WHITE SANDS MISSILE RANGE INTEGRATED WILDLAND FIRE MANAGEMENT PLAN 2022-2023

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Colonel, U.S. Army
Commanding

White Sands Missile Range
INTEGRATED WILDLAND FIRE MANAGEMENT PLAN

PREPARED FOR:

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

August 2022

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Summary of Changes made from the 2018 WSMR Integrated Wildland Fire Management Plan (IWFMP) to the 2023 IWFMP

An Executive Summary has been added to the IWFMP.

Changes to the role of the Wildland Fire Program Manager (WFPM) have been made throughout the IWFMP. The WFPM role follows recommendations from G-9, Department of the Army Initiative, Installation Services (DAIN-IS) and WSMR FES that the WFPM be outside FES. The WFPM will primarily serve as a liaison between WSP-Environmental and FES to coordinate ecosystem management prescribed fires and wildfires that are allowed to burn for ecosystem benefit. Pending signature approval of this document by the Garrison Commander, the new WFPM is Patrick Morrow, WSP-E Wildlife Biologist, WSMR, 575 678-7095.

The IWFMP has been edited and re-organized to follow the template as suggested by the DAIN-IS Memorandum For Army Installations Wildland Fire Program Implementation Guidance. Chapter and Section names have been changed and the order of subjects changed to follow the Guidance recommendations.

Sec. 2.1 Applicable Laws, Regulations and Guidance has been re-organized and updated as per Army Guidance.

Sec. 2.2 Integration with Federal Wildland Fire Management Policy has been updated.

Sec. 4.3.3.1 Initial Attack Incident Commander is a new section describing duties and responsibilities for the first-on-scene firefighting resources.

Sec. 4.6 Water Sources has been updated to reflect new knowledge of tank capacities and functioning wells.

Sec. 4.10 Records and Reports has updated guidance for submitting fire information via Wildland Fire Management Applications (WFMAP).

Table 4.6 has been updated with recent prescribed fire accomplishments and acreages.

Appendix A has updated maps and text that reflect accurate coordinates for the ranches and homesteads located within each Fire Management Unit.

Appendix B contains the latest signed Mutual Aid Agreement (17 July 2019) between WSMR and the New Mexico State Office of the Bureau of Land Management (Pg. A-145).

Added Appendix K: WSMR Wildland Fire Burn Data 1984-2022.

Acknowledgements

The preparer of this plan would like to thank and recognize the many people who provided important technical expertise and contributions to this plan. This list is not all-inclusive, not in order of importance or volume, but includes Brian Knight, Patrick Morrow, Debbie Nethers, Trish Cutler, Cristina Rodden, Kelly Norwood, Jim Bowman, Dave Anderson, Matt Cuba, Acting Fire Chief Marc Davis, and Captains Christopher Gomez and Preston Harris. Thanks are also due to the Eco Inc. team of Doug Burkett, Patrick Mathis, Matt Hartsough, Rob Wu, Gilbert Villegas, Nadia Martinez, Carol Placchi, and Kristen Hestir for their skills in formatting, mapmaking, intelligence gathering and sharing, and other technical assistance as required throughout the formulation of this plan.

Executive Summary

The purpose of the White Sands Missile Range (WSMR) Integrated Wildland Fire Management Plan (IWFMP) is to provide the reader with comprehensive information regarding the different components, processes, Standard Operating Procedures (SOP), risk management strategies, and Office of Primary Responsibility (OPR) for the installation's wildland fire management program.

The importance of wildland fire management to the Army is evidenced by Army Regulation (AR) 200-1 and AR 420-1, which mandates that any installation characterized by unimproved or semi-improved grounds that present a wildfire hazard and/or utilize prescribed fire as a land management tool will develop and implement an IWFMP. To facilitate interagency cooperation and standardization, this plan is written following the general guidance of the Interagency Wildland Fire Management Plan template, with modifications to streamline and to address mission-specific aspects of wildland fire management not encountered by other wildland agencies. In accordance with (IAW) AR 200-1, the IWFMP is written as a supporting document for implementation of the WSMR Integrated Natural Resources Management Plan (INRMP). It also supports a coordinated approach to wildfire response and risk mitigation that includes the Directorate of Emergency Services (DES), Fire and Emergency Services (FES), the Directorate of Public Works-Environmental Division (WSP-E) and the Army. This plan addresses the specific fire related goals and objectives identified in the INRMP as well as existing SOPs for wildfire response. Implementation of this IWFMP will support achievement of fire-related resource management and mission support objectives.

Chapter 1 defines the purpose and need for the IWFMP and describes the location, military mission, and current WSMR staff roles and responsibilities for wildland fire management, including the goals and objectives for an effective wildland fire management program. Chapter 2 describes policies that give the plan authority to guide wildland fire management and discusses integration with relevant land management planning documents as well as interagency wildland fire management planning integration, including National Environmental Policy Act (NEPA) requirements for managing landscapes. Chapter 3 provides background information about the installation, including the natural and cultural resources found across WSMR as well as the military partners and interagency cooperators in WSMR land management. Chapter 4 discusses wildland fire factors found on WSMR (such as vegetation, fire regimes, fire history, climate, weather, and terrain) and describes how these physical factors interact to affect wildland fire behavior, fire spread, and fire frequency. Chapter 4 also contains guidance for planning prescribed fires. Chapter 5 discusses managing wildfires for ecosystem benefit as well as suppressing and preventing wildfires; it also contains safety measures, strategies, and tactics for firefighters and managers to consider in order to contain and control wildfires and to manage prescribed fires. Chapter 6 discusses wildland fire funding requirements, sources, and program challenges and mitigations.

Appendix A contains a summary of WSMR wildland fire goals, objectives, and best management practices. The body of Appendix A contains fire management information for each of WSMR's 36 Fire Management Units (FMUs). Each FMU contains pertinent fire-related text and a map. Appendices B through I contain information related to wildland fire management, including FES SOP for Wildland Fire Responses, expected fire effects on endangered, threatened and sensitive plant and animal species found on WSMR, standard wildland firefighting safety checklists, unexploded ordnance (UXO) safety, wildland-urban interface, Mutual Aid Agreements (MAAs), a sample Delegation of Authority for managing WSMR wildfires, minimum impact suppression tactics (MIST), and guidance for avoiding, recognizing, and understanding fire effects on the cultural resources of WSMR.

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List of Acronyms

ADC	Alamogordo Dispatch Center
AMS	Army Management Structure
AQB	Air Quality Bureau
AR	Army Regulation
ASM	Aerial Supervision Module
BEHAVE	Fire Behavior and Fuel Modeling System
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CAB	Combat Aviation Brigade
CG	Commanding General
DA	Department of the Army
DES	Directorate of Emergency Services
DOD	Department of Defense
DODI	Department of Defense Instruction
DOI	Department of the Interior
DPW	Directorate of Public Works
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FBTC	Fort Bliss Training Center
FDR	Fire Danger Rating
FES	Fire and Emergency Services Division
FIX	Fired in extension
FLAME	Federal Land Assistance, Management, and Enhancement
FMU	Fire Management Unit

FRI	Fire Return Intervals
FWZ	Fire Weather Zone
GC	Garrison Commander
GIS	Geographic Information System
GPM	Gallons per Minute
GPS	Global Positioning System
HAFB	Holloman Air Force Base
HELSTF	High Energy Laser Systems Test Facility
IAP	Incident Action Plan
IC	Incident Commander
ICRMP	Integrated Cultural Resources Management Plan
ICT3	Type 3 Incident Commander
ICT4	Type 4 Incident Commander
ICT5	Type 5 Incident Commander
ICS	Incident Command System
IHOG	Interagency Helicopter Operations Guide
IMT	Incident Management Team
INRMP	Integrated Natural Resources Management Plan
IRPG	Incident Response Pocket Guide
IWFMP	Integrated Wildland Fire Management Plan
JER	Jornada Experimental Range
LCES	Lookouts, Communications, Escape Routes, and Safety Zones
MAA	Mutual Aid Agreement
MAP	Management Action Point
MDEP	Management Decision Execution Package
MIST	Minimum Impact Suppression Techniques

MOA	Memorandum of Agreement
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NFDRS	National Fire Danger Rating System
NFIRS	National Fire Incident Reporting Syste
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NMED	New Mexico Environmental Department
NMSF	New Mexico State Forestry
NWCG	National Wildfire Coordinating Group
NWS	National Weather Service
OACSIM	Office of the Assistant Chief of Staff-Installation Management
ORC	Oscura Range Center
PAO	Public Affairs Office
PMS	Publication Management System
PTB	Position Task Book
WSP-E	Directorate of Public Works, Environmental Division, Conservation Branch
WSP-O	Directorate of Public Works, Operations and Maintenance Division
RAWS	Remote Area Weather Stations
RCRC	Rhodes Canyon Range Center
ROC	Range Operations Center
RX	Prescribed Fire
SANWR	San Andres National Wildlife Refuge
SHPO	State Historic Preservation Office
SNA	Special Natural Area
SOP	Standard Operating Procedure
SRC	Stallion Range Center

USDA	Unites States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
UTV	Utility Terrain Vehicle
UXO	Unexploded Ordnance
VFD	Volunteer Fire Department
WFMAP	Wildland Fire Management Application
WFPM	Wildland Fire Program Manager
WIT	Warhead Impact Target
WSMR	White Sands Missile Range
WSNP	White Sands National Park
WSTF	White Sands Test Facility
WUI	Wildland/Urban Interface

1 Introduction

1.1 Introduction, Purpose, and Need

The purpose of the White Sands Missile Range (WSMR) Integrated Wildland Fire Management Plan (IWFMP) is to provide the reader with comprehensive information regarding the different components, processes, Standard Operating Procedures (SOP), risk management strategies, and Office of Primary Responsibility (OPR) for the installation's wildland fire management program.

The importance of wildland fire management to the Army is evidenced by Army Regulation (AR) 200-1 and AR 420-1, which mandate that any installation characterized by unimproved or semi-improved grounds that present a wildfire hazard and/or utilize prescribed fire (RX) as a land management tool will develop and implement an IWFMP. To facilitate interagency cooperation and standardization, this plan is written following the general guidance of the Interagency Wildland Fire Management Plan template, with modifications to streamline and to address mission-specific aspects of wildland fire management not encountered by other wildland agencies. In accordance with (IAW) AR 200-1, the IWFMP is written as a supporting document for implementation of the WSMR Integrated Natural Resources Management Plan (INRMP) as well as the Integrated Cultural Resources Management Plan (ICRMP). It also supports a coordinated approach to wildfire response and risk mitigation that includes the Directorate of Emergency Services (DES), Fire and Emergency Services (FES), the Directorate of Public Works-Environmental Division (WSP-E), and the Army. This plan addresses the specific fire-related goals and objectives identified in the INRMP as well as existing SOPs for wildfire response. Implementation of this IWFMP will support achievement of fire related resource management and mission support objectives.

Chapter 1 is an introduction to the IWFMP and defines the purpose and need for the IWFMP, describes the location, the military mission, current WSMR staff roles and their responsibilities for wildland fire management, and includes the goals and objectives for an effective wildland fire management program.

Chapter 2 includes the relevant policies that give this plan authority to guide wildland fire management on WSMR and discusses integration with relevant WSMR land management planning documents as well as national and interagency wildland fire management planning integration. Chapter 2 also includes National Environmental Policy Act (NEPA) requirements for managing landscapes.

Chapter 3 provides background information about the installation, including the natural and cultural resources found across WSMR, as well as the military partners and interagency cooperators in WSMR land management.

Chapter 4 discusses wildland fire factors found on WSMR, such as vegetation, fire regimes, fire history, climate, weather, and terrain and discusses how these physical factors interact to affect wildland fire behavior, fire spread, and fire frequency. Chapter 4 contains guidance for planning and implementing RXs.

Chapter 5 discusses managing wildfires, including as a tool for ecosystem benefit. Chapter 5 also discusses suppressing and preventing wildfires on WSMR and contains safety measures, strategies, and tactics for firefighters and managers to consider in order to successfully contain and control wildfires and to manage RXs.

Chapter 6 discusses wildland fire funding requirements, sources, and program challenges and mitigations.

Appendix A contains a summary of WSMR wildland fire goals, objectives, and best management practices. The main body of Appendix A contains the detailed fire management information for each of WSMR's 36 Fire Management Units (FMUs). Each FMU contains text and a map. Pertinent information includes location, size, fuels information, suppression and structure protection strategies, topographical features, water points for engine fill, and environmental and military constraints. Appendix A (Fire Management Units and Maps) is meant to serve as a stand-alone document that can be carried in a notebook or downloaded to a laptop and used as a wildland fire reference inside wildland engines and command vehicles.

Appendices B through I contain information related to wildland fire suppression and management, including WSMR FES SOP for Wildland Fire Responses, expected fire effects on endangered, threatened, and sensitive plant and animal species found on WSMR, standard wildland firefighting safety checklists and UXO safety considerations, wildland urban interface strategies, copies of Mutual Aid Agreements (MAAs), a template for assigning a Delegation of Authority to an outside agency for managing WSMR wildfires, guidelines for utilizing minimum impact suppression tactics (MIST), and guidance for avoiding, recognizing, and understanding fire effects on the vast amounts of cultural resources found across WSMR.

1.2 Key Terms Defined for Wildland Fire Management

Wildland fire terminology and definitions used throughout this document can be found as Glossary of Terms on page 107 or within the National Wildfire Coordinating Group (NWCG) online glossary https://www.nwcg.gov/glossary/a-z.

Wildland fire management is the application of scientific principles and land management activities necessary for the prevention of harmful wildfires, for the sustainment and enhancement of ecosystem components, for the reduction of undesirable brush and weed species, and for the suppression of wildfires. Wildland fire management supports WSMR by utilizing mechanical fuels reduction treatments and wildland fires to enhance the resiliency of WSMR lands and reduce hazardous fuel loads in order to minimize the size and intensity of unwanted wildfires.

Wildland fire is any fire—controlled or uncontrolled—occurring on lands covered wholly or in part by timber, brush, grass, or other flammable vegetation. Two distinct types of wildland fires have been defined: wildfires and RXs.

Wildfire is any unplanned, unwanted wildland fire, including unauthorized human-caused fires, escaped RX projects, and all other wildland fires where the objective is to put the fire out.

Prescribed fire (RX) is any fire ignited by management actions to meet specific objectives. A written and approved RX plan must exist, and NEPA requirements must be met prior to approval for ignition.

1.3 Location

WSMR is the largest overland military test range in the United States, occupying some 3,200 square miles (2.14 million acres/923,358 hectares) in south-central New Mexico (Figure 1.1)(WSMR 2015). WSMR is a roughly rectangular-shaped installation that is approximately 40 miles wide by 100 miles in length. Outside of the WSMR boundary are buffer zones or extension areas termed *fired in extension* (FIX) areas—also termed "call-up areas," which refers to WSMR calling the land tenants to make sure they vacate the area during certain test missions (Figure 1.2). The FIX areas exist to provide additional safety buffers during missile tests; they are off-limits to the public during missile tests and are located on the northern and western boundaries of WSMR. Landowners within the FIX areas are the US Bureau of Land Management (BLM), the State of New Mexico, and private lands. Nearly all of these lands are used for livestock grazing.

WSMR and associated tenants and landowners (i.e., San Andres National Wildlife Refuge [SANWR], National Aeronautics and Space Administration [NASA] Test Facility; White Sands National Park [WSNP], Jornada Experimental Range [JER], Holloman Air Force Base[HAFB]) together with US Army-Fort Bliss Training Center all lie within the northern extent of the Chihuahuan Desert Ecoregion and form the largest undeveloped expanse of land in the southwestern U.S. (WSMR 2015).

Figure 1.1 - Regional Setting of WSMR

1.4 Military Mission and Organization of Team WSMR

WSMR is managed by the U.S. Department of the Army in support of Department of Defense (DOD) readiness programs, including research, development, testing and evaluation of weapons and space systems, and military training. As the largest all-overland test range in the Western Hemisphere, WSMR's expansive and varied terrain is ideally suited to serve as the United States' premier military testing site (WSMR 2015).

The varied terrain and diverse natural environments of WSMR provide for a realistic setting for testing and training exercises (Figure 1.2). The mild climate allows year-round testing, and clear skies provide the long-range visibility necessary for observing missile flights and other activities. The large size of WSMR provides ample space for

impact areas, and mountain ranges provide suitable backstops and backdrops for certain laser and missile tests. The large size, restricted access, and no-flight zones minimize mission impacts on adjacent properties and local populations (WSMR 2015).

WSMR is a subordinate organization of the Army 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 (CG) of WSMR. Staff organizations that report to the CG include the Executive Director, the Chief of Staff, Installation Safety/Nuclear Surety Director, Equal Opportunity, the Staff Judge Advocate, and the White Sands Test Center Commander/Director (WSMR 2015).

U.S. Army Garrison White Sands (USAG-WS) provides WSMR the capabilities, facilities, and services that support expeditionary operations and the tri-services testing and integration of the nation's weapons and sensors while providing for a high quality of life for soldiers and their families. The Garrison Commander (GC) has the responsibility for the administration of the day-to-day functions of WSMR, including administration, human resources, public works, resource management, planning, emergency services, and infrastructure maintenance. The GC is also responsible for maintaining compliance with military requirements, environmental, cultural, and hazardous materials laws and policies, equal opportunity employment, law enforcement, fire services, religious services, and legal services (WSMR 2015).

Overall direction, management, and operations of WSMR is currently enveloped under the umbrella of Team WSMR, which comprises the above-mentioned leadership, the Deputies for the U.S. Navy and the U.S. Air Force, and includes representatives from the many civilian and military organizations using the testing facilities, airspace, and grounds of WSMR (WSMR 2015).

WSMR Main Post contains military testing, research and support facilities, housing, recreation areas, and community support services within a footprint of @2,500 acres. There is an airfield (Condron Airfield) east of the Main Post that can support a variety of fixed-wing aircraft, and there is a concrete helipad capable of supporting large helicopters located east of Building 335 between Nike Road and Aberdeen Avenue.

The 2.2 million acres of WSMR are used for tests and evaluations that include tri-service missile systems, high energy laser and directed energy systems, air-defense fire-distribution systems, space systems, and surface-to-surface missile systems (Figure 1.2). Specialized facilities located on WSMR include special target areas (e.g., Aerial Cable, penetrator warhead tunnels), warhead impact target (WIT) areas, chemical and materials storage, information operations laboratories, electromagnetic, electronic warfare, high energy laser, launch, nuclear effects, and warhead test facilities. Structures on the Range are generally situated in small clusters on sites with local names. Over 150 site names are used in the real property inventory—though many of these sites are outdated, in disrepair, and unused (WSMR 2015).

Particularly relevant for wildland fire, the installation has 10 WIT sites that total approximately 0.7% of WSMR (Figure 1.2). These are categorized by the Department of the Army-Materiel Test Directorate, Warheads Branch as Phase I and Phase II sites. Phase I WIT sites (Category 2 UXO present in Figure 1.2) are used exclusively for testing nonlethal sub-munitions where recovery in the area is allowed. These sites are maintained in a mowed grassland condition. Phase II WIT sites (Category 1 UXO present in Figure 1.2) are used for testing lethal (live) sub-munitions. Recovery within these areas is not permitted. These sites are maintained in a bladed (bare ground) condition (WSMR 2015).

All WIT sites are closed to entry by firefighters because there is potential for UXO that could explode in the heat from a wildfire. Wildfires in WIT areas are monitored until the wildfire burns itself out due to lack of fuels or continues to burn and spreads outside the WIT boundaries. Safety buffers have been built into WIT boundaries, so it is generally safe for firefighters to engage wildfires immediately outside WIT boundaries. However, it is probably safer for firefighters to remain on the nearest set of roads and let the wildfire come to them or let it burn out on its own. See **Appendix A, Fire Management Units** for locations of WITs and other areas of special concern.

1.5 Authority, Roles, and Responsibilities for Wildland Fire Management on WSMR

1.5.1 Garrison Commander

Overall responsibility for the WSMR IWFMP and its implementation lies with the WSMR GC. The GC has the responsibility for all Main Post operations and for the prevention and suppression of human-caused wildfires on WSMR. The GC delegates authority for wildfire suppression and prevention and RX implementation to the DES and FES (See Figure 3.8 and Table 4.1). The GC also designates an installation Wildland Fire Program Manager (WFPM), approves the installation IWFMP, approves RX projects, and approves the deployment of Army civilian firefighters to any off-installation incident (DA 2021).

To align with NWCG program management standards, the Installation Commander serves as (or delegates authority to) an installation Agency Administrator (AA). AA's have decisions authority for the installation for prescribed burn plan approval, concurring personnel qualifications, and for leadership decision/advising during wildfire incidents. The WFPM cannot serve as the AA. The designated WFPM and AA shall be documented in the IWFMP (DA 2021).

1.5.2 DES Fire Chief

The Fire Chief is responsible for ensuring wildfire readiness and response for the installation fire department and for ensuring that the IWFMP accurately reflects FES's SOPs, roles, and responsibilities. The Fire Chief has responsibility to ensure that wildfire prevention activities are occurring, that WSMR FES wildland firefighters are properly trained, equipped, and fit for wildland fire operations and follow National Fire Protection Association (NFPA) and NWCG standards for fitness, equipment, and training.

1.5.3 Wildland Fire Program Manager

The WFPM is designated by the GC and is responsible for coordinating and ensuring that the IWFMP is updated and that environmental personnel who participate in wildland fire activities have the proper training and qualifications to do so, and that mutual aid agreements and/or cooperative agreements remain relevant and current. The WFPM also approves all RX projects for WSMR (Department of the Army [DA] 2021). The WFPM role follows recommendations from G-9 (OCDS, G-9), Department of the Army Initiative, Installation Services (DAIN-IS) and WSMR FES that the WFPM be outside FES and primarily serve as a liaison between WSP-E and FES to coordinate ecosystem management RXs with FES and to provide the labor to execute said RXs. The new proposed WFPM is **Patrick Morrow, WSP-E Wildlife Biologist, WSMR, 575 678-7095**.

1.5.4 Directorate of Public Works-Environment Division (WSP-E)

WSP-E is responsible for writing, updating, and maintaining the WSMR IWFMP; maintaining a wildfire and RX database; and for proposing, designing, and writing RX plans for ecosystem benefits. WSP-E also works with the WFPM to ensure that sensitive natural resources found on WSMR are protected and that FES resources are aware of them and also that the WSMR IWFMP complies and integrates with WSMR DES/FES regulations and with the WSMR INRMP.

1.5.5 Directorate of Public Works-Operations and Maintenance Division (WSP-O)

WSP-O has responsibility to maintain roads to firebreak standards and to maintain WSMR grounds and infrastructure as necessary for their protection from wildfires (DA 2021).

1.6 WSMR Wildland Fire Management Goals

The WFPM has identified the following goals for wildland fire management on WSMR:

1. Firefighter and public safety is the first and highest priority on every WSMR wildland fire.
2. Impacts of wildfires upon firefighters, civilians, WSMR test missions and training activities are minimized by following guidelines that call for rapid suppression responses to keep man-caused wildfires small but also allows for lightning-caused wildfires or remote, hard to reach wildfires to burn for safety, economic and environmental reasons, within the boundaries of FMUs.

3. Coordinated wildland fire management protects lives and WSMR property—including cultural and sensitive natural resources—from wildfire's harmful effects through effective implementation of wildfire prevention, fuels management, wildfire suppression and public education programs.
4. Wildfire severity is reduced and WSMR ecosystems are enhanced through a wildland fire management program that includes adequate funding, training, planning, and implementation for mechanical fuels reduction projects, wildfire suppression, RX treatments, firebreak maintenance, and ***wildland fire use*** (a program that allows wildland fires to burn across the landscape unfettered if they are within defined parameters of designated FMU boundaries).
5. WSMR contractors, Department of Army Civilians (DAC) and soldiers understand the role that wildland fire plays for sustaining WSMR's fire-adapted landscapes and support the use of wildland fire to enhance WSMR's natural resources and testing mission by doing their part in maintaining defensible space around structures and improvements for which they are responsible.
6. WSMR Fire and Emergency Services (FES), WSP-O, and WSP-E understand their roles and responsibilities for effective wildland fire management and work together to coordinate actions to implement and sustain an excellent wildland fire management program.

1.7 WSMR Wildland Fire Management Objectives

The WFPM has identified the following objectives for wildland fire management on WSMR:

1. WSMR structures, infrastructure, historic cultural resources, and other assets will be protected from the harmful effects of wildland fires to the extent possible by maintaining defensible space around these assets. Activities to maintain defensible space include mowing, trimming, brush removal, thinning of excess brush and trees, and/or maintaining green belts for about 30 ft out from structures from October 1 to March 15 (time period outside migratory birds nesting season on WSMR).
2. Existing firebreaks on WSMR—primarily existing roads and border trails—are maintained in conditions that help prevent the spread of wildfires (i.e., keeping road surfaces free of vegetation for a minimum of 8 ft across the width of the road and keeping road shoulders mowed where it is feasible to do so).
3. RXs will improve the effectiveness of firebreaks by burning excessive accumulations of wildland fuels where they occur alongside roads.
4. RXs will be used as a tool to improve the health, resilience, and diversity of native ecosystems across WSMR.
5. Firefighters will use MIST, to the extent practicable, for all wildfires on WSMR (See **Appendix H**).
6. WSP-E archaeologists will be notified whenever wildfire suppression is occurring outside of established Impact Areas due to protection concerns for the vast amounts of cultural resources located throughout WSMR.
7. WSP-E biologists will be notified when wildfire suppression is occurring within vicinity of the Todsen's Pennyroyal protected area near WSMR's west central boundary or within vicinity of the White Sands pupfish protected habitat areas along Salt Creek, Malpais Spring, and Mound Springs.
8. Due to firefighter safety and cost concerns, wildfires that continue to spread after initial attack efforts fail or are still burning after 24 hours will be considered for ***fire use*** and may be allowed to burn within the defensible perimeters of FMUs.
9. WSMR will pursue a Memorandum of Agreement (MOA) with Alamogordo Dispatch Center (ADC). This agreement will include guidance for communicating with ADC and how to order equipment, manpower, and aircraft. This MOA will aid WSMR when wildfires threaten installation resources or boundaries by quickly being able to obtain outside firefighting resources—including engines, hand crews, air tankers, overhead, helicopters, lead planes, and ***aerial supervision modules*** (ASMs).
10. WSMR FES will develop a system for certifying and providing an incident qualifications card to all FES wildland fire certified firefighters.

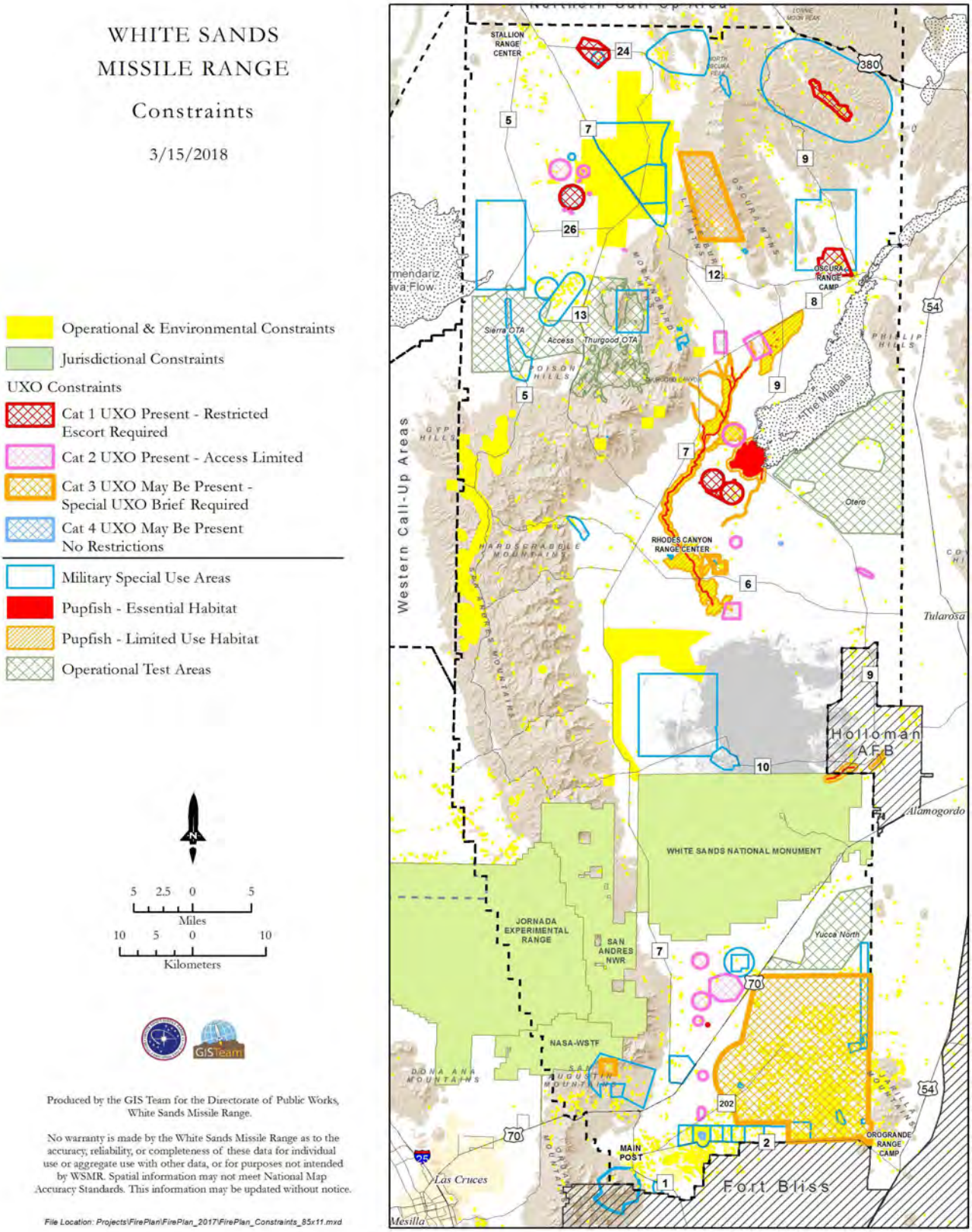

Figure 1.2 - Operational Constraints for WSMR

2 Policy, Land Management Planning, and Partnerships

The intent of this chapter is to establish the linkage between higher level planning documents, legislation, and policies as well as the actions described in the document. It also describes the various types of partnerships and partners engaged in installation wildland fire management activities.

2.1 Applicable Laws, Regulations and Guidance

The governing policy for wildland fire management can be found in DODI 6055.06 (DODI 2000) and Federal Wildland Fire Management Policy. The policies, directives, standards, and guidelines in the following paragraphs identify federal wildland fire management policy and accepted professional standards for wildland fire management on WSMR.

The *1995 Federal Wildland Fire Management Policy* (United States Departments of the Interior and Agriculture) affirmed the positive benefits of fire and discussed the need for landscape-level resource management, integration of fire into land management planning and implementation, and involvement of all affected landowners and stakeholders. *The Review and Update of the 1995 Federal Wildland Fire Policy and Program* (Interagency Federal Wildland Fire Policy Review Working Group, 2001) contains several recommendations to assist implementation of wildland fire policy established under the *1995 Federal Wildland Fire Management Policy and Program* (United States Department of Agriculture, 1995). The review working group included the five original federal agencies with additional representatives from the DOD, Department of Energy, Bureau of Reclamation, United States Environmental Protection Agency (EPA), Federal Emergency Management Agency, and Department of Commerce.

DOD and Army-specific guidance and instructions related to wildland fire include (DA 2021):

- *DODI (Department of Defense Instruction) 6055.06, DOD Fire and Emergency Services Program* – Establishes uniform professional qualification standards, standardized training, and certification procedures for all DoD FES personnel.
- *DODI 4715.03, Natural Resources Conservation Program* – Formalizes policies and procedures for the integrated management of natural resources on military lands.
- *DODI 6055.17, Installation Emergency Management (IEM)* – Establishes policy, assigns responsibilities, and prescribes procedures for developing, implementing, and sustaining IEM programs at DOD installations worldwide for 'all hazards'; establishes the goals of the DOD IEM Program and aligns DOD emergency management (EM) activities with the National Incident Management System (NIMS), the National Preparedness Guidelines (NPG), and the National Response Framework (NRF).
- *DODD (Department of Defense Directive) 3025.18 Defense Support to Civil Authorities (DSCA)* – Provides overarching guidance of how utilization of the US military can be requested by a federal agency and the procedures that govern the actions of the military during employment.
- *AR 40-5 Army Public Health Program*
- *AR 58-1 Management, Acquisition, and Use of Motor Vehicles*
- *AR 200-1 Environmental Protection and Enhancement*
- *AR 350-19 The Sustainable Range Program*
- *AR 385-10 The Army Safety Program*
- *AR 420-1 Army Facilities Management (Ch. 25 Fire and Emergency Services)*
- *AR 525-57 Army Emergency Management Program*
- *AR 600-55 The Army Driver and Operator Standardization Program*
- *AR 600-63 Army Health Promotion*
- *Army Wildland Fire Policy Guidance*
- *Army Fire and Emergency Services Scope of Services Policy Memorandum*
- *Policy Clarification Memorandum - Fire and Emergency Services Staffing*

Federal legal requirements that affect DOD wildland fire management include:

- *Sikes Act (16 USC Chapter 5c, Subsection 670)* – Mandates cooperation with other federal and state agencies for natural resource management.
- *Gonzolas Amendment (10 USC 2465)* – Allows no contract firefighting functions for DOD with exceptions.
- *Reciprocal Fire Protection Agreements (42 USC 1856, Chapter 15A)* – sets the authority to enter into reciprocal agreements for fire protection, to include authorization to enter contracts with State and local governmental entities, to include local fire districts for procurement of services in the pre-suppression, detection, and suppression of fires on any units within their jurisdiction.
- *Endangered Species Act of 1973 (16 USC, Chapter 35)* – Requires protection and management of listed species habitat.
- *National Environmental Policy Act of 1970* – Ensures planned federal actions comply with federal environmental law.
- *Clean Air Act of 1970, Revised 1990* – Requires management of emissions.
- *Fire Control and Prevention Act of 1974* – Requires Federal agencies to protect life, safety, and property.
- *2009 Federal Land Assistance, Management, and Enhancement (FLAME) Act (CR-2014-2)* – Requires interagency "Cohesive Strategy" for wildland fire management.

