Integrated Wildland Fire Management Plan 2022-2027

United States Army
Garrison Fort Carson

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United States Army Garrison Fort Carson

Prepared by

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On Behalf of

Directorate of Public Works
Environmental Division
U.S. Army Garrison Fort Carson

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Table of Contents

List of Figures

List of Tables

List of Acronyms

4WD	Four Wheel Drive
AAR	After Action Review
AR	Army Regulation
ASP	Ammunition Supply Point
ATV	All-Terrain Vehicle
AWD	All Wheel Drive
BAER	Burned Area Emergency Rehabilitation
BI	Burning Index
BLM	Bureau of Land Management
CAB	Combat Aviation Brigade
CDPHE	Colorado Department of Public Health and Environment
CNHP	Colorado Natural Heritage Program
CRFCP	Conservation Reimbursable and Fee Collection Program
DES	Directorate of Emergency Services
DOD	Department of Defense
DODI	Department of Defense Instruction
DPTMS	Directorate of Plans, Training, Mobilization, and Safety
DPW	Directorate of Public Works
EA	Environmental Assessment
ECC	Emergency Communication Center
ENE	East-Northeast
ENGB	Engine Boss
EOC	Emergency Operations Center
EPA	Environmental Protection Agency
ERC	Energy Release Component
ESA	Endangered Species Act
ESE	East-Southeast
FC	Fort Carson
FCRO	Fort Carson Range Operations
FDRS	Fire Danger Rating System
FM	Fuel Moisture
FIRB	Firing Boss, Single Resource
FIRECON	Fire Condition
FWI	Fire Weather Index
FY	Fiscal Year
GC	Garrison Commander
GIS	Geographic Information System
GR	Grass
GS	Grass-Shrub
HE	High Explosive
HerbFM	Herbaceous Fuel Moisture

IAP	Incident Action Plan
IC	Incident Commander
ICRMP	Integrated Cultural Resources Management Plan
ICS	Incident Command System
ID	Infantry Division
IMCOM	Installation Management Command
IMT	Incident Management Team
INRMP	Integrated Natural Resources Management Plan
IQCS	Incident Qualifications and Certification System
ITAM	Integrated Training Area Management
IWFMP	Integrated Wildfire Management Plan
KBDI	Keetch-Byram Drought Index
LCES	Lookouts, Communications, Escape Routes, Safety Zones
LIDAR	Light Detection and ranging
MAA	Mutual Aid Agreement
MBTA	Migratory Bird Treaty Act
MDEP	Management Decision Package
MIST	Minimum Impact Suppression Tactics
MOPL	Mountain Plover
MSOW	Mexican Spotted Owl
MSR	Military Supply Route
NA	Not Applicable
NAD83	North American Datum 1983
NASF	National Association of State Foresters
NB	Non-Burnable
NE	Northeast
NEPA	National Environmental Policy Act
NFDRS	National Fire Danger Rating System
NFIRS	National Fire Incident Reporting System
NFPA	National Fire Protection Association
NNE	North-Northeast
NWCG	National Wildfire Coordinating Group
O&M	Operations and Maintenance
OIC	Officer in Charge
PAO	Public Affairs Officer
PCMS	Piñon Canyon Maneuver Site
PIDC	Pueblo Interagency Dispatch Center
PIJA	Pinyon Jay
PPE	Personal Protective Equipment
PTB	Position Task Book
PTRCO	Property of Traditional Religious and Cultural Importance
RAWS	Remote Automatic Weather Station
RCP	Representative Concentration Pathways

RFMSS	Range Facility Management Support System
RH	Relative Humidity
RXB	Prescribed Burn Boss
SAR	Species at Risk
SDZ	Surface Danger Zone
SH	Shrub
SOP	Standard Operating Procedure
SSW	South-Southwest
STEN	Strike Team Leader Engine
SW	Southwest
TFLD	Task Force Leader
TL	Timber Litter
TU	Timber-Understory
U.S.	United States
USAG	United States Army Garrison
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
UTM	Universal Transverse Mercator
UTV	Utility Terrain Vehicle
UXO	Unexploded Ordnance
WFMAP	Wildland Fire Management Application
WFPM	Wildland Fire Program Manager
WFU	Wildland Fire Use
WIMS	Weather Information Management System
WoodyFM	Woody Fuel Moisture
WP	White Phosphorus
WSW	West-Southwest

Definition of Technical Wildland Fire Terms

Term	Definition
Broadcast Burn	Prescribed fire that is applied across most or all of an area.
Burning Index	A measure of potential control difficulty related to the estimated flame length at the head of a fire.
Chains per Hour	Measurement of speed used in forestry. 1 chain = 66 feet.
Cutting Line	Firefighters using hand tools and/or machinery to create a path completely clear of vegetation to stop the advance of a fire. The width of the line cut is dependent on the fuels in which the fire is burning, and the fire behavior observed.
Dead Fuel Moisture	The moisture content of dead vegetation expressed as a percentage of the dry weight.
Fine Fuels	Live or dead fuels whose moisture content changes rapidly due to their small size and high surface-area-to-volume ratio. Usually these are grasses, leaves, and needles.
Fire Behavior	A measure of the characteristics of a fire as well as a description of the manner in which the fire is spreading. Fire behavior can be described qualitatively (smoldering, creeping, running, torching, etc.) or quantitatively, usually in terms of a rate of spread and flame length.
Fire Intensity	A measure of the heat output of the fire. It can be used qualitatively (hot, cool, etc.) or quantitatively, usually in terms of British Thermal Units per linear foot per second. This specific measurement is called fireline intensity.
Fire Severity	The effect of a fire on an ecosystem. Usually defined by the level of soil heating and mortality of the vegetation.
Firebreak	A linear path, usually a road, navigable by a fire engine, where vegetation has been completely cleared.
Fireline	A containment line around the perimeter of an active fire where fuel is cleared to mineral soil.
Fireline Intensity	A specific measure of fire intensity. Usually measured in British Thermal Units per foot per second.
Flame Length	The average length of the flame from the fire front to the average tip of the flames. This is different than flame "height" which is a measure of how tall the flames are.

Fuels Management	Modifying the structure and/or quantity of vegetation in an area, usually by cutting, masticating, or using herbicide, to reduce potential fire behavior, reduce large fire probability, or reduce ignition probability.
Live Herbaceous Moisture	The moisture content of living herbaceous vegetation expressed as a percentage of the dry weight.
Pile Burn	Burning piles of forestry debris. The piles are generally created during forestry logging operations or fuels management operations. Piles are often burned in the winter when there is little or no possibility of escape.
Rate of Spread	The speed with which the fire is moving forward. Usually expressed in chains per hour.
Spot Fire	A fire ignited outside of the main fire caused by a firebrand being blown or rolling downhill into unburned fuels.

Executive Summary

The United States Army Garrison Fort Carson (USAG FC) has developed this Integrated Wildland Fire Management Plan (IWFMP) per Army Memorandum "Army Installation Wildland Fire Program Implementation Guidance" dated March 15, 2021; AR 200-1 Chapter 4 Section 3.d.12 'Wildland Fire Management'; AR 420-1 Chapter 25 Section X 'Provide Emergency Response Services for Wildland Fires'; and to meet land management goals and objectives.

The mission of USAG FC is to provide a professional training environment that includes facilities and landscapes to support high quality training for the 4th Infantry Division and many other military units. Military training on USAG FC lands requires numerous actions that pose a high risk of wildfire. Wildfires pose a significant threat to the quality and flexibility of military training through direct impacts to infrastructure and training realism, as well as indirectly through fire-related range shutdowns. Wildfires may also result in non-compliance with regulatory requirements, primarily those related to natural and cultural resources, or significant public feedback from impacts to neighboring landowners and communities.

The primary purpose of this IWFMP is to facilitate training opportunities by providing a comprehensive approach to reduce the frequency and intensity of wildfires, reduce the potential for large and/or damaging wildfires, and to minimize the associated costs and potential impacts on the training mission. Fort Carson will implement this plan to comply with applicable laws and regulations, including the U.S. military regulations mentioned above. The IWFMP will also fulfill the requirements of the Army Installation Wildland Fire Program Implementation Guidance dated March 2021, which states that all military lands with burnable acreage must have an IWFMP in place.

This IWFMP lays out specific guidance, procedures, and protocols for the prevention and suppression of wildfires at USAG FC. It conveys the methods and procedures necessary to minimize fire frequency, severity, size, and associated damages, while ensuring that military units can conduct training exercises required to maintain a high level of combat readiness. The plan defines the responsibilities of all offices, departments, and agencies involved, and describes fire pre-suppression and suppression actions.

Additionally, the IWFMP will increase the use of fire for broad-scale land management. The landscapes of USAG FC are fire tolerant and, in many cases, fire dependent. Proper management of these environments requires controlled and purposeful prescribed fire application. This plan provides over-arching guidance for prescribed fire application, while leaving annual, detailed planning to the Wildland Fire Working Group and the Prescribed Fire Coordinator.

The Directorate of Public Works (DPW) Environmental Division, Conservation Branch Chief is the proponent for this plan. The Garrison Commander reviews and approves this plan. Responsibilities necessary to implement the IWFMP include individuals and directorates throughout the Garrison. In addition to the Conservation Branch Chief, primary individuals responsible for wildland fire management are the Wildland Fire Program Manager (WFPM, delegated to the Directorate of Emergency Services Fire Chief per previous IWFMPs), the Range Officer, the DES Fire Chief in his capacity as the lead for the Fire Department, the DPW Natural and Cultural Resources Managers, the DPW Environmental Wildland Fire Lead, the DPW Forester, the Prescribed Fire Coordinator, the Operations and Maintenance Division Chief, the 4th Combat Aviation Brigade (CAB) Commander, and the Garrison Public Affairs Officer.

Major tasks required to carry out the IWFMP include:

- Educate range users about fire prevention measures.
- Implement a daily Fire Condition commensurate with the fire danger that restricts training activity as necessary to limit fire ignitions to days and locations where they can be reliably controlled (see Section 3.2.3 for more information).
- Provide wildfire protection services including staffing, training, and equipping National Wildfire Coordinating Group certified firefighters within DES and DPW Environmental.
- Provide aerial support during wildfire suppression, including aerial bucket maintenance and replacement.
- Establish a well-maintained and fully navigable perimeter firebreak around Fort Carson.
- Implement a fuels management program by leveraging existing roadside and range vegetation maintenance, forest thinning projects, and through the use of prescribed fire.
- Implement a robust prescribed fire program to achieve land management objectives, including pre-planned fires and the use of some training-caused fires.
- Survey and monitor the effects of fires on the environment as necessary.

The Wildland Fire Working Group will facilitate annual planning and execution of tasks in the IWFMP. This group will be chaired by the WFPM and will include voting members from the DES Fire Department, Range Control, and DPW Environmental Division. Advisory members will include additional individuals from those organizations as well as Operations and Maintenance, DPW Geographic Information Systems, Public Affairs, 4th CAB, Integrated Training Area Management (ITAM), and others as needed.

Per the Army Installation Wildland Fire Program Implementation Guidance, this plan will be reviewed annually and updated every five years to ensure the latest wildland fire management information is consistently incorporated into USAG FC wildfire prevention, suppression, and prescribed fire procedures. The WFPM and the Wildland Fire Working Group are responsible for these reviews and updates. In addition, this plan may be updated as necessary as the requirements of the Wildland Fire Management Program evolve.

1. Introduction

1.1. Need and Purpose

1.1.1. Installation Mission

The Mission Statement of the United States Army Garrison Fort Carson (USAG FC) is to provide "mission readiness, support and services for USAG FC Soldiers, Families, and the Community to fight and win our nation's wars." More specifically, USAG FC trains all assigned and attached troops for combat readiness, global peacekeeping efforts, and disaster response. USAG FC's mission ensures the rapid deployment of its various military components to anywhere in the world in support of national defense objectives. Much of the activity at USAG FC is directly related to supporting and training the 4th Infantry Division (ID), 43rd Area Support Group, and 10th Special Forces Group. In addition, the Garrison provides support to the U.S. Army Reserve, the National Guard, the Reserve Officers Training Corps, the U.S. Air Force Reserve, the U.S. Naval Reserve, and the U.S. Marine Corps Reserve.

These missions require the use of large volumes of fire-prone munitions and training aids each year. The vegetation of the installations is almost universally conducive to fire spread. Wildfires are common year-round and there have been several major fires on or near Fort Carson and Piñon Canyon Maneuver Site (PCMS) in the past decade, including some that have crossed or threatened to cross the installation boundary. Fires can damage infrastructure, interrupt training, and burn vegetation necessary for training, as well as harm habitats and species that are protected under a variety of regulations.

Conversely, many of the habitats found on USAG FC lands are dependent on fire to function properly. The Fort Carson and PCMS Integrated Natural Resources Management Plan (INRMP) calls for the use of fire to restore and maintain habitats. It encourages management of ecological resources within the context of a landscape on which fire is an integral, and often beneficial, disturbance agent.

1.1.2. Applicability

This IWFMP applies to all lands managed by USAG FC. This includes Fort Carson (also sometimes referred to as Fort Carson Military Reservation or FCMR) and PCMS. This document consolidates all wildland fire-related plans related to Fort Carson and PCMS, see Section 2.3.5 for details.

1.2. Setting

This section references the Fort Carson and PCMS INRMP. The sections referenced below relate to the 2020-2025 INRMP. Section numbers may change in future drafts of the INRMP.

1.2.1. Location – Fort Carson

Fort Carson is located in the east-central portion of Colorado, south of Colorado Springs, at the base of the Rocky Mountain Front Range (Figure 1). It occupies portions of three counties: El Paso, Pueblo, and Fremont. Fort Carson lies between two major north-south highways: Interstate 25 to the east and Colorado 115 on the west. The City of Pueblo lies approximately 35 miles south of the main post area, and Denver lies about 65 miles to the north. Fort Carson encompasses 137,404 acres.

1.2.2. Location – PCMS

PCMS, which encompasses 235,896 acres, is located in Las Animas County in southeastern Colorado east of Highway 350. It extends to the Purgatoire River and north from Van Bremer Arroyo to the Otero County line. Nearby cities include Trinidad, approximately 30 miles to the southwest, and La Junta, approximately 50 miles to the northeast, but no significant population centers are nearby.

1.2.3. Land Use – Fort Carson

Fort Carson is one of the Army's Power Projection Platforms. As such, it has a high-priority role in deploying and mobilizing units during wartime. Fort Carson military units must be prepared to quickly deploy while other units move to Fort Carson for mobilization training and continued deployment. Fort Carson is home to the 4th Infantry Division (Mechanized), 43rd Sustainment Brigade, 10th Special Forces Group (Airborne), 71st Ordnance Group, and numerous smaller units.

Fort Carson is used for live-fire gunnery and is best suited for squad- to battalion-size exercises of both reserve and active components. However, brigade-size exercises are sometimes conducted at Fort Carson. Training is nearly continuous year-round.

1.2.4. Land Use – PCMS

PCMS was purchased in 1983 to train brigade-sized units. The land was previously occupied by several private ranches, and many historic homesteads still exist. PCMS's primary purpose is light and heavy maneuver training, and it contains a limited number of small arms ranges and specialty ranges such as the live-fire convoy range. Today no troop units are permanently stationed at PCMS, although a small permanent group of Department of the Army civilian employees works there.

1.2.5. Climate – Fort Carson

The climate of Fort Carson is classified as mid-latitude semi-arid, characterized by hot summers, cold winters, and relatively light precipitation. July is the warmest month, and January is the coldest. Precipitation occurs as rain, snow, and hail. The quantity of precipitation is affected significantly by the rain shadow effect of the nearby Rocky Mountains. For an in-depth analysis of climate, refer to Section 2.b. (1) of the INRMP. Section 1.4 of this IWFMP includes an in-depth description of climate and weather at Fort Carson as it relates to wildland fire.

1.2.6. Climate – PCMS

The climate of PCMS is characterized by hot summers, cold winters, and relatively light rainfall. According to data from the National Oceanic and Atmospheric Administration (NOAA)'s National Climatic Data Center (NCDC) for 2004 – 2014, July is typically the warmest month, with an average high of 90 °F and average low of 60 °F, while December is the coldest month, with an average high of 46 °F and an average low of 18 °F. During this 11-year period, PCMS averaged 12.1 inches of precipitation annually, 81% of which fell between April and October. Precipitation fluctuates widely from year to year. Section 1.4 of this IWFMP includes an in-depth description of climate and weather at PCMS as it relates to wildland fire.

1.2.7. Topography – Fort Carson

Fort Carson consists of low plains, high plains, and low hills. Fountain Creek and its tributaries dominate the eastern portion of the installation, which is classified as low plains. The low plains portion of the installation has an elevation range from 5,400 to 6,200 feet. The maximum relief on Fort Carson is 1,840 feet.

The high plains consist of gently rolling uplands to sharp-crested hills and rocky outcrops and are found in the southeastern and western portions of the installation. This area has an elevation range from 5,400 to 6,400 feet above mean sea level.

Where topography is pronounced, it is an important factor in wildland fire behavior as fires move more rapidly uphill due to pre-heating of upslope fuels. Terrain features can also funnel winds or create erratic winds, sometimes resulting in unpredictable and dangerous fire conditions.

1.2.8. Topography – PCMS

PCMS is located within the Raton Section of the Great Plains Province. This section contains features such as mesas, cuestas, plateaus, canyons, and volcanic formations. The landscape is defined by four regions. To the north and northwest are limestone ridges with piñon and juniper woodlands. The Hogback, a basalt dike, runs east and west near the southern boundary. Canyons draining into the Purgatoire River line the eastern side of PCMS. Grassy plains generally cover the area between the canyons, the Hogback, and piñon-juniper woodlands. The elevation at PCMS ranges from 4,262 feet to over 5,576 feet.

1.2.9. Geology – Fort Carson

Geologic units on Fort Carson range in age from the Quaternary (one million years before present) to the Pennsylvanian Period (200-250 million years before present). Unconsolidated sediments deposited during the Quaternary consist of fluvial and alluvial sands, silts, and gravels and wind-deposited silts and sands. Consolidated units include shale, limestone, hard sandstone, siltstone, claystone, conglomerate sandstone, and shale. For an in-depth analysis of geology, refer to Section 2.b. (4) of the INRMP.

Geology does not play a meaningful role in wildland fire management other than its effects on terrain and soils.

1.2.10. Geology – PCMS

The geology of PCMS is generally associated with the Apishapa Uplift that trends southwest to northeast across the southern area of the site. These sedimentary rocks dip generally northeastward 1-3 degrees but may dip up to 36 degrees. Small faults associated with the Uplift are found in the northern edge of PCMS. The major smaller structure within PCMS is the Black Hills Monocline and two associated structures, Sheep Canyon and Muddy Creek monoclines. Several smaller synclines and anticlines are also associated with these monoclines, including the Model Anticline in the western portion of PCMS.

1.2.11. Soils – Fort Carson

There are 34 soil categories and 65 soil associations identified at Fort Carson. Predominant soil associations are the Penrose-Minnequa Complex, Penrose-Rock Complex, Schamber-Razor Complex, and Razor-Midway Complex. For an in-depth analysis of soils, refer to Section 2.b. (6) of the INRMP.

Erosion is a common secondary impact from wildland fires. It can be a considerable problem post-fire in some soils and on steeper slopes where stabilizing vegetation may be removed by fire. Rehabilitation can be labor intensive and expensive. Some soils can also suffer ecological effects from fires, including loss of organic horizons and, in rare cases, establishment of a hydrophobic layer that prevents water from penetrating the soil surface.

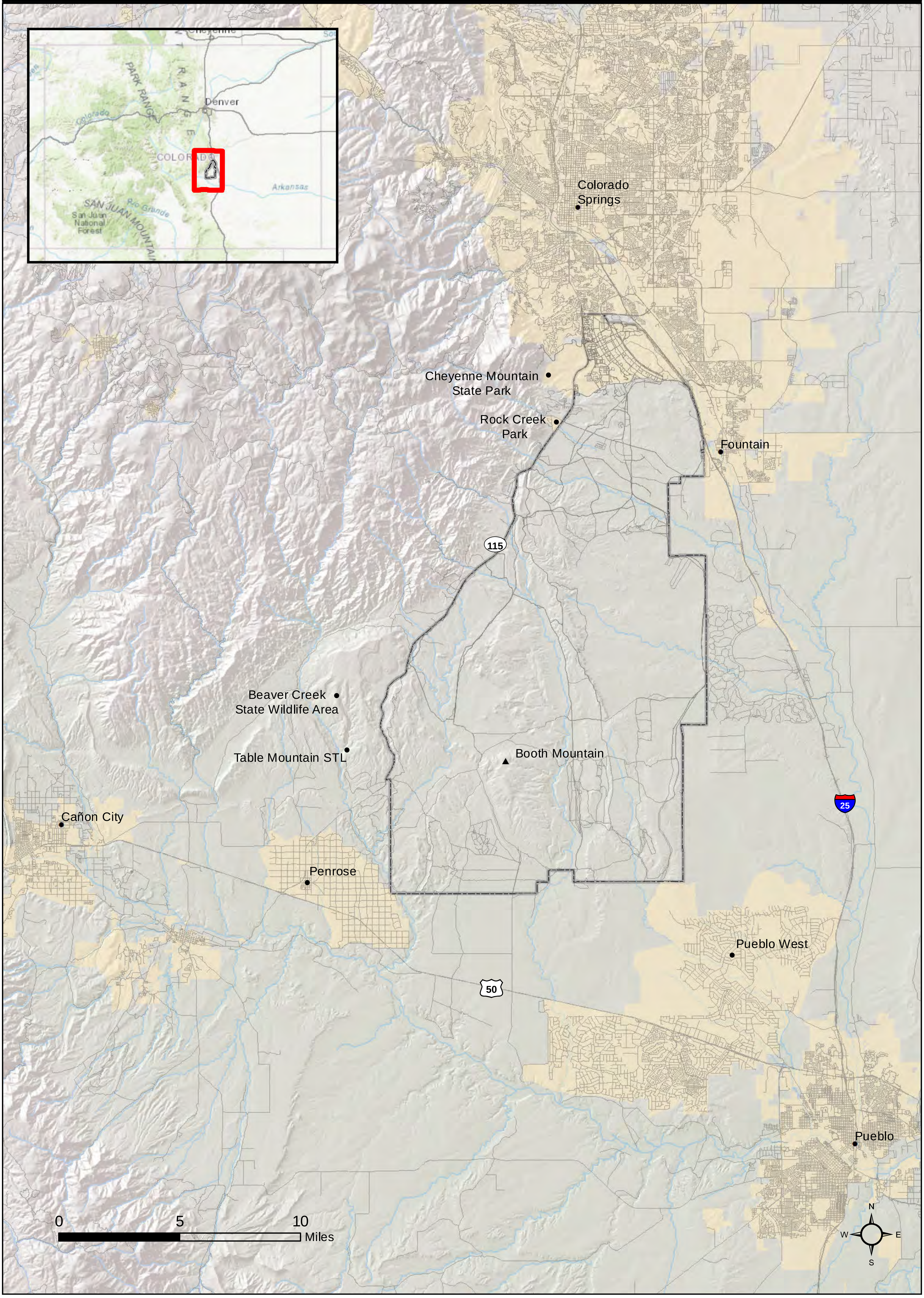
1.2.12. Soils – PCMS

There are 31 soil associations recognized at PCMS. The western part of PCMS is dominated by a flat to gently sloping plain. Soils in this portion are formed in wind-deposited lifts with occasional small ridges of limestone outcropping in some areas. Soils are generally silty and weakly developed and are calcareous throughout. One small area of sand dunes crosses midway through this landscape type. Range sites dominating this landscape are Loamy Plains on upland flats, Saline Overflow in depressions and along intermittent drainages, and Sandy Plains in sand dunes. Most range sites at PCMS have a medium stability rating. If disturbed, they will experience moderate soil losses from water erosion and high soil losses from wind erosion.

Fort Carson

Installation Location

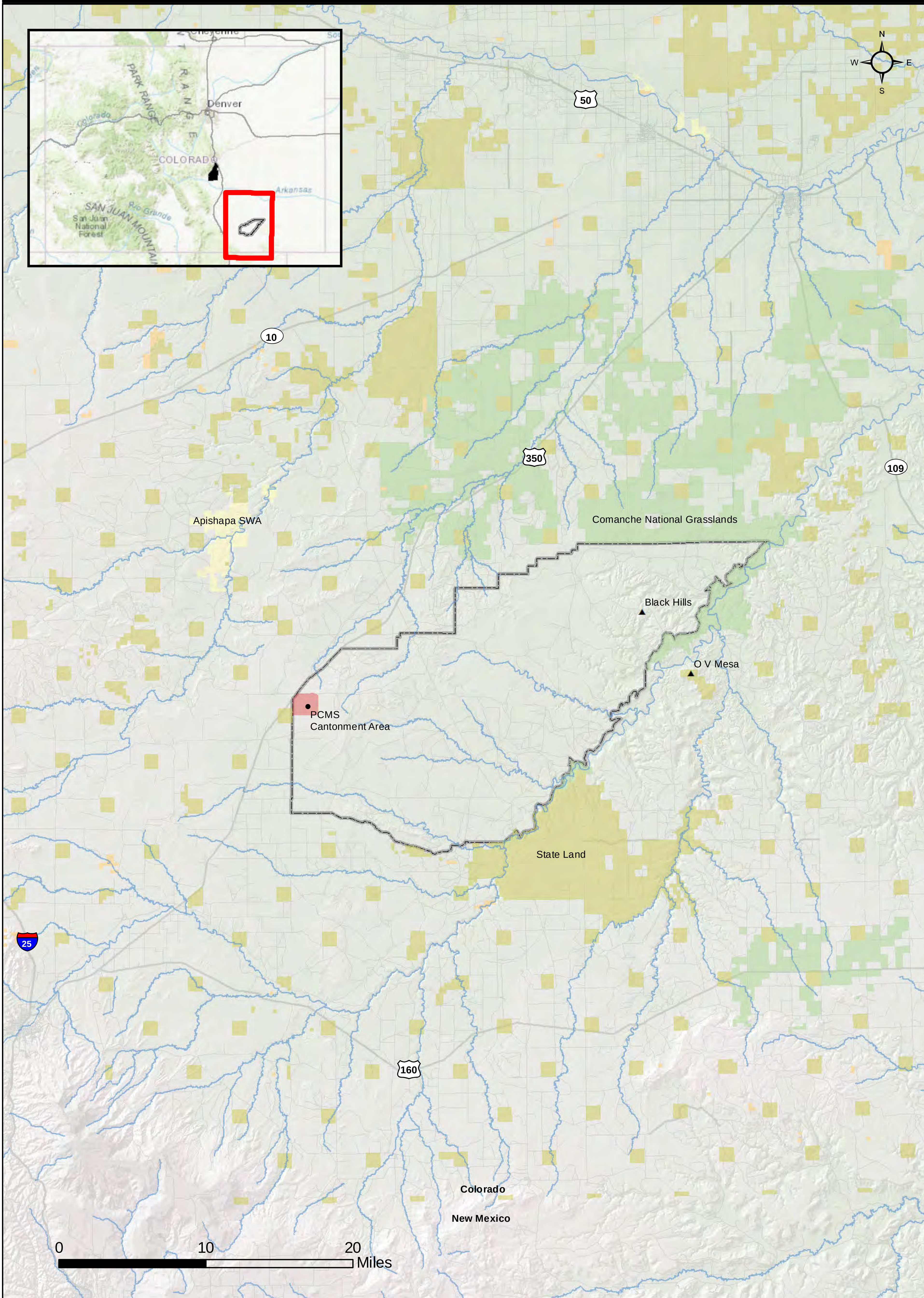
Figure 1



Pinon Canyon Maneuver Site

Installation Location

Figure 2



1.2.13. Air Quality

Wildfires and prescribed fires emit particulate matter and a wide variety of chemicals due to the combustion of wildland fuels, which is often incomplete. The total amounts and proportions of constituent chemicals released vary by fuel type, fuel moisture content, and physiological state, and meteorological conditions under which the fuels were burned.

Since the passage of the Clean Air Act in 1970 (amended 1977 and 1990), the federal government through the Environmental Protection Agency (EPA) has regulated various forms of air pollution, including that from wildland fires. Authority to enforce and enact specific rules and regulations was delegated to individual states, while the EPA sets the national air quality standards.

In the State of Colorado, no regulation enforces or sets specific rules for particulate matter, a component of air quality, for wildland fires. In Regulation No. 1 (Emission Control for Particulate Matter, Smoke, Carbon Monoxide, and Sulfur Oxides), the Colorado Air Quality Control Commission distinguishes between fires that are used for a beneficial purpose and wildfires. Wildfires are beyond the scope of this regulation and no permitting requirements apply to a land manager within whose jurisdiction a wildfire occurs. Regulation No. 9 from the Colorado Air Quality Control Commission rule (Open Burning, Prescribed Fire, and Permitting) sets the limitations, regulations, and permitting for open burning and prescribed fires, and this regulation applies to USAG FC.

1.2.13.1. Fort Carson

The mountains to the west of Fort Carson pose a special challenge to air quality since they act as a wall that prevents dispersion of pollutants. The mountains and high elevation of the region also cause atmospheric inversions in which cold air is trapped beneath warm air, preventing dispersion of pollutants into the atmosphere and concentrating them near the ground where they can become a health issue.

Due to Fort Carson's close proximity to Colorado Springs and other municipalities, wildfires and prescribed fires at the installation can detrimentally affect air quality for thousands of people. Therefore, it is important to properly manage wildland fire smoke emissions.

1.2.13.2. PCMS

Due to its rural location, smoke from wildfires and prescribed fires is of lesser concern at PCMS than at Fort Carson. However, smoke from a large wildfire or prescribed burn would need to be managed to avoid impacts to rural neighbors and populated areas such as Trinidad or La Junta.

1.2.14. Water Quality – Fort Carson

Fort Carson lies within the Arkansas River basin. Fountain Creek is the most notable surface drainage feature and receives runoff from the northeastern portion of the installation. Streams generally flow from northwest to southeast, with few exceptions. Approximately 64 surface acres of water are held in 12 reservoirs, 9 of which actively store water for fishery and wildlife resources. These reservoirs also provide erosion and sediment mitigation by controlling water flow through the drainages.

Groundwater at Fort Carson occurs in both alluvial and bedrock aquifers. The principal bedrock aquifer at Fort Carson is the Dakota-Purgatoire aquifer. Recharge of bedrock aquifers is from infiltration of precipitation and stream flow in areas where the aquifer is exposed at the land surface. Discharge from the aquifer occurs mostly from well pumping and leakage through overlying formations. For an in-depth analysis of surface and groundwater, refer to Sections 2.b. (6) and 2.b. (7) in the INRMP.

As mentioned above, post-fire soil erosion can be a problem, in part due to its effect on water quality if sediment runs into streams. The increased sediment loads can harm drinking water and aquatic wildlife.

1.2.15. Water Quality – PCMS

PCMS is within the Arkansas River basin. The Big Arroyo drainage system is located in the northwest region and flows into Timpas Creek, approximately three miles northwest of PCMS. The Purgatoire River and numerous ephemeral, intermittent, or perennial tributaries are also located within and adjacent to PCMS. The Purgatoire River, which flows northeasterly, is a tributary of the Arkansas River. Due to the climatic water regime, groundwater has historically been the predominant water source for PCMS. This water supply was obtained through a series of wells or springs for the decreed usage of domestic or livestock water. Water at the PCMS cantonment is purchased from the City of Trinidad.

1.2.16. Vegetation – Fort Carson

Shortgrass prairie grasslands comprise 48% of Fort Carson. Major grasses include blue grama, western wheatgrass, galleta, sideoats grama, various dropseeds, buffalo grass, little bluestem, and needle and thread grass. Shrublands, which typically contain a grass understory, comprise 15% of the vegetation of Fort Carson. Shrub species include mountain mahogany, golden currant, prickly pear cactus, cholla cactus, yucca, four-winged saltbush, rabbitbrush, and skunkbush sumac. Deciduous shrublands, whose species include Gambel oak, salt cedar, and willow, are largely restricted to major drainages with greater water availability. Forests and woodlands constitute 37% of Fort Carson's vegetation and include ponderosa pine, piñon pine-juniper associations, and Rocky Mountain juniper in the higher elevations. Cottonwood, willow, and chokecherry dominate woodlands near or along drainages.

These plant communities are the fuel that feeds a fire. They vary in ignitability, flammability, and their ecological responses to fire. For more information about vegetation, refer to Section 2.b. (9) in the INRMP. For an in-depth analysis of how these plant communities contribute to wildland fire, refer to Section 3.1.6 of this IWFMP.

1.2.17. Vegetation – PCMS

Shortgrass prairie grasslands comprise about 41% of PCMS. Major grasses include blue grama, western wheatgrass, galleta, sideoats grama, sand dropseeds, buffalograss, little bluestem, and needle and thread grass. Various shrubs and other plants scattered throughout the grasslands are prickly pear cactus, cholla cactus, yucca, four-winged saltbush, rabbitbrush, and skunkbush sumac.

Shrublands, which typically contain a grass understory, comprise about 33% of PCMS. Deciduous shrublands, which includes Gambel oak, tamarisk, snowberry, and willow, is found along major drainages.

Forest/Woodlands constitute about 17% of PCMS. Ponderosa pine, piñon pine, and one-seed juniper are the dominant species of higher elevation woodlands on rocky and steeper slopes. Cottonwood, willow, and chokecherry dominate woodlands near drainages.

1.2.18. Wildlife – Fort Carson

Fort Carson supports a broad array of wildlife and ecosystems that are integral to the Army training mission and to the landscape-scale natural resources management of eastern Colorado. Seventy-three species of mammals are known to occur at Fort Carson. These include but are not limited to black bear, coyote, red fox, raccoon, prairie dogs, bats, and many others. Animals managed for big game include mule and white-tailed deer, elk, pronghorn, and black bear. Fourteen species of native fish, 8 native amphibians, 19 reptiles, and 286 birds are known to occur at Fort Carson. For a full list of vertebrate species found at Fort Carson, refer to Appendix 5 of the INRMP.

The Mexican spotted owl is the only species protected by the Endangered Species Act known to occur at Fort Carson. It winters in the rugged terrain in the south-central part of Fort Carson. The Mexican Spotted Owl Management Plan specifies that wildfire should be excluded from the known owl habitat on the installation. The monarch butterfly is the only federal candidate species known to occur on Fort Carson. They are found primarily on the eastern side of the installation, particularly in areas with milkweed populations. Additionally, the black-footed ferret has been reintroduced on private property south of Fort Carson but has not been observed within the installation by Fort Carson wildlife staff. Fort Carson is protected from training-related incidental take of black-footed ferrets per an agreement with the U.S. Fish and Wildlife Service (USFWS).

For an in-depth analysis of wildlife refer to Section 4.d. of the INRMP, as well as Section 4.a. for species of conservation concern.

Wildfires can pose threats to wildlife through the direct loss of life, but primarily affect these species through alteration of habitat, both short and long-term. Fire can promote invasive plant species that may invade relatively large areas, displacing native plants that wildlife species depend on. Some species are limited in their ability to move to avoid fire or find new habitat. For additional analysis of how wildland fire impacts wildlife, refer to Appendix 6 of this IWFMP.

1.2.19. Wildlife – PCMS

PCMS lands support a broad array of wildlife and ecosystems that are integral to the Army training mission and to landscape-scale natural resources management in eastern Colorado. Animals managed for big game include deer, elk, pronghorn, and bighorn sheep. Species managed for small game include turkey, dove, coyote, bobcat, and rabbit. Sixty-one species of mammals are known to occur on PCMS. These include bear, coyote, red fox, raccoon, and more. There are 12 species of fish, including 11 native species and one species of state special concern. There are 30 reptiles, 8 amphibians, and 243 bird species known to occur at PCMS.

While there are species of conservation concern, there are no federally listed wildlife species found at PCMS.

For an in-depth analysis of wildlife refer to Section 4.d. of the INRMP, as well as Section 4.a. for species of conservation concern.

1.2.20. Cultural Resources – Fort Carson

As of May 2019, 72% of Fort Carson's total acreage, has been surveyed for archaeological resources by professional archaeologists resulting in the recording of 2,045 archaeological resources. These resources represent every period of human occupation, from the Paleoindian stage to the present. Site types include open/sheltered lithic scatters, open/sheltered camps, open/sheltered architecture, quarries, homesteads, trash scatters, historic foundations/alignments, and other features.

Table 4-3 in the 2017 Fort Carson Integrated Cultural Resources Management Plan (ICRMP) provides a summary of archaeological fieldwork conducted at Fort Carson through May of 2019. Table 4-5 summarizes efforts to identify and evaluate architectural resources and table 4-7 summarizes efforts to identify property of traditional religious and cultural importance (PTRCI) on Fort Carson. One PTRCI has been identified.

Table 4-8 in the ICRMP summarizes the paleontological studies that have been conducted. A total of 81 paleontological resources, defined as fossilized remains, traces, or imprints of non-human organisms, have been identified and documented at Fort Carson. Refer to Chapter 4 of the 2017 Fort Carson ICRMP for a more in-depth discussion of cultural resources on Fort Carson.

Cultural resources can be impacted by wildland fires directly via burning, heating, charring, or scorching, or indirectly via ground disturbing activities associated with firefighting operations, or after the fire by erosion. Further information about these effects is available throughout this IWFMP, including in Section 3.1.1.3.

1.2.21. Cultural Resources – PCMS

Approximately 219,074 acres of PCMS's 235,896 acres, or 93%, have been surveyed for archaeological resources, resulting in the recording of 6,183 archaeological resources. As of May 2019, a total of 33 historical architectural resources have been documented at PCMS. Additionally, several historical homestead and/or ranch complexes have been identified. While these sites do have historical architectural resources, all have been treated and managed as archaeological sites.

Table 4-4 in the 2017 Fort Carson ICRMP, which also addresses PCMS, summarizes archaeological resources on PCMS through May 2018. Table 4-6 in that document summarizes the efforts to identify and evaluate historical architectural resources on PCMS as of May 2018. A total of 36 property of traditional religious and cultural importance (PTRCI) have been identified on PCMS. Table 4-7 in the ICRMP summarizes the efforts to identify PRTRCI on PCMS. A total of 41 paleontological localities have been identified and documented on PCMS, the first of which was recorded in 1985. Table 4-9 summarizes the efforts to identify and document paleontological resources on PCMS.

Refer to chapter 4 of the 2017 Fort Carson ICRMP for a more in-depth discussion of cultural resources on PCMS.

1.3. Fire History

1.3.1. Fire Regime

Historically, fire occurrence varied considerably across the ecosystems present at USAG FC. Fire return intervals were as short as five years and as long as over 100 years, with grassland ecosystems experiencing fire more frequently and forested areas much less often, particularly some of the piñon-juniper forests. Fire severity is a measure of effects on soils and plants that is directly related to both the heat output of the fire and how long it burns in a given location. Fire severity was historically low to moderate throughout the grassland and shrubland ecosystems and low in the ponderosa pine forests, but high in the piñon-juniper forests where stand replacement fires occurred after long intervals.

Under the current fire regime, fire has been largely removed from the environment except where prescribed fire is applied regularly and in the Small and Large Impact Areas at Fort Carson and the Small Arms Range Complex and Range 9 at PCMS where wildfires occur frequently. In those areas, the fire return interval is very short, often two years, or even less in some cases. Fire severity in the prescribed burn areas tends to remain low to moderate, but outside of those regularly maintained locales, high severity fires are more common than they were prior to European arrival.

1.3.2. Regional Fire History – Fort Carson

Fort Carson is located along the central portion of Colorado's Front Range. This region is prone to wildfire due to its climate and dominant vegetation types. The National Fire and Aviation Management Web Application[1] website along with the National Association of State Foresters (NASF) website recorded a total of 1,753 wildfires in the eight-year period from 2010 through 2017 within ten kilometers of the installation boundary. Data from 2018 on had not yet been compiled at the time of this data analysis.

Wildfire data reports were overwhelmingly from the NASF, representing 98.8% of the total. The United States Forest Service (USFS) and Bureau of Land Management (BLM) combined represented the remaining 1.2% of all wildfires reported in this analysis of the area around Fort Carson (Table 1).

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[1] National Fire and Aviation Management Web Application. 2019. https://fam.nwcg.gov/fam-web/, accessed October 2019.

Wildfire data from 2012 were clearly incomplete, as no NASF data were included and a total of only four wildfires were recorded that year. 2012 was a busy wildfire season in Colorado and it is very likely the data are incomplete for that year.

Table 1. Number of wildfires 2010 – 2017 within 10 km of the Fort Carson boundary reported by each agency.

Reporting Agency	Number of Wildfires	Percentage of Wildfires
NASF	1732	98.80%
USFS	14	0.80%
BLM	7	0.40%

Most of the off-post wildfires noted here occurred north of the installation in El Paso County. El Paso County accounts for approximately 96% of all wildfires, but also accounts for the majority of the 10 km buffer around Fort Carson. Teller County to the northwest, Fremont County to the west, and Pueblo County to the south and east, accounted for the remaining 4% of all wildfires.

These off-post fires are heavily concentrated in populated areas. They are much more common in and around southern Colorado Springs and along the northeastern boundary of Fort Carson where there is dense development. However, the largest fires have ignited in more sparsely populated locations where plenty of unmanaged fuels provide room for the fires to grow.

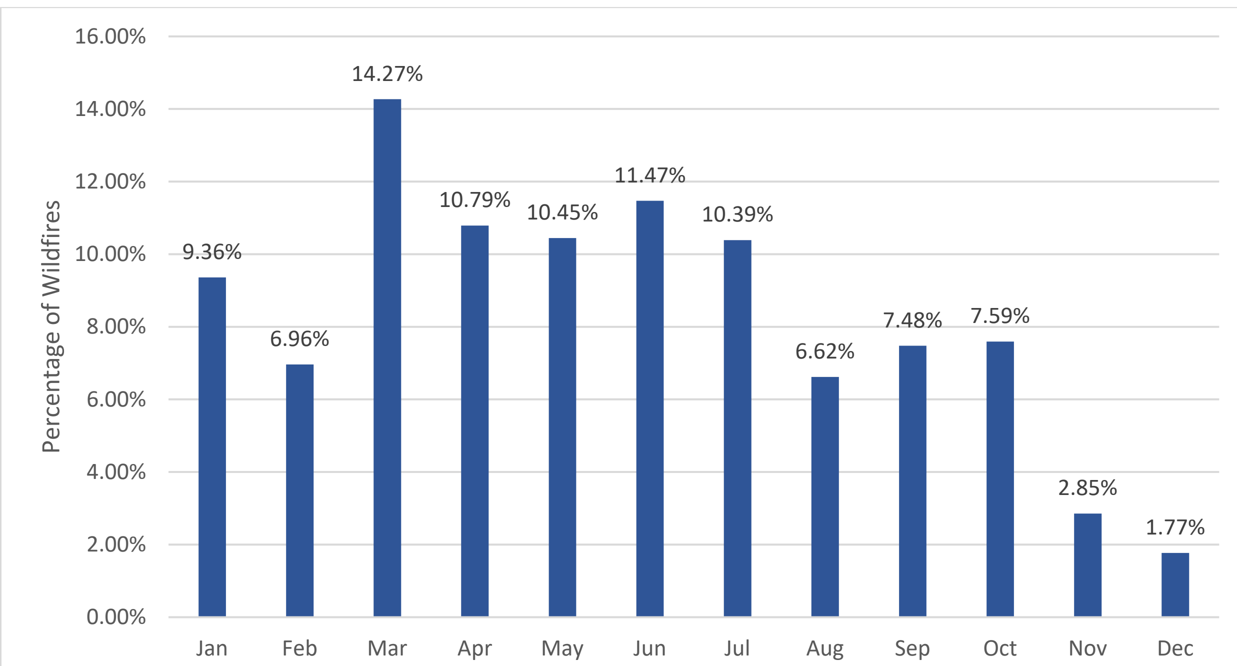


Figure 3. Percentage of off-installation fires 2010 – 2017 within 10 km of the Fort Carson boundary occurring in each month of the year.

Seasonally, off-installation wildfires occurred most frequently in March and remained elevated through July (Figure 3). These five months account for 57.54% of all off-post wildfires. However, fires were common in every month but November and December. Notably, there were almost as many fires in January as there were in the months of April through July.

National wildfire cause data are placed into one of 15 cause categories. Of the 1,753 wildfires recorded, 62.41% were defined as miscellaneous, or 137 fires annually. These were fires that could not be properly classified due to lack of information in the fire record or a cause that does not apply to another category. This includes, but is not limited to, firearms use, blasting, and spontaneous combustion. The next biggest wildfire cause category was fires with an unknown cause which account for 25% of all fires. The remaining 12.55% of fires were caused by smoking, equipment use, debris burning, and more (Table 2). Because the vast bulk of the data are categorized as miscellaneous and unknown, categories that do not provide any useful information about fire cause, these data are of little use.

Table 2. Cause categories for all wildfires 2010 – 2017 within 10 km of the Fort Carson boundary.

Wildfire Cause Category	Wildfire Count	Avg. Wildfires per Year	Percent of Total Wildfires
Miscellaneous	1094	136.75	62.41%
Unknown	438	54.75	24.99%
Smoking	79	9.88	4.51%
Equipment use	57	7.13	3.25%
Lightning	19	2.38	1.08%
Debris burning	18	2.25	1.03%
Fireworks	16	2.00	0.91%
Campfire	9	1.13	0.51%
Arson	8	1.00	0.46%
Natural	5	0.63	0.29%
Children	4	0.50	0.23%
Human	2	0.25	0.11%
Railroad	2	0.25	0.11%
Power line	1	0.13	0.06%
Structure	1	0.13	0.06%

Off-post wildfires ranged from less than a quarter acre to over 5,000 acres, but 88% of off-post wildfires were less than ¼ acre, and 99% were less than 10 acres. The largest fire was 1,500 acres in 2010. There were two fires that were 1,000 to 2,000 acres in the eight-year period of reliable fire data, but no other fires of that magnitude.

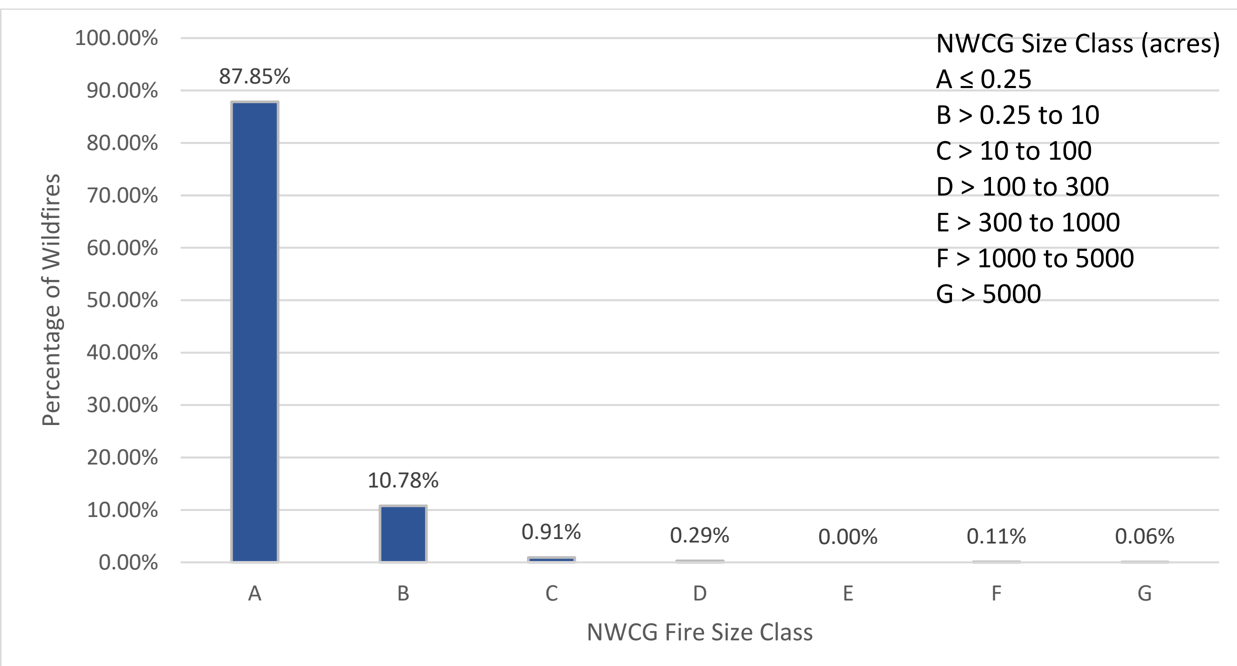


Figure 4. National Wildfire Coordinating Group (NWCG) fire size classes for all wildfires 2010 - 2017 within 10 km of the Fort Carson boundary.

1.3.3. Regional Fire History – PCMS

PCMS is located in southern Colorado, surrounded on three sides by the Comanche National Grassland. This region is prone to wildfire due to its climate and dominant vegetation types. Within 10 kilometers of the installation boundary, the National Fire and Aviation Management website, along with the NASF website, recorded 112 wildfires in the eight-year period from 2010 through 2017. Data after 2017 had not yet been compiled as of this analysis. Wildfires were only recorded in 2010, 2011, and 2012 within 10 kilometers of the boundary, strongly suggesting that data for other years were incomplete.

Wildfire numbers were overwhelmingly dominated by reports from the NASF, representing 97.32% of the total. The United States Forest Service (USFS) represented the remaining 2.68% (Table 3).

Table 3. Number of wildfires 2010 – 2017 within 10 km of the PCMS boundary reported by each agency.

Reporting Agency	Number of Wildfires	Percentage of Wildfires
NASF	109	97.32%
USFS	3	2.68%

Most of the off-post wildfires occurred in Las Animas County, which surrounds PCMS except to the north. Las Animas County accounted for approximately 94.64% of all wildfires reported, but also accounted for most of the 10 km buffer around PCMS. Otero County to the north accounted for the remaining 5.36%.

Seasonally, off-installation wildfires occurred most frequently in June, representing 33.04% of reported fires, more than double any other month (Figure 7). Wildfires were most frequent from May through July. However, fires were common in every month but March, when no wildfires were recorded. Notably, 9.8% of fires occurred in December, indicating wildfires can and do occur in the winter months.

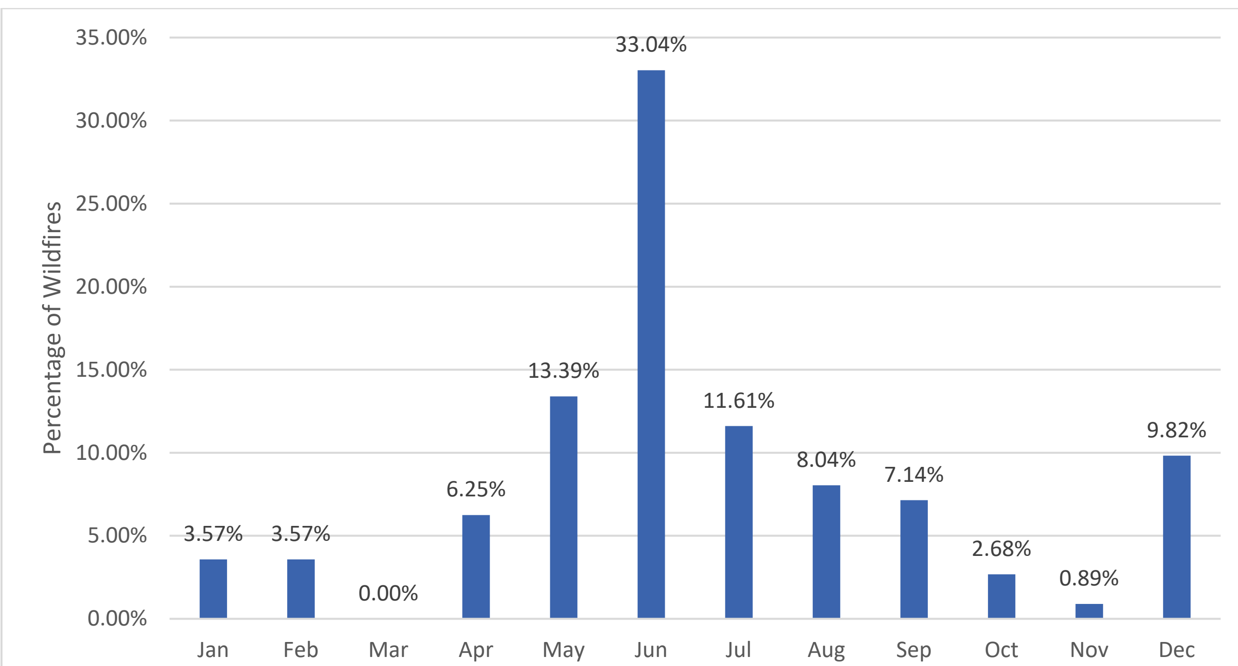


Figure 5. Percentage of off-installation fires 2010 – 2017 within 10 km of the PCMS boundary occurring in each month of the year.

