White Sands Missile Range
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

PREPARED FOR:

White Sands Missile Range
Directorate of Public Works Environmental Division
Building 163
Springfield Ave
WSMR, NM 88002

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INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

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EXECUTIVE SUMMARY

This Integrated Natural Resources Management Plan (INRMP) has been developed for the White Sands Missile Range and the United States Department of the Army. This plan updates the 2015 Integrated Natural and Cultural Resources Management Plan. This revised plan separates the natural and cultural resources into separate standalone plans. The environmental assessment will also be separate.

This INRMP is prepared in accordance with the Sikes Act Improvement Act, Department of Defense Instruction and Manual 4715.03 *Natural Resources Conservation Program*, and U.S. Army Regulation 200-1. INRMP guidance is directed by a series of Department of Defense and U.S. Army guidance memoranda on the Sikes Act and INRMPs. The purpose is to provide guidance for the implementation and management of natural resources during the 5-year period from 2023 through 2027. This INRMP uses an integrated, adaptive, ecosystem management approach for sustainability and consistency with the White Sands Missile Range military mission. The Department of Defense, with the assistance of the U.S. Fish and Wildlife Service and the New Mexico Department of Game and Fish, are responsible under the Sikes Act for carrying out programs and implementing management strategies to conserve and protect biological resources on White Sands Missile Range lands. Implementation of the INRMP is imperative for maintaining and/or increasing mission capabilities, minimizing military testing and training constraints, and maintaining maximum flexibility.

Integrated natural resources management in an ecosystem framework promotes protection of natural resources and biological diversity across White Sands Missile Range while allowing sustained military use of the installation. Effective sustainable use of natural resources supports no net loss in the capability of the installation to support the military mission and ensure the preparedness of the Armed Forces.

This INRMP provides a description of the installation and its surrounding environments and presents various management practices designed to mitigate negative impacts of the installation's mission on regional ecosystems. It is a practical guide for the management, sustainment, and stewardship of natural resources in an effort to ensure no net loss in mission capabilities.

This INRMP represents a revision of the White Sands Missile Range Integrated Natural and Cultural Resources Management Plan, reviews the natural resources activities undertaken since its implementation, and proposes new projects and initiatives for the years 2023 through 2027. It establishes goals that represent a long-term vision for the health and quality of natural resources. From these goals, objectives and management actions are identified that follow Department of Defense, U.S. Fish and Wildlife Service, and New Mexico Department of Game and Fish guidance. The INRMP goals and management actions adjust over time to reflect changing missions and environmental conditions.

The INRMP serves as a source of environmental and natural resources information and compilation of references to pertinent data, to aid preparers with the environmental analysis to accept the revised management plan.

The Conservation Branch monitors management strategies described in this INRMP so that revisions can be made as environmental conditions change. This revised INRMP will undergo interagency review with the U.S. Fish and Wildlife Service and New Mexico Department of Game and Fish on a regular basis to ensure environmental compliance.

LIST OF ACRONYMS

ACUB	Army Compatible Use Buffer
APP	Avian Protection Plan
ARA	Avian Risk Assessment
ASE	Army Strategy for the Environment
ASP	Ammunition Storage Point
ATEC	Army Test and Evaluation Command
BCC	Birds of Conservation Concern
BCI	Bat Conservation International
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
CLEO	Conservation Law Enforcement Officer
DES	Directorate of Emergency Services
DoD	Department of Defense
DPW	Department of Public Works
DSCESU	Desert Southwest Cooperative Ecosystem Studies Unit
EA	Environmental Assessment
EMU	Ecological Management Unit
ESA	Endangered Species Act
ESMC	Endangered Species Management Component
FMU	Fire Management Units
GC	Garrison Commander
GIS	Geographic Information System
HAFB	Holloman Air Force Base
HELSTF	High Energy Laser Systems Test Facility
ICRMP	Integrated Cultural Resource Management Plan
INRMP	Integrated Natural Resources Management Plan
IPMC	Integrated Pest Management Coordinator
IPMP	Integrated Pest Management Plan
ITAM	Integrated Training Area Management
IUCN	International Union for Conservation of Nature
IWFMP	Integrated Wildland Fire Management Plan
JER	Jornada Experimental Range
JLUS	Joint Land Use Study
LRAM	Land Rehabilitation and Maintenance
LURC	Limited Use Restriction or Condition
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSS	Mission-Sensitive Species
MWEPA	Mexican Wolf Experimental Population Area
NASA	National Aeronautics and Space Administration
NCUA/WCUA	Northern/Western Call-Up Areas
NEPA	National Environmental Policy Act

NMACP	New Mexico Avian Conservation Partners
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMLC	New Mexico Land Conservancy
NMSLO	New Mexico State Land Office
NMSU	New Mexico State University
NPS	National Park Service
NRCS	Natural Resources Conservation Service
OMDPNM	Organ Mountains-Desert Peaks National Monument
OMPA	Oscura Mountains Planning Area
PIF	Partners in Flight
PJ	Piñon-juniper/Pinyon-juniper
RDT&E	Research, Development, Test and Evaluation
REPI	Readiness and Environmental Protection Integration
RTLA	Range Training Land Assessment
RTLP	Range and Training Land Program
SANWR	San Andres National Wildlife Refuge
SAR	Species at Risk
SAIA	Sikes Act Improvement Act
SEC	Socorro Electric Cooperative
SGCN	Species of Greatest Conservation Need
SNA	Special Natural Area
SNMEP	Southern New Mexico-El Paso, Texas
SRC	Stallion Range Center
SRP	Sustainable Range Program
SJA	Staff Judge Advocate
TPF	The Peregrine Fund
U.S./US	United States
USACE	United States Army Corps of Engineers
USAEC	U.S. Army Environmental Command
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	Unexploded Ordnance
WIT	Warhead Impact Target
WSMR	White Sands Missile Range
WSNP	White Sands National Park
WSPG	White Sands Proving Ground
WSTC	White Sands Test Center
WSWRA	White Sands Wolf Recovery Area

White Sands Missile Range
New Mexico
INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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1 OVERVIEW

1.1 Introduction

White Sands Missile Range (WSMR) Garrison is managed by the United States (U.S.) Department of the Army and supports Department of Defense (DoD) readiness by providing America's armed forces, allies, partners, and defense technology innovators with the world's premier research, development, test, evaluation, experimentation, and training facilities to ensure our nation's defense readiness (WSMR 2018a). WSMR conducts a wide variety of test missions for the Research, Development, Testing, and Evaluation (RDT&E) of surface weapons firing (surface-to-surface or surface-to-air), airborne weapons/munitions release, directed energy systems, instrumentation and communication systems, air vehicle operations, nuclear/temperature effects, and operational testing of weapons under development in tactical settings (WSMR 2009a).

WSMR's military mission requires expansive and varied terrain as well as a diverse natural environment to provide a realistic setting for testing and training. Military activities on WSMR directly affect natural resources within and beyond the administrative boundaries. Responsible natural resource management will facilitate the military mission by preventing costly delays, mission cancellations, and post-mission mitigation. Laws and regulations intended to protect and conserve natural resources must be considered when planning mission activities.

Integrated Natural Resources Management Plans (INRMPs) are planning documents that allow DoD installations to implement landscape-level management of their natural resources while coordinating with various stakeholders (USFWS 2004). The WSMR INRMP will direct natural resource managers in efforts to protect and enhance biological diversity, ecological integrity, and sustainability for multiple uses via integrated, adaptive, and ecosystem management approaches. This document will describe the natural environment on WSMR, identify Threatened and Endangered and Species at Risk (SAR) species, and describe how the Environmental Division contributes towards sustainment of the military mission. The WSMR INRMP presents a five-year plan and establishes long-term goals for the management of natural resources. The Plan will summarize current natural resource conservation projects and identify a funding schedule for each project. Implementation of this INRMP will support the military readiness mission and RDT&E vision of WSMR (WSMR 2012).

While the installation as a whole is responsible for implementation of and compliance with federal, state, and DoD/Army Executive Order's, laws, and regulations regarding environmental stewardship, the ultimate responsibility rests with the Garrison Commander, who serves as approving official and signatory for this INRMP. The U.S. Fish and Wildlife Service (USFWS) and New Mexico Department of Game and Fish (NMDGF) are also signatories for the WSMR INRMP.

1.2 Authority

DoD requires the heads of the Office of the Secretary of Defense and DoD components to ensure scientifically sound, innovative, and effective stewardship of natural resources under their jurisdictions (DoDI 4715.03). Preparation and implementation of the WSMR INRMP is required by the Sikes Act (16 USC 670 et seq), AR 200-1 (Environmental Protection and Enhancement), Department of Defense Instruction (DoDI) Manual 4715.03, Natural Resources Conservation Program (February 14, 2011), U.S. Department of Defense (DoD) Directive 4700.4 (Natural Resources Management Programs), DoD Manual 4515.03, [INRMP] Implementation Manual,

November 25, 2013), 32 CFR 651 (Environmental Effects of Army Actions), and AR 210-20 (Master Planning for Army Installations) (SAIA, DAIM-ED, 25 May 2006).

Under the authority of the Sikes Act, as amended, 16 U.S.C. 670a-670f (DoD 2013a), a Memorandum of Understanding (MOU) was established in order to promote a cooperative relationship between the DoD, USFWS, and the Association of Fish and Wildlife Agencies (DoD 2013a). This MOU was signed with the purpose of facilitating the preparation, review, revision, update, and implementation of INRMPs (DoD 2013a). The MOU addresses the responsibilities of each signatory to help implement management strategies to rehabilitate, conserve, and protect biological resources on DoD installations (DoD 2013a).

1.3 Purpose

The purpose of the revised WSMR INRMP is to support sustainment of the military mission while identifying and meeting conservation management requirements of the Sikes Act and other directives. The INRMP will serve as a vehicle to ensure compliance with federal and state laws, regulations, and policies pertaining to conservation on WSMR lands. Conservation of WSMR lands is defined as wise use with the goal of maximizing sustainability of natural resources within WSMR to include soils, vegetation, and fauna. Army Regulation 200-1 requires installations to manage flora and fauna consistent with accepted scientific principles and in accordance with applicable laws and regulations, and, where lands and waters are suitable, for conservation of indigenous flora and fauna.

The WSMR INRMP presents a plan and establishes long-term goals for the management of natural resources on WSMR for the next 5-year period, 2023-2027. The goals set forth in this document stipulate objectives and management actions that follow DoD, USFWS, and NMDGF requirements. The INRMP goals and management actions are revised as needed to reflect changing missions and environmental conditions.

1.4 Scope

This plan applies to organizations internal and external to WSMR that are involved with, or interested in, the management or use of WSMR lands and natural resources for military and non-military purposes. The WSMR INRMP applies to lands only within the administrative boundaries of WSMR, with the exception of Mendiburu Ranch. Entities known as Call-up Areas, Fort Wingate Launch Complex, or annexed areas are not within the scope of this plan.

1.5 Stewardship and Compliance

The Army has established a long-range vision to meet its mission today and into the future (DoD 2017). Sustainability is at the core of the Army's environmental strategy and moves the focus beyond simple compliance with environmental regulations towards a focus on environmental stewardship (DoD 2017). The Army's environmental approach applies a community, regional, and ecosystem approach to managing natural resources. The programs and actions in this INRMP not only achieve compliance with laws and regulations but also outline a program that will sustain ecosystems on WSMR through active management and stewardship.

1.6 INRMP Review and Revision

The requirement to review installation INRMPs on a regular basis is outlined in the Sikes Act Improvement Act [(SAIA) 16 U.S.C. 670a et seq.]. Although the SAIA does require a formal review

no less than every 5 years, DoD policy requires installations to invite annual feedback from the appropriate USFWS and state fish and wildlife agency offices on the effectiveness of its INRMP (DoD 2013b). Annual reviews facilitate adaptive management by providing an opportunity for the parties to review the goals and objectives of the plan (DoD 2006). Multiple state and federal laws, regulations and guidance, and DoD and U.S. Army memoranda provide further guidance for the implementation, coordination, review, and revision of the INRMP (Guidance for Implementation of the SAIA, DAIM-ED, 25 May 2006 (DoD 2006), DoD Instruction Number 4715.03 (DoD 2011), DoD Manual Number 4715.03 (DoD 2013b) and INRMP Template, DAIM-EDT, 24 October 2006 (DoD 2006).

1.7 Plan Integration

This INRMP is a reference for other WSMR natural resource management and planning documents, including, but not limited to the following:

Avian Protection Plan

The WSMR Avian Protection Plan (APP) was initiated to minimize electrocution risks and collision hazards for birds on its electrical system and to develop a comprehensive nest management program (Appendix A; WSMR 2013a). The WSMR APP is designed to provide a single resource for power line activities relating to avian protection for WSMR's management and personnel in the field. The document addresses avian protection issues, the regulatory context for avian protection, regulatory compliance procedures, training programs in avian protection, and various avian protection strategies (WSMR 2013a).

Todsen's Pennyroyal Endangered Species Management Component

The Todsen's pennyroyal Endangered Species Management Component (ESMC) was developed to facilitate protection of this endangered species (Appendix B; Britt 2018). This ESMC defines the conservation goals and management objectives, and it prescribes management actions for populations of Todsen's pennyroyal (*Hedeoma todsenii*) on WSMR (Britt 2018).

Comprehensive Oryx Management Plan

The Comprehensive Oryx Management Plan was prepared in a cooperative effort between WSMR and the NMDGF (Appendix C; WSMR and NMDGF 2000). The intent of this plan is to consolidate and present information regarding oryx (*Oryx gazella*) in New Mexico, identify and coordinate WSMR and NMDGF management objectives, and identify potential strategies to achieve those objectives (WSMR and NMDGF 2000).

White Sands Pupfish Conservation Plan

The purpose of the White Sands Pupfish Conservation Plan is to identify actions that can be implemented on WSMR and Holloman Air Force Base (HAFB) to improve the viability of the species (Appendix D; Pittenger 2015). This plan presents a conservation analysis of White Sands pupfish (*Cyprinodon tularosa*) that includes a conservation goal, objectives, and a conceptual ecological model for the species that describes vulnerabilities and stressors (Pittenger 2015). The plan also contains descriptions of conservation actions that target specific stressors or vulnerabilities (Pittenger 2015). Implementation of this plan is supported by a finding of no significant impact (WSMR 2016a).

Golden Eagle Management Plan

There are 31 golden eagle (*Aquila chrysaetos*) breeding territories, a winter population, and a floater population on WSMR. The Draft WSMR Golden Eagle Management Plan is projected to

be completed by 2023. The plan details what is known about the golden eagle in the western U.S. and on WSMR. The plan discusses known threats, mortality, monitoring, conservation measures, and standard management strategies (such as buffer distances) to avoid and minimize take and also the need to apply for take permits on WSMR.

Integrated Pest Management Plan

The Integrated Pest Management Plan (IPMP) is the primary mechanism to establish and maintain safe, effective, and environmentally sound pest management to prevent or control invasive species, pests, and wildlife disease vectors that may affect health and safety of personnel or damage equipment and property. The Environmental Division coordinates with DPW Pest Control Operations to mitigate pest and wildlife issues that adversely affect military readiness and/or operations (Appendix E; WSMR 2010c, US Army 2021). Working in conjunction with the INRMP, the IPMP preserves, protects, and enhances wildlife, natural vegetation, and habitat. Development, management, and implementation of the IPMP is the responsibility of the Integrated Pest Management Coordinator (IPMC) within the WSMR Environmental Division. The decision to implement the IPMP is supported by a finding of no significant impact (US Army 2021).

1.8 Responsibilities

Implementation of the WSMR INRMP requires cooperation between many different military, federal, state, and private entities to ensure that activities are implemented as outlined in the INRMP. Below is a list of the different stakeholders along with a brief description of their responsibilities.

1.8.1 Installation Stakeholders

U.S. Army Garrison – White Sands Commander

The Garrison Commander (GC) is the land holder, responsible for administration of day-to-day and ongoing functions for WSMR. This includes administration, human resources, public works, resource management, planning, and infrastructure maintenance. The GC is also responsible for maintaining compliance with military requirements, including equal opportunity employment, range law enforcement/fire services, and religious services. There are ten directorates and offices under the administration of the GC (Figure 1.8-1).

Directorate of Public Works

The Mission of Directorate of Public Works (DPW) provides, operates, repairs and maintains the installation's infrastructure that supports military readiness and RDT&E functions on WSMR. The DPW is responsible for compliance with environmental laws and regulations and managing natural resources on WSMR. DPW comprises six divisions: Environmental Division, Engineering Services Division, Operations and Maintenance Division, Housing Division, Master Planning Division, and Business Operations and Integration Division.

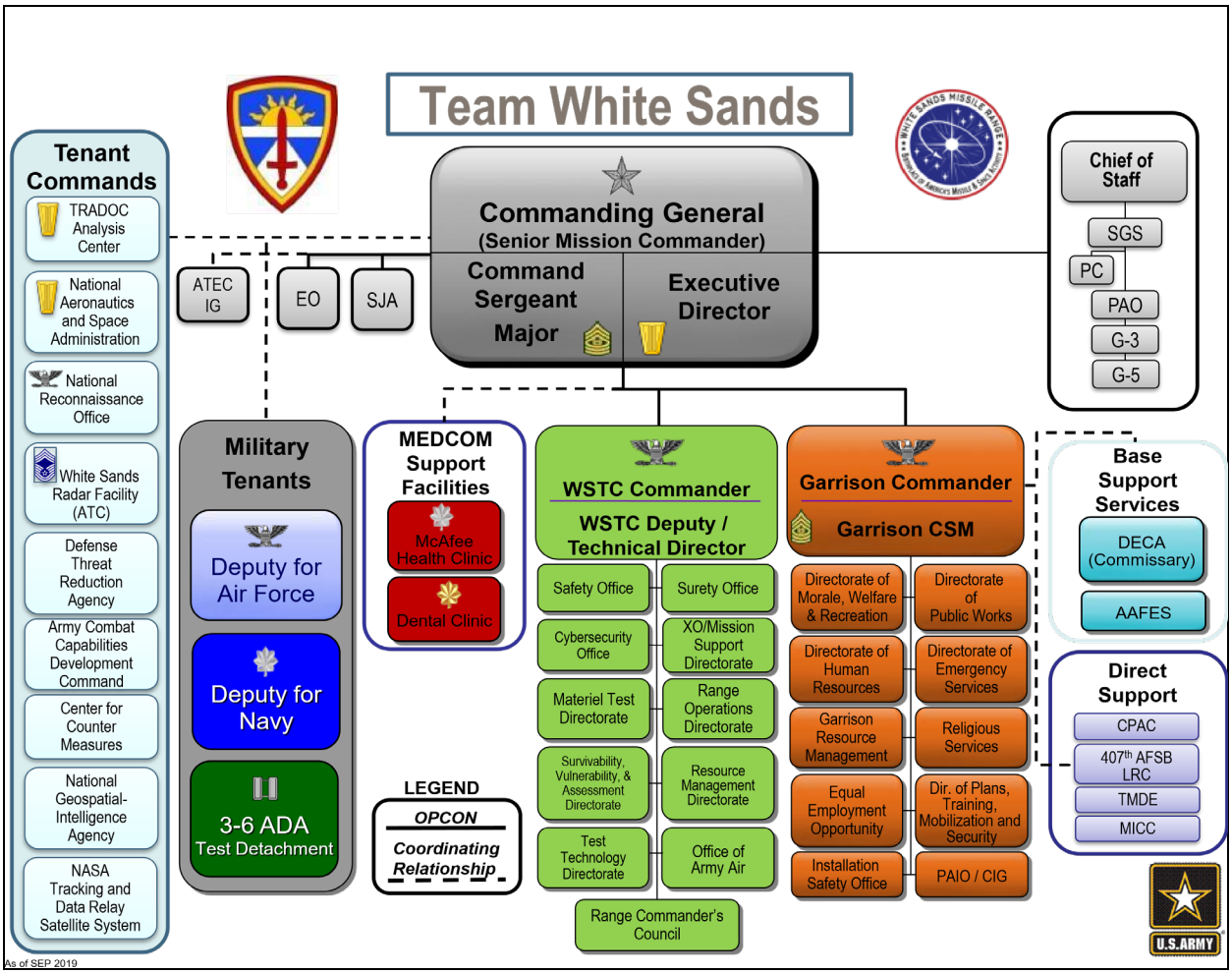

Figure 1.8-1. WSMR Command Structure.

White Sands Garrison Environmental Division

The White Sands Garrison Environmental Division (Environmental Division) ensures missions comply with federal and state laws and regulations as they apply to natural resources. Three Branches within the Environmental Division include Conservation, Customer Support, and Environmental Compliance. The Branches work together to ensure that test operations follow environmental due diligence. The Branches provide technical assistance, education, expertise, and monitoring within and around the WSMR community.

Conservation Branch

The Environmental Division oversees this Branch. WSMR's Conservation Branch has the responsibility and oversight to administer the WSMR Natural and Cultural Resources Programs in accordance with federal, state, and local laws and regulations. In addition to developing, maintaining, and implementing the INRMP and the Integrated Cultural Resource Management Plan (ICRMP), Branch responsibilities include the conservation, management, enhancement, monitoring, protection, and restoration of various natural, historical and archaeological resources. These include wildlife resources and habitats, vegetation, air, soils, water, paleontological, and geologic land resources. The Branch works in

cooperation with the state and federal regulatory agencies in management of cultural and natural resources. Conservation Branch staff functions as primary point of contact for consultations with USFWS, NMDGF, and other coordinating natural resource agencies associated with an environmental analysis. The Conservation Branch provides oversight of Conservation Law Enforcement Officer (CLEO) programs in coordination with Directorate of Emergency Services (DES).

Customer Support Branch

The Customer Support Branch is responsible for administration of and ensuring mission compliance with the National Environmental Policy Act (NEPA). The Customer Support Branch initiates an environmental review after a customer (proponent) submits a project description. Subject matter experts, such as those in the Conservation and Compliance Branches, identify conditions of use to prevent environmental impacts, or they alert the proponent to other environmental requirements.

Environmental Compliance Branch

The Environmental Compliance Branch oversees WSMR Environmental Compliance and Restoration programs. Environmental Compliance Branch responsibilities involve managing compliance with federal and state environmental laws and regulations regarding air, hazardous and toxic materials, spill prevention and control, hazardous waste, and water.

Directorate of Emergency Services

The DES is committed to providing law enforcement and fire protection workforce of professional, knowledgeable, service-driven people working together—and with our local, state, and federal partners—to be the best emergency services unit possible. The Sikes Act and AR 200-3 require that military installations use or employ professionally trained wildlife law enforcement personnel to perform game warden duties. The WSMR police department patrols, enforces regulations and laws, and oversees the CLEO program.

Conservation Law Enforcement Officers

The CLEO program includes officers dedicated to patrol and enforcement for natural and cultural resource protection. CLEO officers coordinate with local and federal law enforcement agencies in the region to deter illegal activities that may damage natural and cultural resources on WSMR.

Staff Judge Advocate

The duties of the Staff Judge Advocate (SJA) are to provide advice and services pertaining to the interpretation of and compliance with laws and regulations applicable to WSMR. SJA also provides litigation support to the Army and WSMR for cases filed in federal court and before federal and state agencies. SJA advises DPW on compliance with environmental laws to ensure 100% compliance.

White Sands Army Test and Evaluation Command

WSMR is a subordinate organization of the Army's Test and Evaluation Command (ATEC), which is a direct reporting unit under the chief of staff, Army. The general officer position is the senior commander on the installation and serves as the commanding general of WSMR. ATEC is responsible for the Integrated Training Area Management (ITAM) program, and Range

Operations uses the WSMR INRMP for integrating and implementing best management practices for natural resource benefits within military mission requirements (WSMR 2011a).

The White Sands Test Center (WSTC) is responsible for planning and operation of tests at WSMR. WSTC personnel schedule tests, control range operations, operate range instrumentation, process collected data, manage the Range communications and flight termination transmission systems, and provide frequency surveillance. Organizationally, WSTC comprises four directorates that perform support functions necessary for the RDT&E community on WSMR. Conservation works with WSTC through the environmental planning process to ensure operations and conservation goals are achieved.

1.8.2 External stakeholders and interested parties

Installation Management Command-Readiness

WSMR is in the Installation Management Command Directorate-Readiness. The Installation Management Command supports the U.S. Army by handling the day-to-day operations of U.S. Army installations around the world. The WSMR GC reports to the Army Materiel Command.

U.S. Army Environmental Command

U.S. Army Environmental Command (USAEC) delivers cost-effective environmental services globally to enable Army readiness. USAEC actively promotes mission readiness by continually assessing and upgrading environmental performance across Army installations and works with installations to enable soldier readiness and sustainable military communities while ensuring compliance with laws and regulations designed to protect human health and the environment.

US Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) provides contract management, construction management, and technical support. WSMR has the option to use USACE contracts as vehicles for natural resources management and to access USACE organizations—such as the Waterways Experiment Station and the Construction Engineering Research Laboratory—for technical assistance and support for natural resources projects. The USACE also funds and administers the Strategic Environmental Research and Development Program and the Environmental Security Technology Certification Program. Army SERDP Projects carried out on WSMR include eDNA sampling, amphibian disease research, and a genomic study of the American kestrel. Results of the eDNA project are pending, but one result was the discovery of the red swamp crayfish (*Procambarus clarkii*) at one site in the Tularosa Basin (T. Wilcox, Geneticist – Rocky Mountain Research Station - unpublished report). WSMR is now considering an eradication program at the site to ensure the species does not spread in the basin or affect the White Sands pupfish. Amphibian disease research detected amphibian chytridiomycosis in 1% of 236 samples collected from northern WSMR, and there were no management or monitoring recommendations provided but we are following up with Dr. Jamie Voyles at the University Nevada, Reno. Research on the American kestrel (*Falco sparverius)* has provided new information on its breeding phenology and success at WSMR—including anticipated shifts from climate change, which will help us to avoid or minimize impacts to the species (Heath et al. 2022).

DoD Legacy Resource Management Program

Congress instituted the DoD Legacy Resource Management Program in 1991 to promote stewardship of natural and cultural resources on military lands. The intent of the program is to fund natural and cultural resources management projects that could go unfunded through normal funding procedures. Legacy projects typically demonstrate innovative techniques for management, conservation, and preservation of natural and cultural resources. Legacy funds can

be requested annually in accordance with instructions provided by the Office of the Deputy Assistant Secretary of Defense for Environment and Energy Resilience. At WSMR, the Legacy Program funded a range wide subterranean cave and mine survey, pinyon jay (*Gymnorhinus cyanocephalus*) and gray vireo (*Vireo vicinior*) research at multiple landscape scales, and Tularosa springsnail (*Juturnia tularosae*) surveys.

U.S. Air Force, Holloman Air Force Base

Located on the eastern edge at the southern part of WSMR, the Holloman Air Force Base (HAFB) major aerial mission uses WSMR airspace, occupies 59,639 acres of land, and supports about 21,000 people. The Environmental Division collaborates with HAFB on the conservation of White Sands pupfish and other opportunity projects (Appendix D; WSMR 2020a).

U.S. Air Force, Kirtland Air Force Base

Kirtland Air Force Base—located near Albuquerque, New Mexico—uses WSMR airspace for training and operates the following facilities on WSMR: National Radar Cross-Section Test Facility and its Advanced Measurement Site.

Fort Bliss, Texas

Fort Bliss and WSMR share an extensive common border and interact regularly in the conduct of their respective activities. Because natural and historic resources and use areas extend across respective borders, Fort Bliss and WSMR have a mutual interest in the collective cultural and natural resources of the region.

WSMR Tenants

WSMR Tenants are units, agencies, or activities that occupy facilities on the installation and receive support from WSMR. There are many tenants on WSMR who have a role in implementing this INRMP (Figure 1.8-1) (Mike Williams, Chief Master Planning - WSMR, Pers. Comm.). It is their responsibility to meet or exceed compliance requirements and to abide by established land-management policies in all of their activities on WSMR. The WSTC may be used by other DoD proponents (including DoD training users), proponents outside the Department—such as U.S. Government agencies, State and local governments, allied foreign governments, and commercial entities (WSMR 2009a).

U.S. Department of the Interior

The U.S. Department of the Interior (USDOI) conserves and manages the nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, providing scientific and other information about natural resources and natural hazards. The DOI strives to promote energy and mineral development, increase outdoor recreational opportunities for Americans, enhance conservation stewardship, and improve management of species and their habitats (USDOI 2018). The USDOI oversees the Bureau of Land Management (BLM), USFWS, and the National Park Service (NPS)—all of whom have lands within or bordering WSMR. The U.S. Geological Service coordinates with WSMR biologists to monitor Salt Creek stream flow gauges.

Bureau of Land Management

The BLM has an interest in WSMR's natural and cultural resources. WSMR and the New Mexico State Office-BLM have a statewide Mutual Aid Agreement for administering a shared response to wildfire suppression on WSMR and adjacent BLM lands (WSMR 2019a).

U.S. Fish and Wildlife Service

The mission of the USFWS is to work with others to conserve and protect, and enhance fish, wildlife, and plants and to enhance their habitats for the continuing benefit of the American people. The USFWS is a signatory agency of the INRMP and is responsible for ensuring compliance with the Endangered Species Act (ESA), the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA), and other statutes and directives. WSMR has entered into a Memorandum of Agreement (MOA) with the San Andres National Wildlife Refuge (SANWR) that allows WSMR to carry out its mission without degrading the USFWS management of SANWR (WSMR 2017).

National Park Service

The NPS preserves the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The NPS cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world. WSMR has entered into an agreement with the White Sands National Park (WSNP) to ensure that both agencies can fulfill their respective missions while providing for public safety (WSMR 2011b). The NPS is also a partner in protecting and maintaining viable populations of the White Sands pupfish (WSMR 2020a).

U.S. Geological Survey

The U.S. Geological Survey (USGS) is a multidisciplinary organization that provides scientific information on biology, geography, geology, geospatial information, and water in order to minimize damage from natural disasters and to help manage the nation's water, biological, energy, and mineral resources. USGS assists WSMR by installing and monitoring stream gauges on Salt Creek and Malpais Spring.

U.S. Department of Agriculture

The U.S. Department of Agriculture (USDA) provides leadership on agriculture, food, natural resources, rural infrastructure, nutrition, and related issues through fact-based, data-driven, and customer-focused decisions (USDA 2018). The USDA promotes American agricultural products and exports, facilitates rural prosperity and economic development, strengthens the stewardship of private lands through technology and research, fosters productive and sustainable use of National Forest lands, and provides all Americans access to a safe and secure food supply (USDA 2018). The USDA oversees the Natural Resources Conservation Service (NRCS), the Jornada Experimental Range (JER), and the U.S. Forest Service (USFS).

Natural Resources Conservation Service

The NRCS acts to conserve natural resources by reducing erosion, improving water quality, restoring and protecting wetlands and streams, and improving fish and wildlife habitat. NRCS activities include conservation planning, implementation, and cost-share program assistance; watershed planning; providing agricultural and other natural resource information; and offering professional help in agronomy, soils, biology, forestry, plant

materials, range conservation, engineering, and other technical areas. The NRCS has completed a recent soil survey of WSMR (USDA-NRCS 2017, USDA-NRCS 2020).

Jornada Experimental Range

The JER conducts basic and applied research in arid rangelands and seeks best practices for sustainable livestock management, ecosystem monitoring, and grassland restoration. JER has conducted experiments and research over many years, including monitoring of controlled fire treatments to measure plant responses to fire. As such, JER has provided guidance and direction to land managers who desire to manage and sustain Chihuahuan Desert ecosystems with the use of grazing and vegetation management practices. WSMR has entered into a MOA with the JER for the cooperative use of land that has been withdrawn from the public domain for use by both the Department of the Army and the USDA (WSMR 2010b).

U.S. Forest Service

The USFS assists WSMR with fire suppression and consulting, as requested by WSMR. WSMR also leases some lands in the Lincoln National Forest and works with the USFWS to assess and mitigate impacts at those sites. In a regional context, the USFS has an interest in WSMR's natural and cultural resources because of its proximity to the missile range.

Animal and Plant Health Inspection Service - Wildlife Services

It is the mission of Wildlife Services to provide federal leadership and expertise in resolving wildlife conflicts to allow people and wildlife to coexist. Wildlife Services provides technical assistance and direct management services to WSMR in order to conduct an Integrated Wildlife Damage Management Program to modify existing habitat and to exclude, haze, relocate, or reduce wildlife populations that pose a threat to human health and safety (WSMR 2020f).

National Aeronautics and Space Administration

The National Aeronautics and Space Administration (NASA) is America's civil space program and the global leader in space exploration. NASA maintains and operates the White Sands Test Facility (WSTF) on WSMR, which tests and analyzes potentially hazardous materials, components, and systems. WSMR has issued a permit to NASA that allows the use of property located on WSMR (Dept. of the Army Permit No. DACA63-4-19-0531).

New Mexico Department of Energy, Minerals, and Natural Resources

The New Mexico Department of Energy, Minerals and Natural Resources includes Administrative Services; Energy Conservation and Management; Forestry, Mining and Mineral Resources; Oil Conservation; State Park Division; and the Youth Conservation Corps. The mission of the department is to provide leadership in the protection, conservation, management, and responsible use of New Mexico's natural resources. It has an interest in mining, mineral resources, forestry, and botanical resources on WSMR. The Forestry Division is the regulatory body over state-listed plant species in New Mexico and is responsible for enforcement of the Endangered Plant Species Act (Sections 75-6-1, New Mexico Statutes Amended 1978).

New Mexico Environment Department

The New Mexico Environment Department's (NMED) interests on WSMR encompass regulating and permitting environmental protection—including air, water (e.g., ground water quality standards), hazardous and solid waste, and above- and underground storage tanks. NMED has

several bureaus involved in monitoring different facets of the WSMR environment (Drinking Water Bureau, Solid Waste Bureau, Air Quality Bureau, Ground Water Quality Bureau, Petroleum Storage Tank Bureau, Surface Water Quality Bureau, and Hazardous Waste Bureau).

New Mexico Department of Game and Fish

The mission of NMDGF is to provide and maintain an adequate supply of wildlife and fish within New Mexico by utilizing a flexible management system providing for their protection, propagation, regulation, conservation, and for their use as public recreation and food supply (NMDGF 2016a). NMDGF is involved with hunting and fishing recreation and with wildlife conservation (New Mexico Wildlife Conservation Act, Sections 17-2-37 through 17-2-46, New Mexico Statutes Amended 1978). These acts control hunting and fishing as well as the management and conservation of species listed by the state as threatened and endangered. NMDGF issues permits for scientific/educational purposes and is responsible for responding to wildlife depredation situations. It administers numerous programs—such as an outreach program to landowners that addresses nuisance wildlife control, several education programs, a nongame wildlife program, and an endangered species program. WSMR partners with NMDGF to implement conservation strategies for state threatened and endangered species. NMDGF, in accordance with the SAIA (16 USC 670a-670o, 1960, 1997), serves as a signatory agency for this INRMP.

Desert Southwest Cooperative Ecosystem Studies Unit

The Desert Southwest Cooperative Ecosystem Studies Unit (DSCESU) was established in 2000 through development of a cooperative agreement between federal, state, and nongovernmental entities, including DoD (DSCESU 2020). The mission of the DSCESU is to provide collaborative research, technical assistance, and education to federal land management, environmental, and research agencies and their partners (DSCESU 2020). The cooperative agreement provides WSMR access to a network of 10 federal agencies, 13 universities, and 14 state and local agencies and nongovernmental organizations studying and managing natural and cultural resources across the states of California, Nevada, Arizona, New Mexico, and Texas and encompassing the Mojave, Sonoran, and Chihuahuan deserts. Through the DSCESU, the Environmental Division is acquiring technical assistance with partners, such as conducting long-term research and management projects with The Peregrine Fund (TPF) and Bat Conservation International (BCI).

New Mexico State University

The Department of Fish, Wildlife, and Conservation Ecology is within the College of Agriculture, Consumer, and Environmental Sciences at New Mexico State University (NMSU). The department applies traditional and emerging scientific methods to understand the ecology of fish and wildlife and the communities they inhabit as well as to inform conservation and management decisions. The New Mexico Cooperative Fish and Wildlife Research Unit is affiliated with the department as part of a national joint federal–state–university program of fish and wildlife research units in cooperation with land-grant colleges and state wildlife departments. Research units are under the direction of the Biological Resources Division of the Department of the Interior, USGS, with oversight from a multi-partner coordinating committee. Their mission is to provide natural resource–oriented research services, graduate education, technical assistance, and university-level teaching for a variety of federal, state, university, and private cooperators.

University of New Mexico

Researchers from the University of New Mexico (UNM), located in Albuquerque, are involved in numerous natural resource projects on WSMR. The University's Museum of Southwestern

Biology houses collections of vertebrates, arthropods, and plants from the Southwest—many of which are representative of species found on WSMR.

Native American Tribes

The United States has a unique legal relationship with Native American tribal governments, as set forth in the Constitution of the United States, treaties, statutes, Executive Orders, and court decisions. In accordance with the Constitution of the United States, Article 1, Section 8, tribal governments are recognized as sovereign, dependent domestic nations. AR 200-1, DoDI 4710.02*: DoD Interactions with Federally recognized Tribes*, Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments,* and 65 FR 67249 require regular and meaningful consultation and collaboration with tribal governments. Currently, 5 tribes have indicated that they have tribal and/or cultural interest in WSMR and were consulted in the development of the INRMP. Consulted Native American tribal governments include Mescalero Apache, Comanche Nation, White Mountain Apache, Pueblo of Isleta, and Ysleta del Sur. In accordance with Executive Order 13007 and DoDI 4715.03, Enclosure 3(7)(b)(3), tribes have the right to access sites and resources that are of religious importance or are important to the continuance of their culture.

Partners in Flight

Partners in Flight (PIF) was started as a movement for bird conservation in 1990. PIF governs by a Steering Committee that provides oversight and direction to the implementation of the PIF conservation plans at local, regional, national, and international scales. PIF has teamed with agencies at the federal, state, educational institution, and nonprofit levels—including the DoD—to develop conservation plans that integrate into ongoing management. A WSMR biologist currently serves on the Steering Committee of the DoD PIF program which "supports and enhances the military mission by providing a focused and coordinated approach for the conservation of migratory and resident birds and their habitats on DoD lands" (DoD PIF 2015). The DoD PIF has developed numerous partnerships at the local to international levels and implements conservation planning, the DoD Coordinated Bird Monitoring Plan, and the DoD Bird/Wildlife Aircraft Strike Hazard program. DoD PIF is included in national working groups to deal with local and regional problems. Participation in DoD PIF by personnel at the Office of the Secretary of Defense and Army Headquarters helps to ensure that bird policies at WSMR are consistent with DoD and Army policies and priorities. WSMR also participates in New Mexico Avian Conservation Partners (NMACP), which is the New Mexico chapter of PIF, which released its "New Mexico Bird Conservation Plan" in 2007 that assessed bird species and habitats in New Mexico, identified priority bird species and provided management recommendations. The Steering Committee for this multi-agency working group currently includes a WSMR biologist and important agency partners in New Mexico, such as the BLM, USFS, USFWS, and NMDGF.

1.9 Goals and Objectives

1.9.1 U.S. Army Goals

The primary purpose of this INRMP is to comply with the Sikes Act, which requires each installation to cooperatively develop an INRMP for the conservation, protection, and management of fish and wildlife resources while simultaneously supporting the military mission to ensure the preparedness of the Armed Forces (WSMR 2000, WSMR 2012, WSMR 2014a). Implementation of the WSMR INRMP will serve as a vehicle to ensure and streamline compliance with federal and state laws and regulations. This INRMP will provide guidance to protect natural resources in a manner beneficial to the mission of national defense.

Army Regulation 200-1 defines conservation as the wise use and scientific management of natural and cultural resources according to principles that provide optimum public benefit, continued productivity and sustainability for present and future generations, and support of the military mission. Through conservation and restoration of biological diversity and ecosystem health, the constraints placed on the mission can be reduced. Mission flexibility is enhanced by improving range sustainability and reducing the likelihood of a species becoming federally listed (DoD 2007). U.S. Army Regulation (AR) 200-1 supports the U.S. Army Strategy for the Environment: Sustain the Mission-Secure the Future strategy (DoD 2007, US Army 2004a) that emphasizes the obligation of the Army to ensure a healthy environment. This strategy establishes a foundation for ecosystem sustainability and acknowledges the importance of implementing effective policies and practices to safeguard the environment. Under this strategy, the Army's environmental mission is to sustain the environment in order to enable the Army mission and secure the future. In doing so, all Army organizations and activities will:

- Foster an ethic within the U.S. Army that takes us beyond environmental compliance to sustainability,
- Strengthen U.S. Army operational capability by reducing our environmental footprint through sustainable practices,
- Meet current and future training, testing, and other mission requirements by sustaining land, air, and water resources,
- Minimize impacts and total ownership costs of U.S. Army systems, materiel, facilities, and operations by integrating the principles and practices of sustainability,
- Enhance the well-being of our soldiers, civilians, families, neighbors, and communities through leadership in sustainability,
- Use innovative technology and the principles of sustainability to meet user needs and anticipate future U.S. Army challenges (US Army 2004a).

1.9.2 WSMR Goals

The following four goals are broad intents for the management of natural resources at WSMR. Section 4 outlines the objectives and strategies used to meet these goals. All goals are designed to support the mission of WSMR through sustainability of natural resources, legal compliance, and supporting the well-being and safety of the residents and workforce.

Goal 1: 100% Compliance with natural resource laws and regulations, executive orders, instructions, and other DoD/Army/WSMR policies.

Goal 2: Maintain the biodiversity of native flora and fauna.

Goal 3: Maintain or replicate natural ecosystem processes.

Goal 4: Support morale, welfare, and recreation of residents and the workforce.

1.10 Natural Resources Management Strategy

The WSMR INRMP utilizes an approach designed to sustain and be consistent with military missions on WSMR while simultaneously protecting and enhancing natural resources for multiple use, sustainable yield, and biological integrity (USAEC 1997, WSMR 1985, WSMR 1992, WSMR 1998). It is DoD policy to manage lands, waters, airspace, and coastal resources or natural

resources for multiple uses when appropriate—including sustainable yield of all renewable resources, scientific research, education, and recreation (DoDI 4715.03). The DoD defines multiple use as the "integrated, coordinated, and compatible use of natural resources so as to achieve a sustainable yield of a mix of desired goods, services, and direct and indirect benefits while protecting the primary purpose of supporting and enhancing the military mission and observing stewardship responsibilities (DoDI 4715.3, Environmental Conservation Program, Enclosure 3 Definitions. 3 May 1996)." This INRMP promotes the integration of various principles of ecosystem-based management, biodiversity management, and adaptive management.

1.10.1 Ecosystem-Based Management

Ecosystem management is the fundamental approach mandated by DoD for managing natural resources on military lands (DoD 1994, Keystone Center 1996b, Leslie et al. 1996, US Army 1997). DoD PIF requires an ecosystem-based management approach to natural resources-related practices and decisions, using the best available scientific information and scientifically sound conservation procedures, techniques, and data (DoDI 4715.03). Ecosystem-based management focuses on maintaining habitat or ecosystem quality, including ecological processes important for maintaining the characteristic biodiversity of an area—rather than focusing on individual species or resources (Noss and Cooperrider 1994). Maintaining ecological health and sustainability while providing for human needs requires an understanding of ecosystems and biodiversity of an area as well as institutional and socioeconomic factors. Thus, a crucial but often underemphasized component of ecosystem management is cooperation and collaboration among agencies and stakeholders. On WSMR, the over-riding institutional consideration is the military mission, which occurs on a landscape with significant biodiversity.

1.10.2 Biodiversity Management

Preserving biodiversity is a primary goal of ecosystem management (Grumbine 1997). The concept of biodiversity encompasses not only species richness but also genetically diverse populations, communities, ecosystems, and landscapes, as well as the ecological function and evolutionary processes that connect them. The DoD Biodiversity Management Strategy (Keystone Center 1996a) identified the INRMP as the primary vehicle for implementing biodiversity protection on military lands. Conserving and restoring biological diversity can potentially minimize the constraints placed on mission requirements and increase mission flexibility by improving range sustainability and reducing the likelihood of a species becoming listed as threatened or endangered.

1.10.3 Single-Species Management

Although ecosystem management is preferable in order to benefit multiple species, single-species research and management is necessary to maintain or prevent further population declines. Single-species management is reflected in the Endangered Species Management Components of INRMPs and in Section 7 Consultations with the USFWS. WSMR biologists participate in multi-agency working groups that focus on single species, such as the Mexican gray wolf (*Canis lupus baileyi*), golden eagle, White Sands pupfish, and pinyon jay. It is also a common strategy to manage for groups of species, such as bats or migratory birds. WSMR biologists participate in the New Mexico Bat Working Group, DoD Partners in Flight, and NMACP, which breaks down the management of bird species into key vegetation types throughout the state.

1.10.4 Adaptive Management

Adaptive management is a systematic approach for improving resource management by evaluating practices and learning from outcomes. An adaptive approach involves exploring

alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, and monitoring; then, using the results to modify management practices for more desirable results.

1.11 INRMP Implementation Accomplishments

Implementation of the WSMR INRMP from 2015-2020 has helped to sustain WSMR's military mission by meeting WSMR's natural resource conservation goals that protect federal and state listed species and valuable wildlife habitat.

Todsen's Pennyroyal Conservation

The Todsen's pennyroyal ESMC was developed to describe potential threats to the federally listed Todsen's pennyroyal and prescribes management actions to protect its populations (Appendix B; Britt 2018). Development of the ESMC supports WSMR natural resource Goals 1-3 (See Section 4). The use of habitat modeling for un-surveyed areas on WSMR has resulted in the significant reduction of potential habitat for Todsen's pennyroyal. Subsequent surveys of the modeled habitat resulted in a substantial reduction of protected acreage for this species as no additional populations were discovered. Planning level surveys for Todsen's pennyroyal supports WSMR natural resource Goals 1-4.

White Sands Pupfish Conservation

The Cooperative Agreement for Protection and Maintenance for White Sands pupfish has recently been updated (Appendix D; WSMR 2020a). The development of this multiagency cooperative agreement supports WSMR natural resource Goals 1-4 (See Section 4). Protecting and maintaining viable populations of the state listed pupfish continue through an effective and cooperative working relationship between the signatories. WSMR has taken the lead of annual monitoring surveys for pupfish from NMDGF (Pittenger 2017, Pittenger 2020). Refugia for pupfish populations have been established at North Mound Spring, Mound Spring, and South Mound Spring (Pittenger 2015). Invasive plant chemical treatments to eradicate saltcedar (*Tamarix ramosissima*) and common reed plants in pupfish habitat have been implemented for three years with the intent of restoring ecosystem health. Aquatic herbicides are not toxic to fish when applied according to label. Invasive plant management in aquatic ecosystems support WSMR natural resource Goals 1-3.

Invasive Plant Species Control

WSMR has completed five years (2015-2020) of targeted chemical treatments of saltcedar—an invasive plant species—within several riparian ecosystems located in the San Andres Mountains. To date, a total of 300 acres has been treated. Ongoing saltcedar monitoring and treatments will continue at specific springs that have regrowth. Population surveys and chemical treatments for the invasive plant African rue (*Peganum harmala*) began in the spring of 2021, with a total of 425 acres being treated along range roads. Invasive plant species control supports WSMR natural resource Goals 1-4.