Applicable guidelines and standards used within Army Wildland fire operations are as follows:

- *The NWCG Wildland Fire Qualification Subsystem Guide (Publication Management System [PMS] 310-1)* contains the training, experience, and physical requirements for various Incident Command System (ICS) positions. The DOD has accepted these standards for use in both wildfire suppression and RX operations on DOD component lands.
- *The Interagency Standards for Fire and Fire Aviation Operations (NFES 2724)* developed by the BLM, US Forest Service (USFS), US Fish and Wildlife Service (USFWS), National Parks Service (NPS), and Bureau of Indian Affairs (BIA) to direct interagency standards and supplement agency-specific policies in all aspect of wildland fire management and agency integration.
- *NFPA 295, Standard for Wildfire Control* specifies procedures for the control of wildfires, including department management, fire ground organization, equipment, and apparatus.
- *NFPA 299, Standard for Protection of Life and Property from Wildfire* provides criteria for fire safe development in areas that may be threatened by wildfire.
- *NFPA 1002, Standard for Fire Apparatus Driver/Operator Professional Qualifications* specifies the minimum requirements in terms of performance objectives and professional competence required for service as a fire apparatus driver operator as set forth for each level of responsibility.
- *NFPA 1051, Standard for Wildland Fire Fighter Professional Qualifications* identifies the minimum job performance requirements for wildland fire duties and responsibilities.
- *NFPA 1143, Standard for Wildland Fire Management* specifies management practices and policies necessary for a fire protection organization to develop a wildland fire management program.
- *NFPA 1144, Standard for Reducing Structure Ignition Hazards from Wildfire* provides minimum planning, construction, maintenance, education, and management elements for the protection of life, property, and other values that could be threatened by wildland fire. It is designed to assist local, state, and federal fire agencies in dealing with the escalating challenges presented by the proliferation of wildland/urban interface communities and the monetary losses of structures in wildland/urban interface areas.
- *NFPA 1906, Standard for Wildland Fire Apparatus* provides minimum requirements for the design, performance, and testing of new automotive fire apparatus that are designed primarily to support wildland fire suppression operations.
- *NFPA 1977, Standard on Protective Clothing and Equipment for Wildland Fire Fighting* specifies the minimum design, performance, testing, and certification requirements for items of wildland firefighting protective clothing and equipment.

- *NFPA 1984, Standard on Respirators for Wildland Fire Fighting Operations* specifies the minimum design, performance, testing, and certification requirements for respirators to provide protection from inhalation hazards for personnel conducting wildland firefighting operations.

The IWFMP incorporates and adheres to DOD and Army policy by considering the use of wildland fire as a natural process, as a tool in the land management planning process, and by providing for the following:

- Wildfires, whether on or adjacent to lands administered by the Army, which threaten life, or are determined to be a threat to installation mission/assets, natural and cultural resources, or improvements under the Army's jurisdiction, will be considered emergencies and their suppression given priority over other installation activities.
- Installations shall cooperate in the development of interagency preparedness plans to ensure timely recognition of approaching critical wildfire situations, to establish processes for analyzing situations and establishing priorities, and for implementing management responses to these situations.
- Installations will enforce rules and regulations concerning the unauthorized ignition of wildfires and will aggressively pursue violations.

This IWFMP affirms these key elements of Army policy:

- Firefighter and public safety are the first priorities of the wildland fire management program and all associated activities.
- Only trained and qualified personnel will be responsible for, and conduct, wildland fire management duties and operations.
- Wildland fire management planning, preparedness, operations, monitoring, and research will be conducted on an interagency basis with involvement by all partners to the extent practicable.
- Fire, as an ecological process, has been integrated into the INRMP and related resource management plans and activities on a landscape scale and across agency boundaries based upon the best available science.
- Wildfire is used to meet identified resource management objectives and benefits when appropriate.
- RX and other treatment types will be employed whenever they are the appropriate tool to reduce hazardous fuels and the associated risk of wildfire to human life, property, and cultural and natural resources and to manage our lands for habitats as mandated by statute, treaty, and other authorities.
- Management response to wildfire will consider firefighter and public safety, cost effectiveness, values to protect, and natural and cultural resource objectives.
- Staff members will work with mission planners, local cooperators, and the public to prevent unauthorized ignition of wildfires on Army lands.
- The military mission is supported by managing wildland fire fuels.
- INRMP and pertinent resource management plans set the objectives for the use and desired future condition of Army lands.
- Wildland fire management plans, programs, and activities support INRMP implementation and emergency wildfire response.
- Sound risk management is a foundation for all wildland fire management activities. Risks and uncertainties relating to wildland fire management activities must be understood, analyzed, communicated, and managed as they relate to the cost of either doing or not doing an activity.
- Standardization of policies and procedures for wildland fire management and resourcing among Army installations is an ongoing objective.
- Maximizing cost effectiveness of any fire operation is the responsibility of all involved, including those who authorize, direct, or implement operations.
    a. Cost effectiveness is the most economical use of resources necessary to accomplish project/incident objectives.

b. Accomplishing the objectives safely and efficiently will not be sacrificed for the sole purpose of "cost-saving."
c. Appropriate oversight will ensure that expenditures are commensurate with values to be protected.

2.2 Integration with Federal Wildland Fire Management Policy

This IWFMP meets Federal Wildland Fire Management Policy by implementing and following these guiding principles:

- Firefighter and public safety are the priority in every fire management activity.
- The role of wildland fire as an essential ecological process and natural change agent has been incorporated into the planning process.
- Wildland fire management plans and activities are based upon the best available science.
- Federal, state, tribal, local, and interagency coordination and cooperation are essential.
- Standardization of wildland fire policies and procedures to meet national standards is an ongoing objective.

The FLAME Act of 2009 directs that an interagency cohesive wildland fire strategy be developed. This IWFMP meets the direction in *The National Cohesive Wildland Fire Management Strategy* by emphasizing the following primary goals:

- Restore and maintain landscapes: Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
- Fire-adapted communities: Human populations and infrastructure can withstand a wildfire without loss of life and property.
- Wildfire response: All jurisdictions participate in making and implementing safe, effective, and efficient risk-based wildfire management decisions.
- The National Strategy sets broad, strategic, national-level direction as a foundation for implementation of wildland fire management actions across the Nation.

2.3 National Environmental Policy Act Compliance

Environmental compliance for planned wildland fire-related actions on Army lands—including firebreak establishment for RX, firebreak maintenance and rehabilitation, use of water resources for suppression, prescribed burning, and non-fire fuel reduction—should be included in the NEPA environmental review process associated with the INRMP. The NEPA process assures that all environmental impacts are being considered and addressed. A well-executed NEPA process assures compliance with the following laws:

- *Endangered Species Act of 1973 (ESA)*
- *National Historic Preservation Act of 1966 (NHPA)*
- *Archeological Resources Protection Act of 1979 (ARPA)*
- *Clean Water Act of 1963*
- *Clean Air Act of 1972*
- *Golden and Bald Eagle Protection Act*
- *Migratory Bird Treaty Act 1912*

Regarding wildfires, NEPA analysis is not required because wildfires are unplanned events. Suppression activities are categorically excluded from NEPA. Emergency ESA consultation, however, should be conducted during or immediately following a wildfire if the wildfire or suppression actions could potentially impact a federally listed species. Additionally, some RXs may be categorically excluded from NEPA. Consult with the Installation NEPA Coordinator for more details.

Each RX project and mechanical fuels project on WSMR will go through the Army's environmental review process with the desired result being an approved Record of Environmental Consideration (REC). If, during the environmental review process, it is determined that a more detailed analysis is needed—such as an Environmental Assessment (EA)—then WSP-E will be the lead on the documentation, analysis, and completion of a new EA.

2.4 Integration with WSMR INRMP and ICRMP

Implementation for this IWFMP included an assessment of its environmental effects as required by 32 Code of Federal Regulations (CFR) 651, Environmental Analysis of Army Actions, dated 29 Mar 2002. An EA was completed specifically for the WSMR IWFMP, March 2004. The current IWFMP is an updated version of the 2004 version and is included as an appendix to the 2023-2027 WSMR INRMP. The INRMP and ICRMP are currently in revision and should be approved in 2023. The revisions include an EA for consideration of potential environmental effects if the plans are implemented. Goals from the draft INRMP related to wildland fire management include:

- Implementing the approved, signed, and updated WSMR IWFMP.
- Use of ***Adaptive wildland fire management*** to meet fire management goals and objectives.
- Use of mechanical treatments as alternatives to the use of fire to achieve natural resource benefits.
- Following all applicable federal, state, and local environmental regulations and laws.
- Use of RXs to meet ecosystem management objectives.

2.5 WSMR Cooperators in Wildland Fire Management

WSMR contains lands within its perimeters that are used and shared by other federal agencies (Figure 2.1). These agencies are participants in wildland fire management on the installation and are considered internal cooperators. Internal cooperators have different missions on WSMR and can also contribute to the frequency and duration of wildfires occurring on WSMR. Internal cooperators can supply assets to assist WSMR firefighters. Some of these cooperators have fire management responsibilities on the WSMR lands that they use.

Interagency agreements exist as MAAs for suppression of wildfires where agencies can benefit each other by reciprocal fire suppression activities. Formal MAAs exist between WSMR FES and the BLM, White Sands Test Facility (WSTF), USWFS, JER, the counties of Doña Ana and Socorro, and the cities of Las Cruces, Organ, and Socorro (See **Appendix B**, **Mutual Aid Agreement**s). The first three entities listed below do not have signed MAAs. Fort Bliss is an adjoining Army training facility and will respond to WSMR wildfires when they are called upon. Holloman AFB and WSNP are completely enclosed within WSMR boundaries and, as such, do not provide wildland fire suppression resources but rather rely on WSMR FES or other nearby Volunteer Fire Departments for wildfire suppression.

Fort Bliss Training Center (FBTC): FBTC adjoins WSMR and comprises most of the southern boundary of WSMR (Figure 2.1). FBTC consists of approximately 1.12 million acres and is an Army installation dedicated to training Army troops in maneuver and gunnery requirements. Units stationed at Fort Bliss use WSMR ranges and airspace for tactical training and military tests. In combination, WSMR and Fort Bliss create an arena of more than 3 million contiguous acres of dedicated DOD land and exclusive-use airspace for training purposes and testing weapons (U.S. Army 2000).

Wildfires have crossed the WSMR/Fort Bliss boundary in the past, mostly within the rugged confines of the Organ Mountains. Fort Bliss FES has wildland fire equipment and firefighters that will respond to wildfires on WSMR if they are near WSMR borders. The same goes for WSMR firefighters, as they will respond to Fort Bliss wildfires near their shared boundary. Fort Bliss FES and WSMR FES have mutual interests and a shared responsibility in keeping wildfires small near their mutual boundary.

Holloman Air Force Base (HAFB): HAFB utilizes the Red Rio and Oscura Bombing Ranges for air-to-ground target training and utilizes WSMR airspace and the extension areas for aerial maneuver training (Figure 2.1). The Range Operations Center (ROC) located at HAFB monitors all US Air Force (USAF) training activities on WSMR and can

also monitor wildfires on Red Rio and Oscura Bombing Ranges using remote cameras in strategic perimeter locations. Wildfire ignitions are common within the Red Rio Bombing Range due to a ready ignition source from munitions and the abundance of light, flashy fuels. Wildfires are mostly held in check inside Red Rio Bombing Range by a system of bladed firebreak roads around the perimeter of the Range. When wildfires burning inside Red Rio Bombing Range threaten to burn across the firebreak boundaries, the ROC will notify WSMR FES for wildfire suppression support. The Oscura Bombing Range does not normally contain sufficient wildland fuels to warrant wildfire escapes. Further, HAFB maintains a Type 6 engine with contract firefighting personnel and a water tender on Oscura Range that will handle wildfires within that area of responsibility.

White Sands National Park (WSNP): The WSNP is enclosed within WSMR boundaries (Figure 2.1). The US National Park Service has responsibility for the administration and management of WSNP and, as such, they have wildland fire management responsibilities for the lands they administer. WSNP has very little wildland acreage that is burnable, the exception being small pockets of burnable fuel in between dune areas that consist of cottonwood galleries and patches of salt grass. WSNP does not have wildland fire protection equipment nor any firefighters in their employ. WSNP fire history shows car fires on the main access road to be the primary source of wildfires, but —due to sparse fuel conditions—these fires are not considered a threat to WSMR lands.

San Andres National Wildlife Refuge (SANWR): SANWR is administered by the USFWS and serves primarily as a refuge and home for a growing population of desert bighorn sheep *(Ovis canadensis nelsoni).* SANWR contains 57,215 acres entirely enclosed within WSMR boundaries and is not open to the public (Figure 2.1). A USFWS RX program has burned substantial acreage on SANWR over the past three decades for the purpose of reducing shrub and tree densities, which serve as hiding cover for predators, and to stimulate the growth of quality forage for desert bighorn sheep. The USFWS New Mexico Fire District employees have the expertise, fire experience, and equipment necessary to aid WSMR with RXs and wildfires. USFWS fire resources will respond to wildfires burning on the SANWR and will be there to help manage wildfires that may cross refuge boundaries and burn onto WSMR. Due to declining agency budgets, however, there has been increasing reluctance on the part of the USFWS Fire District to provide wildland fire resources for off-refuge wildfires and other agencies' RX projects. This is a problem for WSMR because they have relied on USFWS in the past for wildfire support and for accomplishing RX projects.

Jornada Experimental Range (JER): JER is a US Department of Agriculture (USDA) research facility and livestock range encompassing 193,483 acres (Figure 2.2). Some of this acreage includes shared lands administered by WSMR and SANWR. The purpose of JER is to conduct arid lands research and create best management practices for compatible livestock management and ecosystem sustainability. JER has conducted experiments and research over many years involving the controlled burning of vegetative plots to measure plant responses to fire. As such, they have provided guidance and direction to land managers who desire to manage and sustain Chihuahuan Desert ecosystems using tested grazing practices and RXs.

NASA and the White Sands Test Facility (WSTF): WSMR provides NASA, as a leased tenant, the land necessary to conduct experiments and tests on materials and components used in today's space vehicles (Figure 2.1). The WSTF is a diverse facility used in support of NASA, other government agencies, the U.S. military, and private industry. Located on 28 mi^2 in the southwest corner of WSMR, the WSTF is a self-contained and remote testing facility. NASA maintains a small fire department that includes one Type 6 engine for wildland fires (4x4, 350 gal., with foam and three personnel)(Pers. comm., JR Heimbecker). This engine and crew are available upon request for support on WSMR wildfires under guidelines established in a mutual aid agreement between WSMR and WSTF (**Appendix B**).

2.6 Inter-Agency Wildland Fire Management Partners

The regional land ownership surrounding WSMR includes private, state, and federal lands (Figure 2.1). WSMR is mostly surrounded by public land administered by the BLM and by the state of New Mexico. There are scattered blocks of private land on the eastern boundary, north of Highway 70, small parcels directly west of the Main Post on the San Augustin Ranch, and a few sections adjacent to the western boundary at isolated ranches. Wildfires

can cross WSMR boundaries and impact private and public lands. The following external cooperators have firefighters and equipment that are available to assist WSMR firefighters when wildfires threaten to cross boundaries based on Mutual Aid Agreements that are signed and current.

BLM has offices in Las Cruces, Socorro, and Roswell that administer lands which are adjacent to WSMR boundaries. BLM jurisdictions are divided by county lines. Las Cruces District Office administers adjoining BLM lands in Doña Ana, Otero, and Sierra counties; Socorro Field Office administers adjoining BLM lands in Socorro County; and Roswell District Office administers adjoining BLM lands in Lincoln County. These offices maintain a fleet of fire engines that can respond to wildfires near and within WSMR borders.

The state of New Mexico's **Energy, Minerals and Natural Resources Department (EMNRD), New Mexico State Forestry Division (NMSF)** retains the lead responsibility for wildland fire management on non-federal and non-municipal lands within the state of New Mexico. NMSF is responsible for wildfire suppression on 43 million acres of private and state lands within New Mexico but has limited numbers of firefighters and engines available for fighting wildfires. During the wildfire season, the Socorro and Capitan Districts of NMSF maintain engines and crews that can respond to WSMR boundaries if wildfires nearby are threatening state or private lands. Primarily, NMSF relies on agreements with the state's Volunteer Fire Departments (VFDs) and with the federal land management agencies for wildfire suppression assistance on state and private lands in New Mexico.

USFS administers lands in southern New Mexico within the Gila and Lincoln National Forests. These National Forests maintain and support firefighting resources for protecting their lands and others' lands under an interagency zone concept. USFS firefighting resources include multiple wildland fire engines, hotshot crews, helicopters, air tankers, smokejumpers, lead planes, and air attack fixed-wing aircraft. These assets can be used for wildfire suppression near or within WSMR boundaries. WSMR is a part of the Pecos Zone, which is controlled by ADC. ADC controls the movement and use of interagency federal and state firefighting resources throughout southeastern New Mexico and West Texas, and these resources are available to WSMR as needed. If, however, the fire season is a busy one, then prioritization for these resources is made by the Southwest Interagency Coordination Center (SWCC) in Albuquerque, NM.

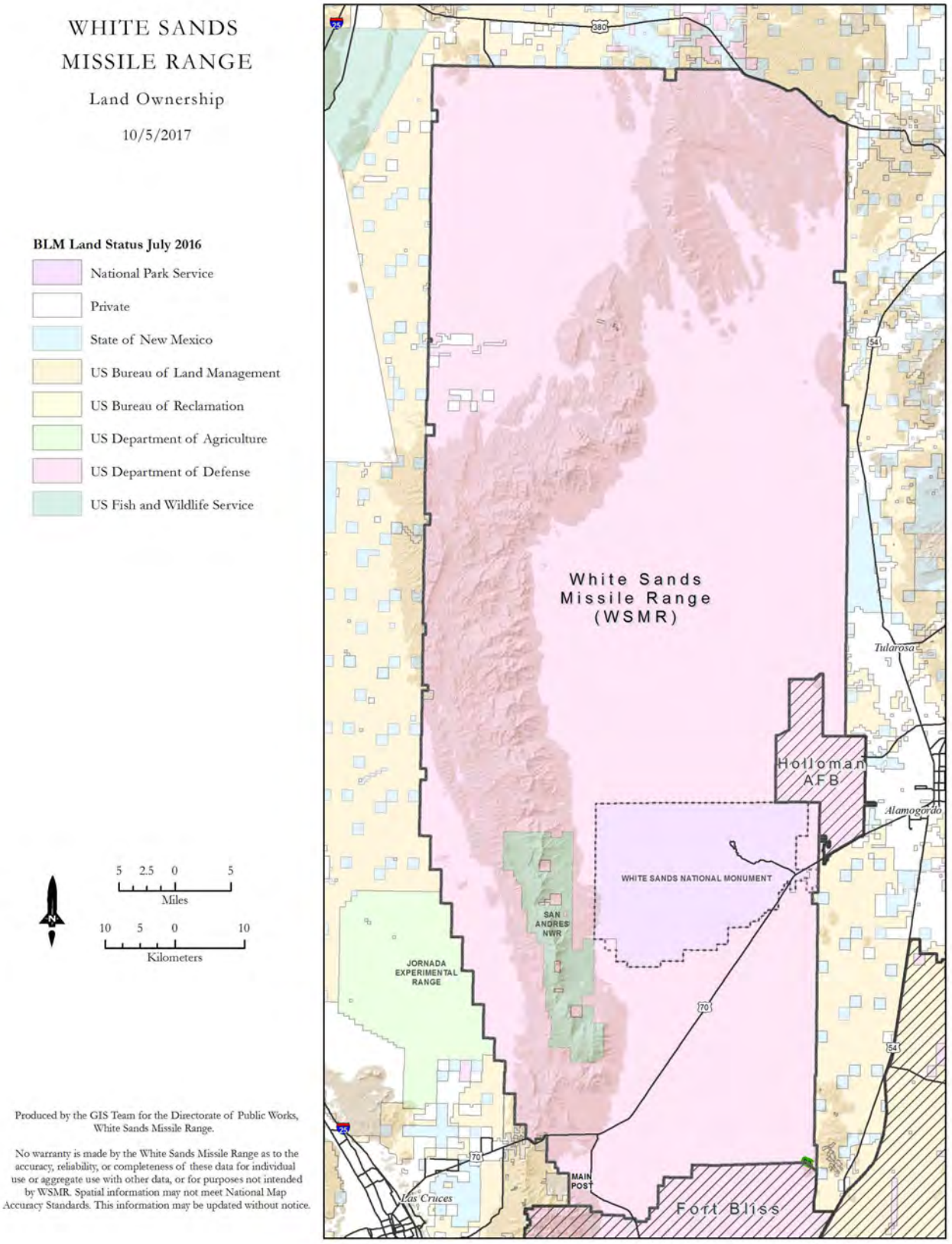

Figure 2.1 - Land Ownership Within and Surrounding WSMR

3 Wildland Fire Area Characteristics and Pre-Fire Planning

3.1 Topography and Physiographic Resources of WSMR

WSMR lies within the Mexican Highland Section of the Basin and Range Physiographic Province (Hawley 1986). Extension of the earth's crust throughout this province during the past 30 million years has produced characteristic short, linear mountain ranges separated by intervening valleys (Stewart 1978). WSMR's present-day terrain includes rugged mountain peaks and canyons, rolling grass-covered hills, sand dunes, lava flows, semi-arid yucca and grassland basins, and large playas with scattered springs and ponds (Figure 3.1)(Muldavin et al. 2000). WSMR includes the northern end of the Tularosa Basin, with a low elevation of 3,885 ft. (1,184 m) on WSMR's eastern side. The Jornada Basin lies on the northwest side of WSMR and is higher, with a low elevation on WSMR of 4,574 ft. (1,394 m). Dividing these two desert basins are the San Andres Mountains, which reach a height of 8,962 ft. (2,732 m) at Salinas Peak, and the Oscura Mountains, reaching 8,639 ft. (2,633 m) at Oscura Peak (WSMR 2015). In between the Oscura Mountains and the San Andres Mountains are the Mockingbird Mountains (high point of 7,463 ft./2,275 m) and the Little Burro Mountains (high point of 6,501 ft./1,982 m)(Figure 3.1).

The San Andres and Oscura mountain ranges are fault-block escarpments. The San Andres Mountains rise abruptly, with steep slopes and escarpment cliffs facing eastward toward the Tularosa Basin. West-facing slopes of the San Andres Mountains gradually descend from the escarpment edge to the floor of the Jornada Basin. The Oscura Mountains to the north have steep cliff faces along their escarpment. The escarpment faces west, and the Oscura mountain range gradually descends to the east from the escarpment edge.

The Tularosa Basin contains numerous ephemeral playa lakes and alkali gypsum flats. Lake Lucero Playa is the lowest depression within the Lake Otero plain; it holds brackish water throughout much of the year. Big Salt Lake—the terminus of Salt Creek—contains valuable wildlife habitat.

Gypsum dunes in the center of WSMR constitute redeposited lakebed evaporates whose gypsum crystals are carried by the wind. Gypsum sands, originating from the dried-up Pleistocene Lake Otero, were deposited into the lake by runoff from surrounding gypsum-rich formations of the mountain ranges during the Pleistocene Age. Gypsum sand dunes occur in the south-central portion of WSMR and extend south into WSNP. The dunes comprise the largest gypsum dune field in the world, covering 432 mi^2—most of which lies within WSMR (WSMR 2015).

The center of the Jornada del Muerto basin on WSMR is believed to be the Pleistocene-age Lake Trinity. The lake evaporated with the onset of a drier, warmer climate. Dune sands that dominate the western portion of the Jornada del Muerto were probably deposited in the Rio Grande channel during the wetter Pleistocene and have since been blown here by prevailing southwest winds and deposited in this basin along the western shore of the Lake Trinity playa (Neal et al. 1983). Alluvial deposits from surrounding slopes of the San Andres and Oscura Mountains have encroached from the south and the east onto Lake Trinity playa deposits (WSMR 2015).

The Tularosa Basin and the Jornada Basin are closed watershed basins for hydrologic functions. The surrounding mountains catch most of the available precipitation, and—when it is sufficient to run off the mountains—water is collected in the desert floor of those basins within shallow playas. Soils on the Tularosa Basin floor are highly calcareous due to the deposition of dissolved calcium from limestone rock carried by water down from the mountains (WSMR 2015).

The Carrizozo lava flows originated from Little Black Peak, northeast of WSMR, and have been dated at 5,200 ±700 years B.P. There were two distinct basaltic flows that erupted within 1,000 years of each other. The flows are well preserved, and they have retained some pahoehoe rope-flow top structures (Dunbar 1999).

The southwest corner of WSMR contains a small portion of the steep-sided Organ Mountains, whose elevations on WSMR range from 4,400 ft. (1,341 m) to 6,525 ft. (1,989 m) on the ridgeline to the east of Texas Canyon. While the Organ Mountains are a very small part of WSMR's geography, they are important in terms of wildfires and their effects. WSMR Main Post sits at the base of the Organ Mountains and has been affected on numerous

occasions by wildfires burning within these mountains, mainly in terms of smoke impacts. Wildfires in the Organ Mountains can grow large, and smoke impacts may last for several days.

Most soils on WSMR are aridisols (58%), which are characteristic of desert soils since they are more alkaline and less developed than non-desertic soils. Organic matter is mostly lacking in aridisols, which limits the soils' ability to hold water and nutrients and resist compaction. Aridisols typically have <1% organic matter as compared to >3% in adjacent soil types. Entisols (30%) and mollisols (12%) make up the remaining soil groups present on WSMR (WSMR 2015). Entisols are young, usually recently established, and weakly developed soils found within the basin bottoms of WSMR. Mollisols are usually formed beneath grasses and occur at high-elevation, mesic sites on WSMR. All soils on WSMR are associated with climates showing at least moderate seasonal or annual moisture deficits, and these soils tend to be highly vulnerable to erosion.

WSMR's soils are prone to both water and wind erosion. Exposed rock is common, and soils themselves can be non-absorbent because of hydrophobic properties. When wet, hydrophobic soils tend to expand, sealing subsurface layers. Because of this, overland flow across the surface is common. Consequently, flash flooding resulting in excavation of arroyos and sheet erosion that removes finer particles and organic matter are common (Sowell 2001). Wildfires can exacerbate soil erosion by removing the organic layer on the surface, which normally acts to absorb rainwater.

Increases in soil erosion can be exacerbated by drought, which leads to loss of grasslands over time and the consequent increase in shrub species—such as mesquite, creosote and piñon-juniper. Creosote shrublands can become homogeneous and may thus act to limit understory vegetation, causing increased cycles of run-off during rain events due to less water percolation into the soil bed. The lack of herbaceous growth beneath these shrubs limits fire spread and helps perpetuate shrub species. Piñon-juniper woodlands, mesquite coppice dunes, and creosote monocultures need disturbance—other than fire—in order to increase understory vegetation and help slow erosion of topsoil.

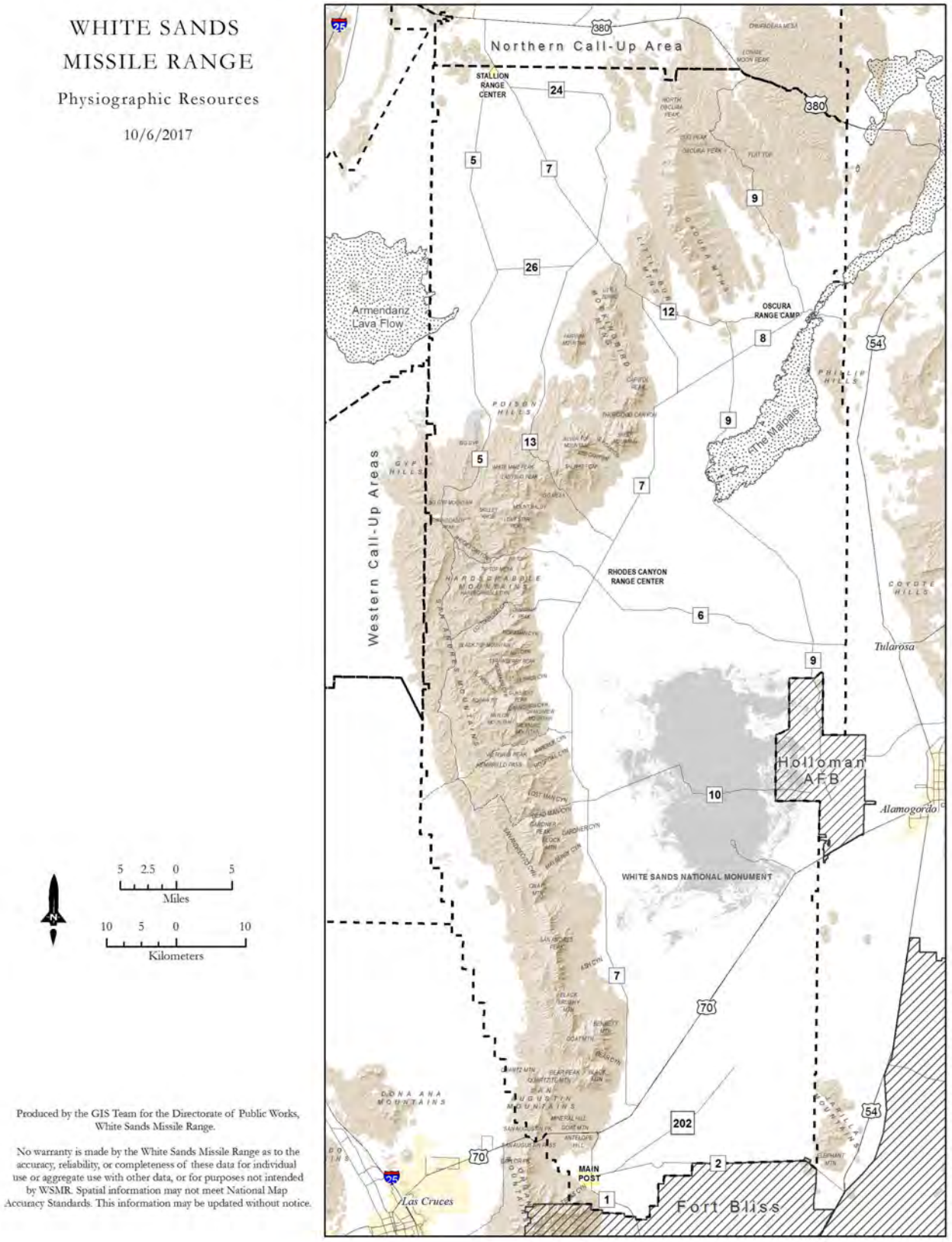

Figure 3.1 - Physiographic Resources of WSMR

3.2 Cultural Resources

WSMR and the surrounding area represent a landscape rich with evidence of a long human occupation. Human habitation on WSMR is represented by prehistoric hunting and gathering camps, historic ranches, railroads, trails, late 20th-century buildings, and military-related buildings and structures from World War II through the Cold War (WSMR 2015). Human activities continue to shape the landscape through the various missions of WSMR. These activities leave imprints on the landscape for future generations to interpret and manage, collectively forming the present-day cultural landscape and, as such, warrant protection from the effects of severe wildfires. There are thousands of cultural sites located on WSMR. Management of cultural resources is described in the WSMR ICRMP. Prehistoric sites include trackways, lithic scatter, pueblo structures, encampments, cave dwellings, and rock art. Historic sites include ranches, homesteads, corrals, and mines. See Section 5.1.4 and, particularly, **Appendix J** for further information on protecting cultural resources from wildland fire damage.

3.3 Climate and Weather

WSMR lies at the northern extent of the Chihuahuan Desert Ecoregion, the easternmost of the North American deserts (Dinerstein et al. 2000). The Chihuahuan Desert is a function of the horse latitudes, found between 32^0-37^0 above and below the equator. This is where air masses that originate at the equator descend, warm, and dry, resulting in little precipitation, and is where most of the warm deserts around the world are found (Sowell 2001). In the northern Chihuahuan Desert, this drying effect is enhanced by the rain shadow effect of the Sierra Madre Oriental and Occidental Ranges in Mexico and the southern Rocky Mountains in the US. Like other North American deserts, summers are long and hot; however, due to its interior location and high elevations (mostly >4000 ft.), winters in this desert are cool and result in frequent below freezing temperatures during nighttime (Barlow et al. 1983).

More than half of the total average annual precipitation occurs during the months of July, August, and September. During the summer months—beginning at the end of May and lasting through mid-October—convective cells are formed by the intersection of moist tropical air from the Gulf of Mexico with local air masses uplifted by intense surface heating. The resulting summer precipitation is localized and generally concentrated in short, high-intensity thunderstorms in the mid-afternoon and evening that often produce substantial runoff water in arroyo drainages as well as standing pools of water in playas (WSMR 2015). Precipitation on WSMR averages 7.9–20 in. (20–35 cm) annually, with >60% occurring as short, intense convective rainstorms from July through September (Barlow et al. 1983). Average annual precipitation in arid high desert basins is less than 10 in. (25.4 cm); semiarid foothills 10-16 in. (25.4 cm-40.6 cm); and highest mountain elevations are almost temperate (average 20 in.)(50.8 cm) (Muldavin et al. 2000). Snowfall averages less than 3.9 in (10 cm), is short-lived, and occurs at higher elevations. Mean annual temperature at WSMR is 63°F (17.2 C). Average low temperature in January is 29°F (-1.66 C); in July the average high is 95°F (35 C). Temperature extremes range from 112°F (44.4 C) recorded at Orogrande in June 1994 to -25°F (-31.6 C) recorded at White Sands National Monument in January 1962 (WSMR 2009). Records indicate daily fluctuations of up to 50°F (10^0C)(Muldavin et al. 2000). Three principal seasons occur across WSMR: warm-wet (July–October), cool-dry (November–February), and warm-dry (March–June). April and May are the driest months (WSMR 2009).

Westerly winds prevail throughout much of the spring. Winds become more southerly in July and August during the summer monsoon, when wind speeds drop to their lowest levels of the year (less than 8.0 mph)(WSMR 2009). The combination of relatively strong, sustained winds and low precipitation in the spring contribute considerably to the occurrence of wildfires and to sand/dust storms in the area. The topography of WSMR also affects wind direction and velocity. The San Andres and Oscura Mountains help to increase the speed of wind gusts and alter primary wind directions through orographic lifting. Wind speeds are accelerated further by the chimney effect of steep, narrow canyons. Orographic lifting and adiabatic cooling also make higher elevations wetter and cooler than adjacent desert basins, while shading makes northern aspects wetter and cooler than southern aspects.

Wildfire season on WSMR and the surrounding area can last from the first frost in November until the onset of the monsoons in July, but the season always reaches a peak during the spring to early summer (March-June), when winds and temperatures are at their peaks and relative humidity is lowest. Most lightning strikes occur between June and September. See Ch. 4, Sec. 4.5 for more on the effects that climate and weather have upon wildland fires on WSMR.