National wildfire cause data is placed into one of 4 cause categories. Of the 112 wildfires recorded, a total of 50.89% did not have a cause assigned. The next biggest wildfire cause category was from lighting which accounts for 25.89% of all fires. A total of 19.64% were defined as miscellaneous, or 2.75 fires annually. These were fires that could not be properly classified into one of the other categories due to lack of information in the fire record or a cause that does not apply to another category. This includes, but is not limited to, firearms use, blasting, and spontaneous combustion. The remaining 3.57% of fires were caused by equipment use (Table 4). Because the vast bulk of the data is categorized as miscellaneous and unknown, categories that do not provide any useful information about the fire cause, this data is of little use.

Table 4. Cause categories for all wildfires 2010 - 2017 within 10 km of the PCMS boundary.

Wildfire Cause Category	Wildfire Count	Avg. Wildfire per Year	Percent of Total Wildfires
Unknown	57	7.13	50.89%
Lightning	29	3.63	25.89%
Miscellaneous	22	2.75	19.64%
Equipment Use	4	0.5	3.57%

Off-post wildfires ranged from less than a quarter acre to over 5,000 acres, but 65.18% of off-post wildfires were less than ¼ acre, and 88.39% were less than 10 acres (Figure 8). The largest fire was 13,575 acres in 2011, and is shown in the NASF data as being located south of the installation. There were five fires that were 1,000 to 3,000 acres in the eight-year period of reliable fire data, but no other fires of that magnitude.

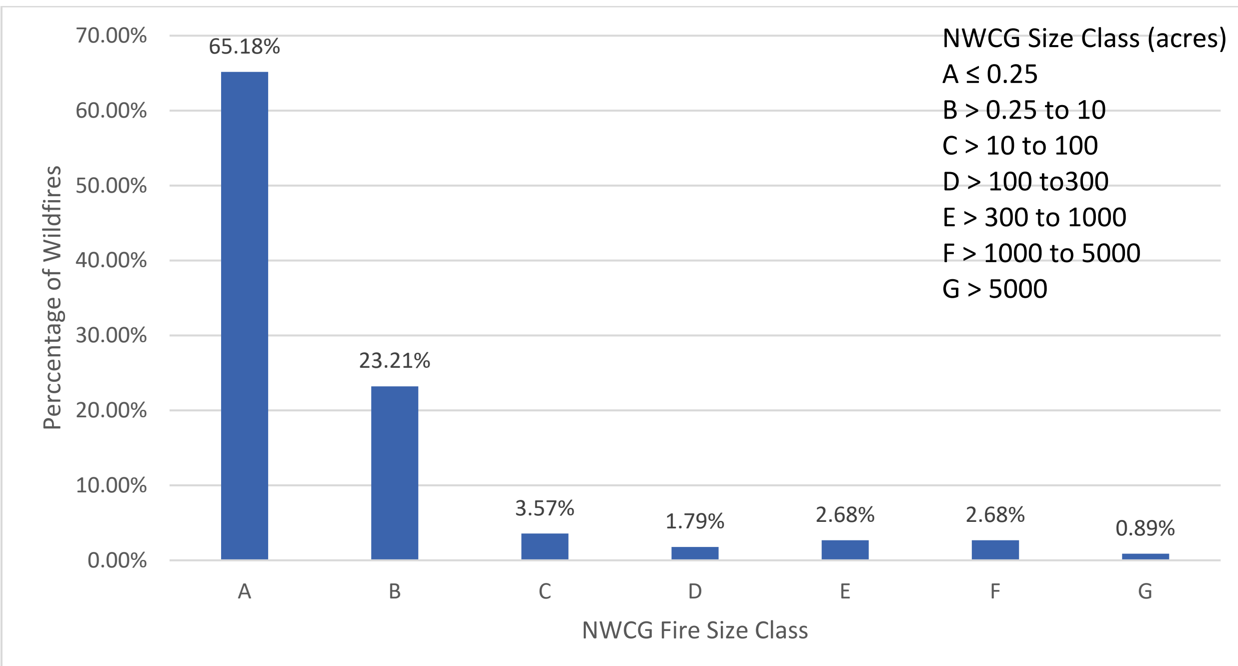


Figure 6. NWCG fire size classes for all wildfires 2010 - 2017 within 10 km of the PCMS boundary.

1.3.4. On-Installation Fire History – Fort Carson

Fire history was acquired from the National Fire Incident Reporting System (NFIRS) via the Navy Safety Center for 2005 through 2018. Data from 2019 was not yet available at the time of data acquisition. Additional fire occurrence data was provided from the installation from 2005 through 2014. The latter data represents fires that were not in the NFIRS system. Beginning in 2015, all fires were present in NFIRS and no supplemental data from the installation was acquired from the installation.

A total of 1,385 fires were recorded during this 14-year time period with an average of 99 fires per year. While year to year variation is substantial, three years in particular, 2007, 2010, and 2012, had at least double the median of 79 fires per year (Figure 7).

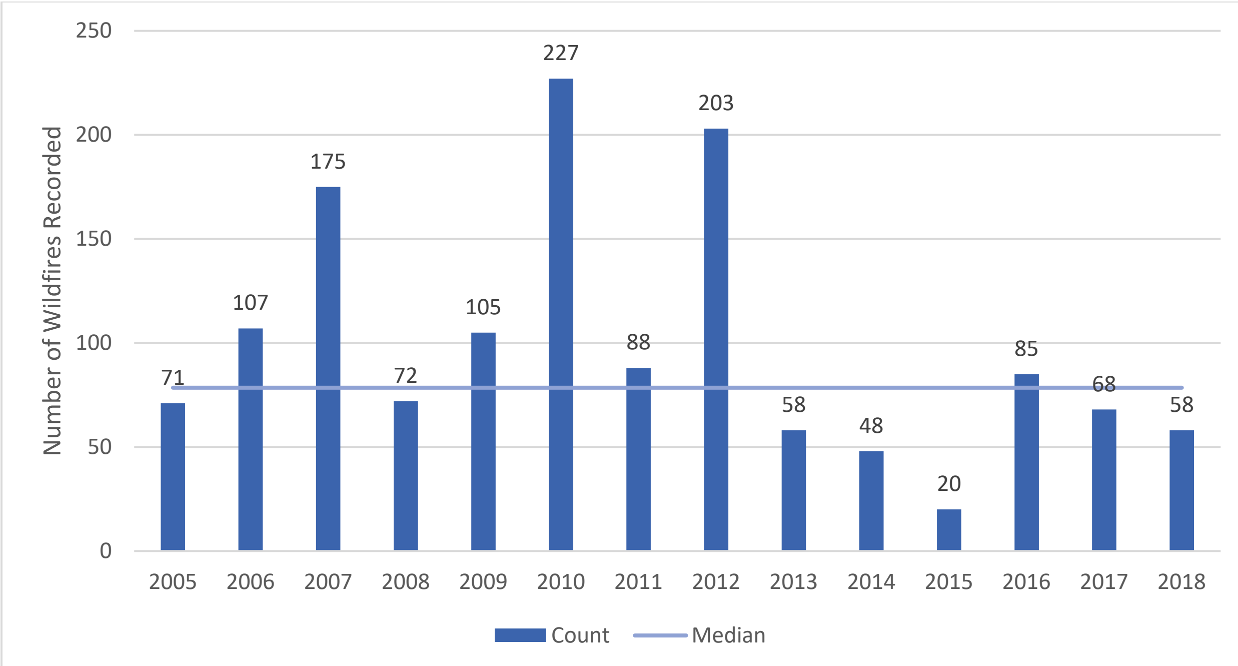


Figure 7. Number of fires occurring at Fort Carson 2005 – 2018 by year.

The fire season at Fort Carson was year-round. A peak in March and April accounted for 28% of all fires, but fires occurred frequently throughout the year (Figure 8). After March and April, November and January were the biggest fire months of the year, notable because they are outside of what is generally considered the fire season in Colorado.

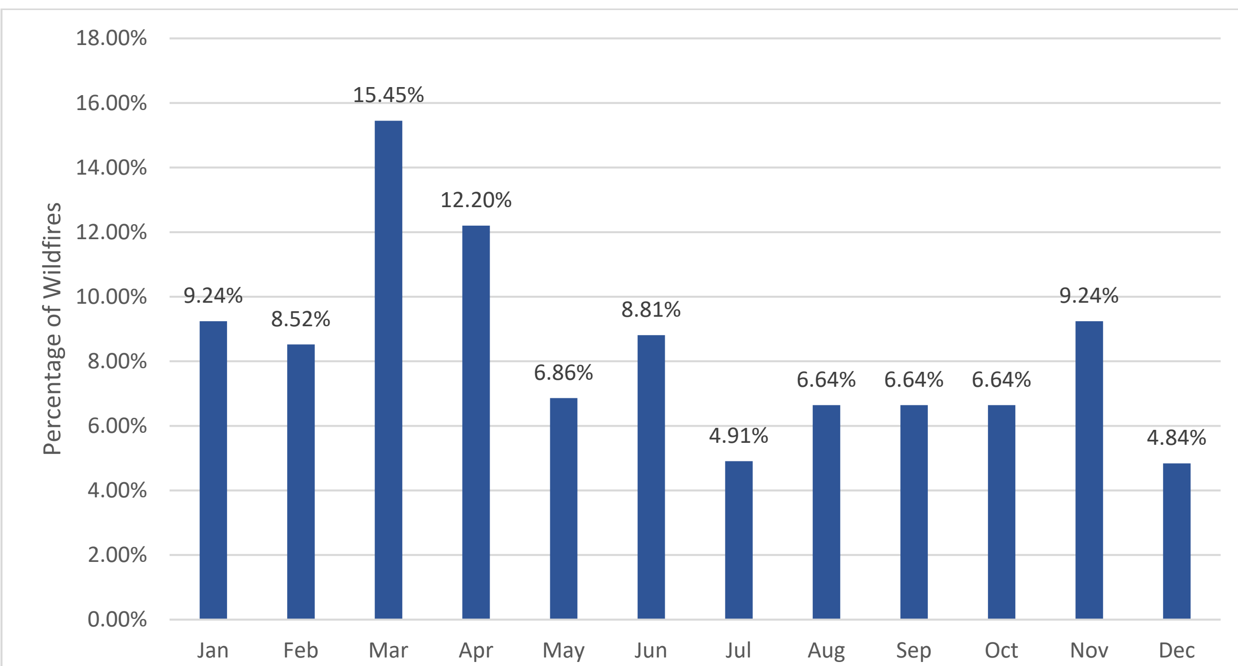


Figure 8. Percentage of fires occurring at Fort Carson 2005 - 2018 by month.

Daily fire frequency peaked at 1400, as is typical for wildfires due to temperatures peaking and relative humidity generally being at its lowest point of the day (Figure 9). Though fire frequency is very strongly influenced by weather conditions, the curve at Fort Carson is extended into the evening hours, likely due to nighttime training which includes the use of tracers and a variety of illumination devices, most of which produce very high temperatures and are therefore excellent ignition sources.

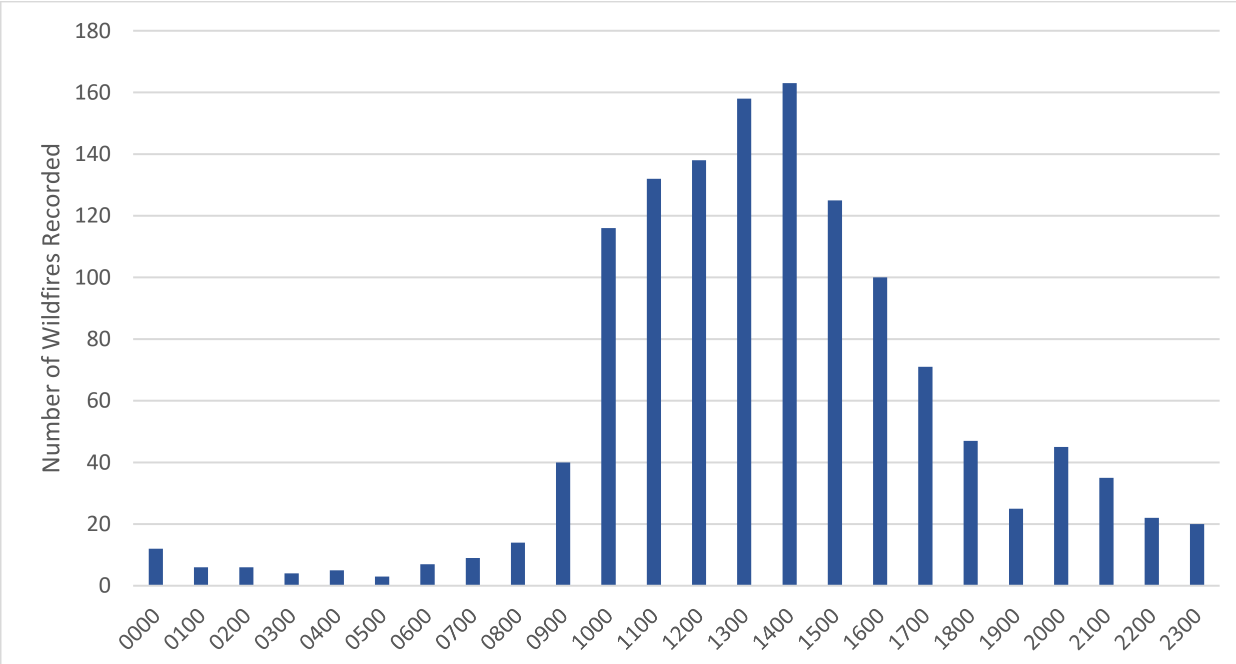


Figure 9. Number of fires occurring at Fort Carson 2005 - 2018 by hour of the day.

The data were summarized into cause categories following the methods of the 2017 Risk Assessment, which applied a location to each fire. Broader categories than those used in the risk assessment were used here to summarize (Table 3). Insufficient information was available to identify detailed causes of wildfires, such as specific munitions.

Training-related fires accounted for 95% of all fires. Mission live-fire was by far the largest cause, accounting for 88% of all fires. Mission non-live-fire ignitions accounted for 6% of all fires. The remaining categories accounted for just 5.24% of all the fires. Though these data are not precise, they demonstrate the overwhelming influence of live-fire activities on fire ignitions, strongly indicating where and when most fires are likely to occur.

Table 5. Fires occurring at Fort Carson 2005 – 2018 by general cause categories.

Cause Category	Wildfire Count	Avg. Wildfire per Year	Percent of Total Wildfires
MISSION - LIVE-FIRE	1221	87.21	88.16%
MISSION - NON-LIVE-FIRE	89	6.36	6.43%
HOUSING	27	1.93	1.95%
BUILDINGS THAT ARE NOT HOUSING	14	1.00	1.01%
ROADS	14	1.00	1.01%
LIGHTNING	12	0.86	0.87%
CHEYENNE MOUNTAIN SHOOTING COMPLEX	6	0.43	0.43%
POWER LINE	2	0.14	0.14%

During the wildfire risk assessment, fire ignition probability was mapped for all available fire history data (Figure 13). Each fire was assigned to one of 115 unique wildfire ignition locations, such as an individual range or a training area. The top 26 locations are shown in Figure 10. These 26 locations each experienced at least one fire per year on average and accounted for 78% of all recorded fires. Together, the Large Impact Area and Ranges 143, 119, 109, and 111 accounted for 37% of all fire ignitions, with each averaging more than six fires per year. The top eight locations accounted for 50% of all ignitions.

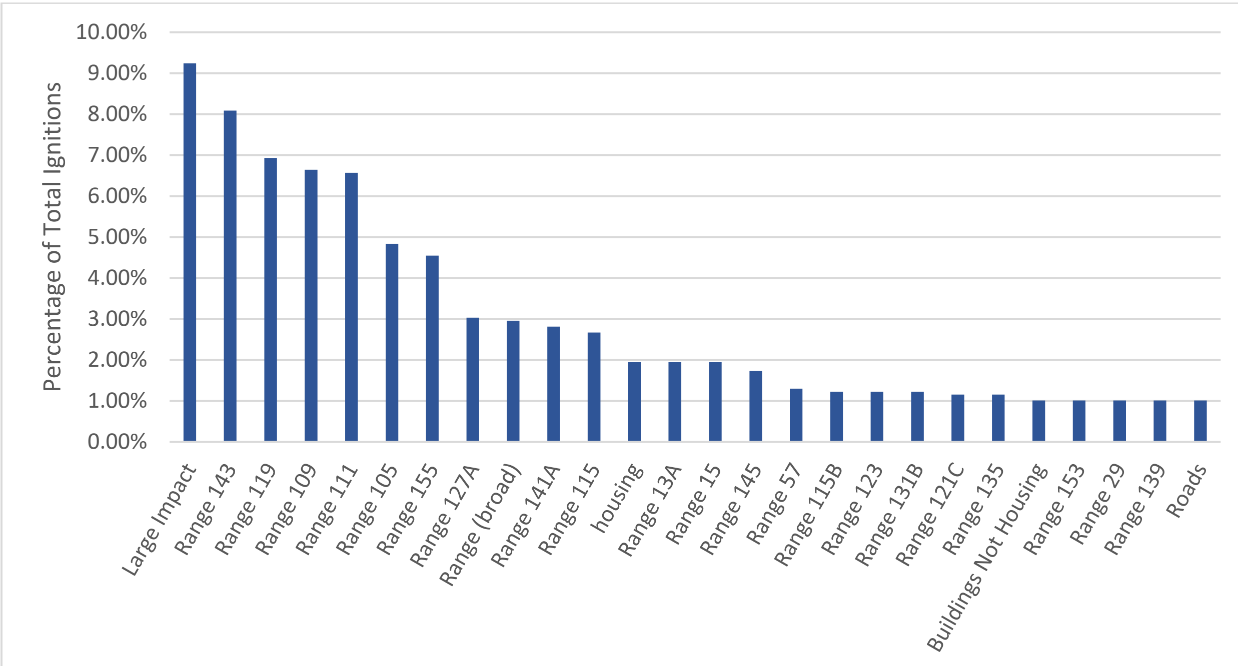


Figure 10. Fire ignition locations at Fort Carson 2005 – 2018.

Only the 919 fires in the NFIRS dataset included any size data. Of those records, 729 included fire size data. These data are therefore incomplete, as they only represent 57% of all the fires recorded between 2005 and 2018. Following typical fire size distributions where the vast majority of fires are small, fires 10 acres or less accounted for 89% of all fires (Figure 11). Fires greater than 100 acres accounted for only 4% of all fires. Six fires grew to more than 5,000 acres, indicating substantial large fire potential.

Fire duration is the elapsed time from when the fire department is notified to when a fire is declared controlled (which indicates the fire is not expected to grow but is not necessarily “out”). Fire duration data were available for 792 fire records, or 57% of on-installation fire records. It should be noted that due to the way responses are dispatched, multi-day fires are not reflected accurately in this data, though those are rare.

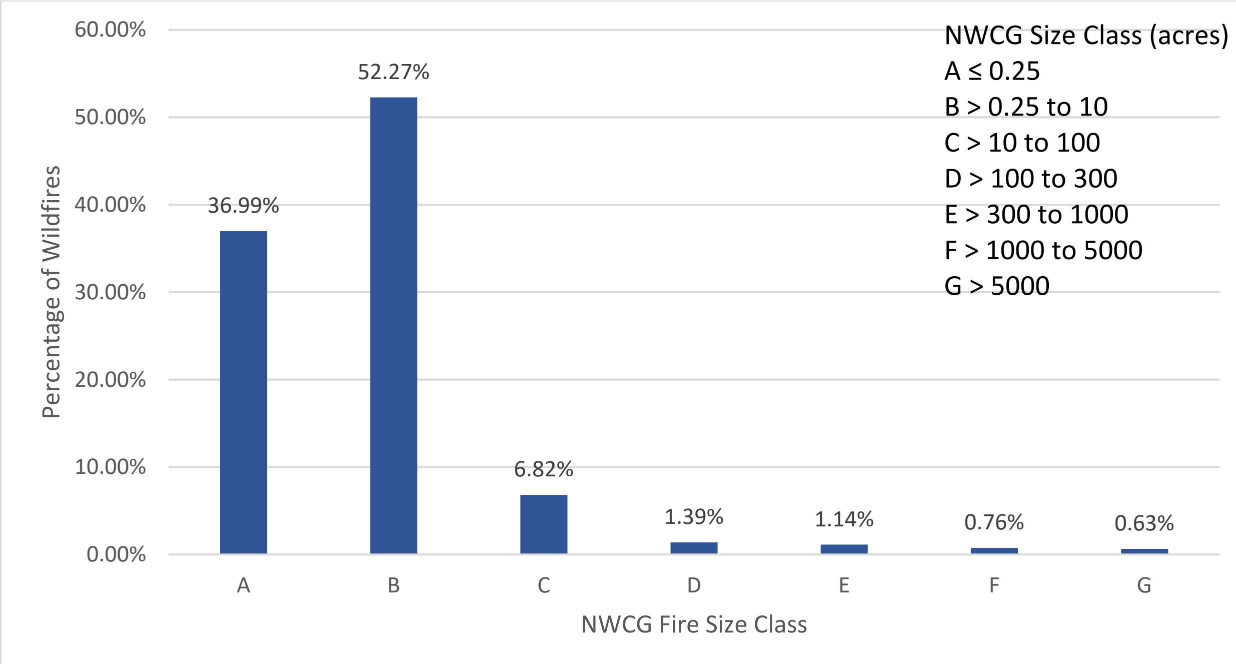


Figure 11. Percentage of fires occurring at Fort Carson by National Wildfire Coordinating Group (NWCG) size class 2005 – 2018.

Most fires at Fort Carson are short-lived. Fire duration was two hours or less 87% of the time (Figure 12). Less than 6% of fires required a response of more than five hours.

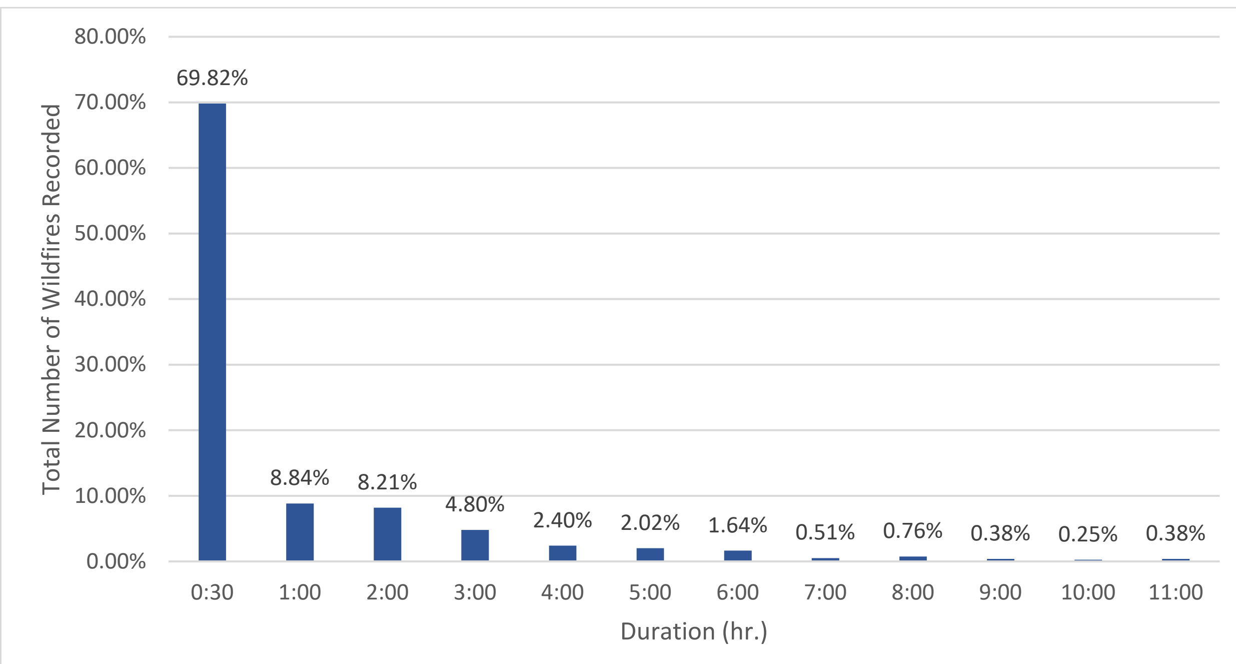
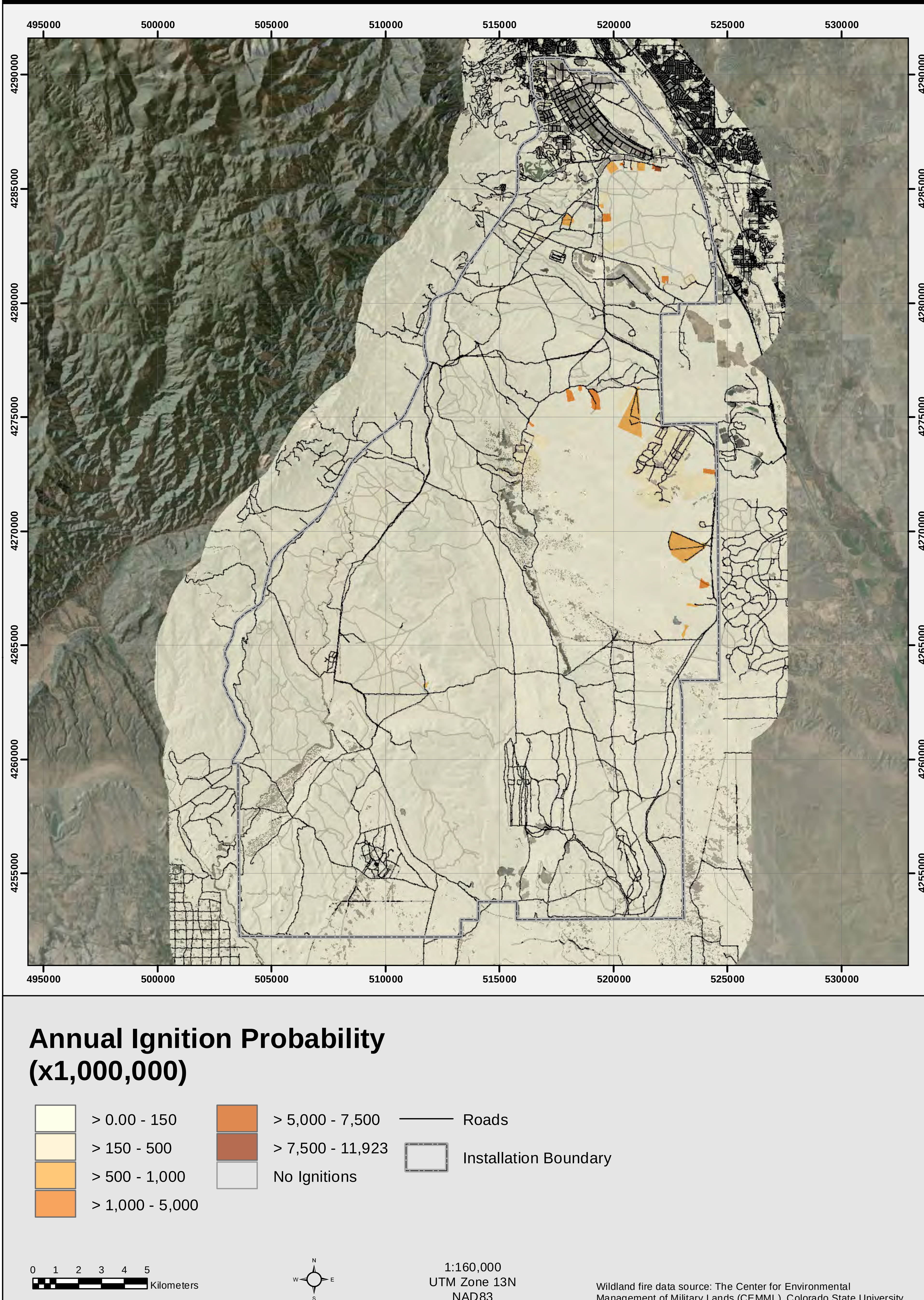


Figure 12. Number of fires occurring at Fort Carson 2005 – 2018 by fire duration.

Fort Carson

Annual Wildfire Ignition Probability
All Wildfires Impacting Fort Carson

Figure 13



1.3.5. On-Installation Fire History – PCMS

Fire history was acquired from the National Fire Incident Reporting System (NFIRS) via the Navy Safety Center for 2005 through 2018. Data from 2019 was not yet available at the time of data acquisition. Additional fire occurrence data was provided from the installation from 2005 through 2014. The latter data represents fires that were not in the NFIRS system. Beginning in 2015, all fires were present in NFIRS and no supplemental data from the installation was acquired from the installation.

A total of 58 fires were recorded during this 14-year period, with an average of 4.14 fires per year. While year-to-year variation was substantial, two years in particular (2006 and 2010) had 7 times the median of 2 fires per year (Figure 14).

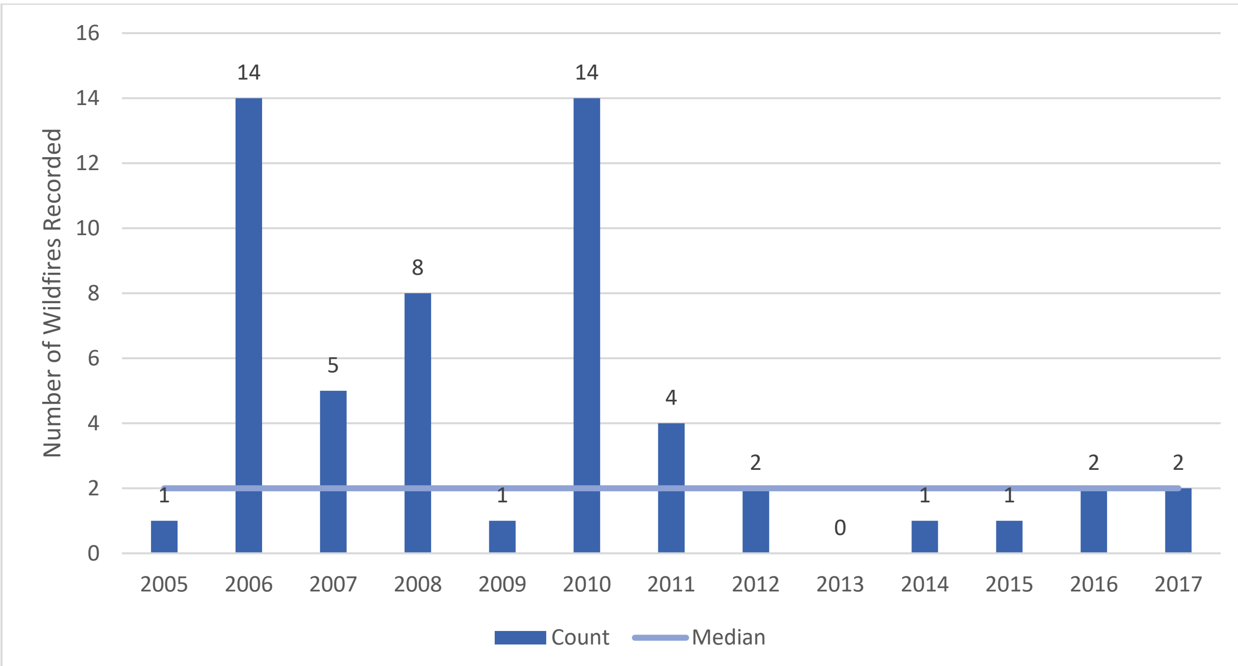


Figure 14. Number of fires occurring at PCMS 2005 – 2018 by year.

The fire season at PCMS was year-round. A peak in June and July accounted for 48.28% of all fires, and roughly correlated with the regional fire history. However, fires occurred frequently throughout the year (Figure 15). Notably, December was the month with the third most wildfires.

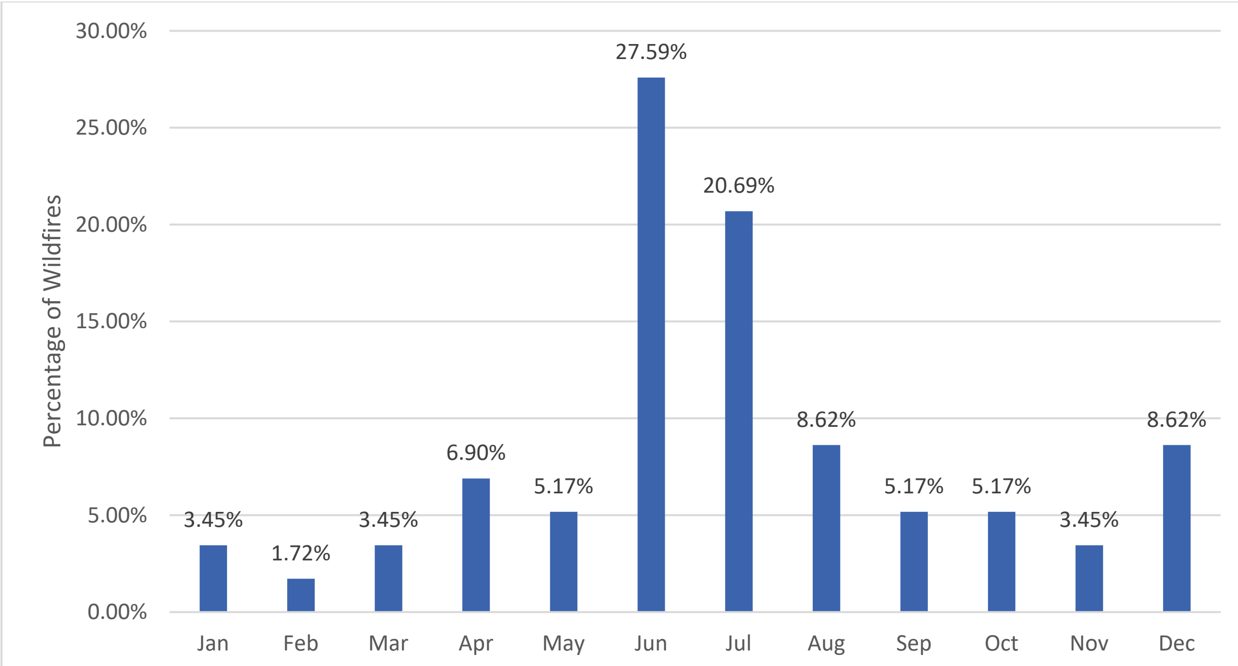


Figure 15. Percentage of fires occurring at PCMS 2005 - 2018 by month.

Daily fire frequency peaked at 1400, as is typical for wildfires due to temperatures peaking and relative humidity generally being at its lowest point of the day (Figure 16). Though this fire frequency curve is very strongly influenced by weather conditions, there were fires in the late evening hours that were likely due to nighttime training that includes the use of tracers and a variety of illumination devices, most of which produce very high temperatures and are excellent ignition sources. No fires were recorded from 2300 – 0300 as well as at 0500.

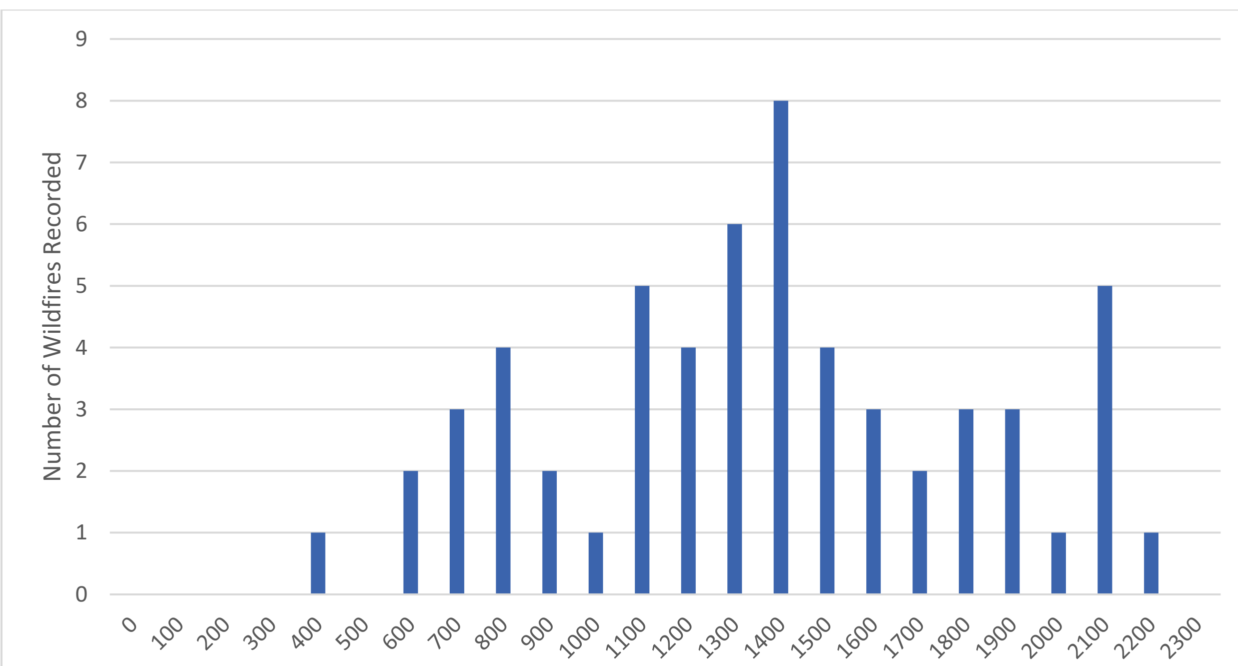


Figure 16. Number of fires occurring at PCMS, 2005 – 2018 by hour of the day.

There was insufficient information to identify detailed causes of wildfires, such as specific munitions. However, there was enough information to categorize wildfire causes into five broad categories (Table 6). Lighting was by far the largest cause of wildfires, accounting for 39.66% of all fires.

Mission live-fire accounted for 25.86% of all fires, while mission non-live-fire ignitions also accounted for 25.86% of all fires. When combined, training-related fires accounted for 51.72% of all fires. The remaining categories, roads and unknown, accounted for 8.62% of fires. Although these data are not precise, they demonstrate the influence of training activities on fire ignitions, strongly indicating where and when most fires are likely to occur.

Table 6. Fires occurring at PCMS 2005 – 2018 by general cause categories.

Cause Category	Wildfire Count	Avg. Wildfire per Year	Percent of Total Wildfires
Lightning	23	1.64	39.66%
Mission – Live-Fire	15	1.07	25.86%
Mission – Non-Live-Fire	15	1.07	25.86%
Unknown	3	0.21	5.17%
Roads	2	0.14	3.45%

During the PCMS wildfire risk assessment, fire ignition probability was mapped for all available fire history data (Figure 18). Each fire was assigned to one of 14 unique wildfire ignition locations, such as an individual range or a training area. Lightning-caused fires are not included in this dataset, as exact locations for those fires are unknown. Range 9 and 7 combined accounted for 36.36% of all wildfires (Figure 17). The training areas combined accounted for an additional 45.45% of all wildfires.

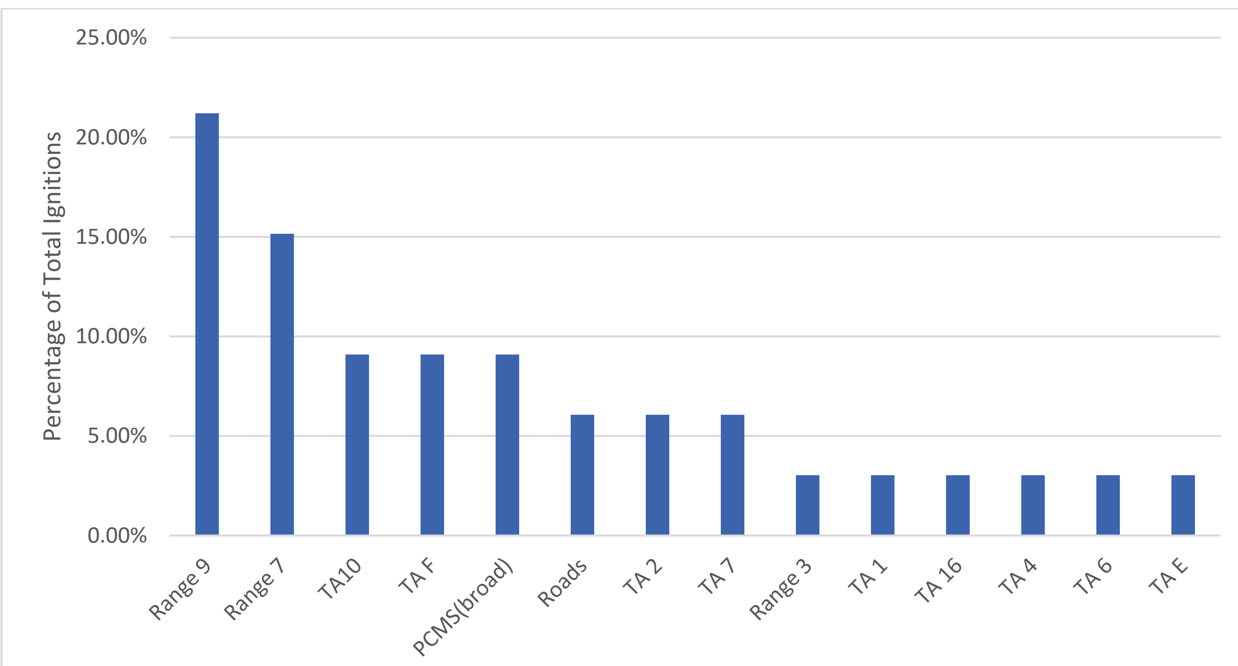
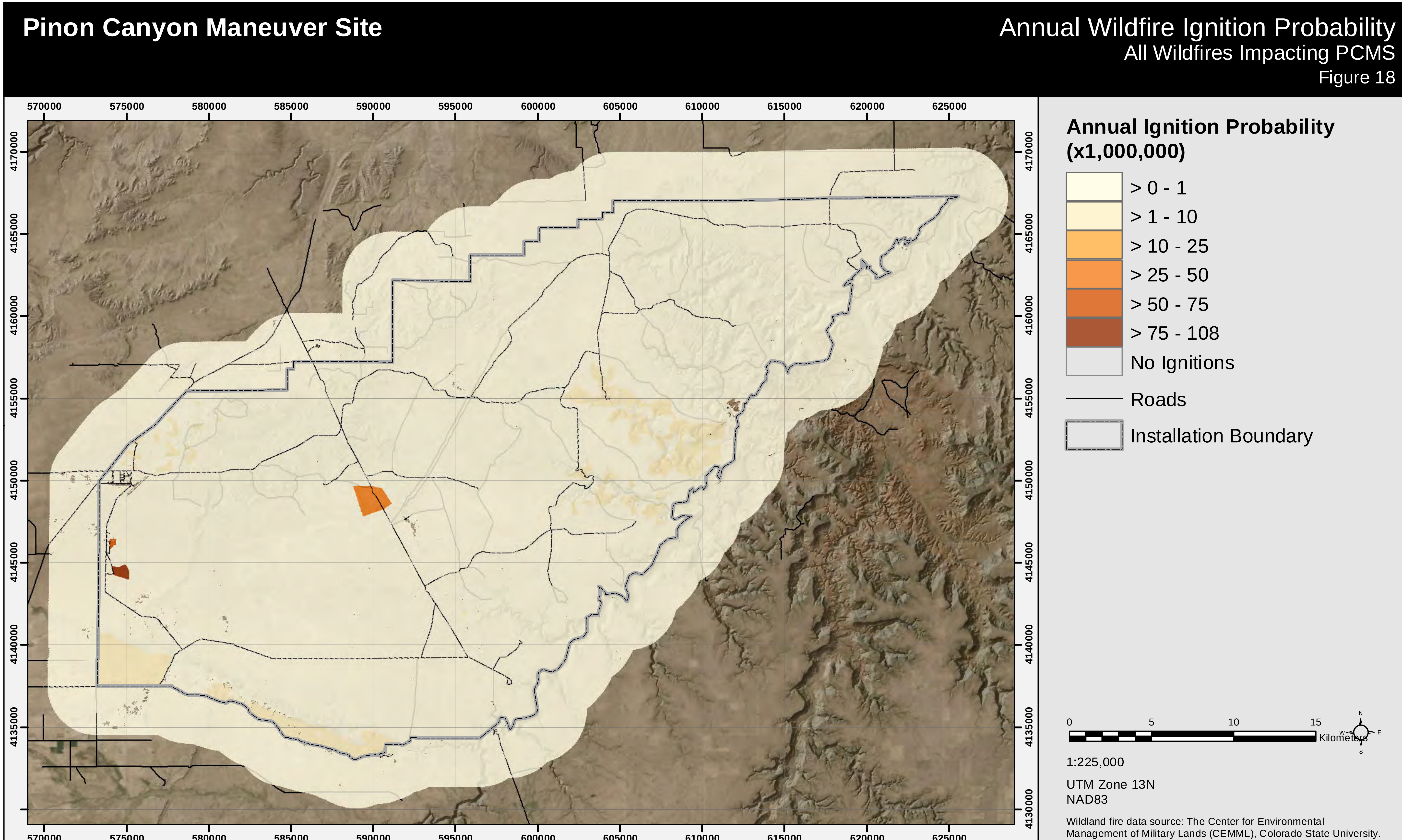


Figure 17. Fire ignition locations at PCMS 2005 – 2018.

Of all the available fire records, only 16 of the 22 fires in the NFIRS dataset included any size data. This data is incomplete and represents only 28% of all the wildfires recorded between 2005 and 2018.

On-post wildfires ranged from less than a quarter acre to 439 acres, but 38% of wildfires were less than ¼ acre, and 69% were less than 10 acres. Two of the 16 fires with size data were greater than 100 acres.

Per information gathered from staff at PCMS, there have been several fires greater than 5,000 acres, including the Callie Marie fire of 2011 at 9,089 acres and the Bridger fire of 2008 at just over 45,000 acres. Additionally, the 2018 Wildfire Risk Assessment demonstrated a strong propensity for large fires at PCMS.


Pinon Canyon Maneuver Site
Annual Wildfire Ignition Probability
All Wildfires Impacting PCMS
Figure 18
Annual Ignition Probability (x1,000,000)
> 0 - 1
> 1 - 10
> 10 - 25
> 25 - 50
> 50 - 75
> 75 - 108
No Ignitions
Roads
Installation Boundary
0 5 10 15 Kilometers
1:225,000
UTM Zone 13N
NAD83
Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.
570000 575000 580000 585000 590000 595000 600000 605000 610000 615000 620000 625000
4130000 4135000 4140000 4145000 4150000 4155000 4160000 4165000 4170000

1.4. Weather

1.4.1. Current Conditions – Fort Carson

Weather is represented here by the Fort Carson Remote Automated Weather Station (RAWS) located near the Turkey Creek Recreational Area for the period 2006 through 2018. These data were used to calculate a variety of weather and fire index metrics, which are presented here and in the following sections. Table 7 contains basic summary of these data, with further detail in the following sections. The data in Table 7 represent the measure associated with each percentile value. For example, the 50th percentile temperature, which is equivalent to the median temperature, is 62 °F. The 97th percentile temperature, which represents a reading where only 3% of all readings are higher, is 89 °F.

Table 7. Percentile weather data for the Fort Carson RAWS, 2006 – 2018.

Percentile (%)	Temperature (°F)	RH (%)	Windspeed (mph)	1 hr. Moisture (%)	10 hr. Moisture (%)	100 hr. Moisture (%)	Herbaceous Moisture (%)	Woody Moisture (%)
50	62	26	7	4.67	5.75	9.81	30	60
80	79	15	11	2.89	3.92	7.19	30	60
90	84	11	13	2.09	3.17	6.15	30	60
97	89	7	17	1.32	2.38	4.99	30	60

1.4.1.1. Temperature

Temperatures at Fort Carson show clear seasonal effects, with median daily summer high temperatures in excess of 80 °F between June and August (Figure 19). Daily temperatures are highest in the afternoon from 1200 through 1600. Median daily high temperatures remain well above freezing throughout the winter, allowing snow to melt, exposing fuels to drying, and creating potential to carry fire throughout the year. Temperatures can be well into the 50s and 60s and even higher, providing opportunities for mid-winter fires.

1.4.1.2. Relative Humidity

Relative humidity (RH) is closely associated with the amount of moisture present in fine fuels, which in turn is a primary determinant of their flammability and the potential for fire spread. Generally, relative humidity remains low and does not limit fire spread, with even the 50th percentile values well within the range of active fire spread. Thirty-nine percent of the time the minimum daily RH is below 15%. Values below 15% can produce aggressive fires that resist initial attack efforts.

Maximum daily relative humidity median values are always less than 80%, indicating frequently poor humidity recovery at night. This may allow fires to burn in light fuels, and at times to burn aggressively, through the night. The night-time hours are often used by firefighters to contain substantial portions of fires that are too active during the day to attack directly.

1.4.1.3. Wind

Wind affects the direction and rate of spread of fires. The median wind speeds, recorded daily at 1300, consistently range from 6 to 9 mph throughout the year. Winds greater than 11 mph occur 12.39% of the time, or 45 days per year on average. The highest median wind speeds occur during February through April, while July and August are the least windy (Figure 19[2]). Diurnal wind speeds are greatest from 1100 through 1600, corresponding with the hottest and driest parts of the day. When accounting for all hours, calm winds of less than one mph occur 8% of the time.

[2] How to read a wind rose: https://www.epa.gov/sites/production/files/2019-01/documents/how_to_read_a_wind_rose.pdf

Along the Front Range of Colorado, foehn winds occur with some regularity and are often referred to as Chinook winds. These winds occur when a large high pressure air mass sets up west of the Rocky Mountains. As air moves over the mountains and down the east side of the Front Range, it speeds up and increases in temperature, creating a warm, dry wind. These winds can reach speeds of 80 mph. The combination of speed and warmth can dry out vegetation quickly and vastly increase the fire risk.