Nuisance Wildlife Abatement

The goal of the nuisance wildlife abatement program on WSMR is to focus on disseminating information on how to coexist with wildlife through education and to mitigate human-wildlife conflicts. WSMR's nuisance wildlife abatement program supports WSMR's natural resource management Goal 4 (see Section 4). Awareness is the major aspect of this program, which includes conducting presentations, development and dissemination of brochures, posters, newspaper articles, global emails, and social media educational material to address nuisance

wildlife and to mitigate human-wildlife conflicts. The Conservation Branch responds to injured, trapped or nuisance wildlife calls. Wildlife is humanely captured, removed, and (when warranted) released or taken to a rehabilitator for care. Beginning in April 2021, in response to mitigating coyote (*Canis latrans*) and bobcat (*Lynx rufus*) conflicts on WSMR main post, a research project has been developed and implemented to determine the ecology of both species in this urbanized environment, with an emphasis on human-carnivore conflict resolution.

Avian Protection Plan

The WSMR APP was developed to minimize electrocution risks and collision hazards for birds involving installation electrical systems and to develop a comprehensive nest management program (Appendix A; WSMR 2013a). The WSMR APP is designed to provide a single resource for power line activities relating to avian protection for WSMR's management and personnel in the field. The document addresses avian protection issues, the regulatory context for avian protection, regulatory compliance procedures, training programs in avian protection, and various avian protection strategies (WSMR 2013a). Electrocution mitigation efforts at WSMR have proven successful in protecting birds. In 2010, there were over 30 reported avian electrocutions at WSMR, but at present there are just three to four reported each year—an approximately 90% reduction. The Conservation Branch attributes this improvement to an institutional commitment to identify hazardous poles, create a mitigation plan, and ensure a significant investment to fund strategic mitigation. Overall, pole mitigation has proven to be well worth the cost: WSMR continues to deliver efficient running utilities, significant reduction in avian mortalities, fewer regulatory violations, and far fewer mission impacts.

Hundreds of power poles have been retrofitted to be raptor-safe—prioritized according to eagle nesting areas—and 30 signs have been installed on WSMR roads to encourage drivers to slow down for raptors feeding in roadways. From 2015 through 2018, 332 poles identified in the APP were retrofitted to be avian-safe by high voltage contractors; however, many poles still need to be inspected and verified as avian-safe. In 2019 and 2022, WSMR provided funding for Socorro Electric Cooperative (SEC) to retrofit 570 poles on WSMR. SEC, however, was unable to execute the work, and approximately 450 of these poles have been de-scoped with funds reapplied to a pole inspection program that is designed to incorporate raptor-safe solutions. In addition, WSMR linemen also retrofit poles periodically (2-3 times a year) after electrocutions occur.

The initial APP and Avian Risk Assessment (ARA) used a conceptual electrocution risk model based on pole hazard and exposure to categorize poles as Priority 1 (P1, high risk) to Priority 4 (P4, no mitigation recommended) based on clearances and surrounding habitat. A 2014 statistical model used four pole hazard (number of phases, number of jumpers, presence of hazardous grounding) and habitat (habitat within 50 m) factors as independent variables to derive a Risk Index (RI) on a 0.00-1.00 scale (Dwyer et al. 2014). Poles with a RI > 0.40 are considered high risk and are 5.25 to 8 times more likely to be associated with an eagle electrocution than low risk (RI <0.40) poles (Dwyer and Mojica 2022, Mojica et al. 2022). The 2014 model was implemented at WSMR in 2016 and has been used to direct retrofitting since; the conceptual electrocution risk model is no longer used.

WSMR continues to prioritize retrofitting the highest risk poles although sometimes lower risk poles are included due to the efficiencies of addressing poles on the same feeder. We are also working to establish the most avian-safe pole designs when old poles are replaced, and new poles are installed. In 2022, we are establishing a contract to replace 90-100 old poles, with emphasis on the new poles to be eagle safe. The configuration includes 10-ft crossarms and neutral below rather than overhead. This configuration requires fewer coverings that will eventually deteriorate. As WSMR works to identify and replace poles that are failing, this strategy will be used whenever

possible as a more long-term strategy to prevent electrocutions in the future. WSMR will also continue to assess and address poles after they electrocute birds. WSMR has reduced raptor electrocution risk by de-energizing certain conductors that are not in active use. This action improves clearances at a scale much larger than pole-by-pole mitigation, but it requires tracking when lines are re-energized.

Risk assessment is an ongoing process because of operational changes to the system—such as switching—and maintenance required for mitigation materials (slow but ongoing deterioration or failure of products related to environmental exposure). The rate of habitat change, however, is slow at the installation, and thus the location and extent of general electrocution risk areas has changed little since the initial ARA. The number of electrocutions in recent years has been small, and it is difficult to identify a special pattern given the small sample size. In general, raptor electrocutions have occurred in known raptor use areas. Electrocution poles are retrofitted reactively to prevent future incidents.

Preferred raptor electrocution mitigation techniques have not changed substantially since 2014. Suggested Practices remains the industry standard for electrocution risk reduction (APLIC 2006). Since 2006, APLIC has emphasized the role of insulation while de-emphasizing the older approach of perch management (anti-perch devices designed to shift perching from dangerous to less dangerous areas), which can be defeated by determined birds. Although perch discouragers exist on the installation, WSMR primarily uses insulation products to mitigate electrocution risk. Since 2014, new products have become available; these are refinements of previously available products. WSMR actively tracks the availability of products through ongoing conversations with vendors and consultants. The APP will be updated in 2023 to reflect the recent slow evolution of avian electrocution mitigation techniques. The development and implementation of the APP supports WSMR's natural resource Goals 1-4.

Golden Eagle Conservation

WSMR partners with TPF each year on golden eagle monitoring and research studies. During the previous INRMP period, the Conservation Branch made great strides in understanding the distribution and abundance of golden eagles and their nests on WSMR. A study of eagle use of oryx gut piles was also completed, with data currently being analyzed. The WSMR Hunt Program distributed information to hunters on the benefits of using non-lead ammunition. While the WSMR Golden Eagle Management Plan is still in draft form, development of the plan has been beneficial for determining appropriate conservation measures, such as standard buffer areas around active nests. In 2018 WSMR acquired its first take permits for two eagle nests and for an adult breeding pair that was subject to potential disturbance from military activities. The mission was able to fund the monitoring, compensatory mitigation, and reporting required by the 5-year take permit in accordance with their Support Agreement with the White Sands Garrison (Appendix F). The disturbance take permit and was the first issued by Region 2 of the USFWS as well as the first EA in the country written for take of golden eagles. Golden eagle monitoring and research supports WSMR's natural resource Goals 1-4.

Species at Risk Assessments

WSMR made significant progress in determining the distribution of several SARs. As a result, the distribution, abundance, and habitat use of the gray vireo, pinyon jay, western massasauga (*Sistrurus tergeminus*), and Oscura Mountain chipmunk (*Neotamias quadrivittatus oscuraensis*) are much better understood. The results are being incorporated into mission and non-mission activities through the environmental review process to avoid and minimize impacts to these species. This survey work is ongoing and is an integral part of adaptive management for a variety of woodland treatments in the Oscura Mountains. During the previous INRMP period, a New

Mexico meadow jumping mouse (*Zapus hudsonius luteus*) survey was completed, which resulted in a final determination that this USFWS endangered species does not occur on WSMR. Survey work for the southwestern willow flycatcher (*Empidonax traillii extimus*) and western yellow-billed cuckoo (*Coccyzus americanus*) resulted in a determination that WSMR does not have adequate breeding habitat for these species. Planning level surveys support WSMR's natural resource Goals 1-4.

Bat Surveys, Habitat Assessment, and Protection

Mine, cave, and acoustic surveys resulted in the discovery of important roost sites on WSMR. The most significant sites have been gated to limit human disturbance. WSMR partners with BCI each year on a variety of projects. All abandoned mines have been assessed and characterized for physical characteristics, safety issues, and wildlife use so that missions can be directed towards the most appropriate sites. Anabat acoustic surveys resulted in the discovery of a species of bat that was previously unknown to occur on WSMR, the Allen's big-eared bat, resulting in a range extension for the species. Furthermore, a 5-year bat exclusion contract was initiated to effectively and humanely exclude bats from buildings. Bat habitat assessments and protection support WSMR's natural resource Goals 1-4.

Pollinator Conservation

The Conservation Branch established a pollinator garden, completed a butterfly survey, and produced an educational pollinator poster during the previous INRMP period. This work substantially increased knowledge of important pollinator sites and butterfly SARs. Pollinator conservation support WSMR's natural resource Goals 1-4.

Integrated Wildland Fire Management Plan

The Conservation Branch revised the Integrated Wildland Fire Management Plan (IWFMP) that addresses firefighter and public safety, wildland fire management, wildland fire program capabilities, and funding and environmental compliance for the burnable wildland acreage found on WSMR (Appendix G; Bumgarner 2018). Many improvements have been completed or are under way and will continue under the scope of this revised INRMP. Projects include improving roadways to firebreak standards; clearing, mowing, or maintaining green belts around range structures; thinning, piling, chipping, grinding, or removing fuels in targeted areas; and planning and implementing prescribed fire projects to reduce hazardous fuel loads, improve wildlife habitat, and promote ecosystem sustainability, resiliency, and diversity (Bumgarner 2018). The development and implantation of the IWFMP support WSMR natural resource Goals 1-3.

Army Compatible Use Buffer Program

To date, the WSMR Army Compatible Use Buffer (ACUB) program has been able to protect, through conservation easements, over 46,279 acres of private land. The WSMR ACUB program finalized the Armendaris conservation easement in the Western Call-Up Area that will protect over 315,000 acres, which is the largest single ACUB acquisition in the Army. This conservation easement nearly doubled the amount of acreage in the Army ACUB program. This program is also negotiating with the New Mexico State Land Office (NMSLO) to protect an additional 355,00 acres. WSMR will continue to partner with the New Mexico Land Conservancy (NMLC) to preserve open space and wildlife habitat and promote responsible cattle ranching and agriculture on lands around WSMR to minimize incompatible development that may affect the critical Test and Evaluation capabilities of WSMR. The ACUB program supports WSMR natural resource Goals 1-4.

WSMR Installation Hunting Program

WSMR's Installation Hunting Program (Hunt Program) oversees successful hunts for five species of big game, and it conducts yearly surveys for desert bighorn sheep (*Ovis canadensis*) and oryx (Appendix H). The Conservation Branch has also observed the expansion of desert bighorn sheep population and area of use in the San Andres Mountains. This increased population has facilitated the establishment of sheep in the Sacramento Mountains, east of the WSMR boundary. The WSMR hunting program supports WSMR natural resource Goals 1 and 4 (See Section 4).

Oscura Mountain Management Plan

The Oscura Mountains Ecosystem Management Planning Area Environmental Assessment (EA) was prepared to evaluate the potential outcomes of a range of ecosystem management projects identified for ecosystem sustainment within the Oscura Mountains Planning Area (OMPA) (Appendix I; WSMR 2019b). This EA evaluated potential impacts from various treatment methods using a landscape perspective (WSMR 2019b). This perspective delineates parameters for implementation of future treatment projects in the OMPA (WSMR 2019b). This approach allows for a more thorough view of cumulative effects rather than a project specific assessment approach. The development and implantation of the Oscura Mountains Ecosystem Management Planning Area Environmental Assessment support WSMR natural resource Goals 1-4.

Planning Level Surveys

Planning Level Surveys (PLSs) on military installations are the foundation for natural resource management planning and are conducted as funding is available. These surveys provide Natural Resource Managers with important information regarding species and species distribution. Many PLSs for faunal and floral taxa and their habitats have been completed on WSMR including: migratory birds, pollinators, butterflies, Tularosa springsnails, bats, springs, mesocarnivores, yellow-billed cuckoos, southwestern willow flycatchers, black bears (*Ursus americanus*), amelanistic lizards, mines and caves, western massasauga, New Mexico meadow jumping mice, and aquatic insects (BCI 2021, Burkett 2016a, Burkett et al. 2017, Burkett et al. 2018, Burkett et al. 2019, Burkett 2021, Corbett and Gilleland 2014, ECO Inc. 2013, ECO Inc. 2014, Frey et al. 2018, Hartsough et al. 2015a, Hartsough et al. 2015b, Hartsough et al. 2015c, Hartsough et al. 2016a, Hobert et al. 2016a, Hobert et al. 2016b, Piorkowski and Diamond 2016, Pittenger 2018, Scobie et al. 2019). Planning level surveys support WSMR's natural resource Goals 1-4.

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2 CURRENT CONDITIONS AND USE

2.1 Installation Overview

2.1.1 Location and Area

WSMR, one of the largest expanses of relatively undeveloped land remaining in the southwestern United States, covers about 2.2 million acres in south-central New Mexico (Figure 2.1-1). The installation is located at the northern margin of the Chihuahuan Desert (Bailey 1998, Groves et al. 2000) (Figure 2.1-1). WSMR is about 104 miles long (north to south) and 39 miles wide, extending into parts of five New Mexico counties and encompassing the majority of two major mountain ranges: San Andres and Oscura Mountains (Figure 2.1-2). Fort Bliss, which comprises approximately 1.1 million acres, borders WSMR to the south and southeast; and HAFB, which comprises approximately 59,700 acres, is located along the eastern margin. WSNP and the SANWR are located entirely within WSMR's boundaries (Figure 2.1-2).

The WSMR headquarters, or Main Post, is located in the southwestern corner of the installation in Doña Ana County, NM. Main Post contains the largest concentration of facilities and mission support activities and personnel on WSMR. The Headquarters area is the primary housing area for both civilian and military workforces, along with troops and accompanying equipment. The housing complex—part of the Army's Residential Community Initiative—is currently managed by Balfour Beatty Communities. An additional up-range cantonment area, Stallion Range Center (SRC), is located at the northwest corner of WSMR in Socorro County. SRC includes support in the form of a fire department, contract range security station, DPW facilities, and dozens of offices for full-time employees. A small DPW contingent is also located at Tularosa Range Center on the eastern boundary of WSMR in Otero County. WSMR is populated with major test facilities and laboratories, along with launch and impact sites. WSMR features over 3,000 instrumentation sites, extensive instrumentation, and a data processing facility for real time and deferred test data processing (WSMR 2018a).

The city of Las Cruces is approximately 15 miles southwest of WSMR; Alamogordo is about 34 miles east; and Albuquerque is about 100 miles north (Figure 2.1-2). U.S. 70, which connects Las Cruces and Alamogordo, bisects the southern part of WSMR. WSMR holds leases and partner agreements with surrounding landowners on approximately 3.3 million acres. These areas, known as call-up areas, may be temporarily evacuated during periodic hazardous test events, effectively doubling the size of the land area when required. Associated with the land area, restricted airspace overlies and extends beyond the WSMR land boundary. Together, WSMR, Fort Bliss, HAFB, and call-up areas provide nearly 6.6 million acres of contiguous land area to support DoD testing and training missions (WSMR 2009a).

WSMR leases areas to stage radar, camera, telemetry, and other instrumentation throughout New Mexico, Arizona, Colorado, Idaho, and Utah. WSMR has an agreement to use land within the Cibola National Forest as a drop zone for booster rockets from Fort Wingate, a launch complex in northwestern New Mexico. The most distant launch area is the Mountain Home Launch Complex near Shoofly, Idaho. WSMR owns approximately 12,000 acres of the Mendiburu Ranch and has administrative oversight of associated grazing leases on New Mexico State land.

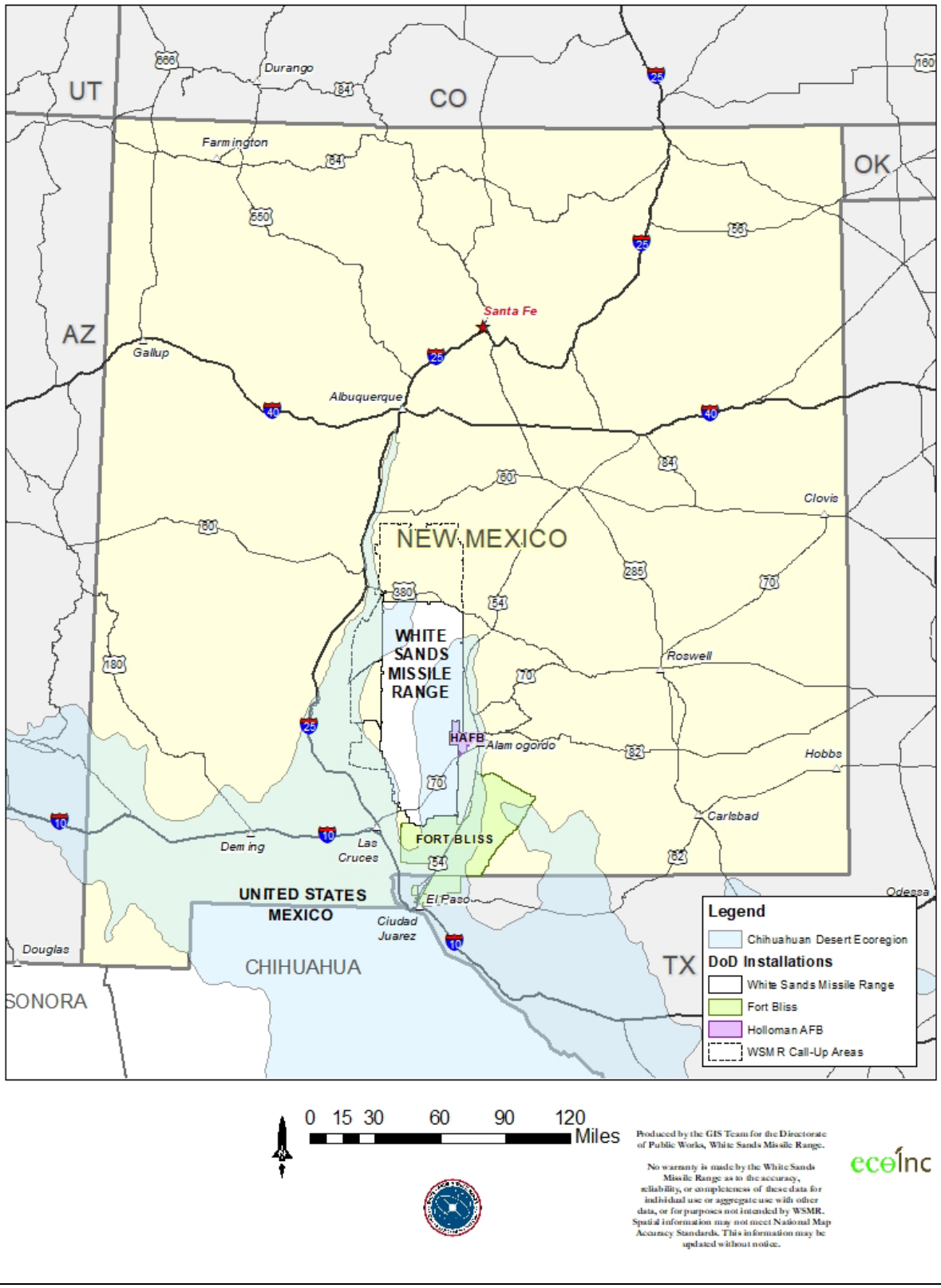

Figure 2.1-1. Regional Map.

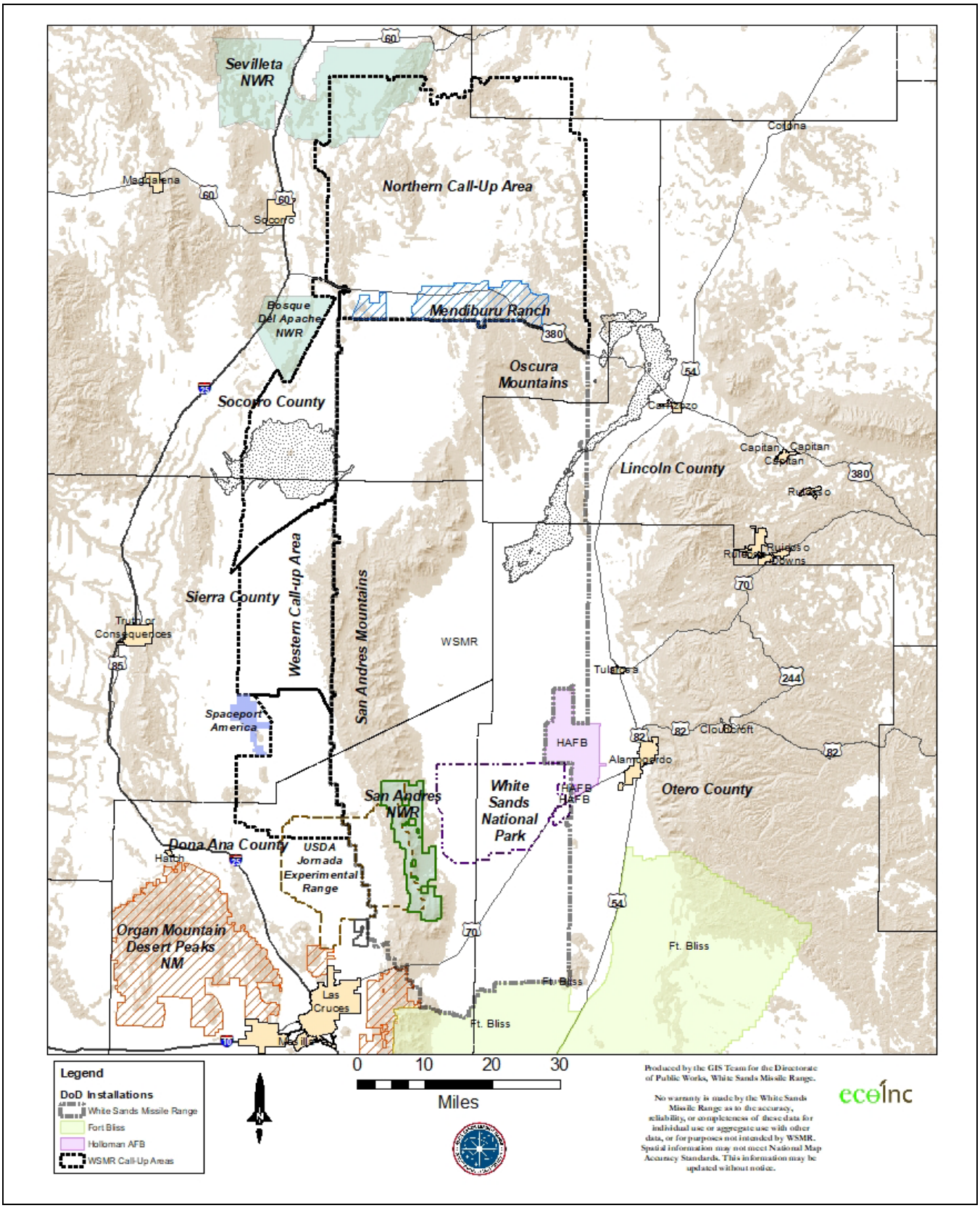

Figure 2.1-2. WSMR Installation Map.

2.1.2 Regional Land Use

Regional land ownership surrounding WSMR includes a mix of federal, state, and private lands.

U.S. Army Fort Bliss

Fort Bliss is a multi-mission military installation located on approximately 1.12 million acres in El Paso County, Texas, and in Doña Ana and Otero Counties, New Mexico (Figure 2.1-2). Army units stationed at WSMR use Fort Bliss training areas, firing ranges, and airspace for tactical training and military tests. In combination, WSMR, HAFB, and Fort Bliss create a vast area of more than 4 million contiguous acres of dedicated DoD land and exclusive-use airspace.

Holloman Air Force Base

Located on the southeastern edge of WSMR, HAFB occupies 59,639 acres of land and supports about 21,000 Active Duty, Guard, Reserve, retirees, as well as DoD civilians and their family members (Figure 2.1-2). HAFB uses airspace managed and controlled by WSMR, including Red Rio and Oscura bombing ranges in the northeastern corner of WSMR. HAFB shares boundaries with WSNP and WSMR and interacts regularly with WSMR in various mission activities.

Bureau of Land Management

The BLM manages most public lands adjacent to WSMR. In addition, military sites may extend across agency boundaries, requiring cooperative efforts between WSMR and BLM. BLM lands neighboring WSMR in Doña Ana, Otero, and Sierra Counties are under the jurisdiction of the Las Cruces District Office. BLM lands neighboring WSMR in Lincoln County are under the jurisdiction of the Roswell District Office. Those BLM lands situated in Socorro County are under the jurisdiction of the Socorro Field Office. The BLM administers the following recreational areas bordering or near WSMR:

Aguirre Springs Recreation Area

Located west of Main Post on the eastern slope of the Organ Mountains, the BLM-administered Aguirre Springs Recreation Area is a popular hiking area and campground.

Organ Mountains-Desert Peaks National Monument

The Organ Mountains-Desert Peaks National Monument (OMDPNM) was established in 2014 and is managed through the BLM Las Cruces District Office (Figure 2.1-2). The OMDPNM protects significant prehistoric, historic, geologic, and biologic resources and includes four areas: the Organ Mountains adjacent to WSMR, Desert Peaks, Potrillo Mountains, and Doña Ana Mountains. The BLM is in the process of developing a management plan for the new National Monument, but for now, specific management for the Organ Mountains falls under the Organ Mountains Coordinated Resource Management Plan (DoI 1989) and Mimbres Resource Management Plan (DoI 1993).

Valley of Fires Recreation Area

The Valley of Fires Recreation Area was established as a State Park in 1966 atop the Carrizozo lava flow. It is located in Lincoln County along U.S. 380, three miles west of Carrizozo (Figure 2.1-2). The Carrizozo lava flow is one of the youngest lava fields in the continental U.S. Some 1,500–5,000 years ago, molten lava flowed from a vent now called Little Black Peak, reaching 44 miles southwesterly. The hardened lava surface comprises 80,000 acres of extremely rough terrain, aptly named “malpais” (badlands) by early Spanish explorers. The malpais covers 42,710 acres on WSMR and is used for safety buffer and training operations. While it is not well suited for road construction or any other structures, it may support certain types of ground activities.

National Park Service

WSNP (147,527 acres) is located within the southeastern portion of WSMR; its Visitor Center is 15 miles southwest of Alamogordo on U.S. 70 (Figure 2.1-2). Containing much of the world's largest gypsum dune field, the White Sands National Monument was established on January 18, 1933, and established as White Sands National Park on December 20, 2019 (S. 1790, 2019). WSNP receives about 600,000 visitors annually. A 57,080-acre co-use area constitutes shared lands for both WSMR and WSNP under an interagency agreement (WSMR 2011b). WSMR uses the co-use area to stage mobile instrumentation equipment and to recover mission debris after a test. During hazardous WSMR testing, affected areas on WSNP are evacuated (WSMR 2009a).

U.S. Fish and Wildlife Service

The USFWS oversees three national wildlife refuges that are important partners for WSMR in ecoregional planning efforts:

Bosque Del Apache National Wildlife Refuge

Located near the northwest corner of WSMR, Bosque Del Apache National Wildlife Refuge was established in 1939 and consists of 57,191 acres of high desert and floodplain once used routinely as an Apache encampment (Figure 2.1-2). The Rio Grande flows through the center of the floodplain.

San Andres National Wildlife Refuge

SANWR is a 57,215-acre refuge established in 1941 for the conservation and development of natural wildlife resources, with primary emphasis on restoring a remnant population of desert bighorn sheep (USFWS 1998a). Located in the southern portion of the San Andres Mountains, approximately 10 miles northeast of Las Cruces (Figure 2.1-2). The refuge is contained entirely within WSMR boundaries. There is no public use of the refuge because of WSMR's security and safety requirements. WSMR and SANWR established an agreement for the purpose of minimizing potential conflicts, to facilitate accomplishing their primary missions, and to promote cooperative efforts between the agencies.

Sevilleta National Wildlife Refuge

Sevilleta National Wildlife Refuge is a 230,000-acre refuge established in 1973. Rather than managing for specific wildlife species, the refuge allows natural processes—such as flood and fire—to prevail. Located 20 miles north of Socorro, Sevilleta National Wildlife Refuge is within the northern extent of the Chihuahuan Desert and is a neighbor of WSMR's northern evacuation area (Figure 2.1-2). The refuge is home to a remote breeding facility for Mexican gray wolves and is responsible for the management of a reintroduced population of desert bighorn sheep. Sevilleta National Wildlife Refuge is host to the University of New Mexico Long Term Ecological Research Program, which conducts a diverse array of research projects on the refuge.

Jornada Experimental Range

Encompassing 193,483 acres, the JER—a USDA Agricultural Research Service (ARS) research facility—was established in 1912. Some of this acreage includes shared, co-use lands administered by WSMR and SANWR (Figure 2.1-2). The JER hosts the Jornada Basin Long Term Ecological Research program, which is administered by NMSU, as well as the Jornada Experimental Range Long Term Agroecosystem Research program, which was established in 2014 and is administered by ARS. The JER hosts numerous additional ecological and geoscience projects, including the Meteorological Sensor Array of the Army Research Laboratory.

U.S. Forest Service, Lincoln National Forest

The Lincoln National Forest was set aside as a Forest Reserve in 1902 and contains 1.1 million acres. It manages lands within the Sacramento, Capitan, and Guadalupe Mountain ranges to the east of WSMR. WSMR also leases facilities, such as Alamo Peak and Sac Peak, from the USFS.

National Aeronautics and Space Administration, White Sands Test Facility

The NASA White Sands Test Facility, a part of the Johnson Space Center in Houston, TX, is on the western slope of the San Andres Mountains, occupying 55,387 acres in the southwestern corner of WSMR (Figure 2.1-2). WSMR permits NASA to use the land necessary to conduct experiments and tests on materials and components used in today's space vehicles.

Spaceport America

Spaceport America is the first purpose-built commercial spaceport in the world (New Mexico Statutes Annotated 1978 §58-31-1 et seq., Laws of 2005). The Federal Aviation Administration licensed launch complex is situated on 18,000 acres in the northern Chihuahuan Desert, adjacent to WSMR's Western Call-up Area (Figure 2.1-2). This facility is built to accommodate both vertical and horizontal launch aerospace vehicles and was established to help shape the future of the commercial space industry.

New Mexico State Land Office

The NMSLO manages lands adjacent to WSMR. The mission of the agency is to use state trust land to raise revenue for New Mexico public schools, hospitals, colleges, and other public institutions. A politically appointed commissioner oversees about 9 million surface acres and 13 million mineral acres. State trust lands allocated in 1898 are leased for the purpose of oil and gas exploration, renewable energy, agricultural and livestock grazing, and other commercial uses.

Municipalities

Alamogordo, New Mexico

Alamogordo (population 31,700), located at the base of the Sacramento Mountains on the eastern edge of the Tularosa Basin, is 34 miles east of the Main Post, 84 miles north-northeast of El Paso, and 70 miles northeast of Las Cruces (Figure 2.1-2). Founded in 1898 as a railroad terminal, Alamogordo is the Otero County seat. Its first principal economic resources were the railroad, timber, and minerals of the Sacramento Mountains. These have been replaced by industry, tourism, and military activities. HAFB, the area's largest employer, is located only a few miles west of Alamogordo.

Carrizozo, New Mexico

Carrizozo (population 941) is located at the junction of U.S. 54 and U.S. 380, near the northeastern corner of WSMR (Figure 2.1-2). Carrizozo, the Lincoln County seat, was established in 1899, when the El Paso and Northeastern Railroad extended its line through the town. The town grew as the railroad drew people to fill jobs and as surrounding land opened to homesteading.

Ciudad Juarez, Chihuahua, Mexico

In 1659, the first Spanish-Indian settlement was founded in the area that is now called Ciudad Juarez in the Mexican state of Chihuahua. Today, Juarez (population 1,500,000) is by far the largest city near WSMR. It is located across the Rio Grande from El Paso and sprawls for miles to the south along the river valley.

El Paso, Texas

El Paso (population 682,447) is a port of entry from Mexico and a major road, rail, and air transportation center. The Spanish named this area along the Rio Grande, already home to native cultures for many centuries, El Paso del Rio del Norte (meaning "the pass through the river of the north") when they crossed the river in 1581. In 1598 Don Juan de Oñate re-named this major passageway, simply, El Paso. The El Paso International Airport is the largest facility for domestic and international air transportation in the region. Many who work on WSMR commute from their homes in El Paso via the access gate to the south of Main Post.

Las Cruces, New Mexico

Las Cruces (population 104,148) is located in the Mesilla Valley along the Rio Grande River at a site that was known as Estero Largo ("long swamp") by 17th century travelers (Julyan 1998). The city was platted in 1848 near graves of a small caravan whose members had been killed by Apache Indians in 1830. Grave markers gave rise to the current name Las Cruces ("the crosses"). Located at the intersection of I-25 and I-10, it is the Doña Ana County seat (Figure 2.1-2). Most government employees and contractors at WSMR commute from Las Cruces.

Socorro, New Mexico

Socorro (population 8,407) is the Spanish word for "help/aid". Among the early inhabitants of the Socorro County were the pueblo people the "Piros" who settled in the area around 1200. The village of Socorro was so named by Don Juan de Oñate who was given supplies by the Piros on his expedition through the area. Socorro is in the Rio Grande Valley and is the county seat of Socorro County.

Truth or Consequences, New Mexico

Truth or Consequences (population 5,865) is the county seat of Sierra County. Originally known by the name Hot Springs, the city changed its name to Truth or Consequences as the result of a radio show contest in 1950. There are many hot mineral springs in the area.

Tularosa, New Mexico

Tularosa (population 3,026) gets its name from the Spanish description for the red or rose-colored reeds growing along the banks of the Rio Tularosa. Tularosa was settled by Hispanic farmers from the Mesilla area following major floods in 1862 (Julyan 1998, Sonnichsen 1960). Original settling efforts a few years earlier had failed due to frequent raids by the Apache from what is now the Mescalero Apache Reservation. This small community is a short distance north of Alamogordo.

Mescalero Apache Reservation

The 460,661-acre Mescalero Apache Reservation (population 3,156) surrounds the mountain peak Sierra Blanca and encompasses parts of both the Sacramento and White Mountains to the east of WSMR. Established in 1873, it comprises wooded upland abounding in such beauty that the Mescalero Apache refer to the mountain as the home of their mountain gods. The reservation is now one of the United States' most prosperous, generating revenues from the Inn of the Mountain Gods resort and casino, the Ski Apache resort, and timber sales (Julyan 1998). Some of the tribe's religious, ceremonial, and sacred sites—including pictographs, petroglyphs, and traditional collecting grounds for plants—are located on present-day WSMR. Much of the reservation remains forested, and commercial development is restricted.

Private Lands

Ranchers and Farmers

Many private ranchers and farmers live adjacent to WSMR's boundaries and are affected by military operations in the area. Occasionally, WSMR will evacuate ranchers from call-up areas for

military projects that need additional land space. Prominent private activities include cattle ranching as well as pecan and pistachio farming.

2.1.3 Installation History

WSMR has become a sophisticated testing facility for a range of military and private developers. Its development history is embodied in structures within its historical district and the two structures listed on the National Register of Historic Places. Its long cultural history prior to development as a testing facility is found in the many thousands of historic and prehistoric sites within WSMR boundaries and in historic ranches, mines, and trails.

More than 200 historic ranches, dating from the late 19th through early 20th centuries, existed in canyons and valleys throughout the range (WSMR 2015). These ranches are closely linked to the history of space and missile development and have contributed to maintaining the open and vast lands that WSMR now occupies.

The current WSMR installation incorporates several earlier federal landholdings and facilities. Established as the White Sands Proving Ground (WSPG) in July 1945, its boundaries encompassed WSNP and SANWR. In 1952, under Public Land Order 833, public lands were withdrawn from all forms of appropriation under associated laws—including the mining and mineral-leasing laws—and reserved for the use of the Department of the Army for military purposes (17 FR 4822). Public Land Order 833 takes precedence over several EO's that previously reserved public lands for use by the DoD (17 FR 4822).

Trinity National Historic Landmark, located in northern WSMR, is where the first atomic bomb was detonated on July 16, 1945. In August 1945, the first trainloads of captured German V-2 rocket components arrived at WSPG (WSMR 1998). Under "Operation Paperclip," Werner Von Braun and his team of 118 German rocket scientists began working at WSMR. V-2 rocket launches took place from 1946 to 1952; in 1950 this project was transferred to Huntsville, Alabama (WSMR 1998).

The WSPG was changed to an Integrated Range and put under the control of the Army, specifically the WSPG Commanding Officer, in 1952. In 1958, WSPG was renamed White Sands Missile Range. By that time, the Main Post at WSMR included barracks, houses, and trailers in addition to structures necessary to the WSMR mission. In 1962, NASA established its White Sands Test Facility at WSMR; shuttle astronaut training began there in 1978.

2.1.4 Military Mission

As the DoD's largest, fully instrumented, open-air range, WSMR provides America's Armed Forces, allies, partners, and defense technology innovators with the world's premiere research, development, test, evaluation, experimentation, and training facilities to ensure our nation's defense readiness. WSMR's primary tenant is ATEC, which uses extensive test resources and infrastructure of this Major Range and Test Facility Base to accomplish its research, development, testing, and evaluation role. As one of the largest test ranges in the US, WSMR provides unique infrastructure and test facilities, including the nuclear survivability test reactor, radar test facilities, a High Energy Laser Systems Test Facility (HELSTF), and a state-of-the-art range control center. As a U.S. Army Test and Evaluation Command facility, WSTCs mission is to provide testing and development of weapons and equipment (both hardware and software) for military use in combat zones and for homeland security.

"Non-hot" missions include a wide variety of activities, such as ground checks, communication checks, soldier training, and unmanned aerial vehicle flights. Approximately 4,900 "non-hot" test events (or missions) were scheduled during 2020, with 3,700 actual missions completed (The remainder were cancelled for various reasons.). "Hot" missions on WSMR are potentially hazardous events that require evacuation of personnel and all nonparticipants during the event. During 2020, 1,135 hot missions were scheduled, with 435 completed. WSMR maintains an MOU with the New Mexico Department of Transportation to allow closure of selected highways (U.S. 54, 70, and 380) for safety during hazardous missions. WSMR has agreements with surrounding landowners to conduct evacuations when a test may cause unsafe conditions on the ground. There are two designated call-up/evacuation areas (Figure 2.1-2).

The Final White Sands Missile Range Land Use and Airspace Strategy Plan (WSMR 2010a) groups WSMR testing and training activities into 15 activity categories. Categories represent both activities and physical augmentation on the installation.

2.1.5 Military Land Use and Operations

WSMR's mission takes place primarily in four areas: main range, operational test areas, call-up areas, and annexes. The scope of this INRMP is limited to the main range—the area within WSMR's formal boundaries. It also includes the Mendiburu Ranch, which adjoins WSMR's northern boundary (Figure 2.1-1).

Main Range

The main range is used for tests and evaluations of tri-service missile systems, high-energy laser and directed energy systems, air defense fire-distribution systems, space systems, and surface-to-surface missile systems (WSMR 2016b). Specialized test beds, laboratories, and facilities located throughout WSMR include special target areas. Numerous locations across the range include Aerial Cable, penetrator warhead tunnels, and impact areas (WSMR 2016b). Other facilities involve chemicals and materials, information operations laboratories, climatic and environmental, dynamic, electromagnetic, electronic warfare, HELSTF, launch, nuclear effects, and warhead test facilities (WSMR 2010a). On the main range, structures are scattered individually or situated in small clusters of sites with local area names (e.g., C-Station). There are currently 564 site names listed in the real property inventory. Individual sites occupy anywhere from a few to several thousand acres. The Main Post area is within this area, including residential neighborhoods, services, a museum, parks, office buildings, and other support facilities.

WSMR provides the only overland testing area in the United States completely administered by the DoD (WSMR 2010a). Weapons systems that have been tested at WSMR include the Forward Area Air Defense System, Multiple Launch Rocket System, Patriot, Army Tactical Missile System, Hawk, Advanced Medium-Range Air-to-Air Missile, Short-Range Attack Missile, Standard Missile, Theatre High Altitude Area Defense, Joint Air-to-Surface Standoff Missile, and Rolling Airframe Missile (WSMR 2016b). Multiple weapon system testing is conducted at the Aerial Cable Range. The Air Force and Navy conducts activities in WSMR airspace and at specific ground locations, including Red Rio and Oscura bombing ranges and Warhead Impact Target (WIT) sites within the Jornada Plain. Some major sites used by WSMR tenants are HELSTF, National Radar Cross-Section Test Facility, and Radar Advanced Technology Backscatter Advanced Measurement Site (now considered part of National Radar Cross-Section Test Facility). The Permanent High-Explosive Test Site is used for conducting large-, medium-, and small-blast, penetration, and thermal-effects tests for the Defense Threat Reduction Agency.

There are WIT sites on WSMR that are categorized as Phase I and Phase II sites (WSMR 2018a). Phase I WIT sites (G10, G16, G20, G25, ABC-1, PUP, and 649) are used exclusively for testing nonlethal sub-munitions where recovery in the area is allowed. These sites are maintained in a mowed condition. Phase II WITs (Denver, Rhodes, and Stallion) are used for testing live sub-munitions (WSMR 2018a). Recoveries in these areas are not permitted on a normal basis. Interior portions of these sites are maintained largely as bare ground.

Operational Test Areas

Several areas have been established on WSMR to support off-road requirements associated with testing weapons systems in a tactical setting. These areas support the need for maneuver "space" and have been evaluated for the presence of sensitive fauna/flora, unexploded ordnance (UXO), cultural resources, and soil erosion potential to demonstrate suitability of these sites for use as maneuver and operational testing areas. Four maneuver and operational test areas have been established: Yucca North (Southern Range Area), Sierra (Northern Range Area), Otero (Northern Range Area), and Thurgood West (Northern Range Area) (WSMR 2017b).

Call-Up Areas

The 1.5 million acres to the north and west of WSMR are known as the Northern and Western Call-Up Areas (NCUA/WCUA) and are contiguous to the main range (Figure 2.1-2). They are maintained under agreements with private landowners and state agencies. These areas are used for the contingency that long-range, ground-launched missiles may require more land area for safety buffer zones than is available on the main range (WSMR 1992).

Annexes

WSMR has annexes in New Mexico, Texas, Idaho, Utah, Arizona, and Colorado that are not contiguous to the main range. Historically, annexes most often used for long-range tests are associated with the Idaho Mountain Home, the Utah Green River, and Fort Wingate Launch Complexes.

General Land Use Constraints

There are several land use constraints recognized on WSMR, such as jurisdictional (*i.e.*, WSNP, SANWR, and JER), environmental (*e.g.*, Special Natural Areas, springs, Todsen's pennyroyal and White Sands pupfish habitats), and operational constraints (*e.g.*, impact areas, specialized areas, UXO areas) that restrict activities on WSMR. Most of these areas support some type and level of activity—with the exception of the Todsen's pennyroyal Critical Habitat and the White Sands Pupfish essential habitat areas, which are off-limits to all surface activity (Britt 2018, WSMR 2010a).

Proposed activities on WSMR are required to be evaluated for overall compliance with environmental regulation. If additional coordination (*e.g.*, agency coordination/consultation, environmental analysis, permitting actions) or surveys (*e.g.*, listed plant or animal species) are required, then the Environmental Division would coordinate with the proponent. This leaves the proponent with the option to complete additional requirements or adjust the proposed action to avoid environmental impacts.

2.2 Physical Environment

2.2.1 Climate

WSMR has a typical northern Chihuahuan Desert climate with abundant sunshine, low humidity, modest rainfall, and about 250 frost-free days a year at lower elevations (Muldavin et al. 2000, Unnasch et al. 2017). Fall, winter, and spring are typically mild, and summer is hot. Strong westerly winds are most dominant in the spring while most precipitation occurs during thunderstorms in late summer (Hatfield and Koperski 2000). Daily and annual temperature and precipitation vary considerably, and weather patterns can be dynamic and difficult to predict (Goudie and Wilkinson 1977). WSMR maintains an extensive surface meteorological data-collection system, referred to as the Surface Atmosphere Measuring System, administered by the Army Research Laboratory.

WSMR, like any landscape, contains numerous “microclimates” that may vary substantially from one to another—even within a particular climate zone—and vegetation patterns often reflect subtle differences in microclimate (Muldavin et al. 2000). Topographic relief as well as solar and wind exposure contribute greatly to small-scale variations.

The arid climate of south-central New Mexico strongly influences biotic and abiotic processes—including rates of soil formation, erosion, and organic matter decomposition—as well as plant and animal growth and distribution. Life on WSMR evolved in tandem with its climate, and thus various adaptations enable desert biota to flourish under hot and dry conditions.

Precipitation and Humidity

The average annual precipitation at WSMR’s Southern Basin Climate Station since 1962 is 10.1 inches (Figure 2.2-1) (Eric Webb, Meteorologist – WSMR, Pers. Comm.). According to the climate station records, 2020 was the fifth driest year on record (Eric Webb, Meteorologist – WSMR, Pers. Comm.). Four of the five driest years on record have all occurred in the last 2 decades (Eric Webb, Meteorologist – WSMR, Pers. Comm.). Most precipitation occurs as thunderstorms, often of high intensity and short duration, from early July through September (Muldavin et al. 2000, Hatfield and Koperski 2000). Mountains and foothills generally receive more moisture than basins (Schmidt 1986). Average annual precipitation in WSMR’s arid desert basins is less than 10 in.; in semiarid foothills 10-16 in.; and highest mountain elevations are almost temperate (Muldavin et al. 2000). Relative humidity in the region ranges from 29-55%, averaging 39% over the course of a year. High temperatures and low humidity result in high rates of water loss from vegetation (evapotranspiration) and surface soils to the surrounding atmosphere.

