U. S. AIR FORCE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Kirtland Air Force Base

Albuquerque, New Mexico

16 February 2018

(See INRMP signature pages for plan approval date)

ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the U.S. Air Force's (AF) standardized Integrated Natural Resources Management Plan (INRMP) template. This INRMP has been developed in cooperation with applicable stakeholders, which may include Sikes Act cooperating agencies and/or local equivalents, to document how natural resources will be managed. Non-U.S. territories will comply with applicable Final Governing Standards (FGS). Where applicable, external resources, including Air Force Instructions (AFIs); AF Playbooks; federal, state, local, FGS, biological opinion and permit requirements, are referenced.

Certain sections of this INRMP begin with standardized, AF-wide "common text" language that address AF and Department of Defense (DoD) policy and federal requirements. This common text language is restricted from editing to ensure that it remains standard throughout all plans. Immediately following the AF-wide common text sections are installation sections. The installation sections contain installation-specific content to address local and/or installation-specific requirements. Installation sections are unrestricted and are maintained and updated by AF environmental Installation Support Teams (ISTs) and/or installation personnel.

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

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DOCUMENT CONTROL

Record of Review – The INRMP is updated not less than annually, or as changes to natural resource management and conservation practices occur, including those driven by changes in applicable regulations. In accordance with (IAW) the Sikes Act and AFI 32-7064, *Natural Resources Management*, the INRMP is required to be reviewed for operation and effect not less than every five years. Annual reviews and updates are accomplished by the base Natural Resources Manager (NRM), and/or an Installation Support Team Natural Resources Media Manager. The installation shall establish and maintain regular communications with the appropriate federal and state agencies. At a minimum, the installation NRM (with assistance as appropriate from the NR Media Manager) conducts an annual review of the INRMP in coordination with internal stakeholders and local representatives of the United States Fish and Wildlife Service (USFWS), state fish and wildlife agency, and National Oceanic and Atmospheric Administration (NOAA) Fisheries, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INRMP Review Summary. By signature to the Annual INRMP Review Summary, the collaborating agency representative asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

INRMP APPROVAL/SIGNATURE PAGES

See the following pages for INRMP approval and signature by the Installation Commander, USFWS, and New Mexico Department of Game and Fish (NMDGF).

377th AIR BASE WING (AFGSC)

CONCURRENCE WITH KIRTLAND AIR FORCE BASE INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Pursuant to the Sikes Act (16 U.S.C. 670a-670o), as amended, Kirtland Air Force Base, New Mexico, has completed its 5-year revision of the installation's Integrated Natural Resources Management Plan (INRMP). The 377 ABW/CC has reviewed the INRMP and concurs with the findings and management recommendations therein.

Richard W. Gibbs

RICHARD W. GIBBS, Colonel, USAF
Commander, 377th Air Base Wing

29 JAN 2018

Date

U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

CONCURRENCE WITH KIRTLAND AIR FORCE BASE
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

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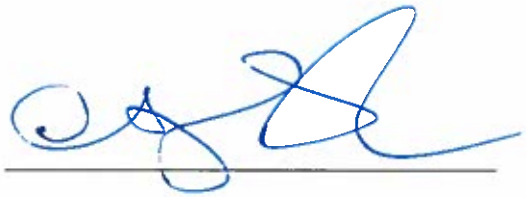

Signature

2/16/18

Date

NEW MEXICO DEPARTMENT OF GAME AND FISH

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Alexandra Sandoval — Signature

1/29/18 — Date

ANNUAL REVIEW AND COORDINATION

Date	Finding	Revision
16 Feb 2018	Complete update required to comply with updated AFCEC template and to ensure Sikes Act compliance for agency review/approval.	5-year update of INRMP completed in coordination with NMDGF and USFWS

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 (Kirtland 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: fish and wildlife, threatened and endangered (T&E) species and species of concern, habitat, water, wetlands, forest management, wildland fire, pests, BASH, outdoor recreation and public access to natural resources, cultural resources, conservation enforcement, public outreach, and geographic information systems (GIS) management of natural resource data.

Natural resources management, as a result of implementation of this INRMP, supports the military mission. Natural resources managers 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, AFI 32-7064, *Integrated Natural Resources Management*, as revised; Memoranda of Agreement concerning migratory birds and use of 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 mission requirements, 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. Section 10 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. This INRMP does not contain any significant changes in management direction for Kirtland AFB from the 2007 INRMP.

The National Environmental Policy Act (NEPA) analysis for the plan consists of an environmental assessment (EA) which is available by contacting the Kirtland AFB Environmental Management Office. For the implementation of specific projects or actions included in the plan, the appropriate environmental impact analysis (Environmental Impact Statement [EIS]/Environmental Assessment [EA]/Categorical Exclusion [CATEX]) will be performed, as required by NEPA.

Please note that in this INRMP only common names for flora and fauna are used. A comprehensive list of scientific names will be found in Appendix C – Flora List for Kirtland AFB, and Appendix D – Fauna List for Kirtland AFB.

1.0 OVERVIEW AND SCOPE

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

1.1 Purpose and Scope

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 Cibola National Forest 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 in this INRMP include fish and wildlife, threatened and endangered species, water, wetlands, forested areas, recreation areas, and cultural resources.

The INRMP content and need is driven by AFI 32-7064 which provides guidance to conserve and enhance biodiversity while maximizing natural resources utilization. The goal of the INRMP is to support the USAF mission while providing sound resources utilization. This plan addresses the interrelationship between individual resources, mission activities, and adjacent land uses.

1.2 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 Installation Development 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 plan to guide Kirtland AFB personnel in the best methods to manage the local ecosystem. The INRMP incorporates the multiple installation plans as well as mission and land use activities affecting the basic land management of the base (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 Installation Development Plan, the Pest Management Plan, the BASH Plan, the Integrated Cultural Resources Management Plan, Wildland Fire Management Plan, and other planning documents to assure that mission activities are conducted consistent with sound ecosystem management for the protection of biological diversity.

1.3 Authority

The Sikes Act (16 U.S. Code [USC] 670a-670o), as amended, requires the preparation and implementation of INRMPs on military installations. The Sikes Act was amended in 1997 to require that all INRMPs be completed and current by November 2011 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* (18 November 2014) 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 MBTA 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 (ESA) 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. The ESA 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 ESA establishes that federal agencies must not authorize, fund or carry out actions to jeopardize threatened or endangered species or modify critical habitat.

The 377th Air Base Wing (ABW) is responsible for ensuring that base assigned and tenant 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.

Environmental Management at Kirtland AFB prepares, implements, and updates the INRMP. Environmental Management provides technical advice on natural resource matters to the Wing Commander, Environmental, Safety, and Occupational Health Council (ESOHC), the Base Civil Engineer (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 tenant units are required to be familiar with the content of the INRMP and comply with its provisions.

Installation-Specific Policies (including State and/or Local Laws and Regulations)	
20.6.2 NMAC Ground and Surface Water Protection	Management and control of discharge of pollutants into surface and ground waters
20.7.10 NMAC Drinking Water	Management and control of pollutants into drinking water
New Mexico Harmful Plant Act (76-6A-AA); NM Harmful Weed Management Act (76-6-1-76-7-22); NM Harmful Weed Act (76-6-23-7-7-30)	Management and control of harmful and noxious weeds and plants, including state technical assistance to private landowners and Federal and state agencies and Indian nations, upon request

1.4 Integration with Other Plans

INRMP revisions and concurrence with the final plan must be coordinated through the installation chain of command and the Air Force Civil Engineering Center (AFCEC) Installation Support Team. The INRMP must mutually support and cannot be in conflict with the Integrated Cultural Resource Management Plan (ICRMP), BASH plan, Installation Pest Management Plan (IPMP), Wildland Fire Management Plan (WFMP), CE Base Maintenance Contract, Range Management Plan, Landscape Plan, Installation Development Plan (IDP), and Air Installation Compatible Use Zone (AICUZ) studies and any other plans that may affect natural resources.

2.0 INSTALLATION PROFILE

Office of Primary Responsibility	377 MSG/CEIEC has overall responsibility for implementing the Natural Resources Management program and is the lead organization for monitoring compliance with applicable federal, state and local regulations
Natural Resources Manager/POC	Name: David Reynolds Phone: (505) 846-0226
State and/or local regulatory POCs (For US-bases, include agency name for Sikes Act cooperating agencies)	New Mexico Department of Game and Fish Mark L. Watson (505) 476-8115 U.S. Fish and Wildlife Service George Dennis (505) 761-4754
Total acreage managed by installation	51,585 acres
Total acreage of wetlands	9.02 acres
Total acreage of forested land	16,953.52 acres
Does installation have any Biological Opinions? (If yes, list title and date, and identify where they are maintained)	No
NR Program Applicability (Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0)	☑ Invasive species ☑ Wetlands Protection Program ☑ Grounds Maintenance Contract/SOW ☑ Forest Management Program ☑ Wildland Fire Management Program ☐ Agricultural Outleasing Program ☑ Integrated Pest Management Program ☑ Bird/Wildlife Aircraft Strike Hazard (BASH) Program ☐ Coastal Zones/Marine Resources Management Program ☑ Cultural Resources Management Program

2.1 Installation Overview

2.1.1 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 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 51,000 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 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

Figure 1. Installation Locator Map

area. The remaining areas of the base (approximately 80% of the base land area) are largely dedicated to military training and operational facilities. Sandia National Laboratories (SNL) operates and maintains several facilities on base for research, testing and evaluation of various weapons, communication and energy systems. Department of Energy (DOE)-permitted areas, as well as SNL-permitted areas are managed outside of the INRMP by the DOE (Figure 2). Bureau of Land Management (BLM) withdrawal land is managed by Kirtland AFB through this INRMP.

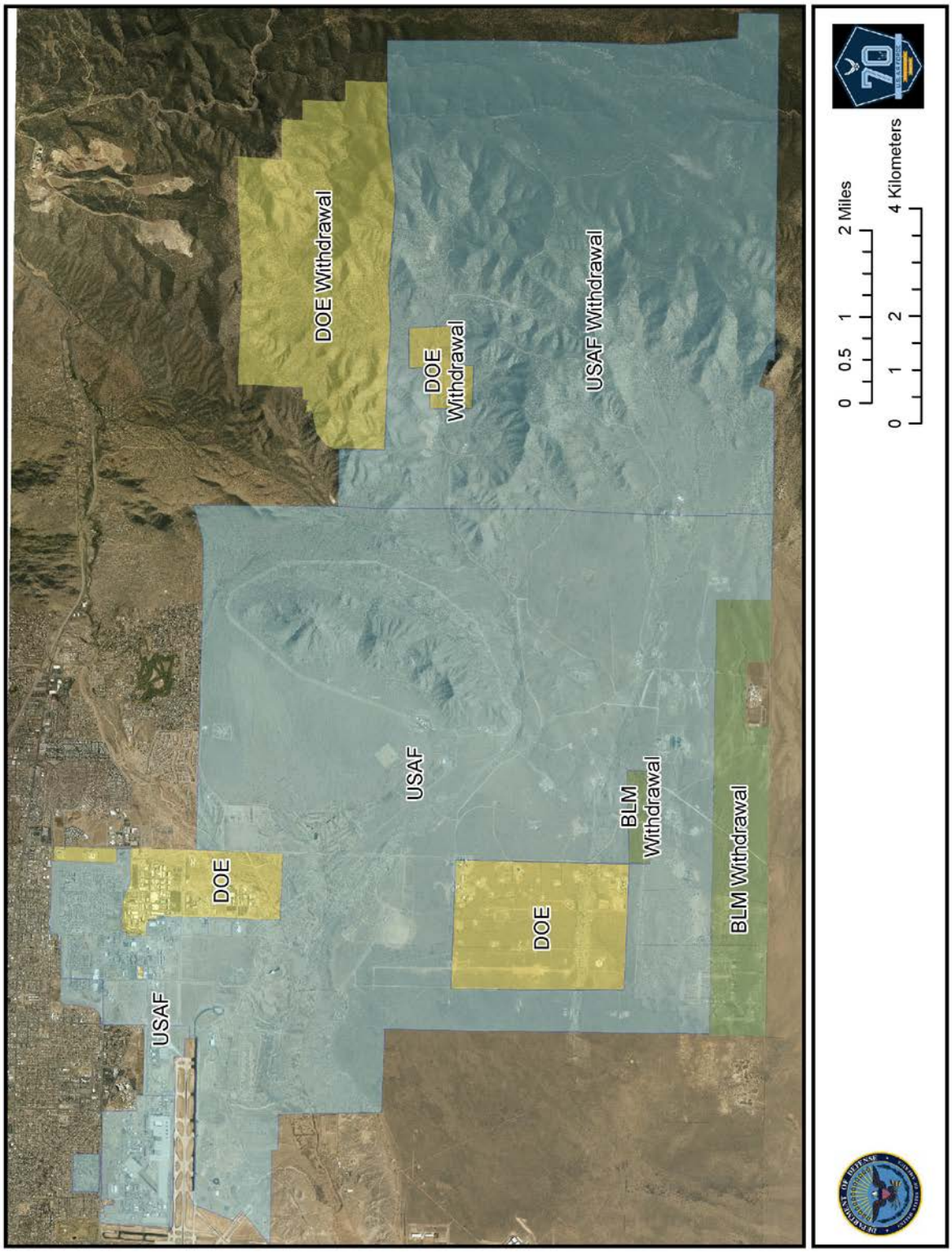


Figure 2. Kirtland AFB Land Status Map

Installation/GSU Location and Area Descriptions

Base/GSU Name	Main Use/Mission	Acreage	Addressed in INRMP?	Describe NR Implications
Kirtland AFB	Research, development and testing; readiness and training; munitions maintenance; and support to base operations for more than 100 tenant units	25,612	Yes	Kirtland AFB manages NR as described in this document
DOE Owned/USFWS Withdrawn to DOE	Department of Energy Projects	7,533	No	Tenant organization, manages their own NR

2.1.2 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).

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.

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.

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. In 1971, Kirtland AFB and its adjoining military neighbors to the east, Sandia and Manzano Army Bases, were merged to form what is known as Kirtland

AFB. On 1 January 1993, Kirtland AFB changed hands to the newly formed Air Force Materiel Command where it remained until 1 October 2015, when it was transferred to the Air Force Global Strike Command (AFGSC).

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 DOE. The 1985 Cibola National Forest 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.

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 substantially. 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 total economic impact of Kirtland AFB in New Mexico has been estimated at $7.8 billion annually (Kirtland AFB 2016b).

2.1.3 Military Missions

The 377 ABW is the host organization at Kirtland AFB. The 377 ABW reports to the Air Force Global Strike Command (AFGSC). The missions of Kirtland AFB fall into four major categories: research, development and testing; readiness and training; munitions maintenance; and support to base operations for more than 100 tenant units. The mission of the 377 ABW is to execute nuclear, readiness, and support operations for American air power.

2.1.3.1 Advanced Systems and Development Directorate

The mission of the Space and Missile Systems Center (SMC) Advanced Systems and Development Directorate (SMC/AD) is to drive future Space capabilities through collaborative innovation, development planning, and demonstrations. One team delivering the full spectrum of small, responsive space capabilities. SMC/AD was previously known as the Space Development and Test Directorate which was deactivated on 9 October 2014.

2.1.3.2 150th Special Operations Wing, New Mexico Air National Guard

The mission of the 150th Special Operations Wing (150 SOW) is to train mission-ready Special Operations and Combat Search and Rescue crews through a Total Force Integration with the 58 SOW. The wing also includes the 250th Intelligence Squadron which provides precision Targeting and Geospatial Intelligence to Air Force and Joint Warfighters. The 150 SOW is also responsible for training and equipping more than 900 wing personnel to support both state and federal missions.

2.1.3.3 58th Special Operations Wing, Air Education and Training Command

The primary mission of the 58th Special Operations Wing (58 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. 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 (Kirtland AFB 2000a). The 58 SOW is also responsible for implementing and maintaining the BASH Plan (Tab 2). This plan establishes procedures to minimize aircraft exposure to the hazards associated with both birds and terrestrial animals in the Kirtland AFB flying area.

2.1.3.4 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.

2.1.3.5 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.

2.1.3.6 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.

2.1.3.7 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.

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.

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.

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 Cibola National Forest. 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.

2.1.3.8 Headquarters Air Force Safety Center

The mission of the Headquarters Air Force Safety Center (AFSC) 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.

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.

2.1.3.9 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.

2.1.3.10 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.

2.1.3.11 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. DOE activities on DOE fee-owned or DOE withdrawn land is not a part of this INRMP.

2.1.3.12 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. Pararescue training occurs throughout Kirtland AFB.

2.1.3.13 Sandia National Laboratories

As a DOE national laboratory, 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.

Listing of Tenants and NR Responsibility

Tenant Organization	NR Responsibility
21st Ordnance Company	377 MSG/CEIEC
58th Special Operations Wing Air Education and Training Command	377 MSG/CEIEC
150th Special Operations Wing, New Mexico Air National Guard	377 MSG/CEIEC
Air Force Inspection Agency	377 MSG/CEIEC
Air Force Nuclear Weapons Center	377 MSG/CEIEC
Air Force Office of Special Investigations, Detachment 116	377 MSG/CEIEC
Air Force Operational Test and Evaluation Center	377 MSG/CEIEC
Air Force Pararescue School	377 MSG/CEIEC
Air Force Research Laboratory	377 MSG/CEIEC
Air Force Safety Center	377 MSG/CEIEC
Civil Air Patrol, New Mexico	377 MSG/CEIEC
Defense Threat Reduction Agency	377 MSG/CEIEC
National Nuclear Security Administration (NNSA) Service Center	Department of Energy Natural Resources Program
NNSA Service Center	Department of Energy Natural Resources Program
Distributed Mission Operations Center	377 MSG/CEIEC
Operationally Responsive Space	377 MSG/CEIEC
Missile Defense Agency	377 MSG/CEIEC
Sandia National Laboratories (SNL)	SNL Natural Resources Program
Space and Missile Systems Center, Advanced Systems and Development Directorate	377 MSG/CEIEC

2.1.4 Surrounding Communities

The region surrounding Kirtland AFB encompasses both urban and rural areas. The City of Albuquerque, with a population of 545,852 people, lies directly north and west of the base. Other surrounding communities are considerably smaller, most being located along the Rio Grande River. Surrounding Communities describes these communities and provides the latest population data. Isleta Pueblo is located directly south of the base, and share a common border. East and northeast of the base is a mixture of National Forest lands, land grant communities and small mountain villages.

Surrounding Communities

Location	Description	Population
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
*Isleta Pueblo	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 (USCB) 2004
Note: *Data from 1991 USCB

2.1.5 Local and Regional Natural Areas

The base is located near four regional natural areas: Sandia Mountain Wilderness Area, Sandia Foothills Open Space, Valle de Oro National Wildlife Refuge, 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. 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 area 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 2008). Wildlife here is typical of a desert environment with coyotes, lizards, and rattlesnakes regularly encountered.

The Valle de Oro National Wildlife Refuge is one of the urban wildlife refuges managed by USFWS. It is comprised of 570 acres located five miles southwest of Albuquerque, New Mexico. The refuge was created on a former dairy farm as a part of the America's Great Outdoors. The refuge was established through a partnership between USFWS and community organizations who recognized the importance of having a wildlife refuge in an urban setting in order to reconnect the local community, especially youth to the land. The refuge is a central project of the Middle Rio Grande Initiative (USFWS 2017a and b).

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, known locally as the bosque, 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. Besides the river, numerous ponds and drainage ditches provide additional aquatic habitat. The Rio Grande valley is a major migration corridor for migratory birds, and 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 2008).

2.2 Physical Environment

2.2.1 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 *Average Climate Data for Albuquerque*.

Average Climate Data for Albuquerque (1981 – 2010)

Month	30-Year Avg. Temp. (°F)	Average Max Temp. (°F)	Average Min Temp (°F)	30-Year Avg. Precipitation (in.)
Jan	36.4	46.8	26.1	0.4
Feb	41.4	52.5	30.3	0.5
Mar	48.1	60.5	35.7	0.6
Apr	56.0	69.0	43.0	0.6
May	65.6	78.8	52.5	0.5
June	74.9	88.3	61.6	0.7
July	78.3	90.1	66.4	1.5
Aug	76.2	87.2	65.1	1.6
Sept	69.3	80.7	57.9	1.1
Oct	57.5	69.0	46.1	1.0
Nov	44.9	55.8	34.1	0.6
Dec	36.3	46.1	26.5	0.5
Average	**57.1**	**68.7**	**45.4**	**0.8**

Source: National Climatic Data Center 2018.

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 (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 during 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.

2.2.2 Landforms

The area of Albuquerque and Kirtland AFB is within the northern portion of the Mexican Highland Section (Rio Grande Subsection) of the Basin and Range physiographic province. The Colorado Plateau is located to the west and the Great Plains geologic province lies to the east.

The surrounding physical features of Kirtland AFB consist of mostly flat, gently sloping grassland to the west and mountainous, canyon terrain to the east. The major landforms include the Four Hills formation, the Manzanita Mountains, Tijeras and Arroyo del Coyote arroyos, and the upper and lower piedmonts.
Modern development is extensive in the northwestern portion of Kirtland AFB and is characterized by an urban setting with large buildings, extensive roadways, utility structures and parking lots. A variety of structures are also scattered along the western portions of Kirtland AFB with few facilities located in the uplands.

Low rugged mountains dominate the eastern landscape of Kirtland AFB. The highest elevation at Kirtland AFB is the 2,255 meters (7,400 feet) ridgeline southwest of Cerro Pelon with a series of short, steep narrow ridgelines radiating from the Four Hills at 1,920 meters (6,300 feet) and west from Mount Washington at 2,217 meters (7,274 feet). The intervening canyons are steep sided 450 to 600 meters (1,500 to 2,000 feet) deep tributary gullies and valleys that drain west toward the Rio Grande along an area marked by much gentler relief. The area west of Manzanita Mountains consists of an extensive treeless expanse of alluvial fans, piedmonts and construction surfaces with slightly incised dendritic drainages.

2.2.3 Geology and Soils

Kirtland AFB is located along the eastern margin of the Albuquerque basin, one of the largest and deepest geological structures within the area of the Rio Grande Rift (Figure 3). The basin formed from crustal subsidence and fault bounded uplift of mountain blocks starting in early Tertiary times and continuing into the Quaternary. When the rift formed, it resulted in the uplift ranges of the Sandia, Manzanita and Manzano Mountains. The basin later filled with alluvium. The present eastern mesa is part of a high standing and nearly flat construction surface graded to the former levels of the Rio Grande.

The Albuquerque basin contains a series of major fault trends and displacements. Within Kirtland AFB, there are the north and northeast-trending Sandia and Coyote faults. The northeast trending Tijeras fault traverses and merges with the Sandia and Hubbell spring faults.

The eastern portion of Kirtland AFB lies within the uplifted Manzanita Mountains. This uplifted area is composed of faulted and tilted sedimentary blocks that consist primarily of Pennsylvanian era limestone that overlie Precambrian substrata. Most of the ridge systems are oriented north-to-south, with steeper western and gentler eastern slopes. The Madera Limestone formation, divided into a lower Los Moyos and an upper Wild Cow Formation, makes up most of the ridges and canyons exposed in the area. Fossils common in both members of the Madera Formation indicate calm, near shore marine environment of deposition. There are several fault lines, and, the ones along Lurance and Sol se Mete Canyons are sources for springs that provide the only permanent water in the study area.

The upper Wild Cow Formation of the Madera Formation is 260 meters (850 feet) thick and outcrops at elevations above 2,195 to 2,315 meters (7,200 to 7,600 feet) along the higher benches and ridgelines in the study area. This formation is defined as a sequence of “alternating limestone and siliciclastic rocks that are often arkosic and generally medium to coarse grained”. Included within this formation are smaller undifferentiated siliciclastic limestones that include siltstone, sandstone and medium to coarse-grained conglomerates. These undifferentiated siliciclastic limestones are found on the side slopes of Lurance, Sol se Mete Canyons and Otero Canyon.

