	State Status
Fish			
Rio Grande Silvery Minnow	*Hyboganthus amarus*	E	E
Birds			
Baird's Sparrow	*Ammodramus bairdii*		T
Common Black-hawk	*Buteogallus anthracinus Anthracinus*		T
Mountain Plover	*Charadrius montanus*		
Yellow-billed Cuckoo	*Coccyzus americanus Occidnetalis*		C
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E	E
American Peregrine Falcon	*Falco peregrinus anatum*		T
Whooping Crane	*Grus americana*	E	E
Bald Eagle	*Haliaeetus leucicephalus*	T	T
Loggerhead Shrike	*Lanius ludovicianus*	SC	
Neotropic Cormorant	*Phalacrocorax brasilianus*		T
Mexican Spotted Owl	*Strix occidnetalis lucida*	T	
Western Burrowing Owl	*Athene cunnicularia*		SC
Bell's Vireo	*Vireo bellii*		T
Gray Vireo	*Vireo vicinior*		T
Mammals			
Spotted Bat	*Euderma maculatum*		T
Pale Townsends Big-eared Bat	*Plecotus townsendii pallescens*	SC	
New Mexico Jumping Mouse	*Zapus hudsonius luteus*		T
Plants			
Santa Fe	Milkvetch *Astragalus feensis*		S
Wild Hollyhock	*Iliamna gradiflora*		R

Notes: E = Endangered, T = Threatened, C = Candidate, SC = Species of Concern, S = Sensitive, R = Rare

APPENDIX H
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
ANNUAL REVIEW AND AGENCY CORRESPONDENCE LETTERS

APPENDIX I
PRAIRIE DOG MANAGEMENT PLAN FOR KIRTLAND AIR FORCE BASE

35-01-188

F I N A L

ENVIRONMENTAL ASSESSMENT

FOR

KIRTLAND AIR FORCE BASE PRAIRIE DOG MANAGEMENT PROGRAM

November 2003

Prepared for
377th Air Base Wing Air Force Materiel Command

SUMMARY OF ANTICIPATED ENVIRONMENTAL EFFECTS

Proposed Actions

Implementation of the Proposed Actions could result in minor short-term negative impacts to air quality, noise, and soils from construction-related activities. Beneficial impacts are expected to occur in the areas of human health and safety, and socioeconomics. No impacts are anticipated to occur to current land uses, water resources, floodplains, vegetation, wetlands, minority and low-income populations, cultural resources, visual resources, transportation, or hazardous wastes from the Proposed Actions. Insignificant impacts would affect wildlife around no-tolerance zones and buffer zones. This impact is due to the decrease of all living wildlife within the burrows during fumigation. However, a positive impact to wildlife is expected from the establishment of the translocated prairie dog colony by providing quality habitat for a variety of species if funding and the law allows.

Human Health and Safety. Removing prairie dogs from specified areas of the base in accordance with the Proposed Actions would benefit human health and safety in four primary areas:

- Reduced risk of human exposure to plague-carrying fleas;
- Reduced numbers of rattlesnakes around occupied areas of the base once prairie dogs are removed;
- Reduced potential for injuries caused by tripping or falling into prairie dog burrows that are located around housing, administration, and recreational areas; and
- BASH reduction by reducing the number of raptors foraging on prairie dogs around flight paths.

No negative impacts to human health and safety from the live capture and relocation of prairie dogs to a relocation site are expected as personnel involved would exercise appropriate caution when handling prairie dogs. Additionally, no negative impacts from the application of aluminum phosphide tablets would occur, as only licensed pesticide applicators would apply the rodenticide while adhering to all field safety protocols.

Air Quality. The absence of prairie dogs from no-tolerance zones would result in positive impacts to air quality from reduced wind erosion caused by prairie dog activities around these sites. Fumigation involves releasing toxic gas inside the burrow system that has been sealed off. When aluminum phosphide tablets are applied in this manner, they release phosphine gas that migrates through the soil and dissipates gradually into the atmosphere. Once it reaches the surface, it quickly mixes with fresh air which eliminates its toxicity, rendering it harmless. Therefore, there will be no impacts to air quality from applying aluminum phosphate tablets. The establishment of a new relocation site may have negligible and short-term effects to air quality caused by the auguring of new burrows and the eventual establishment of a prairie dog colony.

Land Use. No negative impacts to land use are expected as the Proposed Actions reduce conflicts caused by prairie dog inhabitation. The proposed relocation site was inhabited in the past by prairie dogs and relocating prairie dogs to this site would not cause conflicts with military missions.

Geological Resources. Implementation of the Proposed Actions could result in short-term erosion impacts to soils by using the soap and water technique for capturing prairie dogs and auguring new burrows and the eventual establishment of a prairie dog colony in the north central portion of the base. Where applicable, impacts would be minimized by using best management practices to reduce continued erosion.

Water Resources. No negative impacts are expected to water resources from the Proposed Actions since the amount of water used for the soap and water capture method is negligible and no other water resources would be impacted. The aluminum phosphide tablets would have no effect on water resources because the gas from the tablets move upward and are released at the surface. It does not sink into the ground water.

Biological Resources. Implementation of the Proposed Actions could negatively impact the burrowing owl. To avoid significant impacts to the burrowing owl, several measures would be taken. First, fumigation would not be allowed within 150 feet of any burrowing owl hole. Additionally, these holes will be marked to prevent capping of the owl burrows during fumigation so that the owls may continue to use the site in following years. Artificial owl burrows may be installed in no-tolerance zones and the new relocation site to promote burrowing owl inhabitation. Once a prairie dog colony is established at the relocation site it is anticipated that burrowing owls would use abandoned burrows at the new location. No negative impacts are expected for other sensitive species since none are known to occur in the proposed project area. Wetlands would not be impacted, as none are located within the project area. Vegetation at the relocation site would undergo successional changes due to the reintroduction of prairie dogs. While species composition would likely change, it would be under natural conditions providing local wildlife a place to find shelter and food. Local wildlife around the no-tolerance zones and buffer zones would likely decrease temporarily as fumigation kills everything living in prairie dog burrows. However, a positive impact to wildlife is expected from the establishment of the translocated prairie dog colony by providing quality habitat for a variety of species.

Cultural Resources. An evaluation of the area of potential ground disturbance for the Proposed Actions indicates that some significant resources could be affected. However, prairie dogs would not be released in areas identified as having significant cultural resources and prairie dog-proof fencing would be erected around such sites should it become necessary. As a result, no significant impacts to cultural resources are anticipated from the Proposed Actions.

Environmental Management. Several Installation Restoration Program (IRP) sites are located within the no-tolerance zones. Personnel familiar with the sites would determine if prairie dogs could be successfully removed without any risk to human health and safety from contaminants. Impacts from fumigation would not occur because phosphine gas reaching the surface quickly becomes nontoxic as it mixes with fresh air. Additionally, the residue left behind is considered to be non-toxic and does not persist in the food chain. Six active IRP sites are located within the proposed relocation site. Mitigation measures such as constructing prairie dog barriers around these areas would prevent adverse impacts to environmental management activities.

Alternative 1: Alternative Relocation Site

Implementation of Alternative 1 would result in impacts similar to those described for the Proposed Actions. Impacts from live capture and fumigation of prairie dogs would be the same since they include the same areas. Impacts associated with the alternative relocation site would be similar to those associated with the proposed relocation site, but due to its smaller size of approximately 370 acres, the overall impacts would be less. Since the alternative relocation site is larger than the area needed for prairie dog relocation, impacts to the site from prairie dog inhabitation is expected to be similar to that of the proposed relocation site. Fewer cultural and IRP sites are associated with the alternative relocation site, therefore impacts to these resources would also be less significant.

No-Action Alternative

Under this alternative, Kirtland AFB would continue to fumigate prairie dogs on an "as-needed" basis. No changes would occur to any environmental or human resources as a result of the implementation of this alternative. Concerns associated with human health and safety as well as potential conflicts with the military mission at Kirtland AFB would not be addressed under this alternative.

CONCLUSION

After careful review of the EA of the Proposed Actions, I have concluded that the Proposed Actions would not have a significant impact on the quality of the human environment and would not generate significant controversy. Therefore, issuance of a Finding of No Significant Impact is warranted, and an Environmental Impact Statement is not required. This analysis fulfills the requirements of the National Environmental Policy Act and the implementing regulations promulgated by the Council on Environmental Quality.

Approved By: Henry L. Andrews Jr Date: JAN 1 8 2004
HENRY L. ANDREWS, JR., Colonel, USAF
Commander

FINDING OF NO SIGNIFICANT IMPACT

PRAIRIE DOG MANAGEMENT PROGRAM
AT KIRTLAND AIR FORCE BASE, NEW MEXICO

The 377th Air Base Wing of Air Force Materiel Command prepared the attached Environmental Assessment (EA) to assess the environmental consequences of Proposed Actions at Kirtland Air Force Base (AFB). The actions consist of: capture and relocation of prairie dogs to a site on base if funding and the law allows. Otherwise, prairie dogs will be fumigated in no-tolerance and buffer zones on Kirtland AFB. The Department of the Air Force has independently evaluated this EA and adopts it herein.

DESCRIPTION OF THE PROPOSED ACTIONS AND ALTERNATIVES

Proposed Actions

Kirtland AFB proposes to eliminate prairie dogs from specific areas of the base (no-tolerance and buffer zones). Other non-specific areas that receive excessive prairie dog damage may also be subject to control (i.e. future conflicts between base missions and prairie dogs). No-tolerance zones include several small areas located north of Tijeras Arroyo, munitions storage complex, golf course, heliport, Explosive Ordnance Disposal (EOD) Range, Well No. 9 Complex (consists of riding stables, an administration area, the safeguard transportation driving area, and safety inspection pad), antennae array site, and four Department of Defense radioactive training areas. Buffer zones are 200-300 foot areas surrounding each of the no-tolerance zones that may also be subject to prairie dog control. The Proposed Actions include the establishment of a prairie dog relocation site in the north-central portion of the base if funding becomes available and the law allows for relocation. The base proposes to use non-lethal methods, when feasible, to remove prairie dogs from certain no-tolerance and buffer zones. Prairie dog control methods proposed for use at Kirtland AFB vary in success rate and safety to humans and other animal species that use prairie dog burrows for shelter. Soap and water would be one method used to capture prairie dogs in the no-tolerance and buffer zones. Live trapping may also be conducted to capture prairie dogs when time allots. However, at this time live capture and removal is prohibited by the Center for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA) interim final rule restricting import, capture, transport, sale, barter, exchange, distribution, and release of African rodents, prairie dogs, and certain other animals. Lethal control methods, using aluminum phosphide tablets, will be used while the law prohibits relocation and in the event of prairie dogs re-inhabiting no-tolerance and buffer zones.

The primary reason for the use of non-lethal capture methods is to relocate animals to an area where they would no longer pose conflicts with base personnel or missions. Although prairie dogs cause conflicts in certain areas of the base, there are large undeveloped areas where prairie dogs could co-exist with base activities. The north-central portion of the base is one such area consisting of approximately 3,500 acres. If funding is obtained and the law allows, this site would be prepared for prairie dog relocation by mowing the vegetation to less than six inches and by auguring burrows for the newly translocated prairie dogs. Prairie dogs would be released into an artificial burrow and covered with a retention cage for several days to protect them during the relocation process. During this time, they would be provided with food and water until the retention cages were removed 3-5 days later.

Alternative 1: Alternative Relocation Site

This alternative is virtually the same as the Proposed Actions except that the alternative relocation site is located east of the EOD Range and consists of approximately 370 acres. Capture and relocation protocol would be the same as for the Proposed Actions, as well as the use of aluminum phosphide tablets to control remaining or re-inhabiting prairie dogs in no-tolerance and buffer zones. Although the alternative relocation site is large enough to accommodate all of the prairie dogs proposed for relocation, it does not allow for the same degree of future colonization as the Proposed Actions.

No-Action Alternative

The No-Action Alternative consists of continuing the present prairie dog control effort on Kirtland AFB. Prairie dogs would not be captured and the prairie dog relocation site would not be created. Areas where prairie dogs conflict with military mission and operations are fumigated but not throughout any no-tolerance zones in a single effort. Although this alternative does not rectify health and safety concerns, Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations § 1502.14 [CEQ 1978]) stipulate that the No-Action Alternative be analyzed to assess any environmental consequences that may occur if the proposed action is not implemented.

F I N A L

ENVIRONMENTAL ASSESSMENT

FOR

KIRTLAND AIR FORCE BASE PRAIRIE DOG MANAGEMENT PROGRAM

November 2003

Prepared for

377th Air Base Wing Air Force Materiel Command

Erratum

To The
Final Environmental Assessment
For
Kirtland Air Force Base
Prairie Dog Management Program

On November 4th, 2003 the Food and Drug Administration and the Centers for Disease Control and Prevention published in the Federal Register an Interim Final Rule governing the capture and relocation of prairie dogs due to concerns associated with the spread of monkeypox. The Final Environmental Assessment for the Kirtland Air Force Base (AFB) Prairie Dog Management Program was finalized on November 5th, 2003 and, as a result, did not include the new rule in the document. This erratum discusses the purpose of the interim final rule and how it affects the Prairie Dog Management Program at Kirtland AFB. All information contained in this erratum came from the Federal Register Vol. 68, No. 213.

The summary in the interim final rule states: "The Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA) are issuing this interim final rule to amend their regulations to establish new restrictions and modify existing restrictions of the import, capture, transport, sale barter, exchange, distribution, and release of African rodents, prairie dogs, and certain other animals. We are taking this action to prevent the spread of monkey pox, a communicable disease, in the United States."

Monkeypox is a rare viral disease that was inadvertently transported to this country through a shipment of exotic African rodents brought to the U.S. for distribution into the pet trade. In May 2003, people from several midwestern states began contracting monkeypox, primarily as a result of contact with prairie dogs that had contracted monkeypox from diseased African rodents. Monkeypox is a form of other pox diseases such as chicken and small pox and is characterized by rashes, temperature at or above

99.3 degrees, chills and/or sweats, headache, backache, lymphadenopathy, sore throat, cough, and shortness of breath. Monkeypox has a mortality rate in humans ranging from 1-10 percent. Monkeypox can spread to humans from an infected animal through an animal bite or direct contact with the animal's lesions or body fluids (such as a bite) (CDC 2003). Transmission from person to person is possible but monkeypox is less infectious than smallpox.

This interim final rule states that the FDA will regulate the capture and release of prairie dogs, as well as other actions and species, to prevent the spread of monkeypox. Under 21 CFR 1240.63(a)(1)(i), all individuals, including state and federal entities, are not allowed to capture and/or release prairie dogs. However, under 21 CFR 1240.63(a)(2), one can capture and relocate prairie dogs after receiving permission from the FDA. 21 CFR 1240.63(a)(2)(ii)(A) describes the procedures for seeking written permission from the FDA for the capture and relocation of prairie dogs. 21 CFR 1240.63(a)(2)(ii)(B) requires Kirtland AFB to state why they need an exemption, describe the number of animals involved, describe how the animals will be transported, describe any holding facilities, quarantine procedures, and/or veterinarian evaluation involved in the animals' movement, and explain why an exemption will not result in the spread of monkeypox within the U.S. The FDA will grant exemptions on a case-by-case basis and only for specific purposes and in specific circumstances.

Although New Mexico has no known cases of monkeypox, Kirtland AFB would need to request written permission from the FDA to capture and relocate prairie dogs from no-tolerance zones to the proposed relocation site before implementing the 2003 Prairie Dog Management Program. If written permission is granted by the FDA, it is unlikely that the monkeypox virus would spread in the U.S. through the proposed action since monkeypox is not known to occur in the state of New Mexico. Furthermore, written permission would require either a veterinarian evaluation of the prairie dogs involved, or a quarantine period, both of which would help to determine if monkeypox was present. If monkeypox was found to be present, then capture and relocation of prairie dogs would not take place. Personnel involved with the capture and relocation of prairie dogs would wear protective clothing (i.e. pants, long sleeved shirts, and leather gloves) to prevent infection with monkeypox. For the above-mentioned reasons, no significant impacts are expected to occur to personnel involved with the capture and relocation of prairie dogs at Kirtland AFB. Furthermore, monkeypox would not be spread due to the proposed action.

References:

Center for Disease Control and Prevention (CDC) 2003. *Questions and Answers About Monkeypox.* 4 November. http://www.cdc.gov/ncidid/monkeypox/qa.htm

Federal Register 2003. Vol. 68, No. 213. 4 November.

ACRONYMS AND ABBREVIATIONS

ABW	Air Base Wing
AEHD	Albuquerque Environmental Health Department
AFB	Air Force Base
AFI	Air Force Instruction
AFMC	Air Force Materiel Command
AICUZ	Air Installation Compatible Use Zone
BASH	Bird Aircraft Strike Hazard
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CWA	Clean Water Act
DCGL	Derived Concentration Guideline Level
DoD	Department of Defense
DOE	Department of Energy
EA	Environmental Assessment
EIAP	Environmental Impact Assessment Process
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ICM	Interim Corrective Measure
INRMP	Integrated Natural Resources Management Plan
INWS	Interservice Nuclear Weapons School
IRP	Installation Restoration Program
KUMMSC	Kirtland Underground Munition Maintenance and Storage Complex
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMAAQS	New Mexico Ambient Air Quality Standards
NMDG&F	New Mexico Department of Game and Fish
NMEMNRD	New Mexico Energy, Minerals, and Natural Resources Department
NO_2	Nitrogen Dioxide
NRC	Nuclear Regulatory Commission
O_3	Ozone
Pb	Lead
RAP	Revegetation Action Plan
RCRA	Resource Conservation & Recovery Act
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
USAF	US Air Force
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USGS	US Geological Survey
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The potential environmental impacts associated with the capture and relocation of prairie dogs to a relocation site on base and fumigation of remaining prairie dogs in no-tolerance and buffer zones at Kirtland Air Force Base (AFB) were evaluated in this Environmental Assessment prepared for the 377th Air Base Wing (377th ABW) of Air Force Materiel Command (AFMC).

PURPOSE AND NEED FOR THE PROPOSED ACTIONS

AFMC's 377th ABW proposes to capture and relocate prairie dogs to a relocation site on base. Prairie dogs that could not be captured for relocation and those that reinhabit no-tolerance and buffer zones would be fumigated in order to:

- Reduce the risk of aircraft collisions with raptors foraging on prairie dogs inhabiting areas around the flight lines; this is referred to as Bird-Aircraft Strike Hazard (BASH).
- Reduce the risk to humans of contracting plague caused by exposure to prairie dogs infested with plague carrying fleas.
- Reduce the risk of injuries to residents, personnel, and visitors caused by tripping or falling into prairie dog burrows, especially around housing and recreational areas.
- Reduce the risk of human conflicts with rattlesnakes and poisonous spiders that often inhabit prairie dog burrows.
- Avoid impacts to important military missions caused by prairie dogs excavating burrows and gnawing through buried utility cables.
- Reduce damage to landscaped areas on base caused by prairie dog activities such as foraging and excavating.

DESCRIPTION OF THE PROPOSED ACTIONS AND ALTERNATIVES

Proposed Action

Kirtland AFB proposes to remove prairie dogs from specific areas of the base (no-tolerance and buffer zones). No-tolerance zones include several small areas located north of Tijeras Arroyo, munitions storage complex, golf course, heliport, Explosive Ordnance Disposal (EOD) Range, Well No. 9 Complex (consists of riding stables, an administration area, the safeguard transportation driving area, and safety inspection pad), antennae array site, and four Department of Defense radioactive training areas. Buffer zones are 200-300 foot areas surrounding each of the no-tolerance zones that may also be subject to prairie dog relocation and control on an as needed basis. The Proposed Actions include the establishment of a prairie dog relocation site in the north-central portion of the base. The base proposes to use non-lethal methods first to remove prairie dogs from certain no-tolerance and buffer zones. Prairie dog control methods proposed for use at Kirtland AFB vary in success rate and safety to humans and other animal species that use prairie dog burrows for shelter. Soap and water would be one method used to capture prairie dogs in the no-tolerance and buffer zones. Another non-lethal method used would be live trapping. After non-lethal methods have been attempted, aluminum phosphide tablets would be used to fumigate all remaining prairie dogs. Lethal control methods would be used in the event of future reinhabitation of prairie dogs into the no-tolerance and buffer zones.

The primary reason for the use of non-lethal capture methods is to relocate animals to an area where they would no longer pose conflicts with base personnel or missions. Although prairie dogs cause conflicts in certain areas of the base, there are large undeveloped areas where prairie dogs could coexist with base activities. The north-central portion of the base is one such area consisting of approximately 3,500 acres. This site would be prepared for prairie dog relocation by mowing the vegetation to less than six inches and by auguring burrows for the newly translocated prairie dogs. Prairie dogs would be released into an artificial burrow and covered with a retention cage for several days to protect them during the relocation process. During this time they would be provided with food and water until the retention cages were removed 3-5 days later.

<u>Alternative 1: Alternative Relocation Site</u>

This alternative is virtually the same as the Proposed Actions except that the alternative relocation site is located east of the EOD Range and consists of approximately 370 acres. Capture and relocation protocol would be the same as for the Proposed Actions, as well as the use of aluminum phosphide tablets to control remaining or reinhabiting prairie dogs in no-tolerance and buffer zones. Although the alternative relocation site is large enough to accommodate all of the prairie dogs proposed for relocation, it does not allow for the same degree of future colonization as the site chosen in the Proposed Actions.

No-Action Alternative

The No-Action Alternative consists of continuing the present prairie dog control effort on Kirtland AFB. Prairie dogs would not be captured and the prairie dog relocation site would not be created. Areas where prairie dogs are an immediate problem are fumigated on an "as-needed" basis but not throughout any no-tolerance zones in a single effort. Although this alternative does not rectify health and safety concerns, Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations § 1502.14 [CEQ 1978]) stipulate that the No-Action Alternative be analyzed to assess any environmental consequences that may occur if the proposed action is not implemented.

Alternatives Considered, But Not Carried Forward

Four additional alternatives were considered including shooting the prairie dogs with a .22 caliber pellet gun, vacusuction, fumigation as a stand-alone method, and live trapping and relocation as a stand-alone method. These alternatives were eliminated from further consideration for several different reasons. Shooting was eliminated because it would create unnecessary health and safety problems from ricocheting bullets, as well as not being an effective means of control. Vacusuction was eliminated because its success on Gunnison's prairie dogs is undocumented and it is considered by many to be inhumane. The final two alternatives were eliminated because neither alternative achieved the goal of establishing a non-conflicting prairie dog colony on base, coupled with prairie dog control in no-tolerance and buffer zones. Fumigation as a stand-alone method does not include a prairie dog relocation site and the live capture and relocation method does not address prairie dog eradication in no-tolerance and buffer zones.

SUMMARY OF ANTICIPATED ENVIRONMENTAL EFFECTS

Proposed Actions

Implementation of the Proposed Actions could result in minor short-term negative impacts to air quality, noise, and soils from construction-related activities. Beneficial impacts are expected to occur in the areas of human health and safety, land uses, and socioeconomics. No significant impacts are anticipated to occur to water resources, floodplains, vegetation, wetlands, minority and low-income populations, cultural resources, visual resources, transportation, or hazardous wastes from the Proposed

Actions. Insignificant impacts would affect wildlife around no-tolerance zones and buffer zones. This impact is due to the decrease of all living wildlife within the burrows during fumigation. However, a positive impact to wildlife is expected from the establishment of the translocated prairie dog colony by providing quality habitat for a variety of species.

Human Health and Safety. Removing prairie dogs from specified areas of the base in accordance with the Proposed Actions would benefit human health and safety in four primary areas:

- Reduced risk of human exposure to plague-carrying fleas;
- Reduced numbers of rattlesnakes around occupied areas of the base once prairie dogs are removed;
- Reduced potential for injuries caused by tripping or falling into prairie dog burrows that are located around housing, administration, and recreational areas; and
- BASH reduction by reducing the number of raptors foraging on prairie dogs around flight paths.

No negative impacts to human health and safety from the live capture and relocation of prairie dogs to a relocation site are expected as personnel involved would exercise appropriate caution when handling prairie dogs. Additionally, no negative impacts to human health and safety from the application of aluminum phosphide tablets would occur, as only licensed pesticide applicators would apply the rodenticide while adhering to all field safety protocols.

Air Quality. The absence of prairie dogs from no-tolerance zones would result in a minor positive impact to air quality from reduced wind erosion caused by prairie dog activities. The establishment of a new relocation site may have negligible and short-term effects to air quality caused by the auguring of new burrows and the eventual establishment of a prairie dog colony. Fumigation involves releasing toxic gas inside the burrow system that has been sealed off. When aluminum phosphide tablets are applied in this manner they release phosphine gas that migrates through the soil and dissipates gradually into the atmosphere. Once it reaches the surface it quickly mixes with fresh air, which eliminates its toxicity, rendering it harmless. Therefore, impacts to air quality from applying aluminum phosphate tablets are unlikely.

Land Use. No negative impacts to land use are expected as the Proposed Actions reduce conflicts caused by prairie dog inhabitation. The proposed relocation site was inhabited in the past by prairie dogs and relocating prairie dogs to this site would not cause conflicts with military missions. Furthermore, the site is capable of accommodating the relocated prairie dog population.

Geological Resources. Implementation of the Proposed Actions could result in minor short-term negative impacts to soils by using the soap and water technique for capturing prairie dogs and auguring new burrows and the eventual establishment of a prairie dog colony in the north central portion of the base. Impacts would be minimized by using best management practices to reduce continued erosion.

Water Resources. No negative impacts are expected to water resources from the Proposed Actions since the amount of water used for the soap and water capture method is negligible and no other water resources would be impacted. The aluminum phosphide tablet would have no effect on water resources because the gas from the tablets move upward and are released at the surface. It does not sink into the ground water.

Biological Resources. Implementation of the Proposed Actions could negatively impact the burrowing owl. To avoid significant impacts to the burrowing owl several measures would be taken. First, fumigation would not be allowed within 150 feet of any burrowing owl hole. Additionally, these holes will be marked to prevent capping of the owl burrows during fumigation so that the owls may continue to use the site in following years. Artificial owl burrows may be installed in no-tolerance zones and the new relocation site to promote burrowing owl inhabitation. Once a prairie dog colony is established at the relocation site it is anticipated that burrowing owls would use abandoned burrows at the new location. No negative impacts are expected for other sensitive species since none are known to occur in the proposed project area. Wetlands would not be impacted, as none are located within the project area. Vegetation at the relocation site would undergo successional changes due to the reintroduction of prairie dogs. While species composition would likely change, it would be under natural conditions providing local wildlife a place to find shelter and food. Local wildlife around the no-tolerance and buffer zones would likely decrease temporarily as fumigation kills everything living in prairie dog burrows. A positive impact to wildlife is expected from the establishment of the translocated prairie dog colony by providing quality wildlife habitat.

Cultural Resources. An evaluation of the area of potential ground disturbance for the Proposed Actions indicates that some significant resources could be affected. Therefore, prairie dogs would not be released in areas identified as having significant cultural resources and prairie dog-proof fencing would be erected around such sites should it become necessary. As a result, no significant impacts to cultural resources are anticipated from the Proposed Actions.

Environmental Management. Several Installation Restoration Program (IRP) sites are located within the no-tolerance zones. Personnel familiar with the sites would determine if prairie dogs could be successfully removed without any risk to human health and safety from contaminants. Impacts from fumigation would not occur because phosphine gas reaching the surface quickly becomes nontoxic as it mixes with fresh air. Additionally, the residue left behind is considered to be non-toxic and does not persist in the food chain. Six active IRP sites are located in the proposed relocation site. Mitigation measures such as constructing prairie dog barriers around these areas would prevent adverse impacts to environmental management activities.

Alternative 1: Alternative Relocation Site

Implementation of Alternative 1 would result in impacts similar to those described for the Proposed Actions. Impacts from live capture and fumigation of prairie dogs would be the same since they include the same areas. Impacts associated with the alternative relocation site would be similar to those associated with the proposed relocation site, but due to its smaller size of approximately 370 acres, the overall impacts would be less. Since the alternative relocation site is larger than the area needed for prairie dog relocation, impacts to the site from prairie dog inhabitation is expected to be similar to that of the proposed relocation site. Fewer cultural and IRP sites are associated with the alternative relocation site, therefore impact to these resources would also be less significant.

No-Action Alternative

Under this alternative, Kirtland AFB would continue to fumigate prairie dogs on an "as-needed" basis. There would be no changes to any environmental or human resources as a result of the implementation of this alternative. Concerns associated with human health and safety as well as potential conflicts with the military mission at Kirtland AFB would not be addressed under this alternative.

FINAL
ENVIRONMENTAL ASSESSMENT
FOR
KIRTLAND AIR FORCE BASE
PRAIRIE DOG MANAGEMENT PROGRAM

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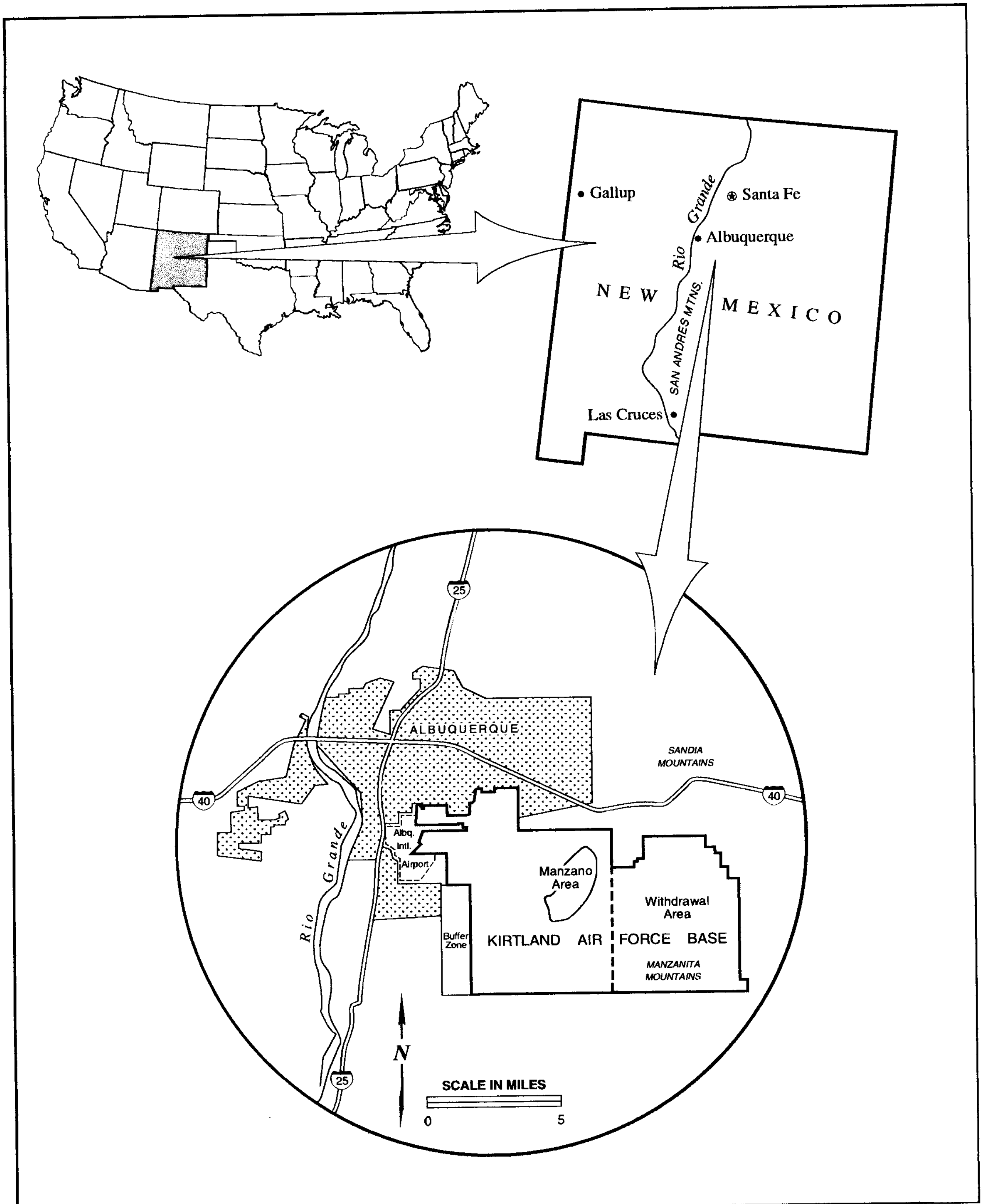
SECTION 1
PURPOSE AND NEED FOR THE PROPOSED ACTIONS

This Environmental Assessment (EA) evaluates the potential impacts on environmental and human resources associated with management of prairie dogs on Kirtland Air Force Base (AFB). This EA also describes how the No-Action Alternative would affect the resources and factors analyzed in this document. This document is part of the Environmental Impact Analysis Process (EIAP) set forth in Title 32 National Defense, Chapter VII Department of the Air Force, Code of Federal Regulations (CFR) Part 989, which implements the National Environmental Policy Act (NEPA) of 1969; and the regulations implementing NEPA promulgated by the President's Council on Environmental Quality (CEQ) as Title 40 of the CFR Parts 1500-1508; and Department of Defense (DoD) Directive 6050.1, *Environmental Effects in the United States of DoD Actions*.

1.1 BACKGROUND

Kirtland AFB is located just southeast of Albuquerque, New Mexico at the foot of the Manzanita Mountains (Figure 1-1). These mountains rise to over 10,000 feet and define the eastern boundary of the area. Kirtland AFB encompasses over 52,000 acres of East Mountains with elevations ranging from 5,200 feet to almost 8,000 feet above mean sea level (US Geological Survey 1990 a, b, c; 1991 a, b, c). Land use for areas adjacent to the base includes Cibola National Forest to the northeast and east, the Manzano Mountains and the Isleta Indian Reservation to the south, and residential and business areas of the City of Albuquerque to the west and north.

Kirtland AFB was originally established in the late 1930s as a training base for the Army Air Corps. In 1941, construction of permanent barracks, warehouses, and a chapel was completed, and a B-18 bomber, Kirtland AFB's first military aircraft, arrived. Troops soon followed, and Kirtland AFB grew rapidly with US involvement in World War II. The base served as a training site for aircrews for many of the country's bomber aircraft, including the B-17, B-18, B-24, and the B-29. After the war, Kirtland AFB shifted from a training facility to a test and evaluation facility for weapons delivery, working closely with both Los Alamos National Laboratory and Sandia Army Base (Sandia National Laboratories). Kirtland AFB and its adjoining neighbor to the east, Sandia Army Base,



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EA

Kirtland Air Force Base Location

FIGURE

1-1

were combined in 1971. The two divisions of the base are still referred to as Kirtland West and Kirtland East, respectively.

Kirtland AFB is now operated by the 377th Air Base Wing (377th ABW) of Air Force Materiel Command (AFMC), the proponent of the action analyzed in this document. The 377th ABW's prime mission, as the host unit at Kirtland AFB, is munitions maintenance and storage, readiness and training, and base operating support for approximately 200 associate organizations with personnel, resources, equipment, and facilities. The 377th ABW also provides fire protection and crash and rescue services for Albuquerque International Sunport.

Kirtland AFB serves as a center for research and development for Air Force Research Laboratory and Sandia National Laboratories. The base functions as a test and evaluation center for the Space and Missile Systems Center and Air Force Operational Test and Evaluation Center. It is also the headquarters for operational organizations such as the Air Force Inspection Agency, the Air Force Safety Center, and the National Nuclear Security Administration Service Center of the US Department of Energy (DOE). Kirtland AFB functions as a training base for the 58th Special Operations Wing of Air Education and Training Command's 19th Air Force and the 150th Fighter Wing of the New Mexico Air National Guard is stationed on the base.

The US Air Force (USAF) owns most of the land at Kirtland AFB, but several other ownership's and leases apply to many areas of the base both large and small. The eastern portion of Kirtland AFB is primarily Cibola National Forest land withdrawn to the USAF by the US Forest Service (USFS). These lands have been withdrawn from public use and are known as the Withdrawal Area (refer to Figure 1-1). The DOE owns certain areas of the base and withdrawn other areas from the USAF and the USFS (USAF 1995).

1.2 Community Characteristics

The area surrounding Kirtland AFB ranges from urban to unpopulated wilderness. Albuquerque, the largest city in the State of New Mexico, is adjacent to the base on the northwest. The Albuquerque Metropolitan Statistical Area is now over 723,000 people (US Census Bureau 2003). Kirtland AFB's host and associate units comprise the largest single employer in New Mexico and have a major economic impact on the surrounding communities: organizations at Kirtland AFB currently employ over 31,000 people

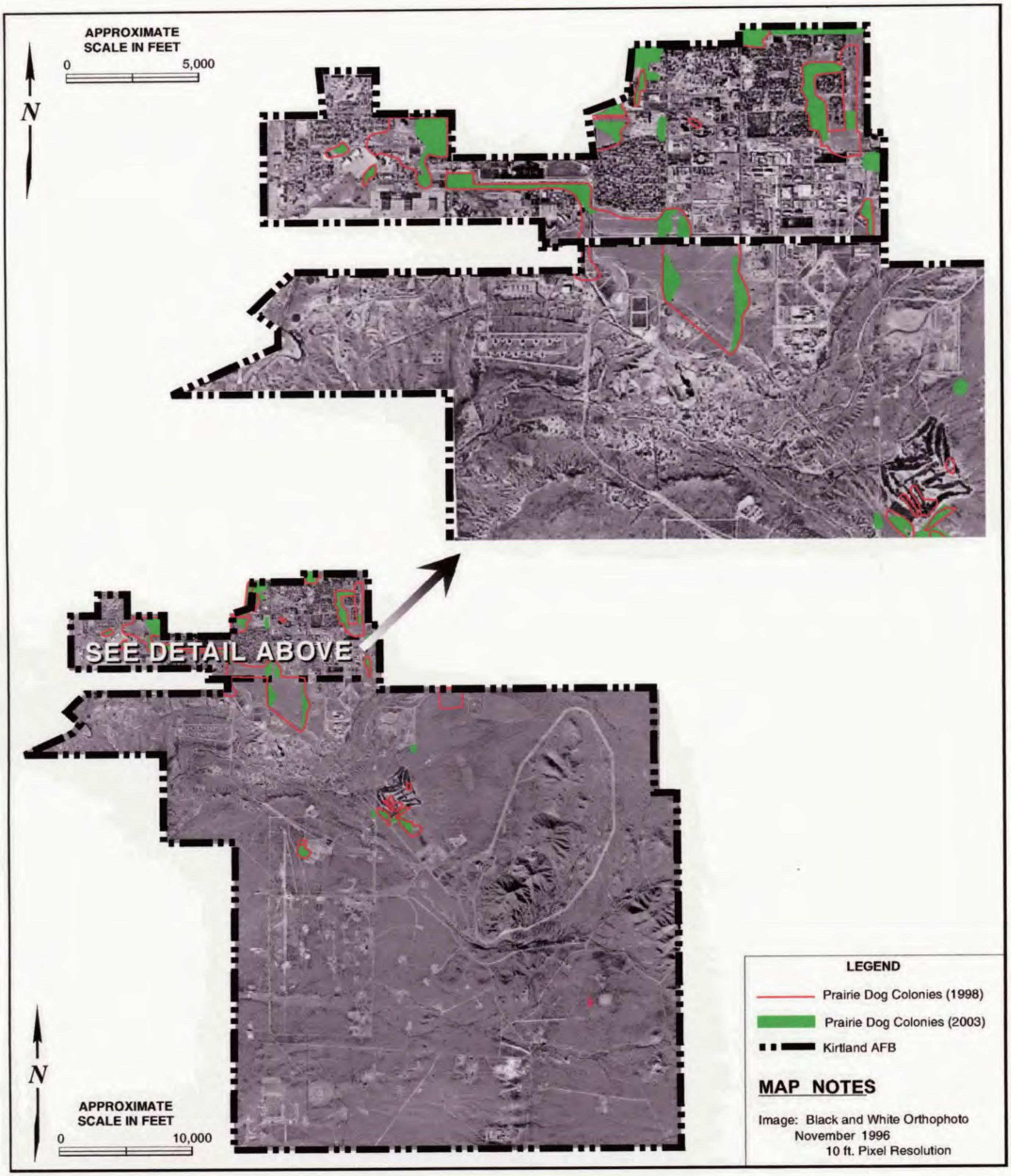
(USAF 2002). Kirtland AFB's estimated annual economic contribution to the Albuquerque metropolitan area exceeds $5.6 billion (USAF 2002a).

1.3 Prairie Dogs at Kirtland AFB

Five species of prairie dogs are found in North America: black-tailed (*Cynomys ludovicianus*), white-tailed (*C. leucurus*), Gunnison's (*C. gunnisoni*), Utah (*C. parvidens*), and Mexican (*C. mexicanus*) (Hygnstrom and Virchow 1994). Slight physical characteristics distinguish each species, as does location, since none of their ranges overlap (Hoogland 1995). However, a farmer near Clovis, New Mexico has identified both Gunnison and black-tailed prairie dogs on his property leading him to believe that prairie dog species can occur where the ranges border one another (Stockton 2003). Only the Gunnison's prairie dog is known to occur on Kirtland AFB. The Gunnison's prairie dog differs from all other prairie dogs by having a white tail and no dark eye patches. Gunnison's prairie dogs form smaller less organized towns than other members of the prairie dog group. In the State of New Mexico, the Gunnison's prairie dog is internally designated as sensitive. This informal designation does not provide the Gunnison's prairie dog with any legal status.

Kirtland AFB contains over 23,000 acres of primarily undeveloped grasslands that provide excellent habitat for prairie dogs. As shown in Figure 1-2, prairie dogs inhabit numerous areas throughout the base. To minimize adverse impacts to missions at the base, the 1997 Prairie Dog Management Program, which uses fumigation, is currently being implemented at Kirtland AFB, particularly in areas identified as no-tolerance zones. In September 1997, a prairie dog inventory was conducted at Kirtland AFB and approximately 1,090 acres of the base contained active colonies (USAF 1997). During an inventory conducted by the LOPEZGARCIA GROUP in May 2003, the amount of occupied habitat was found to be around 650 acres. Reasons for the decline are not clearly understood. Possible explanations may consist of one or more of the following: new construction (paving and buildings), increased predation, fumigation (on a limited basis), and/or a disease outbreak, and differences in surveying techniques.

Gunnison's prairie dogs require grassland or short shrubland habitat, with soil types conducive to burrowing (e.g., sandy loams). Tunnels are dug to an average depth of 3.5 feet and some burrows may interconnect with the burrow systems of their neighbors. Prairie dogs construct mounds of dirt up to 2 feet high and 10 feet in diameter, which



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Prairie Dog Locations at Kirtland Air Force Base

FIGURE

1-2

serve as lookout stations, prevent water from entering tunnels, and may enhance tunnel ventilation (Hoogland 1995). These mounds usually have only one entrance, but two or more is not uncommon for Gunnison's prairie dogs. Dirt around these mounds is generally pushed higher on one side. All species of prairie dogs are active during the day, retreating to their burrows during the night. Burrows are essential for survival since they provide escape from many predators and extreme temperatures. In the summer, prairie dogs remain underground during the hottest part of the day to escape the heat. Many other species such as the burrowing owl (*Athene cunicularia*), rabbits, snakes, lizards, insects, and spiders are known to inhabit prairie dog burrows (New Mexico Department of Game and Fish 2002). Burrowing owls at Kirtland AFB are only known to inhabit prairie dog colonies. On-going studies and research for the past five years has shown that burrowing owls are dependent on prairie dogs for maintaining nesting sites at Kirtland AFB (Finley 2003).

At Kirtland AFB, prairie dogs are currently found in vacant lots and some landscaped areas throughout the cantonment area, around Tijeras Golf Course, and in the grasslands and shrublands on base. Vegetation at these sites consists of grama grass (*Bouteloua spp.*) ring muhly (*Muhlenbergia torreyi*), broom snakeweed (*Gutierrezia sarothrae*), Russian thistle (*Salsola iberica*), and prickly-leaf dogweed (*Dyssodia acerosa*). There are also areas of bare ground. Grasses are the prairie dogs primary food source, but they will also consume forbs and insects. Water requirements are met by metabolizing grazed vegetation.

Predation is a major cause of prairie dog mortality. Some of the species on Kirtland AFB known to prey on prairie dogs include the badger (*Taxidea taxus*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), long-tailed weasel (*Mustela frenata*), golden eagle (*Aquila chrysatos*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), and great-horned owl (*Bubo virginianus*) (Hygnstrom and Virchow 1994; Forrest et al. 1985; Turner 1974; Hoogland 1995). Prairie rattlesnakes (*Crotalus viridis*) and bull snakes (*Pituophis melanoleucus*) may take young, but rarely prey on adult prairie dogs.

1.4 PURPOSE AND NEED FOR THE PROPOSED ACTIONS

AFMC's 377th ABW at Kirtland AFB proposes to manage prairie dogs using the best available methods to enhance their survival and to protect the mission.

1.4.1 Purpose of the Proposed Actions

Air Force Instruction (AFI) 32-7064 requires that installations develop and implement an Integrated Natural Resources Management Plan (INRMP). Section 6.6 of the AFI requires that wildlife damage control be addressed as part of the INRMP or as a supporting document. Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, directs federal agencies to assess the potential effects of proposed actions on children.

The presence of prairie dogs on different parts of Kirtland AFB is not always compatible with public health and safety or with the ongoing mission requirements. However, the prairie dog is a keystone species and therefore an important part of the prairie ecosystem found on the base. The purpose of the Proposed Actions is to better manage the prairie dog population to ensure ecosystem stability, population control, genetic diversity, and successful mission operations including the protection of human health and safety. Therefore, prairie dog management at Kirtland AFB involves control measures using fumigation in areas identified as no-tolerance zones and in other areas, as needed, such as in emergency situations. Another control measure is to capture and relocate prairie dogs, as determined feasible, to an area identified as the prairie dog relocation site, also located on base. A third control measure that has been used successfully at Kirtland AFB, is the use of barriers, as needed, along existing fencing to prevent habitation or rehabitation into areas requiring control of prairie dogs. The areas identified as no-tolerance zones have been chosen based on the need to control existing and expanding hazards to public health and safety, and to control impacts on operational missions. The area proposed for prairie dog relocation has been chosen based on the availability of suitable habitat compatible with surrounding mission uses.

1.4.2 Need for the Proposed Actions

The Proposed Actions are necessary to enable Kirtland AFB to continue fulfilling its missions, reduce risks to human health, and enhance safety by reducing problems associated with prairie dog habitation. Prairie dogs are not contained by above ground chain-link fences, they regularly undermine these fences and gain access to areas incompatible with their presence. Problems associated with prairie dogs and their habitat could be minimized or avoided through removal of prairie dogs entirely from specific areas of the base. Health, safety, and operational hazards are described in detail below.

Prairie dog numbers are declining in the region from various kinds of prairie dog control. The 377th ABW has taken a stance to preserve prairie dogs where possible, as part of a commitment to preserve and enhance the natural resources under its stewardship. Thus, Kirtland AFB is proposing a prairie dog relocation area on the base to help maintain this important part of the prairie ecosystem.

1.4.2.1 Human Health and Safety

At Kirtland AFB, prairie dogs regularly gain access to areas deemed incompatible with their presence for a variety of health and safety reasons. Disease, rattlesnakes, spiders, and tripping hazards are all undesirable components of prairie dog colonies. An additional concern is Bird Aircraft Strike Hazards (BASH), which occur around airfields due to raptors foraging for prairie dogs. These hazards, and how they relate to human health and safety, are discussed below.

Periodic disease outbreaks cause prairie dog populations and their distribution on base to fluctuate greatly. Prairie dogs are susceptible to sylvatic (bubonic) plague, caused by the organism *Yersinia pestis.* While prairie dogs may become infected with plague, they do not spread it. Several species of fleas associated with prairie dogs and other mammals are the major vectors responsible for transmitting plague. In large continuous prairie dog colonies, flea infection rates are often high, with prairie dog mortality reaching up to 99 percent as prairie dogs investigate each other's burrows and become exposed to infected fleas (USAF 1999). Several species of mammals have been documented at Kirtland AFB and the Withdrawal Area as having been infected with plague including the Gunnison's prairie dog, ringtail cat (*Bassariscus astutus*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale gracilis*), coyote, cottontail rabbit (*Sylvilagus spp.*) and rock squirrel (*Spermophilus variegatus*) (USAF 1997). During the early 1980s, Gunnison's prairie dogs and their fleas were found to be plague positive near the Four Hills Subdivision, which is located just north of the base (USAF 1997). A natural die off in the area during this time was attributed to plague based on documented occurrences of plague in the colony and a nearly 100 percent mortality of the prairie dog town. In the mid-1980s a prairie dog and a cottontail rabbit were found dead on Tijeras Golf Course and tested plague positive (USAF 1997). The rock squirrel is the predominant natural reservoir host of plague in the Albuquerque Basin, but the Gunnison's prairie dog is the most abundant species susceptible to plague inhabiting developed areas of Kirtland AFB (USAF 1997).

While humans rarely become infected with plague, it is possible to contract plague from flea infested prairie dogs. In 1996, a Flagstaff, Arizona resident died from plague caused by *Yersinia pestis*. An epidemiological investigation by public health officials indicated that the patient most likely became infected from plague infected fleabites while walking through a Gunnison's prairie dog colony in Navajo County (Morbidity and Mortality Weekly Report 1997). Domestic dogs and cats passing through prairie dog towns are susceptible to infection and may carry fleas to residential areas where humans can be infected. The first two cases of plague in Santa Fe County, New Mexico, were reported in July 1998. The first case involved a veterinarian who received a minor bite wound from a plague-infected cat and the second case involved a woman with flea bites on her arms (Journal of the American Veterinary Medical Association 1998). Recently, in 2002, a Santa Fe couple became infected with plague (ABC 2002; CNN 2003). It is suspected that the couple contracted plague from either a wood rat or its fleas as both species tested plague positive from the couple's property. Fortunately, the strain of plague carried by prairie dogs is treatable if detected early.

Rattlesnakes and black widow spiders constitute another hazard associated with prairie dog colonies because they are known to inhabit prairie dog burrows and can be a threat to personnel who work or recreate nearby.

Prairie dog burrows also pose a tripping hazard. Burrows are often excavated in dirt roads, along walking/jogging paths, and in dirt/gravel parking lots on Kirtland AFB. Base personnel have twisted ankles by accidentally stepping in prairie dog burrows at the golf course, in the Zia Park housing area, and in the area adjacent to Bullhead Park (USAF 1999). On average, one tripping incident per year requires medical attention (Flint 2003).

BASH is another safety issue of special concern. Several species of large raptors are attracted to prairie dog towns and circle above them while hunting. When sucked into a jet engine, a large bird such as a hawk is capable of downing a single engine aircraft, such as the F-16s that fly out of Kirtland AFB. This can result in the loss of the aircraft, and possibly the pilot, as well as cause collateral damage, injury and/or death where the aircraft crashes.

1.4.2.2 Impacts on Operations

Like other burrowing rodents, prairie dogs have sharp teeth adapted for cutting through roots they encounter while digging or foraging. Prairie dogs at Kirtland AFB have severed lines servicing power and communications systems (USAF 1999). According to Civil Engineering personnel, there have been at least three incidents of damage to electrical wiring at the ball fields between the West Gym and Truman Gate (USAF 1997). Breaks in underground power lines are difficult to locate and repair, and may temporarily suspend some base operations. Communication systems are also difficult to repair and are vital to the operational capabilities on base. Security systems at Kirtland AFB could be compromised by interruptions of power and communications, which could be detrimental to overall base security.

Base personnel must also monitor and repair prairie dog damage to vegetation, roads, and trails. Prairie dogs require clear areas around their burrows so they can see and avoid predators. They clear these areas by chewing down grasses and small herbaceous plants near their burrows, usually to a height of less than 6 inches. When prairie dogs move into improved areas of the base, their burrowing and chewing destroys native trees and shrubs, as well as ornamental vegetation planted for landscaping purposes. Burrowing also may undermine roads and trails; therefore, base personnel must constantly monitor and repair those areas to prevent automobile and pedestrian traffic from breaking through pavement or the ground surface. Currently, prairie dogs are impacting landscaped areas located west of the ball fields as well as areas located east of the Eubank Gate (Dunn 2003).

1.5 Decision to be Made and Decision-Maker

The installation commander will make a decision regarding the best alternative to support AFMC and Kirtland AFB.

1.6 Alternative Identification

The CEQ guidelines implementing NEPA, and 32 CFR 989, which implements the USAF NEPA process, require the consideration of reasonable alternatives to a proposed action. Only those alternatives that are determined to be reasonable relative to their ability to fulfill the need for the action warrant a detailed environmental analysis. The identification of such alternatives involves defining a set of criteria based on the need for the action that an alternative must meet. Once defined, these criteria must be applied consistently to each of the candidate alternatives. For these Proposed Actions, alternatives were required to address the need for an adequately sized prairie dog relocation site in an area where the colony would not cause health and safety or operational problems.

1.7 Regulatory Compliance

The following section provides a brief summary of the laws, regulations, EOs, and other requirements that are routinely considered in an environmental analysis for these types of Proposed Actions.

1.7.1 National Environmental Policy Act

NEPA requires federal agencies to consider the potential environmental consequences of proposed actions in their decision-making process. The intent of NEPA is to protect, restore, or enhance the environment through well-informed federal decisions. The CEQ was established under NEPA to implement and oversee federal policy in this process. In 1979, the CEQ issued the Regulations for Implementing the Procedural Provisions of NEPA. The CEQ regulations encourage federal agencies to develop and implement procedures that address the NEPA process in order to avoid or minimize adverse effects on the environment. DoD Directive 6050.1 established DoD policies and procedures to supplement the CEQ regulations promulgated under NEPA.

32 CFR 989 establishes the EIAP and the specific procedural requirements for the implementation of NEPA on USAF projects. EO 11514, *Protection and Enhancement of Environmental Quality*, as amended by EO 11991, *Relating to Protection and Enhancement of Environmental Quality*, set policy for directing the federal government in providing leadership in protecting and enhancing the quality of the nation's environment.

1.7.2 Air Quality

The Clean Air Act (CAA) (42 US Code, Sections 7401-7671, et seq., as amended) establishes federal policy to protect and enhance the quality of the nation's air resources to protect human health and the environment. The CAA requires that adequate steps be taken to control the release of air pollutants and prevent significant deterioration in air quality. The 1990 amendments to the CAA require federal agencies to determine the conformity of proposed actions with respect to State Implementation Plans (SIPs) for attainment of air quality goals. The US Environmental Protection Agency has set forth regulations in 40 CFR 51, Subpart W, that require the proponent of an action potentially affecting air quality to perform an analysis to determine if implementation of the action would conform with the SIP.

The State of New Mexico has adopted additional standards for air quality, the New Mexico Ambient Air Quality Standards, which apply a more stringent standard for carbon monoxide, sulfur dioxide and for the 24-hour standard for nitrogen dioxide.

The Albuquerque metropolitan area and Kirtland AFB are within New Mexico's Air Quality Control Region No.2, which is one of 8 regions in the state. Region No. 2 includes all of northwestern New Mexico. The Albuquerque Environmental Health Department performs air quality functions in Albuquerque, and they are governed by the Albuquerque-Bernalillo County Air Quality Control Board.

1.7.3 Water Quality

The Clean Water Act (CWA) of 1977 and the Water Quality Act of 1987 (33 US Code 1251, et seq., as amended) establish federal policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters and, where attainable, to achieve a level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water.

1.7.4 Biological Resources

The Endangered Species Act requires federal agencies that fund, authorize, or implement actions to avoid jeopardizing the continued existence of federally listed threatened or endangered species, and to avoid destroying or adversely affecting their critical habitat. Federal agencies must evaluate the effects of their actions through a set of defined procedures, which can include preparation of a biological assessment and formal consultation with the US Fish and Wildlife Service.

The Migratory Bird Act of 1918, protects migratory birds from willful destruction including their nests from human activities.

Section 404 of the CWA regulates development in streams and wetlands and requires a permit from the US Army Corps of Engineers for dredging and filling in wetlands.

EO 11990, *Protection of Wetlands*, requires that federal agencies provide leadership and take actions to minimize or avoid the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.

1.7.5 Cultural Resources

AFI 32-7065 implements Air Force Policy Directive 32-70 and DoD Directive 4710.1. It sets guidelines for the protection and management of cultural resources, and requires compliance and coordination with NEPA, the National Historic Preservation Act (NHPA) of 1966, as amended, and related federal standards and authorities.

NEPA directs agencies to administer federal programs and resources to foster environmental quality and preservation. NEPA establishes federal policies to preserve important historic and cultural aspects of our national heritage and requires consideration of environmental concerns during project planning and execution. Compliance with NEPA may be done in coordination with compliance with the NHPA under the regulations of the Advisory Council on Historic Preservation, 36 CFR Part 800. Section 106 of the NHPA requires that every federal agency "take into account" how each of its undertakings could affect historic properties. An agency must afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the agency's project.

The NHPA establishes policies that support and encourage the preservation of historic and prehistoric resources for present and future generations. The NHPA directs federal agencies to assume responsibility for considering historic properties (i.e. significant cultural resources) in their activities.

The Archaeological and Historic Data Preservation Act of 1974 directs federal agencies to notify the Secretary of the Interior of historic and archaeological data that may be lost as a result of federal construction or other federally licensed or assisted activities. When undertakings may cause irreparable damage to historic or archaeological resources, the agency must notify the Secretary, in writing, of the situation. The agency may undertake recovery, protection, and preservation of data with their own project funds, or they may request the Secretary to undertake preservation measures.

The Archaeological Resources Protection Act of 1979 requires a permit for any excavation or removal of archaeological resources from public lands or Indian lands. Excavations must be undertaken for the purpose of furthering archaeological knowledge in the public interest, and resources removed remain the property of the US. The act provides both civil and criminal penalties for violation of the permit requirements.

1.7.6 Land Use

EO 11988, *Floodplain Management*, requires each federal agency to take actions to reduce the risk of flood damage; minimize the impacts of floods on human safety, health and welfare; and restore and preserve the natural and beneficial values served by floodplains. Federal agencies are directed to consider the proximity of their actions to or within floodplains. Where information is unavailable, agencies are encouraged to delineate the areal extent of floodplains at their site.

1.7.7 Environmental Justice and Safety Risks to Children

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to assess the effects of their actions on minority and low-income populations within their region of influence. Agencies are encouraged to include demographic information related to race and income in their analysis of environmental and economic effects associated with their actions and to identify any potential impacts that may disproportionately affect minority or low-income communities.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, directs federal agencies to assess the effects of their actions on children within the agencies' region of influence. Therefore, to the extent appropriate, permitted by law, and consistent with the agency's mission, federal agencies shall:

- Make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children, and
- Ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

1.7.8 Public Involvement

Section 1.6.8 of EO 12372, *Intergovernmental Review of Federal Programs*, directs federal agencies to consult with and solicit comments from state and local government officials whose jurisdictions would be affected by federal actions. In addition, NEPA procedures and USAF policy are intended to ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. In order to comply with these requirements, this document will be released for public review.

1.8 ORGANIZATION OF THIS DOCUMENT

Section 1 of this EA describes the Purpose and Need for the Proposed Actions. Section 2 provides the Description of the Proposed Actions and Alternatives. Section 3 describes the Affected Environment and Environmental Consequences on a resource and factor basis. Section 4, lists Persons and Agencies contacted in the preparation of this EA. Section 5 is the List of Preparers and Section 6 contains the References and Bibliography.

SECTION 2
DESCRIPTION OF THE PROPOSED ACTIONS AND ALTERNATIVES

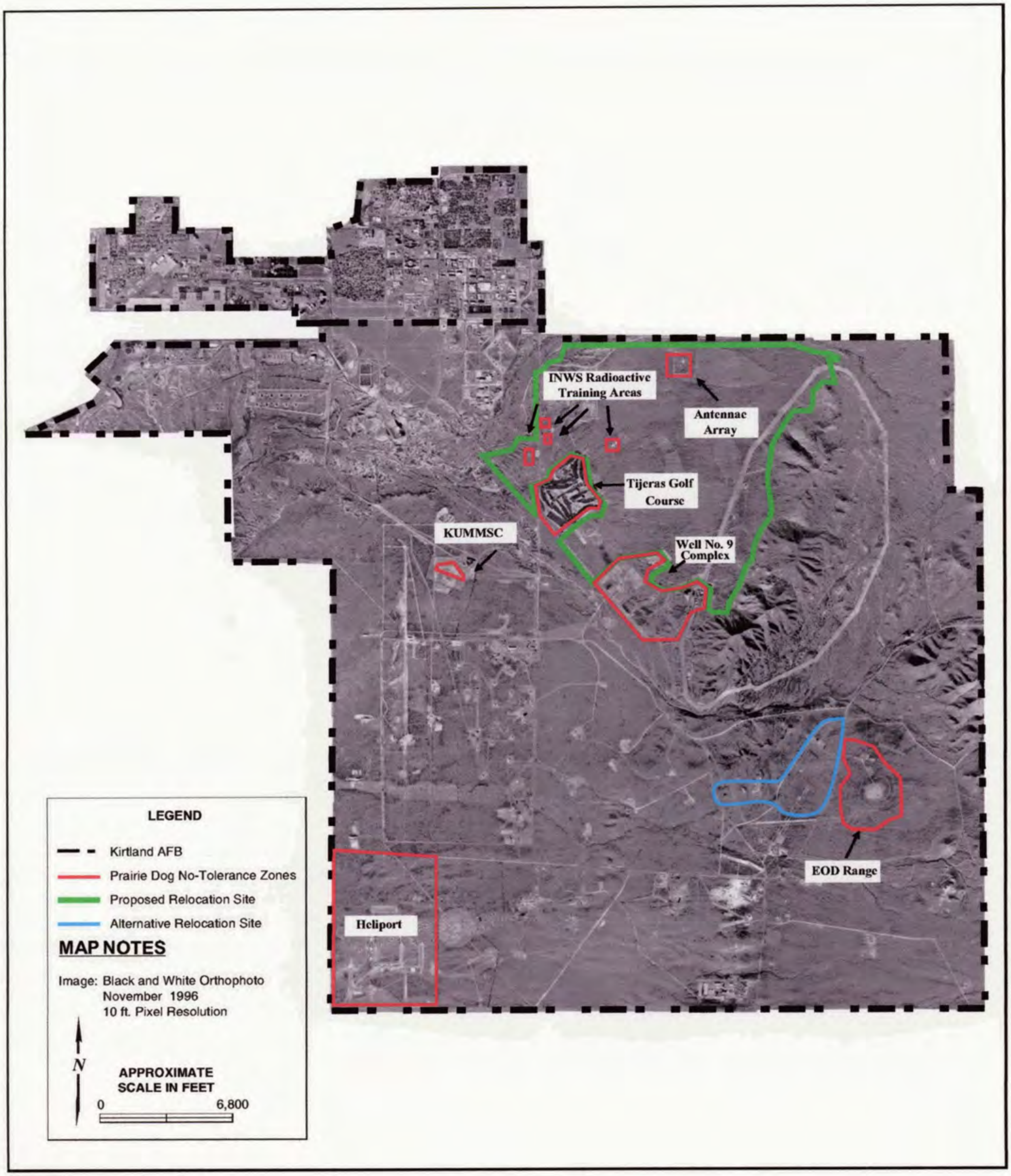
The Air Force Materiel Command's 377th Air Base Wing located at Kirtland Air Force Base (AFB) New Mexico, is proposing to capture prairie dogs from certain portions of the base (no-tolerance zones and buffer zones), release these animals into an on-base relocation site, and fumigate any prairie dogs remaining in the no-tolerance and buffer zones. In unforeseen emergency situations that conflict with base missions, prairie dogs may be controlled in other areas by using any of the described methods. The following sections describe the Proposed Actions and alternatives to these actions.

2.1 PROPOSED ACTIONS

The Proposed Actions involve eliminating prairie dogs from 11 areas throughout Kirtland AFB, called no-tolerance zones, where risks to human health and safety and impacts to operational missions from prairie dogs are greatest. Buffer zones, 200-300 foot areas surrounding no-tolerance zones, would also have prairie dogs removed on an as needed basis. Prairie dogs would be captured from six of these no-tolerance and buffer zones and released in a relatively remote area on base, referred to as the Kirtland AFB prairie dog relocation site. After capturing and relocating as many prairie dogs as reasonably possible, the no-tolerance and buffer zones would be fumigated in accordance with current prairie dog management practices employed at Kirtland AFB. Any prairie dogs reinhabiting these sites would be fumigated. The relocation site and no-tolerance zones are shown on Figure 2-1 and Figure 2-2. Barriers will be established on an as needed basis to prevent rehabitation of prairie dogs into the no-tolerance and buffer zones. Revegetation of no-tolerance and buffer zones would be done in accordance with the Kirtland AFB Revegetation Action Plan (RAP). The RAP addresses how to revegetate an area with minimal impacts to burrowing owls and other sensitive species of wildlife.