3.4 Vegetation Communities of WSMR

Historical accounts from the mid-1800s describe the Chihuahuan Desert Ecoregion (Dinerstein et al. 2000) as lush, shrub-free grasslands. Over the past century and a half, the ecoregion has been heavily degraded by overgrazing and deprivation of natural fire regimes. WSMR, heavily grazed prior to 1945, was also severely impacted by drought from 1942 to 1956. Reported findings show that the principal ground cover, grasses, and forbs, declined substantially during this period (Gao and Reynolds 2003). JER research shows shifts from grass vegetation cover types to shrub vegetation cover types over the previous century (Fredrickson et al. 2005). WSMR contains large areas that have been affected by man's and nature's influences over time, yet there are still relatively intact—albeit smaller—grassland, riparian, and montane vegetation communities on WSMR (Figure 3.2). The diversity of habitats and the quality of vegetation communities found on WSMR provide environments supportive of great biotic diversity. WSMR contains some of the last, best remnants of healthy, functioning Chihuahuan Desert ecosystems and are worthy of conservation (WSMR 2015).

Among desert ecoregions, the Chihuahuan Desert has particularly high biodiversity. It is widely recognized for its cactus diversity and endemism (i.e., found no other place in the world). Four other plant families, grasses, euphorbs, asters, and legumes are also highly speciose and show high levels of endemism in the ecoregion. Plant endemism may be lower on WSMR than in other parts of the Chihuahuan Desert because endemism tends to be greater in the center of the Chihuahuan Desert than at its margins (VanDevender 1987), and WSMR is located on the northern edge of the ecoregion (WSMR 2015).

The New Mexico Natural Heritage Program (NMNHP) described vegetative land cover for WSMR and lists 34 vegetation communities grouped from the >1,000 plant species found on the installation (Muldavin 1996)(Figure 3.2).

Vegetation communities at WSMR generally follow an elevational gradient. At highest elevations, open ponderosa pine occurs with deciduous oak (*Quercus gambelii*) woodlands. Lower montane elevations support a combination of piñon (*Pinus edulis*) and juniper (*Juniperus monosperma*) woodlands intermixed with evergreen oak (*Q. grisea* and *Q. turbinella*), mountain mahogany *(Cercocarpus montanus*), and wavy-leaf oak (*Q. undulata*)(Muldavin et al. 2000). Mountain valleys and mid-elevation slopes contain grasslands dominated by blue, hairy, and sideoats grama grasses (*Bouteloua gracilis*, *B. hirsuta*, and *B. curtipendula*), western wheatgrass (*Pascopyrum smithii*), and New Mexico needle grass (*Stipa neomexicana*), with a significant component of the above-mentioned shrubs as well as buck brush (*Ceanothus fendleri*), skunkbush sumac (*Rhus trilobata*), cacti (*Opuntia spp.*), and agaves (*Agave spp.*). Foothills and alluvial fans support Chihuahuan Desert grasslands dominated by various grama grasses—particularly black grama (*Bouteloua eriopoda*)—along with curly leaf muhly (*Muhlenbergia setifolia*). These grasslands have a distinctive and conspicuous tall and dwarf shrub component represented by such species as common sotol (*Dasylirion wheeleri*), sacahuista (*Nolina microcarpa*), soaptree yucca (*Yucca elata*), mariola (*Parthenium incanum*), ocotillo (*Fouquieria splendens*), and Torrey's jointfir (*Ephedra torreyana*). Major drainages contain riparian forest and shrubland vegetation, especially where water is semi-permanent (Muldavin et al. 2000).

Chihuahuan Desert shrublands are found interspersed with desert grasslands at the bases of the mountains on foothills and bajadas. Shrublands are also significant components of deserts—usually found along arroyos and in low-lying pockets—as well as on the margins of gypsum dunes and playa lakebeds. Viscid acacia (*Acacia neomexicana*) communities occur on lower mountain slopes of canyons and escarpments. Large stands of creosotebush (*Larrea tridentata*), catclaw acacia (*A. greggii*), and honey mesquite (*Prosopis glandulosa*) extend

away from mountain fronts. Rolling sandy plains support sand sage (*Artemesia filifolia*) shrublands, and large alluvial flats are dominated by four wing saltbush (*Atriplex canescens*) communities. In the Tularosa and Jornada Basins, honey mesquite, tarbush (*Flourensia cernua*), snakeweed (*Gutierrezia sarothrae*), soaptree yucca, and creosote prevail. Lowland or basin grasslands containing tobosa (*Hilaria mutica*) and alkali sacaton (*Sporobolus airoides*) intermix with low elevation shrubs. Gypsum dunes and outcrops in basins support unique vegetation communities dominated by gyp dropseed (*S. nealleyi*), gypsum grama (*B. brevista*), pickleweed (*Salicornia bigelovii*), and hairy coldenia (*Tiquilia hispidissima*). Waterways, springs, basin bottoms, and dirt tanks may contain mixtures of wetland species, including American bulrush (*Scirpus americanus*), common reed (*Phragmites australis*), broadleaf cattail (*Typha latifolia*), and salt cedar (*Tamarix chinensis*)(Muldavin et al. 2000).

As wildfires occur across WSMRs landscapes, WSP-E has been conducting monitoring to determine how vegetation responds to wildfires. Currently, WSMR has a total of 36 300-m transects measuring vegetation response from eight wildfires and three RXs that burned between 2011 to 2022. Data gathering is still occurring on these transects. Summaries and database information is available from WSP-E, Conservation Branch, Building 162, Dyer Street, WSMR Main Post.

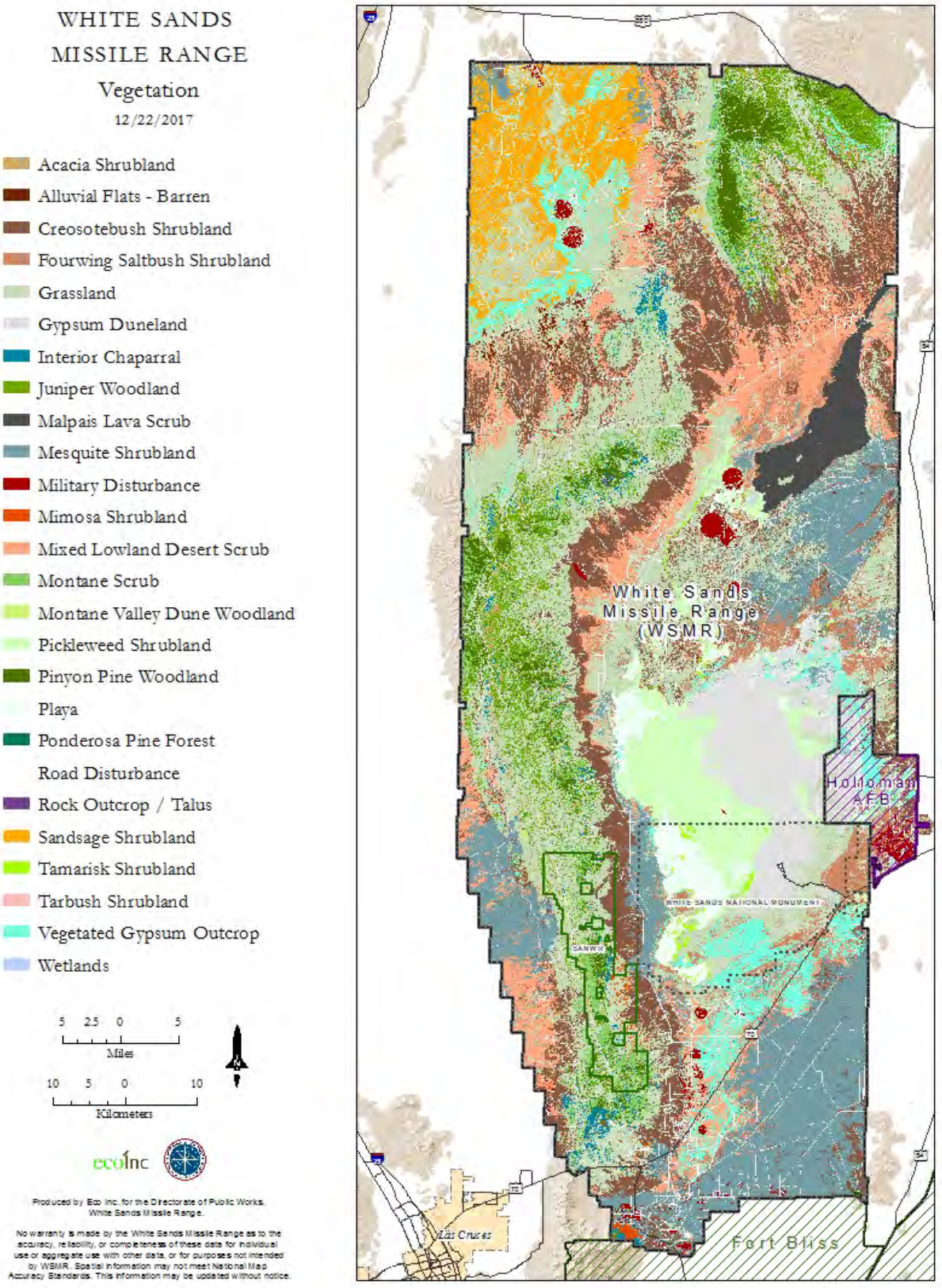

Figure 3.2 - WSMR Vegetative Communities

3.5 Wildlife Resources of WSMR

The borderland region of New Mexico and Texas is a center of biodiversity in temperate North America for birds, mammals, and herpetofauna (Parmenter et al. 1995, Parmenter and Van Devender 1995). The diversity of terrestrial vertebrates 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 or in the Great Plains (Parmenter et al. 1995, Parmenter and Van Devender 1995).

Invertebrates—enormously variable in shape, size, abundance, and environmental adaptations—make up 95% of all animals in the world (Barnes 1987); however, only a few surveys have been conducted for invertebrates on WSMR. It is likely that species new to science will be found at WSMR. The total number of invertebrate species living on WSMR is expected to be in the thousands. Species listed in the WSMR Integrated Natural and Cultural Resources Management Plan (INCRMP)(2015) account for perhaps a quarter of that estimate.

Native fish fauna consists of a single, endemic species: the White Sands pupfish (*Cyprinodon tularosa*). The species is restricted to the Tularosa Basin, where it is found in Malpais Spring and the Lost River in Otero County, Salt Creek in Sierra County, and in Mound Springs in Lincoln County; these sites constitute the key habitat areas for the pupfish (Figure 1.2)(Propst 1990).

WSMR contains habitat that supports diverse herpetofauna: seven species of amphibians (6 toad species—3 spadefoot toads and 3 true toads; 1 salamander species) and 47 species of reptiles, representing three orders and 12 families, (1 turtle species; 27 snake species; 19 lizard species)(Burkett 2008).

Avifaunal diversity on WSMR is high. Of approximately 500 species of birds known to occur in New Mexico, about 60% are documented on WSMR. This percentage includes 290 species, representing 17 orders and 55 families. Over half are residents during summer, winter, or year-round. There are 99 transient species (including migrants). Three exotic, invasive bird species are common on WSMR: the rock pigeon (*Columba livia*), house sparrow (*Passer domesticus*), and European starling (*Sturnus vulgaris*)(WSMR 2015).

A total of 73 species of mammals have been recorded on WSMR (WSMR 2009). Three species are extirpated from the entire region: gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos*), and black-footed ferret (*Mustela nigripes*). One species, black-tailed prairie dog (*Cynomys ludovicianus*), is extirpated from WSMR but persists in adjacent areas. In addition, WSMR (2007) contains six non-native mammal species: house mouse (*Mus musculus*), Norway or brown rat (*Rattus norvegicus*), feral cat (*Felis catus*), feral horse (*Equus caballus*; one stallion alive on WSMR as of 2022), Barbary sheep or aoudad (*Ammotragus lervia*), and oryx or gemsbok (*Oryx gazella*).

A few of the most recognizable mammal species found on WSMR are common and include gray fox (*Urocyon cinereoargenteus*), coyote (*Canis latrans*), black bear (*Ursus americanus*), mountain lion (*Puma concolor*), elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), desert bighorn sheep (*Ovis canadensis nelsoni*), kit fox (*Vulpes macrotis*), American badger (*Taxidea taxus*), bobcat (*Lynx rufus*), jackrabbit (*Lepus californicus*) and the desert cottontail (*Sylvilagus audubonii*).

3.6 Threatened, Endangered and Sensitive Plant and Animal Species of WSMR

One plant species, Todsen's Pennyroyal (*Hedeoma todsenii*), is found on WSMR and is federally listed by the USFWS as endangered under the ESA (WSMR 2009). Todsen's pennyroyal habitat is located adjacent to the western boundary of WSMR, just east of the Western Call-up Area in the Gyp Hills, Hardscrabble Mountains, and the San Andres Mountains (Figure 1.2).

The Northern aplomado falcon (*Falco femoralis septentrionalis*) is listed as endangered but has been designated by the USFWS as a Nonessential Experimental Population within the states of New Mexico and Arizona (WSMR 2009). The Northern aplomado falcon occurs occasionally as a transient visitor on the Jornada grasslands and the central grasslands east of the San Andres Mountains of WSMR. Two federally endangered species, the Southwestern willow flycatcher (*Empidonix traillii extimus*) and the least tern (*Sterna antillarum athalassos*) have

been rarely sighted on WSMR. Both species inhabit riparian areas, are transient within the area, and are not known to nest on WSMR (WSMR 2015). One federally threatened species, the yellow-billed cuckoo (*Coccyzus americanus*)—also a rare, transient visitor—inhabits riparian areas and is not known to nest on WSMR.

The White Sands pupfish is a state-listed threatened species and Army-listed as a Species at Risk (SAR); it is endemic to the Tularosa Basin (Figure 1.2).

Appendix G provides information on the effects that wildland fires may have on the threatened, endangered, or rare plant and animal species of WSMR. This information is valuable to those proposing RXs or fuels treatments because it indicates specific areas or periods of the year to avoid, thus minimizing impacts to these species.

3.7 WSMR Fire Regimes and Basic Fuel Types

WSMR natural resource managers use information from wildfire history records—including the frequency and severity of wildfires in each area—along with historic vegetative community composition as a baseline for comparison with current vegetation and fuel loads. This information is used to develop a ***reference condition*** or a desired ecological state. The analysis of historic and current conditions provides the basis for making informed land management decisions for protecting testing and training lands and implementing beneficial ecosystem projects.

Wildland fires may burn across many of the landscapes of WSMR. However, wildfires will differ widely in terms of frequency, size and spread pattern, fire intensity, and burn severity. Over time, we can measure ***fire return intervals (FRI)*** and see similarities in fire patterns among ecosystems and regions (Table 3.1). These patterns are what constitute ***fire regimes***. A fire regime characterizes the historical features of wildland fires that have been typical for a particular ecosystem (Kennard 2008). Hardy et al. (2000) mapped fire regimes of the western United States using fire severity and fire frequency and combined them into five fire regime classes (Table 3.1). The five natural (historical) fire regimes are classified based on average number of years between fires (***fire frequency***) combined with the amount of replacement (***fire severity***) of the fire on the dominant overstory vegetation. The five standard fire regimes were developed primarily for forests, shrublands, and prairie grasslands where natural vegetative succession is easily measured and where wildfires burn in ways that are predictable in terms of severity and frequency.

On WSMR, wildfire frequency, wildfire severity, and fuel loads are highly variable and do not fit neatly into the standard fire regime groups. Most wildfires on WSMR are spread by flammable grass fuels inter-mixed with desert and woodland shrubs, which tend to inhibit wildfire growth. This is true on the grassland areas of the Jornada Basin (Stallion Range) where shrubs are intermixed but not dominant, allowing for a frequent fire regime that helps maintain the grasslands. This is also true in the grasslands of the Tularosa Basin, where there are many areas of shrubs intermixed with grasses, and in the mountains of WSMR, where piñon and juniper intergrade with grasses. Fire history records show that some areas of Stallion Range have burned 3-4 times in the last thirty years while other areas of these grasslands have not burned at all. Woodland communities—found in the San Augustin, Organ, Oscura, and San Andres Mountains—also exhibit highly variable fire frequencies, fuel continuities, and fire severities and thus exhibit widely variable fire regimes. Much of the Organ Mountains have burned 1-3 times in the past 34 years after not having burned significantly in the previous 75 years. Today, much of the Organ Mountains are experiencing early successional stages of vegetative re-growth after having much of the timber and shrub overstory removed by wildfires in the 1990s and by the Abrams Fire in 2011. In contrast, the northern Oscura Mountains have not experienced a large wildfire in several decades.

Table 3.1 Five Historic Natural Fire Regime Groups

Fire Regime Group	Frequency (Fire Return Interval)	Severity

I	0-35 years	low severity
II	0-35 years	stand replacement severity
III	35-100+ years	mixed severity
IV	35-100+ years	stand replacement severity
V	>200 years	stand replacement severity

Examination of Muldavin's 34 plant community alliances (Figure 3.2) reveals similarities that can be condensed and generalized for purposes of firefighting. These 34 plant community alliances can be grouped into four basic fuel types: desert, grassland, shrubland, and woodland (Figure 3.3). All of these intergrade with each other, and many small occlusions of other fuel types exist within each major type. The important point here is that deserts do not contain the arrangement or continuity of flammable fuels to allow for large wildfire growth. The other three fuel types will carry fire during certain times of the year, and—given the right combinations of wind, temperature, and humidity—will lead to large wildfire growth. Characteristics of fire regimes within each of these fuel types are presented in the following paragraphs.

Desert (Fire Regime Group III): About 60% (1,275,430 acres) of WSMR is desert and does not commonly support large wildfire spread (>500 acres) due to the lack of continuous fuels. There are occlusions of grasslands scattered throughout the deserts of WSMR, particularly in basin and swale bottoms and along ephemeral watercourses. These areas may support wildfire growth over a period of several hours but will die out at night or when the grass pocket runs out of fuel. Desert areas include mesquite coppice dunes, mesquite shrublands, salt playas, pickleweed scrublands, gypsum dunes, four-wing saltbush scrublands, and creosote-dominated piedmonts and basins. The contemporary period (after 1900) had a mean FRI for Chihuahuan Desert ecosystems of 50 years (Poulos et al. 2013). Fire frequency before this period is unknown and was likely highly variable. Periods of extended drought, grazing practices, and climate change have contributed to lengthening of the FRI. The mean FRI for the Chihuahuan Desert now stands at 60-80 years (LANDFIRE 2010).

Grasslands (Fire Regime Group II): About 27% (569,989 acres) of WSMR is covered by grasslands. On WSMR, grasslands nearly always have a shrub component intermixed: ranging from yucca, mesquite, sand sage, little leaf sumac (*Rhus microphylla*), and creosote in basins; to mahogany, Apache plume, sacahuista, agave, skunkbush sumac, and ocotillo on lower hills; to sotol, piñon, oak, buckbrush and juniper in varying densities on mountainsides. Most wildfires on WSMR occur within grass-dominated ecotypes. Grasslands recover quickly after being burned, and some areas can burn again within 3-5 years, depending upon annual precipitation. Frequent wildfire plays a significant role in nutrient recycling and favors grassland propagation by reducing or eliminating less fire-tolerant shrub species (McPherson 1995). Research suggests that the mean FRI for Southwestern grasslands throughout the 17th to early 19th centuries was 5-10 years (Swetnam et al. 1996). Recent fire history indicates that the grasslands of WSMR have an FRI of 10-35 years. This increase in FRI is due, in part, to increased desertification from past grazing practices and changes in precipitation patterns, which led to an increase in the numbers and kinds of shrubs, cacti, and bare ground patches within grasslands.

Shrublands (Fire regime Group III): About 12% (246,283 acres) of WSMR is shrublands, with scattered piñon-juniper, oak, mountain mahogany, skunkbush sumac, and buck brush on north-facing slopes, intergrading with shrubs of Apache plume, sotol, littleleaf sumac, sacahuista, catclaw, ocotillo, mariola, agave, cacti, and oak on south-facing slopes and ridgetops. Shrubs typically burn with high intensity, but due to scattered arrangement and high variability of grass continuity—such as are found across the hills and mountains of WSMR—these shrublands are highly variable in their contributions to wildfire spread. Grasses must be contiguous with shrubs to create flammability and the opportunity for large wildfire growth.

Woodlands (Fire Regime Group III and IV): (54,562 acres) This fuel type makes up about 3% of WSMR and is found in the Organ, San Andres and Oscura Mountains. It is dominated by piñon pine and two juniper species, alligator juniper (*Juniperus deppeanna*) and one-seed juniper (*J. monosperma*). The extent of historic piñon-juniper savannas has decreased while piñon-juniper woodlands have increased. This is due to the disruption of frequent, low severity fire regimes at these sites, which has resulted in widespread tree regeneration (Poulos et al. 2013). In general, the higher the density of piñon and juniper, the less likely the fuel type is to carry wildfire. Based on historic fire and RX records, about 50% of this fuel type on WSMR (including acreage within SANWR) has burned in varying severities at least once in the past 50 years. This is mostly due to an increase in military-caused wildfires, which in combination with RXs has served the purpose of maintaining some of this fuel type in open, savanna-like conditions.

Woodlands of WSMR also include mixed stands of ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*), and piñon pine, which are found within the highest elevations of the San Andres Mountains (>8,000 ft) on Salinas Peak and Silvertop Mountain. Much of the woodland area on Salinas Peak and Silvertop Mountain has burned with a mixture of severities within the last 100 years (Muldavin et al. 2000). An analysis of tree ring fire scars on ponderosa pine on Salinas Peak and on Silvertop Mountain showed that, prior to 1900, the FRI was 20-30 years. The last major wildfire recorded by tree-ring analysis was in 1910, but there have been several small wildfires in this fuel type since then (Muldavin et al. 2000).

The woodland fuel type is also found within an unusual relict piñon pine stand of mixed age, intermixed with one-seed juniper and oak species on the east facing slopes of the Oscura Mountains. An analysis of fire history by Muldavin et al. (2000) for these persistent piñon pine-juniper woodlands of the Oscura Mountains revealed patches of varying ages with some fire scarring. Limited fire-scar data suggests an FRI of 30-100 years or more. Muldavin used historical photo analysis and concluded that about 12% of the Oscura piñon-dominated woodland had burned in fires in the last century. The same analysis in the woodlands of the northern San Andres Mountains indicated that 17% to 49% of the woodlands there had burned in the previous century (Muldavin et al. 2000). The persistent piñon pine woodland of the northern Oscura Mountains is unique in that it is a rare example of a relatively undisturbed, closed canopy woodland. Some of the old-growth piñon trees have died recently, and many more are showing indications of dying, possibly due to old age. Whether recent mortality will lead this closed canopy woodland to become more open or more fire-prone is unknown as there are sufficient ladder fuels underneath the canopy to either potentially fill in the open spaces over time or provide a ladder for fire to move into the overstory and create a large wildfire.

The nature of this persistent woodland is that wildfire has not played a significant role as an agent of disturbance here in the last hundred years or so. We know that lightning provides a ready ignition source and that many trees in this woodland have been lightning-struck, yet there is little evidence of persistent fire scarring throughout this relict woodland. This is partly since little sunlight penetrates the dense canopy, inhibiting ladder fuel and understory growth, and partly due to the nature of piñon and one-seed juniper which regularly shed their small, compact needles, contributing to a surface layer of organic material rich in compact, uniform, decomposing needles that readily absorb moisture but inhibit air circulation. This organic surface layer inhibits wildfires from burning beyond the smoldering stage due to its moisture content and its uniform surface properties. The east-facing aspect of the Oscuras means that these stands are somewhat protected from predominant southwesterly winds and, since wildfires do not spread well downhill, may further help to inhibit wildfire spread. For this fuel type to experience some sort of major fire impact, it requires a combination of alignment of wind, low live and dead fuel moistures, low relative humidity, high ambient air temperature, and a strong ignition source. If a large wildfire were to occur in the north end of the Oscura Mountains, it is unlikely that the entire stand would burn since crown fires in this fuel type become head-driven, plume-dominated fires that tend to not spread well laterally. Fires in this fuel type generally burn in a conical shape, terminating crown fire spread at the apex of the mountain or where fuels become discontinuous.

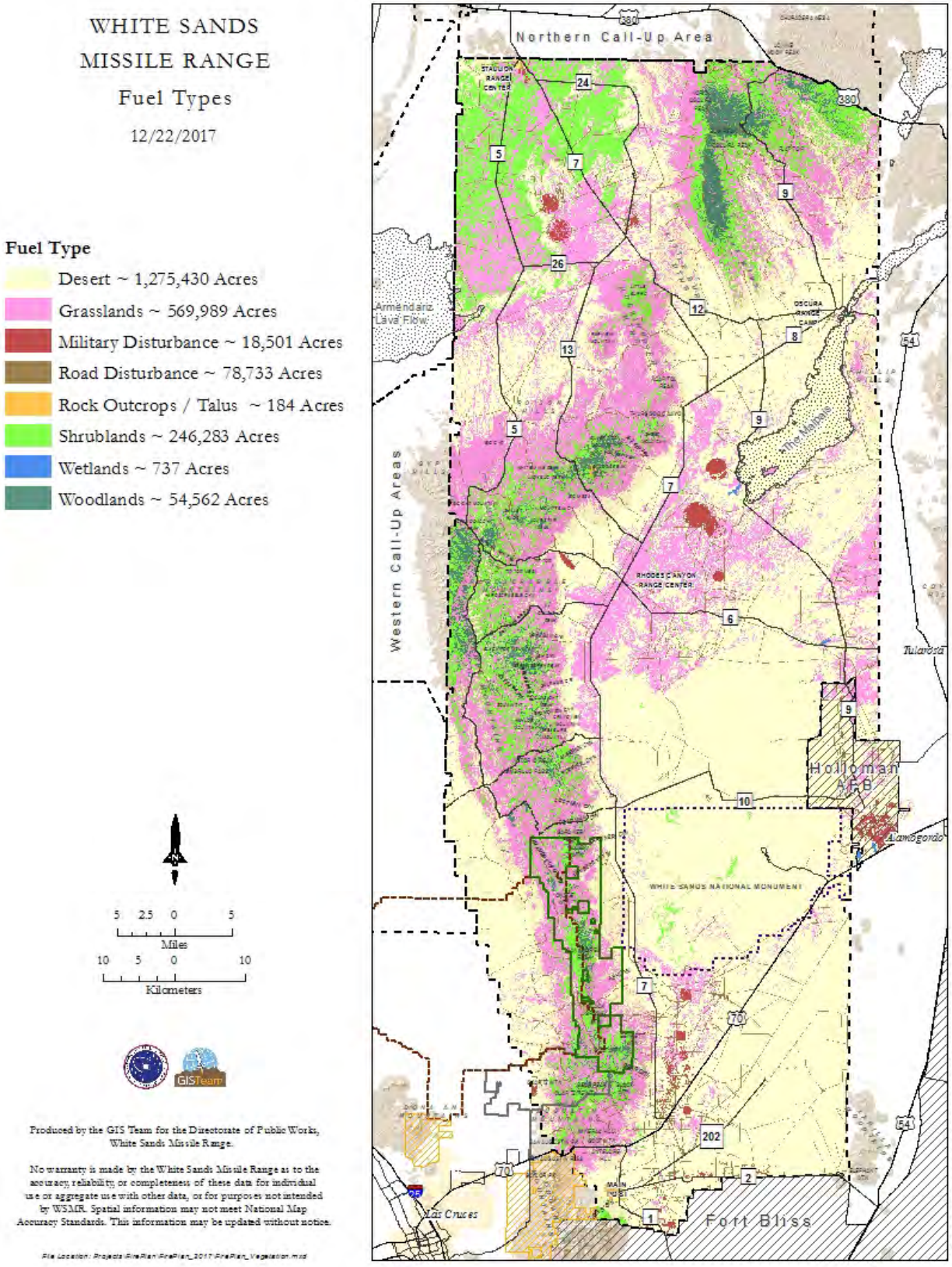

Figure 3.3 - WSMR Major Fuel Types

3.8 WSMR Wildfire History

Wildfire history is used by wildland fire managers as a tool to help direct management focus towards locations where RXs, mechanical fuel reduction treatments, fire use, and firebreaks are most needed and cost-justified (Figure 3.4).

From 1984 to 2022, 448 wildfires have been recorded in the Natural Resources Wildfire database on WSMR, and 313,713 acres have burned—though records are incomplete for this period (See **Appendix K**). Large wildfire events (>500 acres) occur on WSMR every few years. The highest concentration of large wildfires recorded for WSMR burned during the drought years of 1993 and 1994, which followed several years of above average precipitation. Most large wildfires are military mission-caused or lightning-caused. Most wildfires on WSMR occur between March and September, with the largest wildfires usually burning prior to the onset of the monsoon season from April to mid-July. Fire season in southern New Mexico is traditionally considered to be from March to mid-July, but wildfires can occur any time of the year on WSMR.

Wildfire history has only been systematically documented and recorded on WSMR for about 35 years. Figure 3.4 depicts large wildfires that have been digitized since the mid-1980s and includes WSMR fire frequencies that depict where wildfires have concentrated. It illustrates the fact that Stallion Range and Red Rio Range have the highest frequency of wildfires, mainly because this is where live-fire military training and testing activities occur year-round. Some areas within grassland fuel types on WSMR have burned 1-5 times in the last 35 years.

Most fire ecologists agree that, prior to 1850, frequent wildfires within the Chihuahuan Desert grasslands and associated sky island mountain ranges limited the accumulation of woody vegetative biomass and favored the perpetuation of grassland vegetation (Swetnam et al 1996). The indigenous Apache people purposely burned woodland areas of the Organ and San Andres Mountains to maintain open areas for ease of hunting and to attract game to the fresh new growth of forbs and grasses that grew prolifically after fire (Morino et al. 1996). Woodlands were characterized by savannas of scattered mature piñon, ponderosa, and juniper trees surrounded by dense grasses. The historic FRI, prior to 1850, was measured from tree-ring studies and found to be an astonishing 2.4 years in the Organ Mountains (Morino, et al. 1996). Under these conditions, most fuels consisted of dried grasses so that heat generated by burning was not enough to adversely affect soils or the roots of grasses. These fires only killed the seedlings of woody plants and allowed for the quick recovery of grasses. Fires did not contribute to soil erosion and served to maintain the dominant vegetation of grasses and widely spaced trees. This high-frequency, low-severity fire regime was maintained throughout the forests and woodlands of the Southwest until European settlers arrived with their grazing animals in the mid-19th century and, subsequently, displaced the native Americans (Morino et al. 1996)(Swetnam 1996)(Pyne 1982).

Although European influence in the area began prior to 1600, it wasn't until the advent of the railroad in the mid-19th century that large-scale changes began to occur on Southwestern landscapes. With the ability to drive livestock to nearby railheads, grazing pressure on rangelands in New Mexico increased dramatically in the late 19th century (Drewa and Havstad 2001). Wildfires that occurred were suppressed to save grass for grazers. The combination of grazing and fire suppression ultimately led to a decrease in grass biomass and a corresponding increase in woody vegetation within formerly grass dominated sites. Long intervals between wildfires coupled with grazing animals' preference for mesquite beans allowed for the establishment and spread of honey mesquite to previously unknown levels across vast areas of the Chihuahuan Desert (Drewa and Havstad 2001). Shrubs completely replaced grasses in drier lowland areas while higher elevations were occupied by increasingly dense mixtures of trees and shrubs. Today, when wildfires occur at these higher altitude sites, they tend to be stand-replacing fires, which burn the litter, surface, and crowns of mature trees and shrubs. When wildfires burn at high intensities, roots and soil organic material are consumed, which leads to widespread soil erosion. High-intensity wildfires destroy several age classes of trees and shrubs and require decades to recover, particularly within the arid ecosystems of the Southwest (Swetnam 1996).

Fire history studies conducted in several fuel types in southeast Arizona, which are like fuel types found on WSMR, found that widespread fires were significantly associated with the prior occurrence of two consecutive years of wetter-than-average conditions (Baisan and Swetnam 1996). They interpreted these findings as indicating the importance of precipitation for producing fine fuels (e.g., grass), which facilitates the occurrence of widespread fires. In the Chihuahuan Desert, summer precipitation plays an important role in fuel accumulation. Warm-season grass species found in the northern Chihuahuan Desert respond strongly to monsoonal precipitation—i.e., July to October—when up to 90% of their growth occurs (McClaran 1995). A study of tree ring growth and wildfire history in the San Andres Mountains by Muldavin (2000) showed a cyclical pattern of wet years followed by years of drought. Most of the wildfire scars measured by Muldavin from ponderosa pines on Silvertop Mountain and on Salinas Peak were correlated to the earlier years of the onset of drought conditions.