The lower Los Moyos Limestone is described as a sequence of massively bedded cliff-forming wavy laminated and cherty micritic limestone interbedded with shales about 228 meters (750 feet) thick (Chamberlin et al. 1997). The Los Moyos member outcrops at elevations below 2,315 to 2,195 meters (7,600 to 7,200 feet) and covers the lower canyon slopes. This formation also contains numerous rock niches and rock overhangs and outcrops along the lower mountain slopes. This Middle Pennsylvanian era limestone formation is composed of shales and siltstones and conglomerates that grade upward into thin-bedded limestones.

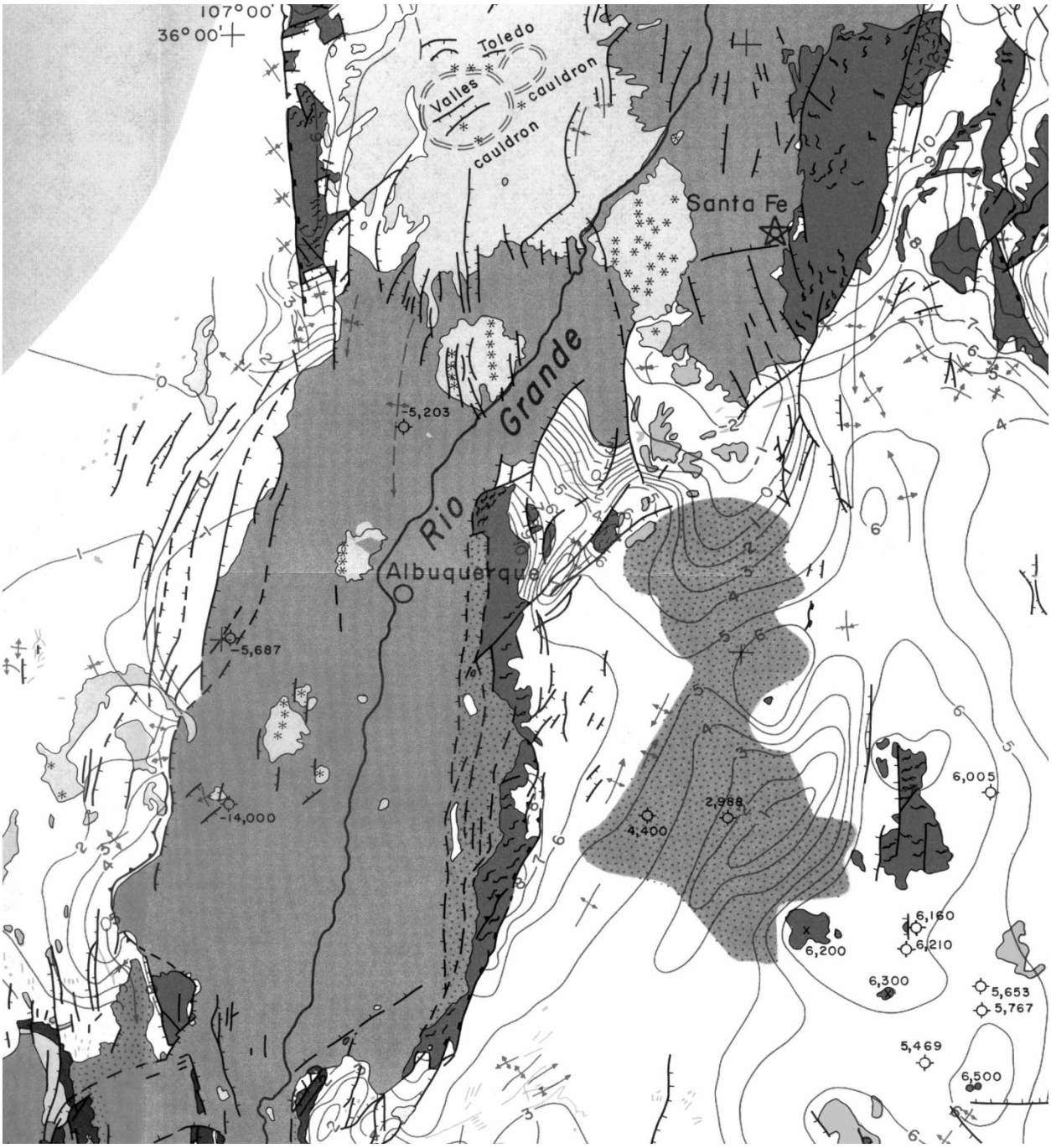
Underlying the Madera Limestone (below 2,133 meters or 7,000 feet) is the Sandia Formation. The Sandia Formation is marked by a thin outcrop in the western Manzanita Mountains and is composed of interbedded limestones and shales that grade to brown sandstone and basal light brown conglomerates. A massive nonconformity separates the Pennsylvanian sedimentary rocks from underlying Precambrian (Proterozoic) rock. A metamorphic belt consisting of gneiss, quartzite, greenstone, and schist extends from Tijeras Canyon southeastward along the western face of the Manzanita Mountains (Kelley and Northrop 1975). This zone includes a continuous outcrop of Manzanita granites between 2,011 to 1,767 meters (6,600 to 5,800 feet) and local outcrops of mafic metavolcannic rocks.

At western limits of the Manzanita Mountains are The Four Hills, a separate block uplift that exposes a variety of Precambrain and Pennsylvanina rocks. There are also a series of low hills south of the Four Hills known as the EOD Hills or Travertine Hills that formed from a wrench-fault system composed of Tertiary conglomerates.

The western portion of Kirtland AFB includes the Albuquerque East Mesas and extends westward toward the Rio Grande. The lower slopes form a series of pediments, dissected slopes, terraces and alluvial slopes. The East Mesas is part of the constructional surface representing the broad ancestral Rio Grande Valley bottom and adjacent slopes prior to stream incision. These alluvial deposits are part of the Santa Fe Group, a complex suite of interfingered piedmont-slope and alluvial fan deposits with floodplain alluvium, playa and aeolian sediments (Hawley and Haase 1992) (Lozinsky et al. 1991). These deposits are exposed along the bluffs and cut banks of Tijeras Arroyo.

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 1.6 to 5.3 million year-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 B.

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. 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).



Source: NM Bureau of Mines and Mineral Resources, 1975

Figure 3. Rio Grande Basin Geology Map

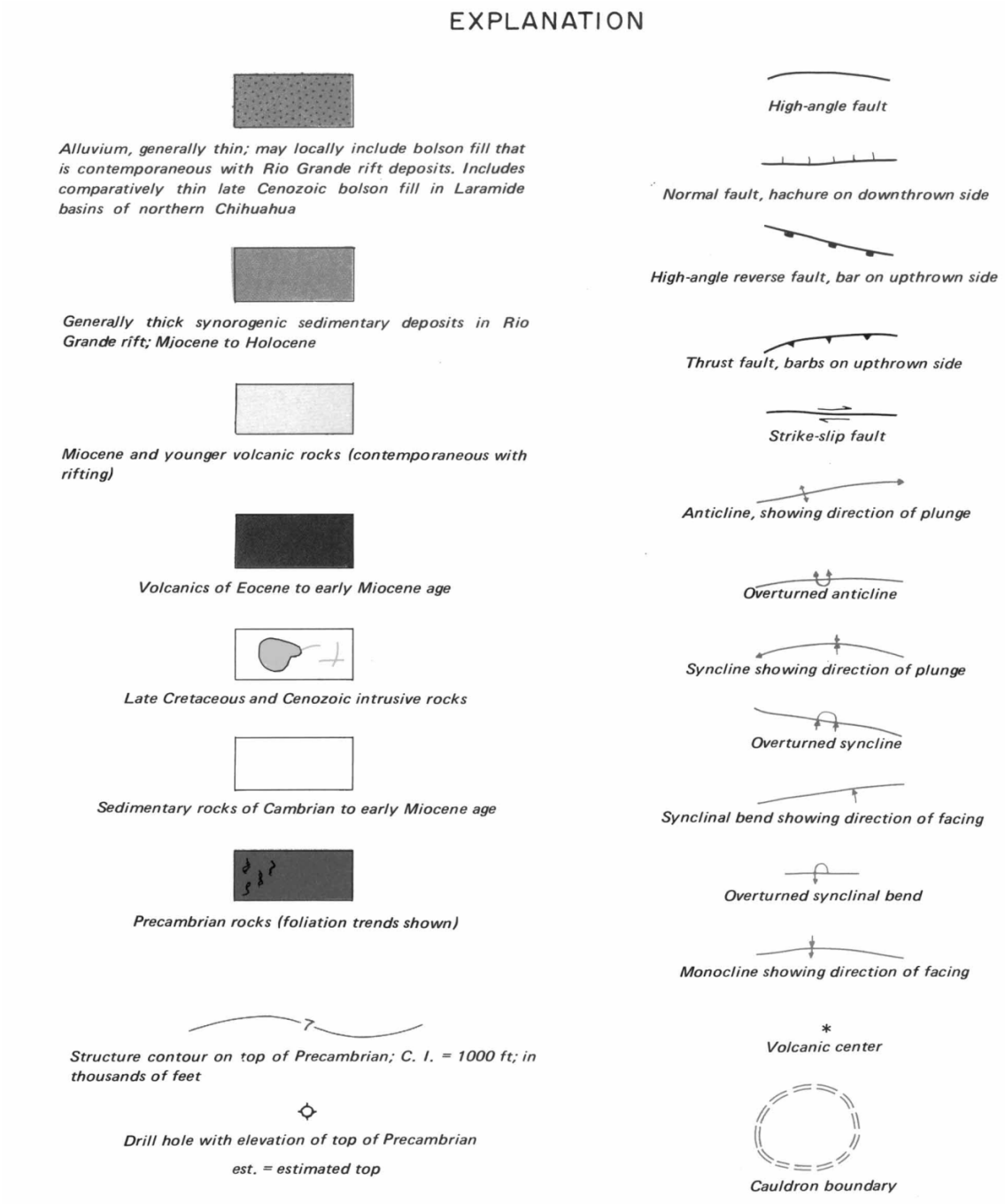


Figure 3. Rio Grande Basin Geology Map (continued)

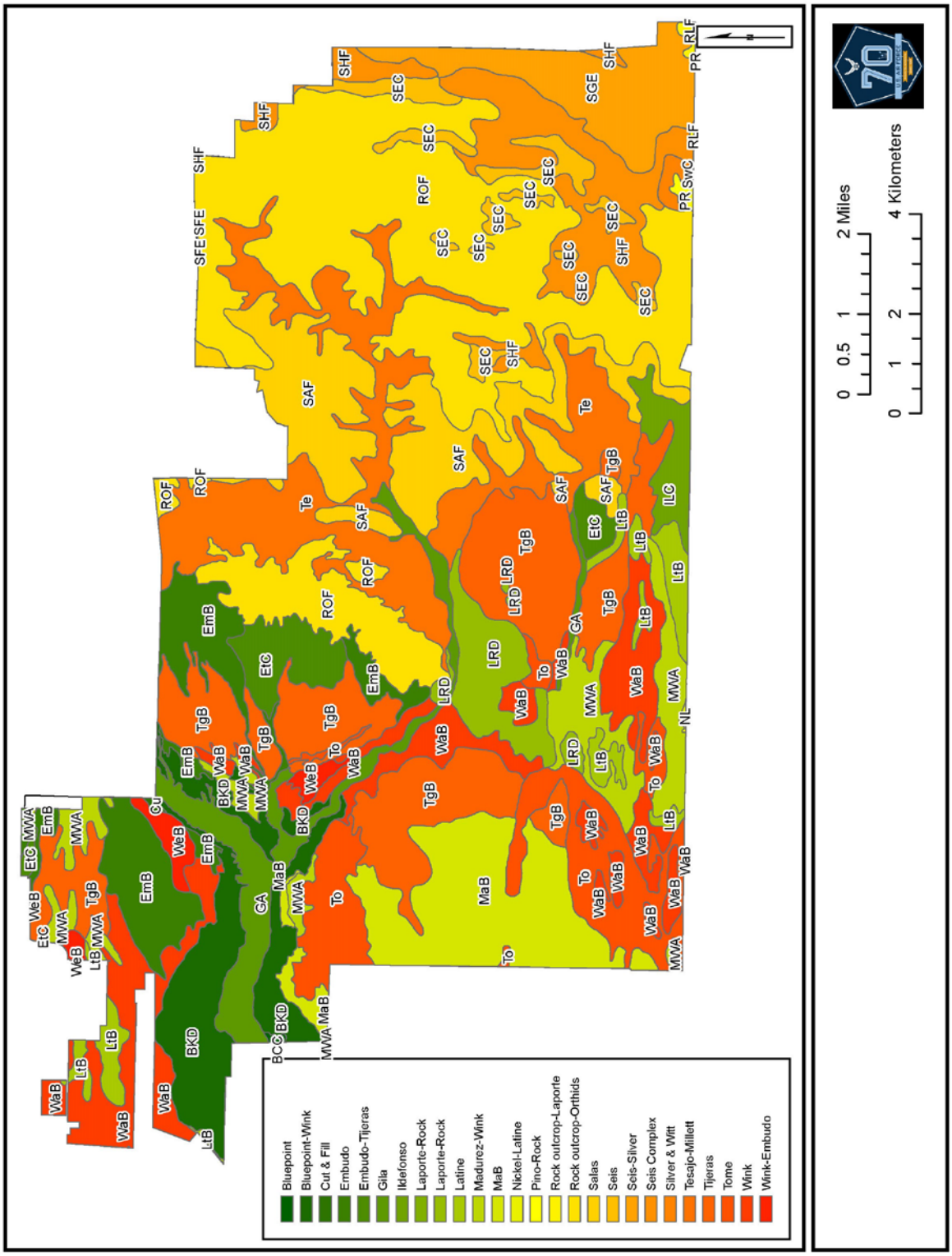


Figure 4. Kirtland AFB Soils

2.2.4 Hydrology

Kirtland AFB is located within the Rio Grande watershed (see Figure 3). 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 storm water 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 5). Precipitation reaches Tijeras Arroyo through springs and 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 1979, USAF 1991). However, nearly 95% of the precipitation that flows through Tijeras Arroyo evaporates before it reaches the Rio Grande River. The remaining 5% is equally divided between groundwater recharge and runoff (USAF 1991). Arroyo del Coyote and numerous other smaller unnamed 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. Six man-made ponds are located on Tijeras Golf Course (Fogel 2000). Twelve naturally occurring springs have been found on the installation, including four in the Withdrawal Area (USACE 1995) (Figure 6).

Seven small wetlands occur on Kirtland AFB (Figure 6). 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. 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. Arroyo del Coyote joins Tijeras Arroyo about one mile west of Tijeras Golf Course. 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 (Schwartz 1979).

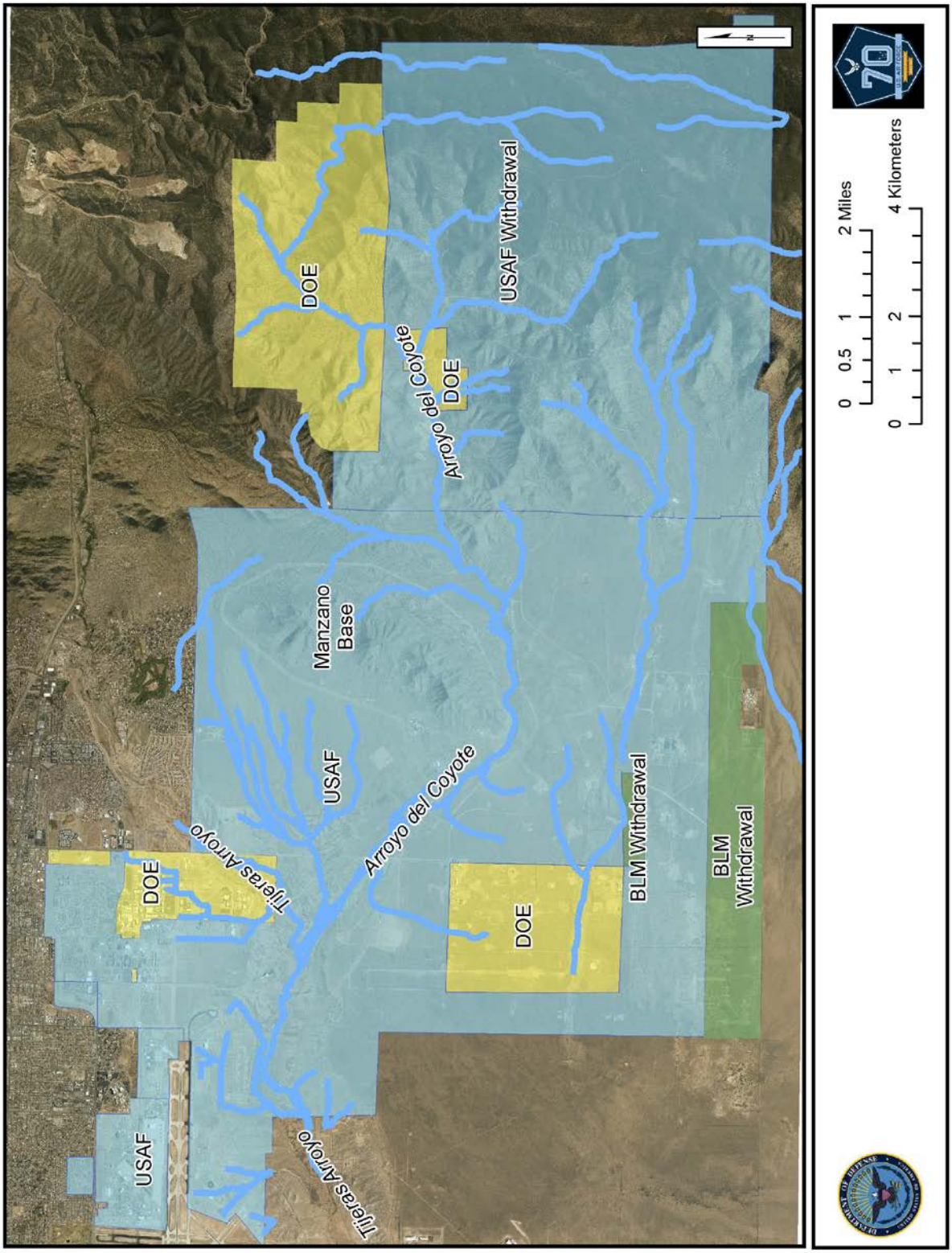


Figure 5. Kirtland AFB Hydrology Map

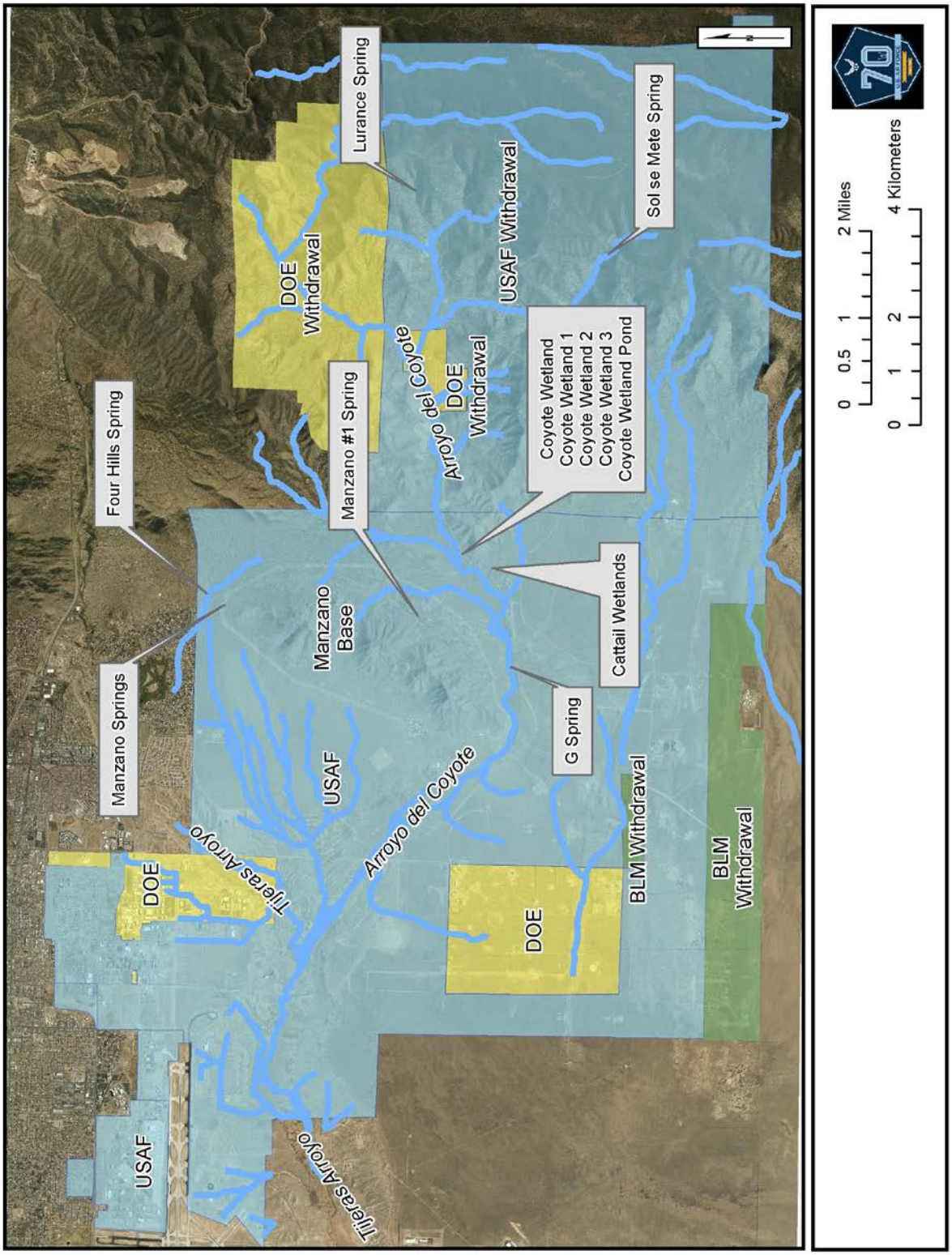


Figure 6. Kirtland AFB Springs and Wetlands

2.3 Ecosystems and the Biotic Environment

2.3.1 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.

2.3.2 Vegetation

Vegetation identified on Kirtland AFB is described in the following sections.

2.3.2.1 Historic Vegetative Cover

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 (USGS 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.

2.3.2.2 Current Vegetative Cover

Four main plant communities are found on Kirtland AFB and in the Withdrawal Area (Figure 7):

- 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 (Figure 5). 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 C.

2.3.2.2.1 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.