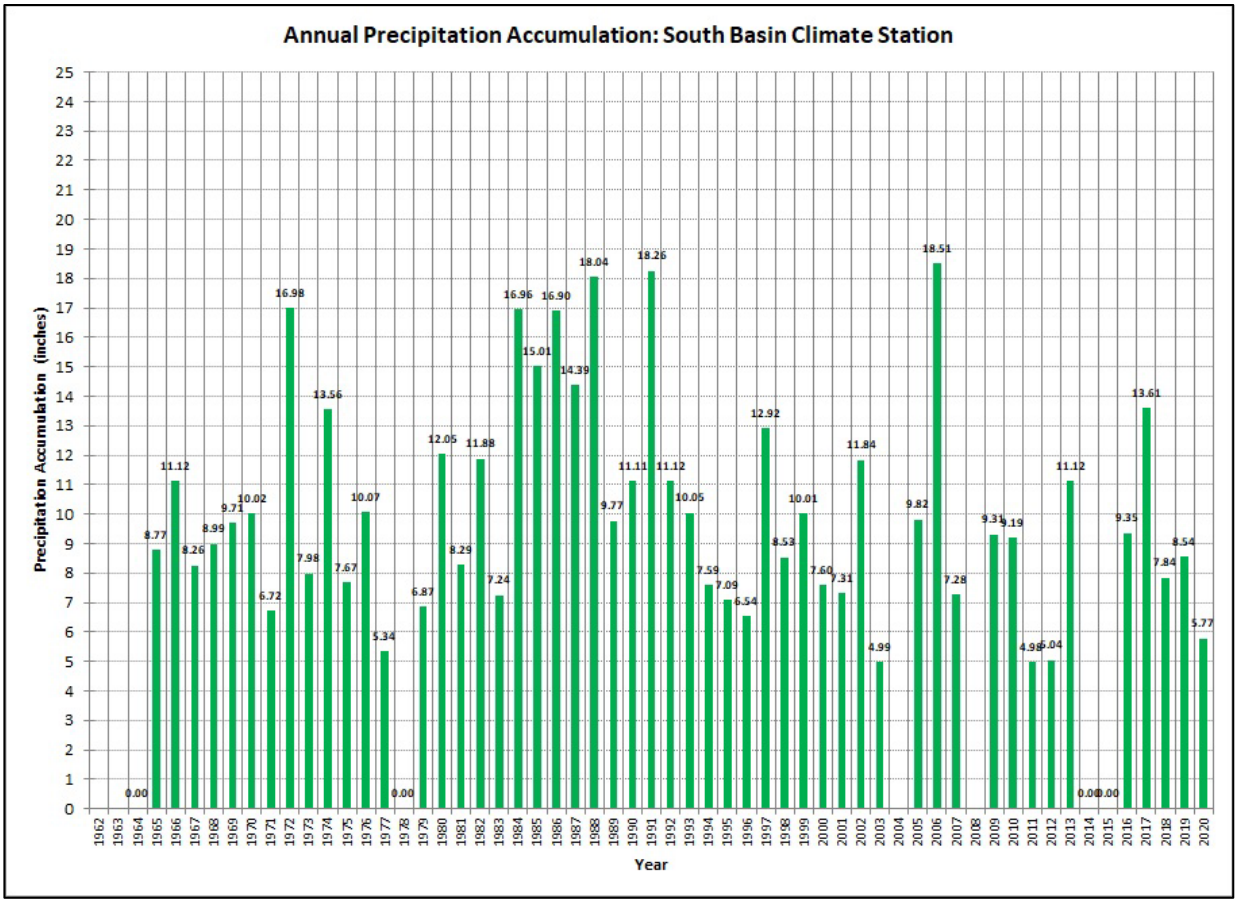

Figure 2.2-1. WSMR Precipitation 1965-2020.

Temperature

Average annual temperature has increased in the southern basin of WSMR from 1962 to 2020 (Figure 2.2-2). Every year since 2011, temperatures on WSMR have been above average (Eric Webb, Meteorologist – WSMR, Pers. Comm.). Average low temperature in January is 29º F; in July, the average high is 95º F (www.weather.com 2020). Temperature extremes range from 112º F (recorded at Orogrande in June 1994) to -25º F (recorded at WSNP in January 1962). Records indicate daily fluctuations of up to 50º F (Muldavin et al. 2000). Mean temperatures range from about 44-82º F (www.weather.com 2012); yet mean minimum and maximum temperatures extend this range by about 20º F. Daily temperature fluctuations of more than 30º F are common. Higher elevations are typically cooler on average.

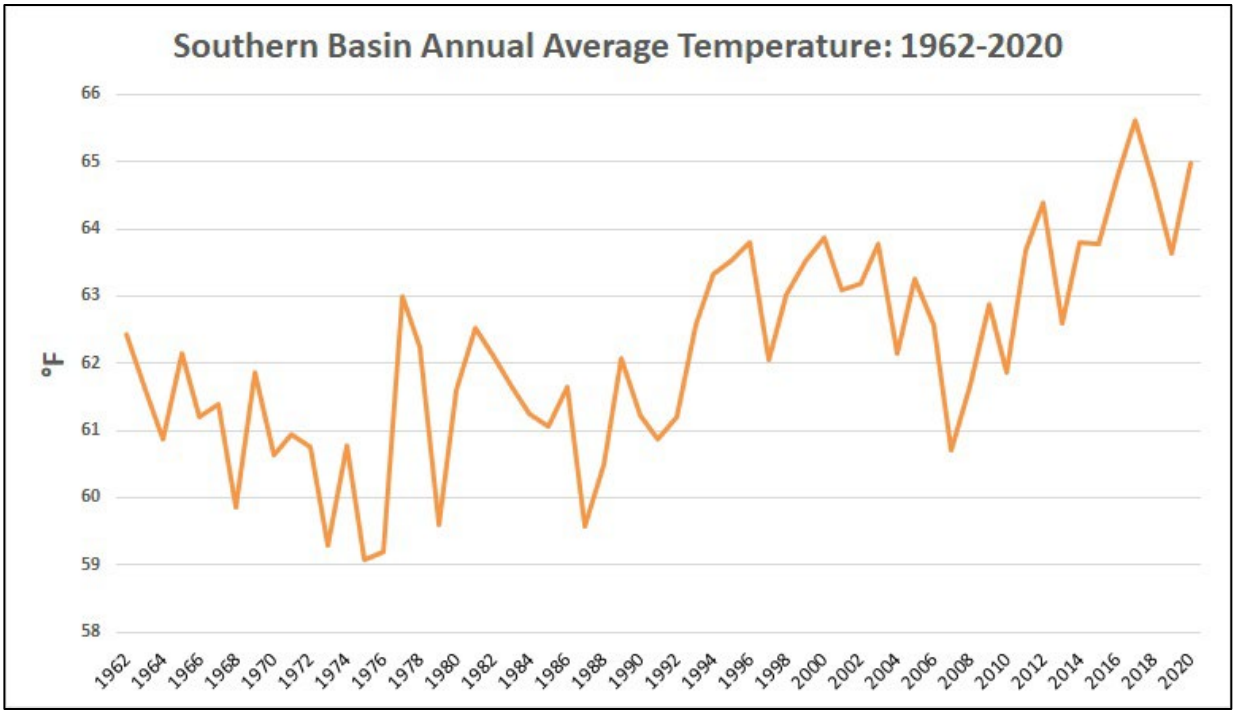

Figure 2.2-2. WSMR Annual Average Temperature 1962-2020.

Wind

As previously stated, strong westerly winds are typical in spring (February to June). Conditions are often dry before the onset of the monsoon season (July through September), and these winds can raise considerable dust and sand from the soil surface, resulting in low visibility (Hatfield and Koperski 2000). Light winds out of the east-southeast bring warm, humid moisture from the western Gulf of Mexico and supply most of the moisture for the monsoon season in the low elevations (Eric Webb, Meteorologist – WSMR, Pers. Comm.). In the mid-upper elevations, WSMR can receive moisture from the Gulf of California. Recurving mid- to late-season tropical cyclones from the Eastern pacific deliver additional rainfall near or just after the end of the monsoon season from September-October (Eric Webb, Meteorologist – WSMR, Pers. Comm.). Rare Atlantic tropical cyclones bring rainfall to boost the monsoon, but when they do occur it is usually earlier in the summer during July or August (Eric Webb, Meteorologist – WSMR, Pers. Comm.). Prevailing wind direction is southwest, but strong winds can blow from any direction, depending on atmospheric pressure variations.

Climate History

Climate has played an important role in determining WSMR's landscape and vegetation patterns (Brown 1994, Ludwig 1986). The climate of southern New Mexico during the Holocene has varied greatly (Dick-Peddie 1993). WSMR's current climate patterns and desert conditions began to emerge in the last 4,000 years (the current interglacial period [Van Devender 1986]). The climate appears to have reached a stable point about 600 years ago (Dick-Peddie 1993). Average annual temperatures in the Southwest have increased over the past 115 years, with two marked warming periods in the 1920s-1930 and from the mid1970s to 2000 (Elias et al. 2015).

The southwest experiences a wide range of weather and climate events, including droughts, heat waves, and floods. Notable wet periods in the last 115 years include 1940–1941 and the 1980s and 1990s (Elias et al. 2015). Region-wide severe droughts occurred in 1900, the mid-1950s, and

early 2000s (Elias et al. 2015). Recent surveys determined that regional drying over the past three decades has resulted in the reduction of available surface water as well as shrinking riparian patch size and changing riparian species composition at most springs on WSMR (Burkett et al. 2019, Pittenger 2018).

2.2.2 Topography

WSMR lies within the Mexican Highland Section of the Basin and Range Physiographic Province (Hawley 1986). Two large basins occur on WSMR: the Jornada del Muerto (west and northwest of the San Andres Mountains) and the Tularosa (east of the San Andres Mountains) (Figure 2.1-2). The San Andres Mountains, the most prominent mountain range on WSMR, traverses the western side of the Tularosa Basin. Salinas Peak (elev. 8,958 ft), the highest point on WSMR, lies within the northern San Andres Mountains. The San Augustin Mountains extend southward from Quartzite Mountain to San Augustin Pass (Seager 1981). Only a small portion of the Organ Mountains lies within WSMR, just south of the Main Post area. The Oscura Mountains, reaching an elevation of 8,700 ft at Oscura Peak, are near the northeastern boundary of WSMR. Other mountain ranges on WSMR include the Mockingbird Mountains, Hardscrabble Mountains, Poison Hills, Gyp Hills, and Little Burro Mountains. Additional prominent topographic and geologic features include the Carrizozo lava flow on the northeastern side of WSMR and the Armendaris lava flow on the northwestern side. Gypsum sand dunes occur in the south-central portion of WSMR. The dunes comprise the largest gypsum dune field in the world, covering 432 square miles. Much of the dune fields are included within the WSNP, whose entirety lies within WSMR boundaries.

The Mendiburu Ranch is part of the Mexican Highland Section of the Basin and Range Province. General topography of Mendiburu Ranch consists of mountainous and hilly terrain in the east with mainly flat land in the west. Lands generally slope downward from east to west, where the elevation is about 4,900 ft. Several areas within the ranch contain canyons that run through the mountains while other areas consist of steep arroyos etched in the easily eroded sandy soils (USACE 2009).

2.2.3 Geology

Nearly 1.4 billion years of geologic history appear within WSMR's boundaries (Bachman 1968, Bachman and Harbour 1970, Dunbar 1999, Dunham 1935, Gile et al. 1981, Kottlowski et al. 1956, Love et al. 2007, Lueth et al. 2002, Meinzer and Hare 1915, Pray 1961, Sandeen 1954, Schmidt and Craddock 1964 Seager 1981). The sedimentary formations of WSMR belong chiefly to the Carboniferous, Cretaceous, and Quaternary systems, but Paleozoic sedimentary rocks older than the Carboniferous may be represented, and sedimentary rocks of Triassic, Jurassic, and Tertiary age may also be present. The igneous rocks are chiefly of pre-Carboniferous (probably pre-Cambrian), Tertiary, and Quaternary age, but there may also be igneous rocks that were erupted after the Carboniferous period (but before the Cretaceous sediments were laid down) and near the close of the Cretaceous period (Meinzer and Hare 1915).

2.2.4 Soils

The NRCS has completed a soil survey of WSMR, and soil maps are available on the USDA NRCS Web Soil Survey [https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm] (USDA-NRCS 2020). For a complete description of soil series represented on WSMR—including horizon and diagnostic characteristics—please reference the NRCS Soil Series Classification Database on the Web Soil Survey.

Soils in the region are generally dry and erode easily. Large, red dune fields spread across basin floors, occasionally interrupted by small, desert grasslands and dry lakebeds (or playas). Deep, eroded arroyos have cut into lower mountain slopes, carrying runoff from seasonal rains at high speeds to lower basins, where water rapidly soaks into the ground to resupply a shallow freshwater table. Within the last five years, storm events have caused sediment flows that have resulted in damaged infrastructure.

The scale of the WSMR soil survey and associated soil series descriptions do not adequately identify increased understanding of how soil condition influences erosional processes in association with disturbance factors (USDA-NRCS 2017, USDA-NRCS 2020). Disturbance factors include removal of vegetation, drought, construction activities, and vehicular activity. It is important to identify highly erodible soils. For example, a finer scale survey would be beneficial in understanding how to predict potential effects of erosion to arroyo riparian communities, groundwater recharge, playas, and sensitive areas. Unfortunately, relationships of soil and vegetation on WSMR are not well understood; yet there is an urgent need for information. Development of ecological site descriptions that incorporate information about vegetation dynamics and soil condition would allow natural resource managers to comprehend the relationship between soils and vegetation for more effective biological restoration and management efforts.

2.2.5 Water Resources

WSMR lies mostly within the Tularosa Valley Watershed. This watershed is an enclosed basin with no external outlet and is part of the Rio Grande Rift (USDA-NRCS 2012a). A playa known as Lake Lucero represents the remains of the Pleistocene Epoch Lake Otero. The northeast portion of WSMR is contained within the Jornada del Muerto Watershed, which is a closed basin with no flow into the Rio Grande (USDA-NRCS 2012b). Most drainages of the northern Jornada del Muerto Basin empty into or terminate at the edge of the central area of subsidence.

Natural water sources on WSMR include over 183 ephemeral and perennial springs, seeps, streams, lakes, ponds, and wetlands in and adjacent to WSMR (Boykin et al. 1996, Burkett et al. 2019, Pittenger 2018). Historically, about half of springs and seeps named on USGS maps were considered likely perennial (Bednarz 1989). A survey of a subset of springs visited by Boykin et al. (1996), was conducted from 2014-2018 (Burkett et al. 2019, Pittenger 2018). Recent surveys determined that regional drying over the past three decades has resulted in the reduction of available surface water as well as shrinking riparian patch size with changing riparian species composition at most springs on WSMR (Burkett et al. 2019, Pittenger 2018). Pittenger (2018) reported a 50% loss in montane springs on WSMR between the early 1990s and 2014—although additional sampling is needed at specific times of the year to confirm that some springs are dry. No jurisdictional wetlands occur on WSMR.

Thompson et al. (1992) reported that there were approximately 170 other watering facilities (in addition to natural sources) on WSMR, such as windmills, earthen tanks, haul tanks, and rainwater catchments. Although most of these watering facilities are no longer functioning, DPW-E is implementing a wildlife-water development program. This program has installed 17 solar panel wells on existing tanks along with three rain catchment units. This program will continue to develop, repair, and add additional rain catchment units throughout WSMR. An earthen tank inventory identified more than 221 earthen tanks as of 2020 (G. Silsby, General Biologist - WSMR Pers. Comm.). Five ponds continually hold water for construction use: Oscura Range Center Pond, Martin Ranch Well, Murray Tank, Small Test Bed, and a small pond at Stallion Range Center (G. Silsby, General Biologist - WSMR, Pers. Comm.).

The only major perennial stream on WSMR is Salt Creek. Water flow in Salt Creek is maintained by spring and seep discharge from the basin-fill aquifer in the Tularosa Basin (Weir 1965). Ground water input occurs throughout the reach of Salt Creek from headwaters downstream to the vicinity of a head-cut waterfall (Pittenger 2015). Tularosa Creek and Three Rivers have water flows that occasionally reach WSMR during periods of high precipitation and runoff from the Sacramento Mountains. Most perennial ponds on WSMR are near the Mound Springs Complex and Malpais Spring. There are seven perennial ponds associated with various springs around the Mound Springs Complex: the most notable of these being Main Mound Spring, North Mound, and South Mound. Groundwater discharge from Malpais Spring provides water to a large, inundated marsh area and associated ponds. Barrel Spring and Guilez Spring are southeast of Malpais Spring near the eastern boundary of WSMR. Natural resource managers are interested in the Mound Springs Complex, Malpais Spring, Pup Spring, and Salt Creek, which are native and introduced refugia habitats for the NMDGF threatened White Sands pupfish (Pittenger and Springer 1999, Pittenger 2018, WSMR and HAFB 2015). Native populations of White Sands pupfish and natural refuge populations may be affected by reduction in overall habitat size (Pittenger 2015). Discharge from springs that maintain core White Sands pupfish habitats may be affected by reduced recharge of the basin-fill aquifer or increased groundwater pumping (Pittenger 2015). Water flow in Salt creek may be more sensitive than Malpais Spring to changing climate and possible reduction of mountain-front recharge because the perennial reach of the stream has a smaller mountain catchment area, and only about one percent of total annual precipitation is estimated to recharge the basin-fill aquifer from these catchments (Huff 2005). Investigations should be conducted to refine the delineation and characteristics of recharge zones for springs discharging from the basin-fill aquifer that sustain habitats of White Sands pupfish (Pittenger 2015).

Lake Lucero occasionally contains water following large rain events that produce significant runoff. Brazel Lake is the terminus of Tularosa Creek. Water is depleted from these areas due to drought and diversion of water east of the WSMR boundary and due to percolation of water to the subsurface, evaporation, and evapotranspiration.

Davies Tank, approximately five miles southeast of the Main Post, is a naturally occurring ephemeral lake located in the southern portion of WSMR. Davies Tank has been extensively manipulated by human use, functioning as a holding site for effluent from the WSMR Main Post wastewater treatment facility since 1986 (Burkett 2017). This inflow of water over many years has contributed to the growth of riparian species, such as willows, cottonwood trees, cattails, rushes, and sedges—as well as other facultative and obligate wetland vegetation that would not otherwise persist at this playa lake.

Surface water within Mendiburu Ranch consists of ephemeral streams and dry washes. The three main washes running through the ranch include Wash Hale, Hoot Owl, and Bruton Canyons (USACE 2009).

Water Quality

Water quality depends on the amount of snow accumulation in mountainous areas as well as on the amount, intensity, and number of precipitation events. The quality of surface water can range from fresh to brine, and the concentration of total dissolved solids increases over time due to evaporation. Water quality in Salt Creek varies with location and rate of flow at the time of collection.

Water quality data has been collected on many of the springs in the Organ, San Augustin, San Andres, and Oscura Mountains (Pittenger 2018, Scobie et al. 2019, Thompson et al. 1992). Salt Creek, Lost River, and springs in the Tularosa Basin have been sampled frequently because they

are considered habitat (or potential habitat) for White Sands pupfish and Tularosa springsnail (Cruz 1983, Pittenger 2018, Scobie et al. 2019, U.S. Geological Survey 1995, Weir 1965).

Water quality standards are regulated by the state of New Mexico and the U.S. Environmental Protection Agency. Army regulations and DoD instructions provide guidelines for water-quality management (DoD 2007); Environmental Protection and Enhancement includes water resources and watersheds. Army Facilities Management establishes policies and procedures for the production, pumping, treatment, and distribution of water and for the collection and disposal of sewage and industrial waste (DoD 2007).

Groundwater

Groundwater on WSMR can occur in all lithologic formations (from Precambrian to recent in age) in the Jornada del Muerto and Tularosa Basins. The main aquifer in each basin is Tertiary (66 million to 2.6 million years ago) to Quaternary (2.6 million years ago to present) bolson-fill and alluvial deposits in the center of the basins. The major source of recharge for all aquifers is primarily by infiltration at mountain-front alluvial fans (Pittenger 2015). Major sources of discharge are from evaporation, evapotranspiration, wells, springs, seeps, Salt Creek, and Malpais Spring.

Groundwater Quality

The quality of groundwater on WSMR ranges from freshwater to brine. Groundwater containing less than 1,000 mg/L total dissolved solids occurs high in alluvial fans adjacent to points of recharge along mountain fronts. More than 85% of groundwater in the Tularosa Basin may contain total dissolved solids exceeding 3,000 mg/L (Orr and Myers 1986). Weir (1965) found that most groundwater within the Jornada del Muerto Basin had total dissolved solids concentrations of 1,000-3,000 mg/L.

2.3 Ecosystems and Biotic Environment

WSMR lies within the Chihuahuan Desert Ecoregion (Dinerstein et al. 2000). The ecoregion is bordered on the west by the American Semi-desert and Desert Ecoregion; on the north by the Arizona-New Mexico Mountains and Colorado Plateau Ecoregion; and on the east and northeast by the Southwest Plateau and Plains Dry Steppe and Shrub Ecoregion (Bailey et al. 1994).

The Chihuahuan Desert Ecoregion is located in southeastern Arizona and southwestern and central New Mexico (Bailey et al. 1994, Dinerstein et al. 2000). The Chihuahuan Desert extends into north-central Mexico, and certain authors extend the ecoregion well into San Luis Potosi, Mexico (Dinerstein et al. 2000). The Chihuahuan Desert landscape is a series of basins and mountain ranges, with a central highland that extends from Socorro southward into Mexico (Dinerstein et al. 2000). Landforms include plains with low mountains consisting of gentle slopes and local relief of 1,000-3,000 ft; plains with high hills and local relief of 1,000-3,000 ft; open high hills with relief of 500-1,000 ft; and tablelands with moderate relief averaging 100-300 ft (McNab and Avers 1994).

2.3.1 Plant Communities

Vegetation is a fundamental landscape attribute used for characterizing habitats. Muldavin et al. (2000) developed a model for describing vegetation communities on WSMR. Vegetation on WSMR was broken down into four major groups at the formation level: forest and woodland, shrubland, grassland, and miscellaneous. Within these groups, vegetation communities were classified into 34 generalized Level 1 Map Units. The information gathered about the distribution of vegetation communities was then used to develop a vegetation map (Muldavin et al. 2000). The forest and woodland group contains six Map Units that are restricted to the higher elevation

areas of the Oscura, San Andres, San Augustin, and Organ Mountains (Muldavin et al. 2000). The shrubland group is made up of twelve Map Units, primarily representing Plains-Mesa Sandscrub, Great Basin Desert Scrub, and Chihuahuan Desert Scrub, with one semi-riparian type (Muldavin et al. 2000). The grassland group comprises eight Map Units that are primarily Chihuahuan Desert Grasslands along with Plains-Mesa-Foothill Grasslands and Great Basin Desert Grasslands (Muldavin et al. 2000). The miscellaneous group contains eight Map Units that represent non-vegetated classes and riparian/wetland areas (Muldavin et al. 2000).

Vegetation on the Mendiburu Ranch is a combination of grasslands with cactus, yucca, sagebrush, juniper, and sumac on flat to hilly terrain (USACE 2009). BLM (1999) lists vegetation as a mixture including blue grama (*Bouteloua gracilis*), bush muhly (*Muhlenbergia 18ormos*), dropseeds (*Sporobolus spp.*), winterfat (*Krascheninnikovia lanata*), fourwing saltbush (*Atriplex canescens*), alkali sacaton (*Sporobolus airodes*), yucca (*Yucca spp.*), three-awn (*Aristida spp*.), vine mesquite (*Panicum obtusum*), burrograss (*Scleropogon brevifolius*), sand sage (*Artemsia filifolia*), and galleta (*Pleuraphis jamesii*) with portions of the allotment to the east in the Chupadera Mesa area dominated by woodland of oneseed juniper (*Juniperous monosperma*) intermixed with oak (*Quercus spp.*), mountain mahogany (*Cercocarpus spp.*), and piñon pine (*Pinus edulis*).

2.3.1.1 Noxious and Invasive Plant Species

Certain fast-growing and competitive plants that are capable of dominating an ecosystem have been termed “noxious plants.” The threats posed by noxious and invasive plants cannot be underestimated: native plants can be entirely displaced, ecosystems may be vastly altered, and native wildlife may be adversely affected (NISC 2016). The Federal Noxious Weed Act (Public Law 93-629 7 U.S.C. 2801 et seq.; 88 Stat. 2148) and EO 13112 require federal agencies to control noxious weeds and invasive flora and fauna species on federal lands (US Army 2021). If native ecosystems are to be conserved, any such species must be properly identified and monitored, and a plan must be implemented for its management. Documentation of distribution and abundance of noxious and invasive plants are conducted as funding allows. Eight exotic plant species that are considered noxious occur on WSMR, and most have state of New Mexico noxious weed classifications (Table 2.3-1) (Ashigh et al. 2010, US Army 2021, C. Rodden, Wildlife Biologist/Pest Management Coordinator - WSMR and D. Nethers, Ecologist – WSMR, Pers. Comm.). The WSMR Integrated Pest Management Plan and the INRMP are the primary instruments for requesting project funding and identifying actions to prevent and manage invasive species (Appendix E; US Army 2021).

Table 2.3-1. Noxious and Invasive Plant Species Present on WSMR.

Common Name	Scientific Name	NM Class Status
Lehmann Lovegrass	*Eragrostis lehmanniana*	No Status, but considered invasive
African rue	*Peganum harmala*	B
Saltcedar	*Tamarix sp.*	C
Saltlover	*Halogeton glomeratus*	B
Russian Olive	*Elaeagnu angustifolia*	C

Tree of Heaven	*Ailanthus altissima*	B
Field bindweed	*Convolvulus arvensis*	C
Russian knapweed	*Acroptilon repens*	B
Malta star thistle	*Centaure melitensis*	B

Notes:
Class "A" noxious plants are limited in distribution or not found in the state at the present time but have the potential to cause serious problems.

Class "B" noxious plants are limited to one portion of the state and high priority is given to preventing the movement into new areas.

Class "C" noxious plants are widespread in the state.

2.3.2 Fauna

The borderlands region of New Mexico and Texas is a center of biodiversity in temperate North America for invertebrates, birds, mammals, and herpetofauna (Parmenter et al. 1995, Parmenter and Van Devender 1995). The diversity of species on WSMR is high, but few warm-blooded vertebrates are centered in or limited in their distribution to the Chihuahuan Desert (Brown 1994). Many vertebrates found on WSMR are those generally found in the Intermountain West and the Great Plains (Parmenter et al. 1995, Parmenter and Van Devender 1995). Species known to occur on Mendiburu Ranch are the same as those known to occur in northern portions of WSMR.

2.3.2.1 Invertebrates

Invertebrate fauna of the desert southwest is incredibly diverse and includes several phyla (Crawford 1981, Whitford et al. 1995). Invertebrate species number in the tens of thousands and many of the less conspicuous species have never been described by taxonomists (Whitford et al. 1995). Invertebrate surveys have been conducted in several different habitats throughout WSMR (Boykin et al. 1996, Buchmann and Donovan 2007, Burkett and Hartsough 2006, Crews and Gillespie 2014, Kroll et al. 2003, Metcalf 1984, Metcalf and Smartt 1997, Metzler and Landry 2016, Piorkowski and Diamond 2016, Pittenger 2018, Rogowski and Stockwell 2005, Scobie et al. 2019, Sullivan and Smartt 1995, Sullivan 1997, Stroud 1950, Wu et al. 2021).

Surveys have identified nine terrestrial and two aquatic snail species on WSMR (Kroll et al. 2003, Metcalf 1984, Metcalf and Smartt 1997, Piorkowski and Diamond 2016, Rogowski and Stockwell 2005, Scobie et al. 2019, Sullivan and Smartt 1995, Sullivan 1997). Terrestrial snails documented on WSMR include species from the genus *Ashmunella*, *Rumina*, *Sonorella*, *Oreohelix*, *Rabdotus*, and *Holospira* (Kroll et al. 2003, Sullivan 1997).

The two aquatic snail species include the Tularosa springsnail and *Physa acuta*. The Tularosa springsnail is an endemic species to WSMR and is a NMDGF Species of Greatest Conservation Need (SGCN) (NMDGF 2016b, Piorkowski and Diamond 2016, Scobie et al. 2019). Tularosa springsnails only occur along the Salt Creek drainage within WSMR (Hershler et al. 2002, Piorkowski and Diamond 2016, Rogowski and Stockwell 2005, Scobie et al. 2019). Springsnail distribution along Salt Creek is affected by a combination of water chemistry factors: oxidation-reduction potential, water temperature, conductivity, pH, and total dissolved solids (Piorkowski and Diamond 2016, Scobie et al. 2019). *Physa acuta* can be found in the immediate vicinity of Salt Creek, and may have biological impacts to the endemic, protected White Sands pupfish as

an intermediate host for parasites (Rogowski and Stockwell 2005, Stockwell et al. 2011, Vinje 2007).

Surveys for aquatic insects were conducted at earthen tanks and springs (Boykin et al. 1996, Pittenger 2018). Eighty-five aquatic invertebrate taxa were identified in samples collected from 72 aquatic habitat sites (Boykin et al. 1996, Pittenger 2018).

Buchmann and Donovan (2007) documented bees from 7 families, 50 genra, and 187 species on WSMR. This represents 19% of the presently recognized bee fauna from New Mexico but may only represent 50-70% of the total WSMR native bee fauna (Buchmann and Donovan 2007).

Butterfly surveys and incidental encounters on WSMR have detected more than 100 butterfly species (Burkett and Hartsough 2006, Wu et al. 2021). Although there are no federal or state listed species of invertebrates on WSMR, the USFWS has determined that listing the monarch butterfly (*Danaus plexippus*) under the ESA is warranted but precluded at this time by higher priority listing actions (USFWS 2020). With this finding, the monarch becomes a candidate for listing. USFWS will review its status each year until they are able to begin developing a proposal to list the monarch. The monarch has been documented throughout WSMR (Wu et al. 2021). Investigators recommend further monitoring of the monarch and Poling's hairstreak (*Satyrium polingi*), which has a rare endemic subspecies (*S. p. organensis*) occurring on WSMR. The probable range of *S. p. organensis* appears to be restricted to a narrow montane corridor that starts in the Organ Mountains, extending along the San Andres Mountains and possibly the Oscura Mountains up to U.S. 380. On WSMR, this subspecies has only been recorded at two sites (Wu et al. 2021). As of January 2022, USFWS has proposed endangered listing for the Sacramento Mountain Checkerspot (*Euphydryas anicia cloudcrofti*). Surveys for this endemic subspecies had previously been conducted in 2005 (Burkett and Hartsough). While *E. a. cloudcrofti* was not found at that time, the survey effort did find host and food plants for that species at several sites; consequently, Environmental Division personnel have proposed follow-up surveys to confirm presence/absence of this potential endangered species.

It is likely that new invertebrate species will be found on WSMR as additional surveys are conducted. This has been the case for woodland snails in the San Andres and Organ Mountains (Metcalf and Smartt 1997, Slaughter 2012), butterflies and moths on WSMR and WSNP (Metzler and Landry 2016, Wu et al. 2021), and for grasshoppers on HAFB and WSMR (D. Lightfoot, Senior Collection Manager, Division of Arthropods - Museum of Southwestern Biology, Pers. Comm.).

2.3.2.2 Pollinators

Pollinators in the United States include most bees and some bats, birds, butterflies, moths, flies, beetles, and other insects (AFPMB 2018). Pollinators play a crucial role in plant reproduction by moving pollen grains from a flower's male parts (anthers) to the female part (stigma) of the same species; if fertilization is successful, it can result in the production of fruits and seeds. Pollinators are afforded consideration under a Presidential Memorandum (*Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators,* June 20, 2014) that calls for creating a federal strategy to promote the health of honey bees and other pollinators (AFPMB 2018). Under this memo, the DoD shall, consistent with law and the availability of appropriations, support habitat restoration projects for pollinators and shall direct military service installations to use, when possible, pollinator-friendly native landscaping and minimize use of pesticides harmful to pollinators through integrated vegetation and pest management practices (AFPMB 2018, DoD 2014a).

Conservation of pollinators supports the DoD mission by helping to maintain diverse healthy ecosystems. These natural landscapes provide realistic conditions for military activities and serve as buffers for local communities. Healthy, diverse native plant communities require less active management and are more resilient to human and naturally occurring stressors (Pollinator Health Task Force 2015). Implementing pollinator conservation can enhance ecosystems under DoD stewardship and thus ensure the long-term sustainability of our nations' natural heritage—all while supporting the military mission.

2.3.2.3 Fish

White Sands pupfish were first recorded as occurring in Salt Creek as early as 1911 (Meinzer and Hare 1915). The first fish collected on WSMR were of White Sands pupfish from the headspring of Malpais Spring in 1927 and from Salt Creek in 1947 (Bradley et al. 1927, Koster 1957). Pupfish collected from Malpais Spring in 1950 provided the holotype for description of the species (Miller and Echelle 1975). Pupfish have been translocated to three locations on WSMR (South Mound Spring, North Mound Spring, and Main Mound Spring) as well as one location on HAFB (Lost River).

Field surveys on WSMR have documented nonnative fish in ponds and springs. Largemouth bass (*Micropterus salmoides*), goldfish (*Carrasius auratus*), and mosquitofish (*Gambusia affinis*) were reported as occurring at Guilez and Barrel Springs (Pittenger and Springer 1999). A population of bluegill *(Lepomis macrochirus*) was discovered in Martin Ranch Pond (Pittenger 1997). Nonnative fish have since been eradicated at all locations on WSMR except at Guilez and Barrel Springs.

2.3.2.4 Amphibians and Reptiles

WSMR contains habitat that supports a diverse array of herpetofauna: 7 species of amphibians and 48 species of reptiles representing 3 orders and 12 families (Burkett 2000, Burkett 2008, Burkett 2016b, Burkett and Black 2004). There are six toad species (three spadefoot toads and three true toads), one salamander species, one turtle species, 27 snake species, and 20 lizard species. Burkett (2016) suggests that three additional species of reptiles and amphibians may occur on WSMR. Possible species that may never be documented due to their secretive nature and scarcity include the New Mexico milk snake (*Lampropeltis gentilis*) and many-lined skink (*Plestiodon multivirgatus*) (Burkett 2008, Burkett 2016b). The nonnative Mediterranean gecko (*Hemidactylus turcicus*) was detected on WSMR Main Post in 2013 (Burkett 2016b).

No USFWS or New Mexico state listed amphibians or reptiles are found on WSMR. NMDGF lists the western massasauga as a SGCN (BISON-M 2021). In 2012, the USFWS was petitioned by WildEarth Guardians to determine if the desert subspecies of western massasauga (*S. t. edwardsii*) may warrant federal protection as threatened or endangered (USFWS 2012b). Taxonomic changes published in the Journal of Conservation Genetics (Blysma et al. 2021) reveal that sub-speciation of the western massasauga is not warranted. Subsequently, the petition to list the formerly accepted sub-species (desert massasauga) was formally withdrawn by the WildEarth Guardians. The USFWS is not scheduled to complete a formal status review of desert massasauga for potential inclusion as a threatened or endangered species under the ESA.

The Conservation Branch recognized a need for collecting information regarding distribution and population status of the western massasauga within WSMR. The snake is considered uncommon, with only a handful of individuals documented on WSMR (D. Burkett, Contract Biologist – WSMR, Pers. Comm.). During 2020 and 2021, survey efforts were conducted to document possible populations potentially within WSMR boundaries and to collect morphological data and genetic material in order to improve understanding of the species distribution and taxonomy (Burkett

2021). These survey efforts reveal a population of massasauga rattlesnakes near the northwestern boundary of WSMR (Burkett 2021).

2.3.2.5 Birds

Due to its wide diversity of habitats, New Mexico has recorded the second highest number of bird species of any non-coastal state in the U.S. (NMACP 2016). The New Mexico Bird Records Committee has verified 551 bird species in New Mexico (Williams 2019). More than 280 species of birds breed in New Mexico, and its extensive grasslands are important areas for wintering birds. The Rio Grande serves as an important flyway for migrant species (NMACP 2016). Various habitats on range support a diverse avifauna, for which WSMR has documented 313 bird species (Appendix O) representing 19 orders and 56 families (Hartsough et al. 2015b, Hartsough et al. 2016a, Hartsough et al. 2016b, Johnson et al. 2020, Weisenberger 2016, WSMR 2022). Three exotic bird species are common on the Main Post area of WSMR: the Eurasian collared dove (*Streptopelia decaocto*), house sparrow (*Passer domesticus*), and European starling (*Sturnus vulgaris*). WSMR has conducted surveys for three species protected by the ESA: northern aplomado falcon (*Falco femoralis*), southwestern willow flycatcher, and yellow-billed cuckoo. Similarly, WSMR has documented 11 species with NMDGF listed status: northern aplomado falcon, southwestern willow flycatcher, yellow-billed cuckoo, bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), broad-billed hummingbird (*Cynanthus latirostris*), Costa's hummingbird (*Calypte costae*), Bell's vireo (*Vireo bellii*), gray vireo, Baird's sparrow (*Centronyx bairdii*), and varied bunting (*Passerina versicolor*).

DoD PIF has identified, through a detailed technical analysis, 15 avian species occurring on DoD lands that may be at risk of becoming listed under the federal ESA (DoD PIF 2021). DoD PIF designated these as "Mission-sensitive Species" (MSS) due to their high potential to impact the military mission should ESA listing be warranted (DoD PIF 2021). There are two bird species that occur on WSMR that are considered Mission-Sensitive Species: burrowing owl (*Athene cunicularia*) and pinyon jay (DoD PIF 2021).

In addition to the MSS list, DoD PIF also categorized an additional 37 species as "Tier 2" species (DoD PIF 2021). Most of these species are experiencing long-term declines and have some potential relevance to future mission impacts if federally listed, but they are not considered highest priority based on DoD PIF's current review criteria. Proactive monitoring and management of Tier 2 species is encouraged when and where appropriate (DoD PIF 2021). There are 14 Tier 2 species that occur on WSMR: long-billed curlew (*Numenius americanus*), flammulated owl (*Otus flammeolus*), golden eagle, greater yellowlegs (*Tringa melanoleuca*), black-chinned sparrow (*Spizella atrogularis*), Kentucky warbler *(Geothlypis formosa*), olive-sided flycatcher (*Contopus cooperi*), Sprague's pipit (*Anthus spragueii*), Virginia's warbler (*Oreothlypis virginiae*), loggerhead shrike (*Lanius ludovicianus*), Lewis's woodpecker (*Melanerpes lewis*), gray vireo, chestnut-collared longspur (*Calcarius ornatus*), and Baird's sparrow (DoD PIF 2021, WSMR 2020c). Objectve 2 in Section 4 describes specific actions implemented for WSMR compliance with the Migratory Bird Treaty Act.

WSMR is located within USFWS Bird Conservation Region 35 (USFWS 2021). The USFWS lists 30 bird species as Birds of Conservation Concern within this region (USFWS 2021). Of these 30 species, 27 species may be present on WSMR at sometime during their lifecycle (See Section 2.3.3.2 Fauna).

2.3.2.6 Mammals

The distinctive mammal fauna of New Mexico originates from several different areas: the Rocky Mountains, Great Plains, Chihuahuan Desert, Mexican Plateau, Sonoran Desert, and the Great

Basin (Findley et al. 1975). Consequently, New Mexico has one of the most diverse mammalian faunas in the world, with 179 mammal species documented (Findley et al. 1975, Frey et al. 2006). Seventy-five species of mammals representing seven Orders and 20 Families have been recorded on WSMR (Appendix P), including eight nonnative species: Norway rat (*Rattus norvegicus)*, house mouse (*Mus musculus)*, feral horse (*Equus ferus caballus*), feral cat (*Felis catus)*, Barbary sheep (*Ammotragus lervia*), domestic cow (*Bos taurus*), oryx, and Persian ibex (*Capra hircus*) (WSMR 2020b). No mammal species on WSMR has federal listed status. The endangered Mexican gray wolf has established packs in the Gila National Forest and Cibola National Forest, and transient wolves have been documented on adjacent lands to WSMR (C. Rodden, C. Rodden, Wildlife Biologist/Pest Management Coordinator - WSMR, Pers. Comm.). Three mammal species occur on WSMR that are NMDGF listed as Threatened: Organ Mountains Colorado chipmunk (*Neotamias quadrivittatus organensis*), Oscura Mountains Colorado chipmunk, and spotted bat (*Euderma maculatum*). Surveys for the USFWS and NMDGF endangered New Mexico meadow jumping mouse on WSMR have determined that none of the riparian habitats appeared suitable for jumping mice and, therefore, it does not occur on WSMR (Frey et al. 2018).

2.3.3 Threatened and Endangered Species and Species at Risk

Section 7 of the ESA of 1973 requires all Federal agencies to use their authorities to conserve endangered and threatened species in consultation with the USFWS. This 'proactive conservation mandate' for Federal agencies is articulated in section 7(a)(1) of the ESA.

Species become imperiled because of one or several factors, such as habitat loss, encroaching development, human activity, exposure to environmental contaminants, disease, and predation. The ESA gives the Secretary of the Interior the responsibility for deciding whether a species' survival has been so jeopardized that it warrants conservation actions; authority for administering the ESA for terrestrial and freshwater organisms has been delegated to the USFWS. Under the ESA, when a species is formally "listed" (i.e., added to the Federal List of Endangered and Threatened Wildlife and Plants) federal agencies are directed to use their legal authorities to carry out conservation programs to support continued survival of the species (USFWS 1999b). The New Mexico Wildlife Conservation Act [17-2-40.1 NMSA 1978] has similar provisions and covers species that are native to New Mexico.

According to the USFWS, a species is considered endangered when it is in danger of extinction within the foreseeable future throughout all or a significant portion of its range; it is considered threatened when it is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. SAR are typically state-listed species, candidates for federal listing, or species that have undergone a sharp decline and have potential to be listed under the ESA in the future. The DoD defines SAR as "species on lists maintained by USFWS, National Oceanic Atmospheric Administration Fisheries Service, and state agencies as threatened or endangered or candidates for such lists. SAR also includes species whose designation as threatened or endangered may require conservation efforts significantly impacting a military mission."

The DoD considers the protection of SAR to be critical, and INRMPs should consider funding for SAR protection a high priority (DoDI 4715.03). All DoD Components are required to establish policy and procedures for the management of SAR and to prioritize proactive management of those species that, if listed, could adversely impact military readiness. Program objectives are to focus on efforts that have the greatest potential to prevent the listing of SAR (e.g., habitat conservation, planning level surveys, monitoring) (DoDI 4715.03). Army Regulation 200-1 requires installations to manage SAR and their habitats to prevent listing that could affect military

readiness, to program and plan for environmental conservation funding for SAR, to incorporate SAR management in the INRMP, and to implement management plans for SAR to include, but not limited to, survey, monitoring, habitat enhancement, and protection. The Army defines SAR as plant and animal species and associated habitats that are not federally listed as threatened or endangered under 16 USC Chapter 35 (ESA) but are either federally listed as candidates or are ranked by NatureServe as critically imperiled or imperiled throughout their range.

2.3.3.1 Flora

In the late 1980s, the Army's Land Condition Trend Analysis program was instrumental in initiating a systematic search for plant species. In 1988, Richard Spellenberg of NMSU began surveying, collecting, and identifying vascular plants on WSMR. By 1991, he had compiled a list of 820 plant taxa. Collecting and cataloging the plants of WSMR is an ongoing activity. The plant inventory effort has been a primary undertaking of Dr. David L. Anderson, retired botanist, and the current herbarium includes 1,192 native taxa, 145 nonnative taxa, and a total of 4,785 individual specimens. The flora list is updated regularly and is maintained and available at the Environmental Division, Building 163. There is interest in digitizing this herbarium, so it can be shared with interested parties outside of the Environmental Division. No known threatened or endangered plant species are located on Mendiburu Ranch (USACE 2009).

Many plants important to Native American tribes are found on WSMR in the San Andres and Oscura Mountains. The WSMR Environmental Division coordinates with tribes to identify areas where sustainable harvesting may occur.

Sensitive Species

The New Mexico Energy, Minerals, and Natural Resources Department Forestry Division has statutory responsibility for the State Endangered Plant Species List. The Division is required to establish a program to promote conservation of listed endangered plant species, research, inventory, monitor, educate, and maintain habitat of these species and further investigate all plant species in the state for the purpose of establishing a list of endangered plant species. WSMR has unique habitats that are home to many floral species considered rare on state, national, and global scales. Three plant species are listed as New Mexico endangered, and an additional 14 species have a New Mexico State Natural Heritage ranking (Table 2.3-2). Some WSMR plant species of interest are not subject to laws and regulations related to federally- and state-listed species. However, they may be given preferential treatment—such as avoidance, protection, or transplanting—when projects that require activities coinciding with species of interest locations occur.

Federal and State Listed Endangered Species

Todsen's Pennyroyal

In the 1970's, Thomas Todsen accessed WSMR for botanical exploration and discovered a rare species: Todsen's pennyroyal. Todsen's pennyroyal occurs in the San Andres Mountains (Sierra County) and on the western slope of the Sacramento Mountains (Otero County) at elevations of 6,200-7,400 ft. There are fifteen known populations of Todsen's pennyroyal on WSMR (Figure 2.2-3) (Britt 2012). The smallest population covers 0.1 acres and the largest covers 1.22 acres (WSMR 2009b). There are twenty-eight populations in the Sacramento Mountains east of WSMR (C. Britt, Contract Biologist – Mesa Ecological Services, Pers. Comm.). Todsen's pennyroyal is the only plant taxon on WSMR federally listed as an endangered species. It was originally listed as endangered—with critical habitat for two known populations—on January 19, 1981 (USFWS 1981). New Mexico has also listed Todsen's pennyroyal as endangered. The Todsen's Pennyroyal ESMC was developed to facilitate protection of this endangered species (Appendix

B; Britt 2018). The ESMC defines the conservation goals and management objectives, and it prescribes management actions for populations of Todsen's pennyroyal on WSMR.

Todsen's pennyroyal populations occur in rugged and remote areas that have no vehicle entry and receive very little land use by the managing agencies or the public. The prevailing land use in and around the WSMR populations consists of flyovers and possible military weapons testing, which could cause impact-related wildfires. It is possible that current testing could have small, limited impacts on individuals within populations. Any fires caused by a weapons testing event are unlikely to create a catastrophic wildfire due to vegetation spacing and a lack of fine fuel. Additionally, areas of known populations, critical habitat, and 0.5 km buffer areas will remain off-limits to ground-disturbing activities (Britt 2018). WSMR operational constraints also limit activities to slopes less than 40% throughout WSMR (Britt 2015, Britt 2018, WSMR 2009b). WSMR has reduced Todsen's pennyroyal protected areas in the San Andres Mountains by 81% by conducting additional population searches in potential habitat (Britt 2019). Predictive modeling indicates that additional pennyroyal searches are warranted on the Mendiburu Ranch. Additional searches will be conducted as funding allows.

Night-blooming Cereus

Night-blooming cereus (*Peniocereus greggii* [Engelmann] Britton and Rose var. *greggi*) is a New Mexico endangered species. On WSMR, most populations of night-blooming cereus have been found on eastern and western slopes of the San Andres Mountains, south of Sulfur Canyon. A survey for this species in 1998 on WSMR reported eight populations (EMNRD 2017, McCarthy et al. 1999, New Mexico Rare Plant Technical Council [NMRPTC] 1999).

Organ Mountain Pincushion Cactus

Organ Mountain pincushion cactus (*Escobaria sneedii organensis*) is a New Mexico endangered species (EMNRD 2017). It occurs in Texas Canyon and is likely to occur in any region where the Organ Mountains extend onto WSMR. Species nomenclature has now become a synonym of *Coryphantha sneedii* (Britton and Rose) A. Berger (NMRPTC 1999, Porter 2020). Porter (2020) characterized genetic variation within the *Coryphantha sneedii* complex, using genomic scale genetic markers in order to determine genetic diversity, investigate population structure, determine population genetic divergences, and estimate gene flow (migration rates) supporting or refuting the presence of a single, genetically integrated species.

Mescalero Milkwort

Mescalero milkwort (*Polygala rimulicola* Steyermark var. *mescalerorum* Wendt and Todsen) is a New Mexico endangered species (EMNRD 2017, NMRPTC 1999). Despite surveys within suitable habitat, only two small populations less than 0.3 miles apart are known (Frazier 1997)—both at elevations of 5,700-6,300 ft on WSMR (Wendt and Todsen 1982, Frazier 1997).