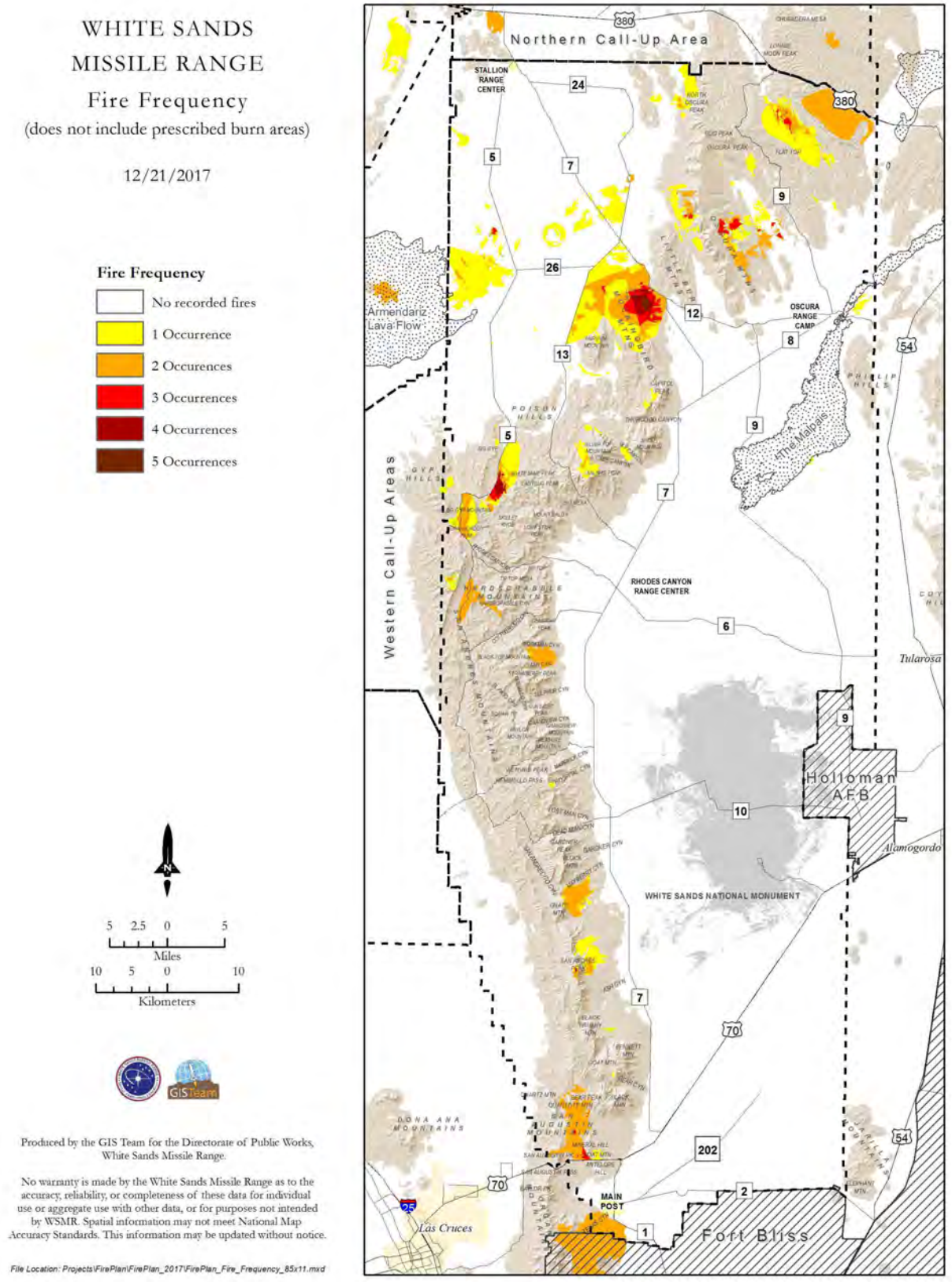

Figure 3.4 - Large Wildfire Frequency and Occurrence on WSMR 1984-2017

3.9 WSMR Fuel Considerations

In the NWCG Glossary of Wildland Fire (NWCG 2012a), ***fuel*** is defined as any combustible material, especially petroleum-based products, and wildland fuels. Fuel is one leg of the fire triangle at which fuel, heat, and oxygen combine to create fire. Remove any one of the three legs of the fire triangle and fires cannot burn. ***Fire behavior*** is influenced by fuels, topography, and weather. Wildland fire managers cannot control the weather or topography in any meaningful way, but fuels can be manipulated in several ways. ***Fuels management*** and ***fire prevention*** thus become the means for reducing fire suppression costs and acres burned by implementing mechanical fuels treatments, conducting RX treatments, and by educating property owners and land stewards on the values of reducing flammable fuels within their areas of responsibility.

WSMR's four fuel type descriptions (Section 3.7) portray fuels within geographical areas where wildfires can and cannot generally spread and thus point to focal areas for wildland fire management activities. WSMR's four basic fuel types are a mixture of many species of vegetation that burn in a characteristic manner. Many areas within each basic fuel type have inclusions of other fuel types. For example, mesquite coppice dunes, four-wing saltbush-dominated alluvial fans and creosote bush bajadas inhabit much of the desert ecosystems of WSMR and surround flammable pockets of grasses. There is, however, little potential for wildfire spread outside the areas of grass within these desert shrub fuel types.

Vegetation in the Chihuahuan Desert Ecoregion is fire-adapted and usually recovers quickly following wildfires under normal rainfall patterns (Dinerstein et al. 2000). There is a strong association between annual precipitation and the annual level of perennial and annual plant growth, but because rainfall is highly variable from year to year, so also is wildfire frequency and intensity. In years with higher-than-average annual precipitation, fuel loads can convert a fuel type that is not normally flammable to one that is highly flammable and, therefore, subject to wildfire spread. This is partly due to prolific annual grasses and forbs that grow in the summer when there is sufficient rainfall. Annuals are better adapted for growing amongst shrubs. In fact, many annuals are protected by shrubs and have much more biomass underneath shrubs than out in the open. These light, flammable fuels are one of the primary carriers for wildfire spread until later in the spring, when the relentless spring winds have the effect of breaking off and removing these cured fuels—effectively lessening the potential spread of wildfires as the year progresses. Cured perennial grasses are the other primary carrier of wildfires on WSMR. Native warm-season perennial grasses are fire-receptive from November until July, when they finally green-up and grow with the onset of the monsoon season. Perennial grasses can carry fire any time of year once they are cured and the weather is dry.

The grasslands of the Jornada del Muerto, foothill and piedmont grasslands, and piñon-juniper savanna grasslands have the highest concentrations of large wildfires (>500 acres) on the installation. The mountain ranges of WSMR have the second highest concentration of wildfires and are more complex in terms of fire management due to the greater topographic relief and the higher variety of flammable fuels. Still, grass fuels are the primary carrier for wildfire spread anywhere on WSMR. Shrubs like sumac, sotol, buck brush, and mountain mahogany are found on rocky lower slopes of mountains while woodland fuels like oaks, piñon, and juniper are found on ridgetops and north-facing mountain slopes but will not sustain wildfire spread on WSMR without the grass component underneath. Grasses grow well at all elevations of WSMR, including at lower elevations within basins, arroyos ,and around playas.

3.10 Live and Dead Fuel Classifications for Predicting Wildland Fire Behavior

Live and dead fuel moistures are important calculations for designing prescriptions for RXs, for making determinations about whether to allow a wildfire to burn, and for determining ***fire danger rating (FDR)*** levels. See https://gacc.nifc.gov/swcc/predictive/fuels_fire-danger/fuels_fire-danger.htm for more information and for interpreting fire danger values from Remote Area Weather Stations (RAWS) or from area dispatch centers. Local RAWS are located at Dripping Springs, Chupadera Mesa, and on SANWR; they are 'owned' by the BLM and by the USFWS (Figure 3.5). ***Live fuel moisture*** levels are measured from live shrubs and trees; they are at their highest

values when plants are actively growing and are at their lowest during winter dormancy. ***Dead fuel moistures*** respond solely to ambient environmental conditions and are critical in determining fire potential. Dead fuel moistures are classed by ***timelag***. A fuel's timelag is proportional to its diameter and is loosely defined as the time it takes a fuel particle to reach 2/3 of its way to equilibrium with its local environment. Dead fuels fall into four timelag classes:

- **1-hour timelag fuels:** less than 1/4" diameter. One-hour timelag fuels are fine flashy fuels (particularly cured grasses, dried pine needles, and dried weeds/forbs) that respond quickly to weather changes. Computed from observation time, temperature, humidity, and cloudiness.
- **10-hour timelag fuels:** 1/4 to 1" diameter. Computed from observation time, temperature, humidity, and cloudiness. Can be an observed value, from a standard set of "10-Hr Fuel Sticks" that are weighed as part of a fire weather observation.
- **100-hour timelag fuels:** 1 to 3" diameter. Computed from 24-hour average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges (usually composed of the dead, larger branches of shrubs or small trees).
- **1000-hour timelag fuels:** 3 to 8 " diameter. Computed from a 7-day average boundary condition composed of day length, hours of rain, and daily temperature/humidity ranges (composed of large, dead tree branches or trunks of smaller dead trees).

One way to describe and to model fire behavior is using a common set of fire behavior fuel models. Scott and Burgan (2005) developed 40 flammable fuel models designed to cover the entire country. These fuel models are important to understand as they are what drives fire behavior predictions and parameters for the BEHAVE Fire Behavior and Fuels Monitoring System program, which is one of the necessary components of an interagency RX plan and can also be used to predict and calculate large wildfire growth. WSMR is roughly covered by five of Burgan's fuel models, which are:

- **GR1 (Grasslands):** Short, sparse (patchy), dry climate grass with average depth <1 ft. Flame length 1-4 ft. This model includes most grasslands and herbaceous understory fuels on WSMR. However, grass cover on WSMR is generally less contiguous than assumed by this fuel model, and hence actual fire intensity and spread will be lower than predicted by the model. Fuel loading in grasslands is determined largely by variations in annual precipitation on WSMR. In many years, fuel loads are too low to carry and spread a wildfire even if ignition occurs. Grama, dropseed, and muhly grasses dominate this fuel model on WSMR, and open pinyon-juniper woodlands or savannas are considered GR1.
- **GS1 (Grass-Shrub mixed):** Low grass load, dry climate grass-shrub mix. Shrubs <50% cover and approximately 1-3 ft. in height. Grass < 1 ft. in depth. Flame length typically 1-4 ft. In the San Andres Mountains, south-facing slopes are represented by this fuel model. Sandsage shrublands and very limited areas of grama grasslands comprise this fuel model on WSMR.
- **SH1 (Low desert Shrublands):** Light load, dry climate shrubland. Shrubs >50% cover with a shrub height of approximately 1-3 ft. with low grass load. Flame length 1-4 ft. Most shrublands on WSMR poorly fit standard fuel model definitions. Cover of shrubs is generally <50% (Hoenes and Bender 2012), but shrublands also lack the herbaceous understory assumed present in GR1/GS1 fuel models, thus limiting the likelihood of fire spread and resulting in overestimation of fire intensity.
- **SH2 (Large Shrub and Grass intermix):** Moderate load, dry climate shrub. Shrubs >50% in cover and 3-10 ft. tall with moderate grass load. Flame length 4-8 ft. Most shrublands on WSMR span the definitions for SH1 and SH2. Cover of shrubs is generally less than 50% but height of shrubs is generally >3 ft. and often 6+ ft. (Hoenes and Bender 2012). This model includes denser oak-mountain mahogany, other shrublands, and pinyon-juniper shrublands on WSMR. These stands typically have canopy cover >20% and heights >3 ft. (Hoenes and Bender 2012). For juniper woodlands, growth form is a shrub rather than a tree (i.e., multi-stemmed basal branching).

- **TU1 (Timber with Understory):** Light load, dry climate, and timber-grass-shrub. Fuel is primarily trees and/or shrubs and litter. Flame length 1-4 ft. This type includes ponderosa pine woodlands and tree-form pinyon-juniper woodlands. However, herbaceous understory is limited in the latter, often containing a significant juniper understory that may act as a ladder fuel. These stands are primarily located in the Oscura Mountains but also occur in the San Andres Mountains.

As noted previously, WSMR fuels do not fit neatly into standard model descriptions. Rarely will the predictions for fire behavior match what occurs on the ground. Within fuel models found on WSMR, the BEHAVE fire modeling program, almost always over-predicts rates of fire spread, flame lengths, and scorch heights on vegetation, so on-the-ground results are almost always less severe than predicted.

3.11 WSMR Climate and Weather Effects on Wildland Fires

WSMR is in the northern Chihuahuan Desert eco-region, an area where naturally occurring wildfires are an integral part of the environment. Chihuahuan Desert grasslands and sky islands historically burned under a low-intensity surface fire regime where the fire frequency is correlated to climate (Swetnam 1996). Natural resource managers desiring to use RX as a treatment to reduce fuel loads or to improve wildlife habitat must consider climate and weather variables when developing their prescriptions for a RX.

RXs are relatively easy to ignite and control in the fall and winter because fuels are dry, relative humidity is moderate and winds are usually light; however, vegetation may not respond favorably post-burn if there is a lack of moisture following the burn or if the burn is hot enough to alter soil conditions. Managers need to factor long-term drought indices and weather forecasts into their planning and try not to burn during extreme drought conditions. Burning closer to the onset of the monsoon season can induce higher mortality in targeted vegetative species and favors regrowth of desirable grass and shrub species. Conversely, this is the season when winds are strongest and most variable, relative humidity is lowest, and temperatures are highest—making control problems more likely for prescribed burners.

The significant amount of variability across WSMR in terms of topography, aspect, and elevation results in substantial variations in local microclimates that can significantly affect fuels, weather, and wildfire behavior. Climate ranges from extremely arid in the Tularosa and Jornada Basins to semi-arid in the San Andres and Oscura Mountains. Because of the mountainous terrain and the much lower Tularosa and Jornada Basins, there are significant diurnal and regional fluctuations in humidity. Typical of desert climates, rapid cooling from nighttime radiation causes increases in relative humidity. Average daily relative humidity increases to about 40 percent at midnight and to 51 percent by 6:00 a.m. At least partial sunshine is present >85% of the time, contributing to strong solar heating of air, soils, and fuels (WSMR 2009).

WSMR climate is characterized by moist summers and dry fall, winter, and spring seasons. This pattern can lead to large amounts of cured annual and perennial vegetation from fall through winter and spring until early summer. In dry years this makes for a long fire season, potentially beginning in November and continuing until July. In the Chihuahuan Desert, perennial grasses are adapted to the summer heat and low moisture regime and will remain dormant until adequate moisture arrives. After that happens, perennial grasses grow quickly and produce about 75% of their total annual foliage in about 60 days (Dick-Peddie 1993) and about 90% of their total growth in about 90 days (McClaren 1995). These perennial grasses retain a high amount of live fuel moisture—even in the absence of additional rainfall—until the arrival of the first frost, typically in November. After that, their energy reserves are fully stored within their root systems while the above-ground biomass cures and is readily available to be consumed by fire.

High amounts of fine fuels from cured grasses are necessary to transport wildfires in WSMR's desert and mountain ecosystems. Consequently, the frequency, duration, and size of wildfires are determined largely by precipitation during the preceding summer months. Additionally, high precipitation in the summer is usually followed by greater

numbers of wildfires than normal during the following spring and early summer. Conversely, low precipitation in the monsoon season means fewer wildfires than normal during the following spring and summer months.

Weather patterns have a large influence on how wildfires behave on WSMR. The nature of fine, dead fuel moisture in grasses (1-hr. timelag fuels) is that cured grasses respond quickly to even minor changes in relative humidity and air temperature. What this means for fire suppression efforts is that a wildfire may burn readily during daylight hours and be difficult to contain, but with nightfall and a corresponding increase in humidity with falling temperatures, that same wildfire will rapidly diminish in intensity and allow for direct suppression efforts to be successful.

The effect of wind on wildfire behavior makes it the most volatile weather variable for firefighters to confront. Winds that are variable in speed and direction, in combination with wildfires burning in grass fuels, are especially dangerous for firefighters. **More wildland firefighter deaths are attributed to engaging wildfires in light, flashy fuels than in any other fuel type.** Minor increases in wind speed make vast differences in overall fire size, particularly in grass fuels. Winds associated with thunderstorms and frontal passages can increase wind speeds rapidly and change directions frequently. These sudden changes can make a relatively benign grass fire, with fire front flame lengths of 1 ft to 2 ft at the head, grow into a fast-moving wildfire spreading in multiple directions, with flame lengths suddenly ranging from 8 ft to 20 ft.

Fire weather forecasters issue ***Red Flag Watches*** and warnings during periods of critical dryness and high-speed wind events to inform the public of the high potential for large, wind-driven wildfires and to caution users within the wildlands to be extra cautious with fire. ***Red Flag Warnings*** can occur anytime during the fire season but are most frequent in the months of April-June.

3.11.1 Predicted Effects of Climate Change and Long-Term Drought

Long-term drought and climate change are issues for the entire Southwest and may lead to an overall decrease in plant abundance and biomass. WSMR precipitation records show that since 1990 more years have been below average than above average in annual rainfall totals. From 1970-1990, however, there were more years of above average annual rainfall than there were below average.

Many scientists and climatologists today agree that the overall climate for this area is changing due to an increase in global temperatures caused by increasing amounts of greenhouse gases in the atmosphere (Bachelet et al. 2001). Most climate scientists predict that the southwestern US will experience increased drought and higher ambient air temperatures for the next several decades. Most climatologists also predict increasingly severe thunderstorms that will have the potential to lead to more episodic monsoonal flooding throughout the American Southwest. Climate scientists expect that these changes may eventually lead to increased desertification for this area throughout this century (Nemani et al. 2003). For wildfire management, the implications are that wildfires will potentially increase in severity and size in places where wildfires can be sustained due to sufficient biomass.

3.12 WSMR Terrain Influences on Wildland Fires

Higher elevations of WSMR see a higher occurrence of wildfires than lower deserts and basins. This is because higher precipitation, lower temperatures, and lower evaporation rates at higher elevations lead to greater amounts of vegetative biomass. The Organ, San Augustin, San Andres and Oscura Mountains and their associated foothills are mostly at elevations above 5,000 ft. Throughout the Southwest, this is an elevation gradient where larger, more complex wildfires begin to occur.

Topographical effects on wildfire growth are not as pronounced as weather effects but can still make a significant difference in how fast wildfires spread. The physical effects of radiation and convection mean that heat is transferred ahead and upwards of a flaming fire front. This effect of preheating and drying upon upslope fuels means that wildfires on slopes burn uphill 2-3 times faster than they do on flat ground. Canyon bottoms, narrow chutes, and saddles—all found in the rugged country of WSMR's mountains and foothills—have a funneling effect

upon winds, causing them to swirl upwards; wildfire spreads rapidly in these places and creates intense wildfire behavior.

The mountains of WSMR create barriers for wind and moisture. The effects of orographic lifting over the mountains create higher wind speeds across mountaintops and aid in the formation of thunderclouds, which tend to form over the mountains and then drift over the basins and valleys below. Frequent lightning occurs from these thunder cells during the monsoon season and aids in starting wildfires. Lightning fires can spread quickly under the influence of thunderstorms but will usually begin to die out with the passage of these storms. Coupled with an increase in nighttime humidity levels, falling wind speeds, and the discontinuous nature of fuels due to rocky and steep terrain, wildfires in the mountains generally die down through the night. It should be noted, however, that wildfires often rekindle the next day as temperatures and winds increase.

Aspect is an important factor for wildfire spread and intensity within the Chihuahuan Desert eco-region. South- and southwest-facing slopes have considerably less vegetation than north- and east-facing slopes. Southern aspects within the foothills and at lower elevations act to slow wildfire spread due to discontinuous fuels while northern aspects have the fuel loads to promote wildfire spread. In deep or steep canyons or in the high country, this effect is less pronounced, and all aspects support wildfires.

3.13 Pre-Fire Planning for Adaptive Wildland Fire Management

Wildland fire management is the application of scientific principles and land management activities necessary for the prevention of harmful wildfires, for the sustainment of ecosystems, and for the suppression of wildfires. ***Adaptive wildland fire management*** is an iterative process that includes the full array of fire management options to meet land management objectives. These options include:

- Direct initial attack to keep wildfires small near valuable human assets and to keep firefighting costs low.
- Indirect attack tactics that allow firefighters to contain wildfires within defensible barriers by back burning or blacklining.
- Indirect attack tactics of monitoring and waiting for the wildfire to consume fuel and burn up to defensible barriers and then suppressing the wildfire from defensible positions.
- Allowing natural fires (lightning fires) to burn (***wildland fire use***) for ecosystem benefits.
- Utilizing RXs and mechanical fuels treatments to reduce hazardous fuel loads and to create additional wildlife habitat.

By adopting an adaptive, integrated fire management approach on WSMR, land stewards acknowledge that WSMR landscapes are fire-adapted ecosystems and that it is no longer acceptable to mandate a policy of total wildfire suppression. The former approach of ‘all fires are bad’ has dictated aggressive suppression policies that have led to an unnatural and excessive build-up of flammable fuels in shrublands and forests across the western U.S. On WSMR, this policy has led to the invasion and degradation of grasslands by shrubs and other woody species.

Today, wildland fire managers across the West recognize that most wildfires benefit fire-adapted ecosystems. Wildfires need to be suppressed if human or cultural resources are threatened or if long-term weather predictions are unfavorable (i.e., long-term drought is ongoing). But when wildfires start in remote locations, fire managers understand that this may be an opportunity to benefit the ecosystem.

WSMR land managers must weigh several variables when deciding to let a wildfire burn. Decisions that allow wildfires to burn can affect military missions with smoke impacts or create short-term health alerts due to smoke volume. Ecosystems can be harmed by wildfires if long-term drought is ongoing. Soils can lose their productivity if fires burn hot and deep. Wildland fire managers must be able to articulate, document and defend their decision-making process to allow wildland fires to burn—particularly when many well-intentioned people see wildfire as a destructive force rather than as a necessary component of fire-adapted ecosystems.

The goals for an effective wildland fire management program on lands managed by WSMR are:

- Firefighter and public safety are always the first and highest priority on every wildland fire response.
- WSMR military and civilian assets, structures, infrastructure, and sensitive cultural and natural resources are protected to the extent possible from harmful effects of wildland fires by an annual fire prevention process of reducing nearby fuel loads through mowing, trimming, brush removal and/or tree thinning from October through February (outside the breeding and nesting seasons of migratory birds).
- WSP-E is notified whenever wildfire suppression is occurring in the wildlands (outside of rights-of-way, infrastructure, and structures) due to protection concerns for the vast amounts of cultural resources located throughout WSMR and due to natural resource concerns for rare, threatened, and endangered species habitats.
- In the Tularosa Basin, both man-caused and natural wildfires can be managed by firefighters from roads or other defensible positions if they are not threatening structures. To create fire-resilient landscapes, wildfires that are ignited by lightning on WSMR should be considered for fire use and allowed to fulfill their natural role in the ecosystem. The decision for allowing a natural fire to burn, or in some cases, a man-caused wildfire to burn, should be made by consensus between the GC, WSP-E, Range Operations, Range Safety, and WSMR FES, and may include other agency partners. The analysis and decision to allow a wildfire to burn will be documented and include a written justification that is signed by the GC and the decision-makers.
- Considerations for allowing a wildfire to burn will include:
  - Risk analysis of firefighter safety,
  - Cost concerns,
  - Long-term weather forecasts,
  - Current fuel conditions and moistures (live and dead),
  - Long-term drought, and
  - Anticipated and observed fire behavior.
- RXs can be used to improve the effectiveness of firebreaks and firebreak roads by blacklining alongside roads and by burning accumulations of wildland fuels within designated areas to protect WSMR's valuable structures and infrastructure.
- RXs can be used to improve wildlife habitat and improve the resiliency and diversity of ecosystems on WSMR.
- Firefighters will use MIST on all wildfires on WSMR (See **Appendix H** for MIST guidelines).

3.13.1 Mission Assumptions and Constraints

- Live-fire training and testing missions are a continual source of potential wildfire ignitions that can lead to large wildfire growth. However, military test missions are the priority for the Range and will occur regardless of the wildfire danger rating.
- In an average year, about 50% of WSMR contains sufficient vegetation to allow for the growth of wildfires. These grassland, shrub, woodland, and arroyo/basin fuel types will burn frequently and rapidly when atmospheric and fuel conditions are right, but usually in a patchy, uneven manner. The remaining 50% will not ordinarily burn (mesquite coppice dunes, creosote bajadas, gypsum playas and basins, bedrock, and bare ground) and are places where live-fire exercises and testing missions can be conducted year-round even during Red Flag Warnings and/or when the fire hazard is rated as Extreme.
- WSMR should strive to maintain up-to-date Mutual Aid Agreements with neighboring wildland fire jurisdictions, particularly USFWS, BLM, and the State of New Mexico. Agreements dictate how and when reimbursement costs are paid for when wildfires cross WSMR boundaries. These agreements can save the Army money in the long run by allowing other agencies' firefighters access to WSMR for suppressing wildfires where it makes sense in terms of safety and for utilizing natural, defensible, or artificial barriers that may occur on either side of an agencies' linear boundary.

- Only when wildfires are threatening humans, man-made improvements, structures, or infrastructure should DOD missions on WSMR be scrubbed to allow for wildfire suppression.
- FES resources are best used for providing point protection when structures are threatened and should keep their vehicles on roads rather than engaging wildfires off-road in the wildlands. In most cases on WSMR, wildfires will burn out on their own. If vegetation near structures is kept short, there is almost no risk of wildfire damage to these improvements. Firefighters can safely provide structure protection in these conditions and may even decide that they are safe enough to leave, freeing up firefighters to be used in places where there may be more effective.
- UXO can be anywhere on WSMR and is especially hazardous to firefighters in the wildlands since some UXO can be detonated by heat from a wildfire (Figure 1.2). Firefighters are safer when engaging wildland fires from the safety of their engines or when parked on roads or firebreaks and engaging wildfires from defensible positions.
- Mission-related wildfires are most likely to be caused by military test activities that involve aerial target intercepts by missile systems or deployment of flares from aircraft during testing or training exercises. WSMR personnel conducting testing and training activities need to be sensitive to wildfire concerns (i.e., Red Flag Warnings) and delay or adjust activities to areas with low potential for wildfires.

3.13.2 Firefighting Constraints

- No fire suppression is allowed within impact areas/WITs (Figure 1.2) due to potential exposure to UXO. Impact areas are marked on maps, WITs are fenced, but other impact areas are not marked on the ground. UXO may be found anywhere on WSMR but is especially prevalent in or near impact areas. Other Special Use Areas (Figure 1.2) may have other firefighting restrictions. See **Appendix A** for specific FMU instructions and firefighting considerations.
- UXO safety protocols require that any encounters with UXO in the field be communicated to Range Control so that Explosive Ordnance Disposal (EOD) contractor personnel can respond and remove or detonate the potential hazard. UXO should never be disturbed but should be photographed from a safe distance with the location recorded on a map or with a hand-held Global Positioning System (GPS) using UTM coordinates. Firefighters battling wildfires in the wildlands of WSMR are at higher risk for injury than others because wildfire heat can trigger UXO to explode. Remember the 3Rs for UXO safety: Recognize, Retreat, Report. See **Appendix F** for more information on UXO hazards and protocols.
- The magnitude of WSMR, the lack of passable roads in the wildlands, and the difficulty of the terrain increases travel times from fire stations to wildfire incidents. Long response times may contribute to extensive growth of wildfires in grass, shrub, and woodland fuel types. Roads designated as FMU boundary firebreak roads need to be added to WSP-O maintenance schedules for regular maintenance. Fire engines need four-wheel drive capabilities with high clearances to be effective in the wildlands of WSMR.
- The Organ, San Augustin, San Andres and Oscura Mountains have potential for large wildfire growth under climatic conditions of dry, hot, and windy weather. These mountain ranges may exhibit extreme fire behavior due to topographic factors of steep, rocky, and rugged terrain and abundant combustible fuels that are highly variable in terms of species composition, fuel moisture, fuel loading and fuel continuity. Due to numerous safety concerns, ground troops and engines must ensure they have uncompromised escape routes, adequate safety zones and adequate communications established before deploying to fight wildfires in these mountain ranges. Wildfire managers must analyze the risks and consider allowing these wildfires to burn or consider the use of aerial firefighting assets if wildfire suppression is the highest priority for wildfire management.

3.13.3 Natural Resources Constraints

In compliance with environmental laws and regulations, restrictions have been placed on several areas of WSMR (Figure 1.2). Environmental constraints include Special Natural Areas (SNAs) which harbor biological, cultural, or

physical elements that are important, both locally and regionally. There are 16 SNAs, including eight biologically sensitive and eight geologically sensitive (WSMR 2015). SNAs on WSMR are not marked in the field. SNAs help protect sensitive plant and animal species habitat, highly unique soils and paleontological resources and include, White Sands pupfish habitat, sensitive black grama grasslands, critical habitat for Todsen's pennyroyal, Salinas Peak ponderosa pine, playa lakes, and the Carrizozo lava flow (WSMR 2015). Allowing wildfires to burn within SNAs may be an acceptable practice but the use of heavy equipment or retardants in these areas is not acceptable. The use of bulldozers should not be considered in SNAs. Use of hand tools for scraping firelines and extinguishing flames and driving brush engines on-road only are acceptable practices when fighting wildfires in SNAs. Post-wildfire monitoring should occur in SNAs to measure fire effects and to help ascertain if mitigations such as soil stabilization and erosion control needs to occur. See **Appendix A** for firefighting constraints by FMUs.

3.13.4 Cultural Constraints

Wildfires burning across WSMR landscapes do not normally create extensive damage to prehistoric artifacts as fuel loads are generally light to moderate. See **Appendix J** for further detailed information on fire effects to cultural resources. Prehistoric cultural artifacts generally consist of non-burnable materials, such as rock or pottery. Many prehistoric sites have likely been burned by wildfires over previous centuries. Prehistoric artifacts can be affected by wildfires, including charring and discoloration from excessive heat. Wildfires can cause damage to historical sites because their primary structural material is wood. Wildfire suppression efforts, including fire-break construction, vehicle, and foot traffic, digging, and trenching, can be more destructive to cultural resources than the wildfires' effects (WSMR 2015). Firefighting resources will consult with WSMR WSP-E archaeologists if planning ground disturbing activities, such as fireline construction, as these specialists maintain records of cultural sites and can provide this information to firefighters so that these sites are left undisturbed.

There are thousands of known cultural sites on WSMR, some are eligible to be listed by the State Historic Preservation Office (SHPO). All listed sites by SHPO and eligible sites are to be protected from damage from wildfires to the extent possible. Obviously, wildfires will burn, and cultural sites will be within the footprint of wildfires. Firefighters will not jeopardize their safety to save cultural sites, but they will try to protect sites given the time to do so. WSMR WSP-E archaeologists will work with firefighters and WSP-O to provide timely information on cultural locations so that firefighters can reduce fuels around sites and attempt to ensure that cultural features are protected. Fuels reduction may include thinning and removing vegetation and scraping a fireline with hand tools around a site. Wildfires can act as an agent to clear away underbrush. This becomes an opportunity for archaeologists to find artifacts that otherwise might not be locatable.

In cases of RXs, all known eligible cultural features will be protected before fires are lit.

3.14 Fire Weather Considerations

WSMR's primary mission as a testing facility for missiles and weapons systems should not be constrained by fire weather concerns. Due to high costs and time-sensitivities, missile and advanced weapons testing should occur on schedule and, if wildfires are started, they will be suppressed as soon as possible. It should be stressed, however, that fire managers and firefighters operating on fires in the wildlands need to pay close attention to forecasted and current weather and its effects on fire behavior—especially when ***Red Flag*** conditions are occurring or may occur.

Fire weather forecasts and weather criteria for ***fire weather watches*** and ***Red Flag Warnings*** for the WSMR area are issued by the Santa Teresa and the Albuquerque, NM, offices of the National Weather Service (NWS) and are based on data from local RAWS. Fire weather forecasts include expected afternoon high temperature, afternoon minimum relative humidity, and a range of wind speeds. The NWS offices employs specially trained fire meteorologists who produce the daily fire weather forecasts for the fire weather zones (FWZs) that cover the expanse of WSMR (Figure3.5). The FWZs serviced by the Santa Teresa and Albuquerque offices are divided by topographic and climatic differences. During the fire season (March-July), fire weather forecasts specific to each FWZ are issued twice daily—once at 0700 and once at 1330. These are the most accurate weather forecasts

available to WSMR wildfire managers. See the Santa Teresa/NWS website at http://www.srh.noaa.gov/epz or the Albuquerque site at http://www.weather.gov/abq/ and click on the fire weather icon at the bottom of the page. The fire weather page also has long-range forecasts which are useful for planning purposes for the upcoming weeks.

Daily fire danger ratings for WSMR and the surrounding area are posted at the following location: https://www.wfas.net/images/firedanger/subsets/fdc_f_sw.png. This information is updated daily and is available to firefighters, range managers, and soldiers, among others. The National Fire Danger Rating System (NFDRS) daily FDR considers current and antecedent weather, fuel types, and both live and dead fuel moistures (Bradshaw et al 1984). NFDRS uses a method of normalizing risk rating classes across different fuel models through data capture from local RAWS (red dots in Figure 3.5). Values between stations are estimated with an inverse distance squared technique on a 10-km grid. NFDRS uses an adjective rating to communicate the daily wildfire risk of Low, Moderate, High, Very High and Extreme (Figure 3.6). The daily forecast fire danger from NFDRS is based on 1300 hours (midday) weather expected and is always the worst-case scenario for the day. Use of NFDRS and the daily fire weather forecast from the NWS provides direction and instructions that should be used together to determine fire danger and fire probabilities on WSMR. All users of the range should be aware of wildfire potential. FES, Public Affairs Office (PAO), and Range Operations should help to disseminate fire weather information, particularly on extreme fire condition days.