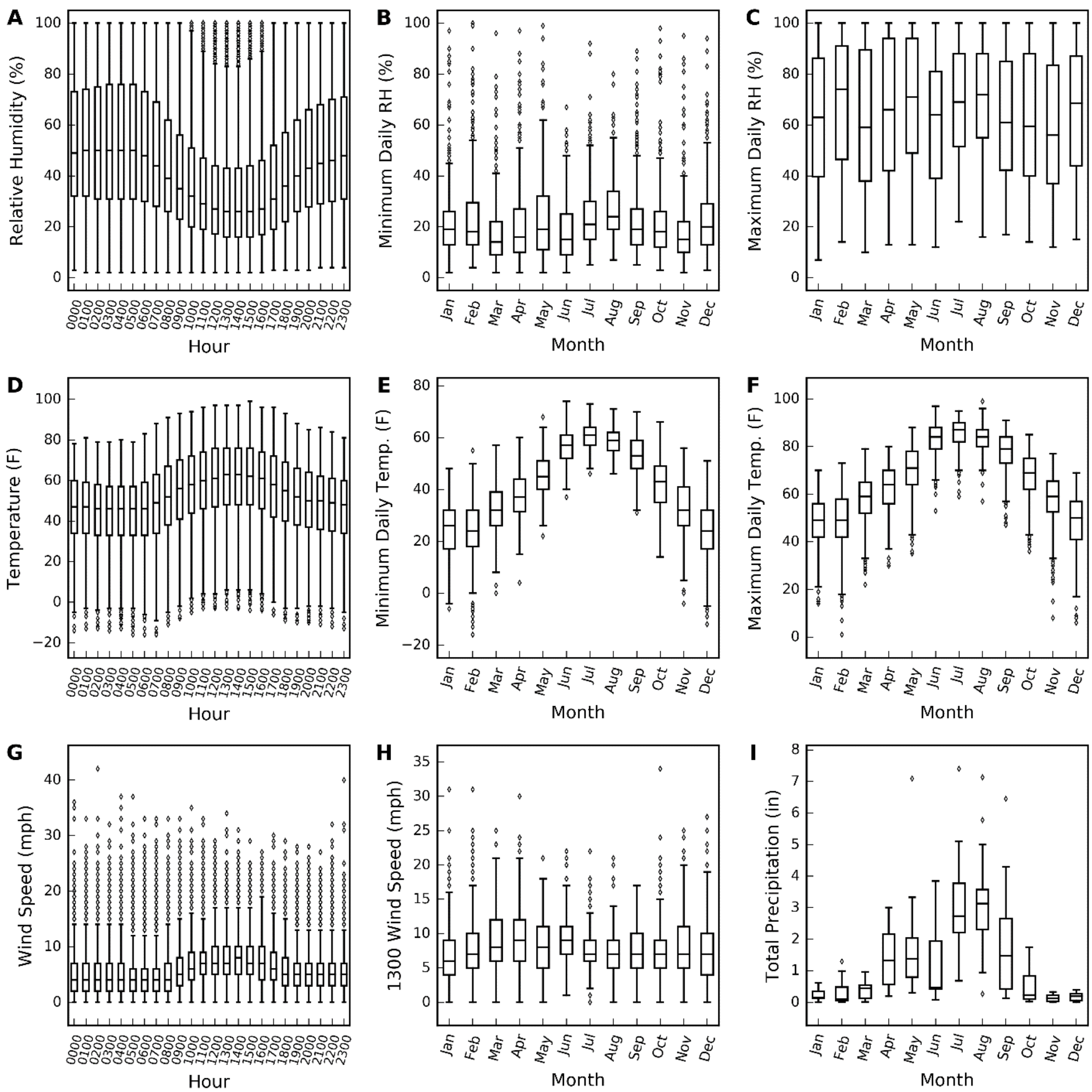


Figure 19. Weather data box and whisker plots from the Fort Carson RAWS, 2006 – 2018. Box and whisker plots show mean (dark line), 25th and 75th quantile (box edges), 1.5 * intra-quartile range (whiskers), and outliers (as identified by the Tukey method). Subplots A to C show hourly and monthly variation across all years and months in A. Relative Humidity, B. Minimum Daily Relative Humidity, and C. Maximum Daily Relative Humidity. Subplots D to I show hourly and monthly variation across all years and months in D. Temperature, E. Minimum Daily Temperature, F. Maximum Daily Temperature, G. Hourly Wind Speed, H. Monthly Wind Speed, and I. Monthly Precipitation.

The predominant wind direction is from the SSW – WNW, accounting for 40.08% of hourly wind direction readings. An additional 18.9% occur in the 45-degree arc from NNE – ENE (Figure 20). During extreme fire weather periods (characterized as ≥ 95th percentile Burning Index (BI)), wind direction is consistently out of the SSW through W (54.43% of the time), and to a much smaller degree the NNE through ENE (21.21% of the time) (Figure 20), with all other wind directions accounting for the remaining 24.36% of the time. The consistency of this pattern is quite strong.

During these high fire danger periods, winds from the SSW through W and NNE through ENE are strong, with winds over 15 mph occurring 42.48% of the time. Considering the high Burning Index value, these conditions make fire control difficult or impossible.

Daytime winds are weakest during July and August. During these months, they are also much more variable, including substantial NNE through E through WSW components. The remainder of the year, winds tend to be primarily from the NE and SW quadrants, though there is substantial variability.

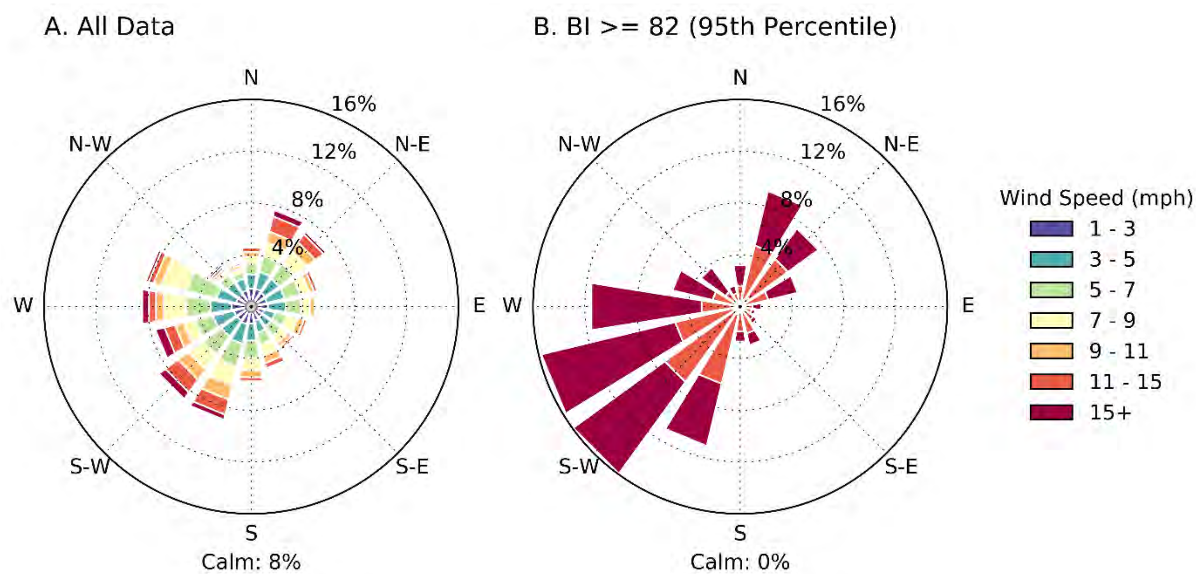


Figure 20. A. Wind rose data from the Fort Carson RAWS, 2006 – 2018. B. Wind data subset of only days when BI was greater than or equal to the 95th percentile. A wind rose shows the relative frequency and strength of the wind from each direction, as well as the percentage of the time the wind is calm.

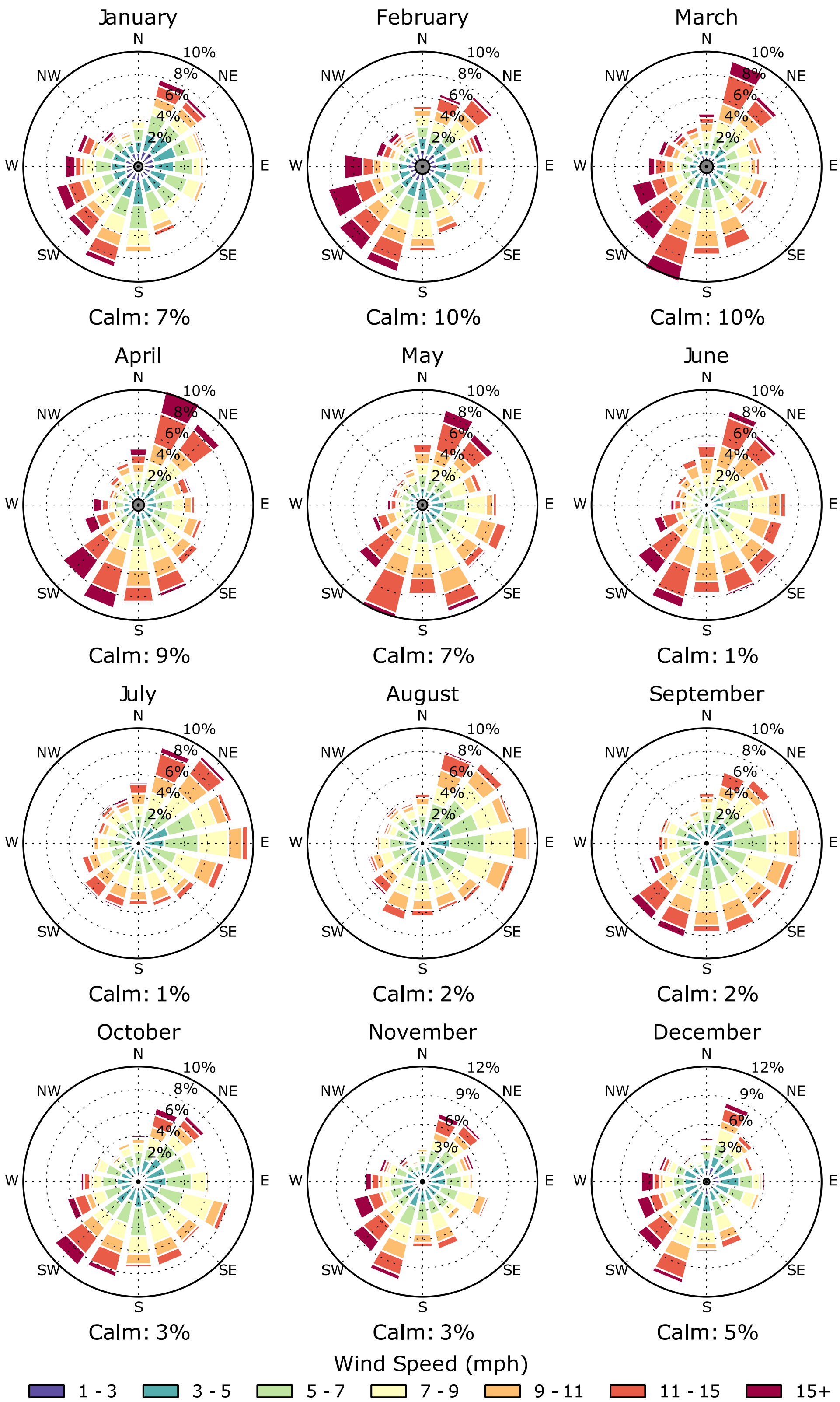


Figure 21. Monthly wind roses depicting daytime conditions (0800 – 1900) at the Fort Carson RAWS, 2006 – 2018.

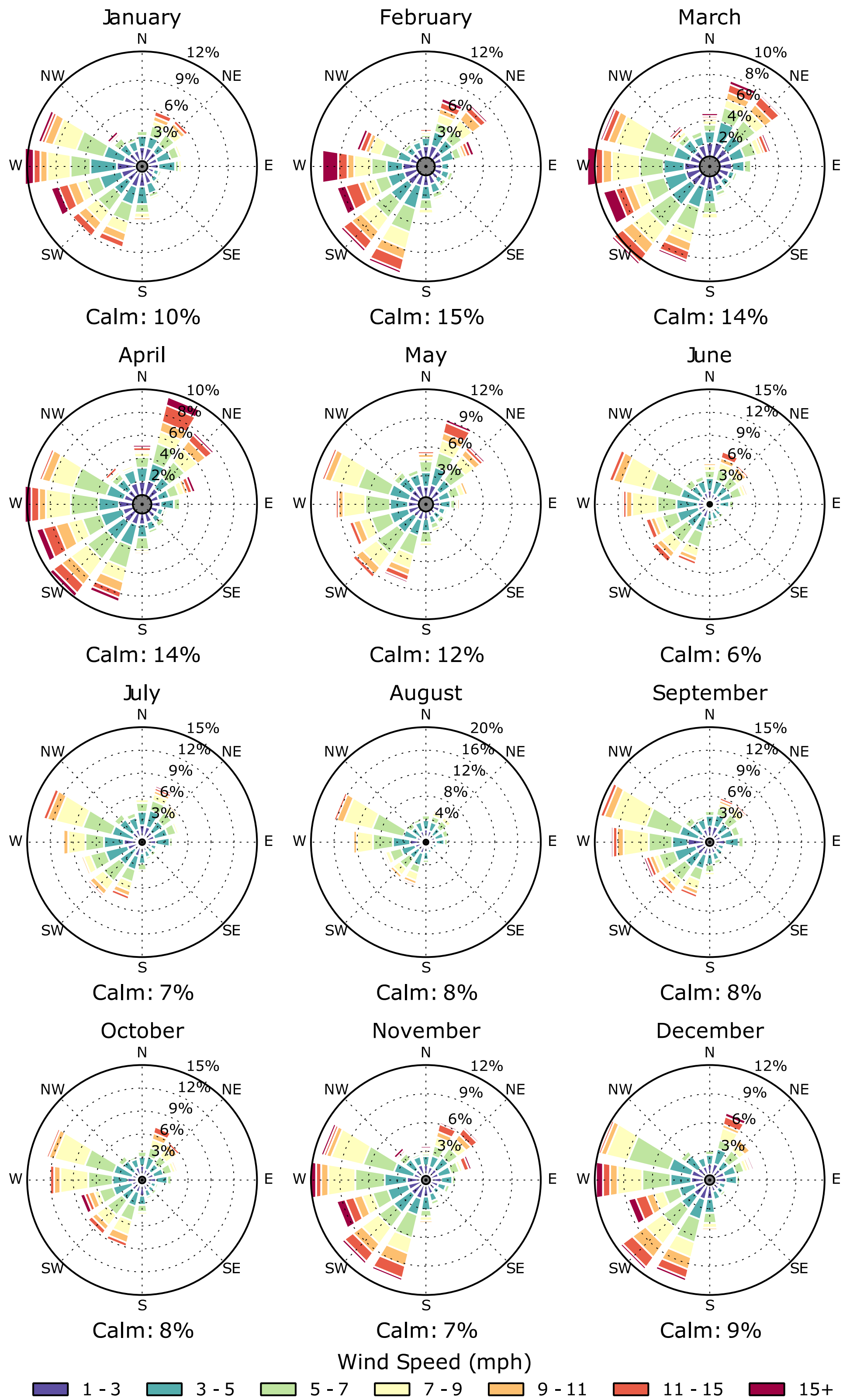


Figure 22. Monthly wind roses depicting nighttime conditions (1900 – 0800) at the Fort Carson RAWS, 2006 – 2018.

1.4.1.4. Precipitation

Precipitation occurs in the Fort Carson area as rain, snow, and intermediate forms, such as hail. Annual average precipitation varies across the installation with more precipitation in the northern portion of the installation and less in the southern portion. Mean annual precipitation in the Colorado Springs area is 17.5 inches per year. The mean from 2006 through 2018 according to the Fort Carson RAWS was 14.74 inches per year, though this may be low as the RAWS does not have a heated rain gauge, so snow may blow off before it melts and is measured. Weather stations in the southern part of the installation received approximately 13.5 inches.

Most of that precipitation falls from April through September and peaks in July and August (Figure 19). Very little precipitation falls in the months of November through March. Average annual snowfall in the region is 42.4 inches per year, which typically occurs from September through May.

1.4.2. Current Conditions – PCMS

Weather is represented here by the Piñon Canyon RAWS, located within Training Area 2 west of the Walters Benchmark, for the period 2006 through 2018. These data were used to calculate a variety of weather and fire index metrics. A basic summary of the data is in Table 8, with further detail in the following sections.

Table 8. Percentile weather data for the Piñon Canyon RAWS, 2006 – 2018.

Percentile (%)	Temperature (°F)	RH (%)	Windspeed (mph)	1 hr. Moisture (%)	10 hr. Moisture (%)	100 hr. Moisture (%)	Herbaceous Moisture (%)	Woody Moisture (%)
50	69	22	6	3.57	4.81	9.39	30	60
80	86	13	11	2.18	3.27	6.92	30	60
90	91	9	14	1.62	2.69	5.97	30	60
97	96	6	21	1.03	2.03	4.8	30	60

1.4.2.1. Temperature

Temperatures at PCMS showed clear seasonal effects, with maximum median daily summer high temperatures in excess of 90°F between June and August (Figure 23), and maximum median daily winter high temperatures less than 55°F in December through February. Daily temperatures were highest in the afternoon from 1200 through 1600. Median daily high temperatures remained well above freezing throughout the winter, which can melt snow, expose fuels to drying, and allow fuels to carry fire throughout the year. Temperatures were well into the 50s and 60s and even higher throughout the year, providing opportunities for mid-winter fires.

1.4.2.2. Relative Humidity

Generally, relative humidity remained low and did not limit fire spread, with even 50th percentile values well within the range of active fire spread. The mid-day relative humidity dropped to 13% or lower on 20% of all days, or roughly 73 days per year. Values below 15% can produce aggressive fires that resist initial attack efforts.

Maximum daily relative humidity was 75% or less more than half the time, indicating frequently poor humidity recovery at night. This could allow fires to burn through the night, at times aggressively. The nighttime hours are often used by firefighters to contain substantial portions of fires that are too active during the day to attack directly. The high number of nights with poor humidity recovery indicates potential fire containment difficulties.

1.4.2.3. Wind

Median wind speeds, recorded daily at 1300, consistently ranged from 6 to 8 mph throughout the year. Winds 11 mph and greater occurred 17.09% of the time, or 62 days per year on average. The highest median wind speeds occurred during March through June, with the median in the remaining months being 6 mph (Figure 25). Diurnal wind speeds were greatest from 1400 through 1700, corresponding with the hottest and driest parts of the day. When accounting for all hours, calm winds of less than one mph occurred 5% of the time (Figure 23).

The predominant wind direction was from the SE – W, accounting for 56.27% of hourly wind direction readings. An additional 28.36% occurred in the 90-degree arc from W – N (Figure 23). During extreme fire weather periods (characterized as ≥ 95th percentile Burning Index), wind direction was out of the SE through WNW 80.7% of the time. During extreme fire weather, winds 11 mph and greater occurred 81.51% of the time.

Daytime winds were much more variable compared to nighttime winds (Figures 25 and 26). Nighttime winds tended to be out of the S through W while daytime winds were likely to be from almost any direction.

1.4.2.4. Precipitation

Precipitation occurs at PCMS as rain, snow, and intermediate forms, such as hail. Annual average precipitation from 2006 through 2018, according to the Piñon Canyon RAWS, was 9.30 inches per year. The RAWS does not have a heated rain gauge, so some precipitation falling as snow may blow off before it melts and is recorded by the station, reducing the total precipitation. The average annual precipitation in La Junta is nearly 12” and in Hoehne it is nearly 18”, suggesting the total measured by the RAWS is low.

Seasonally, July and August accounted for the greatest amount of precipitation, with each receiving at least 1.5” of rain annually. Combined, these two months represented 34.42% of total precipitation. The winter months, November through February, are the driest, with each month representing less than 2% of total precipitation.

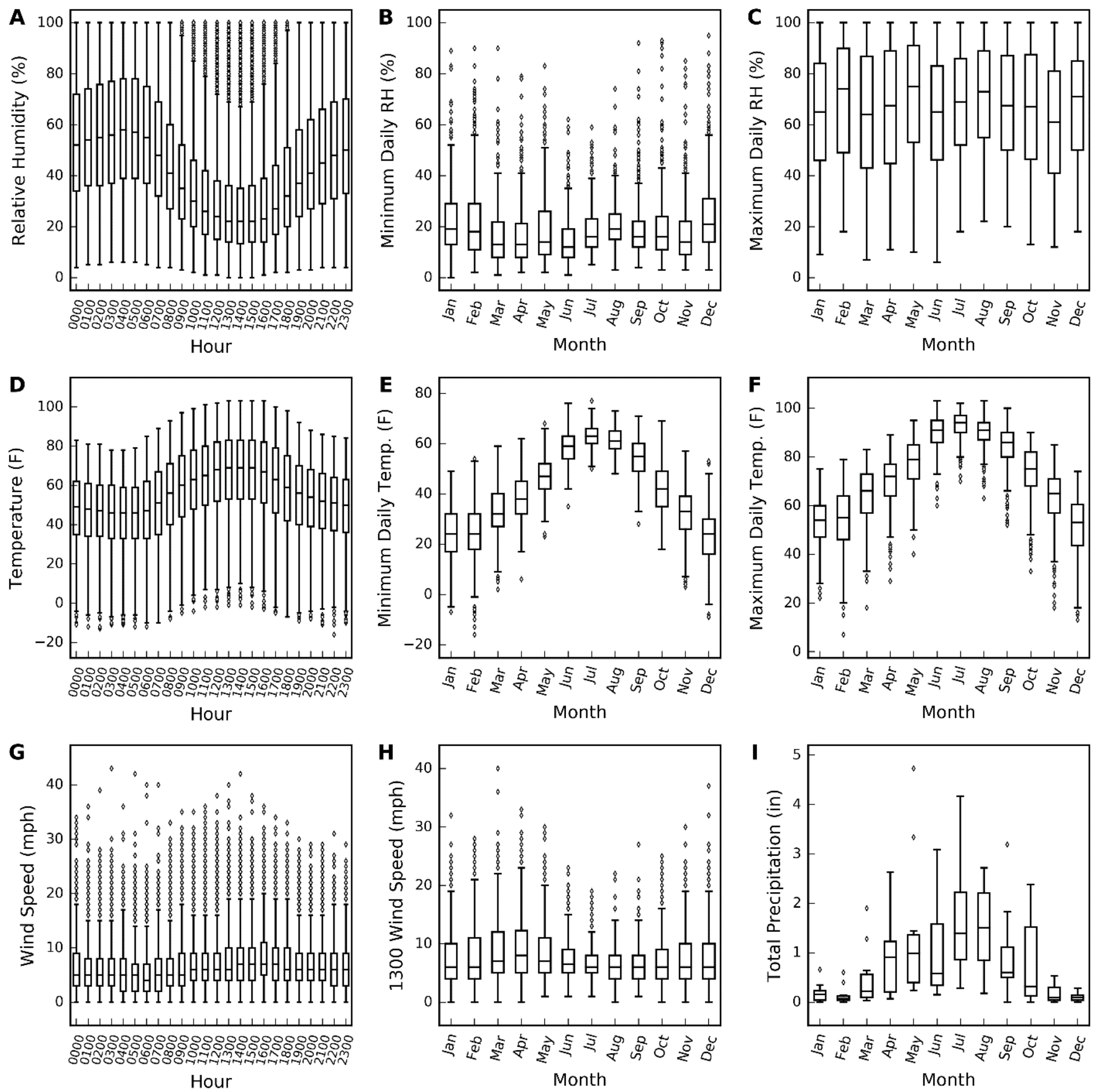


Figure 23. Weather data box and whisker plots from the Piñon Canyon RAWS, 2006 – 2018. Box and whisker plots show mean (dark line), 25th and 75th quantile (box edges), 1.5 * intra-quartile range (whiskers), and outliers (as identified by the Tukey method). Subplots A to C show hourly and monthly variation across all years and months in A. Relative Humidity, B. Minimum Daily Relative Humidity, and C. Maximum Daily Relative Humidity. Subplots D to I show hourly and monthly variation across all years and months in D. Temperature, E. Minimum Daily Temperature, F. Maximum Daily Temperature, G. Hourly Wind Speed, H. Monthly Wind Speed, and I. Monthly Precipitation.

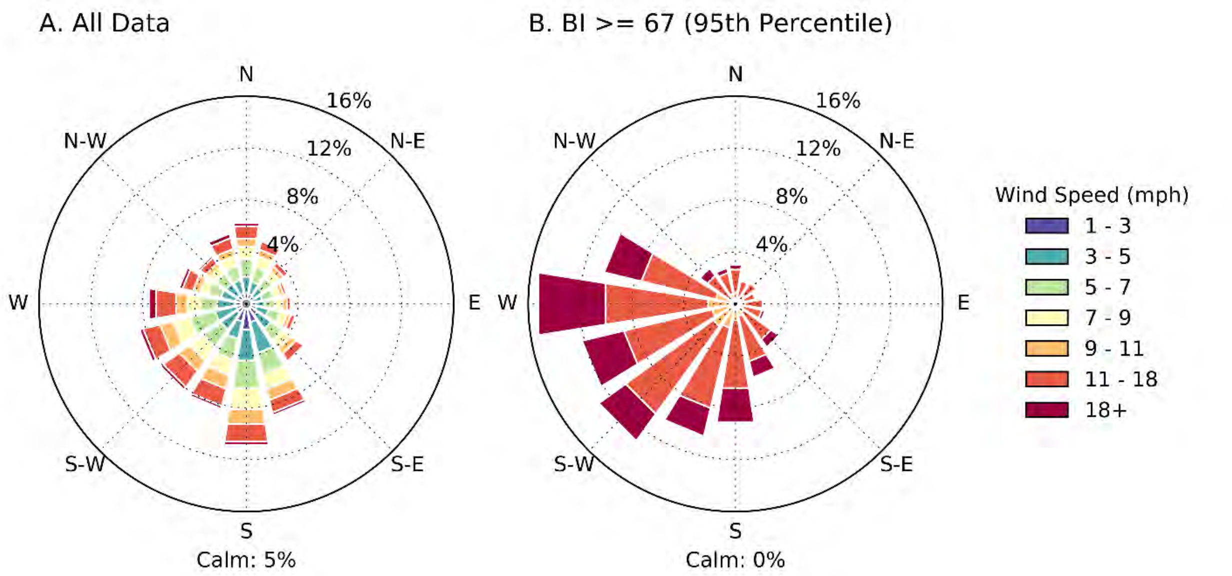


Figure 24. A. Wind rose data from the Piñon Canyon RAWS, 2006 – 2018. B. Wind rose data subset of only days when BI was greater than or equal to the 95th percentile. A wind rose shows the relative frequency and strength of the wind from each direction, as well as the percentage of the time the wind is calm.

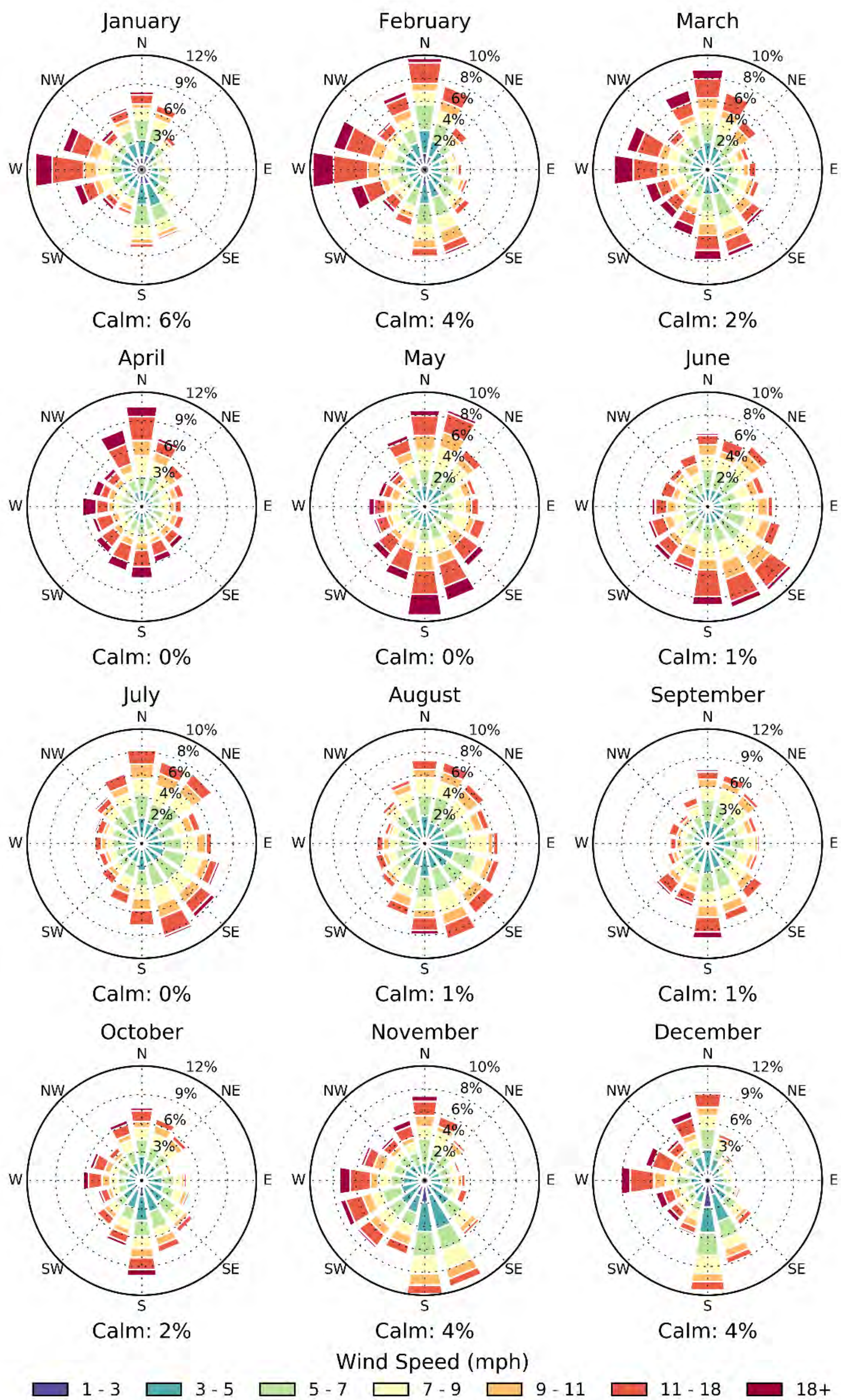


Figure 25. Monthly wind roses depicting daytime conditions (0800 – 1900) at the Piñon Canyon RAWS, 2006 – 2018.

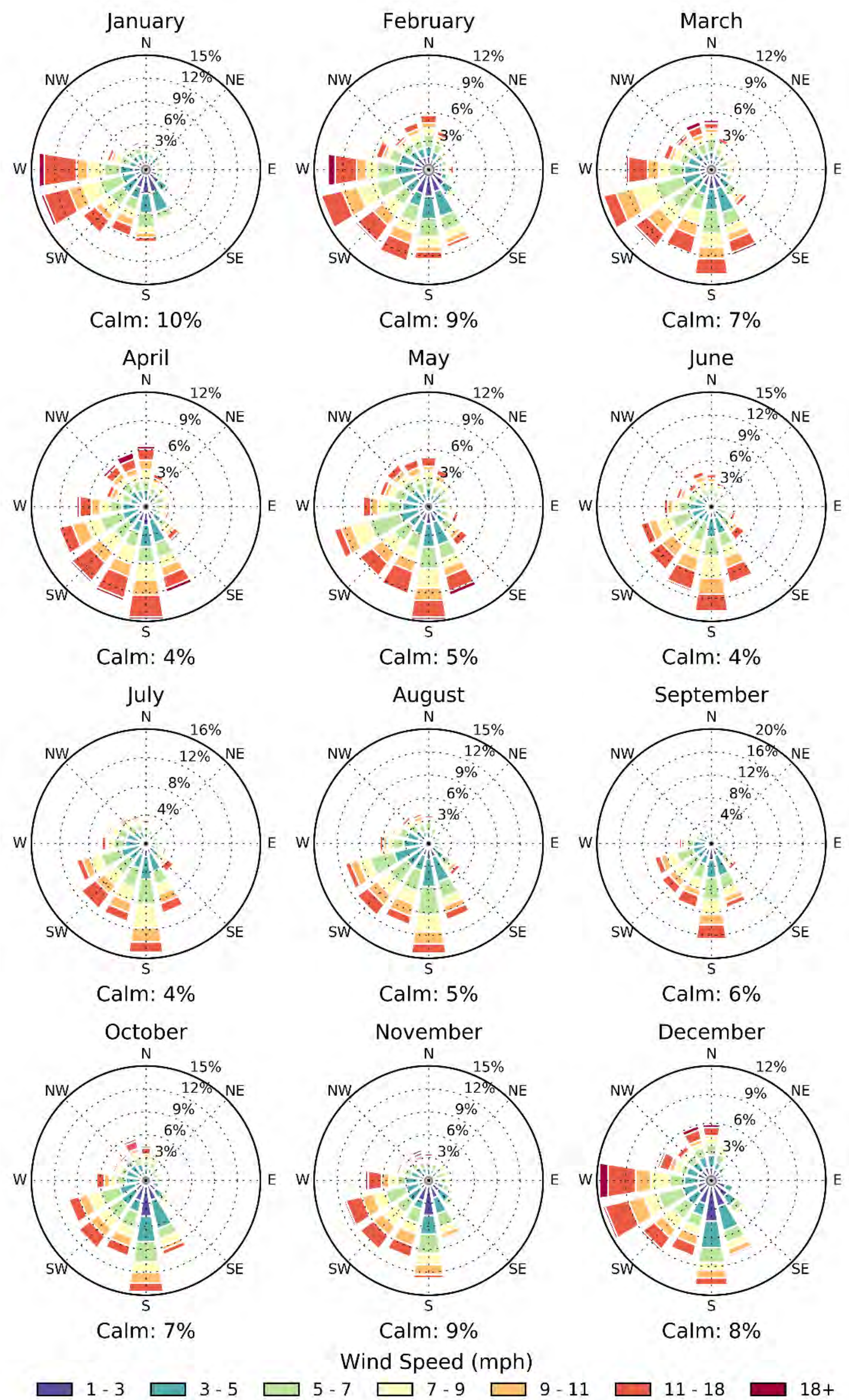


Figure 26. Monthly wind roses depicting nighttime conditions (1900 – 0800) at the Piñon Canyon RAWS, 2006 – 2018.

1.4.3. Fire Indices

Several fire indices are calculated by the National Fire Danger Rating System (NFDRS). Because the significant majority of fires at Fort Carson burn in grass fuels, the Burning Index (BI), which accounts for the influence of wind speed, a major factor in grass fire spread, is a better choice as a fire danger metric than the more commonly utilized Energy Release Component which does not account for wind speed.

A Burning Index/fire behavior cross reference was created to help fire managers with fire suppression decision-making (Table 9) and can be used as a general guide when looking at historical BI data. This is only a general reference. An analysis of local fire behavior is the only way to determine necessary local adjustments.

These data can be further cross-referenced with a variety of fire characteristics charts, such as those described by Andrews and Rothermel (1982)[3]. These guidelines suggest that fires burning under BI conditions between 80 and 110 will be resistant to most control efforts, and those in excess of 110 are unlikely to be contained by any means.

Table 9. Burning Index/fire behavior cross reference per Deeming *et al.* 1977[4].

Burning Index Category	Burning Index Range	Fireline Intensity (BTUs/S/ft)	Narrative Comments
1	0 – 30	0 - 55	Most prescribed burns are conducted in this range.
2	> 30 - 40	> 55 - 110	Generally represents the limit of control for direct attack methods.
3	> 40 - 60	> 110 - 280	Machine methods usually necessary or indirect attack should be used.
4	> 60 - 80	> 280 - 520	The prospects for direct control by any means are poor above this intensity.
5	> 80 -90	> 520 - 670	The heat load on people within 30 feet of the fire is dangerous.
6	> 90 – 110+	> 670 – 1050+	Above this intensity, spotting, fire whirls, and crowning should be expected.

1.4.3.1. Fire Indices – Fort Carson

Data from the Fort Carson RAWS indicate that daily observations of BI most commonly fall into the third BI Category of 40 – 60, representing 39.03% of the data (Figure 27). Just over 23% of observations are between 60 and 80, indicating conditions that could strain fire containment capabilities. Of particular concern is that 11.74% of all daily observations are of BIs in excess of 80, indicating fires that are unlikely to be controlled by any means.

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[3] Andrews P.L., Rothermel R.C. 1982. Charts for interpreting wildland fire behavior characteristics. USDA Forest Service, Intermountain Forest and Range Experiment Station. General Technical Report INT-131. Ogden, Utah.
[4] Deeming J.E., Burgan R.E., and Cohen J.D. 1977. The National Fire-Danger Rating System – 1978. USDA Forest Service, Intermountain Forest and Range Experiment Station, General Technical Report INT-39, Ogden, Utah.

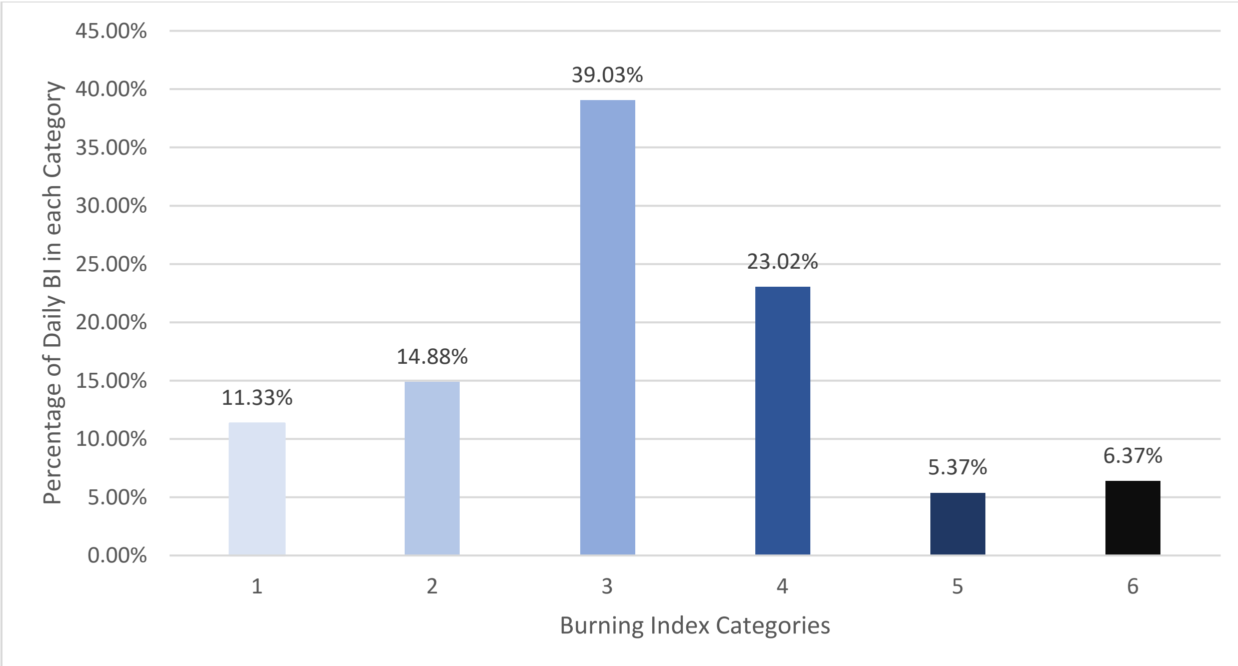

Figure 27. The percentage of daily Burning Index readings at Fort Carson by Burning Index Category.

March, April, and June recorded over 47% of days with a BI in excess of 60 (Figure 28). Additionally, the daily BI exceeded 90 over 10% of the time during these months.

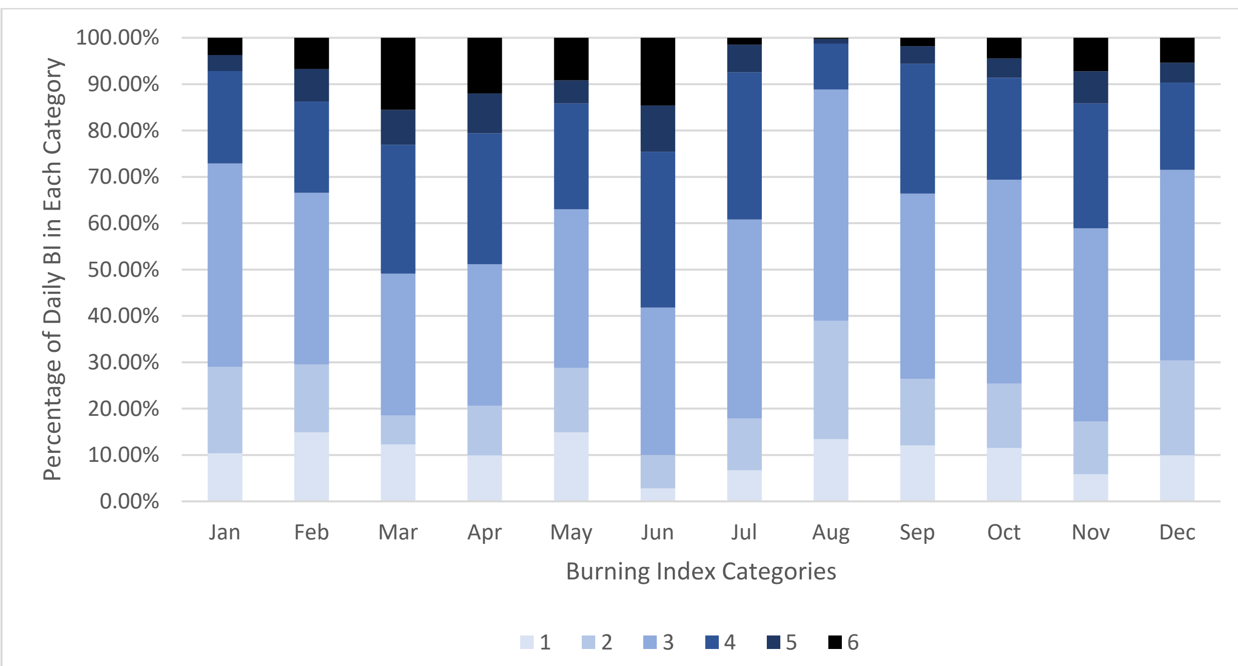

Figure 28. The percentage of each month in each Burning Index category at Fort Carson.

The 1000-hour fuel moisture is an indicator of drought and therefore long-term drying that affects fire conditions particularly in regard to larger fuels, such as those in forests. These larger fuels contribute to fire intensity and severity. The 1000-hour fuel moisture is lowest in June, but the median values are 12% or lower every month of the year except August when it is a mere 1% higher (Figure 29). A value of 12%

is considered moderately dry, and would not be uncommon during fire season, but this condition persists throughout indicating the heavy fuels are available to burn year-round.

The 1-hour fuel moisture, which tracks the moisture of the finest fuels (e.g., leaves and needles), is very consistent, with medians of 4-5% every month of the year but December (Figure 29). For the 25th percentile (occurring 25% of the time) readings of 2% to 3% occur in every month except December, January, and August. Again, this indicates very dry fuels, as dead fuels with moisture values below 5% are highly flammable.

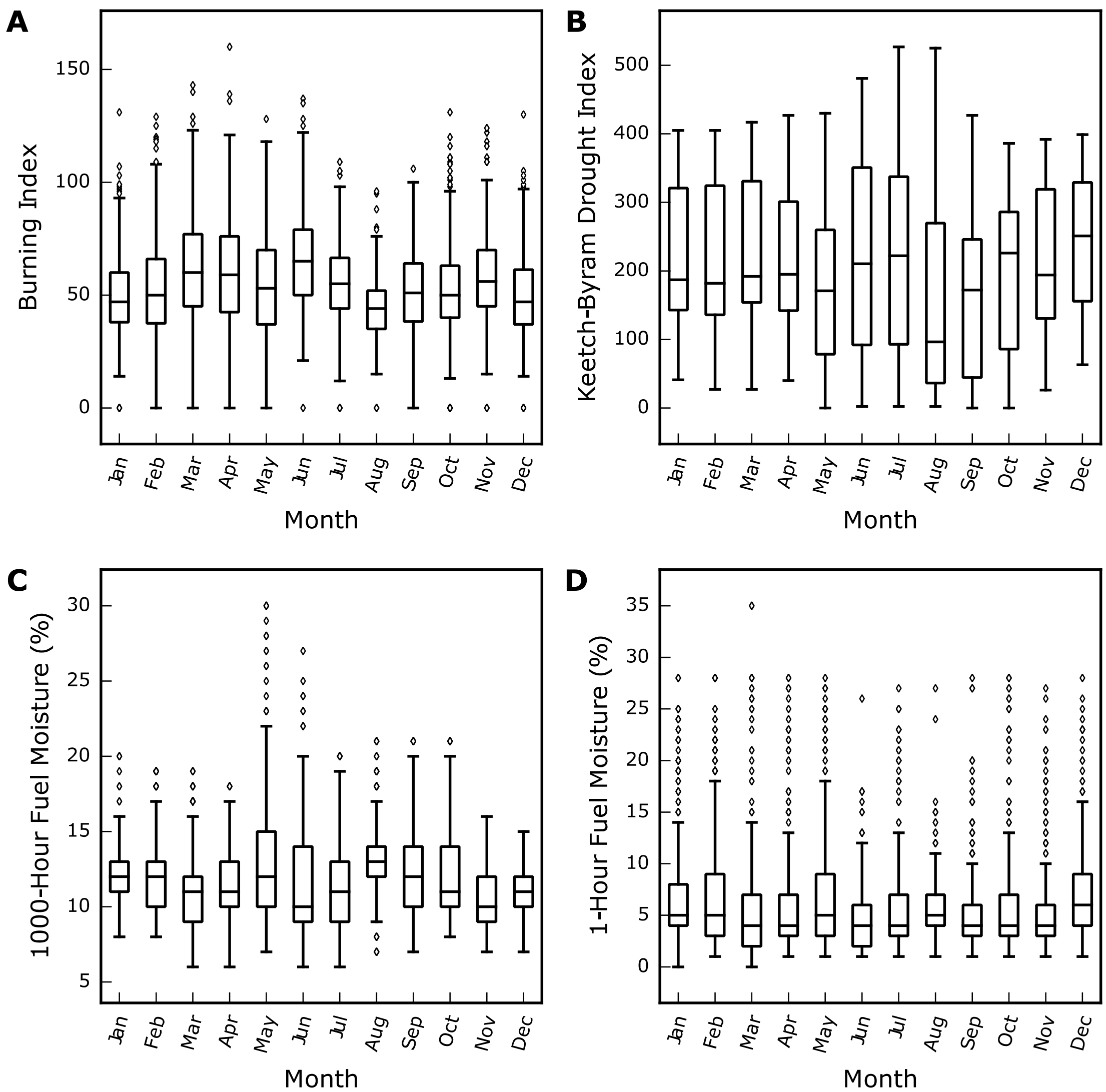

Figure 29. Fire Indices box and whisker plots from the Fort Carson RAWS, 2006 – 2018. Box and whisker plots show mean (dark line), 25th and 75th quantile (boxes), 1.5* intra-quartile range (whiskers), and outliers (as identified by the Tukey method). Subplots A to D show daily readings across all years and months in A. Burning Index, B. KBDI, C. 1000-Hour Fuel Moisture, D. 1-Hour Fuel Moisture.

1.4.3.2. Fire Indices – PCMS

Data from the Piñon Canyon RAWS indicates that the BI is somewhat evenly distributed through categories 1 through 3 (Figure 30). This indicates that approximately 85% of fires occurring on PCMS should be containable with direct, indirect, and machine methods. Observations between 60 and 80 occur 10.67% of the time, indicating conditions that could strain fire containment capabilities. Additionally, 4.12% of all daily BI observations exceed 80, indicating fires that are unlikely to be controlled by any means.

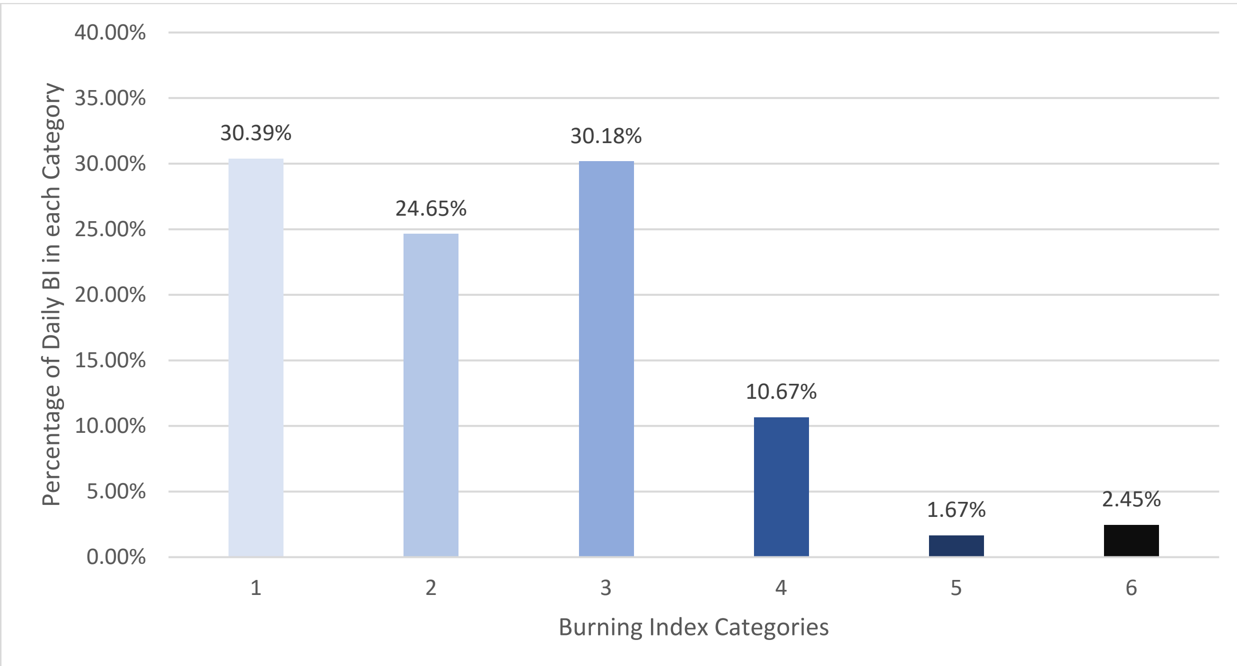

Figure 30. The percentage of daily Burning Index readings at PCMS by Burning Index Category.

The highest fire danger is in March and April, when more than 25% of days with a BI over 60 occur (Figure 31). Notably, November through April is when the BI is most frequently over 60.

The 1000-hour fuel moisture is an indicator of drought and therefore long-term drying that affects fire conditions, particularly in regard to larger fuels such as those in forest fuels. These larger fuels contribute to fire intensity and severity. The 1000-hour fuel moisture is lowest in June at 9%, but median values of 11% or lower occur in every month of the year (Figure 32). A value of 12% is considered moderately dry, and would not be uncommon during fire season, but this condition persists throughout the year, indicating heavy fuels are available to burn year-round.

The Keetch-Byram Drought Index (KBDI) supports this conclusion, with median values in excess of 400 in all but May and June. The 75th percentile KBDI exceeds 540 every month of the year, further indicating significant drought potential. These levels of drought suggest that litter layers will actively contribute to fire intensity and approach the threshold of 600, above which fires can be expected to be very active, including long-range spotting.

The 1-hour fuel moisture, tracking the finest fuels (e.g., leaves and needles), is very consistent, with medians of 3-4% every month of the year but December (Figure 32). Twenty-fifth percentile readings of 2% and 3% occur in every month. Dead fine fuels with moisture values below 5% are generally highly flammable, and the 1-hour fuel moisture at PCMS suggests fires will spread rapidly every month of the year.

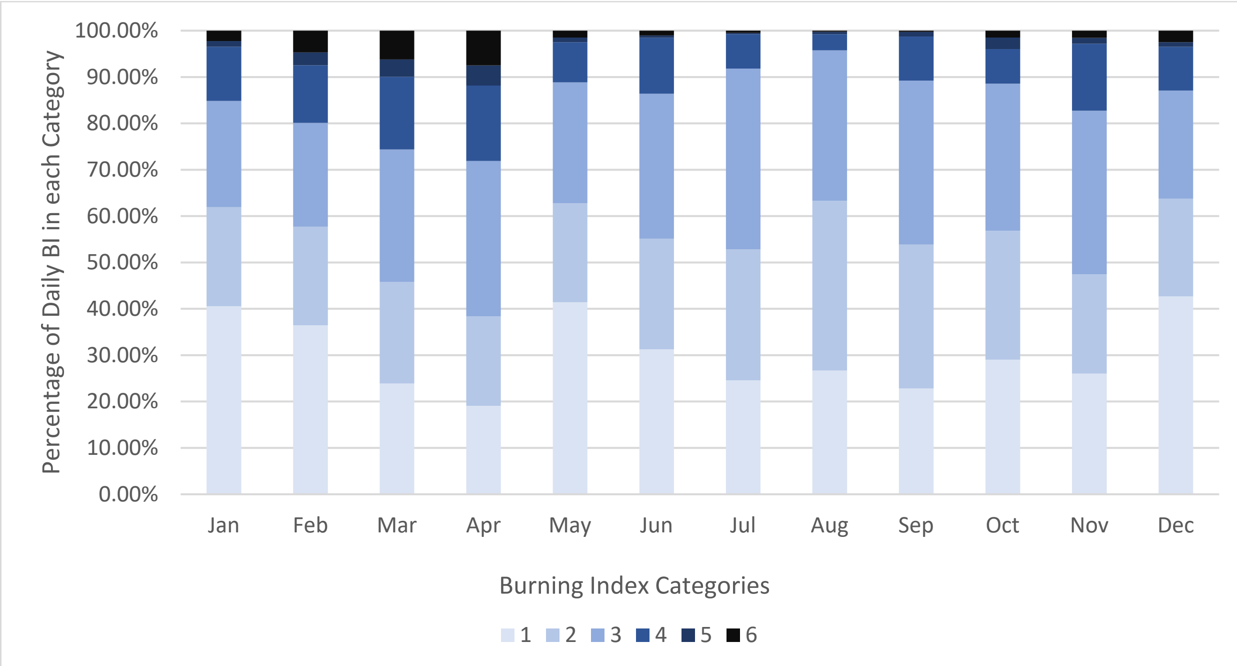

Figure 31. The percentage of each month in each Burning Index category at PCMS.