2.1.1 Capture Methods

Capture methods proposed for use at Kirtland AFB vary in success rate and in safety to humans and other animal species that use prairie dog burrows for shelter. Capture methods include the use of live traps that are pre-baited and set in such a way as to lure a prairie dog inside the trap (cage) and once inside, the trap automatically closes. Another method that has been used involves flushing prairie dogs from out of their burrows using



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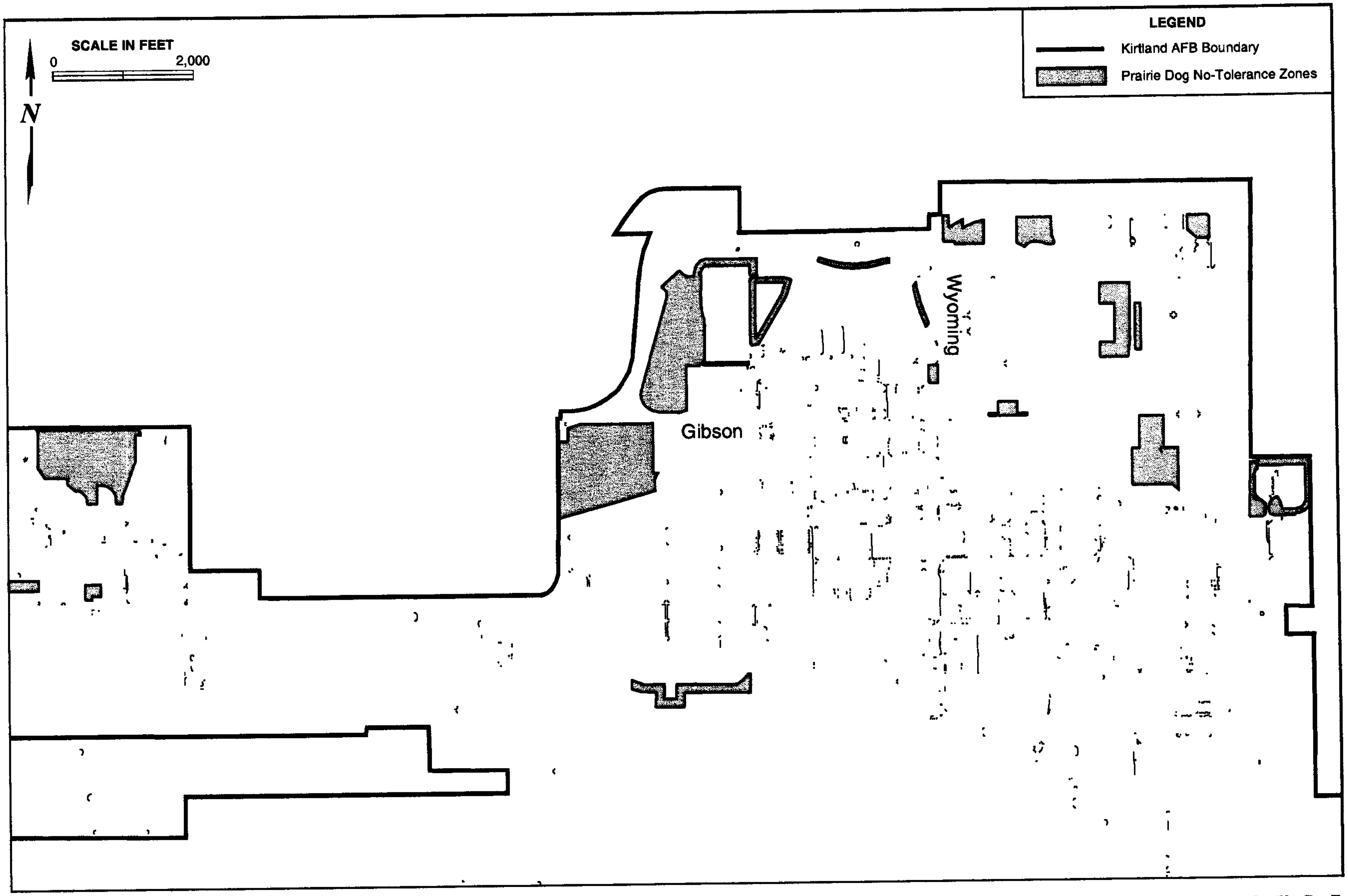
Proposed and Alternative Prairie Dog Relocation Sites and Prairie Dog No-Tolerance Zones at Kirtland Air Force Base

FIGURE

2-1



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Prairie Dog No-Tolerance Zones on Kirtland Air Force Base

FIGURE

2-2

soap and a steady force of water, with personnel located near the burrow opening awaiting their emergence for capture. Once prairie dogs are captured, they would be dusted with flea powder to reduce the potential of spreading plague and then relocated to the relocation site. These capture and relocation techniques are described in the following sections.

2.1.1.1 Soap and Water Method

Implementation of this method requires the use of a water truck or fire truck with an auxiliary pump. Water from the truck is pumped into burrows using a hose with a spray attachment at a pressure that allows prairie dogs to escape the burrow. The water mixes with a nontoxic, biodegradable liquid detergent that has been poured into the entrance of the burrow. This produces a soapy foam, which drives prairie dogs from their burrows. Personnel stationed at different burrow entrances catch the prairie dogs as they emerge, towel them dry, add saline solution to their eyes, dust them with flea powder and place them in cages for relocation.

It is difficult to achieve a 100 percent success rate with these methods. Some prairie dogs occupying towns in previously disturbed areas have been known to respond to disturbances by quickly digging a new chamber and temporarily sealing themselves off from the remainder of the burrow system (Kirtland AFB 1999). In addition, some prairie dogs may drown or suffocate in the burrows if too much water is used or if prairie dogs become confused and flee deeper into the burrow rather than upward and out. Other species of animals that use the burrows for shelter can also drown during this process.

The best time of year to use the soap and water method is in June and July when temperatures are warm, thus reducing the chance of prairie dogs developing hypothermia. Also, prairie dog pups are active above ground and can be captured as well. However, Kirtland AFB may use this method during other times of the year if prairie dogs need to be relocated quickly based on mission conflicts in the no-tolerance zones.

2.1.1.2 Live Capture

Trapping is cost effective, although time-consuming, and its success rate is somewhat seasonal. It is most successful in early spring after snowmelt and before new vegetation growth begins, although it may be used any time that prairie dogs are active. Since prairie dogs emerge from their burrows early in the day, traps need to be set in predawn light. The first day of trapping is usually the most successful as prairie dogs quickly learn to avoid traps (US Air Force [USAF] 1999). Live traps occasionally capture other species such as skunks, rabbits, and ground squirrels.

For live trapping to work effectively, no-tolerance and buffer zones must be pre-baited to allow prairie dogs to become accustomed to the type of food used in the traps. During pre-baiting, clean baited traps are set out with the doors locked in the "open" position. After a couple of days, the traps are set. Traps must be checked continually. Fear and high temperatures can cause trapped individuals to go into shock resulting in death within 15 minutes of capture (USAF 1999). Prairie dogs that go into shock can sometimes be revived if they are placed in a cool, dark place and given time to recover. Traps need to be rendered nonfunctional overnight.

2.1.2 Establishment of the Prairie Dog Relocation Site

Although prairie dogs constitute a problem in certain areas of the base, there are other large undeveloped areas where prairie dogs could coexist with base activities. Implementation of the Proposed Actions involve establishing the prairie dog relocation site in the north-central portion of the base (refer to Figure 2-1). This site is located south of Four Hills Road, along the northern base boundary; it is situated north and east of Tijeras Golf Course, west of Manzano Base, and north of the stables and Central Training Academy. Artificial owl burrows may be created at the relocation site to facilitate burrowing owl occupation of the site.

The proposed relocation area is approximately 3,500 acres in size and elevations at the site range from approximately 5,330 feet to 5,960 feet above mean sea level with the land gently rising to the east (US Geological Survey [USGS] 1990 a, c). Vegetation at the site consists of native grassland and includes species such as three-awns (*Aristida* spp.), grama grasses (*Bouteloua* spp.), dropseeds (*Sporobolus* spp.), ring muhly (*Muhlenbergia torreyi*), needle-and-thread grass (*Stipa comata*), tree cholla (*Opuntia imbricata*), plains prickly pear (*Opuntia polyacantha*), broom snakeweed (*Gutierrezia sarothrae*), and globemallows (*Sphaeralcea* spp.). The soils in the area are primarily sandy loams including Tijeras gravelly fine sandy loam, Embudo gravelly fine sandy loam, and Tijeras complex (US Department of Agriculture [USDA] 1977). These soils are moderately permeable, and the area is drained primarily by sheet flow and small drainage channels that run from the northeast to the southwest (USDA 1977; USGS 1990 a, c).

The prairie dog relocation site was chosen based on Gunnison's prairie dog habitat requirements, which were determined from field observations, research, and consultation with experts. The portion of the base selected for relocation was inhabited by Gunnison's prairie dogs around 1976; however, plague most likely eliminated the majority of this population during the early to mid 80s (USAF 1999; USAF 1997). Buried communication lines run across the site from the northwest to the southeast; use of this site would require these lines to be fenced off or placed in conduit to avoid possible damage caused by prairie dog activity. Other fencing activities may occur on an as needed basis to prevent conflicts between prairie dogs and mission requirements.

The success of relocation efforts is often difficult to determine. Releasing prairie dogs into an established colony increases stress on both resident and released prairie dogs. Although relocated prairie dogs are dusted with flea powder to prevent the spread of plague, plague can still destroy a relocated colony, even after a colony has become successfully established. It is often difficult to determine why relocation failed and whether or not plague was the primary factor attributable to animal deaths.

Mr. Joe Truett, of the Turner Ranch Foundation, is considered to be a leader in developing sound prairie dog relocation techniques. The techniques described below are based on his years of relocation experience.

Well-ventilated trailers and/or trucks would be used to transport prairie dogs from the point of capture to the relocation site. Transportation of the prairie dogs may be conducted at night if daytime temperatures are too high. Prairie dogs would also be protected during inclement weather (i.e. snow, wind, rain).

The location where the prairie dogs are to be released would be prepared by reducing vegetation height (mowing) to 15 centimeters or less. Since the proposed relocation site has few existing burrows, new burrows would need to be created. New burrows would be 7-13 centimeters in diameter and augured at a 45-degree angle to a depth of 1 to 1½ meters to help prairie dogs avoid predation. This technique would be used in combination with a retention basket, which is placed over the burrow. At Vermejo Park Ranch, Havahart rabbit hutches have been used as retention baskets (Truett et al.

unpublished). These baskets would be in place during site preparation before prairie dogs are released into the cage. Food and water would be provided within the baskets until the retention baskets are removed, two or three days later. This technique can yield a 40-50 percent success rate after the first two months of relocation, which is considered high. When possible, relocation efforts would be conducted in June or July as to give the time to acclimate to the new area prior to entering hibernation (e.g. mid-October though mid-November).

Predation by coyotes and badgers represents a big challenge for prairie dogs after relocation. Other predators such as rattlesnakes, golden eagles, and red-tailed hawks generally constitute less of a threat to the newly translocated prairie dogs. Badgers have been observed digging underneath retention baskets to prey on prairie dogs. However, when these cages are well constructed, badger predation is minimized (Truett et al. unpublished). Predation by coyotes is generally greatest during the first couple of days after retention baskets are removed. Coyote predation decreases after prairie dogs learn to retreat to their new burrows.

To minimize the loss of prairie dogs to predation, coyotes observed at the relocation site would be harassed. This harassment would only occur following the first few days after the relocation effort, giving the prairie dogs additional time to become oriented with their new surroundings. Coyotes would be chased and pursued out of the relocation area by either base personnel or volunteers. Personnel with the Turner Ranch Foundation have had success with erecting an electric fence around prairie dog relocation sites. The fence is removed once the newly relocated prairie dogs have adjusted to their new environment. This technique may also be used to minimize the loss of prairie dogs due to predation.

2.1.3 Fumigation in No-Tolerance Zones

Prairie dogs would be eliminated from 11 areas, (no-tolerance zones), located throughout the base (refer to Figure 2-1). The no-tolerance zones include the following sites:

- Subject Areas Within the Highly Populated Cantonment Area;
- Kirtland Underground Munitions Maintenance and Storage Complex (KUMMSC) operational area;
- Tijeras Golf Course;
- Heliport Auxiliary Field;

- Explosive Ordnance Disposal (EOD) Range;
- Well No. 9 Complex (this area includes the riding stables, Central Training Academy administration area, safeguard transportation driving area, and safety inspection pad);
- Antennae Array site; and
- Four Department of Defense (DoD) Interservice Nuclear Weapons School Radioactive Training Areas.

Prairie dogs would not be allowed in these areas due to land use conflicts, risk to human health and safety, and threat to military operations. Additionally, prairie dogs would not be allowed on the EOD Range due to the risk that burrowing owls (which often inhabit prairie dog towns) could be harmed by exploding ordnance. Prairie dogs located in the following no-tolerance zones would not be relocated prior to fumigation due to conflicts with military missions; the KUMMSC, heliport auxiliary field, EOD range, antennae array site, and the four DoD Interservice Nuclear Weapons School radioactive training areas. Currently, only the KUMMSC contains a small prairie dog colony. Following the initial capture and relocation effort, no-tolerance zones and associated buffer zones would be fumigated and reinhabiting prairie dogs would be subject to fumigation. Prairie dog expansion would only be tolerated outside of these no-tolerance zones.

Prairie dog population control methods currently being used at Kirtland AFB include the fumigant aluminum phosphide, a poison gas. Aluminum phosphide is a restricted-use pesticide and may be applied only by persons certified to apply restricted use pesticides. Aluminum phosphide tablets or pellets are applied by placing them as far down the burrow opening as possible. This application procedure requires the burrow opening to be immediately plugged with moist soil or a plug of sod placed grass side down to form an airtight seal. Crumpled newspaper is placed in the burrow entrance before sealing to prevent dirt from smothering the pellets or tablets, rendering them ineffective. Non-target species such as snakes, rabbits, and mice living in treated prairie dog burrows are also killed by this method.

Aluminum phosphide does not produce any harmful residue (Paynter 2003; Degesch America Inc. no date). Eventually (depending on soil compaction and moisture content) the gas migrates through the soil and escapes slowly into the atmosphere, leaving residual aluminum hydroxide, a gray dust that is not classified as a hazardous waste. Aluminum phosphide is not absorbed by plants and will not persist in the food chain (Paynter 2003).

Although secondary poisoning of a predator or scavenger from aluminum phosphide is possible, it is very unlikely. Prairie dogs exposed to aluminum phosphide generally remain in the burrows, thereby eliminating the potential secondary poisoning threat to above ground carnivores. A scavenger or predator could be harmed only if it consumed a prairie dog soon after the prairie dog was exposed to the aluminum phosphide (Paynter 2003). Fumigation with aluminum phosphide typically reduces a target prairie dog population by 85 to 95 percent (Hygnstrom and Virchow 1994; Boren 1996). An additional benefit of this method is that the gas is also toxic to fleas in larval, pupal, and adult stages. Although total elimination of fleas may not occur from gaseous concentrations attained in the burrows, fumigation would reduce flea numbers, thereby reducing the possibility of exposure to plague. Fumigation is most effective during the spring or during the monsoon season (July and August) when soil moisture is high and soil temperatures are greater than 60 degrees Fahrenheit. Failures are most likely to occur in dry, porous soils (Hygnstrom and Virchow 1994; Boren 1996; Paynter 2003).

Fumigation is a satisfactory method to control prairie dogs; however, it is toxic to all animals in a burrow system. Although fumigants can be used year-round, certain seasonal restrictions would need to be established to protect burrowing owls (*Athene cunicularia*). Surveys for burrowing owls and other sensitive species would be conducted before using any capture or control methods that could harm nontarget species. In the event that a burrowing owl is found in a no-tolerance zone, fumigation would not occur within 150 feet of any active burrow while burrowing owls are present (i.e. March-October). Prairie dog holes located more than 150 feet away from the owl holes can be fumigated with little danger to the burrowing owl (Colorado Division of Wildlife 1997). Once burrowing owls have left the area burrows containing prairie dogs may be fumigated. Burrows that were used by the burrowing owl will remain open as to encourage them to use the site in following years. Burrowing owls are monitored by Kirtland AFB personnel.

2.1.4 Barriers

In order to prevent future habitation of prairie dogs into no-tolerance and buffer zones, two barrier methods may be used on an as needed basis. (The barriers would be established on an as needed basis in areas incompatible with prairie dog inhabitation.). The two barrier type methods are described below.

The first type of artificial barrier involves erecting a two-foot high vinyl fence. Chicken wire may be used instead where existing fencing is present. This involves trenching a line for the fence and burying at least 3 inches of the material underground. This material can either be attached directly to an existing fence or support structures would need to be provided for the plastic fencing material. Typical support structures include wooden and T-posts, which are used to attach a heavy gauged wire that has been strung from post to post at a height of 2 feet. The top of the material is then attached to the wire using heavy gauge wire ties (i.e. hog-nosed rings), to give the fence support. Constant maintenance of this structure is necessary if it is to work. Frequent inspection would be required to identify and fix any holes or gaps in the fence, as prairie dogs will readily exploit any weakness in the fence. This barrier type can provide good control as long as it is frequently maintained (Witmer 2002).

A more secure type of artificial barrier involves trenching and burying a galvanized hardware cloth four feet deep (Witmer 2002). This would prevent most prairie dogs from undermining the fence. This underground fence would be used in conjunction with the aforementioned vinyl fence. Future barrier methods may be implemented once they are researched and proven effective.

2.2 ALTERNATIVES

2.2.1 Establishment of the Alternative Relocation Site

Under this alternative to the Proposed Actions, Kirtland AFB would establish the prairie dog relocation site in the southeast portion of the base (refer to Figure 2-1). This site was chosen based on Gunnison's prairie dog habitat requirements, which were determined from field observations, research, and consultation with experts. This portion of the base is not used for any military training or any other activities. No prairie dogs are known to inhabit this area. At present, this alternative site is large enough to accommodate all prairie dogs proposed for relocation at Kirtland AFB. In order to prevent prairie dogs from accessing the EOD Range, prairie dog proofed fencing, as described in Section 2.1.2 for the north security fence line, would be erected.

The alternative relocation site for the prairie dogs is south of the Manzano Base, west of the EOD Range, and east of Loveless Road (refer to Figure 2-1). The site has an elevation range of 5,650 feet to 5,800 feet above mean sea level and is roughly 370 acres in size (USGS 1990a, 1991b). The vegetation present at the alternative relocation site is native grassland similar to that found at the proposed relocation site. The soils in the area are Tijeras gravelly fine sandy loam (USDA 1977). These soils are moderately permeable and surface water is drained as sheet flow (USGS 1990a, 1991b; USDA 1977).

As with the Proposed Actions, fumigation would be used to clear the no-tolerance and buffer zones of prairie dogs remaining after capture and relocation efforts have been completed. Prairie dogs reinhabiting no-tolerance zones would be captured and relocated or fumigated.

2.2.2 No-Action Alternative

The No-Action Alternative consists of continuing the present prairie dog control effort on Kirtland AFB. Prairie dogs would not be captured and the prairie dog relocation site would not be created. No changes from current conditions would occur to any environmental resources on base. Areas where prairie dogs are an immediate problem are fumigated on an "as-needed" basis but not throughout any no-tolerance zones in a single effort. Although this alternative does not rectify health and safety concerns, Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations § 1502.14 [CEQ 1978]) stipulate that the No-Action Alternative be analyzed to assess any environmental consequences that may occur if the proposed action is not implemented.

2.2.3 Alternatives Considered But Not Carried Forward

2.2.3.1 Shooting as a Stand Alone Method

Using a .22 caliber pellet gun as a stand alone method to kill prairie dogs was eliminated from further consideration for two reasons. First, it creates its own health and safety problems from ricocheting pellets. Second, shooting prairie dogs may reduce prairie dog numbers but it is not an effective means of eradication.

2.2.3.2 Vacusuction as a Stand Alone Method

Vacusuction involves using a large vacuum machine truck that has been converted to capture live prairie dogs. Prairie dogs are suctioned from their burrows through a hose and ejected into a padded holding tank located on the truck. This method is expensive and some animals are missed while others are accidentally killed or injured during the process (Kirtland AFB 1999). Therefore, as a stand alone method it is an alternative not carried forward.

2.2.3.3 Fumigation as a Stand Alone Method

Fumigation is an efficient means of controlling prairie dogs. However, Kirtland AFB would like to establish a new prairie dog colony using those already inhabiting the base. Fumigating candidate prairie dogs for relocation efforts would conflict with Kirtland AFB's goal.

2.2.3.4 Live Capture and Relocation as a Stand Alone Method

Live trapping and relocation of prairie dogs on a continuous basis was not considered a reasonable option. Using this method as a stand-alone is very cost and labor intensive, and those animals that are not caught during the initial live trapping and relocation effort learn avoidance measures to capture techniques. Therefore, attempting to live trap and relocate all prairie dogs from select portions of the base would not be feasible using this method.

SECTION 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes relevant existing environmental conditions and potential environmental consequences for each resource potentially affected by the Proposed Actions and alternatives. In compliance with the National Environmental Policy Act (NEPA) of 1970 as amended (42 US Code 4371 et seq.), the Council on Environmental Quality regulations implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500-1508) and Air Force regulations implementing NEPA (32 CFR 989, *Environmental Impact Analysis Process*), the description of the affected environment focuses on only those resources potentially subject to impacts.

Resources and factors analyzed in this document focus on the following areas: human health and safety including protection of children; air quality; land use; soils; water resources; biological resources; cultural resources; and environmental management including hazardous waste and materials use. Noise, transportation and circulation, visual resources and socioeconomics would not be affected by the Proposed Actions, therefore, they have been excluded from further discussion to keep the analysis relevant and concise.

The subsections titled Environmental Consequences under each resource section describe potential impacts related to the implementation of the proposed relocation and fumigation, the alternative relocation site, and the No-Action Alternative. The Proposed Actions discussions are subdivided with descriptions of potential impacts from the no-tolerance zones (i.e. elimination of prairie dogs from the no-tolerance zones), removal methods (i.e. soap and water, live trapping, and fumigation), and establishing the relocation site (i.e. augering new holes, releasing prairie dogs at the site, prairie dog colony expansion at the site, and creation of an observation area).

3.1 HUMAN HEALTH AND SAFETY

3.1.1 Definition of Human Health and Safety

Health and safety issues are defined as those that directly affect the continued ability to protect and preserve life and property. Health and safety issues pertain to hazards that arise from physical conditions in the workplace and the actions of people working. The field of safety is focused on prevention of accidents and mitigation of damages resulting from accidents. An accident is an undesirable, unplanned event resulting in physical harm to people, damage to property, or interruption of business. An accident may be the result of an unsafe act or unsafe condition. Each worker must make a conscious effort to work safely, despite any adverse conditions of the work environment. A high degree of safety awareness must be maintained so that safety factors involved in a task become an integral part of that task.

Safety issues typically associated with and specific to military airfields include the potential for mid-air aircraft mishaps, aircraft collisions with objects on the ground (e.g., towers, buildings, or mountains), weather-related accidents, and bird-aircraft collisions. However, since the Proposed Actions analyzed in this Environmental Assessment (EA) would not affect the type or frequency of aircraft operations, the majority of the safety analysis in this document focuses on ground-based safety issues, although the distribution and significance of accident potential zones surrounding the airfield complex are discussed because bird-aircraft collisions could be decreased by the Proposed Actions.

Because children may suffer disproportionately from environmental health risks and safety risks, Executive Order (EO) 13045, *Protection of Children from Environmental Health and Safety Risks*, was signed in 1997. EO 13045 identifies risks to health and safety that are attributable to products or substances with which a child is likely to come in contact or be exposed to (air, food, water, soil and products). This EO was designed to prioritize the identification and assessment of environmental health risks and safety risks that may affect children and to ensure that federal agencies policies, programs, activities, and standards address environmental risks and safety risks to children. This section identifies the distribution of children and locations where numbers of children may be proportionately high (e.g., schools, child care center, family housing, etc.) in areas potentially affected by implementation of the Proposed Actions. The use of aluminum phosphide tablets, a restricted use pesticide, is addressed in this resource section. Removing prairie dogs from these areas would reduce health and safety risks to children by reducing potential exposure to plague, rattlesnakes, and spiders.

3.1.2 Existing Human Health and Safety Conditions

3.1.2.1 Human Health

There are a number of potential health impacts associated with prairie dog colonies. Although rodents also are susceptible to infectious diseases such as rabies, plague is the primary disease associated with prairie dogs (US Air Force [USAF] 1997). Plague is a serious, sometimes fatal disease caused by the *Yersinia pestis* bacterium and is most commonly transmitted to humans through the bites of infected fleas (USAF 1997).

Rattlesnakes and black widow spiders represent another health and safety hazard associated with prairie dog colonies. Rattlesnakes and spiders may inhabit prairie dog burrows and can be a threat to personnel, residents and visitors who work or recreate in the vicinity of the burrows. Prairie dog burrows also pose a tripping hazard to personnel on base. According to Kirtland Air Force Base (AFB) personnel, people have twisted ankles by stepping in prairie dog burrows at the golf course, in the Zia Park housing area, and adjacent to Bullhead Park (USAF 1999).

3.1.2.2 Industrial Hygiene

Industrial hygiene involves the protection of the public and workers from chemical, microbiological and physical health hazards that emanate from the workplace. Exposure to hazardous materials, use of personal protective equipment, and availability of Material Safety Data Sheets are managed under industrial hygiene programs. Industrial hygiene is the joint responsibility of bioenvironmental engineering and contractor safety departments, as applicable. These responsibilities include: reviewing all potentially hazardous workplace operations; monitoring exposure to workplace chemical (e.g., asbestos, lead [Pb], and hazardous materials), physical (e.g., noise and radiation), and biological agents (e.g., infectious waste); recommending and evaluating controls (e.g., ventilators and respirators) to ensure personnel are properly protected and not overexposed; and ensuring a medical surveillance program is in place to perform occupational health physicals for those workers subject to workplace hazards.

The fumigant aluminum phosphide, used to control prairie dog populations, is an agent that requires licensed certified applicators. Contractor personnel responsible for conducting the Proposed Actions at Kirtland AFB would be responsible for ensuring ground safety and compliance with all applicable and occupational health and safety regulations and worker compensation programs, and would be required to conduct relocation activities in a manner that would not pose any risk to personnel currently occupying any existing facilities.

3.1.2.3 Accident Potential and Aircraft Safety

Most aircraft mishaps (75 percent) involve an airfield takeoff or landing incident. Risks associated with takeoffs and landings at an airfield complex are summarized in the Air Installation Compatible Use Zone (AICUZ) Program (USAF 2002b) The AICUZ Program promotes compatible land use development in areas subject to aircraft noise and accident potential while also protecting the operational capability of the base.

A primary safety concern associated with prairie dogs near active runways is bird-aircraft strike hazards (BASH). According to the Bird Strike Committee USA, more than half of all bird aircraft strikes occur below 100 feet above ground level. Approximately one-half of reported bird-strikes occur in the airfield environment, and one-quarter occur during low-altitude training. Raptors represent a safety hazard at Kirtland AFB because of their predation on prairie dogs especially when prairie dog towns are located near the runways.

3.1.3 Environmental Consequences to Human Health and Safety

3.1.3.1 Significance Criteria

An impact to safety would be considered significant if implementation of an action would substantially increase risks associated with mishap potential or safety relevant to the public or the environment. For example, if implementation of a proposed action would expose personnel to unnecessary health risks (e.g., toxic inhalation from applying fumigants) safety impacts would be considered significant.

An impact to children from environmental health risks or safety risks would be considered significant if a proposed action would result in a disproportionate adverse impact to the health or safety of children.

3.1.3.2 Proposed Actions

No-Tolerance and Buffer Zones. Removing prairie dogs from specified areas of the base in accordance with the Proposed Actions would benefit human health and safety in four primary areas:

- Less likelihood of human exposure to plague-carrying fleas;
- Reduce the risk of human conflicts with rattlesnakes that often inhabit prairie dog burrows;
- Reduced potential for injuries from people falling into prairie dog burrows that are just below the surface in recreation areas, housing areas, and along walking/jogging trails; and
- BASH reduction: Removing prairie dogs from areas near runways and aircraft traffic patterns would reduce the number of raptors hunting in those areas and thereby reduce BASH potential.
- Reduce potential for impacts to security, communications, and base missions from severed electrical wires.

Removal of prairie dogs from the vicinity of the Child Development Center, family housing area, and schools would result in reduced environmental health risks or safety risks to children. Risks associated with the presence of prairie dog burrows in the cantonment area (e.g., rattlesnakes) would be eliminated following removal of prairie dogs from the area.

Removal Methods. Proper use of phased population control methods (nonlethal followed by lethal) would have no negative impact on human health and safety. Individuals involved with use of soap and water foam and live trapping would minimize risk of exposure to prairie dog bites and plague-carrying fleas by wearing protective clothing, exercising caution during prairie dog handling, and strictly adhering to field safety protocols.

Use of aluminum phosphide is unlikely to have negative impacts on human health and safety. Individuals involved with application of rodenticides would be required to strictly adhere to field safety protocols. Only licensed certified pesticide applicators and entomology staff under the direct supervision of a certified pesticide applicator would conduct application of aluminum phosphide. Aluminum phosphide is a highly acute poison that kills through inhalation (Degesch no date). Aluminum phosphide pellets or tablets work by reacting with existing moisture to create phosphine gas, which is the toxic fumigater. After decomposition a gray-white powder composed almost entirely of non-poisonous aluminum hydroxide is left along with a small amount of un-reactive aluminum phosphide (i.e. 2 to 3 percent). If a person or animal is exposed to a nonlethal dose, the individual can quickly recover by breathing fresh air (Degesch no date; Paynter 2003). Workers can eliminate the risk of immediate health and safety hazards by wearing protective clothing and respiratory protection when applying aluminum phosphide. Application of aluminum phosphide in outdoor areas does not typically require use of air-purifying respirators since aboveground concentrations of phosphine gas generally do not exceed safety threshold levels. Respiratory protection is required only for applications indoors or in poorly ventilated areas.

If prairie dogs are found within an active Installation Restoration Program (IRP) site, base personnel would determine which removal method could be implemented without risk to human health and safety from contaminants. This decision would be made based on the degree and type of contamination at the site.

Short-term environmental health risks or safety risks could occur to children if they are unattended during prairie dog removal activities; however, standard site safety precautions (e.g., presence of licensed personnel, and other security measures) would keep potential risks to a minimum.

<u>Relocation Site.</u> Relocating prairie dogs to the north-central portion of the base would enable the prairie dogs to coexist with base activities. Additionally, risk of human exposure to plague-carrying fleas and venomous reptiles would be reduced in the cantonment area and other no-tolerance zones. Although an increased potential for exposure to plague and rattlesnakes would occur in areas adjacent to the relocation site, this risk would also occur following the natural reestablishment of prairie dogs to this location (which is already occurring). Installation of a prairie dog proof fence along the north security fence would reduce these associated risks to people living north of the proposed actions.

Relocating prairie dogs to the north-central portion of the base would not impact aircraft safety in terms of the potential for BASH. As indicated in Figure 2-1, prairie dogs located in specified areas north of Tijeras Arroyo would be removed and relocated to the prairie dog relocation area (several miles east and southeast of the airport). In response to this relocation, raptors would be expected to forage at this new site and would be less likely to forage adjacent to the airport. Implementation of the Proposed Actions is expected to decrease the potential for BASH in the vicinity of the Albuquerque International Sunport.

Six of the active IRP sites occur within the relocation site; therefore, there would be risks to human health and safety from augering holes in a contaminated site. Prairie dogs would be released into the proposed relocation site even if unknown contaminated sites occur there. Due to health and safety concerns, however, no holes would be augered within the active site. Some of the sites are fenced and could be easily avoided, while other sites would have their boundaries delineated to avoid impacts.

The proposed relocation site is situated away from base schools, housing areas, and the Child Development Center, but it is located just to the south of the FootHills housing area. To avoid unnecessary health risks to children in this area, prairie dog proof fencing would be established along the north security fence. Prairie dogs relocated at the site would be dusted with flea powder to prevent the unintentional spread of plague carrying fleas. Therefore, the release of prairie dogs in the proposed relocation site would not result in environmental health risks or safety risks to children.

3.1.3.3 Alternative Relocation Site

Impacts to human health and safety from removal of prairie dogs from the no-tolerance zones would be identical to those described for the Proposed Actions. The potential for BASH would be expected to decrease in the vicinity of Albuquerque International Sunport, slightly more than under the Proposed Actions because the alternative relocation site is farther from the airport than the Proposed Actions.

There is one active IRP site (the Explosive Ordnance Disposal [EOD] Range) near the alternative relocation site. There could be the potential for risks to human health and safety with personnel relocating prairie dogs to this site. To reduce potential risk to human health and safety prairie dogs would only be relocated at the site while the EOD Range is inactive.

3.1.3.4 No-Action Alternative

Selection of the No-Action Alternative would result in no changes to human health and safety. Prairie dogs would continue to be fumigated on an "as needed basis" as outlined in the 1997 Prairie Dog Management EA. The risk to humans from plague-carrying fleas, rattlesnakes, and tripping hazards would continue. The current BASH threat would continue from raptors hunting over prairie dog towns near the runways.

3.1.3.5 Other Future Actions on the Base

The Proposed Actions would have a beneficial impact to human health and safety. Therefore, when considered with the health and safety effects of the other future actions, they are not expected to have any significant cumulative negative impacts to health and safety at the base.

3.2 AIR QUALITY

3.2.1 Definition of Air Quality

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. The US Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for criteria pollutants, including ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter equal to or less than ten microns in diameter, and Pb. The Clean Air Act (CAA) requires that all states attain compliance through adherence to the NAAQS, as demonstrated by the comparison of measured pollutant concentrations and the NAAQS.

The NAAQS represent the maximum levels of background pollution that are considered acceptable, with an adequate margin of safety to protect public health and welfare. The State of New Mexico has adopted additional standards for air quality, the New Mexico Ambient Air Quality Standards (NMAAQS), which apply a more stringent standard for CO, SO_2, and for the 24-hour standard for NO_2. See Title 40, Part 50 of the CFR for the NAAQS. The State of New Mexico uses the NAAQS for attainment determinations; the NMAAQS are used for permitting purposes only.

For the purposes of this EA, Bernalillo County forms the region of concern for air quality.

3.2.2 Existing Air Quality Conditions

3.2.2.1 Climate and Regional Air Quality

The Albuquerque metropolitan area and Kirtland AFB are within New Mexico's Air Quality Control Region No. 2, which is one of 8 regions in the state. Region No. 2 includes all of northwestern New Mexico. The Albuquerque Environmental Health Department Air Quality and Vehicle Pollution Management Divisions administer local, state and federal air quality control regulations for Bernalillo County, and the Albuquerque-Bernalillo County Air Quality Control Board governs them.

In the past, NAAQS and NMAAQS violations have occurred at major intersections and in uptown Albuquerque as a result of high volumes of automobile emissions. The City of Albuquerque has been designated as being in maintenance status for CO as of 15 June 1996 and is currently in attainment for all other federally regulated pollutants (EPA 2002). CO levels are currently at their lowest since the 1970s (CO levels were consistently violated during the 1970s and 1980s). O_3 levels have been increasing since 1990 and exceeded standards twice in 1999 (Albuquerque Environmental Health Department [AEHD] 2000).

3.2.2.2 Air Quality in the Project Area

Air quality in and around the project area is a function of normal climatic conditions in the region, combined with airborne pollutants from a variety of sources. An inventory was completed at Kirtland AFB in which a list of facilities with air emissions (both criteria pollutants and hazardous pollutants) was developed. All of the pollutants were then quantified for facilities on the list. There are a number of facilities located on the installation that generate periodic emissions. The inventory calculated the total potential air emissions using the quantities of hazardous and toxic pollutants maintained at each facility. Based upon the results of the emissions study, Kirtland AFB is subject to Title III and Title V permitting requirements of the CAA, respectively. Kirtland AFB is currently a minor source of Hazardous Air Pollutants under Title III of the CAA.

A Title V permit application was submitted in December 1995 to the Albuquerque-Bernalillo County Air Pollution Control District and deemed complete in June 1996. Table 3-1 summarizes the air emissions inventory for Kirtland AFB.

Table 3-1. Summary of Calendar Year 2001 Air Emissions for Non-exempt Sources at Kirtland AFB

Pollutant	Emissions Actual[b] (tpy)	Emissions Allowable[b] (tpy)
CRITERIA POLLUTANTS AND PRECURSORS		
CO	33.7	171.9
NO_X	57.2	176.4
PM	12.7	48.4
PM_{10}[a]	12.5	47.8
SO_X	5.4	23.0
VOC	95.2	166.5
Total HAPs	**6.9**	**12.0**

Notes: [a]Particular matter ≤ 10 μm is a subset of particulate matter.
[b] These cumulative totals include emissions from 20 New Mexico Administration Code Title, Section 11.41 Authority to Construct permitted sources and Title V sources.

tpy = tons per year
PM = particular matter
VOC – volatile organic compounds
CO = carbon monoxide
PM_{10} = particulate matter equal to or less then 10 microns in diameter
NO_X = oxides of nitrogen
SO_X = sulfur oxides
HAP = hazardous air pollutants

3.2.2.3 State Implementation Plan

Estimated air quality measurements that apply to the air quality in the vicinity of Kirtland AFB are taken from air monitoring stations located near the installation. The closest of these stations, is located about a mile northwest of the base and monitors CO, total suspended particulates and winds. These air-monitoring stations are operated and maintained by the AEHD.

The primary source of air pollutants at Kirtland AFB is privately owned vehicles. Kirtland AFB, through its transportation management program, is engaged in a phased conversion of government-owned gasoline-powered vehicles to natural gas. Other primary emission sources on the installation include aircraft operations and maintenance, EOD, fuel storage, corrosion control, emergency generators, and fire fighting training. Major hydrocarbon emission sources include fuel evaporative losses from fuel storage, transfer and use.

3.2.3 Environmental Consequences to Air Quality

3.2.3.1 Significance Criteria

The 1990 amendments to the CAA require federal agencies to conform to the affected State Implementation Plan (SIP) with respect to achieving and maintaining attainment of NAAQS and addressing air quality impacts. An air quality impact resulting from a proposed action would be significant if it would: (1) increase concentrations of ambient criteria pollutants or O_3 precursors to levels exceeding NAAQS, (2) increase concentrations of pollutants already at nonattainment levels, (3) lead to establishment of a new nonattainment area by the governor of the state or the EPA, or (4) delay achievement of attainment in accordance with the SIP criteria pollutant standards.

3.2.3.2 Proposed Actions

Although prairie dog excavations can increase dust during wind events, moving prairie dogs from one region to another would not impact the overall air quality in the region.

No-Tolerance and Buffer Zones. The absence of prairie dogs from no-tolerance and buffer zones would eventually decrease the potential for wind erosion as disturbed ground becomes revegetated. This subsequently could result in minor improvements to local air quality.

Removal Methods. Use of nonlethal and lethal prairie dog control measures would have no significant negative impacts on air quality. Fumigation involves releasing toxic gas inside the burrow systems that have been sealed off. The gas then slowly migrates through the soil and dissipates gradually into the atmosphere. Use of aluminum phosphide results in the release of phosphine gas and would not significantly affect the air quality because it is trapped in the tunnels until it dissipates. Once it mixes with fresh air it is rendered harmless. Soap and water extraction and live trapping would have no impact on air quality.

Relocation Site. Relocation of prairie dogs to the north-central portion of the base could result in temporary degradation of the vegetation in this area. Fugitive dust from wind erosion may increase slightly and could have a minor, but insignificant, impact on local air quality.

3.2.3.3 Alternative Relocation Site

Under this alternative, air quality would be affected in much the same manner as the Proposed Actions addressed above.

3.2.3.4 No-Action Alternative

Under the No-Action Alternative, there would be no changes to air quality from current conditions. Prairie dogs would continue to be fumigated on an "as needed basis" as outlined in the 1997 Prairie Dog Management EA, therefore fugitive dust from their burrowing activities would not increase since their population is being controlled.

3.2.3.5 Other Future Actions on the Base

The combined emissions from the Proposed Actions, when considered with potential emissions from other future actions at the base, are not expected to have any significant cumulative negative impacts to air quality.

3.3 LAND USE

3.3.1 Definition of Land Use

Land use is the classification of either natural or human-modified activities occurring at a given location. Natural land use includes rangeland and other open or undeveloped areas. Human-modified land use classifications include residential, commercial, industrial, communications and utilities, agricultural, institutional, recreational, and other developed areas. Land use is regulated by management plans, policies, regulations, and ordinances (e.g., zoning) that determine the type and extent of land use allowable in specific areas and protect specially designated or environmentally sensitive areas.

3.3.2 Existing Land Use Conditions

In the vicinity of Kirtland AFB, land use varies from urban to open rangeland. Kirtland AFB is bordered on the north and west by the City of Albuquerque and its suburbs and on the south by the Isleta Pueblo, with the National Forest bordering the east. Immediately north of the installation, land use is predominantly urban. Open spaces and forestland are present northeast of the base. West of Kirtland AFB, land use is a mixture of urban areas and open space. South of the installation, the Isleta Pueblo lands are generally open space and forest or vacant land. These lands are utilized by the Isleta Pueblo for a variety of highly sensitive cultural practices.

3.3.2.1 Kirtland AFB Land Use

Kirtland AFB is among the largest bases (land area) owned by the USAF with 51,558 acres of land (over 802 square miles). Kirtland AFB manages a wide variety of land ownerships and land use agreements with multiple state and federal agencies (Figure 3-1). According to Kirtland AFB's 2002 General Plan, the land at Kirtland AFB is primarily owned by the USAF (20,783 acres unimproved and 7,311 acres improved), but several other ownerships and leases apply. The eastern portion of Kirtland AFB is primarily Cibola National Forest land (15,891 acres) withdrawn from public use by the US Department of Energy (DOE) and the USAF. These lands are known as the Withdrawal Area. The DOE owns certain areas of the base (7,533 acres) and leases other areas from the USAF (USAF 2002c).

The airfield complex serving Kirtland AFB is shared with Albuquerque International Sunport, located adjacent to the northwest corner of the base. Airfield operations and aircraft support facilities, including aircraft maintenance, are concentrated in the airfield complex area. The remainder of the intensive development on base consists of administrative and research, industrial, medical, open space/recreation, and housing located north and east and south of the airfield complex in the northwest corner of the base in the cantonment area. The Proposed Actions would occur in the northwest and north-central portions of the base.

The no-tolerance zones are disturbed sites with a variety of land uses. Much of the area north of Tijeras Arroyo is heavily developed; some of the prevalent land uses in this portion of the base include housing, office buildings, recreational areas and aircraft facilities (see Figure 2-2). The remaining no-tolerance zones (see Figure 2-1) contain a munitions storage complex, a golf course, a heliport, an EOD range, a testing operations area, riding stables, administrative facilities, a driver's training area, a safety inspection pad, an Antennae Array Site, and a weapons training area. The proposed prairie dog relocation site is primarily open grassland and would occupy approximately 3,500 acres.

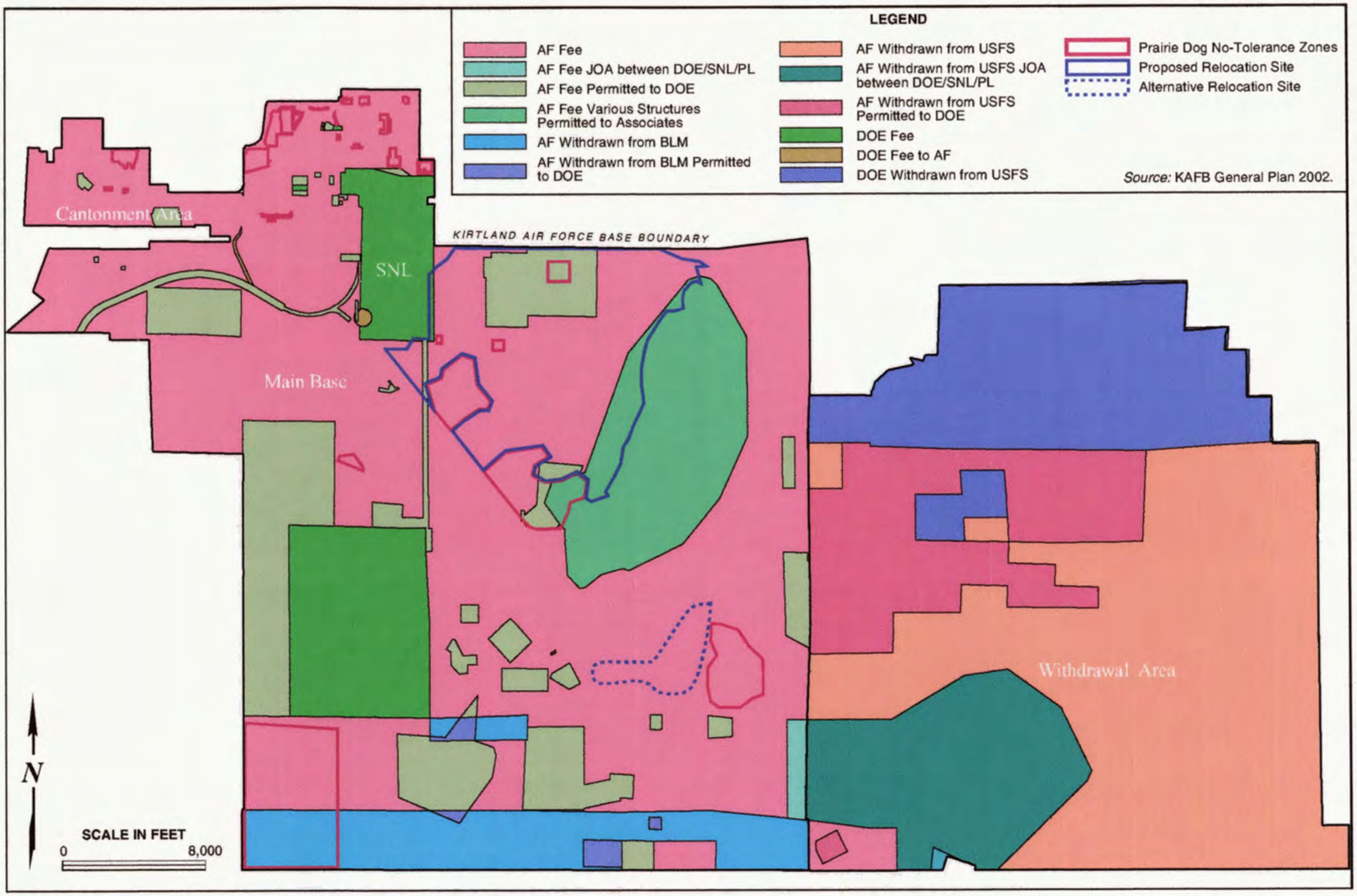

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FIGURE 3-1

Kirtland Air Force Base Land Agreements

The alternative relocation site is currently vacant land. It is primarily open grassland and is similar to the proposed relocation site. The alternative site is approximately 370 acres.

3.3.3 Environmental Consequences to Land Use

3.3.3.1 Significance Criteria

Potential impacts to land use are evaluated by determining if an action is compatible with existing land use and in compliance with adopted land use plans and policies. In general, land use impacts would be considered significant if they would: (1) be inconsistent or noncompliant with applicable land use plans and policies, (2) prevent continued use or occupation of an area, or (3) be incompatible with adjacent or nearby land use to the extent that public health or safety is threatened.

3.3.3.2 Proposed Actions

No-Tolerance and Buffer Zones. Removal of prairie dogs from no-tolerance and buffer zones would not adversely affect land use on base. These areas would be able to be used for their intended land use as a result of prairie dog removal. The Proposed Actions would allow base operations to occur in a safe manner at the munitions storage complex, heliport, EOD Range, Well No. 9 Complex, Antennae Array Site, and training areas. Other no-tolerance zones, including the golf course, riding stables, administrative offices, housing areas, and roadways, could function safely and without disruption from prairie dog activities if the Proposed Actions were implemented.

Removal Methods. Access to no-tolerance zones may be limited while prairie dogs are being captured or fumigated. Any impacts to land use would be short term.

Relocation Site. The proposed relocation site is on a 3,500-acre site located in the north-central portion of the base. Prairie dogs would be released in the northeastern portion of this site. Prairie dogs inhabited this area prior to the current land use. The site is a large undeveloped area consisting of native grassland. A residential area is located off-base north of the proposed relocation site. The existing security fencing along the Kirtland AFB border would be retrofitted to keep prairie dogs from entering adjoining properties. Land use in this area would not be adversely affected by the Proposed Actions if mitigation measures such as prairie dog fencing and barriers were installed and maintained.

3.3.3.3 Alternative Relocation Site

The alternative relocation site is in the southeast portion of the base and consists of 370 acres of grassland. Land surrounding the alternative relocation site has been disturbed by previous human activity and prairie dogs do not currently occupy this area. Impacts to land use would be similar to those described for the Proposed Actions, except that there are no adjoining residential properties.

3.3.3.4 No-Action Alternative

Changes to land use would not occur if the No-Action Alternative were implemented. The No-Action Alternative would result in continued prairie dog degradation of the no-tolerance zones on base. Prairie dog digging could render parks, athletic fields, the golf course, housing units, and jogging paths unusable.

3.3.3.5 Other Future Actions on the Base

No significant impacts to current land use would occur from the Proposed Actions addressed in this document. Therefore, the cumulative effects of the Proposed Actions, when considered with potential disturbances to land use from the other future actions, are not expected to have a significant cumulative negative impact on land use.

3.4 Geological Resources

3.4.1 Definition of Geological Resources

The geologic resources of an area consist of all soil and rock materials. For the purposes of this study, the terms soil and rock refer to unconsolidated and consolidated earth materials, respectively. The geology of an area includes mineral deposits, notable landforms, tectonic features, and fossil remains.

3.4.2 Existing Geological Resource Conditions

3.4.2.1 Geology

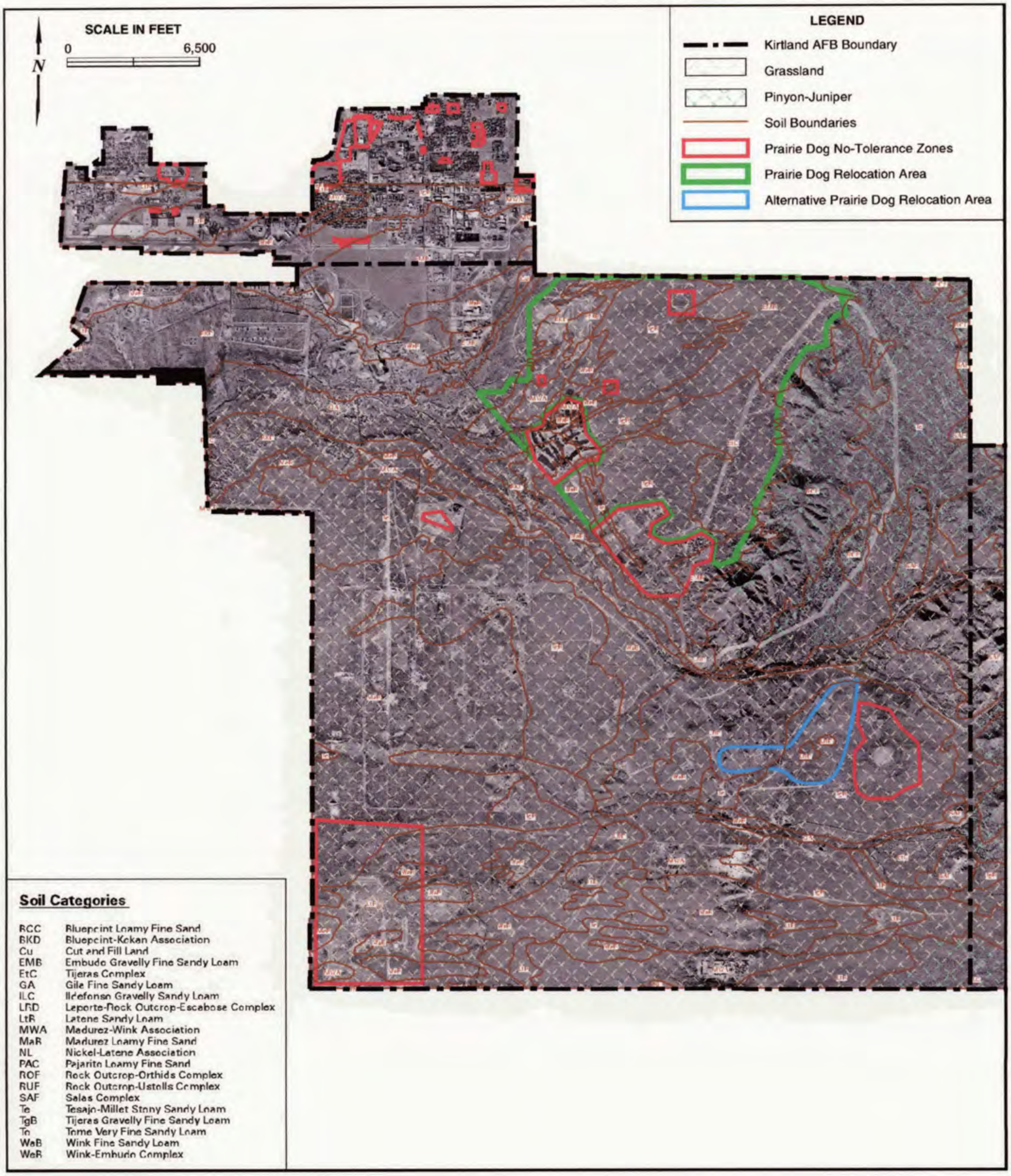
Kirtland AFB is situated in the eastern portion of the Albuquerque Basin, which is one of the largest of a series of north-trending basins and measures 90 miles long and 30 miles wide (Fenneman 1931). The basin extends from the gently sloping area near the Rio Grande River to the steep foothills and slopes of the Manzanita and Manzano Mountains. Different landforms within the basin include mesas, benches, stream terraces, low hills, ridges, and graded alluvial slopes (Lozinsky et al. 1991; Kelley 1977; Kelley and Northrup 1975). Elevations at Kirtland AFB range from 5,200 feet in the west to almost 8,000 feet in the Manzantia Mountains. Several canyons are found within the boundary of Kirtland AFB including Lurance and Sol se Mete Canyons which are located in the northeastern portion of the base, near the boundary of the Cibola National Forest.

Most of the Albuquerque Basin consists of poorly consolidated sediments that eroded from the surrounding mountains following previous faulting and geologic activity. These sediments, known as the Santa Fe Group, are overlain in places by the 5.3 to 1.6-million-year-old Ortiz Gravel deposits. In certain places, Rio Grande River and volcanic deposits are interspersed.

3.4.2.2 Soils

The dominant soils of the Albuquerque Basin are well drained and loamy, with minor amounts of gravelly and stony soils along the mountains and arroyos. A variety of soil associations occur on Kirtland AFB's grasslands: Gila-Vinton-Brazito association, Bluepoint-Kokan association, Madurez-Wink association, and Tijeras-Embudo association (US Department of Agriculture [USDA] 1977). Each association contains several specific soil series that differ in composition and individual characteristics. Primary soil associations on Kirtland AFB are presented in Figure 3-2.

The predominant soil series found in the cantonment area of Kirtland AFB are Tijeras gravelly fine sandy loam, Madurez-Wink association, and Embudo gravelly fine sandy loam (USDA 1977). The dominant soil types present in the western grasslands are Madurez loamy fine sand, Tijeras gravelly fine sandy loam, Madurez-Wink association,



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Kirtland Air Force Base Soils

FIGURE

3-2

and Wink fine sandy loam. Soil series found in the piñon-juniper hills include Rock-outcrop-Orthid complex, Tesajo-Millet sandy loams, and Salas complex.

The primary soil types found at the proposed relocation site are primarily sandy loams including Tijeras gravelly fine sandy loam, Embudo gravelly fine sandy loam, and Tijeras complex. These soils are moderately permeable and have a moderate level of water erosion hazard (USDA 1977). The primary soil series found at the alternative relocation site include Tijeras gravelly fine sandy loam with inclusions of Laporte-Rock outcrop-Escabosa complexes. The soils in this area are moderately permeable and the hazard of water erosion is moderate for the Tijeras and Laporte soils (USDA 1977).

3.4.3 Environmental Consequences to Geological Resources

3.4.3.1 Significance Criteria

An impact to geological resources would be considered significant if a proposed action would violate a federal, state or local law or regulation protecting geological resources (e.g., impacted unique landforms or rock formations), or result in uncontrolled erosion over a larger area than that allowed by regulations protecting soil resources.

3.4.3.2 Proposed Actions

No-Tolerance and Buffer Zones. Elimination of prairie dogs from no-tolerance zones and buffer zones would eventually result in decreased potential for erosion as disturbed ground becomes revegetated.

Removal Methods. Use of nonlethal and lethal prairie dog control measures would not adversely affect geological resources. Although use of soap and water could result in some minor localized soil erosion, best management practices would be implemented to minimize these impacts. This is accomplished by ensuring the nozzle is in the burrow before water is turned on and through placement of hay bales around the burrow to slow the water enough for it to drop its sediment load. Trapping would not affect geological resources.

Relocation Site. Minor degradation of the area's vegetation from augering holes and transporting prairie dogs to the holes, as well as from prairie dog activity, could also degrade the local vegetation, thereby increasing the potential for erosion. Erosion from these activities is expected to be minor and insignificant since similar soils are present at the current areas of prairie dog activity and soil erosion issues there are trivial.

3.4.3.3 Alternative Relocation Site

Impacts to geological resources from use of the alternative relocation site would be similar to those described for the Proposed Actions.

3.4.3.4 No-Action Alternative

Implementation of the No-Action Alternative would result in no changes to geological resources from current conditions. Prairie dogs located in no-tolerance zones would continue to degrade these sites from their foraging and burrowing activities.

3.4.3.5 Other Future Actions on the Base

Insignificant impacts to regional geological resources would occur from the Proposed Actions addressed in this document or other currently known future actions. Therefore, the cumulative effects of the Proposed Actions, when considered with potential disturbances to geological resources from the other future actions, are not expected to have a significant cumulative negative impact on geological resources.

3.5 WATER RESOURCES

3.5.1 Definition of Water Resources

Water resources include all surface waters and groundwater and their availability for human use. For this analysis, those water resources located within the proposed project area and the watershed areas affected by existing and potential runoff, including an area's potential for flooding (100-year floodplains), were investigated. Surface water resources comprise lakes, rivers, and streams and are important for economic, ecological, recreational, and human health reasons. Groundwater comprises the subsurface hydrologic resources of the physical environment and is an essential resource in many areas; groundwater is commonly used for potable water consumption, agricultural irrigation, and industrial applications. Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, water quality, and surrounding geologic composition.

Other issues relevant to water resources include watershed areas affected by existing and potential runoff and hazards associated with 100-year floodplains. Floodplains are often belts of low, level ground present on one or both sides of a stream channel and are subject to either periodic or infrequent inundation by floodwater. Inundation dangers associated with floodplains have prompted federal, state, and local legislation that limit development in these areas largely to recreation and preservation activities. The 100-year floodplain on Kirtland AFB is shown on Figure 3-3.

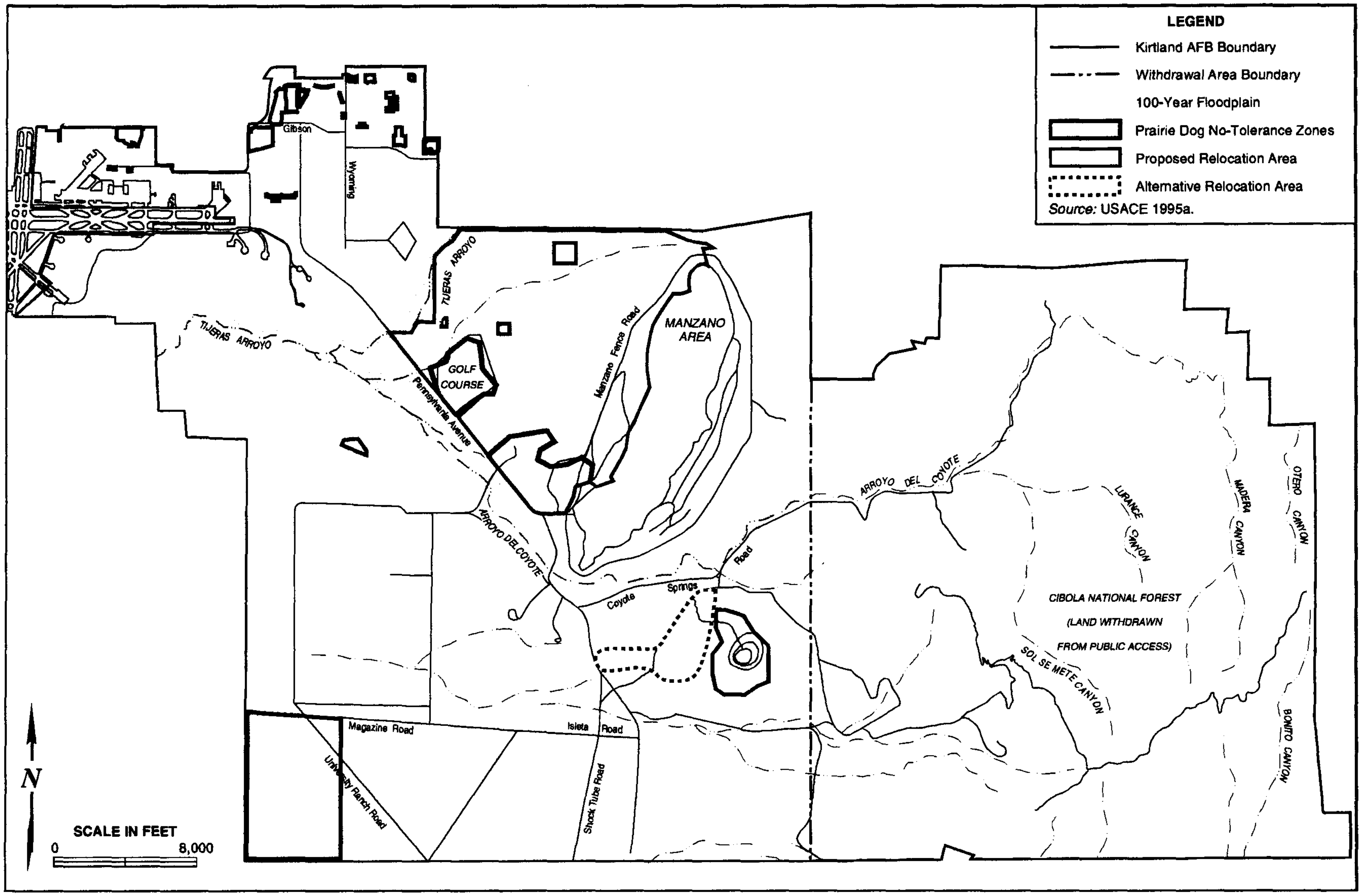
3.5.2 Existing Water Resource Conditions

3.5.2.1 Surface Water

The Rio Grande River is the major surface hydrologic feature in central New Mexico, flowing north to south through Albuquerque approximately 5 miles west of Kirtland AFB. Minor surface water bodies exist on the East Mesa as small wetlands, such as Coyote Springs and Sol se Mete Spring or as small reservoirs such as the ponds located at Tijeras Arroyo Golf Course.

East Mesa surface water occurs in the form of storm water sheet flows that drain into small gullies when it rains. The primary surface channels that drain runoff from Kirtland AFB to the Rio Grande River are the Tijeras Arroyo and Arroyo del Coyote. These arroyos are both water-carved channels that are dry for most of the year. Precipitation reaches these arroyos through a series of storm drains, flood canals, and unnamed smaller arroyos. Surface water enters Tijeras Arroyo where it crosses the northeast corner of Kirtland AFB and then flows south of Albuquerque International Sunport, draining eventually into the Rio Grande River (USAF 1991). Arroyo del Coyote collects water from Madera, Lurance and Sol se Mete Canyons in the Manzanita Mountains and drains into Tijeras Arroyo approximately one mile west of the Tijeras Arroyo Golf Course.

Both Arroyo del Coyote and Tijeras Arroyo flow intermittently during heavy thunderstorms and spring snowmelt (US Army Corps of Engineers [USACE] 1979). However, nearly 95 percent of the precipitation that flows through the Tijeras Arroyo evaporates before it reaches the Rio Grande River. The remaining 5 percent is equally



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100-Year Floodplain on Kirtland Air Force Base

FIGURE

3-3

divided between runoff and groundwater recharge (USAF 1991). The Proposed Actions and alternative relocation sites contain un-named smaller arroyos that drain into these major arroyos.

3.5.2.2 Floodplains

Flooding on Kirtland AFB generally occurs between May and October during high-intensity thunderstorms (USACE 1979a). Tijeras Arroyo and Arroyo del Coyote floods are characterized by high peak flows, small volumes, and short duration. Although flooding occurs infrequently, vegetation can encroach into these arroyos' channels, obstructing the flow of water and causing flooding. A 100-year floodplain encompasses these arroyos and follows their paths. The western boundary of the proposed prairie dog relocation site abuts the Tijeras Arroyo 100-year floodplain.

3.5.2.3 Groundwater

Kirtland AFB is located within the limits of the Rio Grande Underground Water Basin, which has been defined by the State of New Mexico as a natural resource area and has been designated as a "declared underground water basin." The state regulates it as a sole source of potable water. The average depth to groundwater beneath Kirtland AFB is 450 to 550 feet. The Rio Grande Basin's source of groundwater is the Santa Fe Aquifer. Albuquerque relies on groundwater as its sole potable water source.