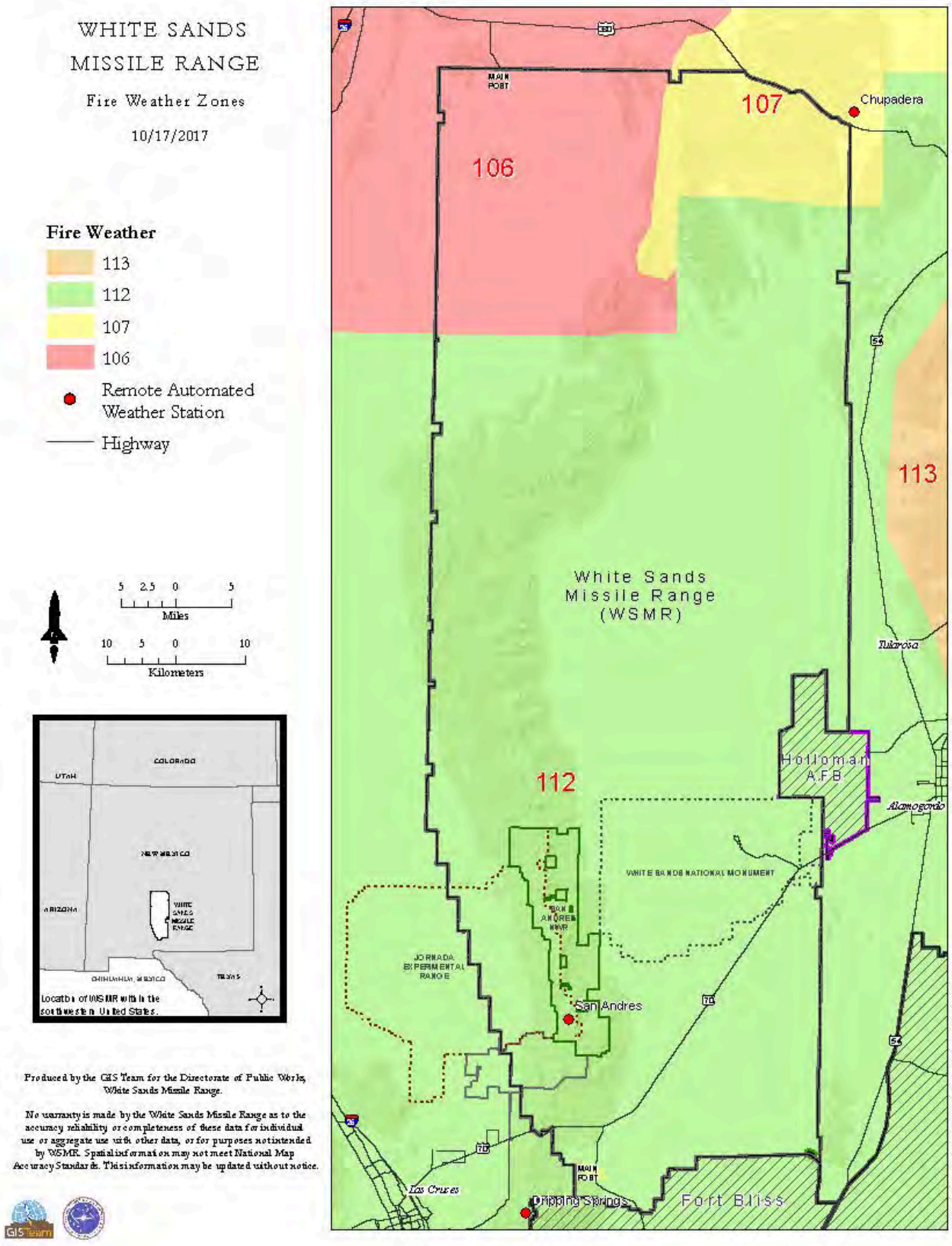

Figure 3.5 - Fire Weather Zones of WSMR

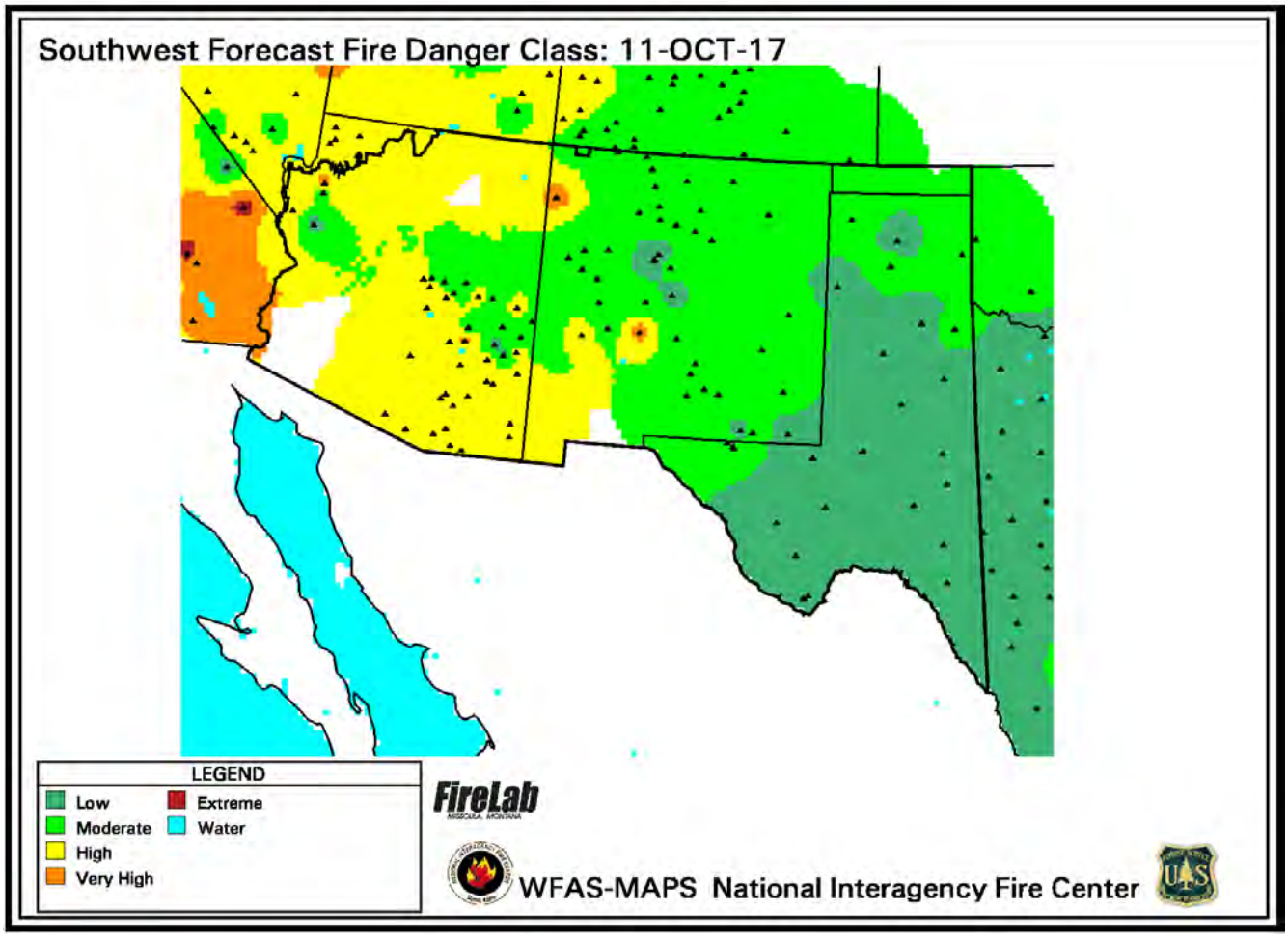

Figure 3.6 - Southwest Area Current Day Fire Danger Class (example)

3.15 WSMR Wildfire Hazard Ratings

WSMR is divided into areas of High and Low wildfire hazard ratings, based primarily on fuel loads (Figure 3.6).

HIGH hazard areas are those areas of WSMR that contain sufficient fuel loads and fuel continuity to promote large wildfire growth and therefore receive the maximum focus and efforts for suppression of wildfires by firefighters (Yellow areas in Figure 3.6). In general, the fuels adjacent to the Main Post and the Organ Mountains, the grasslands of Stallion Range, the San Andres Mountains, the San Augustin Mountains, and the Oscura Mountains and surrounding foothills have the quantities, continuity, and arrangement of live and dead fuels to sustain large wildfire growth.

LOW hazard areas include the Tularosa Basin and the surrounding uplands—areas where wildfire suppression is a lower priority because fuel loading and fuel continuity is insufficient to support large wildfire spread (blue areas in Figure 3.6). Within the Tularosa Basin and surrounding uplands are inclusions of hills, playa lakebeds, and arroyos where grass can grow, sometimes in abundance. However, these inclusions are not continuous, are surrounded by mesquite coppice dunes, bare ground and/or creosote bajadas, and do not support large wildfire growth (wildfires >500 acres).

WHITE SANDS MISSILE RANGE

Fire Management Units (FMUs)

2/7/2018

FMUs & Suppression Strategy

Monitor and suppress from roads/firebreaks and defensible positions

Suppress immediately

FIRE MANAGEMENT UNITS		
Unit #	Unit Name	Acres
1	Main Post	2,572
2	Organ Mountains	11,964
3	Launch Complex Area	159,272
4	Foster Lakes	39,070
5	White Sands National Monument	172,785
6	HELSTF	44,888
7	HTA	35,492
8	NASA/WSTF	23,326
9	Jornada Experimental Range	50,325
10	San Andres NWR	59,294
11	East San Andres Foothills	38,479
12	Hembrillo Canyon	50,165
13	West San Andres Foothills	59,027
14	Grandview Mountain	41,843
15	Strawberry Peak	41,944
16	Hardscrabble	40,526
17	Space Harbor	195,986
18	Otero Maneuver Area	101,472
19	Denver WIT	99,896
20	Malpais	109,479
21	Salinas Peak	53,827
22	Ladybug Peak	69,966
23	Cain	65,347
24	Zumwalt	55,712
25	Capitol Peak	34,966
26	Mockingbird	50,473
27	Red Hill	27,415
28	Red Canyon	27,795
29	Oscura Range	20,890
30	Oscura Mountains South	81,705
31	Little Burro Mountains	29,699
32	Stallion WIT	124,312
33	Grandjean	45,955
34	Trinity	34,288
35	North Oscura Peak	22,240
36	Red Rio	67,457

5 2.5 0 5
Miles
10 5 0 10
Kilometers

Produced by the GIS Team for the Directorate of Public Works, White Sands Missile Range.

No warranty is made by the White Sands Missile Range as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data, or for purposes not intended by WSMR. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notice.

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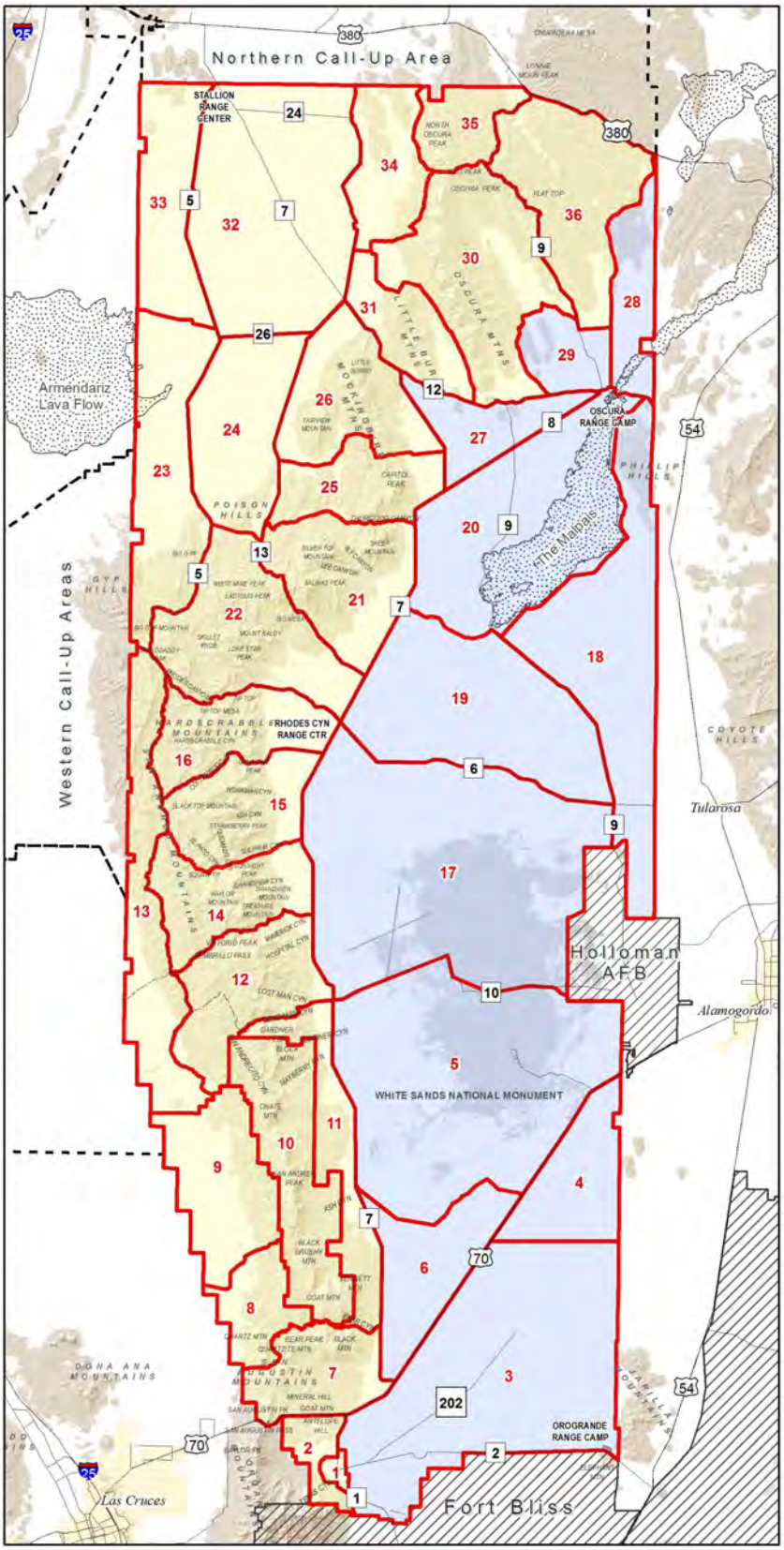

Figure 3.7 - WSMR Fire Management Units and Suppression Strategy

3.16 Wildland/Urban Interface Responsibilities for Team WSMR

The ***wildland/urban interface*** (WUI) is described as any area where wildlands meet or intermix with structures or other human developments (NWCG 2012). Suppressing wildfires as well as providing structure protection within a wildland environment presents significant safety and operational challenges to firefighters. **Appendix J WUI Wildfire Safety Considerations and Operations** details common safety considerations, tactics, and strategies for firefighters operating in the WUI environment. Within WSMR, there are numerous areas of WUI, including range complexes, missile testing and development facilities, training area facilities, advanced weapons and laser testing facilities, and missile launch facilities. These areas on WSMR are described more specifically in **Fire Management Units-Appendix A** along with specific actions to prevent or mitigate wildfire threats where they exist within each FMU.

The importance of maintaining adequate defensible space around WSMR's structures cannot be over-emphasized. Maintaining brush removal and reducing flammable fuels around structures—by keeping vegetation green through watering, by shortening fuels through mowing, or by establishing bare ground—for a minimum of 30 ft away from the structure is a responsibility of WSP-O, the facility owners, and lessees or users. WSMR FES personnel do not have the resources, time, or money to maintain defensible space across WSMR, even though they will be the ones trying to save those structures in the event of a nearby wildfire. WSMR WSP-O maintains firebreak roads and facility grounds in a fire safe condition to the extent that they can; however, they do not have the manpower, time or resources to keep all WSMR facilities fire safe. All organizations using the facilities at WSMR have a responsibility to maintain those facilities in a fire-wise and fire-safe condition.

WUI areas outside WSMR boundaries that can be threatened by wildfires occurring on the installation include the unincorporated community of Organ, the NASA facility at WSTF, the BLM's Aguirre Springs Recreation Area and Campground, as well as isolated ranches and dwellings occurring on WSMR's western, northern, and eastern boundaries.

Holloman AFB and the community of Orogrande are situated within the Tularosa Basin and do not have the fuel loads within the surrounding areas to support large wildfires. Be that as it may, during fire seasons that are preceded by seasonal monsoons with above normal precipitation, the proliferation of annual weeds and grasses can be sufficient to allow for the growth of wildfires in some of these locations.

Facilities located on WSMR Main Post could be threatened by wildfires started on WSMR, Fort Bliss, or BLM lands. There are high fuel loads within the Organ Mountains, and wildfires can easily spread here under the right conditions. However, the Main Post of WSMR is well protected from wildfires due to its location on the desert floor and due to firebreaks that have been put in place on the west, south, and north sides of the Main Post.

3.17 WSMR Mutual Aid Agreements

MAAs are signed documents that allow for resources from one agency to aid another agency without being ordered through a dispatch center. The agencies agree to aid each other during initial attack and can cross respective boundaries to render aid without the need for written authorization for every incident. WSMR FES maintains MAAs with Las Cruces BLM, Socorro BLM, Organ Volunteer Fire Department, NASA Fire Department, Fort Bliss FES, and SANWR **(See Appendix B)**. WSMR FES firefighters are available to address wildfires outside WSMR boundaries on a case-by-case basis as determined by the WSMR WFPM.

An MAA with NMSF would be beneficial to WSMR in that NMSF has jurisdiction over the local VFDs when responding to wildland fires. The VFDs of Organ, Alamo West, Boles Acres, Jackrabbit Flats, Tularosa, Carrizozo, and San Antonio are small and scattered departments, but they can provide engines, water tenders, and firefighters to remote locations within their respective jurisdictions and can provide protection to ranches and other remote infrastructure near WSMR boundaries.

3.18 WSMR Wildland Fire Organizational Structure and Responsibilities

- WSMR FES firefighters have direct responsibility for suppression of all human-caused fires within WSMR boundaries, including structure fires and wildfires. The WFPM position falls under the management of WSMR WSP-E (Figure 3.8). A WSMR WSP-E Biologist is designated as the WFPM. The WFPM is responsible for ensuring that the components of the IWFMP are implemented. The WFPM is responsible for review, approval, and execution of RX burn plans and for maintaining records of individuals outside of FES for their wildland fire trainings, physical training (PT) tests, and experience (DA 2021).
- WSMR will use the standards established by the NWCG for issuing Position Task Books (PTBs). PTBs are used for evaluating an individual's performance in NWCG positions above Firefighter Type II (FFT2) and are documentation for obtaining higher qualifications common to the federal wildland fire community. PTBs and requisite trainings and qualification standards and procedures can be found within the NWCG handbook PMS-310-1 (NWCG 2012b) is located at https://www.nwcg.gov/publications/310-1. The WSMR WFPM will report annually the installation's staffing requirements for the tasks associated with wildland fire management activities.
- At present, WSMR FES is in the process of developing wildland firefighters that will meet NWCG standards pertaining to command structure, equipment, and training. One goal is to eventually have 4-8 qualified Incident Commanders (IC) Type 4 that can lead teams of certified wildland firefighters using wildland fire engines, Utility Terrain Vehicles (UTVs), and water tenders on initial and extended attack wildfires. Use of PTBs will help to progressively elevate firefighters from Firefighter Type II to Firefighter Type I to Crew Boss and Engine Boss to IC Type 4. Currently, wildfire suppression resources are located at Main Post (Station 1), Nike Avenue or LC-38 (Station2), Stallion Range Center (Station 3) and at High Energy Laser Systems Test Facility (HELSTF)(Station 4).
- WSMR's wildland fire management program is rated as Moderate in overall complexity based on an analysis using the Interagency Fire Program Management (IFPM) guidance found at https://www.ifpm.nifc.gov. Eventually, the use of this interagency standard will help to ensure that an appropriately qualified organization is funded and available for wildfire response and overall wildland fire program implementation at WSMR.
- For RX operations, WSMR firefighters will use NWCG standards, and the appropriate level of Burn Boss will be assigned based on the complexity of the project as described in the approved Prescribed Fire Plan. Subordinate positions used on most RXs are Firing Boss and Holding Boss. Firing and Holding Boss are not mandatory positions for all RXs (PMS 484; NWCG 2014). However, Ignition Boss (FIRB) and Holding Boss (Minimum Qualification ENGB), if needed, will be qualified for their position as per NWCG PMS 310-1 and PMS 484.
- WSP-E is responsible for managing the natural resources of WSMR in such a manner that the military mission is sustained and there is no net loss of testing/training lands or capabilities (WSMR 2015). This responsibility includes the management of wildfire and RX for sustaining and enhancing testing/training land environments. WSP-E and FES personnel will work together to implement fuels projects, including prescribed burns for ecosystem benefits and for fuels reduction. WSP-E designs and proposes projects that help sustain ecosystem components. These projects may include prescribed burning or mechanical treatments, such as tree thinning and piling. WSP-E is responsible for ensuring that all prescribed burn projects meet NEPA requirements, that monitoring is conducted for meeting burn objectives, and for maintaining a database of all wildfires and RX projects on WSMR.
- WSP-E creates, maintains, and updates this IWFMP. The IWFMP is integrated with WSMR INRMP and ICRMP, which are created and maintained by WSP-E.
- WSP-O is responsible for the construction and maintenance of access and firebreak roads throughout WSMR as well as the reduction of hazardous fuels around facilities.
- The Range Operations Directorate is responsible for implementing policies, programs, and procedures related to range operations and has complete flight safety control for all missiles, rockets, munitions, and other devices launched from or into WSMR. The directorate conducts flight safety management,

schedules and controls all testing on the range, and operates a vast array of instrumentation used in the test and evaluation of missile systems and weapons. Range operations have priority over wildland fire incidents. Whenever missions are occurring on WSMR, FES firefighters receive their instructions from Rescue Control, who obtains permission from Range Control before dispatching firefighters onto the Range.

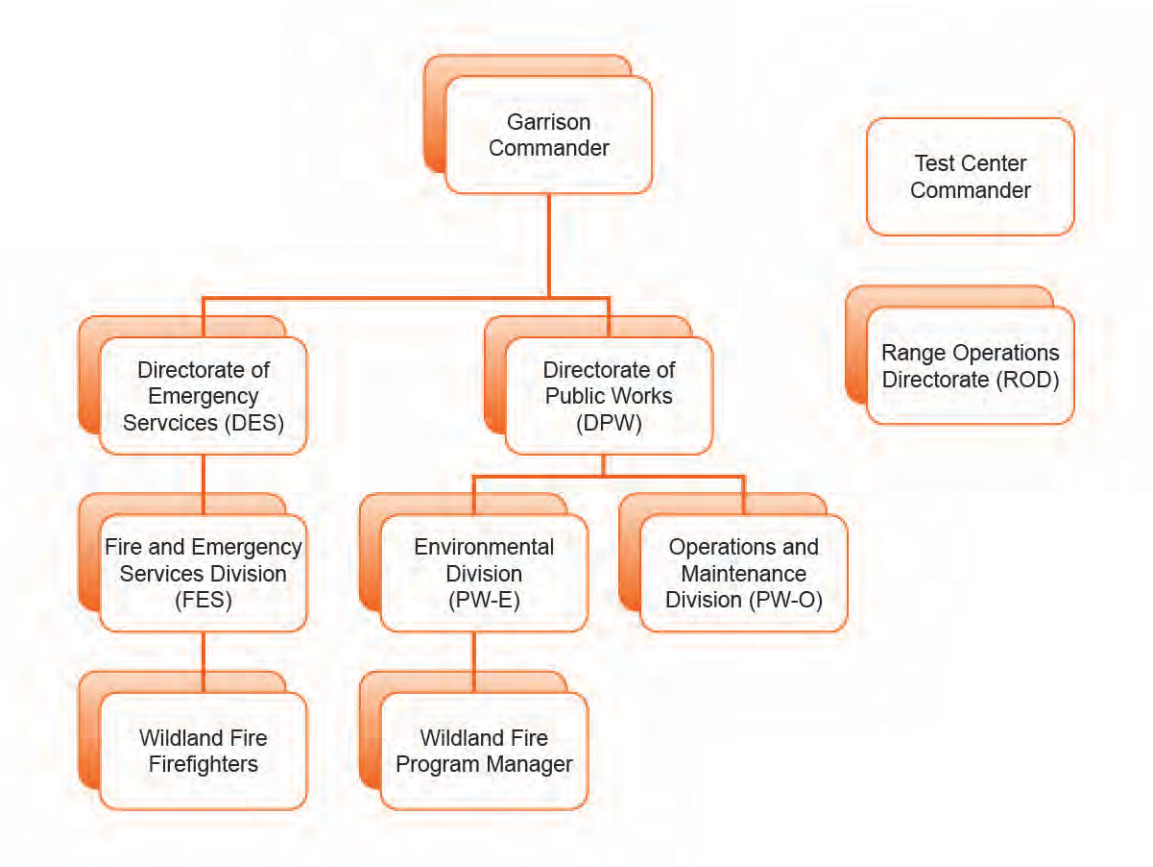

Figure 3.8 - WSMR Hierarchy for Wildland Fire

3.19 Team WSMR Consensus and Documentation Required for Letting Wildfires Burn

The IC on the ground, in communication with wildfire managers—including the WFPM and the GC—makes the decision to fall back to FMU boundaries and allow the wildfire to burn within those boundaries. A decision document needs to be completed within a few hours to document and justify and reduce Army liability. The decision to allow wildfires to burn on WSMR should be made with consensus from the GC, the Director of the Range Operations Directorate, the Fire Chief of WSMR FES, and the Division Chief WSP-E. Considerations for allowing a wildfire to burn will include:

- Risk analysis of firefighter safety
- Risk analysis of fire threat to installation property, installation boundaries, and private property
- Cost concerns of minimal wildfire management versus large-scale wildfire suppression operations
- Potential of test missions to be hampered by wildfire smoke if wildfires are burning for several days
- Long-term weather forecasts

- Long-term drought

If consensus is reached for allowing a wildfire to burn, then a wildland fire use decision document, signed by the GC and the principal decision makers, should include the bulleted analysis of issues listed above as a justification for allowing the wildfire to burn and should also include a map showing a ***maximum manageable area*** (MMA) with ***management action points*** (MAPs) that would trigger suppression actions to the wildfire. Usually, the MMA is the nearest set of firebreak roads (bladed roads) that surround the wildland fire area. MAPs are pre-determined points or lines within the MMA that, as the wildfire approaches, firefighters initiate suppression operations (i.e., igniting backfires to contain the wildfire or suppressing fire using hand tools and/or water from engines and backpack pumps).

3.20 Personnel Training and Certification Standards and Recordkeeping

All WSMR FES personnel engaged in wildfire suppression and RX duties will meet NFPA 1051 *Standard for Wildland Fire Fighter Professional Qualifications* (NFPA 2016)requirements for the positions they are assigned. An Army goal is for all firefighters involved in wildfire suppression and RX operations to meet NWCG standards. All firefighters on the fireline will be certified, at a minimum, as Firefighter Type II under NWCG standards or as Firefighter 1 under NFPA 1051 standards. Requirements for all wildland firefighter positions are established in the NWCG PMS 310-1, *Wildland Fire Qualifications Guide* (https://www.nwcg.gov/publications/310-1)(MWCG 2012b) and in NFPA 1051. Use of the crosswalk for structural firefighters to qualify in wildland fire positions is encouraged. The crosswalk can be found in PMS 310-1 and outlines "gap" course requirements and field training necessary to qualify as Firefighter II and above in order to meet NWCG standards. There is a current effort at IMCOM G4 ENV to provide central authority and establish a mechanism for issuing Red Cards to installation civilian firefighters.

Per NFPA and NWCG requirements, all courses of instruction shall be taught by an NWCG or NFPA certified instructor experienced in the skills being taught. WSMR provides its own instructors for basic level courses (100/200 level) but will bring in outside qualified personnel to teach more advanced courses as necessary (NFPA 2016).

The Fire Chief is responsible for selecting potential trainees, scheduling courses, proper use of PTBs, documenting course completion, maintaining accurate records, certifying firefighters and trainees, and issuing Red Cards.

The WSMR Fire Chief will develop an annual schedule of wildland fire course instruction and a training plan. The Fire Chief coordinates the training plan with FES trainers and outside agencies for cross-leveling and sharing of training opportunities (NFPA 2016).

Individuals will not be assigned to duties for which they lack training and/or certified experience. All personnel dispatched or assigned to wildfires or RXs will be qualified for their assigned position unless assigned as trainees under the direct supervision of higher-qualified personnel. Each firefighter is responsible for showing proof of qualifications and completed training. This is usually in the form of an Incident Qualifications Card, or Red Card. NWCG utilizes PTBs to document trainee's on-the-job performance. PTBs will be used by WSMR FES managers and supervisors to help keep track of everyone's training experience. It is the responsibility of the trainee to maintain their PTBs and to carry it with them on wildfire assignments (NFPA 2016).

All required training courses will be completed prior to completion of a PTB. The training courses are required to prepare the FES employee to perform in the position. The WFPM has discretion over which individuals outside of FES will be provided training courses. Certification of courses and PTBs completed will be documented and tracked by the WFPM and WSMR Fire Chief or their designee.

Currency requirements follow NWCG protocols. The maximum time allowed for maintaining currency is three (3) years for air operations and dispatch positions and five (5) years for all others (NWCG 2012b). Currency for a position can be maintained by meeting any of the following requirements (NFPA 2016):

- By successful performance in the position qualified for within the given timeframe.

- By successful performance in a position identified in PMS 310-1 as Other Position Assignments That Will Maintain Currency.
- By successful performance in a higher position(s) for which that position is a prerequisite, providing the individual was previously qualified in that position.

All primary and secondary wildland firefighters will be certified, as a minimum requirement, in Cardio-Pulmonary Resuscitation (CPR) and Standard First Aid by the American Red Cross or a comparable certification authority.

It is the responsibility of the WSMR Fire Chief to annually certify the qualifications of all WSMR wildland firefighting personnel. An annual fireline safety refresher (NWCG course RT-130) is required for most ICS positions, including all fireline positions. The NWCG Work Capacity Test (WCT; NWCG 2003) or NFPA equivalent is an annual requirement for wildland firefighting (See Sec. 4.6.3).

Under certain circumstances, WSMR personnel—both FES and non-FES personnel—may be requested to assist in wildland fire operations off-post. Requests for WSMR personnel to assist in off-post assignments must be within the guidelines established by an MAA or other Inter-Agency Agreement with the agency requesting the aid, especially if it involves reimbursement of expenses. The decision to send qualified personnel to incidents off-post is at the discretion of the individual's supervisor, the WFPM, and the GC.

3.21 Physical Fitness Standards

All WSMR FES firefighters will meet criteria for physical fitness standards for wildland firefighters as contained in NFPA 1500-*Standard on Fire Department Occupational Safety and Health Program* and receive a physical examination as specified in NFPA 1582-*Standard on Medical Requirements for Fire Fighters*. All other personnel assigned to fireline duties on WSMR must pass the NWCG WCT at the arduous level (walk three miles carrying a 45-lb. pack within 45 minutes) if qualifying for a fireline position—or at the moderate or light level if qualifying for non-fireline positions—and must possess documentation of qualifications for positions assigned and attain a Red Card. NWCG fitness categories are defined in PMS 310-1 as well as the required fitness level for each ICS position.

3.22 WSMR Wildfire Suppression Strategy

WSMR is divided into 36 FMUs to facilitate firefighter response across the installation (Figure 3.7). **Appendix A** contains specific instructions for managing wildfires and protecting resources within each FMU and contains a detailed map of each FMU. Each FMU is distinct, named, and designed to the extent possible to be surrounded by defensible firebreaks and end at WSMR boundaries. Currently there are 25 FMUs that are designated as Immediately Suppress FMUs and 11 FMUs designated as Monitor and Suppress from boundaries. The FMU boundaries and the wildfire suppression strategy reflect the LOW and HIGH wildfire hazard areas described above in Figure 3.6.

The wildfire suppression strategy to be employed by WSMR firefighters is as follows:

1. If the wildfire is located within one of the Immediately Suppress FMUs or is threatening any humans or man-made structures anywhere on WSMR, then the wildfire is immediately suppressed using all available resources at the disposal of the designated IC. If the wildfire cannot be contained within 24 hours by WSMR firefighters and their cooperators or is an area that is difficult to access and may compromise firefighter safety, then WSMR wildfire managers need to decide whether to continue an all-out suppression effort utilizing interagency resources (both ground and air) or to allow the wildfire to burn within the confines of the FMU boundary. The latter decision means that on-scene firefighting resources fall back to defensible boundaries and initiate blacklines or burnouts as necessary to eventually contain the wildfire.
2. If the wildfire is within one of the FMUs that have the option to monitor and suppress from roads or firebreaks and is not actively threatening any man-made structures or facilities or is within an impact area or is within a UXO contaminated area, then the wildfire is monitored. All wildfires are monitored by WSMR FES or by WSP-E or other personnel as designated by the WFPM until the fire either extinguishes itself or

the fire burns to an FMU boundary or other defendable position, such as a firebreak road or other area devoid of fuel. At that point the wildfire is suppressed by firefighters.

All wildfires require a suppression response from WSMR FES resources. Firefighting efforts should be commensurate with the values at risk. If lives are in danger, boundaries are threatened, or military structures or infrastructure is at risk, then an all-hands suppression effort will be made to contain and control the wildfire. This will be accomplished after considering the safety of firefighters first. Lookouts, Communications, Escape Routes, and Safety Zones (LCES) must be in place prior to engaging wildfires.

WSMR FES firefighters will respond when wildfires are detected, and once on scene they will make the determination to engage in active wildfire suppression or to monitor wildfire spread. This determination will be made based on risks to firefighter safety, such as proximity to escape routes and safety zones, flame lengths under 4 ft, ease of access to the fire edge (steepness of terrain, wildfire a long way from the nearest road, etc.), and the ability to suppress quickly and efficiently. If there is any question as to the suppression response, FES will attempt to contact WSP-E resource advisors to determine if the wildfire can continue to burn in order to meet ecosystem objectives. In the absence of feedback from resource managers, the IC should continue to direct suppression of the fire. If it is determined that suppression efforts are not likely to control the wildfire within 24 hours, then the course of action is to fall back to defensible positions, such as a firebreak road, and monitor and eventually suppress from there.

FMUs are designed to contain wildfires within firebreak boundaries. Many wildfires on WSMR will burn out and extinguish as they run out of fuel. If a wildfire approaches an FMU boundary and the wildfire is burning intensely, then firefighters may initiate a backfire from a defensible position and move toward a more secure location. If the wildfire intensity is low enough to allow firefighters to stand at the flaming front and make an attack, then firefighters will engage in directly fighting the wildfire from defensible boundaries using water and hand tools.

All wildfires starting on ***Red Flag Warning*** days are immediately suppressed anywhere on WSMR, except within impact areas. Red flag Warnings mean that wind, temperature, and humidity are aligned at critical thresholds for potentially extreme wildfire behavior and large wildfire growth.

WSMR has a network of roads for accessing different parts of the installation. Designating the roads that surround FMUs as firebreak roads means that they require annual maintenance by WSP-O road maintainers; road surfaces are kept vegetation-free for at least an 8-ft width, and road shoulders are kept mowed or vegetation-free to the extent possible. Firebreak roads should be considered the primary places to initiate suppression actions. Suppression actions may include blacklining the road; laying down a wet line alongside the road; or actively fighting fire from the road and engaging a wildfire using water, foam, and dirt.

If a wildfire is not endangering life or equipment, then training or military testing missions that are scheduled should continue. This allows for wildfires to consume as much fuel within the road system as possible, so that the next wildfire that starts there will not have any place to burn and may also help to meet ecosystem management and natural resource objectives.

Areas surrounding man-made improvements on WSMR must be regularly maintained (mowed and/or kept green by watering) for a minimum of 30 ft away from the structure or kept vegetation-free to minimize the risk of wildfire damage.

Wildfires in the fuel conditions and terrain found on WSMR will normally abate after sunset as winds die down, temperatures fall, and relative humidity rises. This typical nighttime weather pattern allows for firefighters to use direct attack tactics on the wildfire's edge as necessary and gain containment and control under cover of darkness. However, wildfires may not diminish in intensity at night if a frontal passage or low-pressure area is moving through the area bringing strong winds. Firefighters must use local predicted weather forecasts for their area in decision-making as to how and when to directly engage in wildfire suppression (i.e., engage now while wildfire is

small and before weather system moves in, or, if weather forecast is favorable, wait for night and engage when conditions are most favorable for suppressing wildfire).

3.23 WSMR Fire Management Units

WSMR is divided into 36 FMUs (Figure 3.7) that were created based on the defensibility of their boundaries, common fuel types, and common fire management priorities. **Appendix A** contains detailed descriptions, strategies, constraints, and maps for each FMU. The appendix is designed to be a usable tool for firefighters and is meant to be reproduced individually and kept as a guide within fire vehicles for easy reference (or downloaded to a laptop). Each of the 36 FMUs listed in the appendix has a name, physical description, location, size in acres, improvements/structures to be protected, fuel characteristics, along with a suppression strategy section that includes specific risks, hazards, tactics, and special considerations for firefighters. Each FMU description and text is followed by a full-page map showing boundaries, roads, firebreaks, impact areas, structures, power lines, and topography and fire history.