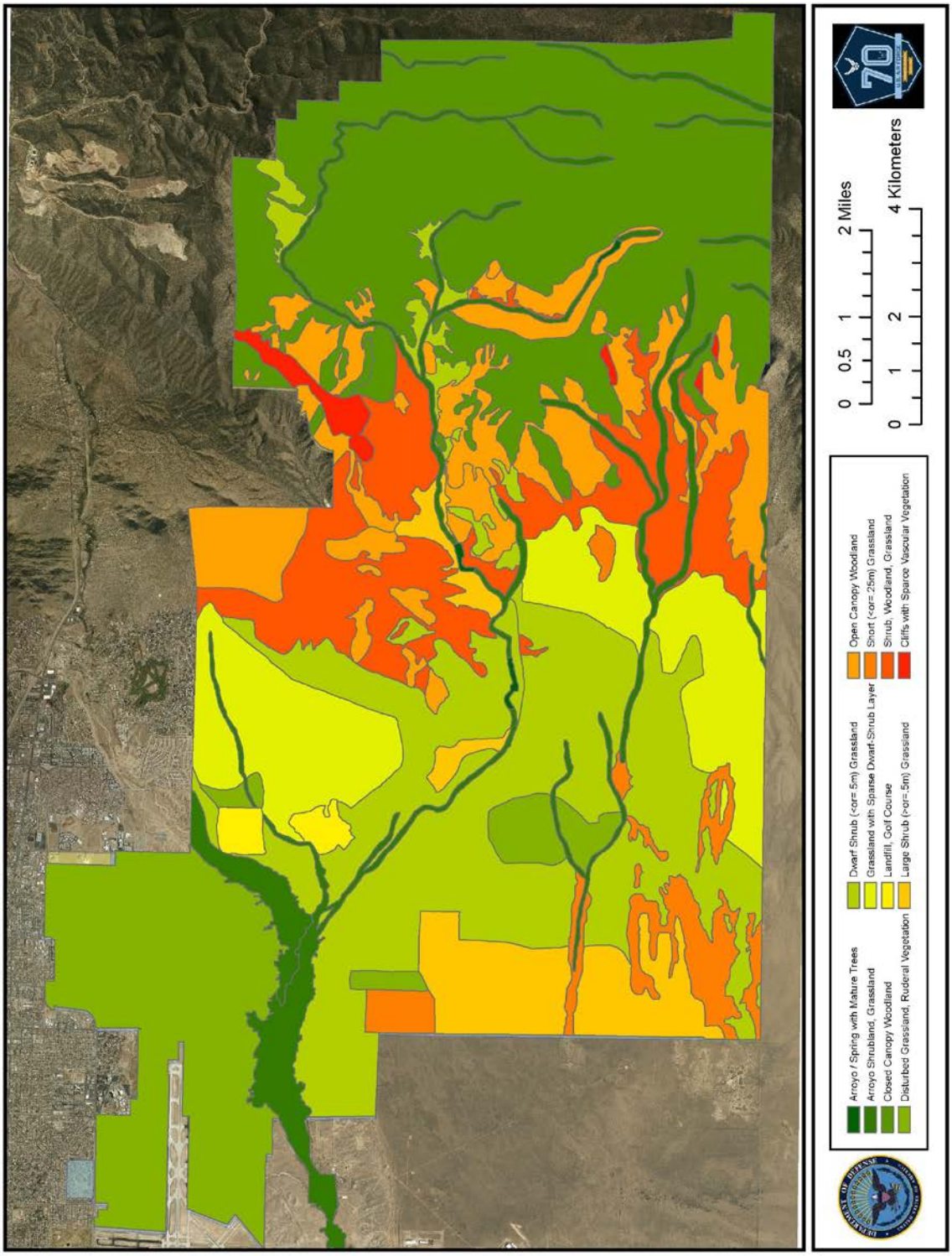


Figure 7. Kirtland AFB Vegetation Map

Primary grass species include ring muhly, Indian ricegrass, blue grama, black grama, six-weeks grama, and spike dropseed. 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. 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 withdrawal 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.

2.3.2.2.2 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.

2.3.2.2.3 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. 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.

2.3.2.2.4 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.

2.3.2.3 Turf and Landscaped Areas

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.

2.3.3 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 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.

Wildlife falls under the jurisdiction of the NMDGF which categorizes species as game or non-game. Migratory birds, federally threatened and endangered species, and critical habitat are regulated by the USFWS. T&E species are addressed in this document under Section 7.4. 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 ESA.

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 D.

2.3.3.1 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.

2.3.3.2 Pinyon-Juniper Woodland Community

Most of the species described in the grassland communities extend into the pinyon/juniper 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 Gray Vireo, Pinyon Jay, 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.

2.3.3.3 Ponderosa Pine Woodland Community

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

2.3.3.4 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 too 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 Four Hills 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 the above sections, 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.

2.3.3.5 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.

2.3.3.6 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. The USFWS has not 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.

2.3.4 Threatened and Endangered Species and Species of Concern

The species of concern potentially occurring on Kirtland AFB and in Bernalillo County are listed in Appendix E, Species of Concern for Bernalillo County. The Gray Vireo, a state threatened species as listed by the NMDGF, is one of the 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 (KAFB 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 (e.g. less than 25%) with one-seeded juniper as the dominate tree/shrub species. Potential Gray Vireo habitat based on a 2005 survey is presented in Figure 8. This habitat area was found to be accurate as recently as the 2015 Gray Vireo survey.

The Western Burrowing Owl, a federal species of concern (not maintained), 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. Burrowing Owl inventories and monitoring of the population have been conducted every year since 1994, and a migration investigation was conducted to identify where nesting owls at Kirtland AFB go to winter. Since Burrowing Owls use prairie dog burrows for nesting, a Prairie Dog Management Plan was developed for the base, which takes into account Burrowing Owl habitat requirements.

The Loggerhead Shrike is New Mexico Species of Greatest Conservation Need. The species 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, have previously occurred and nested on base. However, in 2003, an adult with two chicks was observed just south of the base on the Isleta Pueblo Indian Reservation (KAFB 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, 2011 and 2012 surveys no Texas Horned Lizards were found. 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).

The Peregrine Falcon is a federal species of concern and a state threatened species known to occur and potentially 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 hangars near the airport.

2.3.5 Wetlands and Floodplains

Wetland locations were mapped in 2006 using a Global Positioning System (Figure 6). In 1995, the USACE surveyed the major wetlands and springs in order to determine waters that are jurisdictional pursuant to Section 404 of the Clean Water Act. In addition to providing jurisdictional water determinations for water sources on Kirtland AFB, the 100 year flood plain was reviewed by the USACE. Since the 1995 jurisdictional water survey was completed several additional springs and seeps have been encountered which need jurisdictional assessment.

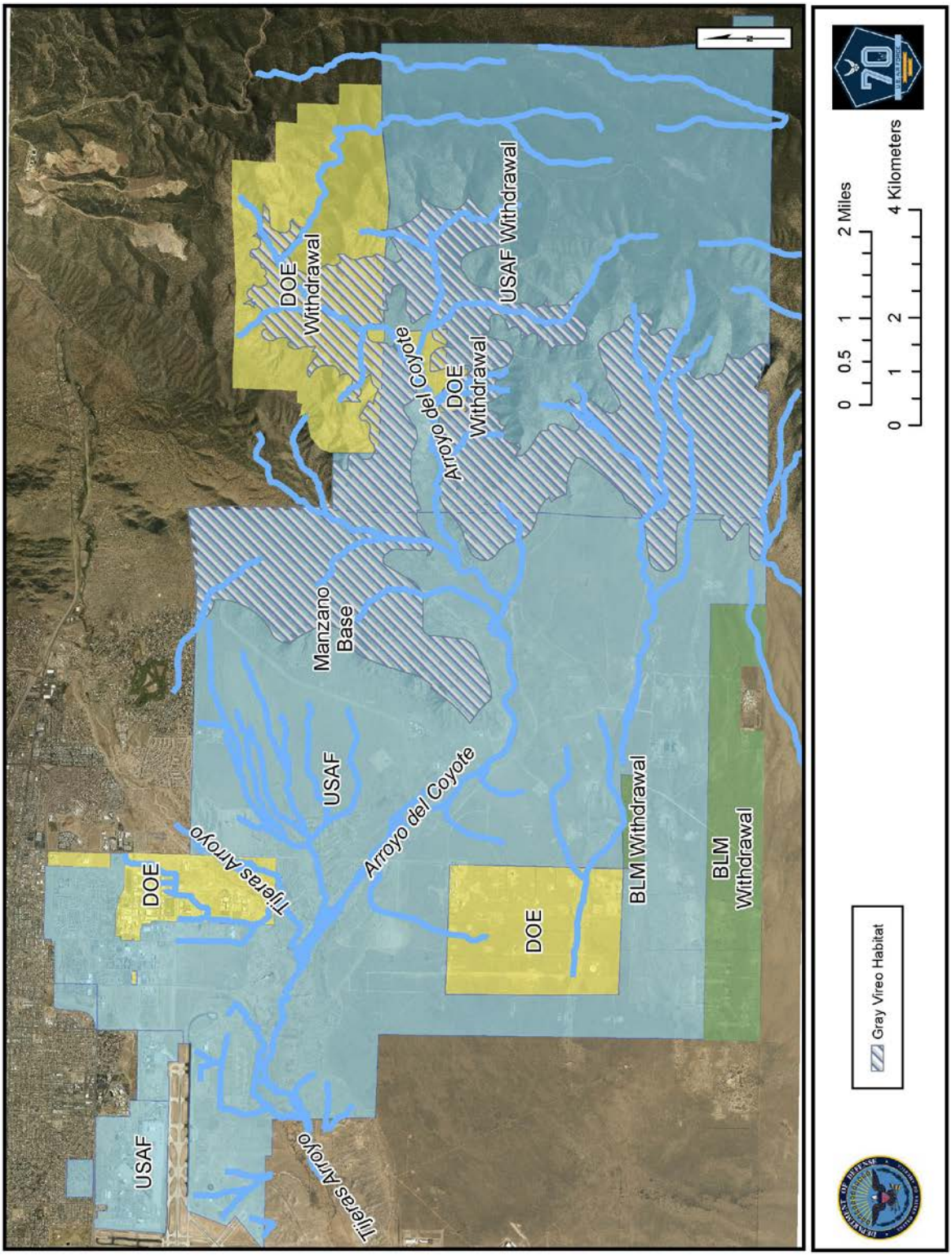


Figure 8. Kirtland AFB Gray Vireo Habitat Map

2.3.6 Other Natural Resource Information

Several biological surveys have been completed during the last INRMP period. Monitoring surveys for Western Burrowing Owl, Pinyon Jay, Gray Vireo, Migratory Song Birds, Cougar, Loggerhead Shrike, and Desert Massasauga have been performed. Monitoring and management of Coyote Springs Wetland has been conducted to address weed invasion, and areas in need of revegetation.

Areas of Kirtland AFB that contain prairie dog colonies have been informally surveyed by the NRM and the U.S. Department of Agriculture - Animal and Plant Health Inspection Service (USDA-APHIS). Beginning in fiscal year (FY) 2018, Kirtland AFB is planning to formally delineate prairie dog colonies throughout the base. USDA-APHIS will conduct the work in coordination with the NRM. This information will be used to assess the health of prairie dog colonies on Kirtland AFB. Monitoring the prairie dog colonies will also provide data for long-term management of prairie dogs on Kirtland AFB.

2.4 Mission Impacts on Natural Resources

2.4.1 Natural Resource Constraints to Mission and Mission Planning

Geospatial data which details natural resource data is maintained in Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) format as required by the Air Force. Data stored in GIS format is utilized by environmental managers and planners to identify all constraints to the military mission from natural resources. Examples of constraints encountered at Kirtland include seasonal restrictions on construction activities, water resource protection and habitat protection.

2.4.1.1 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 (e.g. 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.

2.4.1.2 Wetlands

There are seven 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 (see section 2.3.5). The Coyote Springs wetland complex is the largest wetland on base, consist of multiple springs located primarily south of Coyote Springs Road. Coyote Springs 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.

2.4.1.3 Floodplains

Floodplains occur along Arroyo del Coyote and Tijeras Arroyo. These arroyos run intermittently after heavy rains (USACE 1979). 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 one-half mile across along these drainages, depending on the surrounding terrain. Flooding and erosion within arroyos can cause impacts to the military mission through access issues, road erosion and erosion adjacent to existing infrastructure.

2.4.1.4 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 NMDGF. 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 New Mexico Species of Greatest Conservation Need. The Loggerhead Shrike has been known to occur and breed on base and is protected by the Migratory Bird Treaty Act. 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 NMDGF. Current nesting areas are located south of Kirtland AFB on Isleta Pueblo.

Kirtland AFB Species with Special Status

Species	Federal Status	State Status
Gray Vireo	-	Threatened
Peregrine Falcon	Species of Concern	Threatened
Loggerhead Shrike	-	New Mexico Species of Greatest Conservation Need
Mountain Plover	-	Sensitive taxa
Western Burrowing Owl	Species of Concern	-
Long-legged Myotis	-	Sensitive taxa
Western Small-footed Myotis	-	Sensitive taxa
Gunnison's Prairie Dog	-	Sensitive taxa
Golden Eagle	Bald/Golden Eagle Protection Act	-
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 hangars 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 and manages locations of nesting Burrowing Owls, including the flight line and entire cantonment area, and has developed procedures to relocate owls if necessary. Signage and barriers for nest avoidance are placed where needed including developed areas and areas that are regularly mowed. Other areas where known populations of owls exist is around the landfill

located to the west of Manzano Base. Since this program has been implemented successfully for several years, protection of this species does not constrain development on base.

Kirtland AFB has attempted to move burrowing owls to artificial burrows, particularly along the west side of Manzano Base. The artificial burrows have not been successful thus far and biologists working on the owl surveys and are providing Kirtland AFB with information regarding newer models of artificial burrows that may be more successful.

Several other state species of concern occur on Kirtland AFB. They include the Slate Millipede (federal species of concern), Gramma Grass Cactus (federal species of concern), Long-legged Myotis, Western Small-footed Myotis and the Gunnison's Prairie Dog. The Mountain Plover is not known to occur on base, although it has been observed 55 yards south of the base on Isleta Pueblo.

2.4.1.5 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.

2.4.2 Land Use

Kirtland AFB is approximately five miles southeast from downtown Albuquerque. Kirtland AFB encompasses over 51,000 acres in Bernalillo County and is the sixth largest installation in the USAF. 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, along the mesa top, 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.

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 lands make up 2,045 acres (4% of the installation), semi-improved lands consist of 2,730 acres (5% of the installation), and unimproved lands make up 40,378 acres (76% of the installation). Some of these lands (7,525 acres) are under the jurisdiction of the DOE and will not be included in the following discussions.

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 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

2.4.3 Current Major Impacts

2.4.3.1 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% by 2004. It was developed in 1995 and adopted by Kirtland AFB in 1996.

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 does not have separate industrial and municipal wastewater systems. The Albuquerque Bernalillo County Water Utility Authority treats all of the sanitary sewage produced by Kirtland AFB. An industrial pretreatment program administered by the Albuquerque Bernalillo County Water Utility Authority regulates industrial discharges from the base to sewer lines. Kirtland AFB operates under Permit 2068A issued in 2015 under the Sewer Use and Wastewater Control Ordinance. Kirtland AFB's permit is issued by the 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.

2.4.3.2 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.

From 1 October 2011 through 30 June 2016 there were 85 BASH incidents at the Albuquerque International Sunport reported by commercial airlines (FAA 2018). Species included the following: American kestrel, bat, burrowing owl, sparrow, dove, European starling, hawk, horned lark, rock pigeon, sandhill crane, perching bird, prairie dog, and coyote.

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 CE to avoid collision with aircraft or to prevent attracting raptors. 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.

2.4.3.3 Fuel Storage Tanks

There are POL aboveground storage tanks basewide on Kirtland AFB storing gasoline, diesel, jet propulsion fuel grade 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. All regulated underground storage tanks were removed during 1998 and 2002.

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

2.4.3.4 Installation/Environmental Restoration Program

Kirtland AFB began its Installation/Environmental Restoration Program (IRP/ERP) in 1984. The IRP/ERP operates under Resource Conservation and Recovery Act (RCRA) Hazardous Waste Facility Permit No. NM9570024423 (July 2010). Military Munitions Response Program (MMRP) sites that are former

munitions ranges are being addressed through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Currently, there are 59 active IRP/ERP sites (July 2010 RCRA permit) and four Areas of Concern. As of December 2016 twenty-five of these sites are waiting for Final No Further Action Approval through the New Mexico Environment Department (NMED). These sites are under the control of the AFCEC Environmental Restoration Program at Kirtland AFB and address contamination from past installation operations in accordance with RCRA. Seven MMRP sites are being worked via CERCLA under the direction of Environmental Protection Agency, Region 6.

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. The Bulk Fuels Facility site has impacted the underground aquifer, and contamination has migrated beyond installation boundaries. This site is currently in active remediation (Interim Corrective Measures) under the direction of the NMED

2.4.3.5 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 the installation's recycling efforts.

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

Hazardous waste on Kirtland AFB is managed in accordance with state and federal RCRA regulations. 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 less than 90-day accumulation site in Building 1024 and are stored until transportation and final disposal at a permitted off-site treatment, storage and disposal facility.

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. The QRP captures mixed, white and shredded papers; aluminum beverage containers; toner cartridges; cardboard; 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, and vehicle tires.

2.4.3.6 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 (AEHD) 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 with respect to achieving and maintaining attainment of National Ambient Air Quality Standards and addressing air quality impacts.

Kirtland AFB also obtains air emission source registrations, construction permits, open burning permits, and fugitive dust 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 was issued a Title V permit by the AEHD in December 2011. Kirtland AFB is considered a minor source of hazardous air pollutants under the CAA.

Kirtland AFB's air emissions are from various sources including emergency generators, fire pump engines, boilers, water heaters, fuel storage tanks and fuel dispensing systems, gasoline service stations, surface coating operations, aircraft engine testing, fire training, remediation activities, mulching activities, miscellaneous chemical usage, and open detonation of munitions for military training, emergency remediation, and research and development.

2.4.3.7 Noise/Explosive Impacts

The primary source of noise at Kirtland AFB is airfield operations from aircraft using the Albuquerque International Sunport and Kirtland AFB. In 2009 there were approximately 153,400 landings and takeoffs at the Albuquerque International Sunport and Kirtland AFB combined (KAFB 2011). The noise conditions on and around the airport were evaluated using the FAA's Integrated Noise Model for the EA for the Closure of Runway 17-35 (ABQ 2011). The FAA uses the Integrated Noise Model to assess noise impacts from aircraft operations and produce noise contour maps. The resulting noise contours, shown in Figure 9, represent the most recent noise exposure maps associated with the Kirtland AFB runway. This figure was developed for an EA for the Hercules Tanker Plane Recapitalization at Kirtland AFB, and the "project area" was specific to the EA and is not applicable here (KAFB 2011). However, the noise contours represent the most recent noise exposure maps for the Kirtland AFB runway. Figure 9 depicts the 2011 noise exposure area in 5 dBA increments.

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.

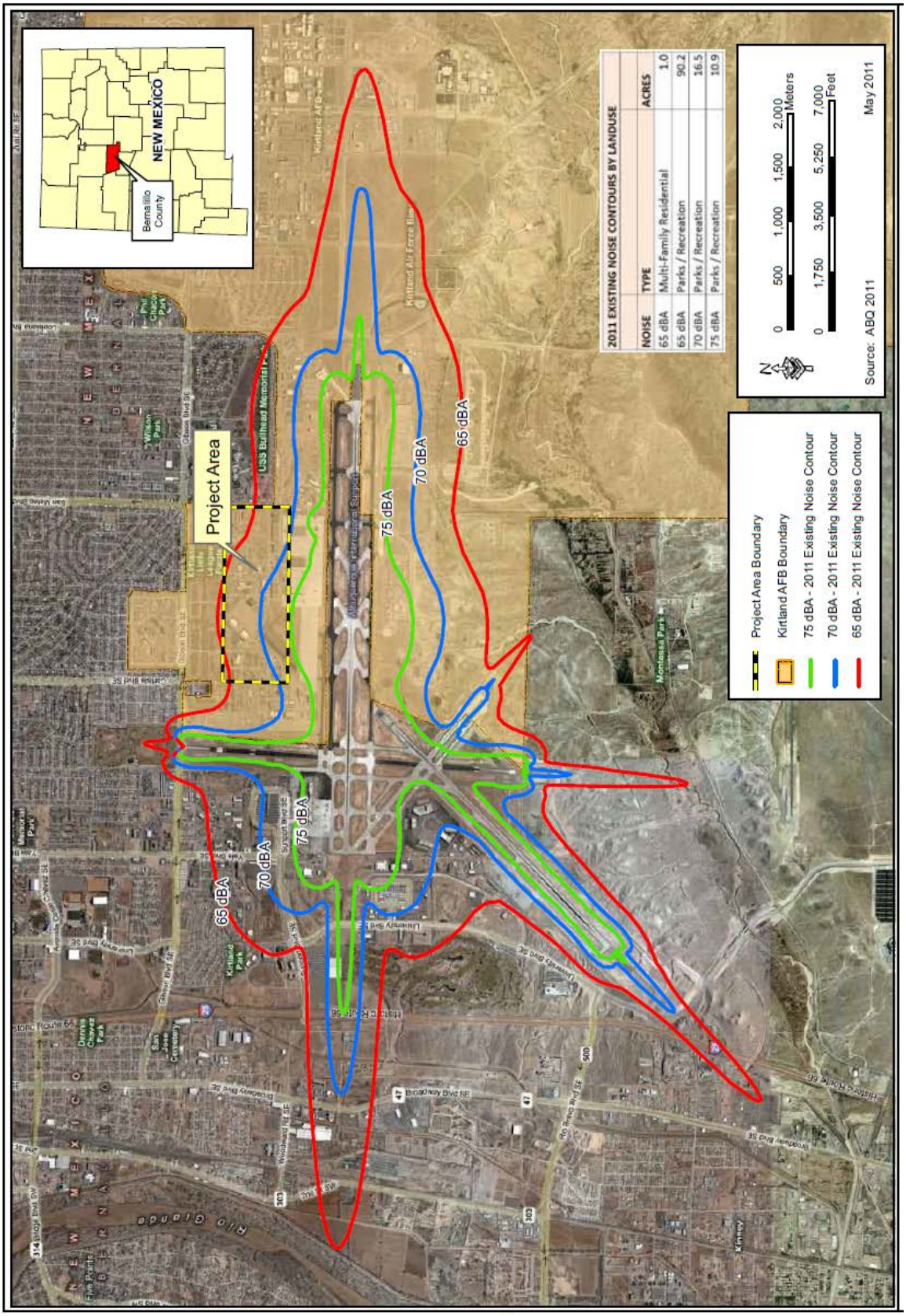


Figure 9. Noise Contours at Kirtland AFB (Excerpted from KAFB 2011)

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. These areas are listed below:

- Area GZ-2
- CHESTNUT Site
- Giant Reusable Air Blast Simulator (GRABS) Site
- 898 Munitions (898 MUNS) storage areas, 750, 740, 26000, 29000, Manzano Mountain
- 3,750 foot radius USAF Explosive Ordnance Disposal Range
- 3,000 foot radius Sol Se Mete Aerial Cable Test Site
- Thunder Range
- Complex 9920
- Explosive Test Facility 9930, 9940, 9939,9956, Sled Track
- 21st EOD Complex
- AFRL HERTF
- 377 SFS Pad 5
- DOE/Sandia Burn Site
- DOE/Sandia Tech Area III

2.4.4 Potential Future Impacts

2.4.4.1 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.

2.4.4.2 Water Resources

Current water resource systems including water supply, stormwater management ponds 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.

Impacts to drainages from invasive species, arroyo downcutting, and erosion are expected to continue and will require maintenance.

2.4.4.3 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.

2.4.4.4 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.

2.4.4.5 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 (KAFB 2002). These sites will continue to be monitored and be recommended for No Further Action approval.

2.4.4.6 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 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.

2.4.4.7 Air Quality

Air quality assessments for proposed Federal actions are required for compliance with NEPA, CAA and other environment-related regulations and directives. All proposed projects are evaluated for air quality impacts and evaluated to determine if permitting is required. The area is currently in attainment status for all pollutants, and current air quality resources are sufficient to support mission growth.

2.4.5 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 and forest cover in the Withdrawal Area are also necessary as they provide a natural backstop for firing ranges and the Starfire Optical Range, and provide natural concealment of military operations from the general public.