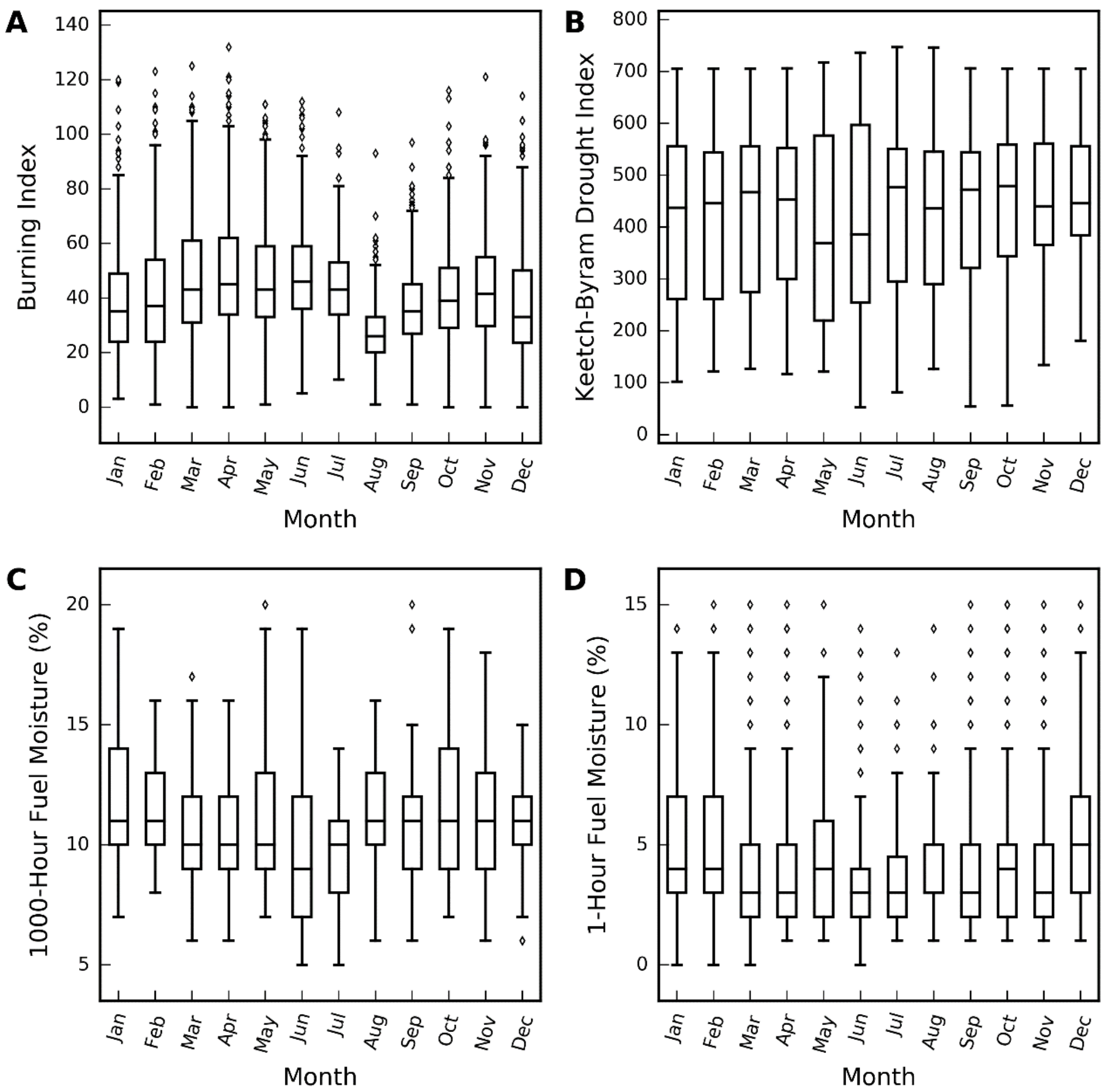

Figure 32. Fire Indices box and whisker plots from the Piñon Canyon RAWS, 2006 – 2018. Box and whisker plots show mean (dark line), 25th and 75th quantile (boxes), 1.5* intra-quartile range (whiskers), and outliers (as identified by the Tukey method). Subplots A to D show daily readings across all years and months in A. Burning Index, B. KBDI, C. 1000-Hour Fuel Moisture, D. 1-Hour Fuel Moisture.

1.5. Projected Changes in Climate

Climate data from the HadGEM2-ES input dataset (Collins et al. 2011[5]; Martin et al. 2011[6]) were acquired from the German Climate Computing Center's Earth System Grid Federation (ESGF-DKRZ) data portal. The Representative Concentration Pathways (RCPs) 4.5, representing a moderate decrease in greenhouse gas emissions, and RCP 8.5, representing unchanged greenhouse gas emissions, were used. For each RCP, we acquired data for the 2030 and 2050 time frames. These are represented by a 10-year bracket of weather data (e.g., 2026 – 2035). The historical time frame is represented by the 30-year period 1976 – 2005.

1.5.1. Climate Change - Fort Carson

Annual precipitation is not projected to change markedly in any of the future scenarios (Table 10). However, the distribution of precipitation is expected to change, particularly in May and July. In both cases, precipitation is likely to decrease, by over 0.5 inches in May and by as much as 1.25 inches in July. There is also a drop in precipitation projected for March in all but the RCP 8.5 2030 scenario. Increases in precipitation are evident in a variety of months and scenarios but are consistent in November through January.

Table 10. Monthly average precipitation relative to the historical average and change by month at Fort Carson. Colors are relative, with green indicating a change that is likely to contribute to reduced or moderate increases in fire activity and red indicating a change that is likely to contribute to more pronounced increases in fire activity.

Monthly Averages (in)						Change (in)			
Month	Historical	RCP 4.5		RCP 8.5		RCP 4.5		RCP 8.5	
		2030	2050	2030	2050	2030	2050	2030	2050
Jan	0.61	0.72	0.69	1.03	0.79	0.11	0.08	0.42	0.18
Feb	0.66	0.85	0.66	0.81	0.65	0.19	0.00	0.15	-0.01
Mar	1.88	1.48	1.39	1.92	1.57	-0.40	-0.50	0.04	-0.31
Apr	1.80	2.25	1.77	2.65	2.20	0.45	-0.03	0.86	0.41
May	3.17	2.59	2.34	2.58	1.80	-0.58	-0.83	-0.58	-1.37
Jun	1.99	1.71	1.94	2.14	1.96	-0.28	-0.05	0.15	-0.03
Jul	3.46	2.51	2.21	2.31	2.78	-0.95	-1.25	-1.15	-0.68
Aug	2.72	4.09	2.68	3.36	3.00	1.37	-0.04	0.64	0.28
Sep	1.56	1.50	1.98	1.31	1.56	-0.06	0.42	-0.25	0.01
Oct	1.08	1.23	1.02	1.05	1.26	0.16	-0.05	-0.03	0.18
Nov	0.72	1.00	0.96	0.68	0.88	0.29	0.24	-0.04	0.17
Dec	0.63	0.77	0.93	0.87	0.96	0.14	0.30	0.24	0.33
Average	1.69	1.73	1.55	1.73	1.62	0.04	-0.14	0.04	-0.07

Temperature maxima are projected to climb in the 2030 scenarios, but the results are somewhat sporadic, reducing confidence in the higher projected values (Table 11). However, by 2050, monthly average

[5] Collins W., Bellouin N., Doutriaux-Boucher M., Gedney N., Halloran P., Hinton T., Hughes J., Jones D., Joshi M., Liddicoat S., Martin G., O'Connor F., Rae J., Senior C., Sitch S., Totterdell I., Wiltshire A., Woodward S. 2011. Development and evaluation of an Earth-System model – HadGEM2. Geosci. Model Dev., 4, 1051-1075, 2011, doi:10.5194/gmd-4-1051-2011.

[6] Martin M., Bellouin, N., Collins J., Culverwell, D., Halloran R., Hardiman C., Hinton J., Jones D., McDonald E., McLaren J., O'Connor M., Roberts J., Rodriguez M., Woodward S., Best J., Brooks E., Brown R., Butchart N., Dearden C., Derbyshire H., Dharssi I., Doutriaux-Boucher M., Edwards M., Falloon D., Gedney N., Gray J., Hewitt T., Hobson M., Huddleston R., Hughes J., Ineson S., Ingram J., James M., Johns C., Johnson E., Jones A., Jones P., Joshi M., Keen B., Liddicoat S., Lock P., Maidens V., Manners C., Milton F., Rae L., Ridley K., Sellar A., Senior A., Totterdell J., Verhoef A., Vidale L., Wiltshire A. 2011 The HadGEM2 family of Met Office Unified Model climate configurations, Geosci. Model Dev., 4, 723-757, doi:10.5194/gmd-4-723-2011, 2011.

temperature maxima are frequently higher than the historical values by 6 °F or more. This is a very substantial warming trend and is concentrated from March through November, the entire fire season.

Table 11. Monthly average maximum temperature relative to the historical average and change by month at Fort Carson. Colors are relative, with green indicating a change that is likely to contribute to reduced or moderate increases in fire activity and red indicating a change that is likely to contribute to more pronounced increases in fire activity.

Monthly Averages (F)						Change (F)			
Month	Historical	RCP 4.5		RCP 8.5		RCP 4.5		RCP 8.5	
		2030	2050	2030	2050	2030	2050	2030	2050
Jan	47.06	45.70	49.74	47.11	50.85	-1.36	2.68	0.05	3.79
Feb	47.71	47.74	50.59	48.93	54.90	0.03	2.89	1.22	7.19
Mar	53.98	56.98	59.03	55.87	60.22	3.00	5.05	1.90	6.25
Apr	62.31	64.36	70.06	65.19	68.07	2.05	7.75	2.88	5.76
May	68.90	72.27	77.08	72.38	79.16	3.37	8.18	3.48	10.26
Jun	79.70	86.64	87.33	84.40	89.29	6.94	7.63	4.70	9.59
Jul	84.36	89.29	92.30	91.70	92.05	4.94	7.94	7.34	7.69
Aug	83.68	86.53	90.00	87.95	91.92	2.85	6.31	4.27	8.24
Sep	76.41	79.93	80.27	82.41	83.81	3.51	3.85	5.99	7.39
Oct	66.31	70.15	74.07	71.22	74.40	3.85	7.76	4.91	8.09
Nov	53.70	56.71	61.37	61.79	62.94	3.00	7.67	8.09	9.23
Dec	47.11	48.44	49.74	49.37	51.15	1.33	2.62	2.26	4.04
Average	64.27	67.06	70.13	68.19	71.56	2.79	5.86	3.93	7.29

Relative humidity is expected to decrease substantially in both 2050 scenarios (Table 12). Decreases in excess of 5% are projected and decreases of more than 3% are consistently projected from March through August. Though RH is expected to remain relatively unchanged overall in the 2030 scenarios, it is expected to decrease by roughly 3 – 8%, mostly in May through September while increasing by similar amounts in January and February. May and August represent the largest and most consistent decreases in RH across scenarios.

Table 12. Monthly average relative humidity relative to the historical average and change by month at Fort Carson. Colors are relative, with green indicating a change that is likely to contribute to reduced or moderate increases in fire activity and red indicating a change that is likely to contribute to more pronounced increases in fire activity.

Monthly Averages (%)						Change (%)			
Month	Historical	RCP 4.5		RCP 8.5		RCP 4.5		RCP 8.5	
		2030	2050	2030	2050	2030	2050	2030	2050
Jan	58.20	63.32	56.69	62.07	59.48	5.12	-1.52	3.87	1.28
Feb	58.02	61.04	59.49	61.10	59.32	3.02	1.48	3.09	1.30
Mar	56.80	54.63	53.39	59.22	54.20	-2.17	-3.41	2.43	-2.60
Apr	50.40	49.75	45.43	54.88	49.44	-0.65	-4.97	4.48	-0.95
May	53.41	52.40	47.74	50.47	43.73	-1.01	-5.67	-2.93	-9.68
Jun	42.95	40.01	40.82	43.94	38.98	-2.94	-2.13	0.99	-3.96
Jul	46.23	41.14	36.31	37.42	39.14	-5.09	-9.92	-8.81	-7.09
Aug	46.41	47.73	40.93	45.36	40.53	1.31	-5.48	-1.05	-5.88
Sep	48.95	46.32	49.28	43.81	44.94	-2.63	0.33	-5.14	-4.01
Oct	47.49	47.65	45.06	45.02	45.70	0.16	-2.43	-2.47	-1.79
Nov	52.98	57.17	52.93	50.97	52.29	4.19	-0.05	-2.01	-0.69
Dec	59.55	61.31	58.06	61.05	59.91	1.77	-1.48	1.50	0.37
Average	51.78	51.87	48.84	51.28	48.97	0.09	-2.94	-0.51	-2.81

Wind speed is not projected to change substantially in either of the 2030 scenarios (Table 13). In the 2050 scenarios, increases are only notable in July and August, with the addition of the 0.7 mph increase in the RCP 8.5 2050 scenario.

Table 13. Monthly average wind speed relative to the historical average and change by month at Fort Carson. Colors are relative, with green indicating a change that is likely to contribute to reduced or moderate increases in fire activity and red indicating a change that is likely to contribute to more pronounced increases in fire activity.

Monthly Averages (mph)						Change (mph)			
Month	Historical	RCP 4.5		RCP 8.5		RCP 4.5		RCP 8.5	
		2030	2050	2030	2050	2030	2050	2030	2050
Jan	6.45	6.14	6.33	6.17	6.30	-0.31	-0.12	-0.27	-0.14
Feb	6.20	5.79	6.41	6.28	6.19	-0.41	0.20	0.08	-0.02
Mar	6.57	6.75	6.51	6.38	6.64	0.18	-0.06	-0.19	0.07
Apr	6.81	7.06	6.86	6.33	7.14	0.25	0.05	-0.48	0.33
May	6.25	6.30	6.44	6.48	6.95	0.05	0.19	0.23	0.70
Jun	6.00	5.92	5.98	5.54	6.34	-0.08	-0.02	-0.46	0.34
Jul	4.99	5.13	5.70	5.19	5.66	0.15	0.71	0.20	0.67
Aug	4.93	4.99	5.47	4.65	5.47	0.06	0.54	-0.28	0.54
Sep	5.30	5.41	5.48	5.47	5.69	0.11	0.18	0.18	0.39
Oct	5.89	5.84	5.46	5.77	5.60	-0.05	-0.43	-0.12	-0.28
Nov	6.12	5.82	6.01	5.96	6.31	-0.30	-0.11	-0.16	0.19
Dec	6.27	6.16	6.22	6.19	6.48	-0.11	-0.06	-0.09	0.21
Average	5.98	5.94	6.07	5.87	6.23	-0.04	0.09	-0.11	0.25

The moderate increase in winter precipitation combined with warmer temperatures in March and April by 2050, could lead to greater vegetation production in the spring. This production would become fuel for fires in the summer. The projections suggest that precipitation would decrease in July and RH would decrease in August and September. This would lead to more fires, due to the drier conditions suggested by dropping precipitation and RH, and increased temperatures creating fuel conditions more receptive to ignitions. Those ignitions would burn in heavier fuel beds produced by the additional early season precipitation.

Conditions in July by 2050 are projected to deteriorate substantially from historical norms, with temperature maxima increasing by almost 8 °F, a drop in precipitation of 0.7 to 1.3 inches, a drop in RH of 7 – 10%, and an increase in wind speed of roughly 0.7 mph. This combination of changes strongly suggests there will be considerably more and larger fires. Other months in the May through August time frame will experience similar, but smaller, increases in fire potential.

Using data from the above tables and standard fuel moisture estimation techniques[7], it is possible to calculate fire behavior under current and future conditions. Calculations were run in BehavePlus[8] using the mean measures in the tables above for the July RCP 8.5 2030 scenario, and Scott and Burgan[9] fuel model GR2 to represent the grasslands at Fort Carson.

[7] Fosberg M.A., Deeming J.E., 1971. Derivation of the 1- and 10-hour timelag fuel moisture calculations for fire-danger rating. USDA Forest Service Research Note RM-207, Ft. Collins, CO.
[8] Andrews P.L., Heinsch F.A., Bevins C.D. 2018. BehavePlus Fire Modeling System. USDA Forest Service and Systems for Environmental Management.
[9] Scott J.H. and Burgan R.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. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 72p.

The results indicate a 35% increase in spread rate, from 13.31 ft/min to 17.93 ft/min, and an increase of 11% in flame length from 2.7 ft to 3.0 ft. These estimates are based on the projected monthly mean data and are intended only to give a sense of the potential trends in fire behavior. Weather conditions that are more conducive to fire activity than the average can be expected frequently under the future climate scenarios, and those conditions will produce considerably more severe fire behavior than the average projections suggest. The magnitude of the increase gives a general indication of the potential for increased fire behavior, but fire behavior escalates at a non-linear rate as conditions deteriorate. As such, fires occurring under conditions farther from the mean will produce increasingly severe fire behavior relative to the change in climate.

With projected temperature increases by 2050 that will result in temperatures in April approximately equivalent to what historically was observed in May, and similar increases in October that approximate historical September temperatures, it can be expected that the fire season will expand as well. Major fires can be expected both earlier and later in the year than they have historically.

These same shifts are likely to require adjustment of the timing of prescribed burns, as vegetation is likely to green up earlier and senesce later in the year. Timing of ecological burns may need to be adjusted as well to ensure fire is applied at the appropriate phenological stage of the vegetation to achieve the desired outcome.

1.5.2. Climate Change - PCMS

Annual precipitation is not projected to change markedly in any of the future scenarios (Table 16). However, the distribution of precipitation is expected to change, particularly in March and July. In both cases, precipitation is likely to decrease, by over 0.5 inches in March and by as much as 1.71 inches in July. A notable drop in precipitation is projected for May in all scenarios. Increases in precipitation are evident in a variety of months and scenarios but are largely consistent in January and February, with double-digit percentage increases.

Table 14. Monthly average precipitation relative to the historical average and change by month at PCMS. Colors are relative, with green indicating a change that is likely to contribute to reduced or moderate increases in fire activity and red indicating a change that is likely to contribute to more pronounced increases in fire activity.

Monthly Averages (in)						Change (in)			
Month	Historical	RCP 4.5		RCP 8.5		RCP 4.5		RCP 8.5	
		2030	2050	2030	2050	2030	2050	2030	2050
Jan	0.69	1.06	0.86	0.92	1.11	0.37	0.17	0.23	0.41
Feb	0.89	1.22	1.02	1.31	0.85	0.33	0.13	0.42	-0.04
Mar	2.23	1.53	1.20	1.73	1.44	-0.70	-1.04	-0.51	-0.79
Apr	1.76	1.94	1.18	2.43	1.41	0.17	-0.58	0.67	-0.36
May	2.54	2.09	2.21	2.24	1.34	-0.45	-0.32	-0.30	-1.20
Jun	1.63	1.31	1.52	2.14	1.02	-0.33	-0.12	0.51	-0.61
Jul	2.86	1.69	1.31	1.14	1.45	-1.17	-1.54	-1.71	-1.41
Aug	1.94	2.36	1.28	1.93	1.60	0.42	-0.66	-0.01	-0.34
Sep	1.38	1.17	1.48	1.03	1.41	-0.21	0.10	-0.35	0.03
Oct	0.87	1.44	1.28	1.10	1.28	0.57	0.40	0.23	0.40
Nov	0.95	1.07	0.99	0.74	0.74	0.12	0.04	-0.20	-0.21
Dec	0.83	1.03	0.90	0.83	1.15	0.19	0.06	0.00	0.32
Average	1.55	1.49	1.27	1.46	1.23	-0.06	-0.28	-0.09	-0.32

Temperature maxima are projected to climb in the 2030 scenarios, but the results are somewhat variable, reducing confidence in the higher projected values (Table 15). However, by 2050, monthly average temperature maxima are frequently higher than the historical values by 6 °F or more. This is a very substantial warming trend and is concentrated in March through November, the entire fire season.

Table 15. Monthly average maximum temperature relative to the historical average and change by month at PCMS. Colors are relative, with green indicating a change that is likely to contribute to reduced or moderate increases in fire activity and red indicating a change that is likely to contribute to more pronounced increases in fire activity.

Monthly Averages (F)						Change (F)			
Month	Historical	RCP 4.5		RCP 8.5		RCP 4.5		RCP 8.5	
		2030	2050	2030	2050	2030	2050	2030	2050
Jan	51.30	49.32	53.79	54.09	54.02	-1.98	2.49	2.79	2.72
Feb	52.69	53.29	55.44	53.68	59.19	0.60	2.76	0.99	6.51
Mar	59.93	63.27	65.25	60.09	66.15	3.34	5.32	0.16	6.22
Apr	68.21	71.39	77.50	70.31	74.33	3.18	9.29	2.10	6.12
May	74.31	78.23	82.70	77.59	85.24	3.93	8.40	3.28	10.93
Jun	84.22	92.20	91.76	88.96	95.44	7.98	7.54	4.74	11.22
Jul	88.97	93.23	95.48	96.32	96.68	4.26	6.51	7.34	7.71
Aug	88.10	91.50	93.06	92.75	95.81	3.39	4.96	4.64	7.70
Sep	81.26	85.95	86.08	87.50	87.43	4.69	4.82	6.24	6.17
Oct	72.12	75.99	79.66	76.70	79.18	3.86	7.53	4.57	7.05
Nov	58.51	62.74	67.22	67.36	68.36	4.23	8.71	8.85	9.86
Dec	52.60	52.42	55.62	54.53	56.21	-0.18	3.02	1.93	3.60
Average	69.35	72.46	75.30	73.32	76.50	3.11	5.95	3.97	7.15

Relative humidity is expected to decrease substantially in both 2050 scenarios (Table 16). Decreases in excess of 5% RH are projected in many months, and decreases of more than 3% are frequently projected from March through August. Although RH is expected to remain relatively unchanged overall in the 2030 scenarios, it is expected to decrease by 3 – 6% in April through September in the RCP 4.5 scenario, while largely increasing by 1 – 6% in December through February. Decreases in the RCP 8.5 2030 scenario are more concentrated, in July and September, with increases in December through June. The RCP 8.5 scenario shows substantial decreases in both 2030 and 2050 in March through August. July represents the largest and most consistent decreases in RH across scenarios, while increases are largest and most consistent in February.

Table 16. Monthly average relative humidity relative to the historical average and change by month at PCMS. Colors are relative, with green indicating a change that is likely to contribute to reduced or moderate increases in fire activity and red indicating a change that is likely to contribute to more pronounced increases in fire activity.

Monthly Averages (%)						Change (%)			
Month	Historical	RCP 4.5		RCP 8.5		RCP 4.5		RCP 8.5	
		2030	2050	2030	2050	2030	2050	2030	2050
Jan	58.20	56.00	62.41	55.74	57.70	6.42	-0.26	1.70	3.35
Feb	58.02	55.35	60.58	57.66	61.20	5.23	2.30	5.85	0.93
Mar	56.80	52.55	50.08	47.06	55.54	-2.47	-5.50	2.99	-5.86
Apr	50.40	43.86	40.69	34.99	48.21	-3.17	-8.87	4.35	-4.67
May	53.41	44.79	42.91	39.83	45.50	-1.88	-4.96	0.71	-9.45
Jun	42.95	41.41	35.82	36.50	42.72	-5.59	-4.91	1.30	-10.23
Jul	46.23	45.95	39.60	35.37	34.70	-6.35	-10.58	-11.25	-11.49
Aug	46.41	47.79	45.74	38.88	45.57	-2.05	-8.91	-2.22	-10.27
Sep	48.95	49.99	46.56	47.53	42.15	-3.44	-2.46	-7.84	-3.79
Oct	47.49	45.26	46.36	44.70	44.80	1.10	-0.56	-0.46	-0.22
Nov	52.98	49.58	52.71	48.64	48.85	3.14	-0.94	-0.72	-1.72
Dec	59.55	54.73	59.45	54.23	55.24	4.72	-0.50	0.51	-0.35
Average	51.78	48.94	48.58	45.09	48.52	-0.36	-3.85	-0.42	-4.48

Wind speed is not projected to change substantially in either of the 2030 scenarios with few exceptions (Table 17). In the 2050 scenarios, notable increases are apparent in May, July, and August. The most consistent increases in wind speed are in May, July, and September.

Table 17. Monthly average wind speed relative to the historical average and change by month at PCMS. Colors are relative, with green indicating a change that is likely to contribute to reduced or moderate increases in fire activity and red indicating a change that is likely to contribute to more pronounced increases in fire activity.

Monthly Averages (mph)						Change (mph)			
Month	Historical	RCP 4.5		RCP 8.5		RCP 4.5		RCP 8.5	
		2030	2050	2030	2050	2030	2050	2030	2050
Jan	6.45	8.36	8.21	8.21	8.35	-0.14	-0.15	-0.01	-0.19
Feb	6.20	8.41	8.43	9.03	8.32	0.02	0.62	-0.09	0.27
Mar	6.57	9.57	9.63	9.68	9.18	0.06	0.11	-0.39	0.24
Apr	6.81	10.27	10.97	10.84	9.24	0.70	0.58	-1.02	0.47
May	6.25	9.31	9.82	10.08	9.82	0.51	0.77	0.51	1.26
Jun	6.00	9.17	9.21	9.07	8.60	0.04	-0.10	-0.57	0.81
Jul	4.99	7.68	8.32	9.00	8.40	0.64	1.32	0.72	1.44
Aug	4.93	7.41	7.46	8.64	7.12	0.05	1.23	-0.29	1.03
Sep	5.30	7.93	8.70	8.19	8.11	0.77	0.27	0.18	0.94
Oct	5.89	8.64	8.70	7.96	8.39	0.06	-0.68	-0.26	-0.33
Nov	6.12	8.52	8.31	8.54	8.47	-0.21	0.02	-0.05	0.54
Dec	6.27	8.37	8.57	8.93	8.55	0.19	0.56	0.17	0.36
Average	5.98	8.64	8.86	9.01	8.55	0.22	0.38	-0.09	0.57

The moderate increase in winter precipitation, combined with much warmer temperatures in March and April by 2050, could lead to greater vegetation production in the spring. This production would become fuel for fires in the summer. The projections suggest that precipitation would decrease in July and RH would decrease in August and September. This would lead to more fires, due to the drier conditions suggested by dropping precipitation and RH, and increased temperatures creating fuel conditions more receptive to ignitions. Those ignitions would burn in heavier fuel beds produced by the additional early season precipitation.

Conditions in July by 2050 are projected to deteriorate substantially from historical norms, with an increase in temperature maxima of 6 – 8 °F, a drop in precipitation of 1.4 to 1.5 inches, a drop in RH of 10 – 11%, and an increase in wind speed of roughly 1.3 – 1.4 mph. This combination of changes strongly suggests there will be considerably more and larger fires. Other months in the May through August time frame will experience similar, but smaller, increases in fire potential.

Using data from the above tables and standard fuel moisture estimation techniques[10], it is possible to calculate fire behavior under current and future conditions. Calculations were run in BehavePlus[11] using the mean measures in the tables above for the July RCP 4.5 2050 scenario, and Scott and Burgan[12] fuel model GR2 to represent the grasslands at PCMS.

The results indicate a 39% increase in spread rate, from an already substantial 19.4 ft/min to 26.8 ft/min, and an increase of 19% in flame length, from 3.2 ft to 3.8 ft. These estimates are based on the projected monthly mean data and are intended only to give a sense of the potential trends in fire behavior. Weather conditions that are more conducive to fire activity than the average can be expected frequently under the future climate scenarios, and those conditions will produce considerably more severe fire behavior than the average projections suggest. The magnitude of the increase gives a general indication of the potential for increased fire behavior, but fire behavior escalates at a non-linear rate as conditions deteriorate. As such, fires occurring under conditions farther from the mean will produce increasingly severe fire behavior relative to the change in climate.

With projected temperature increases by 2050 that will result in temperatures in April approximately equivalent to what historically was observed in May, and similar increases in October that approximate historical September temperatures, it can be expected that the fire season will expand as well. Major fires can be expected both earlier and later in the year than they have historically.

These same shifts are likely to require adjustment of the timing of prescribed burns, as vegetation is likely to green up earlier and senesce later in the year. Timing of ecological burns may need to be adjusted as well to ensure fire is applied at the appropriate phenological stage of the vegetation to achieve the desired outcome.

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[10] Fosberg M.A., Deeming J.E., 1971. Derivation of the 1- and 10-hour timelag fuel moisture calculations for fire-danger rating. USDA Forest Service Research Note RM-207, Ft. Collins, CO.

[11] Andrews P.L., Heinsch F.A., Bevins C.D. 2018. BehavePlus Fire Modeling System. USDA Forest Service and Systems for Environmental Management.

[12] Scott J.H. and Burgan R.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. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO. 72p.

2. Policy and Organization

2.1. Goals and Objectives

2.1.1. Goals

The overarching goal of the IWFMP is to provide for firefighter and public safety and facilitate training necessary for military units to maintain a high level of combat readiness. USAG FC will mitigate wildfire risk by implementing the methods and protocols necessary to control wildfire frequency, intensity, size, and location. USAG FC will facilitate the use of fire as a tool to manage vegetation, habitats, and wildfire risk; ensure compliance with U.S. Army regulations and guidance, federal and state laws, and memoranda of understanding; and meet USAG FC's land stewardship responsibilities.

2.1.2. Objectives

The following are targeted conditions that the USAG FC IWFMP will work towards. Conditions and circumstances may sometimes prevent these objectives from being met.

1) No wildland fire-related fatalities and zero public injuries or property losses.
2) No military ignited wildfires exiting USAG FC boundaries.
3) No loss of training capability that lasts more than three days.
4) No loss of on-installation built infrastructure with an estimated replacement value >$10,000.
5) No fires ignited by weapons systems not authorized by Range Control or under the current Fire Condition (see Section 3.2.3).
6) 100% successful maintenance of the full length of the perimeter firebreak roadbed at Fort Carson (see Section 3.5.1).
7) 100% successful maintenance of Priority 1 segments of the perimeter firebreak at Fort Carson as defined in Section 3.5.1.
8) >95% of all fires reported to Range Control immediately upon detection.
9) Ensure all Range Safety Officers are aware of the requirements of the IWFMP.
10) Ensure all military unit Officers in Charge (OIC) receive a range briefing that includes the information contained in Appendix 3 – U.S. Army Garrison Fort Carson Fire Safety Briefing.

Objectives specific to the Prescribed Burn Program are described in Section 4.1.

2.1.3. Additional Intentions

Some objectives are not easily measured but remain worthy of attention. The USAG FC Wildland Fire Program will strive to meet those listed below. These also may not be met due to conditions and circumstances outside of Fort Carson's control.

- Safety will be the number one priority in all wildland fire management activities, including fire suppression. Safety will never be compromised to meet any other objective.
- Use methods such as the Fire Condition to ensure wildfires are ignited only at times and in locations where fire control is highly probable due to low fire danger, limited fuels, discontinuous fuels, or breaks in fuels such as firebreaks.
- Reduce ignitions using methods such as the Fire Condition, or increase funding of the Fire Department to increase response capabilities, to ensure Fire Department staffing is commensurate with the number of ignitions and the total hours dedicated to wildland fire suppression.
- Use fuels management to reduce fire behavior potential.
- User fire danger rating and the Fire Condition to avoid fires at times when crown fires are likely, to achieve the objectives listed in 2.1.2.

- Weigh all fire management activities against the full spectrum of factors including, but not limited to, financial support, training time and quality, and positive or negative impacts to natural and cultural resources and social values.
- Ensure a highly qualified and competent group of wildland firefighters is maintained within the ranks of the Fort Carson Fire Department and the Directorate of Public Works (DPW) Environmental Division at all times.

2.2. Compliance with Policy, Laws, and Regulations

2.2.1. U.S. Army Policy

All policies in this document meet or exceed the requirements established by the Army Installation Wildland Fire Program Implementation Guidance dated March 2021 (Department of the Army 2021) which also requires the development of this IWFMP. The policies and procedures prescribed by this IWFMP also support the requirements of Army Regulation 200-1, Chapter 4-3, dated December 2007 and comply with DODI 6055.06 (Department of Defense Fire and Emergency Services Program 2006), DOD Fire and Emergency Services Program, and Army Regulation 420-1 which references wildfire incident response planning.

2.2.2. Federal Wildland Fire Policy

All policies in this document are in accordance with the 2001 Federal Wildland Fire Management Policy, to which the Department of Defense is a signatory. All firefighter training will comply with the National Wildfire Coordinating Group Wildland Fire Qualifications Subsystem Guide, PMS 310-1, including the use of Position Task Books. More information about training and certification standards is available in Section 3.13.

2.2.3. USAG FC Policy

This IWFMP complies with the various USAG FC policies, such as the Range Standard Operating Procedures identified in Army Regulation 385-65 and the safety requirements of Fort Carson Regulation 350-11.

2.2.4. Federal Regulatory Requirements

There are multiple federal laws that apply to wildland fire management. This IWFMP complies with all portions of pertinent laws including:

- Endangered Species Act
- National Historic Preservation Act
- Clean Air Act
- Clean Water Act
- National Environmental Policy Act
- Migratory Bird Treaty Act
- Invasive Species Executive Order
- Sikes Act

2.3. Integration with Existing Plans and Requirements

2.3.1. Integrated Natural Resources Management Plan, Fort Carson and the Piñon Canyon Maneuver Site

The IWFMP is designed in part to support INRMP goals and objectives.

The purposes of the INRMP are:

- Give high priority to management objectives that protect mission capabilities of installation lands.
- Conserve the environment for the purpose of supporting the military mission.
- Strive to achieve no net loss of capability of installation lands to support the military mission.

- Eliminate or minimize both permanent and temporary land restrictions on military training.
- To the greatest extent possible, shape the landscape to meet the training needs of the military.
- Achieve 100% compliance with environmental laws and regulations.
- Use an ecosystem-based approach to natural resource management, managing for values such as biodiversity, recreation, water quality, native species, and aesthetics.
- Practice adaptive management, improving our approaches and techniques using the best available science, and sound Best Management Practices (BMPs).
- Foster a sense of environmental stewardship among soldiers, employees, and neighbors who use or have an interest in natural resources on Fort Carson and PCMS.
- Improve communication, coordination, and participation among interested parties and partners in the region.
- In conjunction with ITAM, facilitate sustainable training by promoting education and by managing the natural resources to meet the needs of the trainers and the missionscape.

There are numerous overlaps between the IWFMP and the INRMP, particularly in relation to the goal of no net loss to the military mission, as wildfires can directly and indirectly affect the training environment. Similarly, wildfires affect conservation of federally listed species, preservation of wetlands, vegetation management, and many other program elements of the INRMP.

The INRMP specifically addresses wildland fire in Section 4.o. That section provides brief descriptions of the following programs, which are further developed in this IWFMP:

- The use of prescribed fire as a mitigation tool as well as for ecosystem management, invasive weed control, and forest management
- Fuels management that integrates conservation management and the military mission
- A firebreak system that encircles most of the installation, part of which also includes a fuel break

It also describes a forest thinning program that will integrate with the IWFMP, as well as wildland fire training and smoke permitting. This IWFMP provides additional detail on all of these topics and is the authoritative document on wildland fire management implementation at USAG FC.

2.3.2. Integrated Cultural Resources Management Plan, U.S. Army Garrison Fort Carson

The purpose of the ICRMP is to “support military training requirements, achieve regulatory compliance, and ensure that stewardship responsibilities are met.” More specifically, the goals of the ICRMP are to:

- Support sustainable training
- Reduce/eliminate access restrictions due to resource protection
- Protect historic properties from adverse effects
- Conserve cultural resources and their information for future generations
- Increase cultural resource appreciation
- Contribute to our understanding of culture, history, and archaeology at the local, regional, and national levels

The primary interactions between the IWFMP and the ICRMP are ensuring that wildland fire management actions do not negatively impact cultural resources and ensuring that firefighters are aware of the locations of protected cultural resources to avoid them during fire suppression operations.

2.3.3. Range Standard Operating Procedures

The Range Standard Operation Procedures (SOP) “prescribes [Fort Carson] range Standard Operating Procedures (SOP), safety policies, and responsibilities for firing ammunition, Light Amplification by Stimulated Emission of Radiation, guided missiles, and rockets”. The Range SOP applies to both Fort

Carson and PCMS. The safety of individuals at USAG FC, including firefighters, is predicated on their compliance with the Range SOP.

The primary interaction between the IWFMP and the Range SOP is related to safety of firefighters and personnel carrying out wildland fire management tasks. The Range SOP also prescribes the scheduling of ranges, which is necessary as part of some IWFMP tasks.

2.3.4. National Environmental Policy Act Compliance

Plans that support environmental programs such as the IWFMP require an environmental analysis under the National Environmental Policy Act (NEPA) (32 CFR 651.10(b)). The NEPA review is addressed in the Programmatic Environmental Assessment for the Implementation of the 2020-2025 Fort Carson and Piñon Canyon Maneuver Site Integrated Natural Resources Management Plan (2020), as well as the Programmatic Environmental Assessment for Natural Resources Management Planning Compliance at AMC Installations (2019). Both pre-suppression and post-suppression actions will be reviewed for consistency and compliance with the existing analysis in these documents and findings documented in a Record of Environmental Consideration (REC) or other NEPA documentation, as applicable. Suppression activities are considered emergency actions and will be reported in compliance with 32 CFR 651.11 (b).

2.3.5. Plans Being Consolidated Under the IWFMP

USAG FC currently maintains a variety of disparate plans and documents related to wildland fire management. The below plans will be consolidated under this IWFMP and will no longer exist as stand-alone plans:

- Fort Carson Prescribed Burn Plan
- Fort Carson Fuels Management Plan
- Fire Danger SOP
- Fort Carson Firebreak and Fuels Management Standard

The directives and components of these plans and documents are superseded by this IWFMP.

2.4. Stakeholders and Responsibilities

2.4.1. USAG FC Stakeholders

2.4.1.1. Garrison Commander

The Garrison Commander has overall responsibility and approval authority for all fire prevention and protection requirements. The Garrison Commander will:

- Approve the Integrated Wildland Fire Management Plan.
- Designate an installation Wildland Fire Program Manager (WFPM).
- Designate an Agency Administrator (AA) for Wildland Fire.
- Define the roles and responsibilities as described in this IWFMP.
- Delegate to the Wildland Fire Program Manager the authority to oversee the wildland fire management program.
- Approve the deployment of USAG FC civilian firefighters to off-installation incidents. Army Installation Wildland Fire Program Implementation Guidance requires the Garrison Commander approve the deployment of Army civilian firefighters to any off-installation incident not covered by a mutual aid agreement. This approval authority has been delegated to the DES Fire Chief.
- Order formal investigations of wildfires as necessary.

The AA role has been delegated to the DES Fire Chief and the WFPM role has been delegated to the DES Deputy Fire Chief.

2.4.1.2. Agency Administrator

The DES Fire Chief has been designated as the AA. The AA will approve, or delegate the authority to approve, prescribed fire burn plans. The AA will concur on personnel qualifications and will serve in a leadership role during major wildfire incidents.

2.4.1.3. Wildland Fire Program Manager

The DES Deputy Fire Chief has been designated as the installation Wildland Fire Program Manager. The WFPM, in coordination with the Directorate of Public Works (DPW) Conservation Branch Chief and the Directorate of Plans, Training, Mobilization, and Safety (DPTMS) Range Officer, is responsible for developing, updating, and executing the IWFMP. The WFPM will collaborate closely with:

- The DPTMS Director
- The DPW Conservation Branch Chief
- The Cultural Resources Manager
- The NEPA Manager
- The DPW Operations and Maintenance (O&M) Division Chief
- The Prescribed Fire Coordinator
- The ITAM Coordinator

While the DPW Conservation Branch Chief is officially the proponent for the IWFMP, the WFPM is the primary advocate for the day-to-day implementation of the IWFMP and will communicate directly with Installation Command as necessary to facilitate proper implementation of the IWFMP. The WFPM chairs the Wildland Fire Working Group (see Section 3.4) and will ensure the Annual IWFMP Implementation Plan is developed and executed.

The WFPM is also responsible for carrying out compliance checks regarding all aspects of the IWFMP, including, but not limited to, ensuring firefighters receive appropriate levels and types of training for the duties they are assigned and that training and experience are properly recorded, that the Fort Carson and PCMS Fire Danger Rating Systems (FDRS) and the Fire Conditions (FIRECON) are properly implemented, and that firebreaks and fuels management objectives are met.

2.4.1.4. Directorate of Emergency Services Fire Chief

The Directorate of Emergency Services (DES) Fire Chief (hereafter “DES Fire Chief”) is responsible for providing wildfire protection services throughout USAG FC. The DES Fire Chief also serves as the installation AA. The DES Fire Chief will ensure that the Fire Department is properly staffed and equipped to meet wildland firefighting objectives as defined in this IWFMP.

The DES Fire Chief is responsible for ensuring that wildfire responses are in accordance with this IWFMP, AR 420-1, and DoDI 6055.06. The DES Fire Chief reviews and approves burn plans for prescribed fires to ensure consistency with safety and fire protection goals.

The Fire Chief will ensure that supplies, equipment, training, mutual aid agreements, and qualified personnel are available to meet the goals and objectives of the IWFMP. The Fire Chief manages the wildland fire training and certification of Fire Department and DPW Environmental personnel.

2.4.1.5. Director of Planning, Training, Mobilization, and Security

The DPTMS Director has overall responsibility for enforcing the fire prevention provisions of the IWFMP, as well as other applicable training directives and regulations, including restrictions on or cessation of training activities based on the day’s fire danger. The Director will provide direction to the DPTMS Range

Officer (hereafter "Range Officer") and other elements of the Range Control Branch as necessary to ensure compliance with the IWFMP.

The DPTMS Director ensures that fire prevention and reporting procedures as defined in this IWFMP are adhered to. The DPTMS Director ensures that Range Control Branch personnel support the IWFMP and firefighting by educating range users, enforcing fire prevention measures, coordinating prescribed fire and fuels mitigation operations with the range schedule, maintaining vegetation on the ranges per military training requirements that benefit wildfire control, and providing logistical support during fire incidents. The DPTMS Director will also ensure that equipment for military unit firefighting details is available and in good working order.

2.4.1.6. Directorate of Plans, Training, Mobilization and Security Range Officer

Many of the duties ascribed to the DPTMS Director are expected to be delegated to the Range Officer. In addition to those elements described in Section 2.4.1.5, the Range Officer will ensure Range Control dispatchers:

- Are familiar with the IWFMP.
- Know what training restrictions to apply based on the daily FIRECON.
- Know how and when to communicate the fire danger and associated restrictions to range users.
- Know who to notify in the event of a wildfire and how to notify them.
- Know who to call if additional resources are required by a fire Incident Commander (IC).
- Ensure radio traffic during emergencies is kept to a minimum.

2.4.1.7. Directorate of Public Works Conservation Branch Chief

The DPW Conservation Branch Chief oversees the Natural Resources Program. They will ensure environmental oversight, technical support, and planning assistance are provided to the WFPM. They will facilitate NEPA compliance for annual fuels management and firebreak maintenance and other NEPA compliance as necessary to the execution of the IWFMP. They will ensure Prescribed Fire Burn Plans are reviewed for natural resources concerns. They will provide Resource Advisors (READs) as necessary or as requested by the fire's Incident Commander. The DPW Conservation Branch Chief will also request monies to fund some elements of the IWFMP as defined herein.

2.4.1.8. Directorate of Public Works Operations and Maintenance Division Chief

The DPW O&M Division Chief is responsible for maintaining the Fort Carson perimeter firebreak. Additionally, the DPW O&M Division Chief ensures roadways throughout USAG FC are navigable. While the IWFMP does not require any specific tasks related to the roadways, many of the roads are instrumental to wildland fire suppression and prescribed fire implementation and are utilized routinely to contain fires. On major fires, O&M may also be requested to provide heavy equipment and logistical support.

2.4.1.9. Directorate of Public Works Cultural Resources Manager

The DPW Cultural Resource Manager oversees the Cultural Resources Program. They will provide cultural oversight, technical support, and planning assistance to the WFPM. They will facilitate National Historic Preservation Act Section 106 consultation as necessary to the execution of the IWFMP. These responsibilities include post-fire inspections and providing the State Historic Preservation Officer, Native American Tribes, and other parties with a list of wildfires that have occurred during the year. They will provide READs as necessary or as requested by the fire's Incident Commander.

2.4.1.10. Directorate of Public Works Environmental Division Wildland Fire Lead

This position is the primary liaison between the Fire Department and the DPW Environmental Division. The DPW Wildland Fire Lead heads the DPW Wildland Fire Team by ensuring DPW Environmental Division maintains a wildfire response capability including ensuring DPW personnel are properly trained for positions they are expected to hold during wildland fires. The DPW Wildland Fire Lead assists the Fire Department with wildfire suppression and prescribed fire application. The DPW Wildland Fire Lead provides technical and natural resources related advice to Fire Department personnel regarding wildfire suppression and prescribed fire planning and implementation. This position also updates the annual submittal packet to obtain NEPA coverage for the prescribed burning planned for the year under the Annual IWFMP Implementation Plan.

2.4.1.11. Wildland Fire Working Group

The Wildland Fire Working Group will plan out the implementation of the IWFMP annually in an Annual IWFMP Implementation Plan. This group will offer integration with the various key stakeholder organizations. The Working Group and the Annual IWFMP Implementation Plan are described in detail in Sections 3.3 and 3.4.

The Working Group will:

- Develop and implement the Annual IWFMP Implementation Plan that identifies funding to support tasks, timelines for implementation, and the parties responsible for each task's implementation. The Annual IWFMP Implementation Plan will include prioritization of each task to ensure the highest priorities are funded and implemented.
- Meet no less than twice annually, to establish the Annual IWFMP Implementation Plan, implement it, and adjust it as necessary through the year.
- Coordinate the Annual IWFMP Implementation Plan tasks with range schedules to minimize disruptions to training.
- Document work completed through a year-end report.
- Update the IWFMP annually and revise it at least once every five years.

2.4.1.12. Prescribed Fire Coordinator

The Prescribed Fire Coordinator is responsible for overall implementation of the Prescribed Burn Program. This includes planning, notifications, and execution of prescribed fires in accordance with this IWFMP, applicable regulations, and the Annual IWFMP Implementation Plan. Specific duties are described in Section 4 of this IWFMP.

2.4.1.13. 4th Combat Aviation Brigade

This air combat unit flies UH-60 and CH-47 aircraft, both of which are capable of medium and heavy lift operations. The 4th CAB provides helicopter bucket support during wildland fire operations upon request and as availability allows.

2.4.1.14. Emergency Communications Center Chief

The Emergency Communications Center (ECC) Chief will ensure ECC dispatchers understand the procedures to activate aerial support as requested by Incident Commanders.

2.4.1.15. Integrated Training Area Management Coordinator

The ITAM Coordinator ensures maneuver trails within Training Areas throughout USAG FC are maintained in accordance with training needs. While no specific tasks are assigned to the ITAM Coordinator by this

IWFMP, many of these maneuver trails are utilized during wildland fire suppression and prescribed fire implementation and their continued maintenance is important to the Wildland Fire Program.

2.4.1.16. U.S. Army Garrison Fort Carson Public Affairs Officer

The Public Affairs Officer leads the Public Affairs Office (PAO), which interacts with the public and media on behalf of the Garrison. Upon request from the Fire Department, the Public Affairs Officer will ensure that prescribed fire notifications are properly disseminated to the public. Additionally, the Public Affairs Officer will be responsible for disseminating information both on- and off-installation regarding wildfires or other wildland fire management activities at their discretion.

2.4.1.17. Directorate of Plans, Training, Mobilization, and Security Safety Officer

The DPTMS Safety Officer will ensure all wildland fire management activities occurring on the ranges and training areas comply with USAG FC safety policies and will provide Unexploded Ordnance (UXO) and other safety training upon request.

2.4.1.18. Office of the Staff Judge Advocate

In rare circumstances, fires or deployment of USAG FC resources to fires off the installation may result in legal questions. The Office of the Staff Judge Advocate may weigh in on these legal issues.

2.4.1.19. Military Unit Officers in Charge

The Officer in Charge (OIC) of each unit using any USAG FC facility is responsible for complying with fire prevention procedures defined by the IWFMP and immediately notifying Range Control in the event of a fire.

2.4.2. External Stakeholders

2.4.2.1. United States Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) is the primary federal agency with which USAG FC cooperates on natural resources management. The USFWS is responsible for enforcement and compliance with the Endangered Species Act (ESA) and Migratory Bird Treaty Act (MBTA), as well as other federal wildlife acts, laws and regulations. Cooperative efforts with the USFWS have included federally listed species management, migratory bird protection and management, recreation, fishing, wildlife law enforcement, and wetland inventories.

2.4.2.2. Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) cooperates with USAG FC on erosion control projects, soil surveys, ecological site surveys, plant materials studies, and rehabilitation efforts on disturbed lands.

2.4.2.3. United States Forest Service

The U.S. Forest Service (USFS) manages federal land near Fort Carson and has a vested interest in the success of the wildfire mitigation program to ensure those lands and users are not negatively affected by smoke or fire from Fort Carson. Additionally, the USFS operates and maintains the Remote Automated Weather Stations at Fort Carson and PCMS through an agreement with the Fire Department.

2.4.2.4. United States Bureau of Land Management

The U.S. Bureau of Land Management manages federal land near USAG FC and has a vested interest in the success of the wildfire mitigation program to ensure those lands and users are not negatively affected by smoke or fire from USAG FC.

2.4.2.5. Municipalities and Counties

During a severe fire, neighboring fire departments may be called upon to support firefighting efforts through Memorandums of Agreement (MOA) or Memorandums of Understanding (MOU). More detail is available in Section 3.7.

These municipalities and counties also have a vested interest in the success of the wildfire mitigation program to ensure their municipalities or counties are not negatively affected by smoke or fire from USAG FC.

2.4.2.6. Neighboring Private Landowners

Neighboring private landowners have a vested interest in the success of the wildfire mitigation program to ensure they are not negatively affected by smoke or fire from USAG FC.

2.5. Wildland Firefighting Organizations

2.5.1. Fort Carson Fire Department

The USAG FC Fire Department is a full-service structural fire department at Fort Carson and PCMS. There are four fire stations at Fort Carson and one at PCMS. Station 31 is the main station at Fort Carson and is located near the center of the Fort Carson cantonment area. The dispatch center is located at Station 33. The Fire Station at PCMS is in the cantonment area there.

These fire stations provide wildfire response services to all of USAG FC, both within the training areas and the cantonment areas. They are fully equipped for wildfire and prescribed fire duties.

2.5.2. DPW Environmental, Natural Resources Wildland Fire Team

The Wildland Fire Team complements and supports the DES Fire Department by providing regulatory and technical guidance and assisting wildland firefighting and prescribed fire implementation and monitoring.

2.5.3. Military Unit Firefighting Detail

Military units at USAG FC are required to have a designated detail within their unit available to respond to fires whenever the implemented fire danger is MODERATE or above. These details have no formal firefighter training but will respond to fires their unit creates during training, provided it is safe to do so. Their capabilities are limited, but for smaller fires that occur within the managed fuels of a range, their efforts can limit or halt the spread of a fire into more volatile fuels.

2.5.4. Mutual Aid Agencies

The USAG FC Fire Department maintains a MOA or a MOU with over 50 local, state, and federal agencies. See Section 3.7 for more detail.

2.6. Fire Management Units

Fire Management Units (FMUs) are often defined in a fire management plan to delineate areas where fire management needs differ due to fuels, safety, fire suppression constraints, or other reasons. In this IWFMP, 27 FMUs have been designated. Each FMU is described in detail and relevant information is mapped in Appendix 1 – Fire Management Unit Descriptions.

FMUs were delineated using major roads or other breaks in fuels to define defensible boundaries. Three of the 27 FMUs do not allow for any wildland fire management activities off of established roads due to the presence of UXO. The FMUs vary in size from less than 695 acres to 21,326 acres.