3.24 General Firefighting Strategies for FMUs on WSMR

- Whenever wildfires are ignited anywhere on WSMR, WSMR FES must be contacted so that a wildfire suppression response can begin immediately.
- The primary tactic for suppressing wildfires within Immediate Suppression FMUs (yellow areas in Figure 3.7) is to engage in suppression efforts as close to the fire edge as possible, extinguishing flames using handtools and water. This is called ***direct attack*** (See Section 4.5.3 for additional information). This tactic works best on wildfires with flame lengths less than 4 ft. This tactic may involve driving wildland engines and/or UTVs off-road, initiating engagement of the wildfire from an anchor point, and working along both flanks of the wildfire towards the head. If areas are too rough to drive, then firefighters on foot will use the same tactics using bladder bags and hand tools.
- ICs have discretion on tactics to use even in Immediate Suppression FMUs (yellow areas in Figure 3.7) as these areas may not always require immediate suppression. FMUs are designed to contain wildfires within firebreak boundaries. Many wildfires will burn out, even in the mountains, depending on fuel loads. Firefighters may not need to immediately suppress a wildfire if conditions are not favorable for burning, weather is unpredictable, or there are significant human safety risks.
- Wildfires that occur in any FMU that exhibits intense fire behavior (flame lengths > 4 ft) may be suppressed by firefighters utilizing ***indirect attack*** tactics from roads/firebreaks and/or natural barriers (See Section 4.5.3 for additional information). Indirect attack on intense, fast-moving wildfires is accomplished by burning out fuels ahead of the wildfire along or parallel to firebreaks or roads. Burnouts are conducted by qualified and experienced wildland fire personnel (i.e., completed taskbook for FIRB). If burning out is not feasible due to time constraints or lack of qualified personnel, then firefighters will allow the wildfire to come to the fuel or firebreak rather than attempting to construct new firelines with hand tools or heavy equipment (bulldozers). See **Appendix H MIST Guidelines** for tactical considerations for minimizing impacts to natural resources and using natural features for firelines and safety zones.
- RXs will be used, prior to onset of wildfire season, to reduce hazardous fuels and to create black lines in strategic areas where fuels are concentrated.

3.25 Fire Management Goals Common to all FMUs on WSMR

- Contain wildfires within FMU and installation boundaries to every extent possible.
- Live-fire military training and testing missions continue throughout WSMR even when wildfires are burning because the wildfire threat has been abated by keeping structures and infrastructure brush and weed free, to the extent possible.
- Man-caused wildfires (i.e., missiles, rockets) will have a suppression strategy because of the liability that these types of wildfires have.

- FMU boundaries are effective barriers to wildfire spread because they are maintained by a system of annual road and firebreak maintenance that includes road surface scraping, road shoulder mowing, and water bar and drain dip maintenance.
- Range infrastructure (structures, facilities) are protected from wildfire effects by an established program of timely fire prevention inspections, followed by actions of fuel reduction or removal.
- RX treatments are used to strengthen FMU boundaries and consume available fuels and are only conducted within a RX plan's prescription parameters.

4 Wildland Fire Operations

4.1 WSMR Wildfire Prevention Program

The WSMR wildfire prevention program is focused on reducing or eliminating the unintentional ignitions of wildfires and on reducing the risks and hazards that can contribute to a severe wildfire (Table 4.1). Prevention efforts require an analysis of risks, hazards, and values, and also require education, awareness, and preparation. Wildfire prevention requires actions to be taken to reduce the potential impacts of identified risks and hazards. ***Risks*** are ignition sources that can start wildfires, including live-fire testing, use of pyro and flares, maintenance activities (like welding), vehicles traveling across wildlands, and troops bivouacking in the wildlands. ***Hazards*** are fuels that burn, including the natural vegetation growing across WSMR and the flammable structures located on WSMR.

WSMR FES has an Assistant Chief for Fire Prevention that is responsible for fire prevention and inspections on facilities across WSMR. This effort should be in coordination with WSP-O because their road maintenance program can accomplish much of the identified fire prevention tasks (Table 4.1). Many of the maintained range roads are normal access roads for military and civilian activities and are now designated as firebreak roads. Additional maintenance necessary for firebreak roads includes mowing road shoulders in areas where it is feasible and where fuels loads are high. This is an additional expense but is an important part of the WSMR wildfire prevention program. Areas of fuel accumulations where mowing needs to be done shall be identified and made known after each growing season.

Another primary task for FES wildfire prevention is to identify the areas, facilities, and infrastructure that are vulnerable to wildfire damage and translate that vulnerability into actions needed to reduce the hazards (Table 4.1). The FES Fire Prevention Officer should note structures and other man-made barriers that have fuel accumulations against them and attempt to contact the building users as to the specific fire hazards. WSP-O does not have the staff to conduct fire prevention actions around structures on WSMR. It is the responsibility of the owners, users, or lessors of those buildings to maintain them in a fire-safe condition. Generally, mowing around structures is sufficient to prevent wildfire damage. Maintaining a green belt around structures is another way to prevent wildfire damage but may use a lot of water to maintain greenness. Cultural sites require coordination with WSP-E archaeologists as some vegetation has historical context and may not be removed. Table 4.1 summarizes the annual wildfire prevention actions to be completed on WSMR before fire season becomes active in March.

Since live-fire testing is a priority mission for WSMR, reducing hazardous fuels is the preferred management activity for preventing wildfires. Actions to reduce hazardous fuels include implementing RX to reinforce firebreaks, creating defensible space around improvements by mowing vegetation or watering to keep green, mowing road shoulders in the fall or winter, maintaining road surfaces to be vegetation-free, and removing combustible fuels accumulations (e.g., tumbleweeds) from around structures.

Maintained dirt firebreak roads are used as FMU boundaries in most areas of WSMR and are places where firefighters can stop the advance of wildfires—but not all FMU boundaries are firebreaks. FMU boundaries in some locations like the Oscura Mountains follow canyon bottoms and rocky ridgelines, and while these features may help slow wildfire spread, they are not barriers to wildfire spread. The installation boundary of WSMR is a fenceline in some places, is non-existent in other places, and is not always a barrier to wildfire spread. The perimeter of WSMR has many areas that are not protected by firebreak roads. Wildfires can easily burn across boundaries in these areas and are areas of emphasis for the use of direct attack methods, possibly using aerial resources and other agencies' firefighters.

Table 4.1 - WSMR Wildfire Prevention Actions to be taken before Fire Season

Responsible Party	Hazard Reduction Tasks to be completed before Fire Season	Time frame	FMUs Identified with the Task
WSMR Fire and Emergency Services Asst. Chief Fire Prevention/Operations, WSP-E Cultural Staff and WSP-O	Inspection of Historic Cultural sites for accumulations of brush and weeds. Clearing of weeds and brush around sites by mowing, clearing or crushing	Oct- Feb	All areas as identified by Asst. Chief Fire Prevention
WSMR Fire and Emergency Services Asst. Chief Fire Prevention/Operations w/Range facility owners, lessees, tenants, users	Inspection of WSMR facilities for accumulations of brush, weeds and grass. Clearing of weeds and brush around facilities by mowing, clearing or crushing or being kept green by watering	Year-round	All facilities of WSMR that are currently being used
WSMR Fire and Emergency Services Division	Prescribed burning along firebreaks within areas identified in prescribed fire plans	Oct-Apr or as necessary to reduce fuel loads (may be once every few years)	
PW Operations and Maintenance Division and FES Asst. Chief Fire Prevention/Operations	Fire break road maintenance and mowing of roadway shoulders as identified by FES Fire Prevention/Operations	Bi-annually	

4.2 Best Management Practices for Wildfire Risk and Hazard Mitigation

1. **Pre-fire season fuels management and wildfire containment:**
   - Maintain defensible space around range infrastructure. Mow living vegetation to 3-6 inches in height within 30 feet of structure. Mowing should occur outside the migratory bird nesting season, which is from March 1 to August 31. Any live vegetation within 30 feet of structures that is not mowed or cut to near ground level should be watered regularly to maintain greenness. Clear dead accumulations of vegetation for 30 feet from structures. Do **not** scrape to mineral soil around buildings, if possible, as this creates a dust problem and allows for noxious weed invasions (primarily tumbleweeds) to occur (Table 4.1).
   - Consult with WSP-E cultural staff before doing vegetation removal around historic structures. Even vegetation can have historical context (Table 4.1).

- Maintain designated firebreak roads by removing all vegetative and organic material down to mineral soil on road surfaces for a minimum of 8 feet width and by mowing roadway shoulders (where practical) and by maintaining erosion control features. Mowing should occur outside the migratory bird nesting season which is from March 1 to August 31.
- Use RXs or ***backfires*** to strengthen firebreak effectiveness for stopping a wildfire by ***blacklining*** (burning combustible fuels in long parallel strips) alongside roads and firebreaks where fuels are concentrated and where it is feasible and practical to do so.
- WSMR firefighters should familiarize themselves with their areas of responsibility (AOR) within WSMR by driving roads. Firefighters should have firsthand knowledge of structure locations and associated infrastructure, impact areas, firebreak roads, WSMR boundaries and how to access them, water fill sites, sensitive cultural and natural resources, and FMU boundaries. Firefighters need to recognize the different types of flammable wildland fuels found on WSMR (See Section 3.3 WSMR Fuel Types) and how those fuels affect fire behavior and intensity.

2. Wildfire Suppression:

- Due to safety and resource considerations, the main fire suppression strategy to be implemented by WSMR firefighters in the Low Hazard FMUs (Identified with light blue shading in Figure 3.7) is to monitor wildfires within FMU boundaries from firebreak roads and suppress wildfires if they advance to firebreak roads. These firebreaks can be burned out in advance of a flaming fire front if it is deemed advantageous by the IC and provided there are trained personnel available and in place to do so. In most cases, firefighters will allow wildfires to consume combustible fuels within the confines of the FMU boundaries. Most of these wildfires will die on their own as they run out of fuel (See **Appendix A**).
- In the High Hazard FMUs (yellow shaded areas in Figure 3.7), wildfires will be suppressed at the earliest opportunity unless communication with WSP-E occurs and allows for wildfires to burn to meet ecosystem management objectives. Direct attack is the preferred tactic for fighting wildfires, but in areas where the fire intensity is too high (>4-foot flame lengths) or terrain too rough, then indirect attack tactics will be used.
- Interagency firefighting crews are often the best and safest resources for fighting wildfires in the rugged portions of WSMR. For safety purposes, a WSMR employee that is familiar with military operations, impact area boundaries, UXO, and the installation should accompany interagency fire crews as a resource advisor.
- The decision to utilize helicopters on WSMR wildfires should be based on an assessment of values at risk (See Section 5.5.4). Most wildfires burning on WSMR will not require helicopter support. Helicopters equipped with buckets shall be used when requested by the IC and when wildfires threaten to cross WSMR boundaries or when structures or infrastructure are threatened by wildfires.
- WSMR FES will contact WSP-E for guidance on avoiding cultural and sensitive natural resources when wildfires are burning outside established firing ranges and suppression efforts are planned.

4.3 WSMR Wildfire Suppression Program

An up-to-date, practical reference for use by wildland fire suppression programs is the NWCG publication: PMS 210, Wildland Fire Incident Management Field Guide and is available for downloading at: http://www.nifc.gov/nicc/logistics/references/Wildland%20Fire%20Incident%20Management%20Field%20Guide.pdf (NWCG 2013). The field guide has chapters on basic firefighting safety, wildland fire operations, incident positions and responsibilities, and includes guidelines for managing incidents of increasing complexity. The field guide has charts and tables for fireline production rates, engine operations, heavy equipment usage, and a host of other information that is pertinent to firefighters, ICs, and WFPMs.

More specific to WSMR FES firefighters is the WSMR FES **Standard Operating Procedures: Wildland Fire Responses** (SOP 6.20 dated 28 Sept. 2015) located in **Appendix D** of this document. This is an excellent reference for all firefighters to use when responding to and managing WSMR wildland fire incidents. There are sections on

establishing Incident Command, Safety and Environmental Factors, Initial Reporting, Initial Attack, Strategy and Tactics, and Hotspotting, Coldtrailing, and Mop-up.

The following sections of the WSMR Wildfire Suppression Program are not in-depth since there are excellent basic wildland fire courses and reference materials (see Incident Response Pocket Guide [IRPG]) offered by NWCG that every firefighter certified for wildland firefighting duties utilizes. The following sections are meant to capture the sequence of events for wildfire responses and highlight important safety and tactical information particular to the WSMR wildfire suppression program.

4.3.1 Wildfire Detection

Early wildfire detection is part of an effective initial response to wildfires on WSMR. Any agency, unit leader, soldier, contractor, or individual noticing a wildfire is responsible for reporting it as soon as it is detected. Contact 911 Dispatch Center at (575) 678-1234 or communicate with 911 Dispatch Center (Call sign for FES is Rescue Control), Police Services, or Range Control at (575) 678-2222 or via two-way radio to report wildfires.

4.3.2 Dispatch Procedures

Rescue Control will dispatch appropriate available wildland fire resources to a wildfire burning on WSMR based on the following criteria and then will contact the Assistant Fire Chief for Operations or the designated duty officer in WSMR FES for further guidance:

1. Imminent threats to lives or structures.
2. Red Flag Alert or Extreme FDR.
3. Wildfire is burning in an FMU that requires an immediate suppression response.

Rescue Control will dispatch appropriate wildland firefighting resources, ordinarily two Type 6 wildland fire engines and one UTV, to a wildfire burning on WSMR based on the following criteria:

1. There are no immediate threats to life or structures.
2. Wildfire is burning within an FMU that is designated control from a road or a firebreak.
3. Wildfire smoke is visible, but the location of the wildfire has not been determined.
4. Wildfire is burning within an FMU that is designated for Immediate Suppression response, but it is outside of the primary wildfire season, or the fire danger is rated as Low or Moderate.

Scheduled WSMR test and evaluation missions have priority over wildfire operations. If there are active missions occurring on WSMR, Rescue Control will contact Range Control at 575 678-2222 or by radio to determine when the Range will be open for fire traffic.

4.3.3 Initial Attack Procedures

Initial attack begins with the dispatch of pre-arranged personnel and equipment by WSMR FES. While enroute to the incident, WSMR FES personnel should observe and note the following in order to anticipate fire behavior, firefighter safety, tactics, and resource protection:

- Fuels and topography
- Weather conditions
- Smoke column characteristics
- Access routes
- Fire barriers (natural and constructed)
- Potential water sources
- Capabilities of responding resources
- Unusual human activity or suspicious behavior

The safety and security of responding personnel is the priority throughout the duration of the incident. Response personnel will have an appropriate awareness of the **10 Fire Orders, the 18 Watch-out Situations, and LCES**

(Appendix C). Responding personnel will incorporate their knowledge of the fire area and observe how current wildfire conditions compare to past experiences with similar wildland fuels and weather conditions.

First on-scene resource(s) will make an immediate **size-up** of the incident. Size-up is defined as the evaluation of the fire to determine a course of action for suppression. The size-up checklist in the Interagency IRPG is used as the installation's standard. This information must be relayed to WSMR Rescue Control at the earliest opportunity:

- Incident Type (wildland fire, vehicle accident, hazmat spill, search, and rescue, etc.)
- Location/Jurisdiction
- Incident Size
- Incident Status
- Establish IC and Fire Name
- Weather Conditions
- Radio Frequencies
- Best Access Routes
- Assets/Values at Risk
- Special Hazards or Concerns
- Additional Resource Needs

Initial attack procedures involve either direct or indirect attack tactics depending on FMU designation. Other factors that may influence the method of attack include flame lengths, rate of wildfire spread and proximity to human improvements, difficulty of terrain, and heavy concentrations of fuels. When using ***direct attack*** tactics, firefighters engage the wildfire directly along the flaming perimeter (flame lengths are generally < 4 ft). The direct attack method of engaging wildfire is the simplest and safest method to bring a wildfire under control. This is the safest suppression method because firefighters can have "one foot in the black." The ***'black'*** (or previously burned) areas are the best places for safety zones on a wildfire in light fuels and are easily reachable when fighting fire on the fire's edge. The primary strategy for direct attack is to establish an anchor point and then proceed with firefighters along each flank, directly extinguishing flames with hand tools, swatters, or water from engines or backpack pumps and progressing towards the head of the wildfire, eventually pinching the head and meeting the firefighters from the other flank. See **Appendix H MIST Guidelines** for tactical considerations for minimizing impacts to natural resources and using natural features for firelines and safety zones.

Indirect attack methods should be used when fire behavior is such that direct attack is not feasible (flame lengths > 4 ft) or when wildfire is within an FMU designated as Monitor and Suppress from FMU boundaries. The firefighting strategy for indirect attack is to fall back to a defensible position, establish an anchor point, and burn out fuels ahead of the advancing wildfire as necessary while moving the operation towards an identified safety zone. Tactics include burning out along roads or firebreaks, eventually halting the spread by removing burnable fuel ahead of a wildfire. Indirect attack tactics should be led by wildland firefighters experienced and qualified in burning techniques. There should also be adequate engine and firefighter resources on scene to hold the line and extinguish hotspots and spot fires that may ignite from embers crossing the fireline.

On all wildfire incidents, it is required that lookouts are posted, and safety zones and escape routes are scouted, marked, and made known to everyone on the incident to make sure they are viable options for firefighters. Engaging in indirect attack tactics means that there will be unburned fuels between the firebreak and the advancing fire front. Visibility of the wildfire and changes in fire behavior or direction of spread may be obscured or limited. Winds can change at any time, causing wildfire to rapidly blow across firelines and potentially compromising firefighter access to escape routes and safety zones leading to an entrapment situation.

Once perimeter containment of a wildfire has been achieved, fuels within the interior of the wildfire will be allowed to burn out. Mop-up will only be conducted on the perimeter to bring the wildfire under control. Keep enough resources to patrol and monitor the wildfire until it completely burns out.

Firefighters will use a handheld GPS to record a final fire perimeter before leaving the incident. The coordinates will be downloaded and e-mailed to WSP-E, or the GPS unit may be brought to WSP-E in Building 163 (Environmental Division) on WSMR for downloading and recording wildfire information. FES GPS units need to have mapmaking and area calculating capabilities. WSP-E can provide GPS training for firefighters and will maintain a GIS (Geographic Information System) database for all wildland fires on WSMR.

4.3.4 Initial Attack Incident Commander

Initial attack forces should designate an IC to take charge at the scene before arrival at the incident, if possible. The initial attack IC should be among the first to arrive at the incident. The IC is a single individual responsible to the installation for all incident activities, including the development of incident management strategies and tactics as well as the ordering, deployment, and release of resources. IC responsibilities include:

- Provide a size-up to dispatch as soon as possible upon arrival on scene.
- Complete and file an incident report with the installation dispatch center (as applicable).
- Assess potential management by suppression and/or by wildfire for resource benefits as incident objective(s).
- Use guidance in this IWFMP. If from a cooperating agency, secure a Delegation of Authority to implement the selected suppression response and manage an organization to implement effective strategies and tactics. Minimize suppression impacts where possible without reducing the effectiveness of the actions being undertaken.
- Determine resource needs and order as needed through local dispatch.
- Ensure all resources assigned and those incoming receive a briefing. Document these briefings. Refer to the Briefing Checklist in the IRPG.
- Continually re-assess incident complexity using the checklist in the IRPG. When a more qualified IC is needed, inform dispatch and delegated unit administrator and place the order for a higher-level IC.
- Depending on incident complexity, additional responsibilities for the IC may apply. Utilize NWCG Fireline Handbook for more detailed description of IC responsibilities.
- All resources, including mutual aid resources, will report to the IC (in person, by radio, or by cell phone) to receive an incident briefing prior to tactical assignment deployment.
- All wildfires must be investigated to determine fire cause. Document findings on ICS-214 and determine if negligence or criminal intent were factors. If the IC suspects a fire cause is suspicious, a qualified wildland fire investigator can be ordered. The point of origin should be protected for investigation purposes.

4.4 WSMR Aerial Firefighting Options

Army helicopters may be available to WSMR FES but will not automatically respond to WSMR wildfires. Aerial assets are ordered as needed by the IC onsite or by the WSMR WFPM. The request for helicopters to aid in wildfire suppression operations on WSMR should be based on a risk analysis that considers the potential for a wildfire to escape WSMR boundaries, the proximity of the wildfire to structures or infrastructure, and the potential for hazardous exposure to ground-based firefighters from multiple risk factors—including steep slopes, ingress/egress, escape routes, safety zone accessibility, and potential for wildfire entrapment. Helicopter bucket support may be necessary for suppressing wildfires located in remote, inaccessible terrain, such as that found in the Organ, San Andres, and Oscura Mountains.

Helicopters from the 1st Armored Division Combat Aviation Brigade (CAB) located at Fort Bliss may be available to WSMR; 1 AD helicopters have “bambi” buckets (collapsible soft-sided bucket with electric motor-driven release and fill gate) which can deliver thousands of gallons of water for the purposes of extinguishing wildfires. An estimated 790,000-gal storage tank with an open top to allow for helicopter bucket fill has been built on Doña Ana Range on Fort Bliss and is located just east of the junction of NM 213 (War Road) and the southern terminus of Firing Line Road (UTM coordinate 13S 368,224E 3,566236N). The 1AD CAB helicopters have been training with

the bambi buckets at the Doña Ana dipsite. Currently, 1 AD CAB has two 2,000-gal collapsible bambi buckets for the CH-47s (Chinooks) and two 660-gallon bambi buckets for the UH-60s (Blackhawks).

Contract firefighting helicopters can be ordered from the ADC for wildfires on WSMR and are the best option in terms of bucket delivery of water and working helicopters around firefighters already on the ground. These aerial resources are managed by the USFS. It must be noted, however, that it may take hours—or even a day or more—from the initial order to have a USFS contract firefighting helicopter over a WSMR wildfire. A fire-contract helicopter will usually come with 1-2 pilots, bucket, long line, fuel truck and an agency-certified helicopter manager. Fixed-wing aerial observation (air attack) or an ASM can also be ordered from ADC and is a quick way to get eyes in the sky for gathering intelligence from remote, back-country wildfires. These aircraft can also serve to help lead ground crews into remote parts of a wildfire and can also provide traffic control for other aircraft that may be arriving, such as retardant planes or helicopters.

All aircraft attempting to access WSMR airspace must contact Cherokee Control on VHF frequency 126.95 or UHF frequency 305.5. Cherokee Control maintains total control of the air space. Range activities will dictate request approvals. Cherokee Control is not staffed on a 24-hour basis. If there is NO response from Cherokee Control, then the pilot is advised to contact Holloman Approach (RAPCON) on VHF frequency 120.6 or UHF frequency 269.225.

A recommended resource for aviation users and anyone involved or interested in helicopter operations within the wildland fire environment is the Interagency Helicopter Operations Guide (IHOG). The IHOG and the IHOG Supplemental Forms Package are available for viewing and downloading at: http://www.nwcg.gov/publications/interagency-helicopter-operations-guide (NWCG 2016) An excellent guide for fixed-wing pilots and others interested in federal firefighting aviation is: http://www.fs.fed.us/fire/aviation/av_library.

4.5 Extended Attack Procedures

Extended attack wildfires are wildfires that have escaped initial attack and that are still burning after 24 hours. WSMR will continue to manage these incidents using FES firefighters, including mutual aid resources, if the required expertise and personnel are in place to accomplish safe and effective wildfire management.

The NWCG recognizes 5 levels of wildland fire incident command (See below for descriptions of each level of incident command). The smallest wildfires or initial attack fires require a Type 5 IC (ICT5). Most WSMR FES firefighters with wildland fire experience will qualify as ICT5. Type 4 ICs (ICT4) require more training, but WSMR has experienced and qualified firefighters who can fill this position. If the ICT4 decides that the current incident complexity calls for the next higher level of incident management (Type 3 IC [ICT3]) and that ICT4 is not qualified, nor is there one within WSMR FES ranks, then an outside agency ICT3 will need to be ordered. The order for an ICT3 or higher is placed through ADC. If mutual aid resources are already involved in the suppression efforts, it is possible that there may be an ICT3 within their ranks. If so, a name request is then placed with the order to ADC to facilitate the transition to the higher-level IC.

WSMR FES should work towards qualifying at least four ICT4 firefighters and as many as eight, so that there is at least one for every station at any given time. WSMR FES should work toward qualifying one or two firefighters as ICT3.

Use of outside ICs for WSMR wildfires requires that a delegation of authority be given to the IC for the management of the incident. A ***delegation of authority*** is a written document from the GC to the incoming IC granting the IC the authority to expend funds and order all necessary resources to bring the wildfire under control. See **example of a delegation of authority in Appendix E**. WSMR can help facilitate the transition of wildfire management to an outside, incoming IC and his/her team by providing a short team of WSMR resource professionals that can advise the incoming team as to the location of sensitive natural and cultural resources, WSMR special safety concerns (including areas of UXO contamination, impact area boundaries, military mission

concerns) and other logistical and operational needs. This short team should consist of a WSMR Archaeologist, Wildlife Biologist, Range Safety Officer, and an FES Operations Chief.

The types of IC levels and the corresponding incident complexity are provided below:

Type 5 Incident

- Resources required are local and typically vary from two to six firefighters.
- The incident is generally contained with initial attack resources and often within a few hours after resources arrive on scene.

Type 4 Incident

- Resources are local and vary from a single module to several resources.
- The incident is usually limited to one operational period in the control phase.
- No written Incident Action Plan (IAP) is required. An operational briefing will be completed for all incoming resources not involved in the initial attack.

Type 3 Incident

- Resources are usually local, and some overhead positions may be activated, usually at the division/group supervisor and/or unit leader level. These resources may be called upon to fill key positions such as Operations, Logistics, Safety, and Plans Section Chiefs. These positions in wildland fire organizations are called command and general (C and G) staff positions. Incoming ICT3s may have a predetermined Type 3 organization with qualified C and G staff positions filled.
- Type 3 organizations manage initial attack fires with a significant number of ground and air resources and manage extended attack wildfires until containment/control is achieved.
- Initial briefing and closeout are more formal and more critical.
- Resources vary from several resources to several task forces/strike teams.
- The incident may be divided into divisions.
- The incident may involve multiple operational periods prior to control and require some form of a daily, written IAP.
- A documented operational briefing will be completed for all incoming resources and before each different operational period.

Type 2 Incident

- Resources are usually from the regional area. Type 2 teams are filled by qualified personnel who are preselected annually for that team. All C and G staff positions are filled as well as positions at the Branch, Division, Task Forc,e and Strike Team Leader levels.
- Type 2 organizations manage extended attack wildfires that have exceeded the complexity of a Type 3 team. Type 2 fires usually have significant outside resources involved in air and ground operations. There is typically significant public and political interest, and there are usually multiple land ownerships and government agency jurisdictions involved.
- Only the most complex wildfires on WSMR would need Type 2 Incident Management Teams (IMT). The decision to call in a Type 2 IMT should be a joint decision between the ICT3 at the time, the WFPM and the GC.

Type 1 Incident

- Resources are national in scope and are used on the most complex and largest fires in the nation. It is unlikely that WSMR would have need of a Type 1 IMT.

4.6 Water Sources

Water sources for firefighting purposes are rare commodities across WSMR. This is a logistical problem for firefighters needing to refill wildland fire engines or water tenders and return to the fireline in a timely manner (Figure 4 and Table 4.2) list water sources for firefighter use on WSMR).

The Main Post, Rhodes Canyon Range Center (RCRC), Oscura Range Center (ORC) and Stallion Range Center (SRC) have hydrant systems that are available for wildland engines and water tenders. Overhead standpipes are located at SRC and at two locations on the Main Post. Water storage tanks are located throughout WSMR (Figure 4.1); however, these storage tanks are the property of various contractors, and they must pay for water to be stored in these locations (listed in Table 4.2 as Remote Hauled Water Tanks). Some of these tanks may be locked and unavailable without permission from the contractor. Firefighters should make reasonable attempts to locate and/or contact contract personnel in the area for water access. If unable to contact anyone and the water is available and necessary for meeting wildfire containment objectives, then firefighters should go ahead and fill their engines, while keeping track of gallons taken from the storage tank for possible reimbursement.

There are several wildlife water systems located throughout WSMR (Figure 4.1), consisting of solar wells and drinkers with storage tanks that are available to firefighters for filling engines and bladder bags. Many of these facilities may not be accessible for direct engine fill due to piping and plumbing configurations. Firefighters may have to draft water to fill their engines at these locations. Many WSMR wells have decreased output over the years, and some may even be dry, so scout out and check reliability before sending engines to these sites.

At certain times of the year, water may be available for draft into engines at the dirt tanks located throughout WSMR. However, these locations may not be reliable—especially during drought—and the water may be too muddy or dirty to be put into fire engine tanks. Dirt tanks will need to be scouted by firefighters prior to sending engines to those locations.

Table 4.2 Potential Water Sources for Engine Fill and Firefighting on WSMR

	County and FMU	**UTM Easting** Zone 13S	**UTM Northing**	**Notes-**Updated information since 2018 on water sources is in Bold Type and is current to 8/3/2022.
Construction Wells				
13. Tula Gate (NMOSE T-04087)	Otero FMU 19	392653	3660552	Installed July 2002. Approx. 30,000-gal storage tank at well head. Construction well near Tula Gate. **This well not working currently (2017 10-31).**
17. Herbie Well (aka Rhodes C or well 6) (NMOSE T-5570)	Sierra FMU 16	357993	3672093	Installed March 2009. Approx. 30,000-gal storage tank at wellhead. Water first encountered at 190 ft. below ground surface (bgs), but static water level after construction was 143 ft. bgs.
9. NW30-1 (aka "NW-30)	Dona Ana FMU 11	359144	3637581	Approx. 500-gal tank at well. In Bolson fill located off RR 7 just west of intersection w/ RR 10, just west of Pony site. **Needs generator to operate.**

	County and FMU	**UTM Easting** Zone 13S	**UTM Northing**	**Notes-**Updated information since 2018 on water sources is in Bold Type and is current to 8/3/2022.
38. Murray Well (Construction) (RG 80492)	Socorro FMU 31	365434	3715434	Installed August 2003. Approx. 30,000-gal tank at wellhead. Construction well at Murray well site. Yield-80 gallons per minute (gpm). Site visit on 1/8/15 confirmed well still in place and is in good working order. Well feeds into nearby tank and is used for construction water. Well inside locked gate area. **Well is non-functional at this time.**
32. Martin Ranch Construction Well	Sierra FMU 24	349926	3705132	Dirt storage tank at well. Construction well at Martin Ranch site. Adjacent old windmill well nearby. Well also used as wildlife watering well instead of old ranch well listed with wildlife wells below.
7. Thel-1 (aka THEL Well)	Otero FMU 6	373236	3607374	No info.
36. ORC Fire (AKA Oscura Range Ctr.)	Lincoln FMU 20	391082	3707293	Dirt storage tank at well. Located at Oscura Range Center. Used previously as a fire protection and general non potable supply well. Yields 125 gpm about 90' bgs.
31. Range Road 5 well	Socorro FMU 23	343409	3706614	Installed in 2014. Unknown if tank at well. Newest construction well.

Water Systems for Truck Filling

Stallion Range

49. SRC Non-potable water filling station	Socorro FMU 32	346872	3743302	Tanker fill station at 20,000-gallon non-potable water tank next to water plant. This water is pre-production and not potable.

Main Post

1. Water Point #1	Dona Ana FMU 1	360848	3582324	Tanker fill station along Headquarters Rd. on Main Post. No tank, water directly from potable water lines.
3. Water Point #2	Dona Ana FMU 3	371166	3585681	Tanker fill station along Nike (Range Road 2) east of Main Post. No tank, water directly from potable water lines.

Remote Hauled Water Tanks

39. Aerial Cable	Socorro FMU 31	367916	3719692	Occupied during the week

	County and FMU	**UTM Easting** Zone 13S	**UTM Northing**	**Notes-**Updated information since 2018 on water sources is in Bold Type and is current to 8/3/2022.
43. Atom Peak SST	Socorro FMU 35	373667	3734131	Not occupied all week
44. NOP Barracks (Hilton)	Socorro FMU 35	373898	3734048	Rarely occupied
45. NOP (North Oscura Center Range)	Socorro FMU 35	372896	3735572	Not currently occupied - tank used only for boiler
37. ORC Bombing Range	Lincoln FMU 29	387404	3710637	Occupied during the week
35. ORC Commo	Lincoln FMU 20	390431	3707467	Rarely occupied
40. PHETS/DTRA	Socorro FMU 32	357246	3725130	Occupied during the week
29. Phillips Hill	Lincoln FMU 18	394787	3701222	Occupied during the week
26. Russ Site	Otero FMU 18	396161	3686997	Occupied during the week
25. Salinas Commo	Sierra FMU 21	357411	3685417	Periodically occupied
24. Salinas New Tec	Sierra FMU 21	357274	3685464	Periodically occupied
14. Tularosa (MINDA)	Otero FMU 18	392672	3660527	Occupied during the week 1,200-gallon tank
10. Andre	Dona Ana FMU 5	360374	3637562	Rarely occupied
5. EMRE	Dona Ana FMU 7	358946	3593360	Occupied during the week 2 15-gallon tanks
8. Frequency (Holloman)	Otero FMU 5	392754	3631501	Occupied during the week 8,000-gallon tank
2. Frequency WS (Oasis Site)	Dona Ana FMU 3	368762	3582830	Occupied during the week 12,000-gallon tank
12. J-9	Otero FMU 17	392099	3658875	Rarely occupied 3,000-gallon tank
18. Rhodes Commo	Sierra FMU 16	361124	3670077	Occupied during the week 1,500-gallon tank
11. Tula G	Otero FMU 17	389595	3660535	Rarely occupied
15. Tula Gate	Otero FMU 18	394111	3660393	Periodically occupied
33. Ben Site	Socorro FMU 31	368149	3711082	Rarely occupied

	County and FMU	**UTM Easting** Zone 13S	**UTM Northing**	**Notes-**Updated information since 2018 on water sources is in Bold Type and is current to 8/3/2022.
Wildlife Water Developments Available for Engine Fill				
46. Baca Well	Socorro FMU 35	379240	3736205	Solar well w/8' dia. tire trough (500 Gal.) railroad car storage tank-10,000 gal.
34. Ben Site Well	Socorro FMU 31	368257	3711127	Solar well w/earthen holding tank
20. Buckhorn Well	Sierra FMU 23	338593	3685630	Solar well w/earthen holding tank **Non-functional.**
28. Burris Well	Sierra FMU 25	365513	3700606	Solar well w/8' dia. tire trough (500 gal.) polyethylene storage tank-1550 gal. **Non-functional.**
6. Emre Well	Doña Ana FMU 7	357668	3593897	Solar well w/fiberglass tank (1,000 gal.) railroad car storage tank-10,000 gal. **Non-functional.**
41. Greens Babber Well	Socorro FMU 32	356629	3727213	Solar well w/earthen tank and polyethylene storage tank-1550 gal. **Non-functional.**
19. Hardin Ranch Well	Sierra FMU 22	339294	3679224	Solar well w/earthen tank and Storage tank-polyethylene-1550 gal.
22. John Woods Well	Sierra FMU 22	345894	3686139	Solar well w/fiberglass 10' tank (1,000 gal.) and polyethylene tank-1550 gal.
23. L.W. Well	Sierra FMU 21	352233	3689614	Solar well w/earthen tank and railroad car storage-10,000 gal. **Non-functional.**
4. Lena Cox Well	Doña Ana FMU 7	356618	3592269	Solar well w/8' dia. Tire trough (500 gal.) and railroad car storage-10,000 gal. **Non-functional.**
30.Marcial/Anderson Well	Socorro FMU 23	343401	3705770	Solar well w/earthen tank and railroad car storage-10,000 gal.
27. Martin Well	Sierra FMU 25	354841	3696603	Solar well w/tire trough-8' dia. (500 gal.) and polyethylene storage tank-1550 gal.
48. NECI Well	Socorro FMU 32	351405	3741571	Solar well w/tire trough 8' dia. (500 gal.) and polyethylene storage tank-1550 gal.
21. Pete Woods Well	Sierra FMU 22	342695	3682051	Solar well w/earthen tank and polyethylene storage tank-1550 gal.
16. Potter Ranch/Towner Well	Sierra FMU 16	344048	3671718	Solar well w/tire trough 8' dia. (500 gal.) and railroad car storage-10,000 gal. **Non-functional.**
42. Red Canyon Well	Socorro FMU 28	395177	3731129	Solar well w/tire trough 8' dia. (500 gal.) and polyethylene storage tank-1550 gal.