3.5.2.4 Kirtland AFB

Water Supply

Water on base is supplied by seven installation water wells and two separate but interconnected distribution systems. These systems were developed separately for Sandia Base and Kirtland AFB before they were combined into a single installation. Water is also purchased from the City of Albuquerque. Water purchased from the city is primarily for use in meeting peak demands, for providing water when wells are out of service and to keep water production within water rights allocations.

3.5.3 Environmental Consequences to Water Resources

3.5.3.1 Significance Criteria

Criteria for determining the significance of impacts to water resources are based on water availability, quality, and use; existence of floodplains and wetlands; and associated regulations. An impact to water resources would be significant if it: 1) reduced water availability to or interfered with the supply of existing users; 2) created or contributed to overdraft of groundwater basins or exceeded safe annual yield of water supply sources; 3) adversely affected water quality or endangered public health by creating or worsening adverse health hazards or safety conditions; 4) threatened or damaged unique hydrologic characteristics; or 5) violated established laws or regulations adopted to protect or manage water resources of an area. Impacts to flood plains from a proposed action would be significant if they would negatively alter flow within the floodplain.

3.5.3.2 Proposed Actions

No-Tolerance and Buffer Zones. Removal of prairie dogs from no-tolerance and buffer zones is not expected to affect water resources. The Tijeras Golf Course contains two man-made ponds. These surface water resources are surrounded by rip-rap material which prevents prairie dogs from occurring in the immediate area.

Removal Methods. Use of nonlethal and lethal prairie dog control measures would have no negative impacts on water resources. Use of biodegradable soap is not expected to impact the Rio Grande, groundwater, or the floodplain. Aluminum phosphide dissipates into the atmosphere and would not reach groundwater or surface water.

Relocation Site. Establishment of a prairie dog reserve could result in temporary degradation of the area's vegetation. Due to the lack of surface water in the area, adverse impacts would not occur. Most of the relocation site is found outside of the 100-year floodplain. Release of prairie dogs into this area is not expected to adversely impact the floodplain due to their negligible effects to existing landforms.

3.5.3.3 Alternative Relocation Site

Implementation of this alternative would affect water quality in the same manner as the Proposed Actions addressed above.

3.5.3.4 No-Action Alternative

Implementation of the No-Action Alternative would result in no changes to water quality from the current conditions.

3.5.3.5 Other Future Actions on the Base

Insignificant impacts to water resources would occur from the Proposed Actions addressed in this document. Therefore, the cumulative effects of the Proposed Actions, when considered with potential disturbances to water resources from other future actions, are not expected to have a significant cumulative negative impact on water resources in the area.

3.6 Biological Resources

3.6.1 Definition of Biological Resources

Biological resources include native, naturalized, or introduced plants and animals and the habitats in which they occur. Protected species are defined as those listed as threatened, endangered, or proposed or candidate for listing by the US Fish and Wildlife Service (USFWS); New Mexico Energy, Minerals, and Natural Resources Department (NMEMNRD); and/or the New Mexico Department of Game and Fish (NMDG&F). Federal species of concern, formerly known as candidate category two species, are not protected by law; however, these species could become listed, and therefore are considered when addressing biological resource impacts of an action. The New Mexico Natural Heritage Program also maintains a listing of threatened or endangered species. NMEMNRD holds the responsibility for identifying and listing sensitive plant species considered in this analysis. Animal species of special concern to the NMDG&F are also considered.

Sensitive habitats include those areas designated by the USFWS as critical habitat protected by the Endangered Species Act and sensitive ecological areas as designated by state or federal rulings. Sensitive habitats also include wetlands, plant communities that are unusual or of limited distribution, and important seasonal use areas for wildlife (e.g., migration routes, breeding areas, crucial summer/winter habitats).

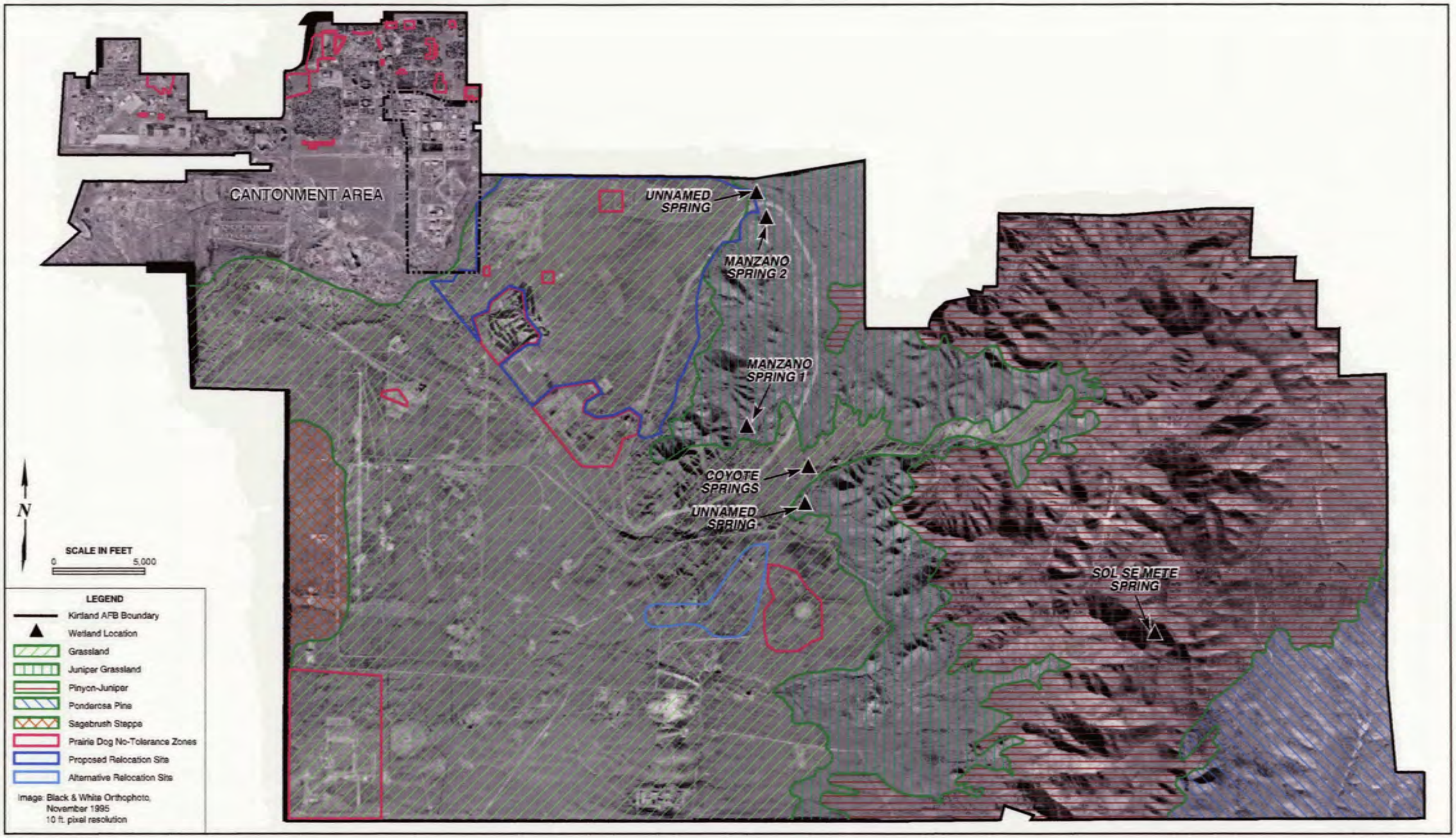
Jurisdictional wetlands are those subject to regulatory authority under Section 404 of the Clean Water Act (CWA) and EO 11990, *Protection of Wetlands*. Wetlands are defined by the USACE (Federal Register 1982) and EPA (Federal Register 1980) as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR § 328.3(b), 1984).

3.6.2 Existing Biological Resource Conditions

Kirtland AFB lies at the intersection of four major North American physiographic and biotic provinces: the Great Plains, Great Basin, Rocky Mountains, and Chihuahuan Desert. Vegetation and wildlife found within Kirtland AFB are influenced by each of these provinces, the Great Basin being the most dominant.

3.6.2.1 Vegetation

The vegetation scheme at Kirtland AFB consists of four main plant communities: grassland, piñon-juniper, ponderosa, and riparian/wetland/arroyo. Transitional areas are found between these communities and contain a mixture of representative species from the bordering areas. Two transitional zones have been delineated in the grassland community and include the juniper-grassland and sagebrush steppe. Both the grassland and piñon-juniper are the dominant vegetative communities at Kirtland AFB. The riparian/wetland/arroyo community is confined to isolated areas inundated by surface water during at least some part of the year. Only the grassland and piñon-juniper communities will be discussed as the Proposed Actions and relocations sites are either located on or near these vegetation associations. Native vegetation communities are shown in Figure 3-4.



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Native Vegetation and Wetland Locations on Kirtland Air Force Base

FIGURE

3-4

The grassland community occurs between elevations of 5,200 and 5,700 feet in the southwestern and north-central portions of Kirtland AFB, although in some areas of the base it can be found as high as 6,900 feet. Vegetation typical of the grassland community at Kirtland AFB includes broom snakeweed (*Gutierrezia sarothrae*), Great Plains yucca (*Yucca glauca)*, Indian ricegrass (*Oryzopsis hymenoides*), purple tree-awn (*Artemisia pupurea*), black grama (*Bouteloua eriopoda*), blue grama (*Bouteloua gracilis*), galleta (*Hilaria jamesii*), foxtail barley (*Hordeum jubatum*), four-wing saltbush (*Atriplex canescens*), sand sagebrush (*Artemisia filifolia*), needle-and-thread grass (*Stipa comata*), globemallows (*Sphaeralcea* spp.), Siberian elm (*Ulmus pumila*), Mormon tea (*Ephedra trifurca*), New Mexican bitterweed (*Senecio neomexicanus*), ring muhly (*Muhlenbergia torreyi*), plains prickly-pear (*Opuntia polyacantha*), and bottlebrush squirrel tail (*Elymus longifolius*). The juniper-grassland transitional zone contains many of the same species as the surrounding grasslands but develops into a savanna type habitat with a presence of one-seeded juniper (*Juniperus monosperma*). All of the no-tolerance zones and both of the relocation sites are found in the grassland community.

Another important plant community found at Kirtland AFB is the piñon-juniper community. The piñon-juniper community ranges in elevation from 6,300 to 7,700 feet. This dominant plant community is composed of Colorado pinyon pine (*Pinus edulis*) and one-seeded juniper with an understory of grasses and shrubs including blue grama, side oats grama (*Bouteloua curtipendula*), banana yucca (*Yucca baccata*), alderleaf mountain mahogany (*Cercocarpus montanus*), and squawberry (*Rhus trilobata*). This plant community occurs primarily in the far eastern portions of Kirtland AFB and the Withdrawal Area. The eastern boundary of the proposed relocation site abuts the piñon-juniper association.

3.6.2.2 Wetlands

The USACE Albuquerque District has delineated wetlands on Kirtland AFB, including a description of waters of the US regulated pursuant to Section 404 of the CWA, and a restatement of the location of the 100-year floodplain determined in a 1979 study (USACE 1995). (Floodplains are discussed in Section 3.5, Water Resources.) There are no wetlands or riparian areas within the area of the proposed project. Two small springs and their associated wetlands are located approximately 200 meters from the northeast corner of the proposed relocation site. The nearest wetland to the alternative relocation area is found approximately 1 mile to the northeast of the site.

3.6.2.3 Wildlife

Wildlife communities at Kirtland AFB are typical of woodland and grassland types of habitat within the central New Mexico region.

Common birds associated with the grassland association at Kirtland AFB include horned lark (*Eremophila alpestris*), scaled quail (*Callipepia squamata*), mourning dove (*Zenaida macroura*), greater roadrunner (*Geococcyx californianus*), American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), curved-billed thrasher (*Toxostoma curvirsostre*), lark sparrow (*Chordestes grammacus*), black-throated sparrow (*Amphispiza bilineata*), western meadowlark (*Sturnella neglecta*), brown-headed cowbird (*Molothrus ater*), and house finch (*Carpodacus mexicanus*).

The birds of prey, or raptors, most commonly found in the grasslands include northern harrier (*Circus cyaneus*), western burrowing owl, red-tailed hawk (*Buteo jamaicensis),* American kestrel (*Falco sparverius*), prairie falcon (*F. mexicanus*), long-eared owl (*Asio otus*), and great horned owl (*Bubo virginianus*). A common scavenger is the turkey vulture (*Cathartes aura*).

The grassland association has a mammal community dominated by rodents, rabbits, and hares. These include the desert cottontail (*Sylvilagus audubonii*), Gunnison's prairie dog (*Cynomys gunnisoni*), white-footed deer mouse (*Peromyscus maniculatus*), silky pocket mouse (*Perognathus flavus*), Merriam's kangaroo rat (*Dipodomys merriami*), and the northern grasshopper mouse (*Onychomys leucogaster*). Mammalian predators found in the grassland association include the coyote (*Canis latrans*), badger (*Taxidea taxus*), kit fox (*Vulpes macrotis*), striped skunk (*Mephitis mephitis*) and bobcat (*Lynx rufus*).

A variety of amphibians and reptiles are found within the grassland association. Many of these species have extensive periods of dormancy during dry conditions and rapid breeding cycles when temporary ponds occur after rains. Amphibians and reptiles found on the grasslands at Kirtland AFB include the Woodhouse toad (*Bufo woodhousii*), New Mexico spadefoot (*Spea multiplicata*), coachwhip snake (*Masticophis flagellum*), whiptail lizards (*Cnemidophorus* spp.), lesser earless lizard (*Holbrookia maculata*), and the western rattlesnake (*Crotalus viridis*).

Much of the wildlife found in the grassland community also occurs in the piñon-juniper woodlands. Additional bird species found in the woodland association include the scrub jay (*Aphelocoma coerulescens*), white-breasted nuthatch (*Sitta carolinensis*), Downy woodpecker (*Picoides pubescens*), and sharp-shinned hawk (*Accipiter striatus*). Mammals known to inhabit the piñon-juniper community include the common porcupine (*Erethizon dorsatum*), black bear (*Ursus americanus*), rock squirrel (*Spermaphilus variegatus*), mule deer (*Odocoileus hemionus*), and mountain lion (*Felis concolor*). Additional reptiles include the mountain patchnosed snake (*Salvadora grahamiae*) and the tree lizard (*Urosaurus ornatus*).

3.6.2.4 Threatened and Endangered Species

Thirty-two state and federally listed species could occur in Bernalillo County. Several state and federally listed species have the potential to occur on Kirtland AFB or within the Withdrawal Area. Federally threatened and endangered species are legally protected under the Endangered Species Act. In New Mexico, threatened and endangered animal species are protected by the New Mexico Wildlife Act. The NMEMNRD maintains listings of state threatened and endangered plants, which are protected under the New Mexico Endangered Plant Species Act. Table 3-2 lists species found in Bernalillo County and their potential for occurring on base or in the Withdrawal Area.

Of the seventeen species listed as threatened or endangered for Bernalillo County, seven of these species could not occur on Kirtland AFB or in the Withdrawal Area due to habitat restrictions. The federally endangered Rio Grande silvery minnow is found only within its critical habitat in the Rio Grande River. The state threatened neotrophic cormorant is attracted to large water bodies, such as Elephant Butte Reservoir in Sierra County, south of Kirtland AFB (NMDG&F 2001). Farther to the north, the neotrophic cormorant is only found along the Rio Grande River. No large water bodies that could attract neotrophic cormorants are located at Kirtland AFB. The state threatened common black-hawk occupies dense, well-developed riparian corridors along permanent streams and rivers (NMDG&F 2001). These habitats contain the necessary prey base to support this bird species. Surface drainages at Kirtland AFB are sporadic and do not contain water year round; therefore, well-developed riparian areas are not found at Kirtland AFB. The Bell's vireo a state threatened bird, prefers riparian habitats similar to that of the common black-hawk. This species prefers dense riparian corridors along permanent grassland streams (NMDG&F 2001). Permanent streams are not present

Table 3-2. Special Status Species, Bernalillo County

Common Name	Scientific Name	Status	Occurrence at Kirtland AFB	Occurrence Within Withdrawal Area	Habitat	Season	Behavior
FISH							
Rio Grande silvery minnow	*Hybognathus amarus*	FE, SE, PCH	No	No	AQ	AY	Breeds
REPTILES							
Texas horned lizard	*Phrynosoma cornutum*	FSC	Potential	Potential	G, PJ	AY	Breeds
BIRDS							
Neotrophic cormorant	*Phalacrocorax brasilianus*	ST	No	No	R, AQ	SP, SM	Breeds
White-faced ibis	*Plegadis chihi*	FSC	No	No			
Bald eagle	*Haliaeetus leucocephalus*	FT, ST	Potential	Potential	G, PJ, P	SP, F	Transient
Northern goshawk	*Accipiter gentilis*	FSC	No	Potential	PJ, P	SP, SM, F	Transient, breeds in summer
Common black-hawk	*Buteogallus anthracinus anthracinus*	ST	No	No	R	SM	Breeds
Ferruginous hawk	*Buteo regalis*	FSC	Potential	Potential	G, PJ, P		
Whooping crane	*Grus americana*	FE, SE	No	No	G, R, AQ	W	Transient
Black tern	*Chlidonias niger surinamensis*	FSC	No	No			
Burrowing owl	*Athene cunicularia hypugaea*	FSC	Yes	Yes	G, PJ	SP, SM, F	Transient, nest in summer
Mexican spotted owl	*Strix occidentalis lucida*	FT, CH	Potential	Potential	PJ, P	AY	Transient, breeds in summer
White-eared hummingbird	*Hylocharis leucotis borealis*	ST	No	Potential	P	SM	Transient
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE, SE, CH	No	No	R	SP, SM, F	Breeds
Loggerhead shrike	*Lanius ludovicianus*	FSC	Yes	Yes	G, PJ, R	AY	Transient, nests in summer, winter resident
American peregrine falcon	*Falco peregrinus anatum*	ST	Potential	Potential	G, PJ, P	SP,SM, F	Transient
Bell's vireo	*Vireo bellii*	ST	No	No	R	SM	Breeds
Gray vireo	*Vireo vicinior*	ST	Potential	Yes	PJ	SP, SM	Transient, breeds in summer
Baird's sparrow	*Ammodramus bairdii*	ST	Potential	No	G, PJ	F	Transient

Table 3-2. Special Status Species, Bernalillo County (continued)

Common Name	Scientific Name	Status	Occurrence at Kirtland AFB	Occurrence Within Withdrawal Area	Habitat	Season	Behavior
MAMMALS							
Black-footed ferret	*Mustela nigripes*	FE	No	No	G, PJ	AY	Breeds
Spotted bat	*Euderma maculatum*	ST	No	Potential	R, PJ, P	SM	Transient
Western small-footed myotis bat	*Myotis ciliolabrum melanorhinus*	FSC	No	Potential	R	SM	Breeds
Yuma myotis bat	*Myotis yumanensis yumanensis*	FSC	No	No			
Occult little brown myotis bat	*Myotis lucifugus occultus*	FSC	No	No			
Long-legged myotis bat	*Myotis volans interior*	FSC	No	Potential	PJ, P	SM	Breeds
Fringed myotis bat	*Myotis thysanodes*	FSC	No	No			
Pale Townsend's big-eared bat	*Plecoyus townsendii pallescens*	FSC	No	No			
Big free-tailed bat	*Nyctinomops macrotis*	FSC	No	No			
Arizona black-tailed prairie dog	*Cynomys ludoficianus arizonicus*	C	No	No	G, PJ		
Pecos River muskrat	*Ondatra zibethicus ripensis*	FSC	No	No			
New Mexican jumping mouse	*Zapus hudsonius luteus*	ST	Potential	No	R	AY	Breeds
PLANTS							
Great Plains ladies'-tresses orchid	*Spiranthes magnicamporum*	SE	No	Potential	R, PJ	AY	Grows

Sources: New Mexico Department of Game and Fish 1999, New Mexico Department of Game and Fish 2002, New Mexico Natural Heritage Program 2002

Notes:

FE = Federal Endangered	ST = State Threatened	G = Grassland	AY = All Year
FT = Federal Threatened	FSC = Federal Species of Concern	PJ = piñon/Juniper	SP = Spring
C = Federal Candidate	PCH = Proposed Critical Habitat	P = Ponderosa	SM = Summer
SE = State Endangered	CH = Critical Habitat	R = Riparian	F = Fall

within the grasslands at Kirtland AFB. Lack of adequate riparian habitat also prevents the federally endangered southwestern willow flycatcher from occurring at Kirtland AFB. During a survey for southwestern willow flycatchers conducted in 1994 to 1996, this species was discovered in riparian habitat along the Rio Grande River near Albuquerque, but not at Kirtland AFB (USAF 1998).

The last two of the seven species that could not occur on Kirtland AFB due to habitat restrictions are the whooping crane and the black-footed ferret. The federally endangered whooping crane is only known in New Mexico from three experimental populations. The populations that migrate through New Mexico primarily travel to the shores of the Gulf of Mexico (NMDG&F 2001). These birds are known to frequent riparian and aquatic habitats along the Rio Grande River, but are not known to occur at Kirtland AFB. The federally endangered black-footed ferret could occur within a 50-mile radius of Kirtland AFB, but it has never been reported in the area (USAF 1991). This species is presumed to be extirpated from Bernalillo County (NMDG&F 2001).

Two federal species of concern are known to occur at Kirtland AFB and the Withdrawal Area. The western burrowing owl inhabits the disturbed grasslands at Kirtland AFB and is typically associated with Gunnison's prairie dog towns. Burrowing owls have the potential to be found throughout Kirtland AFB but typically inhabit the disturbed grasslands surrounding Albuquerque's Sunport flight lines as well as other open areas about the cantonment area. Most burrowing owl nesting sites known to occur at Kirtland AFB are located about the cantonment area. The loggerhead shrike, another federal species of concern, is also commonly observed throughout Kirtland AFB. This species can be found throughout the grassland community as long as there is a shrub component present. It is a year round resident and likely breeds on base during the summer.

Nine of the threatened or endangered species listed for Bernalillo County occur, or have the potential to occur, at Kirtland AFB or in the Withdrawal Area. These species are: the bald eagle, Mexican spotted owl, American peregrine falcon, white-eared hummingbird, gray vireo, Baird's sparrow, spotted bat, New Mexican jumping mouse, and the Great Plains ladies'-tresses orchid. Further information on these species can be found in the Kirtland AFB Southern Perimeter Fence EA, Final December, 2002.

3.6.3 Environmental Consequences to Biological Resources

3.6.3.1 Significance Criteria

Determination of the significance of impacts to biological resources is based on: 1) the importance (legal, commercial, recreational, ecological, or scientific) of the resource; 2) the proportion of the resource that would be affected relative to its occurrence in the region; 3) the sensitivity of the resource to proposed activities; and 4) the duration of ecological ramifications. Impacts to biological resources would be considered significant if species or habitats of high concern would be adversely affected over relatively large areas, or disturbances would cause reductions in population size or distribution of a species of special concern.

Determination of the significance of wetland impacts is based on: 1) the function and value of the wetland; 2) the proportion of the wetland that would be affected relative to the occurrence of similar wetlands in the region; 3) the sensitivity of the wetland to proposed activities; and 4) the duration of ecological ramifications. Impacts to wetland resources are considered significant if high value wetlands would be adversely affected.

3.6.3.2 Proposed Actions

To minimize adverse impacts to nontarget biological resources (i.e. species other than Gunnison's prairie dogs), Kirtland AFB proposes to use nonlethal population control methods (i.e. soap and water foam, and live trapping) in a first attempt to remove prairie dogs from selected areas. After these methods are implemented, remaining prairie dogs would be fumigated with aluminum phosphide. This section describes potential impacts to biological resources (vegetation, wetlands, wildlife, and special status species) from implementation of the Proposed Actions as a whole, with discussions of only those removal methods that may affect the specific resource under consideration. This section also describes potential impacts from relocating prairie dogs to the prairie dog relocation site in the north-central portion of the base and subsequent fumigation of prairie dogs that reinhabit no-tolerance zones.

Vegetation

No-Tolerance and Buffer Zones. Vegetation in areas cleared of prairie dogs is expected to eventually undergo successional changes that have been prevented by selective grazing by the prairie dogs. Forbs (e.g., Russian thistle and globemallows), invasives (e.g., broom snakeweed), and other weedy species would continue to thrive for the first 2 to 4 years following removal of prairie dogs, but grasses would later reestablish in these areas (USAF 1999). Also, there would likely be a shift toward taller species. Studies indicate that these successional changes could take several years to occur (Fagerstone and Ramey 1996). Areas rendered devoid of vegetation by digging and other types of prairie dog activity would eventually become vegetated, thereby decreasing the erosion potential. Once prairie dogs are eliminated from the no-tolerance zones some areas may be revegetated following the guidelines in Kirtland AFB's Revegetation Action Plan, which is currently being developed. This plan will describe proven techniques for revegetating sites previously inhabited by prairie dogs.

Removal Methods. Use of soap and water to capture prairie dogs would result in few, if any, adverse impacts to vegetation. Prairie dog colonies are sparsely vegetated and impacts to plants from truck tires or introduction of a nontoxic, biodegradable soap in and around burrows would be negligible. Best management practices would be implemented to minimize the chance that soapy water might flow away from the prairie dog colony. This is accomplished by ensuring the nozzle is in the burrow before water is turned on and through placement of hay bales to control runoff. Although some plants could be crushed if the water truck were driven off established roads, these impacts are expected to be negligible, especially since vegetation at these sites tends to be degraded already.

Live trapping of prairie dogs is not expected to affect the vegetation in the no-tolerance zones.

Fumigation used initially to clear no-tolerance and buffer zones of all prairie dogs and later to maintain these areas free from prairie dogs, is not expected to adversely impact vegetation. Plants do not absorb aluminum phosphide and fumigation would not leave harmful residues in the burrow (Paynter 2003; Fagerstone 1997). Application of aluminum phosphide leaves residual aluminum hydroxide, a dust that is nonhazardous to plants (Paynter 2003).

Relocation Site. Before prairie dogs are released, vegetation would be mowed at the relocation site. Following the initial mowing and the subsequent maintenance activities by prairie dogs, vegetation at the prairie dog relocation site would undergo successional changes. Vegatation at the relocation site would change to forbs, short grass species, and other shorter types of vegetation.

Minor degradation of the area's vegetation could result from augering holes and transporting prairie dogs to the holes. Digging and other prairie dog activity would render some portions of the prairie dog town devoid of vegetation, increasing the potential for insignificant to minor erosion.

Wetlands

No-Tolerance and Buffer Zones. Removal of prairie dogs from no-tolerance zones is not expected to affect wetlands. No wetlands or springs occur near any of the no-tolerance zones. Coyote Springs is the closest wetland to a no-tolerance zone; it is located approximately 1 mile north of the EOD Range (refer to Figure 3-4). Currently, no prairie dogs occur near the EOD Range; therefore, any fumigation measures used would be limited to isolated prairie dogs that gained access to the site.

Removal Methods. Use of soap and water to capture prairie dogs in the no-tolerance zones would not adversely impact wetlands. As described above, no wetlands or springs occur near any of the no-tolerance zones. Soapy water is not expected to migrate to the Coyote Springs wetland over flat terrain since the volume of water involved would soak into the ground, well before it reached the wetland.

Relocation Site. Two springs are located near the northeast border of the proposed prairie dog relocation site (refer to Figure 3-4). These springs are surrounded by piñon-juniper habitat, which is not typically occupied by prairie dogs. Additionally, the soils surrounding the springs are rocky and not conducive for burrowing, thus not allowing prairie dogs to colonize the area. Increased erosion from water due to ground disturbance by prairie dogs within the prairie dog relocation site would not impact the spring because the relocation site is downslope of the springs (US Geological Survey 1990a, c).

Wildlife

No-Tolerance and Buffer Zones. Local wildlife composition may change in response to the elimination of prairie dogs from portions of Kirtland AFB. Species that rely heavily on prairie dogs as prey, such as the red-tailed hawk, would likely forage less in the no-tolerance zones (USAF 1999). Opportunistic species, such as the coyote, may remain in the area and feed on other prey items (USAF 1997). Other wildlife species inhabiting prairie dog towns include the horned lark, western meadowlark, mourning dove, northern harrier, and badger (Hoogland 1995). These species also occur in areas not occupied by prairie dogs and, therefore, are not expected to abandon the area following elimination of prairie dogs. Under natural conditions, periodic outbreaks of plague can render areas free of prairie dogs for several years, resulting in the same habitat changes expected to occur following the Proposed Actions. Even those species dependent upon prairie dogs are not expected to abandon the base because prairie dogs would still be present at the proposed relocation site and elsewhere on and around Kirtland AFB. Therefore, adverse impacts to wildlife are expected to be insignificant.

Removal Methods. Rabbits, snakes, lizards, and other wildlife occupying prairie dog burrows could drown from application of soap and water. Many invertebrates would drown in the flooded burrows, as well. Small mammals that get water in their lungs could contract pneumonia. The risk of hypothermia would be minimized by not using this method during cold weather. Because of the relatively small numbers of animals potentially affected, adverse impacts to local nontarget animal populations are expected to be negligible.

Some nontarget animals or prairie dogs may accidentally be killed or injured during live trapping. Prairie dogs, rabbits, skunks, and other animals could be injured or may die from exposure while in traps. Due to the small numbers of animals potentially affected, adverse impacts to local nontarget animal populations are expected to be insignificant. The number of animals affected would be minimized through proper maintenance and regular checking of traps and by using personnel experienced in live trapping techniques.

Fumigation with aluminum phosphide kills all wildlife in the tunnel system (Hygnstrom and Virchow 1994; Paynter 2003). Fumigation would adversely affect localized populations of wildlife inhabiting prairie dog burrows such as rabbits, skunks, reptiles, and invertebrates. Because many of these species exhibit a relatively high reproductive rate, and since these species also occupy nearby areas on and off base that are not colonized by prairie dogs, adverse impacts to wildlife populations, with the exception of prairie dogs, are not expected to be long-term.

Aluminum phosphide is an effective poison that kills primarily through inhalation (Degesch no date; Paynter 2003). The gas migrates slowly through the soil and dissipates gradually into the atmosphere, leaving aluminum hydroxide, a nonhazardous residual dust, and trace amounts of uncreative aluminum hydroxide. Aluminum phosphide does not persist in the food chain (Paynter 2003). Although secondary poisoning of a predator or scavenger is possible, it is unlikely for the following reasons (Paynter 2003; Knight 1996). Prairie dogs killed by aluminum phosphide generally remain in burrows, thereby eliminating the potential threat to above-ground carnivores. Prairie dogs that do find their way to the surface would be exposed to fresh air and may recover, and would pose no threat to nontarget species (Degesch no date; Paynter 2003). If a prairie dog happens to die above ground, the toxic gas rapidly dissipates from the body. A scavenger or predator could be harmed only if it consumed a prairie dog soon after the prairie dog was exposed to the aluminum phosphide (Paynter 2003).

Depending on a number of conditions (soil moisture, temperature, concentration of fumigant, and humidity) many of the fleas (adults, larvae, and pupae) and flea eggs also may be killed by aluminum phosphide (Paynter 2003). Fumigation could provide a beneficial impact to local wildlife by eliminating or reducing the number of plague-carrying fleas in the no-tolerance zones.

Relocation Site. Relocating prairie dogs to the north-central portion of Kirtland AFB would mitigate some of the adverse population impacts resulting from the elimination of prairie dogs elsewhere on base. Species wholly or partially dependent on the prairie dog ecosystem (i.e. burrowing owls) would benefit from establishing a prairie dog colony in this location. For example, the relocation site would provide an additional prey base for raptors, badgers, coyotes, and other predators. Just as under natural conditions, this site may periodically become infected with plague, which could cause adverse impacts to local wildlife populations. Prairie dogs would be dusted for fleas before being released to prevent the introduction of plague into an established colony.

Although the proposed relocation site is primarily open grassland, it is also used to test unmanned robotic vehicles that resemble dune buggies. Following release of prairie dogs at the relocation area, robotic vehicle testing would continue. Since these vehicles are relatively lightweight and prairie dog burrows initially descend vertically, prairie dogs in their burrows would be unaffected if the burrows were driven over during testing. Prairie dogs are constantly alert to predators and intruders, therefore, collisions between the vehicles and prairie dogs are unlikely.

Special Status Species

The burrowing owl is the only sensitive species potentially impacted by the Proposed Actions. None of the other special status species potentially occurring at Kirtland AFB would be adversely affected by the Proposed Actions. Although they could occur in grassland habitat, peregrine falcons and loggerhead shrikes do not feed on prairie dogs and are not commonly associated with prairie dog towns. Bald eagles and ferruginous hawks are known to feed on prairie dogs; however, the Proposed Actions involve relocating prairie dogs to a more favorable foraging area and are not expected to result in a marked decrease in the base's prairie dog population. Also, since none of these raptors have been observed on Kirtland AFB, these species are obviously not dependent on the prairie dog population there.

To avoid adversely impacting the mountain plover, a proposed federally threatened species, personnel trained in mountain plover identification would check each area prior to initiation of relocation activities. If a mountain plover is found in an area that may be affected by the Proposed Actions, the USFWS would be contacted immediately for further instruction.

No-Tolerance and Buffer Zones. The species most likely to be affected by the Proposed Actions is the burrowing owl. Prairie dogs provide nest sites for these owls and removing them from the area would prevent them from creating additional burrows in the future. Although holes used by the owls would remain open even after the fumigation effort, these burrows would eventually collapse in rendering them unusable. To compensate for these collapsed holes, artificial owl burrows may be created in areas currently or previously occupied by burrowing owls. Burrowing owls displaced by successional changes resulting from elimination of prairie dogs in no-tolerance zones are expected to gradually relocate to other nearby prairie dog towns and could inhabit vacant burrows at the relocation site.

Removal Methods. Burrowing owls could be killed or injured by each of the lethal and nonlethal prairie dog removal methods. If any of the removal activities occur between March 1 and October 31, the affected prairie dog towns would first be surveyed for burrowing owls. If burrowing owls were discovered in any of the no-tolerance zones, measures would be implemented to avoid harming the owls. Soap and water application and fumigation would not be used in areas where owls are present. Fumigation would be restricted to areas greater than 150 feet away from any hole being used by a burrowing owl as this is the minimum distance required to avoid accidental fumigation. Live trapping would be closely monitored to ensure the immediate release of trapped owls. Burrows occupied by burrowing owls would not be plugged so that they might return the following year and continue to use the site. As a result, burrowing owls are not expected to be adversely affected by any of the removal methods.

Relocation Site. Burrowing owls occupied the relocation site in 1998 and currently continue to use the site (personal observation, Frei 2003). After the relocated prairie dogs become established in this area, it is possible that more burrowing owls could inhabit this site. To facilitate burrowing owl occupation of the relocation site, artificial owl burrows may be created throughout the area.

3.6.3.3 Alternative Relocation Site

Implementation of this alternative would affect biological resources in much the same manner as the Proposed Actions addressed above. Although the alternative relocation site is less than half the size of the proposed relocation site, the area is large enough to accommodate the prairie dogs presently occupying the no-tolerance zones. No wetlands are located near the alternative relocation site.

3.6.3.4 No-Action Alternative

A previous EA found no evidence of significant environmental impacts when base personnel fumigate prairie dogs on an as-needed basis (USAF 1997). Implementation of the No-Action Alternative would continue to fumigate prairie dogs and therefore, would not likely result in changes to biological resources from current conditions. If prairie dogs were not adequately controlled, however, the No-Action Alternative could result in adverse impacts to biological resources in the no-tolerance zones. Vegetation (including ornamentals planted throughout the base) would continue to be clipped short by prairie dogs. If prairie dogs were to expand into the EOD Range, animals associated with prairie dog towns (including burrowing owls) may be killed or injured by exploding ordnance.

3.6.3.5 Other Future Actions on the Base

No impacts to biological resources would occur from the Proposed Actions addressed in this document. Therefore, the cumulative effects of the Proposed Actions, when considered with potential disturbances to biological resources from other future actions, are not expected to have a significant cumulative negative impact on biological resources in the area.

3.7 Cultural Resources

3.7.1 Definition of Cultural Resources

Historic properties (i.e. significant cultural resources) are classified as buildings, sites, districts, structures, or objects. A building is created to shelter any form of human activity. A structure is distinguished from a building in that it is a construction designed for purposes other than creating human shelter. Objects are constructions that are primarily artistic in nature or are relatively small and simply constructed. A site is the location of a significant event, a prehistoric or historic activity, or a building or structure whose location possesses value. A district is a concentration or linkage of sites, buildings, structures, or objects that are united historically or aesthetically by plan or development.

The criteria for establishing significance are set forth in Title 36 CFR Part 60.4. Procedures for the application of the National Register criteria for evaluation are found in various National Park Service bulletins. These bulletins provide guidelines so that decisions concerning significance, integrity, and treatment can be reliably made.

3.7.2 Existing Cultural Resource Conditions

Records available through the New Mexico Cultural Resources Inventory System administered by the Archaeological Resources Management Section were queried for current information regarding previous studies and known cultural resources within the proposed and alternative prairie dog relocation areas. Over 500 historic and prehistoric cultural resources are known to exist on Kirtland AFB. These include historic buildings, structures, and sites dating from European contact, ca. AD 1540, through the Cold War, ca. AD 1945-1991. Prehistoric sites dating from the Paleo-Indian Period to the Pueblo Period have been recorded.

3.7.2.1 Proposed Actions

Four major archaeological studies have been completed in the vicinity of the proposed prairie dog relocation area. These surveys found a total of 20 historic and prehistoric archaeological sites located within the proposed relocation area, 10 of which have been recommended as eligible for inclusion in the National Register of Historic Places

(Sullivan et al. 2002). These sites are concentrated primarily in the northern and western portions of the area.

3.7.2.2 Alternative

Two archaeological inventories have been completed that include the alternative prairie dog relocation area. The Center for Anthropological Studies (Rogers 1980) completed an intensive archaeological survey of a second portion of Kirtland AFB. The project area included 3,955 acres. Fifty-nine isolated loci and 12 archaeological sites were recorded that collectively represent a cultural history of about 10,700 years, although none of those sites were within the proposed relocation site. Eleven of the sites were recommended as eligible for the National Register.

The recent study by Sullivan et al. (2002) also encompassed this area. This study recorded 11 previously unrecorded sites, located primarily in the western portion of the alternative relocation area, 10 of which have been recommended eligible for inclusion in the National Register of Historic Places.

3.7.3 Environmental Consequences to Cultural Resources

3.7.3.1 Significance Criteria

The National Historic Preservation Act of 1966, as amended, establishes the National Register of Historic Places and Title 36 Code of Federal Regulations Section 60.4 defines the criteria used to establish significance and eligibility to the National Register.

3.7.3.2 Proposed Actions

<u>No-Tolerance and Buffer Zones.</u> Removal of prairie dogs from the no-tolerance zones would not affect cultural resources in the area.

<u>Removal Methods.</u> Fumigation or prairie dog trapping efforts within the no-tolerance zones would not affect cultural resources.

<u>Relocation Site.</u> Augering and release of prairie dogs in the relocation site would adversely impact cultural resources if the proper controls are not implemented.

Archaeological resources exist in the northern and western portions of the relocation area. Colony relocation sites would be chosen so that augering does not impact archaeological resources.

Archaeological resources can be impacted by bioturbation if the proper controls are not implemented. Bioturbation refers to physical or biological activities (e.g., burrowing) that can cause mixing of sediments. This is a common problem at archaeological sites and the introduction of prairie dogs to sites would adversely impact the sites, unless they are protected.

Archaeological sites would be treated as no-tolerance zones in order to protect them. Prairie dog colonies would be located away from archaeological sites so that burrowing activities would not impact the sites. Further, expansion or movement of the colonies would be monitored to preclude encroachment upon archaeological sites. If potential encroachment is identified, fencing similar to that proposed for the north security fence and the Antennae Array would be placed as a barrier at the sites.

3.7.3.3 Alternative Relocation Site

Impacts to cultural resources from removal of prairie dogs in the no-tolerance zones and relocation of these animals to the alternative site would be identical to those described for the Proposed Actions. Placement of the auger holes and prairie dog colonies would result in adverse impacts if the proper measures are not implemented.

Ten archaeological sites are located in or near the western portion of the alternative relocation area. If this alternative is selected, the colonies would be relocated to within the eastern and northern portions of the area and monitored for potential encroachment.

3.7.3.4 No-Action Alternative

No changes to cultural resources would result from selection of the No-Action Alternative.

3.7.3.5 Other Future Actions on the Base

No impacts to cultural resources would occur from the Proposed Actions addressed in this document. Therefore, the cumulative effects of the Proposed Actions, when considered with potential disturbances to cultural resources from the other future actions, are not expected to have significant cumulative negative impacts.

3.8 ENVIRONMENTAL MANAGEMENT

3.8.1 Definition of Environmental Management Activities

Environmental management activities at Kirtland AFB include the treatment and/or disposal of sanitary sewage, municipal solid waste, and industrial waste, including hazardous waste. In addition to the activities related to currently generated waste, the IRP is intended to identify, confirm, quantify, and remediate problems caused by past management of hazardous wastes at USAF facilities.

Hazardous wastes are defined as any solid, liquid, semisolid, or gaseous waste, or any combination of wastes, that pose a substantial present or potential hazard to human health or the environment.

To protect people and habitats from inadvertent and potentially harmful releases of hazardous substances, the Department of Defense (DoD) has dictated that all facilities develop and implement Hazardous Waste Management Plans or Spill Prevention, Control, and Countermeasure Plans. Also, the DoD has developed the IRP, intended to facilitate thorough investigation and cleanup of contaminated sites located at military installations. These plans and programs, in addition to established legislation (e.g., the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] of 1980) are intended to protect the ecosystems on which living organisms depend.

3.8.2 Existing Environmental Management Conditions

IRP sites located within 1,000 feet or within the buffer zones of the Proposed Actions sites are listed below.

There are six IRP sites that are potentially located within the proposed relocation area. These include Landfill Nos. 4, 5, 6, Interim Corrective Measure (ICM) Radioactive Training Areas, Sewage lagoons and Golf Course Pond, Radioactive Burial 11, Manzano Sewage Treatment Facility, and the Manzano AFB Landfill.

IRP Site 8: Landfill Nos. 4, 5, 6. This site is located in the northwest region of Kirtland AFB, within the proposed prairie dog relocation area. It is approximately 76 acres. Prairie dogs do not currently inhabit this site. In 2002, a supplemental assessment was conducted. Examination of the site included mapping, active and soil gas surveying, test pit excavation and risk evaluation. Soil samples taken at the site showed methane along the southern portion of the site (former Landfill 4). Volatile Organic Compound (VOC) concentrations sampled less than residential soil-screening levels. Trichloroethane and tetrachloroethane concentrations exceeded screening levels for groundwater. It was noted that the probability of these contaminates leaching to groundwater was low because of limited infiltration (USAF [In Press]).

IRP Site 9: Interservice Nuclear Weapons School (INWS) Radioactive Training Areas. This site is located in the northwest portion of the base and south of the solid waste dump. There are four active training areas and four inactive training areas. Inactive training areas 5–8 are considered high risk. The entire area encompassing all of the training areas occupies approximately 43.2 acres. There are approximately 9.4 acres of this site that are contaminated with thorium oxide sludge at levels above the derived concentration guideline level (DCGL). The concentrations of thorium oxide sludge are limited to the area of the training sites and surveys of the areas show no contamination into surface water drainages. There are approximately 25,779 cubic yards of soils that are radiological contaminated above the DCGL and site characterization data show that the thorium-contaminated soil represents high levels of risk to human health (USAF [In Press]). In August 2002, a Decommissioning Plan was created and includes excavating and packaging contaminated soil, vegetation, and debris, and transporting waste to a Nuclear Regulatory Commission (NRC) licensed radioactive waste disposal facility. The plan is pending the approval of the NRC. The decommissioning activities will be finalized once final status surveys, and closure reports are completed and the NRC approves the final status surveys (USAF [In Press]).

IRP Site 10: Main Golf Course Pond and Sewage Lagoons. The sewage lagoons and golf course pond is located in the northwest area of the Tijeras Arroyo Golf Course within the golf course no-tolerance zone. Prairie dogs are present in the vicinity of this site. In 1998, elevated levels of chromium, nitrate, and gross alpha were found in groundwater. Nitrate/nitrites were detected above action levels in all wells. Three organic compounds were detected in three wells at low levels: chloroform, trichloroethylene, and toluene (USAF 1999b). This site was listed as post-closure and underwent an ICM plan to treat nitrate-contaminated groundwater. An exception was obtained from the required discharge permit from the Groundwater Quality Bureau. A recovery well and liner have been installed (USAF 1999b). Groundwater monitoring continues at this site including water level measurements and sampling. Post closure reporting continues at this site (USAF 2000).

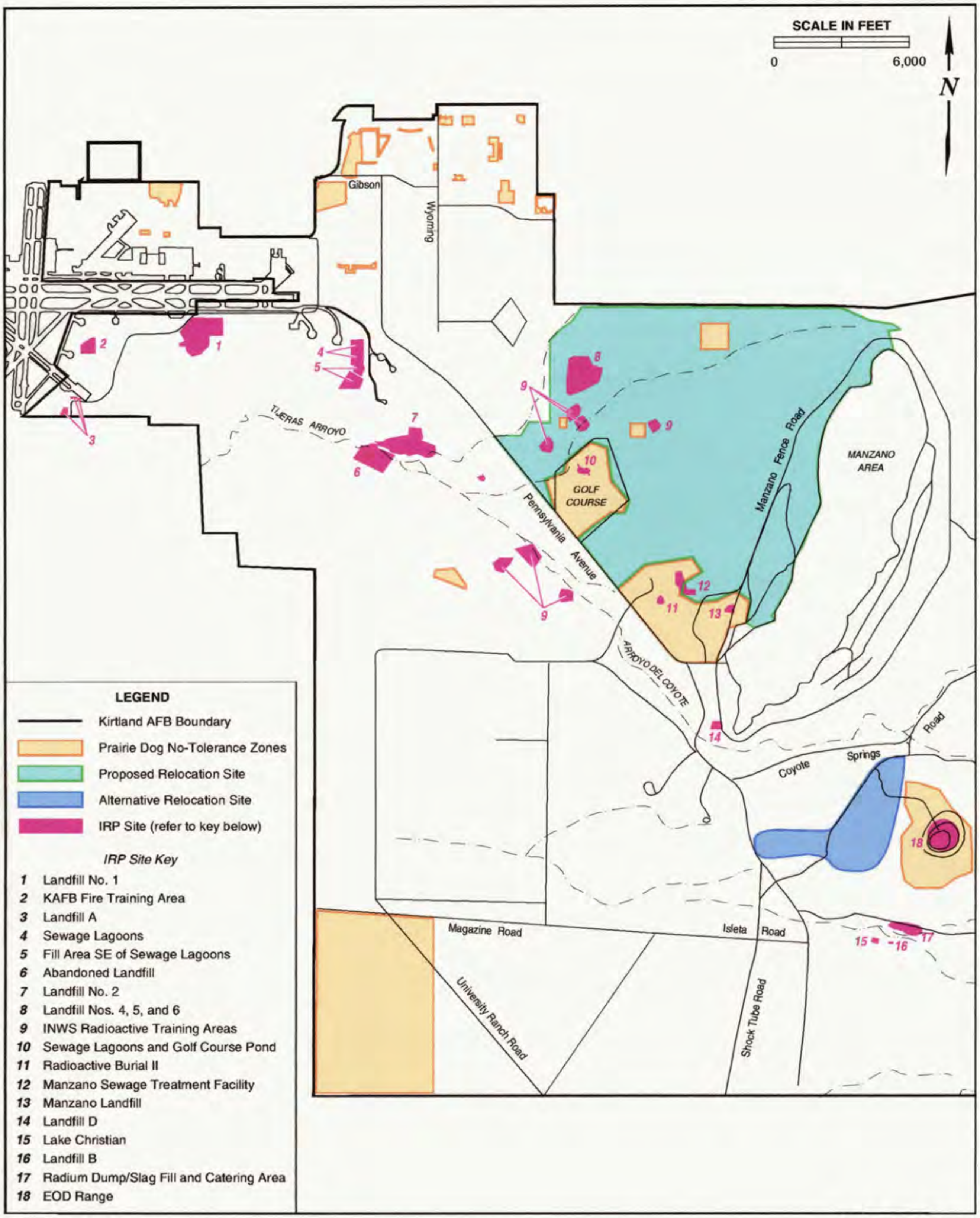
IRP Site 11: Radioactive Burial 11. Located in the northwest portion of the base. It is within the southwest quadrant of the riding club area. Groundwater monitoring of this site began in December 1999. The site is monitored for VOCs, groundwater quality parameters (chloride, iron, manganese, phenols, sodium, and sulfate), contaminant indicator parameters (conductivity, potential of hydrogen, total organic compound and total organic halogens, as well as parameters that are listed in Appendix III of 40 CFR Part 265. An ecological assessment has been completed for this site. A Corrective Measures Study report has also been completed. In 2000, Trichlorofluoromethane, a VOC was detected in low levels. Monitoring in March and September 2002 did not show any releases of VOCs (USAF [In Press]). Analytical results from this site including groundwater results show that all constituents including VOCs, semi-volatile organic compounds (SVOCs), mercury and cyanide concentrations were below applicable action levels and below the New Mexico Solid Waste Management Regulations groundwater standards, respectively. Gross alpha and beta concentrations were shown to have elevated concentrations and radioactive nuclide data collected show the potential doses and cancer risk at this site do not exceed EPA guidelines (USAF [In Press]).

IRP Site 12: Manzano Sewage Treatment Facility. This site is located in the central portion of Kirtland AFB adjacent to the Riding Club. It occupies approximately 22 acres. In 1996, a Phase II Resource Conservation & Recovery Act (RCRA) Facility Investigation was conducted for sampling of the site. Soil samples analyzed showed that concentrations of VOCs, SVOCs, target analyte list (TAL) metals, pesticides, and poly chlorinated biphenyls were below EPA Region 6 human health media-specific screen levels for residential soil ingestion. One pesticide (4,4 dichlorodiphenyldichloroethylene) and two metals (beryllium and manganese) were above the EPA screening levels. These two metals naturally occur at Kirtland AFB in high concentrations. The 1996 ICM removed hazards from the Imhoff tank and sludge drying bed, as well as all hydrocarbon-contaminated waste. All disturbed areas have been reseeded with native grasses at this site (USAF [In Press]).

IRP Site 13: Manzano Landfill. This site is located in the central portion of the base within the fenced cantonment area in the southwest corner of the mixed waste storage area. This site is approximately 11 acres. During the 2002 Supplemental Assessment, samples were taken and analyzed for VOCs, SVOCs, TAL metals, high explosives, gross alpha and beta, and gamma spectroscopy. Samples exceeding the New Mexico Environmental Department DAF-20 levels included one VOC, chloromethane, one SVOC, pyrene and metals including aluminum, beryllium, cobalt, iron, Pb, magnesium, and vanadium. The risk ratio calculated showed 0.22 noncarcenogenic, and 0.16 carcenogenic. Groundwater monitoring in March and September 2002 indicated high levels of nitrate and low-levels of VOCs. Some of which may have come from application of fertilizer and irrigation. A down gradient well was planned for installation during fiscal year 2003. This well would monitor the source of trichloroethylene and elevated nitrates in Kirtland's regional aquifer. Annual sampling was recommended for this site for a 5-year period (USAF [In Press]).

The Alternative Relocation Site is within 1,000 feet of the EOD Range IRP site. This site is located in the southeastern portion of Kirtland AFB, and is southeast of the Manzano area, and north of the Starfire Optical Range. The EOD Range has a radius of 2,500 feet. The area surrounding the range is mostly a buffer zone. In 1996, contaminated soil at this site was removed and replaced with clean soil. Currently, discussions are going on with the New Mexico Environmental Department to have the site removed from the RCRA Part B permit (USAF 1997).

The IRP at Kirtland AFB forms the basis for assessment and response actions under the provisions of CERCLA. As of March 2002, 77 IRP sites and 15 Areas of Concern had been identified at the base (Sillerud 2002). Figure 3-5 shows the IRP sites in and around the no-tolerance zones and the prairie dog relocation and alternative relocation area.



NOV 2003

EA

Active Installation Restoration Program Sites
Kirtland Air Force Base

FIGURE

3-5

3.8.3 Environmental Consequences to Environmental Management

3.8.3.1 Significance Criteria

Numerous local, state, and federal laws regulate the storage, handling, disposal, and transportation of hazardous materials and wastes; the primary purpose of these laws is to protect public health and the environment. The significance of potential impacts associated with hazardous substances is based on toxicity, ignitability, reactivity, and corrosivity. Generally, impacts associated with hazardous materials and wastes would be considered significant if implementation of a proposed action would involve the storage, use, transportation, or disposal of hazardous substances that would substantially increase human health risks or environmental exposure. For example, if implementation of a proposed action would exacerbate conditions at an existing area of contamination associated with an IRP, impacts would be considered significant.

A reduction in the quantity of hazardous substances used and/or generated would be a beneficial impact: a substantial increase in the quantity and/or toxicity of hazardous substances used or generated could be potentially significant. Significant impacts would result if a substantial increase in human health risks and/or environmental exposure were generated and such impacts could not be mitigated to acceptable local, state, and federal levels.

3.8.3.2 Proposed Actions

No-Tolerance and Buffer Zones. Numerous active IRP sites are located within the no-tolerance zones. If prairie dogs are found within an active IRP site, base personnel would determine whether prairie dogs can be relocated without risk to human health and safety from contaminants. This decision would be made based on the degree and type of contamination at the site.

Removal Methods. Use of nonlethal and lethal prairie dog control measures would not affect environmental management activities. The Proposed Actions would result in application of pesticides already used on base. Only licensed certified pesticide applicators and entomology staff under the direct supervision of a certified pesticide applicator would conduct application of aluminum phosphide. Although fumigation involves the release of toxic gas inside the burrow systems, burrow entrances are sealed off and the gas slowly migrates through the soil, breaks down into harmless by-products and dissipates gradually into the atmosphere.

Relocation Site. Six of the active IRP sites on base (Landfill Nos. 4, 5, 6, INWS Radioactive Training Areas, Sewage Lagoons and Golf Course Pond, Manzano Sewage Treatment Facility, Manzano Landfill, and Radioactive Burial 11) occur within the relocation site. Mitigation measures, such as constructing barriers around these areas, would prevent adverse impacts to environmental management activities.

3.8.3.3 Alternative Relocation Site

Impacts to environmental management activities from use of the alternative relocation site would be similar to those described for the Proposed Actions. There is one IRP site (EOD Range) located adjacent to the alternative relocation site. Mitigation measures similar to those suggested for the Proposed Actions would prevent adverse impacts to environmental management activities.

3.8.3.4 No-Action Alternative

Implementation of the No-Action Alternative would result in no changes to environmental management activities from current conditions.

3.8.3.5 Other Future Actions on Base

There are no currently planned or anticipated future actions at Kirtland AFB that would affect or be affected by the Proposed Actions assessed in this document. As a result, no cumulative impacts to environmental and human resources are anticipated to occur from these actions.

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SECTION 6
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APPENDIX J
NUISANCE MANAGEMENT PLAN FOR KIRTLAND AIR FORCE BASE

FINAL

Appendix J

Nuisance Management Plan for Kirtland Air Force Base

October 2009

Prepared for
377th Air Base Wing Air Force Material Command

Disclaimer

Acronyms

ABW	Air Base Wing
AFB	Air Force Base
AFMC	Air Force Materiel Command
BASH	Bird Aircraft Strike Hazard
CE	Civil Engineer
DOD	Department of Defense
DOE	Department of Energy
KAFB	Kirtland Air Force Base
USDA	U.S Department of Agriculture
USGS	U.S. Geological Survey

EXECUTIVE SUMMARY

The Nuisance Management Plan (Appendix I) created for Kirtland AFB is concerned with preventing pest animals and plants from adversely affecting the military mission and operations on base. Nuisance animals, such as coyotes, have come in contact with base personnel and this plan gives advice on what not to do and phone numbers to contact Natural Resources in the event an animal gets injured or has become a nuisance."

CONTENTS

1. INTRODUCTION

Kirtland AFB is located just southeast of Albuquerque, New Mexico, at the foot of the west side of the Manzanita Mountains (Figure 3-1). These mountains rise to over 10,000 feet and define the eastern boundary of an area locally known as East Mesa. Kirtland AFB encompasses more than 52,000 acres of the East Mesa with elevations ranging from 5,200 to almost 8,000 feet above mean sea level (USGS 1990a, b, c; 1991a, b, c). Land uses adjacent to the base include the Cibola National Forest to the northeast and east, the Isleta Reservation to the south, and residential and business areas of the City of Albuquerque to the west and north.

The airfield complex serving Kirtland AFB is shared with the Albuquerque International Support, located adjacent to the northwest corner of the base. Airfield operations and aircraft support facilities are concentrated in the airfield complex area. The remaining intensive development at the base (e.g., administrative, housing, medical, and commercial services) is located east of the airfield complex, also in the northwest corner of the base. The base golf course and landfill are located southeast of the developed area. The remaining areas of the base (approximately 80 percent of the base land area) are largely dedicated to military training and operational facilities. Sandia National Laboratories also operates and maintains several facilities on base for research, testing and evaluation of various weapons, communication and energy systems.

Kirtland AFB has a wide variety of animal species. The activities of the majority of these species do not result in any conflicts with people. However, certain species cause nuisance problems. These species tend to be those that are more adaptable to the urban/suburban environment. Human/wildlife interactions can cause health and safety concerns that must be remedied using wildlife management tools, changes in human behavior, and institutional controls. The chosen remedy is dependent upon the species involved and the circumstances. Particular wildlife species, such as coyotes, pigeons, skunks, bats, and a variety of snakes, present nuisance issues on a regular basis. Other species cause only occasional concerns. These latter species tend to be those that only periodically venture into areas with human activity. This plan outlines the types of persistent nuisance problems that occur at KAFB, and presents information on dealing with these concerns and resolving issues on a long-term basis.

2. RESPONSIBILITIES

The 377th Air Base Wing is responsible for ensuring that base assigned and associate units comply with laws and requirements associated with the management of natural resources. The Wing Commander approves the NMP and any necessary revisions, provides appropriate funding and staffing to ensure implementation of the NMP, controls access to and use of installation natural resources, and signs cooperative agreements entered into between the installation and other entities pursuant to the Sikes Act. The Base Civil Engineer (BCE) is responsible for the preparation, maintenance, and day to-day implementation of the NMP, and is the focal point for all plan actions and issues.

Environmental Management at Kirtland AFB prepares, implements, and updates the NMP. Environmental Management provides technical advice on natural resource matters to the Wing Commander, ESOHC, the BCE, and the Kirtland AFB community planner. In addition, Environmental Management is responsible for budgeting and advocating for natural resources conservation programs and for developing partnerships with other federal, state, tribal, local, academic and non-governmental organizations. Commanders of assigned and associate units are required to be familiar with the content of the NMP and comply with its provisions.

3. GENERAL PROTOCOL FOR REDUCING NUISANCE WILDLIFE PROBLEMS

The following guidelines should be adhered to in efforts to reduce nuisance wildlife problems at KAFB:

- Do not transport wild and domestic animals from off-site onto the Reservation.
- Do not release nuisance wildlife trapped at KAFB to other areas outside of Kirtland AFB.
- Contact the Natural Resources Manager to evaluate all nuisance animals. If require Natural Resources Manager will contact New Mexico Department of Game and Fish for assistance. Any trapped feral cats should be taken to the animal shelter.
- Do not feed resident wildlife and feral cats.
- Secure all dumpsters and other garbage receptacles to avoid providing a steady food supply to potential nuisance animals.
- Keep building maintenance informed of problems to prevent entry of animals through holes, broken windows, etc.
- Use building maintenance and construction techniques that will minimize the potential for entry by wildlife.

4. GENERAL PROTOCOL FOR SICK AND INJURED WILDLIFE

At present there are no protocols in place for sick and injured wildlife due to lack of support by Kirtland AFB veterinarian, security forces and city Animal Damage control/Human Society.

5. SPECIES-SPECIFIC NUISANCE WILDLIFE MANAGEMENT

5.1 MAMMALS

5.1.1 Coyote

Canis latrans

Nuisance Concerns

Coyotes can be a nuisance because they can be found in residential areas of the base. A true scavenger, the coyote will eat prairie dogs, rabbits, snakes, garbage, pet food and pets. They can easily jump backyard walls and fences to find their prey.

Animals that loss their natural fear of humans are more likely to pose a danger to humans and the life span of such and animal is shortened. Prevention is the main way to eliminate unwanted coyotes from an area.

Remedies

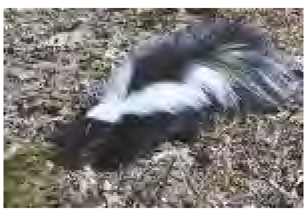
- Do not feed coyotes.
- Eliminate any source of water.
- Remove "bird feeders" coyotes are attracted to the seed and concentrations of birds and rodents that come to them.
- Do not discard edible garbage where coyotes can get to it. Secure garbage containers and eliminate garbage odors. Remove any pet food from outside your home.
- Trim and clean near ground level any shrubbery that provides hiding cover for coyotes prey-rabbits.
- Fence the area to help prevent coyotes from entering. The fence should be 6 feet high with the bottom extending at least 6 inches below ground level for best results.
- Don't leave small children outside unattended.
- Don't allow pets to run free. Always walk your dog on a leash. Accompany your pet outside, especially at night.
- Actively discourage coyotes from visiting your area. Don't be submissive in your behavior. Whenever you see a coyote, make loud noises, throw rocks and wave your arms to make them leave.

Removal Methods

When a coyote is present and appears to be a threat, notification of this action to the Natural Resource personnel is the first step.   Before the removal of an animal, documentation will be taken by Natural Resources personnel to determine if the animal is a threat. Natural Resource personnel will visit the area and fill out a “Coyote Assessment Sheet”. Recommendations for prevention methods and educational material will be distributed at the time of the visit.
If determined the animal is a threat the United State Department of Agriculture (USDA), Wildlife Services will be contacted to remove the animal.

Disease Concern
Coyotes can carry diseases such as rabies or distemper. Typical signs of rabies include drooling, convulsions, circling, disorientation, partial paralysis, unprovoked aggression, and uncharacteristic tameness. Distemper, although not contagious to humans, will cause similar symptoms in the animal. If a coyote bites someone, the animal should be captured without damaging the head and kept for analysis. Kirtland AFB Natural Resource personnel should be contacted. USDA, APHIS–WS will analyze the animal for rabies.

5.1.2 Skunks



Striped Skunk
(*Mephitis mephitis*)

Hog-nosed skunk
(*Conepatus leuconotus*)

Spotted Skunk
(*Spilogale gracilis*)

Nuisance Concerns
Skunks can be a nuisance where they gain entrance into and under buildings. Skunks are opportunistic and will enter buildings where the possibility exists. Broken crawl-space vent screens and other openings at the base of buildings can provide such entryways. Skunks will enter in search of food and den sites.

Remedies
Prevention is the main way to eliminate unwanted contact with skunks. Skunks become a nuisance when their burrowing and feeding habits conflict with humans. They will burrow under porches or buildings by entering foundation openings (USDA 1994). All crawl-space vents, a common point of entry, should be in good repair. There are two things to remember: (1) skunks are nocturnal and should be out foraging at night, and (2) they will generally have young in their den sites (e.g., under floors of buildings) during April and May (Chapman and Feldhamer 1982). Caution should be taken when closing existing openings so as not to trap animals inside. If there are several points of entry, it is always a good practice to leave one open for a day or two to ensure that all the skunks are out before completely sealing the area. Fresh tracks can be detected

in flour left at the entrance. After you are sure that the den is empty, you should immediately seal the remaining entrance (Harper, Byford, and Dixon 2003). Another approach would be to construct a one-way door that will allow access out but not back in. The Kirtland AFB Entomology shop or Natural Resources Personnel manger should be contacted for advice on identifying and closing entry points. Any outside garbage cans should be fitted with tight-fitting lids fastened with bungee cords or latches, and/or they should be housed in a structure that can be fully closed (USDA 1994).

Removal Methods

Skunks can be live trapped relatively easily using sardines, fish-flavored cat food, chicken entrails, or peanut butter for bait (USDA 1994). It is generally recommended that wire live traps be covered with canvas or other covering to give the trapped animal a secure feeling, which will minimize the chance that the animal will discharge its scent (Harper, Byford, and Dixon 2003). The Kirtland AFB Entomology shop should be contacted once a problem is identified to trap and remove the nuisance animals. The employee should not handle the animal in any way because of the possibility of disease and/or spraying. Entomology personnel are trained to handle these animals and are properly vaccinated against disease.

Disease Concern

Skunks can carry diseases such as rabies or distemper. Typical signs of rabies include drooling, convulsions, circling, disorientation, partial paralysis, unprovoked aggression, and/or uncharacteristic tameness. Distemper, although not contagious to humans, will cause similar symptoms in the animal. If a skunk bites someone, the animal should be captured without damaging the head and kept for analysis. The Kirtland AFB Entomology shop should be contacted to aid in capturing the skunk for testing. USDA, APHIS–WS will analyze the animal for rabies.