The information in Appendix 1 includes for each FMU the name, expected fire response type, and descriptions of the fuel characteristics, topography, fire frequency, expected flame lengths, the integrated fire hazard, values at risk, risks to firefighters, fuels management actions, the default fire suppression strategy, and fire escape potential. The appendix can be used for pre-fire planning, as well as during incidents.

2.7. IWFMP Reviews and Updates

The IWFMP will be reviewed annually and signed as current by the Garrison Commander. The IWFMP will be updated no less than once every five years. Minor changes may be addressed with addendums or similar additions, but major changes require an update to the plan. The WFPM will ensure that the Wildland Fire Working Group (see Section 3.4) reviews the plan annually and that funding and/or effort is allocated for IWFMP updates.

As part of each review or update, the Working Group will consider fire activity, prevention, response effectiveness, changes in the type, location, or volume of training, and changes to the landscape, such as major disturbances or substantial acreages of invasive species. The committee will conduct an informal audit of fire expenses and recommend what, if any, changes are necessary to improve the wildfire management program.

3. Pre-Suppression Actions

3.1. Risk Analysis

A wildfire risk assessment of Fort Carson was completed in 2017[13] and one for PCMS was completed in 2018[14]. In addition, a follow-on risk assessment of the Infantry Platoon Battle Course (IPBC) recently built at what was previously Range 127 was carried out to discern the changes in risk associated with that change in land use.

Risk is defined as a combination of the probability of an event, the potential magnitude of that event, and the potential outcomes of the event. Within the context of wildfire, these factors are accounted for by the probability of ignition, the breadth of potential fire behavior, and measures of the values at risk. The net wildfire risk resulting from the risk assessment is shown in Figure 37.

3.1.1. Values at Risk

This section describes the resources potentially at risk from wildfire. In the Wildfire Risk Assessments, items in the following categories were assessed using an economic analysis for non-monetary resources and valued accordingly in the risk assessment.

3.1.1.1. Wildland/Urban Interface – Fort Carson

Due to the primacy of protecting life in all firefighting prioritization efforts, the wildland-urban interface is often the number one concern during suppression operations. Most structures at Fort Carson are in the cantonment area. Many of those on the perimeter of the cantonment area could be threatened by a wildfire, including most of the housing units. Numerous buildings throughout the remainder of the installation are in locations where direct flame contact or thrown embers could ignite them.

Any fire that leaves the installation may potentially impact neighboring properties. Fires have left the installation in the past and preventing a recurrence is one of the most important objectives of fire management at Fort Carson. Historically, fires have exited the installation to the east and west of the Large Impact Area. There are numerous homes to the east that are widely dispersed with plentiful fuels between them allowing for fire spread to any given home. There are fewer homes, but still dozens of them, to the west as well along Tierra Rojo Drive, Barrett Road, and others which are also surrounded by extensive fuels. The situation to the west of Fort Carson is complicated by heavier fuel loads and considerable topography.

However, the potential also exists for fires to exit the installation elsewhere or to affect on-installation structures. Fire pathways from the Large Impact Area to the homes to the east are short and broad, giving fires ample opportunity to burn into neighboring communities should they escape the installation boundary. Fires igniting on the east side of the Large Impact Area would provide little opportunity for firefighters to address them prior to them reaching the installation boundary.

Homes to the west are farther away from the Large Impact Area, and most fires would have to burn into the wind in order to reach them (see Figure 20), making a fire escape in this direction less likely. However, the primary finding in the analysis of risk associated with the new IPBC was that the introduction of additional live-fire training at the IPBC would increase ignition probability there, as well as the probability that a fire would cross the western boundary. While the overall likelihood of a fire crossing the boundary was still five times higher on the eastern boundary, this increase is of note given the difficulties associated with fires crossing the western boundary as noted above.

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[13] U.S. Army Installation Management Command. 2017. Type 3 Risk Assessment, Fort Carson.

[14] U.S. Army Installation Management Command. 2017. Type 3 Risk Assessment, Piñon canyon Maneuver Site.

3.1.1.2. Wildland/Urban Interface – PCMS

There are few structures at PCMS, including in the cantonment area. Most structures in the cantonment are at low risk because fuels there are mowed. Historic homesteads are at significant risk because they are in remote locations and are surrounded by flammable landscapes.

If a fire were to leave the installation, neighboring properties could be affected. There are few barriers to fire anywhere in the vicinity of PCMS, so fires have significant potential to move in almost any direction. However, there are only a handful of structures near the installation, with the largest concentration being in Model, 10 miles to the southwest of the cantonment area. No population centers are near the installation.

3.1.1.3. Natural and Cultural Resources – Fort Carson

Natural resources exist throughout the installation. However, natural resources identified as being of particular value include Mexican spotted owl roosting trees, eagle nesting sites and Arkansas darter habitat. Bat habitat, Colorado checkered whiptail lizard habitat, wetlands, hunting and fishing areas, forests, areas prone to erosion, and flood control areas should also be factors considered in fire management decision-making.

Cultural resources are typically surface manifestations or shallowly buried. Thus, they can be susceptible to wildfire damage depending on the type of resource. For instance, wood used in the construction of buildings or structures could be consumed by fire, causing the buildings or structure to become unstable. Fire can contaminate cultural features, such as hearths and roasting pits, from which datable materials (typically charcoal) could be recovered. Fire could cause lithic artifacts to fragment. It could also damage rock art by causing rock faces to crack or spall. Wildfire suppression activities can also damage cultural resources through firefighting activities, particularly ground-disturbing activities like bulldozing. This can affect the resource's eligibility for inclusion in the National Register of Historic Places. Secondary erosion that results from the wildfire or wildfire suppression activities is also a cause of concern. Requirements related to mitigating these impacts are noted in Section 5.1.2. Cultural resources were found by the 2017 Fort Carson Risk assessment to represent low risks.

3.1.1.4. Natural and Cultural Resources – PCMS

Natural resources identified during the 2018 PCMS Wildfire Risk Assessment as being of particular value include wetlands, Colorado checkered whiptail habitat, and eagle nests. The 2018 risk assessment showed all of these values to be at low risk from wildfires. Historic and prehistoric sites, such as Brown’s Sheep Camp, were shown to be at low to moderate risk from wildfires. In the event of a severe wildfire, erosion would be a major post-fire concern.

3.1.1.5. Infrastructure – Fort Carson

Infrastructure to support training, as well as to provide other services, exists in concentrated locations throughout Fort Carson, particularly in the Small and Large Impact Areas. Infrastructure directly related to training includes standard and electronic targets, cover and concealment, range buildings, and other built infrastructure, such as power lines and communication nodes, necessary to support them. Roads may be damaged by post fire erosion, particularly at drainage crossings.

Other infrastructure of concern includes solar energy sites, railways, the bulk fuel storage area, the Central Energy Plant, the Ammunition Holding Area and ammunition storage points, water distribution pumps and the Fountain Water Treatment Plant, the Booth Mountain Repeater Tower Complex, the installation Remote Automated Weather Station, and other lesser-valued items.

Many of these items are well protected, but they have been identified by installation personnel as being of high value and even a well-protected structure or facility can suffer damage during a major fire.

3.1.1.6. Infrastructure – PCMS

The 2018 Wildfire Risk Assessment identified the natural gas line crossing the installation, including a gas line valve block, as the most at-risk value on the installation. Other at-risk values include gas regulator stations, fiber junction nodes, electric junction nodes, weather stations, and stream gauges. There was also low risk associated with the cell tower located on the installation. Fuels clearance around the cell tower site likely mitigates most of this risk, but the base of the tower itself may be close enough to fuels outside the fence to allow sufficient heat to damage some of the electronic components. There was moderate risk associated with electronic targetry on ranges 7, 3, and 1, with the highest risk strongly associated with the Multi-Purpose Machine Gun Range.

3.1.2. Ignition Sources – Fort Carson

The Risk Assessment estimated ignition probability based on past fire history records and input from installation subject matter experts. The assessment found that an average of 126.7 ignitions occur on Fort Carson lands each year. This differs somewhat from the ignition total provided in this IWFMP due to differences in the period of record of the data utilized.

With an estimate of 99 to 127 fires per year, Fort Carson produces a substantial fire load annually. The Risk Assessment found that live-fire sources account for the vast majority of ignitions at 88.9%. These are concentrated in the Small and Large Impact Areas, specifically at Range 119, the Large Impact Area (generally), and Ranges 109, 143, 111, and 105. Each of these individual locations accounted for more than 5% of all ignitions at Fort Carson by itself. Ignitions outside of the Small and Large Impact Areas account for only approximately 25% of all ignitions.

Ignitions off the installation within three kilometers (1.9 miles) of the installation boundary were found to be considerably lower than those on the installation, but still very substantial at 44.5 ignitions per year. This indicates a substantial threat of fires burning onto the installation.

Information regarding temporal distribution of ignitions can be found in Section 1.3, and in the 2017 Fort Carson Risk Assessment.

3.1.3. Ignition Sources – PCMS

The Risk Assessment found an average of 5.3 ignitions per year at PCMS. This differs somewhat from the ignition total provided in this IWFMP due to differences in the period of record of the data utilized.

With an estimate of 4 to 5 fires per year, there is a small fire load annually at PCMS as compared to Fort Carson. The Risk Assessment found that the largest source of ignitions was lightning, causing 41.51% of wildfires. Live-fire ignition sources comprised 28% of ignitions and were concentrated on Ranges 7 and 9 and to a lesser degree on Range 3. The remaining ignitions occurred throughout the Training Areas or the fire record listed the cause as unknown.

Ignitions off the installation within three kilometers (1.9 miles) of the boundary were found to be considerably lower than those on the installation at 0.73 ignitions per year.

Information regarding temporal distribution of ignitions can be found in Section 1.3, and in the 2018 Wildfire Risk Assessment.

3.1.4. Fire Weather – Fort Carson

A full accounting of weather data from the Fort Carson RAWS is available in Section 1.4. The impact of this weather on fire behavior is described here.

The relatively consistent SW/NE wind direction during high fire danger periods (see Figure 20) assists wildfire management because the direction of spread of major fires is to some degree predictable. Orienting fuel breaks and fuels management across this directional predisposition can increase the effectiveness of those mitigation measures, compared to orienting them parallel to the SW/NE spread direction of fires.

A result of the consistently low relative humidity, where even 50th percentile values are conducive to active fire behavior, is that 1-hour fuel moisture remains quite low throughout the year. With even median daily wind speeds, which vary from 6 – 9 mph, fires can be expected to spread at 16 – 27 feet/min or more, with flame lengths of three to four feet. Given these are the standard conditions, severe conditions can be expected to produce fires that spread very rapidly and may at times be too intense to combat directly, or at all. For example, with the same wind speeds but 95th percentile 1-hour fuel moisture of 1%, spread rates increase to 44 feet/min and flame lengths to 5.5 feet. Increasing the wind speed to even 15 mph pushes spread rates over 100 feet/min and flame lengths to almost 9 feet.

The poor nighttime relative humidity recovery is of concern when fires grow to large sizes and require multi-day suppression responses. In those cases, a lack of nighttime humidity allows the fire to continue to grow rapidly and reduces or eliminates the ability of firefighters to gain advantage on a fire during the night, a tactic that is often important on large fires.

Juxtaposed with a year-round fire season whose peak essentially lasts from April through October, there is ample opportunity for a major fire. History bears this out with repeated significant fire events, although mitigation measures have helped reduce negative outcomes in all of those instances. Increases in temperature and decreases in relative humidity projected for the next 10 – 30 years suggest that the peak fire season will lengthen and become more severe, particularly in May, July, and August, extending the time period during which fires could grow to substantial size and exacerbating fire behavior.

The distribution of Burning Index values (see Figures 27 and 28) further indicates substantial potential for a major fire, especially during the 6.87% of the year when the Burning Index is above 90, which equates to 25 days every year on average. That is a substantial portion of the year, and it is concentrated into just a few months, largely March through June. According to Monitoring Trends in Burn Severity data[15], of the 10 major wildfires on or in the immediate vicinity of Fort Carson that have been detected since 1985, all have occurred in the January through June time frame, with seven of those in January through March. These data, when combined with the weather data, strongly suggest that major fires are most likely in the winter and early spring. It is important to recognize this timeframe as a period when fire potential is elevated, as the general public usually considers mid to late summer to be of highest concern.

Given that March and April are the two most common months for fire ignitions at Fort Carson, the above information is of additional concern. Igniting many fires when overall fire potential and major fire potential are at their peak is likely to lead to more major fires, unless the ignitions are closely managed to occur only when firefighters are confident they can control the fire. The potential for major fires during this portion of the year should be a decision factor when considering whether to overrule the Fire Danger Rating System and authorize fire-prone training on elevated fire danger days.

[15]https://mtbs.gov/

3.1.5. Fire Weather – PCMS

A full accounting of weather data from the Piñon Canyon RAWS is available in Section 1.4. The impact of this weather on fire behavior is described here.

The relatively consistent SE through WNW wind direction during high fire danger periods (see Figure 24) assists wildfire management because the direction of spread of major fires is to some degree predictable. Orienting fuel breaks and fuels management across this directional predisposition can increase the effectiveness of those mitigation measures, compared to orienting them parallel to the preferred spread direction of fires.

A result of the consistently low relative humidity, where even 50th percentile values are conducive to active fire behavior, is that 1-hour fuel moisture remains quite low throughout the year. With even median daily wind speeds, which vary from 6 – 8 mph, fires occurring in the most common fuel model, GR2, can be expected to spread at 21 to 30.8 feet/min with flame lengths of 3 to 4 feet. Given these are the standard conditions, severe conditions can be expected to produce fires that spread very rapidly and may at times be too intense to combat directly, or at all. For example, with the same wind speeds but 97th percentile 1-hour fuel moisture of 1%, spread rates increase to 33 to 48 feet/min and flame lengths to 5 to 6 feet. Increasing the wind speed to even 15 mph pushes spread rates to 113 feet/min and flame lengths to 9 feet. Such conditions occur 5-10% of the time, or about 18 to 37 days per year.

The poor nighttime relative humidity recovery is of concern when fires grow to large sizes and require multi-day suppression responses. In those cases, a lack of nighttime humidity allows the fire to continue to grow rapidly and reduces or eliminates the ability of firefighters to gain advantage on a fire during the night, a tactic that is often important on large fires.

The distribution of Burning Index values (see Figures 30 and 31) further indicates substantial potential for a major fire. The 2.45% of the year when the Burning Index is above 90, indicating severe fire behavior, equates to 9 days every year on average and is concentrated in February through April.

According to Monitoring Trends in Burn Severity data, of the 19 major wildfires on or near PCMS that have been detected since 1989, 15 have occurred in March through June, with six in June alone. These data, when combined with the weather data, strongly suggest that major fires are most likely in early spring through early summer.

Given that June and July are the two most common months for fire ignitions at PCMS, the above information is of additional concern. Igniting many fires when overall fire potential and major fire potential are at their peak is likely to lead to more major fires, unless ignitions are closely managed to occur only when firefighters are confident they can control the fire. The potential for major fires during this portion of the year should be a decision factor when considering whether to overrule the fire danger rating system and authorize fire-prone training on elevated fire danger days.

3.1.6. Fuels and Fire Behavior

3.1.6.1. Fuel Types and Characteristics

The standard for classifying vegetation into fuel models for use in fire behavior models in the U.S. is a set of 40 fire behavior fuel models developed by the U.S. Forest Service (Scott and Burgan[16]). These are one of the inputs required to model fire behavior, along with weather, additional vegetation information, and topography.

[16] https://www.fs.fed.us/rm/pubs/rmrs_gtr153.pdf.

Fort Carson and PCMS fuel models were mapped using vegetation maps, LANDFIRE[17] data, and site visits in 2016 by a team from Colorado State University (Figure 33). These fuels were used for the Fort Carson and PCMS Wildland Fire Risk Assessments. A summary of those findings is below.

Fort Carson

Vegetation at Fort Carson is dominated by grasslands (82.12%), with grass/shrublands accounting for another 7.68% (Table 18, Figure 33). Grass fuels are easily ignitable and can produce high rates of spread. Sizeable areas of piñon-juniper woodlands exist, particularly in the western, higher elevation of the installation. Fires in piñon-juniper often exhibit limited fire behavior until wind speed increases and relative humidity decreases beyond threshold levels. At that point, fires are more likely to spread rapidly through the crowns. Therefore, piñon-juniper woodlands were modeled in the Risk Assessment at Fort Carson as low-load grasslands (GR2) in fires burning under typical weather conditions (Figure 33), and very high load shrubs (SH7) in fires burning under extreme conditions (not shown). Extreme conditions were defined in the Risk Assessment as relative humidity less than 10% and wind speeds greater than 20 mph for at least one hour of the duration of the simulated fire.

Table 18. Spatial extent and percentage of total installation area of each fuel model at Fort Carson.

Fuel Model #	Fuel Model Code	Fuel Model Description	Standard Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load, dry climate grass	87990.11	63.74%	68207.86	49.41%
101	GR1	Short, sparse dry climate grass	22037.62	15.96%	22037.62	15.96%
122	GS2	Moderate load; dry climate grass-shrub	8211.23	5.95%	8211.23	5.95%
62	CU2	Intermediate Roads	5037.80	3.65%	5037.80	3.65%
99	NB9	Barren	4185.35	3.03%	4185.35	3.03%
104	GR4	Moderate load; dry climate grass	3327.33	2.41%	3327.33	2.41%
121	GS1	Low load, dry climate grass-shrub	2078.33	1.51%	2078.33	1.51%
63	CU3	Minor Roads	1577.48	1.14%	1577.48	1.14%
91	NB1	Urban	1262.56	0.91%	1262.56	0.91%
61	CU1	Major Roads	993.91	0.72%	993.91	0.72%
145	SH5	High load, dry climate shrub	389.64	0.28%	389.64	0.28%
124	GS4	High load, humid climate grass-shrub	285.34	0.21%	285.34	0.21%
81	CU4	Developed area burnable fuels	164.35	0.12%	164.35	0.12%
98	NB8	Water	158.35	0.11%	158.35	0.11%
161	TU1	Low load dry climate timber grass-shrub	106.53	0.08%	106.53	0.08%
60	CU0	Airfields	82.73	0.06%	82.73	0.06%
142	SH2	Moderate load dry climate shrub	62.05	0.04%	62.05	0.04%
188	TL8	Long needle litter	38.25	0.03%	38.25	0.03%
183	TL3	Moderate load conifer litter	16.46	0.01%	16.46	0.01%
182	TL2	Low load broadleaf litter	12.23	0.01%	12.23	0.01%
88	CU8	Custom unburnable	6.23	0.00%	6.23	0.00%
141	SH1	Low load dry climate shrub	5.78	0.00%	5.78	0.00%
181	TL1	Low load compact conifer litter	3.11	0.00%	3.11	0.00%
165	TU5	Very high load, dry climate shrub	2.89	0.00%	2.89	0.00%
186	TL6	Moderate load broadleaf litter	1.33	0.00%	1.33	0.00%
103	GR3	Low load, very coarse; humid climate grass	0.89	0.00%	0.89	0.00%
185	TL5	High load conifer litter	0.44	0.00%	0.44	0.00%
147	SH7	Very high load, dry climate shrub	0.00	0.00%	19782.26	14.33%

[17] LANDFIRE, Landscape Fire and Resource Management Planning Tools. 2020. www.landfire.gov.

PCMS

Fuels at PCMS were dominated by grasses (fuel models GR1 and GR2 primarily). Upon completion of the quality control of the LANDFIRE data, grassland fuels, including fuel models GR1, GR2, and GR3, accounted for 98.64% of the installation's area (Table 19, Figure 34).

Piñon-juniper trees and shrubs are present in a number of locations within the installation, but stands tend to be isolated pockets within extensive areas of grassland fuels. Fires in piñon-juniper often exhibit limited fire behavior until wind speed increases and RH decreases beyond threshold levels. At that point, fires are more likely to spread rapidly through the crowns. Therefore, piñon-juniper woodlands were modeled as short, sparse grasslands (GR1) in fires burning under typical weather conditions (Figure 34), and very high load shrubs (SH7) in fires burning under extreme conditions (not shown). Extreme conditions were defined as relative humidity less than 10% and wind speeds greater than 25 mph for at least one hour during the duration of the simulated fire.

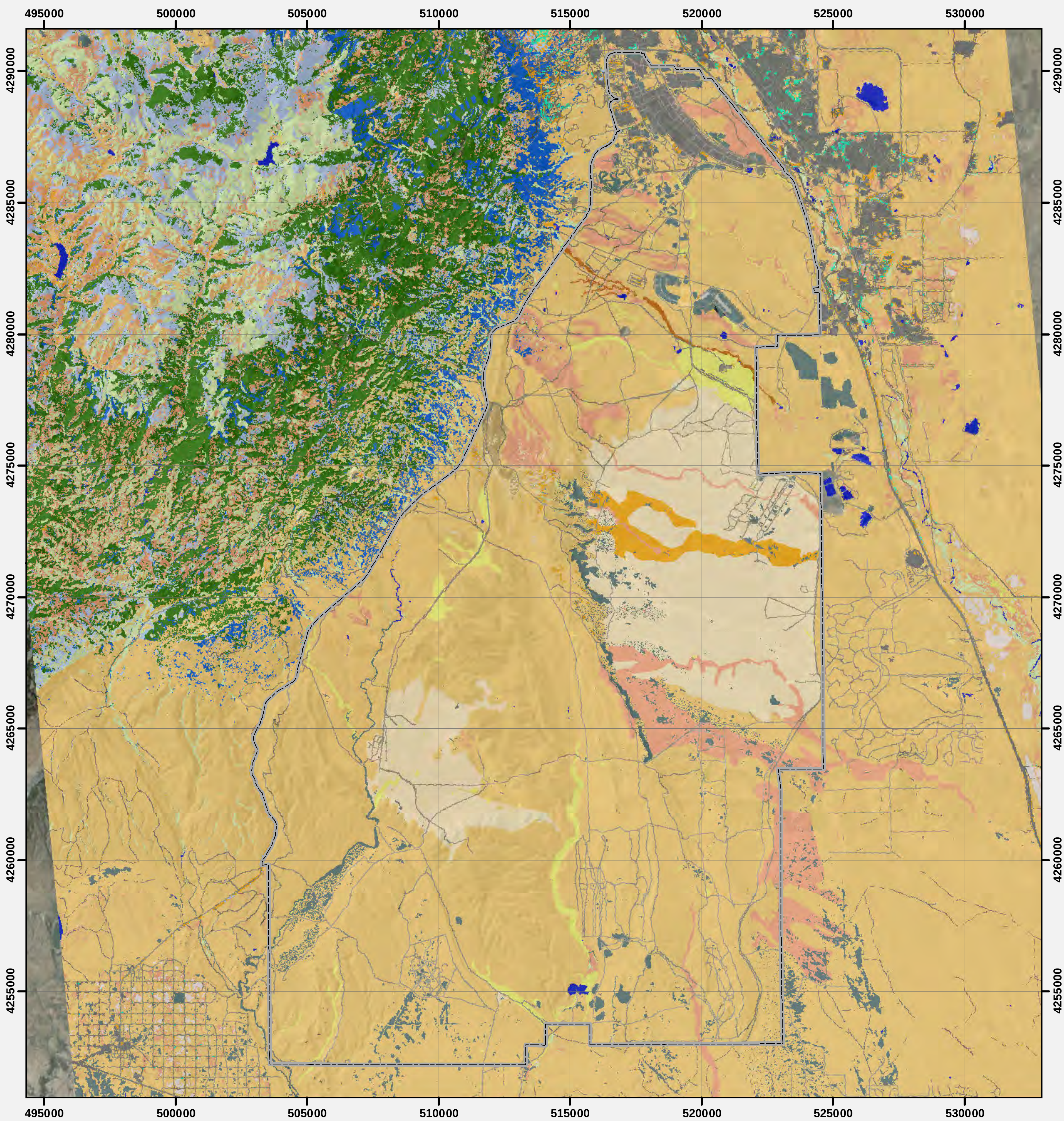
Table 19. Spatial extent and percentage of total installation area of each fuel model at PCMS.

Fuel Model #	Fuel Model Code	Fuel Model Description	Standard Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load, dry climate grass	186550.01	79.21%	186550.01	79.21%
101	GR1	Short, sparse dry climate grass	45718.32	19.41%	37355.42	15.86%
62	CU62	Intermediate roads	1265.46	0.54%	1263.45	0.54%
63	CU63	Minor roads	727.92	0.31%	721.47	0.31%
122	GS2	Moderate load, dry climate grass-shrub	358.29	0.15%	358.29	0.15%
99	NB9	Barren	335.16	0.14%	335.16	0.14%
121	GS1	Low load, dry climate grass-shrub	331.15	0.14%	331.15	0.14%
91	NB1	Urban	68.72	0.03%	68.72	0.03%
103	GR3	Low load, very coarse, humid climate grass	42.48	0.02%	42.48	0.02%
60	CU60	Airfield	38.03	0.02%	38.03	0.02%
124	GS4	High load, humid climate grass-shrub	30.91	0.01%	30.91	0.01%
145	SH5	High load, dry climate shrub	24.24	0.01%	24.24	0.01%
104	GR4	Moderate load, dry climate grass	12.90	0.01%	12.90	0.01%
98	NB8	Water	4.89	0.00%	4.89	0.00%
141	SH1	Low load, dry climate shrub	0.22	0.00%	0.22	0.00%
182	TL2	Low load, broadleaf litter	0.22	0.00%	0.22	0.00%
147	SH7	Very high load, dry climate shrub	0.00	0.00%	8371.36	3.55%

Fort Carson

Standard Conditions Wildland Fuel Models

Figure 33



Standard Wildland Fuels

- CU0 - Airfield
- CU1 - Major roads or firebreaks
- CU2 - Intermediate roads
- CU3 - Minor roads
- CU4 - Developed area, but burnable
- CU8 - Custom
- GR1 - Short; sparse dry climate grass
- GR2 - Low load; dry climate grass
- GR3 - Low load; very coarse; humid climate grass
- GR4 - Moderate load; dry climate grass
- GS1 - Low load; dry climate grass-shrub
- GS2 - Moderate load; dry climate grass-shrub
- GS4 - High load; humid climate grass-shrub
- NB1 - Urban
- NB3 - Ag
- NB8 - Water
- NB9 - Barren
- SH1 - Low load dry climate shrub
- SH2 - Moderate load dry climate shrub
- SH5 - High load; humid climate grass-shrub
- TL1 - Low load compact conifer litter
- TL2 - Low load broadleaf litter
- TL3 - Moderate load conifer litter
- TL5 - High load conifer litter
- TL6 - Moderate load broadleaf litter
- TL8 - Long needle litter
- TU1 - Low load dry climate timber grass shrub
- TU5 - Very high load; dry climate shrub
- Installation Boundary

0 3 6 Miles

N W E S

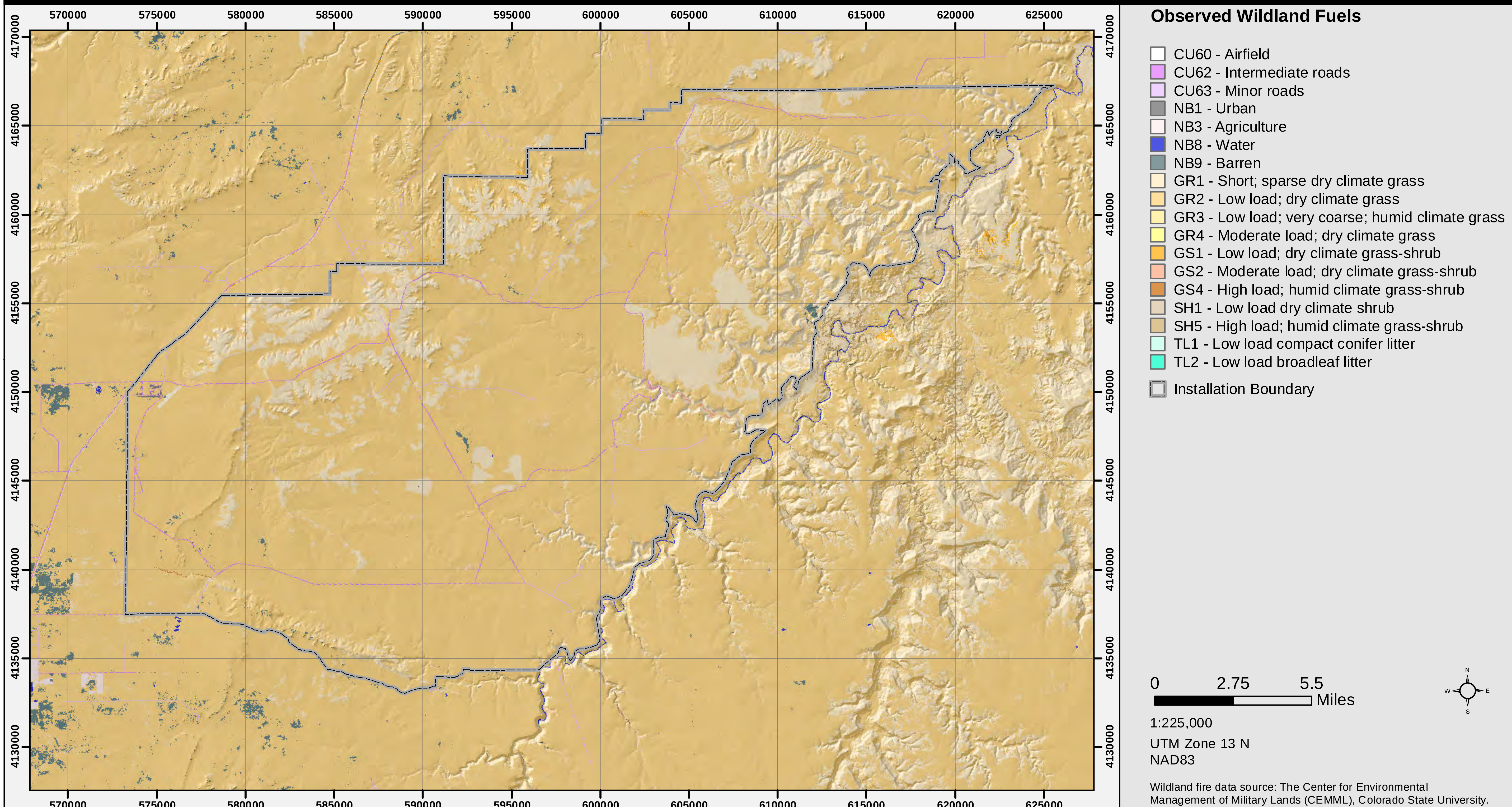
1:160,000
UTM Zone 13N
NAD83

Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

Pinon Canyon Maneuver Site

Observed Wildland Fuel Models

Figure 34



3.1.6.2. Fire Behavior

The tables below summarizes the expected fire behavior for all fuel models found at Fort Carson and PCMS. Fire behavior is given in rate of spread (chains per hour (ch/hr)) and flame length (feet) for three percentile weather conditions as predicted by BehavePlus. The color coding indicates likely containment success based on the NWCG Fire Characteristics Charts categories[18] (aka "haul" charts). Green indicates high likelihood of success, yellow moderate likelihood of success, and red indicates it is unlikely a fire under these conditions could be contained. Black indicates there is virtually no possibility of containment while these conditions persist. Fire behavior in the SH7 fuel model is not applicable under 50th and 80th percentile conditions because that fuel model is intended to represent an active crown fire in piñon-juniper stands. Crown fires under 50th and 80th percentile conditions are unlikely. Although the GS4 and SH5 fuel models indicate uncontrollable fires even under 50th percentile conditions, these fuels are very rare throughout USAG FC.

Table 20. Expected fire behavior in each fuel model found at Fort Carson. Fire behavior determined based on weather inputs from the Fort Carson RAWS (Table 7).

Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))			
Fuel Model	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
NB1	0/0	0/0	0/0
NB8	0/0	0/0	0/0
NB9	0/0	0/0	0/0
GR1	7.0/1.3	16.1/2.0	39.6/3.3
GR2	24.7/3.8	55.7/5.9	132.9/9.6
GR3	40.4/6.3	81.5/9.2	163.1/13.4
GR4	49.4/7.1	111.7/11.0	267.0/18.0
GS1	11.6/3.1	23.8/4.5	50.4/6.7
GS2	16.0/4.5	32.9/6.6	69.3/9.8
GS4	23.2/14.1	43.0/19.3	80.3/26.3
SH1	5.1/2.0	13.3/3.6	27.0/5.3
SH2	5.2/4.2	9.5/5.8	18.1/8.0
SH5	55.3/14.0	102.2/19.3	192.7/27.4
SH7	NA	NA	123.4/25.5
TU1	1.6/1.4	2.9/2.0	5.4/2.7
TU5	5.2/5.9	8.9/7.8	15.5/10.5
TL1	0.4/0.4	0.8/0.6	1.5/0.8
TL2	0.6/0.6	1.1/0.8	2.4/1.2
TL3	0.8/0.7	1.5/1.0	3.0/1.6
TL5	1.8/1.4	3.7/2.1	7.6/3.1
TL6	2.3/1.8	4.8/2.6	10.3/4.0
TL8	2.6/2.3	5.0/3.3	9.9/4.8

[18] Andrew P.L., Heinsch F.L., Schelvan L. 2011. How to generate and interpret fire characteristics charts for surface and crown fire behavior. U.S. Department of Agriculture Forest Service General Technical Report RMRS-GTR-253.

Table 21. Expected fire behavior in each fuel model found at PCMS. Fire behavior determined based on weather inputs from the Piñon Canyon RAWS (Table 8)

Fire Behavior (Rate of Spread(ch/hr)/Flame Length(ft))			
Fuel Model	*50th Percentile Weather*	*80th Percentile Weather*	*97th Percentile Weather*
NB1	0/0	0/0	0/0
NB8	0/0	0/0	0/0
NB9	0/0	0/0	0/0
GR1	6.4/1.3	18.0/2.2	55.1/4.0
GR2	22.5/3.8	62.0/6.4	189.8/11.6
GR3	37.9/6.4	88.3/9.8	217.1/15.5
GR4	45.1/7.1	124.5/12.0	381.5/21.6
GS1	10.1/3.0	25.2/4.7	70.1/8.0
GS2	14.0/4.3	34.8/6.9	96.3/11.5
GS4	20.3/13.5	44.3/19.7	107.3/30.2
SH1	5.6/2.3	14.2/3.8	36.6/6.2
SH5	49.2/13.6	107.8/20.3	253.9/31.5
SH7	NA	NA	161.8/29.2
TL1	0.4/0.4	0.8/0.6	2.0/1.0
TL2	0.6/0.6	1.3/0.9	3.3/1.4

3.1.6.3. Integrated Fire Hazard

The 2017 Risk Assessments estimated fire frequency as well as the probability of high intensity fire. Combining the two provides an indicator of overall fire hazard (likelihood x intensity). Although this measure assumes fire frequency and fire intensity are of equal importance to measuring overall fire hazard, which is unproven, it can nonetheless be informative. This measure is termed "integrated fire hazard" and is shown in Figures 35 and 36.

In these figures, areas of low fire frequency and low fire intensity result in a low fire hazard and vice versa. Anywhere the Risk Assessments showed zero fire likelihood or zero likelihood of high intensity fire, the value of the integrated fire hazard is zero. This includes much of the cantonment area and most areas mapped as fuel model GR1.

Fort Carson

The integrated fire hazard was highest just to the northeast of Range 57 and running southeast from there along an intermittent stream through the Small Impact Area. In this location, fire frequency is high and the grass/shrub fuels represented by fuel model GS2 support higher fire intensity. But the largest area of elevated integrated fire hazard is north of Range 104. Here, heavy grassland fuels dominate, along with stringers of heavy grass/shrub fuels, both of which can produce high fire intensity. The proximity to many ranges facilitates a relatively high probability of fire. This has been mentioned as an area of concern for firefighters, and these data support that concern.

Finally, there is a broad area of moderate integrated fire hazard south of the Large Impact Area. This is driven primarily by the moderate fire frequency modeled in the Risk Assessment.

PCMS

The integrated fire hazard was highest in a drainage in Training Area A just to the southwest of Brown's Sheep Camp. In this location, fire frequency is moderate and the grass/shrub fuels represented by fuel model GS4 support higher fire intensity. Areas of moderate fire hazard include an area of about 2,000 acres southeast of the airfield and MSR 5. Additionally, an area of approximately 4,500 acres in Training

Area 10 south of MSR 1 had an elevated integrated fire hazard. In both cases, much of this result was driven by moderate relative fire frequency, and fire intensity exceeding initial attack capacity 40-60% of the time.

3.1.6.4. Risk Summary – Fort Carson

The weather and fuels conditions are more than sufficient to produce many fires as well as very substantial fires. Because weather and fuels conditions support ignitions throughout the entire year, there is no off-season for fire at Fort Carson, only periods of diminished fire ignition and spread potential. The latter is dependent on the fuels, which are largely grasslands and grass/shrublands of moderate fuel loading. Run-of-the-mill fires in these fuels, which encompass all of the primary ignition areas, should be relatively straightforward to extinguish.

Given the mitigation measures already in place, including the use of prescribed fire to limit the ability of fires to exit the high ignition probability areas, the largest issues are fires igniting well within the impact areas and fires igniting in unusual locations.

Fires igniting deep within the impact areas, where they are relatively inaccessible, may build in intensity before reaching the edges of the impact areas where they can be engaged by firefighters. This also increases the length of fire perimeter that needs to be contained when it exits the impact area. The sheer length of fireline can be a major impediment to successful containment, even when the impact area has been burned.

Further, years in which high precipitation produces larger than normal fuel loads exacerbate the situation described above. If that is also combined with unsuccessful application of prescribed fire, as might be expected in a wet year followed by a dry summer, the potential for fire escape increases further. These factors should be considered when determining whether fire-prone activities beyond what is recommended by the Fire Danger Rating System should be authorized.

Fires igniting in unusual locations are always an issue of concern as it is impossible to plan for and mitigate every eventuality. A fire igniting almost anywhere on the western portion of the installation would be difficult to manage. Fires throughout much of that area would have ample fuels to burn in and escape across the boundary is a significant concern. However, these issues are naturally mitigated to some degree by the SW/NE tendency of the winds during high fire danger periods, which would push fires more or less parallel to the boundary. However, a fire in the southwestern corner of the installation, while unlikely, could threaten Penrose. Fortunately, ignition probability in that portion of the installation is quite low.

Managing the risk posed by the high volume of ignitions produced by high tempo military training is a matter of accepting minor losses from the many small fires that are inevitable, while ensuring that fires do not occur when they are likely to be of high intensity. No firebreak and no amount of suppression resources will halt such a fire. Therefore, the only way to mitigate high intensity fires is to prevent them from ever occurring. The primary means of accomplishing that goal is proper implementation of a Fire Danger Rating System.

3.1.6.5. Risk Summary – PCMS

Similar to Fort Carson, fuels at PCMS are plentiful, the weather is conducive to fire, and the fire season is year-round. A major fire is possible under a wide variety of conditions that occur with some regularity, and indeed, there have been two major fires at PCMS in the past. Other than the MSRs, there are no substantial barriers to fire spread, allowing fires to spread freely across large acreages.

Fortunately, ignition probability is relatively low and there are few high value assets outside of the cantonment area. There are only 4.14 ignitions per year (see Section 1.3.5). Human-caused ignitions are highly concentrated in known areas (see Figure 18). The impact area is where the most human-caused ignitions occur and is located on the western side of the installation. Although it is close to the boundary, the predominant wind direction during high fire danger periods should push fires away from the boundary (see Figure 20), though under some conditions, fires may be pushed towards the cantonment area. There are also a significant number of fires at Range 9, located in the center of the installation. Fires igniting here would have to travel over four miles to reach the installation boundary.

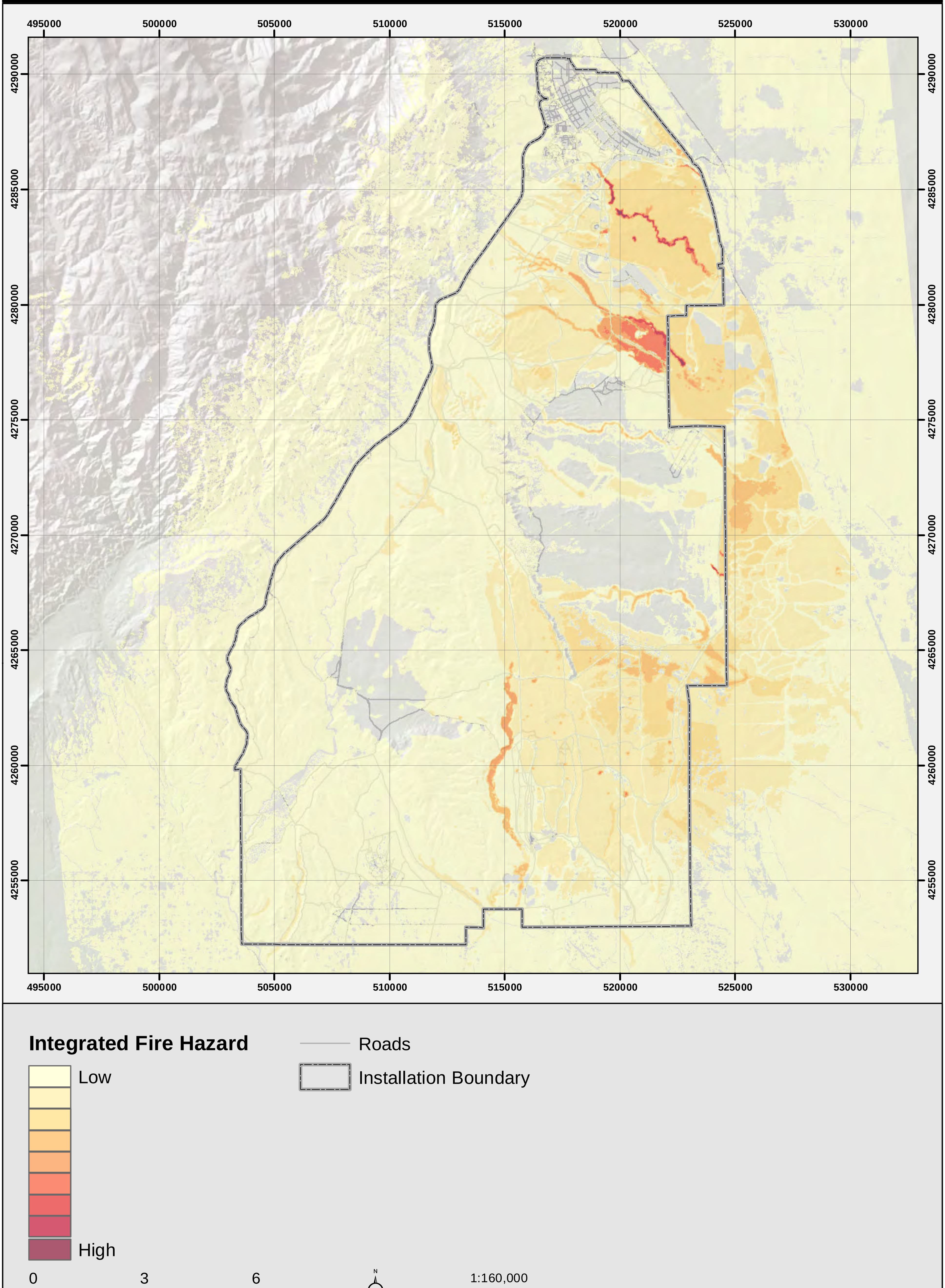
The most important assets are in the north-central portion of the installation. Large fires from either the impact area or Range 9 could be pushed in this direction by predominant winds, but a fire would have to cover tens of thousands of acres to reach that distance. These assets also have reasonable standoff distances from the fuels around them.

The fundamental risk at PCMS is a fire ignition where firefighting access is difficult. Access to the impact area and Range 9 is good, which mitigates some of the risk there. However, most wildfires are ignited by lightning, making a fire in a remote location probable as lightning strikes on the fairly flat topography are essentially random. Additionally, access to large portions of the installation is poor, particularly in the eastern third, which is dissected by numerous shallow, but steep-sided, canyons. A fire igniting here, if it is any distance from the few roads that exist, will result in a response time of many hours, will require firefighters to travel on foot and fight the fire without the aid of engines, and if it is in a canyon, will preclude the use of heavy machinery whenever there is not road access. There is also no water available for engines or helicopters in almost all cases because none exists, there is very limited access to it, it is too shallow to dip out of, or a combination of these. These difficulties will allow fires to spread for hours prior to initial attack resources arriving on scene and will take considerable time and effort to suppress, usually days.

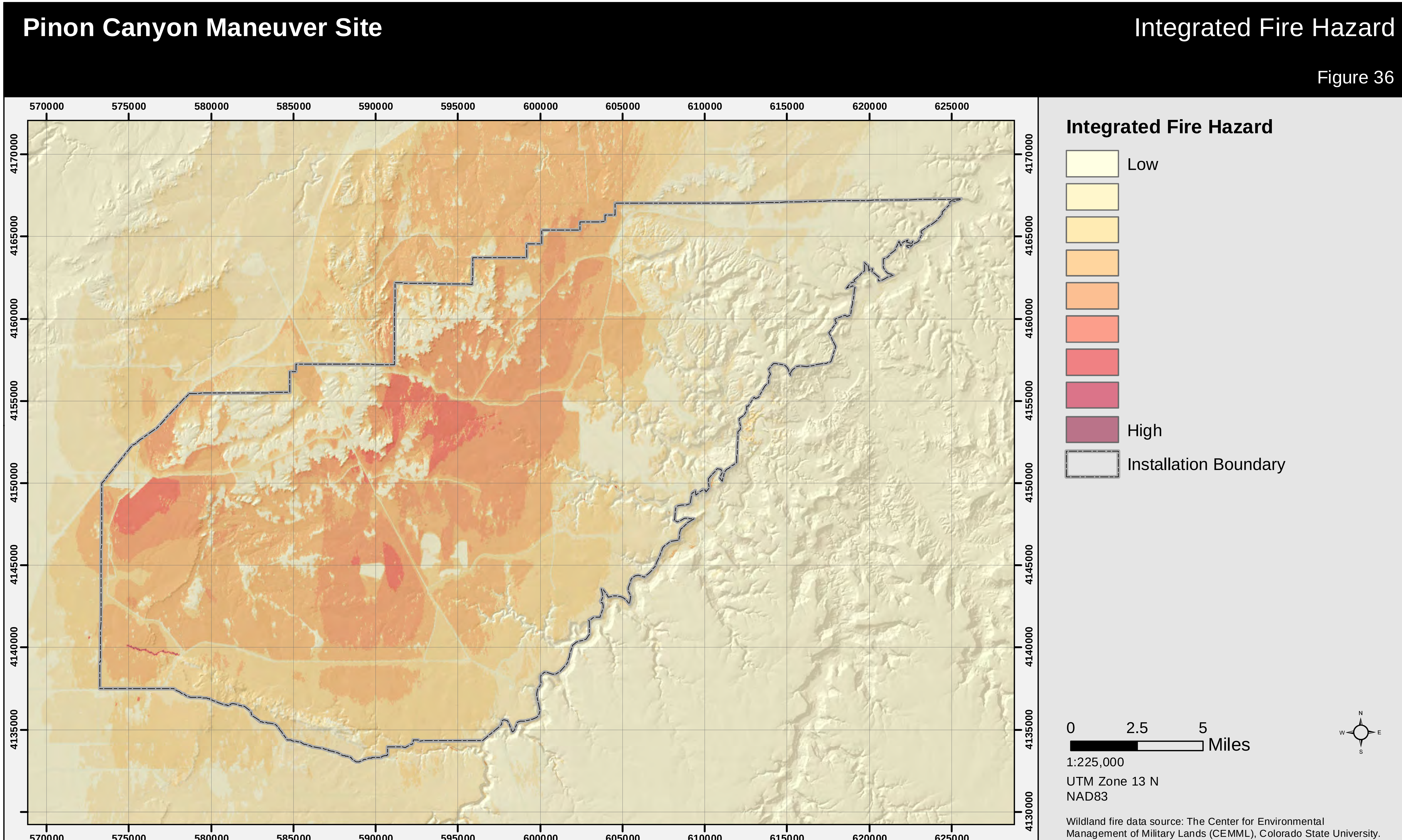
Managing the geographically widespread risk presented by lightning ignitions is not achievable. There is too much land with too little access. Additional roads in strategic locations can help, but a truly compartmentalized installation is cost prohibitive. However, the human-caused ignitions are largely concentrated in a few relatively small areas and containing those fires to those smaller areas should be feasible.

Fort Carson **Integrated Fire Hazard**

Figure 35



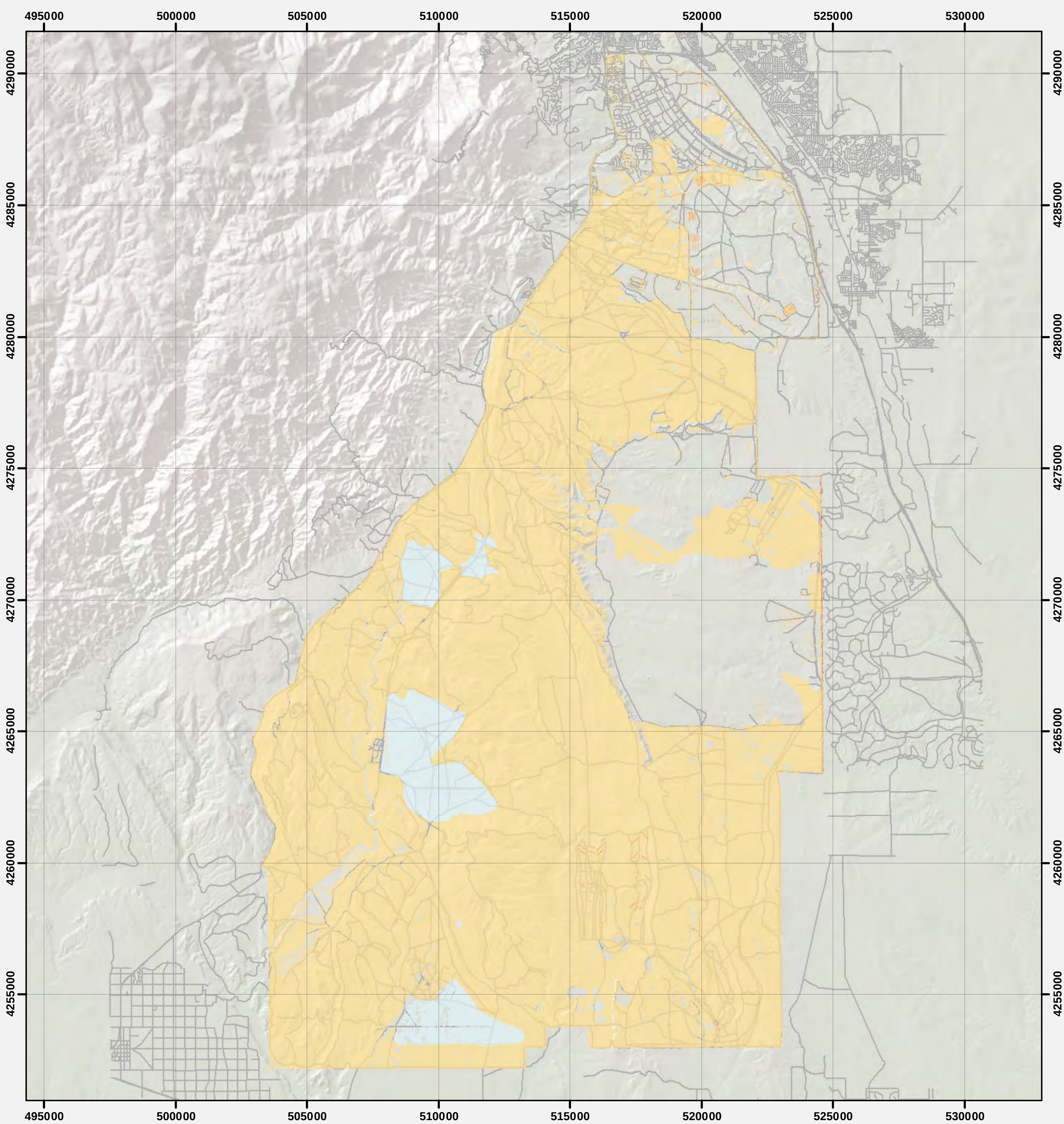
Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.