3.0 ENVIRONMENTAL MANAGEMENT SYSTEM

The AF environmental program adheres to the Environmental Management System (EMS) framework and it's Plan, Do, Check, Act cycle for ensuring mission success. Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*, U.S. Department of Defense Instruction (DoDI) 4715.17, *Environmental Management Systems*, AFI 32-7001, *Environmental Management*, and international standard, ISO 14001:2004, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

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

4.0 GENERAL ROLES AND RESPONSIBILITIES

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

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
Installation Commander	Approve/sign the INRMP and all revisions, or delegate signature authority as allowed by AFI 32-7064 §2.7.1. Certify the annual review of the INRMP as valid and current; or delegate the certification of the annual INRMP review authority to no lower than Base Civil Engineer. Provide appropriate staffing to ensure implementation of the INRMP. Control access to and use of installation natural resources. Sign cooperative agreements and interagency agreements entered into, pursuant to the Sikes Act, 16 U.S.C. §670c-1. Approve and sign the installation WFMP, or delegate signature authority. Consider, in coordination with the Environmental Planning Function (EPF), the impact of proposed actions on federally listed threatened and endangered species by including the species in the scoping of the NEPA analysis at the earliest possible time and follow the process described in section 8.3.4. (AFI 32-7064, §2.7)
AFCEC Natural Resources Media Manager/Subject Matter Expert (SME)/ Subject Matter Specialist (SMS)	Advocate for resources required to implement approved installation Integrated Natural Resources Management Plans. Provide and manage contracts, interagency agreements, and cooperative agreements on behalf of, and for use by AF organizations for natural resources program management assistance and implementation of natural resources management projects, with the exception of the installation BASH program, which is managed by the Wing Flight Safety Office. Update the INRMP as requested by the installation.
Installation Natural Resources Manager/POC	Ensure the INRMP is reviewed annually and updated/revised as required by AFI 32-7064. Manage natural resources on Air Force installations in accordance with applicable federal, state,

Office/Organization/Job Title (Listing is not in order of hierarchical responsibility)	**Installation Role/Responsibility Description**
	and local laws and regulations. Work with local USFWS and State Fish & Game on development of the goals of the INRMP.
Installation Security Forces	Control access to and use of installation natural resources.
Installation Unit Environmental Coordinators (UECs); see AFI 32-7001 for role description	Assist with implementation of the INRMP by following guidance provided by 377 MSG/CEIEC.
Installation Wildland Fire Program Manager	Responsible for the development, update, and implementation of the WFMP.
Pest Manager	Ensure compliance with Kirtland AFB Pest Management Plan. Coordinate with 377 MSG/CEIE on any requests to use pesticides that are not already approved for use on Kirtland AFB.
Range Operating Agency	Assist with implementation of the INRMP by following guidance provided by 377 MSG/CEIEC. Guidance generally provided through the AF 813 process.
Conservation Law Enforcement Officer (CLEO)	Patrol the Withdrawal area for trespassers and poachers of wildlife and cultural resources.
NEPA/Environmental Impact Analysis Process (EIAP) Manager	Assist with implementation of the INRMP by providing guidance to project proponents and other stakeholders. Assist with communication between the Installation Natural Resources Manager and the project proponent(s) both on and off base as necessary.
National Oceanic and Atmospheric Administration (NOAA)/ National Marine Fisheries Service (NMFS)	N/A
US Forest Service	Contributes to the implementation of the INRMP.
US Fish and Wildlife Service	Contributes to the implementation of the INRMP. Review and approve INRMP with signature by Region 2 Director.
USDA-APHIS	Contributes to the implementation of the INRMP.
New Mexico Department of Game and Fish	Contributes to the implementation of the INRMP. Review and approve INRMP with signature by the Department Director.

5.0 TRAINING

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

Installation Supplement – Training

As per AFI 32-7064:

- As a Category I installation, the Kirtland AFB NRM must take the course, *DoD Natural Resources Compliance*, endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval School, Civil Engineer Corps Officers School

(CECOS). See http://www.netc.navy.mil/centers/csfe/cecos/ for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the Air Force Institute of Technology (http://www.afit.edu), the National Conservation Training Center managed by the USFWS (http://www.training.fws.gov), and the Bureau of Land Management Training Center (http://training.fws.gov).

- Natural resource management personnel shall be encouraged to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and state conferences and training courses.
- All individuals who will be enforcing fish, wildlife and natural resources laws on AF lands must receive specialized, professional training on the enforcement of fish, wildlife and natural resources in compliance with the Sikes Act. This training may be obtained by successfully completing the Land Management Police Training course at the Federal Law Enforcement Training Center (http://www.fletc.gov/).
- Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, to include training that is mandatory to attain any required permits.
- Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement.
- The DOD supported publication Conserving Biodiversity on Military Lands -- A Handbook for Natural Resources Managers (http://dodbiodiversity.org) provides guidance, case studies and other information regarding the management of natural resources on DOD installations.

Natural resources management training is provided to ensure that base personnel, contractors, and visitors are aware of their role in the program and the importance of their participation to its success. Training records are maintained IAW the Recordkeeping and Reporting section of this plan. Below are key NR management-related training requirements and programs:

- Personnel applying pesticides (377 MSG/CEO Base Maintenance Contractor) receive training and certification to comply with all federal, state, local and Air Force regulations.
- Environmental Management System Awareness training is provided to base personnel by 377 MSG/CEIEC Environmental Management.
- Environmental outreach/training is conducted at environmental cross-functional team meetings, facility managers training, newcomers training, and training Contracting and Civil Engineering personnel.

6.0 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

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

Installation Supplement – Recordkeeping

Records are filed in accordance with the file system and categories prescribed by AFRIMS. The primary location for the storage of records is the electronic server.

Kirtland AFB will coordinate with the University of New Mexico to assess the feasibility of sharing GIS data.

6.2 Reporting

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

Installation Supplement –Reporting

Kirtland AFB will send annual INRMP updates to USFWS and NMDGF to keep cooperating agencies updated on Kirtland AFB progress towards goals and changes to the NR program.

7.0 NATURAL RESOURCES PROGRAM MANAGEMENT

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

Installation Supplement –Natural Resources Program Management

Development and implementation of this INRMP is the responsibility of the 377 ABW/CC with the 377 MSG/CEIEC leading the effort. Plans for various management activities on the installation are produced and implemented in compliance with the INRMP. Coordination with Region 2 of the USFWS, and NMDGF are signatories for this plan, and provide technical support and input.

Natural Resources Program Management Related Plans

Plan	Office	Telephone
Kirtland AFB Installation Development Plan	377 MSG/CE	(505) 853-2747
Integrated Natural Resources Management Plan	377 MSG/CEIEC	(505) 846-0226
Stormwater Pollution Prevention Plan	377 MSG/CEIEC	(505) 846-6362
Integrated Pest Management Plan	377 MSG/CEO	(505) 846-5650
Grounds Maintenance Plan	377 MSG/CEO	(505) 846-5650
Kirtland BASH Plan	58 SOW/SE	(505) 853-5838
Integrated Cultural Resources Management Plan	377 MSG/CEIEC	(505) 846-0226

DOE manages natural resources within their lease areas; AFCEC provides support by securing resources for the implementation of projects detailed in the INRMP. Tennent organizations coordinate projects that may affect natural resources with 377 MSG/CEIEC.

Kirtland AFB maintains cooperative agreements administered by the USACE with several universities to monitor wildlife, vegetation, and habitat resources.

7.1 Fish and Wildlife Management

Applicability Statement

This section applies to AF installations that manage fish and wildlife on AF property. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

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). As part of effective ecosystem management on military installations containing natural resources, the Air Force is required under AFI 32-7064 to inventory and manage wildlife occurring on Air Force lands. In addition, military installations are required to protect neotropical migratory bird species living within its perimeters under the Migratory Bird Treaty Act (16 U.S.C. 703-712 et seq.).

Kirtland AFB has participated in the Monitoring Avian Productivity and Survivorship (MAPS) Program (Animas Biological Services 2009; 2010; 2011; 2015, and 2016). Additional Surveys are being conducted in 2017.

The MAPS program was initiated in 1989 by The Institute for Bird Populations (Point Reyes, CA) to assess and monitor population dynamics of North American land birds. The MAPS Program utilizes constant-

effort mist netting and banding at a network of monitoring stations throughout North America that are managed and operated by professional biologists and highly trained volunteers. MAPS data are used to evaluate temporal and spatial patterns in the vital rates of target avian species and to investigate the relationship between these patterns and species population trends, landscape-level habitat characteristics, and weather variables. The study area is located in the foothills of the Manzanita Mountains approximately 1.7 miles east of the Kirtland AFB Withdrawal Area boundary and 0.3 miles north of the boundary between Kirtland AFB and Isleta Pueblo

Threatened and Sensitive Species on Kirtland AFB

Federal Species of Concern species defined by the USFWS known to occur on Kirtland AFB include the Western Burrowing Owl and Peregrine Falcon. Other federal species of concern occur on Kirtland AFB, they include the Slate Millipede and Gramma Grass Cactus.

NMDGF sensitive taxa species include: Long-Legged Myotis, Western Small-footed Myotis and Gunnison's Prairie Dog. Historic populations of Mountain Plovers should be monitored as part of the land bird survey in order to ascertain whether the species warrants conservation and management under the INRMP.

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 NMDGF. 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. April – September).

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 hangars 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.

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.

A summary table of Kirtland AFB species with special status is shown on page 46.

Pest Management and Wildlife Control

The Base Maintenance Contract and USDA-APHIS are responsible for pest management and wildlife control. In the event that wildlife injuries or mortalities occur on Kirtland AFB, USDA-APHIS staff is contacted to address the issue. Requisite reporting is conducted by the USDA-APHIS and the information is provided to Kirtland AFB natural resource personnel.

Avian Management

Proposed development, infrastructure maintenance and ground disturbing activities on Kirtland AFB are reviewed by environmental staff. Natural resource personnel conduct surveys prior to activities that could potentially affect wildlife or habitat.

All projects completed on Kirtland AFB are reviewed by the NEPA program manager and projects that have the potential to impact avian species subject to the Migratory Bird Treaty Act are routed for review by the Natural Resource Manager. Projects that may be subject to Categorical Exclusion under NEPA, Environmental Assessments and dig permits comprise the type of project subject to review. Kirtland AFB reviews all projects regardless of the tenant organization that is conducting the work.

The primary treatment for avoiding protecting birds subject to the Migratory Bird Treaty Act is to implement seasonal work exclusions for species that do not winter on the installation.

In the event that an occupied nest has to be removed due to an emergency Kirtland AFB maintains a contract with the USDA-APHIS. USDA-APHIS has a wildlife biologist on staff that can assist with the removal and holds a take permit from the USFWS.

Based on the type of project to be conducted appropriate surveys are planned & completed. It is common for building demolition or exterior work to encounter nesting birds, these projects are rescheduled after the birds have fledged or outside of the breeding season. Project actions that initiate review are detailed on Kirtland AFB's environmental checklist and include:

- Demolition of buildings/structures
- Removal/trimming of trees
- Outdoor activities
- Replacement of existing or installation of new power poles

Kirtland AFB avoids removal of vegetation during the nesting season. During the breeding season, bird eggs and nestlings are vulnerable to inadvertent taking through disturbance of vegetation and building maintenance activities 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. Following are standard procedures employed by natural resource personnel to mitigate risk to birds during standard operations and maintenance projects; the following best management practices (BMPs) have been developed to address common species on the installation. Where practicable and in compliance with Air Force directives, the BMPs are presented to the planning group for consideration.

- If only a small area (less than 1/2 acre) is to be disturbed between 1 April and 31 August, Kirtland AFB natural resources personnel surveys the area for bird nests before the project begins.

- If a large area (greater than 1/2 acre) is to be disturbed, Kirtland AFB natural resources personnel surveys the area for bird nests before the project begins.
- Kirtland AFB avoids removing standing dead trees, unless there is an immediate safety hazard or adverse effect on Kirtland AFB's mission. Kirtland AFB natural resources personnel evaluate the area for any occupies nests prior to removal of the nests and transport to a rehabilitation facility.

Birds hit human-made structures at any time, day or night. Birds are easily deceived by and strike reflected images of habitat and sky on windows installed in the conventional vertical position. BMPs are implemented where possible for new and existing buildings on Kirtland AFB.

The following discussion of avian and building/structure is described and specific recommendations for risk mitigation are excerpted from the USFWS (2016). Glass reflectivity and transparency create a lethal illusion of clear airspace that birds do not see as a barrier. During the daytime, birds collide with windows because they see reflections of the landscape in the glass (e.g., clouds, sky, vegetation, or the ground); or they see through glass to perceived habitat (including potted plants or vegetation inside buildings) or to the sky on the other side. According to the USFWS, the majority of collisions with both residential and urban buildings happen during the day, as birds fly around looking for food. Large avian mortalities at night more frequently occur at communication towers, offshore drilling platforms and in other situations where there is a bright light source in a dark area, especially during inclement weather. Most consider bird/glass collisions an urban phenomenon involving tall, mirrored-glass skyscrapers, the reality is that 56% of collision mortality occurs at low-rise (i.e., one to three story) buildings, 44% at urban and rural residences, and <1% at high-rises. The majority of structures that exceed two stories do not have windows while 1-2 story buildings typically have windows on both stories.

Significant restraints for implementation a of recommended BMPs on buildings include potential retrofitting windows which are located on historic building that are eligible to the National Register of Historical Places (NRHP). Original windows located on historic buildings are considered a character defining feature of these buildings and the State Historic Preservation Office (SHPO) require mitigation for the implementation of avian safe windows/lighting that do not affect the historic fabric of the building. Lighting, particularly on hangers and other structures are critical to Kirtland AFB's mission in accordance with Federal Aviation Administration (FAA) and Air Force guidelines and has the potential to impact Kirtland AFB's mission.

Recommended BMPs for Avian Building and Window Collisions (USFWS 2016):

- Coordinate with tenants to identify where avian mortality have previously occurred and complete an assessment and the causes.
- Reduce the exterior reflectivity of windows by applying commercially available window film or installing a permanent sunscreen over the window.
- Bird silhouettes may be placed in windows to prevent collisions.
- If exterior treatments are not an option, applying treatments on the inside can also be helpful. If you can see the markings from the outside of the window at window level, birds probably can too. Check this several times during the day, as reflections may only occur during certain light conditions See items under Glass Options for a list of window treatment options for existing structures.

- For buildings over two stories tall, turn off or dim lights near windows at night where possible.
- Program building lighting systems to achieve a measurable reduction in night-lighting from 2100 to 0600, or ideally ensure that all unnecessary lights are turned off were compatible the Kirtland AFB's mission are switched off during that period.
- Extinguishing all exterior vanity lighting (roof-top floods, perimeter spots, etc.) during migration periods (15 Feb – 15 May and 15 Aug – 30 Nov).
- 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 identified and rectified. Observed bird mortalities or injuries are reported to the Kirtland AFB NRM.
- If you have indoor plants, trees or shrubs, either treat the adjacent glass or move all plants away from clear glass windows far enough that they cannot be seen from the outside by birds. If you were at window level looking in, could you see the plant? If the answer is "yes", then birds can probably see it too.

Avian Safe Tower and Electrical Structure Management

The construction of new towers and existing towers create a significant impact on migratory birds, especially for the numerous species of birds that migrate at night. The USFWS has estimated that communications towers kill four to five million birds per year, which violates the spirit and the intent of the Migratory Bird Treaty Act (MBTA) and the Code of Federal Regulations at Part 50 designed to implement the MBTA. The USFWS is focusing more attention on the bird's collision issue and has considered action under the MBTA. The known or suspected risk factors to birds are: height of tower, guy wires, lighting, weather, and location.

Although most towers at Kirtland AFB are relatively short compared to communications towers, the use of guy wires, electrical distribution structures and substations pose a significant risk. Lighting could still contribute to bird kills especially during spring and fall migration. The USFWS Interim Guidelines for Recommendations on Communications Tower Siting, Construction, Operation, and Decommissioning, and Avian Power Line Interaction Committee (APLIC) provide BMPs for structures that pose threats to birds.

- Using construction techniques that do not require guy wires (e.g., use a lattice structure, monopole, etc.).
- Report observed bird mortalities. Report occurrences of bird injury or mortality to Kirtland AFB Natural Resources.
- Retrofit old tower poles that are identified as high risk for avian mortalities. 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.
- Because of their large size, eagles are particularly susceptible to electrocution risks. Golden Eagles are known to occur at Kirtland AFB. Golden Eagles are currently protected under both the MBTA and the Bald and Golden Eagle Protection Act.
- Coordinate with engineers and FAA to explore solutions to minimize mortalities from avian/towers thought the base.

Development of an avian protection plan (see section 10) will provide and updated assessment for risk and recommendations for decreasing avian mortalities on Kirtland AFB. APLIC standards will be employed in

order to develop this plan. A preliminary study was conducted in 2014 which details problem structures and priority replacement projects (Envirological Services, Inc. 2014).

INRMP Implementation (2007 – 2016)

Summaries of activities resulting from implementation of previous INRMPs are detailed in the text below.

Kirtland AFB has been identified as an Important Bird Area (IBA) by the Audubon Society due to the large urban colony of burrowing owls that nest on base (Audubon Society 2017). IBAs are identified and nominated by an Audubon New Mexico technical committee in consultation with NMDGF and land managers.

Kirtland AFB works cooperatively with other agencies on an as-needed basis including the USFWS, NMDGF, 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. Kirtland AFB does not maintain any designated areas authorized for wildlife-related outdoor recreation. Hunting, trapping, and fishing are not allowed on the base, as these activities would conflict with mission objectives.

Kirtland AFB is a signatory to the 2007 Tijeras Arroyo Wildlife Corridor MOU between the City of Albuquerque, DOE/NNSA and the Sandia Site Office. The MOU establishes goals for maintaining the arroyo as a viable wildlife corridor including the installation of wildlife friendly fencing where the arroyo enters and exits Kirtland AFB. The fencing has been installed along the east side of the installation. The west side, where the arroyo exits Kirtland AFB, may need to be improved and maintained.

Personnel responsible for enforcement of wildlife laws is currently not staffed. 377 MSG/CEIE is working with Security Forces to lay the framework for implementation of a Conservation Law Enforcement Officer (CLEO) Program.

Wildlife Studies and Management

Natural resources 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 which was developed by Kirtland AFB natural resource personnel, USFWS, and NMDGF. These programs were initiated to address regulatory requirements, mission requirements and resource-specific concerns (declining populations, etc.). The issues/concerns and mitigation projects related to wildlife were developed by Kirtland AFB personnel, NMDGF and USFWS.

Various plans and programs have been developed/implemented including prairie dog management, vegetation and wildlife inventories, pest management, avian survey and monitoring, and habitat improvements such as the construction of raptor nesting platforms and wetland restoration.

A vegetation survey and examination of prairie dog colony size and density and its relationship to Burrowing Owl nest success in order to provide comparative data between the cantonment area and grasslands east and west of Manzano base.

Wildlife Studies (2007 – 2016)

A summary of the wildlife studies, status and recommendations, conducted since the 2007 INRMP was implemented are presented below. Best management practices are detailed for each species as provided by biologists that conducted the various studies.

Western Burrowing Owl (*Athene cunicularia)*

Kirtland AFB has conducted Burrowing Owl monitoring surveys every year from 2007 through 2016; further surveys are planned and budgeted for the next 5 years (2017 – 2022). Portions of this text is excerpted from the following reports, all of which are on file at Kirtland AFB (Hawks Aloft 2003; Envirological Services, Inc. 2005, 2010, 2011, 2012, 2015a, 2015b, 2016, 2017). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.
Burrowing Owls are listed as a Bird of Conservation Concern (no longer maintained) by the USFWS in Region 2 Southwest Region.

Overview

Burrowing Owls live in cavities, but do not make 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, Gunnison's Prairie Dogs, badgers, ground squirrels, rock squirrels, foxes, and coyotes. Burrowing Owls in New Mexico are closely associated with prairie dog colonies.

In New Mexico, most owls migrate, but some are found year round. Owls return from their winter grounds in March or April and then depart again in July, August, and September before migration in the fall.

Status

The population of Burrowing Owls on Kirtland AFB has experienced a sharp decline in size and reproduction, and much of the recent nest failure has been attributed to predation. On Kirtland AFB, the population of Burrowing Owls has been monitored annually since 1998. After 18 years of monitoring, an overall decline of 84.6% has been documented. Along with the decline in number of owls, there has been a decline in reproduction. During the breeding seasons from 2010 to 2015, 60.6% of the owl pairs failed to produce young. High predation rates of young and adult owls have caused the majority of recent nest failure on Kirtland AFB. Since 2010, 42.4% of nest failure was conclusively attributed to predation. The general decline is similar to other Burrowing Owl populations in western North America. Several proposed mechanisms may be involved in this decline, including high predation rates, habitat loss, construction activities, the decrease in burrowing mammals, drought, and migration and over-winter habitats.

Eighteen Burrowing Owl predator species have been identified on Kirtland AFB, including two mammals, two snakes, 11 diurnal raptors, and three nocturnal raptors. The predators documented during surveys include skunk, coyote, bull snake, prairie rattlesnake, Osprey, Northern Harrier, Cooper's Hawk, Swainson's Hawk, Red-tailed Hawk, Ferruginous Hawk, Golden Eagle, American Kestrel, Merlin, Peregrine Falcon, Prairie Falcon, Great Horned Owl, Long-eared Owl and Barn Owl.

Recommendations for Best Management Practices

The habitat of Kirtland AFB is valuable for many wildlife species, and is unique to its surroundings for reasons including lack of pressure from agriculture, cattle grazing, hunting, or major housing developments. Results from this year and the previous survey periods have shown variability in the distribution and diversity of predators on Kirtland AFB. Monitoring is important to determine predator population status and to determine if management practices are needed in order to protect declining Burrowing Owl populations.

A prairie dog study examining colony size and density and its relation to Burrowing Owl occupation and nest success should be conducted. A vegetation study should be conducted comparing the cantonment and grassland areas west of Manzano Base to determine habitat structure and composition for Burrowing Owl management.

Proposed Conservation Projects

Proposed conservation projects for the management of Burrowing Owls is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation. This data is also critical for avoidance of occupied nests during project review and approval by the NRM. The NRM coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis. Flagging or other barriers are installed where needed to minimize human interactions with the owls.

Loggerhead Shrike (*Lanius ludovicianus*)

Kirtland AFB has conducted Loggerhead Shrike monitoring surveys during 2003 - 2016; further surveys are planned and budgeted for the next 5 years (2017 – 2022). Portions of this species discussion is excerpted from the following reports, all of which are on file at Kirtland AFB (Envirological Services, Inc. 2006, 2011, 2015c). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

The Loggerhead Shrike is currently listed as a New Mexico Species of Greatest Conservation Need and occurs on Kirtland AFB; thus, this species warrants conservation and management action under the INRMP.

Overview

The Loggerhead Shrike belongs to the Order Passeriformes, and is the only member of the Family Laniidae that occurs exclusively in North America. The species occupies a large geographic range and a wide variety of habitats. Shrikes hunt like small hawks, preying on invertebrates, insects, small animals, lizards, and some small birds. They are known for their unique behavior of impaling their prey on sharp thorny vegetation or barbed wire.

Shrikes are considered a partial migrant; Shrikes breeding north of 40° latitude are almost exclusively migratory, New Mexico is within the range where migration is not considered requisite. Shrikes are present year-round in New Mexico and at Kirtland AFB, and some of these birds occupy the installation throughout the year, while others either disperse or migrate.

Loggerhead Shrikes occur on Kirtland AFB in habitats that include grasslands and shrublands on the east end of the base, and juniper savannah in the southwest region of the base that approaches pinyon-juniper canyons and foothills. The majority of nests on Kirtland AFB are found in four-wing saltbush. Other common vegetation communities where nesting has been observed include one-seeded juniper and Siberian elm stands.

Additionally, Shrikes are found in developed areas adjacent to either saltbush shrublands or juniper savannahs. Developed areas are characterized by roads, structures and buildings and nearby landscaped shrubs and trees. Shrikes are not necessarily deterred by human activity, and some aspects of development are used frequently by Shrikes (e.g. power lines and poles, other high perches, barbed wire fences, etc.). The highest density of breeding Shrikes, and Shrikes detected during seasonal surveys occur on the areas with the greatest degree of human activity and disturbance, and the greatest density of manmade structures. Nests found in developed areas were always accompanied by undeveloped habitat directly adjacent to them. Areas with dispersed buildings, utility lines, other structures and landscaped vegetation may provide Shrikes with many hunting perches and impale sites. In addition, they may use cultivated landscape plants as nest substrates, and in periods of low precipitation these plants may provide better concealment or cooler microclimates than native vegetation. Finally, prey populations may be more available in these areas as result of increased water or food availability (i.e. bird feeders, garbage, etc.). However, while Shrikes seem to tolerate “everyday activities”, they are susceptible to abandonment if habitat is disturbed near their nests sites, especially during nest initiation (i.e. nest building and egg laying). In two instances in 2011, nest abandonment occurred after human disturbance occurred near their nest sites.

Loggerhead Shrikes are present on Kirtland AFB in all seasons, though in varying densities. Typically, Shrikes are most abundant during the months that follow breeding. In 2015, Shrike abundance on Kirtland AFB was more consistent than in other years. Shrikes were more abundant in all seasons in 2015 versus 2014, and this could result from increased breeding success in 2014, though in others years with higher nest success this did not necessarily translate to an increased population size in following years.