5.1.3 Gunnison's Prairie Dog

(*Cynomys Gunnisoni*)

Nuisance Concerns

Prairie dogs on KAFB are found in a variety of locations, mainly due to areas being cleared of high vegetation, and close proximity to excellent grazing opportunities. They can cause problems along walking paths, golf courses, and anywhere where there is good grazing next to desert shrub. No tolerance zones have been setup around the base for safety concerns of the flight line and for aesthetic purposes. The primary concern with these animals is the burrows they create, either for living purposes or underneath fences and in the middle of lawns. There is a safety concern as well, considering they tend to burrow next to paths across the installation, making for trip and fall hazards. Unused burrows can also be havens for snakes, black widows, and other rodents.

Remedies
Physical barriers are an option. Exclusion of prairie dogs is rarely practical, although they may be discouraged by tight-mesh, heavy gauge, galvanized wire, 5 feet (1.5 m) wide with 2 feet (60 cm) buried in the ground and 3 feet (90 cm) remaining aboveground. A slanting overhang at the top increases the effectiveness of the fence. Another alternative is to allow grass to grow over 12 inches as this will discourage prairie dogs from colonizing in an area.

Removal Methods
Live trapping is an effective way of removing problem prairie dogs from an area. This is a labor intensive process and a relocation site must be established prior to removal. Pre-baiting should be done in order to achieve the most success with the trapping. This method does not remove all prairie dogs, but can significantly diminish population size and affect on an area. Live trapping should always be the first method used.

If all dogs need to be removed from an area, live trapping should occur first and then proceed to other methods of control. Kill traps can be used in certain instances where chemical controls are not a viable way to control. Chemical controls can be used if all dogs need to be removed from an area or from a no tolerance zone on base. Aluminum Phosphide is a restricted use pesticide, registered as fumigant for the control of burrowing rodents. The tablets react with moisture in prairie dog burrows and release toxic phosphine gas (PH3). Soil moistures need to be high to be an effective fumigant. For best results, fumigants should be applied in spring when soil moisture is high and soil temperature is greater than 60˚F. Success rates of 85% to 95% can usually be obtained if fumigants are applied correctly. In order to achieve a greater success rate, these methods have to be repeated persistently. Caution must be taken around burrowing owls. There can be no fumigation or other chemical toxins used within 100 meters of owls.

Disease Concern
Of all the factors affecting Gunnison's prairie dog populations, sylvatic plague is the most significant. Flea-born plague occurs in regular outbreaks and causes population declines and extirpations. It is believed that prairie dogs are highly susceptible to plague because of high population densities, abundant flea vectors, and uniformly low resistance. There have been no known cases of this to exist on KAFB.

5.1.4 Bats




Mexican Freetail (*Tadarida brasiliensis*) Big Brown Bat (*EptesicusFuscus*) Western Long eared (*Myotis evotis*) Southwestern Bat (*Myotis auriculus*)

Nuisance Concerns

Bats become a nuisance when they roost in large numbers in human dwellings. Around KAFB you are most likely to encounter nuisance bats when a roosting colony takes up residence in an office building, hanger, or place of residence. Attics often make excellent habitat, as do barns. Bats need only a half inch or less of space to crawl through in order to enter a building. Once inside, if the habitat is good, the colony grows until the homeowner notices the bats flying out of the building, notices the droppings in the attic, chimney, outside, or even basement (when the droppings fall down the walls). Sometimes a bat will get lost and find its way out of the attic and into the living area. Occasionally a transient bay may also fly into a house.

Removal Methods

The only way to effectively get rid of bats is to exclude them from the building. This can be done by inspecting your building for holes greater than 1/4 inch and sealing them. This process often includes screening vents, sealing construction gaps, re-flashing chimneys, repairing rotted wood and more. Removal of a bat that is in your house or a building can happen by setting up one way doors in which the bats leave the roost at night and aren’t able to come back in. This is put in place after the structure is bat proofed. This process takes a couple of days in the summer and a couple of weeks in the winter. If you currently have a bat in your building, contact Kirtland Entomology to remove them.

Disease Concerns

The rapid and smelly accumulation of guano (droppings) is, and serves as a fertile breeding ground for a fungal disease called Histoplasmosis, which is transferable to humans who breathe in the fungal spores. Bats are also known to carry rabies, a viral disease that causes progressive paralysis and death in mammals, including humans.

5.1.5 Ringtail Cat

Bassariscus astutus

Nuisance Concerns

Ringtail cats can be considered a nuisance because they will get into abandoned buildings or within family housing. Since they are nocturnal they are rarely seen and some of the few ways you know one was around is by their musky scent or droppings. They like fruits and are fond of nectar, which can cause them to do some damage to a garden. Except in bad weather, they move frequently, rarely spending more than three straight nights in one den. They are easily domesticated, which can cause a problem with them sticking around as mousers.

Removal Methods

Exclusion is the best method for dealing with ringtail cats. Survey buildings and make sure to seal off anything greater than one inch. Keep fruit from trees picked up off the ground. Eliminate the number of rodents by keeping trash and food picked up, so as not to make an easy meal.
If you happen to have a live animal inside a building, live trapping or noosing can be used to remove it. This procedure should be handled by the New Mexico Department of Game and Fish.

Disease Concern

As with all mammals there is a chance that they can carry rabies and distemper. Another common disease is Baylisascaris roundworm. These bacteria can cause skin irritations from larvae migrating within the skin, eye and brain tissue damage due to the random migration of the larvae, and nausea, a lethargic feeling, in coordination and loss of eyesight. This disease is easily mitigated by hand washing after coming in contact with the dung.

5.2 Birds

5.2.1 Pigeons (Rock Dove)

Columba livia

Nuisance Concerns

Pigeon droppings deface and accelerate the deterioration of buildings and increase the cost of maintenance. Large amounts of dropping may kill vegetation and produce an objectionable odor. Pigeon manure deposited on park benches, statues, cars and unwary pedestrians is aesthetically displeasing. The pigeons located around the airport are a threat to human safety because of potential bird-aircraft strike hazard (BASH).

Removal Methods

Elimination of feeding, watering, roosting, and nesting sites is vital to long-term pigeon control. Sealing trashcans eliminate pools of water; modify structures, building, and hangers to make areas less attractive to these birds. Also, do not feed theses animals as this will make them more difficult to get rid of.

Pigeons can be excluded from buildings by blocking access to indoor roosts and nesting areas. Opening to lofts, vents, and eaves should be blocked. Roosting on ledges can be discouraged by changing the angle to 45˚ or more. Within hangers roosting can be permanently prevented by screening the underside of the rafter area with netting.

The uric acid in their feces is highly corrosive. Also, debris from roosting flocks can build up, backing up gutters and drains thus causing damage to roofs and other structures. Extensive damage to air conditioning units and other roof top machinery is commonplace. There are also other economic costs that can be associated from pigeon's taking up residence such as slip and fall liability and projection of an unclean, dirty company image. Besides physical damage, the bacteria, fungal agents and ectoparasites found in pigeon droppings sometimes represent a health risk. (From: http://web.birdbarrier.com/BirdBarrier/Site%20Pages/Pigeon_id.htm) 11.4.2 IPM for Pigeons

Follow the procedures listed in Table 1, Pigeon Extermination Form. Ensure form has been completed with any information requested.

Table 1, Pigeon Extermination Form

1. The purpose of extermination	Elimination of vertebrate pests
Rock Pigeon	
Standard Pigeon	
2. Inspection procedures	Verify infestation
Estimate number of pigeon in facility.	
Determine what method of control is necessary.	
3. Type of Extermination	Pellet Air Riffles
Indoor perching areas	
Nesting areas	
All hoarding areas	
4. Notification procedures	Prior to Treatment
Johnny Jacobs	846-5650
Carol Finley EM	846-0053
LE Desk	846-7913
5. Refer to BASH Plan 91-121 for further information in regards to control.	
6. Facility, Owner, Manager	
Facility:	
Facility Address:	
Facility Manager:	
Daytime telephone:	
7. Certified Applicator in Charge	
Name:	Johnny Jacobs/Kenneth Gomez
Company:	Chugach Management Services JV
License:	52106
Daytime Telephone:	505-846-5650 / 846-8508
Mobile Telephone:	505-934-9682 / 235-8669
8. Emergency Information	
Hospital Emergency:	505-262-7222
Fire Department:	505-853-2094
Police Department:	505-846-758

9. Clean up and Disposal Procedures
   a. Clean areas where birds fall with disinfectant
   b. Mop soiled areas as needed with disinfectant
   c. Place dead birds in black plastic bag
   d. Transport all birds and soiled cleaning material to Entomology Building 20417
   e. Dispose all birds and soiled materials in approved Dumpster located at Building 20417

10. Log Book
   Log will be kept on each facility:
      a. Track date of shoot

b. Track number of kills
e. Track Facility / Building number

Disease Concern
Pigeons may carry and spread diseases to people through their droppings. They are known to carry or transmit pigeon ornithosis, encephalitis, Newcastle disease, cryptococcosis, taxoplasmosis, and salmonella.

5.2.2 Ravens

Corvus Corax

Nuisance Concerns
Ravens are found in a variety of locations that they can come into human contact. The main concern is when they roost in hangers on the flight line. They end up destroying hangers and other buildings by nest building and from their droppings. Another concern is nest building on remote locations, like satellite dishes that are controlled remotely and can end up harming chicks in the nest. They have been seen trying to building nests on power lines. This can cause a problem because the adults and chicks can electrocute themselves.

Removal Methods
Ravens are a protected species under the Migratory Bird Treaty Act. Any actions that are taken to remove them or their nests from an area must be coordinated with the Natural Resources Manager and a permit obtained from the U.S. Fish and Wildlife Service. Harassment with a laser pointer near their eyes and deterrence are the preferred ways of getting nuisance ravens away from an area. If they are building nests, destroy the nests before completion. Try and make sure ravens cannot enter into buildings to either roost or nest. There are other methods that can be used to discourage ravens from building nests or roosting on power poles. They must be raptor proofed. Other methods that can be used are live trapping.

Disease Concern
The West Nile Virus can be carried by these birds. The only way to contract the virus is to be bitten by a mosquito after it has bitten the raven. Aspergillosis is a fungal disease of the respiratory tract of birds and mammals usually caused by *Aspergillus fumigatus. A. flavus, A. niger, A. nidulans, A. terreus, A. glaucus* and *Penicillium* sp. have also been identified as

pathogenic. It is possible for humans to contract this disease from inhaling the spores that are present on the air sacs.

5.2.3 House Sparrows

Passer domesticus

Nuisance Concerns

House sparrows are a bird species typically found in close association with people. This species find suitable nesting sites in buildings where open access is afforded by holes in walls, broken vents, doors, and windows. House sparrows will choose similar nesting sites. Sparrows construct partially roofed nests of grasses, straws, and weed stems lined with feathers. These nests will frequently fill the entire area of the cavity.

Remedies

To prevent sparrows from nesting in buildings, all openings more than 3/4 inch in diameter should be closed. Heavy plastic (e.g., polyvinyl chloride) or rubber strips hung in large, open doorways of warehouses and other buildings have been successful in excluding birds, while allowing people and machinery to pass through. Where sparrows are nesting or roosting on building ledges, wooden, metal, or Plexiglas® covers can be placed to cover ledges at a 45° angle to prevent use. Metal protectors or porcupine wires are also available for preventing roosting on ledges or roof beams. Nylon or plastic netting can also be used across the bottom of exposed beams and rafters to prevent use of those areas (USDA 1994). Glass should be replaced in broken windows and doors. Heavy plastic (e.g., polyvinyl chloride) or rubber strips hung in large, open doorways of warehouses and other buildings can also be effective with sparrows. House sparrows have a tendency to nest behind signs on buildings; therefore, all signs should be mounted flush with the building wall. In general, the manager should examine ventilators, vents, air conditioners, building signs, ledges, eaves, overhangs, and ornamental openings for potential and existing bird usage and eliminate those sites where practical (USDA 1994).

Removal Methods

House sparrows are not native to the United States and are considered to be mainly nuisance birds. For this reason, they are totally unprotected by any laws. Therefore, significant latitude can be taken in the removal of these birds from problem areas. Toxicants are available to deal with house sparrows and starlings; however, they must be administered by a licensed applicator. USDA, APHIS–WS should be consulted for such applications. These species can also be live trapped fairly easily. However, caution must be taken because non-target species could be caught in the process. Care would need to be taken to ensure that non-target species were released unharmed. Nest removal and destruction represent another viable method; however, persistence is required because birds might attempt to re-nest in the same area several times. Therefore, any nest-removal activities must immediately be followed by a solution that permanently closes that nesting location.

Disease Concern

One of the more serious health concerns is the fungal respiratory disease histoplasmosis. The *Histoplasma capsulatum* fungus can grow in the soils beneath bird roosts, and spores can become airborne in dry weather, particularly when the area is disturbed.

5.2.4 House Finch

Carpodacus mexicanus

Nuisance Concerns

House finches are about the same size as house sparrows. Their nests are a mixture of twigs, grasses, various debris, and feathers. They will commonly nest on building ledges and in holes under eaves and soffits. They might sometimes be confused with house sparrows because of their size and general habits; however, the reddish head on the male is unmistakable.

Remedies

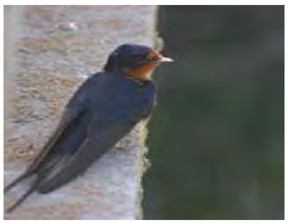
The house finch, unlike the house sparrow, is protected under federal law, which has an impact on the options available for the treatment of nuisance issues concerning this species. However, preventative measures similar to those recommended for house sparrows will also handle this species. Because of its protected status, any actions taken to resolve nuisance issues with this species should be first coordinated with the Natural Resource Manager.

Removal Methods

This species can be live trapped fairly easily; however, caution must be taken because non-target species might be caught in the process. Care would need to be taken to ensure that non-target species were released unharmed. The removal of nesting material at the early stages of nest building is another viable method; however, persistence is required because birds might attempt to re-nest in the same area several times. Therefore, any nest-removal activities must immediately be followed by a solution that permanently closes that nesting location. Once the young have fledged, nesting material can be removed, and permanent remedies can be implemented. These finches can have two sets of young in a year, so the timing of the action can be critical to ensuring that the birds don't re-nest. If it is necessary, birds can be removed during their nesting stage because of health and safety concerns.

Disease Concern
There are no significant disease concerns associated with this species. However, gloves and dust masks should be worn during nest removal to guard against any ectoparasites or airborne particles that might be present in the nesting material.

5.2.5 Barn Swallow



Hirundo rustica

Nuisance Concerns
Several species of smaller birds construct mud nests in and around buildings at KAFB. One species commonly found on KAFB is the barn swallow. Barn swallows typically build their nests on a ledge or vertical wall, or in the corner of two vertical walls, a short distance below a horizontal surface. On smooth concrete or painted surfaces, the nests are often placed on mud-dauber nests. Their nests are cup-shaped and constructed of pellets of mud and pieces of straw and are lined with feathers (Nicholson 1997).

Remedies
The most effective method of swallow control is exclusion from potential nesting sites. Plastic netting or poultry wire mounted on buildings from the outside edge of the eave down to the side of the building can be very effective. Panels made of fiberglass or other materials mounted under eaves to form a concave (rounded) surface can also work. Barn swallows, in particular, will enter buildings through doors, windows, or other entryways. They will seek nesting sites among the rafters in the buildings; therefore, it is important to keep entryways closed to buildings in which swallows could be a problem. For buildings to which doors need to remain open for extended periods of time for equipment passage and such, vinyl-plastic strip doors can be effective (USDA 1994). Swallows will tend to frequent buildings or warehouses that are infrequently used and/or have open access through broken windows or doors. These entryways should be sealed to prevent entrance. However, caution should be taken during the breeding season because birds could be trapped inside. To avoid this possibility where birds are known to be nesting, procedures for closing entryways should not be undertaken from late April through June.

Removal Methods
Nest removal can be conducted in the early stages of nest building with the use of a hose, broom, or other similar method. Persistence is the key during this process because the birds might attempt to rebuild several times. Eventually the birds will abandon the area to find a more suitable location. It is important to concentrate any nest destruction on the early stages of nest building because both barn and cliff swallows are protected against harm by federal law. This protection means that nesting swallows cannot lawfully be disturbed once in the process of laying and incubating eggs. Swallow young will fledge from the nest within 15 days of hatching, so another option would be to wait until the young have fledged and then take action (Harrison 1975). Once the young have fledged, nests can be knocked down, and permanent remedies can be undertaken. These swallows can have two sets of young in a year; therefore, the timing of the action can be critical to ensuring that the birds don't renest. If it is necessary, birds can be removed during their nesting stage because of health and safety concerns.

Disease Concern
Disease is not considered to be a major issue with swallows. However, gloves and dust masks should be worn during nest removal to guard against any ectoparasites or airborne particles that might be present in the nesting material.

5.3 Reptiles

5.3.1 Rattlesnakes

Prairie Rattlesnake
(*Crotalus viridis*)

Massasauga Rattlesnake
(*Sistrurus catenatus*)

Western Diamondback Rattlesnake
(*Crotalus atrox***)**

Nuisance Concerns
Snakes are of great concern. They can be found in and around buildings, burrows created by prairie dogs, and in various locations that provide good hiding. The main concern is finding a snake and being bitten.

Remedies
One of the best ways to discourage rattlesnakes from inhabiting gardens and homes is to remove suitable hiding places. Heavy brush, tall grass, rocks, logs, rotten stumps, lumber piles, and other places of cover should be cleaned up. Keep weeds mowed close to the ground or hoe them out completely. Since snakes often come to an area in search of prey, eliminating rodent populations, especially ground squirrels, meadow voles, deer mice, rats, and house mice, is an important step

in making the habitat less attractive for snakes. Rattlesnakes cannot dig burrows but frequently use those dug by rodents. After controlling the rodents, fill in all burrows with soil or sod and pack down firmly.

Rattlesnakes may seek refuge beneath buildings. If there is a gap or opening, they will enter and inhabit a building, just as house mice do. Sealing all cracks and other openings greater than 1/4 inch can prevent them from entering. Gaps beneath garage doors are often large enough to permit snakes to enter, especially young ones. In summer, rattlesnakes may be attracted to cool and/or damp places, such as beneath buildings and in basements. Access doors on crawl spaces should be inspected carefully for breaks or gaps. Use caution if you must crawl under a house or other building. Hot tub or swimming pool pump enclosures may provide cover if they are not well sealed. The dampness associated with ornamental water fountains, pools, and fishponds may also make the surrounding area attractive to snakes.

Snakes can be excluded from an area by installing a snake-proof fence. While expensive, fences are often necessary for children's play areas. Be sure to make gates tight fitting and keep vegetation and debris from collecting around the fence. Snakes can climb accumulated vegetation and gain access to the top of the fence. Check the fence frequently to be sure it has not been damaged in any way.

Removal Methods

Great caution should be taken when dealing with a rattlesnake. Probably the best removal system is to allow the snake to move off on its own. If the snake persists, call someone who is experienced in handling of snakes (Entomology or Natural Resources Manager). It should be removed by picking it up with a snake stick and placing in a large trash bucket to be relocated. In extreme situations, the snake can be easily killed by chopping off its head with a shovel or a pick. Make sure to bury the head as it can still bite down and release venom for more than an hour after its decapitation.

Disease Concern

Salmonella is a concern for people handling snakes. Children and people with weakened immune systems should avoid touching snakes. Make sure after handling a snake that you wash your hands to prevent the spread of salmonella.

5.4 Invasive Plant Species

The two species that are considered Class C Noxious Weeds on base are Salt Cedar and Russian Olive. Both species are able to outcompete native plants. They were mainly introduced as ornamentals and for erosion control. These species can cause an enormous fire hazard and foster less biodiversity of plants and animals.

5.4.1 Salt Cedar (*Tamarix chinensis and Tamarix ramosissima*)

Nuisance Concerns:
Salt Cedars are found along riparian areas around Kirtland AFB. This plant species is a federally and state registered noxious weed. They were introduced to this area for their landscape value of a stabilizer and high salinity or alkaline tolerance. This causes more native species to become eradicated, because of lack of water and thick mats of shed leaves. This species also poses a fire hazard, because the resinous leaves burn explosively. Salt cedars are fire-adapted species and have long tap roots that allow them to intercept deep water tables and interfere with natural aquatic systems. Salt cedar disrupts the structure and stability of native plant communities and degrades native wildlife habitat by outcompeting and replacing native plant species, monopolizing limited sources of moisture, and increasing the frequency, intensity and effect of fires and floods. Although it provides some shelter, the foliage and flowers of salt cedar provide little food value for native wildlife species that depend on nutrient-rich native plant resources.

Remedies:
Management of salt cedar requires a long term commitment to maintain at low levels and prevent reinfestation. A variety of methods have been used in the management of salt cedar, including mechanical, chemical and biological. The most effective management probably involves a combination of these.

Removal Methods:

- **Mechanical** - Techniques include hand-pulling, digging, root-cutting, use of weed eaters, axes, machetes, bulldozers, fire and flooding. Removal by hand is generally recommended for small infestations of saplings under 1-inch diameter. Root-cutting and bulldozing may be effective but are costly, labor intensive and may cause extensive damage to soils and lead to resprouting. Fire has been used with some success, but because salt cedars are fire-adapted, they readily resprout after fire. Flooding can be used to control salt cedar if root crowns remain submerged for at least three months.
- **Chemical-** For extensive infestations of salt cedar, chemical control has been shown to be the most effective method. Cautious use of herbicides aids in restoration of salt cedar infested sites by allowing repopulation by native plant species. Systemic herbicides (e.g., those that kill the plant from the root up) are recommended for salt cedar management and application methods include foliar sprays, cut stump treatments, basal bark treatments, and

aerial sprays. Because tamarisk usually grows in or adjacent to streams, wetlands and other waterways, it is important to use products registered for aquatic application.

- **Biological-** Fifteen insects are being investigated as potential biological control agents for salt cedar. Two of these, a mealybug (*Trabutina mannipara*) and a leaf beetle (*Diorhabda elongata*), have preliminary approval for release. Five others are being tested within the United States and an additional eight species are under study overseas. Final approval for release of the mealybug and the leaf beetle is pending resolution of concerns regarding their potential impact to the southwestern subspecies of the willow flycatcher (*Empidonax trailii extimus*), a federally endangered bird. In parts of its range where native willows, its natural nest trees, have been replaced by salt cedar, the willow flycatcher now utilizes it for this purpose. Concern is over the possibility that, due to the environmental damage caused by tamarisk, native plant species may not be able to replace it if the biological control agents succeed in eliminating it.

5.4.2 Russian Olive (*Elaeagmus angustifolia*)

Nuisance Concerns:
This invasive plant can interfere with natural plant succession, nutrient cycling, and tax water reserves. Because Russian-olive is capable of fixing nitrogen in its roots, it can grow on bare, mineral substrates and dominate riparian vegetation where over-story cottonwoods have died. Russian olive was planted in landscapes, along roadsides because of salt tolerance, for windbreaks, wildlife habitat, and surface mine reclamation. Although Russian-olive provides a plentiful source of edible fruits for birds, ecologists have found that bird species richness is actually higher in riparian areas dominated by native vegetation.

Remedies:
Early detection and rapid response is critical since large, dense infestations are very expensive to eliminate populations and restoration is often needed to prevent reestablishment. Management must focus on elimination of seed source seed bank as well as elimination of parent plants. Long-term monitoring is all crucial as plants can quickly establish and even in the absence of disturbance or survive under dense stands of associated plants.

Removal Methods:

- **Manual-** Mowing hedges with a brush type mower, followed by removal of cut material are an effective method for eradication.

- **Chemical**- It can be effectively controlled using any of several readily available general use herbicides such as triclopyr or imazapyr. Metasulfuron-methyl with a surfactant is also reported to be highly effective in controlling this plant.

5.4.3 Russian Thistle *Salsola Tragus*


Nuisance Concerns:
These plants can be problematic in a wide range of areas, including agricultural, roadside, pastures, urban, and residential areas. They pose several threats including increased fire hazard, harboring harmful insects and pathogens, and competing with desirable plants for limiting resource (Rentz). Large plants can reduce highway safety by obstructing views along right-of-ways and causing drivers to swerve their cars in an attempt to avoid colliding with windblown plants. In many areas, plants accumulate along tree rows and fence lines, posing a serious fire hazard that necessitates hours of manual labor for cleanup and disposal. It has been reported that prairie wildfires can spread rapidly when ignited balls of burning russian thistle blow through grasslands. Russian thistle thrives in areas of high disturbance and are common along roadsides, construction sites, and other areas where soil is frequently disturbed. <u>Prevention or reduction of disturbance is critical in preventing establishment of these weeds!</u>

Remedies:
Avoid discing or loosening the soil in abandoned areas because loose soil is necessary for Russian thistle germination. Planting competitive, more desirable species can be an effective method of preventing Russian thistle establishment in most noncrop environments (Rentz). Russian thistle competes poorly in situations with firm, regularly irrigated soil, and it is rarely a problem in managed gardens, turf grass, or landscapes.

Removal Methods:

- **Manual**- Cultural control practices such as mowing and hoeing, or destroying young plants can prevent seed production. Burning can be used to destroy accumulated plants.
- **Chemical**- The most effective preemergent herbicides are Aatrex (atrazine), Velpar (hexazinone), Devrinol (napropamide), Telar (chlorsulfuron), Oust (sulfometuron), Princep (simazine) and Hyvar (bromacil). Postemergent herbicides that are effective when properly applied include Banvel or Vanquish (dicamba), Roundup (glyphosate), 2,4-D and Gramoxone (paraquat).

- **Biological control**- There is recent interest in the introduction of a blister mite, *Aceria salsolae*, for Russian thistle control. A native to the Mediterranean Basin, this mite is known to attack only Russian thistle and stunts it by killing the growing tips. Several other potential biological control agents, such as a seed-feeding and stem-boring caterpillar and two different weevils are also under investigation.

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APPENDIX K
Wildland Fire Management Plan for Kirtland Air Force Base

DRAFT

APPENDIX K

WILDLAND FIRE MANAGEMENT PLAN

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September 2008

ACRONYMS

AFI	Air Force Instruction
AQRV	Air Quality Related Values
BA	Biological Assessment
BI	Burning Index
BLM	Bureau of Land Management
BO	Biological Opinion
CONOPS	Contingence Operations
DoD	Department of Defense
DOE	Department of Energy
DODI	Department of Defense Instruction
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
ESA	Endangered Species Act
FEMO	Fire Effects Monitor
FIREPRO	
FMO	Fire Management Officer
FMP	Fire Management Plan
FMU	Fire Management Unit
FUMA	Fire Use Manager
GMP	General Management Plan
IC	Incident Commander
IMT	Incident Management Team
INRMP	Integrated Natural Resource Plan
IT	Information Technology
KAFB	Kirtland Air Force Base
KAFBFD	Kirtland Air Force Base Fire Department
MMA	Maximum Manageable Area
NAAQS	National Ambient Air Quality Standard
NEPA	National Environmental Policy Act
NFDRS	National Fire Danger Rating System
NHPA	National Historic Preservation Act
NMED	New Mexico Environment Department
NWCG	National Wildfire Coordination Group
OSHA	Occupational Safety and Health Administration
PFM	Prescribed Fire Monitor
RAWS	Remote Automatic Weather Station
RMP	Resource Management Plan
SACS	Shared Application Computer System
SHPO	State Historic Preservation Officer
SOG	Standard Operating Guide
T&E	Threatened and Endangered
TLFM	Time Lag Fuel Moisture
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
WFIP	Wildland Fire Implementation Plan
WFSA	Wildland Fire Situation Analysis
WFU	Wildland Fire Use
WIFC	Withdrawn Interagency Fire Committee
WIMS	Weather Information Management System

Introduction:

1.1. Purpose of the Wildland Fire Management Plan

This fire management plan (FMP) outlines actions that will be taken by Kirtland AFB Fire Personnel and Natural Resource Personnel to meet the fire management goals for the installation. The plan meets the requirement in AFI-32-7064 that states "Installations with unimproved lands that present a wildfire hazard, and installations which utilize prescribed burns as a land management tool, will develop and implement a Wildland Fire Management Plan (WFMP). The WFMP will be incorporated into or consistent with the INRMP as a component plan." The natural resources component of the Kirtland AFB Integrated Natural Resources Management Plan (INRMP) addresses the issue of Wildland fire management in a general manner. This specific action plan implements fire related management actions from the INRMP.

This plan implements current interagency fire management policies and legislation. It helps achieve resource management and fire management goals as defined in:

- AFI 32-7064 Integrated Natural Resource Management.
- The Federal Wildland Fire Management Policy and Program Review (2007)
- Managing Impacts of Wildfires on Communities and the Environment and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (also known as the National Fire Plan, Congressional legislation delivered to USDI/USDA 2007)
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the environment: 10 Year Comprehensive Strategy Implementation Plan (an adjunct to the National Fire Plan 2007)

The goal of Wildland fire management is to plan and make decisions that help accomplish the mission of the Air Force and the National Wildlife Refuge System, which is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

1.1.1. <u>Goals</u>

- Startup (1st five years)
  - Get all necessary equipment and personnel to fund and equip a 14 person seasonal team

- Begin making fire breaks in accordance with Cibola National Forest Resource Management Plan along existing roads and along borders with Isleta Pueblo and Forest Service.
- Survey vegetation cover and fuel loading to predetermine best method of treatments.
- Small prescribed fires to clean up understory where fire breaks are established; if received and approved by USFS.
- Restore fire lookout tower

➢ Short term Goals (5-10 years)
- Using landscape modeling and photo point analysis begin mechanical treatment on areas that would be most affected by catastrophic fire.
- Start prescribed burn rotation
- Constantly work with the CFRP to determine best course of action for landscape scale forest management.
- Have a seasonal wildland fire crew of at least 15 members
- Begin long term monitoring of forest health based on fire and mechanical treatments.
- Conduct studies on the effect of the military mission.

➢ Long term Goals (10+ years)
- Prescribed burn rotation of 5 to 7 years with burned areas being around 1000 acres.
- Continual monitoring of forest health
- Continual work with CFRP
- Work is done on a landscape scale
- Photo point analysis on long term forest management

1.1.2. <u>Objectives</u>

➢ Protect people and property as the highest priority.
- Provide for the safety of firefighters, Tenants and staff.
- Directly protect real and personal property from the effects of fire.
- Reduce fuels with prescribed fire and thinning in places where wildfire is a threat to people and property.
- Implement programs to prevent unplanned human-caused ignitions and reduce human caused wildfires.
- Strive to meet health and safety standards that relate to fire, particularly for air quality and on-the-job safety (e.g., NWCG and OSHA regulations).

➢ Protect KAFB’s natural and cultural resources from undesirable effects of fire and suppression.

- Reduce fuels with prescribed fire and thinning in places where fire would adversely affect Base resources.
- Avoid negative effects to sensitive areas.
- Employ minimum impact suppression tactics, particularly in wilderness or other sensitive areas.

➢ Suppress unwanted fire.
- Ensure Base is adequately prepared to suppress unwanted wildland fire.
- Suppress all human-caused fire.
- Prevent unwanted fire from spreading onto neighboring government and private lands.

➢ Allow fire to assume its natural role in Base ecosystems with justification.
- Determine fire-related data needs relative to natural resources.
- In particular, attempt to determine range of natural variation related to fire (in time, space and intensity), role of fire, and fire effects on species in Desert and Mountain ecosystems.
- Search for scientific results relative to data needs and apply to fire program.
- Promote research relative to data needs and apply results to fire program.
- Tap the experience of individuals familiar with fire in the East Mountains.
- Monitor fire effects and incorporate results into fire program.
- Determine desired conditions before allowing or introducing fire.

➢ Use wildland and prescribed fire for resource management purposes.
- Return fire to fire-dependent ecosystems.
- Specify and aim for desired conditions.
- Keep fire use within the natural range of variation (in time, space, and intensity).
- Reduce fuels in places where fire would adversely affect resources.
- Look for opportunities to use fire to restore and maintain cultural landscapes.

➢ Manage fire cooperatively with neighboring agencies and private land owners as well as other stakeholders.
- Maintain open lines of communication.
- Collaboratively plan and implement fire operations.
- Enter cooperative agreements covering fire-related activities.
- Jointly conduct fire research programs.
- Jointly deliver consistent messages about fire prevention and management.

➢ Coordinate fire activities with all Base Tenets, and supporting agencies as well as public.
- Openly communicate about fire activities with all Base and supporting agencies.
- Incorporate appropriate fire management tasks for Base users.

- Keep the public informed about base fire operations, taking advantage of interpretive opportunities when presented.
- KAFB fire management policy directs the base to manage for the continued presence of
- Fire on the landscape, while protecting human safety and safeguarding the natural and cultural resources of the base. Fire management will be conducted in concert with vigorous research that contributes to our understanding of how fires influence key resources and ecosystem process.

KAFB will deploy the full toolbox of alternative strategies that are available to wildland fire managers. This will include full suppression where necessary, prescribed fire where needed, wildland fire use wherever and whenever possible, and manual fuel reduction where necessary. KAFB will endeavor to manage all aspects of wildland fire in concert with neighbors and interagency cooperators. An interagency wildland fire plan for the East Mountain/Withdrawn areas is being discussed with cooperators and will continue to be developed as a concept.

1.2. General Description of the area in the Fire Management Plan

Kirtland AFB is located just southeast of Albuquerque, New Mexico, at the foot of the west side of the Manzanita Mountains (Figure 1-1). These mountains rise to over 10,000 feet and define the eastern boundary of an area locally known as East Mesa. Kirtland AFB encompasses more than 52,000 acres of the East Mesa with elevations ranging from 5,200 to almost 8,000 feet above mean sea level (USGS 1990a, b, c; 1991a, b, c). Land uses adjacent to the base include the Cibola National Forest (CNF) to the northeast and east, the Isleta Pueblo to the south, and residential and business areas of the City of Albuquerque to the west and north.

The airfield complex serving Kirtland AFB is shared with the Albuquerque International Sunport, located adjacent to the northwest corner of the base. Airfield operations and aircraft support facilities are concentrated in the airfield complex area. The remaining intensive development at the base (e.g., administrative, housing, medical, and commercial services) is located east of the airfield complex, also in the northwest corner of the base. The base golf course and landfill are located southeast of the developed area. The remaining areas of the base (approximately 80 percent of the base land area) are largely dedicated to military training and operational facilities. Sandia National Laboratories also operates and maintains several facilities on base for research, testing and evaluation of various weapons, communication and energy systems.

Table 1: Ground Category Acreage on Lands Maintained by Kirtland Air Force Base*

Area	Category	Size (Acres)	General Description
Kirtland AFB (36,787 acres)	Improved	1,980	Athletic areas, housing areas, commercial and industrial areas; administrative areas, golf course, riding stables, Fam camp, active landfill, storm water catchment basin
	Semi-improved	2,425	Dirt roads and low maintenance administrative areas, storage areas, heliport, safety zones, training sites and obstacle course, burn pits, road sides, closed landfill cells
	Unimproved	32,382	Areas containing native or naturalized vegetation with no roads or other structures present.
Withdrawal Area (15,891 acres)	Improved	65	Buildings and Paved Areas
	Semi-improved	305	Areas around buildings, and graded areas such as the M-60 Firing Range and dirt roads
	Unimproved	15,521	Areas containing native or naturalized vegetation with no roads or other structures present.

Source: Memorandum of Understanding between USDA and USAF for total acres on the base and in the Withdrawal Area; areas calculated using a detailed analysis of land maintenance schedules from Jacobs 2000, land use inputs from 377th Civil Engineering Squadron/Civil Engineering Environmental Quality, and 1991 aerial photographs.
* Acreage includes DOE Lands

1.3. Significant Values to Protect

1.3.1. Firefighter Safety

The safety of installation and cooperator firefighters is the utmost concern in all wildland fire operations. Several national requirements, including the NWCG Qualifications Guidelines (310-1), are in place to aid the conduct of safe operations. It is of the highest importance that all firefighters have the training and experience for their positions and equipment they operate. All personnel will be issued fire-resistant clothing, a hard hat with chinstrap, leather gloves, leather boots minimum of 8 inches tall, eye protection and hearing protection. Personnel must use the appropriate PPE in conjunction with their assigned task.

1.3.2. Fire Communications

For safety reasons, all personnel on a wildfire or a prescribed fire must have communications with at least one other person at all times. This communication can be either visual or verbal. UHF "trunking" system radios will be the primary media for communications; VFH radios will be used to communicate with partner agencies. If this is not available or are not working then personnel must be within voice or sight distance of each other.

Any safety issues that have the potential to cause an aviation-related mishap should be reported on the SAFECOM website. This website is intended as an "accident prevention tool" developed for the Department of Interior and the U.S. Forest Service and uses Forms OAS-34 or FS-5700-14 to report aviation safety issues. It is also important to review SAFECOMS that have been submitted from other programs in order to learn from their mistakes.

A number of items may be found on the "Safety Awareness in the Fire Environment" (SAFE) website at http://www.nifc.gov/safety_study/index.htm as works in progress resulting from the Wildland Firefighter Safety Awareness Study. This initiative resulted from the wildland firefighter fatalities suffered in 1994. Constant reminders of the 10 Standard Fire Orders and the 18 Situations That Shout Watch Out help keep the individual's attention on safety. In compliance with the NWCG standards, annual safety refresher training and work capacity tests are requirements, and will be conducted by Kirtland AFB Fire Department before the start of the fire season every year.

A number of DoD mission considerations affect the operation of the wildland fire management program as well as firefighter safety. The most critical is the issue of UXO. Because this is a munitions test area, and has been for over 60 years, large areas on Kirtland AFB contain various types and quantities of UXO material. Fires can cause some UXO to explode, as can tractors and plows used in suppression activities, posing a serious risk to firefighter safety. Therefore, certain areas have been designated as "no suppression zones." In these areas, suppression activities are limited to using and maintaining existing roads as firebreaks. Personnel will not suppress fire using engines, tractors, or hand tools in forested or range areas in any designated no suppression zone. In recognition of the hazard associated with fire management activities in areas with potential UXO, these areas can be found on the Suppression Considerations Map.

There are also areas that are "restricted suppression zones". These areas may be contaminated with UXO but to a lesser extent than the "no suppression zones". Suppression in these areas is limited to times when fire danger is elevated and when allowing the fire to burn could be more detrimental to firefighter safety than suppressing the fire. Values at risk, including natural resources will also be considered. In normal circumstances a block and burn tactic should be used in these areas. For more information on these hazard areas and their locations, see discussion of the various Fire Management Zones (FMZs) in Sections 5.2 and 6.2.

Actual mission requirements also affect the way in which fire operations are conducted. When active missions are occurring, safety considerations may prevent firefighters from being near the active range for wildfire suppression operations. Active missions also restrict the opportunity to conduct prescribed fire operations. All prescribed fires and wildfire responses must be coordinated with Kirtland's Controlled Firing Area Committee (CFAC) in order to assure safety for firefighters with respect to mission activity.

1.3.3. Mission Operations

Mission operations are potentially at risk from both wildfires and prescribed fires. Wildfires and/or fire suppression operations can interfere with missions. Additionally, certain missions require a smoke-free environment and can be impacted from smoke from wildfires or prescribed fires. All prescribed burns will be coordinated with the CFAC and the appropriate test engineers to avoid mission delay or interference. On occasion, missions may need to be canceled or delayed in order to suppress an existing wildfire. The decision to cancel a mission will depend on the location of the fire, the risk to other variables, and the potential for fire growth.

1.3.4. Endangered Species and Other Biological Considerations

Endangered species on the installation can be affected both positively and negatively by fire. While prescribed fire may be applied to enhance habitat, many wildfires will produce adverse effects. During most wildfire events, biologists are available to provide input to the fire command staff regarding the effect of suppression plans on endangered species and biological communities. Prescribed fire planning and execution requires that all Natural Resources Section Elements be active participants so that all biological and management considerations are evaluated during the prescribed fire planning and prioritization process.

Gray vireos, a state threatened species, as listed by the NMGFD, occupy areas with an open canopy (i.e. less than 25 percent) with one-seeded juniper as the dominate tree/shrub species. During the summer, the Withdrawal Area has the largest gray vireo colony in New Mexico (Schwarz 1998). Potential gray vireo habitat based on the 2003 survey is presented in Figure 5-2.

The western burrowing owl, a federal species of concern, is a common resident at Kirtland AFB. It is very closely associated with the prairie dog colonies on base, as they use abandoned prairie dog burrows for nesting. Owls generally occur on base between March and October before migrating south, although a few birds may occur on base during mild winters.

The loggerhead shrike is also a federal species of concern and a state threatened species. It has been observed on the base and in the Withdrawal Area and is found in the area throughout the year. Loggerhead shrikes occupy grassland, pinyon-juniper woodlands, and riparian habitats.

Mountain plovers, a federal species of concern, are not known to occur on base. However, in 2003, an adult with two chicks was observed just south of the base on the Isleta Pueblo Indian Reservation (Kirtland AFB 2004a). Appropriate nesting habitat for this species is limited on base; therefore, it is unlikely that the mountain plover uses Kirtland AFB during the nesting season. However, the southern grasslands of the base may potentially be used as brood-rearing habitat or during migration.

1.3.5. Cultural Resources

While fire itself will not harm Kirtland AFB cultural resources such as ring middens or remnants of stone shelters, care must be taken during suppression efforts to prevent accidental damage through careless location of fire lines, use of heavy equipment, careless use of chemicals, pillaging by firefighters, etc. Some level of mitigation or protection for rare plant communities, such as seep forest communities and spring wetlands or areas of high densities of threatened or endangered species. Historically, *natural* fires may have skipped over these areas. It would be desirable to have a low intensity fire in the plant communities.

In order to avoid erosion problems, except when absolutely necessary due to high fire danger and values at risk from a going wildfire, firebreaks will not be constructed using a tractor and plow or blade on slopes leading down to creeks or through wetlands. Locations of wetlands and other sensitive natural areas are included on the "Suppression Considerations" map which is kept in map tubes behind the seat of each piece of over-the-road firefighting equipment. Whenever feasible, hand lines or wet lines will be used instead of heavy equipment in these sensitive areas. In wildfire situations, burnout or backfire operations will be considered as the first suppression option in order to avoid soil disturbance associated with tractors and plows. If damage is caused to sensitive areas from heavy equipment, the Incident Commander is required to report the damage to dispatch and to assure that remedial actions are taken to prevent erosion and minimize degradation to the site.

1.3.6. Real Property

There are numerous outlying buildings, ranges, and miscellaneous structures on base that are in need of protection. Full suppression techniques will be used around these areas.

1.3.7. Private Property/Urban Interface

There are several areas that border Kirtland AFB that need to be protected from wildfires. They are the International Airport to the west, four hills neighborhood on the northeast corner, houses to the east, and the Isleta Pueblo to the south. Reduction of hazardous fuels by the use of mechanical and prescribed fire where applicable around communities at risk from wildfire will be the best form of treatment. Continue and expand fuels reduction projects adjacent to communities and subdivisions. **Goal: Suppress all unwanted wildland fires with minimum cost, using an appropriate suppression response, while protecting values at risk.** Prioritize fuels projects which will reduce fuel loading within or adjacent to urban interface. Work with interagency and local organizations to identify and develop projects.

Chapter 2 - FWS Guidance

2.1. Implementation of Fire Policy

Implementation of wildland fire management components must be consistent with fire management capabilities and should consider the current and predicted conditions affecting wildland fire behavior. Preplanned decisions based on historical fire behavior indices should be considered to most efficiently aid in WFIP decisions requiring appropriate management response.

A standard wildland fire implementation plan (WFIP) has been developed. The complete WFIP consists of three stages and is prepared progressively. Each individual stage constitutes a standalone implementation plan and specific forms and formats are available for each stage. Progression from one stage to the next is dependent upon fire activity, potential duration, and relative risk as it relates to the incident. As each progressive stage is prepared, it is attached to the previous stage and becomes the guiding document until management of the fire accomplishes resource objectives or progression to a higher stage occurs.

Since each stage can be completed individually and used as a stand-alone plan, it is possible that an individual fire will be managed under only Stage I for its duration. Some fires will progress to Stage II and some will progress to Stage III. Thus, the overall objectives for managing individual fires can be accomplished through successful implementation of any or all of the stages.

2.1.1. Federal Interagency Wildland Fire Policy

This FMP implements these guiding principles of federal wildland fire policy:

- Firefighter and public safety is the first priority in every fire management activity.
- The role of wildland fire as an essential ecological process and natural change agent has been incorporated into the planning process. Federal agency land and resource management plans set the objectives for the use and desired future condition of the various public lands.

- Fire management plans, programs, and activities support land and resource management plans and their implementation.
- Sound risk management is a foundation for all fire management activities. Risks and uncertainties relating to fire management activities must be understood, analyzed, communicated, and managed as they relate to the cost of either doing or not doing an activity.
- Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives,
- Fire management plans and activities are based upon the best available science.
- Fire management plans and activities incorporate public health and environmental quality considerations.
- Federal, State, tribal, local, interagency, and international coordination and cooperation are essential.
- Standardization of policies and procedures among federal agencies is an ongoing objective.

2.1.2. National Fire Plan

This FMP emphasizes the following primary goals of the 10 Year Comprehensive Strategy and Cohesive Strategy for Protecting People and Sustaining Natural Resources: Improving fire prevention and suppression, reducing hazardous fuels, restoring fire-adapted ecosystems, and promoting community assistance.

2.1.3. Department of Interior (DOI) Fire Policy

This FMP meets DOI policy in 620 DM 1 by making full use of wildland fire as a natural process and as a tool in the planning process.

2.1.4. U.S. Fish and Wildlife Service Fire Policy

This FMP addresses a full range of potential wildland fires and considers a full spectrum of tactical options (from monitoring to intensive management actions) for appropriate management response (AMR) to meet Fire Management Unit (FMU) objectives. It fully applies procedures and guidelines in the Service Fire Management Handbook and the Interagency Standards for Fire and Fire Aviation Operations and affirms these key elements of FWS fire policy:

- Firefighter and public safety is the first priority of the wildland fire management program and all associated activities.
- Only trained and qualified leaders and agency administrators will be responsible for, and conduct, wildland fire management duties and operations.

- Trained and certified employees will participate in the wildland fire management program as the situation requires, and non-certified employees will provide needed support as necessary.
- Fire management planning, preparedness, wildfire, prescribed fire operations, other hazardous fuel operations, monitoring, and research will be conducted on an interagency basis with involvement by all partners to the extent practicable.
- The responsible agency administrator has coordinated, reviewed, and approved this FMP to ensure consistency with approved land management plans, values to be protected, and natural and cultural resource management plans, and that it addresses public health issues related to smoke and air quality.
- Fire, as an ecological process, has been integrated into resource management plans and activities on a landscape scale, across agency boundaries, based upon the best available science.
- Wildland fire is used to meet identified natural resource management objectives and benefits when appropriate.
- Prescribed fire and other treatment types will be employed whenever they are the appropriate tool to reduce hazardous fuels and the associated risk of wildfire to human life, property, and cultural and natural resources and to manage our lands for habitats as mandated by statute, treaty, and other authorities.
- Appropriate management response will consider firefighter and public safety, cost effectiveness, values to protect, natural and cultural resource objectives, and the military mission.
- Staff members will work with local cooperators, the public, and the military to prevent unauthorized ignition of wildfires on our lands.

2.1.5. Kirtland AFB-specific Fire Management Policy

Base Civil Engineer

- As the chief executive within the base, the Base Civil Engineer is responsible to the Wing Commander for all fire management activities within the base.
- Manages all operational and emergency fire management program accounts. Ensures that funds are both allocated and requested to maintain the fire management program described in this plan.
- Approves and terminates local and zone fire management agreements.
- Signs delegation of authority for incident management teams and is the agency administrator.
- Approves the WFSA, thus approving upon their submittal the strategies chosen for the management of base wildland fires managed under a suppression strategy.

- Approves appendices to this plan.
- Periodically assess and certify by signature that continued management of wildland fire use actions is acceptable. Under certain conditions, the base Civil Engineer may delegate this responsibility to another organizational level.

Fire Chief

- Provides personnel for fire management assignments.
- Acts as member of multidisciplinary team for fire planning.
- May act in place of Base Civil Engineer in absence.
- Approves the FMO's WFIP, thus certifying daily the management, continuation, or termination of base WFUs.
- Reviews all FMO's prescribed fire plans.
- Ensures that project compliance has been completed.
- Assigns FMO to brief incoming and outgoing incident management teams.

Fire Management Officer

- Supervises and/or coordinates all wildfire prevention, pre-suppression, suppression, and fire related aviation operations, acts as duty officer whenever present. Serves as or appoints prescribed burn boss/IC for base fires.
- Acts as FUMA, if qualified. Prepares or reviews all Base prescribed burn plans, wildland fire assessments, WFSAs, WFIPs, and individual fire reports.
- Provides liaison with fire management staffs of regional and neighboring land management agencies. The FMO serves as the direct contact for the KAFB Fire management.
- Coordinates base wildland fire management dispatching.
- Maintains inventories of all base Wildland fire-related resources and ensures that all firefighters are fully qualified for duties assigned.
- Maintains records of all wildland fires and ensures transmission of these records to the DoD fire management computer system.
- Provides training opportunities to qualified personnel to maintain proper numbers of employees to carry out routine fire management operations.
- Maintains fire weather records collected on the base and ensures that daily fire weather data is entered into WIMS when implemented. Interprets NFDRS outputs, and advises the Fire Chief and Albuquerque Zone of high, very high, or extreme fire danger.
- Acts as agency representative to incident management teams assigned to base fires.
- Recommends and reviews mutual aid/ mutual response agreements for the Fire Chiefs signature.
- Ensures that post-fire reviews are completed on a timely basis for all suppression fires, prescribed fires, and WFUs.

- Reviews and updates this fire management plan and its appendices including base pre-attack plans on an annual basis to maintain a professional fire management program that is consistent with current technology and NWCG policy.
- Ensures the implementation of the base's fire management program as detailed in this plan.
- Ensures that project level interagency consultation is initiated/completed.
- Ensures that sensitive resources are being protected.
- Assists with the on base procurement of personnel for all facets of fire management including pre-suppression, suppression, wildland fire use monitoring, management ignited prescribed fires, traffic control, etc.
- Assists in the coordination of fire restrictions on the base that may be imposed during prolonged periods of very high or extreme fire danger.
- Oversees and performs all aspects of prescribed and wildland fire monitoring.
- Coordinates all wildland fire and prescribed fire related research with other interagency officials.
- Collects or directs the collection and processing of fuels data.
- Provides fire prevention information to subordinates, and works with the base Civil Engineer and the Fire Chief of interpretation and education so that this information will be communicated to Base Personnel as appropriate. Provides personnel for fire management assignments.
- Acts as team leader of the Base in coordination with the interagency cooperators on the multidisciplinary team for the purpose of fire planning.

Assistant Fire Management officer

- Assists the FMO with all Wildland Fire Management policy and operations.

Fire Inspector

- Provides information on utilities and other facilities that may be susceptible to fire damage, damaged by the suppression effort, or overused as part of a suppression effort.
- Provides fire prevention information to subordinates, and provides that this information will be communicated to base Personnel as appropriate.
- Provides interpretive services to inform the public of the base fire management program, fire prevention, specific fires, and of fire effects, etc.

2.2. Land/Resource Management Planning

2.2.1. Land/Resource Planning Documents

The fire management plan for Kirtland AFB is a detailed program of action to carry out fire management policies and objectives. Broad resource management policies for Kirtland AFB can be found in the Base Fire Department SOG's and CONOPS plans.

These policies are refined into specific resource management goals in the INRMP. The INRMP further identifies the specific management objective of using fire as a tool in restoring and maintaining the natural environment of the Base.

The fire management plan is an integral part of the INRMP. It describes specific management strategies for the preservation of the wilderness character of the base. The INRMP states that the base's wilderness and the entire base's undeveloped areas "will be managed as a natural zone wherein fire will be restored to its natural role as a primary agent in the maintenance of natural vegetation mosaics, and..."Will be allowed to continue unimpeded."

Fire once played an important role in the functioning of the upper high Desert/Mountain ecosystem. Naturally occurring fires have helped shape the landscape over time and maintain the diversity of species. Many plant and wildlife species have evolved under the influence of fire and, in some cases, depend on fire for their continued existence. To remove all fires from an ecosystem deprives that system of a powerful and dynamic natural force. The ultimate goal of fire management for KAFB Eco- System is to restore fire to diverse ecosystems where possible through wildland fire use and prescribed fires. Human-caused wildland fires will not be considered candidates for wildland fire use and will be suppressed. An approved fire management plan will aid in meeting the goals of the Base.

2.2.2. Compliance with Regulatory Acts

Department of Defense Policy

DoD wildland fire suppression policy is found in DoD Instruction (DoDI) 6055.6, Enclosure 2, Section E2.5.9. *Wildland Fire Preparation and Response*, available on the Internet at http://web7.whs.osd.mil/pdf/i60656p.pdf. This section dictates:

- "E2.5.9. Wildland Fire Preparation and Response. Fire department and natural resources preparedness and response to wildland fires shall be in accordance with the Federal Wildland Fire Management Policy and Program Review of 1995 and the Interagency Fire Management Agreement (reference (l)), except as covered under DoD Directive 3025.15 (reference (m)). The Department of Defense shall establish and maintain voting membership in the National Wildfire Coordinating Group to facilitate the development of policy, standards and training with the Federal wildland agencies. The Department of Defense shall establish and maintain a fire protection specialist position at the National Interagency Fire Center to represent DoD wildland fire requirements, coordinate the use of military assets through the Director of Military Support, and manage the wildland fire qualification system for the Department of Defense" *DoDI 6055.6, October 10, 2000.*

U.S. Air Force Policy
AFI 32-7064, Chapter 12 specifically addresses wildland fire program management. This plan, as written, meets the current policy and operational requirements set forth in AFI 32-7064.

Kirtland AFB Integrated Natural Resources Management Plan
The goals and supporting objectives listed in the INRMP that pertain to the operation of the wildfire suppression program, or to the application of prescribed fire to Kirtland AFB habitat, are supported by the Wildland Fire Management Plan (WFMP). The WFPM should be viewed as a step-down plan from the INRMP. Implementation of the WFPM will contribute to attainment of the INRMP goals and objectives.

Federal Fire Policy: 1995–2001
The Federal Wildland Fire Management Policy and Program Review (1995) (FFPR–1995), used as a foundation for both DoDI 6055.6 and AFI 32-7064, is found on the Internet at http://www.fs.fed.us/land/wdfire.htm. A revision of the Federal Fire Policy Review completed in late 2000 (FFPR–2001), can be found at http://www.nifc.gov/fire_policy/index.htm. To the extent possible, this plan meets the suggested actions in FFPR–2001. The 2001 review of the FFPR–1995 contains a number of suggestions to aid implementation. The review working group included the five original Federal agencies with additional representatives from the Department of Defense, Department of Energy (DOE), Bureau of Reclamation (BOR), U.S. Environmental Protection Agency (USEPA), Federal Emergency Management Agency (FEMA), and Department of Commerce (DOC). It is possible that minor changes to both DoD and Air Force policies may result from that review.

Wildland Fire Qualifications
The NWCG Wildland Fire Qualification Subsystem Guide, 310-1 (310-1) found at http://www.nwcg.gov/pms/docs/PMS310-1.pdf is incorporated in this plan by reference, National Fire Protection Association (NFPA) Standards as are applicable. The 310-1 contains the training, experience, and physical requirements for various Incident Command System positions. DoD has accepted these standards (AFI 32-7064) for use in both wildfire suppression and prescribed fire operations on DoD component lands.

DoDI 6055.6.4.5 assigns the administration and maintenance of the DoD Fire Fighting Certification Program for all DoD Components to the Secretary of the Air Force. It is expected that qualification data will eventually be maintained for all DoD wildland firefighters in the Air Force managed Fire Fighter Certification Program.

Local qualification and certification information will be kept in the Incident Qualification System (IQS) for the immediate future. This application was developed for the National

Association of State Foresters with support from the U.S. Forest Service and is specifically designed to meet the requirements of the NWCG standards. Some employee data is currently maintained in this system. As necessary, data will be passed on to HQ AFCESA/CEXF for the maintenance of the DoD Firefighting Certification Program.

For compliance with AFI 32-7064, *Integrated Natural Resources Management*, Chapter 12, (revised 17 September 2004), the Air Force has adopted the Incident Qualifications and Certification System (IQCS) database to track training and certification for wildland firefighters that maintain NWCG certifications in accordance with 310-1.

Current plans call for the Virginia Interagency Coordination Center (VICC) to maintain the IQCS data and related information for all Air Force personnel and contractors. The VICC would issue Incident Qualification Cards ("red cards") that indicate the certification level of the holder. The cards would be issued unsigned, and thus would require verification and signature by the appropriate approving official for the installation, as indicated in the *Wildland Fire Management Plan* (AFI 32-7064 Chapter 12).

2.3. Fire Management Partnerships

Kirtland AFB cooperates closely with cooperators and base neighbors in the suppression of wildland fires and in prescribed fire. The interagency community in the Albuquerque Zone shares all firefighting resources.

The base will coordinate all suppression, wildland fire use, and prescribed fire activities with interagency cooperators. The base has cooperative agreements with other agencies and will continue to work on an Interagency Fire Management Plan to either supplement or replace this one.

2.3.1. Internal Partnerships

- Base Civil Engineer –KAFB
- Fire Chief –KAFB
- Fire Management Officer –
- Assistant Fire Management Officer – Vacant
- District Forester –
- Fire Management Officer–
- Fire Management Officer Assistant–USFS (Sandia Ranger District)

2.3.2. External Partnerships

Kirtland AFB contains the following cooperative agreements on File:

- Memorandum of Understanding for Mutual Assistance with Albuquerque City Fire Department
- Memorandum of Understanding for Mutual Assistance with Bernalillo county Fire Department
- Memorandum of Understanding for Smoke Monitoring with the State of New Mexico
- Memorandum of Understanding for Mutual Assistance with the Village of Tijeras

3.0 Fire Management Unit Characteristics

The fire season at Kirtland AFB statistically starts in March and lasts until November. During these months, wildland fires normally spread from a point of ignition at varying intensities and rates. It must be noted here that wildland fires have occurred in the East Mountains areas during every fire season of the year. The base's current fire management plan continues many of the strategies of existing plans. Wildland fire use, suppression, prescribed burning, and non-fire fuels treatments remain the basis for action. Ideally, the base will one day be in a condition that safely allows maximizing wildland fire use. It will take an aggressive thinning and prescribed burning program to achieve these goals. The current plan particularly emphasizes the treatment of problem fuels areas and cooperation with the USFS along the base's Withdrawn Area boundaries.

3.1.1. Management Goals, Objectives, and Constraints in CCPs

The interdisciplinary team developed the following goals (italicized) and objectives (bulleted) for the Kirtland AFB wildland fire program:

Protect people and property as the highest priority.

- Provide for the safety of firefighters, Tenants and staff.
- Directly protect real and personal property from the effects of fire.
- Reduce fuels with prescribed fire and thinning in places where wildfire is a threat to people and property.
- Implement programs to prevent unplanned human-caused ignitions and reduce human caused wildfires.
- Strive to meet health and safety standards that relate to fire, particularly for air quality and on-the-job safety (e.g., NWCG and OSHA regulations).

Protect KAFB's natural and cultural resources from undesirable effects of fire and suppression.

- Reduce fuels with prescribed fire and thinning in places where fire would adversely affect Base resources.
- Avoid negative effects to sensitive areas.

Suppress unwanted fire.

- Ensure Base is adequately prepared to suppress unwanted wildland fire.
- Suppress all human-caused fire.
- Prevent unwanted fire from spreading onto neighboring government and private lands.

Allow fire to assume its natural role in Base ecosystems with justification.

- Determine fire-related data needs relative to natural resources.
- In particular, attempt to determine range of natural variation related to fire (in time, space and intensity), role of fire, and fire effects on species in Desert and Mountain ecosystems.
- Search for scientific results relative to data needs and apply to fire program.
- Promote research relative to data needs and apply results to fire program.
- Tap the experience of individuals familiar with fire in the East Mountains.
- Monitor fire effects and incorporate results into fire program.
- Determine desired conditions before allowing or introducing fire.

Use wildland and prescribed fire for resource management purposes.

- Return fire to fire-dependent ecosystems.
- Specify and aim for desired conditions.
- Keep fire use within the natural range of variation (in time, space, and intensity).
- Reduce fuels in places where fire would adversely affect resources.
- Look for opportunities to use fire to restore and maintain cultural landscapes.

3.1.2. <u>Management Goals, Objectives, and Constraints from other sources</u>

Manage fire cooperatively with neighboring agencies and private land owners as well as other stakeholders.

- Maintain open lines of communication.
- Collaboratively plan and implement fire operations.
- Enter cooperative agreements covering fire-related activities.
- Jointly conduct fire research programs.
- Jointly deliver consistent messages about fire prevention and management

Coordinate fire activities with all Base Tenets, and supporting agencies as well as public.

- Openly communicate about fire activities with all Base and supporting agencies.
- Incorporate appropriate fire management tasks for Base users.
- Keep the public informed about base fire operations, taking advantage of interpretive opportunities when presented.

Kirtland AFB fire management policy directs the base to manage for the continued presence of fire on the landscape, while protecting human safety and safeguarding the natural and cultural resources of the base. Fire management will be conducted in concert with vigorous research that contributes to our understanding of how fires influence key resources and ecosystem process.

Kirtland AFB will deploy the full toolbox of alternative strategies that are available to wildland fire managers. This will include full suppression where necessary, prescribed fire where needed, wildland fire use wherever and whenever possible, and manual fuel reduction where necessary. Kirtland AFB will endeavor to manage all aspects of wildland fire in concert with neighbors and interagency cooperators. An interagency wildland fire plan for the East Mountain/Withdrawn areas is being discussed with cooperators and will continue to be developed as a concept.

Cost Effectiveness

Accomplishing fire operations objectives safely and efficiently will not be sacrificed for the sole purpose of "cost saving". Care will be taken to ensure that suppression expenditures are commensurate with values to be protected, while understanding that other factors may influence spending decisions, including the social, political, economic, and biophysical environments. Considering that we will need more money now in startup costs our goals will change over time. As of now, these are our goals:

- Start up costs (first 5 years)
    - Firefighting equipment used in support of wildland operations.
        - Brush trucks
            - Two F650 trucks
        - PPE
        - Radios
            - Repeaters
            - Complete system
    - Mechanical Thinning (local treatments)
        - Removing dogwood thickets
        - Fund and procure mechanical thinning equipment
    - Prescribed Burns
        - Only in areas where it is safe to do so
        - Keeping burn areas small around 100 acres.
    - Personnel
        - Seasonal crew for mechanical thinning and prescribed burns
        - Research on stand data and fuel loading

- Short-term Needs (5-10 years)
    - Maintenance of firefighting equipment
    - Personnel
    - Continuous funds for mechanical thinning: local treatments leading to a landscape goal
    - Continuous funds for prescribed burning
        - Small fires based on mechanical thinning
            - No more than 500 acres
- Long-term Needs (10+ years)
    - Maintenance and procurement of replacement equipment
    - Personnel
    - Mechanical Thinning on a Landscape Scale
    - Prescribed Burns
        - Creating a rotating burn schedule for larger areas
            - Burn an area every 7 years to maintain landscape
            - Try for 1000 acres per burn
                - Do 3 or 4 burns per season
    - Long term monitoring of burned and mechanically thinned areas.

The first year startup costs will be upwards of $500K to 750K due to necessary equipment. All costs are based on equipment and treatments to landscape. Manpower costs have not yet been determined. After the first year the costs will have to be determined by how efficient and effective mechanical treatment and prescribed burning are based on an average per acre for treatments. Other local agencies have gotten their cost per acre down to $75 dollars.

3.1.3. Common Characteristics of the Fire Management Units

Fire History

The frequency of fires set by Native Americans or lightning prior to the late 1800s is not known for the vegetation communities in the Sandia Mountains. Ahlstrand (1981b) reported a significant decrease in fire frequency after Native Americans were excluded from former mescal gathering and roasting areas by Europeans in the mid 1800s. Intense grazing eliminated fuels that could support fires in many areas in the Southwest (Swetnam et al. 1999). For the period between 1496 and 1922, fire frequency of about every 5 to 10 years, with widespread fires every 17 years, was estimated from tree-ring fire-scar data in higher elevation forests and woodlands of the Sandia Mountains (just southwest of town of Tijeras in the same mountain range) (Ahlstrand 1981b).

Over the past 150 years, livestock grazing, climate change, and fire suppression have contributed to the increase of shrubs and decrease of grasses. Although fire is a natural disturbance in lower elevation Desert ecosystems, fire frequency in grasslands and shrub lands is difficult to determine due to lack of direct evidence. The literature suggests about 5 to 15 years as a fire-return interval that maintains grassiness in the face of invading shrubs in the high Desert (Kittams 1972, Ahlstrand 1982). Given the southwest-to-northeast wind-driven pattern of fires in the Sandias, it is likely that some of the historically frequent fires starting upwind in the Sandia high country reached settled areas. Long-term fire effects studies in the region have yet to be carried out (Gebow and Halvorson 2002). The Sandia's has 10-years of data from its fire effects monitoring program that are highly variable, but the fire ecologist plans to reanalyze the data set in the near future. (Cibola National Forest and surrounding lands). Lightning fires accounted for 65.2 percent of the total number of ignitions for the 60-year period. Until the mid-1960s, though, lightning fires ran a close second to human actions, particularly smoking, as the main cause of fires in the Forest.