Pinon Canyon Maneuver Site
Integrated Fire Hazard
Figure 36
Integrated Fire Hazard
Low
High
Installation Boundary
0 2.5 5 Miles
1:225,000
UTM Zone 13 N
NAD83
Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

Fort Carson

Wildfire Risk

Figure 37



Wildfire Risk

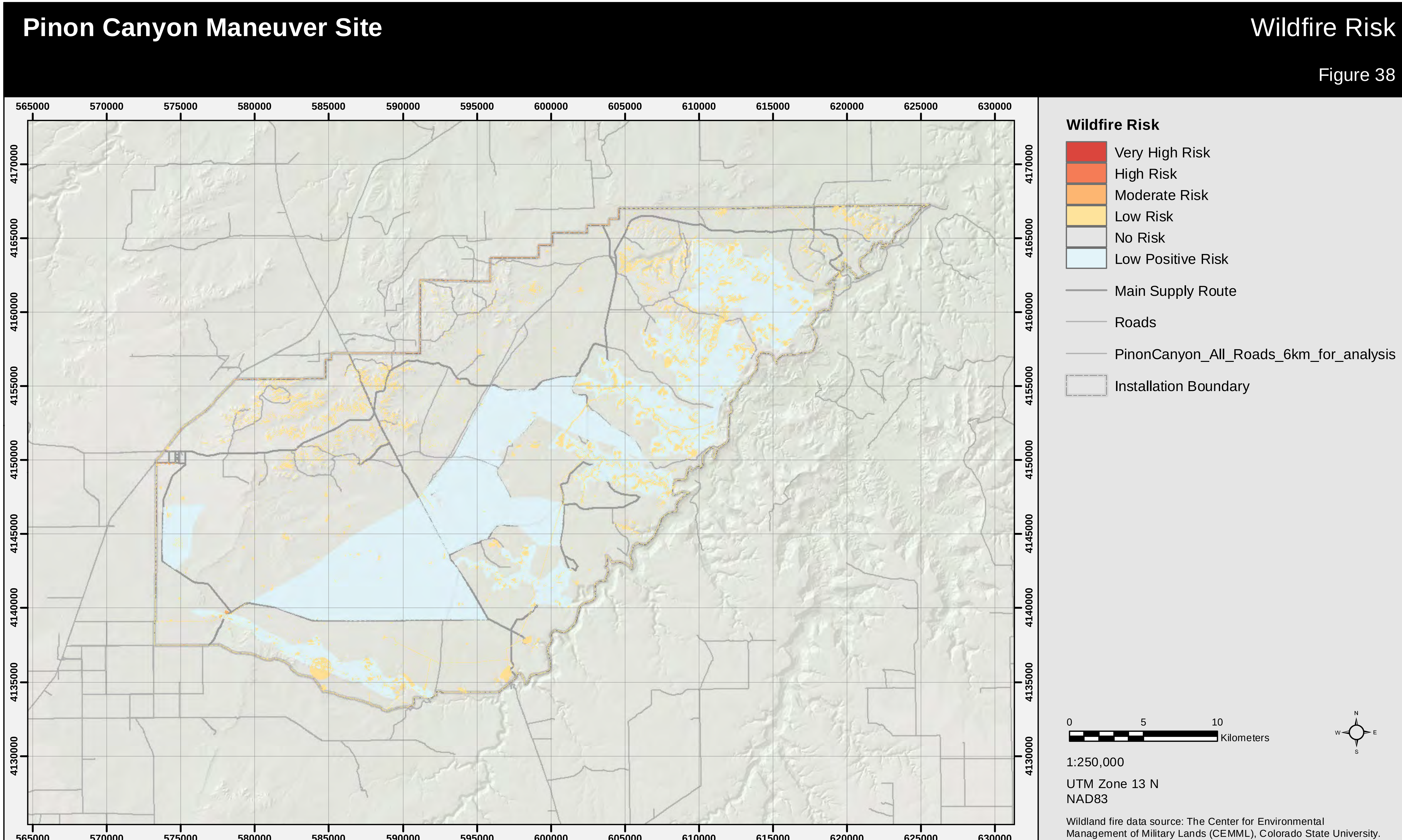
- Very High Risk
- High Risk
- Moderate Risk
- Low Risk
- No Risk
- Low Positive Risk
- Roads

0 3 6 Miles

N S W E

1:160,000
UTM Zone 13N
NAD83

Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.



Pinon Canyon Maneuver Site
Wildfire Risk
Figure 38
565000
570000
575000
580000
585000
590000
595000
600000
605000
610000
615000
620000
625000
630000
4170000
4165000
4160000
4155000
4150000
4145000
4140000
4135000
4130000
Wildfire Risk
Very High Risk
High Risk
Moderate Risk
Low Risk
No Risk
Low Positive Risk
Main Supply Route
Roads
PinonCanyon_All_Roads_6km_for_analysis
Installation Boundary
0
5
10
Kilometers
N
W
E
S
1:250,000
UTM Zone 13 N
NAD83
Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

3.2. Fire Prevention

3.2.1. Education

Range Control personnel will include fire prevention as part of every pre-training briefing to all USAG FC land users. This will include the topics addressed in Appendix 3.

Signs will be posted by Range Control in strategic locations as reminders of prevention and awareness of the FIRECON (see Section 3.2.3 for more information). Range Control Personnel will update these signs daily. Fire danger in February, March, April, June, and November is VERY HIGH or EXTREME more than 15% of the time at Fort Carson (see Figure 27). Similarly, Fire danger in February, March, and April is VERY HIGH or EXTREME more than 15% of the time at PCMS. Additionally, USAG FC has a year-round fire season, there is no 'off-season' for wildfires. They occur with some frequency every month of the year. This information will be communicated to range users early in the training scheduling process so that users can try to utilize portions of the year with lower fire danger.

Fire prevention and environmental pocket cards will be issued to users, including to civilian users, to increase individuals' awareness of fire and environmental issues. These will include succinct information about general fire prevention measures and the training restrictions associated with the FIRECON.

Limits on training related to fire prevention include:

- No vehicles may maneuver on or within 100 m of the boundary firebreaks.
- Fire-producing materials, including pyrotechnics, will not be thrown from vehicles.
- No open fires (campfires, cooking fires, etc.), except in locations designated by Range Control.
- Live-fire training will be evaluated daily and may be restricted when wind gusts exceed 25 mph. The unit OIC will make this determination, or Range Control may call a check fire or cease fire.
- Heat-producing training aids, including pyrotechnics and simulators, will be placed in buckets or cans, never in vegetated areas.
- A firefighting detail is required for all direct-fire live-fire exercises and when using pyrotechnics whenever the FIRECON is MODERATE or greater (see Table 25 and Section 3.6.2).
- If a fire is ignited by non-live-fire training, training in the area will be ceased until the fire is extinguished.
- Burn pans are required for all propellant burns. Burn pans must be >30 feet from any vegetation.

3.2.2. Enforcement

Responsibility for enforcement of range directives, which includes fire prevention procedures, is delegated to Range Control. The Range Officer will ensure compliance with fire prevention and reporting measures and use tools at their disposal to assess punitive measures on those who do not comply, including revoking range privileges.

Secondary responsibility for enforcement of fire prevention rests with the unit commanders. Per the Fort Carson Range SOP, Unit OICs are responsible for ensuring fire precautions are in place, including a firefighting detail, as appropriate.

Failure to follow fire prevention protocols may result in termination of scheduled training and responsible individuals may be subjected to administrative disciplinary action in accordance with applicable regulations.

3.2.3. Fire Condition

USAG FC uses a Fire Danger Rating System (FDRS) to guide determinations about what the FIRECON for the day should be, one for Fort Carson and a separate one for PCMS. When the FIRECON is elevated, fire-prone training and munitions are more restricted to avoid wildfire ignitions when the potential for large-scale fires is high. The FDRS provides recommended fire prevention measures that the G3 takes into consideration when determining what training is safe and the acceptable level of risk given the types and importance of training scheduled for the day. This is communicated to units through the FIRECON.

The FDRS is based on the current weather and fuel conditions, and the propensity of various types of munitions and training to start fires. As weather and fuel conditions become more conducive to fire, more weapons systems and more types of training are generally restricted. Red Flag warnings, which indicate extreme fire danger, also figure into training restrictions.

USAG FC will implement a Fort Carson and a PCMS FDRS based on the National FDRS (NFDRS) framework[19] using data from the Fort Carson and Piñon Canyon RAWS that is compiled and made available through the Weather Information Management System (WIMS).

3.2.3.1. Development of the Fire Danger Rating System for Fort Carson

An analysis was carried out to determine which index or variable is best suited to predicting wildfire occurrences at Fort Carson. Weather and fire data from 2006 – 2018 were analyzed in Fire Family Plus[20]. Three fuel models were considered. NFDRS Fuel model G is often used in fire danger rating because it includes all live and dead fuel categories, making it sensitive to the effects of weather on all live and dead fuels. Fuel model L represents western perennial grasses, which are abundant at Fort Carson. Fuel model W is a new NFDRS model introduced in 2016 and intended to approximate fire behavior as would be calculated by Fire Behavior System fuel model GS2, which represents moderate load, dry climate grass/shrub fuels, also present in abundance at Fort Carson. Fuel model V was also considered along with W and produced very similar, but poorer, results.

The results of the analysis are summarized in Table 22 through Table 24 below. Few of the candidate indices performed well, regardless of fuel model, but there were some exceptional results. The best performing indices were Burning Index (BI) and Energy Release Component (ERC). None of the candidates produced statistically significant results when predicting large fires (defined as > 10 acres for this analysis, Table 23). Fire acreage data is the least accurate of the fire activity data and this result may simply be a result of insufficiently accurate, or simply insufficient, data. ERC was the only statistically significant predictor of multi-fire days (two or more fires in the same day).

In addition to statistical measures, practical considerations are necessary to determine a good index to use for decision-making. While the ERC under Fuel Model W was found to be statistically highly relevant in predicting fire days (Table 22), and under Fuel Model L and W when predicting large fires (Table 24), the granularity of the data is insufficient, with the bulk of observations occurring within only 12 points on the ERC scale. This does not leave adequate variability to make decisions with much confidence.

The BI is an appealing candidate because it is a composite of all the other indices, meaning it accounts for all the variables available. The BI accounts for the moisture available in fuels as small as grass blades to as large as one-foot diameter logs, temperature, rainfall, day length, evapotranspiration, drought, wind, relative humidity, and fuel availability.

The BI under Fuel Model L was found to have sufficient decision space to provide meaningful insights into fire probability, with a range of fire day observations of well over 100 points. The drawback to using this predictor is the lack of multi-fire day predictive capacity (none of the models were able to predict large

[19] Bradshaw, L., Deeming J.E., Burgan R.E., Cohen J.D. 1978 National Fire-Danger Rating System--technical documentation. Gen. Tech. Rep. INT 169. Ogden, UT: Intermountain Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture; 1983. 44 p.

[20] Fire Family Plus Version 5.0. 2020. https://www.firelab.org/project/firefamilyplus

fire days), but none of the predictors was strong across fire day and multi-fire day capacities and it is more important to predict fire occurrence than multi-fire day occurrence.

The result of the above analysis is that BI under Fuel Model L is best suited to utilize for fire danger rating at Fort Carson. The daily recommended fire danger is broken into five categories, low through extreme, which are associated with training recommendations commensurate with the fire risk. These are detailed in Appendix 2.

Table 22. Correlation of variables of interest with days of wildfire occurrence. Statistically significant results ($p < 0.05$) with an $R^2 > 0.8$ are bolded.

	Fuel Model G			Fuel Model L			Fuel Model W		
Variable	Chi^2	P-Value	R^2	Chi^2	P-Value	R^2	Chi^2	P-Value	R^2
1 hr FM	3.8	0.6976	0.98	3.8	0.6976	0.98	10.8	0.2140	0.94
10 hr FM	10.6	0.1583	0.95	10.6	0.1583	0.95	13.5	0.0944	0.89
1000 hr FM	21.8	0.0053	0.79	21.8	0.0053	0.79	11.7	0.0679	0.63
BI	17.0	**0.0300**	**0.81**	18.8	**0.0158**	**0.85**	65.8	0.0000	0.66
ERC	4.5	0.8050	0.97	10.9	0.1441	0.95	29.3	**0.0003**	**0.88**
FWI	41.5	0.0000	0.75	41.5	0.0000	0.75	41.5	0.0000	0.75
HerbFM	101.4	0.0000	0.30	101.4	0.0000	0.30	19.6	0.0006	0.60
KBDI	21.4	0.0061	0.64	21.4	0.0061	0.64	21.4	0.0061	0.64
WoodyFM	2.3	0.5076	0.96	2.3	0.5076	0.96	19.3	0.0007	0.60

Table 23. Correlation of variables of interest with days of wildfires >10 acres.

	Fuel Model G			Fuel Model L			Fuel Model W		
Variable	Chi^2	P-Value	R^2	Chi^2	P-Value	R^2	Chi^2	P-Value	R^2
1 hr FM	7.5	0.2740	0.80	7.5	0.2740	0.80	8.9	0.3467	0.60
10 hr FM	3.1	0.7952	0.91	3.1	0.7952	0.91	9.2	0.3224	0.64
1000 hr FM	8.0	0.4361	0.57	8.0	0.4361	0.57	9.2	0.1028	0.68
BI	8.7	0.3666	0.73	4.7	0.7912	0.85	12.3	0.1367	0.74
ERC	9.2	0.3221	0.70	3.5	0.7470	0.92	7.1	0.5293	0.83
FWI	5.6	0.6915	0.81	5.6	0.6915	0.81	5.6	0.6915	0.81
HerbFM	21.5	0.0058	0.67	21.5	0.0058	0.67	1.8	0.7708	0.93
KBDI	16.4	0.0374	0.04	16.4	0.0374	0.04	16.4	0.0374	0.04
WoodyFM	0.4	0.9434	0.99	0.4	0.9434	0.99	2.6	0.6248	0.91

Table 24. Correlation of variables of interest with days with two or more wildfires.

	Fuel Model G			Fuel Model L			Fuel Model W		
Variable	Chi^2	P-Value	R^2	Chi^2	P-Value	R^2	Chi^2	P-Value	R^2
1 hr FM	7.1	0.3083	0.93	7.1	0.3083	0.93	7.2	0.5128	0.92
10 hr FM	4.4	0.7353	0.96	4.4	0.7353	0.96	2.7	0.9540	0.96
1000 hr FM	26.1	0.0010	0.69	26.1	0.0010	0.69	5.4	0.4948	0.80
BI	9.5	0.2997	0.77	23.7	0.0026	0.64	45.0	0.0000	0.58
ERC	9.4	0.3128	0.90	14.2	**0.0481**	**0.87**	15.7	**0.0476**	**0.87**
FWI	31.0	0.0001	0.62	31.0	0.0001	0.62	31.0	0.0001	0.62
HerbFM	46.9	0.0000	0.41	46.8	0.0000	0.41	15.9	0.0031	0.62
KBDI	18.2	0.0200	0.46	18.2	0.0200	0.46	18.2	0.0200	0.46
WoodyFM	4.1	0.2510	0.91	4.1	0.2510	0.91	15.3	0.0040	0.62

3.2.3.2. Development of the Fire Danger Rating System for PCMS

There is insufficient fire occurrence data to carry out a fire business analysis, which is used to determine weather and fire index thresholds to delineate fire danger categories. Instead, the Fort Carson FDRS was used as a starting point and consideration was given to the FDRS used by the Pueblo Interagency Dispatch Center (PIDC) in order to develop a FDRS for PCMS.

The values determined for breakpoints in the Fort Carson FDRS differ from those in the PIDC FDRS primarily at lower fire danger. The Fort Carson FDRS is overall slightly more conservative than the PIDC FDRS, which is appropriate given the much higher concentration of ignitions at Fort Carson.

As a result, the same FDRS breakpoints were used for the PCMS FDRS. Over the coming years, it is recommended that the WFPM track fire occurrences at PCMS as they relate to the FDRS. At the 5-year update of this plan, consideration should be given to adjusting those breakpoints based on that experience.

3.2.3.3. Implementation of the FDRS

The WFPM will facilitate Fire Department personnel acquiring WIMS login credentials. All Fire Department personnel should use a single set of login credentials.

The DES Fire Chief will ensure that the day's fire danger and recommended training restrictions are determined via the methods in Appendix 2 every morning. If data from the Fort Carson RAWS are not available, data from the Red Creek RAWS (14 miles south of Fort Carson) will be substituted as stated in Appendix 2. If data from the Piñon Canyon RAWS are not available, data from the Rocky Ford RAWS (41 miles northeast of PCMS) will be substituted as stated in Appendix 2.

The fire danger, as assessed by the process described in Appendix 2, will be included in the daily Fire Weather Briefing. The Fire Weather Briefing will be passed to Range Control and G3, as well as others at the discretion of the DES Fire Chief, no later than 0700 hours via the Fire Weather Notification Distro list.

The G3 will consider the day's recommended fire danger and training restrictions, as well as other information communicated in the Fire Weather Briefing and other factors including, but not limited to, the volume, types, and location of training scheduled; the availability of firefighting resources; and the goals and objectives of the IWFMP.

The G3 will establish the Fire Condition (FIRECON) to be utilized for fire prevention for the day at each installation (Fort Carson and separately PCMS). This may differ from the recommended fire danger. If G3 concurs with the recommended fire danger, the FIRECON will be the same as the recommended fire danger and the training restrictions associated with the FIRECON in Table 25 will be implemented.

If the G3 requires additional flexibility, they will discuss the situation with the Fire Department. The G3 has final authority to determine the mitigation measures to be taken. The G3 may decide to implement a lower FIRECON than the recommended fire danger, resulting in fewer training restrictions, and accept the risk associated with allowing additional training. Alternatively, the G3 may waive or reduce specific training restrictions, or restrictions at specific ranges, or may waive or reduce the same for only part of the day, for example the morning when fire ignitions are less likely. The hours of 1100 through 1600 should be avoided in these scenarios as that is the hottest and driest part of the day when fire ignitions are most likely. The G3 will generally make these changes to facilitate special training such as large-scale training events, very high value training, or training that cannot be rescheduled, but the decision to deviate from the recommended fire danger may hinge on other factors as well.

If the recommended fire danger is EXTREME, the FIRECON and training restrictions may only be reduced to those under the VERY HIGH FIRECON. Only the G3 may choose to reduce the FIRECON implemented from EXTREME to VERY HIGH in this situation. This responsibility may not be delegated. If the G3 chooses to accept the risk and reduce the FIRECON from EXTREME to VERY HIGH, this decision will be documented in a written communication to the DES Fire Chief prior to the start of any training for the day. If possible, this decision should be made at least 24 hours ahead of time to give the DES Fire Chief time to adjust staffing and placement of resources, provided additional staff is available.

The Range Officer will ensure that the fire danger and restrictions are communicated to all units using the ranges each day, including requirements for fire details.

It is recommended that a log be kept of the daily recommended fire danger and the FIRECON and training restrictions that are ultimately implemented. This could allow future adjustment of the recommended restrictions under each of the FIRECON categories and/or adjustment of threshold values for the recommended fire danger.

3.2.3.4. Special Circumstances

If the FIRECON is VERY HIGH or EXTREME and the DES Fire Department notifies Range Control that all firefighting units are committed to other incidents (see Section 3.6.3), Range Control will temporarily cease all live-fire in order to reduce the potential for additional fire ignitions until the Fire Department's resources are released from the current incident and are again available for wildfire response. Alternatively, the G3 may accept the additional risk and allow live-fire training to continue. This decision may not be delegated.

If the FIRECON is HIGH and the DES Fire Department notifies Range Control that all firefighting units are committed to other incidents (see Section 3.6.3), Range Control will temporarily raise the FIRECON to VERY HIGH and implement the associated training restrictions in order to reduce the potential for additional fire ignitions until the Fire Department's resources are released from the current incident and are again available for wildfire response. Alternatively, the G3 may accept the additional risk and leave the FIRECON at HIGH. This decision may not be delegated.

If the recommended fire danger for the current day, or that forecast by WIMS for the following day, is VERY HIGH or EXTREME, or if a red flag warning is forecast for the following day, it is recommended that a DES firefighter be on board for any end of day Medevac flight. This will help detect fires that may have gone undetected during the day and allow them to be addressed at night or early the next day before they burn into the hotter windier portion of the day.

If the recommended fire danger is VERY HIGH, the aerial resources required under VERY HIGH FIRECON are required, even if the G3 has reduced the FIRECON to HIGH.

If the recommended fire danger is VERY HIGH and aerial resources are not available, the FIRECON will be set to EXTREME and associated fire restrictions implemented. The G3 may waive this requirement. This decision may not be delegated. If the recommended fire danger is EXTREME and aerial resources are not available, no training will be authorized. This requirement may not be waived.

Table 25. Fire danger training restrictions and precautions.

FIRECON	Potential Fire Behavior	Training Restrictions All Ranges and TAs	Precautions
LOW	Fires do not ignite easily. Fires may spread, particularly in grass fuels. Fire control is routine.	None.	Normal precautions. Avoid high-heat munitions coming into contact with vegetation. No firefighting detail required.
MODERATE	Fires may ignite and spread, particularly in grass fuels. Fires are usually easily contained.	Tracers require FCRO permission.	OIC ensures that all training restrictions are enforced, and firefighting detail is available to react to fire immediately.
HIGH	Fires start with some regularity, particularly mid-day. Fires spread easily. High intensity fire may occur in pockets of heavy fuels. Fires may strain control resources if they grow beyond several dozen acres.	All tracers, incendiary munitions (API, HEI, INC, SAPHEI, TH), hand-held pyrotechnics, and heat- or spark-producing simulators require FCRO permission.	OIC ensures that all training restrictions are enforced, and firefighting detail is available to react to fire immediately.
VERY HIGH	Fires start from almost any high-heat source. Fires will spread easily and rapidly. High intensity fire is commonplace. Fires will easily spot across roads and firebreaks. Fire containment may not be possible.	No pyrotechnics, incendiary munitions, tracers, HE munitions, or claymores. No powder burns. Tracers, hand-held pyrotechnics, and heat- or spark-producing simulators restricted to specific Large Impact Area ranges and require case-by-case approval from FCRO. Mortar/artillery illumination and WP are allowed in the Large Impact Area when wind speed <25 mph. Aircraft may not release live weapons or drop flares.	OIC ensures that all training restrictions are enforced, and firefighting detail is available to react to fire immediately. The firefighting detail may be called upon by FRCO to assist the Fire Department in fighting major fires on the installation. Aerial firefighting resources will be on two-hour standby.
EXTREME or RED FLAG	Ignitions are a near certainty. All fires are severe. Fires will spread aggressively and grow to large sizes in short periods of time. Extreme fire behavior is likely including crown fires in coniferous forests, long-distance spotting, and fire whirls. Fire containment is usually not possible.	No heat- or spark-producing munitions or training aids of any kind. No powder burns. Exceptions may be made on a case-by-case basis by FRCO.	OIC ensures that all training restrictions are enforced, and firefighting detail is available to react to fire immediately. The firefighting detail may be called upon by FRCO to assist the Fire Department in fighting major fires on the installation. Aerial firefighting resources are required for any training with any munitions requiring a FRCO exception. The aircraft must be on-site, pre-spun, with the ability to be airborne within 15 minutes.

3.2.4. Estimated Effects of the Fire Danger on Training

3.2.4.1. Fire Danger Effects at Fort Carson

Based on an analysis of the Burning Index from 2006 – 2018, the recommended fire danger fluctuates seasonally, but is frequently elevated throughout the year. As shown in Figure 39, the fire danger is at its peak in March, with 26% of all days in VERY HIGH or EXTREME fire danger. However, more than 20% of days in April and June are in VERY HIGH or EXTREME fire danger as well. EXTREME fire danger, under which the recommendation is to restrict most types of training, averages 9% of the time in these months.

Conversely, December through February and May are all in the LOW or MODERATE fire danger categories more than 50% of the time. Very little training is restricted under the recommended mitigation measures in these fire danger categories.

Overall, more days fall into the HIGH fire danger category than any other category (Figure 40). This means the Fort Carson daily or individual authorizations of the use of the munitions listed in the HIGH category in Table 25 will be very important to the success of the fire mitigation strategy. It will be important that the G3 and the Fire Department determine what is tenable for any given day based on a sober assessment of the situation and a realistic acknowledgement of the risks.

It is recommended that trainers and Range Control Range Schedulers familiarize themselves with these fire danger patterns to minimize restrictions on fire-prone training. The months of December through February and May have the greatest chance of being in the LOW or MODERATE categories. The months of January, July, and August have the lowest chance of being in the VERY HIGH or EXTREME categories.

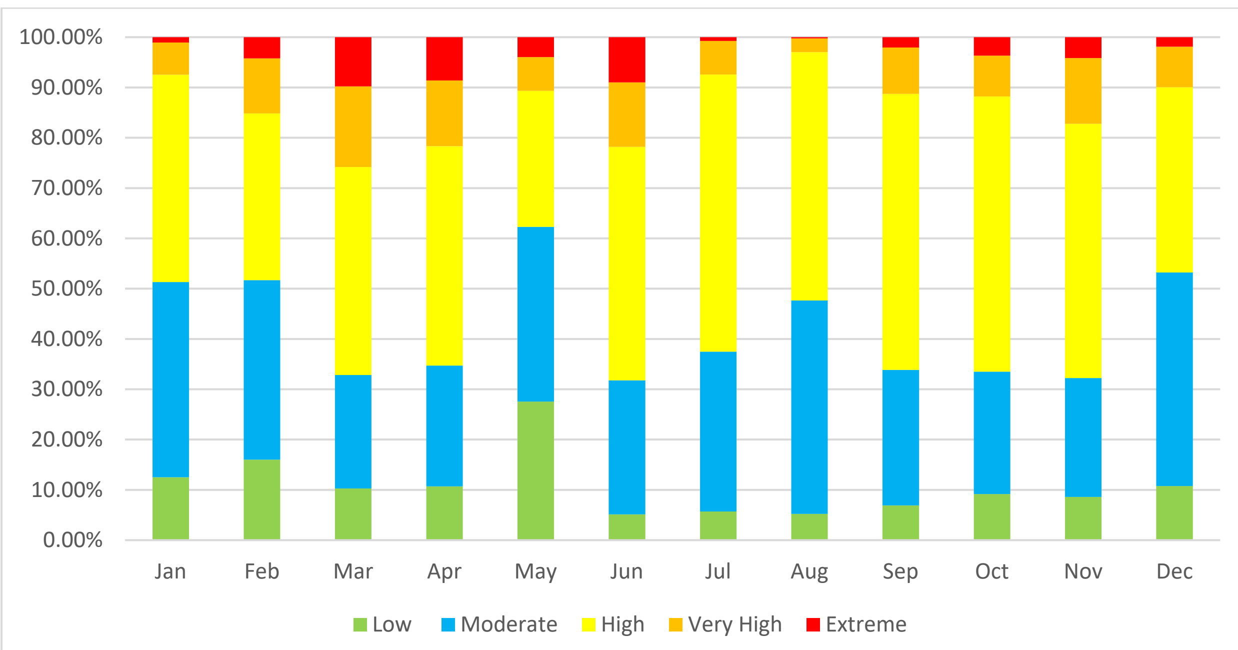


Figure 39. Percentage of days in each recommended fire danger category by month at Fort Carson 2006 – 2018.

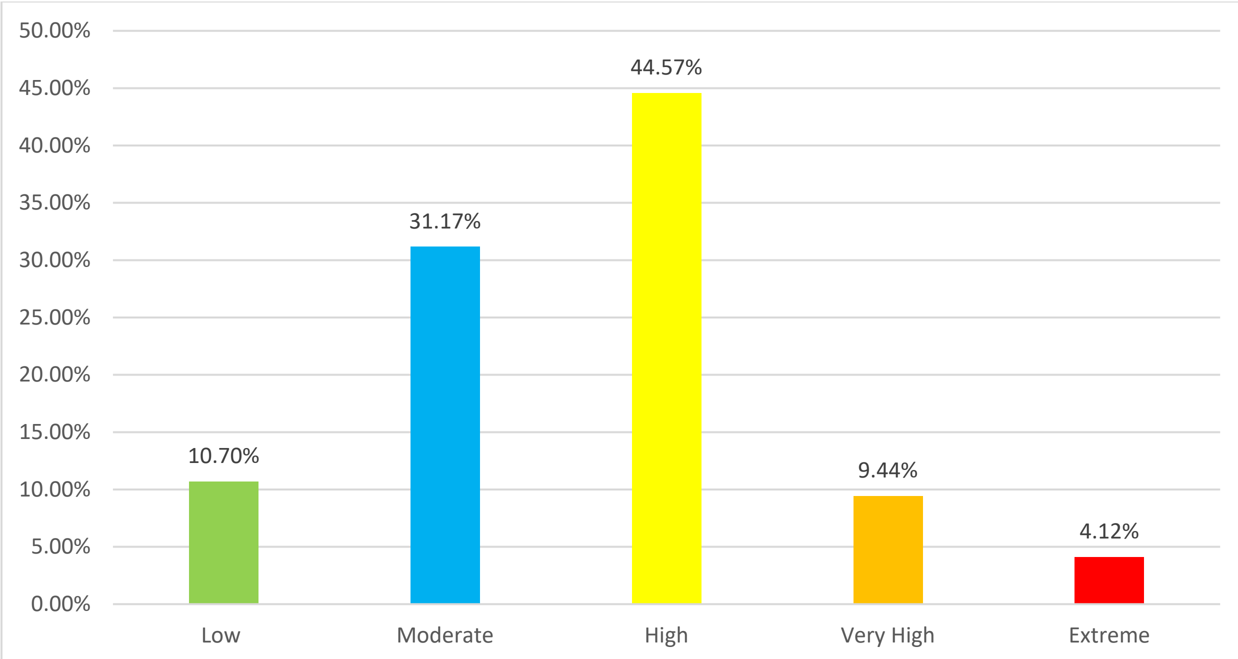


Figure 40. Percentage of days in each recommended fire danger category overall at Fort Carson 2006 – 2018.

3.2.4.2. Fire Danger Effects at PCMS

Based on an analysis of the Burning Index from 2006 – 2018, the recommended fire danger fluctuates seasonally, but is frequently elevated throughout the year. As shown in Figure 41, the fire danger is at its peak in April, with 25% of all days in VERY HIGH or EXTREME fire danger. However, more than 15% of days in March are also in VERY HIGH or EXTREME fire danger. EXTREME fire danger, under which the recommendation is to restrict most types of training, averages 11% of the time in these months.

Conversely, December through February and May are all in the LOW or MODERATE fire danger categories more than 45% of the time. Very little training is restricted under the recommended mitigation measures in these fire danger categories.

Overall, more days fall into the HIGH fire danger category than any other category (Figure 42). This means the PCMS daily or individual authorizations of the use of the munitions listed in the HIGH category in Table 25 will be very important to the success of the fire mitigation strategy. It will be important that the conversations between the G3 and the Fire Department determining what is tenable for any given day represent a sober assessment of the situation and a realistic acknowledgement of any risks to be accepted.

It is recommended that trainers and Range Control Range Schedulers familiarize themselves with these fire danger patterns to minimize the frequency of restrictions on fire-prone training. The months of December through February and May have the greatest chance of being in the LOW or MODERATE categories. The months of May, July, and August have the lowest chance of being in the VERY HIGH or EXTREME categories.

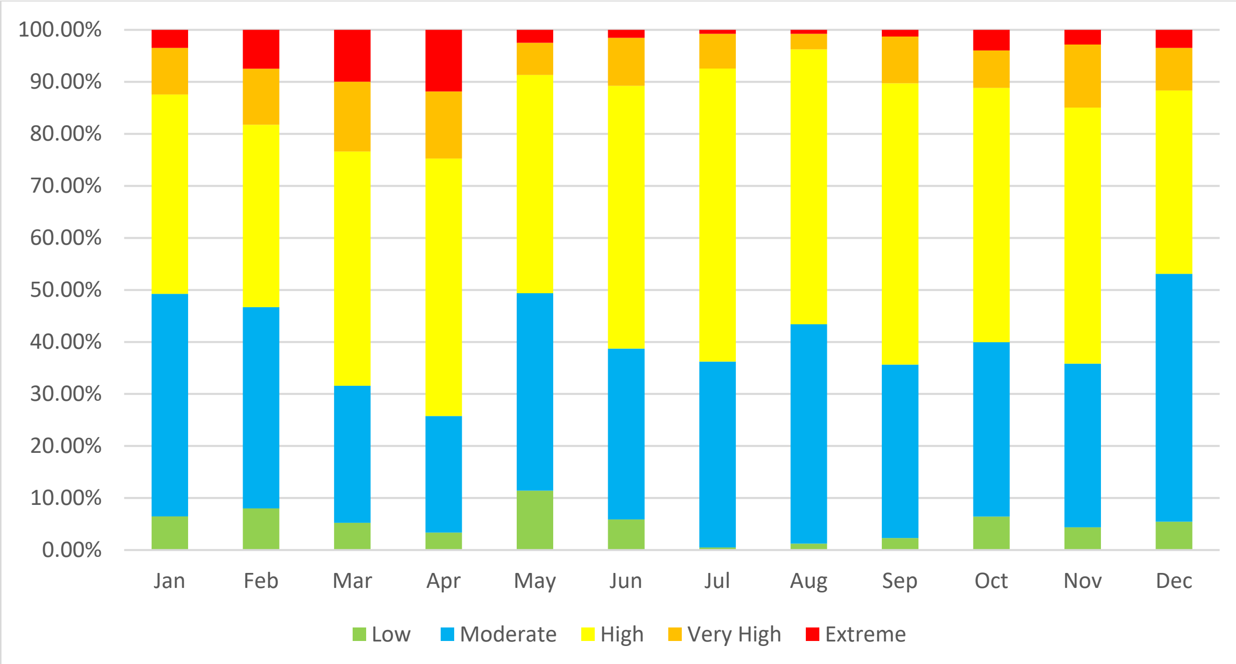


Figure 41. Percentage of days in each recommended fire danger category by month at PCMS 2006 – 2018.

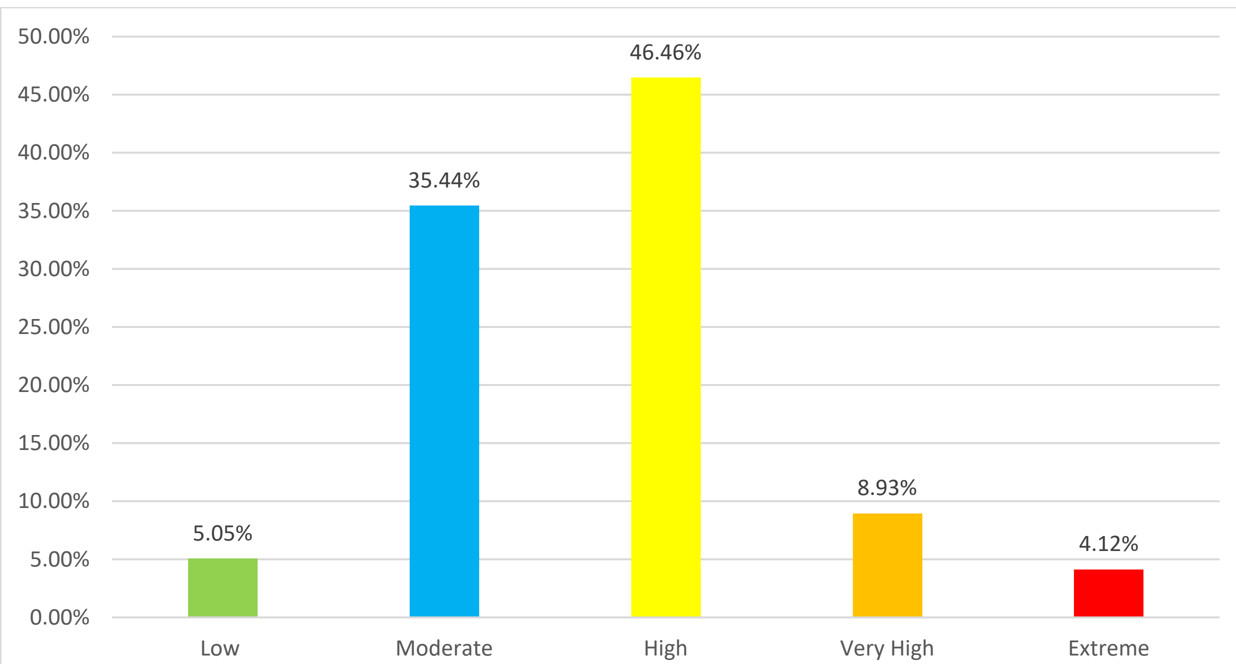


Figure 42. Percentage of days in each recommended fire danger category overall at PCMS 2006 – 2018.

3.2.5. Fire Weather Briefings

Every morning, the DES Fire Chief will ensure a Fire Weather Briefing is sent to Range Control and the G3 no later than 0700 hours. The briefing will be disseminated via the email distribution list.

This briefing will include the day's recommended fire danger rating and associated recommended training restrictions. It will also include relevant details about the day's weather (e.g., wind speed and direction, relative humidity, and the Burning Index for the day), aerial bucket status, a graphic of historic Burning

Index, local watch-out thresholds, and definitions of the various training restrictions. Items may be added or removed at the discretion of the DES Fire Chief.

3.2.6. Public FDRS Information

The Wildland Fire Working Group will consider implementation of a public-facing web page that conveys information about the current fire danger, the meaning of each fire danger level, the FIRECON implemented, the training restrictions for the day, and other information about how USAG FC is mitigating the fire danger each day. It is recommended that such a web page would be supported by the PAO.

3.3. Annual IWFMP Implementation Plan

An Annual IWFMP Implementation Plan will be developed by the Wildland Fire Working Group (see Section 3.4). Its primary components will be fuels management (see Section 3.5.2), firebreak maintenance (see Section 3.5.1), and prescribed fire tasks (see Section 4.2.6), but it may include any IWFMP-related work required. The Annual IWFMP Implementation Plan will be specific enough to identify where, when, and what will be accomplished each year, such as how many acres are intended to be burned, which burn units are the priorities for the year, and what general locations will be targeted for mechanical fuels management. It will identify funding to support tasks, timelines for implementation, and the parties responsible for each task's implementation. It will prioritize implementation of each task to ensure the highest priorities are funded and implemented. It will forecast no less than two fiscal years ahead to allow for programming of funding for future years.

In July of each year, the group will begin developing the Annual IWFMP Implementation Plan which will cover the coming fiscal year as well as project the following fiscal year. This will be completed no later than August 15. The Working Group will analyze program elements and assess progress every April, following the spring prescribed burn season, and report on overall program accomplishments every July.

3.4. USAG FC Wildland Fire Working Group

This group will offer integration with the various key stakeholder organizations and a wide capability due to the breadth of skill sets of those included. The Working Group will consist of one voting representative from each of the primary stakeholder organizations: DES, DPW Environmental, and Range Control. The WFPM will serve as the chair for meetings and will be responsible for organizing each meeting. It is recommended that meetings of the Working Group include a much broader array of individuals, including the Prescribed Fire Coordinator, the Natural and Cultural Resources Managers, the Installation Forester, the ITAM Coordinator, and individuals from DPW O&M.

The Wildland Fire Working Group's primary purpose is annual planning and implementation of the Wildland Fire Program. Leading the Wildland Fire Program with a working group balances each stakeholder's interests and distributes responsibility. The bulk of the required work is focused on fuels management, but the entire array of wildland fire management topics will be within the purview of the Working Group.

The Working Group will:

- Develop and implement an Annual IWFMP Implementation Plan that is designed to achieve the objectives of the IWFMP (see Section 2.1 and 3.3).
- Meet no less than twice a year to establish and implement the Annual IWFMP Implementation Plan. Additional meetings may be called for at the discretion of the WFPM in coordination with the other voting members.
- Coordinate annual wildland fire management tasks with range schedules to ensure disruptions to training are minimized.

- Review the Annual IWFMP Implementation Plan for consistency with the IWFMP, the INRMP, and other applicable instructions.
- Document work completed through a year-end report.
- Update the IWFMP annually and ensure the IWFMP is revised at least once every five years.

3.5. Firebreaks and Fuels Management

All firebreak maintenance, fuels management, and prescribed burns must be coordinated with the DPW Conservation Branch Chief and the Cultural Resources Manager. It is recommended that coordination start early as any permits that are necessary may take months to acquire.

3.5.1. Firebreaks

The perimeter firebreak at Fort Carson is the only officially designated firebreak at USAG FC. Many other roads and trails may be used as fire containment lines during a fire, but only the Fort Carson perimeter firebreak is required to meet these specifications.

The firebreak roadway will:

- Be a minimum of 30 feet wide.
- Be devoid of vegetation.
- Be navigable by an AWD or 4WD Type 6 Engine.
- Be maintained no less than three times per year.

Roadside vegetation along the firebreak will also be managed. Roadside herbaceous, grass, and shrub vegetation along the edges of the firebreak road will meet the following specifications to a distance of 30' from the edge of the roadway. See also Figure 43.

- All trees will be removed.
- Dead woody material >3" in diameter will be removed.
- Shrubs will be limited to 10% crown cover. Of shrubs that remain, mountain mahogany and currant will be preferred over Gambel oak and scrub oak.
- Grass, shrub, and herbaceous fuels must be less than 2' high.

Roadside forest vegetation along the edges of the firebreak road will meet the following specifications to a distance of 150' from the centerline of the roadway. See also Figure 43.

- All junipers will be removed unless they are large and old 'legacy' trees in good health.
- Trees <12' tall will be removed.
- Tree cover will be thinned to 25' crown spacing.
- Remaining trees greater than 12' tall will be limbed to 6'.

In some circumstances, it may not be possible to achieve 150' on one or both sides of the firebreak, for example where the firebreak is close to Highway 115. It may also be desirable in some circumstances to put more of the 300' total width on one side of the firebreak than the other; for example where there is steep terrain on one side of the firebreak. The DPW Forester, in coordination with the DPW Wildland Fire Lead and the WFPM, will have the authority to make such changes as necessary and beneficial to meeting the objectives of the IWFMP.

The firebreak will be managed to mitigate erosion, including water bars, rolling dips, outslopes, turnouts, and other features as appropriate and/or as determined by the WFPM and DPW O&M. Creeks and other obstacles must be navigable by a Type 6 Engine. This will require considerable work as many of them are currently impassable.

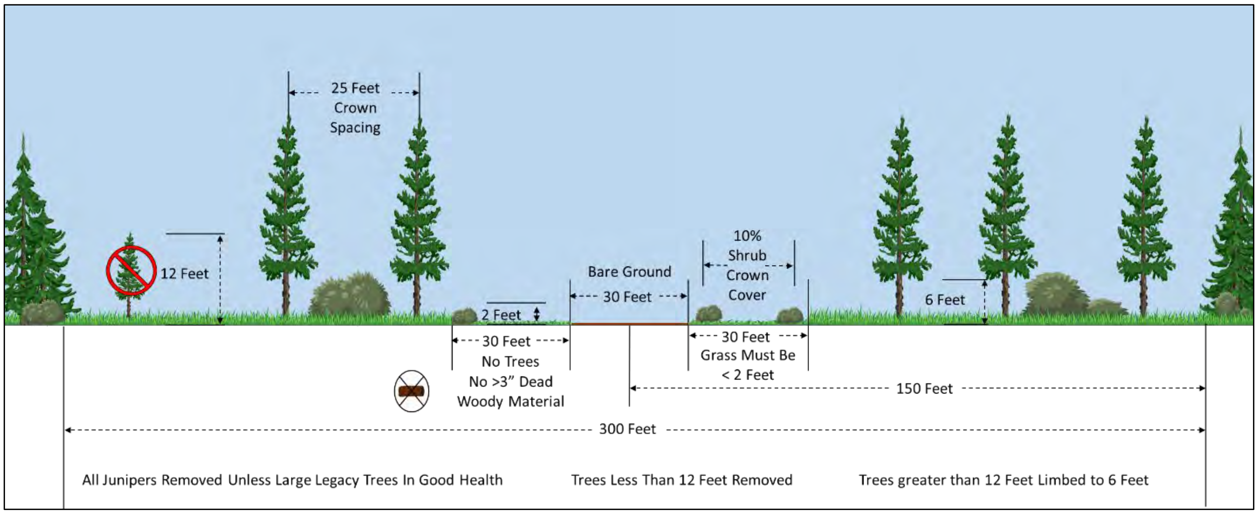


Figure 43. Diagram of firebreak specifications.

The DPW Operations and Maintenance Division Chief will ensure the firebreak is maintained in a fuel-free condition no less than three times per year. The DPW Wildland Fire Lead will ensure vegetation along the edges of the firebreak is maintained per the above specifications.

The firebreak roadway is already implemented. However, considerable additional work is required to establish the roadside vegetation maintenance. The roadside vegetation maintenance of the firebreak along the eastern boundary of the installation will be fully implemented by January 1 of 2027. The remainder of the roadside vegetation maintenance of the firebreak will be fully implemented by January 1 of 2032. The DPW Operations and Maintenance Division Chief will request funding necessary to achieve that objective.

In addition to the firebreak required by this IWFMP, numerous roadways throughout USAG FC are important to wildland fire management. These include the Military Supply Routes (MSRs), an extensive network of military training maneuver trails maintained by ITAM, bulldozer lines maintained by Range Control in the Small Impact Area at Fort Carson, and other roads maintained by DPW O&M.

It is important that the WFPM remain aware of which roads are actively being maintained and which may no longer be maintained. Those that fall into disrepair may represent lack of fire containment in a location where fire containment was previously considered routine. These changes can, in some cases, substantially alter the calculus of what training is viable in what location under what fire danger conditions, which in turn should affect decisions about FIRECON implementation.

As a result, the ITAM Coordinator will provide an annual update to the WFPM within one month of the end of each fiscal year. The update will note which maneuver trails were maintained in the last year and, if known, which they intend to maintain in the upcoming year. These are shown in Figure 46 and 47.

Vegetation management along the sides of the MSRs will increase the road's effectiveness during fire suppression. DPW O&M will maintain the fuels along the sides of the MSRs at <12 inches to a distance of 15' from the road edge as feasible, considering time and funds available.

The Range Officer will ensure the bulldozer lines in the Small Impact Area at Fort Carson are maintained. These dozer lines will continue across drainages whenever possible and within the constraints of environmental requirements. Where they cannot be completed, fuels management to reduce the fuels in these locations will be funded by the DPW Operations and Management Division Chief and will be implemented by the DPW Conservation Branch Chief.

3.5.2. PCMS Maneuver Trail Improvements

The ITAM program intends to upgrade multiple maneuver trails at PCMS. Just as they are at Fort Carson, maintained roads are valuable to fire management at PCMS. Maneuver trails are marked by level of interest to the Wildland Fire Program in Figure 47. Note very maneuver trail is of particular interest to the Wildland Fire Program, and therefore many are not marked. The ITAM Coordinator will provide an annual update to the WFPM regarding annual maneuver trail maintenance as specified in Section 3.5.1.

3.5.3. Fuels Management

Prescribed fire will be used extensively at USAG FC to manage fuel loads and reduce risk, but also for ecological purposes, such as forest restoration and habitat improvements. USAG FC will implement a Prescribed Burn Program, which is discussed in detail in Section 4.

Multiple actions under the INRMP integrate well with fire mitigation and restoring forests and re-introducing fire to the landscape. These include thinning and salvage, forest products sales, removing ladder fuels, reducing crown connectivity, removing understory fuels, creating zones of defensible space, and reducing piñon-juniper encroachment into grasslands. These all occur under the auspices of the Forest Management Program.

The WFPM will work closely with the DPW Forester to consider fire mitigation projects and fire reintroduction on the landscape in forestry planning. Collaborative opportunities include locating thinning projects strategically on the landscape to leverage roads, naturally low fuel load areas, and breaks in fuels to create defensive lines against large-scale fire spread; and leveraging the Prescribed Burn Program to facilitate understory vegetation and woody fuel reduction in areas desired by the Forestry Program as well as forest health and habitat restoration.

Routine maintenance of the ranges has the ancillary benefit of reducing fuel loads and fire potential on some ranges. Mowing or otherwise reducing fuels diminishes fire behavior on the ranges, slowing fire spread and reducing the ability of a fire to move into unmanaged fuels. These benefits improve the ability of military firefighting details to successfully and safely attack fires, improve containment success by the fire department, and reduce the amount of time necessary to fight fires. The latter in turn reduces range downtime.

Fuels immediately surrounding valuable targets should be reduced to <6 inches wherever possible to a distance of at least 10 feet from the target. This will allow firefighters to focus on fire containment rather than point protection of targetry, reducing the time necessary to combat the fire and range downtime.

Fuels around housing, offices, range buildings, radio towers, and other structures should also be reduced to <6 inches wherever possible to a distance of >30 feet from the structure. This will greatly improve the chances of the structure surviving a fire. In forest fuels, it may be possible to retain some mature trees within this managed area, provided they are limbed to 6 feet and their canopies do not touch. Confer with the Installation Forester or the Fire Department if there are questions about which trees should be removed.

Other important routine maintenance is DPW Environmental’s maintenance of roadside fuels along the MSRs. Reducing the fuels alongside the MSRs increases the road’s effectiveness during fire suppression.

3.5.3.1. Risk Reduction Fuels Treatment Priorities

The Type 3 Risk Analysis identifies where high-ignition-probability areas exist at Fort Carson and PCMS. There are also limitations to the application of prescribed fire or other fuels treatment options. As a result, some locations are better suited than others to provide a wildfire protection benefit. To focus efforts on those locations, areas of the installations have been prioritized for fuel treatment. These areas are defined by prescribed fire burn units, as the most likely treatment method is prescribed fire. However, the entire burn unit does not need to be treated in order to achieve the desired outcome, nor is prescribed fire the only option for treatment. Portions of the burn unit can be treated to achieve a large enough area of treated fuels to improve the likelihood of fire containment success. In all cases, these treatments are located to contain high-ignition-probability locations.

Fort Carson

Highest priority is given to burn units separating high-ignition-probability locations from the installation boundary (Figure 44). These are primarily along the eastern side of the Large Impact Area.

Though there are many ignitions in the Small Impact Area, the distance between the ranges and the eastern installation boundary is only a few dozen meters. There are no prescribed fire containment options in this small area. There are also issues with smoke affecting I-25 which is immediately adjacent to the eastern installation boundary. As a result, no burn units have been designated there and it is unlikely prescribed burns can be implemented there. Other means of fire control, including firebreaks, other vegetation management options, and ignition mitigation are required to address the risk of fire there.

Secondary priorities are focused on areas where fires may escape from high-ignition-probability areas but are interior to the installation.

In addition, a study developed in conjunction with this IWFMP recommends focusing some fuels management in a more or less north to south strip from TA 18 southwards through TA 22, 34, 37, and through Range 143 to bisect the installation with a well-maintained corridor that limits the potential for fire to spread from west to east or east to west across the installation. This corridor runs across the likely spread direction of a major fire, which would generally be pushed to the northeast or southwest. Prescribed fire should be applied between MSR 7 and MSR 9, though that entire width need not be treated. There are interior roads that could be used to produce a narrower, but still multi-hundred-meter wide treated corridor. Some of the length of this corridor may not be treatable on a regular basis due to range conflicts, but treating this corridor through TAs 18, 22, and 34 would provide a substantial line of defense against a major fire exiting the Large Impact Area and moving to the west or southwest.

The total acreage of burn units designated as high and moderate priority is 22,718 acres. However, only portions of many of these burn units need to be treated to create a containment around the high ignition probability areas. In all, closer to 15,000 acres would need to be treated. If prescribed fire is the treatment utilized, and assuming a three-year cycle for these areas, 5,000 acres per year would need to be burned in these high and moderate priority burn units.

The Wildland Fire Working Group will consider these areas during deliberation of each year’s Annual IWFMP Implementation Plan. There is no requirement that these areas be treated; the above is informational. However, there is a likelihood that treatment of these areas will be necessary in order to achieve some of the IWFMP and the Programmatic Prescribed Burn Program objectives.

PCMS

Highest priority is given to burn units in and around the Ranges in TA 7 and Range 9, which are the highest ignition probability locations (Figure 45). It will be important to maintain the fuels in and just west of the western side of the impact area, as there is only a quarter-mile between the edge of the impact area and the installation boundary. Roads surround the live-fire ranges, creating a smaller, more manageable area to burn.

Similarly, a network of roads in and around Range 9 should allow for compartmentalized burning of the range and surrounds. As burns are completed and beneficial holding lines are identified, it is recommended that those holding lines be mapped and reused each time burns are completed to limit the creation of new social road networks.