Shrike nest success is highly variable, but is low overall, and is strongly correlated with winter precipitation. Relatively high nest success was observed on Kirtland AFB in 2014, probably due to abundant food resources resulting from a strong monsoonal precipitation event in 2013. 2007 also had relatively high success for this population, and was also accompanied by an above average monsoon in 2006. However, the typically low nesting success on Kirtland AFB is cause for concern. Predation drives this variation; in periods of abundant food resources, Shrike nests are targeted by predators less frequently. Quantifying predators on Kirtland AFB, especially coyotes, coachwhips, and gopher snakes could provide insight on the impact of predator densities in different areas.

Status

Shrike nest initiation has advanced significantly since 2007. Earliest nests were initiated 31 days earlier in 2015 than 2007, and mean nest initiation has also advanced dramatically; nests in 2015 were initiated on average 24 days sooner than in 2007. These advances are attributed to increased spring temperatures.

The greatest number of breeding Loggerhead Shrikes on Kirtland AFB was recorded in 2015 (41 pairs); this is in contrast to 2014 when the fewest number of breeding pairs were recorded (18 pairs). Nests are found most frequently in saltbush shrubland with dispersed shrubs and trees and where human usage was medium to heavy. Extensive grassland areas with few shrubs were not used as frequently.

In New Mexico, Shrikes have also experienced steady declines, prompting their listing by the NMDGF as a New Mexico Species of Greatest Conservation Need, citing these declines and paucity of information regarding their causes. Though reasons for this widespread decline are not well defined, there is consensus that pressures encountered during migration and on wintering grounds are a limiting factor. Loggerhead Shrikes are not ranked as a high priority, but long-term declines and no general consensus of causes lead to concerns about the species vulnerability and therefore its status bears careful monitoring. Also, since the species has a vast range and shows declines throughout the range, this suggests that at least some of the factors affecting the decline are not restricted to a given habitat type (i.e. grasslands) or to a given geographic region.

Recommendations for Best Management Practices

Comparatively, Kirtland AFB is relatively static in overall land-use changes: widespread development is absent as is grazing. This offers opportunity to study this species on habitats that are consistently available and unchanged. Habitat available to Shrikes on Kirtland AFB is important as a breeding site, and to varying degrees, depending on the year, as wintering habitat. It is recommended that saltbush, juniper, and Siberian elm should be retained unless its removal is completely necessary.

The basic breeding biology of Loggerhead Shrikes on Kirtland AFB has been fairly well established (habitat preferences, plant species preferences, timing, success, etc.), though some aspects of nest success would benefit from future study. However, habitat use and presence throughout the winter are not well defined. From seasonal surveys, Shrikes may occur on Kirtland AFB in highly variable numbers. A study designed to explore the use of Kirtland AFB by Shrikes in the winter could provide information on how important Kirtland AFB as a wintering location.

Proposed Conservation Projects

Proposed conservation projects for the management of Shrikes is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation. This data is also critical for avoidance of occupied nests, breeding sites, and wintering habitat during project review and approval by the CE Environmental Division. The Natural Resource Manager coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

Pinyon Jay (*Gymnorhinus cyanocephalus*)

Kirtland AFB conducted Pinyon Jay monitoring surveys from 2008 through 2013; further surveys are planned and budgeted for the next 5 years (2017 – 2022). Additional efforts include modeling colony-scale habitat for Pinyon Jays. Portions of this species discussion are excerpted from the following reports, all of which are on file at Kirtland AFB (University of New Mexico 2012a, 2012b, 2014). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

Due to its unique keystone mutualism with pinyon trees, the Pinyon Jay is arguably the most important avian indicator of pinyon woodland productivity and warrants conservation and management action under the INRMP.

Overview

Pinyon Jays are year-round residents in pinyon-juniper habitats across the southwestern US. They nest colonially and breed (often cooperatively) on traditional nesting grounds. They are omnivorous, taking pine seeds, acorns, juniper berries, arthropods, and small vertebrates, but they especially depend on the seeds of pinyon pines. With their ability to carry up to 50 pinyon seeds at a time, Pinyon Jays are the main long-distance seed disperser for pinyon trees. In turn, the trees provide abundant, highly nutritional seeds during mast years (typically every three to seven years). Cached seeds sustain Pinyon Jays over winter, support successful breeding, and strongly influence Pinyon Jay population viability. Pinyon Jays form large winter flocks that historically have numbered up to several hundred birds and range widely in search of pinyon seeds and other foods.

Status

The most recent Pinyon Jay survey detailed two separate nesting colonies/flocks and at least one large winter flock at Kirtland AFB. The flock stays within its home range in the winter and does not stray far from the winter range that encompasses both nesting colony areas

Pinyon Jays are considered to be at risk because populations range-wide have been declining significantly for over 40 years. As a result, the Pinyon Jay is listed as a DOD Species at Risk. Despite documented declines, their habitat use in pinyon-juniper woodlands has hardly been studied.

Global climate change is expected to bring increased temperatures and frequent drought, which can be expected to impact cone production. In the Southwest, impacts of fire and insect damage to pinyon trees are increasing. In addition, the range of pinyon-juniper habitat is predicted to contract significantly in southern New Mexico, Utah, and Arizona under climate change and expand in northern New Mexico and Colorado.

Pinyon Jay population viability is tied to pinyon mast crops. The size and frequency of mast crops can strongly affect Pinyon Jay reproduction and population viability. Historically pinyon masting occurred every three to seven years but is now becoming less frequent. This will likely cause Pinyon Jay populations to decrease.

This situation makes the Kirtland AFB Pinyon Jay habitat especially important. Kirtland AFB is currently an area of relatively good habitat health and Pinyon Jay success. In addition, livestock grazing, firewood cutting, development, and other human activities that impact pinyon juniper habitats do not typically occur at Kirtland AFB. If southern populations of the tree and the bird disappear, Kirtland AFB may eventually become the southern edge of the range for the Pinyon Jay, and its last line of defense against habitat loss and degradation.

Recommendations for Best Management Practices

Management of pinyon-juniper habitat for Pinyon Jay nesting should include maintaining tree densities similar to those reported with most areas dominated by pinyon trees. Kirtland AFB recommends no net loss of mature, healthy pinyon stands, to retain pinyon seed production areas and options for new colonies. Lower-elevation Juniper Woodland and Savanna habitat is also necessary for wintering Pinyon Jays.

No new roads or infrastructure be constructed any closer to traditional Pinyon Jay colonies than what currently exist. Ground training activities should not be conducted within 1.25 miles of traditional Pinyon Jay colony sites between March and July. In pinyon mast years, ground training should not be conducted within 1.25 miles of areas where jays are harvesting pinyon seeds between August and October. Activities that create loud noises or destroy habitat within 1.25 miles of a nesting colony should be avoided. No activities that carry high potential for wildfires should be conducted within a flock's breeding home range.

Kirtland AFB recommends continued study of the Pinyon Jay populations, with a focus on locating all colonies on base, monitoring their reproductive success, and continuing to monitor pinyon tree productivity and health. A pilot thinning project is recommended in areas of highest pinyon tree density, where pinyon health and productivity would be monitored at thinned versus control sites.

Proposed Conservation Projects

Proposed conservation projects for the management of Pinyon Jays is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation. This data is also critical for avoidance of occupied nests, colonies, and pinyon harvest areas used by the Pinyon Jays during project review and approval by the CE Environmental Division. Additionally the Pinyon Jay monitoring efforts are critical for review and consultation of potential forest management projects in the Withdrawal area. The Natural Resource Manager coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

Raptors

Kirtland AFB conducted Ferruginous Hawk/raptor monitoring surveys from 2008 through 2011; further surveys are not planned or budgeted for the next 5 years (2017 – 2022). In addition to the Ferruginous Hawk surveys, all species of raptors observed were inventoried during the investigations. Portions of this raptor discussion are excerpted from the following reports, all of which are on file at Kirtland AFB (Envirological Services, Inc. 2004, 2009, 2011b). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

The Peregrine Falcon was observed (see further discussion in the Threated and Endangered Species section) during raptor surveys conducted since the implementation of the 2007 INRMP. The Peregrine Falcon is currently listed as Threatened by the NMDGF and occurs on Kirtland AFB; thus, this species warrants conservation and management action under the INRMP.

Overview

The Ferruginous Hawk is a large, soaring hawk of the western plains. Their breeding distribution extends from southern Canada through northern Arizona and New Mexico. They winter most commonly in southern California, Colorado, Arizona, New Mexico, north Texas, and Mexico. Northern populations are migratory, and although almost nothing is known about migration in southern breeding locations, they appear to migrate short distances or are sedentary.

Ferruginous Hawks are stenophagous, feeding on a limited variety of prey species. Their main prey source varies depending on location, with rabbits, ground squirrels, and prairie dogs making up most of their diet. Ferruginous Hawks are largely perch hunters, waiting for prey on a raised perch or on the ground near mammal burrows, they will also hunt aerially at low and high altitudes.

Ferruginous Hawks inhabit flat and rolling terrain in grasslands, shrubsteppes, and deserts of North America while avoiding montane forests, forest interior and cultivated areas. They become locally abundant at the interface between pinyon-juniper and shrubsteppe habitats. Nesting habitats include sparse riparian forests, canyon areas with cliffs and rock outcrops, and isolated trees and small groves of trees in grassland and shrubsteppe areas. Winter and migratory habitat largely overlap with breeding habitat. Prey availability largely influences winter habitat selection, with Ferruginous Hawks commonly wintering around prairie dog towns.

Status

Loss of natural grassland habitat, decline of prey mammals, and drought contribute to the decline of the Ferruginous Hawk. Causes of decline also include the effects of cultivation, grazing, controlling small mammals, mining, and fire in nesting habitats.

Although uncommon, Ferruginous Hawks were observed on Kirtland AFB year round, using the base as wintering grounds, as stopover habitat during migration, and as part of their home range during the breeding season. On Kirtland AFB, most observations of Ferruginous Hawks were recorded over prairie dog colonies in the cantonment area, grassland area west of Manzano Base, and the DOE solar tower at the southern edge of the installation. Gunnison’s Prairie Dogs have been shown to be an important food resource for Ferruginous Hawks during their migration in New Mexico. The long term existence of prairie dogs on Kirtland AFB is crucial for the presence of Ferruginous Hawks. One banded adult female Ferruginous Hawk wintered in the cantonment area of Kirtland AFB during both the winters of 2009-10 and 2010-11. The habitat of Kirtland AFB is valuable for many wildlife species, and is unique to its surroundings for reasons including lack of pressure from agriculture, cattle grazing, or major housing developments.

Ferruginous Hawks may avoid Kirtland AFB during the breeding season due to the high levels of human activity and disturbance related both to mission activities and regular operation. Ferruginous Hawks are sensitive to disturbance, even minor disturbance, during the breeding season. This species generally avoids areas of human activity at this time. Nevertheless, human activity appears to be less of an issue during winter months, as this hawk favored and was observed commonly in the cantonment area of Kirtland AFB.

On Kirtland AFB, Cooper’s Hawks, Red-tailed Hawks, Ferruginous Hawks, Golden Eagles, and American Kestrels can be found year round. These raptors use the base as wintering grounds, foraging habitat during migration, and as part of their home range or for nesting during the breeding season.

Swainson's Hawks and Peregrine Falcons use Kirtland AFB as foraging habitat during migration and for breeding habitat. Northern Harriers, Merlin, and Prairie Falcons use Kirtland AFB as foraging habitat during migration and for wintering. Turkey Vultures use the base as foraging habitat during migration.

Recommendations for Best Management Practices

Results of the raptor surveys documented the use of Kirtland AFB as raptor breeding ground. A study should be conducted to identify breeding raptor population diversity and distribution, habitat use and requirements, nest success, sources of disturbance and mission impacts of these species.

If Ferruginous Hawks are discovered nesting on Kirtland AFB in the future, minimum buffer zones of 800 feet around the nest should be created during years when prey is abundant and Ferruginous Hawks are in good physiological condition. These buffer zones should be expanded in years when prey is scarce and hawks appear less tolerant of disturbance.

For wintering Ferruginous Hawks on Kirtland AFB, buffer zones of 450 feet should be created around foraging areas.

Proposed Conservation Projects

Proposed conservation projects for the management of Ferruginous Hawks and raptors is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation and tracking nests in the cantonment area where human/raptor interactions can occur. This data is also critical for avoidance of occupied nests during project review and approval by the Kirtland NRM.

Additional conservation measures to be implemented include completion of raptor-safe electrical retrofits of distribution poles in areas where collisions have occurred. An avian protection plan (APP) is proposed for development and implementation by the installation. The Natural Resource Manager coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

Bats

Kirtland AFB conducted bat diversity and monitoring surveys during 2007 - 2016; additional survey will be conducted in 2017. Two bat species identified on Kirtland AFB, the Long-legged Myotis and Western Small-footed Myotis, are identified by the NMDGF as sensitive taxa. Portions of this text are excerpted from the following reports, all of which are on file at Kirtland AFB (Envirological Services, Inc. 2010b, 2011c, 2012b). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

A bat diversity and maternity roost study to determine the occurrence, distribution, and requirements of bat species on Kirtland AFB, Bernalillo County, New Mexico, was initiated in late summer 2007 and continued annually through 2016. This project determined what species of bats occur on Kirtland AFB and the status of maternity roost sites and provided information for future management plans. The objectives of the study were: (1) to conduct an inventory of bat species on Kirtland AFB using mistnetting and acoustic survey

techniques, (2) to provide information on individual bats captured, including species, gender, and reproductive condition, (3) to assess the status of bat populations on Kirtland AFB using a combination of mark-recapture and roost survey techniques, (4) to identify the roosting requirements of bats on Kirtland AFB necessary for reproduction and stability of bat populations, (5) to survey abandoned mines for bat use, identifying mine occupants to species if found, and (6) to make recommendations for additional surveys and studies.

Overview

Bats are ecologically unique among mammals for a number of reasons. Despite their small size, bats have low reproductive rates and long generation times. Consequently, the long-term stability of populations is susceptible to only slightly elevated mortality rates or slightly depressed recruitment rates. These unique characteristics make them particularly sensitive from a conservation perspective and, therefore, potentially useful indicators of overall ecosystem integrity. Most threats to bat populations, whether at local or global scales, are linked to human activity, with the recently discovered white-nose syndrome in the eastern U. S. as a potential exception, although the origin remains unknown. Timber production, agriculture and human infrastructure are recognized as among the primary threats to the long-term persistence of many bat populations. Disturbance to roost sites, such as caves and mines, in the forms of vandalism and habitat change, have already contributed to declines in populations of some species. Contaminants have also played a role in bat declines. Furthermore, Pacific island populations of some species have been reduced because of hunting, predation by exotic species, and their use as a delicacy in the human diet. Since Mohr's 1952 bat banding study, declines have been documented in many local bat populations throughout North America, but the long-term data and standardization required to adequately assess the status of most species of bats are currently lacking.

Status

A total of 445 individuals of 10 species were captured from 2007 – 2016 on Kirtland AFB. Bat species captured in descending order of abundance are detailed below:

Common Name	**Scientific Name**
Western Small-Footed Bat	*Myotis ciliolabrum*
California Leaf-Nosed Bat	*M. californicus*
Southwestern Myotis	*M. auriculus*
Silver-Haired Bat	*L. noctivagans*
Pallid Bat	*A. pallidus*
Big Brown Bat	*Eptesicus fuscus*
Hoary Bat	*L. cinereus*
Townsend's Big-Eared Bat	*C. townsendii*
Long-Legged Myotis	*M. volans*
Fringed Myotis	*M. thysanodes*

All these species are listed as either medium or low priority by the Western Bat Working Group, except for Townsend's Big-Eared Bat which is listed as high priority. The bat species whose geographic ranges

theoretically overlap Kirtland AFB that have not yet been captured are the long-eared myotis, the Arizona myotis bat, the Yuma myotis, the western pipistrelle, the Mexican free-tailed bat, the big free-tailed bat, the spotted bat, and Allen's big-eared bat, many of which are medium and high priority species. Several of these species are also all considered Species of Greatest Conservation Need by the New Mexico Department of Game and Fish. Acoustic sampling has confirmed the presence of the Mexican free-tailed bat, the big free-tailed bat, and the western pipistrelle, and suggested that the very rare Allen's big-eared bat, and the unexpected western red bat, may be present as well.

Several species documented at these sites, namely the Pallid Bat, the Big Brown Bat, the California Myotis, and the Southwestern Myotis, appear to have local, resident populations, as evidenced by their abundance and the presence of reproductive females. The capture of a reproductive female Fringed Myotis at David Canyon Tank, located adjacent to Kirtland AFB on USFS land, in 2009 is a strong indication that this species, a species of medium priority, is breeding in the area as well. Ideally, females of this species will be radio-tracked to maternity sites within Kirtland AFB in the future. For unknown reasons, more males than females have been caught for the Silver-haired bat, Hoary Bat, Townsend's Big-eared Bat, Long-legged Myotis, and Fringed Myotis. Townsend's Big-Eared Bat may sexually segregate across sites with males found at the higher elevation sites, as in some other species.

Recommendations for Best Management Practices

Data on roost sites are of greatest importance to the NRM**.** To date, there is a limited, but growing amount of data pertinent to management of bat species on Kirtland AFB. Most notably, the current data are limited with respect to the inventory, description, and characterization of bat roost sites. Species to be radio tagged should be prioritized based on maternity roost vulnerability, species abundance and distribution, and the amount of information currently available for that species. The vulnerability of characteristic maternity roosts differs greatly among species. Species which typically use roosts that are inaccessible to human disturbance should usually be given lower priority than those which typically use roosts that may be greatly disturbed or even destroyed by human activity. Species such as Townsend's Big-Eared Bat that typically roost in mines, caves and buildings should therefore be afforded greater concern than species such as Western Pipistrelle which typically roost in relatively inaccessible cliffs and crevices. Another consideration in determining the vulnerability of the roost site is the degree to which bats are concentrated in these roosts. Some bats such as Townsend's Big-eared Bat or Pallid Bat may form maternity colonies of 3 to 20 individuals while other species such as Townsend's Big-Eared Bat, Long-legged Myotis, and Mexican Free-tailed Bat may form colonies of hundreds, thousands or even millions.

It is recommended to continue the collection of additional information on localities of mines on the base and to check remaining known localities, as (1) mines that are used as roosts by maternity colonies of bats cannot be found by radio-telemetry (signal doesn't travel above ground), and (2) colonies in mines typically represent the largest concentrations of a single species that can be found under natural conditions and are thus bat conservation hot spots.

Although restoration of natural (i.e., pre-European settlement) hydrological cycles will likely yield the greatest benefits to bats and most other wildlife, the construction of water holes, as has been done on Kirtland AFB, can also benefit bats and our ability to monitor them. To accommodate bats, we recommend that such water holes be constructed to be at least 6.5 feet in diameter, but preferably more than 16 feet. Development of water along Madera Canyon and the surrounding hills holds the greatest potential to enhance the habitat for the greatest diversity of bat species.

Proposed Conservation Projects

Proposed conservation projects for the management of bats is detailed in Section 10 (Annual Work Plans). Specifically, monitoring surveys are recommended to track populations on the installation. The proposed interval of monitoring surveys will be reassessed after results of the 2017 study is completed. The Natural Resource Manager coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

Decontamination protocol to decrease the spread of White-nose Syndrome is available at www.whitenosesyndrome.org (2016). Kirtland AFB is actively working with biological contractors to implement these procedures. White-nose Syndrome has been encountered in the West Texas Panhandle and there is a significant possibility that it will be encountered at Kirtland AFB and proactive planning for treatment/mitigation is warranted at this time.

Desert Massasauga (*Sistrurus catenatus*)

Kirtland AFB conducted Massasauga surveys from 2009 through 2016; further surveys are planned and budgeted for the next 5 years (2017 – 2022). Portions of the text is excerpted from the following reports, all of which are on file at Kirtland AFB (CW Painter Natural History Consulting 2012, 2015). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

This is one of the longest running studies of the Desert Massasauga and the associated grassland herpetofauna ever carried out in the American Southwest. The fact that this study is being conducted in grassland habitat that has remained un-grazed for almost a century is especially important to help understand the historic grassland herpetofauna of the Southwest.

The species is listed as a NM Species of Greatest Conservation Need by the New Mexico Department of Game and Fish and is detailed in the New Mexico State Wildlife Action Plan (NMDGF 2016). Sensitive species may require special attention, as an understanding of their biology and ecology is critical for their management. Desert Massasauga has been studied in southeastern Colorado and in southeastern Arizona but such studies are lacking in New Mexico and the status of Desert Massasauga throughout most of its current range is little understood and warrants conservation and management action under the INRMP.

Overview

The ground color of the Desert Massasauga is typically gray to light brown with 37 to 40 dark brown saddles forming a regular pattern along the dorsal surface. There is a lateral series of smaller blotches in two alternating rows. The tail is banded by alternating bands of gray and dark brown. A prominent dark stripe extends from the eye to the angle of the jaw. The tip of the tail is black in adults but in juveniles this is yellow and may be used in caudal luring. The scales are heavily keeled and the rattle is very small.

The Desert Massasauga is most commonly associated with shortgrass prairie habitat with abundant Sand Sage, Buffalograss, and Blue Grama. This species tends to avoid rocky areas. In Colorado specific requirements appear to vary seasonally but in general shortgrass prairie dominated by Buffalograss and grama grasses below approximately 4921 foot elevation is an absolute requirement. Intact prairie habitat that has not been tilled or overgrazed by livestock seems to be preferred to grasslands that have been heavily

impacted by these practices. In New Mexico, the species prefers desert grasslands or intact shortgrass prairie, although they are also common in the Shinnery Oak – Sand Sage sandy habitat in southeastern New Mexico. On Kirtland AFB, the Desert Massasauga is expected to occur in the low elevation grassland habitats. Protection and conservation of such large, contiguous tracts of native shortgrass prairie habitat is absolutely necessary for the long term survival of the Desert Massasauga.

Status

The Massasauga is not listed as state threatened or endangered by New Mexico, however it is considered to be declining throughout its total range. Factors contributing to the current status are associated with habitat fragmentation and loss, including by urbanization, agriculture, and extensive livestock grazing (WildEarth Guardians 2010).

There was insufficient data collected during these studies to document abundance trends or population size of Desert Massasauga on Kirtland AFB, however the species is expected to be widespread and stable but uncommon in the low elevation grasslands on Kirtland AFB. The major causes of population declines reported for Desert Massasauga are habitat loss, conversion to agriculture, overgrazing, roadway mortality, and deliberate take by humans. There is relatively little anthropogenic disturbance of the grassland habitat on Kirtland AFB with no livestock grazing or conversion to agriculture occurring. There are occasional disturbances to the grasslands but these appear to be small and localized. Roadway mortality seems to be limited on Kirtland AFB as only two dead individuals were discovered during these studies. Although there are numerous reports of rattlesnakes on Kirtland AFB, very few are reported to be killed and the vast majority of these reports investigated are of the Prairie Rattlesnake.

Recommendations for Best Management Practices

Continued trapping at established sites within the habitat of this species will provide additional information on important aspects of the life history of the Desert Massasauga, including growth rates, reproduction, diet, activity periods, movement, habitat use, relative abundance, etc. Continued monitoring of the funnel traps established during 2009 would provide insights into these life history traits.

A continuation of this study would provide long term demographic data on the Desert Massasauga and the grassland amphibian and reptile community on Kirtland AFB. Such long-term ecological studies are unique and are critically important to the mission of Kirtland AFB to allow for informed wildlife management decisions on military lands. This grassland study area on Kirtland AFB is unique as it has not been subjected to livestock grazing for almost a century and would provide important comparative information to federal and state land management agencies (e.g. Bureau of Land Management, State Land Office) where livestock grazing management is a controversial issue.