Fire Ecology

Fires in Cibola National Forest over the past 20 years initially resulted in an increase in grasses and a reduction in shrubs, cacti, and agaves (Kittams 1972, Ahlstrand 1982). However, most woody species are not killed by fire and respond to burning by producing vegetative sprouts at the protected plant base. Perennial herbs often persist after fires and many annual seeds germinate after burning. Annual and perennial grass response after fire depends on the season burned. Studies show that with normal precipitation, blue grama is not harmed by prescribed burning but may decrease for two to three years under drought conditions (Wright 1978). Another study examining the effects of fire on the less common black grama has shown that fire can be detrimental (Cornelius 1988). Non-native grass species, such as Lehmann love grass, recover from fire more quickly and may replace native grasses. Summer burns can kill perennial grasses, especially if followed by a post-burn drought (Debra Peters, Jornada LTER Site, pers. comm.).

Climate/Weather

The climate at Kirtland AFB is characterized by low precipitation; wide temperature extremes; frequent drying winds; and short, but heavy, rains.

The average annual temperature in Albuquerque is 57 degrees Fahrenheit (ºF), with an average daily fluctuation of 28ºF. In summer, high temperatures in the vicinity of Kirtland AFB average 90ºF and low temperatures average 62ºF. During the winter, temperature inversions occur when colder, heavier air stagnates beneath warmer air due to the lack of wind and the presence of the Sandia Mountains, a physical barrier to air flow. Because of these inversions, winter months (December to February) are quite cool, with an average daily low of 38ºF and an average daily high of 58ºF. Sunshine occurs nearly 3,400 hours a year and is evenly distributed in all seasons (U.S. Department of Agriculture [USDA] 1977).

Annual precipitation is variable in the area surrounding Kirtland AFB. West facing slopes generally receive more precipitation than the plateaus between the mountains and the Rio Grande. The average annual precipitation in Bernalillo County ranges from 8 inches in the county's arid valley and mesa areas to 30 inches in the Sandia Mountains east of Albuquerque. Precipitation occurs primarily during the summer months, and more precipitation falls at higher elevations. Half of the average annual precipitation events occur from July to October, during heavy thunderstorms. Annual snowfall averages range from approximately 10 inches in the valley to 3 feet in the foothills. In the higher mountain areas, snowfall averages can reach as high as 10 feet. In the valley, which has an elevation similar to much of Kirtland AFB, the snow season extends from November to early April, but snow seldom stays on the ground for more than a day (USDA 1977).

Prevailing winds in the area are from the north in the winter and from the south along the river valley in the summer. The average annual wind speed is 9 miles per hour. Gusts up to 50 miles per hour can occur in the vicinity of Tijeras Canyon due to the release of heavy, cold air held back by the Sandia and Manzanita Mountains (USDA 1977). Strong winds occur primarily in late winter and early spring.

SOILS

Most of the Albuquerque Basin consists of poorly consolidated sediments that eroded from the surrounding mountains following previous faulting and geologic activity. These sediments, known as the Santa Fe Group, are overlain in places by the 5.3 to 1.6-millionyear- old Ortiz gravel deposits. In certain places, Rio Grande soil types and volcanic deposits are interspersed. A description of each soil type, its characteristics, and the common native vegetation associated with it is included in Appendix D (USDA 1977).

In the eastern half of the installation, bedrock is exposed in a series of northeast trending geologic structures. This area consists primarily of granite, metamorphic rock, and marine carbonate rocks that are approximately 570 million years old (USAF 1999). The dominant soils of the Albuquerque Basin are well drained and loamy, with minor amounts of gravelly and stony soils along the mountains and arroyos.

Current Vegetation

The vegetation scheme observed during field investigations at Kirtland AFB consists of six main plant communities: Sagebrush steppe, grassland, juniper woodland, pinyon juniper woodland, ponderosa pine woodland, and riparian/wetland/arroyo. These vegetative communities correspond closely with the accepted US Forest Service (USFS) plant community descriptions. Transitional areas are found between these communities and contain a mixture of representative species. The pinyon-juniper woodland and grassland vegetation communities are the most common at Kirtland AFB. The riparian/wetland/arroyo community is confined to isolated areas inundated by surface water during at least some part of the year. The five primary vegetative plant communities on Kirtland AFB and the Withdrawal Area are presented. Due to the limited occurrence of the riparian/wetland/arroyo community it is not considered a primary vegetative plant community.

1. Sagebrush Steppe Community

This community occupies a small portion of the base along the south west boundary of the installation. It is dominated by sand sagebrush (*Artemisia filifolia*), with scattered grasses such as black grama and spike dropseed (*Sporobolus contractus*). Other species include galeta, ring muhly (*Muhlenbergia torreyi*), broom snakeweed, and Great Plains yucca (*Yucca gluaca*). Cryptogrammic crust is common in this vegetation community.

2. Grassland Community

The grassland community is the most wide-spread vegetation complex at Kirtland AFB. This community generally occurs between elevations of 5,200 and 6,000 feet in the southwestern portion of Kirtland AFB. Near the Manzano Base, these grasslands are found as high as 6,900 feet. Primary grass species include ring muhly, Indian rice grass, black grama, blue grama and spike dropseed (USAF 1991). Sand sagebrush is the most common shrub in this community, but apache plume (*Falugia paradoxa*) and four-wing saltbush (*Atriplex canescens*) are also present. Other species found in Kirtland AFB's grasslands include red three-awn (*Aristida purpurea* var. *longiseta*), purple three-awn (*Aristida purpurea* var. *purpurea*), six-weeks three awn (*Aristida adscensionis*), hairy grama, mesa dropseed (*Sporobolus flexuosus*), and scorpionweed (*Phacelia integrifolia*). Plains prickly pear cactus (*Opuntia polyacantha*) is also found, as well as Great Plains yucca.

3. Juniper Woodland Community

The juniper woodland community is a transitional zone between the grassland and pinyon-juniper woodland vegetation types and ranges in elevation from 5,800 to 6,800 feet. As a result, most of the vegetation present in the juniper woodland community is representative of these two bordering communities. One seeded juniper (*Juniperus monosperma*) is the main shrub component, forming a savanna type of habitat. Plant species found more commonly here than in the other two associations include clarets cup cactus (*Echinocereus triglochidiatus*), nolina (*Nolina microcarpa*), indigo bush (*Dalea formosa*), bush muhly (*Muhlenbergia porteri*), side oats grama (*Bouteloua curtipendula*), wavy leaf oak (*Quecus x pauciloba*), gray oak (*Quecus turbinella*), tree cholla (*Opuntia imbricata*), and squawbush (*Rhus trilobata*). A few Colorado pinyon pine (*Pinus edulis*) may be found in the upper elevations.

4. Pinyon-Juniper Woodland Community

Pinyon-juniper woodlands at Kirtland AFB range in elevation from 6,300 to 7,700 feet. This plant community is composed of Colorado pinyon pine and one-seeded juniper, with an understory of shrubs and grasses. At most elevations, this community consists of open woodland with blue grama and, to a lesser degree, side-oats grama dominating the understory. Other species associated with this plant community are thread leaf groundsel, alder leaf mountain mahogany (*Cercocarpus montanus*), hop-tree (*Ptelea trifoliate*), New Mexican locust, and banana yucca (*Yucca baccata*). This plant community occurs primarily in the eastern portions of Kirtland AFB and is in good condition due to the lack of disturbance and habitation.

5. Ponderosa Pine Woodland Community

The ponderosa pine woodland community is found at elevations ranging from 7,500 - 7,988 feet, but may occur lower in north facing canyons (USGS 1991c). Common species found in this community include the Ponderosa pine (*Pinus ponderosa*) and the Colorado pinyon pine. Gambel oak (*Quercus gambelii*) is common in some locations, providing islands of important pine-oak woodlands. Intermingled with these species are creeping barberry, New Mexican locust, snowberry (*Symphoricarpus rotundifolius*), Rocky Mountain juniper and Kentucky bluegrass (*Poa pratensis*). This community occurs primarily within the Manzano Mountains and is restricted to higher elevations. It is relatively undisturbed, although small logging operations do occur within the Withdrawal Area.

6. Riparian/Wetland/Arroyo Community

The riparian/wetland/arroyo community consists of species that have a greater moisture requirement than species common to the other communities. These plant communities are found along Tijeras Arroyo, Arroyo del Coyote, and the various springs found on Kirtland AFB, where sufficient moisture occurs during at least some part of the year.

Species associated with the riparian/wetland/arroyo community include salt-cedar (*Tamarix chinensis*), yerba mansa (*Anemopsis californica*), three-square bulrush (*Scirpus* *americanus*), and cattail (*Typha latifolia*). The small, scattered wetlands on Kirtland AFB are in good to fair condition. The Coyote Springs wetland complex is the largest wetland on base and has been used as a recreation area in the past. Because of past disturbance, this wetland is in fair condition, although several recent projects (tamarisk removal) have focused on restoring the wetland. One of the current management questions with respect to fire is the desired conditions of the desert mountain grassland and shrub lands on KAFB.

- Current vegetation trends:

One important aspect of managing the base's vegetation is knowing the trajectory of plant communities into the future. Is composition and structure static? Is shrub/tree density increasing and grass cover decreasing or is the reverse true? While a vegetation map has recently been completed and is currently slated for validation, it is only a snapshot of the vegetation at a point in time. Currently no monitoring data is being collected to determine vegetation dynamics over time. While there will be monitoring of vegetation with respect to fire effects associated with fuels treatments, this data will need to be supplemented with trend data to assess fire effects in the context of the surrounding vegetation. Revisiting the plots that were established to develop the map would be an important first step in determining vegetation structure.

- Desired Condition-Vegetation Structure and Composition:

During the ranching period, vegetation change likely occurred, most plausibly due to an increase in shrub density and cover, principally Pinchotii juniper and a corresponding reduction in grass cover. Research is needed to determine, to the extent possible, what extent vegetation change did occur, and what the primary cause was. This will help management define desired conditions and what role fire may play on the landscape.

- Restoration:

While natural fire and possibly prescribed fire may effectively serve to maintain current tree and shrub densities by reducing or eliminating seedlings, it will have limited effect on reducing the density of established shrubs and trees. Fire merely top-kills most tree and shrub species that occur on Kirtland Air Force Base. Burned trees return to pre-burn stature from basal buds following fire within 5 to 20 years, depending on the species and its size prior to burning and precipitation patterns. If the goal of vegetation management is to shift vegetation structure and composition to pre-grazing conditions, where fire return intervals were conceivably shorter, shrub density lower and grass cover greater, treatments other than prescribed fire may be required.

Chemical or mechanical treatments may be needed to kill trees and shrubs that established during the grazing era followed possibly by natural and prescribed fire to maintain the restored vegetation. Prior to general landscape applications an assessment of the efficacy and feasibility of prescribed fire and alternative mechanical and chemical treatments is needed. Mechanical and chemical treatments will need to be conducted at a small-scale prior to general application. The effects of prescribed fire can be addressed largely through fire effects monitoring of currently planned projects; however, some controlled experiments may be required.

- Fire Return Intervals:

One of the problems of using recurrent prescribed fire to replace or supplement an altered natural regime is knowing the historical frequency of fire occurrence before livestock grazing became widespread. Unlike forests, there is no fire record left from which historical fire return intervals can be determined. However, an analysis of fire history and annual precipitation at Cibola National Forest Service suggest that the cumulative area burned from a year up to a five-year period is related to the amount of precipitation received in preceding years, especially over a three- to five-year period that can vary over time. Generally during dry periods the potential to burn large areas is small. As precipitation increases this potential increases. This relationship between cumulative area burned and precipitation pattern is probably related to fire frequency. For Sandia Mountain Range, there appears to be a precipitation threshold that when reached there is a high probability of having large areas burn and a low probability of only a small area burning. The inverse is true of dry or drought years. A major limitation of this analysis is that it spans a period where grazing had already significantly altered the vegetation and presumably the fire regime for an extended period and that the vegetation over the period of the analysis was in a state of recovery. In an intact system, it is possible that vegetation response to precipitation patterns may be different. This will warrant research into the dynamics of precipitation and fire regime.

PUBLIC SAFETY

The first and primary goal in this plan is to provide for the protection and safety of people and property. This extends to the personal safety of the public, base personnel, firefighters and contractors.

1. Public Safety Issues and Concerns

The vast majority of the base is centered in and around the developed area. The developed area also includes a vast complex, of facilities and a residential area. The base Employ’s over more than 24,000 Personnel. Wildland areas along base boundaries include housing, livestock and agricultural resources.

2. **Public Safety Protection**
   - **Prevention:** The cornerstone of the public safety protection effort is prevention. The base will seek to provide a variety of prevention efforts to include the following groups and topics:
     - *Targeted Groups*
       - Base employees
       - Base visitors
       - Base residents
       - East Mountain Users
       - Community groups/civic clubs/residents
       - Students/youth
     - *Primary Topics*
       - Workplace/wildland interface fire prevention
       - Residence/wildland interface fire prevention
       - Wildland fire prevention
       - Fire reporting, response, management
     - *Fire Season Efforts*
       - Fire season specific information, postings
       - Interpretive programs
       - Pre-event prevention planning and activities with cooperators
       - High/extreme fire danger public use restrictions
       - Advisories at point of sale for tickets and in the visitor center
       - High fire danger signing
     - *Methods of Delivery*
       - Non-personal (e.g., signs, brochures, posters, displays)
       - Personal contact
       - Interpretive programs
       - Group presentations

   - **Fire Incident Public Safety Protection**

     Fire event public safety protection considerations for the IC include the following:
     - Management and control of public access to minimize risk of harm and interference with safe and efficient operations of fire management personnel.
     - Media advisories and pre-arrival advisories for visitors

- Signing—smoke warnings, prescribed fire advisory, emergency event advisory
- Area closures
- Escort on roads/trails through fire areas in cases where safe passage may continue and when there may be reduced visibility or other minor hazards
- Area evacuation
- Public exclusion from fire perimeter
- Advisory to adjacent landowners
- Escape routes and safety zones identified and communicated to the public
- Staging of suppression resources in developed areas
- Broad-scale Withdrawn backcountry closure
- Obtain the assistance of other public safety agents to assist.
- Roadblocks/advisory control points to advise Personnel and residents of hazardous conditions, potential evacuations, etc.
- Daily briefing to Wing staff on current fire conditions/situation
- Fire perimeter/area of operations security patrol
- Safety briefing/personal protective equipment/escort/ for VIPs, media, other official visitors

3. Public Information and Education

Educating and informing the base public on the value of fire as a natural process is important to increasing base public understanding and support for the base's fire management program. The FMO, in coordination with the fire department and other resource specialists, has the primary responsibility for providing this information. As fire danger and/or fire activity on the base increases, the Fire Management Officer will provide key staff with up-to-date information on the current and expected fire situation on the base and surrounding areas.

Fire staff will use the most appropriate and effective means to get information to the base public regarding the fire management program. This may include handouts, personal contacts, and media releases. The base's fire information program will include:

4. Year-Round Activities

- ➢ Information on the base's fire management program will be incorporated, as appropriate, into base brochures, newspapers and other handouts.

- Base interpretive and educational programs will be designed to enhance base public and staff awareness of the fire management program.
- Fire management-related information will be shared with the local community and local, state and other federal agencies.

5. Fire In-Progress Activities

- When fires are actively burning on the base, all Fire Personnel will include a fire safety message as well as information on the fire situation.
- The media will be informed through news releases and/or informational briefings from the base's public affairs specialist, or if assigned, a fire information officer.
- The most up-to-date fire situation information will be shared with the local community, as well as with all neighboring landowners—private, local, state and federal.

Prior to any prescribed fire within the base boundary, informational materials, including handouts and news releases, will be made available to base Public, the local community and the media that convey the base's goals and objectives for that specific management action. All fire related activity will be reported to Albuquerque Zone. The report should cover mechanical and prescribed burns, WFUs, as well as wildland fire, and be updated until the event ends. At the end of the event, an entry will be made to close out that activity.

6. Protection of Sensitive Resources

Sensitive resources will be identified on maps for the resource advisors. In some prescribed fires preburn mitigation and/or black-lining around sensitive resources might help us avoid unwanted fire effects and meet our legal responsibilities for biological diversity, endangered species and cultural resource protection.

- Threatened and Endangered Species.

No prescribed burns will be conducted in areas that contain listed or proposed threatened or endangered species without prior consultation and approval of the USFWS.

- Cultural Resources.

While fire itself will not harm park cultural resources such as ring middens or remnants of stone shelters, care must be taken during suppression efforts to prevent accidental damage through careless location of fire lines, use of heavy equipment, careless use of chemicals, pillaging by firefighters, etc. Some level of mitigation or protection for rare plant communities, such as seep forest communities and spring wetlands or areas of high densities of threatened or endangered species. Historically, *natural* fires may have skipped over these areas. It would be desirable to have a low intensity fire in the plant communities.

- Natural Resources

Section 9 of the Endangered Species Act and federal regulation pursuant to Section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting to engage in any such conduct. Harass is further defined as intentional or negligent actions that creates the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, and sheltering. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Incidental take is defined as taking that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under Sections 7(b)(4) and 7(o)(2), taking that is incidental to, and not intended as part of the agency action is not considered a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement. In order to be exempt from the prohibitions of Section 9 of the Act, the DoD and their employees, contractors, or subcontractors must comply with terms and conditions that implement the reasonable and prudent measures described below. These terms and conditions are non-discretionary.

3.2. Improved Areas FMU

3.2.1 Description

The Full Suppression Unit (FMU 1) designation represents the area surrounding the base developments, residential areas, and the area near Albuquerque. A small area excludes WFUs and designates a full suppression unit (FMU 1) around Base developments. This unit allows suppression, manual fuels reduction, to manage fire, fuels and vegetation. It was delineated to address the susceptibility of private and public property and residents to wildland fire and smoke. All unplanned fires—human- or lightning caused—would be suppressed to protect developments and provide for the safety of Base Personnel. The base will use manual fuels reduction to reduce fuel loading immediately around structures and other infrastructure within this unit. FMU 1 encompasses primarily grassland, desert shrub land communities.

3.2.2. Objectives and Constraints

In this unit (FMU 1), all unplanned ignitions will be suppressed and there will be no wildland fire use. All areas in this unit will, however, be subject to manual fuel treatments for the purpose of fuel reduction or vegetation management. All natural and unwanted human ignitions will be suppressed in these areas. However, hazardous fuel treatment activities will be conducted and will involve elimination of high fuel concentrations and for protective black lining.

Special considerations: Likelihood of associated structural fires, smoke dispersal, utility Systems, use of retardant, aesthetics in Sensitive and high traffic use areas.

3.2.3. Values to Protect

All structures will be protected within this FMU. Base personnel are also of great importance. There are some biological values, such as the burrowing owl in this area of base. There are large numbers of cultural resources in this area, mainly historical buildings and districts.

3.2.4. Safety Considerations

Public safety is the biggest consideration when talking about this FMU. Air quality would be of great concern during fire. Also, hazardous materials that can be found in the area pose a threat to base personnel and firefighters.

3.3. Unimproved Areas FMU

3.3.1. Description

The Natural Fire Unit (FMU 2) encompasses the withdrawn areas except for the full suppression areas of FMU 1. This unit includes the remote backcountry areas northeast and southeast, where wildland fire use is an available tool in addition to the tools available in FMU 1. Although manual fuels reduction is optimal, it would be used primarily to remove fuel from around sensitive cultural and natural resources. Wildland fire use will be considered an option when conditions are within prescription and other criteria are met (appropriate management response). FMU 2 also specifies protection measures for special features such as habitat of threatened and endangered species. This unit contains all the vegetation communities found at KAFB (desert shrub lands, desert grasslands, montane woodlands and chaparral, woodland and forest, and arroyo riparian woodlands and shrub lands) and includes most of the base's designated wilderness. Protection measures would be required for sensitive natural and cultural resources in FMU 2. Fewer sites requiring protection are present in this unit than in FMU 1, but among them are the new Cable Sites, radio repeater sites and numerous Natural resource work sites.

3.3.2. Objectives and Constraints

For each natural (lightning-caused) ignition in FMU 2, the Base Fire Chief or Marshal will delegate their Authority to the Fire Management Officer (FMO). The FMO will assume the duties of Incident Commander (IC) if the WFU is subsequently declared a wildland fire under suppression strategy. A Stage I WFIP, using the format described in the WPIRG, will be prepared by the FMO for each WFU in the Natural Fire Unit, if requested. This will be recertified daily by the FMO.

All WFUs will be monitored at least daily until declared out. Stage II or Stage III WFIPs will be completed as warranted. Monitoring of WFUs in the Natural Fire Unit will follow the guidelines found in Chapter VI of this plan. The decision to classify a natural ignition as a WFU will be made only by the FMO using the WFIP certification process. Since wildland fire use is the method recognized for properly managing the natural areas of this wilderness, his/her decision will normally allow a WFU to continue to burn within the Natural Fire Unit, provided it meets all prescription criteria and parameters.

When a WFU in this unit is burning towards the base boundary, the FMO will be notified immediately and the fire will be reevaluated for its merits as a WFU using the WFIP process. If the established Natural Fire Unit prescription is exceeded, the fire will be suppressed.

The maximum manageable area for any WFU is the base boundary; this can be adjusted on adjacent federal lands with agreement from the Cibola National Forest or the BIA. If holding actions cannot prevent a WFU from escaping the maximum manageable area limits, suppression actions will be commenced. When a WFU appear to be burning towards an adjacent portion of the Full Suppression Unit (FMU 1) and a holding action is not capable of stopping its progress the fire will be declared a wildland fire under suppression strategy and will be suppressed

3.3.3. Values to Protect

Natural and cultural resources in these areas will be protected by using mechanical treatments as needed. Outlying building owned by Kirtland AFB will be protected and will be regarded as FMU 1. The winch site, cable site, and radio towers are sensitive areas that need to be protected. There are outlying communities that border Kirtland AFB.

3.3.4. Safety Considerations

Safety in FMU 2 is of great concern due to the abundance of UXO and of the Wildland Urban Interface I Four Hills, Isleta Pueblo, and along the eastern boundary. Fuel loads in the area are also of great concern, when considering the firefighters.

Chapter 4 - Wildland Fire Operational Guidance

4.1. Appropriate Management Response

A wildland fire that is not a prescribed fire requires an Appropriate Management Response (AMR). The AMR, which can range from aggressively suppressing the incident as wildfire to managing the incident as a wildland fire use event, is guided by the strategies and objectives outlined in the development of the L/RMP, reflecting land and resource values and objectives. The FMP outlines fire management activities and procedures to accomplish those objectives. The objective of a wildland fire use project is to obtain resource benefits whereas a wildfire is to be extinguished at minimum cost.

Kirtland AFB Fire Department is responsible for all fires on Kirtland AFB. Currently there are no formal Fire Protection Agreements with the withdrawn area of base. Refer to Table 3 for general guidelines on responses to different fire situations. Implementation of wildland fire management components must be consistent with fire management capabilities and should consider the current and predicted conditions affecting wildland fire behavior.

Preplanned decisions based on historical fire behavior indices should be considered to most efficiently aid in WFIP decisions requiring appropriate management response. All processes and forms presented here can be found in the WPIRG.

For all base ignitions, a Stage I WFIP will be completed by the FMO, or other qualified person designated by the Fire Chief or Fire Marshal, if requested. The Fire Chief, Fire Marshal or FMO will retain full authority to approve or disapprove the management decisions or appropriate management response chosen in the WFIP

4.1.1. <u>AMR Direction</u>
The observed fire frequency is relatively moderate, with an average of twelve ignitions per year (based upon fire program (FIREPRO) analysis, 1984 - 2001). On a ten-year average, these could be predicted as five Class A, four Class B, and three Class C fires each year. However, there have been 10 Class D or larger fires since 1940, which clearly demonstrates the potential for a large fire to occur within the Withdrawn and Base areas.

While it is possible to have a major fire under less severe conditions, it appears that such a fire is most likely to occur when the temperature exceeds 75 degrees, relative humidity is less than 45 percent, and the wind speed measured at twenty feet above the ground level exceeds twenty miles per hour.

Lightning-caused fires during monsoon season have definitely accounted for the largest number of ignitions and acres burned. The potential in the Sandia Mountains for very large, wind driven fires cannot be ignored. High-wind events occur during prolonged dry periods prior to the onset of monsoon rains, and many last five or more days. In times of increased backcountry visitor use around the base boundaries, these high-wind events should cause particular reason for concern and preparedness.

General AMR Direction

Evaluation and selection of an appropriate management response to a wildfire will include consideration of risks to public and firefighter safety, threats to the values to protect, costs of various mitigation strategies and tactics, and potential wildfire benefits.

Wildfires will be staffed or monitored during active burning periods as needed to ensure that appropriate mitigation actions can be made to protect values threatened.

All wildfires will be supervised by a qualified Wildland Fire Officer responsible for

- Assess the fire situation and make a report to dispatch as soon as possible.
- Use guidance in this FMP or a delegation of Authority to determine and implement an appropriate management response.
- Determine organization, resource needs, strategy and tactics.
- Brief incoming and assigned resources on the organization, strategy and tactics, weather and fire behavior, LCES, seasonal and historic ERCs, and radio frequencies.
- Advise dispatch of resources needed for the AMR.
- Manage the incident until relieved or the incident is under control.

The FMP and a delegation of authority can provide a general strategy to an IC, who has discretion to select and implement appropriate tactics within the limits described for the FMU(s), including when and where to use minimum impact suppression tactics (MIST) unless otherwise specified. All resources, including mutual aid resources, will report to the IC (in person or by radio) and receive an assignment prior to tactical deployment.

General AMR Constraints

- **Restrictions and Special Concerns for the FMUs:**

Five species of rare herpetofauna potentially occur on Kirtland AFB. They are the: Northern leopard frog, Texas horned lizard, Texas long-nosed snake, desert king snake, and desert massasauga. Each of these is listed by Region 3 of the US Forest Service (USFS) as Sensitive. The Texas horned lizard is also listed by the New Mexico State

Office of the Bureau of Land Management (BLM) as Sensitive, by the US Fish and Wildlife Service as a Species of Concern, and in Mexico as a Threatened Species. New Mexico considered listing the desert massasauga as an endangered species in April 1990 but was found to be more common than previously believed. Several State protected Migratory birds have habitats on KAFB including the burrowing owl and the grey vireo. The base has been identified as possibly containing activity centers for Mexican spotted owl. Over 600 sites on the Canyon walls in the withdrawn areas contain polychromatic pictographs that are likely sensitive to smoke and heat and are certainly sensitive to certain suppression activities. Ruins, Burial grounds are found as well on areas on KAFB. Archeologists are concerned that fire could affect the accuracy of readings of carbon data at all archeological sites. They are also concerned about direct heat effects such as spalling on cliff shelters and pictographs. Aerially applied retardants will only be used in initial or extended attack when approved on a case-by-case basis by the IC in consultation with the resource advisor. Determinations on whether or not to use retardant will place firefighter and public safety as the highest priority.

- **Potential Fire Behavior**

During the height of fire season, normally July and August, there is a potential for fires to move very rapidly (i.e., 100 feet/minute) and to grow very large, very quickly (i.e., 500 acres/hour). Safety of firefighters is a very real concern during this period and suppression strategies must always be crafted accordingly. Extreme fire behavior is typically the result of high winds, very low relative humidity, and hot temperatures. During periods of extreme fire behavior, most suppression resources have proven to be ineffective until a change in the weather occurred. Fire behavior during these periods has even remained extreme overnight. Many lightning ignitions occur after the onset of the monsoon rainy season (July through October). These are typically very slow spreading and confined to the vegetation in the immediate area of the ignition. This is due to increased moisture and normally greened-up herbaceous surface fuels during this period.

4.1.2. <u>Preparedness</u>

Fire Prevention Program:

The KAFB *Wildland Fire Prevention Analysis and Action Pla*n (Attachment 3) details by geographic areas of the base, patrols and other activities that will occur to prevent human-caused fires. The KAFB *Wildland Fire proposal Plan* (Attachment 3) also details stepped up patrols of areas of the base during periods of high to extreme fire danger. The prevention analysis shows a very low risk of human-caused ignition for all of the withdrawn areas of the base. However, the likelihood of increased urban interface could alter this situation. There does remain a substantial risk of a human-caused ignition on the

Main base as compared to that of the Withdrawn. The objectives of a Fire Prevention Program in KAFB areas are:

- To reduce the threat of human-caused fires through employee, visitor and neighbor education.
- To integrate the prevention message into interpretive programs through involvement of the KAFB Fire prevention division. Some general actions that will be undertaken to enhance fire prevention awareness and to prevent unwanted human-caused fires in the base include:
- Fire Department personnel will annually ensure that all of their employees are familiar with the portions of this plan that are pertinent to fire prevention, and that they can properly explain fire prevention regulations and information to base personnel and neighbors. The Fire Management Officer will assist the Fire Inspectors and Assistant Chiefs by providing them with timely fire prevention information.
- Campfires will be prohibited at all times.
- All other fire use (i.e., camp stoves, smoking, etc.) will be prohibited in all withdrawn areas during prolonged periods of very high or extreme fire danger (i.e., Staffing Class IV or V). All such restrictions will be communicated by the Fire Management Officer to the Albuquerque Zone Coordination Center (ABZ) for the purpose of coordinating restrictions with other agencies.
- During periods of extreme fire danger (i.e., Staffing Class V), the FMO may close any portion(s) of the Withdrawn areas he/she deems prudent to reduce the potential fire risk. In the event of a closure, all reasonable efforts will be taken by Base authorities to locate and remove tenants from the closed areas.
- Public information media will be used as necessary to advise both tenants and residents of extreme fire conditions and closures; the Base Public Announcement system, which is used for information dissemination to base personnel, will also be utilized as necessary. Statements and releases for the public media will normally be coordinated through the bases public affairs specialist, helping to insure the accuracy of the information released.
- Signs, posters, display, and appropriate interpretive activities will be placed at roads, trailheads, parking areas, and bulletin boards to warn personnel of the danger and to solicit their cooperation in fire prevention. Signs notifying base personnel of the current fire danger will be maintained at various locations on base.
- Roving foot and vehicle patrols will be utilized to enforce all base restrictions or regulations aimed at fire prevention.

The *Wildland Fire Prevention Analysis and Action Plan* (Attachment 3) contains the specific prevention actions identified for specific areas of the base. This prevention analysis will be reviewed annually along with the rest of this plan and updated if changes occur that alter the identified risks, hazards, or values.

Activities – Complete before end of month	J	F	M	A	M	J	J	A	S	O	N	D
Winterize Fire Management Equipment											X	
Inventory Fire Engine and Cache		X	X									
Annual Refresher Training			X	X								
Annual Fitness Training			X	X								
Pre-Season Engine Preparation		X	X									
Prescribed Fire Plan Preparation	X											
Review and Update Fire Management Plan												X
Prepare Pre-season Risk Analysis				X	X							

Table 4: Kirtland AFB annual fire readiness activities

Annual Training: The Kirtland AFB FD hosts a refresher course each year. Other training opportunities are provided, particularly on-the-job training opportunities on cooperator prescribed fires and suppression fires.

Annual Preparedness Review: An annual preparedness review of the fire program operations and equipment is held every year during the spring. There is a committee (Withdrawn Interagency Fire Committee Which will meet twice a year (fall and spring). The Committee is completed with Albuquerque Zone interagency cooperators. Preparedness review recommendations are discussed within the committee. Preparedness review guidance may be found in the Red Book (*Interagency Standards for Fire and Aviation Operations* 2005) in Chapter 19.

Fire Weather and Fire Danger

- **KAFB will receive its Fire danger and Fire Weather reports directly from Albuquerque zone or the USFS.**

- **National Fire Danger Rating System (NFDRS):** The NFDRS calculated Burning Index (BI) at the (ABZ RAWS) is used exclusively for fire danger trend monitoring. The BI is the index most sensitive to wind speed and the most influential element in fire danger in grass fuels. New NFDRS staffing breakpoints are calculated yearly by the FMO using Fire Family Plus. Drought indices are best calculated using the ABZ RAWS NFDRS calculated 1,000- hour time lag fuel moisture (TLFM). The base also uses measured live-fuel moistures as indicators of drought for prescribed fire purposes.

The Palmer Drought Index, while useful, uses airport weather data and the airport is located on the base property. Fire use and prescribed fire prescriptions both contain elements to account for drought.

Typically, if the 1,000-hour TLFM index is under 8 percent there will be management concerns regarding controllability of wildland fire. Historic lows of this index of 5 percent coupled with even a little bit of wind have displayed uncontrollable extreme fire behavior (i.e., BI of 70+). It can also led to lightning-caused ignitions during drought conditions as they often threatened to spread out of the base onto public lands.

Pre-Attack Plans

It is the responsibility of the FMO and the Fire Chief and Marshal to annually conduct an interdisciplinary meeting to update the Base wildland fire pre-attack plans (Attachment 4 and 5). A pre-attack plan for suppression wildland fires should minimally consist of a WFIP Stage I and a WFSA completed for typical scenarios of human or lightning ignitions on the base. The primary consideration in all pre-attack plans will be firefighter and public safety. Additional pre-attack plan information is in Chapter IV-C.

4.1.3. <u>Detection</u>

There are limited detection areas on Kirtland AFB. The Cidro Lookout is located Tijeras New Mexico overlooking the Isleta Pueblo to the south and Kirtland to the north around Mount Washington. Other detection is by Sandia National Laboratories Security Patrols in the withdrawn area, as well as 58th SOW overflight.

4.1.4. <u>Dispatch, Initial Response, and Initial Attack</u>

Initial attack (IA) will always deploy the appropriate management response, which are “specific actions taken in response to a wildland fire to implement protection and fire use objectives.

Initial attack will always deploy an appropriate management response using suppression action consistent with firefighter and public safety and values to be protected. The aim of

IA is to catch an ignition while it is still small and within the first 12-hour burn period. The base has the standard goal of a 95 percent success rate at initial attack and has proposed to staff 14 seasonal Firefighters to statistically achieve this goal. At no time in IA will firefighter or public safety be compromised or risked unduly to protect any base resource or infrastructure. All ignitions regardless of source in the base Full Suppression Unit (FMU 1) will be suppressed. For ignitions within the Natural Fire Unit (FMU 2), the Stage I WFIP may point out a need to initiate IA as the appropriate management response.

- **Information Used to Set IA priorities:** Initial attack suppression will routinely occur in the Full Suppression Unit and on all human caused ignitions. Priorities will be established based on the following concerns (in order of importance):
    - Public and firefighter safety
    - Threat to natural or cultural resources and base infrastructure
    - Threat to base cooperator or private land
    - Cost
    - Air quality
- **Criteria for Appropriate IA Response:** The Base Integrated Natural Resource plan provides no guidance towards fire management policy other than to state that the base is actively engaged in fire planning for the KAFB, Withdrawn land areas on an interagency basis.
- **Initial Attack Resources and Dispatching**
    - **Resources:** The Base has substantial involvement with all surrounding cooperators such as the USFS Sandia Ranger District. Most IA in the area should involve an interagency response. The base has permanent firefighters and a proposed fourteen seasonal firefighters from April through September. The base fire department maintains a well-stocked fire cache located at building 999. KAFB FD has various firefighting apparatus available for suppression activities. Proposal will include two, Type 6 engines.
    - **Dispatching:** All IA dispatching is performed by the Kirtland AFB FD Dispatch located in Station #2 and Albuquerque Zone coordination center. Kirtland AFB has on File List of cooperative agreements detailing mutual assistance in initial and extended attack of wildland fires.
- **Confinement as an IA Suppression Strategy:**
  Confinement is acceptable as a suppression strategy particularly if safety of firefighters and cost of suppression versus values-at-risk are issues. Confinement in the remote portions of the base may be the most acceptable means of

suppression based on the Southwest Area Preparedness Level at the time of the fire. A high preparedness level is usually the result of major fire activity in the Southwest, often in wildland/urban interface areas with high values at risk. Confinement may be the strategy of choice due to simple shortage of firefighting resources. Confinement can be a strategic selection through the WFSA process when the fire is expected to exceed initial attack capability or planned management capability. Confinement can only be used on fires along the base withdrawn boundary if the affected base cooperator or neighbor is a co-signer of the WFSA detailing the terms of the confinement. If confinement is considered for lightning ignited fires, they will normally be managed as WFUs. Confinement may be acceptable as an appropriate strategy in the Full Suppression Unit.

- **Typical Fire Response Times**
  - *During Fire Season (March-November):*
    - Most of the Natural Fire Unit (FMU 2) can only be reached via several hours of driving, hiking, or by helicopter. Proposal of Team in Withdrawn area could cut this time down to forty five minutes.
    - Most of the Full Suppression Unit (FMU 1) can be reached in less than an hour by engines.
    - Hotshot or regular hand crews are typically no less than 4 hours away, if available.
    - Helicopter(s) are typically one to several hours away.
    - Heavy air tankers are located at Alamogordo and Albuquerque, New Mexico
    - Turnaround time from area tanker bases is over 45 minutes.
  - *During the off-season:*
    - Times are usually longer due to lack of immediately available wheel or rotor resources. There are no air tankers available.

4.1.5. Extended Attack and Large Fire Suppression

Determining Extended Attack Needs

By definition, IA fires are handled by Type 4 and 5 incident management organizations. The key to both of these organizations (found in the complexity analysis process below) is that resources present to manage the fire are simple and of one kind (such as a squad or crew of firefighters, or two engines). The mixing of different types of resources such as engines, hand crews, and aircraft coupled with longer periods of time necessary to achieve control are typically the reasons for stepping up to an extended attack (i.e., Types I, II, and III) incident management organization.

Implementation Plan Requirements – WFSA Development:
By policy, the Wildland Fire Situation Analysis (WFSA) process is used to document strategic and tactical decisions regarding extended attack fires. Upon arrival of an incident management team to a base wildland fire, the FMO will minimally provide a draft WFSA for the team to complete. Wildland Fire Situation Analyses must be reviewed and approved daily by the FMO until a wildland fire has been declared controlled.

Complexity Analysis Process – IA to Extended Attack:
The complexity analysis process is designed to help guide a decision to step-up incident Management to an extended attack or Type 3 incident management organization. The criteria for transitioning from initial to extended attack is that complexity has increased due to mixing of types of resources and increased number of resources

Limited Delegation of Authority for the IC:
The Limited Delegation of Authority is the Wing Commanders and Fire Chiefs direction to an incident management team regarding management of a wildland fire. It is part of the briefing package presented to the team by the FMO.

4.1.6. <u>Wildland Fire Use Operations</u>

Wildland Fire Use to Suppression: Exceeding Existing WFIP – Selecting a New Strategy
The conditions that cause an existing WFIP to be exceeded include threats to the base boundary, increased demand on area firefighting resources, increased impacts of smoke on air quality, and political concerns. Should a WFU require placement into a full suppression strategy, the WFIP will be terminated and a Wildland Fire Situation Analysis (WFSA) begun. The Incident Commander will then begin the procedures for an extended attack detailed above.

Rehabilitation
The Natural Resource personnel will make recommendations to the FMO regarding rehabilitation actions that may be necessary after suppression actions. These recommendations will be made in the form of a rehabilitation plan, and, if an IMT is present, will be made to allow the IMT sufficient time to implement them prior to team demobilization. Completion of these recommended actions will then be the shared responsibility of the FMO and the IMT, if present. Reseeding or revegetation after wildfires requires the prior written approval of the Wing commander.

Fire Reporting

Incident Status Summary forms will be completed by the IC no later than 1800 (6 p.m.) each day for all Class D and larger wildfires. These will be faxed or e-mailed ASAP to the ABZ. A master log of all wildfire suppression activities (other than those that involve an IMT) will be maintained in the office of the FMO. From this master record all wildfire-related forms and timekeeping records will be generated. Completion of the Individual Fire Report form will be the responsibility of the IC.

C. Wildland Fire Use Guidelines

"Wildland Fire Use must be based soundly on management objectives (public and firefighter safety, cultural and natural resource objectives, etc.) and may include the full range of fire management strategies on a fire's entire perimeter."

4.1.7. Aviation Operations

Kirtland AFB has no internal assets for aviation operations. All fire-related aviation operations will follow applicable guidelines of the DOI National Business Center-Aviation Management Directorate.

4.1.8. Reviews and Investigations

Reviews and investigations are used by wildland fire and aviation managers to assess and improve the effectiveness and safety of organizational operations.

Reviews

Reviews are methodical examinations of system elements such as program management, safety, leadership, operations, preparedness, training, staffing, business practices, budget, cost containment, planning, and interagency or intra agency cooperation and coordination. Reviews do not have to be associated with a specific incident. The purpose of a review is to ensure the effectiveness of the system element being reviewed, and to identify deficiencies and recommend specific corrective actions. Established review types are described below and include:

- preparedness review
- after action review
- fire and aviation safety team review
- aviation safety assistance team review
- national cost oversight team review
- individual fire review
- lessons learned review
- escaped prescribed fire review

Preparedness Reviews

Fire preparedness reviews assess fire programs for compliance with established fire policies and procedures as outlined in the current *Interagency Standards for Fire and Fire Aviation Operations* and other pertinent policy documents. Reviews identify organizational, operational, procedural, personnel, or equipment deficiencies, and recommend specific corrective actions. Interagency Preparedness Review Checklists can be found at:

http://www.nifc.gov/references/prep_review.htm

- ***BLM/FS - Preparedness review functional checklists that can be found at:*** *http://www.blm.gov/nifc/st/en/prog/fire/fireops/preparedness/preparedness_review/checklists.html*

Investigations

Investigations are detailed and methodical efforts to collect and interpret facts related to an incident or accident, identify causes (organizational factors, local workplace factors, unsafe acts), and develop control measures to prevent recurrence. Established investigation types include:

- serious wildland fire accident investigation
- non-serious wildland fire accident investigation
- entrapment/ burnover investigation
- fire shelter deployment investigation
- fire trespass investigation

All fires must be thoroughly investigated to determine cause. Initiation of cause determination must be started with notification of an incident. The initial attack incident commander and the initial attack forces are responsible for initiating fire cause determination and documenting observations starting with their travel to the fire. If probable cause indicates human involvement, an individual trained in fire cause determination should be dispatched to the fire.

4.1.9. Reports

Locally approved form will be completed by the IC no later than 1800 (6 p.m.) each day for all Class D and larger wildfires. These will be faxed or e-mailed ASAP to the ABZ. A master log of all wildfire suppression activities (other than those that involve an IMT) will be maintained in the office of the FMO. From this master record all wildfire-related forms and timekeeping records will be generated.

Requirements accessed through ACES-FD will be the responsibility of the FMO. This form will be filled out for the following types of fires:

- All wildfires on Kirtland AFB
- Wildfires threatening Kirtland AFB lands on which we take action
- All escaped prescribed fires. When a fire exceeds prescription, it must be declared a wildfire, and a separate new report filed to report acres burned by the wildfire from the time of declaration to the time of being declared out.
- All false alarms responded to by field office staff.

When we take initial attack off our lands, the agency with jurisdiction where the fire occurs will file a report and we will file a limited report to document our response and to support potential billing to non-federal entities for trespass fires.

4.2. Hazardous Fuels Management

4.2.1. Prescribed Fire Program for Hazardous Fuels and Habitats
The goal of the prescribed fire program Kirtland Air Force Base is to employ fire to reestablish and to maintain natural vegetation communities with minimum risk of fire escape, with total cooperation with base neighbors where possible, with minimum damage to natural and cultural resources, and at an acceptable cost.

Prescribed fire management efforts will consist of a careful application of fire to achieve resource management goals utilizing (1) wildland fire use and (2) prescribed burns. All WFUs and prescribed burns will be conducted consistent with all policies and laws such as Fire Management Guidelines, the Endangered Species Act, the Wilderness Act, and other pertinent federal or state laws pertaining to endangered species, air quality, or public safety. Except in the lands below the withdrawn area, the terrain is generally remote and extremely rugged, containing cliffs, ridges, and steep canyon walls. Most rock outcrops consist of exfoliating limestone and large pieces can readily be broken loose. In addition, poisonous spiders, insects, and reptiles are abundant. Since the risk of personal injury increases dramatically at night, the base will limit nighttime prescribed fire operations to passive monitoring activities, unless needs determined by FMO/Fire Chief require other action.

4.2.1.1. Program Overview
Guidelines specific to Kirtland Air Force Base for prescribed burns are as follows:

- Prescribed burns will be utilized as a means to return the base's vegetation composition to a species composition that more closely represents what was present at the advent of Europeans to the area.
- Fuel loads are artificially high in some areas of the Base (especially near undeveloped areas and canyon bottoms). Should these areas burn uncontrolled under extreme conditions, developed areas and cultural resources could be

damaged and soil and vegetative damage could result from too intense of a fire. The base must burn the fuels in these areas under less intensity-producing prescription.

- Prescribed burns may be used to conduct fire research necessary to obtain information needed to better manage the base's natural environment.

4.2.1.2. Effect of National and Regional Preparedness Levels

Prescribed fires may be ignited during National Preparedness Levels 4 and 5 as specified in the National Interagency Mobilization Guide. The effect of igniting a fire during these levels is that competition for manpower and resources is extremely limited if and when your fire escapes.

Wildland fire use is allowed in all five levels of Base preparedness; however, it is likely that in the higher levels, either the WFIP process or the Southwest Area Preparedness Level will preclude wildland fire use. The Southwest Area Preparedness Levels contains important information for the decision making process in the Stage I WFIP for certification of a wildland fire use. An example is the statement in Preparedness Level IV that the Zone Fire Management Board will "Limit prescribed fires and fire use fires (WFU) to those certified by the agency administrator to have little chance of requiring suppression resources beyond those committed on the unit."

4.2.1.3. Project Planning

Some general guidelines for all KAFB areas that are excerpted from regional guidelines are as follows:

- Each prescribed burn will be planned by writing a prescribed fire plan that contains all the information in the suggested plan format. A fire prescription will be clearly stated in each prescribed fire plan and will strictly govern the decision to ignite and/or allow prescribed fires to burn. The prescription will be a specific statement defining the conditions of temperature, humidity, wind direction, and speed and fuel moistures under which the fire will be allowed to burn. The prescription will specify acceptable ranges of these various indices and will also specify the limit of the geographic area to be covered and the nearby and regional resources that must be available in case immediate suppression becomes necessary.
- All new prescribed fire plans or amendments to existing plans must be approved by the Wing Commander and Base Staff as well as the FMO. Plans not executed during a calendar year must go through the approval process the next year, except for previously approved re-occurring burn areas. Re-occurring burn area plans must be reviewed and updated as necessary.

- All prescribed burn projects must be documented in the National Fire Plan Operations and Reporting System at the time the prescribed fire is proposed.
- All prescribed burns must be documented on an Individual Fire Report form according to instructions that are found in the base's mobilization guide. These forms must be then entered no later than five days following the fire being declared out to the fire reporting module of the ACES-FD.
- Prior to any prescribed burn, the FMO will ensure that the Wing Commander, Fire Chiefs, Albuquerque Zone Coordination Center (ABZ), and all affected neighboring agencies and landowners are alerted using the Base PIO. All prescribed fires will be conducted in compliance with the *New Mexico State Air Quality Implementation Plan* requirements and appropriate permits will be secured.
- A Prescribed Burn Complexity Analysis will be completed with each prescribed fire plan. For all burns, simple or complex, the positions of burn boss, ignition specialist and holding specialist must be filled with separate fully qualified persons. Trainees may be used to meet training objectives, but must be supervised by fully qualified personnel. All available expertise may be utilized in the planning stages.
- At least 14 days of fire weather data will be gathered on or very near the site prior to any prescribed burn so that fuel moisture and other indices provided by the NFDRS will be as accurate as possible. The ABZ RAWS will also be utilized.
- Prescribed burns will not be ignited if the Southwest Region Preparedness Level reaches or exceeds Preparedness Level IV. Prescribed burns that are in progress will be allowed to burn in Regional Preparedness Level III, but may be suppressed in Preparedness Level IV or V.
- Fire weather and behavior will be monitored during all prescribed burns, and fire effects on the resources will be documented and permanently filed after the burn. The *Western Region Fire Monitoring Handbook* will be used as a basis for fire behavior and effects monitoring.
- Any prescribed burn that escapes its predetermined boundaries will be declared an unwanted fire by the burn boss if initial holding actions are not immediately successful.
- All prescribed burns will be continually checked until declared out.

4.2.1.4. Project Implementation

A prescribed fire must be declared a wildfire by those identified in the burn plan when that person(s) determines that the contingency actions have failed or are likely to fail and cannot be mitigated by the end of the next burning period. An escaped prescribed fire must be declared a wildfire when the fire has spread outside the project boundary, or is likely to do so, and cannot be contained by the end of the next burning period. A prescribed fire can be converted to a wildfire for reasons other than an escape. An appropriate management response will be made to such incidents and a formal analysis (WFSA) undertaken when needed.

It is the responsibility of the FMO and the Fire Chief to annually conduct an interdisciplinary meeting to update the base's wildland fire pre-attack plans. A pre-attack plan for wildland fire use should minimally consist of a WFIP (Stages I, II and III) completed for typical scenarios of lightning ignitions in the Natural Fire zone of the base as well as maps and known hazards of the area.

WFIPs from actual WFUs can also serve as good pre-attack plans for future WFUs and should also be included in Attachment 4 and 5. These pre-attack plans, if properly completed through Stage III for representative scenarios, should serve well as templates for any subsequent ignitions. The primary consideration in all pre-attack plans will be firefighter and public safety.

4.2.1.5. Smoke Management

The fire management program for the base will be in full compliance with interstate, state, and local air pollution control regulations as required by the Clean Air Act, Title 42, and United States Code 7418. All prescribed burns will be registered with the New Mexico Environment Department (NMED), Air Quality Division (per 20 NMAC 2.60, 113).

In addition, measures will be taken to protect smoke-sensitive areas in and around the Base. These include the Main Base and Albuquerque Sun port. Monitoring of smoke from prescribed fires will occur according to NMED requirements. The main part of the base is adjacent to Albuquerque City and the prevailing wind will usually carry smoke in that direction. The base's entrances and road visibility is also of concern. Fires in the Eastern two thirds of the base may pose smoke management problems, depending on conditions at the time of the fire. Prescriptions for prescribed fires in this portion of the base will insure that winds are sufficiently strong enough or mixing heights high enough to disperse the smoke away from Albuquerque City.

4.2.1.6. After Action and Escaped Fire Reviews

The Burn Boss will ensure an informal After Action Review (AAR) is conducted for each operational period on a prescribed fire, as in Red Book chapter 17.

All prescribed fires declared a wildfire will have an investigative review initiated by the project leader. The level and scope of the review will be determined by policy and procedures of the Red Book and the Fire Management Handbook.

4.2.2. Non-fire Hazardous Fuels Treatment Program

Mechanical Treatment

In Withdrawn and sensitive areas and highly overgrown areas, the use of prescribed fire treatment may not be practical or the best initial fuels management choice. In these cases, mechanical thinning using chainsaws and/or hand tools will be used to decrease fuel loads. *****THIS WILL BE THE PRIMARY SOURE FOR FUEL REDUCTION ON Kirtland AFB*****

- **Annual Program Activities:** The *Five-Year Fuels Treatment Plan* (*In Draft*) details the annual program for manual thinning and/or prescribed burning on the base.
- **Equipment and Seasonal Use Restrictions:** These restrictions are spelled out in the five year plan. Seasonal restrictions would be used to protect nesting and breeding wildlife.
- **Required Effects Monitoring:** A project-by-project determination will be made as to the level of monitoring necessary. Monitoring will range from pre- and post-project photographic documentation to implementation of standards in the *Fire Monitoring Handbook* (2003).
- **Critique of Mechanical Treatment Projects:** Upon completion of treatment, KAFB Fire staff will inspect the site to determine if specifications were sufficient to achieve resource management goals. Upon completion of the initial treatment, a maintenance schedule will be developed based upon inspection finding and long-term program objectives.
- **Cost Accounting:** All costs charged to project will be tracked by the FMO and provided to the Base Civil Engineer before completion of the project.
- **Reporting and Documentation:** Project progress, accomplishments, completion reports, and compliance or consultation documentation will be entered into the computer system as required.
- **Annual Planned Project List:** Draft in progress for the five-year plan for fuels treatment projects.

4.2.3. Processes to Identify Hazardous Fuels Treatments

Our analysis of current Kirtland AFB wildland fire risk and fuel conditions incorporated historic fire maps and fire ignition reports, interpretation of current satellite imagery, landscape-scale fire behavior modeling with data from the USFS Regional Office, field surveys, and plot-scale fire behavior modeling on field-collected data. What follows are a discussion of the various tools used, their strengths and weaknesses, and a general sketch of the process that we used to reach community-specific fuels management recommendations described later in this document.

Fire History

What has happened in the past, how much did it cost to fight, and what were the effects on the landscape?

Survey Plots/ Photo point Analysis

Survey plots and photo point analysis will allow us to see before and after pictures and treatment affects to best allow us to refine our techniques and bring the forest health back to pre suppression periods.

Landscape-Scale Fire Behavior Modeling

Using modeling we will best determine what types of mechanical and prescribed treatments will best work for this type of landscape. Some of the procedures and analysis used are:

- Current conditions: measurement of vegetation and fuels at the landscape scale
- Current vegetation: What are current vegetation conditions prior to treatment?
    - Forest sampling in the field (forest plots)
    - Remote sensing of forest conditions
        - Forest and vegetation classification (IKONOS imagery)
        - Forest structural diversity analysis (IKONOS imagery)
- Current fuels: What are current fuel loads prior to treatment?
    - Fuels sampling in the field (forest plots)
    - Ladder fuels: probability of fire ascending forest canopy (LaFHA)
    - Integration of data sources into a fuel model/map for the study area
- Fire modeling: how might current conditions (above) affect fire *behavior* and *effects*?
    - Fire *behavior*: What is the range of potential fire behavior given current conditions & a range of weather scenarios? (FARSITE & FlamMap models)
    - What are likely *effects* of fire behavior on these landscapes as determined by simulation models? (Stephens approach using FARSITE & FlamMap outputs)
    - Temporal dynamics of forest stands, including tree growth (FVS)
- Effects of treatments: how might landscape-scale treatments change fire behavior and effects (using FlamMap)?
    - Group Selections (GS) and Defensible Fuel Profile Zones (DFPZs)
        - Measure: how does the installation of GSs & DFPZs affect fuel loads?

- Model: how does the placement of GSs & DFPZs affect potential fire behavior? Do they reduce the probability of catastrophic fire under extreme weather conditions?
- Modeling: how does the installation of GSs & DFPZs affect fire effects such as mortality to different species and size classes of trees? Would the reduction in fire extent and intensity reduce the severity of canopy fires?

- Spatial allocation and efficiency: DFPZs and Strategically Placed Landscape Area Treatments (SPLATs)
  - How does the installation of alternative treatments affect fuel loading?
  - How does the placement of alternative treatments affect potential fire behavior?
  - How do different levels of management intensity (extent of treatment) affect the treatment's ability to reduce the size or intensity of fires?
  - What effect would alternative treatments have on resulting fire *effects*? Fire and habitat model integration Correlate spectral entropy canopy diversity with habitat variables Model interaction between vegetation management and both fuels and fire,

Planning Implications

Using the data provided from landscape modeling, fire history, and photo point analysis, and knowing our values to protect will cause lots of time and care when planning fires or fighting ones that have already been ignited.

Limitations

Along much of Kirtland's urban interface boundary there are areas that are at a high risk due to unbroken fence lines which do not allow ready access to the reservation for firefighters and fire suppression equipment. These fences also have the added disadvantage of cutting off potential escape routes for firefighters when fighting wildfires along the boundary. Other limitations include biological and cultural resources, and how will this affect the military mission.

Fuels Management Analysis

This is a necessary step to know where we stand if a wildfire ignites and what would be needed to successfully contain the blaze. This step involves acquiring tree stand data, ground fuel loads, and the use of landscape scale modeling.

Weather Data

Weather data from Kirtland AFB is taken from the International Sunport which is adjacent to the base. There are data sets from all the way back to the 1940’s to allow us to better prepare for prescribed burns based on past weather patterns.

4.3. Emergency Stabilization and Rehabilitation

Kirtland AFB does not have a Normal Fire Rehabilitation Plan. If emergency rehabilitation or restoration is needed, an interdisciplinary-burned area rehabilitation team will be formed, and plans will be developed at that time. Emergency fire rehabilitation based on FMU requirements would most likely be focused on:

- Slopes of 40% where surface erosion from water is likely.
- Temporary fences should be considered in areas where military units training may inhibit re-establishment of native plants following wildfire.
- Re-seeding of natural vegetation to restore plant communities.
- Road obliteration or restoration.

4.4. Prevention, Mitigation, and Education

4.4.1. Prevention/Mitigation

Unplanned fire is not desired at our current fuel loads, therefore, emphasis on prevention/mitigation programs that reduce unplanned ignitions and threats to life, property, natural and cultural resources.

4.4.2. Education

Educating and informing the base public on the value of fire as a natural process is important to increasing base public understanding and support for the base’s fire management program. The FMO, in coordination with the fire department and other resource specialists, has the primary responsibility for providing this information. As fire danger and/or fire activity on the base increases, the Fire Management Officer will provide key staff with up-to-date information on the current and expected fire situation on the base and surrounding areas.

Fire staff will use the most appropriate and effective means to get information to the base public regarding the fire management program. This may include handouts, personal contacts, and media releases. The base’s fire information program will include:

- **Year-Round Activities**
  - Information on the base’s fire management program will be incorporated, as appropriate, into base brochures, newspapers and other handouts.
  - Base interpretive and educational programs will be designed to enhance base public and staff awareness of the fire management program.

- Fire management-related information will be shared with the local community and local, state and other federal agencies.

- **Fire In-Progress Activities**
  - The media will be informed through news releases and/or informational briefings from the base's public affairs specialist, or if assigned, a fire information officer.
  - The most up-to-date fire situation information will be shared with the local community, as well as with all neighboring landowners—private, local, state and federal.

Prior to any prescribed fire within the base boundary, informational materials, including handouts and news releases, will be made available to base Public, the local community and the media that convey the base's goals and objectives for that specific management action. All fire related activity will be reported to Albuquerque Zone. The report should cover mechanical and prescribed burns, WFUs, as well as wildland fire, and be updated until the event ends. At the end of the event, an entry will be made to close out that activity.

5.0. Monitoring and Evaluation

5.1. Fire Management Plan

5.1.1. Annual FMP Review

The Wing Commander or Designated authority of Kirtland Air Force Base approves this plan. Significant changes to the body of this plan must be approved by the Base Civil Engineer, Fire Chief and concurred by the FMO. Subsequent amendments, modifications, and the required annual reviews are also under the signature authority of the Base Civil Engineer, Fire Chief and concurred by the FMO.

The only exceptions to this procedure will include:

- Grammatical corrections
- Minor procedural changes
- Deletions, corrections, and additions to the appendices.

A memorandum detailing the corrections, changes, or updates will be approved by the Base Civil Engineer, Fire Chief and concurred by the FMO, And appended to this plan as Attachment X. Any revised pages to be appended to the plan are to be dated. Changes requiring the approval and concurrence of the Base Civil Engineer, Fire Chief and concurred by the FMO Will be submitted with a new cover sheet for signature and dates that will replace the original cover sheet upon receipt by the FMO.

This FMP will be reviewed annually and updated as needed, upon local agency administrator approval. Revisions of the FMP with Regional review and concurrence are required every five years and following completion of a new (or significantly revised) CCP or habitat management plan.

5.1.2. Fire Management Plan Terminology

Terms in the FMP are defined in the National Wildfire Coordinating Group, located at http://www.nwcg.gov/pms/pubs/glossary Any terms used not in the glossary are defined below.

5.2. Treatment Effectiveness

All prescribed fires and unwanted fires will be monitored as described in the *National Fire Monitoring Handbook* (2003). Monitoring should minimally include documenting the fire's environment (weather, fuel, topography), fire behavior (rate of spread, flame length, etc.), and fire effects (scorch height, consumption, etc.). Furthermore, monitoring will be done to document how well the burn is within its prescription and to advise the burn boss (RXB1 or RXB2) of conditions that may cause the burn to exceed its prescription and/or when the burn is out of prescription. It is the responsibility of the burn boss to insure that monitoring is accomplished.

The Base currently lacks the knowledge to accurately and completely state how native species and ecosystem processes can be sustained. Therefore, the plan follows a relatively conservative approach to prescribed fire in the ecosystem, relying on past conditions and historic patterns as a guide for fire management strategies. Past fire disturbance regimes provide a general premise that native species have functioned and are adapted to the range of habitat patterns resulting from historic disturbance events for a prolonged period. Long-term ecological fire research would describe the range of conditions established by fire disturbance and ecological succession.

Monitoring of indicator species is needed to track the changes in the base ecosystem following fire.

The indicators must be 1) based on simple measurements, 2) quantifiable, 3) repeatable and 4) yield information on ecosystem condition.

Analysis will be conducted to determine the extent of detrimental impact that can result from fire suppression activities such as retardant and fire line construction.

Appendix B: Prescribed Fire Plan Template (2008)

A standardized, reproducible template form for the Prescribed Fire Plan development process is included in this appendix. A standardized format is provided for the Prescribed Fire Plan in PDF. An electronic version editable in Word is also available. Users should prepare the plan using the electronic version.

PRESCRIBED FIRE PLAN

ADMINISTRATIVE UNIT(S): ______________________________

PRESCRIBED FIRE NAME: ______________________________

PREPARED BY: ______________________________ **DATE:** __________

Name & Qualification/Currency

TECHNICAL REVIEW BY: ______________________________ **DATE:** __________

Name & Qualification/Currency

COMPLEXITY RATING: __________________

MINIMUM RXB REQUIREMENT: ______________

APPROVED BY: __________________________________ DATE: ______________
Agency Administrator

ELEMENT 2: AGENCY ADMINISTRATOR GO/NO-GO PRE-IGNITION APPROVAL CHECKLIST

Instructions: The Agency Administrator's GO/NO-GO Pre-Ignition Approval is the intermediate planning review process (i.e. between the Prescribed Fire Complexity Rating System Guide and Go/No-Go Checklist) that should be completed before a prescribed fire can be implemented. The Agency Administrator's Go/No-Go Pre-Ignition Approval evaluates whether compliance requirements, Prescribed Fire Plan elements, and internal and external notifications have been or will be completed and expresses the Agency Administrator's intent to implement the Prescribed Fire Plan. If ignition of the prescribed fire is not initiated prior to expiration date determined by the Agency Administrator, a new approval will be required.

YES	NO	KEY ELEMENT QUESTIONS
		Is the Prescribed Fire Plan up to date? *Hints: amendments, seasonality.*
		Will all compliance requirements be completed? *Hints: cultural, threatened and endangered species, smoke management, NEPA.*
		Is risk management in place and the residual risk acceptable? *Hints: Prescribed Fire Complexity Rating Guide completed with rational and mitigation measures identified and documented?*
		Will all elements of the Prescribed Fire Plan be met? *Hints: Preparation work, mitigation, weather, organization, prescription, contingency resources*
		Will all internal and external notifications and media releases be completed? *Hints: Preparedness level restrictions*
		Will key agency staff be fully briefed and understand prescribed fire implementation?
		Are there any other extenuating circumstances that would preclude the successful implementation of the plan?
		Have you determined if and when you are to be notified that contingency actions are being taken? Will this be communicated to the Burn Boss?
		Other:

Recommended by: ____ Date: ___________

FMO/Prescribed Fire Burn Boss

Approved by: ____ Date: ___________

Agency Administrator

Approval expires (date): ____________________________________

ELEMENT 2: PRESCRIBED FIRE GO/NO-GO CHECKLIST

	YES	NO
A. Has the burn unit experienced unusual drought conditions or does it contain above normal fuel loadings which were not considered in the prescription development? If NO proceed with checklist below, if YES go to item B.		
B. Has the prescribed fire plan been reviewed and an amendment and technical review been completed; or has it been determined that no amendment is necessary? If YES to any, proceed with checklist below, if NO, STOP.		

YES	NO	QUESTIONS
		Are ALL pre-burn prescription parameters met?
		Are ALL smoke management specifications met?
		Has ALL required current and projected fire weather forecast been obtained and are they favorable?
		Are ALL planned operations personnel and equipment on-site, available, and operational?
		Has the availability of ALL contingency resources been checked and are they available?
		Have ALL personnel been briefed on the project objectives, their assignment, safety hazards, escape routes, and safety zones?
		Have all the pre-burn considerations identified in the Prescribed Fire Plan been completed or addressed?
		Have ALL the required notifications been made?

		Are ALL permits and clearances obtained?
		In your opinion, can the burn be carried out according to the Prescribed Fire Plan and will it meet the planned objective?