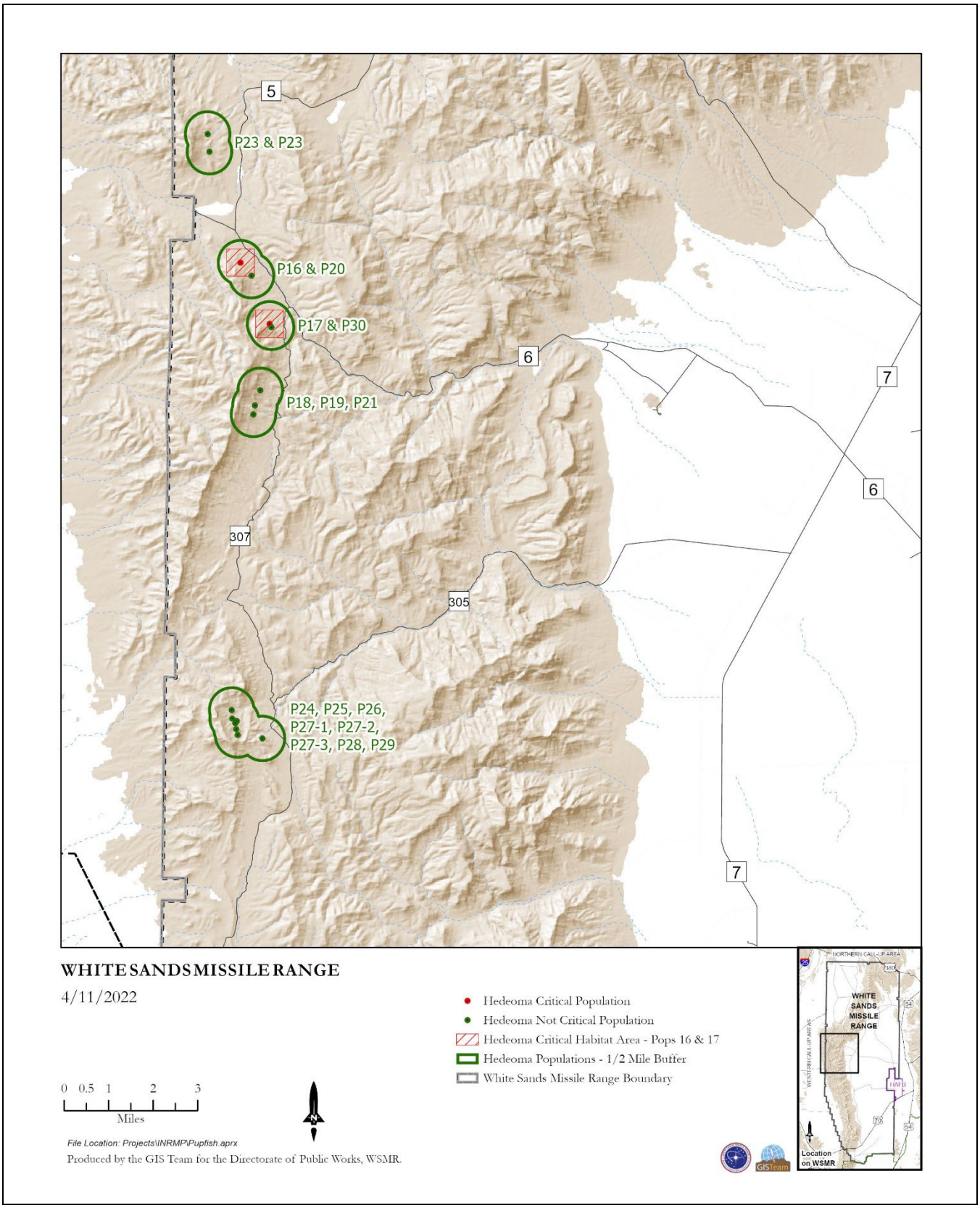

Figure 2.2-3. Todsen's Pennyroyal Populations and Protected Areas.

Federal and State Species of Concern

There are no federal species of concern on WSMR. There are 14 species with special status as determined by Natural Heritage New Mexico (Table 2.3-2) (NMRPTC 1999).

Table 2.3-2. Floral State Species of Concern and WSMR Species of Interest.

Species	New Mexico Status[a]	BLM Status[b]	USFS Status[c]	Global Rank[d]	WSMR Species of Interest	Occurrence
Organ Mountains Evening Primrose (*Oenothera organensis*)	S2	-	-	G2	-	Documented in the Organ and San Andres Mountains *
Alamo Beardtongue (*Penstemon alamosensis*)	S3	Sen	Sen	G3	-	Single occurrence located in mouth of Bear Canyon*
Mosquito Plant *(Agastache cana)*	S3	-	-	G3	X	Lower canyons and slopes of Organ Mountains*
Castetter's Milkvetch (*Astragalus castetteri* Barneby)	S3	-	-	G3	-	Collected from San Andres Mountains *
Warner's Dodder (*Cuscuta warneri*)	S1	-	-	G1	X	Anecdotal evidence shows this plant occurs in Sierra County*
Sandberg's Pincushion Cactus (*Escobaria sandbergii* Castetter, Pierce and Schwerin)	S2	-	-	G2	-	Occurs in the southern San Andres Mountains
Vasey's Bitterweed (*Hymenoxys vaseyi*)	S2	-	-	G2	-	Occurs in the southern San Andres Mountains and Organ Mountains
New Mexico Rockdaisy (*Perityle staurophylla* [Barneby] Shinners var. *staurophylla*)	S3	-	-	G4T3T4	-	Occurs in San Andres Mountains
San Andres Rockdaisy (*Perityle staurophylla* [Barneby] Shinners var. *homoflora* T.K. Todsen)	S2	-	-	G4T2	-	Occurs in San Andres Mountains
Silver Mock orange (*Philadelphus microphllus* Gray subsp. *Argyrocalyx* [Wooton] C.L. Hitchccock)	S3	-	-	G4	-	Occurs in San Andres Mountains, Chalk hills

Species	New Mexico Status[a]	BLM Status[b]	USFS Status[c]	Global Rank[d]	WSMR Species of Interest	Occurrence
Plank's Catchfly or Campion (*Silene plankii* C.L. Hitchcock and Maguire)	S2	-	-	G2	-	Found on Salinas Peak and at Mockingbird Gap
Sivinskis Scorpionweed (*Phacelia sivinskii* Atwood, Knight and Lowrey)	S3	-	-	G3	-	Occurs in San Andres Mountains and Chupadera Hills
La Jolla Prairie Clover (*Dalea scariosa* S. Watson)	S3	-	-	G3	-	Found in Bosque Canyon in San Andres Mountains
New Mexico Beardtongue (*Penstemon neomexicanus* Wooton and Stanley)	S4	-	-	G4	X	Occurs in Oscura Mountains

[a] New Mexico state Status (Natural Heritage): S1-Critically Imperiled Species, S2-Imperiled Species, S3-Vulnerable Species, S4 – Apparently Secure
[b] BLM Status: Sen – Sensitive
[c] USFS Status: Sen – Sensitive
[d] Global Rank: G1 – Critically Imperiled, G2 – Imperiled, G3 – Vulnerable, G4 – Apparently Secure, T# = Intraspecific Taxon
* Official Enterprise GIS data

2.3.3.2 Fauna

Fish

White Sands Pupfish

The White Sands pupfish is NMDGF listed as threatened under the New Mexico Wildlife Conservation Act (BISON-M 2020). This species is scheduled to have a species status assessment and 12-month finding on a petition to list the species under ESA and, if warranted, a listing proposal in Fiscal year 2025 (National Domestic Listing Workplan, https://www.fws.gov/sites/default/files/documents/national-domestic-listing-workplan_0.pdf). The White Sands pupfish is a priority 2 Army species at risk (Balbach et al. 2010).

White Sands pupfish is endemic to the Tularosa Basin, where it is known from Mound Spring, Salt Creek, and Malpais Spring (Miller and Echelle 1975, Stockwell et al. 1998, Pittenger and Springer 1999, Pittenger 2015). A fourth population occurs in Lost River on HAFB (Miller and Echelle 1975, Suminski 1977, Jester and Suminski 1982, Echelle et al. 1987). Salt Creek and Malpais Spring populations are native while South Mound Spring, North Mound Spring, Mound Spring, and Lost River populations were established through translocation. The population of pupfish at Mound Spring was established sometime between 1967 and 1973, and the Lost River population was established in 1970 (Pittenger and Springer 1999). The extremely limited distribution and geographic range of White Sands pupfish makes it vulnerable to extinction from natural and anthropogenic causes (WSMR 2020a). To protect viable populations, WSMR has entered into a cooperative agreement that delineates an effective and cooperative working relationship between its signatories in protecting and maintaining viable populations of the White Sands pupfish in its habitats on WSMR, HAFB, and WSNP (Appendix D; WSMR 2020a).

Approximately 250 pupfish from Malpais Spring were translocated to North Mound Spring in March 2017. Two hundred fifty pupfish from Malpais Spring were translocated to South Mound Spring in November 2018. White Sands pupfish occupy about 657 acres of spring outflow, cienega, and lagoon habitat at Malpais Spring. Approximately 20.4 miles of stream channel in Salt Creek are also inhabited. Habitat at Mound Spring is relatively small, consisting of four ponds—including Main Mound Spring (Upper and Lower Ponds)—with a total surface area of about 0.4 acres. Upper and Lower Ponds have maximum depths of 11 and 13.7ft, respectively. White Sands pupfish monitoring was initiated in 1995 and has been conducted at least once each year since then (Pittenger and Springer 1996, Pittenger 2009, Pittenger 2017, Pittenger 2020).

In 2020, a fish health analysis was conducted in Malpais Spring in preparation for translocations in 2021 (B. Bakevich, Rio Grande Basin Native Fish Supervisor – NMDGF, Pers. Comm.). No pathogens were detected. In 2021, NMDGF translocated 25 fish each to North Mound and South Mound Springs from Malpais Spring to supplement the current refugia populations. A fish health analysis was also conducted in Salt Creek in 2021 in preparation for translocations in fall of 2022 to Mound Spring and potentially Lost River (B. Bakevich, Rio Grande Basin Native Fish Supervisor – NMDGF, Pers. Comm.). No pathogens were detected.

There are three categories of White Sands pupfish habitat management: essential habitat, limited-use areas, and areas of concern (WSMR and HAFB 2015, WSMR 2020a) (Figure 2.2-4). Essential habitat is aquatic habitat that is occupied by White Sands pupfish on a perennial or intermittent basis. Essential habitat must be protected from adverse anthropogenic disturbances to ensure survival of the species (WSMR 2020a). All non-emergency vehicular traffic shall be restricted within essential habitat—with the exception of use of existing improved and unimproved roads (WSMR 2020a). Likewise, all non-emergency activities shall be restricted within essential habitats unless the responsible WMSR, HAFB, or WSNP official is consulted (WSMR 2020a).

Limited-use areas are lands adjacent to existing habitat where activities must be managed to ensure that degradation of essential habitat does not occur through direct or indirect effects, such as contaminant runoff and excessive soil erosion (WSMR 2020a). All reasonable precautions shall be taken in coordination with USFWS and NMDGF, as appropriate, to avoid or minimize degradation of essential habitat due to activities on limited-use areas (WSMR 2020a).

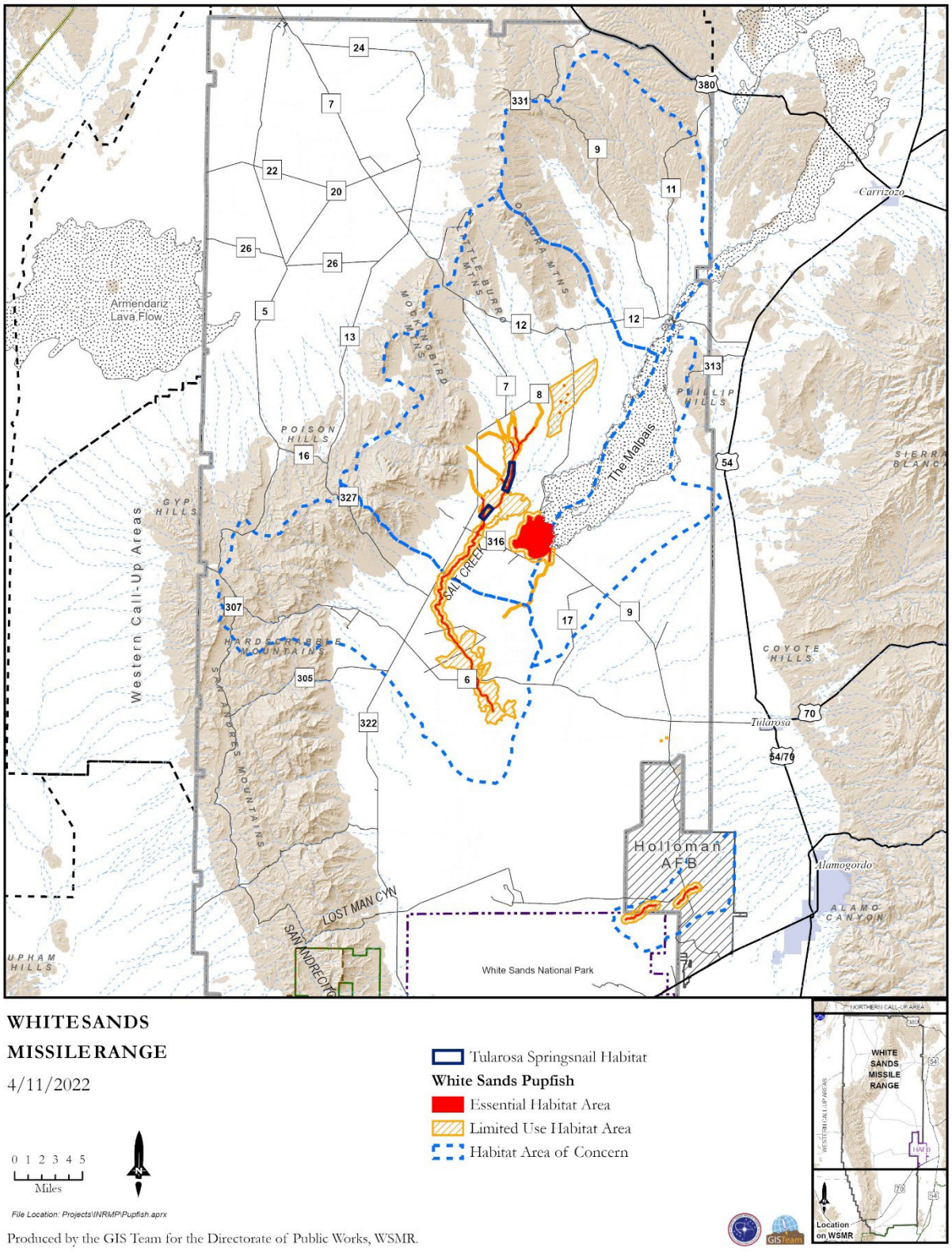

Figure 2.2-4. White Sands Pupfish and Tularosa Springsnail Habitat Areas.

Areas of concern consist of all watersheds within the topographic drainage basin of Salt Creek, Malpais Spring, Malone Draw-Lost River, and Mound Springs Complex (WSMR 2020a). Activities in these areas of concern will be considered for their cumulative impacts on White Sands pupfish habitats (WSMR 2020a).

Reptiles

Two of the five species of rattlesnakes occurring on WSMR are listed by NMDGF as SGCN.

Banded Rock Rattlesnake

The banded rock rattlesnake (*Crotalus lepidus*) is listed as NMDGF SGCN due to commercial trade, indiscriminate killing, and human encroachment on habitat. None of these factors are of significant impact on WSMR, but road construction and development of new sites in rocky montane habitats could reduce habitat for this species. On WSMR, this rattlesnake is known from rocky outcrops in the foot-slopes and upper mountain habitats in the Organ, San Augustin, San Andres, Mockingbird, and Oscura Mountains. They are the second smallest of the five species of rattlesnake that occur on WSMR. While they can be locally common, they are not widespread across the range (Burkett 2016). Only a few specimens have been collected from the Oscura and Mockingbird Mountains. The largest population recorded on WSMR is associated with large talus slopes around Salinas Peak in the San Andres Mountains.

Western Massasauga Rattlesnake

The western massasauga rattlesnake is listed as NMDGF SGCN due to conversion of grasslands to agriculture, herbicide, grazing, pet trade, indiscriminate killing, and fragmentation of populations. None of these factors are of significant impact on WSMR, but road construction and development of new sites in sandy desert grassland habitats in the Stallion Basin could reduce habitat for this species. The western massasauga on WSMR is known from the gypsum dune fields in the Tularosa Basin and sandy grass and shrub habitat in the Stallion Basin (Burkett 2021). Vehicular surveys for western massasauga rattlesnakes were conducted in the eastern Tularosa Basin and northern Jornada Basin within WSMR from April through mid-October 2020 (Burkett 2021). No massasauga were detected in the Tularosa Basin. Eight massasauga were found during road survey efforts in the northern Jornada Basin within in a 5-mile stretch of Range Road 7, south of Stallion Range Center (Burkett 2021). Genetic samples were collected and submitted for analysis in hopes to further understand the relatedness of this population to the species across its range. During the plan period, WSMR will continue to survey for the massasauga to better understand population distribution and habitat requirements. This information will be used to avoid and minimize impacts to this species on WSMR.

Birds

The 1988 amendment to the Fish and Wildlife Conservation Act mandates the USFWS to identify species, subspecies and populations of all migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA. The Birds of Conservation Concern identifies the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities of the USFWS (USFWS 2021). This document is intended to stimulate coordinated, collaborative, and proactive conservation actions among international, federal, state, tribal, and private partners. WSMR lies mostly within USFWS Bird Conservation Region 35. There are 27 species of Birds of Conservation of Concern (BCC) identified by the USFWS that may occur on WSMR. Of these 27 species, 14 are the focus of current management interest on WSMR (Table 2.3-3). The other 13 species include Clark's grebe (*Aechmophorus clarkii*), common nighthawk (*Chordeiles minor*), Broad-tailed hummingbird (*Selasphorus platycercus*),mountain

plover (*Charadrius montanus*), ferruginous hawk (*Buteo regalis*), Woodhouse's scrub-jay (*Aphelocoma woodhouseii*), evening grosbeak (*Coccothraustes vespertinus*), thick-billed longspur (*Rhynchophanes mccownii*), Cassin's sparrow (Peucaea cassinii), eastern meadowlark (*Sturnella magna*), Scott's oriole (*Icterus parisorum*), Grace's warbler (*Setophaga graciae*), pyrrhuloxia (*Cardinalis sinuatus*). These species may become future species of interest for WSMR.

NMACP presents high priority species in two broad categories, which are further sub-divided according to degree of vulnerability (NMACP 2016). Species of overall conservation concern are listed under the species conservation category and species of concern in maintaining state biodiversity under the biodiversity conservation category. Within each list, species are categorized into two levels of vulnerability:

- Level 1 includes species of high conservation concern in either category. These are species facing moderate to severe threats and showing unknown or declining local population trends. They are species in need of immediate conservation action.
- Level 2 species are of moderate or potential conservation concern in either category. They show some signs of vulnerability and may warrant careful monitoring.

Species conservation and biodiversity conservation categories are established based on the vulnerability factor importance of New Mexico to breeding. In total, 78 NMACP priority and stewardship species occur on WSMR (NMACP 2016).

Twenty-four species of birds documented on WSMR are federally or NMDGF listed as threatened or endangered or as a SAR (Table 2.3-3). The NMDGF listed endangered brown pelican (*Pelecanus occidentalis*) and the NMDGF listed threatened neotropic cormorant (*Phalacrocorax brasilianus*) are not discussed below since they occur at WSMR infrequently and sporadically as stopover or fly-over migrants (WSMR 2009a, WSMR 2002, Natural Heritage New Mexico 2003).

Table 2.3-3. Threatened and Endangered and Species at Risk Avifauna on WSMR.

Species	Federal Status	New Mexico Status	Status on WSMR
Yellow-billed Cuckoo Western population[A]	Threatened	SGCN*	A rare migrant confirmed sporadically. No breeding cuckoos have been documented, and breeding habitat does not occur on WSMR.
Costa's Hummingbird	USFWS BCC*	Threatened/SGCN	Rarely encountered on WSMR. No breeding documented.
Broad-billed Hummingbird	None	Threatened/SGCN	Rare migrant.
Snowy Plover	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Rare migrant.
Long-billed Curlew	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon in open grasslands.

Golden Eagle	BGEPA; DoD PIF Tier 2 Species	None	Rare in grasslands, deserts, and other open country, usually in mountainous areas. The WSMR breeding population appears to be stable over the last 10 years, with most breeding territories filled by adult breeding pairs.
Bald Eagle	BGEPA	Threatened/SGCN	Occasional during migration or winter months.
Flammulated Owl	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon in oak and pine woodlands.
Burrowing Owl	USFWS BCC; DoD PIF MSS	SGCN	Uncommon and local in open grasslands.
Northern Aplomado Falcon	Endangered, Nonessential Experimental Population	Endangered/SCGN	Rare year-round resident possibly extirpated. Last confirmation on WSMR - 8/15/2015.
Peregrine Falcon	Delisted	Threatened/SGCN	Nest in nearby Organ Mts. Occasionally observed on WSMR. May nest in the Oscura Mountains.
Olive-sided Flycatcher	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon. Uses riparian corridors.
Southwestern Willow Flycatcher	Endangered	Endangered/SGCN	Willow Flycatchers pass through during migration, but WSMR lacks adequate breeding habitat for the Southwestern subspecies, which has not been documented at WSMR.
Bell's Vireo	None	Threatened/SGCN	Rarely encountered.
Gray Vireo	None; DoD PIF Tier 2 Species	Threatened/SGCN	Breeds on WSMR. Common in canyons of San Andres Mts. and PJ woodlands of Oscura Mountains.
Loggerhead Shrike	None; DoD PIF Tier 2 Species	SGCN	Common throughout WSMR.
Pinyon Jay	USFWS BCC; DoD PIF MSS	SGCN	Declining in juniper and piñon/juniper habitats on WSMR.
Bendire's Thrasher	USFWS BCC; DoD PIF MSS	SGCN	No confirmed sightings on WSMR and unlikely to occur east of the Rio Grande.
Sprague's Pipit	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon and local in grasslands.
Chestnut-collared Longspur	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Common locally to uncommon in grasslands.

Black-chinned Sparrow	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon and local in chaparral and similar arid hillsides with brushy vegetation.
Baird's Sparrow	USFWS BCC; DoD PIF Tier 2 Species	Threatened/SGCN	Infrequently encountered in Stallion Basin grasslands.
Virginia's Warbler	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon. Use PJ woodlands and riparian areas.
Varied Bunting	USFWS BCC	Threatened/SGCN	Infrequently encountered.

[A] = Avifauna species are listed in accordance with Clements Checklist of Birds of the World
* USFWS BCC = Bird of Conservation Concern – species, subspecies and populations of migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA
*SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists)

Yellow-billed Cuckoo (Western Population)

The yellow-billed cuckoo (western population) is currently listed as a USFWS threatened species and a NMDGF SGCN (NMDGF 2016b, USFWS 2014a). Thompson et al. (1999) reported one yellow-billed cuckoo sighting in 1996 on Salt Creek and one in 1993 in the San Andres Mountains. In 2001, D. Holdermann reported two probable sightings, and in 2002 a single, yellow-billed cuckoo was observed at Davies Tank (Sadoti et al. 2003). Meyer (2006) reported a yellow-billed cuckoo in each of two successive surveys at a Salt Creek site. Davies Tank held the most promise as breeding habitat for this species, but this is no longer the case as riparian habitat has been greatly reduced (D. Burkett, Contract Biologist – WSMR, Pers. Comm., Burkett 2017). The initial study of southwestern willow flycatcher and yellow-billed cuckoo habitats across WSMR, found that potential habitats in 2002 and 2003 were marginal or poor (New Mexico Natural Heritage Program 2003). Prolonged drought over the past fourteen years since the initial delineation of southwestern willow flycatcher and yellow-billed cuckoo habitats has continued to degrade these previously marginal patches to the point that they were considered unsuitable for breeding by 2016 (Burkett 2016a).

Costa's Hummingbird

Costa's hummingbird is a USFWS BCC and is listed as threatened by NMDGF (BISON-M 2020). This hummingbird occurs on SANWR in the San Andres Mountains during the breeding season (Weisenberger and Howe 1996). These occurrences in potential breeding habitat in desert washes in the San Andres Mountains may indicate range expansion or may represent vagrant spring migrants (Williams 2000b). Sightings on WSMR include two males with territories at Mayberry Canyon in May 1995 and a male seen foraging in April 1996 near Cedar Site (Weisenberger and Howe 1996).

Broad-Billed Hummingbird

The broad-billed hummingbird is listed as threatened by NMDGF (BISON-M 2020). A single broad-billed hummingbird was observed in the WSMR housing area (Holderman 2000, Williams 2000a).

Snowy Plover

The western snowy plover (*Charadrius nivosus nivosus*) is the only subspecies of the snowy plover recognized in New Mexico (Bison-M). It is a USFWS BCC and a NMDGF SGCN and a Biodiversity Conservation Level 1 Species (NMACP 2016). The species was assessed for the

International Union for Conservation of Nature (IUCN) Red List of Threatened Species in 2020, and it is listed as a globally Near Threatened Species. The snowy plover is an occasional summer resident of WSMR that occurs near alkaline water sources in the Tularosa Basin when water is present. In 1996-1997, the plover was documented at Big Salt Lake, Malpais Spring, and Salt Creek at Range Road 316, where it was confirmed breeding in 1997 (Thompson et al. 1999). During May 2007, several sites were surveyed, and one adult plover was observed at Big Salt Lake (Mara Weisenberger, unpublished data). In July 2015, an adult plover was observed at Pup Spring east of Salt Creek (Doug Burkett, Contract Biologist – WSMR, unpublished data).

Long-Billed Curlew

The Long-billed curlew is a is a USFWS BCC, Biodiversity Conservation Concern Level 1 species, DoD PIF Tier 2 Species, and a NMDGF SGCN (NMACP 2016). The long-billed curlew is an uncommon migrant to open grasslands on WSMR and primarily breed in Plains-Mesa Grassland habitat in northeast NM (NMACP 2016). Recent evidence suggests a higher number of wintering curlews in the grasslands of the Mexican Plateau and the Chihuahuan Desert than previously known.

Golden Eagle

In 2013, TPF and the American Eagle Institute initiated an aerial survey for golden eagle nests within all potential breeding habitat on WSMR. There are currently 31 breeding territories documented on WSMR (excluding the Organ Mountains and SANWR) with over 240 nests (each pair with multiple nests). TPF conducts annual occupancy surveys of these territories and has documented high occupancy, with typically 85-95% of territories occupied by adult breeding pairs each year. There is also a population of wintering golden eagles and, presumably, a year-round floater population of eagles waiting for an opportunity to occupy a breeding territory. TPF has also initiated annual prey surveys to document trends in lagomorph abundance.

Top threats to golden eagles on WSMR include electrocution on power poles, vehicular strikes, and disturbance of active nests from military activities. TPF is also researching potential exposure to lead (via ammunition) from feeding on oryx gut piles. The WSMR APP has identified the most hazardous power poles, and those within 6 mi. of eagle nests are prioritized for remediation. Hundreds of poles have been remediated or are under contract for remediation, and, consequently, eagle electrocutions have been significantly reduced. Road signs warning of eagles feeding on roadways were funded by the Defense Threat Reduction Agency and installed in 2017 as mitigation for an eagle nest take permit where nests were in harm's way, and mortalities of eagles on roadways have also declined. Avoiding disturbance to nests is accomplished with buffer distances from active nests with eggs or nestlings (Appendix F). The need for buffers is assessed through coordination with customers. If take from disturbance can't be avoided, WSMR will apply for an eagle take permit from the USFWS. However, implementation of avoidance and minimization measures usually precludes the need for a take permit. Thus far, only one mission at WSMR has ever required an eagle take permit.

The following ongoing conservation measures are considered beneficial to eagles or their habitat: prescribed fire, erosion control, minimization of grassland fragmentation, limited use of rodenticides toxic to raptors (US Army 2021), and the WSMR Environmental Regulation (200-2), which prohibits harming birds or disturbing active nests. WSMR is currently implementing avoidance and minimization measures and mitigations for golden eagles on WSMR (Appendix F). Measures to monitor, manage, and conserve the Golden Eagle on WSMR are described in Objective 3, Section 4, of this INRMP—including the completion of the Draft WSMR Golden Eagle Mangement Plan.

Bald Eagle

The bald eagle was federally listed as endangered in 1967, reclassified as threatened in the lower 48 states in 1995, and was federally delisted in 2007; generally, bald eagle populations are expanding and increased encounters with this species are likely (USFWS 1995b, USFWS 2007). It is NMDGF listed as threatened and as a SGCN (BISON-M 2020). Periodically, Bald eagles are detected on WSMR; no nests or winter concentration sites occur (Biological and Conservation Database 2000, P. Cutler, Wildlife Biologist – WSMR, Pers. Comm.). More recently, bald eagles have been documented on four separate locations feeding on oryx carcasses in the Tularosa Basin (3 locations) and at Mockingbird Gap (1 location) (D. Burkett, Contract Biologist – WSMR, Pers. Comm.). While breeding of this species is not expected on WSMR, its utilization of gut piles and carcasses here underscores the importance of understanding lead issues—particularly in educating hunters and encouraging the use of lead-free ammunition.

Flammulated Owl

The flammulated owl is a is a USFWS BCC, NMDGF SGCN, and DoD PIF Tier 2 Mission Sensitive Species (DoD PIF 2021). It is also on the Species Conservation Level 1 List (NMACP 2016). It occurs primarily in open, mature to old ponderosa pine or other forests with similar features (Linkhart and McCallum 2020). On WSMR, the suitable breeding habitat may occur in Texas Canyon in the Organ Mountains, or perhaps in the open/sparse conifer forest of the Salinas Peak area. On 1 May 2021, NMSU graduate students documented three flammulated owls on WSMR in Texas Canyon in the Organ Mountains (Hailey Jacobsen, Master's Degree Student - NMSU, Pers. Comm). It is not known if they breed in the Organ Mountains, or if they are passing through during migration (Mara Weisenberger, Las Cruces District Office Monument Manager – BLM, Pers. Comm.). Nocturnal surveys are needed to understand if and where this species breeds on WSMR.

Burrowing Owl

The burrowing owl is a is a USFWS BCC, NMDGF SGCN, and DoD PIF Mission Sensitive Species (DoD PIF 2021, NMDGF 2016b). This species has been documented throughout the basins of WSMR during the breeding season, but anecdotal observations by biologists or other personnel are becoming less and less frequent (Trish Cutler, Wildlife Biologist – WSMR, Pers. Comm.). Although burrowing owls may be year-round residents on WSMR, they have not been documented during the non-breeding season (Cartron, 2010). The burrowing owl was likely common on WSMR before the black-tailed prairie dog (*Cynomys ludovicianus*) was extirpated from the range in the mid-20th century (Oakes et al. 2004). Currently, badger (*Taxidea taxus*), kit fox (*Vulpes macrotis*), banner-tailed kangaroo rat (*Dipodomys spectabilis*) burrows, and holes in cut-bank arroyos are the most likely sources of nesting habitat for the owl. A resurvey of former locations is necessary to determine if they are still present in historic locations on WSMR, and data from seven permanent raptor survey routes from the Stallion Basin and eastern Tularosa Basin will be analyzed for trends in numbers detected.

Northern Aplomado Falcon

The northern aplomado falcon had been considered extirpated from the United States since the late 1950s and was officially listed as an endangered species in 1986 (USFWS 1986). In July 2006, the USFWS published a final ruling for the aplomado falcon under Section 10(j), classifying the species as a Nonessential Experimental Population in New Mexico and Arizona (USFWS 2006). The aplomado falcon was first observed on WSMR in May 1991 (WSMR 2008). WSMR created the Endangered Species Management Plan for the Northern Aplomado Falcon to provide a summary of biological and ecological knowledge of the species, a description of management goals for WSMR, and the steps necessary for achieving those goals (Appendix B; Hartsough and

Burkett 2007). Observations of aplomado falcons have occurred sporadically over the past 29 years (Hartsough et al. 2016b, WSMR 2007a, WSMR 2007b). The 10(j) re-classification of the species facilitated the release of captive-reared birds in an effort to re-establish viable populations of aplomado falcons in Arizona and New Mexico. TPF initiated a reintroduction program in New Mexico in 2007 on WSMR and adjacent private, state, and federal lands. Releases of over 140 aplomado falcons occurred until 2012. This restoration effort was unsuccessful in establishing a re-introduced population of aplomado falcons and was discontinued in 2012. The last confirmed aplomado sighting on WSMR occurred in the summer of 2015 (Hartsough et al. 2015a). Presence of aplomado falcons from natural dispersal or colonization events is still possible, given maintenance of suitable habitat conditions. WSMR will continue to conduct aplomado falcon surveys every other year on the 7 permanent routes that were established in 1996 (Hartsough et al. 2016b).

Peregrine Falcon

The subspecies *F. p. anatum* was federally listed as endangered in 1970 and delisted in 1999 (USFWS 1970, USFWS 1999a). It is listed by NMDGF as threatened (BISON-M 2020). NMACP lists it as a Species Conservation Concern Level 1 species (NMACP 2016). Observations of peregrine falcons have occurred throughout WSMR and on lands adjacent to WSMR (D. Burkett, Contract Biologist – WSMR, Pers. Comm., Biological and Conservation Database 2000, Kris Johnson, Director & Research Associate Professor – University of New Mexico, Pers. Comm.). Although the species has not been documented nesting within WSMR, adults have been observed numerous times outside of migration season and a sibling group was observed along the Hardscrabble Mountain escarpment during summer (P. Juergens, Vice President of Conservation, Domestic Programs – The Peregrine Fund, Pers. Comm.). This probably means that there are resident birds on WSMR (P. Juergens, Vice President of Conservation, Domestic Programs – The Peregrine Fund, Pers. Comm.).

Olive-Sided Flycatcher

The olive-sided flycatcher is a Biodiversity Conservation Concern Level 2 species, DoD PIF Tier 2 Species, and a NMDGF SGCN (NMACP 2016). Olive-sided flycatchers are associated with openings and edges in coniferous forest habitat (NMACP 2016). On WSMR, this species is an uncommon migrant and is primarily associated with riparian corridors (NMACP 2016). Olive-sided flycatchers primarily breed in the northern and central mountains of NM, extending south as far as the Mogollon and Sacramento ranges.

Southwestern Willow Flycatcher

The southwestern willow flycatcher subspecies was federally listed as endangered in 1995 (USFWS 1995a), and portions of its habitat were designated as critical habitat in 1997. NMDGF listed the southwestern willow flycatcher as endangered in 1988 (NMDGF 1988, BISON-M 2012). Migrant willow flycatchers have been documented on WSMR during spring migration (Burkett 2016a). A report of a single individual was reported in June 2009 at Davies Tank (WSMR 2009b). Surveys conducted in 2016 detected willow flycatchers during early migration along Salt Creek and at Davies Tank, but no southwestern willow flycatchers were detected during subsequent survey periods (Burkett 2016a). Davies Tank once held the most promise as breeding habitat for southwestern willow flycatchers, however current riparian habitat conditions are not suitable for breeding flycatchers (Burkett 2017, Meyer 2006). Surveys of Davies Tank in 2017 found that the previous thicket of coyote willow (*Salix exigua*), Gooding's willow (*Salix goodingii*) and cattail have all succumbed to lack of water flow due to reconfiguration of the effluent from the WSMR sewer treatment facility (Burkett 2017). Marginal habitat at this site no longer exists after a new effluent pipe to the earthen holding tanks was constructed.

A habitat delineation study concluded that southwestern willow flycatcher and yellow-billed cuckoo breeding habitat on WSMR is marginal, limited in area, and widely dispersed (New Mexico Natural Heritage Program 2003). The likelihood of southwestern willow flycatcher and yellow-billed cuckoo population persistence on WSMR is limited by the size and geographic distribution of riparian habitats (New Mexico Natural Heritage Program 2003). Since that time, riparian habitat has diminished across WSMR due to drought, new construction, and maintenance of earthen tanks (Big Brushy Tank and Davies Tank).

Bell's Vireo

Bell's vireo is NMDGF listed as threatened and as a SGCN (BISON-M 2020). NMACP lists it as a Biodiversity Conservation Level 1 species (NMACP 2016). Bell's vireo has been documented in the San Andres Mountains, but there has been no evidence of breeding (Williams 2000c).

Gray Vireo

The gray vireo is listed by NMDGF as threatened and a Category I ("Immediate Priority") SGCN (NMDGF 2016a, NMDGF 2016b). NMACP lists it as a Conservation Concern Level 1 species (NMACP 2016). This species is on the Tier 2 list of the DoD PIF MSS List (DoD PIF 2021). NMDGF recommended improving the knowledge of the ecology of the species and the impacts of habitat use or alteration rather than specific actions to recover the species (Pierce 2007).

On WSMR, breeding populations occur in the Oscura Mountains in juniper savanna and canyon habitats; for the San Andres Mountains, in or adjacent to desert riparian corridors in canyon watersheds (Williams 2000b, Hobert et al. 2009). Gray vireo surveys in the San Andres Mountains reported 196 territories (Hobert et al. 2009), and surveys in the Oscura Mountains in May 2019 resulted in 81 territories (Johnson et al. 2020). More extensive line transect surveys in 2021 resulted in 120 gray vireo territories (L. Wickersham, Senior Project Manager – Animas Biological Studies, Pers. Comm.).

Primary threats to the gray vireo include loss or alteration of suitable nesting and wintering habitat (NMACP 2016). A reduction in juniper has resulted from clearing trees for livestock grazing, firewood cutting, drought, and insect infestation. Some of this loss has been offset (but not overcome) by increases in juniper as a result of long-term overgrazing of grasslands (NMACP 2016). The NMACP (2016) recommended that management for gray vireos in New Mexico should focus on the protection of existing healthy piñon-juniper (PJ) woodlands in order to minimize the impacts of recent and ongoing loss of this habitat to drought and beetle infestation. Areas containing only juniper and a shrub component that provide suitable habitat for gray vireos should be conserved. Specific recommendations include:

- Restrict clearing or woodcutting in areas of healthy and intact PJ habitat.
- When and where feasible, initiate restoration of PJ habitat.
- Maintain 35-45% shrub cover over large areas in middle-aged stands of juniper or PJ.

The DoD Legacy program funded gray vireo research on WSMR, Army National Guard Camel Tracks Training Site, and Kirtland Air Force Base in New Mexico (Johnson et al. 2012). Mean territory size across sites was 2.3 ha (Wickersham et al. 2020). Vireos selected nest sites with more trees and taller trees (3.3 to 4.0 m)—but not the tallest trees—compared to available habitat within their territories, and this trend was also observed on BLM lands in other areas in New Mexico (Johnson et al. 2012, Wickersham et al. 2020). Higher tree density at nest sites versus surrounding habitat may help conceal nests from predators and cowbirds and provide more foraging opportunities on leaves, branches, and tree trunks close to nests (Johnson et al. 2012). Habitat modeling characterized 30,074 acres of potential habitat in the northern Oscura

Mountains. In 2019, WSMR began treating about 20% of this area with prescribed fire, herbicide treatments, and thinning.

WSMR is currently conducting prescribed burns and herbicide treatments targeting juniper within gray vireo breeding habitat in the Oscura Mountains (Bumgarner 2019). Prescribed burns are not likely to impact the species, and could benefit it, if juniper mortality is relatively low (<25%) and burns are carried out prior to nesting season. Herbicide treatments would only be used in areas of slight to moderate slopes (<20% slope) and where prescribed fire treatments are ineffective due to the lack of continuous fine ground fuels, the large size and density of juniper trees, and where mechanical or manual treatments would not be cost effective (Bumgarner 2019). In 2019-2020, 42 gray vireo nests were found within the areas that will be treated with herbicide. WSMR is implementing management actions to avoid/minimize impacts to gray vireos on WSMR (Appendix J).

Pre-treatment monitoring of the herbicide treatment polygons was initiated in 2020 and continued in 2021. Gray vireo surveys and nest searches, point counts for all PJ birds, and vegetation surveys were conducted. Methods used were consistent with those being used by other agencies in the state to monitor the effects of various woodland treatments on PJ birds. Gray vireo nests were buffered by a 115-m radius (representing a 10-acre area), and herbicide treatment polygons were redrawn to exclude the buffers. Treatments are planned for the fall of 2022, along with the recommended post-treatment monitoring of PJ birds.

Forty treatment and forty control plots were established for vegetation monitoring with line-point intercept methods, for which tree density, species, and size were recorded. Monitoring methods are similar to those being used by the BLM to monitor herbicide treatments in New Mexico and to the ongoing Assessment, Inventory, and Monitoring Strategy on the Las Cruces and Socorro BLM Districts. Plots will be read two years after herbicide treatments and, thereafter, every 5 years to assess treatment effects on vegetation and wildlife.

Research needs for the gray vireo include surveys in unsurveyed habitat, a population size estimate and density for the Oscura and San Andres populations (initiated in the Oscura Mountains in 2021), monitoring of known populations, habitat use, response to treatments, and reproductive success. Adaptive management after assessing response to treatments will be an important process for this species.

Loggerhead Shrike

The loggerhead shrike is a DoD PIF Tier 2 Species and a NMDGF SGCN. Loggerhead shrikes are common throughout WSMR in lowland habitats. This species is associated with open country and with short vegetation, including desert grasslands and shrublands and open woodlands or juniper savannahs (NMACP 2016).

Pinyon Jay

The USFWS was formally petitioned to list the pinyon jay as threatened or endangered under the ESA, and to designate critical habitat (Estrella 2022). The USFWS will begin the 90-day finding process to determine whether the petition presents substantial information indicating that the petitioned action may be warranted, and if so, will initiate a status review of the species and issue a 12-month finding indicating whether the petitioned action is warranted or not warranted. The pinyon jay is a DoD PIF MSS and a NMDGF SGCN (DoD PIF 2021). Natural Heritage New Mexico ranks the pinyon jay as imperiled/vulnerable (S2/S3) in New Mexico (Johnson et al. 2020b). Its NatureServe global rank is G3, meaning vulnerable throughout its range (Johnson et al. 2020b). NMACP (2016) ranks the pinyon jay as a Conservation Concern Level 1 species, the highest bird

conservation priority. The species was listed as Vulnerable on the Red List of Threatened Species by the IUCN in 2004, meaning it faces a high risk of extinction in the medium-term future if current population declines continue (IUCN 2018, Somershoe et al. 2020). This species occurs on WSMR in PJ habitats in the Oscura and San Andres Mountains, in which it has a mutualistic relationship with the piñon pine. Pinyon jay surveys have been conducted in the Oscura Mountains periodically since 2004 (Johnson et al. 2020).

Potential threats to this species throughout its range include human alteration of woodlands, drought, climate change, and fire suppression. Noise disturbance and piñon nut harvesting may also impact the pinyon jay (Somershoe et al. 2020). Objectives of WSMR's current pinyon jay study in the Oscura Mountains include:

- Re-survey historical nesting colony sites and document active and inactive nests.
- Survey areas in the North Oscura Peak area proposed for selective tree thinning and prescribed burning.
- Document the health and structure of piñon trees and state of piñon cone crops on monitoring transects.
- Provide management recommendations to avoid/minimize impacts to pinyon jays (Appendix J).

Surveys in 2019 failed to find active nests but did detect several active flocks of pinyon jays in the North Oscura Peak area. The estimated flock size was approximately half of previous surveys conducted in the area (Johnson et al. 2020). Piñon tree health and vigor has decreased precipitously in this habitat, likely due to decreasing cool season rainfall (Johnson et al. 2020). In 2021 a flock of 35+ was found on the Mendiburu Ranch north of U.S. 380. This flock likely includes birds from the North Oscura Peak nest colony site that have joined with other flocks to form a larger flock. It is possible that with less frequent and smaller piñon mast crops, resource use could be shifting to alternative foods such as insects (Trish Cutler, Wildlife Biologist – WSMR, Pers. Comm.). Nesting may occur closer to these alternative resources, and nests could be more dispersed than a nest colony in a piñon stand. Future research will include annual monitoring of the flock and nest sites, documenting flock home range via telemetry, and understanding seasonal resource use within the flock's home range. This information will allow WSMR to more easily minimize conflict with the siting and timing of missions or woodland management activities in the Oscura Mountains (Appendix J). Information on reproductive success is needed to understand viability of the flock.

Retention of the Oscura flock is important for woodland health on WSMR, as the pinyon jay is the only long-distance disperser of piñon nuts in this ecosystem. The Conservation Strategy for the pinyon jay outlines several management recommendations that WSMR is implementing, including 500-m buffers around nest sites (both historic and current), avoiding treatments at significant foraging or caching sites, and the minimization of disturbance during the nesting season (Somershoe et al. 2020). The pinyon jay should also benefit from woodland management practices that improve woodland health or maximize the production of piñon mast crops. Retention of water sources may also be prudent, but it is not known if pinyon jay reproductive success is related to access to free-standing water (Kris Johnson, Director & research Associate Professor – University of New Mexico, Pers. Comm.).

Remote camera surveys at water sites in the San Andres Mountains documented a flock of about three dozen birds in May of 2021 (Doug Burkett, Contract Biologist – WSMR, Pers. Comm.). Pinyon jays documented at Hardin Ranch, Rosebud Spring, and Grapevine Spring are close

enough in proximity to likely be from the same flock (Kris Johnson, Director & research Associate Professor – University of New Mexico, Pers. Comm.). A flock of 135 pinyon jays was seen southeast of Big Gap in the Chalk Hills in September of 2018 (Charles Britt, Contract Biologist – Mesa Ecological Services, Pers. Comm.). Nest sites in the San Andres Mountains have not yet been investigated; however, WSMR has initiated surveys in 2022 for this species in the San Andres Mountains in accordance with survey protocols published by the Pinyon Jay Working Group.

Bendire's Thrasher

The Bendire's Thrasher is a DoD PIF Mission Sensitive Species (DoD PIF 2021), a NMDGF SGCN, and a Conservation Concern Level 1 Species (NMACP 2016). The species is listed as Vulnerable on the IUCN Red List of Threatened Species. This species has been included on past versions of the WSMR bird species checklist but has not been confirmed and is not likely to occur here. The range of this species is primarily west of the Rio Grande, with very few locations to the east of the river and no historic records known from WSMR (Corrie Borgman, Wildlife Biologist – USFWS, Pers. Comm.). A survey conducted in potential habitat on WSMR in 2016 did not result in any sightings of this species (Martha Desmond, Regents Professor, Fish, Wildlife, and Conservation Ecology - NMSU, unpublished data).

Sprague's Pipit and Chestnut-Collared Longspur

These two species of wintering birds are Conservation Concern Level 1 species, DoD PIF Tier 2 Species, and NMDGF SGCN (BISON-M 2021, NMACP 2016). These species are uncommon and local in grasslands on WSMR. Management recommendations for these species include avoiding fragmentation of desert grasslands and using prescribed fires to reduce shrub invasion and to maintain grassland heterogeneity. WSMR has submitted a funding request to install a Motus Wildlife Tracking System in grasslands to document species tagged elsewhere that fly through WSMR.