Proposed Conservation Projects

Proposed conservation projects for the management of the Desert Massasauga is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation as populations are known to be decreasing in the Albuquerque area and increasing further south near Socorro. The Natural Resource Manager coordinates with the biologists conducting the surveys

in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

Rare Amphibian and Reptiles

Kirtland AFB conducted rare amphibian and reptile surveys in the early 2000s and from 2010 through 2012 (AMEC 2001, 2004, 2013b); no further surveys are planned and budgeted for the next 5 years (2017 – 2022). The objective for the surveys was to ascertain the composition and extent of the reptile and amphibian populations occupying Kirtland AFB with an emphasis on locating any listed or rare species. Portions of this text are excerpted from AMEC reports, all of which are on file at Kirtland AFB (AMEC 2001, 2004, 2013b). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

Overview

Monitoring of rare amphibian and reptile species, which are often of interest as potential "vital signs" of ecosystem health, is conducted intermittently on Kirtland AFB. Instead, herpetofauna monitoring at Kirtland AFB should focus on the entire community where possible, and targeted monitoring should focus on the most common species or species groups. These target species should be common, easily observed and counted, and respond predictably and measurably to fluctuations of climatic variables.

Species documented on Kirtland AFB include:

Common Name	**Scientific Name**
Bullfrog	*Lithobates catesbeiana*
Tiger Salamander	*Ambystoma tigrinum*
Couch's Spadefoot	*Scaphiopus couchii*
New Mexico Spadefoot	*Spea multiplicata*
Plains Spadefoot	*Spea bombifrons*
Red-spotted Toad	*Anaxyrus punctatus*
Woodhouse's Toad	*Anaxyrus woodhousii*
Coachwhip	*Masticophis flagellum*
Collared Lizard	*Crotaphytus collaris*
Lesser Earless Lizard	*Holbrookia maculata*
Eastern Fence Lizard	*Sceloporus undulatus*
Roundtail Horned Lizard	*Phrynosoma modestum*
Longnose Leopard Lizard	*Gambelia wislizenii*
Mountain Short-horned Lizard	*Phrynosoma hernandesi*
Side-blotched Lizard	*Uta stansburiana*
Northern Tree Lizard	*Urosaurus ornatus*
Desert Massasauga	*Sistrurus catenatus*
Blacktail Rattlesnake	*Crotalus molossus*
Western Diamond-backed Rattlesnake	*Crotalus atrox*
Western Rattlesnake	*Crotalus viridis*
Great Plains Skink	*Plestiodon obsoletus*
Wandering Gartersnake	*Thamnophis elegans*

Glossy Snake	*Arizona elegans*
Gopher Snake	*Pituophis catenifer*
Plains Hog-nosed Snake	*Heterodon nasicus*
Western Hooknose Snake	*Gyalopion canum*
Texas Longnosed Snake	*Rhinocheilus lecontei*
Night Snake	*Hypsiglena torquata jani*
Mountain Patchnose Snake	*Salvadora grahamiae*
Ringneck Snake	*Diadophis punctatus*
Desert Striped Whipsnake	*Masticophis taeniatus*
Desert Grassland Whiptail	*Aspidoscelis uniparens*
New Mexico Whiptail	*Aspidoscelis neomexicana*
Chihuahuan Spotted Whiptail	*Aspidoscelis exsanguis*
Woodland Striped Whiptail	*Aspidoscelis inornatus*
Plains Striped Whiptail	*Aspidoscelis inornatus*
Plateau Striped Whiptail	*Aspidoscelis velox*

Status

Seven amphibians (six native, one introduced) have been documented at Kirtland AFB. No listed species of amphibians or reptiles have been identified on Kirtland AFB. It is widely acknowledged that amphibian populations have declined throughout the world. Factors implicated in declines include habitat destruction, global climate change, chemical contamination, disease, invasive species, and commercial exploitation.

Global declines of some amphibian and reptile populations call for the need to establish long-term monitoring programs to track population trends of these wildlife species and to correct these trends when possible. It is estimated that 48% of amphibian species and 52% of reptile species in the United States are listed as being of conservation concern by various government agencies. Given that even undisturbed habitats are exhibiting reptile and amphibian declines, it is imperative that baseline inventories, distribution, and relative abundance are established trends can be identified. Once a baseline is established, monitoring on some scale can continue while incorporating climatic variables or other biotic factors (i.e., to identify any correlation).

Recommendations for Best Management Practices

Establishing a baseline for reptile and amphibian species in all plant communities on Kirtland AFB allows Natural Resource Managers to make informed management decisions. Additionally, species of concern (i.e., Federal or State listed species or habitat identified as critical to a species survival) can be identified and managed appropriately. Consultation with USFWS and NMDGF should be initiated to determine an adequate schedule for conducting additional baseline surveys.

Mountain Lion (*Felis concolor*)

Kirtland AFB has conducted mountain lion surveys from 2010 through 2016; further surveys are planned and budgeted for the next 5 years (2017 – 2022). Portions of this text are excerpted from the following reports, all of which are on file at Kirtland AFB (Furman University 2011, 2015; New Mexico State

University 2017). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

For several years, mountain lions were frequently photographed by remote cameras set by Sandia National Labs and Kirtland AFB personnel on their respective properties. These photos revealed that mountain lions were an integral part of the current Kirtland AFB biotic community and frequently found in undeveloped areas used by base personnel. In demonstrating the frequent use of base property by these large predators, the photos forced us to acknowledge that very little was known about this top predator in the context of Kirtland AFB operations, housing, environmental management, and ecology. To address this issue Kirtland AFB initiated a mountain lion research program.

Effective management and conservation of any species requires a detailed planning process that identifies specific goals. The first critical goal is to determine the population size and distribution of the species in question. The degree of detail desired in population data varies widely from the simple documentation of species presence for the conservation of rare and endangered species to details of population demographics for the management of game species. Some individual species may fall into both categories depending on location. Mountain lion, for example, are considered big game species in much of the western U.S., including New Mexico; but, they are an extirpated or endangered species in the Mid-west and Florida respectively. The ongoing mountain lion study has yielded invaluable information regarding population and behavior at Kirtland AFB and thus warrants conservation and management action under the INRMP.

Overview

The mountain lion or mountain lion was historically the most widely distributed large mammal in the New World, ranging from northern British Columbia to Patagonia and from coast to coast throughout this range. Currently the mountain lion's range still extends from North to South America, but in North America it is limited to the western states with a small isolated population still persisting in Florida. Like most felids, mountain lions are obligate carnivores. They are stalking predators that hunt alone, relying on carefully maneuvering undetected within a 50 feet striking distance of their prey. Mountain lions are opportunistic hunters and will take advantage of whatever food source is available, but mule deer make up about 75% of their diets in the winter and 60% in the summer in western North America. They have been shown to selectively prey on vulnerable animals including old males and very young deer and elk. Many studies have examined the impact of mountain lion populations on prey populations, and environmental conditions tend to influence prey population levels more strongly than mountain lion predation. This trend is, along with other factors, attributed to the mountain lion's self-limiting social structure.

Primarily nocturnal and solitary, mountain lions are elusive loners that rarely encounter humans. By maintaining a rigid social structure, they also rarely encounter other mountain lions. Males have large territories (100-150 square miles) that overlap female home ranges and that they defend against other males to protect their access to prey and females. Females maintain smaller home ranges (50-100 miles) that have a high degree of overlap with neighboring females. Mountain lions are polygamous, but often the same lions will mate year after year because of the maintenance of home ranges. Gestation usually lasts from 82 to 96 days and while female mountain lions are reproductive year-round most births are between April and September in the northern hemisphere. Litter sizes range from 1 to 6, but the average litter size in western North America is 2.4 kittens. Mountain lion kittens stay with their mother until age 1.5 to 2 years. This year round reproductive strategy allowed mountain lions to maintain viable populations across a large range

throughout most of history, but loss of habitat and direct conflict with humans has extirpated the species from large areas of its historic range.

Mountain lions are top predators that perform a vital ecological function. Predation by mountain lions helps control mesocarnivore and grazer populations, initiating cascade effects that maintain healthy populations across trophic levels as well as indirectly providing food subsidies to scavenger species. For these reasons, management of apex predators such mountain lions can be an effective, top down method for broader conservation efforts aimed at protecting other species. Because of their requirement for large home ranges, mountain lions are highly susceptible to regional level population disturbances resulting from a loss of habitat continuity.

The issue of habitat continuity is of particular concern in New Mexico. While the northern part of the state exhibits heterogeneity of suitable mountain lion habitat, the southern and eastern populations are naturally fragmented by large areas of grassland and low desert. A 2005 study of the genetic health of mountain lion populations in Utah, Colorado, Arizona, and New Mexico found that the most significant genetic split found in these populations was between mountain lions north of I-40 in New Mexico and those to the south. Further, this study identified the Manzano Mountain region as a crucial transition zone between these populations. Kirtland AFB sits directly astride this transition zone, and the Kirtland AFB mountain lion population therefore serves an integral role in the health of the statewide population. In fact, it is an important genetic bridge between southern and northern mountain lion populations in the American west in general.

Status

From 2010 to 2015 mountain lions were regularly documented on Kirtland AFB with an array of remote cameras in the mountainous areas of the base and trapped in order to place GPS collars on the animals. The movements of mountain lions GPS collared on base showed that Kirtland AFB makes up only a portion of their home range. All of the marked mountain lions regularly traveled south into the Manzanos, and one male mountain lion made several trips north of I-40 into the Sandia Mountains. Despite only spending a portion of their time on Kirtland AFB, mountain lions regularly used resources that occur on base. These include water available in the form of springs and guzzlers, prey items such as mule deer, and habitat features that provided den sites for kittens. Mountain lion abundance estimates generated from remote camera data from fall of 2010 to the spring of 2015 indicated a significant decline in the number of mountain lions associated with Kirtland AFB, from a high of ~4.5 individuals using the base to a low of less than one. Mountain lion photo rates (mountain lion photos per 1,000 camera nights) also declined significantly during this time period. Continued monitoring of mountain lions using Kirtland AFB could provide more information about the installation's role in providing a habitat link between northern and southern New Mexico mountain lion populations.

Recommendations for Best Management Practices

Due to a lack of mountain lion population data, wildlife managers in the western U.S. struggle with balancing traditional management concerns like sport hunting and depredation with growing conservation interest in mountain lions. Data on mountain lion populations are especially needed where wildlife conservation goals conflict over mountain lion management, as when mountain lion predation threatens

endangered species. A technique to efficiently determine mountain lion densities would help define ecological relationships between mountain lion and prey densities, and give managers a tool for linking mountain lion population levels with their impact on vulnerable species, large game, and livestock.

Proposed Conservation Projects

Proposed conservation projects for the management of mountain lions is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring is recommended to track populations on the installation and range of the species. The Natural Resource Manager coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis. Camera monitoring also benefits the installation by tracking poachers that trespass on base and is used to justify the position of a Conservation Law Enforcement Officer.

Fish and Wildlife Management Issues:

Following are issues identified by Kirtland AFB personnel related to the management of fish and wildlife on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. These issues are developed by Kirtland AFB in coordination FWS and NMDGF with the intent of identification of areas where Kirtland AFB needs improvement and drive the need for projects during this current INRMP period.

- Monitoring of birds, bats, amphibians, predators and reptiles has been completed intermittently for the base.
- Cougar populations have declined over the past few years.
- Free standing water for wildlife is limited on base, thus restricting species distributions.
- Power lines pose an electrocution and collision risk to avian species and all high-risk structures have not been raptor proofed.
- Kirtland AFB vegetation data does not include all species occurring on base.
- Communication between the agencies needs to continue, otherwise natural resource management would be negatively affected.
- Wildlife have been injured on the existing fencing along the southern boundary of Tijeras Arroyo and the base.

7.2 Outdoor Recreation and Public Access to Natural Resources

Applicability Statement

This section applies to all AF installations that maintain an INRMP. Kirtland AFB is required to implement this element.

Program Overview/Current Management Practices

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, historical buildings, a scenic lookout at the fire tower and wetland springs.

A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

Outdoor Recreation and Public Access to Natural Resources Issues:

Following are issues identified by Kirtland AFB personnel related to the management of *Outdoor* Recreation and Public Access to Natural Resources on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007.

These issues are developed with the intent of identification of areas where Kirtland AFB needs improvement and drive the need for projects during this current INRMP.

- Base personnel who recreate on the base in undeveloped areas designated for official use only are in conflict with the military mission.

7.3 Conservation Law Enforcement

Applicability Statement

This section applies to all AF installations that maintain an INRMP, as all installations are required to provide a method for enforcement of conservation laws. Kirtland AFB is required to implement this element.

Program Overview/Current Management Practices

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. 1,873 individuals were recorded on game cameras trespassing on Kirtland AFB in 2016.

Conservation Law Enforcement Issues:

Following are issues identified by Kirtland AFB personnel related to the conservation law enforcement issues on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

- 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 are occasionally poached on base.
- Unauthorized feeding of wildlife occurs on base conflicting with the military mission.

7.4 Management of Threatened and Endangered Species, Species of Concern and Habitats

Applicability Statement

This section applies to AF installations that have threatened and endangered species on AF property. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

All native species of birds are protected under the MBTA. This law, as it applies to both military readiness actions and non-military readiness actions, as well as other Executive Orders and interagency agreements, is described below.

- DoD Compliance with the MBTA and E.O. 13186 Golden Eagles are currently protected under both the MBTA and Bald and Golden Eagle Protection Act of 1940, as amended; 16 U.S.C. 668

The following laws, regulations and Executive Orders proscribe DOD actions in relation to the management and protection of migratory birds.

- MBTA and Implementing Regulations
- MBTA Incidental Take Permits

Migratory birds are of great ecological and economic value and are an important international resource. They are a key ecological component of the environment and they also provide immense enjoyment to millions of Americans who study, watch, feed, or hunt them. Recognizing their importance, the U.S. has been an active participant in the internationally coordinated management and conservation of migratory birds. The MBTA (16 USC 703-712) is the primary legislation in the U.S. established to conserve migratory birds. The USFWS is the federal agency responsible for administering and enforcing the law.

Because of their large size, eagles are particularly susceptible to electrocution risks. Golden Eagles are known to occur at Kirtland AFB.

Wildlife studies that have occurred throughout base have found there are two state threatened species on base, Gray Vireo and Peregrine Falcon. A survey conducted in 2015 revealed 32 gray vireo territories occurring in juniper woodland habitat (Animas Biological Services 2016). Any proposed thinning treatments of pinyon-juniper stands for habitat improvement for the state- listed Gray Vireo will be coordinated with the NMDGF.

A summary of the wildlife studies of listed species conducted since the 2007 INRMP was implemented is presented below.

Gray Vireo

Kirtland AFB has conducted Gray Vireo monitoring surveys every year from 2003 through 2016; further surveys are planned and budgeted for the next 5 years (2017 – 2022). Coordination with DOE biologists has occurred from 2007 to the present. Portions of this text are excerpted from the following reports, all of which are on file at Kirtland AFB (Animas Biological Services 2012, 2013, 2016; Clover Leaf Environmental Solutions, Inc. 2006; LOPEZGARCIA Group 2002, 2004, 2005). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

The Gray Vireo is currently listed as a state threatened species by the NMDGF and occurs on Kirtland AFB; thus, this species warrants conservation and management action under the INRMP.

Overview

The Gray Vireo is a short-distance migrant that breeds only in the hot, arid regions of the southwestern U.S. and northwestern Mexico. Throughout its range, Gray Vireos prefer piñon-juniper, scrubland, or chaparral habitats in arid, mountainous terrain or high plains. In New Mexico, the species is primarily associated with juniper woodlands of the foothills and mesas, usually with a well-developed grassy understory, and in some areas a piñon pine or oak component. Gray Vireos occur throughout New Mexico west of the Great Plains; however, distribution is patchy.

The gray vireo is a small songbird measuring about 5½ inches. It is a rather non-descript bird, light gray with brownish-gray wings and faint wing bars. It also has a white eyering and a relatively long tail. The Solitary Vireo sometimes occurs with the gray vireo, but generally occupies higher elevations and denser vegetation. The solitary vireo has distinct white wing bars and flight feathers and more pronounced white lores and eye ring than the gray vireo. The gray vireo also has a habit of constantly flicking its tail during foraging activities, which distinguishes it from other vireos.

Status

Gray Vireo populations have disappeared from some historic areas in New Mexico; however, recent studies have identified new or previously unknown breeding territories throughout the state, including in the Manzanita Mountains on Kirtland AFB. The best estimate of population size in New Mexico is 418 territories; density estimates throughout the state range from 0.01–0.06 acres.

Gray Vireo surveys first occurred on Kirtland AFB in 1993 and 1994; surveyors detected 24 individuals along the foothills of the Manzanita Mountains. The first comprehensive base-wide survey for Gray Vireos

was conducted in 2003 and identified 53 territories. At that time, this population was considered the second largest in New Mexico. The second comprehensive base-wide survey was conducted from 2010 to 2011 and estimated a population of at least 86 and as many as 102 territories. Combining data from 2008 to 2015, territory size ranged from 0.4 to 23.7 hectares (mean = 4.5 hectares). Territory size data were not normally distributed (median = 3.6 hectares). There was no significant difference in territory size across years. The arrival of Gray Vireos on territory at Kirtland AFB typically spans a 3–4 week period beginning in early May.

Gray Vireo habitat within Kirtland AFB is comprised of one-seed juniper savannahs, with approximately 10% piñon pine. Understory vegetation is dominated by native grasses, tree cholla, and prickly pear cactus. Elevation ranges from approximately 1675–2135 meters (5,500–7,000 feet.).

Gray Vireos at Kirtland AFB experienced the highest levels of nest success in 2013, 2014, and 2015 compared with all prior years of monitoring. Correspondingly, data from monitoring beginning in 2008 show that nest parasitism by Brown-headed Cowbirds was reported at the lowest levels from 2013 to 2015. The data continues to indicate that the majority of nest failures come from predation. Though nest parasitism by Brown-headed Cowbirds has also contributed to nest failures at Kirtland AFB, we observed less parasitism from 2013 to 2015 compared with earlier years of the study. Possibly, not all parasitized nests were located in these years, especially if they failed early. Gray Vireos often abandoned parasitized nests after the first cowbird egg is, though not always. These observations suggest that Gray Vireos may have evolved a mechanism for cowbird egg recognition.

Nest site selection models, combining data from 112 nests from 2009 to 2015, indicated that mean tree height around the nest was an important predictor of nest locations and that Gray Vireos nested in areas with taller trees relative to available habitat. Taller trees may provide vireos better vantage points than shorter trees for nest defense.

Recommendations for Best Management Practices

Juniper trees are clearly important to nesting Gray Vireos and should be considered carefully in managing habitat for this species. In recent years, tree removal by fire, chaining, or thinning has been implemented on public lands to combat juniper expansion into grasslands and shrublands. Fire frequency has been shown to be quite low in some pinyon-juniper and pinyon woodlands, especially persistent pinyon woodlands. Hence, fire is not recommended as a management tool in these habitats.

Throughout their range, vireos sometimes occupy shrub-dominant habitats with fewer trees; therefore, tree height and density may be less important to vireos outside of Kirtland AFB. However, it seems clear that tree height is important to Gray Vireos in both nest site selection and nest success. We recommend maintaining stands of pinyon-juniper at mean heights reported in this study to ensure Gray Vireos continue to occupy territories on Kirtland AFB. Further, if thinning or other tree removal activities occur on Kirtland AFB, we recommend retaining as many tall junipers (and to a lesser extent pinyons) within the Gray Vireo breeding areas as possible.

The impact of military activities on Gray Vireos and other sensitive wildlife species is of great importance to Kirtland AFB natural resource managers. Gray Vireos may tolerate some level of noise and human disturbance on Kirtland AFB. However, because Gray Vireos are a New Mexico Threatened species, we recommend continued seasonal closures of Gray Vireo breeding habitat as well as continued occupancy and nest monitoring to ensure the population remains viable.

The Gray Vireo survey methodology adopted in 2007 should be continued to provide a standardized survey protocol for comparing data in future years. Survey methods include playing audio of singing Gray Vireos (playback) for 30 seconds, and listening for a response, at suitable habitat locations. Conducting follow-up playback surveys at negative survey locations throughout the breeding season is important to document late migrants moving into territories, or possibly unpaired males abandoning territories and moving to new locations.

Proposed Conservation Projects

Proposed conservation projects for the management of Vireos is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation. This data is also critical for avoidance of occupied nests & potential habitat during project review and approval by the NRM. The NRM coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

Mountain Plover

Kirtland AFB has conducted Mountain Plover monitoring surveys during 2001, 2003 and 2004; further surveys are not planned or budgeted for the next 5 years (2017 – 2022). Portions of this text are excerpted from the following reports, all of which are on file at Kirtland AFB (LOPEZGARCIA Group 2002, 2004, 2005). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

The Mountain Plover is currently listed as a state sensitive taxa by the NMDGF and is known to have occurred on Kirtland AFB; thus, this species warrants conservation and management action under the INRMP.

Overview

The Mountain Plover is found in short-grass prairies and prairie dog towns. It may also inhabit shrub steppe if prairie dog towns are present. Breeding habitat consists of level terrain with exposed ground and sparse vegetation. Buffalo grass, blue grama grass, and prickly pear cactus are typical vegetation components. An inhabitant of arid and semiarid regions, it is rarely found near water, but rather in areas heavily grazed by livestock. Although little is known about the plovers' brood-rearing habitat, it may consist of taller and denser vegetation located some distance from the nesting site. Potential nesting and brood-rearing habitat for the Mountain Plover at Kirtland AFB is limited to the southern grasslands that lie directly north of the heavily grazed portions of Isleta Pueblo.

This species is about seven inches tall and resembles the more common killdeer, a species known to breed on Kirtland AFB. The Mountain Plover is recognized by its light brown dorsal plumage, buff chest, and white underbelly. During the breeding season, it develops a dark crown on its head and has a dark line extending from the eye to the beak, contrasting with its white forehead. The killdeer, the only species with which it might be confused, is darker in color and has two dark broad bands on its chest.

Mountain Plovers arrive at nesting grounds between late April and early May in New Mexico. Males tend to occupy previously held territories from which they conduct a “falling leaf” display. This display entails flying 15 to 30 feet into the air, holding their wings over the back in a deep V, and then floating back to the ground. A female also takes part in this aerial performance, but generally only after mating has occurred. In general, the base does not contain nesting habitat for the Mountain Plover. However, heavy grazing on the Isleta Pueblo Indian Reservation, located directly south of the base, has created ideal nesting habitat.

The Mountain Plovers’ nest consists of a shallow scrape on the ground usually near a prominent object such as a cactus, cow pie, or shrub. The nest may be lined with small bits of twigs, leaves, and other small materials. Three olive colored eggs with blackmottling are laid and incubated for 29 days. Soon after hatching, the female may move her chicks to different habitat during the brood-rearing season. Important brood-rearing habitat criteria are not clearly understood, but tend to be associated with an abundance of insects. Young fledge in 33 to 35 days, but maintain their juvenile plumage until the following year.

Status

No Mountain Plovers were found on base during the 2003 and 2004 surveys.

This once-abundant bird now has a total estimated population of less than 10,000 birds. Reasons for its decline are many and include: historical market hunting, conversion of short-grass prairie to agriculture, a decline in prairie dog populations, mining practices, domestic livestock management practices, and possibly indirect effects from pesticides.

There are several possible explanations for their absence at the base.

- Currently, only scattered and marginal Mountain Plover nesting habitat occurs on base and is limited to the extreme southern grasslands.
- The developed portions of the base are regularly disturbed by joggers, maintenance workers, vehicles, and landscaping equipment, thus making marginal habitat at best unsuitable for Mountain Plovers.
- Grazing has been eliminated from the base since the 1940s; therefore, vegetation has increased in stature and shrubs have begun to reestablish in the grassland community. Intense grazing of grassland habitat is often necessary to keep vegetation height at a level suitable for use by Mountain Plovers.
- Although scattered areas of nesting habitat occur on Kirtland AFB, primarily in the southern grasslands, larger expanses of quality habitat lie just to the south on the Isleta Pueblo Indian Reservation. Mountain Plovers are likely to use this larger expanse of nesting habitat instead of the small and isolated areas of Kirtland AFB.