Targeted fuels management may also be appropriate around high-value resources such as the FAA Tower, cell towers, and important cultural resources such as some of the historic homesteads. These treatments need not be extensive as the resources are small.

3.5.3.2. Annual Fuels Management Planning

Among other responsibilities, the Wildland Fire Working Group, as described in Section 3.4, is responsible for developing an Annual IWFMP Implementation Plan (see Section 3.3). A primary element of the Annual IWFMP Implementation Plan will be the fuels management tasks to be completed for the year. Fuels management tasks under the Annual IWFMP Implementation Plan will forecast no less than two fiscal years ahead to allow programming of funds within federal budget cycles.

Each task will be described in sufficient detail to allow each tasked individual or entity to carry out their tasks as designated by the Wildland Fire Working Group, to include costs and timelines. These tasks will:

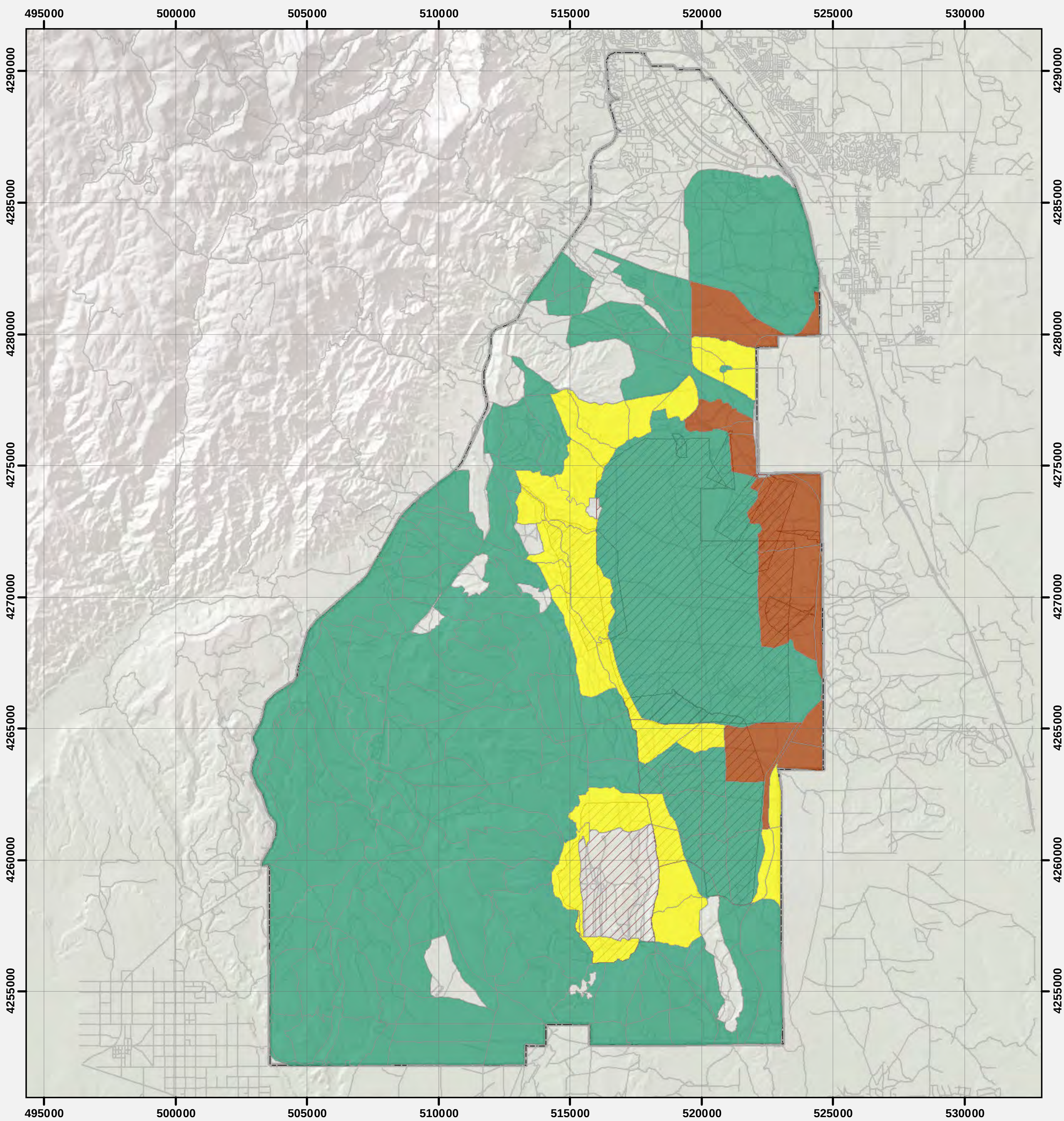
- Include all projected prescribed burns for the year (see also Section 4). The Prescribed Fire Coordinator will be the primary responsible party.
- Describe the annual firebreak roadbed maintenance requirements. The DPW O&M Division Chief will be the primary responsible party.
- Describe the annual firebreak roadside vegetation maintenance requirements. The DPW Wildland Fire Lead will be the primary responsible party.
- Reference supporting or complementary projects in the INRMP. The DPW Conservation Branch Chief will be the primary responsible party.
- Identify any new issues and establish the task(s) needed to identify potential mitigation measures. The primary responsible party will vary by the issue needing resolution.
- Fulfill NEPA requirements associated with fuels management, generally by leveraging the annual REC. The DPW Conservation Branch Chief will be the primary responsible party.

The Wildland Fire Working Group will begin developing the Annual IWFMP Implementation Plan per the timeline specified in Section 3.3. The Wildland Fire Working Group will analyze program elements and report on overall program accomplishments in July.

Fort Carson

Fort Carson Risk Reduction Fuels Treatment Priorities

Figure 24



Risk Reduction Treatment Priority

- High
- Moderate
- Low

Ranges with more than Three Ignitions/Year

Roads

Installation Boundary

0 3 6 Miles

N S E W

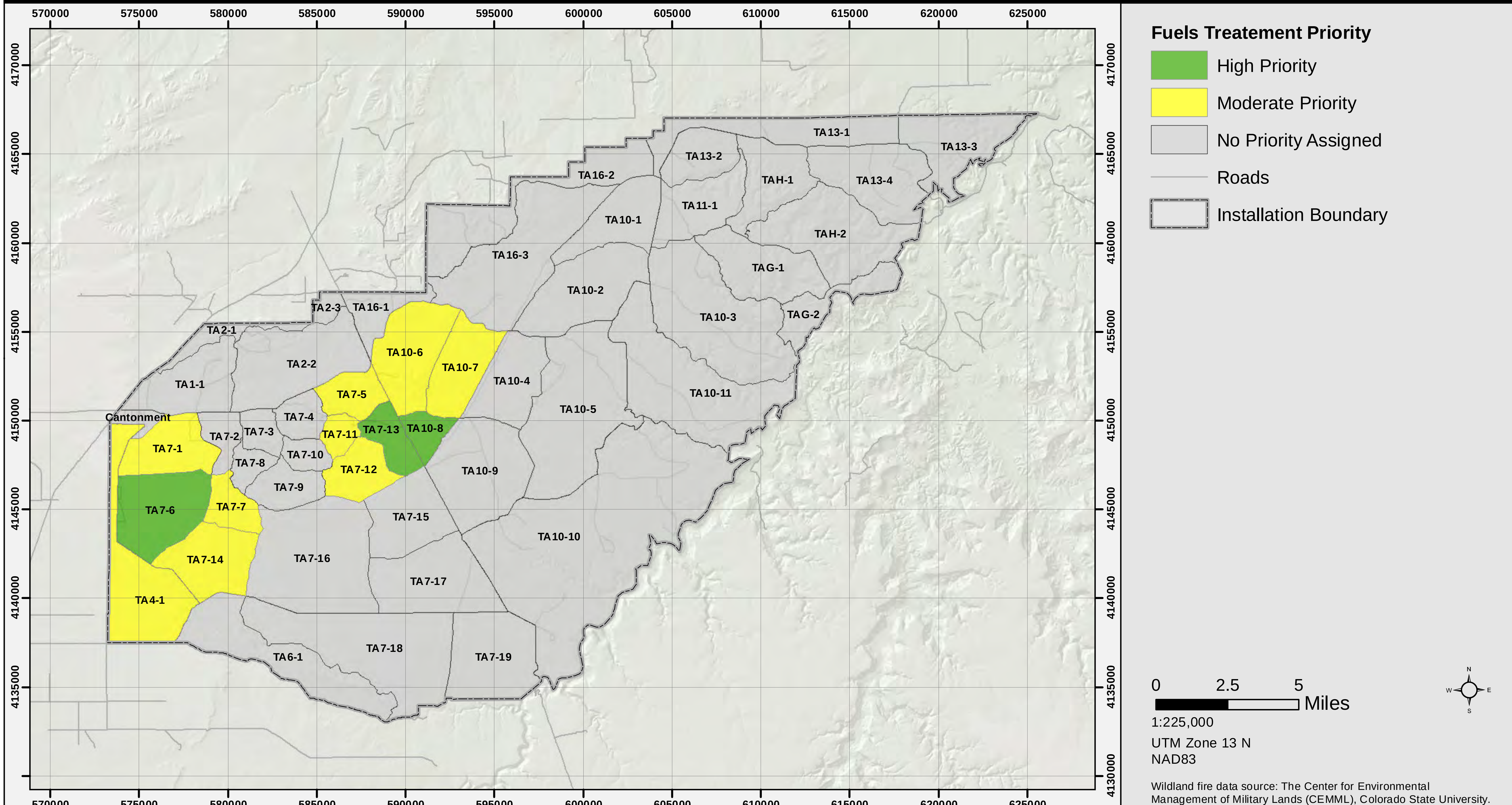
1:160,000
UTM Zone 13N
NAD83

Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

Pinon Canyon Maneuver Site

PCMS Priority Fuel Treatment Areas

Figure 45



Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

3.6. Firefighting Infrastructure, Resources, and Supplies

3.6.1. Fire Stations

Fort Carson

There are four fire stations at Fort Carson (Figure 46). Two are in the cantonment area, one is at Butts Army Airfield, and one is in Turkey Creek Recreation Area (Station 34). All are fully outfitted for structural and wildland firefighting duties except Station 34, which is more wildland fire-oriented. All of these stations are capable of responding to a wildland fire, however.

PCMS

There is one fire station at PCMS, located in the cantonment area (Figure 47). It is outfitted for structural and wildland firefighting duties.

3.6.2. Military Unit Firefighting Detail

The military unit occupying any range or training area will establish a firefighting detail from within their ranks whenever their training includes direct-fire live-fire (not indirect-fire) or the use of pyrotechnics and when the FIRECON is MODERATE or higher. During daytime training, the firefighting detail may not take part in training; they must be ready to immediately respond to any fire. At night, the firefighting detail may participate in training, but must be able to respond to a fire within 10 minutes of detection. For many training exercises, it will not be possible for the firefighting detail to participate in training.

The firefighting detail will be positioned in the immediate vicinity of the training in order to respond immediately to a fire. Response times in excess of 10 minutes defeat the purpose of the firefighting detail as the Fire Department can respond within 15 minutes to most ranges.

The unit will be responsible for replacing any firefighting equipment assigned to them that is lost or broken.

3.6.3. Staffing Requirements

3.6.3.1. Minimum Staff

Staffing of the Fire Department will be in accordance with DODI 6055.06. In addition, the DES Fire Chief will ensure that the Fire Department retains on staff sufficient NWCG-qualified personnel as shown in Table 26.

Table 26. Minimum NWCG-qualified personnel to be retained on the staff of the USAG FC Fire Department.

NWCG Qualification Level	Number of Staff Required
Prescribed Fire Burn Boss Type 2	2
Firing Boss	2
Engine Boss	4
Incident Commander Type 4	2

In addition, DPW Environmental will retain on staff the DPW Wildland Fire Lead. This individual will be NWCG-qualified as Engine Operator or higher. At the discretion of the DPW Conservation Branch Chief, additional firefighters may be added to the DPW Conservation Branch staff.

3.6.3.2. Staffing Levels

During periods of high fire danger, the DES Fire Chief may increase staffing, stage resources, or assign resources to patrol for smoke. Staffing increases and/or staging of resources are recommended whenever changes to the recommended fire restrictions are made by the G3. The DES Fire Chief will be familiar with indices relevant to wildfire activity at USAG FC, such as the Burning Index and wind speeds available from

WIMS, as well as other factors such as the projected installation training load and locations of scheduled training, to determine when and where additional staffing is required.

If response resources, including mutual aid resources, are committed to incidents, such that the DES Fire Chief believes insufficient resources are available to respond to additional wildfires at Fort Carson or PCMS, additional resources may be brought on via overtime staffing at the Chief's discretion. If this is not viable due to insufficient funds or unavailability of resources, the DES Fire Chief will notify Range Control, who will place additional restrictions on training per the protocols in Section 3.2.3.4.

The DES Fire Chief will ensure that all DES personnel who may serve as an IC on a fire are familiar with the values at risk. These are described in Section 3.1.1.

The DES Fire Chief will also explore the potential for establishing a seasonal wildland fire crew to increase wildfire response capability during the more fire-prone parts of the year.

3.6.4. Fire Response Vehicles and Apparatus

Some of the Fire Department's vehicles must be capable of responding to wildfires and supporting prescribed burns. The DES Fire Chief will maintain in good working order fire response vehicles of the types and numbers defined in Table 27 and Table 28.

Table 27. Minimum vehicles to be maintained by the DES Fire Department at Fort Carson.

Vehicle Type	Number Required
Type 6 Engine	5
Type 3 Engine	2
UTV w/ pump	1
UTV (support)	1
Type 2 Water Tender	1
Type 1 Water Tender	1

Table 28. Minimum vehicles to be maintained by the DES Fire Department at PCMS.

Vehicle Type	Number Required
Type 6 Engine	2
Type 3 Engine	1
UTV w/ pump	1
UTV (support)	1
Type 2 Water Tender	1
Type 1 Water Tender	1

DPW Environmental Division's fire response capability also requires fire response vehicles including wildland fire engines and ATV/UTVs necessary for prescribed fires (Table 29).

Table 29. Minimum vehicles to be maintained by DPW.

Vehicle Type	Number Required
Type 6 Engine	2
Type 2 Tactical Water Tender	1
Utility Truck	1
ATV w/ Torch	1
UTV w/ Terra Torch	1

In addition to those listed above, numerous additional vehicles and machinery may be utilized to help fight fires. These include bulldozers, motor graders, skid steers, and others. These are owned by DES, DPW, and other Directorates.

All personnel operating fire apparatus shall be qualified and licensed to operate emergency vehicles per National Fire Protection Association (NFPA) and/or DODI 6055.06 requirements. The DES Fire Chief shall monitor vehicle qualification and training programs for Fire Department personnel.

The Fire Department will perform daily preventive maintenance inspections of fire vehicles and pumps to ensure operational readiness. DPW Environmental fire crew members will perform daily preventive maintenance inspections each day that a fire vehicle is used, or at least once monthly.

All discrepancies shall be identified, annotated, and communicated to the DES Fire Chief for Fire Department vehicles per DES procedures and the DPW Wildland Fire Lead for DPW vehicles per DPW procedures. Maintenance and repair of wildfire response vehicles shall be performed by properly certified individuals.

3.6.5. Equipment and Supplies

3.6.5.1. DES Fire Department

The DES Fire Chief will ensure that fire stations and apparatus are equipped per DODI 6055.06.

3.6.5.2. Military Firefighting Detail Equipment

The Range Officer will maintain a cache of fire flappers and shovels for use by military unit firefighting details. The Range Officer will ensure each unit occupying a range when the FIRECON is MODERATE or above is provided this equipment. Each unit will be provided no fewer than 5 flappers and 5 shovels for any static live-fire range. When units are occupying a maneuver live-fire range, they will be provided no fewer than 8 flappers and 8 shovels. Further information about when to provide units with this equipment is in Table 25 and Section 3.6.2.

The Range Officer will ensure the following quantities are maintained in good working order:

Fort Carson - 200 fire flappers and 200 shovels.

PCMS - 50 fire flappers and 50 shovels.

The Range Officer will determine where this equipment will be stored. Once quarterly, the Range Officer will replace or repair any unsatisfactory equipment. Additionally, the WFPM will conduct periodic checks, no less than once annually, of the military firefighting detail equipment to ensure it is available and in serviceable condition.

3.6.6. Fire Department Fire Caches

The DES Fire Chief will ensure a cache of wildland fire equipment sufficient to outfit 40 firefighters is available at Station 34. The quantities and types of equipment in the cache will be at the discretion of the DES Fire Chief. This equipment should include items such as hand tools, backpack pumps, and PPE (see Section 3.8.3).

3.6.7. Remote Automated Weather Stations

RAWS are designed specifically for wildland fire weather and fuels assessment and take a full range of weather measurements. Other variables of interest to fire managers are calculated from direct measurements, including fuel moisture and FDRS indices.

The Fort Carson and PCMS RAWS are maintained by the U.S. Forest Service. The data for both are available in WIMS.

In the event data from either RAWS are unavailable, the WFPM will ensure the Forest Service is aware of the deficiency. The WFPM will explore a MOU or similar agreement with the Forest Service to allow Fort

Carson to purchase sensors and other equipment necessary to ensure the Fort Carson and Piñon Canyon RAWS are consistently maintained and rapidly repaired when items malfunction.

If data from the Fort Carson RAWS are unavailable, data from the Red Creek RAWS will be used as a backup as described in Section 3.2.3. This backup RAWS is not well situated to represent weather conditions at Fort Carson but is the best available alternative.

There is no reasonable alternative to the PCMS RAWS. The closest RAWS with data available in WIMS is near Colorado City, over 50 miles away and tucked up against the foothills where the wind speed, wind direction in particular can be expected to be notably different much of the time. Other variables may not accurately represent the weather at PCMS as well. If the data from the PCMS RAWS are unavailable, the Fire Department will use tools and methods at the discretion of the WFPM to estimate the fire danger and establish a FIRECON each day including National Weather Service spot forecasts. This situation should be avoided when training is occurring at PCMS by communicating with the U.S. Forest Service to facilitate maintenance and repair of the RAWS as necessary.

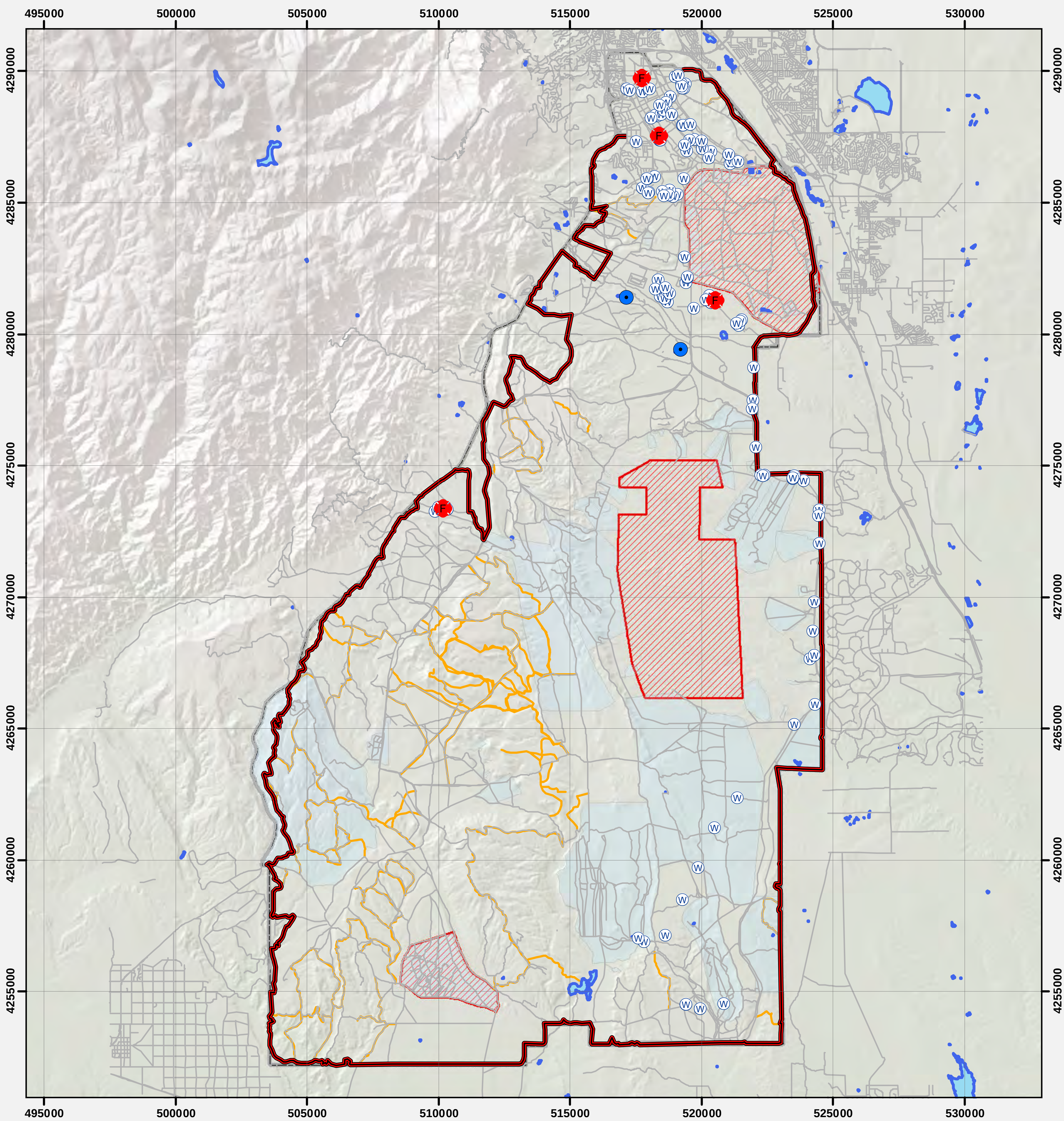
Table 30. USAG Fort Carson RAWS identification and location information.

Name	Installation	WIMS ID	Location	Latitude	Longitude	Elevation
Fort Carson	Fort Carson	053603	West side of Fort Carson	38° 36' 27"	-104° 53' 12"	6450 ft
Red Creek (backup)	Fort Carson	054001	5 mi ESE of Wetmore	38° 12' 26"	-104° 59' 52"	5883 ft
Piñon Canyon	PCMS	056202	North side of PCMS in TA2	37° 32' 33"	-104° 01' 55"	5422 ft

Fort Carson

Fire Suppression Resources

Figure 46

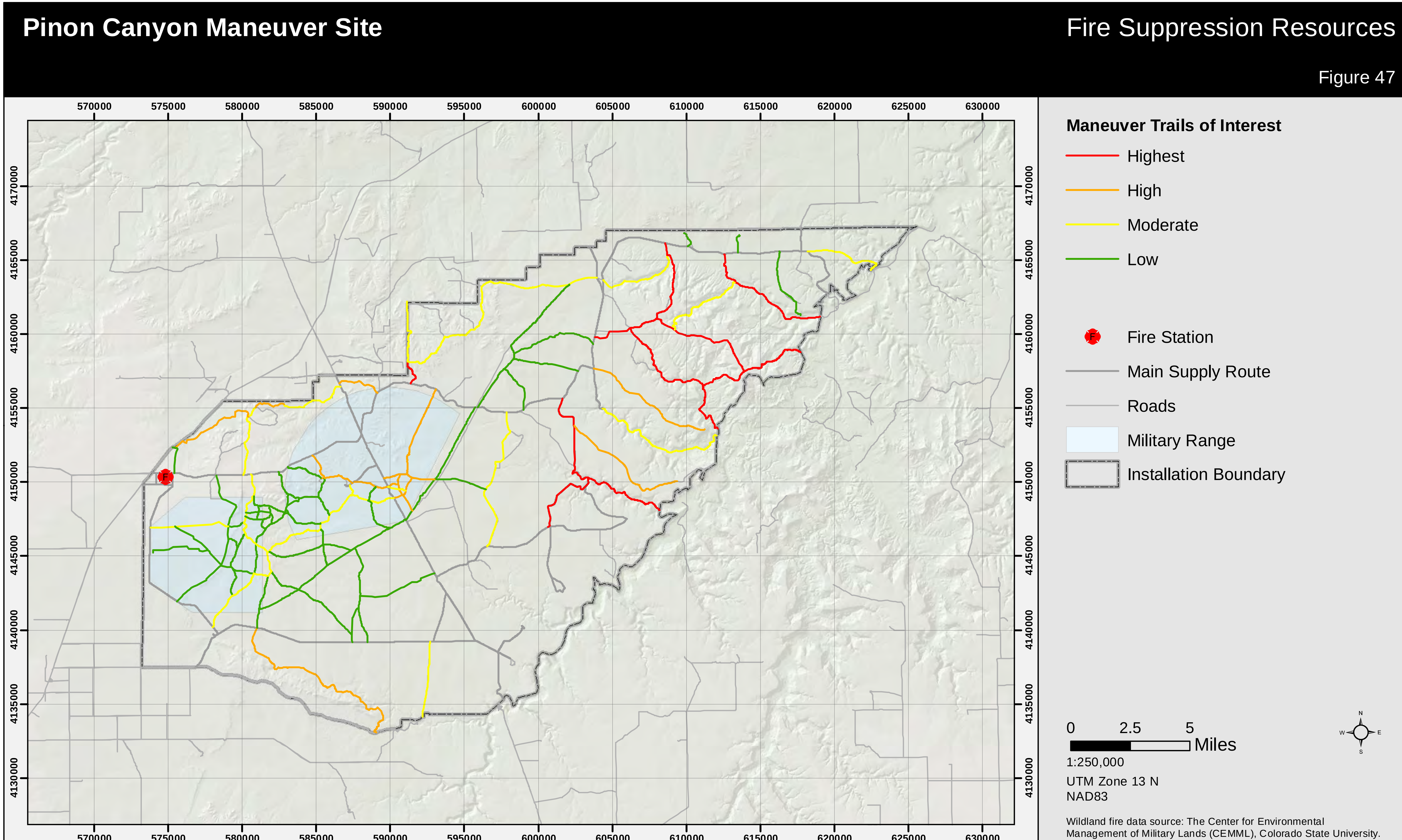


Firebreak
Fire Access Roads
Roads
Fire Station
Hydrant/Water Source
Dip Site
Permanent Surface Water Body
Ranges
Impact Area
Installation Boundary

0 3 6 Miles

1:160,000
UTM Zone 13N
NAD83

Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.



Pinon Canyon Maneuver Site
Fire Suppression Resources
Figure 47
570000
575000
580000
585000
590000
595000
600000
605000
610000
615000
620000
625000
630000
4170000
4165000
4160000
4155000
4150000
4145000
4140000
4135000
4130000
Maneuver Trails of Interest
Highest
High
Moderate
Low
Fire Station
Main Supply Route
Roads
Military Range
Installation Boundary
0
2.5
5
Miles
1:250,000
UTM Zone 13 N
NAD83
Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

3.7. Cooperative Wildland Firefighting Agreements

USAG FC has MOAs or MOUs with over 50 local, state, and federal agencies to provide mutual aid for the suppression of wildland fires on USAG FC lands and for USAG FC to provide support for off-installation fires. These agreements do not expire unless both parties agree to terminate them. These agreements do not require a response when one is requested by the agency having jurisdiction over the fire; they only allow for the agreeing agencies to respond to fires within each other's jurisdiction.

Per Army Wildland Fire Policy Guidance, only the Garrison Commander may authorize a deployment of Fort Carson firefighters to an off-installation fire. The Garrison Commander has delegated this authority to the DES Fire Chief. No other individual has the authority to deploy Fort Carson firefighters off of the installation.

3.8. Personnel Safety

3.8.1. Unexploded Ordnance

UXO can detonate when it is disturbed or heated. Traditional firefighting techniques often require surface disturbance (e.g., cutting fireline, dozer operations) and navigation in roadless areas or on rarely used roads, either on foot or in vehicles (e.g., scouting the fire, placing lookouts, etc.). These activities can also cause UXO to detonate. Even aerial resources can be harmed by detonations if they are at a low altitude, as is common when engaging a fire.

The IC or the Burn Boss (see Section 4.5.1) will make UXO awareness a safety priority on every fire. Every safety plan will ensure all personnel on the fire know where high-hazard UXO areas are.

All USAG FC personnel who may reasonably be expected to participate in firefighting duties on the fireline will be trained in basic UXO identification and avoidance procedures, with a refresher once every five years. The details of UXO safety will be communicated in those trainings and are not described here. The WFPM will coordinate with the DPTMS Safety Officer to provide this training. More than one class will be necessary to accommodate various shifts.

UXO may be encountered anywhere but is known to be concentrated in the Large Impact Area at Fort Carson. Unfortunately, this correlates with many of the most common locations for wildfires and UXO is likely to be encountered while firefighting as well as during prescribed burns in that vicinity. Recognize, Retreat, Report is the standard response to UXO[21]. UXO discovered outside of the Large Impact Area should be marked clearly and communicated to Range Control so that the Explosive Ordnance Detail can remove or detonate any hazardous items. Personnel should photograph UXO from a safe distance and record the location on a map or by other means.

The presence of UXO does not preclude firefighting, nor does it preclude the use of aerial resources to fight fires. However, firefighters and firefighting aircraft will not enter the Large Impact Area to fight fires without the approval of the IC as defined in Section 5.1.2. Firefighters operating in the Large Impact Area will not leave the maintained road surface, will not disturb the ground (e.g., no digging or bulldozers), and will avoid grouping together.

It is recommended that any agencies responding from outside USAG FC to help with fires at USAG FC be given tasks that do not require them to enter areas known to contain UXO. If they must enter these areas, they should be accompanied by a firefighter or other individual knowledgeable about UXO safety. This individual must be qualified and equipped to serve in a fireline duty (see Section 3.13).

[21] https://www.denix.osd.mil/uxo/for-work-crews/firefighters/index.html

3.8.2. Live-Fire Military Training

Live-fire range facilities are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Access to the down range portion of the live-fire ranges to conduct firefighting operations is prohibited to all personnel while live-fire is taking place on ranges affecting the area of the fire. The responding personnel, including military firefighting details, must ensure that all ranges affecting the area of the fire are in a "check fire" or "cease fire" condition before sending fire suppression forces downrange. Effective communication with Range Control is essential to ensuring firefighter safety, particularly ensuring Range Control fully understands the location(s) of firefighters.

3.8.3. Personal Protective Equipment

Personnel safety and prevention of injuries are the first priority in every fire management activity. All USAG FC firefighting personnel will be equipped with proper PPE per PMS 2107 or the NFPA equivalent (see Table 31). Use of PPE is mandatory. The DES Fire Chief will ensure, personally or by delegation to the IC, that proper PPE is worn at all times when DES personnel are actively engaged in firefighting duties. The DPW Wildland Fire Lead will ensure the same for all DPW personnel actively engaged in firefighting duties.

Table 31. Mandatory personal protective equipment.

Equipment	Required when…
Hard hat with chinstrap	On the fireline, in helicopters.
All leather, minimum 8" high boots with slip and melt-resistant soles and heels. No steel toes.	On the fireline, in helicopters.
Flame resistant (e.g., Nomex) shirt, trousers, or coveralls. Sleeves should be rolled down.	On the fireline, in helicopters.
Leather or leather/flame resistant combination gloves.	On the fireline, in helicopters.
Eye (goggles/safety glasses), face, and neck protection	When necessary, in helicopters.
Fire Shelter (M-2002 or current)	On the fireline.
Hearing protection (ear plugs/earmuffs)	When working with high noise-level firefighting equipment, such as helicopters, air tankers, chain saws, pumps, etc.
Chaps (only required for sawyers and swampers).	When operating or swamping for chain saws.
Dust/smoke mask	When necessary.

It is mandatory that all firefighting personnel be equipped with the proper PPE necessary for fighting wildfires. Wildland firefighters must be intimately familiar with the tools used and PPE worn. Knowledge of proper selection, use, and care of the various tools used in wildland firefighting aids firefighters in performing their job as efficiently and effectively as possible. Likewise, knowledge of the proper donning, care, capabilities, and limitations of PPE gives firefighters a better sense of which situations are tenable and which are not. Firefighting personnel will ensure that proper PPE is worn at all times when actively engaged in firefighting duties.

Military unit firefighting details engaging in firefighting will wear their Army Combat Uniform, including their long-sleeve shirt with sleeves rolled down, fire resistant gloves, helmet, and combat boots. They will be provided with eye protection if they do not have any, but any shatterproof glasses or sunglasses are acceptable. Neck and face protection may be worn if it is made of fire-resistant materials; synthetic materials should not be worn. This will be considered sufficient PPE for firefighting details. The Flame Retardant Army Combat Uniform or Army Aircrew Combat Uniform will be worn when they are available.

3.8.4. LCES and Standard Fire Orders

Lookouts, Communications, Escape Routes, and Safety Zones (LCES) are critical elements of any safe firefighting environment. The LCES system will be emplaced for every wildfire and prescribed fire. In addition, decades of accident investigations have found common threads when fires result in injuries or deaths. These are summarized in the 10 Standard Fire Orders and the 18 Watch Out Situations. The Fire Orders are considered firm, and all should be in place at all times. The Watch Out Situations are cautionary and utilized as best practices. If more than one of the 18 Watch Out Situations is occurring simultaneously, firefighters should be particularly wary and disengagement from the fire may be necessary. Additional information is available from the NWCG[22,23].

3.8.5. Medical Treatment and Medevac

Medical treatment and medevac procedures will follow the existing DES Fire Department procedures as detailed in the DES Emergency Response Plan.

3.9. Public Safety

Public safety may be threatened by wildfires, primarily through the effects of smoke, though the fire itself may on rare occasions represent a threat. Any public in the vicinity of a fire will be informed of fire activity using personal contacts and signs. The broader public will be made aware of fire activity using public announcements and other methods. These communications will be made at the discretion of the PAO (see Section 3.12.2).

As necessary, the Fire Department will close unsafe or hazardous areas, including roads that may be impacted by smoke. Under rare circumstances, evacuations of the public may be necessary. The Fire Department will coordinate with other USAG FC, local, and State Emergency Management Officials as necessary to implement evacuations. However, most fires requiring evacuations will already be large and under the command of an Incident Management Team from outside of USAG FC. The USAG FC Fire Department and other USAG FC Emergency Management officials will implement evacuations determined necessary by the Incident Management Team.

3.10. Water Resources

3.10.1. Water Resources – Fort Carson

There is very little reliable surface water at Fort Carson. Few of the creeks run year-round and in those that do, the volume of water is generally insufficient to support firefighting operations. However, there are numerous small reservoirs throughout the installation. Surface water features that retain water year-round are identified in Figure 46.

There are also numerous fire hydrants and tanks throughout the cantonment areas and along Installation MSR 1 and in Turkey Creek Recreation Area. These are also identified in Figure 46.

3.10.2. Water Resources – PCMS

Water must be trucked to fires at PCMS. Effectively the installation has no available surface water. The only reliable surface water is in the creek in Taylor Arroyo, which is largely inaccessible. The Purgatoire River is also largely inaccessible to vehicles, though it could be used as a dip site when there is sufficient water in it, and crews could be flown in to set up portatanks when it is too low to dip out of directly. There are no reservoirs on the installation. There are fire hydrants within the cantonment area, but nowhere else. There is a Bambi pit in the cantonment available for use when helicopters need a dip site, but this location makes for long turnaround times when fires are in the western portion of the installation.

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[22] https://www.nwcg.gov/publications/pms118
[23] https://www.nwcg.gov/publications/pms110

3.11. Aerial Firefighting Resources

USAG FC maintains a MOA with the 4th Infantry Division (ID) to provide the Fire Department with 24 hour per day, 365 day per year aerial firefighting support from the 4th Combat Aviation Brigade. Aerial resources are required as a mitigation measure during VERY HIGH and EXTREME FIRECONs (see Table 25 and Section 3.2.3.4), including requirements for shorter than normal response times in some circumstances. Aerial firefighting resources will be ordered by the Installation Operations Center.

The 4th CAB Commander will ensure sufficient fire bucket-trained pilots are available to support firefighting missions, ideally including pilots with the skill to use long-lines. Bucket training will include drops of water on targets. Aerial bucket support will be provided upon request by the IC of any given incident, and as available. Requests for aerial resources will be made by the IC through the Emergency Communications Center (ECC). Aircraft responding to wildfire support requests should utilize long-lines whenever conditions and pilot certifications and/or experience allow to reduce rotor wash effects on the fire.

Per the MOA with 4th ID, the DES Fire Chief will maintain in good working condition a minimum of four buckets suitable for use on CH-47 aircraft (generally 1000-gallon capacity) and four buckets suitable for use on UH-60 aircraft (generally 660-gallon capacity). An additional two CH-47 and two UH-60 buckets will be designated for training.

The Logistic Readiness Center will maintain the buckets. The DES Fire Chief will be responsible for bucket replacement.

3.12. Communications

3.12.1. Radio Frequencies

DES is the primary firefighting resource at USAG FC and will utilize their existing radios, radio frequencies, and communications procedures for communications on wildland fires. Radio frequencies are kept up to date by the Fire Department. The DPW Wildland Fire Lead will utilize DES radio frequencies and protocols for communications on wildland fires. Additionally, the DES Fire Chief will ensure there is at least one air-to-ground compatible radio available at each fire station.

The WFPM will ensure a list of radio frequencies is up to date and available to all Fort Carson firefighters, including those in DPW. This list will also be provided by the IC as a reference for firefighters from other agencies responding to incidents on Fort Carson.

3.12.2. Public Relations

All information about wildland fires will be disseminated at the discretion of the USAG FC PAO. Other USAG FC Directorates may provide information about wildland fires only with the PAO’s approval.

All prescribed burns require notification of the PAO (see Section 4.8.4). ICs on wildfires will provide information to the DES Fire Chief who will determine what information should be passed to the PAO. However, fires on which any of the following events occur will always require PAO notification:

- Wildfire exceeds 100 acres.
- Wildfire requires extended attack (see Section 5.1.3).
- Fire is threatening to or has crossed the installation boundary.
- The DES Fire Chief determines smoke is impacting on or off-installation housing or other locations where people congregate.
- The DES Fire Chief determines there has been significant damage to equipment or a structure.

L	**C**	**E**	**S**
Lookouts	Communications	Escape Routes	Safety Zones

The 10 Standard Fire Orders

Fire Behavior

1. Keep informed on fire weather conditions and forecasts.
2. Know what your fire is doing at all times.
3. Base all actions on current and expected behavior of the fire.

Fireline Safety

4. Identify escape routes and safety zones and make them known.
5. Post lookouts when there is possible danger.
6. Be alert. Keep calm. Think clearly. Act decisively.

Organizational Control

7. Maintain prompt communications with your forces, your supervisor and adjoining forces.
8. Give clear instructions and ensure they are understood.
9. Maintain control of your forces at all times.

If 1-9 are considered, then...

10. Fight fire aggressively, having provided for safety first.

The 10 Standard Fire Orders are firm. We don’t break them; we don’t bend them. All firefighters have the right to a safe assignment.

The 18 Watch Out Situations

1. Fire not scouted and sized up.
2. In country not seen in daylight.
3. Safety zones and escape routes not identified.
4. Unfamiliar with weather and local factors influencing fire behavior.
5. Uninformed on strategy, tactics, and hazards.
6. Instructions and assignments not clear.
7. No communication link between crewmembers and supervisors.
8. Constructing line without safe anchor point.
9. Building line downhill with fire below.
10. Attempting frontal assault on fire.
11. Unburned fuel between you and the fire.
12. Cannot see main fire, not in contact with anyone who can.
13. On a hillside where rolling material can ignite fuel below.
14. Weather gets hotter and drier.
15. Wind increases and/or changes direction.
16. Getting frequent spot fires across line.
17. Terrain or fuels make escape to safety zones difficult.
18. Feel like taking a nap near fireline.

3.13.Firefighter Training and Qualifications

3.13.1. Applicability

All USAG GC personnel engaged in fire suppression and prescribed fire duties will meet NWCG wildland firefighting requirements, including Resource Advisors (READs, see Appendix 7). All USAG FC firefighters will meet physical fitness standards as established by the NWCG.

Individuals will not be assigned to duties for which they lack NWCG training and/or certified experience. All personnel dispatched or assigned to wildfires or prescribed fires will be qualified for their assigned position unless assigned as trainees under the direct supervision of higher-qualified personnel at all times.

3.13.2. Firefighter Position Descriptions

Position Descriptions (PDs) containing wildland fire management duties must state if the position qualifies the position holder as a primary or secondary firefighter, as described in Chapter 46 of the Office of Personnel Management Civil Service Retirement System and Federal Employees Retirement System Handbook for Personnel and Payroll Offices. Personnel not classified as a primary or secondary firefighter may perform wildland fire management activities as a collateral duty, commensurate with their NWCG qualifications.

All positions expected to participate in wildland fire operations must include wording within the PD clarifying this expectation, related hazards, and the training and physical fitness requirements in accordance with this guidance and as identified in the installation IWFMP. This requirement is effective immediately for all vacant positions/new hires and must be included in all wildland fire-related PDs by the end of fiscal year 2028 through voluntary means, attrition, or other negotiated terms.

At USAG FC, most wildland firefighters are professional firefighters under the DES Fire Department, and it is expected these requirements are already met. DPW Environmental Position Descriptions may require updating.

3.13.3. Training Standards

All USAG FC personnel assigned fireline duties will meet NWCG standards for training and qualification as established in PMS 310-1[24], latest edition. READs may be on the fireline if escorted by a NWCG qualified individual, or if they are NWCG qualified themselves. Further detail on READs is available in the Appendix 7.

3.13.4. Responsibilities

3.13.4.1. USAG FC Commanders, Directors, Supervisors, and Leaders

Ensure individuals requiring firefighting training within their command are available for scheduled training. They will notify the WFPM when the qualifications of their personnel expire.

3.13.4.2. Assistant Chief of Training

The Assistant Chief of Training selects potential trainees, schedules courses, ensures proper use of Position Task Books (PTBs) and documentation of course completion, certifies and recertifies DES trainees (DPW certifies their employees via the Installation Management Command (IMCOM)), monitors training for standardization, and coordinates training with cooperating agencies. The Assistant Chief of Training will coordinate with the DPW Conservation Branch Chief to ensure DPW personnel are included in the training program.

[24] https://www.nwcg.gov/publications/pms310-1

The Assistant Chief of Training will develop an annual schedule of course instruction and a training plan for each Fiscal Year. The Assistant Chief of Training will coordinate the training plan with other directorates whose personnel may be required to carry out fireline duties, and with outside agencies, for cross-leveling and sharing of training opportunities. Training will be announced with sufficient time for supervisors to schedule and meet workloads.

3.13.4.3. WFPM

The WFPM will approve the training schedule provided by the Assistant Chief of Training.

3.13.4.4. DPW Wildland Fire Lead

The DPW Wildland Fire Lead will recommend DPW employees to the Assistant Chief of Training for inclusion in training opportunities.

3.13.4.5. Incident Commander

The IC for each wildfire incident shall ensure that all responders are qualified for the duties assigned to them. The IC will consider the qualifications requirements of outside fire departments or cooperating responders for duties at the incident.

The IC is responsible for managing a training and qualification program on the incident, should one be used. The IC shall ensure that if personnel are assigned duties for which they are not properly certified, they are directly supervised by someone who is NWCG qualified.

3.13.4.6. Individual Firefighters

Each firefighter is responsible for showing proof of qualifications and completing training. This is usually in the form of an Incident Qualifications Card, commonly known as a “Red Card.”

Individuals are responsible for informing their supervisor when qualification requirements are in danger of expiring so that supervisors can find opportunities for them to maintain their qualifications. Individuals are responsible for maintaining their uncompleted PTBs.

3.13.5. Training Process

USAG FC will use the NWCG-based training approach requiring both education and on the job experience for qualification. The educational portion uses the completion of approved training courses with a passing score on an examination, while the performance portion of the program uses hands on evaluation under realistic conditions to ensure proper performance under field conditions.

All courses of instruction shall be taught by an NWCG-qualified instructor experienced in the subject matter being taught. USAG FC will provide its own instructors whenever possible, but, but will bring in qualified personnel from other state or federal agencies to teach more advanced courses as required.

The NWCG utilizes PTBs to document trainees’ on the job performance. PTBs will be used by USAG FC wildland fire managers and supervisors to keep track of each individual's training experience. PTBs for DES personnel may be certified by DES. PTBs for DPW personnel will be reviewed by DES but will be certified by IMCOM (see Section 3.13.6). It is the responsibility of the trainee to maintain each of their PTBs.

3.13.6. Position Task Book Review and Certification

All PTBs of DES personnel will be reviewed and certified by a committee made up of the WFPM, two Battalion Chiefs, and two Wildland Fire Captains. When DPW personnel are being reviewed, the DPW Wildland Fire Lead will be added to this committee, and the committee will only review the PTBs, they will not certify them. After a positive review from the committee, DPW PTBs will be certified per the IMCOM Training Transition Plan.

The WFPM will convene this committee as necessary to review and certify PTBs, but no less than once annually unless there are no PTBs to be reviewed. It will be the responsibility of individual firefighters and/or their supervisors to submit materials to the committee for review. PTBs from DES personnel that pass review will be signed by the DES Fire Chief (DES personnel). IMCOM will sign DPW PTBs.

3.13.7. Fitness Standards and Medical Standards

All USAG FC personnel who are assigned fireline duties are required to meet fitness standards for the position(s) they are expected to hold. All personnel assigned to fireline duties must pass the NWCG work capacity test appropriate to the duty being assigned. For most fireline positions, the Arduous level work capacity test is required.

Work capacity tests may be administered by the WFPM or the DPW Wildland Fire Lead, or as delegated, provided the individual administering the test is NWCG-qualified to do so. Work capacity tests that are administered will meet standards in PMS 307[25].

3.13.8. Certification Standards

Personnel who have learned skills or been NWCG certified from sources outside the Army, such as training programs through other agencies, shall not be required to complete specific courses or training again in order to qualify in a wildfire position. However, this training and experience must be documented and be consistent with the requirements outlined in this program and approved by the WFPM (for DES personnel) or the DPW Wildland Fire Lead (for DPW personnel), and the individual must have maintained currency in the discipline as defined by PMS 310-1.

Certification of individuals will follow protocols established by NWCG. Training courses are used to prepare the employee to perform in the position. Requisite training courses for each position are defined by the NWCG. The WFPM and the DPW Environmental Wildland Fire Lead will jointly determine which individuals will be provided training courses.

Training on the fireline will be recorded per the standards of NWCG. The training program outlined in this IWFMP will not determine the number of times an individual should serve as a trainee before advancement. This determination is left to the trainee supervisor based on task evaluations, position performance evaluations, and their own judgment on the quality of an individual's experience. Supervisors will submit recommendations for advancement or change in positions to the WFPM.

Certification will be documented and tracked by the WFPM (DES personnel) and the DPW Wildland Fire Lead (DPW personnel). Upon completion of each training course, the WFPM/DPW Wildland Fire Lead will document each individual who completed the course by name, organization, and ICS position. A memo will be provided to the individual and their commander or director.

The WFPM (DES personnel) and the DPW Wildland Fire Lead (DPW personnel) are responsible for maintaining all certification memos and will compile a qualification list of all wildland-trained personnel at USAG FC. Additionally, they will document training by issuing an NWCG-compliant incident qualification card each year for all individuals qualified for NWCG positions.

IMCOM maintains an Incident Qualifications and Certification System (IQCS). Currently USAG FC uses an Incident Qualification System (IQS) maintained by the State of Colorado. It is recommended that USAG FC transition both DES and DPW IQS tracking to the IMCOM IQCS system.

[25] https://www.nwcg.gov/sites/default/files/publications/pms307.pdf

3.13.9. Currency Requirements

Currency for NWCG qualifications will follow NWCG protocols as defined by PMS 310-1. Per PMS 310-1, the "maximum time allowed for maintaining currency is three (3) years for air operations and dispatch positions and five (5) years for all others." In addition, an annual safety refresher (NWCG course RT-130) is required for most ICS positions under NWCG, including all fireline duties.

It is the responsibility of the WFPM (DES personnel) and the DPW Wildland Fire Lead (DPW personnel) to annually certify the NWCG qualifications of USAG FC personnel who may be assigned fireline duties. Personnel who have lost NWCG currency will be re-certified on a case-by-case basis by the WFPM based on a subjective determination of the individual’s capacity to carry out the duties of the position being re-certified.

3.14. Inter-Departmental Drills

Due to the inherently inter-departmental nature of firefighting at USAG FC, an on-installation inter-departmental drill will be carried out no less than once every five years to test response protocols, communications, resource ordering, and other skills and equipment necessary for proper fire response. DES drills with other fire and emergency services entities in the area with some frequency. These drills often occur off of the installation, but many of the objectives of the on-installation inter-departmental drill are addressed. However, these drills do not preclude the need for a periodic on-installation drill which will include entities that are not included in off-installation drills.

The on-installation drill will include representatives from partnering fire departments and agencies at the discretion of the DES Fire Chief, including local, county, state, and federal entities. It should also include DPW firefighters, Range Control, DPW O&M (as bulldozer operators and logistics crews), and 4th CAB. It is important that these other directorates are involved in the drill as they will play important roles in a real-world incident.

The drill should simulate a major fire requiring the activation of all USAG FC firefighting resources. Ideally, the drill should include firefighting units actively responding to the imagined fire in the field, but a “sand table” exercise is acceptable. Units should communicate via radio and assets should be ordered as they would be in a real-world situation using the actual communications devices and protocols. The drill should continue from report of the fire, through initial attack, extended attack, resource ordering, etc. through to the execution of an informal post-fire after action review (see Section 6.2.1). It will be the responsibility of the WFPM to organize the drill.

3.15. Neighboring Fire Department Annual Orientations

Each year, it is recommended the DES Fire Chief invite representatives from neighboring fire departments that are likely to respond during a major incident to give them an orientation to the installation. The orientation’s focus should be on ensuring an organized, safe, and effective fire response from partner agencies. It should include discussions on safety, particularly UXO and live-fire-related hazards, navigating Fort Carson/PCMS, the locations of important firefighting resources (e.g., water sources), and communications. At the discretion of the DES Fire Chief, a field tour of Fort Carson/PCMS may be valuable.

3.16. Wildland Urban Interface Precautions

Homes are one of the primary assets to be protected during wildfires. Achieving success will be much more likely if homeowners and USAG FC Housing Managers implement Firewise[26] principles around homes and buildings. This issue is almost entirely limited to Fort Carson as there are few buildings at PCMS.

[26] https://www.nfpa.org//-/media/Files/Firewise/Fact-sheets/FirewiseHowToPrepareYourHomeForWildfires.pdf

Housing Managers, DPW, and homeowners should manage vegetation around any home or building to meet Firewise principles to reduce the potential impacts to the structure. Doing so will not only give firefighters a better chance at protecting buildings but will allow them to apply more resources to fighting the fire rather than point protection of homes, increasing their ability to contain the fire at a smaller acreage.

3.17.Wildland Fire Mapping Resources

It is recommended that the data regarding values at risk and firefighting resources provided in this IWFMP be consolidated into a usable form for DES and DPW firefighters. For field use, this may be hard copy or electronic format, and could be a single large format map or multiple smaller format maps in the vein of a gazetteer or map book. It could also be in the form of georeferenced pdfs, cloud-based geographic information system (GIS), or other electronic form accessible via tablet in the field. If the latter, it is recommended that the data be available offline as many parts of USAG FC have little or no cell coverage. If desired, the WFPM will work with DPW Environmental to produce maps meeting the needs of firefighters.

The WFPM will obtain 10 GIS licenses for DES firefighters. The WFPM will work with DPW Environmental GIS specialists to gain access to environmental and other USAG FC data so that DES firefighters can make their own maps as necessary, for example, for prescribed burns.

3.18.Constraints on Wildland Fire Management

Constraints specific to the Prescribed Fire Program are noted in Section 4.2.1. In addition to those, the wildland fire program at USAG FC is often constrained by insufficient personnel and equipment to carry out duties, particularly those related to fuels management. This limits the acreage that can be treated and how quickly treatments can occur once they are identified.

UXO constrains both suppression operations and fuels treatment wherever it occurs in any quantity. This is primarily in the Large Impact Area, but other locations throughout USAG FC exist where UXO is of sufficient density to make fire suppression and/or fuels management more difficult or infeasible.