Black-Chinned Sparrow

The black-chinned sparrow is a NMDGF SGCN (BISON-M), and it is a Conservation Concern Level 2 species (NMACP 2016). It is also a DoD PIF Tier 2 Mission Sensitive Species (DoD PIF 2021). WSMR is within the breeding range of the black-chinned sparrow and could also harbor wintering sparrows from other areas off-range. Breeding habitat is typically arid brushlands on rugged mountain slopes from sea level to almost 2,700 m (Tenney 2020). Brush is generally tall (1–2 m), at least moderately dense, of mixed species, and broken by rocky outcrops and scattered large shrubs or trees (Tenney 2020). Topography is gently to steeply sloped. This species prefers young stands with openings or alleyways through brush, but it avoids overgrown stands (Tenney 2020). A partial migrant, in winter the black-chinned sparrow generally moves downslope or south into desert scrub and dry washes (Tenney 2020). On WSMR, little is known about this sparrow except that it occurs in the Oscura and San Andres Mountains.

Baird's Sparrow

Baird's sparrow is listed as threatened by the NMDGF and a SGCN (BISON-M 2020, NMDGF 2016b). NMACP lists it as a Conservation Concern Level 1 species (NMACP 2016). Baird's sparrow has been documented within WSMR on the Jornada Plain in Socorro County (Biological and Conservation Database 2000, Hartsough et al. 2015b). Individuals were observed in open yucca grasslands where dominant grasses were alkali sacaton, black grama, three-awn, and burrograss (Biological and Conservation Database 2000). Baird's sparrow does not breed in New Mexico and is considered a migrant and an uncommon winter resident on WSMR. The primary strategy available to support wintering populations of this (and other) grassland species involves

conservation and rehabilitation of the grasslands in Jornada Plain as well as minimizing fragmentation.

Virginia's Warbler

The Virginia's warbler is a NMDGF SGCN and a Conservation Concern Level 1 species (NMACP 2016). This warbler is uncommon in PJ woodlands and riparian areas on WSMR. This species occurs at middle elevations, where coniferous woodland or forest mixes with deciduous shrubs or trees (NMACP 2016). Across its range, this species is primarily associated with pinyon-juniper and oak woodlands (NMACP 2016). A dense understory is critical, and steep draws or scrubby hillsides are especially favored (Sedgwick 1987, Yanishevsky and Petring-Rupp 1998, NMACP 2016). During spring and fall migration, the species uses lower elevation foothills and cottonwood-dominated riparian corridors (Phillips et al. 1964, NMACP 2016).

Varied Bunting

The varied bunting is a NMDGF SGCN (NMDGF 2016b). Williams (2000b) reported that varied bunting rarely breed on SANWR. Five varied buntings were captured and banded on WSMR and three were captured and banded on SANWR in 2012 (Southwestern Ornithological Research and Adventures 2012). Varied buntings were detected in Texas Canyon during summer and fall surveys in 2015 (Hartsough et al. 2015b).

Varied Buntings occur in brushy desert canyons and along washes and riparian edges, and less commonly in open desert with dense vegetation (Lockwood 1995, Groschupf and Thompson 1998). Management for varied bunting on WSMR should focus on maintaining dense arroyo riparian vegetation, especially in areas closely surrounded by canyon walls or hillsides (NMACP 2016); maintaining tall, dense grasses on hillsides, in canyons or draws where dense riparian vegetation is present (NMACP 2016); and maintaining structure of habitat in known areas of occurrence. Management efforts should also include monitoring known populations and surveying for new populations (NMACP 2016).

Mammals

Currently no USFWS listed mammal species occur on WSMR. However, the federal and state endangered Mexican gray wolf has established packs in the Gila and Cibola National Forests, and transient wolves have been documented on lands adjacent to WSMR (C. Rodden, Wildlife Biologist/Pest Management Coordinator - WSMR, Pers. Comm., NMDGF 2016b, USFWS 2015). The Mexican gray wolf is the rarest subspecies of gray wolf in North America and was listed as endangered in 1976 (USFWS 2015). The USFWS has been engaged in efforts to conserve and ensure the survival of the Mexican gray wolf for over three decades. The species is designated as a nonessential experimental population in New Mexico and Arizona (USFWS 1998b). The USFWS began reintroducing Mexican gray wolves back into the wild in the Mexican Gray Wolf Experimental Population Area (MWEPA) in Arizona and New Mexico in 1998 (USFWS 1998d, USFWS 2014b, 63 FR 1752).

WSMR is a federal cooperating agency for Mexican gray wolf recovery and was originally designated as the White Sands Wolf Recovery Area (WSWRA) (USFWS 1998d, USFWS 2014b). The USFWS has reevaluated the WSWRA and has concluded that it is unlikely to improve the effectiveness of the Mexican Wolf Reintroduction Project in managing the experimental population of Mexican gray wolves (AMOC and IFT 2005, Paquet et al. 2001, USFWS 2014b). Therefore, the designation of the WSWRA for the reintroduction of Mexican gray wolves has been removed (87 FR 39348). The USFWS considers WSMR to be part of Zone 2 within the MWEPA (87 FR 39348). Within Zone 2, Mexican gray wolves would be allowed to naturally disperse into and occupy areas; this is also where Mexican gray wolves may be translocated. On federal lands

within Zone 2, initial releases of Mexican gray wolves would be limited to pups less than five months old to allow for the cross-fostering of pups from the captive population into the wild and to enable translocation-eligible adults to be re-released with pups born in captivity (USFWS 2014b).

Two NMDGF threatened mammal species documented on WSMR include the spotted bat and Colorado chipmunk [two subspecies] (Table 2.3-4). A single mammal, the Townsend's big-eared bat (*Corynorhinus townsendii*), is listed by NMDGF as a SGCN.

Table 2.3-4. Threatened and Endangered and Species at Risk Mammals on WSMR.

Species	Federal Status	New Mexico Status	Status on WSMR
Spotted Bat	None	Threatened/SGCN	Few specimens documented on WSMR, apparently uncommon to rare.
Townsend's Big-eared Bat	None	SGCN	Significant roost site at Victorio Peak and Fairview Mining District. Captured at 5 of 16 sites on WSMR during 2014.
Organ Mountains Colorado Chipmunk	None	Threatened/SGCN	A small area of habitat within WSMR occurs in portions of Texas and Ash Canyons in the Organ Mountains.
Oscura Mountains Colorado Chipmunk	None	Threatened/SGCN	Stable populations occur within PJ habitats in the Oscura Mountains.
SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists) Current USFWS listing can be found at https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B0FV			

Spotted Bat

The spotted bat is NMDGF listed as threatened (BISON-M 2020). It has been documented in the Tularosa Basin at Mound Spring (Chung-MacCoubrey 2000) and Oscura Pond (Hartsough et al. 2015d). In the Stallion Basin, a single individual was captured at Greens Baber Tank (Hartsough et al. 2015d). A spotted bat was documented at Borrego Spring, which is located within the WSMR NCUA area near Bingham, Socorro County (Chung-MacCoubrey 2000). Audible calls of spotted bats were heard at additional sites on WSMR, and three individual spotted bats have been reported on buildings at HAFB (BCI 2021, Biological and Conservation Database 2000, Chung-MacCoubrey 2000).

Spotted bat foraging habitat can include forest openings and subalpine mountain meadows in spruce, pine, and piñon-juniper woodlands, large/riverine/riparian areas, and riparian habitat associated with small streams in narrow canyons, wetlands, and meadows. The dependency on rocky cliff-roosting habitat within 40 km of foraging areas may limit spotted bats to very small geographic areas with specific geologic features. The greatest conservation needs for this species are conservation of foraging habitat and roost site protection (Luce and Keinath 2007); however, very little is known about spotted bat foraging and roosting sites on WSMR.

Townsend's big-eared bat

The Townsend's big-eared bat occurs throughout much of western North America, from British Columbia to Mexico, and eastward to Texas, with isolated populations in Kansas, Arkansas, Missouri, Oklahoma, Kentucky, West Virginia, and Virginia. The species occurs in Washington, Oregon, California, Nevada, Idaho, and possibly southwestern Montana and northwestern Utah

(BISON-M 2021). It has been detected at numerous sites across WSMR (Hartsough et.al. 2015, Corbett and Gilleland 2014). Victorio Peak may have one of the largest winter hibernacula of Townsend's big-eared bats in the western U.S. (Corbett and Gilleland 2014). This species also roosts in the Fairview Mining District of WSMR.

Although Townsend's big-eared bat forages in a variety of habitat types, its flight and echolocation style make it well suited to forage among the canopies and along the edges of mature forested stands (Gruver and Keinath 2006). Townsend's big-eared bats roost and hibernate in caves and under rocky outcrops in semi-desert shrublands, PJ woodlands, and open montane forests (Gruver and Keinath 2006). These bats are extremely sensitive to disturbance at roost sites, particularly during the reproductive season and during hibernation (Gruver and Keinath 2006); therefore, human activity in and near roosts must be minimized or eliminated, especially during reproductive and hibernal periods. Woodland management regimes, prescribed burns, and other vegetation management actions should strive to maintain a mosaic of mature forest canopy that can be perpetuated through time (Gruver and Keinath 2006). With many roost sites already identified, including Victorio Peak, roost site protection is a primary conservation strategy for this species on WSMR.

Colorado Chipmunk

The geographic range of the Colorado chipmunk includes three recognized subspecies: Organ Mountains Colorado chipmunk, Oscura Mountains Colorado chipmunk, and Colorado chipmunk (*N. q. quadrivittatus*) (Wilson and Reeder 1993). In New Mexico, *N. q. oscuraensis* and *N. q. australis* are isolated in the Oscura and Organ mountains, respectively (Sullivan 1996).

Organ Mountains Colorado Chipmunk

The Organ Mountains Colorado chipmunk is NMDGF listed as threatened (BISON-M 2021). It is a federal species of concern and is listed as sensitive by BLM (USFWS 2012a). The US Army considers the chipmunk a species at risk of being federally listed (Memorandum: *Army Species at Risk Policy and Implementing Guidance*, September 15, 2006). In the Organ Mountains, this chipmunk occurs on north-facing slopes at elevations of 6,000-7,300 ft (Patterson 1980). At the home range and within home range scales, chipmunks selected arroyos that were steep-sided, greener, and contained montane scrub land cover (Schweiger 2021, Schweiger et al. 2021). At the micro-habitat scale, chipmunks selected areas that had greater woody plant diversity, rock ground cover, and coarse woody debris ground cover (Schweiger 2021, Schweiger et al. 2021). There is no population estimate available for Organ Mountains chipmunks on WSMR (Sullivan and Wilson 2001, P. Cutler, Wildlife Biologist – WSMR, Pers. Comm.), although studies in Texas Canyon are ongoing by Dr. Jennifer Frey and students at NMSU. It is suggested that steep-sided arroyos provide thermal refuges for chipmunks (Schweiger 2021, Schweiger et al. 2021). Very little chipmunk habitat in the Organ Mountains occurs within the boundaries of WSMR.

Oscura Mountains Colorado Chipmunk

The Oscura Mountains Colorado chipmunk is listed as threatened by NMDGF (BISON-M 2021), primarily because it is endemic to a small, isolated habitat and there is potential for continued habitat loss (NMDGF 2016b). The Oscura Mountains Colorado chipmunk is a priority 2 Army species at risk (Memorandum: *Army Species at Risk Policy and Implementing Guidance*, September 15, 2006). This chipmunk is restricted to the Oscura Mountains entirely within boundaries of WSMR (Perkins-Taylor and Frey 2018, Perkins-Taylor and Frey 2020, Sullivan 1996). Surveys conducted from 2005 through 2008 detected Oscura Mountains Colorado chipmunks within 1.4 km of the northern WSMR boundary near Scholle Well. There are no population size estimates for this chipmunk.

This chipmunk relies on mature PJ woodlands, high elevation, and escarpments (Perkins-Taylor and Frey 2018, Perkins-Taylor and Frey 2020). Preliminary results of a microhabitat analysis suggest that chipmunks are selecting microhabitats with large-diameter old growth piñon pine (C. O'Connell, Master's Degree Student - NMSU and J. Frey, College Professor – NMSU, Pers. Comm.). In addition, the den site of a radio-collared chipmunk was found within a large-diameter old growth juniper (C. O'Connell, Master's Degree Student - NMSU and J. Frey, College Professor – NMSU, Pers. Comm.). The preliminary results require confirmation but suggest that both old growth piñons and junipers are key resources for the chipmunk and that management should seek to reduce impacts on these woodlands. Long-term monitoring of chipmunks using developed occupancy methods will allow managers to differentiate between natural population fluctuations and more severe overall population declines (Perkins-Taylor and Frey 2018).

Black-Tailed Prairie Dog

The black-tailed prairie dog has been extirpated from most of its former range in the arid desert grassland ecosystem of the Southwest, primarily due to systematic poisoning from 1918 to 1944 (Oakes et al. 2004). There are 47 records of prairie dog occurrence on WSMR (Oakes et al. 2004). Field surveys on WSMR and modeling efforts identified the highest suitability habitats consisting of a combination of deep and silty loam soils, with more than 30% cover, predominantly (48%) grass, and slopes of 0-2% were selected most frequently (Oakes et al. 2004). As of 2004, 209,332 acres were identified as highly suitable habitat with an additional 121,281 acres of moderately suitable habitat (Oakes et al. 2004). On WSMR, Oakes et al. (2004) estimated that 100,000 acres of prairie dog colonies existed prior to 1920, and by 1940 only 6 colonies remained, which were small and scattered. The final extirpation of the species on WSMR probably occurred during mid to late 1970's (Oakes et al. 2004). In 2004 and 2005, WSMR conducted black-tailed prairie dog and burrowing owl surveys at the Taylor Draw colony just outside of the northeast WSMR range boundary (Hartsough and Burkett 2006). There was an estimated a population of 612 prairie dogs in 2004 and 1772 prairie dogs in 2005 (Hartsough and Burkett 2006). Burrowing owl nest surveys resulted in an estimated population of 36 and 48 adults in 2004 and 2005, respectively, plus an unknown number of offspring.

2.4 Special Natural Areas

Special Natural Areas (SNAs) warrant special management practices independent of other resource management strategies because they harbor biological and/or physical elements that are important locally and/or regionally. Management goals in SNAs focus primarily on protection rather than restoration or improvement of the resource—although restoration would be considered if needed. There are eight SNAs defined within the boundaries of WSMR (Table 2.4-1).

Table 2.4-1. Special Natural Areas.

Special Natural Area (SNA)	Principal Characteristics
Western San Andres Mountains	A portion of the western San Andres Mountains harbors the federally Endangered Todsen's pennyroyal found on steep mountain slopes within the San Andres Mountains. This SNA includes populations of the plant, and Critical Habitat, surrounded by a ½ mile buffer area.
Aquatic Habitats	Salt Creek and several springs in the Upper Tularosa Basin EMU harbor endemic

Special Natural Area (SNA)	Principal Characteristics
	populations of the NMDGF Threatened White Sands pupfish. The Tularosa springsnail occurs within the Salt Creek drainage. These perennial waters are also a critical resource for other wildlife in the basin such as bats and migratory birds. Boundaries of this SNA are defined by the boundaries of the limited Use and essential Habitat defined in the White Sands pupfish Conservation Agreement.
Oscura Mountains Woodland/Escarpment	Relatively rare Piñon Pine/Scribner's Needlgrass plant community and mesic western wheatgrass meadows. Cliff faces provide nesting habitat for several pairs of golden eagles and other raptors. Piñon-juniper woodlands support several species at risk, including the Oscura Mountains Colorado chipmunk, pinyon jay, and gray vireo.
Salinas Peak Montane Habitat	Biogeographically unique relict populations of Ponderosa pine on Salinas Peak and Silver Top Mountain. A small relict stand of quaking aspen (*Populous tremuloides*) also exists on Salinas Peak.
Native Chihuahuan Desert Grasslands	Black grama grasslands occurring in the northern Jornada basin represent some relatively rare communities still existing in the Chihuahuan Desert. These grasslands are important habitat for wintering grassland bird species such as Baird's sparrow, and potentially for the western massasauga.
Subterranean Habitats (Mines, Caves)	Provide habitat for bats and other wildlife on WSMR. Restricted human access to help prevent the spread of White-nose Syndrome.
Gypsum Dunelands	White gypsum dunes provide unique habitat that harbors western massasauga rattlesnakes and unique white color morphs of three lizard species.
Carrizozo Lava Flow	Well-preserved flow structures that harbor unique color morphs and genetic isolates of two species of snakes Trans-Pecos ratsnake (*Bogertophus subocularis*) and

Special Natural Area (SNA)	Principal Characteristics
	Great Plains ratsnake (*Pantherophus emoryi*) and numerous dark color morphs of small mammals. Cracks, crevices, and caves are likely to support bat colonies. This flow is the subject of numerous scientific investigations.

2.5 Ecological Management Units

Land use on WSMR is discussed in the context of seven Ecological Management Units (EMUs): Jornada Plain, Lake Lucero/Dunes, Main Post/Lower Tularosa Basin, Oscura Mountains, San Andres Mountains, Southern Jornada, and Upper Tularosa Basin (Figure 2.5-1). EMUs have been developed so they can be managed separately from other units. Landforms, ecosystem processes, and conservation elements define each EMU (US Army 1997). EMU descriptions identify natural resources within the unit, ongoing natural resource management and monitoring, military infrastructure and activities, SNAs, Threatened and Endangered species, and Cooperative agreements that may limit or restrict military activities. Potential conflicts between missions and sensitive natural resources are identified and resolved whenever possible to avoid/minimize environmental impacts.

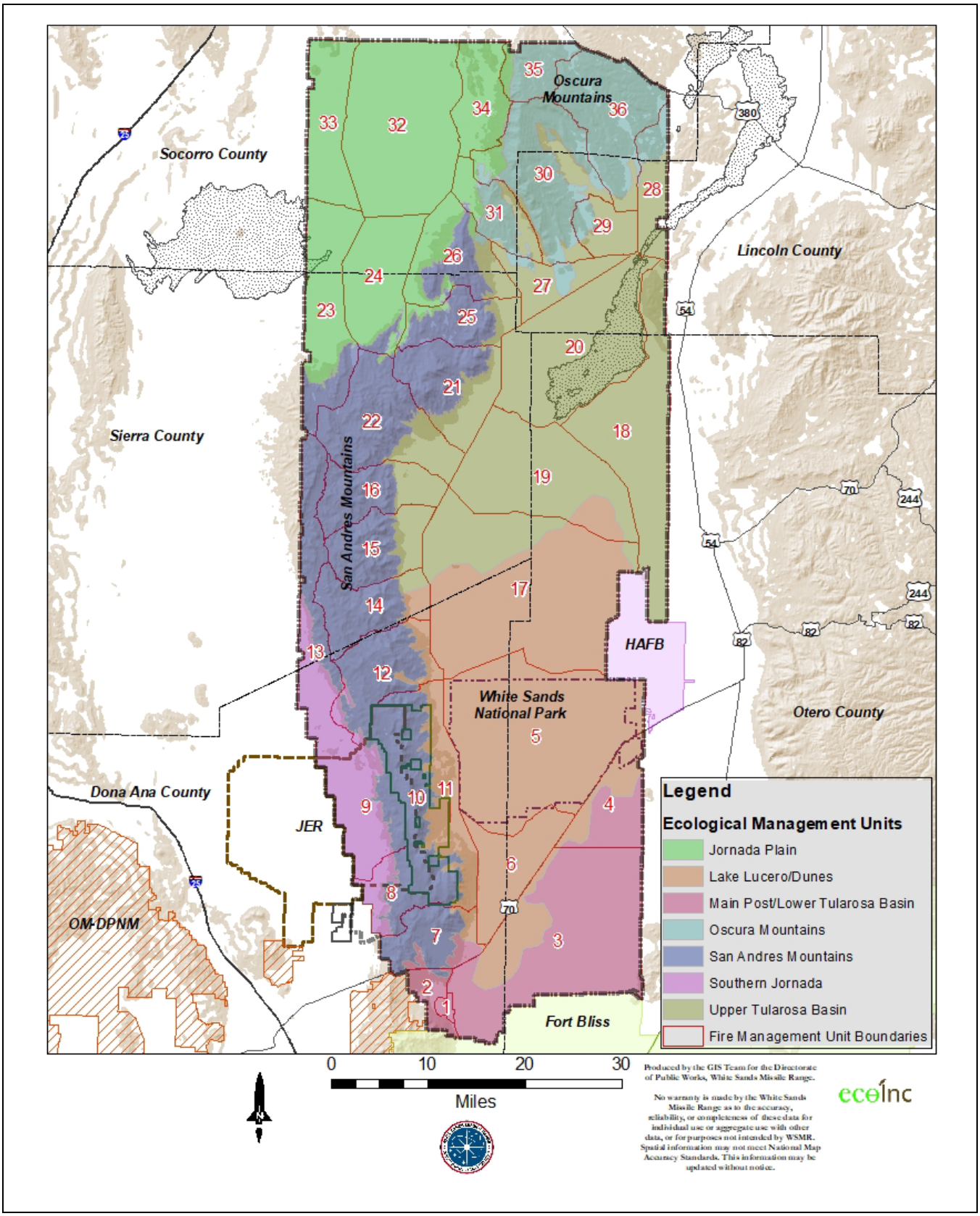

Figure 2.5-1. WSMR Ecological Management Units.

2.5.1 Jornada Plain EMU

The Jornada Plain EMU, located in the northern Jornada del Muerto Basin, comprises 141,547 ha (349,762 acres) (Figure 2.5-2). Military personnel, resource managers, and mission personnel refer to this part of WSMR as “Stallion Range” or “Stallion Basin.” The WSMR boundary fence defines the northern and western limits of this EMU. The eastern and southern boundaries are defined by several mountain ranges: Oscura, Little Burro, Mockingbird, and northern San Andres Mountains. Topography is mostly undulating to flat, with elevations ranging from 1,414 to 1,930 m (4,639 to 6,332 ft).

Geology and Soils

Soils for the Jornada Plain EMU are mapped and described by the USDA. (USDA-NRCS 2017, USDA-NRCS 2020). Sediments are bound on the east and south by alluvial materials from the Oscura Mountains and San Andres Mountains. The western edge of the EMU contains a small portion of the Armendaris lava flow and is surrounded by sand sheets.

Active soil erosion is often observed at some of the larger disturbed areas within the EMU including: Zumwalt Test Track, Permanent High Explosives Test Site, and the Stallion, Coma and 649 WITs. During large storm and high wind events, massive plumes of fine particulate soils can be observed emanating from these sites. Adverse effects of such events include removal of topsoil, reduction in levels of soil organic matter, breakdown of soil structure, elimination of native vegetation, and diminished nutrients for plant growth. This soil loss contributes to large-scale erosion during rain events, creating substantial gullies that require increased need for road maintenance. Washed out roads negatively affect sustainability of the Range and the ability to carry out military testing activities.

Water

Runoff from rainfall in the mountains from the east and southern boundaries of the Jornada Plain EMU drain into large, flat vegetated and un-vegetated ephemeral playa lakes. There are approximately 40 developed water sources dispersed throughout the EMU, including earthen tanks, solar panel wells, and rain catchment tanks. No natural springs or perennial streams occur within this EMU.

The 32 earthen tanks in this EMU are in various states of repair, with the majority still capable of holding ephemeral water following rain events. Within this EMU, just two rain catchments occur, but these hold water only after sufficient rainfall fills the holding tanks. Six solar-powered wells provide water when they are functioning but are constantly falling in and out of repair. Two of the six wells have been abandoned and have not been maintained for several years. The remaining four wells are providing water on a relatively consistent basis.

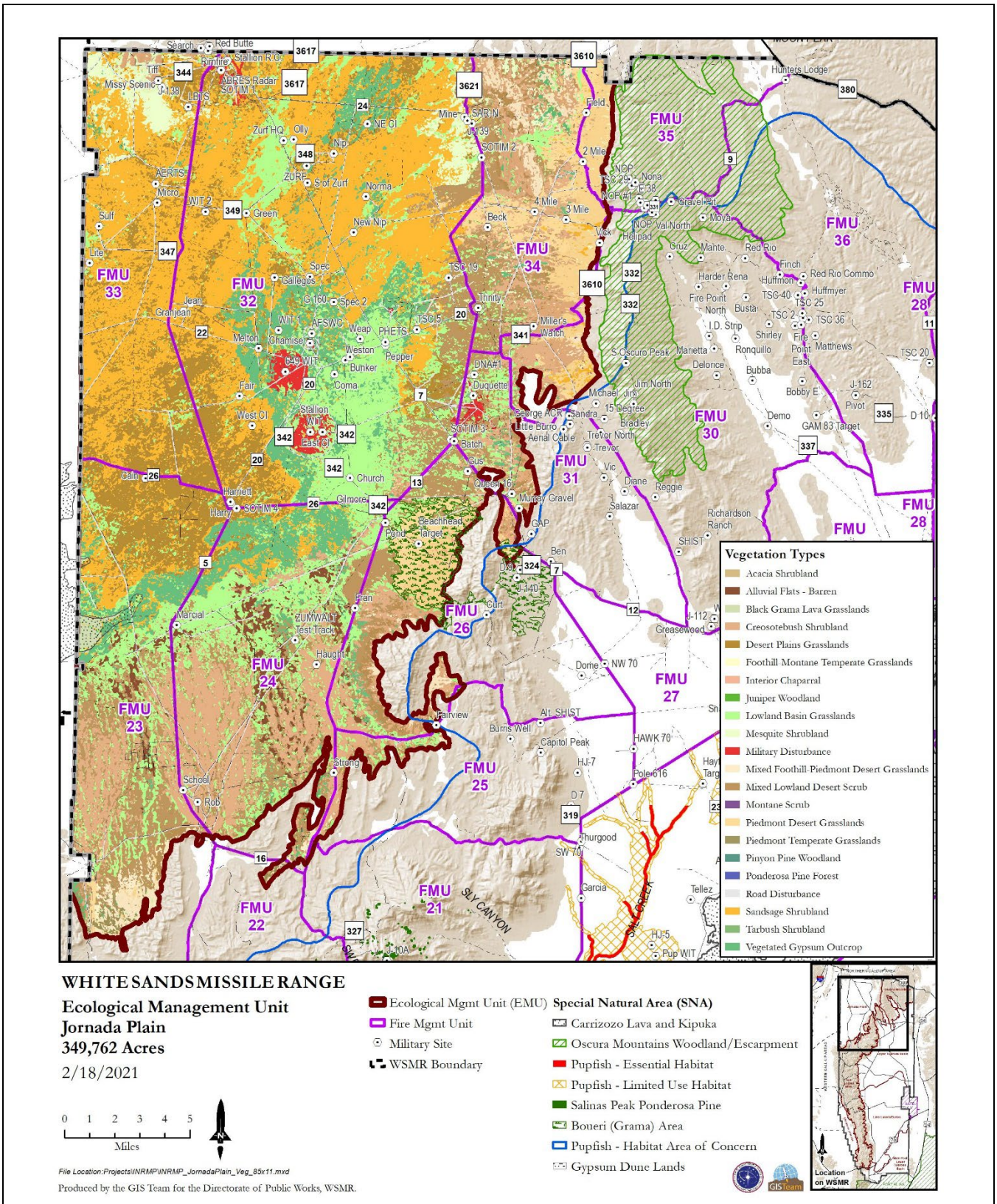

Figure 2.5-2. Jornada Plain EMU.

Vegetation

Dominant vegetation in the Jornada Plain EMU includes sandsage shrubland and lowland basin grasslands (Figure 2.5-2). The alluvial fans on the northwestern face of the San Andres Mountains and the western face of the Oscura Mountains are creosote bush (*Larrea tridentata*) shrublands intersected by occasional drainages containing mixed lowland basin grasslands. The lowland basin grasslands terminate at gypsum outcrops in the center of the basin. The high-quality, relatively un-fragmented Chihuahuan Desert piedmont and desert plains grasslands in the Jornada Plain EMU are locally and regionally rare—though at one time they were widespread throughout the Southwest (Schmutz et al. 1991, McClaran 1995, Ludwig et al. 2000). These grassland types provide habitat for many endemic plants and animals (D. Lightfoot, Senior Collection Manager, Division of Arthropods - Museum of Southwestern Biology, Pers. Comm.). The soaptree yucca (*Yucca elata*) that occurs throughout much of the grasslands is unique to the Chihuahuan Desert and rare in New Mexico. Desert grasslands throughout the Chihuahuan Desert have been greatly degraded or replaced entirely by shrublands because of overgrazing, fire suppression, and development (Brown 1950, Gibbens and Beck 1987, Dick-Peddie 1993).

Nonnative plants in this EMU include saltcedar, African rue, and Russian thistle (*Salsola tragus*). Saltcedar occurs primarily around earthen tanks and in some low-lying playa areas where rainwater collects. African Rue is found in disturbed environments, such as roadsides and fields in desert to semi-desert areas (US Army 2021). Russian thistle is invading native grasslands on the eastern edge of this EMU at the base of the Oscura Mountains (Doug Burkett, Contract Biologist – WSMR, Pers. Comm.).

Threatened and Endangered Species

There are no known USFWS or state listed plant species in the Jornada Plain EMU (Table 2.5-1). Four faunal species listed by the NMDGF as threatened or endangered occur within this EMU, but none are breeding residents. One species of reptile designated by NMDGF as a SGCN, the western massasauga, occurs in this EMU. The federally endangered northern aplomado falcon has been detected in the Jornada Plain EMU (Hartsough et al. 2016b). Over the past 20 years, the majority of northern aplomado falcon detections were recently released birds from the reintroduction effort on WSMR, BLM, NMSLO lands, and on private lands adjacent to WSMR (Hartsough et al. 2016b, Mutch 2014).

Special Natural Areas

The Jornada plain EMU contains large tracts of native Chihuahuan Desert grasslands that are important to the Chihuahuan Desert Ecoregion (Dinerstein et al. 2000). These grasslands represent some relatively rare communities still existing in the Chihuahuan Desert and are important habitat for wintering grassland bird species, such as Baird's sparrow, and they may potentially be important for the western massasauga.

Table 2.5-1. Federal and State Threatened and Endangered Species and Species at Risk Documented in Jornada Plain EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
FLORA			
La Jolla prairie clover	None	S3***	Occurs in San Andres Mountains and on the Northern Jornada del Muerto.
Warner's dodder	None	S1***	Unlikely but possible in playa areas of this EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
FAUNA			
Western massasauga	None	SGCN**	Rare in desert scrub and yucca and desert grasslands.
Long-billed curlew	USFWS BCC*; DoD PIF Tier 2 Species	SGCN	Uncommon in open grasslands.
Golden eagle	None; DoD PIF Tier 2 Species	None	Rare in grasslands, deserts, and other open country, usually in mountainous areas.
Burrowing owl	USFWS BCC; DoD PIF MSS	SGCN	Uncommon and local in open grasslands.
Northern aplomado falcon	Endangered, Nonessential Experimental Population	Endangered	Rare year-round resident. Possibly extirpated. Last confirmation in Jornada EMU-9/21/2013.
American peregrine falcon	None	Threatened	Rare migrant.
Loggerhead shrike	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Common throughout WSMR.
Pinyon jay	USFWS BCC; DoD PIF MSS	SGCN	Declining in juniper and piñon/juniper habitats.
Sprague's pipit	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon and local in grasslands.
Chestnut-collared longspur	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Common locally to uncommon in grasslands.
Black-chinned sparrow	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon and local in chaparral and similar arid hillsides with brushy vegetation.
Baird's sparrow	USFWS BCC	Threatened	Uncommon/sporadic in winter.
Virginia's warbler	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon. Use PJ woodlands and riparian areas.
Spotted bat	None	Threatened	Uncommon/rarely detected.

* USFWS BCC = Bird of Conservation Concern – species, subspecies and populations of migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA

**SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists)

******* Natural Heritage New Mexico Rank: S1 – Critically Imperiled, S2 – Imperiled, S3 - Vulnerable

Fire Management

The Jornada Plain EMU includes seven fire management units (FMUs) (Figure 2.4-2 [Bumgarner 2018]). The grasslands of the Jornada del Muerto, foothill and piedmont grasslands, and PJ savanna grasslands have the highest concentrations of historic large wildfires (>500 acres) on the installation (Bumgarner 2018). Fire history records show that some areas of Stallion Range have burned 3-4 times in the last 30 years while other areas of these grasslands have not burned at all during that time frame. Three prescribed fires in the Smith Hills/Bingham area, Trail Canyon, and Cain Well have burned 7,760 acres.

Natural Resource Monitoring and Management

Monitoring programs in this EMU include long-term northern aplomado falcon surveys (Hartsough et al. 2016b). Raptor point-count surveys in basin grassland habitats continue along established

routes in this EMU every other year. Extensive efforts to protect raptors, particularly golden eagles, from power line electrocutions are ongoing with WSMR in cooperation with Socorro Electric throughout the Jornada EMU (WSMR 2014b).

Continued monitoring of vegetation transects established in areas of prescribed grassland burns will document vegetation changes due to fire and drought.

Surveys for western massasauga rattlesnakes initiated in 2020 were successful in detecting a previously unverified population of the species in the northern portion of the Jornada Plain EMU (Burkett 2021). Surveys for this species are planned to continue within this EMU for the next several years. Defining a population boundary will help WSMR conserve this species.

Military Activities

Official Enterprise Geographic Information System (GIS) data indicate that there are 83 test sites, about a dozen of which are in relative continual use, within the Jornada Plain EMU (Figure 2.5-2). Additional testing entities and tenants periodically use existing sites scattered throughout the EMU. SRC, located at the very north end of the EMU, provides support for mission activities in the northwest part of the main range. The Ground-based Electro-Optical Deep Space Surveillance facility in the north end of this EMU has a dark skies requirement to aid in tracking objects in space.

2.5.2 Upper Tularosa Basin EMU

The Upper Tularosa Basin EMU is the largest EMU on WSMR. This EMU is 210,086 ha (519,124 acres). Elevations range from 1,187 to 1,399 m (3894 to 4589 ft). Ephemeral drainages dissect the landscape, and there are scattered alkaline and brackish playas throughout. This EMU is constrained to the north and west by the foothills of the Oscura, Little Burro, Mockingbird Mountains, and San Andres Mountains; the eastern extent is WSMR's eastern boundary, and the gypsum dune lands are at its southern extent (Figure 2.5-3).

Geology and Soils

The Upper Tularosa Basin EMU soils have been mapped out and described (USDA-NRCS 2017, USDA-NRCS 2020). Quaternary/Tertiary basin-fill deposits dominate this EMU. Along the east side of the Little Burro and Mockingbird Mountains are piedmont alluvium of the upper and middle Quaternary as well as rocks of basin fill from the Rio Grande rift (Love et. al 2007). Lacustrine and playa lake deposits lie at the southern extent of Salt Creek; at the eastern extent are alternating deposits of eolian and alleviated materials (Love et. al 2007). Underlying fill deposits within the basin are the same as those occurring as rock outcrop in the San Andres and Sacramento Mountains. The Carrizozo lava flow comprises two distinct flows that originated from Little Black Peak, northeast of the main range. These basaltic flows have been dated at 5,200 ±700 years BP and occurred within 1,000 years of each other (Dunbar 1999). They extend 75 km (40 mi) and have an average thickness of 10 to 15 m (33 to 49 ft).

Water

Meinzer and Hare (1915) first inventoried the water resources within the Upper Tularosa Basin EMU, and Weir (1965) re-evaluated the resources in the northern part of the EMU. The hydrologic system within this EMU is locally and regionally important. Although water resources are scarce there, the basin contains a unique system of interconnected springs. Scattered throughout the EMU are approximately 21 documented springs and 53 tanks or wells (Thompson et al. 1992; USGS 1981).

Salt Creek—from Salt Springs downstream to Big Salt Lake—provides habitat for the White Sands pupfish (Pittenger and Springer 1999). Perennial flow in Salt Creek is maintained by ground water discharge from the alluvial aquifer (Pittenger 2015). Salt Creek flow volume has decreased steadily from 2016 through 2020 (Pittenger 2022). Saltcedar has become established along Salt Creek and may impact pupfish habitat by water loss through evapotraspiration, physical changes to habitat structure and productivity (Pittenger 2015). Barrel and Guilez Springs in the southeastern part of the EMU are human-altered springs that have been identified as alternative sites for the White Sands pupfish; however, nonnative fish and red swamp crayfish currently inhabit these springs.

Outflow from Malpais Spring produces a large area of flooded vegetation and a network of channels, some of which have been human altered. Salinity increases with distance from the headspring. Mound Spring and other springs in that complex have been human-altered, first for watering livestock (Meinzer and Hare 1915) and later during road-building activities. White Sands pupfish are native to Malpais Spring, with replicate populations introduced to Mound Spring, North Mound Spring, and South Mound Spring.

Brazel Lake, west of the Tularosa gate, was once the largest body of freshwater on WSMR that was fed by Tularosa Creek. This lake, however, is now dry due to water diversion occurring east of the WSMR boundary.

Water condition monitoring within this area is driven by both regulatory compliance and science. Long-term groundwater monitoring occurs at the Oscura Munitions Disposal Area and the Tula Peak Burial Pits. A desalination unit was installed at Oscura Range Center, but it is not operational. A freshwater well at RAMS is not currently used as a drinking water well, but it supplies water for non-potable uses. Science-driven monitoring includes a stream-flow gauge station on Salt Creek and annual sampling for cations, anions, and metals in Malpais Spring and Main Mound Spring. Periodic water-quality sampling has been conducted at Tularosa Creek, Brazel Lake, and other springs in the area (Doty 1968).

Water levels in Salt Creek and Malpais Spring have been monitored for decades in support of White Sands pupfish study efforts. Water flow in Salt Creak fluctuates greatly with seasonal rainfall events, causing periods of high-water flow and long periods of drought, which results in drying up of much of the lower stretches of the creek. Water flow at the stream gauge at Range Road 316 for 1995-2019 shows annual and seasonal variability in water flow but no overall trend of discharge (USGS 2022). The water gauge at Malpais Spring also shows fluctuation in water flow from 2003-2020 but no overall trend (USGS 2022). No gauge data is available for water levels in Guilez and Barrel Springs, but anecdotal field observations indicate levels have gone down substantially in the past three decades. Water levels in North Mound and South Mound Springs appear to have remained very stable and consistent over the past three decades. Main mound spring water levels have remained relatively constant in the eastern pool but have vacillated greatly in the western pool. The western pool has gone completely dry for extended periods on several occasions over the past decade.

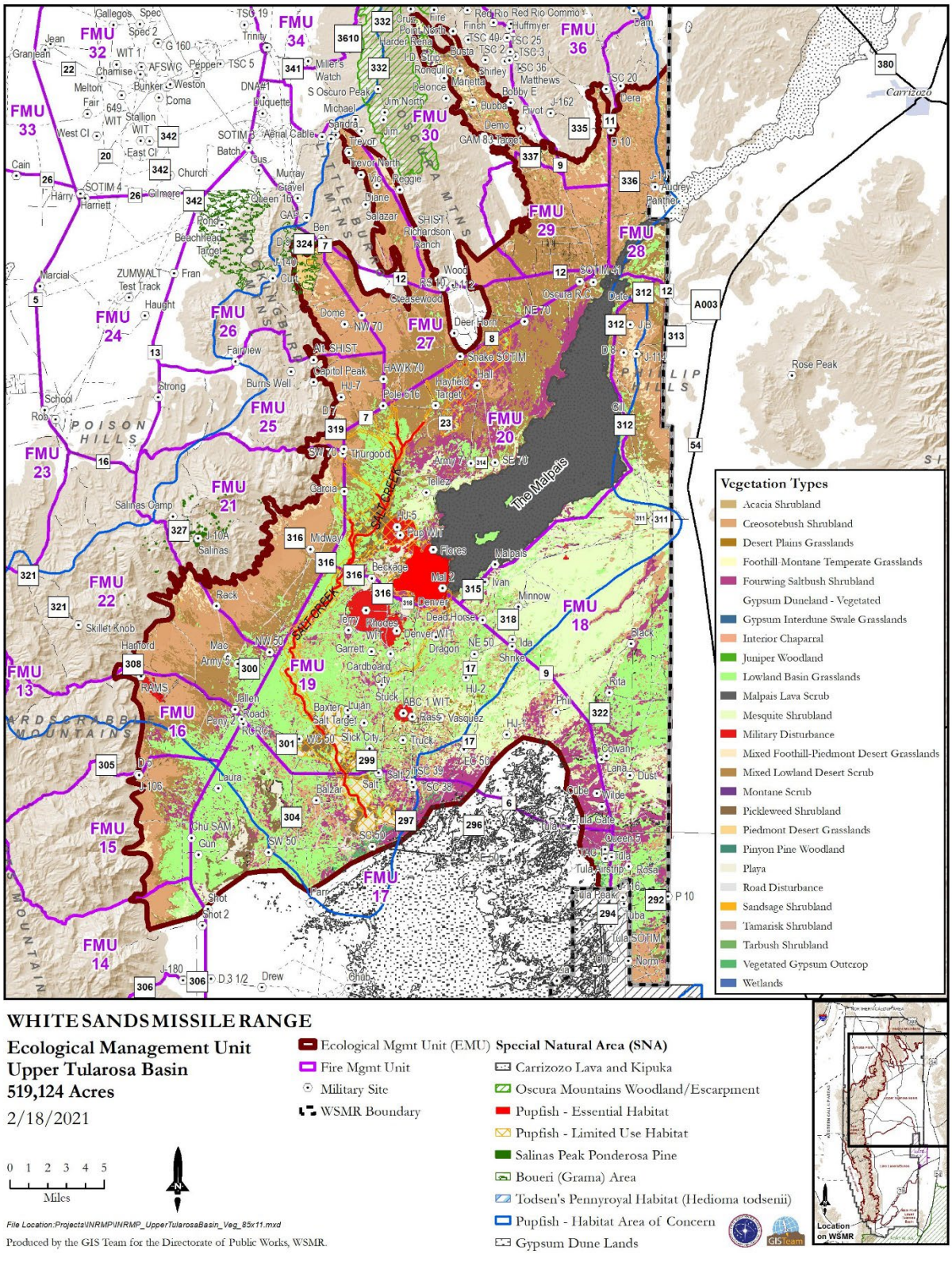

Figure 2.5-3. Upper Tularosa Basin EMU.

Vegetation

Shrubland and grassland communities dominate the Upper Tularosa Basin EMU. Because of its size, it contains a high diversity of vegetation communities, from foothills grasslands to desert shrublands and lowland swales (Figure 2.5-3). Creosote bush shrublands cover the lower reaches of the alluvial fans in the surrounding mountain piedmonts and extend into the basin, where they are associated with mixed lowland desert scrub. Inter-mixed communities of creosote bush, tarbush (*Flourensia cernua*), and fourwing saltbush shrublands characterize mixed lowland desert scrub. This habitat has large expanses of creosote bush/tarbush, creosote bush/alkali sacaton, and creosote bush with sparse ground cover communities (Muldavin *et al.* 2000). Fourwing saltbush dominates barren alkali flats surrounding the lava flow and transitions into gypsic soils of the Lake Lucero/Dune lands EMU. Lowland basin grasslands dominate relatively uniform alkali sacaton and galleta grasslands. The grasslands at the eastern end of this EMU become intermixed with honey mesquite (*Prosopis glandulosa*)/alkali sacaton communities. Inland saltgrass (*Distichilis spicata*)–alkali sacaton grasslands occur within the wetlands of the Malpais Spring area and in the Salt Creek drainage.

Threatened and Endangered Species

No USFWS or state listed plant species occur in the Upper Tularosa Basin EMU. There are four federally listed species and seven NMDGF listed species that have the potential to occur in the Upper Tularosa Basin EMU (Table 2.5-2).

Table 2.5-2. Federal and State Threatened and Endangered Species and Species at Risk Documented in Upper Tularosa Basin EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
FAUNA			
Tularosa springsnail	None	SGCN**	Endemic to Salt Creek Drainage.
White Sands pupfish	None	Threatened	Occurs in Salt Creek, Malpais Spring and Mound Springs Complex.
Yellow-billed Cuckoo Western population	Threatened	SGCN	A rare migrant confirmed sporadically. No breeding cuckoos have been documented, and breeding habitat does not occur on WSMR.
Golden eagle	BGEPA; DoD PIF Tier 2 Species	None	Nesting territories of year-round residents are typically in mountainous areas, with foraging in grasslands, shrublands, and other open country. Winter population primarily in basins.
Bald eagle	BGEPA	Threatened	Uncommon migrant.
Burrowing owl	USFWS BCC*; DoD PIF MSS	SGCN	Uncommon and local in open grasslands.
Northern aplomado falcon	Endangered, Nonessential Experimental Population	Endangered	Rare year-round resident. Possibly extirpated. Originally documented near Rita Site in 1991. Last observed in Upper Tularosa Basin EMU-8/15/2015.
American peregrine falcon	None	Threatened	Rare migrant.

Species	Federal Status	New Mexico Status	Status on WSMR
Olive-sided flycatcher	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon. Uses riparian corridors.
Loggerhead shrike	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Common throughout WSMR.
Black-chinned sparrow	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon and local in chaparral and similar arid hillsides with brushy vegetation.
Spotted bat	None	Threatened	Uncommon/Rarely documented.
*USFWS BCC = Bird of Conservation Concern – species, subspecies and populations of migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA **SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists)			

Special Natural Areas

There are two SNAs in the Upper Tularosa Basin EMU: Aquatic habitat that supports the White Sands pupfish and Tularosa springsnail and the Carrizozo lava flow.

Fire Management

There are five entire FMUs and parts of two other FMUs within Upper Tularosa Basin EMU (Figure 2.5-3 [Bumgarner 2018]). A prescribed fire in Helm's Valley burned 1,556 acres in 2021.

Natural Resource Monitoring and Management

Ongoing management activities in the Upper Tularosa Basin EMU include annual monitoring surveys for White Sands pupfish at Malpais Spring and Salt Creek (Pittenger 1997, Pittenger 2017, Pittenger 2020, Pittenger 2021). Missile and aerial target impacts in pupfish habitat are monitored as they occur. Raptor point-count surveys are conducted on established routes every other year along the eastern WSMR boundary near Rita and Black sites in this EMU (Hartsough et al. 2016b).

Trespass cattle are an ongoing problem on the eastern side of the Upper Tularosa EMU north of Range Road 12. Erosion and flood events periodically damage portions of the boundary fence in this area. Boundary fence maintenance is ongoing and is important for limiting trespass cattle. Range Operations is responsible for coordinating and removing trespass cattle from WSMR.

Military Activities

Official Enterprise GIS data indicate that there are 111 test sites within the Upper Tularosa Basin EMU (August 2020). Major facilities and test sites in this EMU include RAMS, Rhodes, Denver, and Pup WIT sites, Oscura and Red Rio Bombing Ranges, and Rhodes Canyon Range Center. RAMS site has a mission requirement for dark skies. The Rhodes, Denver, and Pup WIT sites are used for testing explosive munitions and are fenced to keep people and large animals out.

2.5.3 Oscura Mountains EMU

The Oscura Mountains EMU is approximately 71,558 ha (176,819 acres) in area, with elevation reaching 2,650 m (8,700 ft) at Oscura Peak (Figure 2.5-4). The EMU contains three distinct mountain ranges: the Little Burro Mountains in the southwest part of the unit, the Oscura

Mountains in the center, and Chupadera Mesa to the northeast. The Oscura Mountains have a steep west-facing escarpment that dips to the east with rolling, dissected uplands (Kottlowski and Steensma 1979). Chupadera Mesa, an easterly dipping plateau, lies northeast of the Oscura Mountains.