If all the questions were answered "YES" proceed with a test fire. Document the current conditions, location, and results

_______________________________ _______________________

Burn Boss Date

ELEMENT 3 COMPLEXITY ANALYSIS SUMMARY

PRESCRIBED FIRE NAME			
ELEMENT	**RISK**	**POTENTIAL CONSEQUENCE**	**TECHNICAL DIFFICULTY**
1. Potential for escape			
2. The number and dependence of activities			
3. Off-site Values			
4 On-Site Values			
5. Fire Behavior			
6. Management organization			
7. Public and political interest			
8. Fire Treatment objectives			
9 Constraints			
10 Safety			
11. Ignition procedures/ methods			
12. Interagency coordination			
13. Project logistics			
14 Smoke management			

COMPLEXITY RATING SUMMARY	
	OVERALL RATING
RISK	
CONSEQUENCES	
TECHNICAL DIFFICULTY	
SUMMARY COMPLEXITY DETERMINATION	
RATIONALE:	

ELEMENT 4: DESCRIPTION OF PRESCRIBED FIRE AREA

A. Physical Description

1. Location**:**
2. Size:
3. Topography:
4. Project Boundary:

B. Vegetation/Fuels Description:

1. On-site fuels data
2. Adjacent fuels data

C. Description of Unique Features:

ELEMENT 5: OBJECTIVES

A. Objectives:

1. Resource objectives:

2. Prescribed fire objectives:

ELEMENT 6: FUNDING:

A. Cost:

B. Funding source:

ELEMENT 7: PRESCRIPTION

A. Environmental Prescription:

B. Fire Behavior Prescription:

ELEMENT 8: SCHEDULING

A. Ignition Time Frames/Season(s):

B. Projected Duration:

C. Constraints:

ELEMENT 9: PRE-BURN CONSIDERATIONS AND WEATHER

A. Considerations:

1. On Site:

2. Off Site

B. Method and Frequency for Obtaining Weather and Smoke Management Forecast(s):

C. Notifications:

ELEMENT 10: BRIEFING

Briefing Checklist:

- Burn Organization
- Burn Objectives
- Description of Prescribed Fire Area
- Expected Weather & Fire Behavior
- Communications
- Ignition plan
- Holding Plan
- Contingency Plan
- Wildfire Conversion
- Safety and Medical Plan
- Aerial Ignition Briefing (if Required)

ELEMENT 11: ORGANIZATION AND EQUIPMENT

A. Positions:

B. Equipment:

C. Supplies:

ELEMENT 12: COMMUNICATION

A. Radio Frequencies

1. Command Frequency(s):

2. Tactical Frequency(s):

3. Air Operations Frequency(s):

B. Telephone Numbers:

ELEMENT 13: PUBLIC AND PERSONNEL SAFETY, MEDICAL

A. Safety Hazards:

B. Measures Taken to Reduce the Hazards:

C. Emergency Medical Procedures:

D. Emergency Evacuation Methods:

E. Emergency facilities:

ELEMENT 14 TEST FIRE

A. Planned location:

B. Test Fire Documentation:

1. Weather conditions On-Site:

2. Test Fire Results:

ELEMENT 15: IGNITION PLAN

A. Firing Methods (including Techniques, Sequences and Patterns):

B. Devices:

C. Ignition Staffing:

ELEMENT 16: HOLDING PLAN

A. General Procedures for Holding:

B. Critical Holding Points and Actions:

C. Minimum Organization or Capabilities Needed:

ELEMENT 17: CONTINGENCY PLAN

A. Trigger Points:

B. Actions Needed:

C. Additional Resources and Maximum Response Time(s):

ELEMENT 18: WILDFIRE CONVERSION

A. Wildfire Declared By:

B. IC Assignment:

C. Notifications:

D. Extended Attack Actions and Opportunities to Aid in Fire Suppression:

ELEMENT 19: SMOKE MANAGEMENT AND AIR QUALITY

A. Compliance:

B. Permits to be Obtained:

C. Smoke Sensitive Receptors:

D. Potential Impacted Areas:

E. Mitigation Strategies and Techniques to Reduce Smoke Impacts:

ELEMENT 20: MONITORING

A. Fuels Information Required and Procedures:

B. Weather Monitoring (Forecasted and Observed) Required and Procedures:

C. Fire Behavior Monitoring Required and Procedures:

D. Monitoring Required To Ensure That Prescribed Fire Plan Objectives Are Met:

E. Smoke Dispersal Monitoring Required and Procedures:

ELEMENT 21: POST-BURN ACTIVITIES

Post-Burn Activities That Must Be Completed:

APPENDICES

A. Maps: Vicinity and Project

B. Technical Review Checklist

C. Complexity Analysis

D. Agency Specific Job Hazard Analysis

E. Fire Behavior Modeling Documentation or Empirical Documentation (unless it is included in the fire behavior narrative in Element 7; Prescription)

A: MAPS

1. **Vicinity**
2. **Project**

B: TECHNICAL REVIEWER CHECKLIST

PRESCRIBED FIRE PLAN ELEMENTS:	S /U	COMMENTS
1. Signature page		
2. GO/NO-GO Checklists		
3. Complexity Analysis Summary		
4. Description of the Prescribed Fire Area		
5. Objectives		
6. Funding		
7. Prescription		
8. Scheduling		
9. Pre-burn Considerations and Weather		
10. Briefing		
11. Organization and Equipment		
12. Communication		
13. Public and Personnel Safety, Medical		
14. Test Fire		
15. Ignition Plan		
16. Holding Plan		
17. Contingency Plan		
18. Wildfire Conversion		
19. Smoke Management and Air Quality		
20. Monitoring		
21. Post-burn Activities		
Appendix A: Maps		
Appendix C: Complexity Analysis		
Appendix D: Agency specific job hazard analysis		
Appendix E: Fire Prediction Modeling Runs or Empirical Evidence		
Other		

S = Satisfactory U = Unsatisfactory

Recommended for Approval: _________ Not Recommended for Approval: _________

________________________ ____________ __________________

Technical Reviewer Qualification and currency (Y/N) Date

☐ **Approval is recommended subject to the completion of all requirements listed in the comments section, or on the Prescribed Fire Plan.**

C: COMPLEXITY ANALYSIS

D: AGENCY SPECIFIC JOB HAZARD ANALYSIS

E: FIRE BEHAVIOR MODELING DOCUMENTATION OR EMPIRICAL DOCUMENTATION

APPENDIX L

TIJERAS ARROYO GOLF COURSE ENVIRONMENTAL MANAGEMENT PLAN (GEM)

Air Force Center for Engineering & the Environment

Tijeras Arroyo Golf Course
Environmental Management (GEM) Plan
Kirtland AFB, New Mexico

AFCEE

October 2008

AF SERVICES GOLF

San Antonio, Texas

Tijeras Arroyo GC

Tijeras Arroyo Golf Course Environmental Management Policy

**In concert with the
Kirtland AFB mission,
we pledge to employ
only those management practices
that minimize or eliminate the potential
for negative impacts to the environment
and the surrounding community,
ensure compliance with all
appropriate regulations,
and to regularly reevaluate our processes
to achieve the highest standards
of environmental excellence.**

Table of Contents

Executive Summary

U. S. Air Force GEM Program

The U. S. Air Force Golf Course Environmental Management (GEM) program is a proactive Air Force Center for Engineering & the Environment (AFCEE) initiative to foster a better understanding of the environmental challenges facing our golf courses worldwide.

Armed with the support and approval of the Air Force Services Agency golf program, AFCEE's goal is to facilitate the creation of an environmentally friendly golf course facility while supporting the installation mission. Chapter 11 of AFI 32-7064 requires a GEM Plan as part of the Integrated Natural Resources Management Plan (INRMP).

GEM Program process

There are five steps in the GEM program process.

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Environmental Compatibility Quotient (ECQ) scores

The following is the summary of the environmental compatibility quotient (ECQ) scores for the site visit conducted in Month Year:

- **Actual ECQ = 57, Getting started**
- **Potential ECQ = 72, Showing progress**

Potential or Final environmental challenges

The following potential environmental challenges were identified in compiling this Draft or Final GEM Plan:

- Nuisance species
- Migratory birds
- Energy conservation
- Installation Restoration Program (IRP) sites
- Proposed improvement projects
- Air quality

Where do we go from here?

The true measure of a successful GEM program is how well is it executed in the field each and every day. The installation golf and environmental staffs should continue to analyze, document, monitor, evaluate, revise, and implement changes based on lessons learned. The GEM Plan should be updated annually and revised during the next INRMP iteration update. The entire GEM process can be found on the regularly improved AFCEE GEM program website (http://www.afcee.brooks.af.mil/ec/golf/).

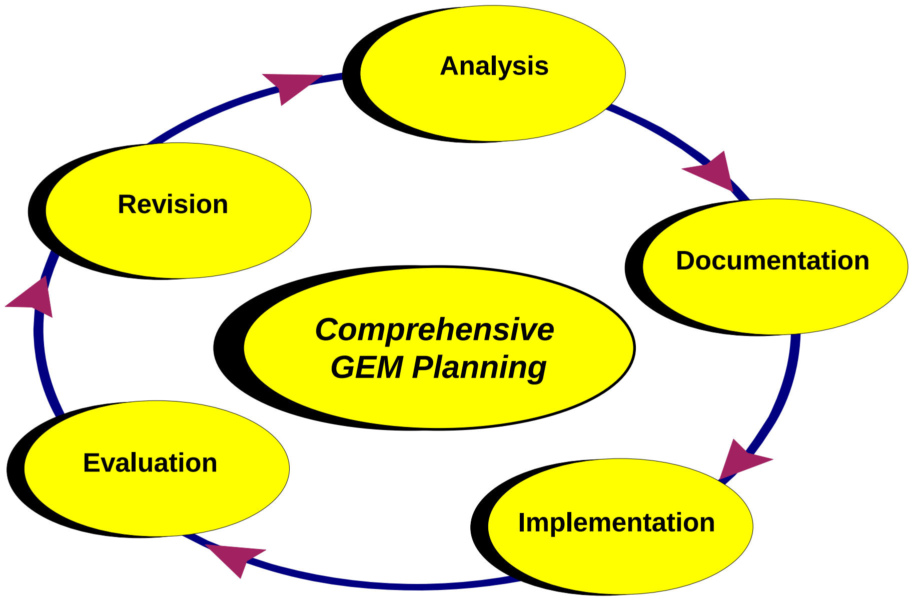
Tijeras Arroyo Golf Course
Kirtland AFB, NM

The 1st green is guarded by a huge sand bunker.

The golf course environmental baseline assessment (GCEBA), or the Draft Golf course Environmental Management (GEM) Plan is the initial step in creating a successful ecosystem-based comprehensive GEM Plan. The intent of the GEM Plan is to provide an efficient management tool that will enable course managers to devote more of their efforts to caring for their customers and the golf course. Properly designed and implemented, the GEM Plan will keep the entire golf facility in compliance with the constantly changing environmental requirements while contributing to the local community.

The GEM Initiative

The goal of the GEM initiative is to facilitate the creation of an environmentally friendly approach to golf course management while protecting and promoting the great game of golf. AFCEE is dedicated to helping to identify ways that more rounds can be played on better-conditioned courses while minimizing or eliminating negative impacts to the environment. In most cases, golf courses are being managed compatibly with the environment. The comprehensive GEM planning process is the vehicle to document our successes while communicating directly with our customers, commanders, and local community.



GEM Process

The five steps of the GEM Process are based on continual improvement.

GEM Process

Efficient implementation is the most important aspect of any initiative where practices and procedures are examined and may undergo significant change. This is especially true of the comprehensive GEM planning process. The GEM Plan is derived from several diverse environmental regimes to include the National Environmental Policy Act and the ISO 14001 environmental management system.

There are five basic steps in the implementation of the GEM Planning process:

- Analysis
- Documentation
- Implementation
- Evaluation
- Revision

Analysis

Experienced environmental managers realize the importance of assembling all of the data relevant to a problem prior to determining its best solution. Comprehensive analysis is the most important task of the GEM process. Properly completing the analysis is paramount to the long-term compatibility of a golf course's management practices with the local community's natural resource and environmental management goals and objectives.

GCEBA COMPONENTS

The GCEBA is comprised of the following components:

- Site visit, interviews, and data collection
- Course specific analysis
- Miscellaneous facility review
- Environmental compatibility quotient checklists
- Identification of potential environmental management challenges
- Summary report

Documentation

It is not enough just to know how to create a successful golf course environmental management program. There must be a written record documenting existing site data, maintenance practices, pesticide applications, and other historical golf course activities. By documenting what we know, we will be able to determine how to make better decisions in the future. The completed GEM Plan will assist in the daily management of the course while providing a convenient vehicle to communicate to the community and customers alike the environmental issues that challenge golf course managers as well as their plans to deal with them. In order to reach established environmental stewardship goals the golf course staff must consistently employ only those management practices that minimize or eliminate potential negative impacts to the environment.

Tijeras Arroyo Golf Course
Kirtland AFB, NM

The course is ready for a complete bunker renovation project.

U.S. AIR FORCE GEM PLAN COMPONENTS

The GEM Plan will be comprised of the following components:

- GCEBA report
- Map of the entire golf course facility grounds depicting locations of the significant environmental management challenges and the golf course facilities
- Booklet that describes the environmental management challenges depicted on the GEM Plan map
- Specific practices that will be employed by the golf course staff to deal with each environmental management challenge after coordination with and approval by the installation environmental staff
- Compilation of best management practices employed at the golf course in their implementation of the GEM initiative recommendations

Implementation

Positive and decisive action is the only true measure of the success of the GEM Plan. By implementing new practices, whether to knowingly improve the course's role in the environmental stewardship of the installation or to just try new ideas to determine their value, will the golf staff and golfers benefit. The installation golf staff should consider adopting the GEM Initiative process and establish an environmental policy that minimizes or eliminates any and all potential negative environmental impacts.

Evaluation

In order to ensure the highest quality of customer service and environmental stewardship, there must be continual self-evaluation and improvement. There also should be consistent, on-going measurement of the reduction or elimination of environmental impacts the newly implemented practices have on the course. For example, documenting the reduced use of inputs such as fertilizers, pesticides, and irrigation can be used to demonstrate the increased environmental stewardship of the golf course management practices as well as the overall value of the GEM initiative. It is important for golf courses to show improvement over time. Improvements can be easily accomplished by regularly evaluating golf course maintenance methods, practices, and management approaches to day-to-day issues in concert with the desire and ability to change.

Revision

The very nature of a superior GEM Plan implies that all documents be regularly maintained to represent the most current conditions. Golf course managers and superintendents should be constantly looking for ways to improve their environmental stewardship. Acting on lessons learned is right behind initial implementation as the most important aspect of a successful GEM Plan. The GEM Plan should be kept as current as possible at all times. Ideally, it should be updated annually and completely rewritten on the same cycle as the Integrated Natural Resources Management Plan.

Course Specific Analysis

One of the most pragmatic and enjoyable tasks in the baseline assessment portion of the GEM process is the course specific analysis. From a general description of the course to the details of the course's history and makeup to the various observations on course playability, aesthetics, and style of management, the course specific analysis sets the stage for the rest of the GEM Plan report.

Tijeras Arroyo Golf Course Kirtland AFB, NM

Course Layout Map

Course Description

Nestled next to the Manzanita Mountains and bounded on the west by the Tijeras Arroyo, a large, normally dry desert wash, the golf course at Kirtland AFB embraces its central New Mexican environment. Turf flourishes only where the original 1976 irrigation system delivers water. The 18-hole, nearly 7000 yard track is nicely routed amongst the ancient talus slopes of the nearby mountain ranges. Numerous water-loving trees define the golfing corridors while several small, oddly-conceived and located ponds interfere with play along the way. All in all, Tijeras Arroyo is a fun golf course that is probably in its best condition ever - a living testament to the director's and the superintendent's love for the game and their customers.

Tijeras Arroyo Golf Course Aerial Photo, Kirtland AFB, NM

Tijeras Arroyo Golf Course Kirtland AFB, NM

Clean, clear air, refreshing breezes and mostly sunny skies typify the climate in Albuquerque, New Mexico.

Course Details

Architect		Unknown
Year constructed		1971
Climate		High desert
Average annual precipitation		10 inches
Average growing season		225 days
Elevation		5200 ft ASL
Prevailing wind direction		East/west
Total facility acreage		210 acres
Total actively maintained acreage		110
Par		36-36-72
Yardage/Rating/Slope		Black- 6971/71.9/127 Blue- 6574/69.9/123 Silver- 6268/68.5/120 Green- 5889/66.9/114
Turfgrass	Tees-	Bluegrass/Bermudagrass
	Fairways-	Bluegrass
	Greens	Penncross
	Roughs-	Bluegrass/fescue
Irrigation source		Non-potable well supplemented with restoration effluent

Nicely designed facility sign greets customers at course entry.

Tijeras Arroyo Golf Course Kirtland AFB, NM

Environmental Compatibility Quotient (ECQ) Checklists

Many diverse and complex aspects of golf course management have been revealed through the literature search conducted to compile this study. In order to simplify the process, these aspects have been summarized into eight main topics and incorporated into five distinct environmental compatibility categories.

- Planning & Compliance
- Operations & Maintenance
- Water Resource Management
- Conservation
- Pesticides & Pollution Prevention

The environmental compatibility quotient (ECQ) checklist questions have been compiled using examples from several sources including Audubon International, Center for Resource Management, and Committed to Green. The ECQ checklists represent the best method currently available to determine the relative environmental compatibility of a golf course's management practices. The checklists can be used in many ways including:

- As a tool to establish a current snapshot or baseline of a golf course's relative environmental compatibility
- As a tool to identify areas for improvement or to demonstrate current successes
- As a self-assessment tool for the golf course manager and superintendent
- As documentation for an environmental award nomination
- As documentation for regulatory requirements or inquiries from customers, the media, or the general public

Determining the Environmental Compatibility Quotient (ECQ)

The ECQ compiled for an installation's course is a snapshot of the overall performance and compliance with the GEM Plan. There are two measures obtained as a result of using the ECQ checklists to determine the status or quality of the environmental management program: 1) determining the actual and; 2) potential environmental compatibility quotients.

- **Actual ECQ-** the total percentage of "Yes" responses for all ten checklists. This number represents the current level of the golf course management practice compatibility with the environment
- **Potential ECQ-** the total percentage of "Yes" responses plus the total percentage of "Partial" responses for all ten checklists. Maybe the most significant measure; the potential ECQ represents a level of compatibility that could be reached by finalizing or fully implementing a particular practice or procedure.

ECQ Scoring Scale

Percent Responses Yes or Partial per Category	Level
90-100%	Advanced (Green)
70-89%	Showing progress (Yellow)
69% or less	Getting started (Red)

Tijeras Arroyo Golf Course Kirtland AFB, NM

A new patio addition provides comfortable outdoor dining opportunities.

The following ECQ checklists are a record of the interview conducted with Tijeras Arroyo Golf Course manager, superintendent, and environmental staffer during the visit to Your Installation.

Planning & Compliance

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Has management demonstrated that environmental stewardship is an important part of their responsibilities by initiating the Comprehensive Golf course Environmental Management (GEM) Planning process?	✓		
2	Is the GEM Plan complete, updated regularly, and readily available to employees and customers?			✓
3	Has the golf course adopted and posted an environmental policy?		✓	
4	Is a map of the property highlighting environmental challenges posted for employees and customers?			✓
5	Does management conduct a comprehensive annual evaluation for each identified environmental challenge and its management approach, objective, and target?			✓
6	Does the course have a Tree Management Plan complete with planting plan and maintenance schedule?			✓
7	Is there a written and regularly updated Integrated Pest Management Plan for the entire golf course property?		✓	
8	Is there a map of the course's "hot spots" or specific areas that may require regular special care or attention?			✓
9	Is there an up-to-date comprehensive golf course development plan or master plan that details the desired short- and long-term improvements to the facility?		✓	
10	Is there at least one project planned and funded for the next year that would increase the compatibility of the course's management program with comprehensive GEM planning goals and objectives?	✓		

Planning & Compliance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Have all employees been familiarized with the GEM Plan and are they trained regularly on the importance of environmental performance and compliance with its goals and objectives?			✓
12	Are environmental management issues regularly discussed during staff meetings?	✓		
13	Are the actual amounts of each pesticide or fertilizer on the facility available in writing for every application over the last year?	✓		
14	Has the facility attained full certification in the Audubon Cooperative Sanctuary Program or similar industry-recognized environmental management program?			✓
15	Are employees trained in their native language on the benefits of minimizing potential negative impacts?	✓		
16	Are comprehensive written records maintained to measure and document the environmental compatibility of the entire facility's management practices?		✓	
17	Are there documented functional and aesthetic thresholds integrated into pest control decisions?		✓	
18	Is there a written comprehensive Water Resources Management Plan that delineates the care of each of the course's water features?			✓
19	Are employees trained on what to do in case of a spill and have spill containment kits been provided at all appropriate locations?	✓		
20	Have the maintenance activities and their performance been examined to determine the potential to negatively impact an identified environmental challenge?		✓	
	Totals	**6**	**6**	**8**

Operations & Maintenance

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is there a written, regularly updated and comprehensive Turfgrass Management Plan for each type of turf and playing area?	✓		
2	Are there designated natural or minimally maintained buffers around sensitive landforms or features and/or core wildlife habitats?	✓		
3	Are green, tee, and fairway mowing heights maintained at levels that do not excessively stress important playing surfaces?	✓		
4	Are aeration, topdressing and other drainage improvements regularly implemented to improve soil health and minimize or eliminate inputs of pesticides or fertilizers?	✓		
5	Are soil tests or plant tissue analysis regularly used to determine turfgrass nutritional requirements?	✓		
6	Is the information collected in soil tests and plant tissue analysis integrated into a regularly updated Nutrient Requirement Plan and map?		✓	
7	Is there at least one project planned and funded for the next year that would improve the course's protection of the environment?	✓		
8	Are all appropriate employees trained to be familiar with (national, federal, state, and OSHA) regulations that apply to storage and handling of potentially hazardous materials used on the property?	✓		
9	Has there been an examination of all aspects of the operation for potential negative impacts for the snack bar/restaurant, clubhouse, pro shop, pesticide mixing and storage facilities, fuel storage and delivery areas, and maintenance complex?	✓		
10	Have all employees received documented training that would increase their awareness of environmental stewardship goals and objectives?			✓

Operations & Maintenance Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are containers used to store used oil for equipment maintenance in good condition, not leaking, and clearly labeled?	✓		
12	Are oil/water separators and/or golf course wash racks operating properly and correctly maintained?	✓		
13	Are all golf course vehicles and equipment maintained and cleaned in a manner that eliminates the potential for spreading of disease or other contamination?	✓		
14	Are biodiesel and/or ethanol products utilized everywhere they may be appropriate?	✓		
15	Are waste products such as oil, grease, tires, and batteries stored in a covered container and disposed of properly off site?	✓		
16	Does the superintendent use hand held GPS units to assist in GIS mapping of the golf course areas?			✓
17	Are energy efficiency ratings factored into equipment purchases for use throughout the facility?	✓		
18	Has the entire facility been studied to quantify solid waste streams to identify functions that produce the greatest quantities?	✓		
19	Are at least 90% plates, cups, and utensils in use by the restaurant/snack bar facility reusable rather than disposable?			✓
20	Does course management utilize a web-based golf course planning tool for every day decision-making and recordkeeping?			✓
	Totals	**15**	**1**	**4**

Water Resource Management				
#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are written records of water quality monitoring activities, results, and pollution control measures readily available?		✓	
2	Where appropriate, are slow-release fertilizers and/or spoon-feeding techniques used to reduce the potential for runoff impacts and nutrient loading to water quality?	✓		
3	Does the irrigation system operate using computerized controllers based on real-time evapotranspiration rates?		✓	
4	Are the golf course sprinklers and outdoor irrigation of non-golf course areas and indoor plumbing regularly monitored and maintained for proper distribution and leaks?	✓		
5	Have low-flow water saving devices been installed wherever possible?	✓		
6	Is at least 65% of the irrigation water for the golf course property recycled or non-potable?	✓		
7	Are there projects planned and funded that may eliminate or minimize a potential water quality or erosion problem?	✓		
8	Are water features regularly monitored for algae, erosion, excessive aquatic plant growth, eutrophication, and sedimentation?	✓		
9	Are low impact design (LID) principles such as using vegetative or drainage filters to cleanse parking lot runoff prior to leaving the property?			✓
10	Are there signs appropriately located to warn golfers of the potential hazard of drinking recycled or otherwise non-potable water?	✓		

Water Resource Management Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are there flow meters for monitoring total water use?		✓	
12	Has the irrigation system or its components recently been upgraded to reduce or eliminate inefficiency and overall water use?	✓		
13	Is there a map of the watershed in which the golf course property resides and location(s) of floodplains and storm water drainage that exists on the property?	✓		
14	Is the quality of the irrigation water regularly checked to determine overall quality or nutrient, salt or total suspended solid parameters?			✓
15	Is water quality data regularly collected to establish baseline conditions and maintenance procedures for all water features on the property?		✓	
16	Are settling ponds and/or detention ponds used to effectively remove sediments and pollutants from entering important water features?	✓		
17	Are biological processes such as the addition of grass carp or white amur used to control unwanted aquatic vegetation in major water features?			✓
18	Have the property's Water Quality Management Zones been identified and mapped based on industry-standard risk factors?			✓
19	Has the property's water features been studied to determine the aquatic and amphibious species population?			✓
20	Has the property been examined for potentially significant wetlands or associated sensitive water-based habitats?	✓		
	Totals	**11**	**4**	**5**

Conservation

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Is all motorized equipment maintained for efficient operation that would minimize the potential of creating excessive air polluting emissions?	✓		
2	Has the entire golf course property been examined for critical habitats, state species of concern, and threatened or endangered species?	✓		
3	Are all manmade ponds or other large water features adequately lined to minimize or eliminate losses?	✓		
4	Are employees encouraged to minimize their trips around the course to conserve on the use of fossil fuels?	✓		
5	Have efforts been made to connect natural areas to facilitate wildlife movement through the course property by returning an area to its natural state or revising maintenance procedures?			✓
6	Have all necessary permits been secured and are they updated and their requirements satisfied in a timely manner?	✓		
7	Are recycling containers conveniently provided for customer and employee use throughout the golf course facility?		✓	
8	Has there been a study to determine the presence of invasive exotic species on or near the course?	✓		
9	Is there a comprehensive and readily available Drought Management Plan for the entire golf course facility?			✓
10	Is there at least one project planned and funded that may minimize or eliminate the course's potential negative environmental impacts?	✓		

Conservation Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Does management harvest storm water to supplement irrigation water supplies for use anywhere on the golf course facility grounds?			✓
12	Are at least 85% of plants used in landscaped areas drought-tolerant native trees, shrubs, groundcovers, or their cultivars?			✓
13	Are there signs posted to highlight key habitats or have appropriate areas been designated "Environmentally Sensitive Zones" per The Rules of Golf?	✓		
14	Has a comprehensive energy audit been conducted for the entire golf course facility?			✓
15	Are all employees trained to understand that poor management practices may adversely impact worker and environmental health and welfare?		✓	
16	Is there an inventory of bird and mammal species documented, maintained, and readily available?	✓		
17	Are food, shelter, and nesting attributes of plant species for landscape development considered during the design/selection process?	✓		
18	Have all damaged or degraded habitats due to construction or maintenance of the course been fully restored?			✓
19	Has the entire property been examined for archaeological, cultural, or historical resources?	✓		
20	Is the irrigation pump station a variable speed model for energy efficiency?	✓		
	Totals	**12**	**2**	**6**

Pesticides & Pollution Prevention

#	Environmental Compatibility Indicator	Yes	Partial	No
1	Are there established, documented and communicated minimally maintained and fertilizer and pesticide application buffer areas around water features or sensitive landscapes?			✓
2	Is the equipment wash rack adequately covered to minimize or eliminate collection of precipitation?			✓
3	Does the chemical storage area have a sealed metal or concrete floor and are all pesticides handled over an impermeable surface?	✓		
4	Does the chemical storage area have a lip along the edges and does it have at least 150% of total storage volume secondary containment?	✓		
5	Are liquid products stored below dry products and are dry materials stored on pallets or shelves to keep them off the floor?	✓		
6	Has the least toxic pest control strategy been identified for each of the most common pests and is it always used first when an action threshold is reached?	✓		
7	Is equipment cleaned with compressed air or blowers on part of the course instead of or prior to washing at a designated wash rack where pollution prevention measures are employed?			✓
8	Are leachate potentials of pesticides considered in the integrated pest management process?	✓		
9	Does the fuel storage/delivery area comply with local, state, federal, or other applicable regulations?		✓	
10	Are written records maintained of all applications of pesticides to include: - the pest and treatment type (preventative/curative); - the location (specific playing area) of each pesticide used; - the area (SF/SM) and quantity of each pesticide used; - the chemical or common name of the active ingredient(s); - the date, location, or purpose of the application?	✓		

Pesticides & Pollution Prevention Checklist (continued).

#	Environmental Compatibility Indicator	Yes	Partial	No
11	Are all pesticide applications recorded and mapped to guide future pest control decisions?	✓		
12	Other than the head superintendent, are there trained scouts on staff to monitor turf and plant health and pest problems?	✓		
13	Are there scouting forms utilized and are they collected and organized into a report or guide for use in future pest control decisions?			✓
14	Is IPMIS being used to track activities including surveillance and biological, cultural, mechanical, and chemical controls?	✓		
15	Are current copies of all Material Safety Data Sheets (MSDS) for all chemicals used anywhere on the golf course property maintained and readily available?	✓		
16	Are fertilizers and pesticides stored in separate facilities?	✓		
17	Is the chemical storage structure/area locked, well ventilated and fire resistant and is access limited to appropriate personnel?	✓		
18	Is there a regularly updated Water Pollution Abatement Plan readily available for the golf course property?			✓
19	Are golfers adequately notified in the pro shop and on the first and tenth tees about the day's planned or recently completed spraying of any chemical or fertilizer?	✓		
20	Are there written pest profiles for common regional pests along with alternative potential control measures readily available?		✓	
	Totals	**13**	**2**	**5**

Tijeras Arroyo Golf Course Kirtland AFB, NM

Numerous existing trees like these short-lived Lombardy poplars will soon need to be removed and or replaced.

Environmental Compatibility Quotient Summary			
Environmental Compatibility Category	Yes	Partial	No
Planning & Compliance	6	6	8
Operations & Maintenance	15	1	4
Water Resource Management	11	4	5
Conservation	12	2	6
Pesticides & Pollution Prevention	13	2	5
Totals	57	15	28

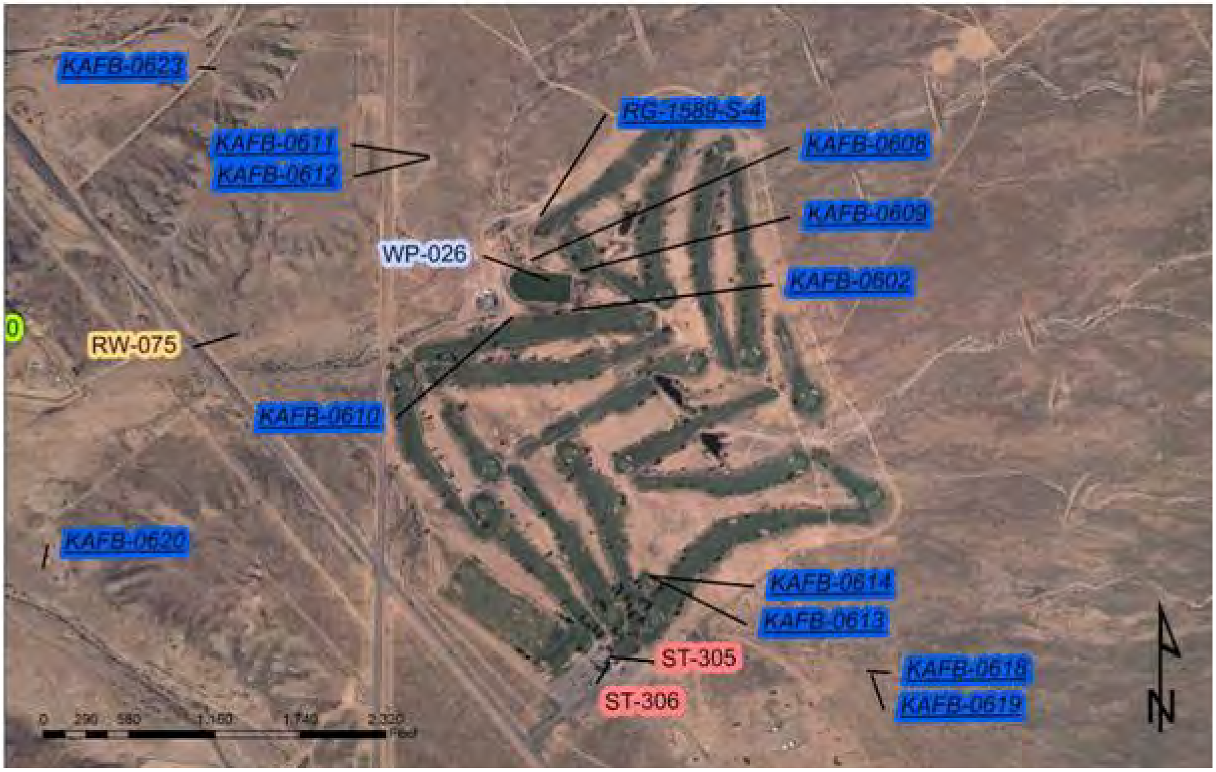
Key to checklist responses

- **Yes** = Practice is complete or ongoing and can be verified
- **Partial** = Practice has been initiated yet is not completed
- **No** = Practice is not in place

Oct 08 – Tijeras Arroyo Golf Course ECQ:

- **Actual ECQ = 57, Just started (Red)**
- **Potential ECQ = 72, Showing progress (Yellow)**

Environmental Compatibility Quotient Scoring Scale	
Total Yes or Partial Responses	Environmental Compatibility Level
90-100%	Advanced (Green)
70-89%	Showing progress (Yellow)
69% or less	Just started (Red)



Environmental Challenges Map

Environmental Challenges

One of the important results of the GCEBA process is the identification of significant environmental challenges to be addressed in the GEM Plan. Ideally, the golf staff will address their management approach to each challenge to accomplish course and local community environmental management objectives while still attaining acceptable levels of course playability and customer satisfaction. Along with the newly established baseline, the GEM Plan consists of a map and description of the final environmental challenges and the prescribed approach to their management. In addition, the GEM Plan includes a comprehensive list of future environmental management goals and objectives and a course-specific set of best practices.

The following environmental challenges were identified during the GEM process:

- Nuisance species
- Migratory birds
- Energy conservation
- Installation Restoration Program (IRP) sites
- Proposed improvement projects
- Air quality

Assessing environmental challenges

The assessment of the environmental challenges is probably the most crucial as it provides a prioritized list of coordinated actions significant to the long-term success of the golf facility. The finalized GEM Plan will include the description, driver or requirement, management practice, objective, and target:

DESCRIPTION

Once the challenge has been identified, a short description and a few historical or statistical details assist greatly in understanding the key factors in devising management practices.

DRIVER/REQUIREMENT

Challenges are defined as "things that are bigger than the course". Some of the reasons behind why a particular issue becomes a challenge are important to recognize and understand. A driver or requirement may be a local, regional, or national law, regulation, or initiative that creates the requirement to protect species, habitat, or preserve a resource such as open space or unique ecosystems.

OBJECTIVE

Objectives are the overall goals for environmental performance focusing specifically on management activities associated with each challenge and the potential for impacts. The objective should directly relate to the environmental policy.

MANAGEMENT APPROACH

A course's approach to managing environmental challenges in accordance with the driver or requirement, environmental policy (see page 2), and established objectives and targets is the heart of the GEM Plan.

TARGET

The target is the time frame and/or quantifiable unit of measure to achieve the established objectives.

Tijeras Arroyo
Golf Course
Kirtland AFB, NM

Prairie dogs are as cute as they are destructive!

Cross section of a prairie dog burrow. (Drawing by Mark E. Marcuson; courtesy University of Nebraska–Lincoln, Department of Forestry, Fisheries

Prairie dogs often make their homes among many other burrowing species.

Tijeras Arroyo
Golf Course
Kirtland AFB, NM

Nuisance species

According to the NMSU Guide L-201, "New Mexico is the home of the black-tailed and Gunnison prairie dogs. Black-tailed prairie dogs occupy most of the eastern half of the state, and Gunnison prairie dogs are found in the western half. One of the first considerations is to determine if you have a problem. Although prairie dog control may be necessary for health concerns and other reasons, most control programs are undertaken because the rodents remove important vegetation. Prairie dogs clip and remove vegetation near their burrows, eating the vegetation and cutting it for nesting material. Prairie dogs also cut vegetation to maintain space and remove cover that might hide predators. In general, if there are at least 10–15 prairie dog mounds per acre, the value of lost vegetation justifies the cost of a control program. If there are fewer than 10–15 mounds per acre, the cost of treatment usually outweighs the value of lost vegetation. If, however, prairie dog control is implemented to prevent or eliminate further expansion, considerations other than vegetation loss may justify the control effort."

The Prairie Dog Management Environmental Assessment states that among several other areas of Kirtland AFB, the Tijeras Arroyo Golf Course "Prairie dogs will not be allowed in these areas due to land use conflicts, risk to human health and safety, and threat to military operations."

Additionally, the INRMP states under golf course pests "Mosquitoes represent a particular problem on the golf course and are controlled through physical, biological and chemical means. Other golf course pests include coontail, anthracnose foliar blight, gray snow mold or typhula blight, puncture vines, broadleaf plantain, and common mallow.

Driver/requirement

- Customer expectations for acceptable quality playing conditions
- Real property protection
- Land use conflicts
- Risk to human health and safety
- Threat to military operations

Objective

Minimize the damage caused by controllable nuisance pests.

Management approach

- After complete coordination with all appropriate installation personnel, take all permitted actions to control nuisance pests
- Consider the addition of raptor poles to encourage natural control of nuisance mammal species

Target

Eliminate all nuisance pests on the actively maintained portions of the golf course by 2012 as permitted or allowed by the installation environmental management staff.

Both the Gunninson's and the Black-Tailed prairie dogs occur in New Mexico.

Tijeras Arroyo Golf Course Kirtland AFB, NM

Tijeras Arroyo
Golf Course
Kirtland AFB, NM

Athene cunicularia*, or burrowing owl, occurs throughout the western United States.*

Migratory birds

Burrowing owls are among the most interesting native American. They are usually easy to see as they are active in the daylight hours and are fairly tolerant of human activity. According to the Burrowing Owl Plan, they "prefer flat open areas with short vegetation and available burrows, these owls are often seen sharing abandoned fields, channels, parks, or other open areas around cities, areas with crops, and rangelands. They also inhabit many types of 'artificial habitats', such as airfields, parking lots, sports fields, and golf courses. Although the 2007 study notes that only one breeding pair has been known to occupy the course, managers must be prepared to properly care for these migratory animals. The Burrowing Owl Plan states that the Tijeras Arroyo Golf Course "has short, maintained vegetation, and due to watering, an abundance of prey. Although the 2007 pair was very productive (producing eight fledglings), there was evidence of poison found around the owl burrow. This issue is under investigation.

Driver/requirement

- Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, January 10, 2001
- Migratory Bird Treaty Act, as amended (16 U.S.C. 703 *et. seq.*)
- Migratory Bird Conservation Act

Objective

Ensure that golf course management practices consider the protection of all migratory birds and their habitats.

Management approach

- Work closely with installation environmental staff to document presence of migratory birds such as the burrowing owl and follow all provided maintenance guidelines
- Never allow prairie dog management or any other management practice to harm or kill migratory bird species

Target

Immediately begin migratory bird management consultation with the installation environmental staff.

Tijeras Arroyo Golf Course Kirtland AFB, NM

Abandoned prairie dog burrows can provide a home for the burrowing owl is they are located away from human activity.

Tijeras Arroyo Golf Course Kirtland AFB, NM

The irrigation pump house and controller is a great source of energy savings.

Energy conservation

Energy use has become a major concern for nearly everyone worldwide in the last few years. The phenomenal rise in gas prices has fueled increased costs for nearly every commodity. Utilities such as electrical are not immune to this trend. The course management desires to install solar panels to assist in their greening of the golf course facilities. Sustainable operations begin with sustainable planning. The sustainability efforts of golf course management are laudable and should receive complete support and approval. Solar panel installation is another initiative. The clubhouse and possibly the maintenance complex could provide an efficiency opportunity for energy savings.

Driver/requirement

- Executive Order 13123, Greening the Government Through Efficient Energy Management
- Executive Order 13423, Strengthening Federal Environmental, Energy and Transportation Management
- Energy Independence & Security Act

Objective

Meet all presidential and regulatory directives on energy conservation.

Management approach

- Consider energy efficiency prior to all equipment purchases throughout the facility
- Pursue solar energy generation modifications to the clubhouse

CE Squadron/Services Squadron	Environmental / Golf Staff

Target

Attain comprehensive compliance with all directives within prescribed milestones for the entire golf course facility.

Tijeras Arroyo Golf Course Kirtland AFB, NM

The clubhouse is a primary consideration for solar panel installation.

Tijeras Arroyo
Golf Course
Kirtland AFB, NM

Preserving groundwater quality is serious business at Kirtland AFB.

Installation Restoration Program (IRP) sites

Several monitoring wells can be observed throughout the Tijeras Arroyo Golf Course facility property. Test results of Kirtland's Well #7 revealed high nitrate concentrations – much higher than allowed for drinking water. The installation's solution to this challenge was to pipe the water from #7 to the golf course where it could be used for irrigation purposes. Several water hazards, now lined as part of the remediation, store this water prior to its use to nurture the turfgrasses.

Driver/requirement

- AFI 32-7020, The Environmental Restoration Program
- Resource Conservation Recovery Act (RCRA)

Objective

Ensure daily compliance with restoration program site requirements.

Management approach

- Abide with all specified land use controls (LUCs) and water use restrictions as directed
- Work closely with installation restoration program manager to ensure compliance

Target

Immediately integrate direction into regular maintenance practices.

Tijeras Arroyo Golf Course Kirtland AFB, NM

The new cart storage facility is near the proposed site for the new maintenance complex relocation.

Proposed improvement projects

One of the most common recurring problems with Air Force golf is the relative age and functionality of a course's irrigation system. Water is the lifeblood of a golf course – especially one located in a low precipitation area like New Mexico. Inefficient pumps waste energy and water. Out of date or non-functioning controllers inhibit flexibility and stewardship efforts. Leaking pipes waste tremendous amounts of water and worn out sprinklers and nozzles do a poor job of getting the water where it is needed without creating puddles and poor playing conditions. All of these reasons are why Tijeras Arroyo Golf Course managers believe they need and deserve a new state of the art irrigation system.

Another proposed project for the Kirtland AFB golf management staff is the relocation of the maintenance complex. The facility currently sits on the far west side of the property. The wash rack, which, according to the environmental staff, is the only approved location to wash any type of equipment. The golf equipment must be driven across the entire course to be washed or then return to the maintenance complex. In addition, the fuel tank for the same equipment is also on the east side of the property near the wash rack. The golf course management staff desires to relocate the maintenance complex near the wash rack and the fuel tank which just happen to be near the tree nursery and the new golf cart storage facility.

Driver/requirement

- National Environmental Policy Act
- AFI 32-7060, Environmental Impact Analysis Process

Objective
Ensure that all project proposals receive appropriate impact analysis well in advance of scheduled implementation of the proposed action.

Management approach
- Complete appropriate work request and impact analysis forms to ensure that environmental documentation is complete prior to taking any action
- Consult with installation impact analysis program manager at earliest possible time

Target
Initiate all projects by completing an AF Form 332 and AF Form 813 as soon as feasible.


The heart of the irrigation system at Tijeras Arroyo is the main pond near the 11th and 12th holes.

Tijeras Arroyo Golf Course Kirtland AFB, NM

Tijeras Arroyo Golf Course Kirtland AFB, NM

Pristine skies and clean air are the norm in Albuquerque.

Air quality

According to the INRMP, "Air quality at Kirtland AFB is a function of several factors, including the quantity and dispersion rates of pollutants in the region, temperature, the presence or absence of inversions, and topographic and geographic features of the region. The Albuquerque Environmental Health Department performs air quality functions in Albuquerque, and the Albuquerque-Bernalillo County Air Quality Control Board governs them. The 1990 amendments to the Clean Air Act (CAA) require federal agencies to conform to the affected State Implementation Plan (SIP) with respect to achieving and maintaining attainment of National Ambient Air Quality Standards and addressing air quality impacts. The CAA General Conformity Rule states that nonattainment and maintenance areas must conform to the applicable SIP. Kirtland AFB is covered by a Carbon Monoxide Maintenance Plan.

Kirtland AFB's mission-related air emissions are from training exercises, aircraft engine testing, activities related to aircraft refueling and maintenance, explosive ordnance disposal, fuel storage and distribution, and corrosion control activities. Non-mission related air emissions come from external combustion, internal combustion engines, and vehicle refueling and maintenance."

Driver/requirement

- Clean Air Act

Objective

Minimize or eliminate excessive emissions from golf course equipment, vehicles and equipment care.

Management approach

- Encourage employees to minimize their trips on and around the course
- Ensure equipment cleaning solution containers are closed at all times
- Eliminate all aerosols from maintenance and clubhouse inventories
- Replace 2-cycle powered equipment as funding and technology allow
- Prepare policy to alter maintenance staff work plans during announced regional air quality health alert days
- Discourage use of non-paved maintenance trails during extremely dry and windy conditions

Target

Perform scheduled annual engine overhauls and regular equipment maintenance as necessary to minimize or eliminate excessive exhaust emissions.

Implementation

Setting goals and objectives is an important step in the implementation of an installation's GEM Plan. Implementation is the single best evidence that the installation GEM team is working well together in their task of supporting the mission.

GEM Plan goals & objectives

Goals are defined as actions or results that should be accomplished in the next year.

- Post a map highlighting the identified environmental challenges for both employees and customers
- Deliver and document environmental training to all employees
- Establish, document and communicate fertilizer and pesticide application buffers to all appropriate employees

Objectives are defined as actions or results that are desired to be accomplished prior to the next INRMP update.

- Compile and implement Tree Management, Drought Management and Water Resource Management Plans for the entire facility
- Map the courses "hot spots" that require special care or attention
- Compile and begin implementation of a comprehensive Golf Course Development Plan
- Regularly monitor the quality of the course's irrigation water
- Ensure that only drought-tolerant native plant materials are used in developing the landscape
- Repair all degraded or damaged landscapes due to construction or maintenance of the course

GEM Plan best practices

Best practices are defined as any action, method, practice, or result that has proven its value and worth over time. The GEM program has been designed to create a body of scientific data to share with all U.S. Air Force installation golf and environmental staff members.

- Acquired license to specifically deal with primary nuisance species
- Utilized environmental restoration project to secure long term irrigation source

Tijeras Arroyo Golf Course Kirtland AFB, NM

Your descriptive caption here.

Conclusion

The Tijeras Arroyo Golf Course is under new management. The improvements are obvious to all. The snack bar is full for lunch. The course's greens are smooth as velvet and the number of rounds is up – in a down market! Hiring folks with energy and desire is really paying off. It is time for the rest of us to rally round and help these fine folks out. Take an afternoon and tee it up at Kirtland. It will be a great time spent.

Environmentally, the course is also in fine condition. Securing a long term water supply along with the establishment of new and better relationships with installation environmental managers are two great steps toward sustainability. The journey awaits. Let's get started!

The gallery

On the following pages are some of the more revealing photographs of challenges, maintenance practices, and other areas of the golf course facility.

CE Squadron/Services Squadron Environmental / Golf Staff

Burrowing owls provide a unique challenge.

The overall quality of the course is greatly improved.

Nitrate-laden waters fill the golf course ponds.

Wash rack is a recurring source of water quality concerns.

Poor drainage fronting the green and bunker hinder play.

Tree nursery success is questionable.

Battery-driven golf carts assist with air quality compliance.

Many natural areas occur throughout the course .

Maintenance complex provides minimal indoor storage.

Prairie dog war zone at the driving range.

Soils are eroding into the golf hazards/Well#7 ponds.

Emergent vegetation is showing up in the irrigation pond.

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AFCEE/TDN, 3300 Sidney Brooks, San Antonio, TX 78235-5112
afcee.td.awag@brooks.af.mil?subject=golf

Please visit our Golf Course Environmental Management Program website:
http://www.afcee.brooks.af.mil/ec/golf/

APPENDIX M

AVIAN BEST MANAGEMENT PRACTICES

Kirtland AFB Avian BMPs

(Adapted from Sandia National Laboratories)

1.0 Introduction

This document, describing avian best management practices for Kirtland Air Force Base (AFB). By reducing or avoiding the impact of Kirtland AFB activities on bird population, Kirtland AFB may minimize or eliminate the potential violation of the MBTA, and the possibility of any enforcement action.

The Migratory Bird Treaty Act of 1918 (MBTA) is the primary regulation for the protection of migratory birds in the U.S. Migratory birds in general includes all native birds in the U.S., except those non migratory species such as quail and turkey that are managed by individual states. Under the provisions of the MBTA, it is unlawful "by any means or manner to pursue, hunt, take capture [or] kill" any migratory birds except as permitted by regulations issued by the U.S. Fish and Wildlife Service (USFWS). The term "take" is not defined in the MBTA, but the USFWS has defined it y regulation to mean to "pursue, hunt, shoot, would, kill, trap, capture, or collect" any migratory bird or any part, nest or egg of any migratory bird covered by the conventions, or to attempt those activities.

The USFWS has developed a system of permits for specific types of activities that involve the take of migratory birds, including those governing scientific collection and bird banding, and lethal and non-lethal measure taken to prevent depredation of agricultural crops and to protect public health and safety. Existing migratory bird permit regulations do not authorize take resulting from activities such as forestry or agricultural operations, construction or operation of power lines, and other activities where an otherwise legal action might reasonably be expected to take migratory birds, but is not the intended purpose of the action. Birds that are trapped in buildings may be humanely captured, but must be immediately released into the wild, or if injured, transported to a permitted rehabilitator.

Under the provisions of the MBTA, the unauthorized take of migratory birds is a strict liability criminal offense that does not require knowledge or specific intent of the part of the offender. As such, even when engaged in an otherwise legal activity where the intent is not to kill or injure migratory birds, violations can occur if bird death or injury results.

2.0 Regulatory Drivers

The main driver for migratory birds in the U.S. is the MBTA (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755). The 1960 statute (Public Law 86-732) amended the MBTA by altering earlier penalty provisions. Public Las 99-645, the 1986 Emergency Wetlands resources Act, amended the MBTA to require that felony violations under the Act must be “knowingly” committed. Public Law 105-312 also amends the law to allow the fine for misdemeanor convictions under the MBTA to be up to $15,000 rather than $5,000.

While some courts have held that the MBTA does not apply to Federal agencies, in July 2000, the U.S. Court of Appeals for the District of Columbia Circuit ruled that the prohibitions of the MBTA do apply to Federal Agencies and that a Federal agency’s taking and killing of migratory birds without a permit violated the MBTA. On March 13, 2002, the U.S. District Court for the District of Columbia ruled that military training exercises of the Department of the Navy that incidentally take migratory birds without a permit violate the MBTA.

On December 2, 2002, the President signed the 2003 National Defense Authorization Act Section 315 of the Authorization Act provides that, no later than one year after its enactment, the Secretary of the Interior (Secretary) shall exercise authority under section 704(a) of the MBTA to prescribe regulations to exempt the Armed Forces for the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense or the Secretary of the military department concerned. All other Federal agencies must adhere to the MBTA.

Under Executive Order 13186, the USFWS issued Director’s Order 172 on Service Guidance to Conserve Migratory Birds (Appendix 1). Identify goals for Federal program activities, the USFWS highlighted the need to identify means and measures to avoid and/or minimize potential for take of migratory birds, eggs and active nests, including but not limited to (1) project modification, (2) time-of-year restrictions on vegetation clearing (3) avoidance of cavity trees, colonial bird nests, and other active nests, and (4) avoidance of nests of species of concern. The USFWS also seeks to ensure that environmental analyses of Federal activities under the National Environmental Policy Act (NEPA) or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, particularly on species of concern. The USFWS also called out the need for compliance with communication tower and power line guidelines and wind power guidelines as they are developed in project assessments.

3.0 Avian Best Management Practices

3.1 Roles and Responsibilities

3.1.1 Kirtland AFB Ecology Program

- Identify best management practices for projects and activities to reduce risks to migratory birds.
- Conduct National Environmental Policy Act (NEPA) project review.

- Prepare, maintain, and update Avian Bird Best Management Practices.
- Obtain permits as required by law.

3.1.2 Program or Project Managers

- Incorporate best management practices for protection of migratory birds into project planning and implementation
- Contact biological resources subject matter experts when directed to do so: Carol Finley (505) 846-0053 or Dustin Akins (505) 846-0226.
- Ensure impacts to migratory birds are considered when identifying environmental aspects and impacts of work activities and incorporate best management practices into procedures.

3.1.3 Work Force, Line Personnel, & Contractors

- Report occurrences of bird injury or mortality to Kirtland Air Force Base Natural Resources.
- Follow procedures as defined in their work documents.
- General sightings of birds can also be reported to Kirtland Air Force Base Natural Resources. Sitings or raptors (hawks, owls, etc.) would be particularly valuable.

3.2 Best Management Practices for Protection of Birds

The risks to birds found at Kirtland AFB includes: loss, alteration, or fragmentation of habitat; mortality resulting from collisions with building windows and guyed towers; collisions and electrocutions on power lines; the potential take of eggs and nestlings during project operations that disturb vegetation during the breeding season; and exposure of birds to contaminants. Many of the above risks can be mitigated.

3.2.1 Vegetation Disturbances

Where practicable, Kirtland AFB can try to avoid removal of vegetation during the nesting season. During the breeding season bird eggs and nestlings are vulnerable to inadvertent taking through disturbance vegetation causing the abandonment or destruction of nests. The peak of the breeding season for most species includes late March, April, May, June, July August and September.

Mitigation Measures for Vegetation Removal:

1. If only a small area (<1/2 ac [1/5 ha]) is to be disturbed between April 1st and August 31st, have a Kirtland AFB biologist survey the area for bird nests before beginning the project.
2. If a large area (>1/2 ac [1/5 ha]) is to be disturbed, avoid the removal of vegetation during the peak breeding season. Have a Kirtland AFB biologist survey the area for bird nests before beginning the project.

3. Do not mow shrubs, open fields, or other potential nesting areas between April 1st and August 31st without having a Kirtland AFB biologist survey the area first.
4. Avoid removing standing dead trees unless there is a hazard to workers. Have a Kirtland AFB biologist evaluate the area prior to removal.

3.2.2 Bird Collisions with Buildings and Windows

Birds hit human-made structures at any time, day or night. The annual mortality og birds resulting from window collisions in the U.S. is estimated to be between 97.6 and 975 million birds (Klern 1990, Evans 1996). Birds are easily deceived by and strike reflected images of habitat and sky on windows installed in the conventional vertical position. Lights on buildings or towers have been shown to cause mortality to flying birds.

Mitigation Measures for Building and Window Collision:

1. For new or remodeled buildings, install windows at an angle so that the pane reflects the ground instead of the surrounding sky and habitat.
2. Reduce the exterior reflectivity of windows by applying the window film CollidEscape (http://www.collidescape.citymax.com/page/page/6049375.htm, last accessed on 04.21.2011) or installing a permanent sunscreen over the window.
3. For buildings over two stories tall, turn off or dim lights near windows at night.
4. Program buildings' lighting systems to achieve a measurable reduction in night-lighting from 9PM to 6AM, or-ideally-ensure that all lights are switched off during that period.
5. Extinguishing all exterior vanity lighting (roof-top floods, perimeter spots, etc.) during migration periods (Fed 15th – May 15th and Aug 15th – Nov 30th).
6. When lights must be left on at night examine and adopt alternatives to bright, all-night , floor wide lighting. Options include installing motion-sensitive lighting, using desk lamps and task lighting, re-programming timers, adopting lower intensity lighting, reducing perimeter lighting, re-scheduling work and night cleaning, establishing interior working areas, and using blinds and curtains.
7. Report all observed bird mortalities and injuries. If the event is a collision with a building or window, identify the location so that problem areas can be indentified and rectified. Observed bird mortalities or injuries can be reported, to report occurrences of bird injury or mortality to TELCON, EOC or the Ecology Program.

The document, Bird-safe Building Guidelines (Brown and Caputo 2007), has many more design suggestions, mitigation, and case study examples fro reducing bird collisions (http://www.nucaudubon.org/home/BirdSafeBuildingGuidelines.pdf, last accessed 04/21/2011).

3.2.3 Tall Towers

The construction of new towers creates a potentially significant impact on migratory birds, especially the numerous species of birds that migrate at night. The US Fish and Wildlife Service (USFWS) has estimated that communications towers kill 4-5 million birds per year (shire et al. 2000), which violates the spirit and the intent of the Migratory Bird Treaty Act and the Code of Federal Regulations at Part 50 designed to implement the MBTA. The USFWS is focusing more attention on the birds collision issue and has considered action under the Migratory Bird Treaty Act. The known or suspected risk factors to birds are: Height of toer, Guy wires, Lighting, Weather, and Location.

Although most towers at Kirtland AFB are relatively short compared to many communications towers, the use of guy wires and lighting could still contribute to bird kills especially during spring and fall migration (Gehring et al. 2004).

The USFWS Interim Guidelines for Recommendations on Communications Tower Siting, Construction, Operation, and Decommissioning, last accessed on 4/25/2011. (http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html) has many recommendations.

1. Using construction techniques which do not require guy wires (e.g., use a lattice structure, monopole, etc.).
2. Report observed bird mortalities. Report occurrences of bird injury or mortality to Kirtland Air Force Base Natural Resources.
3. Retrofit old power poles that are identified as problems. Suggested Practices states that ''95 percent of all eagle electrocutions could be eliminated by correcting 2 percent of all the poles." Fabricated products are available to retrofit poles to make them unattractive for perching or to provide insulation to prevent phase to phase and phase to ground contact by birds. The bird electrocution Mitigation Website (http://bems.edmlink.com/, last accessed 04/21/2011) has online programs to assist in finding products to retrofit specific types of power poles.
4. Because of their large size, eagles are particularly susceptible to electrocution risks. Golden Eagles *Aquila chrysaetos* are known to occur at Kirtland AFB. Golden Eagles are currently protected under both the MBTA and the Bald and Golden Eagle Protection Act.

3.2.4 Environmental Contaminants

Birds at Kirtland AFB may be exposed to environmental contaminants that could affect individuals by reducing reproduction or survival. Many bird species concentrate their activities in areas containing water. Contaminants in soils may erode downstream and become concentrated within drainages. Metallic and organic compounds accumulate in aquatic sediments and also may accumulate or biomagnifies in the tissues of aquatic organisms.

Best management practices for contaminants should include the ongoing evaluation of ecological risks and the communication of any risks to management. Ecological risk assessment can then help prioritize future environmental remediation. Reducing or eliminating pesticide use also benefits migratory birds.

Mitigation Measures for Environmental Contaminants

1. Birds that are found with deformities or areas with high numbers of unexplained bird mortalities should be reported and investigated. Observed bird mortalities or injuries can be reported to Kirtland Air Force Base Natural Resources.
2. Proposed and current evaporation ponds that receive contaminated effluents should be evaluated for risk to bird species, Barn Swallows *Hirundo rustica* or Horned Larks *Eremophila alpestris*, which make heavy direct use of ponded waters and associated insects. If the ponds preent an unacceptable risk, they should be coved so that they are not available. Regular maintainence should be used to prioritize remediation activities.
3. Ecorisk assessments conducted for environmental remediation activities should consider impacts of contaminants to migratory birds most at risk. Information from these assessments should be used to prioritize remediation activities.
4. Use integrated pest management techniques to minimize the use of pesticides at Kirtland AFB.

4.0 Birds of Conservation Concern

Birds of conservation Concern identified by the USFWS and partners in Flight (PIF) Watch List Species (Rich eta l. 2004), and New Mexico Partners in Flight (Rustay et al 2007) that are known to occur at Kirtland AFB are found in the Table 4.1. The Partners in Flight assessment process is based on a series of biologically-based measures of conservation variety of measures or “vulnerability factors” are considered. Some of these are: breeding distribution, non-breeding distribution, and population size.

Continental and local declines in numerous bird populations continue to be a concern for the future of migratory and resident bird species. There are numerous factors that can lead to spatial and temporal changes in bird populations. Some of these factors are: natural events such as drought, floods, or normal successional processes, or the combination of natural events and human activities.teh cumulative effects of land use may become additive over time. All of these effects can create a rather difficult and usually complicated problem when trying to interpret data. An added difficulty is some birds are generalist and can be found in several different habitat types.

The following table list species of concern and the habitat types they are most associated with.

Table 4.1 Birds of Conservation Concern, PIF Watch List and New Mexico PIF that Occur at Kirtland AFB.

Species	Protected Status	Potential to Occur at Kirtland AFB	Primary habitats Used
Ferruginous Hawk	BOCC	High	DGL, DSL
Flammulated Owl	BOCC, NMPIF	Low	PJW, PPW
Burrowing Owl	BOCC, PIF WL, NMPIF, DoD PIF,	High	DGL
Gray Vireo	BOCC, NMT, PIFWL, NMPIF	High	SPJW
Bell's Vireo (migrant)	BOCC, NMT PIFWL, NMPIF	Low	-
Pinyon Jay	BOCC, PIFWL, NMPIF	High	PJW
Juniper Titmouse	PIFWL, NMPIF	High	PJW
Virginia's Warbler	BOCC, PIFWL, NMPIF	High	PJW,PPW
Grace's Warbler	BOCC, PIFWL, NMPIF	Moderate	PPW
Black-chinned Sparrow	PIFWL, NMPIF	High	ASL, SPJW, PJW
McCown's Longspur (winter)	PIFWL, NMPIF	Low	DGL
Swainson's Hawk	PIFWL, NMPIF	High	DGL
Prairie Falcon	BOCC, NMPIF	Moderate	Forages Widely DGL, DSL
Scaled Quail	NMPIF	High	DGL, DSL
Band-tailed Pigeon	PIFWL	Moderate	PPW
Northern Pygmy-Owl	NMPIF	Low	PJW, PPW
White-throated Swift	PIFWL	Low	Forages Widely
Black-chinned	NMPIF	High	SPJW

Hummingbird			
Broad-tailed Hummingbird	NMPIF	High	SPJW, PJW, PPW
Williamson's Sapsucker	BOCC, NMPIF	High	PPW
Red-naped Sapsucker	NMPIF	High	PJW,PPW
Cordilleran Flycatcher	NMPIF	Moderate	PJW,PPW
Cassin's Kingbird	NMPIF	High	SPJW,PJW,PPW
Loggerhead Shrike	BOCC, NMS, NMPIF	High	ASL, DSL, SPJW
Plumbeous Vireo	NMPIF	High	SPJW,PJW, PPW
Warbling Vireo (migrant)	NMPIF	Low	-
Western Scrub-Jay	NMPIF	High	SPJW, PJW, PPW
Western Bluebird	NMPIF	High	SPJW, PJW, PPW
Mountain Bluebird	NMPIF	High	SPJW, PJW, PPW
Crissal Thrasher	BOCC, NMPIF	High	DSL, PJW
Black-throated Gray Warbler	BOCC, NMPIF	High	PJW
Vesper Sparrow	NMPIF	High	DGL, DSL
Black-throated Sparrow	NMPIF	High	DGL, DSL
Sage Sparrow (winter)	BOCC, NMPIF	High	DGL,DSL
Lazuli Bunting (migrant)	NMPIF	Low	MOS,MER
Bullock's Oriole	NMPIF	High	Mature Elm Trees
Peregrine Falcon	BOCC, NMT, NMPIC	Moderate	DGL, DLS (forages widely)
Bank Swallow (migrant)	NMPIF	Low	(forages widely)
Sprague's Pipit (winter)	NMPIF	Low	DGL, DSL

Golden Eagle	BOCC, NMPIF	High	DGL, DSL
Northern Harrier (winter)	NMIF	High	DGL, DSL (forages widely)
Sage Thrasher (winter)	NMPIF	High	DGL, DSL, SPJW
Wilson's Warbler (migrant)	NMPIF	High	-
Red-faced Warbler	PIFWL, NMPIF	Low	-
Say's Pheobe	NMPIF	High	DGL, DSL, SPJW
Chihuahuan Raven	NMPIF	High	DGL, DSL, SPJW
Cassin's Sparrow	NMPIF	High	DGL
Olive-sided Flycatcher (migrant)	NMPIF	Low	PPW
Brewer's Sparrow (migrant)	PIFWL	High	DGL, DSL, SPJW
Short-eared Owl (winter)	PIFWL	High	DGL, DSL

BOCC= US Fish and Wildlife Service Bird of Conservation Concern; NMS=New Mexico Sensitive Taxa (Informal); NMT=New Mexico Threathened; PIFWL=Partners in Flight Watch List; NMPIF=New Mexico Partner's in Flight.

Low= Seen only once or twice or transients records from SNL, habitat marginal; Moderate = Habitat exists; the species is irecorded occasionally, has not been recorded breeding at SNL; High=Habitat exists and the species is recorded breeding and/or a regular winter resident at SNL.

DGL= Desert Grassland, DSL=Desert Shrubland, ASL=Arroryo Shrubland, SPJW=Scattered Pinyon-Juniper Woodland, PJW=Closed Canopy Pinyon-Juniper Woodland, PPW=Ponderosa Pine Woodland.

(winter)=species regularly occurs during winter months only.

(migrant)=species occurs only during spring or fall migration. Habitat type varies.

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APPENDIX N

SICK AND INJURED WILDLIFE PLAN
(Waiting for approval to be implemented)

Preface: Throughout the past, intermittent reports of sick/injured wildlife have been taken on Kirtland Air Force Base (AFB). For the most part, Kirtland AFB has not had any options for involvement when it comes to animals that have become sick or injured; outside Federal assistance is also not available. New Mexico Game and Fish, as well as the United States Fish and Wildlife Service and the United States Department of Agriculture Wildlife Services do not have the manpower to assist with our matters in a timely fashion and required payment for their assistance. The Security Forces Squadron on Kirtland AFB cannot assist either, as discharging firearms on the base is prohibited. Even if sick/injured wildlife could be put down with firearms, a suspect rabid animal would need to have its brain tissue intact for sampling.