Recommendations for Best Management Practices

Although it is not protected by the ESA or listed by the State of New Mexico, this species should still be considered an uncommon inhabitant worthy of conservation. Enhancement of Mountain Plover nesting habitat at Kirtland AFB is not a viable option. Intensive grazing would conflict with military missions, while mowing large portions of the grasslands to achieve appropriate habitat would be time consuming and

expensive. Furthermore, the grasslands at Kirtland AFB might provide quality brood-rearing habitat for birds nesting on Isleta Pueblo.

If a Mountain Plover is positively identified, it should be promptly reported to Kirtland's Natural Resource Program Manager and the NMDGF. This would provide state and federal agencies with much needed information about this species.

An overview of programmatic best management practices for avian species is detailed in Sections 7.0 and 7.4.

Proposed Conservation Projects

Proposed conservation projects for the management of Vireos is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation. This data is also critical for avoidance of occupied nests & potential habitat during project review and approval by the NRM. The NRM coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

Peregrine Falcon

The Peregrine Falcon was observed during the 2008-2011 raptor surveys conducted since the implementation of the 2007 INRMP. Peregrine falcons were observed by Kirtland AFB natural resources personnel in 2003. Portions of this text are excerpted from the following reports, all of which are on file at Kirtland AFB (Envirological Services, Inc. 2004, 2009, 2011b). Results of studies, species description, habitat description and proposed management techniques are detailed in these reports.

The Peregrine Falcon is currently listed as Threatened by the NMDGF and occurs on Kirtland AFB; thus, this species warrants conservation and management action under the INRMP. Further surveys are planned as part of the land bird surveys over the next 5 years (2017 – 2022).

Overview

The Peregrine Falcon, a state threatened species, is a medium to large sized falcon ranging from 16-20 inches and 36-48 inches in wingspan. It is distinguished from the similar Prairie Falcon by darker upper parts including the head and facial pattern and a lack of dark axillaries (under wings). Peregrine Falcons are common as migrants through central New Mexico but are rare and local breeders. Peregrine Falcons require tall cliffs (usually over 165 feet) for nesting and hunting. They also require ledges, potholes or small caves which are inaccessible to mammalian predators for successful nesting.

The eastern portion of the withdrawal area contains extensive cliff lines along ridges. These limestone formations do provide suitable habitat for nesting.

Status

Peregrine Falcons occur year round in New Mexico. This species is migratory, and in New Mexico, falcons usually return to nesting cliffs in March. As both Peregrine Falcons observed during surveys were recorded in April of 2011, it is possible the breeding territories of these birds included Kirtland AFB. On Kirtland AFB, suitable nesting cliffs can be found in the canyons of the DOE and DOD withdrawal areas to the east, and breeding activity has been documented in the area.

Peregrine Falcons nested in an eyrie in the withdrawal area to the east in 2010. In 2011, a mated pair was observed often around base and most commonly near the horse stables, and this pair was observed showing courtship behavior. The 2010 eyrie was inactive in 2011.

Recommendations for Best Management Practices

Additional survey/monitoring efforts of the Peregrine Falcon should be conducted to meet State regulatory requirements. Electrical equipment that has not been bird guarded pose a risk to peregrine falcons on Kirtland AFB. High-risk structures should be retrofitted with avian-safe equipment to mitigate the risk of electrocutions and collisions.

An overview of programmatic best management practices is detailed in Sections 7.0 and 7.4.

Proposed Conservation Projects

Proposed conservation projects for the management of Vireos is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation. This data is also critical for avoidance of occupied nests & potential habitat during project review and approval by the CE Environmental Division. The Natural Resource Manager coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

New Mexico Meadow Jumping Mouse

Kirtland AFB conducted a New Mexico Meadow Jumping Mouse survey in 2016; further surveys are not planned or budgeted for the next 5 years (2017 – 2022). Portions of this text are excerpted from the 2017 report by the University of Montana which is on file at Kirtland AFB (University of Montana 2017). Results of studies, species description, habitat description and proposed management techniques are detailed in this report.

Overview

Jumping mice belong to the family Dipodidae, which includes birch mice and jerboas. The meadow jumping mouse, is the most widely distributed mouse in the Zapodinae subfamily. Their range extends from Alaska and across Canada and south into the contiguous United States. Arizona and New Mexico comprise the southernmost portion of the range while the Atlantic coast, from Labrador to North Carolina, define its

easternmost range. The meadow jumping mouse range does not extend west past the Great Plains expect for small pockets of subspecies.

First described in 1911, the New Mexico meadow jumping mouse is a subspecies of meadow jumping mouse endemic to eastern Arizona, New Mexico, and portions of southern Colorado. The New Mexico meadow jumping mouse (hereafter, jumping mouse) is a relatively short-lived species with an average lifespan of 3 years or less. The jumping mouse has dense, coarse pelage. The broad, grayish brown dorsal stripe on the back is indicative of Zapus species. Jumping mice are white underneath – occasionally suffused with yellow – and yellow-brown on the sides. Adult jumping mice grow to a length of 187 to 254 mm and have elongated feet – approximately 30 mm – from which they derive their namesake. Their extremely long and distinctly bicolored tail (dark brown above and white below) ranges from 110 mm to 130 mm and accounts for most of their length. Adult jumping mice weight varies substantially depending on time of year but ranges from 13 to 28 grams. The jumping mouse is the only mammal with eighteen teeth (dentition: 1/1, 0/0, 1/0, 3/3).

The jumping mouse is a habitat specialist and a riparian obligate. They thrive within a narrow range of environmental conditions and require dense riparian vegetation in moist soils in order to persist. Jumping mice typically inhabit moist, montane meadows near perennial (persistent) running water at elevations from 6600 to 8900 feet. Jumping mice appear to utilize only two types of riparian communities: persistent wetlands with beaked sedge and reed canarygrass associations, or shrub-scrub wetlands composed of willows and alders.

On June 10, 2014 the USFWS listed the New Mexico meadow jumping mouse (hereafter, meadow jumping mouse) as endangered under the ESA of 1973 with an effective date of July 10, 2014. Prior to the Service's ruling, the State of New Mexico listed the species as threatened in 1983 and changed status to endangered in 2006. Rapid habitat loss coupled with declining populations prompted the Service's listing decision. The Service's final rule indicated the meadow jumping mouse met the definition of endangered due to "present or threatened destruction, modification, or curtailment of its habitat or range" as outlined in section 4 (a) (1) (A) of the ESA. Following the listing decision, the Service designated critical habitat on March 16, 2016 with an effective date of April 15, 2016 [50 CFR §17] (USFWS 2016).

Meadow jumping mouse critical habitat encompasses 5,657 hectares in eight units located in Arizona, Colorado, and New Mexico. Apache and Greenlee Counties in Arizona; Archuleta, La Plata, and Las Animas Counties in Colorado; and Colfax, Mora, Otero, Sandoval, and Socorro counties in New Mexico. Critical habitat comprises elements essential to meadow jumping mouse conservation. Broadly, these elements consist of riparian communities along rivers and persistent wetlands.

Status

Survey crews did not detect New Mexico meadow jumping mice at any of the surveyed areas on Kirtland AFB. The sites surveyed had marginal habitat and lacked many of the primary constituent elements that meadow jumping mice require. It is extremely unlikely that any populations inhabit Kirtland AFB. The amount of potential habitat on base, proximity to potential habitat, and proximity to critical habitat – approximately 73 miles from Kirtland AFB to nearest critical habitat unit – additionally reduce the likelihood that meadow jumping mice are present on Kirtland AFB.

Proposed Conservation Projects

Currently no proposed projects are planned, further surveys should be conducted in the event that the species is encountered on Kirtland AFB.

Golden Eagle

The Golden Eagle has been intermittently observed during avian surveys conducted prior to and since the implementation of the 2007 INRMP (Envirological Services, Inc. 2004). Results of these surveys are excerpted for the discussion below. The statutory requirements that directly address the protection and conservation of eagles include: The ESA (16 U.S.C. 1531 et. seq.), the MBTA (16 U.S.C. 703-712 et. seq.), the Bald and Golden Eagle Act, the Fish and Wildlife Coordination Act (16 U.S.C. 661 et. seq.), and the Sikes Act "Conservation Programs on Military Reservations" (16 U.S.C. 670 et. seq.). This species warrants conservation and management action under the INRMP. Further surveys are not planned or budgeted for the next five years (2018 – 2022).

Overview

The Golden Eagle is a raptor that is characterized by golden lanceolate nape feathers, dark eyes, yellow cere, gray beak, fully feathered legs, large yellow feet, and great talons. Its wingspread can reach almost eight feet. Juveniles often have white tails and white markings on the wings. Due to the size of the Golden Eagle they are ranked at the top of the food chain as apex predators of avian species.

The species is best suited to hunting in open or semi-open areas. Native vegetation seems to be attractive to them and they tend to avoid developed areas of any type from urban to agricultural as well as heavily forested regions.

Golden Eagles nest in cliffs which may be used seasonally or year-round. One or two young survive to fledge after approximately three months. Juveniles typically attain full independence in the fall, after which they establish a territory for themselves in four to five years.

Golden Eagles are opportunistic not only in their taking of prey items, but also in their use of the local landscape. In areas that lack taller vegetation and trees, eagles will use electrical utility poles to hunt, rest, feed, nest, and establish territorial boundaries. The concentration of prey such as prairie dogs, rodents, small birds and rabbits, are also an attractant and eagles to use utility poles for perching.

Status

Golden Eagles can be found year round on Kirtland AFB. Golden Eagles are resident throughout much of New Mexico, holding their breeding territories throughout the year to maintain ownership. Migrant eagles from the north spend their winter in New Mexico. As data shows heavier use of Kirtland AFB during the winter, it appears the installation supports migrants as well as resident eagles. Golden Eagles nest on cliffs, and often multiple suitable cliffs exist in one territory.

On Kirtland AFB, appropriate breeding habitat occurs in the DOE and DOD Withdrawal area and breeding activity has been documented. Eagle habitat includes the Manzanita Mountains and the adjacent open

grasslands for foraging. Historically, two Golden Eagle nests have been documented on the cliffs in the Withdrawal area, but no recent studies in the last five years document birds active in the area

An area south of the DOE solar tower along the southern boundary with Isleta Pueblo was a frequent foraging ground for Golden Eagles. Increased military training activity in this area may have impacted the prairie dog and Burrowing Owl population, and may have reduced foraging activity in this area.

Recommendations for Best Management Practices

Since Golden Eagles are present year round on Kirtland AFB, APLIC recommends standards of 60 inches of horizontal separation and 40 inches of vertical separation for electrical pole configurations. Kirtland AFB surveys found that none of the distribution poles on base met these requirements, however major upgrades are currently in progress. Previously, several forms of pole configurations commonly used on Kirtland AFB attributed to this standard not being met. Compact fiberglass crossarms were found on 896 poles, and the short arms do not provide the separation needed for large birds to perch without the potential to come into contact with energized phases. On poles using the industry standard of wood crossarms, the lack of clearance is due to both the insufficient crossarm length and the short vertical distance in which the crossarm is mounted from the top of the pole. Both of these measurements do not afford the recommended distance needed between energized and grounded components. Once the electrical upgrades projects on Kirtland AFB are complete, an updated inventory of high-risk electrical structures will be completed. The NRM will work to secure funding to complete raptor proofing for any remaining high-risk electrical structures.

Proposed Conservation Projects

Proposed conservation projects for the management of Golden Eagles is detailed in Section 10 (Annual Work Plans). Specifically, long-term monitoring surveys are recommended to track populations on the installation and are included with land bird monitoring. The creation of an avian protection plan and completion of electrical system upgrades are additional conservation projects for Golden Eagles. The NRM coordinates with the biologists conducting the surveys in order to have updated population data for planning purposes; data is uploaded to the GIS system on a yearly basis.

Management of Threatened and Endangered Species, Species of Concern and Habitat Issues:

Following are issues identified by Kirtland AFB personnel related to the Threatened and Endangered Species, New Mexico Species of Greatest Conservation Need, and habitat on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

- The Gray Vireo, a state threatened species, is located on the base.
- Unauthorized feeding of wildlife occurs on base conflicting with the military mission.
- Power lines pose an electrocution and collision risk to avian species and all high-risk structures have not been raptor proofed.
- Mountain Plovers, a former federal candidate species, may potentially be found in the southern grasslands of the base.

- Long-term monitoring of the Loggerhead Shrike, a New Mexico Species of Greatest Conservation Need, has been intermittently performed.
- The Western Burrowing Owl, a former federal candidate species of concern, population at Kirtland AFB has declined over the past several years. Reasons for the decline are not clearly understood, although construction projects and existing human activity near nests during the nesting season is of concern.
- The Desert Massasauga, a New Mexico Species of Greatest Conservation Need, has declined on base over the past few years.

7.5 Water Resource Protection

Applicability Statement

This section applies to AF installations that have water resources. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

Kirtland AFB maintains all required water resource protection permits for surface and ground water.

Floodplains

Flooding on Kirtland AFB generally occurs between May and October during high intensity thunderstorms (USACE 1979). 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.

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. 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% 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.

Depth of groundwater below surface in Albuquerque between 1960 and 2002 show significantly higher declines along the east side of Albuquerque (USGS 2016). Areas adjacent to Kirtland AFB exhibited a decline between 21 feet to 120 feet. This decline is associated with the growth of Albuquerque and over reliance on groundwater for municipal supply.

Since 2008 use of surface water from the San Juan Chama Drinking Water Project has resulted in a decrease of the depth of groundwater below ground surface (ABCWUA 2016). This increase in the aquifer is also due to aggressive conservation measures and aquifer recharge projects that utilize surface water. Kirtland AFB is currently reducing potable water by 2% per year based upon FY 2007 usage base level, which is a goal in Executive Order 13693.

Water Resource Protection Issues:

Following are issues identified by Kirtland AFB personnel related to the water resources on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

- Use of herbicides and fertilizers on grounds could affect water resources if used excessively.
- Floodplains and springs may are affected by vegetation, especially tamarisk, trees of heaven and cattails, that has encroached into arroyo channels.
- Stormwater pollution sources' could affect water resources if not managed.

7.6 Wetland Protection

Applicability Statement

This section applies to AF installations that have existing wetlands on AF property. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

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 and is a historic site with cultural significance to area pueblos and tribes. 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. 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. An enhancement project was completed that involved the construction, lining, filling and vegetating of a small pond in the complex as well as removing the salt cedar stand. A security gate prevents access to the restoration area. Efforts are underway in 2017 to continue restoration of the coyote springs wetland area. Section 106 consultation with area pueblos and tribes as well as SHPO was completed December 2017.

Wetland Protection Issues:

Following are issues identified by Kirtland AFB personnel related to wetland protection on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

- Restoration of the Coyote Springs wetland complex is not complete and restoration efforts must be accomplished annually.

7.7 Grounds Maintenance

Applicability Statement

This section applies to AF installations that perform ground maintenance activities that could impact natural resources. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

Land Management and Grounds Maintenance are maintained by 377 MSG/CE and the Base Maintenance Contractor. 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 Kirtland AFB provides information on 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. The U. S. Air Force Golf Course Environmental Management (GEM) program (Tab 3) is a proactive AFCEC 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, AFCEC'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, Section 11, requires a GEM Plan as part of the INRMP.

The golf course environmental baseline assessment, 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.

Grounds Maintenance Issues:

Following are issues identified by Kirtland AFB personnel related to grounds maintenance on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The following issue was identified to address specific resource needs and plan for projects over the next five years.

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

7.8 Forest Management

Applicability Statement

This section applies to AF installations that maintain forested land on AF property. This section is applicable to Kirtland AFB

Program Overview/Current Management Practices

Currently, 15,891 acres of Cibola National Forest 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 utilizes the Cibola National Forest 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 Cibola National Forest 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.

Forest Management Issues:

A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The following issues were identified to address specific resource needs and plan for projects over the next five years.

During previous visits observations included a large area of pinyon tree mortality on a north facing slope within the withdrawal area, Presumably other locations within the withdrawal areas contains areas of high pinyon mortality, which is caused by drought and subsequent attack by phytophagous insects. These landscape scale pinyon (and in some cases, juniper) die-off events occurring in New Mexico are a response to changing climactic conditions, which can substantially reduce tree densities.

Kirtland AFB is in the process of development of an Environmental Assessment in coordination with the USFS in order to address these issues.

7.9 Wildland Fire Management

Applicability Statement

This section applies to AF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

Fire is a natural component of the various habitats located on Kirtland AFB. These habitats, and their respective vegetation and wildlife, have evolved with unique fire regimes that shaped the structure and composition of these biotic communities. 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 led to a heavy fuel load, especially in the withdrawal lands portion of the base. The 1941 East Mountain Complex Fire, reduced fuel loads on base to an average of 20%. While wildfires that have occurred on base since 1941 have been relatively infrequent, they have been suppressed immediately. 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.

A WFMP has been approved, and will soon be implemented for the base (Tab 1). This 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 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 the Impacts of Wildfire on Communities and the Environment: A Report to the President in Response to the Wildfires of 2000 (USDA/USDI 2000)
- Protecting People and Sustaining Resources in Fire-Adapted Ecosystems – A Cohesive Strategy (USFS 2000)
- 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 U.S. for the benefit of present and future generations of Americans.

Kirtland AFB 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. 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/Withdrawal areas is being discussed with cooperators and will continue to be developed as a concept.

Wildland Fire Management Issues:

Following are issues identified by Kirtland AFB personnel related to the management of wildland fire management on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

- Wildland Fire Management Plan has not been implemented

7.10 Agricultural Outleasing

Applicability Statement

This section applies to AF installations that lease eligible AF land for agricultural purposes. This section **IS NOT** applicable to Kirtland AFB.

Program Overview/Current Management Practices

This section is not applicable to Kirtland AFB.

7.11 Integrated Pest Management Program

Applicability Statement

This section applies to AF installations that perform pest management activities in support of natural resources management, e.g. invasive species, forest pests, etc. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

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 Integrated Pest Management Plan (IPMP) (Tab 5) 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% 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 IPMP 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:

- 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.
- Structural pests. These pests include termites and carpenter ants.
- Stored product pests. These include lesser grain borer and the Mediterranean flour moth

- 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.
- 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.
- 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.
- 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.

The IPMP is also 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 Kirtland AFB:

- Do not transport wild and domestic animals from off-site onto the Reservation.
- Do not release nuisance wildlife trapped at Kirtland AFB 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.

Integrated Pest Management Issues:

Following are issues identified by Kirtland AFB personnel related to integrate pest management on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

- Pigeon's loaf and nest on hangers causing a health concern from their accumulated droppings.

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)

Applicability Statement

This section applies to AF installations that maintain a BASH program to prevent and reduce wildlife-related hazards to aircraft operations. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

The Kirtland AFB BASH Plan identifies procedures to decrease the potential for bird and wildlife aircraft strike hazards (KAFB 2016a). 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 Resources and Community Planning, USDA-APHIS, USFWS, and the New Mexico Civil Air Patrol Liaison.

Kirtland AFB 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 used 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, 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.

Bird/Wildlife Aircraft Strike Hazard (BASH):

Following are issues identified by Kirtland AFB personnel related to pest management on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

- 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, including coyotes, which lead to an increase in the BASH potential. Data regarding BASH potential will be discussed with the BASH working group and the Albuquerque Sunport.

The NRM will work with the BASH Working Group and assess the potential for conducting a study of the effects of mowing on raptor and prairie dog populations

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7.13 Coastal Zone and Marine Resources Management

Applicability Statement

This section applies to AF installations that are located along coasts and/or within coastal management zones. This section **is not** applicable to Kirtland AFB.

Program Overview/Current Management Practices

This section is not applicable to Kirtland AFB

7.14 Cultural Resources Protection

Applicability Statement

This section applies to AF installations that have cultural resources that may be impacted by natural resource management activities. This section is applicable to Kirtland AFB.

Program Overview/Current Management Practices

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.

The Kirtland AFB Integrated Cultural Resources Management Plan provides for effective management and protection of cultural resources (Tab 4). It summarizes the history and prehistory of the installation, and reviews past historical and archaeological survey efforts. 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.

Cultural Resources Protection Issues:

Following are issues identified by Kirtland AFB personnel related to the management of cultural resources protection on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

Issue:

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

7.15 Public Outreach

Applicability Statement

This section applies to all AF installations that maintain an INRMP. The installation is required to implement this element.

Program Overview/Current Management Practices

Partnerships with agencies such as the NMDGF, USFS, USDA-APHIS 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:

- Public Outreach program should be established and maintained to show Kirtland AFB efforts that protect the environment.

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7.16 Geographic Information Systems (GIS)

Applicability Statement

This section applies to all AF installations that maintain an INRMP, since all geospatial information must be maintained within the AF GeoBase system. The installation is required to implement this element.

Program Overview/Current Management Practices

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.

GIS Issues:

Following are issues identified by Kirtland AFB personnel related to the management of geospatial on the installation. A review of the 2007 INRMP was conducted along with the studies conducted since 2007. The issues were identified to address specific resource needs and plan for projects over the next five years.

- Cohesion between different GIS departments within the Air Force needs improvement; thus GIS information is not being distributed efficiently in proper format for agency distribution.

8.0 MANAGEMENT GOALS AND OBJECTIVES

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

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

Installation Supplement – Management Goals and Objectives

- Goal 1: 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. Kirtland AFB shall consider designating some areas as high priority for protection from development. These areas should include Tijeras Arroyo wildlife corridor and grasslands along the southern edge of the installation.
- 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.

Section 7 identified specific management issues for components of the Natural Resources Management Program. Section 10 contains specific projects that will be implemented, based on available funding, to achieve the goals and objectives set forth in this Section. 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.

9.0 INRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural Resources Management Staffing and Implementation

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 was drafted by the Kirtland AFB NRM and has been approved by the Wing Commander, BCE, and AFCEC. 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.

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 2007 INRMP as directed by AFI 32-7064. Although an INRMP was drafted for the five-year rewrite in 2012, it was not signed by the USFWS and NMDGF, as required. This INRMP will be implemented by actions to achieve the goals and objectives stated in Section 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 32-7061, including CATEXs, EAs, or EISs.

Work plans are presented in Section 10. 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. Projects have been given a priority of high, medium, or low. High priority projects are the most critical to the military mission, therefore funding for these

projects will be requested first. As high priority projects are completed, funding for less critical projects (e.g. medium priority and low priority), 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. Despite a decrease in support staff, project output is still required to be met.

As required by AFI 32-7064, annual review and updates of this INRMP are required by Kirtland AFB, USFWS and NMDGF. 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. Integrated Natural Resources Management Plan Integration INRMP Objectives/Projects is detailed in Section 10 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 as appendices of this INRMP. Any issues that arise will be addressed in a timely manner with all affected agencies getting involved.

9.2 Monitoring INRMP Implementation

377 MSG/CEIEC is responsible for the implementation of the INRMP, and will conduct the annual review of the INRMP.

9.3 Annual INRMP Review and Update Requirements

The INRMP requires annual review, in accordance with DoDI 4715.03, *Natural Resources Conservation Program*, and AFI 32-7064, to ensure the achievement of mission goals, verify the implementation of projects, and establish any necessary new management requirements. This process involves installation natural resources personnel and external agencies working in coordination to review the INRMP. If the installation mission or any of its natural resources management issues change significantly after the creation of the original INRMP, a major revision to the INRMP is required. The need to accomplish a major revision is normally determined during the annual review with USFWS and the NMDGF. The NRM documents the findings of the annual review in an Annual INRMP Review Summary and obtains signatures from the coordinating agencies on review findings. By signing the Annual INRMP Review Summary, the collaborating agency representatives assert concurrence with the findings. If any agency declines to participate in an on-site annual review, the NRM submits the INRMP for review along with the Annual INRMP Review Summary document to the agency via official correspondence and request return correspondence with comments/concurrence.

The USFWS, the NMGF, and the NRM/IST conduct an Annual INRMP Review Meeting. This meeting takes place in person with respective representatives for each agency. Individuals may telephone or video call if they cannot attend in person. During this meeting the NRM/IST updates the external

stakeholders/parties with the end of the year execution report and coordinates future work plans and any necessary changes to management methods etc. All parties review the INRMP and begin preliminary collaborative work on updating the INRMP (new policies, procedures, impacts, mitigations, etc.) as applicable. Following completion of updates, to include internal AF review, the INRMP is staffed for signature.