Geology and Soils

The Oscura Mountains EMU soils have been mapped and described (USDA-NRCS 2017, USDA-NRCS 2020). The west slope of the Oscura Mountains is mostly Pennsylvanian, the upper member of the Madera Formation, and interbedded sandstone, shale, and limestone (Bachman 1968). The Deama-Rock outcrop—a dark, grayish brown soil composed primarily of limestone—covers large areas of the northern Oscura Mountains and Chupadera Mesa.

Water

The Geographic Names Committee of the USGS has mapped surface water features and containments, such as wells and tanks, for the continental United States; this source indicates that there are approximately 46 scattered springs and 52 other water sources—including wells, tanks, and windmills—in the Oscura Mountains EMU. Prolonged drought throughout the southwest has resulted in the reduction of surface water at springs and seeps throughout WSMR, and springs in the Oscura Mountain EMU are no exception (Burkett *et al.* 2019, Pittenger 2018).

As of 2021, there are five natural springs (Deer, Council, Dripping, Yates, Oak) in the EMU known to be producing surface water. Three solar powered wells with tanks or drinkers are currently functioning and providing water in this EMU (Baca, Red Rio, Red Canyon). Dozens of earthen tanks periodically provide water in this EMU when adequate rainfall fills them.

Vegetation

The Oscura Mountains are dominated by PJ woodlands at higher elevations and by creosote shrublands and mixed foothill grasslands in the foothills and bajada areas (Figure 2.5-4). Interior chaparral forms a band along the western facing slopes of the Oscura Mountains.

The Little Burro Mountains reach elevations of 1,966 m (6,450 ft) and are dominated by mixed foothill piedmont grasslands that transition to creosote bush shrublands and by scattered fourwing saltbush at lower elevations. Lowland desert grasslands occur along the western edge of alluvial fans that empty into the Jornada Plain.

The EMU contains three sensitive vegetation association sites: the piñon pine/Scribner's needlegrass (*Achnatherum scribneri*) woodland, interior chaparral, and western wheatgrass (*Pascopyrum smithii*) meadows (Muldavin et al. 2000, WSMR 2009a). The piñon pine/Scribner's needlegrass woodland community is regionally important because it contains a large number of old-growth piñon and has not been recently grazed by domestic livestock.

WSMR has two of the three types of PJ woodlands described by Romme et al. (2009). In the North Oscura Peak area, "persistent woodlands" are dominated by piñons and characterized by shallow, course-textured (often rocky) soils, a sparse understory, and infrequent high-intensity fires. Downslope, these woodlands transition to sparser "piñon-juniper savannas" dominated by juniper and characterized by moderately deep soils that support grass and a more frequent low-intensity fire regime. WSMR does not have the "wooded shrubland" type of PJ woodlands. This type of woodland is characterized by a dominant shrub stratum with a variable tree component that may range from very sparse to relatively sparse. Both piñon and juniper provide important food and cover resources for several wildlife species, and in the state of New Mexico PJ woodlands have the greatest number of bird species at risk compared to other vegetation types.

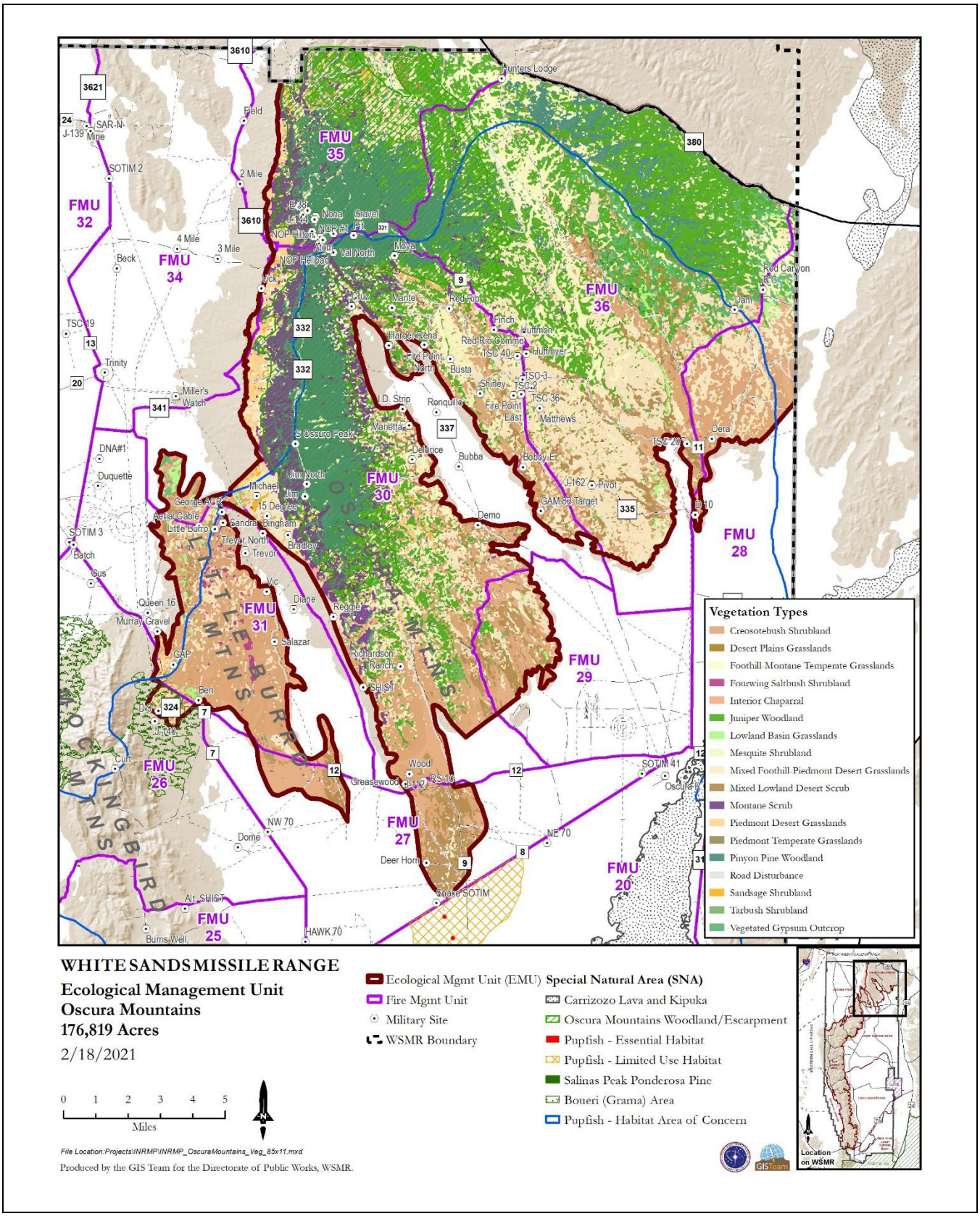

Figure 2.5-4. Oscura Mountains EMU.

Threatened and Endangered Species

No USFWS endangered or threatened plant or animal species are known to inhabit the Oscura Mountains EMU. Four NMDGF threatened faunal species have been documented in this EMU (Table 2.5-3).

Special Natural Areas

The Oscura Mountains Woodland/Escarpment SNA contains plant communities that are an important and unique continuum of successional PJ woodland forests. At high elevations, scattered mesic grassland meadows, dominated by blue grama–western wheatgrass, occur in these woodlands. These dense grasslands typically occur in narrow valleys at high elevations in the Oscura Mountains.

WSMR has identified the blue grama–western wheatgrass meadows within this SNA as rare plant communities because they are poorly represented within the region. The mesic environment and heavy clay soils in this area create openings in the PJ woodland that provide important resources for wildlife. The piñon pine/Scribner's needlegrass association is also relatively rare within the region; this community on WSMR is considered one of the healthiest such communities in the Southwest (Muldavin et al. 2000).

Fire Management

The Oscura Mountains EMU contains portions of five FMUs (Figure 2.5-4) (Bumgarner 2018). The Oscura Mountains and surrounding foothills have the quantity, continuity, and arrangement of live and dead fuels to sustain large wildfires. Two prescribed burns in 2019 and 2021 covered a combined 1,948 acres. Thinning has been implemented on 156 acres, and 610 acres are slated to be chemically treated in an effort to reduce hazardous fuels, improve nutritional quality of forage, and increase heterogeneity of vegetation species and structure thus improving overall wildlife habitat (C. Rodden, Wildlife Biologist/Pest Management Coordinator – WSMR, Pers. Comm., Bumgarner 2018).

Table 2.5-3. Federal and State Threatened and Endangered Species and Species at Risk Documented in Oscura Mountains EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
FLORA			
Sivinski's scorpionweed	None	S3***	Occurs in the Chupadera Hills.
FAUNA			
Golden eagle	BGEPA; DoD PIF Tier 2 Species	None	Nesting territories of year-round residents are typically in mountainous areas, with foraging in grasslands, shrublands, and other open country. Winter population primarily in basins.
Flammulated owl	USFWS BCC*; DoD PIF Tier 2 Species	SGCN**	Uncommon in oak and pine woods.
Gray vireo	USFWS BCC; DoD PIF Tier 2 Species	Threatened	Common breeder.
Peregrine falcon	None	Threatened	Nest in nearby Organ Mts. Occasionally observed on WSMR. May nest in the Oscura Mountains.

Olive-sided flycatcher	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon. Uses riparian corridors.
Pinyon jay	USFWS BCC; DoD PIF MSS	SGCN	Declining in juniper and piñon/juniper habitats.
Black-chinned sparrow	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon and local in chaparral and similar arid hillsides with brushy vegetation.
Virginia's warbler	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Uncommon. USE PJ woodlands and riparian areas.
Oscura Mountain chipmunk	Army SAR (Priority 2)	Threatened	Locally abundant/Uncommon overall.
Spotted Bat	None	Threatened	Uncommon/Rarely documented.
*USFWS BCC = Bird of Conservation Concern – species, subspecies and populations of migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA **SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists) *** Natural Heritage New Mexico Rank: S1 – Critically Imperiled, S2 – Imperiled, S3 - Vulnerable			

Natural Resource Monitoring and Management

Sensitive species in this EMU include the Oscura Mountains Colorado chipmunk, pinyon jay, gray vireo, and golden eagle. To minimize the impacts of any PJ woodland management measures, pre-treatment and post-treatment monitoring for sensitive species such as the gray vireo, pinyon jay, golden eagle, and Oscura Mountain Colorado chipmunk will be conducted (Bumgarner 2019). All proposed project treatment areas where habitat or other information suggests possible presence of SAR plants would be surveyed prior to treatment for occurrence (Bumgarner 2019). Where treatments negatively affect sensitive species, adaptive management will be used to adjust treatment methods for future projects to better avoid/minimize impacts.

Surveys for pinyon jays in the Oscura Mountains have been extensive (Johnson and Smith 2006, Johnson and Smith 2007, Johnson and Smith 2008a, Johnson and Smith 2008b, Johnson et al. 2012, Johnson et al. 2014, Johnson et al. 2019). Findings indicate that pinyon jay populations have been declining in the Oscura Mountains; consequently, PJ woodland treatments will not occur during the pinyon jay breeding season (Bumgarner 2019). Historic pinyon jay nest areas will be left intact and buffered by leaving trees within 500 meters (Bumgarner 2019). Surveys for pinyon jays are ongoing and will continue in the future. In 2021, a flock of about three dozen birds was documented near the western edge of the Red Rio Bombing Range impact area, and a similar number of birds was documented north of U.S. 380 on the Mendiburu Ranch managed by WSMR. A group of about 25 birds was seen near Deer Spring in Garden Springs Canyon, and pinyon jays were documented using Yates Spring in 2020. The most recent documented nesting occurred north of U.S. 380 on the Mendiburu Ranch and on WSMR near the N-2 gate.

The gray vireo nests in juniper savanna habitats in the Oscura Mountains (Johnson et al. 2014). Surveys conducted for gray vireos in the Oscura Mountain Planning Area (OMPA) found 81 gray vireo territories in PJ woodland habitat (Johnson et al. 2020). Monitoring for gray vireos will be conducted pre- and post-treatment of PJ woodlands (Bumgarner 2019). Monitoring of gray vireo presence/absence, habitat use, and reproductive success are ongoing and will continue (Johnson et al. 2020).

Extensive surveys for the Oscura Mountain Colorado chipmunk have been conducted in the Oscura Mountains (Sullivan 1996, Sullivan and Wilson 2001, Hartsough and Burkett 2008, Perkins-Taylor 2017, Perkins-Taylor and Frey 2018, Perkins-Taylor and Frey 2020). Cutting of piñon pines will not occur within 150 m of the Oscura Mountain escarpment in order to conserve chipmunk habitat (Bumgarner 2019). This population appears to be stable and inhabits much of the PJ woodland along the Oscura Mountain escarpment and in rocky outcrops and canyons in this EMU (Perkins-Taylor 2017, Perkins-Taylor and Frey 2018, Perkins-Taylor and Frey 2020). Surveys for chipmunks are ongoing and scheduled to continue.

Golden eagles nest in cliffs along the western escarpment and in rocky cliffs along Workman Ridge in this EMU. TPF conducts surveys annually, and the Environmental Division has worked with customers operating in this EMU to prevent impacts on nesting golden eagles. Survey efforts for nesting eagles and coordination with customers are ongoing and scheduled to continue.

Management of PJ woodlands will improve the overall health and resilience of the OMPA in order to sustain the mission of providing valuable, natural, and resilient testing and training grounds for WSMR (Bumgarner 2019). Ongoing management actions within the OMPA include conducting prescribed fire to improve habitat mosaic structure and species composition, manual and mechanical thinning of PJ woodlands along roadsides to increase width of firebreaks, and application of chemical herbicides to control unwanted vegetation (Bumgarner 2019). In support of these actions, WSMR has installed 80 vegetation monitoring plots and conducted sensitive species surveys.

Trespass cattle are an ongoing problem in the Oscura EMU. Portions of the WSMR boundary fence continue to be damaged, and ongoing maintenance is important for limiting trespass cattle. Range Operations is responsible for coordinating and removing trespass cattle from WSMR.

Military Activities

Official Enterprise GIS data indicate that there are 69 test sites in the Oscura EMU. Permanent sites consistently used include several facilities along the north Oscura Mountain escarpment, Aerial Cable, and Red Rio Bombing Range (Figure 2.5-4).

2.5.4 San Andres Mountains EMU

The San Andres Mountains EMU is 165,561 ha (409,101 acres)—encompassing the entire San Andres Mountains range, including the Mockingbird Mountains (Figure 2.5-5). The San Andres Mountains drain into three closed basins, the Tularosa Basin to the east and the Jornada del Muerto and Jornada Draw to the west. The basins isolate the mountains in both directions. This mountain range is relatively roadless, largely ungrazed by domestic livestock, and sparsely developed. The mountain range provides habitat for large mammals, including mule deer (*Odocoileus hemionus*), elk (*Cervus canadensis*), desert bighorn sheep, mountain lion (*Puma concolor*), and black bear. Precipitous cliffs provide staging and nesting areas for raptors, including golden eagles, turkey vultures (*Cathartes aura*), and prairie falcons (*Falco mexicanus*). This EMU contains about 25 golden eagle breeding territories and is thus the most important EMU for breeding golden eagles on WSMR. The San Andres Mountains are also an important migration route for nocturnal migrating birds (Trish Cutler, Wildlife Biologist – WSMR, Pers. Comm.). Limestone and gypsum outcrops support several endemic plant species.

Geology and Soils

The San Andres Mountains EMU soils have been mapped and described (USDA-NRCS 2017, USDA-NRCS 2020). Small areas of unique montane duneland soils with one-seed juniper

vegetation occur within San Andrecito Canyon and a few other interior valleys in the south-central San Andres Mountains. The total area of this type of duneland is approximately 328 ha (810 acres).

Water

Thompson et al. (1992) identified 22 human-altered springs, 16 windmills/wells, eight earthen tanks, and six rain catchments in the San Andres Mountains EMU. Most historic windmills and rain catchments are no longer functioning. However, since the initial survey, 9 of the 16 windmills have been replaced with solar pumps, and three new modern rain catchments have been installed with plans for three more (C. Rodden, Wildlife Biologist/Pest Management Coordinator – WSMR, Pers. Comm.). In a survey of the biotic and physical attributes of springs, USGS topographic maps indicated presence of 244 springs within this EMU. Prolonged drought throughout the southwest has resulted in the reduction of surface water at springs and seeps throughout WSMR, and springs in the San Andres Mountains EMU are no exception (Burkett et al. 2019, Pittenger 2018).

The largest spring and associated riparian area within the San Andres Mountains EMU, San Andres Spring, is located within SANWR. Surface water at this spring varies seasonally and from year to year and supports a 0.5-mi long cottonwood, willow, and hackberry overstory with a diverse understory of riparian vegetation. This patch of over 10 acres (4.5 ha) is the largest native riparian area within the entire missile range.

Vegetation

Vegetation in the San Andres Mountains EMU includes PJ woodlands, montane grasslands, Chihuahuan Desert scrub, and foothill grasslands with mesquite and creosote bush scrub on alluvial fans. Vegetation map units that comprise more than 5% of the EMU are mixed foothill–piedmont desert grasslands (29.8%), foothill–montane temperate grasslands (16.6%), juniper woodland (11.8%), montane scrub (10.4%), piñon pine woodland (7.3%), and creosote shrubland (6.1%) (Figure 2.5-5). The ridges of the San Andres Mountains and the more gently sloping west side of the mountains consists of piñon pine, one-seed and alligator juniper, oak spp. and mountain mahogany interspersed with grama grasses, bear grass, agave, cacti, and sotol.

Interesting vegetation communities within this EMU include the ponderosa pine community on top of Salinas Peak and Silver Top Mountain. There is also an un-mapped area on the southeastern slope of the San Andres Mountains that contains the highest diversity of cactus species on WSMR (D. Anderson, Retired Biologist – WSMR, Pers. Comm.).

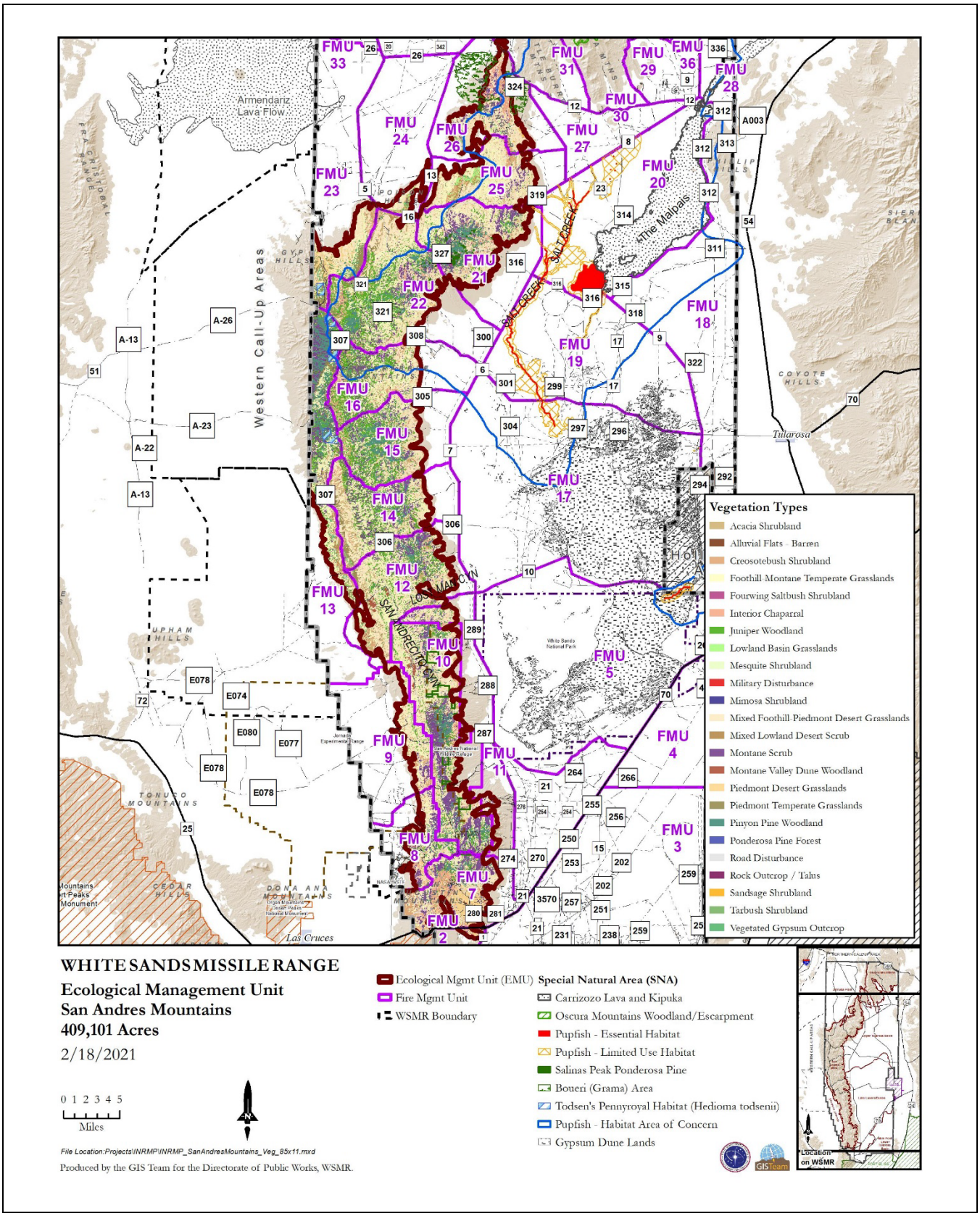

Figure 2.5-5. San Andres Mountains EMU.

Threatened and Endangered Species

One USFWS endangered plant species exists in this EMU. No USFWS listed animal species have been documented within the San Andres Mountains EMU. State listed species within this EMU include three plant and five animal species (Table 2.5-4).

Table 2.5-4. Federal and State Threatened and Endangered Species and Species at Risk Documented in San Andres Mountains EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
FLORA			
Todsen's pennyroyal	Endangered	Endangered	15 known populations in northeast portion of EMU.
Mescalero milkwort	None	Endangered	Two small population in southern San Andres Mountains known.
Night-blooming cereus	None	Threatened	Rare - Scattered populations on the eastern and western slopes of San Andres Mountains, south of Sulphur Canyon.
Silver-cup mock orange	None	S3***	Found in the Chalk hills in the middle potion of the San Andres Mountains.
Alamo beardtongue	None	S3***	The three occurrences of Alamo beardtongue are located between the western boundary of the Small Missile Range and the eastern boundary of the NASA operations site.
Sanberg's pincushion cactus	None	S2***	Southern San Andres Mountains.
San Andres rockdaisy	None	S2***	Known from San Andres Mountains.
New Mexico rockdaisy	None	S3***	Known from San Andres Mountains.
Sivinski's scorpionweed	None	S3***	Known from San Andres Mountains.
Vasey's bitterweed	None	S2***	Southern San Andres Mountains.
Plank's catchfly	None	S2***	Known from Salinas Peak.
Castetter's milkvetch	None	S3***	Known from San Andres Mountains.
FAUNA			
Yellow-billed Cuckoo Western population	Threatened	SGCN	A rare migrant confirmed sporadically. No breeding cuckoos have been documented, and breeding habitat does not occur on WSMR.
Costa's hummingbird	BCC*	Threatened	Rare migrant.
Golden eagle	BGEPA; DoD PIF Tier 2 Species	None	Nesting territories of year-round residents are typically in mountainous areas, with foraging in grasslands, shrublands, and other open country. Winter population primarily in basins.
Flammulated Owl	BCC; DoD PIF Tier 2 Species	SGCN**	Uncommon in oak and pine woods.

Species	Federal Status	New Mexico Status	Status on WSMR
Peregrine falcon	Delisted	Threatened/SGCN	Nest in nearby Organ Mts. Occasionally observed on WSMR. May nest in the Oscura Mountains.
Olive-sided flycatcher	BCC; DoD PIF Tier 2 Species	SGCN	Uncommon. Uses riparian corridors.
Bell's vireo	None	Threatened	Rare, possible breeder.
Gray vireo	BCC; DoD PIF Tier 2 Species	Threatened	Common breeder.
Loggerhead shrike	BCC; DoD PIF Tier 2 Species	SGCN	Common throughout WSMR.
Pinyon jay	BCC; DoD PIF MSS	SGCN	Declining in juniper and piñon/juniper habitats.
Black-chinned sparrow	BCC; DoD PIF Tier 2 Species	SGCN	Uncommon and local in chaparral and similar arid hillsides with brushy vegetation.
Virginia's warbler	BCC; DoD PIF Tier 2 Species	SGCN	Uncommon. Use PJ woodlands and riparian areas.
Varied bunting	BCC	Threatened	Uncommon breeder.
Spotted bat	None	Threatened	Uncommon/Rarely documented.
*BCC = Bird of Conservation Concern – species, subspecies and populations of migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA **SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists) * **Natural Heritage New Mexico Rank: S1 – Critically Imperiled, S2 – Imperiled, S3 - Vulnerable			

Special Natural Areas

The San Andres Mountains EMU contains the Western San Andres Mountains SNA and the Salinas Peak Montane Habitat SNA. The Western San Andres Mountains SNA contains populations of the federally listed Todsen's pennyroyal. The Salinas Peak Montane Habitat SNA harbors remnant populations of ponderosa pine that are biogeographically unique. The stands on WSMR are possibly relicts of a cooler period of the Pleistocene or mid-Holocene with genetic relationships to both Rocky Mountain and Mexican ponderosa pine populations (Muldavin et al. 2000). Two localities include 64 ha (158 acres) on Salinas Peak and 4.4 ha (10.8 acres) on Silver Top Mountain.

Fire Management

The San Andres Mountains EMU contains portions of 15 FMUs (Figure 2.5-5) (Bumgarner 2018). Due to safety concerns with placing engines and firefighters in remote, narrow canyons with difficult egress and ingress to safety zones, wildfire managers must consider allowing wildfires within the San Andres Mountains to burn—attacking wildfires only from strong defensible positions or using aerial resources of helicopters and air tankers. (Bumgarner 2018). Currently, two prescribed burns targeting 5,922 acres are scheduled for 2022 in an effort to reduce hazardous fuels, improve nutritional quality of forage, and increase heterogeneity of vegetation species and structure, thus improving overall wildlife habitat.

Natural Resource Monitoring and Management

The San Andres Mountains EMU contains numerous abandoned mines and other features that may be important for bats (Corbett and Gilleland 2014, Gilleland 2015). The mine complex at Victorio Peak and the Fairview Mining District provide excellent roost habitat, with large numbers of bats and year-round usage (Corbett and Gilleland 2014). Victorio Peak may contain one of the largest Townsend's big-eared bat hibernacula in the western U.S. (Corbett and Gilleland 2014).

Several abandoned mine sites were identified as priority sites in need of protection, and gates were subsequently installed at Victorio Peak, Fairview Mining District, and Mockingbird Gap Mine (Gilleland 2015). Gates are designed to prevent access by humans and large animals while still allowing access by bats and mesocarnivores.

Management activities of golden eagles within this EMU include raptor protection on power poles and buffers around active nests for ground-based and flight activities (WSMR 2021a). If buffers cannot be met without compromising military activities, then WSMR will discuss with USFWS to determine other practical measures and/or apply for an eagle take permit (WSMR 2021a). Eagle nest monitoring will be conducted using methods that avoid or minimize disturbance to eagles (WSMR 2021a).

Populations of Todsen's pennyroyal on WSMR may be at greater risk than populations in the Sacramento Mountains due to 1) occurring in habitat at lower elevations, 2) occurring in smaller patches, and 3) existing at what appears to be the upper elevation extent of available habitat at the local level (Britt 2018). WSMR supports recovery of Todsen's pennyroyal and has developed conservation goals to comply with the ESA, the Todsen's Pennyroyal Recovery Plan, Todsen's Pennyroyal 5-Year Review, and updates to the Recovery Plan (Britt 2018, USFWS 2001, USFWS 2011, USFWS 2022). Management objectives for Todsen's pennyroyal include continued monitoring efforts of existing populations, supporting new population search efforts, supporting research related to phenology, genetics, and impacts of climate, studying the effects of fire on Todsen's pennyroyal, and minimizing military mission related impacts on known populations (Britt 2018, USFWS 2022).

Trespass cattle are an ongoing problem in the San Andres Mountains EMU. Portions of the WSMR boundary fence continue to be damaged, and ongoing maintenance is important for limiting trespass cattle. Range Operations is responsible for coordinating and removing trespass cattle from WSMR.

Military activities within SANWR are discouraged and all activities within the refuge are coordinated with SANWR managers and staff directly per memorandum of agreement (WSMR 2017). Flight level restrictions over SANWR require that manned or unmanned aircraft do not fly lower than 2000 feet above ground level (WSMR 2017).

Military Activities

The San Andres Mountains EMU is sparsely used for military activities and official Enterprise GIS data indicate that there are 16 test sites in this EMU (Figure 2.5-5). The Salinas site is an active communications and laser testing facility located in the Salinas Peak Montane Habitat SNA. RDT&E activities have occurred and are anticipated to continue in this EMU. Sites within SANWR in the southern portion of the San Andres Mountains EMU that are operational include TSC 35 and SW 30. The Defense Threat Reduction Agency's Granite Target Site occurs in the southern portion of the Mockingbird Mountains, north of Fairview Mountain.

2.5.5 Lake Lucero/Dunes EMU

The Lake Lucero/Dunes EMU is approximately 193,646 ha (478,499 acres) in area and contains the largest gypsum dune field in the world (Figure 2.5-6). Elevations range from 1,180 to 1,875 m (3,871 to 6,151 ft). The broad elevation range is due to the inclusion of the eastern bajada of the San Andres Mountains, which runs along the entire western border of the EMU. WSNP contains much of the world's largest gypsum dune field within this EMU. A 57,080-acre Co-Use Area, administered by both WSMR and WSNP, allows activities in accordance with an interagency

agreement (WSMR 2011b). The agreement allows WSMR to place mobile instrumentation equipment within the Co-Use area and to access the area for explosive ordnance disposal and recovery operations using established roads (WSMR 2011b). During hazardous WSMR testing, affected areas on WSNP are evacuated (WSMR 2009a).

Geology and Soils

Lake Lucero/Dunes EMU soils have been mapped and described (USDA-NRCS 2017, USDA-NRCS 2020). Quaternary/Tertiary sediments dominate this EMU. The alluvial fans, basin-fill sediments, playas, and dunes follow in a progression from west to east across this landscape. The unique gypsum sands are widespread in the dune fields and playas and are mixed with other sediments.

Water

The Tularosa Basin is a closed, surface-water basin system with no outlet. Upland precipitation either runs into the basin and recharges groundwater resources at the margins of the basin or flows down to the basin to collect in ephemeral playa lakes. One of the lowest points in the Tularosa Basin is Lake Lucero, a large playa that periodically fills from major rainstorm events (Figure 2.5-6).

Vegetation

The vegetation associations within the Lake Lucero/Dunes EMU are stratified into alluvial fans, alluvial plains, and basin floor. In a progression from the uplands to the basin floor, foothill-piedmont grasslands typically are found at higher elevations transitioning to creosote bush shrublands on alluvial fans and mesquite shrublands on alluvial plains. The vegetation associated with the alluvial landforms of the San Andres Mountains occurs along the western edge of the EMU and comprises 22% of the vegetation within the EMU (Figure 2.5-6). The remaining 78% of the EMU is either barren of vegetation or dominated by vegetation tolerant of gypsum and alkaline substrates of the basin floor.

Pickleweed (*Salicornia virginica*) shrublands are the dominant community of the basin floor of alkaline flats. Vegetated gypsum duneland communities are dominated by broom dalea (*Psorothamnus scoparius*) and hoary rosemarymint (*Pycnanthemum incanum*) shrublands. Gyp dropseed (*Sprobolus nealleyi*)/hairy coldenia (*Tiquilia canescens*) and fourwing saltbush/gyp dropseed vegetation communities characterize vegetated gypsum outcrop. Mixed grassland communities such as gypsum grama (*Bouteloua breviseta*), indian ricegrass (*Oryzopsis hymenoides*), and New Mexico bluestem (*Schizachyrium scoparium*) are tolerant of the gypsum substrate and are found in inter-dunal swales. Cottonwood trees (*Populus deltoides*) and saltcedar grow in many inter-dunal swales where the shallow water table provides adequate water for these riparian species to thrive.

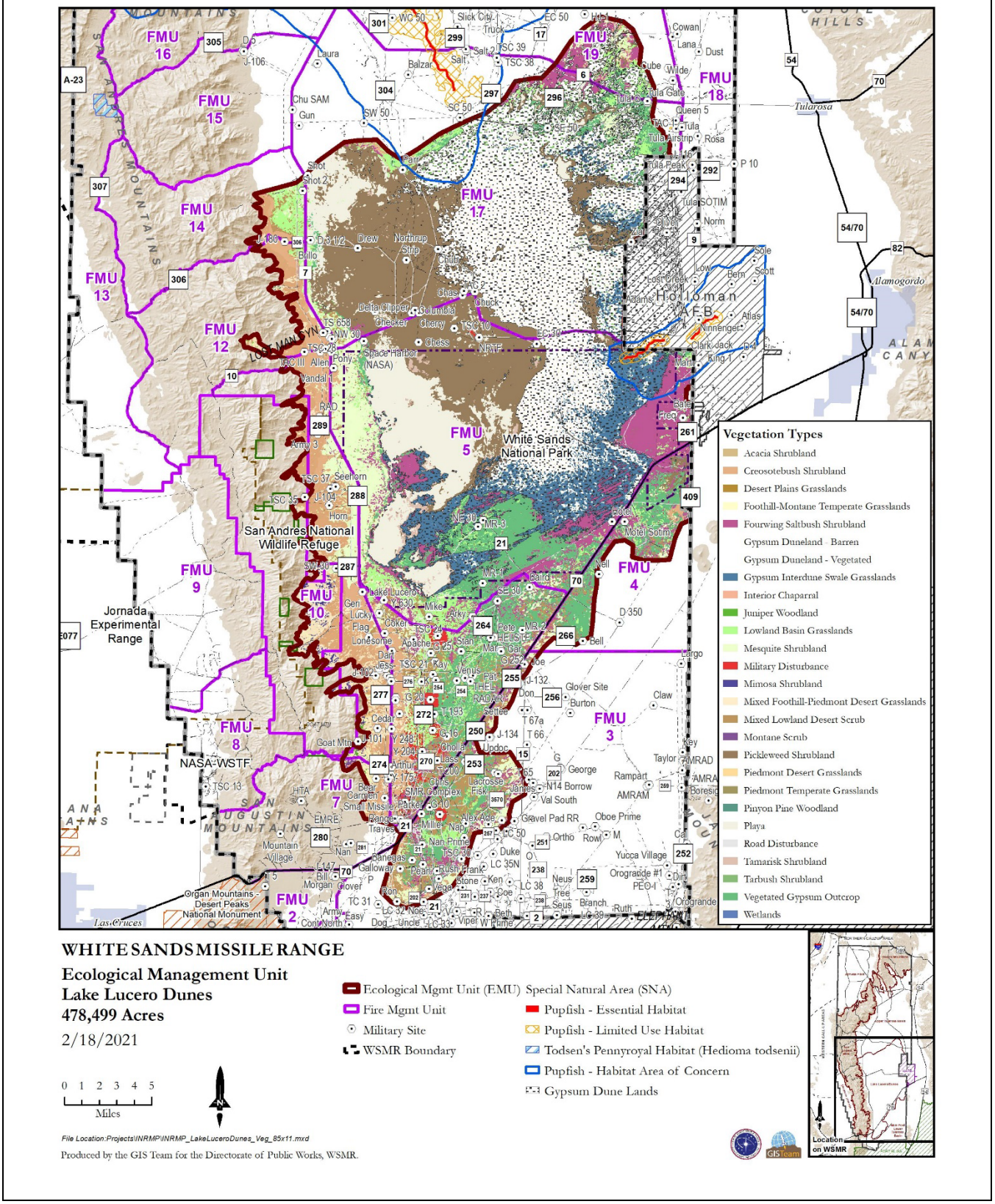

Figure 2.5-6. Lake Lucero/Dunes EMU.

Threatened and Endangered Species

No USFWS listed flora or fauna species have been documented within the Lake Lucero/Dunes EMU. State listed species within this EMU include one floral and seven faunal species (Table 2.5-5).

Table 2.5-5. Federal and State Threatened and Endangered Species and Species at Risk Documented in Lake Lucero/Dunes EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
FLORA			
Night-blooming cereus	None	Endangered	Rare - Scattered populations on the eastern and western slopes of San Andres Mountains, south of Sulphur Canyon.
Organ Mountains evening primrose	None	S2***	Populations have been documented in Ash canyon San Andres Mountains.
FAUNA			
Saltonia incerta (spider)	None	None	Restricted to salt crusts of intermittent or dry lakes, streams or rivers in the desert southwest.
White Sands pupfish	Under Review	Threatened	Uncommon breeder.
Little Striped white whiptail	Army SAR (Priority 2)	None	Common within gypsum dune fields.
Bleached earless lizard	Army SAR (Priority 3)	None	Common within gypsum dune fields.
White Sands prairie lizard	Army SAR (Priority 3)	None	Common within gypsum dune fields.
Western massasauga	None	SGCN**	Rare within desert scrub and yucca and desert grasslands and gypsum dune fields.
Costa's hummingbird	USFWS BCC*	Threatened	Rare migrant – no breeding confirmed in EMU.
Snowy plover	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Rare migrant.
Golden eagle	BGEPA; DoD PIF Tier 2 Species	None	Nesting territories of year-round residents are typically in mountainous areas, with foraging in grasslands, shrublands, and other open country. Winter population primarily in basins.
Bald eagle	BGEPA	Threatened	Rare migrant.
Burrowing owl	BCC; DoD PIF MSS	SGCN	Uncommon and local in open grasslands.
Northern aplomado falcon	Endangered; Nonessential Experimental Population	Endangered	Very rare resident.
Peregrine falcon	None	Threatened/SGCN	Rare migrant.
Bell's vireo	None	Threatened	Rare migrant – no breeding confirmed in EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
Loggerhead shrike	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Common throughout WSMR.
*BCC = Bird of Conservation Concern – species, subspecies and populations of migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA **SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists) *** Natural Heritage New Mexico Rank: S1 – Critically Imperiled, S2 – Imperiled, S3 - Vulnerable			

Special Natural Areas

The Lake Lucero/Dunes EMU contains the Gypsum Duneland SNA, which has the largest area of vegetated and unvegetated gypsum dunes and fossilized gypsum dunes in the world—contiguous with those within WSNP and HAFB. The area has seasonal playas, particularly those associated with Lake Lucero, that provide important habitat for endemic species and migratory waterfowl and shorebirds. The Gypsum Duneland SNA provides unique habitat that harbors western massasauga rattlesnakes and unique white color morphs of three lizard species (Hobert et al. 2016a). The entirety of WSNP is within this EMU, making interagency cooperation necessary for effective management (WSMR 2011b). The primary concern within this EMU is the potential for the military mission to affect a globally unique landscape.

Fire Management

The Lake Lucero/Dunes EMU contains portions of 12 FMUs (Figure 2.5-6) (Bumgarner 2018). This EMU has low potential for widespread fire due to absence of fine fuels. None of this EMU is proposed for prescribed fire management.

Natural Resource Monitoring and Management

WSMR collaborates with ongoing White Sands pupfish management in the Lake Lucero/Dunes EMU on populations at Malone Draw and Lost River on HAFB and WSNP (WSMR 2020a). Graduate students from the Rosenblum Lab (University of California, Berkeley) study lizard ecology within different habitats on WSMR. Research involves collection of various lizard species for genetic analysis.

Military Activities

This EMU has the highest number of military test sites (145) of any EMU, according to official Enterprise GIS data (Figure 2.5-6). Most mission activities are conducted in the southern part of the EMU. There are four Phase I WIT sites including G10, G16, G20, and G25. These sites receive surface-to-surface missiles, and potential adverse environmental impacts from these activities are designed to be confined to these WIT sites.

2.5.6 Southern Jornada EMU

The Southern Jornada EMU (Figure 2.5-7), which includes the western slope of the southern San Andres Mountains, is 33,297 ha (82,276 acres) in area, making it the smallest EMU on WSMR. Elevations range from approximately 1,360 to 1,583 m (4,462 to 5,193 ft). The Southern Jornada EMU is representative of an ecosystem concept isolating the physiographic features of the alluvial fans and basin floor rather than including that terrain with the San Andres Mountains and bajadas. Management issues in this EMU can be complex because Co-Use Areas are administered jointly by WSMR, NASA, and the JER (US Army 2010).

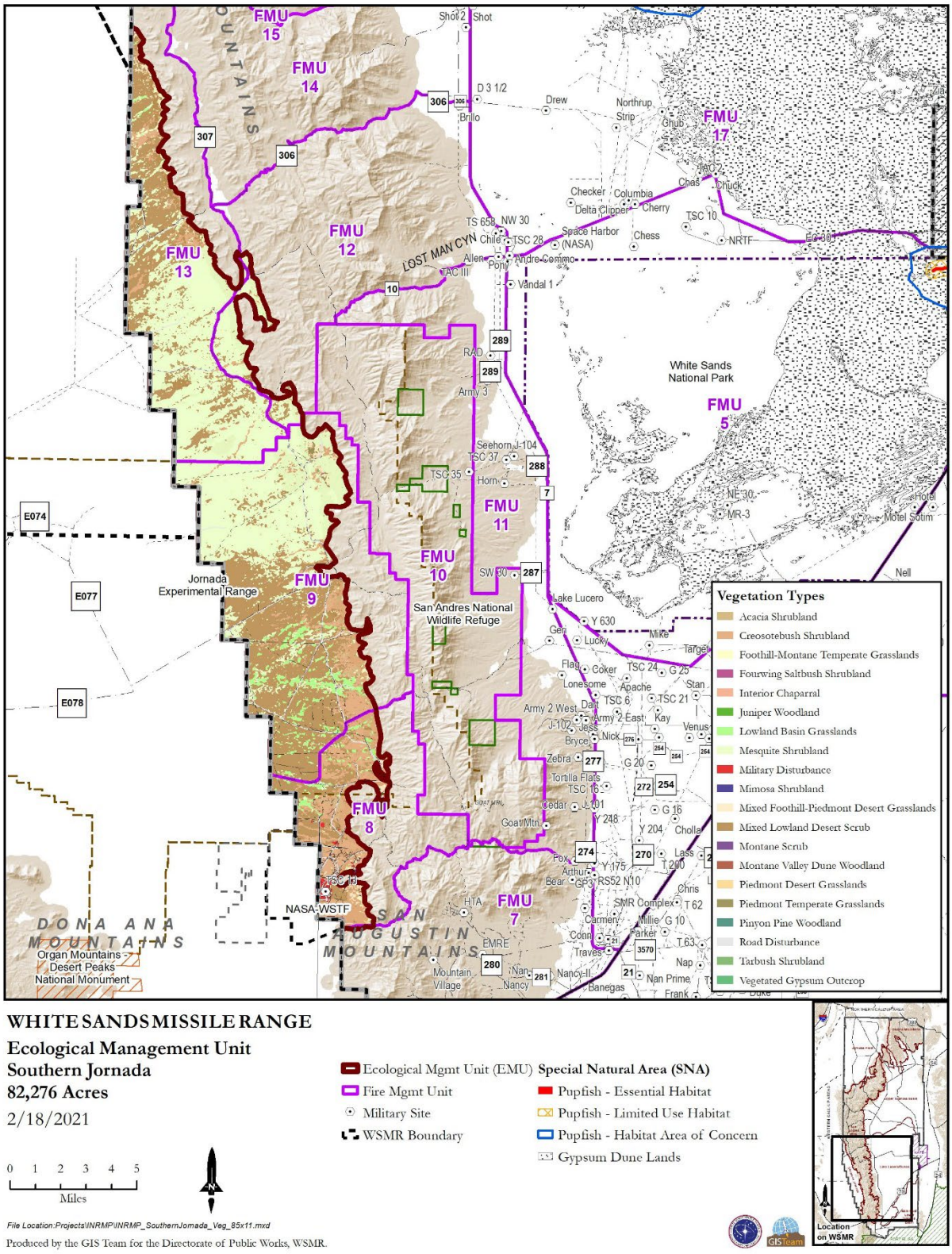

Figure 2.5-7. Southern Jornada EMU.

Geology and Soils

The Southern Jornada EMU soils have been mapped and described (USDA-NRCS 2017, USDA-NRCS 2020). The EMU was designed so that it would include the bajada and its transition into the Jornada Basin. It is dominated by alluvial and eolian Quaternary/Tertiary sediments. The southern half of the EMU is piedmont alluvial deposits of the upper and middle Quaternary, with massive alluvial fans. The northern half of the EMU is a mix of piedmont alluvial deposits and sediments.

Table 2.5-6. Federal and State Threatened and Endangered Species and Species at Risk Documented in Southern Jornada EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
FLORA			
Night-blooming cereus	None	Endangered	Rare - Scattered populations on the eastern and western slopes of San Andres Mountains, south of Sulphur Canyon.
Alamo beardtongue	None	S3***	The three occurrences of alamo beardtongue are located between the western boundary of the Small Missile Range and the eastern boundary of the NASA operations site.
FAUNA			
Golden eagle	BGEPA; DoD PIF Tier 2 Species	None	Nesting territories of year-round residents are typically in mountainous areas, with foraging in grasslands, shrublands, and other open country. Winter population primarily in basins.
Burrowing owl	USFWS BCC*; DoD PIF MSS	SGCN**	Uncommon and local in open grasslands.
American peregrine falcon	None	Threatened	Rare migrant and likely small breeding population.
Bell's vireo	None	Threatened	Rare migrant.
Loggerhead shrike	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Common throughout WSMR.
Baird's sparrow	USFWS BCC	Threatened	Rare migrant/winter.
Chiricahua leopard frog	Threatened	SGCN	Refugia population contained in a steel rim tank on JER/WSMR co-use area.

*BCC = Bird of Conservation Concern – species, subspecies and populations of migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA
**SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists)
*** Natural Heritage New Mexico Rank: S1 – Critically Imperiled, S2 – Imperiled, S3 - Vulnerable

Water

Surface flows in the Southern Jornada EMU are intermittent and drain into Jornada Draw, a closed surface-water basin. There are approximately 370 linear km (230 mi) of surface drainages, approximately 18 tanks and wells, and one spring within this EMU (Thompson et al. 1992; USGS 1981). WSTF obtains water from two wells west of the facility. Exploration for water occurred in

the early 1960s. The USGS drilled six wells (Doty 1963); only two yielded enough water to be developed as water-supply wells. Additional drilling and exploration have been associated with the Resource Conservation and Recovery Act contamination-assessment program. Monitoring is regulation driven. The wells supplying water to the NASA facility are regulated under the Safe Drinking Water Act.

Vegetation

Dominant vegetation is mesquite shrubland, mixed lowland desert scrub, and creosote bush shrub land, with lowland basin grasslands scattered throughout. Coppice dunes occur in the middle to upper section, and sand sheets occupy most of the basin. Foothill piedmont desert grasslands, which comprise a very small part of this EMU, occur on the ridges along the eastern edge of the EMU.