	County and FMU	**UTM Easting** Zone 13S	**UTM Northing**	**Notes-**Updated information since 2018 on water sources is in Bold Type and is current to 8/3/2022.
47. Red Rio Well	Socorro FMU 36	382476	3738675	Solar well w/tire trough 8' dia. (500 gal.) and polyethylene storage tank-1550 gal. **Non-functional.**

WHITE SANDS MISSILE RANGE

Firefighting Water Sources

11/6/2017

Water Source Type

- Construction Well
- Hauled Water Tank
- Truck Filling
- Wildlife Water Tank

NUM	TYPE	NAME
1	Truck Filling	Main Post Water Point #1
2	Hauled Water Tank	Frequency WS (Oasis Site)
3	Truck Filling	Main Post Water Point #2
4	Wildlife Water Tank	Lena Cox Well
5	Hauled Water Tank	EMRE
6	Wildlife Water Tank	EMRE Well
7	Construction Well	Thel-1 (aka THEL Well) (NMOSE T-03634)
8	Hauled Water Tank	Frequency (Holloman AFB)
9	Construction Well	NW30-1 (aka NW-30)
10	Hauled Water Tank	Andre
11	Hauled Water Tank	Tula G
12	Hauled Water Tank	J-9
13	Construction Well	Tula Gate (NMOSE T-04087)
14	Hauled Water Tank	Tularosa (MINDA)
15	Hauled Water Tank	Tula Gate
16	Wildlife Water Tank	Potter Ranch/Towner Well
17	Construction Well	Herbie Well (aka Rhodes C or Well 6)
18	Hauled Water Tank	Rhodes Commo
19	Wildlife Water Tank	Hardin Ranch Well
20	Wildlife Water Tank	Buckhorn Well
21	Wildlife Water Tank	Pete Woods Well
22	Wildlife Water Tank	John Woods Well
23	Wildlife Water Tank	L.W. Well
24	Hauled Water Tank	Salinas NewTec
25	Hauled Water Tank	Salinas Commo
26	Hauled Water Tank	Russ Site
27	Wildlife Water Tank	Martin Well
28	Wildlife Water Tank	Burris Well
29	Hauled Water Tank	Phillips Hill
30	Wildlife Water Tank	Marcial/Anderson Well
31	Construction Well	Range Road 5 Well
32	Construction Well	Martin Ranch Construction Well
33	Hauled Water Tank	Ben Site
34	Wildlife Water Tank	Ben Site Well
35	Hauled Water Tank	Oscura RC Commo
36	Construction Well	ORC Fire (aka Oscura Range Ctr.)
37	Hauled Water Tank	Oscura RC Bombing Range
38	Construction Well	Murray Well (RG 80492)
39	Hauled Water Tank	Aerial Cable
40	Hauled Water Tank	PHETS/DTRA
41	Wildlife Water Tank	Greens Baber Well
42	Wildlife Water Tank	Red Canyon Well
43	Hauled Water Tank	Atom Peak SST
44	Hauled Water Tank	NOP Barracks (Hilton)
45	Hauled Water Tank	NOP (North Oscura Center Range)
46	Wildlife Water Tank	Baca Well
47	Wildlife Water Tank	Red Rio Well
48	Wildlife Water Tank	NECI Well
49	Truck Filling	SRC Non-Potable water filling station

5 2.5 0 5 Miles

10 5 0 10 Kilometers

Produced by the GIS Team for the Directorate of Public Works, White Sands Missile Range.

No warranty is made by the White Sands Missile Range as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data, or for purposes not intended by WSMR. Spatial information may not meet National Map Accuracy Standards. This information may be updated without notice.

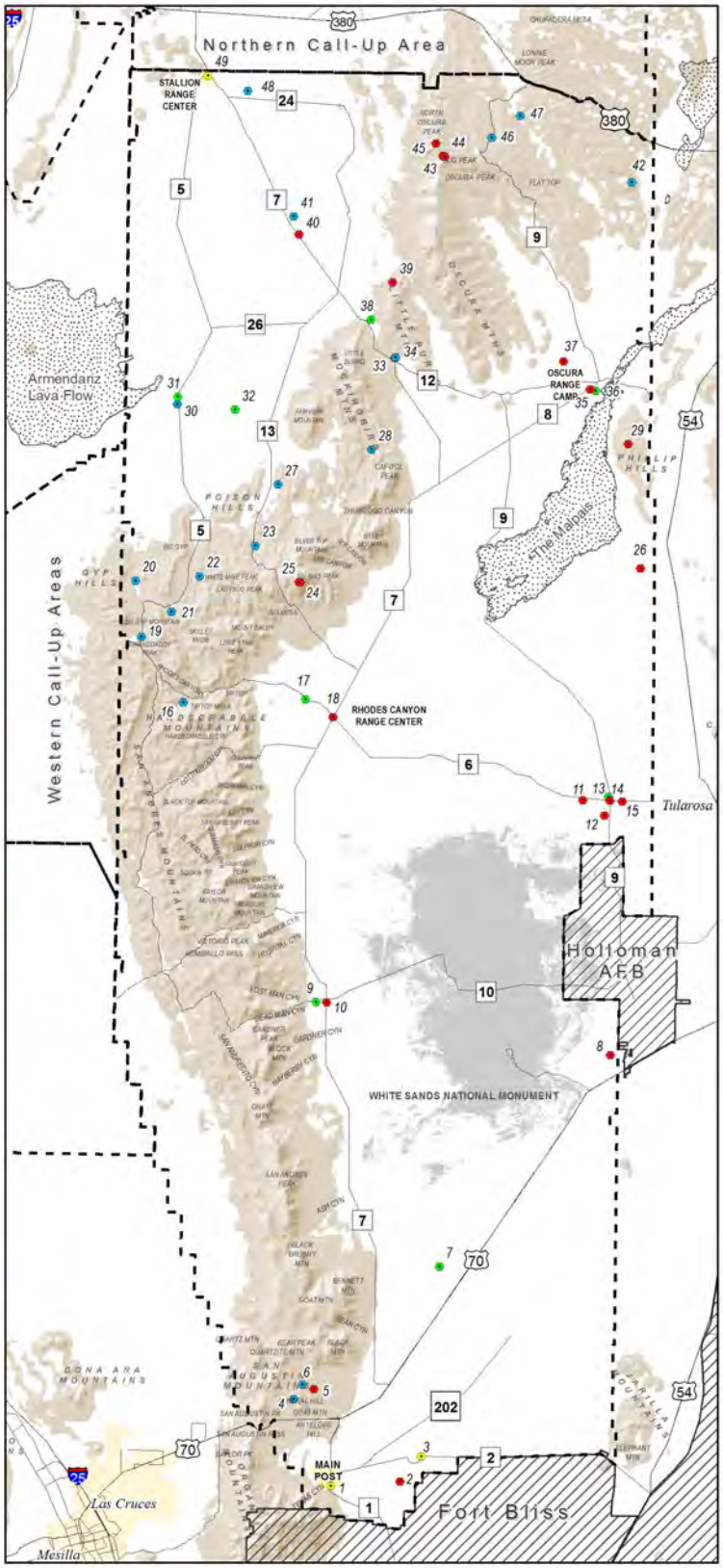

Figure 4.1 - Potential Water Fill Sites for Firefighting Purposes on WSMR

4.7 Rehabilitation Needs and Procedures

Very few areas within WSMR will require rehabilitation after a wildfire. Seeding of burned areas with native grass seed is common practice in many areas but is generally unnecessary on WSMR. The vegetation found across WSMR has evolved with wildfire and, in general, recovers quickly after being burned (3-5 years being typical for native grasslands).

Ground disturbances such as hand lines or bulldozer lines caused by firefighting efforts should be restored, as much as possible, back to original condition. Firelines that were created by scraping should be covered up with previously cut brush, rocks, and sticks. Water bars should be placed on disturbed slopes. Place water bars at a 30˚ angle to the scraped fireline so that water is carried off of the disturbed area and into undisturbed vegetation. Place water bars so that there is one for every 6-ft rise in elevation. Use of bulldozers should be discouraged except around structures because the disturbance caused by heavy equipment usually is more pronounced and lasts far longer than the disturbance caused by a wildfire. See **Appendix H** for rehabilitation guidelines.

Soil erosion can be a problem after a severe wildfire if it burns through steep country. Water diversions—made by placing sticks or logs parallel to the contours of the slope and staking them down—are useful in trapping sediment and limiting soil erosion. Aerial or hand seeding of native grasses can help severely burned areas recover more quickly, but costs can be prohibitive. Be careful using seed: minimize the chances of introducing non-native or invasive weeds or grasses; only order seeds from sources that certify their seeds to be at least 98% weed-free and are mixtures of plants that are adapted to the area and elevation. Canyon and arroyo bottoms can benefit from gabion structures designed to slow down water flow. Place boulders, logs, and cut brush into gullies to help slow down the movement of water and trap sediment.

4.8 Communications

Handheld and mobile two-way radios are the most common form of communications for wildland fires. WSMR has programmable radios for WSMR FES firefighters that are compatible with local Fire Departments and VFDs, BLM, NMSF, USFWS, and USFS to communicate with these and other agencies. Cell phones should not be strictly relied on in the wildland environment of WSMR as coverage is unavailable in many areas. The following are communication SOPs for wildland firefighters:

- All WSMR personnel assigned to wildfire suppression duties will carry a radio, or they will remain in vocal contact with someone that has a radio.
- All fire-assigned personnel will be familiar with the controls of the radio and must be able to communicate common wildfire principles, tactics, and operational procedures in clear text.
- Radio communications on each wildfire incident will have an assigned frequency that will be made known to all fire-responding personnel.
- Radios should be checked for battery charge and proper frequency set before engaging in wildfire operations.
- Over-the-air transmissions should be kept short, and messages should be transmitted in a clear, methodical tone.
- Important safety and tactical messages should receive affirmation and acknowledgement.
- WSMR FES Rescue Control will monitor fire-assigned frequency and be able to always transmit information to fire resources.

4.9 Equipment

Table 4.3 - WSMR FES Wildland Firefighting Equipment

Equipment Call Sign	Water Tender	Type 6	Structure
Engine 1	NA	NA	**1,000 GPM, * 300 gal.*, 4 personnel**
Engine 2	NA	NA	**1,000 GPM, 300 gal., 4 personnel**
Engine 3	NA	NA	**1,000 GPM, 300 gal., 4 personnel**
Engine 4	NA	NA	**1,000 GPM, 300 gal., 4 personnel**
Wildland 1	NA	**150 GPM 250 gal. 2 personnel**	NA
Wildland 2	NA	**150 GPM 250 gal. 2 personnel**	NA
Wildland 3	NA	**150 GPM 250 gal. 2 personnel**	NA
Wildland 4	NA	**150 GPM 250 gal. 2 personnel**	NA
Attack 1 (Humvee)	NA	**150 GPM 250 gal. 2 personnel**	NA
Attack 2 (Humvee)	NA	**150 GPM 250 gal. 2 personnel**	NA
Attack 3 (Humvee)	NA	**150 GPM 250 gal. 2 personnel**	NA

Equipment Call Sign	Water Tender	Type 6	Structure
Attack 4 (Humvee)	NA	**150 GPM 250 gal. 2 personnel**	NA
Tender 1 (tactical Type 2)	**500 GPM, 1,800 gal.**	NA	NA
Tender 2 (support Type 2)	**1,250 GPM, 3,000 gal.**	NA	NA
HEWATT 3 (tactical Type 1)	**500 GPM, 2,500 gal.**	NA	NA
HEWATT 4 (tactical Type 1)	**500 GPM, 2,500 gal.**	NA	NA

*GPM-Gallons per Minute
*Numbers are in US gallons

Support Vehicles	4x4
Chief 1	YES
Chief 2	YES
Fire Prevention	YES
Training	YES
HELSTF panel truck	NO

Table 4.4 contains a list of mandatory personal equipment, clothing, and gear to be worn or carried by all firefighters when engaged in wildland fire operations on WSMR.

Table 4.4 - Mandatory Personal Protective Equipment for Wildland Fires

Equipment	Required when...
Hard hat	On the fireline
All leather, 8" high boots with slip and melt-resistant soles and heels. No steel toes.	On the fireline
Flame resistant clothing (Nomex pants and shirt) Sleeves should be rolled down.	On the fireline, in helicopters
Leather gloves	On the fireline

Equipment	Required when...
Eye (safety glasses), face (Nomex shroud), and neck protection (shroud or bandanna)	On the fireline
Fire Shelter	On the fireline
Hearing protection. American National Standards Institute (ANSI) approved ear plugs or earmuffs	When working with high noise-level firefighting equipment, such as helicopters, air tankers, chain saws, portable pumps, etc.
Chaps (required for chain saw operators and swampers)	When operating or swamping for chain saws
Dust/smoke mask	When necessary

4.10 Records and Reports

Guidance from AR 420-1 and DODI 6055.06 (DODI 2000) requires that a fire report be completed by WSMR FES personnel and forwarded to the National Fire Incident Reporting System (NFIRS). The Emergency Reporting System (ERS) is the automated software system that WSMR FES uses to record fire reports, record training, and report fires to NFIRS. Contact the DOD NFIRS Program Manager at the Naval Safety Center, 375 A Street, Norfolk, VA 23511-4399, or at https://nfirs.fema.gov/ for technical assistance.

There is a new wildland fire reporting system for the Army called the Wildland Fire Management Application (WFMAP). The system requires log-in with a username and password. For additional information contact: cemml_fire_support@mail.colostate.edu. Currently, WSP-E is entering wildland fires into this database.

WSP-E should receive a copy of each wildfire report along with any other data (including GPS points) to update and maintain the wildfire record database for WSMR.

The WSMR Fire Chief is responsible for tracking NFPA/NWCG standards for WSMR FES firefighters.

4.11 Public Relations and Cooperator Notifications

The WSMR PAO will be notified at 575 678-1134 and integrated into the incident operations whenever wildfires escape initial attack, when wildfires are near WSMR boundaries or near dwellings, and whenever RX events are planned. WSMR PAO maintains a contact list of media outlets in order to get information out to the public quickly. This helps to inform and assure the public that the incident is under control or that efforts to control the incident are under way. Whenever wildfires threaten to cross installation boundaries, close coordination between WSMR FES and WFPM, WSMR PAO, the federal wildland firefighting agencies, municipal and volunteer fire departments, the affected public, and private landowners must occur. Table 4.5 lists cooperators that can assist WSMR with wildland fire management both on and off-range (list may not be all-inclusive).

Table 4.5 - WSMR Wildland Fire Cooperators

WSMR Fire Dispatch (Rescue Control) and Police	575 678-1234
WSMR PAO	575 678-1134
WSMR Fire Station #1-Main Post	575 678-0470
WSMR Fire Station #2-LC-38	575 678-9128

WSMR Fire Station #3-Stallion Range Center	575 679-4434
WSMR Fire Station #4-HELSTF	575 679-5167
WSMR FES	575 678-5105
WSMR FES Fire Chief	575 678-0314
WSMR Fire Prevention and Inspections	575 678-3585
WSMR Range Control	575 678-2222/2221
WSMR Range Scheduling	575 678-6141/6142/6144
Holloman AFB Fire Dept.	575 752-7228
Holloman AFB PAO	575 572-5406
Rich Bedgood, Deputy Range Manager	575-572-5074
Holloman Range Operations Center (ROC)	575 572-5716
Fort Bliss PAO	915 744-8435/8406
Fort Bliss Fire Dispatch	915 744-1283/2115
McGregor Range Control/Range Operations	915 744-9546/9547/9548/9554
Silver City Interagency Dispatch Center	575 538-5371/5372
Alamogordo Interagency Fire Dispatch Center	575 437-2286 or 877-695-1663
Las Cruces District-BLM	575 525-4300
Pecos District-BLM Roswell	575 627-0272
Carlsbad Field Office-BLM	575 234-5972
Socorro Field Office-BLM	575 835-0412
Lincoln National Forest-US Forest Service	575 434-7200
Cherokee Range Control	575 678-8000
San Andres National Wildlife Refuge	575 382-5047
USFWS NM Fire District	575 835-0040
Jornada Research Center	575 646-4842
NASA-WSTF Emergency Management Coordinator	575 524-5338
NASA-WSTF Fire Department	575 524-5641
NM State Police	575 827-9309
NM Air Quality Bureau	800 224-7009
NM State Forestry-Capitan District	575 354-2231
NM State Forestry-Socorro District	575 835-9452
El Paso Municipal Fire Department	915 485-5600
Alamo West Volunteer FD	575 434-3686
Las Cruces Municipal Fire Department	575 528-3473
Talavera sub-station (LCFD)	575 532-5532
Organ Volunteer FD	575 382-5411

Mescalero Forestry-BIA	575 464-4410
Dona Ana County Fire and Emergency Services	575 647-7921
Otero County Emergency Svc Dispatch	575-885-2111
Sierra County Emergency Management	575 894-6215
Socorro County Emergency Management	575 835-2700
Lincoln County Emergency Management	575 336-8600
National Weather Service-Santa Teresa Office	575 589-4088

4.12 Interagency Cooperation

Wildland firefighters require the cooperation of multiple agencies: the NWS, whose local offices produce daily fire weather forecasts; the USFS, which maintains a fleet of aerial firefighting resources including lead planes, aerial supervision platforms, air tankers, and smokejumper aircraft and helicopters; the BLM, which usually has the nearest available engines and overhead; and the ADC, which is open year-round for aid in ordering crews, overhead, equipment, and aircraft. These assets are available to all wildland fire management agencies. The IC has the authority to order interagency resources as needed for WSMR wildfires. The order is placed through Rescue Control, who will contact ADC as appropriate.

ADC covers wildfire responses throughout southeast New Mexico and most of west Texas (also called Pecos Zone) and includes all WSMR lands. A common FM frequency monitored by ADC and a good frequency for WSMR firefighters to use when attempting to contact ADC is FM RX freq. 168.575, channel guard 192.8, TX freq. 166.875, and channel guard 136.5.

Interagency aircraft dispatched by ADC and responding to wildfires on WSMR or requesting to enter WSMR airspace must contact Cherokee Range Control at 575 678-8000 or by radio on VHF frequency 126.95 or UHF 305.5. If no answer, call Holloman Approach (RAPCON) on VHF 120.6 or UHF 269.225 for clearance to access WSMR airspace.

WSMR will pursue an MOA with ADC. This agreement would include guidance and protocols for communicating with ADC and ordering equipment, manpower, and aircraft. This MOA could aid WSMR when wildfires threaten the installation's resources or boundaries by quickly being able to obtain outside firefighting resources, including engines, hand crews, air tankers, helicopters, lead planes, and ASMs.

4.12.1 Coordination between WSMR FES and Holloman AFB

Holloman Air Force Base (HAFB) controls ground access and air operations at the Red Rio Bombing Range and at Oscura Bombing Range—both of which are in the northeast portion of WSMR. HAFB maintains bladed firebreaks around both impact areas. HAFB relies on WSMR FES personnel for any fire suppression activities outside their system of maintained firebreaks. As mentioned previously, wildfires are not fought within impact area boundaries. HAFB maintains a contract for a Type 4 engine with two personnel along with a 1,000-gal tactical water tender at the Oscura Bombing Range when bombing missions are occurring. These assets are available for firefighting outside the boundaries of Oscura Bombing Range.

SRC Station #3 personnel respond to wildfires at Red Rio Range. Gates are locked by HAFB at the two primary access points to Red Rio Range. There is a telephone in a box at each of these gate locations that connects directly to HAFB ROC. The telephones must be turned on before a call can be made to ROC for the gate combination and permission to enter Red Rio Bombing Range. The ROC is manned 100 hours/week on average and always when missions are occurring on Red Rio Range. HAFB maintains a camera network around the two Bombing Ranges that can be helpful in spotting wildfires in their vicinity. The camera network has both visible and infrared detection

cameras. HAFB employs a Range Officer that is ICT4-qualified and drives a 100-gal Type 6 engine that can be used for wildfires at Red Rio Range (Contact Richard Bedgood, Deputy Range Manager 575-572-5074).

It is recommended that HAFB ROC give WSMR FES their radio frequency for maintaining direct radio communications at Red Rio. WSMR FES should utilize this frequency whenever they are responding to wildfires at Red Rio to facilitate safety, for ensuring Red Rio Range is closed to AF flight missions and open for wildfire operations, and for coordinating their wildfire response (Pers. comm., Gary Atwell).

4.13 WSMR Prescribed Fire Management

Prescribed fire (RX) is the controlled application of fire to wildland fuels under specified conditions that limits the fire spread to a predetermined area and, at the same time, produces the desired intensity necessary to achieve resource management objectives. WSMR RXs are ignited and conducted only if environmental conditions are within the parameters of an authorized RX plan. RX plan prescriptions can be used to establish connections between ecosystem management objectives, military objectives, and firefighting objectives. This process helps to achieve mutual goals and objectives and improves program efficiency. Prior to implementing a RX, WSMR burn plan preparers must have ensured compliance with NEPA, NHPA, and ESA requirements.

On WSMR, there are two recognized types of RXs. The first falls under the guidance of the Sustainable Range Program Activities for Environmental Programs (Management Decision Execution Package [MDEP] VENQ) and is for the purpose of ecosystem management and for the protection or benefit of listed or proposed threatened or endangered species. The second type of RX falls under the guidance of the Sustainable Range Program Activities for Facilities (MDEP QMUN) and is for the purpose of vegetation control and fuels reduction in order to protect people, property, equipment, or mission capability (Sustainable Range Program [SRP] 2005).

Prior to 2018, WSMR has completed RX projects, including the Strawberry Peak RX, Trail Canyon RX, Cain Well RX, Big Gyp RX, and the Bingham Smith RX. These burns were completed for the purpose of meeting ecosystem management objectives. Future RX projects for meeting ecosystem management goals and objectives—including more burning in the previous RX areas—are being planned for, and burn plans have been written for Rosebud Canyon (San Andres Mountains), northern Bear Den Canyon (San Andres Mountains), and the Oscura Mountains and Foothills (Table 4.6). Future RXs for fuels reduction projects designed to protect people and facilities are planned and are listed after the San Andres Mountains burn in Table 4.6.

The *NWCG Standards for Prescribed Fire Planning and Implementation* (PMS 484; NWCG 2014) provides interagency RX plan guidance and a burn plan template (https://www.nwcg.gov/publications/484).

Table 4.6 - WSMR Prescribed Fire Projects and Accomplishments

Prescribed Burn (RX) Projects	Frequency	Size (Acres)	Comments	FMU
Trail Canyon	10-15 Yrs.	1000	Three engines, 1 water tender, 2 UTVs, 12-15 personnel, 1 day to implement.	34
Cain Well	5-10 Yrs.	1,500	Two engines, 1 water tender, 2 UTVs, 12-15 personnel, 1 day burn.	33
Helm's Valley	10-12 Yrs.	150	Three engines, 1 water tender, 2 UTVs, 10-15 personnel, 1–2-day burn.	30
Big Gyp	10-15 Yrs.	2,500	Three engines, 1 water tender, 2 UTVs, 10-15 personnel needed to burn along roads, firebreaks, and hand lines; multi-day project (2-4 days to implement fully).	23
Strawberry Peak	15-20 Yrs.	2,500	Three engines, 1 water tender, 2 UTVs, 10-15 personnel needed to burn along roads, firebreaks, and hand lines; multi-day project (2-4 days to implement fully).	15
Bingham Smith	10-12 Yrs.	200	Two engines, 1 water tender, 2 UTVs, 8-12 personnel, 1 day burn.	34
Hunter's Lodge	5-15 Yrs.	6,000	Three engines, 1 helicopter, 1 water tender, 2 UTVs, 12-20 personnel, 1-3 days to implement.	30,35,36
Rhodes Canyon	10-12 Yrs.	2,000	Two engines, 1 water tender, 2 UTVs, 6-10 personnel, 1 day burn.	22
Oscura Mountains and Foothills	As Needed	100	Piled or lop and scattered fuels for extending firebreak around facilities. Two engines, 1 water tender, 2 UTVs, 10-15 personnel, 1 day burn.	30,35
Silvertop Mountain	As Needed	3,500	Two engines, 1 helicopter, 1 water tender, 2 UTVs, 12-15 personnel, 1–3-day burn.	21
Sheep Mountain	As Needed	6,000	Two engines, 1 helicopter, 1 water tender, 2 UTVs, 12-15 personnel, 1–3-day burn.	21
San Andres Mountains Mule Deer habitat Enhancement	10-15 Yrs	10,500	This is a multi-year project of prescribed burning in strategic locations to reduce decadent shrubs and increase browse. Two engines, 2 UTVs, 10-15 personnel are needed for 3 days over 3-5 years to fully implement.	12-16

Prescribed Burn (RX) Projects	Frequency	Size (Acres)	Comments	FMU
WUI fuels reduction (programmatic prescribed fire plan to include all the facilities on WSMR)	As Needed		This will be an annual fire prevention program to lessen hazardous fuels around structures, compounds with fences, historical sites, and outside of impact areas. Activity will include scraping around improvements, piling of hazard fuels and burning those piles and/or burning along firelines and fence rows as needed.	ALL
Totals		**35,650**		

Prescribed Fire Accomplishments 2019-2022	Date	Acres Burned
Hunter's Lodge	Apr 2019	2,177
Hunter's Lodge (Bruton Canyon)	Apr 2021	237
Helm's Valley	Apr 2021	1,556
Helm's Valley	Mar 2022	1,041
Yates Valley	Mar 2022	550
Total Acres Burned	**2019-2020**	5,561

4.13.1 Prescribed Fire Objectives

- RX program will support WSMR's primary military test mission. The program would result in no net loss of mission time from a RX. All RXs would use firebreak roads and reduce combustible fuels within the designated area by 60-90%.
- The RX program will support ecosystem management goals. RX would be used to restore natural fire regimes on 2,000-12,000 acres/year for a total of 40,000 acres of various vegetation cover types over 15 years to control encroachment of shrubs in grasslands and regenerate trees and desirable shrubs in woodlands, etc., without altering soil chemistry or natural fire regimes.
- Use RX to assist in the control of undesired invasive/exotic plant species.
- Enhance forest health dynamics and reduce potential for crown-driven wildfires by mechanical fuels reduction and prescribed burning within piñon-juniper woodland ecosystems to diversify age structure and reduce closed stand densities while creating mosaic patterns of burned and unburned patches that are important to both wildlife and vegetative diversity.
- Establish a professional wildland firefighting contingent within WSMR FES that can manage WSMR RXs as part of their duties. The use of outside resources to implement RXs is costly and creates logistical problems when needing to feed, transport, and house extra firefighters. The use of trained WSMR FES personnel will not only enhance training opportunities but it will also open windows to implement RXs because FES personnel are available when WSMR is mission-free. WSMR FES personnel will also be available when burning weather and fuel moisture conditions are favorable and within burn plan prescriptions.

4.13.2 Prescribed Fire Constraints

The following are factors that may limit, may require additional mitigations, or may delay the use of RX on WSMR:

- Military and contractor testing is the priority for WSMR over all other projects. Getting the project into the Range Schedule and blocking out a few days is imperative. Burning within the required weather and fuel conditions dictated by a burn plan prescription while working within a limited window around testing missions is a challenge. Flexibility is important for burn managers and firefighters as weather and testing missions will change frequently and suddenly. Small RX projects with simple logistical needs that can be executed in a single burning period are more likely to be completed than large, complex multiple-day burns.
- Long-term drought conditions put additional stress on plants to the point that RX treatments may cause undesired mortality within vegetative communities. This is particularly true in grassland ecosystems where moisture must be sufficient either pre- or post-RX to enable desirable native grasses to recover. Burn managers use long-term weather forecasts and limit burn activities when there are long-term drought indications.
- WSMR complies with all EPA regulations and adheres to the state of New Mexico Environment Department's (NMED) Air Quality Bureau (AQB) requirements for air pollution and smoke generation. All prescribed burns planned on WSMR must be registered with the NMED AQB (http://www.nmenv.state.nm.us/aqb). The NMED AQB relies on smoke ventilation forecasts from the local offices of the NWS and upon the smoke mitigation techniques that are written into RX plans to base decisions on whether or not permitted burns will be allowed to occur. WSMR must request a waiver from the NMED AQB if attempting to burn during NWS forecasts for poor or fair smoke ventilation conditions. Waiver requests are more likely to be granted when WSMR prescribed burns are located far from human populations and when smoke mitigation techniques are included within the RX plan. Many days in the wintertime on WSMR have NWS ventilation forecasts rated poor or fair smoke ventilation, which limits RX acres.
- RX projects usually require months of preparation, coordination, and planning prior to implementation. All RX projects require a detailed written plan. WSMR RX plans must meet compliance with NEPA, the NHPA, and the ESA (NWCG 2014). WSMR WSP-E resource professionals have the expertise in archaeology, wildlife biology, and NEPA requirements to help ensure that RX plans meet mandated environmental regulations.
- Required contingency resources (usually wildland fire engines) from other agencies must be available in order to execute a RX, but they may not be available due to higher needs in other places. If contingency resources are unavailable for the planned RX, then the project will be delayed until contingency resources are available.
- In order to implement and lead WSMR RX projects, a RX Burn Boss is required. Burn Bosses must meet NWCG requirements for the position. It generally takes at minimum 3-4 years of RX experience and additional RX training for an individual to obtain the necessary abilities, skills, and knowledge to qualify as an RXB2. Optimally, WSMR would have two RXB2-qualified individuals for implementing future RX projects.

4.13.3 Prescribed Fire Plans

The ***Prescribed Fire Plan (RX Plan)*** is the site-specific implementation document. It is a legal document that provides the WFPM and the GC the information needed to approve the plan and provides the RX Burn Boss with all the information needed to implement the RX. RX Plans describe the project area, burn objectives, fuel loads and vegetative conditions, desired outcomes, and the conditions (prescription) necessary to achieve the desired results. The level of detail in a burn plan is commensurate with the project complexity (NWCG 2014).

An interagency template will be used for RX Plans implemented on WSMR. See https://www.nwcg.gov/publications/484 for the *Prescribed Fire Planning and Implementation Procedures Guide* (PMS 484; NWCG 2014) and for the fill-able format Interagency Prescribed Fire Plan template. Each element must be addressed and then assembled in the sequence identified in the template. Should an element not apply to a specific RX Plan, not applicable (N/A) may be utilized. Programmatic plans for multiple burns under like conditions may be appropriate. Additional information may be added as appendices. Use of the RX Plan template assures

that WSMR burn plans will meet the criteria required for other agencies' personnel to be used in the implementation of the project—including the use of other agencies' burn bosses.

When changes to a RX Plan are necessary, the plan must be amended to identify the affected sections, the reason for the change(s), and have the changes clearly identified. Amendments take place before ignition. Amendments to the RX Plan require GC approval and signature. RX Plan amendments must consider affects to the complexity of the RX, and therefore the final complexity rating must be reviewed, and a new complexity analysis performed if the proposed amendment(s) will result in a change to the Risk or Technical Difficulty of one or more elements in the complexity analysis. Common reasons for amending the RX Plan may include:

- Changes or corrections to objectives.
- Changes in the RX Plan that may affect complexity determinations.
- Changes to fire behavior prescription parameters.
- Changes to project area boundaries resulting in either an increase or decrease in the project area.
- Changes in the minimum required resources or capabilities identified in the plan.

4.13.4 Notifications and Coordination

WSMR RX proponents will coordinate with the WFPM for project management and implementation. The WFPM will work with the proponent and WSP-E to complete a RX plan for the proposed project. The WFPM will notify and inform the GC of the proposed RX project. If the proposed project is near the boundaries of WSMR, adjoining fire departments, landowners, and land management agencies will be notified for their input into the RX Plan. WSMR WSP-E and FES will work together to make these notifications. Neighboring fire departments that have existing MAAs with WSMR should be requested to help with the implementation of the project. This fosters good working relationships and helps to train all involved personnel in wildland fire operations.

Coordination through Range Operations (575 678-2400) and their subordinate commands—Range Control (575 678-2222) and Range Scheduling (575 678-6141/6142/6144)—must occur. Advance notification of 1-3 months is necessary for Range Scheduling to be able to block time for implementing the RX project.

Land management agencies such as the USFS and the BLM will often provide technical assistance and technical review of the fire plan and can also provide engines and overhead to help manage the burn. At the very least, outside agency engines can usually be listed as contingency resources to be called in the event the RX escapes its allowable burn perimeter and cannot be contained by onsite resources.

Every RX Plan must receive a technical review. The technical reviewer and RX Plan preparer must be qualified or have been previously qualified as a RX Burn Boss at an experience level equal to or higher than the complexity being reviewed. Either the technical reviewer or the RX Plan preparer must be current in their qualification, minus the physical fitness requirement. The plan preparer and the technical reviewer may not be the same person. Army installations may coordinate with external agencies to attain plan technical reviews. If an external agency is used to provide technical reviews of Army RX Plans, they must meet the appropriate RXB level based on the outcome of the complexity analysis (NWCG 2014).