377 MSG/CEANQ Natural Resources Program working with the Base Judge Advocate and base Veterinarian, have come up with the most feasible plan to address sick/injured wildlife.

Proposal: Train two natural resource biologists in chemical immobilization and euthanasia for field application. Chemical immobilization training will be accomplished through Safe Capture International Inc.; chemical euthanasia training will be accomplished with assistance from the base veterinarian.

Cost Estimates:

1 Person	
Air	$360.00
Lodging	$200.00
Training	$700.00
Meals	$240.00
Car	$120.00
Total	$1,620.00

The above costs were based on Safe Capture International Inc.'s training available September 10, 2012 in Dallas TX. It is estimated that training for two individuals will be approximately **$3,000**.

Risk Assessments:

Risk to Biologists Applying Techniques:

1. Cross-contamination resulting in human exposure to viral or bacterial disease
   Physical harm to biologist induced by specimen
   a. Animal responding adversely to sedation resulting in biting/scratching biologist

Risk to Kirtland AFB if immobilization and euthanasia are not practiced:

1. Sick/injured wildlife, whether diseased or not, pose a physical threat to pets and people in the area
2. Untreated rabid animals can spread rabies to domestic animals on base putting pet owners at risk of exposure to rabies
3. Untreated rabid animals can spread rabies off of base into communities adjacent to the Kirtland AFB
    a. Legally, Kirtland AFB is responsible for animals that reside on base
        i. E.g. packs of coyotes that den on base but travel off base to forage are still Kirtland AFB's responsibility
4. Failure to intervene in an injured wildlife situation can draw unwanted attention to the situation and result in legal intervention

1.0 Introduction

Kirtland AFB urban areas are surrounded in the east and south by large expanses of grasslands and forested areas. It is not uncommon for wildlife from the large undeveloped areas surrounding the urban areas of base to forage through or set up residence in the urban areas. There are numerous prairie dog colonies and desert cottontails that inhabit areas in the heart of Kirtland AFB, next to houses, facilities and roads. With a high abundance of small grazers living in the base interior, predators like badgers, raptors and coyotes have been drawn in as well.

With all of this wildlife activity going on near the populated areas of Kirtland AFB, there comes a risk. Wildlife are unpredictable when encountered; adding a human element can often times end poorly for the human and the animal. It is the responsibility the Kirtland AFB Natural Resources Program to manage wildlife occurring on Kirtland AFB. In the past coyote that have become ill have sometimes chosen to inhabit areas of high human traffic. While in the process of dying sick wildlife can be erratic and impulsive in behavior, this behavior coupled with close human proximity could result in more instances of people and their domestic pets being bit or harassed by wildlife.

1.5 Wildlife Diseases

Plague: Plague made its most notable appearance in the Middle Ages killing millions of people throughout Europe. Outbreaks still occur of the plague throughout the world and in North America. In 2011 two plague cases were reported for New Mexico and occurred in Santa Fe County. Plague is carried by fleas on rats, but the fleas infected with plague can move from host to host spreading the disease before they die. Although it does not occur often, there is always a chance that sick or injured wildlife could be afflicted by plague

Mange: Mange is caused by mites that live on skin and hair of mammalian hosts. For the most part, the mites only live on the skin until females lay eggs. When egg laying commences, the female burrows into the outer layer of skin, laying eggs along the way. Often times, animals with mange will exhibit physical changes like hair and weight loss. Bald patches on animals will be a good indicator of a prospective mange case. Mange can jump from one host to another if close contact has taken place.

Rabies: Rabies or rhabdovirus is carried and transmitted by mammals, and affects the central nervous system. As is with the plague, once clinical symptoms take notice, the virus is most always fatal. For the most part, rabies is spread through infected saliva, most likely delivered through a bite from an infected animal. The disease can be transmitted though through the air or cross-contamination of a mucous membrane.

2.0 Treatment of Sick and Injured Wildlife

Any form of wildlife that becomes sick or injured in the vicinity of humans immediately becomes a risk to human health and must be dealt with. Before the animal is assessed, the area where the animal has been observed will be cleared of people. Once natural resources has cleared the area, the animal will be physically assessed, from a safe distance, to determine its present state and overall health. If the subject animal is healthy, it will be "spooked" out of the area. If the subject animal is deemed sick or injured, chemical immobilization will take place. Natural Resource biologists, trained in field techniques, will administer the tranquilizers. Tranquilizing darts will be fired from a safe distance via an air rifle to immobilize the animal. Once the animal is immobilized, natural resource biologists will euthanize the subject animal. The Kirtland AFB veterinarian will train Natural Resource biologists in field application of pharmaceuticals for the purpose of euthanasia. Once the animal has been put down, biologists will determine, based on prior field observations, whether the animal may have been rabid or not. During field observations, biologists will use the attached Rabies Field Assessment sheet to determine whether the suspect animal was potentially rabid. If the subject animal is deemed to be rabid, natural resource biologists will send brain tissue samples to the State Epidemiologist (packing and shipping instructions attached). The only cost associated with sending the State Epidemiologist samples, is shipping and handling; analysis is completed free of charge.

NOTE before entering the field, appropriate PPE is always worn.

- Pants, down the over the footwear
- Footwear completely covering the foot
- Thick, leather gloves
- Safety glasses, if required for operation of air rifle

Direct Contact with Animal

- Because the biologists working with wildlife will come into direct contact with the animals, extra levels of PPE will be required

- Tyvek coveralls will be used to reduce the likelihood of plague/mange transmission from specimen to biologist
- Safety glasses and face mask will be worn when working with the specimen to avoid exposing facial membranes to contamination through body fluid transmission.
- Nitrile gloves worn when administering pharmaceuticals and working with the specimen

Decontamination Measures

- Once the specimen carcass has been contained and ready to be dropped at the biological waste dumpster (Bldg 20417); biologists will decontaminate themselves
    - (Considering both biologists have worn full PPE and come into contact with specimen)
        - While completely dressed in PPE use Lysol wipes and spray to completely cover all PPE on the biologist (make sure to use each other to cover each other completely with lysol)
            - At this point biologists are still in full garb and have completely wiped down with Lysol
            - First, remove tyvek suit and place in receptacle (tub, bucket, etc…)
            - Second, remove nitrile gloves and put in trash bag
            - Third, remove eye wear and face mask and place in receptacle
            - Fourth, remove boots and place in receptacle
            - Fifth, completely seal the receptacle
                - When biologist return from the field, PPE will be hung or laid out in and outdoor area, exposed to the sun for a few hours
                    - Exposing the items outdoor will eliminate viral residue (U.V. rays will destroy viruses) and air out the material

APPENDIX O
BURROWING OWL MANAGEMENT PLAN
(Waiting for approval to be implemented)

Burrowing Owl Management Plan for Kirtland Air Force Base

June 2012

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Kirtland Air Force Base Protection Plan Summary
For
Protection of the Western Burrowing Owl (Species of Concern)

1. Purpose: Outline communication strategy to identify impacts and conservation methods for
Western Burrowing Owls that may occur due to Kirtland Air Force Base (KAFB) Mission Activities.

2. Situation:

Background: The Western Burrowing Owl has been listed as a "Species of Concern" by the New Mexico Department of Game and Fish. They are protected under the "Migratory Bird Treaty Act of 1998 (MBTA). The MBTA prohibits any disturbance of migratory birds or their nests, unless approval is received from the US Fish and Wildlife Service (USFWS). Burrowing Owls are also protected under Department of Defense Regulation and Guidelines, including Integrated Natural Resources Management (AFI 32-7064) and Natural Resources Management Program (DOD Directive 4700.4). The Burrowing Owl Management Plan was developed to set guidelines for the protection of the species.

3. Assumptions:

- Identification of impacts to the Western Burrowing Owl by KAFB Workforce will prevent KAFB from being in violation of the MBTA.
- Identification of conservation methods in response to future impacts will prevent any interruptions in Mission related activities.
- Compliance with conservation methods may prevent KAFB from future listing of the Western Burrowing Owl and "designated habitat" by USFWS.

4. Goals and Objectives:

- Produce written documentation of impact s to the Western Burrowing Owl and conservation
methods for all internal and external audiences of KAFB.
- Improve existing habitat and incorporate areas that have adequate habitat structure that have no future plans of development into a network of restored grassland habitat for Burrowing Owls.
- Carry out and maintain a monitoring system for the Burrowing Owl populations and their habitat inside KAFB and provide artificial burrows as a mitigation tool.
- Encourage an educative program at different levels inside KAFB to provide the air force base community with the proper information about the Burrowing Owl's natural history and conservation needs.

5. Audiences:

- Air Force Personnel (active duty, civilians, contractors, retirees, Guard and Reserve)
- Tenant Organizations (AFRL, DTRA,)

6. Recommendations:

- Create a "Rules of Engagement" for Western Burrowing Owl protection and conservation
- Distribute "Rules of Engagement" document to Audiences and Tenant organizations on KAFB
- Publish articles in the base newspaper, The Nucleus, to inform internal audiences of Western Burrowing Owl presence and avoidance protocol.

7. Themes and Messages:

Theme: Protection and Conservation of the Western Burrowing Owl are tools that will comply with the Migratory Bird Treaty Act and New Mexico Game and Fish Departments roles and regulations.

<u>Messages:</u>

- The Western Burrowing Owl Management Plan has a series of actions proposed to manage the current population, as well as to enhance the habitat over time.
- Proposed base activities are likely to disturb an owl's nest site, it may be necessary to delay the proposed activity until the owl has finished breeding. If this is not possible, the owls must be relocated to a safer area.
- A 75-meter buffer is to be established around active nest burrows in areas with active construction projects. If this is not feasible, the nest site should be mitigated.
- Artificial burrows must be constructed in quality habitat on KAFB to replace Burrowing Owls burrows that have been destroyed during the mitigation process.

8. Themes and Messages:

Theme: The Western Burrowing Owl Management Plan provides for the physical protection and identification of nesting Burrowing Owl burrows.

<u>Messages:</u>

- For 14 years KAFB has been monitoring/trapping and banding the owl population. This process identifies areas of the base where Burrowing Owls nest. The nest sites are marked with pink flagging to make them easy to identify for the Grounds and Maintenance personnel.
- In areas of the base with high densities of Burrowing Owls signs were created to notify motor vehicle drivers. This action will help prevent owls from being hit by vehicles when flying across the roads.
- It is important to educate base residents and personnel of the presence of Burrowing Owls within the base boundaries. Fact Sheets and Brochures have been developed and are distributed throughout the base via "kiosks".

9. Themes and Messages:

Theme: A High Security site "KUMMSC" is a nesting site for Burrowing Owls and Prairie Dogs. Control of these species at "KUMMSC" is recommended.

<u>Messages:</u>

- Kirtland Air Force Bases Entomology Office enforces lethal control of prairie dogs within the KUMMSC boundaries. When prairie dogs are absent from an area Burrowing Owls will not return to the site. Burrowing Owls need fossorial species to provide them with burrows in order to nest.

10. Themes and Messages:

Theme: Prairie dog control within "no-tolerance zones" protects KAFB landscape areas. This process does have an impact on the Burrowing Owl Population.

Messages:

- Burrowing Owls are strongly associated with burrowing mammals such as Gunnison's prairie dogs; these burrows are necessary for protection and nesting efforts. On KAFB, Gunnison's prairie dogs have created all owl nest burrows.
- Due to lethal control of prairie dogs and development many of the Burrowing Owl nest habitat has been lost. Due to the close associations of the two species, the decline of the Burrowing Owl can be attributed in part to the decline of the prairie dog and predators on KAFB.
- On KAFB, efforts have been made to remove prairie dogs by fumigation and by relocation. Presently, prairie dogs are trapped in areas of low tolerance, and relocated into the landfill grasslands.

11. Themes and Messages:

Theme: Burrowing Owl Surveys and Monitoring provide the metric for success of Kirtland Air Force Base Burrowing Owl Management Plan.

Messages:

- In December of 2007, a Burrowing Owl Management Plan was developed to provide guidelines and conservation actions for the species. This Plan is due to be revised in 2013 and will address current decline issues and management strategies.

Introduction

Kirtland Air Force Base (KAFB) is located in a crucial position for wildlife, as its boundaries comprise quality desert grassland and prairie habitat with various stages of vegetation. This habitat is valuable for many species of birds and other wildlife that find this area attractive due the lack of human presence and disturbance.

On KAFB, the population of Western Burrowing Owls (*Athene cunicularia hypugaea)* has been studied since 1998. These studies have provided significant information about the breeding population and habitat usage.

During this period, and as a product of achievement of the military mission, drastic changes have occurred inside the base that have both benefited and negatively affected the Burrowing Owls. The impact that these alterations have had on the Burrowing Owl habitat has not been evaluated, and the solutions interposed have obeyed no standard, mainly due to the lack of appropriated guidelines. As part of effective ecosystem management, and to encourage management activities that protect Burrowing Owls, this management plan was created for KAFB.

A series of actions are proposed in this plan to manage the current population, as well as to enhance the habitat over time. By providing high quality habitat and stable prairie dog colonies, the population of Burrowing Owls using KAFB for breeding, stopover, or for wintering grounds will benefit.

Goals and objectives for maintaining a Burrowing Owl population on KAFB

The high quality of the habitat, the lack of pressure from agriculture, cattle grazing, or major construction development, coupled with a strong commitment from the Air Force Materiel Command, the Environmental Management Branch, and the Natural Resources Manager, provides enhanced potential for successful management of Burrowing Owls on KAFB. All the objectives and related actions included in this plan are designed to be long term and low cost to ensure Burrowing Owl presence on KAFB. The objectives of this plan include:

- Implement an array of management activities based on vegetation control, aimed at grassland restoration and prairie dog relocation within identified key areas to provide habitat space and structure for the Burrowing Owl population during their breeding season, for migration stopovers, and for wintering owls on KAFB.

- Improve existing habitat and incorporate areas that have adequate habitat structure that have no future plans of development into a network of restored grassland habitat for Burrowing Owls.

- Carry out and maintain a monitoring system for the Burrowing Owl populations and their habitat inside KAFB.

- Encourage an educative program at different levels inside KAFB to provide the air force base community with the proper information about the Burrowing Owl's natural history and conservation needs.

Population status

Burrowing Owls (*Athene cunicularia*) were once common breeders throughout western United States and Canada in prairies and desert grasslands. Burrowing Owls have now been extirpated from areas on the western, northern, and eastern periphery of their breeding range. In response to these declines, Burrowing Owls are federally listed by the United States Fish and Wildlife Service as a Species of National Conservation Concern (USFWS 2002), and listed as an Endangered Species in Canada.

Research shows populations of Burrowing Owls have declined in many states, including California, Arizona, New Mexico, Nevada, Utah, Colorado, Washington, Kansas, Nebraska, Minnesota, and Iowa. Burrowing Owls are listed as state endangered in Minnesota and Iowa, and are being considered or have been petitioned for state listing in California and Washington. In New Mexico, they are listed as a high responsibility species by New Mexico Partners in Flight (NMPIF 2003).

Declines in Burrowing Owl populations are documented throughout the West, including studies conducted in New Mexico (Arrowood et al. 2001, Holroyd et al. 2001, Murphy et al. 2001). New Mexico State University in Las Cruces documented a 71% decline in Burrowing Owls from 1993 to 2002 (Finley 2002). On Holloman Air Force Base in the Tularosa Basin near

Alamogordo, an 83% decline was documented from 1996 until 2002 (Finley 2002). By 2003, the population experienced a 100% decline (Bailey 2006). These general declines are similar to other Burrowing Owl populations in western North America.

The population of Burrowing Owls on Kirtland Air Force Base experienced a 69% decline from 1998 to 2003. From 2003 to 2007 the population showed some increase, but still has declined 35% from 1998 to 2007 (McDonnell and Cruz 2006).

Management status

Both federal laws and Department of Defense regulations and guidelines protect Burrowing Owls. Federal laws include the Migratory Bird Treaty Act, the Fish and Wildlife Coordination Act, the Sikes Act, and the Endangered Species Act.

Under the Migratory Bird Treaty Act (16 U.S.C. 703-712 et seq., as amended), it is unlawful to take, import, export, possess, buy, sell, purchase, or barter any migratory bird. Feathers or other parts, nests, eggs, and products made from migratory birds are also covered by this act. “Take” is defined as pursuing, hunting, shooting, poisoning, wounding, killing, capturing, trapping, or collecting. Nests of migratory birds, including Burrowing Owl burrows, receive year-round protection under the Migratory Bird Treaty Act.

Under the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the conservation of birds, as well as the vegetation upon which the birds are dependent, are given equal consideration with the development program itself. This Act considers the conservation of wildlife resources by prevention of their direct or indirect loss and damage due to proposed activity.

The Sikes Act, Conservation Programs on Military Reservations (16 U.S.C. 670 et seq.), authorizes the Secretary of Defense to carry out a program of planning for, and the development, maintenance, and coordination of, wildlife, fish, and game conservation and rehabilitation. The Secretary of each military department (Army, Navy, Air Force) shall manage the natural resources of each military reservation under the Secretary's jurisdiction, to the extent not inconsistent with the military mission of the reservation.

The Endangered Species Act (16 U.S.C. 1531 et seq.) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species.

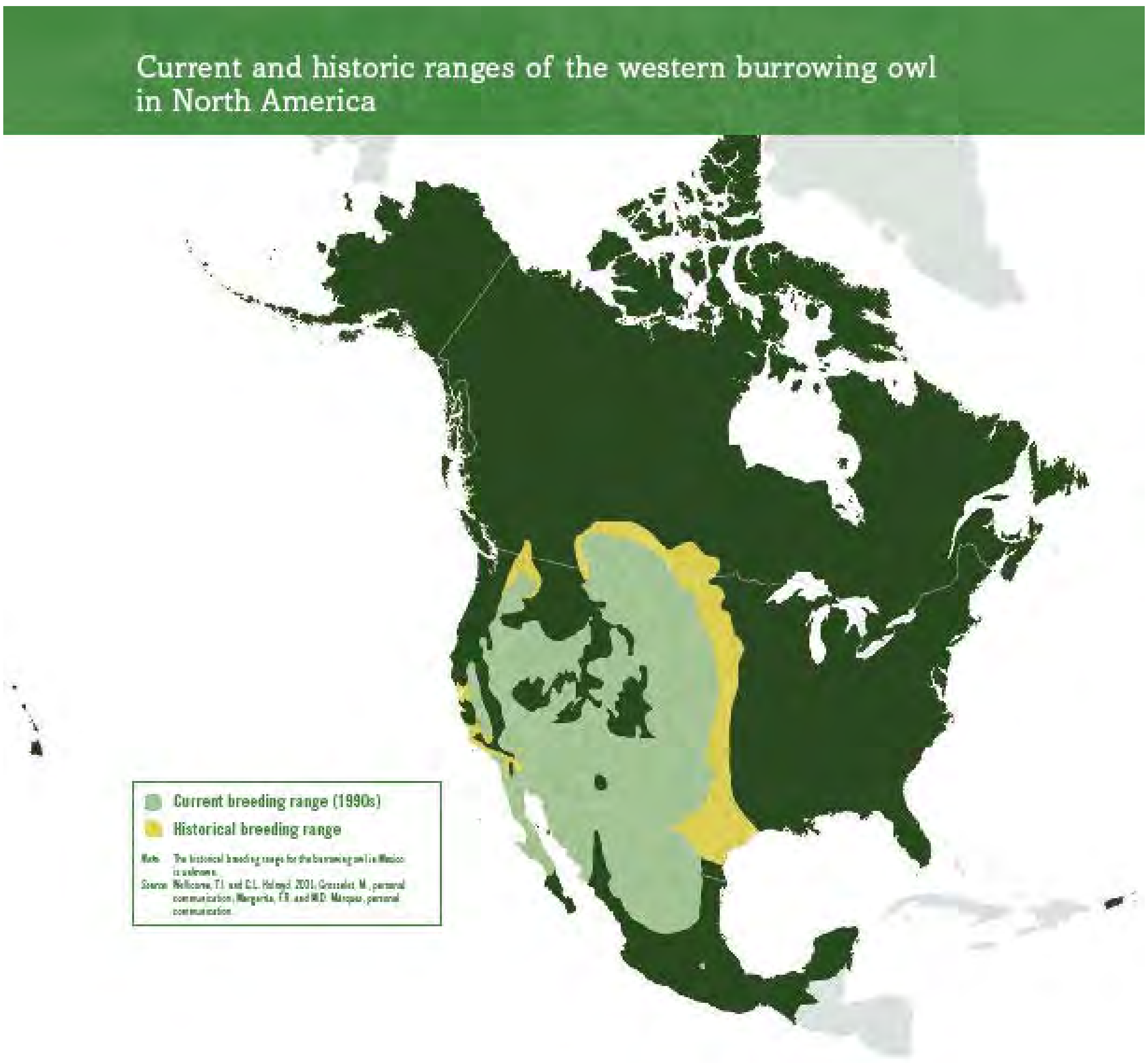
Burrowing Owls are also protected under Department of Defense Regulation and Guidelines, including Integrated Natural Resources Management (AFI 32-7064) and Natural Resources Management Program (DOD Directive 4700.4).

Natural history

Range

The breeding range of the Western Burrowing Owl extends from southern Alberta and southern Saskatchewan in Canada south through the western portion of the U.S. through central Mexico (Haug et al. 1993). The wintering range withdraws from the northern portion of breeding range. Winter range extends south through Mexico and Central America (AOU 1983). California, New Mexico, Arizona, and southern Texas are important wintering areas of Burrowing Owls in the U.S. (Haug et al. 1993).

Figure 1. Range of the Western Burrowing Owl (Canada 2005).



Habitat description

Western Burrowing Owls are small ground-dwelling owls of the deserts and prairies. They inhabit dry, open, short-grass, treeless plains of western North America (Haug et al. 1993). These include grasslands, steppes, deserts and prairies ranging from south central Canada to central Mexico. These owls have adapted to human environments by also occupying such urban and semi-urban environments as agricultural fields, golf courses, airports, and residential areas (Haug et al. 1993). Burrowing Owls often form loose nesting or wintering colonies, and are found in an elevation range that extends from sea level around sand dunes or coastal plains to 2900 meters above sea level in prairies of the Mexican high plateau (Howell 1995, McDonnell and Cruz 2005b).

In New Mexico, Burrowing Owls are associated with certain plant communities. These include desert grasslands dominated by various annual and perennial grasses and shrubs such as snakeweed (*Gutierrezia sp.*), rabbitbrush (*Chrysothamnus naoseosus*), four-wing saltbush (*Atriplex canescens*), Russian thistle (*Salsola kali*), yucca (*Yucca spp.*), and prickly pear (*Opuntia spp.*) (Martin 1973, Botelho and Arrowood 1996, McDonnell and Cruz 2006).

Nesting habitat varies according to geographic location, but in most areas, there are numerous similarities. Burrowing Owls inhabit ground cavities, but do not excavate these cavities themselves. Therefore, they rely on other burrowing mammals to dig the burrows they will later occupy. Some of these mammals include black-tailed prairie dogs (*Cynomys ludovicianusi*), Gunnison's prairie dogs (*Cynomys gunnisonii*), American badgers (*Taxidea taxus*), ground squirrels (*Spermophilus spp*.), rock squirrels (*Spermophilius variegates*), kangaroo rats (*Dipodomys spp.*), foxes (*Vulpes spp*.), and coyotes (*Canis latrans*). Burrowing Owls in New Mexico are closely associated with prairie dog colonies (Desmond et al. 1995). When available, these prairie dog towns are preferred habitat (Butts and Lewis 1982).

Generally, owls select nest sites in open areas with nearby nest and alternate burrows (Martin 1973). These sites can be situated in open ground or in cliff walls or drainage walls (Coulumbe 1971, Haug et al. 1993, Plumpton and Lutz 1993, Botelho and Arrowood 1998). Burrowing Owls select open areas with a high percentage of bare ground surrounding their burrow openings, relatively high nearby perches for hunting and predator detection, and a lower percentage of grass cover (MacCracken et al. 1985, Green and Anthony 1989). This seems to aid in predator detection by increasing horizontal visibility (Coulumbe 1971, MacCracken et al. 1985). In addition, dense grass cover may impede the movements of prey species (Green and Anthony 1989).

Foraging habitat is similar to breeding habitat, and generally occurs in short grass, mowed or grazed pastures, agricultural fields, and other semi-urban environments (Coulumbe 1971, Butts 1973, Johnsgard 1988). Foraging habitat of one pair may overlap with that of another pair (Coulumbe 1971, Johnsgard 1988).

On KAFB, Burrowing Owl habitat includes natural prairies dominated by ring muhly (*Muhlenbergia torreyi*) and blue gramma (*Bouteloua gracilis*) grasses that occur in the landfill grassland area and horse stable vicinity, and snakeweed and ring muhly grass dominate the Cantonment and Club Road areas. On KAFB, Gunnison's prairie dogs create all of the occupied burrows. The elevation remains around 1500 meters, and the landscape is mostly flat although there are gentle slopes around the landfill grassland.

Habitat requirements

Burrowing Owls have some specific habitat requirements, although they have proven to be adaptable if their habitat structure changes. The principal aspect for suitable habitat for this species is always that of short vegetation in flat regions with availability of burrows or similar structures. In New Mexico, they primarily inhabit mixed grass-shrub-barren ground vegetation type better known as desert grasslands. This habitat is commonly found in the basins and valleys around the hills and mountain ranges of southwestern North America.

Although the desert grasslands are vast in New Mexico, this habitat type is highly fragile. The closely related plant species are constantly changing, very much dependent on the water resources. The grasslands are composed of shrubs and grasses dispersed in a mosaic that responds to the natural influence of climate factors, such as rainfall in summer and winter, and human induced actions, such as cattle grazing and development. The desert grasslands, therefore, are in constant modification and fragmentation due to the difference in coverage by grasses and shrubs (McClaran 1995).

In New Mexico, and more specifically on KAFB, the vegetation may vary from different proportions of grass/shrub association to one or the other group's domination of the landscape. Since this is a constantly changing environment, the landscape may vary drastically within a few years.

Since Burrowing Owls prefer flat open areas with short vegetation and available burrows, these owls are often seen sharing abandoned fields, channels, parks, or other open areas around cities, areas with crops, and rangelands. They also inhabit many types of 'artificial habitats', such as airfields, parking lots, sports fields, and golf courses.

Because they do not excavate their own burrows, they rely on burrowing mammals for natural burrows, and where there is a lack of these, they may use other structural crevices or holes to substitute for natural burrows. Nevertheless, the preferred habitat is natural prairies and desert grasslands, where prairie dog colonies are located. If prairie dogs do not exist in an area, owls may occupy burrows created by other burrowing mammals such as ground squirrels, rabbits, badgers, and desert tortoises.

The landscape often plays a secondary role, but is always that of open or semi-open areas with short to mid size vegetation. The topography can be flat or somewhat hilly with creeks and drops but rarely mountainous, although they will use the flatter sides of the foothills.

Site fidelity

Burrowing Owls often return to the same breeding grounds, territories, or nest burrows (Martin 1973, Rich 1984, Belthoff and King 1997). On KAFB, every year there are owls that return to the same nest burrow or to nearby burrows. Since trapping began on KAFB in 1997, 80 owls banded on KAFB have returned to breed following years (Table 1).

Table 1. Number of banded Burrowing Owls from 1998 to 2007 that returned to Kirtland Air Force Base, Albuquerque, New Mexico; the proximity of their return to previously used burrows measured in meters (m) or kilometers (km).

Year	Same burrow	Within 50m	Within 100m	Within 300m	Between 400m - 8km	Unknown distance	Total
1998			5				5
1999			7		8		15
2000			1	2		1	4
2001			2		1	2	5
2002	1			1	3	3	8
2003		2		1	3	2	8
2004	2	1	1	1	3		8
2005	1	1	1		2		5
2006	3		1	3	5		12
2007	1		2	2	1	4	10

Prey

Burrowing Owls consume a wide range of prey. They forage mostly on arthropods, mainly Coleoptera and Orthoptera, but they will prey on small mammals, small and medium sized birds, and small amphibians and reptiles when they are present. Although the Burrowing Owl is a small nocturnal bird of prey (ca. 150 g), they can take prey species close to their size.

On KAFB, 93% (observed in 2006) to 98% (observed in 2005) of the diet is insects, including beetles, moths, and grasshoppers. The remaining prey is composed of small mammals such as mice, shrews, and kangaroo rats, and bird species such as sparrows, larks and doves (McDonnell and Cruz 2005a, 2006).

Research on KAFB has provided information on the quantification of the prey delivered at nesting burrows. Nevertheless, the prey items seem to vary from year to year depending on habitat variations and climate factors.

Important areas of KAFB for nesting Burrowing Owls

After ten years of monitoring Burrowing Owls on KAFB, there is sufficient information to identify key areas for breeding owls. With the use of the Geographic Information System (GIS), maps were created to delineate breeding owl territories from 1998-2007 (Maps 1-11).

The identified areas are important in terms of managing the landscape structure throughout the year, as well as ensuring the permanence of the prairie dog colonies or artificial burrow structures in the same identified areas.

Distribution of owls from 1998 to 2007

The available owl habitat on KAFB was broken down into nine different areas to compare habitat use from year to year. Over time, there have been some changes in habitat usage, mainly because of development or prairie dog control, but other areas of the base are used consistently every year (Table 2).

Table 2. Number of breeding pairs recorded in different areas of Kirtland Air Force Base, Albuquerque, New Mexico from 1998-2007.

	Fitness Area	Randolph Avenue	Cantonment Area	Gibson Gate	Club Road	Landfill Grasslands	Peace-keeper	Golf Course	Horse Stables
1998		9	12	5	20	2	4		
1999	3	6	11	7	18	3			
2000		6	15	1	9	2			
2001	2	3	7		7	1			
2002	2	1	15	1	3				
2003	1	1	11		2	1			
2004	1	1	12		3	2			
2005	1	1	19		2	1			
2006	1	2	22		4	10			2
2007	1	2	12		3	6		1	9
Total	12	32	136	14	71	28	4	1	11

Fitness Area

The Fitness Area is defined as the area around Doris Street and Aberdeen Avenue between the Truman Gate and the Carlisle Gate. This area has low owl use but consistent use from year to year. Owls have been observed foraging in the fields around the Truman Gate and the sports fields to the west. Problems with these habitats include low tolerance for prairie dogs around the sports fields and a new building built in 2007 in an owl territory used from 2001-2007 between Randolph Avenue and Doris Street.

Randolph Avenue

This area is defined as the section of Randolph Avenue that runs east to west between San Mateo Boulevard and Randolph Avenue that runs north to south. This area was heavily used by the owls from 1998-2000 until prairie dog control began in the area. Owls benefited from the open fields and lights of Bullhead Memorial Park. Since 2000, owl utilization of this area has been low.

Cantonment Area
The Cantonment Area is defined as the fields between north/south running Randolph Avenue and Wyoming, and M Avenue to the north and Pennsylvania to the south. This area has historically been a successful area for breeding Burrowing Owls. Every year this area has been important habitat, and is becoming increasingly more important when compared to the total number of breeding owls. The percentage of the population that uses the cantonment area has been increasing in recent years (Table 3), as other historic habitat becomes unavailable for owls. Problems for owls in this area have included predators (such as snakes, badgers, coyotes, and raptors), collisions with vehicles, and vandalism by humans.

Table 3. Comparison of important areas for Burrowing Owls on Kirtland Air Force Base, Albuquerque, New Mexico by means of number of breeding pairs and the percent of total breeding pairs using each area from 1998-2007. The last column, total breeding pairs, includes pairs from areas other than the targeted areas listed in this table.

	Randolph Avenue		Cantonment Area		Club Road		Landfill Grasslands		Total Breeding Pairs
	# pairs	% of total	# pairs	% of total	# pairs	% of total	# pairs	% of total	
1998	9	17	12	23	20	38	2	4	52
1999	6	13	11	23	18	38	3	6	48
2000	6	18	15	45	9	27	2	6	33
2001	3	15	7	35	7	35	1	5	20
2002	1	5	15	68	3	14	0	0	22
2003	1	6	11	69	2	13	1	6	16
2004	1	5	12	63	3	16	2	11	19
2005	1	4	19	79	2	8	1	4	24
2006	2	5	22	54	4	10	10	24	41
2007	2	6	12	35	3	9	6	18	34

Gibson Gate
The Gibson Gate area is defined as the area north, east, and just south of the Gibson Gate. Owl pairs used this area from 1998-2002, but from 2003 to the present, no owls have bred in this area.

Club Road
The Club Road area is defined as the area east of Wyoming, north of F Street, northwest of the Eubank Gate, and north and south of Club Road. This area in the northeast corner of the base historically has been a popular location chosen by breeding Burrowing Owls. This area was heavily used by owls from 1998-2001, when there was an abundance of available burrows and prairie dogs in the area that is now the new housing development. Three factors may be involved in the decline of owls in this area, drought, development, and prairie dog control (Carol Finley, pers. comm.). Since 2001, some owls have bred in the remaining habitat north of Club Road and east of Family Camp.

Landfill Grasslands
This area is defined as the region northeast, east, and southeast of the landfill, out to the base of the Manzanita Mountains. Comparison of this area is complicated as historically pairs were monitored along the north base border (near Four Hills). In recent history, it is known that owls have bred here, but this area has not been monitored or included in analysis, as it is DOE property. Owl usage from 1998-2001 occurred in the Four Hills area, with owl colonization of the area to the south beginning in 2003, and reaching its peak in 2006 following the wildfire in this area. In the landfill grassland area, there is minimal human disturbance and an abundance of prey, making this area highly important for the Burrowing Owl population. Prairie dogs are relocated into this area from areas of low tolerance for prairie dogs on KAFB, increasing the prairie dog colony size here and the amount of maintained burrows. This area may hold increasing importance in future years, with rising pressure from development and prairie dog control occurring in other owl habitat on KAFB.

Peacekeeper
This area encompasses the Peacekeeper Challenge Course southeast of the golf course. Although this area has short vegetation and many burrows, it was only used by breeding owls in 1998 and not since.

Golf Course
The Tijeras Arroyo Golf Course has only hosted one breeding owl pair (in 2007). This area has short, maintained vegetation, and due to watering, an abundance of prey. Although the 2007 pair was very productive (producing eight fledglings), there was evidence of poison found around the owl burrow. This issue is under investigation.

Horse Stables
Beginning in 2006, owls began using the area inside the horse stables fence to breed. In 2007, the stables were closed, and the lack of disturbance encouraged an increase in breeding owls, second only to the cantonment area that year.

Factors influencing the Burrowing Owl population on KAFB

Factors potentially limiting the population size on KAFB

The density and height of vegetation in some areas limits the utilization of existing burrows by Burrowing Owls. Burrowing Owls require short grass prairies, and therefore are found in areas of KAFB that fit this requirement. For example, owls commonly utilize the cantonment area because the fields are mowed annually for aesthetic purposes, keeping the vegetation short. As high as 79% of breeding pairs have been located in the cantonment area (Table 3). Another example is the 2005 lightning strike that caused a fire that burned 700 hectares of land in the landfill grasslands area, clearing the area of the tall grass cover that historically deterred the owls from selecting this area for breeding. Owls bred and dispersed into this area the following year in unprecedented numbers. In 2005, only 4% of breeding pairs were found in the landfill grasslands. In 2006, after the fire, 24% of breeding pairs utilized this area (Table 3). Other areas of KAFB may look appropriate for owls in that there are large flat prairies that are underutilized by the base mission, but if the ground cover is not low in height and absent of other dense vegetation, owls will not utilize the area.

Prairie dog distribution will also limit the areas available for owls. As owls depend on the prairie dogs to dig and maintain their burrows, they will not be located in areas apart from the prairie dog colonies. Prairie dog populations have been declining nationwide, and historically on KAFB, prairie dogs have been removed from undesirable locations by poisoning. Currently, in areas with no tolerance for prairie dogs, the prairie dogs are trapped and relocated into the landfill grassland area by the Natural Resource Manager. Besides maintaining burrows, prairie dogs will also help keep the vegetation low, and their alert calls aid owls in detecting predators (Hoogland 1981). Some areas of KAFB contain old burrows, but without a current prairie dog population to maintain these burrows, owls will not be found there.

Factors benefiting the population on KAFB

Because of the healthy prairie dog population in some areas, habitat availability and the availability of nesting burrows on KAFB are high in these areas. Although the Burrowing Owl breeding distribution has varied from year to year, consistent successful use by breeding owls has occurred every year in certain areas of the military base (Maps 1-11). Several historic territories are no longer available for owls due to development or prairie dog control, but other areas have only recently begun to be utilized by the owls, including the landfill grasslands and horse stables. These new habitats combined with the available historic habitats represent significant potential for future breeding owls.

According to studies and observations from recent years, the availability of prey on KAFB is high (McDonnell and Cruz 2005a, 2006). Historically, this was not always the case, and possibly this was related to drought. In New Mexico, the desert grassland vegetation is a constantly changing environment, and the vegetation may vary and change drastically within only a few years, influencing the prey composition from year to year as well. The last few years on KAFB have shown an increase in precipitation, which should have a direct affect on the arthropods and other prey. Observations have shown that different areas of the base present different concentrations of prey species due to the differences between the vegetation structure and habitat quality.

Some human disturbances found elsewhere will not occur on KAFB, such as agriculture or cattle grazing. Although the results vary as to whether these human activities are harmful for Burrowing Owls, they are disturbances to natural grassland habitat. KAFB represents an area of high value for owls by not presenting any of these activities, especially when compared to the Albuquerque valley and surrounding areas, where agriculture and grazing, as well as development, are the major factors for habitat loss.

Research protocols

Surveying

Breeding surveys for Burrowing Owls should be conducted from March to June to determine the amount and location of owls breeding on KAFB. Owl pairs should be monitored from May to August to determine productivity. A standardized survey protocol must be followed, in order to allow for comparisons from year to year and to determine trends. The New Mexico Burrowing Owl Working Group has established survey guidelines that should be followed (Appendix A).

Dispersal surveys should be conducted from August to October to gather information on the movements and habitat usage of the adult and juvenile owls inside the military base. Previous surveys indicate that juvenile owls may gather once the adults have left the breeding grounds (McDonnell and Cruz 2005a, 2006). These congregations of juvenile owls were in different locations after the 2005, 2006, and 2007 breeding seasons, and not necessarily in breeding locations from that year. In order to prevent conflict between dispersal owls and the military mission and base community, it is important to identify all areas of owl usage within the base boundaries.

Migration surveys are also important between February and March as well as between October and November. Observations have shown that KAFB represents a very valuable habitat for migrating Burrowing Owls that use the base as stopover areas during both spring and fall migration periods.

Winter surveys should cover the gap between migration seasons (December through February). This fieldwork is intended to gather information on the winter population of owls. Observations show that this small population is composed of owls that bred on KAFB, but may also include individuals from elsewhere. Therefore, the benefit of providing these wintering owls (as well as the stopover individuals) with adequate habitat goes beyond the KAFB breeding population.

Prey surveys

Actual prey availability may be determined by carrying out prey studies, with sampling stations set up in different key areas of the base where owls have been nesting, stopping over, and overwintering. With the collected information, habitat quality for Burrowing Owls and other grassland wildlife may be more readily determined. Prey base surveys could provide valuable information about prey taken compared to prey available. Also, this could help us understand the relationships between the habitat and climate variables.

Trapping and banding

A trapping and banding initiative is necessary to determine site fidelity. This initiative has aided in recognizing individuals during the breeding phase and during dispersal and migratory movements within the base boundaries. Banding may also be equally valuable to retrieve information from owls that were banded inside the base and recovered elsewhere, giving us an opportunity to determine more about owl movement.

Table 4. Schedule of main research actions and the months the actions should be carried out.

Actions	J	F	M	A	M	J	J	A	S	O	N	D
Breeding Surveys			x	x	x	x						
Pair Monitoring					x	x	x	x				
Prey Studies	x	x	x	x	x	x	x	x	x	x	x	x
Banding	x	x	x	x	x	x	x	x	x	x	x	x
Dispersal Surveys								x	x	x		
Migration Surveys		x	x							x	x	
Winter Surveys	x											x

Mitigations

Because of the above listed laws, regulations, and guidelines, as well as the Burrowing Owl's federal status as a species of management concern, if Burrowing Owls are located in areas of KAFB where there will be construction or in areas where their presence will adversely affect the base mission, the owls must be mitigated. If proposed base activities are likely to disturb an owl's nest site, it may be necessary to delay the proposed activity until the owl has finished breeding and left the area. If this is not possible, the owls must be relocated to a safer area. The Natural Resource Manager must be contacted, as well as the US Fish and Wildlife Service for proper permits, and the guidelines below should be followed.

A 75-meter buffer should be established around active nest burrows in areas with active construction projects. If this is not feasible, the nest site should be mitigated. If fumigation is to occur within 300 meters of owl locations, the owls should be mitigated.

If owls must be mitigated, they must first be monitored to determine breeding status. Different actions may be proposed to rectify the situation. If suitable owl habitat that will not be disturbed is near the nest site, passive relocation may be used. In this method, owls are encouraged to move to a safe burrow by installing a one-way door in the burrow to be destroyed so owls can get out but not back in. Other natural or artificial burrows must be provided or made available nearby for the owls to use.

If safe habitat is not available nearby, owls may be trapped and relocated to a soft release cage that contains an artificial burrow in the landfill grasslands. This area has proven to be excellent habitat for both breeding and foraging Burrowing Owls.

The entire owl family should be relocated into the soft release cage. The adult owls should be trapped and banded, and a nest camera should be placed into the burrow to determine if eggs are present. If there are eggs, the burrow must be dug out and the eggs removed and placed into the artificial burrow nest chamber. If there are young, the young must be trapped and banded. Both adults and young should immediately be released into the soft release cage for a three-week period.

Owls should be fed one mouse per adult and one mouse per chick per day while in the soft release cage. After the three-week period, one side of the release cage may be opened to allow the owls to feed on their own. The amount of mice fed per day should decrease until no mice are being fed at the end of the fourth week. The owls should be monitored for another two weeks to ensure they are feeding on their own and functioning normally.

Chemical use

Due to the lack of agriculture activities inside and around the boundaries of KAFB, pesticide exposure is likely rare while owls are on their breeding grounds. Although herbicides are commonly used inside the base, they are only used to control weeds around buildings. Nevertheless, evidence of sprayed chemicals was found around an active owl burrow (burrow 160, Cruz and McDonnell, pers. obs.).

During the 2007 breeding season, an issue arose with the owl family nesting on the Tijeras Arroyo Golf Course. Observations confirmed poisoned grains profusely spread around the burrow area (Carol Finley, John Pike, Cruz, McDonnell, pers. obs.). It was common knowledge and readily observed by golfers and staff that Burrowing Owls were nesting there. The distributor of the poisoned grains was unknown. This issue is still being investigated.

Studies will be carried out during the 2008 breeding season to determine the levels of organophosphates and organochlorines in the blood of Burrowing Owls that breed on KAFB. Measures will be pending upon the results of the sampling and analysis process.

The importance of prairie dogs to Burrowing Owl ecology

Creation of burrows for Burrowing Owls

One factor of critical importance for the Burrowing Owl is the availability of burrows (Coulumbe 1971, Haug et al. 1993). The western Burrowing Owl does not create its own burrow, and depends on burrowing mammals to excavate its nest site (Stewart 1975, Desmond 1991, Sidle et al. 1998). Therefore, Burrowing Owls are strongly associated with burrowing mammals such as Gunnison's prairie dogs, black-tailed prairie dogs, American badgers, ground squirrels, rock squirrels, kangaroo rats, foxes, and coyotes. These burrows are necessary for protection and nesting efforts (Thompson 1971, Haug 1993).

In New Mexico and elsewhere, Burrowing Owls are closely associated with prairie dog colonies (Butts and Lewis 1982, Plumpton and Lutz 1993, Desmond et al. 1995). On KAFB, Gunnison's prairie dogs have created all owl nest burrows. When available, Burrowing Owls choose prairie dog burrows disproportionately to their availability (Butts and Lewis 1982). However, prairie dog populations have decreased as much as 98% nationwide since 1900, as a result of habitat loss, eradication programs, and plague (Miller et al. 1994).

Researchers have suggested that the absence of available nest burrows may result in owl population declines. Due to the close associations of the two species, the decline of the Burrowing Owl can be attributed in part to the decline of the prairie dog (Arrowood et al. 2001).

Prairie dog control methods and the impact on Burrowing Owls

Removal of prairie dogs from colonies may result in the deterioration of burrows and encroachment of dense vegetation (Butts 1973). Burrows may already be unusable by owls only one year after a prairie dog control program has been put into place (Butts 1973). The nesting success of Burrowing Owls is positively influenced by active prairie dog colonies in the immediate vicinity of owl nests (Desmond and Savidge 1999).

On KAFB, efforts have been made to remove prairie dogs by fumigation and by relocation. Prairie dog control has caused the decline of nesting owls from the Randolph Avenue area and the Club Road area (Carol Finley, pers. comm.). The prairie dog population is under current management by the Natural Resource Manager. Presently, prairie dogs are trapped in areas of low tolerance (mainly around Randolph Avenue), and relocated into the landfill grasslands.

Impacts for Burrowing Owls of expanding prairie dog colonies

The prairie dog colony is currently localized in the west flank of the landfill grasslands of KAFB. With more prairie dogs relocated into this area, the prairie dog colony will expand, the vegetation will be kept shorter, and prey levels will increase, opening up more habitat for Burrowing Owls.

As prairie dogs are primarily herbivorous and selective in their diet, they keep the vegetation short by grazing on grasses and forbs. Prairie dog foraging affects the entire area of their colony (Whicker and Detling 1988a). In a study in Oklahoma, prairie dogs maintained openness by clipping off vegetation that exceeded 15-20 cm in height (Butts and Lewis 1982). Prairie dogs rarely allow shoots to reach full size, and therefore canopy height (5-10cm) within a colony is generally less than half of any nearby, uncolonized grassland (20-30cm) (Archer et al. 1987, Whicker and Detling 1988b). Because of prairie dog grazing, above ground plant biomass on their colonies is typically maintained at one-third to two-thirds of the above ground biomass on adjacent uncolonized areas (Whicker and Detling 1988b).

Prairie dog grazing also has been observed to change the plant species composition within the colony (Agnew et al. 1986, Archer et al. 1987). Over time, short grass species and annual forbs replace mid-height or tall grasses, and this contributes to a reduced canopy height (Whicker and Detling 1988a). Also, intensive grazing by prairie dogs may shift the dominance to dwarf morphs of plant species that may be more grazing tolerant or simply be less intensively grazed than the taller morphs (Jaramillo and Detling 1988).

The shorter vegetation also supports populations of arthropods (Butts and Lewis 1982). Prairie dog ecosystems support higher numbers of small mammals and arthropods compared to surrounding grasslands without prairie dogs (O'Meilia et al. 1982, Agnew et al. 1986, Miller et al. 1994). The strength and ecological value of the habitat for Burrowing Owls is increased with augmentation of their main prey species.

Management plan for prairie dogs on KAFB

Because of the close ecological relationship between prairie dogs and Burrowing Owls, the creation of a management plan for prairie dogs on KAFB is strongly recommended. This plan should emphasize both maintenance of colonies in existing areas and alleviation programs in areas that prairie dogs are not tolerated. Other issues to be addressed include an evaluation of the success of prairie dog relocation, and an evaluation of new areas of KAFB that are suitable for establishing new prairie dog colonies. The requirements of prairie dogs as well as existing infrastructure and future development plans of the base should be taken into account in these evaluations. By increasing the prairie dog population over time, the return of the native grassland ecosystem is encouraged, and the future of appropriate habitat for Burrowing Owls is ensured.

Vegetation control and grassland restoration

Fire in desert grasslands

Desert grasslands are highly dependant on fire. Historically, fire played a major role in shaping and maintaining grasslands (Wright and Bailey 1982). Fire was once common in most desert grasslands. Fire interacts with drought, insects, rodents and other browsers/grazers, topography, and disease to restrict woody plant establishment (Wright and Bailey 1982).

Without periodic fire, grasslands gradually revert to dominance by woody plants (McPherson 1995). Fire may virtually eliminate grass cover in the short term but enhance grass cover over the long term by killing woody plants (McPherson 1995). In areas burned every five to ten years, woody plants are uncommon and scattered, while woody plants dominate many areas that have not been burned for at least twenty years (McPherson 1995). Controlled and managed fires should be considered by KAFB to maintain their desert grasslands.

Use of the landfill grasslands by Burrowing Owls

Burrowing Owls require open, short vegetated grasslands. As development and low prairie dog tolerance cause former owl breeding habitat on KAFB to disappear, the open, low-use space of the landfill grasslands becomes more attractive for future owl management.

The major problem with the habitat condition of the landfill grasslands is the height of the vegetation. Historically these grasslands have been underutilized when compared to the other habitats of the base. The winter precipitation, spring rains, and summer monsoons, as well as the lack of grazing and fire disturbance, cause heavy vegetation growth (McClaran 1995), therefore only a small percentage of the base population chooses to nest in this area (Table 5).

Table 5. Number of breeding pairs located in the landfill grasslands, number of pairs that produced nestlings, number of nestlings, and percent of the entire base population of breeding pairs and nestlings produced in the landfill grassland on Kirtland Air Force Base, Albuquerque, New Mexico from 1998-2007.

Year	Number of breeding pairs	Number of pairs that produced nestlings	Total number of nestlings produced	Percent (%) of pairs located in landfill grassland	Percent (%) of nestlings produced in landfill grassland
1998	2	1	4	4	3
1999	3	2	5	6	4
2000	2	1	4	6	4
2001	1	1	5	5	6
2002	0	0	0	0	0
2003	1	1	4	6	7
2004	0*	0	0	0	0
2005	1	1	7	4	8
2006	10	3	17	24	17
2007	6	4	22	18	14

*in 2004, 3 pairs were mitigated into the landfill grasslands, but no pairs chose to breed in the area

This underutilization changed in the breeding season of 2006, after the lightning-started fire in the area. The burn cleared the tall brush and grass cover, opening up the area for the owls. In the eight-year period before the fire, only 11 pairs attempted to breed in the landfill grasslands. This was five percent of all the breeding pairs from those years, and only four percent of all the nestlings were produced in this area (Table 6). In just two years since the fire, 16 pairs have attempted to breed in the landfill grasslands, and this accounts for 21 percent of the breeding pairs and 15 percent of the nestlings produced (Table 6).

Table 6. Comparison of use and productivity in the landfill grasslands between pre-burn (1998-2005) and post-burn (2006-2007) on Kirtland Air Force Base, Albuquerque, New Mexico.

Year Range	Number of breeding pairs	Number of pairs that produced nestlings	Total number of nestlings produced	Percent (%) of pairs located in landfill grassland	Percent (%) of nestlings produced in landfill grassland
1998-2005*	11	7	29	5	4
2006-2007^	16	7	39	21	15

* years before burn in landfill grassland
^ years after burn in landfill grassland

Although many pairs chose territories in the landfill grasslands in 2006 and 2007, many of these pairs failed to produce young. In 2006, ten pairs chose territories in this area, but seven of those pairs did not produce young. Six pairs failed for unknown reasons, and it is possible they abandoned their burrows because the vegetation grew too tall. The fact that many owls chose this area for their breeding grounds when they arrived in early spring to low ground cover, but failed to produce young after the vegetation grew, supports the idea that management actions to ensure grassland restoration are needed in order for this area to be productive for owls.

Vegetation management

Mowing can be an effective tool for the management of vegetation height for Burrowing Owl conservation, as it does not typically disturb the structure of the nest. The use of large-tired mowers reduces the risk of nest damage (Rosenberg et al. 1998), and mowing restrictions during the months when chicks emerge from the burrow (May-June), minimizes risk. In the past few years on KAFB, mowing appears to have been an effective tool in the Cantonment and Club Road areas.

Mowing can also be an effective tool for managing weeds. Mowing before plants set seed can hinder their spread and is recommended in areas of high annual weeds (Wootten 2006).

In order for mowing to be a successful management tool, several guidelines must be met. For weed management, it is important to mow approximately three to four weeks after heavy rainfall, which will trigger the plant to make seeds. In New Mexico, this means mowing must be conducted in July or August. If mowing occurs after weeds have set seed, it can increase weed prolification. After the mow, the area can be re-seeded with low growing native vegetation.

Mowing in the winter is also helpful if the vegetation is high. All of the annual vegetation will be dead, but this will shorten vegetation that remains, and make the area ideal for owls returning to their breeding grounds in the spring.

Burrowing Owls and prairie dogs (and therefore burrows) are localized in only part of the landfill grasslands. Under this plan, it is important to mow this localized area. The remaining grasslands can be left for other species that prefer taller vegetation.

According to other controlled mowing efforts, a 4 to 10 inch height should provide suitable nesting habitat for Burrowing Owls (Rosenberg et al. 1998). It is important to mow all areas adjacent to burrows as to avoid creating small islands of tall vegetation that may allow predators near the nest. If carefully done, mowing equipment should be able to mow over nests without harming burrows or the equipment itself. Research on other military installations reports no collapse of burrows due to mowing operations (Rosenberg et al. 1998).

The maintenance department in charge of mowing should be issued a mowing schedule specifying when certain areas should be mowed. In addition, it is important that the maintenance department:
(1) Contact the Natural Resources Manager every time before they mow, so if there is a specific concern about late-nesting owls or disturbance, it can be communicated,
(2) Always avoid flag boundaries installed to alert maintenance staff of active burrow locations.

Any mowing operation is potentially harmful to Burrowing Owls. Mowing disturbance has caused the failure of seven burrows since 1998 (one in 1998 and six in 1999). All failures were due to mowing directly over active burrows. If guidelines are not followed, mowing can be detrimental to the Burrowing Owl population.

An experimental program of mowing and monitoring the effects on Burrowing Owl nest sites and habitat usage will provide the most appropriate data for the multipurpose management of grasslands, prairie dogs, and Burrowing Owls on KAFB. Further research will provide more stringent guidelines as to the frequency and timing of mowing in order to control vegetation height and to encourage native species. A vegetation management effort is an important step toward properly managing the owl population and the health of the grassland habitat on KAFB for wildlife conservation, road and air safety, and management efficiency.

Artificial burrows

Artificial burrows and their importance for Burrowing Owl populations on KAFB

It is essential for successful endangered species management to understand the requirements of a species for reproduction. For Burrowing Owls, this means understanding their requirements for underground burrow systems for nesting and roosting (Belthoff 2000). When the numbers of prairie dogs or other burrowing mammals are low, the availability of nest burrows often limits the number of Burrowing Owls in grassland environments. On KAFB, the prairie dog population is stable in some areas but nonexistent in other suitable areas. One method to open up new habitats for both Burrowing Owls and prairie dogs, as well as to supplement existing habitat, is to create artificial burrows. Artificial burrow installation in areas where burrows are limited or nonexistent will allow Burrowing Owls and prairie dogs to start colonizing the selected new habitats of KAFB. Once prairie dogs are relocated into these areas, daily feeding may encourage them to dig new burrows and remain in the release area (Truett et al. 2001).

Burrowing Owls nest in nest boxes constructed of wood or made of plastic and buried in the ground or covered by a mound of soil. This type of artificial burrow has been used with success on other military installations around the state and nationally. In 2000, Belthoff reported over 70% of artificial burrow reuse in one study area during 1999 and 2000. On KAFB, artificial burrows were installed in 2003 and 2004 in a few locations. Plastic nest chambers with corrugated tubing tunnels were installed in clusters of three. These burrows have not been maintained, no owls have nested in these burrows, and they are likely all filled with dirt and unusable.

The use of artificial burrows on KAFB may be beneficial because:

(1) There is concern regarding locations of some prairie dog colonies, due to potential conflicts with base operations, including new development plans,

(2) Artificial burrows facilitate monitoring owls inside the nest, as units can be equipped with a viewing pipe where a video probe can be inserted inside the chamber,

(3) The number of nesting owls may be increased by the addition of artificial burrows because there are many locations that do not have natural burrows but are adjacent to good foraging areas inside the military base,

(4) The use of artificial burrows provides the Natural Resource Manager with opportunities to decide where to locate new habitats for Burrowing Owls in this first stage of the process,

(5) Artificial burrows can be effective, low cost, and easy to build. They are an environmentally friendly conservation measure to implement in the short term that allows participation from all levels of the community, and encourages the contact between scientists and the public, and finally,

(6) Artificial burrows provide an excellent opportunity for education and bird watching since these burrows can be conspicuous. One or more locations can be disclosed to the base public for observation, and a kiosk or sign can be placed at a safe range from the burrow with information and recommendations on owl observation and conservation.

Artificial burrow construction

The plans for artificial burrows presented in this section were based on several artificial burrow designs (Rosenberg et al. 1998, Belthoff 2000, Conway et al. 2002), with input from the authors of this document to enhance these artificial burrows plans.

An inexpensive and easily assembled artificial burrow can be constructed from a standard wooden box or 5 gallon bucket to serve as a nest chamber, and a 4 inch diameter slotted drainage tubing, which serves as the burrow tunnel. A hole is cut in the box or bucket side to attach the drainage tubing. Artificial burrows that have large chambers (68 liters or 18 gallons) and small diameter tunnels (10cm or 4 inches) are favored by Burrowing Owls (Belthoff 2000, Smith and Belthoff 2001).

If a plastic bucket is used in the construction, it is vital that several ½-inch holes be drilled on the sides and top of the bucket. This will avoid the accumulation of CO_2 and moisture that can be hazardous to the owls inside this type of chamber.

Dirt is then heaped over the chamber (box or bucket) so it is well covered, and the tunnel (drainage tube) is buried. Corrugated pipe is used to simulate the tunnel and it is important to secure it in place with some stakes to avoid movement when soil is placed on top. The tunnel should be laid so that there is at least one 90-degree angle, so light does not penetrate the nest box. At the burrow entrance, a perch should also be provided. Five-foot tall perches have been used on KAFB at natural burrow locations with very good results and benefits for the owls. The depth of dirt above the top of the box should be at least 12 inches, to provide adequate protection from coyote excavation and insulation from heat stress.

A cluster of three boxes is preferred over a single burrow, and can be placed within the same mound to better replicate natural burrow systems. More soil will be needed to adequately cover these systems, however. Young owls often move to nearby natural burrows soon after they emerge from the nest. This may facilitate predator avoidance, nest overcrowding, or parasite loads. Although owls will successfully use a single box, a series of several boxes in the same mound may help increase survival and productivity. In locations where space is an issue, a single box can be used.

Maintenance

The artificial burrows must be maintained in order to assure viable use year after year. The vegetation around the burrows and on the mound should be kept to a height of no more than 10 inches, which will allow visibility for predator avoidance. In addition, occasional checks should be made each year to ensure that the tunnels are not clogged or exposed, the mound is adequately covered, and the perch post secure. Given the climate in the Albuquerque valley, general condition checks should be made after the rains of the monsoon season and after the winter precipitation before the owls return to breed in early March.

If needed, any necessary repairs should be completed before the breeding season begins. Vegetation removal will need to be conducted according to the mowing schedule as the vegetation grows. Visits to assess vegetation can be conducted while monitoring in order to minimize disturbance to individual burrows.

Suggested locations

To provide for the requirements of Burrowing Owls, preliminary surveys should be conducted to obtain the orientation of the tunnel entrances of burrows naturally built in or near to the proposed areas for artificial burrow construction. This will improve the probabilities of occupancy in the future (Belthoff 2000). A single survey to document the orientation of previously used natural burrows will benefit the construction of artificial burrows if a trend is noticed for any area inside KAFB.

After obtaining the burrow orientation of the different areas on base, additional factors should be considered before determining placement of artificial burrows on KAFB. First, close access for monitoring is very important, as well as for the installation and burrow maintenance. Large amounts of soil are required to cover artificial burrows. Thus, for logistic reasons alone, burrows should be placed in areas accessible by vehicles.

Second, burrow location should ensure high survival rates of chicks and adults, and not be located in areas that might compromise this principle. Preferred areas would be those that minimize disturbance by humans, pets, and preferably, natural predators. Also, consideration should be taken for flooding, high speed vehicles (whether on the ground or in the air, as vehicle collisions with owls have occurred on KAFB) and overall habitat quality for foraging. Therefore, we recommend that boxes be placed at distances greater than 50 meters from areas of frequent disturbance and from paved roads. Areas of frequent disturbance would include sites such as jogging paths, sports fields, offices and/or operational buildings.

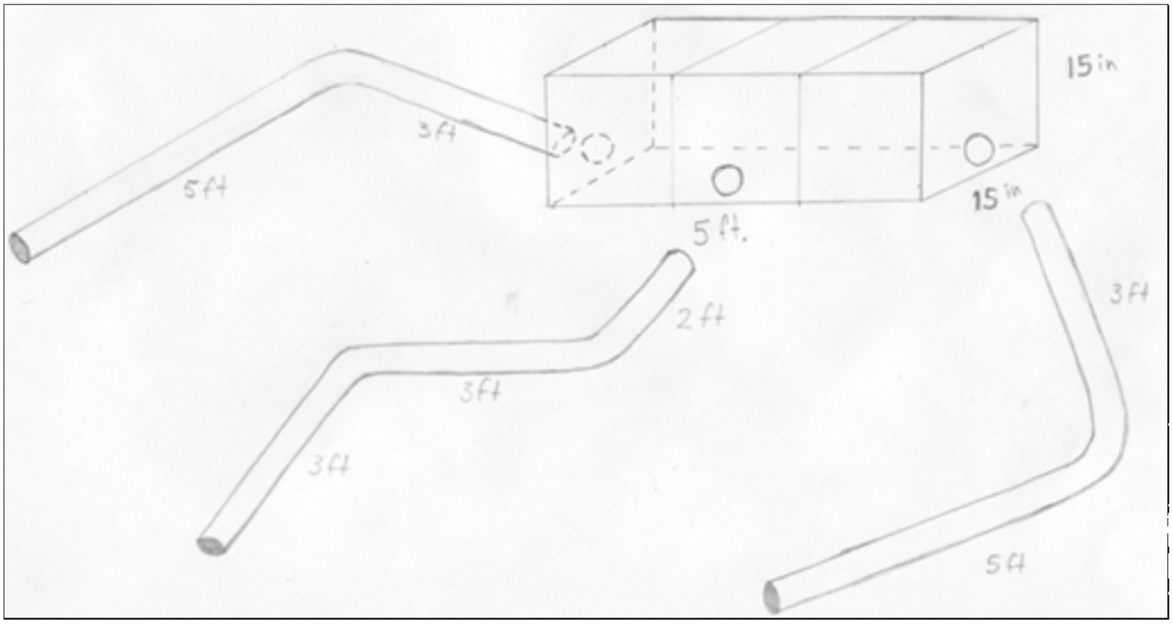
Third, artificial burrows should be placed at distances greater than 100 meters from one another, thus increasing the likelihood of use. Burrowing Owls may nest more successfully with distance from other nesting pairs.

Fourth, burrows are more likely to be used if they are placed within one kilometer of other active owl burrows because artificial burrows may provide nesting sites for dispersing young that are recruited into the population.

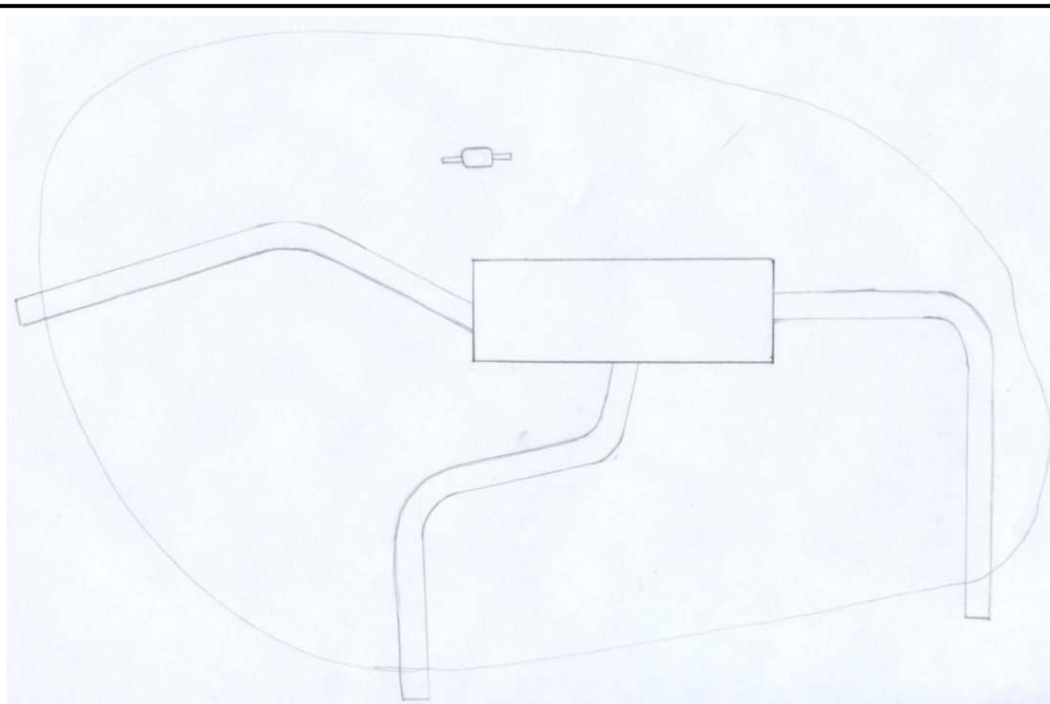
Finally, sites that do not have natural burrows but otherwise meet the needs for nesting Burrowing Owls should be considered as areas for artificial burrows. These areas may provide new breeding habitats and additional foraging and dispersal habitats.