Threatened and Endangered Species

One USFWS listed faunal species exists in the Southern Jornada EMU. There is a refugia population of Chiricahua leopard frog (*Lithobates chiricahuensis*), which are USFWS threatened and a NMDGF SGCN, being held in a steel rim tank. This population was established by the BLM, Las Cruces District Office in 2009 (R. Burke, Wildlife Biologist – BLM Las Cruces District Office). These frogs are used to genetically augment or restore wild populations affected by disease or loss of habitat. The BLM, Las Cruces District Office is responsible for the management and maintenance of this refugia population (R. Burke, Wildlife Biologist – BLM Las Cruces District Office). No USFWS listed floral species are known to exist in the Southern Jornada EMU. One New Mexico floral species and three faunal species listed as endangered occur or have the potential to occur in the Southern Jornada EMU (Table 2.5-6).

Special Natural Areas

There are no SNAs in the Southern Jornada EMU.

Fire Management

There are parts of four FMUs within the Southern Jornada EMU (Figure 2.5-7) (Bumgarner 2018). No proposed prescribed fire areas occur within this EMU.

Natural Resource Monitoring and Management

Trespass cattle are an ongoing problem in the Southern Jornada EMU. Portions of the WSMR boundary fence continue to be damaged, and ongoing maintenance is important for limiting trespass cattle. Range Operations is responsible for coordinating and removing trespass cattle from WSMR.

The portion of the JER within the WSMR boundary is approximately 34,089 ha (111,839 acres) in area and is managed under an MOU between WSMR, WSTC, and JER (US Army 2010).

The NASA WSTF, located at the southwestern end of the San Andres Mountains, has been a part of the NASA Johnson Space Center since its construction in 1963. The facility houses the ground terminal of the Tracking and Data Relay Satellite System. This facility also coordinates activities at White Sands Space Harbor, located in the Lake Lucero/Dunes EMU (NASA-JSC 1992).

Military Activities

Official Enterprise GIS data indicate that NASA WSTF is the only site within the Southern Jornada EMU.

2.5.7 Main Post/Lower Tularosa Basin EMU

The Main Post/Lower Tularosa Basin EMU, 70,344 ha (173,820 acres) in area, is located in the southwestern corner of the missile range (Figure 2.5-8). Except for a small portion of an eastern portion of the Organ Mountains, basin features typical of the Chihuahuan Desert dominate this landscape. Expansive eolian deposits are the northern part of an extensive complex of shifting and stabilized sand sheets and dune fields that continue to the southern Tularosa Basin. The composition of these dune fields is in stark contrast to the lacustrine and gypsum-dominated sands that occur to the north. Activities in this EMU are diverse and include housing for WSMR personnel, WSMR administration facilities, tenant facilities, and launch and test facilities. This EMU contains more roads and disturbed areas per unit area than any other EMU.

Geology and Soils

The Main Post/Lower Tularosa Basin EMU soils have been mapped and described (USDA-NRCS 2017, USDA-NRCS 2020). There are two principal geomorphic structures in the EMU: piedmont slopes located near the western and southeastern boundaries of the EMU and an expansive and hummocky basin floor that merges upward to the margins of the slopes. The piedmont surfaces vary in composition because of the influence of the distinct stratigraphy of the Organ, San Augustin, and Jarilla Mountains.

Water

Most of the streams in the Main Post/Lower Tularosa Basin EMU originate in the mountains and flow to the east. Other surface drainages occur on alluvial fans of the Jarilla Mountains in the southeastern part of the EMU. Surface water includes 92.8 linear km of ephemeral drainages, three reservoirs, 76 wells, two springs, and four haul tanks.

Eleven supply wells provide potable water for Main Post, including facilities along Nike Blvd, Orogrande Range Camp (on Fort Bliss), and northward along the eastern boundary from Orogrande Range Camp (WSMR 1998). The Soledad Well Field also pumps water to the Main Post and is capable of supplying water to an effective population in excess of 14,400 people (WSMR 1998).

The WSMR Main Post wastewater treatment facility is a trickling-filter system that provides secondary wastewater treatment. The facility is located 2.4 km (1.5 mi) southeast of the Main Post. Discharge from the wastewater treatment facility flows six miles east to Davies Tank, creating a wetland-pond area of approximately three acres of surface water. Fort Bliss manages a sewage treatment evaporative pond at Orogrande Range Camp, outside the southeastern corner of WSMR.

More than 100 test and production wells have been drilled in the Main Post area, primarily before 1980. Monitoring within this area has been both regulation- and science-driven. Fifteen drinking water supply wells are monitored under the Safe Drinking Water Act. Twelve are in the Main Post area and four are in the Soledad Canyon area. Sewage discharge is monitored using the Clean Water Act as a guide to set best management practices. From 1971 through 1988, the USGS monitored water levels and quality within the area (Cruz 1972–1986; Myers and Sharp 1989, Myers and Sharp 1992). Twice in 1999, WSMR conducted range wide water-level measurements to obtain regional data; the study included some wells on WSMR's eastern boundary, wells at White Sands National Monument (now WSNP), and a few at HAFB (Williams and Furrick 2000a,b). The U.S. Geological Survey manages an annual statewide groundwater program that includes seven sites on WSMR. Only three of more than 40 Resource Conservation and Recovery Act sites within this area are currently being monitored on a long-term basis.

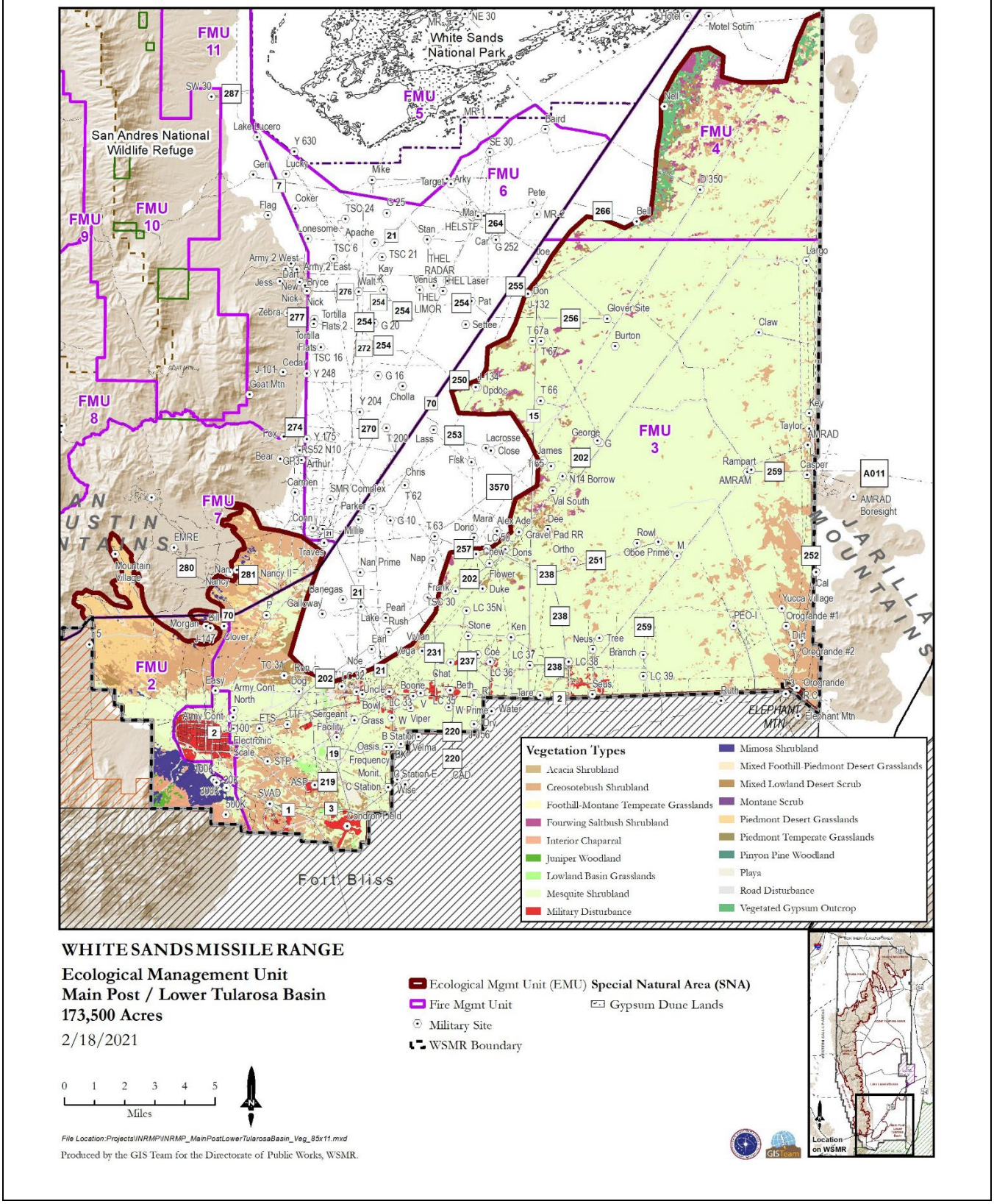

Figure 2.5-8. Main Post/Lower Tularosa Basin EMU.

Two metal livestock watering tanks and several earthen tanks exist throughout the western portion of this EMU south of U.S. 70 (Burkett 2020). At the time of the site visit, all earthen tanks were dry. Solar powered well pumps provide water to the metal watering tanks (Burkett 2020).

Vegetation

Basin shrublands dominate this EMU and are part of an extensive field of mesquite coppice dunes that extends south into Texas and Chihuahua, Mexico (Muldavin et al. 2000). Mesquite shrublands and creosote bush shrublands comprise 72% and 12%, respectively, of the vegetation cover in this EMU; the remaining 16% is disturbed areas, piedmont grasslands, plant communities on the alluvial fans, and upslope into scattered chaparral, piñon pine, and juniper (Muldavin et al. 2000).

Threatened and Endangered Species

The following is a list of species in the Main Post/Lower Tularosa Basin EMU that are listed by the New Mexico as threatened or endangered (Table 2.5-7). No USFWS listed species are known or expected to occur in this EMU.

Table 2.5-7. Federal and State Threatened and Endangered Species and Species at Risk Documented in Main Post/Lower Tularosa Basin EMU.

Species	Federal Status	New Mexico Status	Status on WSMR
FLORA			
Alamo beardtongue	None	S3***	Single occurrence located in mouth of Bear Canyon, San Andres Mountains.
Organ Mountains pincushion cactus	None	Endangered	Occurrence confined to several populations or to one extended population.
Organ Mountains evening primrose	None	S2***	Populations have been documented in Texas canyon, but it is also likely to occur at seeps and springs in drainages where the Organ Mountains extend onto WSMR (NMRPTC 1999).
Mosquito plant	None	S3***	Lower canyon slopes of Organ Mountains.
Sandberg's pincushion cactus	None	S2***	Occurs in the southern San Andres Mountains.
FAUNA			
Yellow-billed Cuckoo Western population	Threatened	SGCN	A rare migrant confirmed sporadically. No breeding cuckoos have been documented, and breeding habitat does not occur on WSMR.
Golden eagle	BGEPA; DoD PIF Tier 2 Species	None	Nesting territories of year-round residents are typically in mountainous areas, with foraging in grasslands, shrublands, and other open country. Winter population primarily in basins.
Flammulated owl	USFWS BCC*; DoD PIF Tier 2 Species	SGCN**	Uncommon in oak and pine woods.

Burrowing owl	USFWS BCC; DoD PIF MSS	SGCN	Uncommon and local in open grasslands.
American peregrine falcon	None	Threatened	Visits Davies Tank to hunt for waterfowl, dove, etc. Known to nest nearby in the Organ Mountains.
Costa's hummingbird	USFWS BCC	Threatened	Rare migrant.
Bell's vireo	None	Threatened	Rare migrant.
Loggerhead shrike	USFWS BCC; DoD PIF Tier 2 Species	SGCN	Common throughout WSMR.
Baird's sparrow	USFWS BCC	Threatened	Rare migrant/winter.
Spotted bat	None	Threatened	Possible / Uncommon.
Organ Mountains Colorado chipmunk	None	Threatened	Uncommon. In upper reaches of Texas Canyon.
*USFWS BCC = Bird of Conservation Concern – species, subspecies and populations of migratory nongame birds that without additional conservation action are likely to become candidates for listing under ESA **SGCN = Species of Greatest Conservation Need (https://www.usgs.gov/news/new-database-available-usgs-releases-species-greatest-conservation-need-lists) *** Natural Heritage New Mexico Rank: S1 – Critically Imperiled, S2 – Imperiled, S3 - Vulnerable			

Special Natural Areas

There are no SNAs in the Main Post/Lower Tularosa Basin EMU.

Fire Management

There are four entire FMUs and part of a fifth FMU within the Main Post/Lower Jornada EMU (Figure 2.5-8) (Bumgarner 2018). No prescribed fire management actions are proposed for habitats within this EMU.

Natural Resource Monitoring and Management

Lighting on WSMR should be designed in accordance with the New Mexico Night Sky Protection Act (NMSA 1978 Article 12, WSMR 2005). Dark skies also serve as a mission and capability asset, as several missions at WSMR require dark skies. The Night Sky Protection Act requires that outdoor lighting be fitted with shielding that directs light downward, rather than upward or laterally. Lights directed downward help to prevent sky glow and associated impacts to nocturnal migrating birds (NMSA 1978 Article 12). The act allows present lighting to remain throughout its useful life, but it requires the installation of conforming lights whenever replacement would normally occur so that any economic burden is limited or avoided altogether.

Widespread replacement of high-pressure sodium floodlights with LED lights throughout this EMU has the potential to impact nocturnal migrating birds due to change in spectrum and brightness of LEDs. The Nuclear Effects Laboratory has funded carcass searches, and the Environmental Division has initiated more extensive research on nocturnal migrants and lighting throughout the southern Tularosa Basin.

Extensive efforts to protect raptors, particularly golden eagles, from power line electrocutions are ongoing within the Main Post/Lower Tularosa Basin EMU (Appendix A; WSMR 2014b). If a bird is discovered injured or dead at WSMR near a utility pole, the Environmental Division works with the DPW to implement the applicable retrofitting approach and documents the corrective actions

(WSMR 2014b). Other nearby similar pole or line configurations are also evaluated for possible retrofitting. Initially, field crews record the actions taken to correct the hazard (WSMR 2014b).

Approximately 107 cattle from the San Agustin Ranch graze within WSMR in the western portion of this EMU, referred to as Parcel 2 (WSMR 2018b). Trespass cattle are an ongoing problem on the west side of the Main Post/Lower Tularosa Basin EMU north of U.S. 70. Portions of the WSMR boundary fence continue to be damaged, and ongoing maintenance is important for limiting trespass cattle. Range Operations is responsible for coordinating and removing trespass cattle from WSMR.

WSMR DPW has developed a Tree Management Plan for the Main Post area of WSMR (Appendix K)(WSMR 2021b). The immediate goals of the Tree Management Plan were to map and estimate the number of trees on the Main Post, identify their species, locate access to existing irrigation or water supply, and develop a plan to replace dead trees in the Housing Areas (WSMR 2021b). Maintaining trees supports DoD/Army objectives and policies to provide habitat for and conserve migratory birds; accordingly, the Tree Management Plan includes guidance on timing of maintenance to reduce potential impacts on birds. This plan also supports goals/objectives of the WSMR INRMP.

Military Activities

Official Enterprise GIS data indicate that there are 139 test sites in the Main Post/Lower Tularosa Basin EMU. The following is a list of static facility areas used for RDT&E operations, administrative space, or Garrison functions within the Main Post/Lower Tularosa Basin EMU:

- Temperature Test Facility
- Environmental Test Complex (Environmental Test Areas 1 and 2)
- Hot Chamber
- Main Post
- Nuclear Effects Laboratory
- South Range Launch Complexes
- Launch Complex 32-39

Main Post

The Main Post currently provides housing for over 352 families (R. Angelo, Chief, Housing Division – WSMR, Pers. Comm.). Employees working on WSMR—including civilian, military, and contractors—total approximately 5,026 (Human Resources - WSMR). Many of the issues that arise on the Main Post are like those in small communities bordering national forests and wilderness areas. The close proximity of these communities to natural areas is often referred to as the “wildland–urban interface.” As development increases in these areas, so do encounters with wildlife. Possible consequences include damage to native vegetation, direct human-wildlife conflicts, and damage to property by wildlife. The urban setting of Main Post provides many resources that attract various species of wildlife, including deer, oryx, bats, birds, raccoons, skunks, bobcats, and coyotes. Although some interactions with wildlife may be enjoyable and desired by the workforce and residents, there can be deleterious consequences. Some wildlife—such as gophers, squirrels, skunks, raccoons, bats, and coyotes have adapted to living within and/or among infrastructure which leads to costly labor-intensive programs to minimize human-wildlife conflicts and damage to infrastructure. Prior to any removal of wildlife, the Conservation Branch focuses on disseminating wildlife safety education and encourages coexistence. Other costly programs are used for controlling weeds and insects to maintain landscapes and playgrounds. Guidelines and educational programs would help to reduce the impact of wildlife in

the Main Post area. Because water is scarce for both humans and wildlife, unnecessary irrigation creates water-availability issues. Xeric landscaping helps minimize unwanted pests and conflicts with wildlife.

Testing

The most active testing areas in this EMU are in the South Range Launch Complex. The Navy uses Launch Complex facilities 34-37 to support surface-to-air and surface-to-ground weapon testing, missile assembly, missile all-up round testing, and research rocket build-up and launch operations. Due to the open structures, condition of buildings, and layout of the South Range Launch Complex, it is not uncommon to have various problems with species of wildlife such as birds, bats, raccoons, and reptiles inside these buildings.

Other facilities include Launch Complex 50, Ammunition Storage Point (ASP), and the Nuclear Effects Laboratory. Laser and missile warning systems, such as the Advanced Tactical Aircraft Sensor, are tested by the Center for Countermeasures at the AMRAD site. The Dusty Infra-red Test Site is 6.4 km (4 mi) long and 1.6 km (1 mi) wide; activities at this site include the use of obscurants to evade radar systems. The ASP site was historically used for the Navy upper-atmosphere research sounding rocket.

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3 RANGE SUSTAINABILITY

3.1 Integrating Military Mission and Sustainable Land Use

The Army is committed to environmental stewardship as an integral part of sustaining the Army mission (US Army 2007). U.S. Department of the Army environmental policy and guidance reflects the importance of maintaining and improving Army testing and training ranges in order to sustain the current military mission and to meet future mission requirements (DoD 2003, US Army 2004a, US Army 2004b, US Army 2005b, US Army 2007, WSMR 2017b). The Army's strategy to promote sustainable environmental use includes pollution prevention, conservation, and preservation of natural and cultural resources, compliance with applicable environmental laws, and restoration of previously contaminated sites (US Army 2007).

In support of the Army's commitment to environmental sustainability, WSMR has developed an Environmental Sustainability Plan (WSMR 2017b). The goal of this plan is to maximize the capability, availability, and accessibility of the WSMR testing and training lands to provide Army, Navy, Air Force, DoD, and other customers with high quality services for experimentation, test, research, assessment, development, and training in support of our Nation's National Security Strategy (WSMR 2017b).

Objectives to meet WSMR's sustainability goals include:

- Minimize external encroachment on lands adjacent to WSMR.
- Maintain the ability to support the current and future needs of the military mission on WSMR.
- Incorporate sound land management practices into everyday installation activities to ensure sustainability of the installation's biological heritage, land, and natural and cultural resources.
- Ensure that WSMR resources and capabilities are protected to maintain accessibility for multiple missions.
- Establish partnerships with local and regional community interests to contribute towards a desirable quality of life that makes southern New Mexico a great place to work and live.
- Establish an interdisciplinary approach for sustaining the range that integrates range safety, operational, facilities, and environmental management functions.
- Establish a WSMR Sustainability Working Group collectively responsible for execution of this plan and its maintenance as a living document (WSMR 2017b).

WSMR provides multiple environments for conducting a wide range of military testing and training. Natural vegetation supported by stable soil provides opportunities for realistic ground-based testing and training in a desert setting. Mountain ranges on WSMR provide protection and security for directed energy (laser, HPM) testing and are ideal for conducting Global Positioning System and open-air radio frequency jamming in a live fire scenario (WSMR 2018a). The large acreage encompassed by WSMR provides restricted airspace for military aircraft operations as well as capability for supporting the testing of long-range weapons systems that have substantial land and airspace requirements (WSMR 2017b). The land base provides adequate acreage for impact areas and safety zones. The ability to sustain test and training lands in a natural and balanced

ecological state is critical to maintaining the long-term integrity of the military mission (US Army 2004a, WSMR 2017b).

3.1.1 Natural Resource Constraints

Compliance with numerous environmental laws, policies, and regulations that provide protection of environmental resources and guidance for their management is critical to the military mission. Without proper natural resources management, unrestricted military use could degrade the land and result in additional threats to plant or animal species, including becoming listed as threatened or endangered under state laws or under the ESA. This would result in USFWS consultations resulting in restrictions/prohibitions for military testing and constraining the ability of the military to support the training missions. Implementing constraints to military activities in sensitive natural resource areas of WSMR provides compliance with existing environmental laws and ensures that the military mission is sustained into the future.

Current land use on WSMR includes areas with either jurisdictional, environmental, or operational constraints that restrict activities on almost 1.2 million acres (WSMR 2010a). These primarily include areas that are not entirely off-limits, except for portions of jurisdictional constraint areas, Todsen's pennyroyal habitat, and White Sands Pupfish essential habitat (Britt 2018, WSMR 2010a, WSMR 2020a). The degree of limitation on activities of any given constraint is variable and, in many cases, surmountable. A preliminary screening for environmental constraints can be used as a starting point for determining how to conduct a mission while avoiding/minimizing impacts to natural resources (WSMR 2010a). Constraints are dynamic and can be modified in the future as new information becomes available.

Jurisdictional constraints include areas not owned by WSMR but that are partially or entirely contained within its boundaries. These include JER, WSNP, and SANWR (WSMR 2010a). Activities within these areas are restricted to those detailed in each respective MOA or Interagency Agreement (WSMR 2010b, WSMR 2010b, WSMR 2011b, WSMR 2017).

Environmental constraints reflect resources that require coordination with specialists in the Environmental Division prior to mission activity in the area (WSMR 2010a). Environmental coordination must be carried out in relation to listed floral and faunal species, SAR, and species of interest (WSMR 2010a). Changes in the status of any given species can change constraints imposed on testing and training activities. Areas of environmental constraints include: SNAs, lava flows, springs, Big Salt Lake, Todsen's pennyroyal habitat, White Sands Pupfish Essential and Limited use habitat, areas of other rare or species of interest plants, areas which contain slopes greater than 40%, and areas containing other sensitive wildlife species (WSMR 2010a).

Operational constraints reflect non-environmental land use limitations that are related to historical and/or current mission activity (WSMR 2010a). These constraints may vary geographically and/or temporally and include dedicated use areas, specialized areas, UXO areas, impact areas, and quantity-distance and ammunition supply point areas (WSMR 2010a).

3.2 Encroachment

The DoD Readiness and Environmental Protection Integration (REPI) program is a key tool for combating encroachment that can limit or restrict military training, testing, and operations. The DoD created the REPI Program in response to the incompatible development and loss of habitat around its installations that can lead to restrictions or costly and inadequate training and testing alternatives. This program facilitates cost-sharing partnerships between military departments, other federal agencies, state and local governments, and private conservation organizations to

help relieve or avoid land use conflicts near military installations and address regulatory restrictions that inhibit military activities (DoD 2020a).

The NCUA/WCUA provides invaluable airspace for the DoD and its partners. WSMR uses these areas for critical long-range flight programs (High Speed/Hypersonic Weapons), target use, and to provide invaluable airspace that is called up daily for various mission sets (WSMR 2019c). WSMR hosts 100% of the military's Remote Pilot Aircraft training, 70% of F-22 and F-16 pilot training, and most training for nearby HAFB (DoD 2020b).

Encroachment is of critical concern to the NCUA/WCUA because it presents risks to low-flying missile operations and may affect the use and choice of radar locations. Development along NCUA/WCUA's borders would also lead to issues related to radiation, noise, air quality degradation, and dust. Projected population growth and recent land sales indicate that the likelihood of this threat will only increase with time (DoD 2020b). WSMR has collaborated with local stakeholders and hopes to purchase easements and enter into cooperative land use planning efforts in the NCUA/WCUA to mitigate encroachment (AECOM 2015, DoD 2020b).

If funding is approved on a consistent basis, the protections through the Army Compatible Use Buffer (ACUB) program and other means will sufficiently protect/sustain the mission, maintain current levels of operation, allow for an increase in activity, and allow ranchers to continue their operations. The easements or other agreement mechanisms will:

(1) Restrict or eliminate encroachment, development, and incompatible infrastructure that would degrade the testing/training mission.

(2) Eliminate degradation of the restricted airspace used by the Army and Air Force and protect the critical long-range flight corridors in the NCUA/WCUA.

(3) Preserve the electromagnetic testing environment for Army and other multi-service systems undergoing Test and Evaluation at WSMR.

(4) Prevent development near the installation that may have an adverse impact on ground water resources and/or security.

(5) Prevent fugitive noise and dust near surrounding communities.

(6) Prevent urban sprawl, including the requirement to create additional evacuation agreements that are costly (DOA 2022, WSMR 2019c).

3.2.1 U.S. Army Compatible Use Buffer

Title 10, Section 2684a of the U.S.C. authorizes the DoD to collaborate with non-federal governments or private organizations to establish land buffers around installations. The Army implements this authority through the ACUB program. This program is an integral part of the Army's sustainability program and supports collaborative partnerships with public and private organizations to establish buffer areas around training and testing areas without acquiring any new land for Army ownership. The Army climate strategy considers the ACUB program to be an important strategy for climate change mitigation (DOA 2022).

The Army assists these partner organizations in acquiring land or receiving approval from willing landowners in order to prevent these adjacent properties from being developed. The partner will own and manage the land according to mutual objectives agreed upon by all parties. These buffer areas not only relieve constraints placed on the training and testing at the installation but also help to conserve valuable habitat and critical open areas. Most of the funding comes through the

Readiness Environmental Protection Integration program (REPI) with some match provided by the partner.

In 2017, the Army approved WSMR for an ACUB program. WSMR established a cooperative agreement with the NMLC to work with private landowners and the NMSLO in WSMR's NCUA/WCUA. The NMLC negotiates conservation easements with landowners that pay the owners the value of the land that is lost by being excluded from significant future development. Easements are "in perpetuity" and cannot exceed "fair market value" as determined by an independent appraisal. The NMLC is responsible for executing, as well as enforcing and monitoring, the easements.

3.2.2 Readiness and Environmental Protection Integration Challenge

The REPI Challenge initiated its pilot effort in 2012 to offer funding for REPI buffer land transactions at eligible military bases (DoD 2020c). The Challenge's goals are to cultivate projects that conserve land at a greater scale, test promising ways to finance land protection, and harness the creativity of the private sector and market-based approaches. The REPI Challenge awards funds on an annual basis to one or more projects that provide innovative approaches to protecting the military mission. This annual competition seeks to cultivate projects that conserve land at a greater scale, thereby helping the REPI Program meet its goals (DoD 2020c).

3.2.3 Limited Use Restriction or Condition

A Limited Use Restriction or Condition (LURC) is an easement between the DoD and the NMSLO (B. Knight, Environmental Division Chief – WSMR, Pers. Comm.). The LURC restricts or limits the use of state trust lands to facilitate the use of nearby DoD lands in support of military training and testing for a term of 75 years. The LURC outlines the prohibited, restricted, and unrestricted land uses that may or may not occur on the state trust lands detailed in the easement (B. Knight, Environmental Division Chief – WSMR, Pers. Comm.).

3.2.4 Joint Land Use Study

A Joint Land Use Study (JLUS) is a cooperative planning effort conducted as a joint venture between an active military installation, surrounding jurisdictions, state and federal agencies, and other affected stakeholders to address compatibility around military installations.

The goal of a JLUS is to reduce potential conflicts between military installations and surrounding areas while accommodating new growth and economic development, sustaining economic vitality, protecting public health and safety, and protecting the operational missions of WSMR. JLUS programs have three core objectives:

- UNDERSTANDING - Increase communication between the military, local jurisdictions, and other stakeholders to promote an understanding of the strong economic and physical relationship between WSMR and its neighbors.
- COLLABORATION - Promote collaborative planning between the military, local jurisdictions, and other stakeholders in order to ensure a consistent approach in addressing compatibility issues.
- ACTIONS - Develop and implement strategies for reducing the impacts of existing and future incompatible activities on the community and military operations.

In 2015, WSMR entered into the Southern New Mexico-El Paso, Texas (SNMEP) Joint Land Use Study (AECOM 2015). The SNMEP JLUS area encompasses six counties; two states; and the

three military installations of Fort Bliss, WSMR, and HAFB (AECOM 2015). The land area of interest is approximately 27,000 square miles−one of the largest JLUS areas (AECOM 2015). Within its geographic span, the region's natural, cultural, recreational, and renewable energy resources; weather; terrain; growth opportunities; and diversity of military training and testing missions create one of the most distinctive and valuable defense communities in the United States.

Several physical characteristics of the SNMEP region are critical to the effective performance of missions at Fort Bliss, WSMR, and HAFB. Physical characteristics include expansive, contiguous areas of special use airspace to support aerospace activity; rugged, uninterrupted land areas to accommodate maneuver training and hazardous test events; a clear electronic spectrum; and a wide range of geologic features (AECOM 2015). The ability to deploy and support operational forces, perform realistic aerospace and live-fire training, and conduct weapons system testing in this environment is vital to maintaining the mission effectiveness of the three installations and the overall readiness of military forces (AECOM 2015).

Since the completion of the SNMEP JLUS, the members formed an Implementation Committee that continues to meet quarterly to collaborate on land use planning, economic impacts, and mitigating encroachment. The Implementation Committee was awarded two follow-on grants from the Office of Economic Adjustment which will allow the Implementation Committee to continue to work together on compatibility tools identified in the original study.

3.3 Enabling the Military Mission through Range Sustainment

The Army Strategy for the Environment (ASE) is designed to strengthen the Army today and into the future by transitioning the Army's compliance-based environmental program to a mission-oriented approach based on the principles of sustainability (US Army 2004a). This strategy applies a community, regional, and ecosystem approach to managing natural resources on installations in order to ensure the long-range vision for a sustainable Army (US Army 2004a).

The U.S. Army Sustainable Range Program (SRP) provides policy and guidance for meeting the goal of ASE and for managing the long-term viability of the Army ranges and training lands (US Army 2005). The goal of the SRP is to maximize the capability, availability, and accessibility of ranges and training lands to support doctrinal requirements, mobilization, and deployments under normal and surge conditions (US Army 2005). Capability refers to the Range and Training Land Program (RTLP) and ITAM Program and the continuing capacity of ranges to meet the demands dictated by the characteristics of its weapons systems and doctrinal requirements (US Army 2005). Availability refers to the non-environmental facility management functions and the continuous availability of the infrastructure that is essential for safely operating the range complex (US Army 2005). Accessibility refers to the environmental compliance and management functions and the continuous access to the land for realistic military training and testing (US Army 2005). The SRP ensures that the Army utilizes the best data and science to support the mission and that all aspects of range management are fully integrated for sustaining training lands.

The RTLP provides for the central management, programming, and policy for modernization of the Army's ranges and their day-to-day operations. Currently, WSMR does not have a RTLP. ITAM provides Army Range Officers with the ability to manage and maintain training lands by integrating mission requirements with environmental requirements and sound land management practices. The WSMR ITAM program is focused environmental degradation that limits the Army's testing and training capabilities. On WSMR, ITAM is focusing on erosion control within Thurgood

Canyon and in Operational Testing Area's, and in any other areas that could benefit from ITAM capabilities. (J. Thompson, Environmental Engineer – WSMR, Pers. Comm.).

3.3.1 Integrated Training Area Management

ITAM programs are viewed as programs that directly support testing and training missions. Although WSMR is designated as a Major Range and Test Facility Base, it does support limited training missions that are increasing in frequency (Wilson 2015). The WSMR ITAM program is managed by the WSTC in accordance with the Army Test and Evaluation policy (WSMR 2011a) that assigns ATEC as responsible for the SRP program, which includes ITAM (AR 73-1). The WSMR ITAM program mission is to achieve sustainable use of military lands by promoting proactive management and conservation of ecological function within diverse landscapes to ensure no net loss of testing and training capability (US Army 2005, Wilson 2015). The program attempts to prevent environmental degradation through proactive project planning rather than focusing on land rehabilitation after an activity occurs (Wilson 2015). As training missions on WSMR increase, the ITAM program will help to address range sustainability issues—both present and in the future.

3.3.1.1 Land Rehabilitation and Maintenance

The Land Rehabilitation and Maintenance (LRAM) program is a key component for sustaining realistic training conditions and supporting the personnel, weapons, vehicles, and mission requirements for the units using the installation (US Army 2005, Wilson 2015). LRAM is intended to sustain the long-term condition of the land used for military operations. The primary function of LRAM is to repair, maintain, and reconfigure Army training lands to ensure its capability to support sustainable and safe maneuver training conditions (US Army 2005, Wilson 2015). LRAM mitigates mission, training, and testing effects by combining preventive and corrective land rehabilitation, repair, and/or maintenance practices in order to reduce the impacts of training and testing on an installation (US Army 2005, Wilson 2015). Installations coordinate with the Range Modernization and Planning team members to identify, plan, and execute approved LRAM projects.

3.3.2 Range Training Land Assessment

The Range Training Land Assessment (RTLA) component of ITAM acquires data and assesses information to maximize the capability and sustainability of the land for supporting mission activities (US Army 2005, Wilson 2015). This is accomplished through inventorying and monitoring natural resource condition and management as well as analysis of natural resource information (US Army 2005, Wilson 2015). RTLA provides input to decisions that promote sustained and multiple uses of military lands. The program evaluates relationships between military land use and condition of the physical and biological resources data. Data evaluation and reporting is a critical aspect to the success of the RTLA program (Wilson 2015).

3.4 ESA Consultation Requirements with USFWS

The purpose of the ESA is to provide a means to conserve the ecosystems upon which endangered and threatened species depend and to provide a program for the conservation of such species. Section 7 of the ESA directs all federal agencies to aid in the conservation of listed species and requires them to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat (USFWS 1998c). Under Section 7, federal agencies often enter into partnerships and Memoranda of Understanding with the USFWS for implementing and funding conservation agreements, management plans, and recovery plans developed for

listed species (USFWS 1998c). These types of partnerships and planning efforts are developed to take pro-active approaches to listed species management.

Section 7 compliance is required for federally listed species and critical habitat or when a species is proposed for listing or critical habitat is proposed for designation (USFWS 1998c). A Section 7 consultation is required when the action agency requests consultation after determining the proposed action may affect listed species or critical habitat. If, however, USFWS concurs in writing that the proposed action is not likely to adversely affect any listed species or critical habitat (i.e., the effects are completely beneficial, insignificant, or discountable), then an informal consultation occurs. If the USFWS, through informal consultation, does not concur with the action agency's finding that the proposed action is not likely to adversely affect the listed species or critical habitat, then a formal consultation is required (USFWS 1998c).

During formal consultation, the USFWS and the action agency share information about the proposed project and the species or critical habitat likely to be affected. Formal consultation may last up to 90 days, after which, the USFWS has an additional 45 days to prepare a biological opinion. The conclusion of the biological opinion will state whether the Federal agency has insured that its action is not likely to "jeopardize the continued existence" of a listed species and/or result in the "destruction or adverse modification" of critical habitat.

WSMR has never initiated any formal consultations with USFWS regarding listed species. WSMR has informally consulted with the USFWS on the potential biological effects to Todsen's pennyroyal, northern aplomado falcon, southwestern willow flycatcher, and Mexican spotted owl (*Strix occidentalis*) resulting from military activities (WSMR 2009a, WSMR 2009b). The USFWS concurred with WSMR assessments and determined that the impacts associated with implementing new mission requirements and developing new test and training capabilities at the installation would not likely adversely affect threatened or endangered species (WSMR 2009b).

3.5 Compliance with MBTA and BGEPA

WSMR is responsible for compliance with the MBTA and BGEPA. The MOU between DoD and USFWS For the Conservation of Migratory Birds (Appendix M) further describes various measures to avoid and minimize impacts to migratory birds (DoD 2014b). For incidental take from military readiness activities (actual tests and training), we follow 50 CFR Part 21 Migratory Bird Permits: Take of Migratory Birds by the Armed Forces. Support activities, such as the operation of utilities, falls under the MOU even if associated with a readiness activity. Objectives 2 and 3 in Section 4 describe, specifically, our actions and processes to ensure WSMR compliance with both federal laws.

3.6 Requirements for the Clean Water Act

The Army recognizes that supporting sustainable best management practices for water conservation and reuse is key to ensuring that the Army of tomorrow has access to water in a prudent manner (WSMR 2020e). WSMR complies with all required Federal and State Clean Water Act (33 U.S.C. §§ 1251 *et Seq*.) and Safe Drinking Water Act regulations. Permits include operational permits for drinking water systems and underground injection control (U.S Department of the Army 2007, WSMR 1020e). WSMR also follows applicable EOs (i.e., EO 11990, Protection of Wetlands and EO 11988, Floodplain Management), to conserve, protect, and restore surface water resources (wetlands, estuaries, streams and lakes) and groundwater (wells and aquifers (WSMR 2020e). WSMR utilizes best management practices with regard to wastewater, storm water, and septic systems. The Clean Water Act does not apply to WSMR wastewater facilities

due to WSMR's unique physical geology and hydrology, which doesn't meet the definition "waters of the United States" (US Army 2002, US Army 2016).

3.7 NEPA Compliance and Environmental Protection

NEPA is a national policy to encourage productive and enjoyable harmony between man and his environment. All federal agencies are to use practical means to maintain environmental quality (42 U.S.C. 4321, 40 CFR 1500-1508). The Army's implementing regulation under NEPA is 32 CFR 651. The proponent of a proposed action is ultimately responsible for complying with NEPA (32 CFR 651). Conservation Branch staff may serve as the proponent when implementing certain actions of the INRMP.

NEPA compliance at WSMR involves a systematic, interdisciplinary evaluation of potential environmental consequences expected to result from implementation of a proposed action (DoD 2019b). Subject matter experts from the Conservation Branch and other WSMR organizations are participants as members of an interdisciplinary team. Subject matter experts contribute to understanding how a proposed action might potentially affect a natural resource, provide applicable scientific data, and generate best management practices or mitigations for minimizing impacts.

Following the environmental review of a proposed action, Customer Support Branch staff determine whether a proposed action is categorically excluded under 32 CFR 651, adequately analyzed in an existing environmental document, or requires an environmental assessment or environmental impact statement.

3.8 WSMR Installation Hunting Program

Hunting on WSMR is conducted for recreation and wildlife population management. Since the 1950s, WSMR and NMDGF have cooperated in conducting hunts for big- and small-game species on WSMR. WSMR is closed to fishing and sport trapping as well as hunting for black bear, Barbary sheep, and turkey. The collection and/or killing of reptiles and amphibians is prohibited.

Administration and Regulations

Hunting on WSMR is authorized and regulated in accordance with WSMR *Garrison Policy Letter #12: White Sands Missile Range Installation Hunting Program* (WSMR 2019d; Appendix H); state, federal, and Army and Range regulations; and Army and Range policies. Hunting seasons, dates, areas, closures, species, licensing, weapons restrictions, and bag limits are established by and in compliance with state regulations. WSMR (2019d) addresses responsibilities, policies and procedures, safety and security issues, and methods, means, and access for hunting on WSMR.

State hunting regulations and requirements are identified annually in the NMDGF Hunting Rules and Information booklet. This document provides notification of laws and regulations governing each type of hunt, seasons and bag limits, and updated maps of hunt areas. Lands within WSMR boundaries are included within NMDGF Management Unit 19. The entirety WSMR or portions of the range, are subject to closure without notice due to mission or security concerns. Hunt areas on WSMR are established by the Environmental Division in coordination with NMDGF and are based on safety, security, and mission parameters.

Hunting occurs on WSMR under two structures: General Public Big Game Hunts and Restricted Access Hunts. Species hunted under General Public Big Game Hunts are oryx, elk, pronghorn antelope, desert bighorn sheep, and mule deer. Oryx hunt opportunities include once-in-a-lifetime,

youth, broken-horn, military veteran, mobility impaired hunts, and official escort standard oryx population management hunts (WSMR 2019d). Licenses are available only through a lottery draw process conducted annually by NMDGF. General Public Big Game Hunts are normally 2-3 days long and are subject to Range Operations.

Restricted Access Hunts are available only to WSMR personnel who have long-term up-range access authority and have a Range Hunting Permit as well as to guests who are escorted by sponsors that are properly permitted (WSMR 2019d). Hunting opportunities include lottery draw oryx hunts, mountain lion, javelina, and small game hunting. Restricted Access oryx hunts are conducted to reduce oryx numbers in remote areas of the range (*i.e*., primarily outside of once-in-a-lifetime oryx hunt areas).

Small game, migratory bird, mountain lion, and javelina hunting is permitted during state-regulated open seasons. The Sikes Act authorizes military installations to charge fees commensurate with local fees for all hunting. Collected fees from the sale of special state licenses are deposited into the Army Fish and Wildlife Conservation Fund (21X5095), AR200-1, Chapter 4-3(d)(9)(c). These fees can be applied to improvement of habitat on WSMR, including research, aerial surveys, or direct habitat improvement projects. Consistent with the Sikes Act and AR 200-1, WSMR currently charges a $150 hunting fee for oryx and desert bighorn sheep, $100 for elk, $50 for pronghorn antelope, and $50 for mule deer license holders. The use and the operation of professional outfitters and guides is permitted only during General Public Big Game Hunts. WSMR charges outfitters/guides a $500 fee per season to operate on the installation.

Safety and Security

Hunter and visitor compliance with safety, security, and access requirements are of the utmost importance in sustaining continued hunting opportunities on WSMR. Hunters are briefed and made aware that all areas of the range may contain hazardous items and must adhere to established safety and UXO procedures. Hunt areas and units are specifically established to avoid known UXO hazards. Areas identified as hazardous on hunt maps and in the field are always closed to hunting. WSMR (2019d) identifies additional safety and security requirements for WSMR.

Big Game Hunting

Nine big game animals occur on WSMR: oryx, elk, pronghorn antelope, mule deer, desert bighorn sheep, Barbary sheep, black bear, mountain lion, and javelina. Only oryx, elk, pronghorn antelope, bighorn sheep, mule deer, mountain lion, and javelina are currently managed through hunting programs on WSMR. Continued monitoring of black bear and Barbary sheep populations will help to determine the need of establishing future hunting seasons for these species.

Oryx

Oryx were originally imported and raised in captivity at Red Rock Wildlife Area by NMDGF (Burt and Lee 1967). During 1969-73 and 1976-77, 93 oryx were introduced onto WSMR as part of NMDGF exotic big game program to diversify and increase sport-hunting opportunities (Jones and Schmitt 1995, Saiz 1975, WSMR and NMDGF 2000). Oryx utilize all habitats on WSMR but prefer grassy bajadas and playas while using canyons and high-elevation woodland habitat to a lesser extent (Bender 2006, WSMR and NMDGF 2000). Oryx have expanded their range beyond the installation's 2.2 million acres.

In 2000, WSMR and NMDGF developed a management plan to address management of oryx on the installation and adjacent lands (WSMR and NMDGF 2000). The intent of the plan is to consolidate and present information regarding oryx in New Mexico, identify and coordinate WSMR

and NMDGF oryx management objectives, and identify potential strategies to achieve those objectives (WSMR and NMDGF 2000). Additionally, the plan identifies the following major management issues: conflict with mission, controlling oryx distribution, determining trends in population, maintaining population levels within management objectives, oryx management on adjacent public and private lands, and addressing potential environmental damage caused by oryx (WSMR and NMDGF 2000).

Based on surveys, models, and other estimates, the WSMR population is currently estimated at 3,500-4,000 animals (P. Morrow, Wildlife Biologist – WSMR, Pers. Comm.). Due to recent population increases, WSMR—in coordination with NMDGF—is increasing the number of hunting licenses. WSMR's goal is to maintain the population at approximately 2,500 animals. This population level supports maximum recreational hunting opportunity while minimizing mission and environmental impacts (P. Morrow, Wildlife Biologist – WSMR, Pers. Comm.).

The success of oryx on WSMR currently provides hunting opportunities for 1000-1200 people yearly (G. Villegas, Contract Biologist – WSMR, Pers. Comm.). Over 20,000 oryx have been harvested on WSMR since the first hunt in 1974 (G. Villegas, Contract Biologist – WSMR, Pers. Comm., WSMR and NMDGF 2000). Over the past decade, oryx hunter participation (successful draw participants that show up to hunt) averages over 95%, with a successful harvest rate averaging 90- 95%. Harvest levels are set in an effort to maintain desired population numbers, with between 800-900 oryx harvested annually in the past two seasons.

Elk

A small population of elk have become established in the San Andres Mountains and Oscura Mountains on WSMR over the last couple of decades (Bender and Caltrider 2009, Rosas-Rosas et al. 2019.). For four years, this limited population allowed WSMR and NMDGF to establish either sex hunts; however, due to the low hunting success rate, WSMR has recommended to NMDGF that elk hunting cease until studies show that the elk population is increasing.

Pronghorn Antelope

Two populations of pronghorn antelope have been identified on WSMR. The Stallion Range herd is centered on the upper Jornada del Muerto of WSMR. The Upper Tularosa herd occupies the area north of Range Road 12, including the southern Chupadera Mesa east of the Oscura Mountains and west of the Carrizozo lava flow. Exchange of pronghorn antelope between these herds may occur along the southern tip of the Oscura Mountains. Pronghorn antelope are occasionally sighted in the Tularosa Basin south of Rhodes Canyon Range Center on the eastern boundary of the San Andres Mountains—and even farther south in the Foster Lake area south of U.S. 70. Historically, this species occupied the southern Tularosa Basin before extensive grasslands were converted to mesquite shrubs by domestic livestock during the late 19th and early 20th centuries (WSMR 2002). Recent population numbers on WSMR are significantly lower than in the late 1990s and early 2000s, and the total population is thought to be about 150 animals (P. Morrow, Wildlife Biologist – WSMR, Pers. Comm.).

Historically, up to 40 licenses were issued for the Stallion Range herd. Currently, WSMR allows five youth-only hunting licenses for pronghorn antelope in the Stallion Range each year. The Upper Tularosa herd has not been hunted on WSMR.