10.0 ANNUAL WORK PLANS

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

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

Annual Work Plans	Funding Source	Priority Level
Geographic Information Systems		
Promote cohesion of natural resource GIS data between different GIS departments at Kirtland AFB. Establish process for delivery of data to appropriate agencies. Ensure that contractor produced Natural Resource data meets Air Force standards. FY18-22	Base	M
Fish and Wildlife		
Continue Avian Monitoring Program to conduct long-term land bird surveys. Assess need for continuing bat and amphibian through coordination with USFWS and NMDGF. FY18-22	AFCEC	H
Continue monitoring cougar distribution and populations. FY18-22	AFCEC	M
Continue working with Friends of the Sandia to maintain, repair, and install wildlife guzzlers throughout the base. Assess the feasibility of the installation of guzzlers at springs through the base. FY18-22	Base	M
Complete raptor-proofing of high risk electrical structures. Coordinate with USDA-APHIS to ensure avian mortalities are reported. FY18-22	Base	M
Develop an avian protection plan in coordination with the USFWS and NMDGF. FY18-22	Base	H
Continue monitoring vegetation for the base by conducting additional flora surveys. FY19	AFCEC	L

Annual Work Plans	Funding Source	Priority Level
Continue communication between the DOD, USFS, USFWS, USDA-APHIS, NM Game and Fish, and DOE concerning natural resources issues. FY18-22	Base	H
Complete implementation of the October 2007 signed "Memorandum of Understanding" – Tijeras Arroyo Wildlife Corridor' between the DoD, DOE and City of Albuquerque." FY18	Base	M
Threatened and Endangered Species		
Conduct Mountain Plover surveys once every five years. FY20	AFCEC	M
Continue monitoring of the Gray Vireo. FY18-22	AFCEC	H
Continue monitoring of the Loggerhead Shrike. FY18-22	AFCEC	H
Continue Kirtland AFBs Burrowing Owl migration study- FY18-22	AFCEC	H
Continue annual monitoring of nesting Burrowing Owls. Install signage adjacent to Burrowing Owl nests where appropriate. FY18-22	AFCEC	H
Continue monitoring the success of artificial burrows on base to replace Burrowing Owl nesting habitat that has been disturbed by development. FY18-22	Base	M
Conduct long-term monitoring of the Desert Massasauga with emphasis on distribution on base and population trends. FY18-22	AFCEC	H
Water Resource Protection		
Continue implementation of the Pest Management Plan. FY18-22	Base	H
Continue vegetation management as required. FY18-22	Base	M
Maintain compliance with NPDES and MS4 permits for the base.	Base	H
Wetland Protection		
Continue the wetland restoration and enhancement at the Coyote Springs wetland complex including coordination with USACE, SHPO, and Native American Tribes. Monitor flora and fauna at the Coyote Springs wetland complex. FY18-22	AFCEC	H
Grounds Maintenance and Land Management		
Develop a long-term photographic monitoring program that documents changes in landscape and vegetation on base. FY19-22	Base	M
Forest Management		
Continue working with the Sandia Ranger District in joint management of forests in the Withdrawal Area to restore conditions and reduce fuels loads. Support establishment of a wildland fire management team. FY18-22	Base	H
Wildland Fire Management		
Implement the Wildland Fire Management Plan. 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% of the area is accessible by road. Ensure proper coordination with SHPO, NMDGF, USFWS, pueblos, tribes and stakeholders and complete an Environmental Assessment for implementation of the plan. FY18-22	Base	H
Integrated Pest Management Plan		
Implement a Pigeon Management Plan for aircraft hangers on base where pigeons are causing health concerns. FY18-22	Base	M
BASH		
Continue to monitor and remove prairie dogs around flight lines to reduce foraging raptors in the area. FY18-22	Base	H
Maintain the mowing program by the Base Maintenance Contract around flight lines in order to reduce attracting prey species for raptors and other wildlife. FY18-22	Base	H
Outdoor Recreation		
Educate base personnel on locations of running, walking, and biking paths within designated areas of the base. Develop signage and maps; communicate via printed materials in kiosks and publish in the Nucleus. FY18-22	Base	M
Cultural Resources Protection		

Annual Work Plans	Funding Source	Priority Level
Maintain communication between cultural and natural resource personnel to ensure protection of cultural resources discovered during INRMP implementation. Educate Kirtland personnel to ensure Section 106 process is followed. FY18-22	Base	H
Enforcement		
Continue to monitor trespass within the base. FY18-22	Base	H
Support two positions for Conservation Law Enforcement Officers (CLEO) Program. Officers will patrol the Withdrawal area for trespassers and poachers of wildlife and cultural resources. FY18-22	Base	M
Ensure that Kirtland AFB security personnel, DOE security personnel, USDA-APHIS and the NMDGF work together when poaching of wildlife or collision with vehicles occur on base. FY18-22	Base	H
Ensure that new security personnel are aware that unauthorized feeding of wildlife is prohibited on base. FY18-22	Base	M
Public Outreach		
Organize conservation projects with non-profit organizations such as Scout Troops, Friends of the Sandias and the Youth Conservation Corp. FY18-22	Base	H
Add Natural Resources outreach/education to existing meetings: (1) quarterly Environmental Management System (EMS) cross-functional team meetings (2) EMS awareness trainings (3) facility manager training (4) enhance newcomers training (5) CE trainings for stormwater and fugitive dust (6) create Kirtland AFB specific environmental guidebook. FY18-22	Base	M

11.0 REFERENCES

11.1 Standard References *(Applicable to all AF installations)*

AFI 32-7064, *Integrated Natural Resources Management*
Sikes Act
eDASH Natural Resources Program Page
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12.0 ACRONYMS

12.1 Standard Acronyms (Applicable to all AF installations)

- eDASH Acronym Library
- Natural Resources Playbook – Acronym Section
- U.S. EPA Terms & Acronyms

12.2 Installation Acronyms

- **ABCWUA –** Albuquerque Bernalillo County Water Utility Authority
- **AEHD –** Albuquerque Environmental Health Department
- **AFGSC –** Air Force Global Strike Command
- **AFIA –** Air Force Inspection Agency
- **AFOTEC –** Air Force Operational Test and Evaluation Center
- **AFRL** – Air Force Research Laboratory
- **AFSC** – Air Force Safety Center
- **APLIC** - Avian Power Line Interaction Committee
- **377 ABW** – 377th Air Base Wing
- **BLM** – Bureau of Land Management
- **C&D** – Construction and Demolition
- **CECOS** – Civil Engineer Corps Officers School
- **DOE** – Department of Energy
- **°F** – degrees Fahrenheit
- **GRABS** – Giant Reusable Air Blast Simulator
- **HERTF** – High Energy Research and Test Facility
- **IBA** – Important Bird Area
- **MAPS** – Monitoring Avian Productivity and Survivorship
- **NM** – New Mexico
- **NMAC** – New Mexico Administrative Code

- **NMDGF –** New Mexico Department of Game and Fish
- **NMED –** New Mexico Environment Department
- **NNSA** – National Nuclear Security Administration
- **PLO –** Public Land Order
- **SMC –** Space and Missile Systems Center
- **SMC/AD -** Space and Missile Systems Center Advanced Systems and Development Directorate
- **SNL –** Sandia National Laboratories
- **150 SOW –** 150th Special Operations Wing
- **58 SOW –** 58th Special Operations Wing
- **UCSB** – U.S. Census Bureau
- **USDA-APHIS** – U.S. Department of Agriculture – Animal and Plant Health Inspection Service
- **USDI** – U.S. Department of Interior
- **USFS –** U.S. Forest Service
- **USFWS –** U.S. Fish and Wildlife Service

13.0 DEFINITIONS

13.1 Standard Definitions (Applicable to all AF installations)

- Natural Resources Playbook – Definitions Section

13.2 Installation Definitions

- No Installation specific definitions for Kirtland AFB

14.0 APPENDICES

Appendix A. Annotated Summary of Key Legislation Related to Design and Implementation of the INRMP

Federal Public Laws and Executive Orders	
National Defense Authorization Act of 1989, Public Law (P.L.) 101-189; Volunteer Partnership Cost-Share Program	Amends two Acts and establishes volunteer and partnership programs for natural and cultural resources management on DoD lands.
Defense Appropriations Act of 1991, P.L. 101-511; Legacy Resource Management Program	Establishes the "Legacy Resource Management Program" for natural and cultural resources. Program emphasis is on inventory and stewardship responsibilities of biological, geophysical, cultural, and historic resources on DoD lands, including restoration of degraded or altered habitats.
EO 11514, Protection and Enhancement of Environmental Quality	Federal agencies shall initiate measures needed to direct their policies, plans, and programs to meet national environmental goals. They shall monitor, evaluate, and control agency activities to protect and enhance the quality of the environment.
EO 11593, Protection and Enhancement of the Cultural Environment	All Federal agencies are required to locate, identify, and record all cultural resources. Cultural resources include sites of archaeological, historical, or architectural significance.
EO 11987, Exotic Organisms	Agencies shall restrict the introduction of exotic species into the natural ecosystems on lands and waters which they administer.
EO 11988, Floodplain Management	Provides direction regarding actions of Federal agencies in floodplains, and requires permits from state, territory and Federal review agencies for any construction within a 100-year floodplain and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for acquiring, managing and disposing of Federal lands and facilities.
EO 11989, Off-Road vehicles on Public Lands	Installations permitting off-road vehicles to designate and mark specific areas/trails to minimize damage and conflicts, publish information including maps, and monitor the effects of their use. Installations may close areas if adverse effects on natural, cultural, or historic resources are observed.
EO 11990, Protection of Wetlands	Requires Federal agencies to avoid undertaking or providing assistance for new construction in wetlands unless there is no practicable alternative, and all practicable measures to minimize harm to wetlands have been implemented and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.
EO 12088, Federal Compliance With Pollution Control Standards	This EO delegates responsibility to the head of each executive agency for ensuring all necessary actions are taken for the prevention, control, and abatement of environmental pollution. This order gives the U.S. Environmental Protection Agency (US EPA) authority to conduct

Federal Public Laws and Executive Orders	
	reviews and inspections to monitor Federal facility compliance with pollution control standards.
EO 12898, Environmental Justice	This EO requires certain federal agencies, including the DoD, to the greatest extent practicable permitted by law, to make environmental justice part of their missions by identifying and addressing disproportionately high and adverse health or environmental effects on minority and low-income populations.
EO 13112, Exotic and Invasive Species	To prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	The U.S. Fish and Wildlife Service (USFWS) has the responsibility to administer, oversee, and enforce the conservation provisions of the Migratory Bird Treaty Act, which includes responsibility for population management (e.g., monitoring), habitat protection (e.g., acquisition, enhancement, and modification), international coordination, and regulations development and enforcement.
United States Code	
Animal Damage Control Act (7 U.S.C. § 426-426b, 47 Stat. 1468)	Provides authority to the Secretary of Agriculture for investigation and control of mammalian predators, rodents, and birds. DoD installations may enter into cooperative agreements to conduct animal control projects.
Bald and Golden Eagle Protection Act of 1940, as amended; 16 U.S.C. 668-668c	This law provides for the protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violation of the Act.
Clean Air Act, (42 U.S.C. § 7401– 7671q, July 14, 1955, as amended)	This Act, as amended, is known as the Clean Air Act of 1970. The amendments made in 1970 established the core of the clean air program. The primary objective is to establish Federal standards for air pollutants. It is designed to improve air quality in areas of the country which do not meet Federal standards and to prevent significant deterioration in areas where air quality exceeds those standards.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (Superfund) (26 U.S.C. § 4611–4682, P.L. 96-510, 94 Stat. 2797), as amended	Authorizes and administers a program to assess damage, respond to releases of hazardous substances, fund cleanup, establish clean-up standards, assign liability, and other efforts to address environmental contaminants. Installation Restoration Program guides cleanups at DoD installations.
Endangered Species Act (ESA) of 1973, as amended; P.L. 93-205, 16 U.S.C. § 1531 et seq.	Protects threatened, endangered, and candidate species of fish, wildlife, and plants and their designated critical habitats. Under this law, no Federal action is allowed to jeopardize the continued existence of an endangered or threatened species. The ESA requires consultation with the USFWS and the NOAA Fisheries (National Marine Fisheries Service) and the preparation of a biological evaluation or a biological

Federal Public Laws and Executive Orders	
	assessment may be required when such species are present in an area affected by government activities.
Federal Aid in Wildlife Restoration Act of 1937 (16 U.S.C. § 669–669i; 50 Stat. 917) (Pittman-Robertson Act)	Provides Federal aid to states and territories for management and restoration of wildlife. Fund derives from sports tax on arms and ammunition. Projects include acquisition of wildlife habitat, wildlife research surveys, development of access facilities, and hunter education.
Federal Environmental Pesticide Act of 1972	Requires installations to ensure pesticides are used only in accordance with their label registrations and restricted-use pesticides are applied only by certified applicators.
Federal Land Use Policy and Management Act, 43 U.S.C. § 1701–1782	Requires management of public lands to protect the quality of scientific, scenic, historical, ecological, environmental, and archaeological resources and values; as well as to preserve and protect certain lands in their natural condition for fish and wildlife habitat. This Act also requires consideration of commodity production such as timbering.
Federal Noxious Weed Act of 1974, 7 U.S.C. § 2801–2814	The Act provides for the control and management of non-indigenous weeds that injure or have the potential to injure the interests of agriculture and commerce, wildlife resources, or the public health.
Federal Water Pollution Control Act (Clean Water Act [CWA]), 33 U.S.C. §1251–1387	The CWA is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Primary authority for the implementation and enforcement rests with the US EPA.
Fish and Wildlife Conservation Act (16 U.S.C. § 2901–2911; 94 Stat. 1322, PL 96-366)	Installations encouraged to use their authority to conserve and promote conservation of nongame fish and wildlife in their habitats.
Fish and Wildlife Coordination Act (16 U.S.C. § 661 et seq.)	Directs installations to consult with the USFWS, or state or territorial agencies to ascertain means to protect fish and wildlife resources related to actions resulting in the control or structural modification of any natural stream or body of water. Includes provisions for mitigation and reporting.
Lacey Act of 1900 (16 U.S.C. § 701, 702, 32 Stat. 187, 32 Stat. 285)	Prohibits the importation of wild animals or birds or parts thereof, taken, possessed, or exported in violation of the laws of the country or territory of origin. Provides enforcement and penalties for violation of wildlife related Acts or regulations.
Leases: Non-excess Property of Military Departments, 10 U.S.C. § 2667, as amended	Authorizes DoD to lease to commercial enterprises Federal land not currently needed for public use. Covers agricultural outleasing program.
Migratory Bird Treaty Act 16 U.S.C. § 703–712	The Act implements various treaties for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful without a valid permit.
National Environmental Policy Act of 1969 (NEPA), as amended; P.L. 91-190, 42 U.S.C. § 4321 et seq.	Requires Federal agencies to utilize a systematic approach when assessing environmental impacts of government activities. Establishes the use of environmental impact statements. NEPA proposes an interdisciplinary approach in a decision-making process designed to identify unacceptable or unnecessary impacts on the environment. The Council of Environmental Quality (CEQ) created Regulations for Implementing the National Environmental Policy Act [40 Code of

Federal Public Laws and Executive Orders	
	Federal Regulations (CFR) Parts 1500– 1508], which provide regulations applicable to and binding on all Federal agencies for implementing the procedural provisions of NEPA, as amended.
National Historic Preservation Act, 16 U.S.C. § 470 et seq.	Requires Federal agencies to take account of the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). Provides for the nomination, identification (through listing on the NRHP), and protection of historical and cultural properties of significance.
National Trails Systems Act (16 U.S.C. § 1241–1249)	Provides for the establishment of recreation and scenic trails.
National Wildlife Refuge Acts	Provides for establishment of National Wildlife Refuges through purchase, land transfer, donation, cooperative agreements, and other means.
National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd–668ee)	Provides guidelines and instructions for the administration of Wildlife Refuges and other conservation areas.
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. § 3001–13; 104 Stat. 3042), as amended	Established requirements for the treatment of Native American human remains and sacred or cultural objects found on Federal lands. Includes requirements on inventory, and notification.
Rivers and Harbors Act of 1899 (33 U.S.C. § 401 et seq.)	Makes it unlawful for the USAF to conduct any work or activity in navigable waters of the United States without a Federal Permit. Installations should coordinate with the U.S. Army Corps of Engineers (USACE) to obtain permits for the discharge of refuse affecting navigable waters under National Pollutant Discharge Elimination System (NPDES) and should coordinate with the USFWS to review effects on fish and wildlife of work and activities to be undertaken as permitted by the USACE.
Sale of certain interests in land, 10 U.S.C. § 2665	Authorizes sale of forest products and reimbursement of the costs of management of forest resources.
Soil and Water Conservation Act (16 U.S.C. § 2001, P.L. 95-193)	Installations shall coordinate with the Secretary of Agriculture to appraise, on a continual basis, soil/water-related resources. Installations will develop and update a program for furthering the conservation, protection, and enhancement of these resources consistent with other Federal and local programs.
Sikes Act (16 U.S.C. § 670a–670l, 74 Stat. 1052), as amended	Provides for the cooperation of DoD, the Departments of the Interior (USFWS), and the State Fish and Game Department in planning, developing, and maintaining fish and wildlife resources on a military installation. Requires development of an Integrated Natural Resources Management Plan and public access to natural resources, and allows collection of nominal hunting and fishing fees. NOTE: AFI 32-7064 sec 3.9. Staffing. As defined in DoDI 4715.03, use professionally trained natural resources management personnel with a degree in the natural sciences to develop and implement the installation INRMP. (T-0). 3.9.1. Outsourcing Natural Resources

Federal Public Laws and Executive Orders	
	Management. As stipulated in the Sikes Act, 16 U.S.C. § 670 et. seq., the Office of Management and Budget Circular No. A-76, Performance of Commercial Activities, August 4, 1983 (Revised May 29, 2003) does not apply to the development, implementation and enforcement of INRMPs. Activities that require the exercise of discretion in making decisions regarding the management and disposition of government owned natural resources are inherently governmental. When it is not practicable to utilize DoD personnel to perform inherently governmental natural resources management duties, obtain these services from federal agencies having responsibilities for the conservation and management of natural resources.
DoD Policy, Directives, and Instructions	
DoD Instruction 4150.07 DoD Pest Management Program dated 29 May 2008	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.
DoD Instruction 4715.1, Environmental Security	Establishes policy for protecting, preserving, and (when required) restoring and enhancing the quality of the environment. This instruction also ensures environmental factors are integrated into DoD decision-making processes that could impact the environment, and are given appropriate consideration along with other relevant factors.
DoD Instruction (DODI) 4715.03, Natural Resources Conservation Program	Implements policy, assigns responsibility, and prescribes procedures under DoDI 4715.1 for the integrated management of natural and cultural resources on property under DoD control.
OSD Policy Memorandum – 17 May 2005 – Implementation of Sikes Act Improvement Amendments: Supplemental Guidance Concerning Leased Lands	Provides supplemental guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD. The guidance covers lands occupied by tenants or lessees or being used by others pursuant to a permit, license, right of way, or any other form of permission. INRMPs must address the resource management on all lands for which the subject installation has real property accountability, including leased lands. Installation commanders may require tenants to accept responsibility for performing appropriate natural resource management actions as a condition of their occupancy or use, but this does not preclude the requirement to address the natural resource management needs of these lands in the installation INRMP.
OSD Policy Memorandum – 1 November 2004 – Implementation of Sikes Act Improvement Act Amendments: Supplemental Guidance Concerning INRMP Reviews	Emphasizes implementing and improving the overall INRMP coordination process. Provides policy on scope of INRMP review, and public comment on INRMP review.
OSD Policy Memorandum – 10 October 2002 – Implementation of Sikes Act Improvement Act: Updated Guidance	Provides guidance for implementing the requirements of the Sikes Act in a consistent manner throughout DoD and replaces the 21 September 1998 guidance Implementation of the Sikes Act Improvement Amendments. Emphasizes implementing and improving the overall INRMP coordination process and focuses on coordinating with stakeholders, reporting requirements and metrics, budgeting for

Federal Public Laws and Executive Orders	
	INRMP projects, using the INRMP as a substitute for critical habitat designation, supporting military training and testing needs, and facilitating the INRMP review process.
USAF Instructions and Directives	
32 CFR Part 989, as amended, and AFI 32-7061, Environmental Impact Analysis Process	Provides guidance and responsibilities in the EIAP for implementing INRMPs. Implementation of an INRMP constitutes a major federal action and therefore is subject to evaluation through an Environmental Assessment or an Environmental Impact Statement.
AFI 32-7062, Air Force Comprehensive Planning	Provides guidance and responsibilities related to the USAF comprehensive planning process on all USAF-controlled lands.
AFI 32-7064, Integrated Natural Resources Management	Implements AFPD 32-70, Environmental Quality; DODI 4715.03, Natural Resources Conservation Program; and DODI 7310.5, Accounting for Sale of Forest Products. It explains how to manage natural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFI 32-7065, Cultural Resources Management	This instruction implements AFPD 32-70 and DoDI 4710.1, Archaeological and Historic Resources Management. It explains how to manage cultural resources on USAF property in compliance with Federal, state, territorial, and local standards.
AFPD 32-70, Environmental Quality	Outlines the USAF mission to achieve and maintain environmental quality on all USAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.
Policy Memo for Implementation of Sikes Act Improvement Amendments, HQ USAF Environmental Office (USAF/ILEV) on January 29, 1999	Outlines the USAF interpretation and explanation of the Sikes Act and Improvement Act of 1997.

Appendix B. Soil Descriptions for Kirtland Air Force Base

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 Mountains	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 the east and west Mesas.	Black grama Three-awn Apache plume

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%	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	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	Pinyon pine One-seeded juniper Alderleaf mountain
Rock outcrop-Orthids complex, 40-80% slopes	40% Rock outcrop and 30% Orthids with 30-80% slopes. On the west face of the Manzanita	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	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-	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	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
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 C. Flora List for Kirtland Air Force Base

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*
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	*Guara 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*
Bitterweed	*Hymenoxys acaulis var. acaulis*
Winterfat	*Krascheninnikovia lanata (syn. Eurotia lanata)*
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	*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	*barbatus*
James penstemon	*Penstemon jamesii (syn. P. jamesii ssp. jamesii)*
Wandbloom 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 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*
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 D. Fauna List for Kirtland Air Force Base

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 gunnisonii*
Black Tailed Prairie Dog	*Cynomys ludovicianusi*
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*
Allen's Big-eared Bat	*Idionycteris phyllotis*
Western Red Bat	*Lasiurus blossevillii*
Silver-haired Bat	*Lasionycteris noctivagans*
Hoary Bat	*Lasiurus cinereus*
Bobcat	*Lynx rufus*
Striped Skunk	*Mephitis*
Long-tailed Weasel	*Mustela frenata*
Southwestern Myotis	*Myotis auriculus*
California Myotis	*Myotis californicus*
Small-footed Myotis	*Myotis ciliolabrum*
Little Brown Myotis	*Myotis lucifugus*
Arizona myotis bat	*Myotis occultus*
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*
Big Free-tailed Bat	*Nyctinomops macrotis*
Mule Deer	*Odocoileus hemionus*
New Mexico Grasshopper Mouse	*Onychomys arenicola*
Northern Grasshopper Mouse	*Onychomys leucogaster*
Western Pipestrelle	*Parastrellus hesperus*
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*
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*
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*
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*
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*
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*

Fish

Catfish	*Ictalurus spp.*
Carp	*Cyprinus spp.*
Goldfish	*Carassius auratus*

Appendix E. Species of Concern for Bernalillo County

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 Charadrius*		T
Mountain Plover	*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*		
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

15.0 ASSOCIATED PLANS

Tab 1 – Wildland Fire Management Plan

Tab 2 – Bird/Wildlife Aircraft Strike Hazard (BASH) Plan

Tab 3 – Golf Environmental Management (GEM) Plan

Tab 4 – Integrated Cultural Resources Management Plan (ICRMP)

Tab 5 – Integrated Pest Management Plan (IPMP)