The WSMR PAO (575 678-1134) must be notified once a RX is scheduled. They, in turn, will provide pre-burn, burn day, and post-burn information to installation command, the local media, and other external interested parties. ADC will receive a copy of the RX plan as part of the pre-burn notifications.

Signage on local highways stating a 'prescribed fire is in progress and smoke may be encountered' should be utilized as needed.

4.13.5 Smoke Management and Air Quality

Federal regulations specified by Section 118 of the Clean Air Act of 1997 as amended, require that all RX projects must comply with all applicable pollution control requirements. In New Mexico, the Clean Air Act is administered

by the NMED AQB (http://www.nmenv.state.nm.us/aqb). NMED AQB requires RXs to be conducted under specific conditions and to be registered with the state of New Mexico. RXs in excess of 10 acres per day or 1,000 cubic feet vegetation pile per day require upfront notification to NMED AQB by 10 AM one business day prior-to the planned burn. The notifications are submitted electronically to NMED, using the forms located at http://smoke.state.nm.us/ (NMED AQB 2016). The RX Burn Boss should complete the form and submit it to NMED, as applicable, with a paper-copy or scanned-copy of the form provided to the WSMR WSP-E-EC Air Quality Program Manager (Jorge A. Uribe, 575-678-7020). Regulatory reference: Smoke Management, NMAC 20.2.65 (NMED resource Rich Naden, 505-476-4330).

The only smoke-sensitive area on WSMR is the Main Post, where schools and a hospital exist. RX managers will consider wind direction and not allow ignitions if smoke could impact the Main Post or other populated areas outside of WSMR. Generally on WSMR, prevailing wind direction is from the southwest to northeast, which allows for smoke generation from most RXs to be transported away from populated areas of Las Cruces, the Rio Grande corridor, and the Main Post area of WSMR.

In order to assure that winds will be favorable for burning, RX Burn Bosses will request a spot weather forecast prior to ignitions. The NWS Office in Santa Teresa, NM (575 589-3972) accepts online requests for spot weather forecasts and will provide (in about an hour's time) a site-specific fire weather forecast covering the next 24 hours (https://www.weather.gov/epz/fireweather). This applies to WSMR lands in the following counties: Doña Ana, Sierra, and Otero. The north end of WSMR in Socorro County and Lincoln County is covered by the NWS office in Albuquerque and can be reached at (505 243-0702) or https://www.weather.gov/abq/forecasts-fireweather.

Outside of the Main Post area, WSMR has few limitations on the use of RX due to its remote nature. Still, WSMR fire managers must consider and mitigate smoke impacts when burning in the vicinity of the following areas:

- Communities, due to their proximities to WSMR boundaries. This includes the communities of Organ, Orogrande, HAFB, Tularosa, and the Main Post at WSMR.
- The main travel corridors through WSMR—primarily US 70, US 380, and US 54—where travelers could be affected by smoke.
- WSMR military and contractor facilities, Range Centers, and testing complexes in the Tularosa Basin and Jornada del Muerto Basin.
- Scattered ranches, recreational facilities, and residences near WSMR's boundaries.

RX Burn Bosses will utilize numerous mitigation techniques to reduce emissions and impacts of smoke to humans from RXs. These mitigation techniques include:

- When burning near smoke receptor sites of communities, highways, facilities, or residences, use weather forecasts to predict wind direction, and only burn when winds are favorable to carry smoke away from populated areas.
- Check the burn area for combustible human trash and refuse. Remove, when possible, to minimize toxic emissions.
- Be aware of conditions capable of creating higher levels of emissions, such as high fuel moistures, high ground-level wind speeds, temperature inversions, and stable atmospheric conditions.
- Rotate burn crews in and out of high smoke exposure situations.
- Keep crews upwind of fire and smoke whenever possible.
- Limit burns during inversions and stable atmospheric conditions to a few hours during the middle of the day.
- Utilize spot weather forecasts on the day of the burn and update forecasts throughout the burn.
- Utilize backing fires to lessen the impacts of smoke.
- Monitor dispersal of smoke throughout the burn.
- If smoke becomes problematic, initiate termination of the burn.

- Utilize WSMR PAO to contact local and regional agencies, newspapers, radio stations, etc., before the burn. This gives those individuals with respiratory ailments the opportunity to leave the vicinity before the burn begins.
- If the burn is near major roads or facilities, initiate mop-up as soon as possible to lessen the impacts of smoke on visibility and human health.
- Keep records on smoke direction, thickness, and dispersion during and after the burn until all smoke has dissipated.
- Minimize nighttime burning.
- Conduct awareness training for firefighters on the dangers of smoke exposure.

4.13.6 Use of Fire Breaks

Firebreaks and fuel breaks are the best places to begin igniting prescribed burns because they facilitate egress along an escape route to a safety zone and they facilitate wildland fire engines' ability to move up and down the fire's edge to keep the burn under control. Firebreaks are man-made or natural barriers to wildfire spread. WSMR has a system of roads, many of which meet firebreak road standards of bladed or scraped road surface devoid of any flammable fuel for at least 8 ft across the top of the road. Two-track roads can act as firebreaks in light fuels such as grass and as long as the winds are favorable. Two-track roads need to be blacklined to be effective firebreaks.

4.13.7 Contingencies for Escapes

The RX Burn Boss has authority and responsibility to declare when a RX escapes its allowable burn perimeter and becomes a wildfire. Minor slopovers and small spot fires will not generate a declaration of a wildfire if contained quickly; however, if any slopovers or spot fires occur, all ignitions will be halted and all resources necessary to bring the slopover or spot fire under control will be utilized. Prescribed burning can resume, with added caution, once the slopover or spot fire is declared controlled by the Burn Boss.

A critical part of the planning process for utilizing RX is to have contingency resources identified and available if the RX escapes pre-planned boundaries. Contingency resources needed to bring the escaped burn under control must be aware of their pre-planned role. These resources do not need to be on scene, but they must be committed to being available to respond if needed. Land management agencies with wildland fire responsibilities are usually willing to provide contingency wildland engine resources. The Lincoln National Forest, Las Cruces District-BLM, Carlsbad Field Office-BLM, Socorro Field Office-BLM, and Mescalero BIA are good sources for WSMR contingency resources. Two to three engines are sufficient contingency resources for WSMR RXs. These resources must be within the regional geographic area and be listed in the burn plan.

Burn managers can contact ADC to enlist their aid in locating contingency resources and also to find out what types and numbers of ground and aerial assets are available in the region during the time of the planned burn, just in case they are needed.

4.13.8 Prescribed Fire Monitoring

RX monitoring is the collection and analysis of observations or measurements to evaluate changes in vegetation and to help determine whether management objectives are being met. Rx fires on WSMR should include funding for long-term monitoring. This means there should be plans for a pre-burn monitoring assessment that captures current fuel loads and vegetative composition and details the methods needed to capture post-fire vegetation composition and fuel load changes over a specific period of time.

During the RX, monitoring is required to assure the project stays within prescription. Assigned personnel monitor weather, fire behavior, and smoke dispersal during all phases of the project. Observed weather indices are also recorded and broadcast to RX personnel throughout the duration of the burn.

Pre- and post-fire vegetation monitoring methods range from the utilization of advanced technology (GIS, GPS, and remote sensing) to standard field monitoring methods (transects, quadrats, and photo points). WSMR

currently has an established program that utilizes standard 100-m fixed ***line-intercept*** range transects that measure species composition or bare ground at 1-m intervals both pre- and post-RX.

At a minimum on simple burn projects, WSMR natural resources staff should utilize fixed photo points to document changes in vegetation biomass, composition, and structure. Monitoring and documenting post-burn results and fire effects helps to determine if the RX objectives were met. Long-term monitoring (post-burn to 5 years) for vegetation response after RXs helps to determine if habitats are degrading or progressing towards a desired management objective.

4.13.9 Scheduling

Fall, winter, and early spring are ideal times to schedule RXs. Fuels are dormant and cured after the first heavy freeze and will help to carry the burn. Winds are usually lighter in the fall and winter when compared to spring; prolonged moisture events are rare. Firefighting resources are not usually committed to wildfires at this time of year and should be available to assist or list as contingency resources.

RX projects are scheduled for implementation with input from Range Scheduling (Phone # 575 678-6141, 6142, 6144) several weeks before the burn is planned. The best opportunities for scheduling RX projects and receiving authorization is on weekends because there will be fewer conflicts with WSMR test missions. Many of WSMRs test missions can occur simultaneously with the RX depending on fire location and the type of test being evaluated. If possible, schedule a block of at least five days to implement the burn. This will allow for burning around weather events that may take the RX out of prescription for a day or two.

4.13.10 Post-Prescribed Fire Reporting Requirements

The RX Burn Boss has the authority to declare the RX as "out" and reports this information to Rescue Control and Range Control. For WSMR RX projects, it is usually safe to declare the fire out 24 hours after the last smokes have been observed. Declaring the RX as out opens the area to normal traffic.

Every RX project that is accomplished on WSMR requires a post-burn narrative and report. The narrative is a concise record of what was accomplished, what was not accomplished that had been planned for, and a summary of the after-action review of what went right and what could have been done better from the firefighter's point of view. Along with the narrative, there will be a report that includes the following quantifiable information:

- Planned perimeter of RX in acres (taken from the burn plan)
- Actual perimeter of the RX in acres (computed from a GPS that recorded points around the actual burned perimeter)
- Percentage of planned burn that was actually burned
- ***Fire or burn severity*** estimate that includes a combination or percentage of the classes given below:
  1. **Unburned.**
  2. **Scorched.** Foliage is yellow; litter and surface vegetation are barely burned or singed.
  3. **Low severity.** Small diameter woody debris is consumed; some small twigs may remain. Leaf litter may be charred or consumed, and the surface of the duff may be charred. Original forms of surface materials—such as needle litter or lichens—may be visible; essentially no soil heating occurs.
  4. **Moderate severity.** Foliage, twigs, and the litter layer are consumed. The duff layer, rotten wood, and larger diameter woody debris is partially consumed; logs may be deeply charred; shallow ash layer and burned roots and rhizomes are present. Some heating of mineral soil may occur if the soil organic layer was thin.
  5. **High severity.** Deep ash layer is present; all or most organic matter is removed; essentially, all plant parts in the duff layer are consumed. Soil heating may be significant where large-diameter fuels or duff layers were consumed. The top layer of mineral soil may be changed in color; the layer below may be blackened from charring of organic matter in the soil.

Documentation for each RX implemented on WSMR will be maintained as project files for reference and review with recurring fire effects monitoring, routine program audit, and for potential legal or investigative review in the instance of an incident or loss resulting from RX implementation. Project files may be maintained electronically, as on a shared drive or SharePoint, and/or as hard copies in an office filing system. The NWCG standard (reference PMS 484; NWCG 2014) for minimum project file archive documentation includes the following:

- RX Plan (and amendments)
- Monitoring data, including weather, fire behavior, fire effects, and smoke dispersal observations
- Weather forecasts
- Notifications
- Documented RX organization(s)
- Any written agreements related to implementation
- All *Agency Administrator Ignition Authorization(s)*, ref. PMS 485
- All *Prescribed Fire Go/No-Go Checklist(s)*, ref. PMS 486
- After Action Review
- Incident action plans (if used as installation SOP)
- Unit log (ref ICS form 214)
- Actual ignition patterns and sequences used (can be included on ICS 214)
- Permits: air, burn, etc.
- Any installation-specific forms/records
- Final burn perimeter, progression, and/or accomplishment maps

4.14 Wildland Fire Safety and Risk Analysis

Appendix A Fire Management Units contains specific safety considerations for each of the 36 FMUs on WSMR, and these should be incorporated into risk analyses when wildfires occur.

The risk analysis process incorporates the number one priority for all wildland fire management activities, which is a commitment to provide for public and firefighter safety. With that commitment firmly in mind, risk management is the process used to assess the potential safety risks and hazards and weigh them against the potential benefits of any fire management activity. ***Risk management*** is defined as the process whereby management decisions are made and actions taken concerning the control of hazards and the acceptance of remaining risk. The risks involved with any fire activity must be identified, assessed, and mitigated (or eliminated) when possible and practicable. The remaining risk must be considered acceptable to everyone involved and be weighed for potential benefits during the management decision of continuing or discontinuing the activity.

WSMR should incorporate this five-step risk analysis and mitigation process:

Step 1 – Establish situational awareness.

Step 2 – Identify hazards and benefits and assess the risk.

Step 3 – Control, mitigate, or eliminate hazards.

Step 4 – Make go/no-go decision based on acceptability of remaining risk.

Step 5 – Evaluate effectiveness of hazard controls and continuously re-evaluate.

Always practice risk management to minimize firefighter exposure to inherent hazards in wildland fire operations while still accomplishing management objectives. The following list includes common hazards faced by wildland firefighters on WSMR:

- smoke inhalation
- burns from flames
- burns from skin contact with smoldering vegetation

- sharp cutting hand tools
- chainsaws
- mobile apparatus
- heavy equipment
- aircraft
- uneven footing on steep slopes
- loose, rolling rocks
- vegetation that has thorns or spines
- unseen stump holes filled with ash
- fire-weakened roots of trees that may fall at any time
- venomous insects and reptiles
- daytime/nighttime air temperature extremes
- dusty conditions
- night operations with limited visibility
- long working shifts leading to physical and mental fatigue
- low humidity and hot temperatures leading to dehydration
- UXO
- toxic waste and hazardous materials on fire
- structures surrounded by wildland fuels

Wildland fire safety is a process and a culture that must be promoted and communicated at every operational level. All wildland firefighters have a responsibility to provide for their own personal safety and have the right to refuse an assignment if they do not feel it is safe. All wildland firefighters should carry a Red Card, which certifies that they have received basic wildland fire safety and operational training. Wildland firefighters receive training that teaches them to use a common set of guidelines to help communicate important safety-related information. The first set of guidelines that every wildland firefighter must know and understand is ***LCES***. Along with LCES, the "***Standard Fire Orders",*** the "***18 Watch Out Situations***" and the "***Downhill Fireline Construction Checklist*****"** are common practices and safety considerations for all Red-Carded wildland firefighters. See **Appendix C** for further information or go to https://www.nwcg.gov/sites/default/files/publications/pms461.pdf for a copy of the latest Incident IRPG, which contains these safety guidelines. The IRPG is now an NWCG requirement for all wildland firefighters to have in their possession while on the fireline. Special safety and tactical considerations for fighting wildfires within the wildland/urban interface are detailed in **Appendix I.**

4.14.1 Unexploded Ordnance Safety

See **Appendix F The 3Rs for Explosives Safety for Firefighting Safety** (Recognize, Retreat, and Report) for further information or go to http://www.denix.osd.mil/uxo/SafetyTopics/Firefighting.cfm.

Firefighters will treat all UXO as if it were explosive. UXO poses a potential risk of injury or death to anyone in the vicinity (DOD 2004). UXO has the potential to be encountered anywhere on WSMR; however, UXO is much more likely to be encountered near impact areas.

Situational Awareness

- Early identification of potential UXO is the first and most important step in reducing risks posed by UXO.
- Many types of UXO may be encountered: Small arms munitions; projectiles; grenades; rockets; mortars; guided missiles; bombs; sub-munitions.
- UXO may be found fully intact or in fragments. All UXO—whether intact or in fragments—presents a potential hazard and should be treated as such.
- Deteriorated UXO presents a particular hazard because it may contain chemical agents that could become exposed.

Hazard Control

- If you see UXO, stop and do not move closer.
- Isolate and clearly mark the area, take a GPS point and take a photograph.
- Deny entry to others.
- Never transmit radio frequencies near UXO.
- Never remove anything near UXO.
- Never touch, move, or disturb UXO.
- Keep a minimum of 750 meters away from areas on fire that may contain suspected UXO of 155-mm or larger shells.
- Aircraft must maintain a minimum altitude of 550 m above ground level (AGL) or more above IAs that have received 155-mm munitions, including their associated safety buffer areas when wildfires are burning within their footprint.
- Report discovery of UXO to Range Operations and to your immediate supervisor.

5 Monitoring and Evaluation

The intent of this chapter is to document processes for determining whether the IWFMP is being implemented as planned and fire-related goals and objectives are being achieved. Information obtained from monitoring and evaluation is used to update the IWFMP and land management plans.

5.1 Hazard Fuels

WSMR uses the 40 Fuels Models developed by Burgan and the appropriate NWCG photo series to classify fuels for determining flammability and burn severity. Chapter 4 of this document has in-depth discussions of the fuels and their burn characteristics found on WSMR.

5.2 Treatment Effectiveness and Vegetative Response

WSMR has been capturing vegetative responses to fire for several years now. WSP-E maintains a database and spreadsheet that captures Line-intercept data on 300-m to 600-m transects. All RXs and large wildfires (>500 acres) receive five randomly placed transects that are measured annually for five years and then every five years thereafter for a span of 15 total years of data.

5.3 IWFMP Review and Reporting Requirements

The WSMR WFPM and WSP-E will ensure that the IWFMP receives yearly review and updates (DA 2021). WSMR will report annually on amount of acres burned by wildfire and prescribed burning; costs/impacts of fire on training/testing mission; amount of claims/asset loss/ complaints; IWFMP/INRMP compliance status; number and qualifications/level of certification of personnel available to support installation wildland fire management program; annual wildland fire training; known critical resource requirements; status of firebreak maintenance; other information as needed.

- The US Army's Office of Assistant Chief of Staff for Installation Management (OACSIM) will establish a uniform, consolidated annual reporting requirement that will be tasked through commands to installation WFPMs for annual program accomplishment reporting, needs assessment, and monitoring progression to attainment of NWCG training standard for personnel. Information gathered will inform Program Objective Memorandum (POM) development and prioritization of resource allocation.
- WSMR Fire Chief shall report annually the quantity, type, and status of wildland fire equipment available at the installation through commands to OACSIM.
- WSMR Fire Chief shall report the number and certification level of personnel comprising the wildland fire organization and specifically identify gaps in staffing and certification based on the organizational structure standard.
- All wildfires and RXs are reportable incidences regarding burn extent, personnel, and equipment support requirements. Army will provide a database of record, such as the WFMAP, to provide a central data collection, query, and information distribution system. The WSMR Fire Chief will ensure that all wildfires continue to be reported in the NFIRS and that the WFPM maintains prescribed and wildfire information within the installation database (DA 2021).

6 Wildland Fire Program Implementation and Resourcing

Effective wildland fire management on WSMR depends on adequate funding for the following program areas: ***fire prevention***, ***wildfire suppression***, and ***fuels management*** (including RX and mechanical fuels treatments). Funding for these program areas is an installation responsibility; it is pre-planned and based on prior years of funding and on how much of that money was executed within the program area. Requests for additional funding are made at the program execution level and require written justification and cost breakdown (Table 6.1).

Unplanned funding includes actual wildfire suppression costs. All operational costs incurred by WSMR resources to fight wildfires resulting from military activities, unknown causes, or on unimproved grounds are reimbursable and are charged to the WSP-O appropriated Army Management Structure (AMS) codes, the military unit causing the wildfire, or a combination of both (Table 6.1)(DA 2021).

Wildland fire management activities conducted for the purpose of ecosystem management and for compliance with environmental laws and regulations will be supported by MDEP VENQ and include recurring activities associated with mechanical fuels treatments and the use of prescribed burning for (a) conserving a species under the ESA when required by a biological opinion or Endangered Species Management Component (ESMC) when part of an approved INRMP and (b) invasive species control as required for ecosystem management. Wildland fire management for ecosystem management includes the use of wildland fire under prescribed conditions and the management of wildfires under prescribed conditions.

Funding for Fuels Management for the protection of human resources and infrastructure (MDEP QMUN) runs through WSP-O. Fuels Management funding—provided to both WSP-O and WSP-E—can be used for mechanical fuels treatments, including thinning with chainsaws, hand piling, the use of various light and heavy machinery for mulching, grinding, and/or chipping, and for RX projects (DA 2021).

WSMR wildland fire management programs have identified funding needs to meet NWCG standards for adequate personal protective equipment, training and protection of personnel and other human resources as described below:

- WSMR FES has need for funding to train FES personnel to NWCG standards for wildland firefighters and to obtain higher NWCG qualifications for Crew Boss/Engine Boss, RX Burn Boss, and ICT3-4.
- WSMR FES has need for funding to purchase and replace wildland fire gear, clothing, and equipment—such as next generation fire shelters, Wildland Nomex pants and shirts, and specialized hand tools.
- WSMR FES firefighters receive specialized training for fighting structure fires and wildfires, but battling wildfires is secondary to protecting lives and saving structures. WSMR FES currently staffs four fire stations: Main Post, HELSTF, Nike Road, and Stallion Range. Currently when wildfires are burning, WSMR FES personnel often must shut their stations down to leave and battle wildfires. There are not enough firefighters to fight both wildfires and protect structures. There is a need for additional funding to hire and train more firefighters in wildland firefighting techniques while maintaining their structural firefighting capabilities and certifications.
- WSP-E has need for funding to implement prescribed burns in the San Andres and Oscura Mountains to enhance wildlife habitat and improve ecosystem health, to implement prescribed burns to protect desert and piedmont grassland habitats for federal candidate and sensitive bird species, and to improve ecosystem health on Stallion Range and in the montane grasslands of the San Andres and Oscura Mountains and foothills.
- WSP-E has need for funding to send one or two employees to a Resource Advisor Training course administered through the NWCG. This training will enable employees that are already knowledgeable in natural and cultural resources protection to safely accompany firefighting resources and help them avoid damage to WSMR's important natural and cultural resources. See http://www.nwcg.gov/pms/pubs/RAguide_2004.pdf for the guide (PMS 314) for this position.

WSMR will continue to implement improvement projects to its land and infrastructure that will help to protect Range facilities from harmful wildfire effects and will help to keep wildfires within FMU boundaries. Many improvements have been completed or are under way and will continue under the scope of this plan. Projects include improving roadways to firebreak standards (i.e., road surfaces kept vegetation-free for at least an 8-ft width and road shoulders kept vegetated but mowed or brushed to keep vegetation short); clearing, mowing or maintaining green belts around range structures for about 30 ft out from the building; thinning, piling, chipping, grinding, or removing fuels in targeted areas; and planning and implementing RX projects to reduce hazardous fuel loads, improve wildlife habitats, and promote ecosystem sustainability, resiliency and diversity.

Table 6.1 - Army Funding for Wildland Fire Management

MDEP	Responsibility	Functional Area
VENQ	WSMR WSP-E	Prescribed Fire and mechanical treatments for ecosystem management and ESA compliance
QDPW-P	WSMR DES/FES	Wildfire prevention tasks including inspections of grounds, structures, infrastructure, and facilities for fire hazards and for educating the public about fire prevention
QEMS	WSMR DES/FES	Preparing for wildfire suppression including equipment maintenance and purchase, and training
QMUN	WSMR WSP-O	Firebreak maintenance and construction, prescribed fire, and mechanical fuel treatments to reduce wildfire hazards and for the protection of human resources
	WSMR WSP-O appropriated AMS code and/or the military unit causing the fire	Wildfire suppression activities

7 Literature Cited

Atwell, Gary 2017. Impact Area/Range Manager. Holloman Air Force Base. Personal communication with Steve Bumgarner, November 2017.

Bachelet, D., R.P. Neilson, J.M. Lenihan and R.J. Drapek. 2001. *Climate change effects on vegetation distribution and carbon budget in the United States.* Ecosystems, 4, 164-185.

Baisan, C.H.; Swetnam, T.W. 1990. *Fire history on a desert mountain range: Rincon Mountain Wilderness, Arizona, U.S.A.* Canadian Journal of Forest Research. 20: 1559-1569.

Barlow, J.C., Powell, A. M., Timmerman, B.N. 1983. Invited papers from the Second Symposium on resources of the Chihuahuan desert region, United States and Mexico. Chihuahuan Desert Research Institute, Alpine, Texas. 172 pp.

Barnes, R. D. 1987. *Invertebrate zoology.* Saunders College Publishing Company. Philadelphia, PA.

Bradshaw, Larry S.; Deeming, John E.; Burgan, Robert E.; Cohen, Jack D., compilers. 1984. *The 1978 National Fire-Danger Rating System: technical documentation.* Gen. Tech. Rep. INT-169. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.

Brown, D.E. 1994. *Biotic communities of the southwestern United States and northwestern Mexico.* University of Utah Press, Salt Lake City, UT. 342 pp.

Burkett, D.W. 2008. *Amphibians and reptiles of White Sands Missile Range field guide 2008*. White Sands Technical Services, LLC, WSMR NM. 65 pp.

Department of the Army (DA). 2021. Memorandum from Office of the Deputy Chief of Staff, G-9. *Army Installation Wildland Fire Program Implementation Guidance.* 600 Army Pentagon, Washington, DC. 15 March, 2021.

Dick-Peddie, W.A. 1993. *New Mexico Vegetation, Past, Present and Future*. University of New Mexico Press. Albuquerque, New Mexico.

Dinerstein, E., D. Olson, J. Atchely, C. Loucks, S. Contreras-Balderas, R. Abell, E. Inigo, E. Enkerlin, C.E. Williams, and G. Castilleja. 2000. *Ecoregion-based conservation in the Chihuahuan Desert: A biological assessment and biodiversity vision.* A collaborative effort by World Wildlife Fund, Comision National para el Conocimiento y Uso de la Biodiversidad (CONABIO), The Nature Conservancy, PRONATURA Noreste, and the Instituto Tecnologico y de Estudios Superiores de Monterrey (ITESM). World Wildlife Fund, Las Cruces, NM.

Drewa, P.B., and Havstad, K. M. 2001. *Effects of fire, grazing, and the presence of shrubs on Chihuahuan desert grasslands*. Journal of Arid Environments, 48, 429-443.

Dunbar, N.W. 1999. *Cosmogenic 36Cl-determined age of the Carrizozo lava flows, south-central New Mexico.* New Mexico Geology (New Mexico Bureau of Mines and Mineral Resources) 21 (2):25–55.

Fredrickson, E.L., R.E. Estell, A. Laliberte, and D.M. Anderson 2005. *Mesquite recruitment in the Chihuahuan Desert: Historic and prehistoric patterns with long-term impacts.* Journal of Arid Environments 65 (2006) 285-295.

Gao and Reynolds 2003. *Historical shrub-grass transitions in the northern Chihuahuan Desert: modeling the effects of shifting rainfall seasonality and event size over a landscape gradient.* Global Change Biology (2003) 9, 1475-1493.

Hardy, C.C., D.L. Bunnell, J.P. Menakis, K.M. Schmidt, D.G. Long, D.G. Simmerman and C.M. Johnston 2000. *Coarse-scale Spatial Data for Wildland Fire and Fuel Management.* US Department of Agriculture (USDA) Forest

Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, Montana. (Online) http://www.fs.fed.us/fire/fuelman.

Hawley, J.W. 1986. *Physiographic provinces.* In New Mexico in Maps, 2nd ed., edited by J.L. Williams, 23–27. University of New Mexico Press, Albuquerque, NM.

Heimbecker, J.R. 2017. Emergency Management Coordinator, WSTF. Personal communication with Steve Bumgarner, December, 2017.

Hoenes, B.D., and L. C. Bender. 2012. *Factors influencing foraging habitats of desert mule deer in the greater San Andres Mountains, New Mexico.* Southwestern Naturalist 57:370-379.

Kennard, D. 2008. The Encyclopedia of Southern Fire Science. http://forestencyclopedia.net/.

LANDFIRE 1.1.0. 2010. U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior (online): http://www.landfire.gov/index.php.

McClaran, M.P. 1995. *Desert grasslands and grasses.* In The desert grasslands, edited by M.P. McClaran and T.R. Van Devender, 1–30. University of Arizona Press, Tucson. AZ.

McPherson, G.R. 1995. *The role of fire in desert grasslands.* Pp 130-151 in M.P. McClaran and T.R. Van Devender, eds., the Desert Grassland. University of Arizona Press, Tucson, Arizona.

Morino, K.A., C. Baison, and T. Swetnam 1996. *Reconstruction and interpretation of historical patterns of fire occurrence patterns in the Organ Mountains, New Mexico.* Laboratory of Tree Ring Research, University of Arizona. Tucson, Arizona.

Muldavin, E.M. 1996. *Spatial-temporal dynamics of montane forest communities in relation to fire in the Organ Mountains, Ft. Bliss, Texas and New Mexico.* Final report to Directorate of Environment, Fort Bliss, Texas.

Muldavin, E., Y. Chauvin, and G. Harper. 2000. *The Vegetation of White Sands Missile Range, New Mexico, Volume 1: Handbook of Vegetation Communities.* Final report for Cooperative Agreement no. 14-16-002-91-233, White Sands Missile Range, US Fish and Wildlife Service, The Nature Conservancy, and the University of New Mexico. Albuquerque, NM: New Mexico Natural Heritage Program. 195 pp.

Neal, J.T., R.E. Smith, and B.F. Jones. 1983. *Pleistocene Lake Trinity, an evaporite basin in the northern Jornada del Muerto, New Mexico*. In Socorro Region II: New Mexico Geological Society 34th Field Conference, edited by C.E. Chapin and J.F. Callender, 285–90. Guidebook no. 34. New Mexico Geological Society, Socorro, NM.

Nemani, R.R., C.D. Keeling, H. Hashimoto, W.M. Jolly, S.C. Piper, O.J. Tucker, R.B. Myneni. S.W. Running. 2003. *Climate-driven increases in global terrestrial net primary production from 1982 to 1999*. Science, 300, 1560-1563.

NFPA 1051. 2016. *Standard for Wildland Firefighting Personnel Professional Qualifications.*

New Mexico Environment Department, Air Quality Bureau (NMED AQB), Smoke Management Program. 525 Camino de los Marquez, Suite 1, Santa Fe, New Mexico, 87505. NMENV.smoke@state.nm.us.

National Wildfire Coordinating Group (NWCG). 2003. *Work Capacity Test Administrator's Guide.* National Wildfire Coordinating Group. PMS 307/NFPA 1109. Boise, Idaho. April, 2003.

NWCG. 2012a. *Glossary of Wildland Fire Terminology*. National Wildfire Coordinating Group. Publications Management System 205. Boise, Idaho.

NWCG 2012b. *Wildland Fire Qualifications System Guide.* National Wildfire Coordinating Group. Publications Management System 310-1. Boise, Idaho. October 2012. https://www.nwcg.gov/publications/310-1.

NWCG. 2013. *Wildland Fire Incident Management Field Guide*. National Wildfire Coordinating Group. Publications Management System 210. Boise, Idaho. April.

NWCG. 2014. *Prescribed Fire Planning and Implementation Procedures Guide.* April 2014. Publications Management System 484. Boise, Idaho. https://www.nwcg.gov/publications/484.

NWCG. 2016. *Interagency Helicopter Operations Guide.* National Wildfire Coordinating Group. Publications Management System 510. June, 2016. http://www.nwcg.gov/publications/interagency-helicopter-operations-guide.

Parmenter, R.R., and T.R. Van Devender. 1995. *Vertebrates in the desert grassland.* In The desert grassland, edited by M.P. McClaran and T.R. Van Devender, 194–233. University of Arizona Press, Tucson, AZ.

Parmenter, R.R., S.L. Brantley, J.H. Brown, C.S Crawford, D.C. Lightfoot, and T.L. Yates. 1995. *Diversity of animal communities on southwestern rangelands: Species patterns, habitat relationships, and land management.* In Biodiversity on rangelands, edited by N.E. West, 50–71. Natural Resources and Environmental Issues, vol. 4. Utah State University, College of Natural Resources, Logan, UT.

Poulos, H.M., J. Villanueva Diaz, J. Cerano Paredes, R.G. Gatewood. 2013. *Human influences on fire regimes and forest structure in the Chihuahuan Desert borderlands.* Forest Ecology and Management, Vol. 298, pg. 1-11. 15 June 2013.

Propst, David L. June 27, 1990. *White Sands Pupfish Conservation Plan*. New Mexico Department of Game and Fish - Endangered Species Program. Revised April 8, 1994, by John S. Pittenger. New Mexico Department of Game and Fish, Evaluation Section. Santa Fe, New Mexico 87503.

Pyne, S.J. 1982. *Fire in America: A Cultural History of Wildland and Rural Fire* (1982; paperback edition, University of Washington Press, 1997).

Scott, Joe H.; Burgan, Robert E. 2005. *Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model.* Gen. Tech. Rep. RMRS-GTR-153. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 72 p.

Sowell, J. 2001. *Desert ecology.* University of Utah Press, Salt Lake City, Utah.

Sustainable Range Program (SRP). 2005. Sustainable Range Program Environmental Activities Matrix (phase 1) OACSIM responsibilities. pg. 6. 23 June 2005.

Stewart, J.H. 1978. *Basin-range structure in western North America, a review in Cenozoic tectonics and regional geophysics of the Western Cordillera.* Geological Society of America, Memoir 152, p. 1-32.

Swetnam, T.W. 1996. *Historical fire regime patterns in the southwestern United States since AD 1700.* Pp. 11-32, Fire effects in southwestern forests: Proceedings of the second La Mesa Fire symposium, March 29-31, 1994, Los Alamos, New Mexico, ed. C.D. Allen. General Technical Report RM-286. Fort Collins, Colorado. USDA Forest Service.

U.S. Army. 2000. *Fort Bliss, Texas and New Mexico, Mission and Master Plan Programmatic Environmental Impact Statement.* US Army Air Defense Artillery Center and Fort Bliss. Fort Bliss, Texas and New Mexico.

VanDevender, T.R., R.S. Thompson, and J.L. Betancourt. 1987. *Vegetation history of the deserts of southwestern North America: The nature and timing of the Late Wisconsin-Holocene transition.* In North America and

adjacent oceans during the last deglaciation, edited by W.F. Ruddiman and H.E. Wright, Jr., pp. 323-352. The geology of North America, vol. K-3. Geological Society of America, Boulder, CO.

White Sands Missile Range (WSMR). 2007. *Mammal checklist of White Sands Missile Range.* September 2007. Directorate of Environment and Safety, WSMR, NM.

WSMR. 2009. *Final biological assessment for development and implementation of range-wide mission and major capabilities at White Sands Missile Range, New Mexico regarding Todsen's pennyroyal (Hedeoma todsenii), northern aplomado falcon (Falco femoralis septentrionalis), southwestern willow flycatcher (Empidonix traillii extimus) and Mexican spotted owl (Strix occidentalis lucida).* WSMR, NM. 45 pp.

WSMR 2015. *White Sands Missile Range Integrated Natural and Cultural Resources Management Plan 2015-2019.* WSMR, NM. 356 pp. + appendices.

Appendices.