Desert Bighorn Sheep

In 1999, SANWR, WSMR, and NMDGF created a management plan to restore populations of the state endangered desert bighorn sheep to the San Andres Mountains (USFWS 1999c). As part of the re-introduction program, these entities developed and implemented lion control measures

in the southern San Andres Mountains. Management activities covering mountain lion control during bighorn sheep augmentation are in the *Environmental Assessment, Mountain Lion Management to Protect State Endangered Desert Bighorn Sheep* (USFWS 2002). Twenty desert bighorn sheep from Kofa National Wildlife Refuge, Arizona, and 31 desert bighorn sheep from a captive breeding facility at Red Rock Wildlife Area, New Mexico, were transplanted to SANWR in 2002. These sheep augmented the functionally extinct herd, which was comprised one indigenous ewe, her lamb, and seven previously released rams from Red Rock Wildlife Area. For the first two years following release, radio-collared bighorn sheep suffered high mortality from a combination of predation and, possibly, disease. Although, unknown at the time of these transplants, recent testing and strain-typing indicates that sheep transplanted from Kofa National Wildlife Refuge transmitted *Mycoplasma ovipneumoniae* to the San Andres herd, which may have facilitated pneumonia-related mortalities seen post-translocation. High lamb production produced herd recruitment rates that sustained overall herd numbers. In 2005, there were no documented mountain lion predation events, and—although mortality on radio-collared bighorn sheep from other causes remained high—aerial surveys showed that the population was increasing. The herd was again supplemented with an additional 30 bighorn from Kofa National Wildlife Refuge in 2005. During 2006, mountain lion predation and pneumonia negatively impacted radio-collared bighorn. In the fall of 2008, the population was estimated at 85-95 bighorn (NMDGF 2009); subsequently, by the fall of 2009, the estimate had increased slightly to 95-105 sheep (NMDGF 2010).

NMDGF down-listed desert bighorn sheep from endangered to threatened status in 2008, and the species was delisted altogether in November 2011 (BISON-M 2021). By 2012, the San Andres Mountains population—along with populations in other mountain ranges in New Mexico—had increased to a level that allowed for hunting to once again be available for the species across the state. Ram hunting on WSMR began in 2012 post-delisting, with two tags per year in 2012-2014, three tags in 2015, four tags in 2016, and five tags since 2017.

Aerial surveys in the San Andres Mountains during 2021 documented 178 bighorn sheep (84 ewes, seven yearling ewes, 24 lambs, and 63 rams [20 Class IV]). Based on these surveys, the population estimate for 2021 was 190-230 animals, and this population now occupies the entire San Andres Mountains. From 2017-2021, five ram licenses were issued annually by NMDGF for WSMR. These hunts have achieved 100% harvest success (G. Villegas, Contract Biologist – WSMR, Pers. comm.).

Mule Deer

Mule deer occur throughout WSMR and are hunted based on a conservative harvest strategy. Populations declined in the mid 1990's; however, they have increased over the last decade. Hunting was canceled through the decline years but was re-established in 2018. WSMR currently allows for five licenses, with plans to increase up to 25 licenses in the next five years. Mule deer populations on WSMR can be limited by a variety of factors including weather, disease, predation, and anthropogenic effects (Bender 2006b, Bender 2007, Bender 2009, Bender 2010, Bender et al. 2012). Chronic wasting disease appears to have no significant potential to affect mule deer population growth (Bender 2006b, Bender 2007, Bender 2009). Habitat management initiatives, such as forest thinning and prescribed burning, should benefit mule deer populations on WSMR (Bender 2006b, Bender 2007, Bender 2009, Bender et al. 2012, WSMR 2019b).

Mountain Lion

Mountain lions remain relatively common in the San Andres Mountains and Oscura mountains. When mule deer numbers declined in the mid-1990s, mountain lions probably also declined, and those lions that remained in the population may have compensated for a lack of deer by selecting other prey.

Predator control—partly aimed at mountain lions—was an important aspect of WSMR's wildlife program from the 1950s through the mid-1980s (Taylor and Anderson 1983). It was conducted to increase big game populations, which benefited sportsmen. Between 1979 and 1985, NMDGF, WSMR, and USFWS made a concerted effort to reduce mountain lions in the southern San Andres Mountains to protect a declining desert bighorn sheep population (Logan *et al*. 1996). From 1980 to 1984, 41 mountain lions were removed from SANWR, and—despite reducing mountain lion predation rates on bighorn by 86%, and total mortality rates by 55%—the program was discontinued (White Sands Technical Services 2010). During October 2002 to December 2003 (prior to initial bighorn augmentation efforts), 16 mountain lions were removed from WSMR (NMDGF 2009). On average, three mountain lions were removed from the San Andres Mountains annually from 2003-2009. The last lion removed from the San Andres Mountains came from Black Mountain in March of 2009. Since 2017, 6 collared sheep mortalities have been recorded in the San Andres Mountains. Two of the mortalities were confirmed to have been caused by mountain lions and one mortality was possibly caused by a mountain lion (L. Smythe, Refuge Manager, San Andres National Wildlife Refuge – USFWS, Pers. Comm., E. Rominger, Bighorn Sheep Biologist – NMDGF, Pers. Comm.). Although the other three mortalities were too old to determine the exact cause of death, there was evidence of lion activity which possibly suggests scavenging behavior (L. Smythe, Refuge Manager, San Andres National Wildlife Refuge – USFWS, Pers. Comm.). However, NMDGF classifies these mortalities as caused by mountain lion because studies in the area indicate that lions scavenged in only 2% of cases. Therefore, NMDGF concludes that lion presence at a sheep carcass indicates predation rather than scavenging.

In 1971, the mountain lion was placed on the list of New Mexico's protected wildlife species, and—under NMDGF management—hunting seasons, bag limits, and depredation policies were established (Evans 1983). Sport hunting for mountain lions was stopped on WSMR to accommodate mountain lion research during 1985-1995. After completion of this study, WSMR developed a mountain lion hunting policy and re-opened mountain lion hunting (WSMR 1996). Mountain lion hunting on WSMR is allowed as a Restricted Access Hunt. Any licensed hunter can harvest up to two mountain lions per year on WSMR until the maximum allowable take for NMDGF Unit H, which includes WSMR, has been met.

Javelina

Javelina have become increasingly established throughout WSMR in the San Andres Mountains and Oscura Mountains in the last 15-20 years. Currently, healthy populations of javelina exist around Mineral Hill and Antelope Hill in the southern portion of the range. They are also common around the Mockingbird Mountains. In the northern portion of the range, javelina are recorded on trail cameras in the San Andres and Oscura Mountains at spring and water units on a routine basis. Javelina hunts on WSMR are treated as Restricted Access Hunts. Hunters who successfully draw a Javelina license for NMDGF Management Unit 19 must adhere to Restricted Access Hunt protocols.

Small Game and Bird Hunting

Small-game species include furbearers, upland game birds, waterfowl, migratory birds, and non-protected species. Eight mammal species on WSMR are classified as protected furbearers, and four are unprotected furbearers. Twenty bird species occurring on WSMR are legally hunted, including three species of quail, three species of dove, and 14 species of waterfowl. Small game and furbearer populations fluctuate widely from year to year, and hunting pressure tends to correlate with population size. Most small game hunters on WSMR hunt for quail and dove. Coyote hunters make up most of those hunting unprotected furbearers. Between 150 and 200 small game hunters participate annually (G. Villegas, Contract Biologist – WSMR, Pers. comm.).

Hunting Areas

General Public Big Game oryx and pronghorn antelope hunt areas are primarily in the Tularosa Basin and northwestern portion of WSMR (Stallion area), which has higher concentrations of animals. There are established Once-in-a-Lifetime Hunt areas that are described annually in the New Mexico Big Game Information booklet.

Desert bighorn sheep hunt areas include the San Andres Mountains on both SANWR and WSMR. Specific hunt areas fluctuate annually, depending on bighorn sheep distribution, coordination between SANWR and WSMR, and ongoing mission testing and training activities.

The primary elk and mule deer hunt area is in the Oscura Mountains and the Stallion oryx hunt area. These hunts are conducted simultaneously with General Public Big Game oryx hunts in the Stallion area. Hunters are allowed access over two consecutive weekends.

Security Badge Hunt areas are located in remote portions of the range where WSMR and NMDGF have identified a management requirement to reduce oryx numbers. There are four Security Badge Hunt areas: the Oscura Mountains, Southern San Andres Mountains, Small Missile Range, and the area south of U.S. 70. Oryx hunting is also allowed on designated areas of SANWR (USFWS 2013). Hunt maps are provided to WSMR hunt sponsors prior to each hunt. Changes to hunt areas can occur during the season due to access limitations. If changes are required, the Environmental Division notifies and reassigns hunters to alternative hunt areas.

Small game, mountain lion, and javelina hunting are only allowed in hunt units identified on the Small Game Hunting Map developed and maintained by the Environmental Division. Revisions to this map and to hunt units can occur without notice. WSMR hunt sponsors must ensure they have the most current maps and should communicate with the Dispatch Center prior to their hunt in order to ensure they do not violate access restrictions. Hunt units are in areas north and south of U.S. 70, and WSMR hunt sponsor and guest requirements apply to all units. The Environmental Division issues hunt maps to hunters during the permitting process or upon request.

Use of Lead Ammunition on Range

Avian predators and scavengers are susceptible to lead poisoning when they ingest lead bullet fragments left in the tissues of unrecovered game animals or in carcass remains of harvested animals (Slabe et al. 2022). Non-lead ammunition has become more widely available and is now made in many standard calibers. While WSMR has not restricted the use of lead ammunition, we are tracking the use of ammunition (both lead and non-lead) by hunters. WSMR also includes information on the benefits of using non-lead ammunition in hunter briefing packets that are given to all big-game hunters. WSMR and TPF have also studied the use of oryx gut piles by golden eagles and eagle carcasses are necropsied for potential mortality factors, including lead (T. Cutler, Wildlife Biologist – WSMR, Pers Comm.).

3.9 Public Access

The DES is responsible for Range access, security policies and procedures, and coordination with the Environmental Division for all conservation law enforcement activities. Public access on WSMR is strictly controlled and is limited to the WSMR Missile Park and Museum (US Army 2017). Permits for these areas are only available at the Las Cruces gate. For active and retired military personnel who want to use the WSMR RV Park and Desert Emerald Park on Main Post, permits are available at the Las Cruces and El Paso gates. WSMR Public Affairs Office and WSMR Environmental Division manage the public open house tours of Trinity Site. The DES coordinates with WSNP for public Lake Lucero tours. WSMR DES and Environmental Division

manage access to the range in support of the WSMR Hunt Program (WSMR 2019d). All public access to WSMR is subject to military testing constraints.

3.9.1 Natural Resources Law Enforcement

Many aspects of natural resources management require effective environmental law enforcement (*e.g.*, protection of rare or unique species, harvest controls, protection of sensitive natural and cultural areas, and hunting recreation).

Jurisdiction

WSMR's law enforcement authority—including the authority to enforce laws pertaining to natural and cultural resources—is based on the type of legal jurisdiction in effect for its lands. Lands within WSMR were withdrawn for use by the Department of the Army for military testing in 1953 by Public Land Order 833. New Mexico legislative action (19 NMSA 2, par. 8) stipulated that WSMR has "exclusive" federal jurisdiction for that portion of the installation south of U.S. 70. The Army has sole responsibility for enforcing laws regarding actions occurring on this parcel of land, regardless of whether the crime is a state or federal offense.

WSMR has only "proprietary" jurisdiction for its lands north of U.S. 70, an area that is roughly three-fourths of the installation's overall surface area. The NMDGF has primary legal enforcement authority in this area, and state regulations and laws apply to these lands unless an offense is covered under a specific federal statute. For example, offenses related to hunting and poaching of game must be handled by state or local law enforcement agencies. Violations against federal acts—such as ESA, MBTA, and BGEPA—would be referred to USFWS law enforcement. In such instances, WSMR law enforcement authorities may investigate a violation and detain the offender but must hand over the offender to local, state, or federal authorities for prosecution.

Staff and Responsibilities

The Sikes Act and AR 200-3 require that military installations use or employ professionally trained wildlife law enforcement personnel to perform game warden duties. The DES has responsibility for law enforcement on WSMR, including natural and cultural resources laws. DES employs four full-time civilian game wardens to enforce hunting regulations and laws, patrol boundaries, deter cultural artifact hunters, and perform other enforcement duties. WSMR game wardens have full authority to enforce all federal and state laws on WSMR, including provisions of the ESA, MBTA, BGEPA, the Antiquities Act, and other relevant federal and state laws and regulations. They are authorized to issue citations and arrest violators. Their efforts focus primarily on enforcing hunting and trespass laws and regulations.

Although the WSMR Hunt Program is administered by the Environmental Division, WSMR game wardens play a critical role in implementing the program. A typical hunt—involving up to 85 hunters and their guests—requires significant supervision. Field staff to supervise the hunt is composed of contract biologists, Environmental Division wildlife biologists, DES game wardens, and NMDGF conservation officers (P. Morrow, Wildlife Biologist – WSMR, Pers. Comm.).

Training

Although WSMR's game wardens are knowledgeable, experienced, and highly trained—having received federal and state law enforcement training and regularly participating in NMDGF law enforcement and training programs—WSMR has neither a certification program nor training standards to ensure that future game wardens will have such credentials. A certification process for game wardens should be cooperatively developed between DES and the Environmental Division. Game wardens are unique in that they are not only responsible for remaining proficient

in law enforcement-related topics, but they also require essential training in conservation, environmental law, biology, and wildlife management in order to be effective. The USFWS offers many advanced courses dealing with these topics. Environmental agencies, wildlife organizations, and colleges and universities often provide classes and seminars that can be important to cultivating a well-versed game warden. Archeological Resources Protection Act training has been provided to some game wardens through the Federal Law Enforcement Training Center.

3.9.2 Trespass Security

Outside of controlled WSMR events, there is no recreational access allowed on WSMR. Because WSMR is adjacent to public land, recreational users occasionally trespass onto WSMR to hunt or visit cultural resource sites. WSMR has a boundary fence surrounding all sides of the Range with access through numerous locked gates. Patrols, surveillance, and enforcement occur to control unauthorized access onto WSMR. Boundary fence maintenance is a continuous undertaking and is important for limiting trespass cattle. Range Operations is responsible for coordinating and removing trespass cattle from WSMR.

3.9.3 Illegal Dumping

Illegal dumping of solid waste on WSMR property is difficult to regulate because of the large area of the installation. Illegal dumping on WSMR can occur when projects end, and equipment and materials are abandoned. WSMR (2013b) outlines specific guidance for proper hazardous and non-hazardous waste disposal resulting from military and non-military activities. Occasionally, trash is left behind during WSMR-sponsored events, such as hunts or tours.

3.10 Environmental Outreach

Environmental outreach is intended to promote an environmental stewardship ethic and create an understanding of the importance of performing job skills in accordance with appropriate environmental requirements (Appendix L; US Army 2007, WSMR 2013b). The environmental awareness outreach program provides specific details necessary to protect the environment during execution of proposed military activities, and the program serves military personnel, tenants, installation staff, civilian employees, and other members of the public (Appendix L; US Army 2007, WSMR 2013b).

Environmental outreach also promotes many programs, such as endangered species habitat management, spill prevention, energy conservation, and requirements for NEPA documentation through consultation with WSMR Environmental Division staff and Army or local compliance publications (US Army 2007, WMSR 2015, WSMR 2020d).

An effective environmental awareness effort is essential to implementation of a range-oriented environmental program. The objectives of the WSMR environmental awareness outreach are:

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

- To ensure that personnel using WSMR lands understand the inherent dangers that they may encounter while traveling through and working on the range.

These objectives are achieved through continued use and improvement of current environmental awareness training programs on WSMR. This includes annual Environmental Officer training, newcomer briefings for new residents and employees, and briefings in the field to mission personnel or visiting units.

Conservation education is instrumental in creating conditions needed to manage natural resources. WSMR stresses education to provide military personnel, civilian employees, test proponents, and the public with insights into installation natural environments and conservation challenges. Education also promotes awareness of critical environmental projects and the rationale behind them. A conservation awareness program must be directed to both installation and external interests if it is to be effective.

WSMR Environmental Division provides professional talks and presentations at conferences and seminars; prepares natural resources talks and informal presentations for local clubs, societies, organizations, and schools; provides briefs to the media on upcoming events and environmental findings; and performs guided tours of environmental interest areas on the installation, including various ecosystems. WSMR also develops environmental multimedia materials, such as posters, brochures, videos, field guides, and other items that are provided to the WSMR community.

WSMR Environmental Division presents nuisance wildlife and safety briefings and creates educational materials that identify nuisance wildlife issues and hazards on WSMR. Included in these briefings and materials are appropriate contacts for dealing with nuisance wildlife problems, prevention of potential human-wildlife conflicts, and appropriate responses and actions to take when encountering wildlife on WSMR.

3.11 Artificial Lighting

Dark skies are a capability asset to WSMR, as several missions at WSMR require dark skies. Lighting on WSMR should be designed in accordance with the New Mexico Night Sky Protection Act (NMSA 1978 Article 12, WSMR 2005). The purpose of the act is to regulate outdoor night lighting fixtures to preserve and enhance the state's dark skies while promoting safety, conserving energy and preserving the environment for astronomy. The Night Sky Protection Act requires that outdoor lighting be fitted with shielding that directs light downward—rather than upward or laterally. Lights directed downward help to prevent sky glow and associated impacts to nocturnal migrating birds. The Night Sky Protection Act allows present lighting to remain throughout its useful life but requires the installation of conforming lights (whenever replacement would normally occur) so that any economic burden is limited or avoided altogether.

The DoD Uniform Facility Criteria for Interior and Exterior Lighting Systems and Controls (UFC 3-530-01) requires certain measures that also mitigate potential effects to nocturnal migrants. For example: to avoid over-lighting, use fully shielded lights, use of controls such as timers, dimmers, or motion sensors, and to adopt measures recommended by local, state, and federal wildlife agencies.

WSMR is currently carrying out research to characterize outdoor lighting throughout the installation, to assess potential effects on nocturnal migrants, and to develop solutions to mitigate impacts to wildlife, to human health, and to missions that require dark skies.

3.12 Adaptive Management for Climate Change

The DoD must be able to adapt current and future operations to address the impacts of climate change in order to maintain an effective and efficient U.S. military (DOA 2022, DoD 2016, Stein et al. 2019). Consequently, military installations are required to address potential impacts of climate change on natural resources and the training mission (DOA 2022, DoD 2013b). DoD requires all components to, in a regionally consistent manner, and to the extent practicable and using the best science available, utilize existing tools to assess the potential impacts of climate change to natural resources on DoD installations, identify significant natural resources that are likely to remain on DoD lands or that may in the future occur on DoD lands and, when not in conflict with mission objectives, take steps to implement adaptive management to ensure the long-term sustainability of those resources (DoDI 4715.03).

Climate change effects—such as rising global temperatures, changing precipitation patterns, increasing frequency or intensity of extreme weather events, and rising sea levels—may lead to increased maintenance/repair requirements for training/testing lands and associated infrastructure and equipment (e.g., roads, targets, buildings) (Stein et al. 2019). In addition to the loss of use of training and test ranges, these impacts result in increased land management requirements due to stressed threatened/endangered species and related ecosystems on and adjacent to DoD installations (DoD 2019a). As climatic conditions change, it may become more difficult and costly to sustain populations of some SAR or threatened and endangered species on DoD installations where they are found (Stein et al. 2019).

Global climate models increasingly predict warming temperatures and changes in the timing and amount of precipitation in the southwestern U.S. Projected summertime temperature increases are greater than annual average increases in parts of the region and are likely to be exacerbated by expanding urban heat island effects. Further water cycle changes are projected, which—combined with increasing temperatures—signal a serious water supply challenge in decades and centuries ahead. The prospect of future droughts becoming more severe due to warming is a significant concern, especially because the Southwest continues to lead the nation in population growth (Gonzales et al. 2018, USACE 2013a). DoD efforts to assess potential impacts should be predictive in planning for probable changes.

3.12.1 Climatic Vulnerability Assessment

The USACE has developed a Climate Assessment Tool that assess current and potential vulnerabilities to Army installations over the next 20 years (USACE 2013a, DoD 2019a). Climate related events that are evaluated include exposure to coastal and riverine flooding, drought, desertification, wildfire, and permafrost thaw (USACE 2013a). Climatic vulnerabilities for WSMR identified by the Climate Assessment Tool include drought and desertification (USACE 2013a, USACE 2013b, DoD 2019a).

Drought can negatively affect U.S. military installations in various ways, particularly in the Southwest. Prolonged drought can have broad implications for base infrastructure, impair testing activities, and—along with increased temperature—can increase the number of black flag day prohibitions for testing and training (DoD 2019a). Drought can contribute to heat related illnesses, including heat exhaustion and heat stroke, outlined by the U.S. Army Public Health Center. A reduction in precipitation may increase bare ground, which can lead to greater dust production and soil erosion. Blowing dust can become a safety hazard and create conditions unfavorable to testing. Long-term drought can lead to decreases in vegetation, decrease in available water to wildlife, negative effects on riparian habitats, and increase in wildfire potential and severity

(Bumgarner 2018, DoD 2019a, USACE 2013b). Loss of plant abundance and biomass would be expected to contribute to erosion and the desertification of the testing and training lands of WSMR.

Habitat transition and direct physiological impacts of temperature, precipitation trends, and variability resulting from climate change are expected to have consequences for environmental management programs and regulatory compliance (USACE 2013b). WSMR has been identified as vulnerable to current and future desertification (USACE 2013a, DoD 2019a). Desertification poses several challenges related to training and maneuvers. It accelerates erosion and increases soil fragility, thus possibly limiting future training and testing exercises (DoD 2019a). Desertification results in reductions in vegetation cover, leading to increases in runoff from precipitation events. Increased runoff contributes to higher erosion rates, increased stream sediment loads, and deposition of sediment in unwanted areas.

Following rain, eroded soil may be less suitable for native vegetation, resulting in bare land or revegetation with nonnative, noxious species. In cases where this results in the expansion of shrublands, this could affect the suitability of the landscape for military maneuvers and off-road use. An increase in bare ground and erosion would likely lead to increased dust and particles, which could exceed regulations or be hazardous to human health.

Desertification can alter ecosystem composition: more drought-tolerant species and growth forms may be favored in the long-term, and shrublands will likely replace grasslands. Grasslands are an important resource on WSMR. They add to training land diversity and provide habitats for threatened or endangered species, such as northern aplomado falcon and Baird's sparrow. If these species lose habitat and decrease in numbers due to factors predicted with climate change, their status designations may change. This loss of habitat to desertification could complicate the ability of WSMR to maintain status of currently listed species populations and may result in increased listings of species that are currently considered at risk but not yet listed. If species become listed as threatened or endangered, it could mean a decrease in the amount of land available for military missions because critical habitat might be designated within WSMR boundaries (USACE 2013b).

Warmer, drier conditions may make PJ woodlands more susceptible to pests, such as the pine bark beetle (EPA 2016b). Infestations can lead to decreased canopy cover and increased threat of wildfires in the Oscura Mountains (USEPA 2016). Decreased piñon pine-juniper canopy cover may negatively affect the state threatened gray vireo, Oscura Mountain chipmunk, and pinyon jay, which is a DoD Mission Sensitive Species and NMDGF species of greatest conservation need (DoD PIF 2021, NMDGF 2016b). Climate change is considered the leading threat to Todsen's pennyroyal by impacting its phenology and habitat (Britt 2018, Parmesan and Hanley 2015). The loss of Todsen's pennyroyal populations could lead to an increase in formal consultations with the USFWS and the establishment of additional Critical Habitat.

3.12.2 Adaptation to Climatic Vulnerabilities

Concern about climate change impacts to DoD lands has led to a new management strategy known as climate adaptation (DoD 2013b, DoD 2016, Stein et al. 2019). This strategy is designed to reduce climate-related vulnerabilities and enhance resilience to climate impacts (Stein et al. 2019). Climate adaptation planning can be viewed as a process of risk management consisting of four components:

- Assess climate vulnerabilities.
- Develop adaptation responses.

- Implement adaptation actions.
- Monitor and adjust actions as needed (Stein et al. 2019).

Because of the uncertainties involved in projecting future climatic conditions and how natural resources may respond to those conditions, adaptive management can be an important planning tool for resource managers on DoD lands.

Although climate change factors that influence desertification cannot be managed on an installation scale, future natural resource management and research efforts on WSMR should continue to consider climate change (DOA 2022). WSMR should continue long-term monitoring projects to assess effects of climate change at the ecosystem, community, population, and species levels of threatened and endangered floral and faunal populations (Britt 2018, Stein et al. 2019, WSMR and HAFB 2015). Proactive land management planning is very important since land rehabilitation for erosion, dust, and vegetation issues becomes more difficult and expensive as aridity in an area increase.

Loss of natural surface water for wildlife could impact populations of many species. The tracking of the presence/absence of surface water throughout the range will be important for managers to understand how water resources are changing and to make appropriate decisions about the distribution of supplemental water dependent upon the availability or the development of rain catchment systems. The understanding of hydrology and conservation of existing water sources, such as spring heads and wells, may be critical to prevent impacts to vegetation and wildlife.

Adhering to WSMR's wildland fire management actions will help to ensure that fire-fighting strategies and prescribed burns are successfully implemented to aid in sustaining training lands (Bumgarner 2018). Prescribed burning is a useful management tool for controlling shrub encroachments upon grasslands. Prescribed fire can also reduce fuel loads before fire season, thereby reducing the potential for large, intensive wildfires later in the year.

Climate change doesn't just affect lands within WSMR's boundaries, and the DoD understands that surrounding lands must also respond to the effects of climate change. The ACUB program contributes to climate resiliency by protecting large, open expanses of grassland habitat through conservation easements on lands surrounding WSMR. The protection of these grasslands aid in carbon sequestration and—along with responsible grazing practices—helps to maintain manageable fuel loads for minimizing wildland fires (DOA 2022). Additionally, most ranches have programs for managing water resources and minimizing soil loss through erosion. Eliminating incompatible development and maintaining natural range landscapes is beneficial to fighting climate change.

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4 NATURAL RESOURCE MANAGEMENT ACTIONS

This chapter directs WSMR natural resource managers in their efforts to comply with Natural Resource Laws and Regulations to protect and enhance the natural resources of WSMR for multiple use, sustainable yield, biological diversity, ecological integrity, and sustainability (USAEC 1997). WSMR's natural resource management goals are derived from federal regulations, DoD mandates, directives and instructions, and professional peer-reviewed natural resource publications. The goals have been developed with the aim of meeting or exceeding DoD and U.S. Army environmental stewardship goals and WSMR test, evaluation, and research mission goals:

Goal 1: 100% Compliance with Natural Resource Laws and Regulations, Executive Orders, Instructions, and other DoD/Army/WSMR Policies.

Goal 2: Maintain the Biodiversity of Native Flora and Fauna.

Goal 3: Maintain or Replicate Natural Ecosystem Processes.

Goal 4: Support Morale, Welfare, and Recreation of Residents and the Workforce.

These four broad management goals are supported by the objectives and strategies described in the following text.

OBJECTIVES

Objective 1: Comply with the Sikes Act.

- With the USFWS and NMDGF, develop, update, and revise the WSMR INRMP for the conservation and rehabilitation of natural resources on WSMR. (Goals 1-4)
- Document annual INRMP accomplishments and share reports detailing accomplishments with NMDGF and USFWS. Annual reviews will also detail why progress on an objective was not achieved and will outline any resolutions or future work to address those objectives. (Goals 1-4)
- Carry out planning level surveys to identify and monitor natural resources on a recurring basis. (Goals 1-4)
- Develop programs and carry out research that contribute to the conservation, rehabilitation, and protection of natural resources. For example: bat-friendly gates at roost sites, raptor protection on power lines, water for wildlife, disease monitoring, wildlife-friendly fencing, down-shielded floodlights, prevention of bird collisions with windows, nuisance wildlife management and resolution, reduction of invasive species, erosion control, and other habitat protection and restoration projects. (Goals 1-4)
- Participate in the environmental review process to incorporate measures that contribute to the conservation, rehabilitation, and protection of natural resources. (Goals 1-4)
- Carry out programs such as hunting and birdwatching that contribute to the sustainable multipurpose use of the resources. (Goals 1-4)
- Provide training and coordinate with game wardens and Staff Judge Advocate for enforcement of federal natural resource laws. (Goals 1-4)

Objective 2: Comply with the Migratory Bird Treaty Act.

- Participate in the environmental review process to assess effects to migratory birds and incorporate measures that ensure MBTA compliance. (Goals 1-4)

- Determine if each activity falls under appropriate guidelines. (Appendix M; Goals 1-4)
    a. For non-readiness activities, follow the MOU between DoD and USFWS For the Conservation of Migratory Birds (Appendix M; DoD 2014b). The MOU includes various measures to avoid and minimize impacts to migratory birds. The MOU applies to all support activities such as construction and demolition, roads and grounds maintenance, operation of utilities, recreation, natural resource management, or any other support function.
    b. For military readiness activities (actual tests and training), follow 50 CFR Part 21 Migratory Bird Permits: Take of Migratory Birds by the Armed Forces.
- Carry out surveys, monitoring, and research that contribute to the conservation of migratory birds. Prioritize special status species but include all bird species in surveys whenever feasible. (Goals 1-4)
- Identify threats, and work with USFWS and other partners to investigate and prevent bird mortality. For example, disease issues, toxins, electrocutions, and artificial lighting. (Goals 1-4)
- Apply for and maintain all required permits for migratory birds. A permit system for incidental take may become available during this INRMP plan period. (Goals 1-4)
- Provide training on MBTA compliance to the WSMR Game Wardens and others working with birds. (Goals 1-4)
- Participate in DoD PIF to stay up to date on DoD, Army, and USFWS policies for MBTA compliance. (Goals 1-4)

Objective 3: Comply with the Bald and Golden Eagle Protection Act.

- Participate in the environmental review process to assess effects to golden or bald eagles and incorporate measures that ensure BGEPA compliance. (Goals 1-3)
- Continue use of standard buffer distances and other conservation measures for active golden eagle nests (Appendix F). (Goals 1-3)
- If it is not possible to implement standard buffers or other measures without compromising a military activity, work with USFWS to modify proposed action to avoid take. If take may still occur, the Garrison will apply for a take permit from USFWS. Take permits include requirements for monitoring, reporting, and mitigation that may be passed on to the proponent. (Goals 1-3)
- Finalize a Golden Eagle Management Plan that identifies threats to eagles at WSMR and implements standard measures to identify threats and prevent impacts to eagles and their nests. (Goals 1-3)
- Monitor occupancy of golden eagle breeding territories, annually, and monitor nest status for select pairs of eagles that may interact with military activities. (Goals 1-3)
- Monitor prey availability to eagles, annually, to understand the relationship with reproductive success. (Goals 1-3)
- Participate in DoD PIF Eagle Working Group to understand DoD, Army, and USFWS policies for BGEPA compliance. (Goals 1-3)
- Educate natural resource staff and CLEO officers on protocols for reporting mortalities of federally protected species, especially eagles or any species listed under the ESA. (Goal 1)

Objective 4: Comply with the Endangered Species Act.

- Participate in the environmental review process to assess potential effects to ESA-listed species and incorporate measures to ensure ESA compliance. (Goals 1-3)
- Assess every activity for potential to affect species listed as Proposed, Threatened, or Endangered species. Specialized surveys (and associated permits) may be required. (Goals 1-3)
- Carry out Section 7 Consultation (may be informal or formal) with the USFWS for any activity that may affect a listed species. (Goals 1-3)
- In accordance with ESA Section 7(1)(a), carry out activities to conserve listed plant and animal species. (Goals 1-3)
- Develop an Endangered Species Management Component for each listed species.
- Participate in multi-agency working groups for ESA-listed species. (Goals 1-3)

Objective 5: Conserve SAR.

- Participate in the environmental review process to assess and minimize potential effects to SAR (as defined in Section 2). Surveys may be required to determine if SAR may be affected by a proposed action. (Goals 1-3)
- Follow all Army and DoD regulations and policies for Species at Risk (SAR). (Goals 1-3)
- Carry out surveys and research to determine distribution and habitat requirements of SAR. (Goals 1-3)
- Develop management plans to identify threats, develop monitoring plans, and implement standard conservation measures to prevent decline and potential for ESA listing. (Goals 1-3)
- Participate in multi-agency working groups for SAR. (Goals 1-3)

Objective 6: Conserve aquatic ecosystems.

- Survey and monitor baseline aquatic ecosystems and conditions. (Goals 1-3)
- Ensure GIS database reflects correct aquatic ecosystem (e.g., springs, wetland) acreage for annual reporting requirements. (Goals 1-3)
- Retain size, function, or value of aquatic ecosystems. (Goals 1-3)
- Avoid modification where there are practical alternatives. (Goals 1-3)
- Prevent disturbance of perennial or intermittent streams. (Goals 1-3.)
- Protect aquatic ecosystems from detrimental anthropomorphic activities. (Goals 1-3)
- Prevent the introduction and spread of invasive or exotic species. (Goals 1-3)
- Protect sensitive aquatic ecosystems for indigenous insects, fish, and amphibians. (Goals 1-3)
- Incorporate Best Management Practices to limit impacts and enhance awareness regarding testing and training operations in and around aquatic ecosystems. (Goals 1-4)

Objective 7: Control the proliferation of floral and faunal invasive species.

- Acquire reliable baseline data on the presence and distribution of invasive species. (Goals 1-4)
- Control existing populations of invasive species by developing treatments, monitoring projects, and subsequent native species restoration to reduce natural and cultural resource damage and costs. (Goals 1-4)
- Monitor habitats with rare plants and wildlife that may be at risk for invasive species introductions. (Goals 1-4)
- Comply with environmental legislation, regulations, and guidelines that address the control of invasive species. (Goals 1-4)
- Tier management plans for the control of invasive species to the IPMP and the INRMP. (Goals 1-4)
- Prohibit introduction of invasive species during military, revegetation, and landscaping activities. (Goals 1-4)
- Integrate native plant species into landscaping plans and minimize impacts to existing native habitats. (Goals 1-4)
- Through the NEPA process, request military units and contractors to spray off vehicles prior to entering and exiting installation to reduce the spread of invasive species. (Goals 1-4)

Objective 8: Establish and maintain a safe, effective, and environmentally sound Integrated Pest Management Plan.

- Survey and manage pest species that affect human health, quality of life, natural resources management (e.g., reduce ecosystem functionality, displace native species), or the military mission. (Goals 1-4)
- Develop or use humane pest management practices to control the damage caused by feral animals and nuisance wildlife to infrastructure, sensitive habitats, and wildlife populations. (Goals 1-4)
- Comply with environmental legislation, regulations, and guidelines that address integrated pest management and application of pesticides. (Goals 1-4).
- Implement pest management controls from the IPMP and other pest-related guidance and plans to minimize the use of pesticides and impacts to natural and cultural resources. (Goals 1-3)
- Maintain and implement the IPMP on a five-year cycle to ensure that the plan reflects changes in pest and wildlife populations and current management strategies and issues. (Goals 1-2)
- Coordinate with Preventive Medicine, Occupational Health, and IPMC to provide expertise as needed to minimize health and safety risks. (Goal 4)

Objective 9: Minimize damages to soil resources from ground-based activities.

- Use the environmental review process to minimize incremental changes to soil health over time. (Goal 1)

- Contribute to the development of best management practices that reduce soil loss and maintain ecosystem health. (Goal 3)
- Coordinate with partners to maintain soil and ecological site description data in the WSMR GIS database. (Goals 2-3)
- Use remote sensing tools and ground-based monitoring approaches to quantify soil and habitat conditions to document incremental changes over time. (Goals 2-3)
- Monitor and document rates of change to soil condition associated from ground based or natural disturbance events. Events can consist of an individual event or cumulative events across a watershed. (Goal 3)
- Leverage with partners and subject matter experts to understand hydrologic regimes and functions as they relate to soil loss and protection of soils. (Goal 3)
- Identify landscapes on WSMR that provide reference conditions for soils and ecological sites. Use these reference conditions as a comparison point when engaged in ecological restoration activities. (Goal 3)
- Collaborate with partners and subject matter experts to obtain grant dollars, such as SERDP or Legacy, to development models that identify potential landscape scale changes to soil condition. (Goal 3)

Objective 10: Manage agricultural outleasing.

- Administer and manage grazing leases in accordance with Army Regulatory Guidance, AR 450-80, AR 200-1, and the Sikes Act. (Goal 1)
- Utilize grazing lease to support range buffer safety, manage and control vegetation and erosion, maintain native forage species, and provide evacuation fee cost savings. (Goal 1-4)
- Allow game hunting opportunities to continue within the lease properties in accordance with appropriate regulations and laws. (Goal 4)

Objective 11: Ensure that GIS capabilities and databases are kept current with the latest natural resource information.

- Utilize GIS resources to assist with development and implementation of comprehensive and complex natural resource management decisions, including compliance with environmental laws, regulation, etc. (Goal 1)
- Share GIS data with state and federal agencies and the Natural Heritage New Mexico program to support cooperative efforts to manage and conserve wildlife. (Goal 1)
- Train personnel to ensure accurate data collection and relevance of data collection to best integrate data into the GIS database. (Goal 1)
- Develop and implement written standards and procedures for GIS administration, including managing metadata. (Goal 1)
- Use GIS to map environmental constraints that can be conveyed to customers and used for planning missions and other activities. (Goal 1)
- Continue to use GIS to support hunting programs to ensure hunt areas are consistent with mission requirements and limitations as well as to identify hazardous areas and environmental constraints. (Goal 4)

Objective 12: Implement the IWFMP.

- Implement the IWFMP (Bumgarner 2018; described in Section 1.11) in accordance with Army regulations and DoD instructions and guidance to address firefighter and public safety, wildland fire management, wildland fire program capabilities, and funding and environmental compliance for the burnable wildland acreage found on WSMR. (Goal 1)
- Maintain existing natural vegetative communities and their biodiversity by allowing wildfires to burn as needed. (Goals 2-3)
- Implement a prescribed fire program to maintain, restore, and/or enhance native habitats. (Goal 3)
- Maintain or mimic natural processes by restoring low-intensity and frequent wildland fires to the landscapes of WSMR in order to reduce the threat of severe wildfires. (Goal 2)

Objective 13: Ensure that Environmental Division staff continue to pursue professional development opportunities.

- Encourage Environmental Division staff to join and participate in professional societies and to attend conferences with a priority of ecosystem management, biodiversity, and recreational opportunities on military installations. (Goal 4)
- Ensure that Environmental Division staff keep current on certifications to fulfill job requirements. (Goal 4)
- Encourage Environmental Division staff to disseminate natural resource information learned at WSMR. (Goal 4)

Objective 14: Raise awareness about protecting and enhancing the natural environment among residents, tenants, and employees.

- Educate workforce, tenants, housing residents, and contractors about natural resources issues on WSMR, best management practices, Environmental Compliance, and natural resources programs and initiatives. (Goal 4)
- Engage workforce, tenants, housing residents to encourage participation in natural resources initiatives and conservation projects. (Goal 4)
- Coordinate outreach and education events and activities with the Public Affairs Office. (Goal 4)
- Conduct presentations, development and dissemination of newspaper articles, global emails, and social media educational material to address problems and reports of nuisance wildlife. Focus on disseminating information regarding wildlife safety, identification education, and encourage coexistence to mitigate human-wildlife conflicts. (Goal 4)
- Interact with surrounding communities and professional organizations to exchange information and knowledge on environmental subjects. (Goal 4)
- Form partnerships and collaborate to accomplish natural resources initiatives and projects on WSMR and in the surrounding region. (Goal 4)

Objective 15: Provide hunting opportunities.

- Provide hunting opportunities for viable populations of big and small game animals in a safe and sustainable manner in accordance with State and Federal requirements.

(Goals 1 and 4)

- Set annual big game harvest levels that will sustain manageable population sizes and minimize conflict with WSMR's military mission. (Goal 4)
- Provide hunters with comprehensive education regarding safety and security concerns for hunting on WSMR. (Goal 4)
- Continue to collect Sikes Act hunting fees consistent with Army and other federal requirements to fund natural resource management programs such as prescribed burning, chemical treatment of PJ, development and maintenance of wildlife water units, and wildlife studies. (Goal 4)
- Utilize collected fees to support natural resource management projects consistent with regulations and guidance. (Goal 4)

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5 NATURAL RESOURCES MANAGEMENT PLAN IMPLEMENTATION

Implementation of the WSMR INRMP will serve as a vehicle to ensure and streamline compliance with federal and state laws and regulations. Implementation of this INRMP is subject to the availability of annual funding and staffing. WSMR requests funding and associated staffing through appropriate channels. Where projects identified in the plan are not implemented due to lack of funding, staffing, or other compelling circumstances, the installation will review the plan's goals and objectives to determine whether adjustments are necessary. The Conservation Branch, with support from other Environmental Division Branches, is the primary organization charged with implementation of this INRMP.

5.1 Project Development

An INRMP is considered implemented if an installation does the following:

- Actively requests, receives, and uses funds for "must fund" projects and activities
- Ensures that enough professionally trained natural resources management personnel are available to perform the tasks required by the INRMP
- Coordinates annually with all cooperating offices
- Documents specific INRMP action accomplishments undertaken each year
- Evaluates the effectiveness of past and current management activities and adapts those activities as needed to implement future actions (DoD 2013b).

5.1.1 Natural Resources Management Budgeting

The INRMP provides long-term natural resources management direction in the form of scheduled practices (recurring and non-recurring projects and supporting actions) that are incorporated into annual budget proposals (DoD 2011). Funds are allocated annually based on budget proposals and congressional intent. Management goals and objectives are long-term. Projects and supporting actions may occur on an annual basis or may occur at specific times. There are currently 19 projects on the WSMR projects list proposed for implementation from 2023-2027 (Appendix N). They may have short (5 year or less) or long (up to 15 year) timeframes. To fully implement the goals, objectives, and strategies of the INRMP, annual budgets are programmed into the Army's Conservation Budgets and Conservation Program Objective Memorandum. U.S. Army Headquarters policies and guidance resources direct installation-level conservation programming and budgeting. WSMR shall implement this INRMP subject to the availability of funding.

5.1.2 Natural Resources Management Staffing

Implementation of this INRMP requires enough professionally trained natural resources management and enforcement personnel. Professional staffing requirements include expertise in GIS, NEPA, threatened and endangered species management, wildlife ecology, plant ecology, and pest management. Implementation of the INRMP requires active cooperation and assistance from WSMR partners, both signatory and otherwise. WSMR will continue to utilize expertise from federal and state agencies, universities, Cooperative Ecosystem Study Units, and contractors to accomplish specific tasks. Specific personnel assignments are contingent on available funds but are necessary for the completion of projects (Appendix N).

5.1.3 Annual Review and Coordination

Natural resources management is a dynamic process; therefore, management plans often require frequent reviews and updates. Annual review of the INRMP will facilitate adaptive management by providing an opportunity for the parties to review the goals and objectives of the plan (DoD 2006). Following completion of the INRMP, WSMR's Environmental Division will do periodic reviews and updates to account for changes in the military mission, changes to natural resources or ecosystem conditions, or changes to regulatory requirements or policies. The Environmental Division, in coordination with USFWS and NMDGF staff, will do an annual review for INRMP implementation and effectiveness. The results of this review will be provided to WSMR senior leadership and will be incorporated into the INRMP as appropriate. Informational changes and minor modifications to implementation strategies may be included as annotations or edits to the INRMP.

5.1.4 Documentation of Annual INRMP Accomplishments

The annual review cycle will document accomplishments from specific INRMP actions. The documentation will be maintained as part of the administrative record for Sikes Act implementation. Annual INRMP accomplishment reviews will be coordinated with the NMDGF and USFWS as intended by the Sikes Act.

5.1.5 Evaluation of Current Management Activities

Evaluating the effectiveness of past and current management activities outlined in the INRMP will provide WSMR resource managers and their partners an opportunity to monitor the temporal and spatial effects of management actions on ecosystems. This will allow WSMR resource managers to carry out adaptive management by adjusting management strategies and conservation measures in response to improved knowledge and data.

5.2 Support No Net Loss of Mission Capabilities

This INRMP uses an integrated, adaptive, ecosystem management approach designed for sustainability and consistency with the military missions on WSMR. This INRMP protects and enhances natural resources for multiple use, sustainable yield, and biological integrity. Implementation of this INRMP and integration with the ICRMP is imperative for increasing mission capabilities, minimizing military training constraints, and maintaining maximum military flexibility.

Integrated natural resources management in an ecosystem framework promotes water quality, soil productivity, and recreational uses of natural resources and protection of biological diversity while allowing military training access to the resources needed to maintain a high degree of combat readiness. Effective sustainable use of natural resources supports no net loss in the capability of an installation to accomplish the military mission.

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Appendices.

List of Appendices

(Appendix files provided in digital format only. WSMR Operational Security has reviewed all documents and issued the following directive: “Approved for Public Release, Distribution is Unlimited.”)

Appendix A: WSMR Avian Protection Plan
filename: Appendix A - WSMR_APP.pdf

Appendix B: Endangered Species Management Plans

- Todsen's Pennyroyal Endangered Species Management Component
  filename: Appendix B1 - FINAL_Tod_Penny_ESMC_2018.pdf
- WSMR Endangered Species Management Plan for the Northern Aplomado Falcon
  filename: Appendix B2 - WSMR ESMP Aplo.pdf

Appendix C: Comprehensive Oryx Management Plan
filename: Appendix C - Oryx Management Plan 5-8-00.pdf

Appendix D: Endangered Species Management Plans

- White Sands Pupfish Conservation Plan
  filename: Appendix D1 - White Sands Pupfish Conservation Plan 08-05-2015.pdf
- Cooperative agreement for protection and maintenance of White Sands Pupfish
  filename: Appendix D2 - Pupfish Cooperative Agreement with signatures 2019.pdf

Appendix E: White Sands Integrated Pest Management Plan
filename: Appendix E - WSMR FINAL Integrated Pest Management Plan_Feb2021_2026Portfolio.pdf.pdf

Appendix F: Eagle Conservation

- Incidental Take Permit
  filename: Appendix F1 - EagleDisturbancePermitMB22173C-0.pdf
- Nest Take Permit
  filename: Appendix F2 - EANESTI_White_Sands_Missle_Range_MB11141C_20161219_Signed.pdf
- Eagle Management Component
  filename: Appendix F3 - SAR - Golden Eagles.pdf
- Non-Lead WHY Brochure
  filename: Appendix F4 – Non-lead WHY brochure_ 08242017.pdf

Appendix G: Integrated Wildland Fire Management Plan
filename: Appendix G - WSMR IWFMP main body final signed 7-2-18.rev 9-7-18.pdf

Appendix H: WSMR Hunting Program/Policy
filename: Appendix H - WSMR Hunting Policy 2019.pdf

Appendix I: Oscura Mountains Ecosystem Management Planning Area EA
filename: Appendix I - OMPEA_FinalJuly2019.pdf

Appendix J: Management Component for Species at Risk
filename: Appendix J - SAR - Gray Vireo and Pinyon Jay.docx

Appendix K: WSMR Tree Management and Life Cycle Plan
filename: Appendix K - Trees Management Life cycle plan Report - Final.pdf

Appendix L: WSMR Environmental Regulation
filename: Appendix L- WSMR Reg 200-2, Environmental Protection.pdf

Appendix M: Migratory Bird Conservation

- MBTA Incidental Take Flowchart
  filename: Appendix M1 - MBTA Incidental Take Flowchart.pdf
- MOU between DoD and USFWS for Conservation of Migratory Birds
  filename: Appendix M2 - MBTA MOU DOD FWS 2014.pdf

Appendix N: WSMR Projects List
filename: Appendix N - WSMR Projects List.pdf

Appendix O: WSMR Bird List
filename: Appendix O - WSMR Bird List 2022.pdf

Appendix P: WSMR Mammal List
filename: Appendix P - WSMR Mammal Checklist 2020.pdf