On KAFB, numerous sites fulfill the criteria for optimal placement of artificial burrows. Both the landfill grasslands and the fields adjacent to the horse stables would be ideal locations. Artificial burrows can be placed along the perimeter of the grasslands where access is good and foraging areas are nearby. Other possible sites include north, south, east, and west of the Tijeras Arroyo Golf Course, higher areas around the arroyo road to the landfill, and available areas south of Southgate Avenue. Other possible areas in terms of access by vehicles, low availability of current burrows, and access to foraging sites, would be the large area South of Pennsylvania and around Lovelace Road and Coyote Springs Road. Although these areas have no prairie dogs or owls, they would be appropriate habitat if burrows were created. Whether Burrowing Owls or prairie dogs occupy these burrows to start, the number of available burrows in the area will be increased, thus expanding available habitat on KAFB.

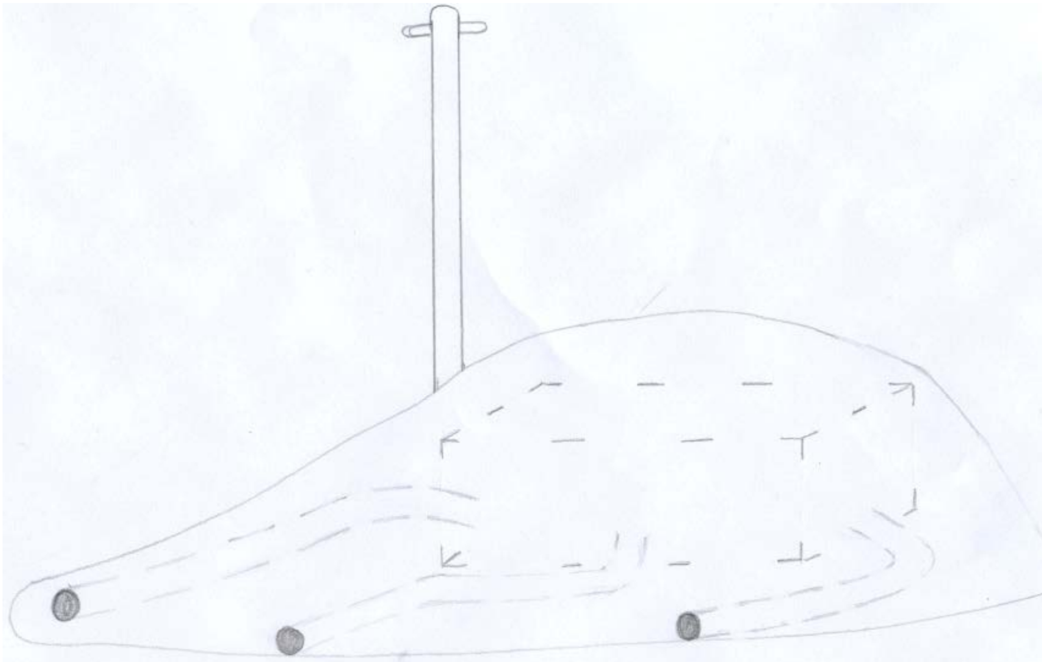
Materials needed to build a multi chamber artificial burrow:	Materials needed to build a single chamber artificial burrow:
3 corrugated pipes, 2.5m (8ft) x 10cm (4in)	1 corrugated pipe, 2.5m (8ft) x 10cm (4in)
1 wooden perch, 1.5m (5ft)	1 wooden perch, 1.5m (5ft)
1 wood box, 1.5m x 40cm x 40 cm (or 5ft x 15in x 15in), divided in 3 chambers	1 wood box, 50cm x 40cm x 40 cm (or 20in x 15in x 15in)
The following is a series of images that illustrates the multi-chamber artificial burrow. This burrow type is recommended for locations with a very limited amount of natural burrows.	



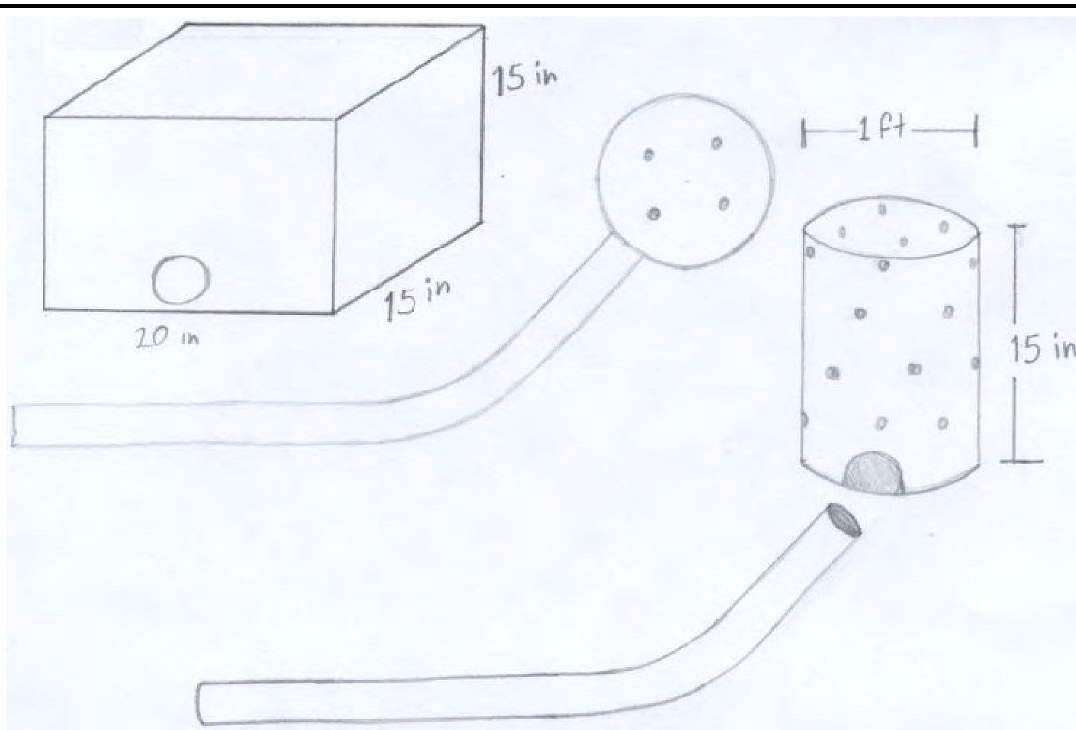
The diagram above shows the proper materials and dimensions, and how it is laid out in the ground. The tunnels can be fixed to the ground using stakes or wire, enough to secure them in place avoiding movement once there is dirt covering. The wooden box has three chambers allowing owls and prairie dogs to share the mound and burrows independently.



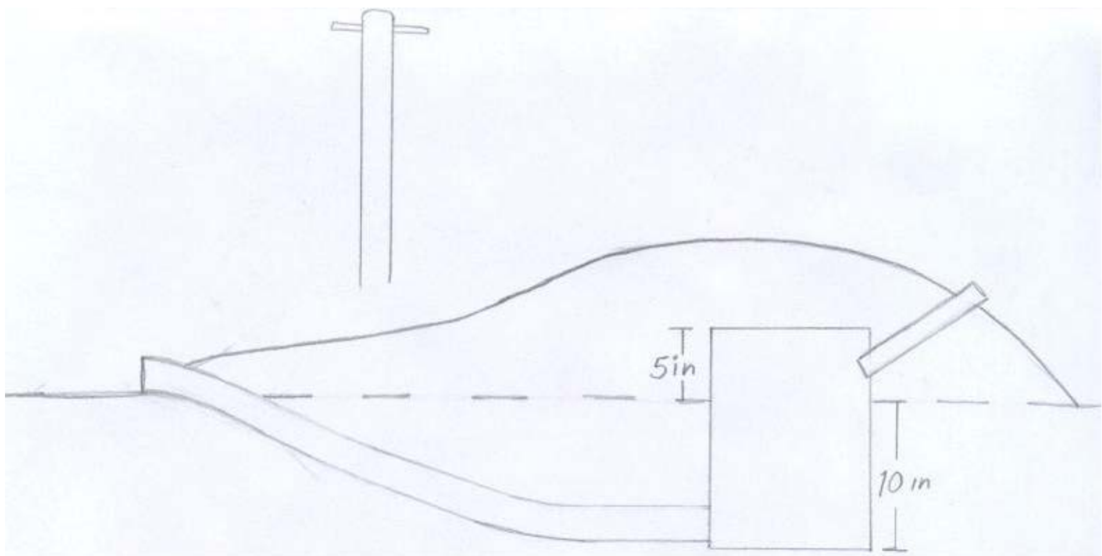
The diagram above displays the same burrow plan viewed from above. Notice the line around the area that simulates the artificial burrow once it is covered. The three tunnels go to the different edges of the mound, making entrances independent. The orientation of each tunnel entrance should mimic those resulting from the natural burrow orientation survey.



This lateral image is the same as the diagram above; note that in this view the structure is covered as if finished. In this case, the perch is in the highest part of the mound to provide better views.



The drawings above show the upper and lateral view and dimensions of the single artificial burrow using the plastic 5 gallon bucket. Note the holes in the bucket to promote aeration, and the dimensions of the wooden box to be used as an alternative chamber instead of the plastic bucket. Wood does not trap CO_2 and transpires better than plastic.



The diagram above shows the single artificial burrow with two thirds buried into the ground and the remaining covered with soil; in this case is easier to bury only one pipe and small chamber than those in the multi burrow type. The perch should be placed close to the burrow and in such a way that will allow the adults to see the burrow entrance from its perch. The orientation of each tunnel entrance should mimic those resulting from the natural burrow orientation survey.

Training programs for students and base personnel

Although uncommon, human activity has caused disturbance and failure for some owls on KAFB. Active burrows have failed due to vandalism; four burrows were filled or damaged for unknown reasons since 1998. Another major concern is automobile collisions. Death of owls on roads (usually juveniles) happens every year. Plans are in place by the Natural Resource Manager to install "Burrowing Owl crossing" signs. Owl deaths due to human disturbances should always be documented and reported to the Natural Resource Manager, in order for action to be taken to prevent future accidents.

Education programs can promote the conservation of Burrowing Owls, and could prevent accidental death of some owls. Programs could be conducted with different groups on KAFB, including students and teachers, social groups and clubs, troop training programs, etc. These programs could provide the air force base community with information about Burrowing Owl natural history and conservation needs. Programs can build awareness and create interest in these charismatic owls, as well as enhance pride and respect for nature in the community. Scheduled weekly programs in schools have proven to be one of the best alternatives for growth and learning. Knowledge is a powerful tool and could truly enhance our efforts towards Burrowing Owl conservation and management

Informal and engaging educational materials, such as brochures and pamphlets, are highly recommended because of the positive impact on individuals, especially those with minimal awareness of these environmental issues. In addition, the base newspaper "The Nucleus" may be used to publish valuable information and any important updates on the owl monitoring effort within KAFB. These are good outreach tools and should be readily available to the entire community on KAFB.

Conclusion

The Burrowing Owl population on KAFB is unique in New Mexico, with ten years invested into the monitoring of Burrowing Owls; this is one of the only locations in New Mexico where owl trends can be analyzed over time. The ten years of monitoring has provided enough data to support the proposed measures in this management plan, which were designed to increase the owl population without impeding the military mission.

Recommended actions include the continuation of surveys and monitoring of the owl population, to mitigate any owls in danger due to development or fumigation, and to educate the base community about safety around owl territories and owl conservation.

In addition, actions to enhance owl habitat should be conducted in areas currently used by owls as well as new habitats with potential to be colonized by owls. These actions include prairie dog relocation from areas of low tolerance, mowing tall vegetation and re-seeding with low growing native vegetation, and installing artificial burrows. These actions are aimed to restore native desert grassland vegetation and prairie dog colonies, which will encourage Burrowing Owls to occupy these areas as breeding, migration stopover, and wintering grounds.

The combination of all goals and actions presented in this management plan create a dynamic and progressive stance for viable and achievable procedures that will ensure the continuation of efforts to support and enhance the Burrowing Owl population on KAFB. With this management plan, KAFB can take proactive steps towards managing their Burrowing Owl population. These actions can be an example for other installations, and may be critical in preventing the listing of Burrowing Owls under the Endangered Species Act.

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Appendix A. New Mexico Burrowing Owl Working Group: Recommended Burrowing Owl Survey and Monitoring Protocol

Introduction

The New Mexico Burrowing Owl Working Group (NMBOWG) was formed to determine the status of the Western Burrowing Owl (*Athene cunicularia hypugea*) in response to apparent declines in owl populations in the state of New Mexico. Currently, Burrowing Owls are listed as a species of Conservation Concern by the United States Fish and Wildlife Service (USFWS 2002). In New Mexico, Burrowing Owls are listed as a high responsibility species by New Mexico Partners in Flight (NM PIF 2003). The NMBOWG is open to anyone who is interested in the plight of the Burrowing Owl. Our meetings are held twice a year at various locations throughout the state.

The goals of the NMBOWG are two fold: 1) to strengthen & broaden environmental education/outreach programs intended to teach the general public about Burrowing Owls. This is being accomplished by our continued citizen-based science project which encourages participants to "adopt" a location/route for Burrowing Owl monitoring (see www.hawksaloft.org/burrowingowl); 2) to determine trends in abundance and distribution for Burrowing Owl populations throughout NM through long–term survey and/or monitoring studies. We are seeking commitments from state & federal agencies, as well as appropriate non-government agencies to aid in these efforts.

Step I. Determine if there is suitable Burrowing Owl habitat

<u>Habitat Types</u>

Arrowood et al. (2001) reported that 75% of New Mexico's ecological zones, as described by Dick-Peddie (1993), contain known or potential Burrowing Owl sites. These include: Chihuahuan desert scrub, closed basin scrub, desert grassland, Great Basin desert scrub, juniper savanna, lava beds, plains-mesa grassland, plains-mesa sand scrub, sand dunes, urban and farmland (Arrowood et al. 2001). More specifically, Burrowing Owl habitat is generally dry, open, short-grass, treeless plains (Haug et al. 1993). Burrowing Owls are also known to use areas that include shrubs such as creosote bush (*Larrea tridentate*), mesquite (*Prosopis* spp.), four-wing saltbush (*Atriplex canescens*), and rabbit-brush (*Chrysothanmus nauseous*; Martin 1973, Botelho and Arrowood 1996). Because Burrowing Owls are highly adaptable species, they may also inhabit human-modified landscapes such as golf courses, agricultural fields, and parking lots. Burrowing Owls do not dig their own burrows, and therefore depend in part upon the presence of burrowing mammals. In New Mexico, Burrowing Owls are associated with Gunnison's prairie dogs (*Cynomys gunnisonii*), black-tailed prairie dogs (*Cynomys ludovicianusi*), American badgers (*Taxidea taxus*), ground squirrels (*Spermophilus* spp.), rock squirrels (*Spermophilus variegatus*), foxes (*Vulpes* spp.), and coyotes (*Canis latrans*). Burrowing Owls may also utilize artificial structures as burrows such as, storm drains, berms, roadsides and irrigation canals.

<u>Breeding Phenology</u>

Burrowing Owls are migratory in New Mexico, though there are owls that over winter in the state, particularly males in the southern part of NM (Johnson et al. 1997, Arrowood et al. 2000). Typically, owls arrive on the breeding grounds by March. Once a suitable nest burrow is chosen, pairs will form and nests are initiated. Females, on average, lay six to seven eggs. Egg incubation is done solely by the female and usually lasts 28-30 days (Martin 1973, Haug et al. 1993). During this time, the male feeds its mate. The young chicks fledge from the nest burrow to come above ground at 14 days. The chicks remain in the general area of the nest, being fed by their parents until independence, which is considered to be 44 days of age (Haug et al. 1993). Owls begin to leave the breeding site at the beginning of August, although some birds may stay until October and very few stay on the breeding grounds year round (Martin 1973). Exact dates vary throughout the state and by year, but Table 1 provides estimated dates for Burrowing Owl breeding phenology in New Mexico.

Table 1. General breeding phenology of the Burrowing Owl in New Mexico.

	Pair Bonding/Nest Initiation	**Egg Laying and Incubation**	**Chicks fledge above ground**	**Independenc e**
New Mexico	March and April	Late April early June	Early-Mid June	Mid-Late July

Step II. Determine survey and/or monitoring technique

Methods for surveying and monitoring Burrowing Owls in New Mexico vary according to the amount of time, energy, and money deemed appropriate to answer management and/or conservation goals. Surveys can be used to determine the abundance of owls in a given area and can be used over time to determine trends. In-depth monitoring studies can be used to provide further information on aspects such as reproductive success, fledging rate, mortality, survivorship, dispersal, and recruitment. In order to compare information between study sites and years, it is essential to collect comparable data. Once a survey method is chosen, it is important to be consistent and maintain the same protocol over time in order to determine long-term trends. The NMBOWG presents the following protocols in order to maintain consistent data collection for surveying and monitoring.

Recommended Survey Methods

The most suitable time to survey for Burrowing Owls in New Mexico is during the nest initiation/incubation phase (see Table 1). It should be noted that certain weather conditions are not conducive for owl surveys. When temperatures reach above 30°C (86°F) or winds exceed 20 km/hr (approx. 12mph) owls will likely be in their burrows and not visible.

Burrowing Owl surveys can be accomplished effectively by either walking or driving transects. Surveys can be conducted using line transects in which all owls are recorded along the line or by point counts conducted at given stations along a transect with or without broadcasting audio Burrowing Owl alarm (*quick-quick-quick*) and/or male territory (*coo-coo*) calls. Studies have shown that broadcasting calls is most effective for estimating abundance of owls (Haug and Didiuk 1993), and depending upon the broadcast system, can reach areas up to 300m (Conway and Simon 2003). Data sheets for each survey method are provided at the end of this document. These methods may need to be modified depending upon the terrain and equipment being used.

METHOD 1: **Walking Transects**

A. **Without Audio Calls** (Use Survey Data Sheet B provided at the end of this document.)
Line-intercept transect without broadcasting: Select transects in suitable owl habitat. A single, straight line should be walked for the entire length of the transect (for specific protocol and comparison of line transects methodology see Emlen 1971 and 1977). Observers should record all owls observed within 30m of either side of the line. If a more thorough estimate of abundance in a specific area is desired, an observer should walk multiple parallel lines, (or many observers walk parallel lines concurrently) approximately 50m apart. All owls observed within 25m on either side of the transect line should be recorded.

B. **With Audio Calls** (Use Survey Data Sheet A provided at the end of this document.)
Point counts: If walking transects is being conducted in conjunction with broadcasting calls, an observer should proceed along a transect line, stopping at points approximately every 200m to search, broadcast, and scan. Distance between points depends upon terrain and broadcast system. If the broadcast system can be heard up to 200m, then the observer should stop every 200m. If a more thorough estimate of abundance is desired, the observer should walk multiple parallel lines (or many observers walk parallel lines concurrently) to cover a given area. The lines should be spaced according to the same distance of audio coverage. Once stopped at an observation point, the observer should scan for any owls with binoculars for the first two minutes, after which a territorial and/or alarm calls should be played for one minute. Finally, there should be two additional minutes of scanning after broadcasting. Scanning and broadcasting should be done in a 360° arc. All owls spotted during this five-minute observation should be recorded on data sheets.

METHOD 2: Roadside Point Counts

A. Without Audio Calls (Use Survey Data Sheet A.) Select routes that are located in suitable owl habitat. Stop the vehicle and pull off the side of the road at 0.5-mile (0.8km) intervals. If visibility is impaired at a point, continue until the next immediate suitable surveying spot is reached. Since no broadcasting system is being used, all surveyors should exit the vehicle and scan with binoculars in a 360° arc for a total of five minutes.

B. With Audio Calls (Use Survey Data Sheet A.) Select routes that are located in suitable owl habitat. Stop the vehicle and pull off the side of the road at 0.5-mile (0.8km) intervals. If visibility is impaired at a point, continue until the next immediate suitable surveying spot is reached. Since a broadcasting system is being used, exit the vehicle and scan for the first two minutes. Afterwards, owl calls (territorial and/or alarm) should be played for one minute, followed by two additional minutes of scanning. Scanning should be done with binoculars in a 360° arc.

METHOD 3: Surveys for Burrowing Owls nests/pairs in black-tailed prairie dog colonies

Burrowing Owl abundance can be estimated by counting the number of Burrowing Owls observed in a prairie dog colony from a remote observation point and/or by walking transects within a colony to check each burrow for nesting activity. The utility of either method depends on the size of the colony, timing of the census, and/or the amount of time and effort invested in surveying.

A. **Observations from a remote site**. (Use Survey Data Sheet B.)
To determine the number of breeding pairs, this method should be used in the beginning of the breeding season, before incubation begins so that both the male and female owl are likely to be seen above ground (see Table 1) and in the morning or evening hours when owls are most active. Park (using the vehicle as a blind) or stand >150m away from the colony to avoid disturbing the owls. Make visual counts by scanning the entire town using a spotting scope (25-80X) or binoculars from an observation point. Count individual owls over several (at least 5) visual sweeps estimating abundance with the highest count. Counts can be repeated over several visits for most accurate results. If the prairie dog town is too large to see from one point, smaller plots can be delineated (i.e. 1 ha) as representative plots within the colony for Burrowing Owl surveys. Permanent wooden stakes can be used to identify the corners of plots. If survey data on the number of Burrowing Owl chicks and/or fledglings is desired, the same observation method is used during the later periods of the owls' nesting phenology (see Table 1).

B. **Observations from walking transect.** (Use Survey Data Sheet C.)
Nest observations determined from walking transects through the prairie dog colony: The number of Burrowing Owls nesting within a colony can be determined by searching the entire colony for nests during the early breeding season. The number of nest provides an estimate of the number of nesting pairs from which density can be ascertained. Each prairie dog colony should be surveyed twice for Burrowing Owl nests during the nest initiation/incubation stage (see Table 1) by walking line transects through the colony and checking each prairie dog burrow opening. Burrowing Owl nests can predictably be identified during this early phase of nesting by visually inspecting each burrow for owl nesting material and maintenance activities. Nest burrows typically have strands of shredded material (dung, plant material, scat, pellets, feathers; Martin 1973, Desmond 1991, T.Mader pers. obs.) at the entrance of nest burrow. There is variability in the degree of these kinds of nest decoration; sometimes nests are obvious and sometimes they are not. Additionally, in the vicinity of the nest burrow, nearby burrows (satellite burrows) are typically whitewashed with feces and often contain pellets (food remains). Nests in question can be marked and re-checked during the second nest visit to verify activity. The locations for each Burrowing Owl nest should be marked using a Global Positioning System (GPS). Depending on goals of the project, it may also be a good idea to permanently mark burrows for long-term monitoring. Do not use red marker flags or other markers that might attract nest predators or otherwise interfere with nesting success. Twelve inch steel nails along with aluminum tags can be used to discretely mark nest burrows. Aluminum tags should have unique numbers to identify nests. An engraver can be used to mark plates (supplies can be purchased through any field equipment company such as Forestry Suppliers, Inc., Ben Meadows and others). In addition to nest locations, the perimeter of the colony should be mapped using a GPS unit to determine aerial extent of the colony. This data can then be used to determine acreage, density of Burrowing Owls, and distance among colonies.

Step III. Determine monitoring technique

Monitoring studies can be used to provide additional information on aspects such as reproductive success, fledging rate, survivorship, mortality factors, dispersal, and recruitment. The optimum months for monitoring Burrowing Owls during the breeding season are May through July. Observations should be conducted within the first three hours after sunrise and/or an hour before dusk. This is when the owls are the most active and when you will have the best chance of observing all the owls at the burrow. Distance of observer to owls will depend on the location (urban/rural) of the owls. Urban owls will typically tolerate human disturbance more than rural owls. A blind (car/other) should be used while observing Burrowing Owls. Always be in the blind at least 20 minutes before the start of your observations. Data you collect will depend on the goals and objectives of your study.

Recommended Monitoring Techniques (for some potential objectives)

A. Determining reproductive success
Counting the number of fledglings may be done when the chicks come above ground at 14 days old. In order to get an accurate count of the number of chicks, observations should be conducted every other day for a week, and for a period of at least 30 minutes. Chicks do not all hatch at the same time, nor are all the chicks outside the burrow at the same time necessarily. Fledglings will remain near the nest until complete independence is attained, which is on average at 44 days of age.

B. Dispersal and recruitment data

The most effective way to determine these types of data is through marking individuals with bands. Types of bands commonly used are USFWS aluminum band in conjunction with unique combinations of leg color-bands. Banding of owls require permits from state and federal entities that regulate bird banding. Naturally, banding requires that the owls be trapped. Females are easier to capture before and after the incubation period. Females and chicks respond well to the use of a box trap using a one-way trap door. When the owls are known to be inside the burrow, place the box traps in the entrance of the nest burrow with the one-way trap door facing the burrow entrance. Males can be captured anytime during the breeding season. A bow-net baited with a mouse works best for trapping males. Once individuals are marked within the study population, several types of data can be collected on a long-term basis, such as the dispersal locations of fledglings from their natal burrows, return rates of individuals to the breeding grounds and previously used nest burrows, and survivorship.

NOTE: Individuals without Burrowing Owl banding or trapping experience should work with and/or consult with researchers that have conducted successful banding and trapping programs prior to initiating trapping and banding.

To help you design a monitoring program for your management needs, we have included a list of papers that discuss Burrowing Owls studies of dispersal, recruitment, return rates to breeding grounds and previously used burrows.

- **Dispersal and yearling recruitment:** Todd, LD. 2001. Dispersal patterns and post-fledging mortality of juvenile Burrowing Owls in Saskatchewan. Journal of Raptor Research 35:282-287.
- **Dispersal:** King, RA and Belthoff, JR. 2001. Post-fledging dispersal of Burrowing Owls in southwestern Idaho: Characterization of movements and use of satellite burrows. Condor 103:118-126.
- **Return Rates:** Lutz, RS and Plumpton, DL. 1999. Philopatry and nest site reuse by Burrowing Owls: Implications for productivity. Journal of Raptor Research 33:149-153.
- **Productivity in relation to return rate and the use of previous burrows:** Botelho, ES and Arrowood, PC. 1998. The effect of burrow site use on the reproductive success of a partially migratory population of western Burrowing Owls (*Speotyto cunicularia hypugaea*). Journal of Raptor Research 32:232-240.

Step IV. What to do with your data

Data sharing agreements

Currently the University of New Mexico through Natural Heritage New Mexico (NHNM) has data sharing agreements with U.S. Bureau of Land Management and U.S. Forest Service Southwestern Regional Office (R-3), U.S. Department of Defense at Holloman Air Force Base and White Sands Missile Range to coordinate Threatened, Endangered, and Sensitive (TES) species databases in exchange for information on status and distribution of TES plants and animals. The NHNM data manager, Rayo McCollough, (rayo@unm.edu or 505-277-3822 x225) is the primary technical contact, and can incorporate information on Burrowing Owls provided by federal land management agencies in New Mexico into the existing database. This compiled data would then be available to land managers through the existing secure interactive website (nmnhp.unm.edu/ecology).

Data Sheets

Three types of data sheets are provided below. Survey Data Sheet A is best suited for point count roadside surveys with or without call broadcasting, and walking transects with callback broadcasting at points. Survey data sheet B is best suited for walking line-intercept transects without stops for callback playing and surveying prairie dog towns from a distance. Survey data sheet C is best suited for estimating owls when walking transects through prairie dog town and estimating Burrowing Owl densities by looking at nest burrows.

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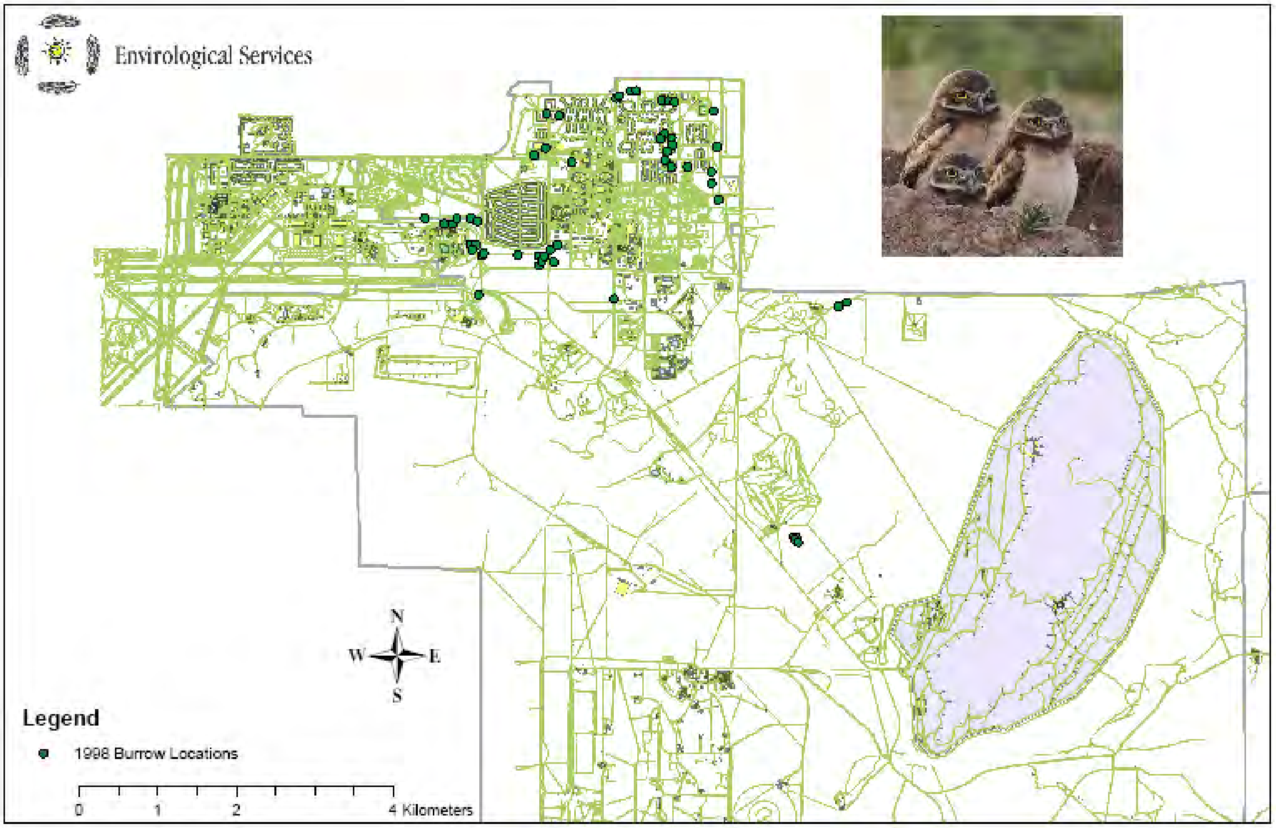
Historic Locations of Nest Burrows for Burrowing Owls on Kirtland Air Force Base, Albuquerque, NM, 1998



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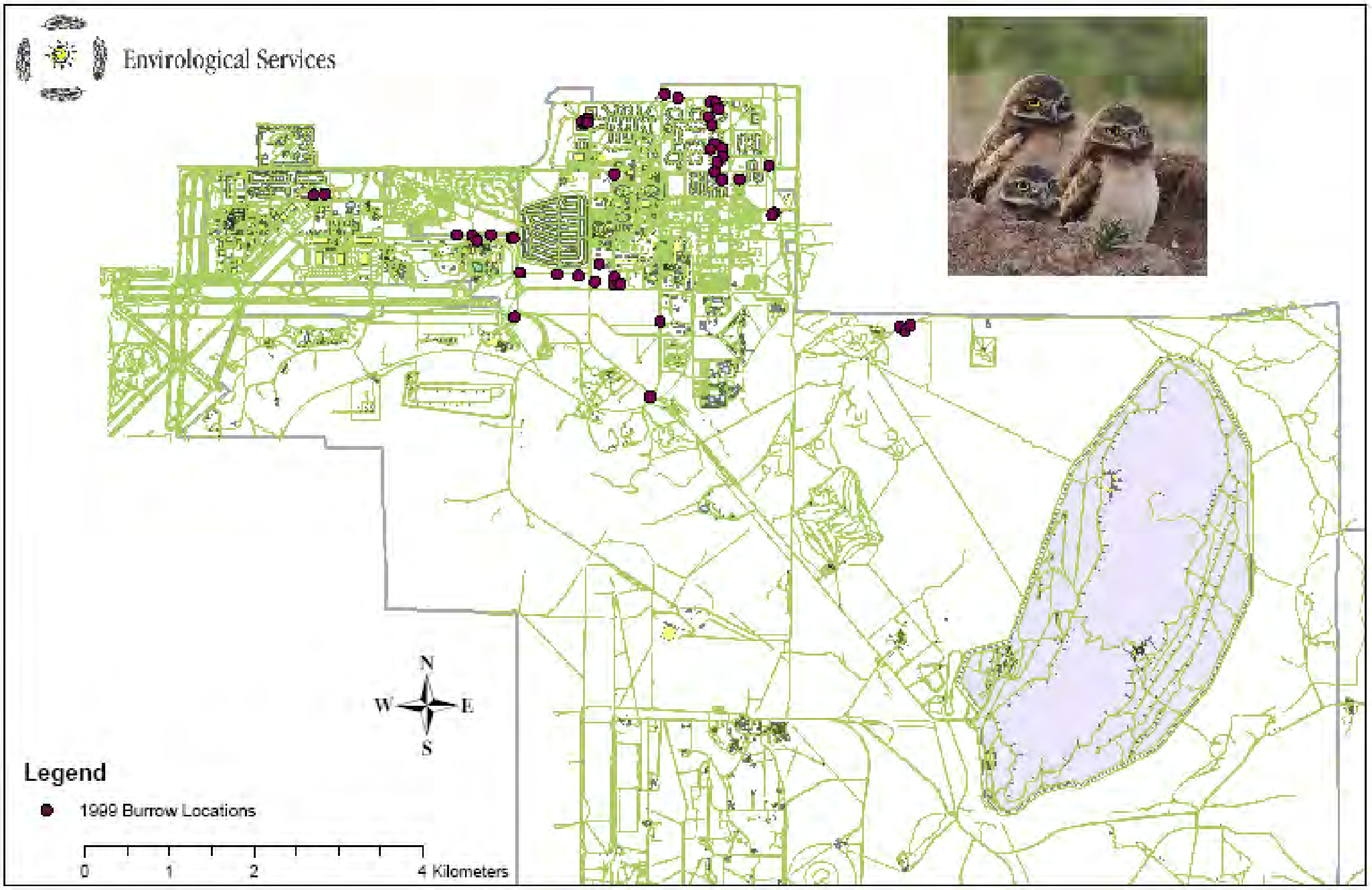

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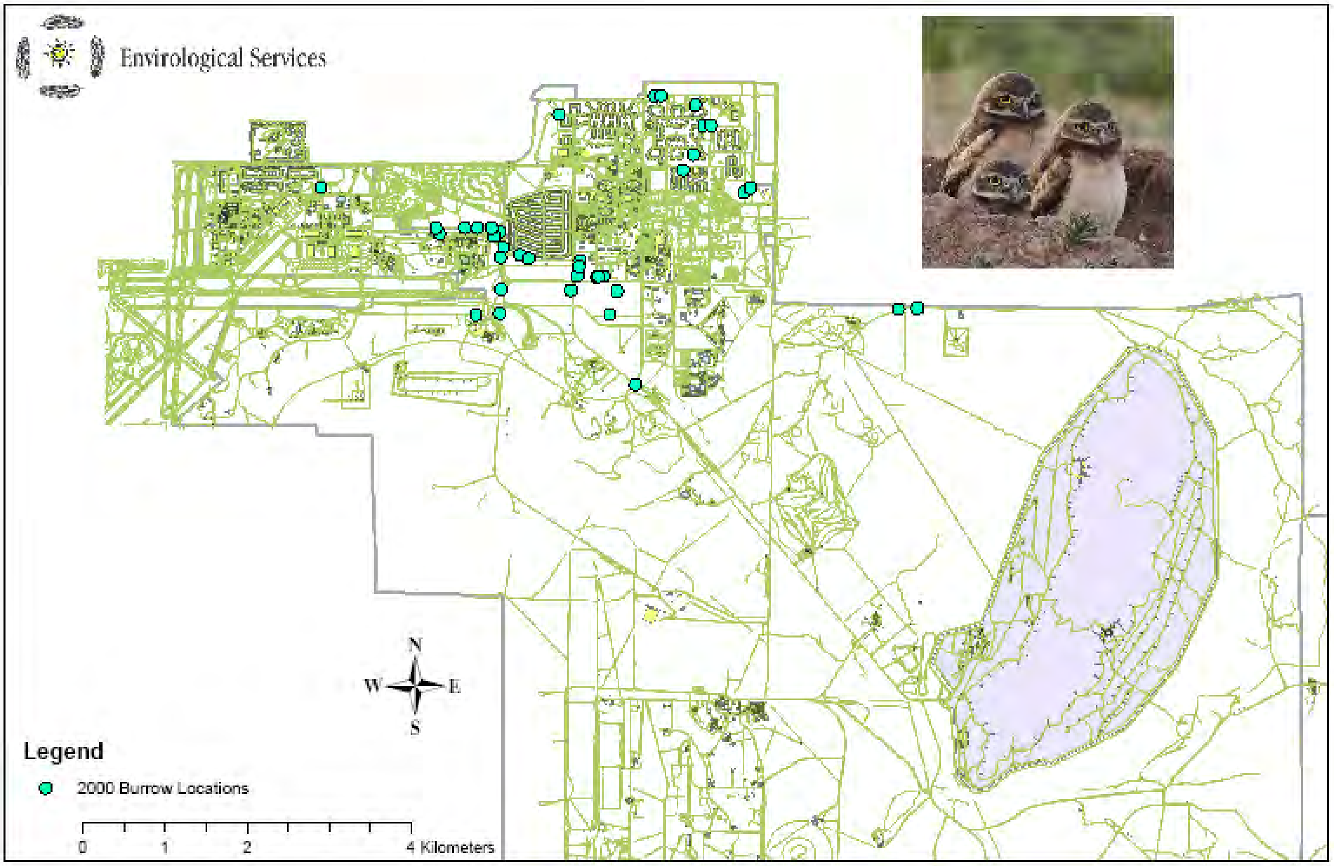

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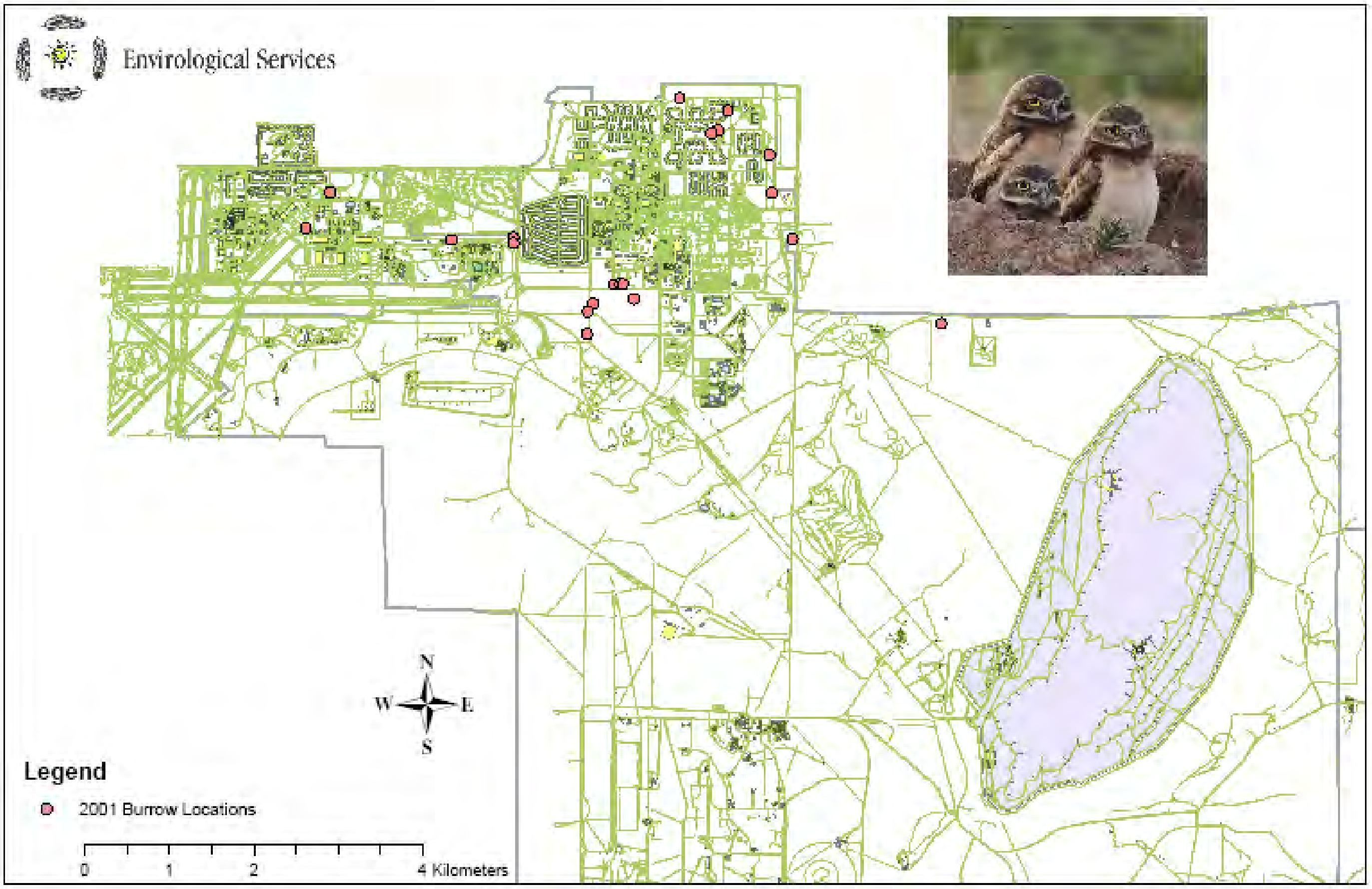

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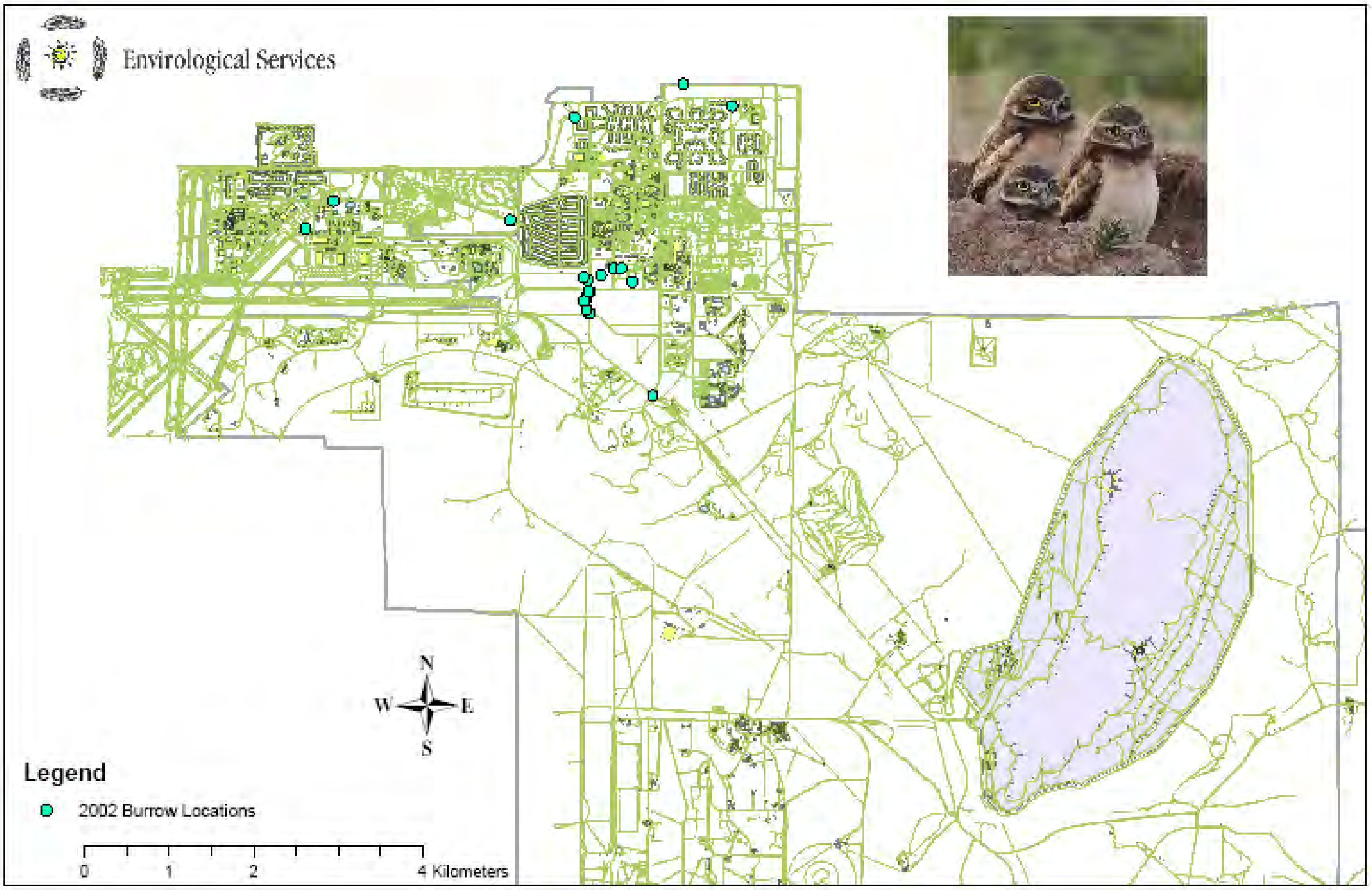

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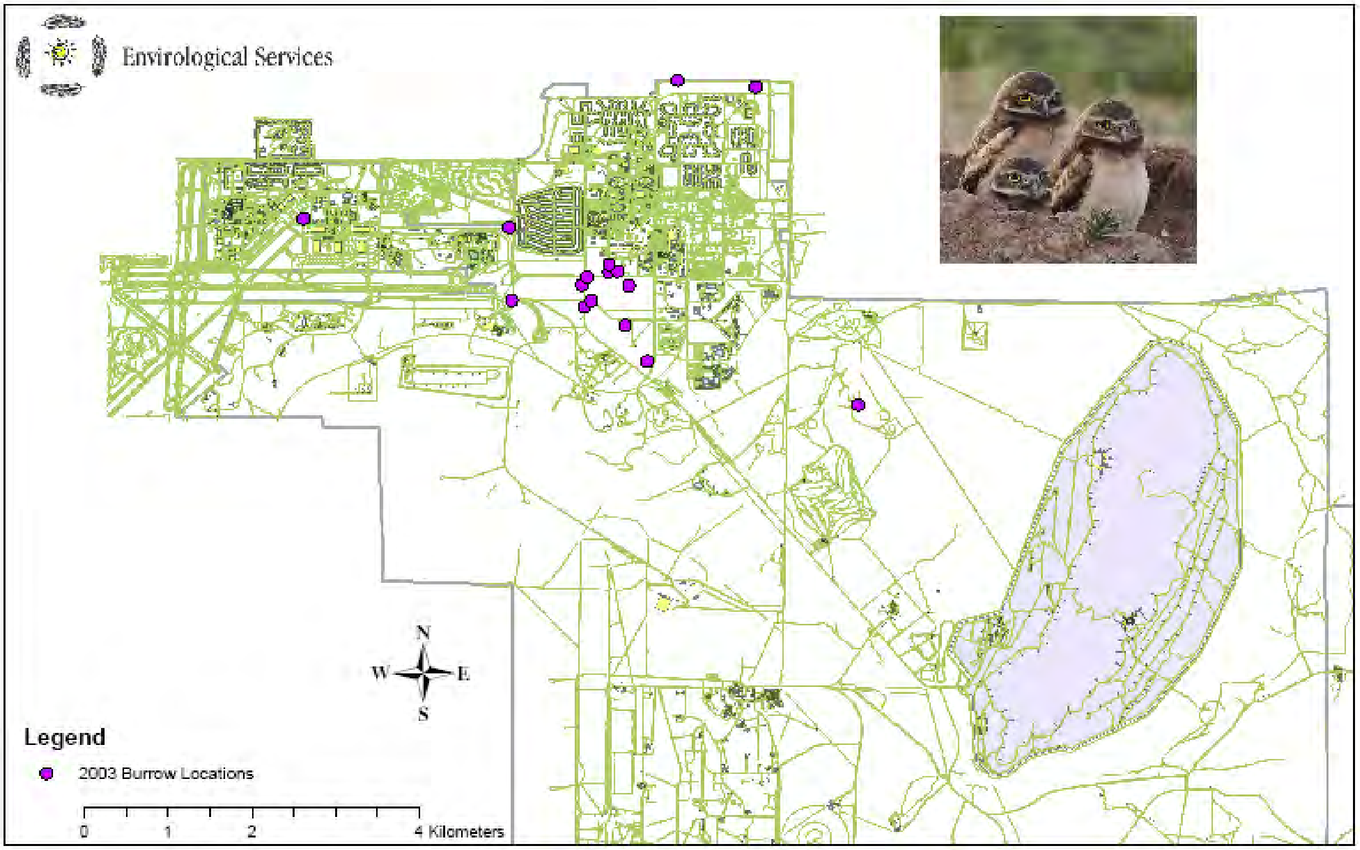
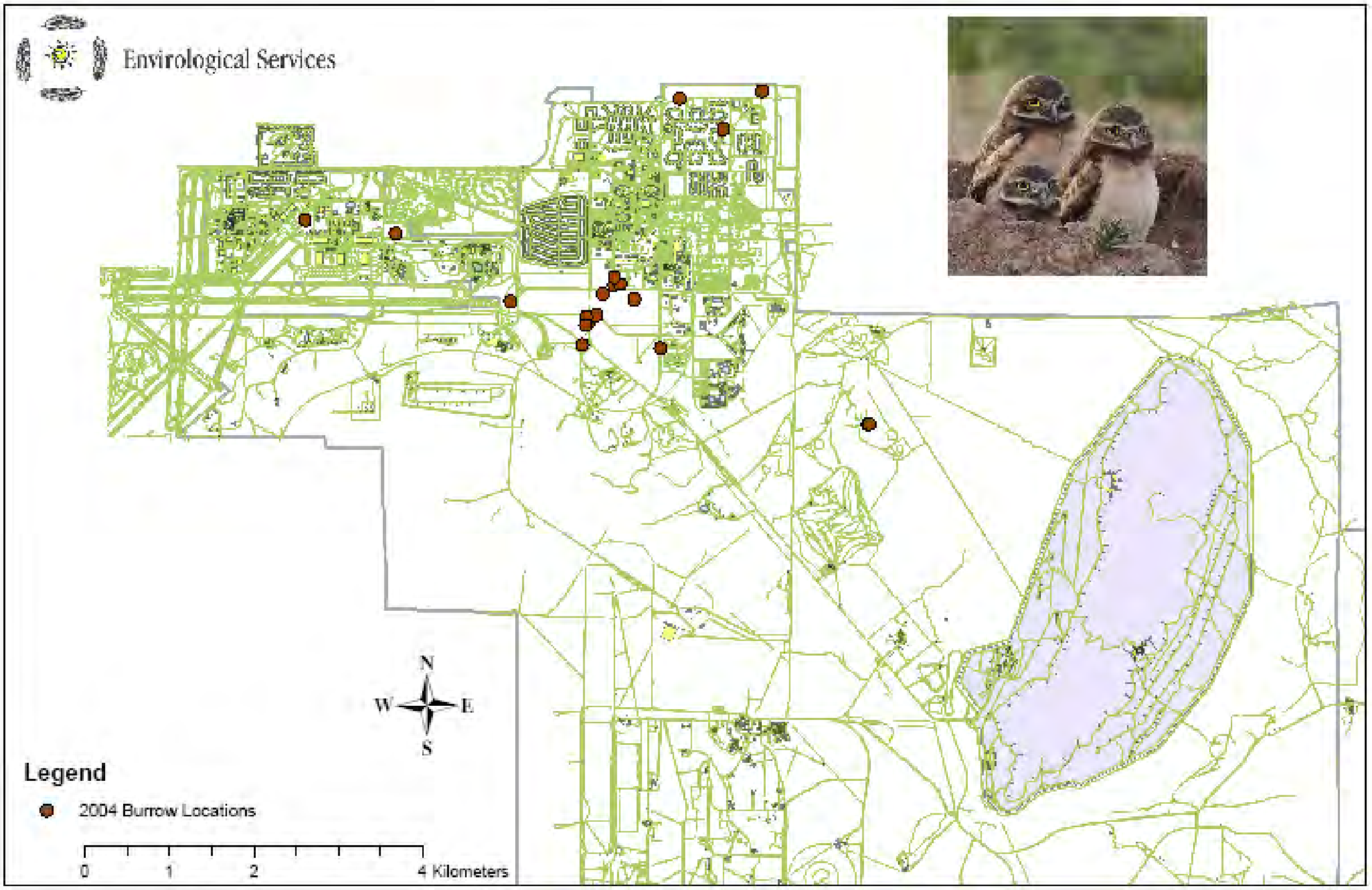
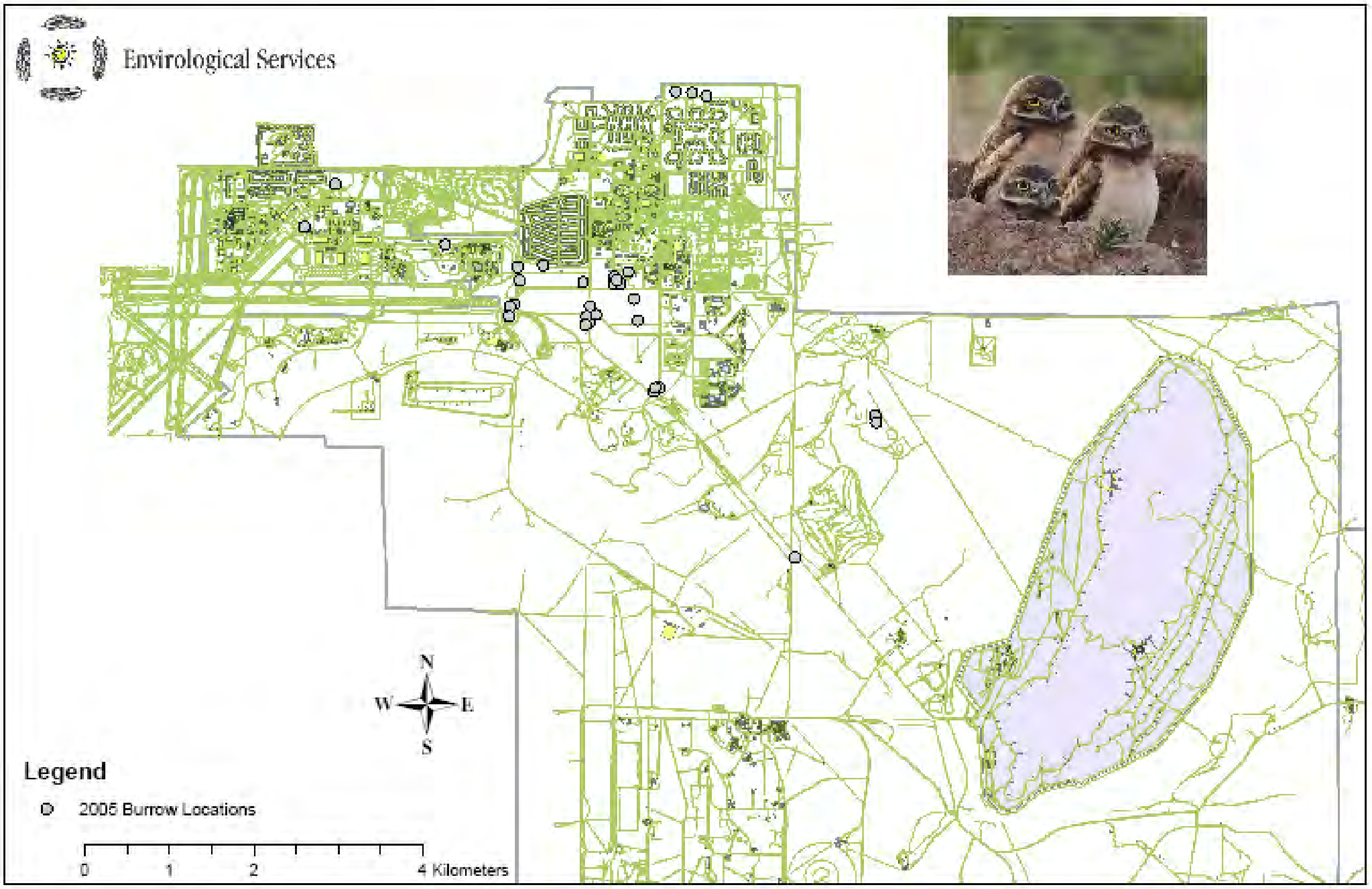


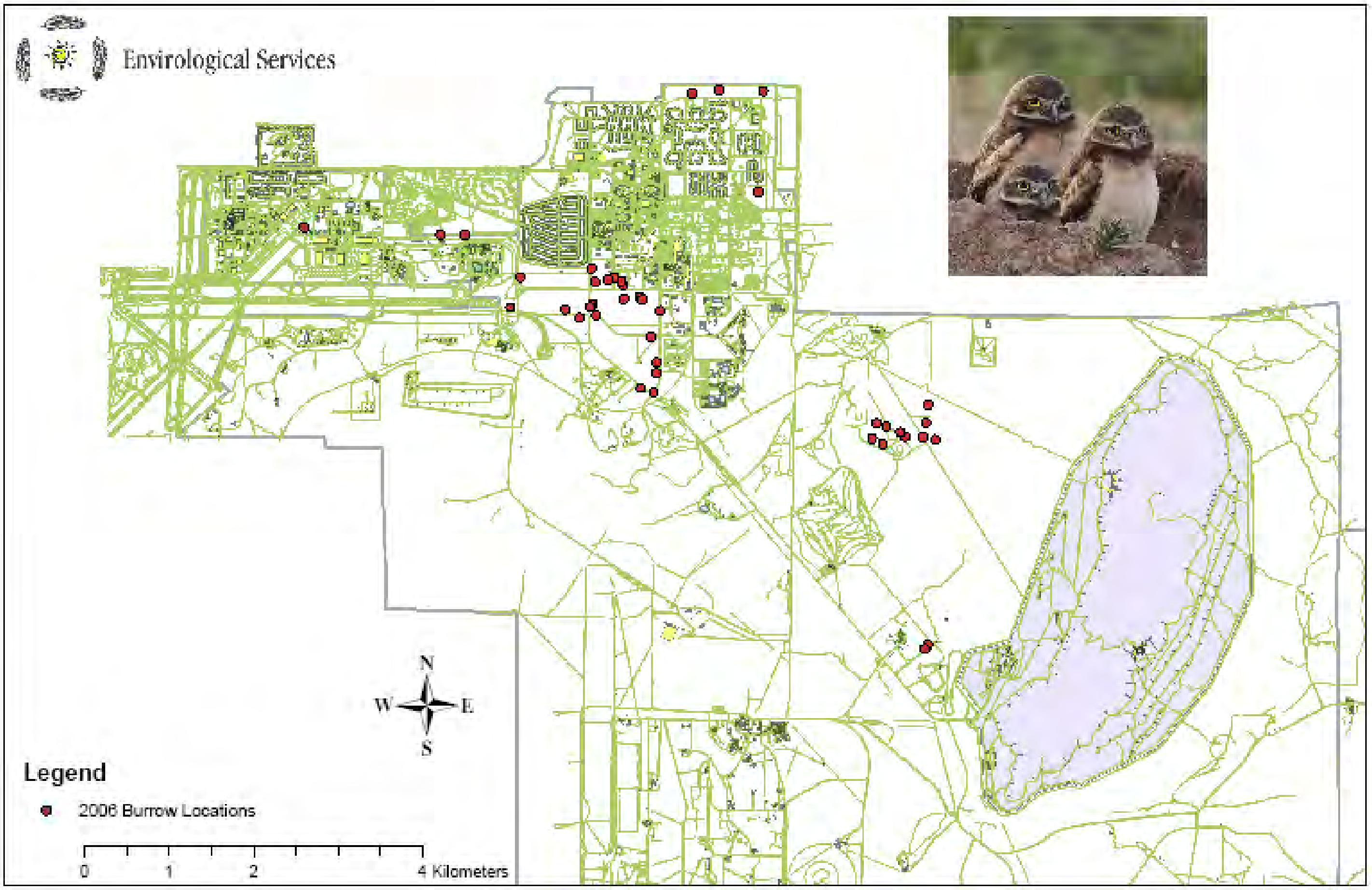
Locations of Nest Burrows for Burrowing Owls on Kirtland Air Force Base, Albuquerque, NM, 2004



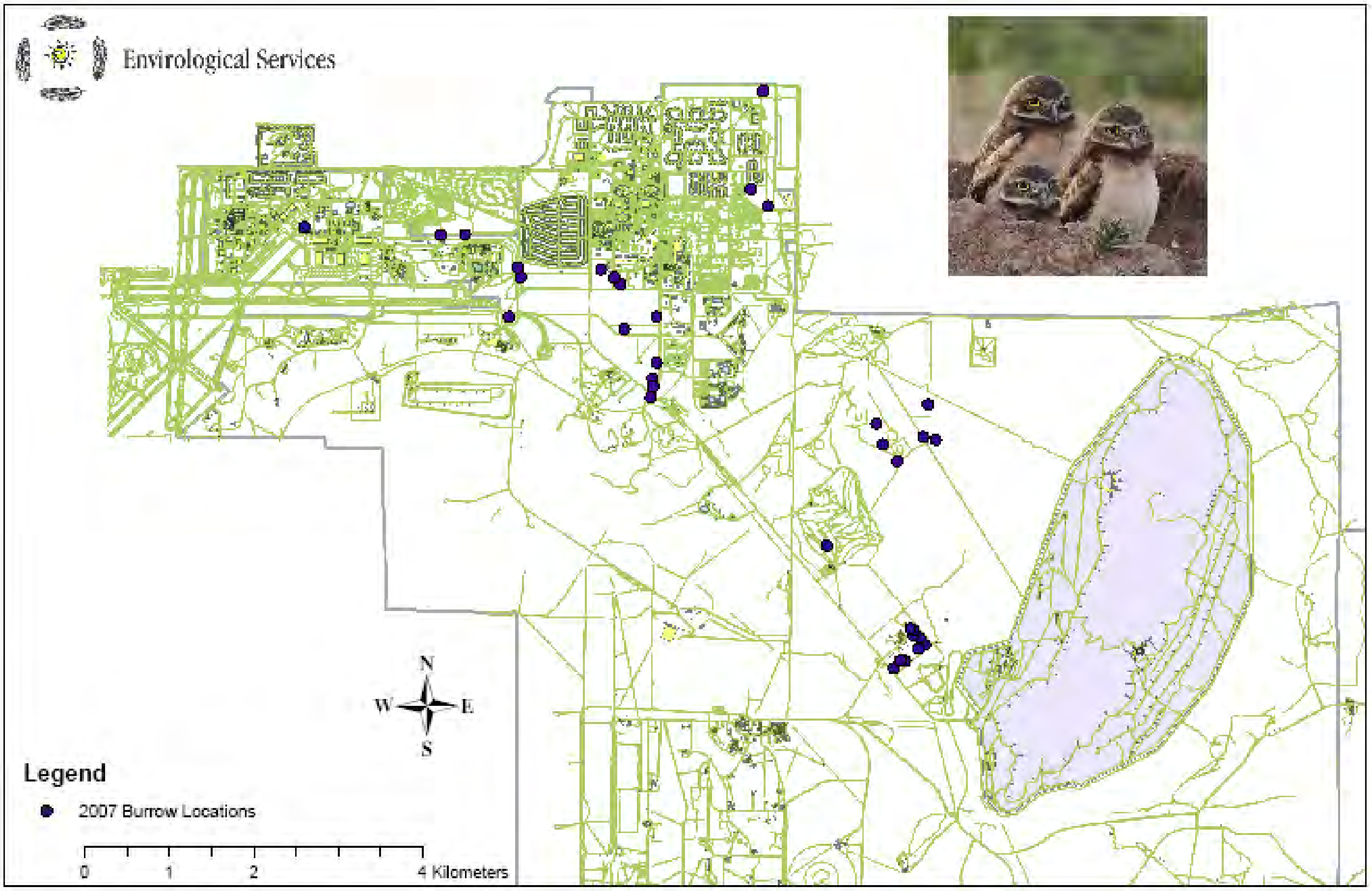
Locations of Nest Burrows for Burrowing Owls on Kirtland Air Force Base, Albuquerque, NM, 2005



Historic Locations of Nest Burrows for Burrowing Owls on Kirtland Air Force Base, Albuquerque, NM, 2006



Locations of Nest Burrows for Burrowing Owls on Kirtland Air Force Base, Albuquerque, NM, 2007



Historic Locations of Nest Burrows for Burrowing Owls on Kirtland Air Force Base, Albuquerque, NM, 1998-2007