The terrain is steep enough in some locations to preclude safe access for firefighters. These are largely on the western side of Fort Carson and the eastern side of PCMS. Steep and sometimes deep gullies and arroyos exist throughout both installations, impeding overland travel by vehicle, and sometimes on foot. These gullies also experience flash floods from time to time, which may destroy roads and firebreaks that cross them.

Cultural resources exist throughout USAG FC and avoiding damage to them requires consultation and coordination that can be time consuming. These sites must also be protected during fire suppression operations, which can in some cases constrain the available fire suppression options.

Live-fire activities are a frequent constraint to fuels management activities and to fire suppression operations, particularly at Fort Carson. In some circumstances, fires cannot be suppressed because of ongoing high-value training that precludes shutting down ranges to allow safe access to a fire. Fuels management is essentially infeasible in the Small and Large Impact Areas at Fort Carson due to the training tempo, which rarely allows for downrange access. Other locations on the installation suffer from a similar, if less pronounced, lack of access. These factors are present at PCMS as well, but are less pronounced.

4. Prescribed Fire Program

This section of the IWFMP, and other sections referenced herein, will serve as the Programmatic Prescribed Fire Burn Plan for USAG FC. This section replaces any previous programmatic prescribed fire planning. Under this programmatic plan, additional planning will occur, including burn planning under the Annual IWFMP Implementation Plan, which will set the goals for the prescribed fire program for each year; and Prescribed Burn Plans, which are the specific plans for executing an individual prescribed burn.

A prescribed fire is a planned ignition, intentionally ignited under pre-determined conditions, in a pre-determined location, in compliance with applicable laws, policies, and regulations, designed to meet specific objectives. It is a safe way to apply a natural process to achieve ecosystem health and other natural resources objectives and to reduce wildfire risk. In addition to intentionally ignited fires, under this IWFMP, some naturally or accidentally ignited fires may be allowed to burn to meet specific objectives provided they are burning in locations and under conditions that provide for easy control, or because they are inaccessible due to the presence of UXO.

Prescribed fire is a cost-effective tool widely used to manage fuel, fire risk, and ecosystems. It also allows treatment of fuels where other means would be too damaging (e.g., heavy equipment or herbicide), where UXO does not allow for personnel to enter the area, or where terrain or substrate precludes the use of heavy machinery. Proper application allows large areas to be efficaciously treated. Prescribed fire will continue to be a significant component of the USAG FC fuels management program.

Prescribed fire has been used routinely at USAG FC for many years. It will be weighed as a tool against other treatment methods any time there is a fuels reduction or ecological management goal. Considerations will include cost, personnel effort, timeline, and ecological effects among others. Prescribed fire is not the right tool for every fuels treatment, but very often it is the only viable tool when the treatment area is large.

4.1. Goals and Objectives

The prescribed burn program will strive to reduce wildfire ignitions, improve ecological health, reduce the potential for wildfires to exceed IWFMP objectives, reduce wildfire acreage within impact areas, reduce fire escapes from impact areas, reduce wildfire intensity, and return fire to fire-adapted ecosystems, all within the overarching goal of supporting high quality, high tempo military training. Some objectives are specific to the goal of the burn. Broadly speaking, burn goals are for “risk reduction” or “ecological” burns, though one burn may achieve multiple goals.

Acreage and frequency of burns in the objectives below are subject to weather conditions. Drought in particular may make it impossible to meet objectives for one or more years.

4.1.1. Measurable Objectives for All Prescribed Fires

1) No prescribed fire escapes as defined by this IWFMP.
2) No damage to known targets, fiber optics, and other training infrastructure.
3) No damage to high-value cultural resources.
4) On a five-year average, burn >10% of USAG FC lands annually including acreage from all prescribed burn types.
5) 100% of burns are coordinated with DPW Environmental.
6) No violations of USAG FC smoke permits.
7) No rill, gully, sheet, or wind erosion resulting from prescribed fires requiring erosion mitigation measures.
8) No reductions in vegetation resulting from prescribed fires requiring revegetation mitigation measures.

9) 100% of prescribed fires reported to IMCOM through the Wildland Fire Management Application to ensure credit is given to the USAG FC prescribed burn program and funding can be justified.

4.1.2. Risk Reduction Prescribed Fire Objectives

Objectives related to risk reduction will be subjectively assessed after each burn by the Burn Boss. Annual objectives will be subjectively assessed at the end of each calendar year by the Prescribed Fire Coordinator. Objectives will not be measured via formal pre- and/or post-burn surveys unless deemed necessary by the DPW Conservation Branch Chief and/or the DES Fire Chief.

4.1.2.1. Measurable Objectives for Risk Reduction Prescribed Fires

- Burn a buffer around the Large Impact Area, with all reasonably burnable portions of the buffer burned at least once every three years.
- Burn all reasonably treatable portions of the Small Impact Area at least once every three years.
- Burn all reasonably treatable portions of Range 9 at least once every three years.
- Burn all reasonably treatable portions of Burn Units TA 7-6, TA 7-13, and TA 10-8 at PCMS at least once every three years.
- When a surface danger zone (SDZ) is treated, create a minimum 300 ft blackline around all target areas.
- Ensure >75% of the intended burn area is completely burned on >90% of all risk reduction burns.
- Annually reduce 1- and 10-hour fuels in burned areas by an average of >60%.
- To avoid negative ecological effects, do not burn the same burn unit more than two years in a row unless the area is deemed a safety hazard or a wildfire escape risk by the WFPM or has specific ecological objectives for species or ecosystem management.

4.1.2.2. Non-Measurable Objectives

Some outcomes are not easily measured. The following additional objectives for risk reduction prescribed fires will be considered.

- Ensure strategic placement of prescribed fires to create defensible areas of control that separate high-probability ignition locations, such as impact areas, from high value locations and installation boundaries.
- Use prescribed fire as a training opportunity for DES firefighters and DPW Environmental personnel.
- Use prescribed fire as an educational tool for USAG FC personnel including, but not limited to, DES firefighters, DPW Environmental personnel, Soldiers, and commanders.
- Avoid prescribed burns when the area is experiencing drought conditions, defined as Drought Monitor[27] conditions in excess of D2, because that increases the possibility of damage to plant root crowns, slows or reduces plant response after a burn, and increases the possibility of severe soil erosion.
- Avoid fires that create water-repellant soils, or otherwise lead to poor water infiltration into the soil, or that negatively impact water quality through soil erosion.

4.1.3. Ecological Prescribed Fire Objectives

The primary goal of these burns is ecological improvements. Most of the habitat types at USAG FC are fire-adapted and respond well to fire. Prescribed fire is an efficient and effective way to encourage regeneration of plants, recycling of nutrients, manage some invasive species, and utilize a natural process to improve ecological condition.

[27] https://droughtmonitor.unl.edu/

These are general objectives for ecological burns. Special focus is necessary for species of concern and invasive species. The objectives of ecological burns can vary widely depending on the desired effects and are generally specific to the individual burn. These natural resources objectives will be coordinated between the DPW Conservation Branch Chief and the WFPM. Additional information is available in Appendix 6 – Prescribed Fire Ecological Considerations.

4.1.3.1. Measurable Ecological Prescribed Fire Objectives

- Comply with the Migratory Bird Treaty Act and avoid prescribed burns in areas where birds are actively nesting.
- No impacts on species of concern that result in population decline.
- Prescribed burn every area mechanically treated for the purpose of reintroducing fire with sufficient frequency to prevent another mechanical treatment being necessary, usually <10 years.
- Burn at least one high priority ecological burn unit each year on a five-year average.

4.1.3.2. Non-Measurable Ecological Prescribed Fire Objectives

- Improve the ecological condition of the land within burns where the primary objective is ecological restoration or maintenance, including, but not limited to, increasing native species diversity, improving rare species habitat, reducing invasive species cover, or promoting regeneration of overstory species.
- Following a burn, reduce the spread and density of noxious weeds using integrated weed management.
- Develop site-specific, measurable ecological objectives prior to a burn and assess if objectives were achieved following a burn. Utilize the information to adjust future burns.

4.2. Implementation Policy

4.2.1. Constraints on the Prescribed Fire Program

The military mission takes precedence in almost all cases over executing prescribed fires. As a result, burns must take advantage of relatively small windows of opportunity, particularly when burning on live-fire ranges where fire personnel downrange can interfere with training on multiple ranges due to overlapping surface danger zones (SDZs). This is particularly pertinent at Fort Carson but is an issue at PCMS as well.

Infrastructure is present within many burn units. This may include targetry, fences, utility lines, natural gas lines, communication nodes, and many others. Pre-treatment around these items is likely to be necessary in many cases, requiring additional effort.

Many burn units have not been burned in many decades. Fuel loads may be too high to burn these areas safely or without unacceptable levels of tree mortality or other detrimental ecological outcomes. These burn units may require mechanical or other pre-treatment, which is expensive. This limits USAG FC's ability to return fire to these locales.

Air quality along the Front Range of Colorado substantially limits days when prescribed fire is viable at Fort Carson. The concentration of populated areas, including Colorado Springs, and the topography and climatic conditions conspire to create numerous days when inversions and other atmospheric factors reduce the dispersion of pollutants produced by fires and result in poor air quality.

There are only so many days every year when the weather conditions required by the prescription window are met.

In addition to these factors, personnel and equipment limitations in the USAG FC Fire Department budget restrict the size of burns, the days they can reasonably be accomplished, and the frequency with which they can be executed.

In combination, these factors significantly limit the ability of USAG FC to apply as much prescribed fire as might be desirable. The conflicts with training additionally restrict where burns can be implemented even if the other factors are all acceptable on any given day. As a result, prescribed fire practitioners must be highly flexible, including being ready with many potential Prescribed Fire Burn Plans for a wide variety of locations so they can be implemented as opportunities allow.

4.2.2. Prescribed Fire Policy

The following policy statements apply to the use of prescribed fire:

1. A NWCG-compliant, site-specific, Prescribed Fire Burn Plan must be completed for all management-ignited prescribed burning projects in advance of ignition. Every Prescribed Burn Plan will be signed by an individual qualified under NWCG as a Prescribed Fire Burn Boss. Every Prescribed Burn Plan will be signed by the AA. Every prescribed fire will be executed in compliance with an approved Prescribed Fire Burn Plan.
2. It is recommended that each Prescribed Fire Burn Plan be based on a NWCG-compliant Prescribed Fire Burn Plan Template developed specifically for USAG FC to avoid unnecessary repetition of information and paperwork. See Section 4.7 for details.
3. Naturally or accidentally ignited fires may be allowed to burn only if they fall within the Wildland Fire Use (WFU) prescriptions noted in Section 4.7.
4. A prescribed fire that exceeds, or is anticipated to exceed, one or more prescription parameters and/or line holding capability must be declared a wildfire and cannot be re-delegated as a prescribed fire. At this point, appropriate suppression action must be taken on the entire fire.
5. The Agency Administrator must approve each Prescribed Fire Burn Plan and any changes. This responsibility may not be delegated.
6. Every prescribed burn must be coordinated with DPW Environmental. Risk reduction burns in areas with known populations or habitat for species of concern require consultation with a Natural Resources Advisor.

4.2.3. Prescribed Fire Program Strategy

One of the primary goals of the IWFMP and the Prescribed Fire Program is to ensure that fires that occur in high-ignition probability areas do not cause damage to valued resources or escape the installation. These locations are where most wildfires ignite and improving wildfire containment options around them is a good way to reduce potential fire impacts.

One of the ways this is achieved is by the application of prescribed fire within or around high-ignition probability ranges and/or the impact areas. By reducing the fuel loads within or adjacent to these locations with prescribed burns early in the fire season, there is much less fuel for fires to utilize when they burn to the edges of the ranges or impact areas. Even burning in the fall or winter can reduce fuel loads substantially enough to reduce fire behavior and make the often-extensive road networks in the area much more effective as barriers to fire during fire suppression operations. Given these considerations, prescribed fire application will often be focused on the burn units adjacent to and/or near the Small and Large Impact Areas as well as several high-ignition probability ranges elsewhere at Fort Carson. These burns will reduce fuel availability to any fires burning out of the Small and Large Impact Areas. At PCMS, burns will be concentrated on and around Range 9 and within the Impact Area to reduce ignitions and the intensity of fires that are ignited in these higher ignition probability locations.

Secondary focus will include meeting the restoration objectives of the INRMP. These ecological burns will be more focused on creating the conditions desired by Natural Resources Managers and less focused on wildfire mitigation. These burns will be less frequent than risk reduction burns due to the additional planning and preparation burden necessary to execute them, as they are often in areas that are not as easily controlled due to lack of roads, steeper terrain, and heavier fuel loads.

Tertiary focus will include prescribed fires along the length of the perimeter firebreak at Fort Carson. Constraints such as burning close to major public roads and in areas with poor access/control lines and heavier fuels also exist. The firebreak is also over 50 miles long, resulting in very extensive acreage to be treated. These factors mean that not every location along the firebreak can (or should) be burned, nor is it reasonable to expect short burn rotations. Therefore, these burns should focus on areas where the results can be expected to last for a longer time, such as burns where woody fuels and/or needle litter predominate, rather than grassland areas that will grow back quickly.

4.2.4. Prescribed Fire Funding

Prescribed fires often achieve multiple objectives, but there is almost always a clear primary reason the burn is being conducted. Per IMCOM guidance, prescribed fires will be funded by the proper Management Decision Package (MDEP). With few exceptions, these fall into one of the four MDEPs listed below. The approximate proportion of all burns expected to be executed under each MDEP is estimated below, but there will be substantial year-to-year variation.

Table 32. Approximate percentage of prescribed burn acres expected to be executed under each Management Decision Package.

MDEP	Percentage of Acres	Description
Conservation Reimbursable Lands Management (CRFCP)	5%	The primary objective of these burns is managing a timber crop by reducing fuels, encouraging reproduction, clearing for planting, etc.; managing agricultural or grazing lands; or managing game species.
Ecological Management/Restoration/TES (VENQ)	10%	The primary objective of these burns is ecosystem management or meeting environmental regulatory requirements for a listed species, including habitat maintenance.
Mission (TATM)	35%	The primary objective of these burns is directly related to a mission need including maintaining training landscapes, clearing maneuver training lanes, preserving line of sight, etc.
General Fuels Management (QMUN)	50%	These burns do not have a regulatory driver. Their purpose is to reduce fuels for the purpose of fire mitigation.

4.2.5. Fire Effects Considerations

The seasonality, return interval, severity, and other factors related to fire application are very important to ecosystem management and health. Ecosystems at USAG FC are adapted to fire return intervals as short as several years, but as long as a century or more. It is important not to over-prescribe fire as doing so can severely damage an ecosystem for a long period of time.

Additionally, in an age of constant threat from invasive species, it is important to be cognizant of invasive species locations and pressures. Many invasive species thrive in disturbed areas and prescribed burns can provide opportunities for invasion if the circumstances are right. Some of these species can produce monocultures of very low value to native species, and some can increase fire potential.

Climate change adds additional stress to many of the ecosystems at USAG FC as numerous species on the installation exist at the edge of their biological and geographical range. Hotter and drier weather further stresses these species, sometimes making it difficult or impossible for them to recover from a fire, or to reproduce successfully afterwards. As a result, the range of some species may change over time. These shifts will lead to changes in where fire regimes occur as well.

Even ecosystems that are adapted to frequent fire can suffer from over-application of prescribed fire. The grasslands of eastern Fort Carson and most of PCMS are well-adapted to fire, but caution is necessary to avoid over-application of prescribed fire in an effort to maintain a very low fuel load.

Detailed information about fire effects is in Appendix 6.

4.2.6. Prescribed Fire Annual Planning

Annual prescribed fire planning will occur as part of the Annual IWFMP Implementation Plan. The Annual IWFMP Implementation Plan will include tasks specific to prescribed fire (see Section 3.3 and 3.4).

Prescribed burn areas will be identified by burn unit, by rough geographic descriptions, and/or marked on maps. General objectives for each burn will be identified (e.g., risk reduction, habitat improvement, etc.). Prescribed burns planned for each year for risk reduction should support a larger multi-year plan designed to contain fires in the Small and Large Impact Areas at Fort Carson, and in the Impact Area and Range 9 at PCMS, but other multi-year plans, such as those designed to support ecological objectives or other risk mitigation objectives, may come into play.

Burns should be prioritized for execution. Prioritization should account for time since last burn relative to the desired time since last burn, the relative importance of each burn to achieving IWFMP objectives, the cost in terms of effort level and money, and other factors. High priority burns should be advocated for by the WFPM, the Prescribed Burn Coordinator, and the DPW Conservation Branch Chief to their superiors and to Range Control and the G3 in order to encourage identification of times when they may be carried out within the training schedule, as that is often an impediment to prescribed burn implementation.

The number of burns and the acreage planned for each year should well exceed the number of burns and acreage expected to actually be burned to provide a wide variety of burn location options for any given day suitable for carrying out a prescribed burn. It is critical that suitable days for burning not be lost due to lack of planning as they are a chokepoint for achieving IWFMP objectives (See Section 4.2.1).

4.3. Prescribed Fire Responsibilities

These responsibilities are coordinated with those described in Section 2.4.1. The responsibilities below are specific to Prescribed Fire and are not comprehensive of the position's responsibilities.

4.3.1. Agency Administrator

The AA is responsible for approving all Prescribed Fire Burn Plans. This responsibility may not be delegated.

4.3.2. Wildland Fire Program Manager

The WFPM will work closely with the Prescribed Fire Coordinator to ensure proper execution of the Prescribed Fire Program. The WFPM will review the Annual IWFMP Implementation Plan to ensure the objectives of the Prescribed Fire Program are being met.

4.3.3. Prescribed Fire Coordinator

The Prescribed Fire Coordinator will work closely with the WFPM. This individual will be highly experienced in prescribed fire but does not necessarily need to be Burn Boss qualified.

The Prescribed Fire Coordinator shall:

- Work through the Wildland Fire Working Group and in coordination with the WFPM to ensure that the Annual IWFMP Implementation Plan targets sufficient and appropriate areas for prescribed burns for the year.

- Identify which burns will be executed and when.
- Ensure that prescribed fires are planned and scheduled in coordination with other directorates, including as appropriate:
    - Directorate of Emergency Services, Fire Department
    - Directorate of Public Works
        - Conservation Branch Chief
        - Operations and Maintenance Division Chief
        - Cultural Resources Manager
    - DPTMS Range Officer
    - Installation Operations Center
    - DPTMS Range Safety Officer
    - Public Affairs Office
- Ensure a NWCG-compliant Prescribed Fire Burn Plan is available for each burn area identified in the Annual IWFMP Implementation Plan well before burn season begins.
- Acquire necessary smoke permits.
- Work with the PAO to ensure appropriate public notice is given prior to and during periods of prescribed fire activity.
- Track prescribed burn projects to ensure that all Prescribed Fire Burn Plan requirements are met.
- Track prescribed burn projects to ensure annual and programmatic prescribed fire objectives are met.
- Record and report accomplishments of the prescribed fire program and recommend improvements to the WFPM and the DES Fire Chief.
- Within the first quarter of each fiscal year, determine whether the previous fiscal year's annual objectives were achieved.

4.3.4. DES Fire Chief

The DES Fire Chief shall:

- Ensure that the personnel executing prescribed fires meet minimum NWCG requirements.
- Coordinate workforce and equipment needs for prescribed fires.
- Ensure that prescribed fire responsibilities in combination with other resource commitments do not exceed USAG FC fire containment capabilities and are coordinated with Command fire suppression needs.

4.3.5. Range Officer

Within the constraints of meeting training requirements, the Range Officer shall ensure that days for prescribed fires are scheduled in order to meet IWFMP management goals.

4.3.6. DPW Conservation Branch Chief

The DPW Conservation Branch Chief will ensure that prescribed fires are compliant with National Environmental Policy Act requirements. Additionally, the DPW Conservation Branch Chief will ensure locations and objectives for ecological burns are identified and support the Fire Department in planning and executing ecological burns.

4.4. Smoke Management and Air Quality

USAG FC is a signatory to the Colorado Smoke Management MOA. USAG FC works with the Colorado Air Pollution Control Division to ensure compliance with State of Colorado and EPA standards.

4.4.1. Sensitive Smoke Receptors

There are numerous sensitive smoke receptors on and off USAG FC lands. These include hospitals, highways, schools, nursing homes, and concentrated populations.

Fort Carson

The bulk of these receptors are to the north of the installation, but there are sensitive smoke receptors in every direction. Sensitive smoke receptors within 3.1 miles of the installation boundary are mapped in Figure 48.

PCMS

Smoke receptors near PCMS are much more limited due to the rural location. Almost all smoke receptors are near the eastern third of the installation. Sensitive smoke receptors within 3.1 miles of the installation boundary are mapped in Figure 49.

4.4.2. Smoke Permits

In coordination with the Colorado Department of Public Health and Environment (CDPHE), USAG FC has established an approved Significant User of Prescribed Fire Planning Document (see Appendix 4). This document, approved by CDPHE, allows USAG FC to apply for a single annual smoke permit for each of the three Fort Carson prescribed fire permit areas (Figure 50) and for PCMS. This reduces unneeded paperwork and effort for Fort Carson and CDPHE while ensuring compliance with relevant statutes related to air quality. The plan is valid for 10 years and will need to be updated in 2023. The Prescribed Fire Coordinator is responsible for ensuring the Significant User of Prescribed Fire Planning Document is updated at that time and as necessary thereafter.

There are limitations on these annual permits. They apply to light smoke, and therefore are applicable primarily to grassland and grass/shrubland fuels. Timber fuels are likely to produce more smoke and/or smoke for longer durations, and any burn expected to burn significant timber fuels will need a permit specific to that prescribed fire.

All burn permits, including any permits that might be required for an individual fire, are applied for by the Fire Department. In addition to the Significant User of Prescribed Fire Planning Document, the Prescribed Fire Coordinator will also support acquisition of permits for burns requiring a smoke permit specific to the burn. The Prescribed Fire Coordinator will ensure that the annual smoke permits are completed no later than January 31 of each year. The Prescribed Fire Coordinator will provide the DPW Air Quality Manager with copies of all smoke permits.

Once the current Significant User of Prescribed Fire Planning Document expires, this IWFMP will serve as the Significant User of Prescribed Fire Planning Document for future applications. This document contains all information currently in the existing Significant User of Prescribed Fire Planning Document and represents the official status, objectives, and requirements of USAG FC's overall fire management plan, including prescribed fire.

The Smoke Permitting group at CDPHE encourages Burn Managers to contact them with questions to ease the smoke permitting process. The Fire Department should take advantage of this and communicate regularly with the Smoke Permitting group to ensure proper compliance.

The State does not make daily go/no go decisions about individual burns in relation to smoke or any other factor. That decision is left to the Burn Boss and will be part of the go/no go criteria for every prescribed fire, including WFU fires (see Section 4.7.2), but is not applicable to Inaccessible Fires (see Section 4.7.3), which cannot be effectively suppressed.

4.4.3. Smoke Management Techniques

Mop-up of smoldering material will be utilized wherever UXO safety hazards allow to diminish smoldering combustion and associated smoke emissions. The amount and type of fuel burned, the total acreage burned, the time of year of the burn, the moisture content of the fuels when burned, and many other factors can influence how much smoke is produced.

Most prescribed fires at USAG FC are low to moderate fuel load grasslands. The flashy nature of these fuels allows prescribed fires of 100s to 1000+ acres to be carried out in less than a day. The low fuel loads lead to a low volume of smoke per acre and in these circumstances, additional smoke management techniques are not necessary.

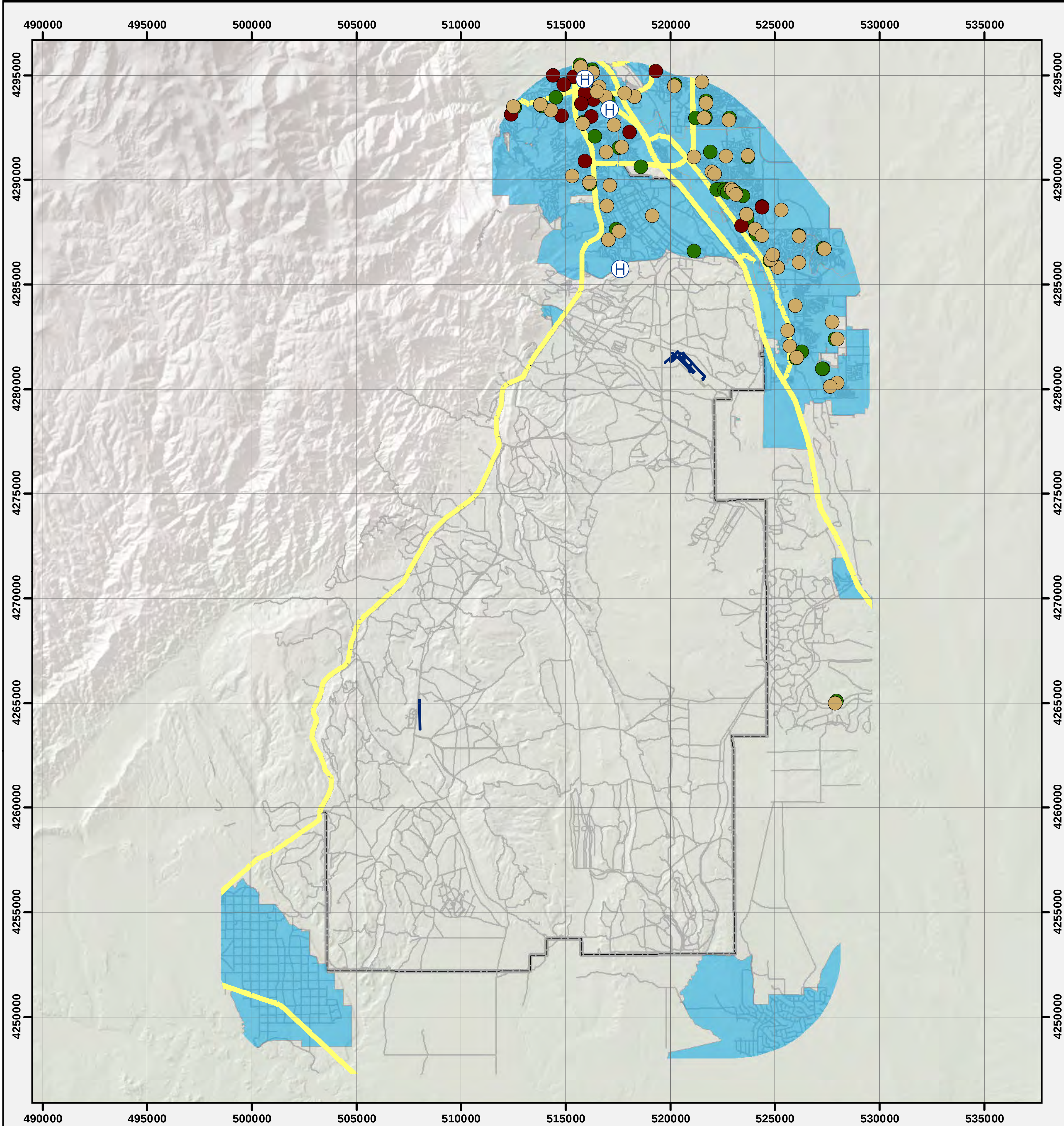
When burns are planned that include heavier fuel loads, fuels that are more likely to smolder for longer periods of time, or burns that will take more than a day to complete, the Prescribed Fire Coordinator will consider additional techniques to reduce smoke emissions within the constraints of achieving the burn objectives.

The PAO will address any smoke complaints per their standard protocols.

Fort Carson

Sensitive Smoke Receptors

Figure 48



Sensitive Smoke Receptors Within 5km of Installation Boundary

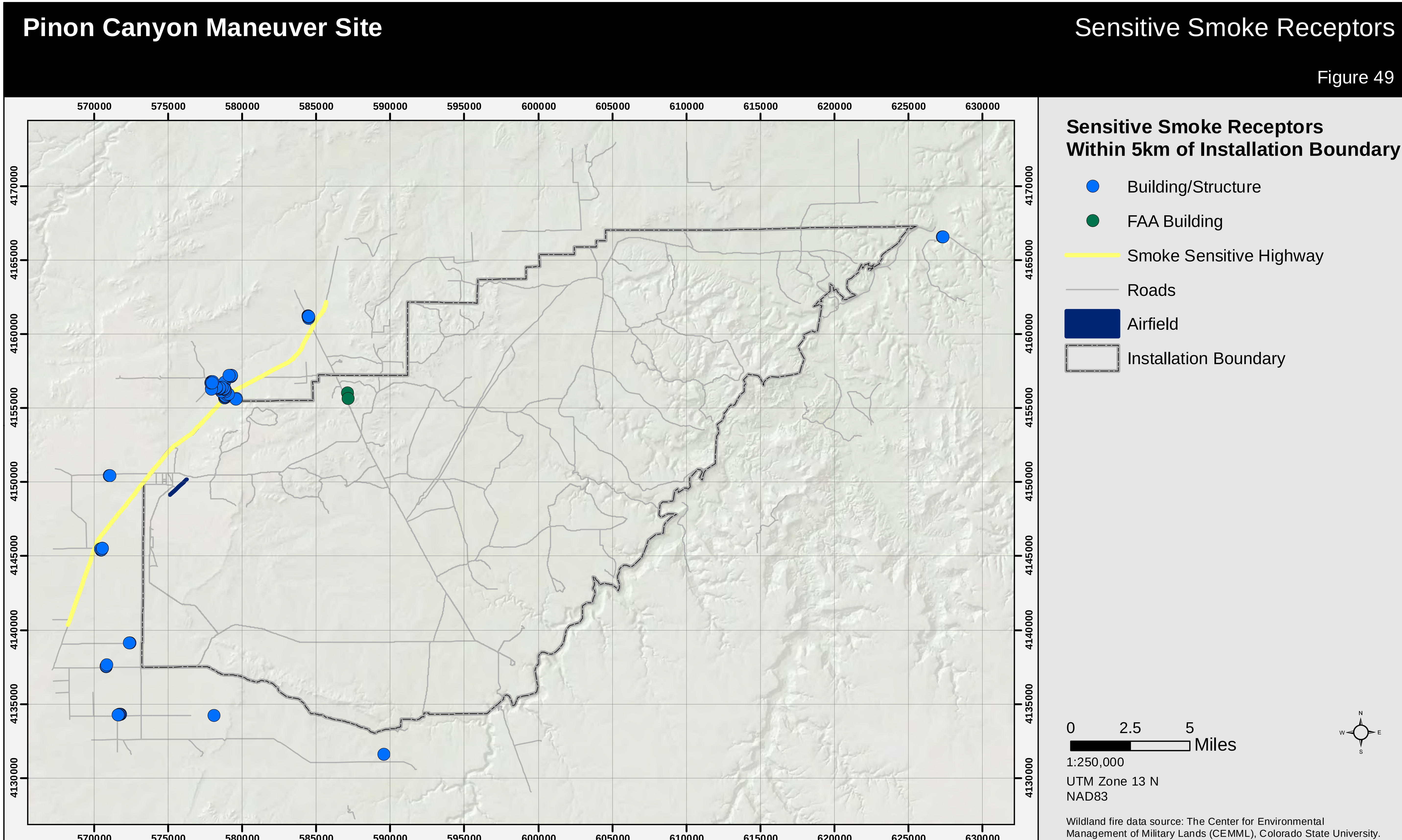
- Child Care Center
- Hospital
- Nursing Home
- School
- Smoke Sensitive Highway
- Roads
- Airfield
- High Density Population Area
- Installation Boundary

0 5 10 Miles

N W E S

1:200,000
UTM Zone 13N
NAD83

Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.


Pinon Canyon Maneuver Site
Sensitive Smoke Receptors
Figure 49
Sensitive Smoke Receptors Within 5km of Installation Boundary
Building/Structure
FAA Building
Smoke Sensitive Highway
Roads
Airfield
Installation Boundary
0 2.5 5 Miles
1:250,000
UTM Zone 13 N
NAD83
Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

4.5. Prescribed Fire Organization

4.5.1. Burn Boss

A NWCG-qualified Burn Boss will be designated for every prescribed fire. USAG FC will maintain on staff at least two individuals qualified as Prescribed Fire Burn Boss Type 2 (RXB2) (see Section 3.6.3.1). USAG FC prescribed burns are almost always of sufficient complexity to preclude the use of a Burn Boss qualified as RXB3. In the unlikely event that a burn necessitates a Prescribed Fire Burn Boss Type 1 (RXB1), the Prescribed Fire Coordinator will work with regional partners to secure an outside Burn Boss to lead implementation of that burn.

The Burn Boss will be an individual experienced with local weather, fire behavior, fuels, and terrain conditions and shall personally supervise the burning operations. More complex burns may require a Firing Boss and a Holding Boss as well, but on very simple burns, the Burn Boss may also act as the Firing Boss and/or Holding Boss. The complexity of the burn shall be defined via the interagency complexity guide described in Section 4.7.

The Burn Boss has direct responsibility for on-site implementation of the approved Prescribed Fire Burn Plan. The Burn Boss has several responsibilities that may not be delegated:

- Ensure the safety of personnel.
- Ensure that all individual Prescribed Fire Burn Plan requirements are met and that personnel are briefed before proceeding with ignition.
- Ensure the availability of suppression resources in the event the prescribed fire escapes and is declared a wildfire.
- Ensure that the forecast on-site weather parameters are within prescription at the time of ignition and predicted to remain so during the expected life of the burn.
- Make the go/no go decision.
- Control directly, or through supervision of the Firing Boss, the method, rate, and location of firing.
- Make the decisions to proceed, accelerate, defer, or curtail operations based on attainment of the approved prescription criteria or lack thereof, including daily validation of prescribed criteria on multi-day projects.
- Accomplish mop-up to predetermined standards in accordance with the Prescribed Fire Burn Plan.
- Certify that the fire is out.
- Determine whether the fire met its risk reduction objectives.
- Notify the DPW Conservation Branch Chief when the burn is complete so that they can determine if the burn met ecological objectives.

4.5.2. Holding Boss

The Holding Boss reports to the Burn Boss. The Holding Boss ensures that the fire is confined to the area designated in the Prescribed Fire Burn Plan and takes suppression actions when the fire exceeds or has the potential to exceed the planned area.

Holding Bosses will be qualified at a level commensurate with the complexity of the burn. The Holding Boss on low complexity and moderate complexity burns will be NWCG-qualified as a Single Resource Boss. High complexity burns will require a Holding Boss NWCG-qualified as a Strike Team Leader Engine (STEN) or Task Force Leader (TFLD). If internal personnel lack qualifications, outside partners will be brought in to fill these positions.

4.5.3. Firing Boss

The Firing Boss reports to the Burn Boss. The Firing Boss maintains control of all ignition sources on the burn project at all times, including aerial ignition devices. The Firing Boss ensures that Prescribed Fire Burn Plan objectives will be met by the deployment, sequence, and timing of all ignition sources. The Firing Boss on all prescribed burns will be NWCG-qualified as a Firing Boss, Single Resource (FIRB).

4.6. Burn Units

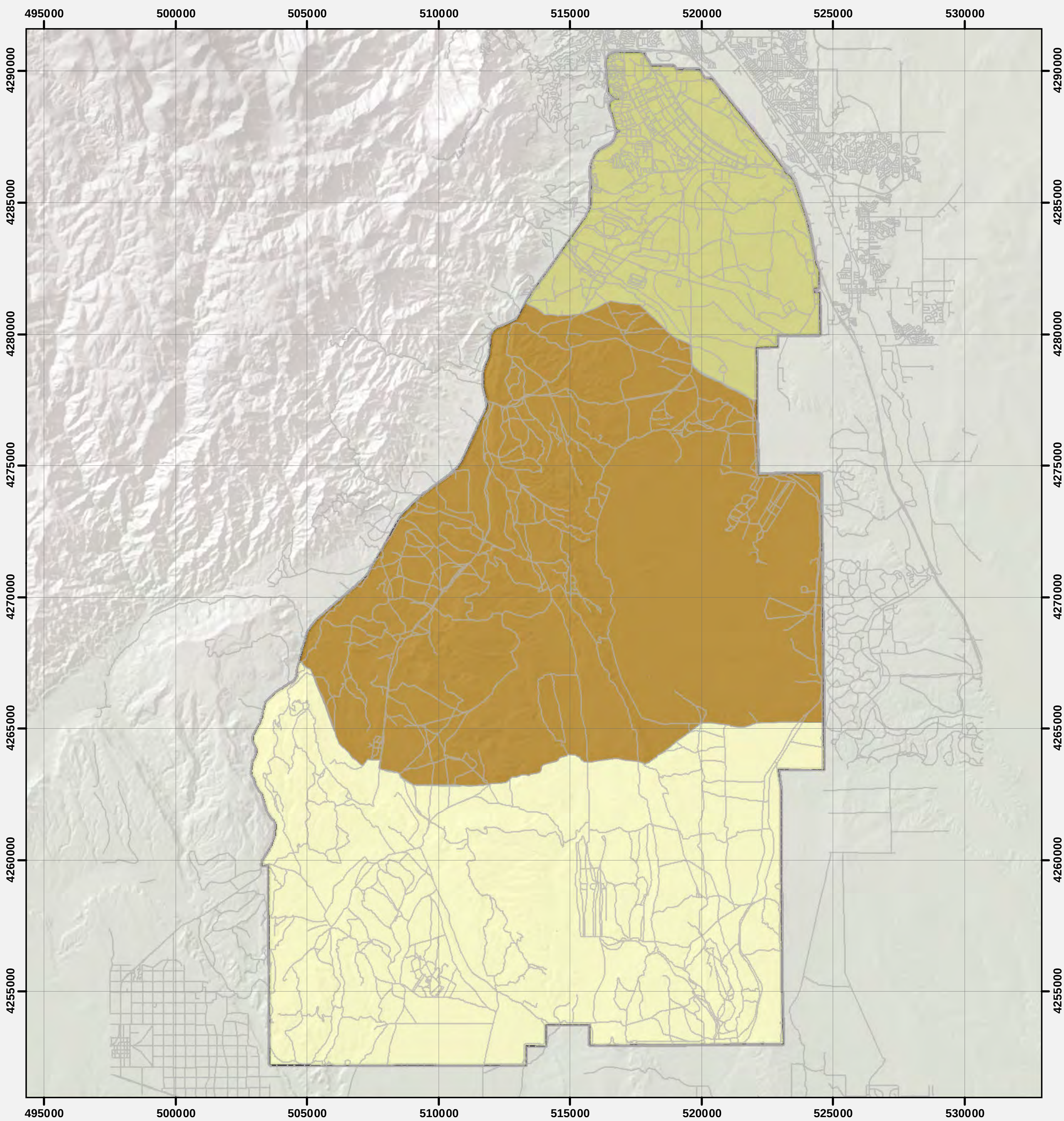
Areas where prescribed fire is generally accepted as a potential fuels management option have been organized into Burn Units for ease of communication and to pre-identify smaller, more manageable areas to burn (Figures 51 and 52). There is no requirement to burn only within these units, and the designation of Burn Units in no way will restrict the size or shape of any area to be burned in any given prescribed fire. Prescribed burns may burn only a portion of a burn unit, all of a burn unit, or parts or all of multiple burn units. Prescribed fires may also be applied in areas not designated as burn units. Burn units simply provide a means to easily organize and communicate what areas are to be burned.

The Small and Large Impact Areas at Fort Carson have been designated as burn units, but there are extensive constraints on application of prescribed fire in these locations including lack of access due to training schedules, UXO, targetry that is sensitive to fire and requires extensive pre-fire treatment, and others. As a result, burns in these locations may not always be practical. Other burn units include similar constraints in many cases, but these two burn units are particularly difficult to burn in.

Fort Carson

Fort Carson Smoke Permit Areas

Figure 50



Fort Carson Smoke Permit Areas

- North
- Middle
- South
- Roads
- Installation Boundary

0 3 6 Miles

N S E W

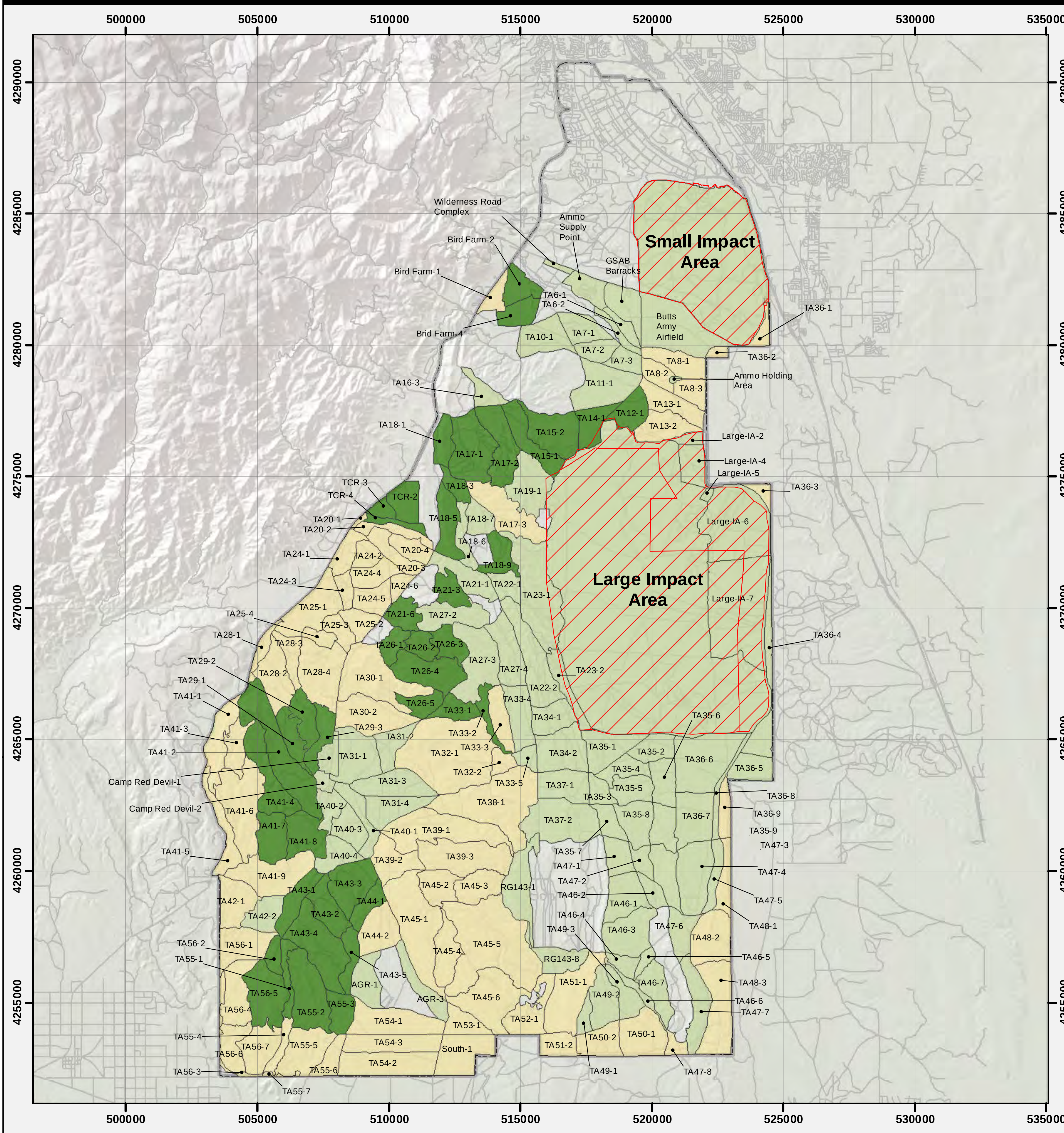
1:160,000
UTM Zone 13N
NAD83

Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

Fort Carson

Fort Carson Prescribed Fire Burn Units

Figure 51



Fort Carson Prescribed Fire Burn Units

Purpose

- Environmental
- Fire protection
- Fire protection/ environmental
- Fuel reduction

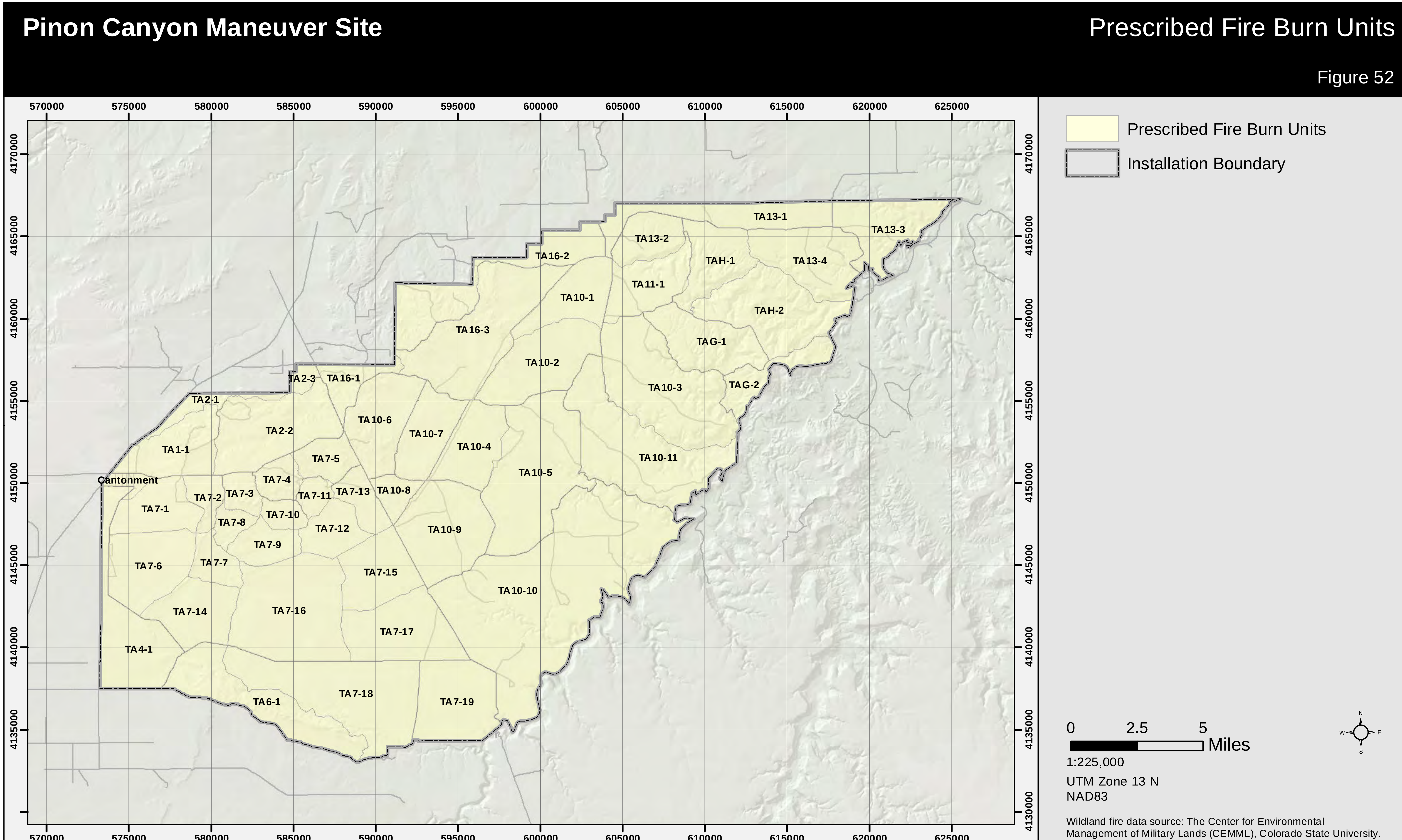
- Roads
- Installation Boundary

0 3 6 Miles

N W E S

1:160,000
UTM Zone 13N
NAD83

Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.


Pinon Canyon Maneuver Site
Prescribed Fire Burn Units
Figure 52
Prescribed Fire Burn Units
Installation Boundary
570000
575000
580000
585000
590000
595000
600000
605000
610000
615000
620000
625000
4170000
4165000
4160000
4155000
4150000
4145000
4140000
4135000
4130000
TA13-1
TA13-3
TA13-2
TA16-2
TAH-1
TA13-4
TA11-1
TA10-1
TAH-2
TA16-3
TAG-1
TA10-2
TA2-3
TA16-1
TA10-3
TAG-2
TA2-1
TA10-6
TA2-2
TA10-7
TA1-1
TA10-4
TA7-5
TA10-11
TA10-5
Cantonment
TA7-4
TA7-2
TA7-3
TA7-11
TA7-13
TA10-8
TA7-1
TA7-10
TA7-8
TA7-12
TA10-9
TA7-9
TA7-6
TA7-7
TA7-15
TA10-10
TA7-14
TA7-16
TA7-17
TA4-1
TA7-18
TA6-1
TA7-19
0
2.5
5
Miles
1:225,000
UTM Zone 13 N
NAD83
N
W
E
S
Wildland fire data source: The Center for Environmental Management of Military Lands (CEMML), Colorado State University.

4.7. Prescribed Fire Burn Plan Requirements

4.7.1. Management-Ignited Prescribed Fires

The Prescribed Fire Coordinator will ensure a NWCG-compliant Prescribed Fire Burn Plan template is developed for use for USAG FC prescribed fires by the beginning of fiscal year 2024. This template will include standardized information for those items that do not change, or are unlikely to change, from one burn to the next. Elements that are expected to change with each burn will be filled out by the individual writing the burn plan. Each Prescribed Fire Burn Plan will include all NWCG-required Prescribed Fire Burn Plan elements as defined by the Interagency Prescribed Fire Planning and Implementation Procedures Guide[28]. Until the template is completed, the existing burn plan format used by USAG FC will be considered acceptable. Complexity of burns will be assessed using the Prescribed Fire Complexity Rating System Guide[29].

Every Prescribed Fire Burn Plan will be reviewed and signed by a NWCG-qualified Burn Boss. In addition, every Prescribed Fire Burn Plan will be reviewed by any members of the DPW Conservation Branch designated by the DPW Director. Once reviewed, each Prescribed Fire Burn Plan will be signed by the AA. No management-ignited prescribed fire will be implemented without these reviews and signatures.

Management-ignited prescribed burns may be implemented at USAG FC for several purposes as described below.

4.7.1.1. Risk Reduction Burns

These burns are focused on mitigating wildfire risk. They are generally carried out on or near live-fire ranges because that is where the majority of ignitions on the installation occur. A strategy of containment is often utilized, burning a strip around areas of concern, usually SDZs, but sometimes not burning the interior area. However, risk reduction burns may be implemented anywhere at USAG FC.

4.7.1.2. Wildland-Urban Interface Burns

These are a subset of risk reduction burns. Housing and administrative areas at Fort Carson may be exposed to damage from wildland fires. Prescribed burning can reduce this risk provided adequate protective measures are taken prior to burning. There are more utilities to contend with and extensive outreach to homeowners and building occupants is required to ensure full awareness of those in the area. Pre-burn treatments would also likely be required, including cutting and removal of vegetation around buildings and utility components. Considerations should include impacts to tank trails, roads, and highways.

The level of effort required to safely carry out these burns is considerable. As a result, it may be more effective and cost efficient to coordinate with DPW Housing and encourage Housing Managers and homeowners to follow Firewise principles[30] and/or increase vegetation maintenance around structures. These alternatives should be considered prior to implementing prescribed fires in the wildland-urban interface.

4.7.1.3. Ecological Burns

The primary objective of these burns is ecological improvements. Most of the ecosystems at USAG FC are fire adapted and respond well to fire. Prescribed fire is an effective way to encourage regeneration,

[28] https://www.nwcg.gov/publications/484
[29] https://www.nwcg.gov/publications/424
[30] https://www.nfpa.org//-/media/Files/Firewise/Fact-sheets/FirewiseHowToPrepareYourHomeForWildfires.pdf

manage some invasive species, and utilize a natural process to improve ecological condition in a wide variety of ways. More information about ecological burns is available in Section 4.1.3 and in Appendix 6.

4.7.2. Wildland Fire Use Fires

In addition to intentionally ignited prescribed fires, under the right circumstances, USAG FC will allow some unintentionally or naturally ignited wildfires to burn. For the purposes of this IWFMP, these are referred to as Wildland Fire Use (WFU) fires.

A full NWCG-compliant Prescribed Burn Plan is not required for WFU fires. The wildfire's IC will ensure that an Incident Action Plan (IAP) is developed for any wildfire that is intended to be used for WFU within six hours of its ignition. Generally, natural or human-ignited wildfires will be allowed to burn only in the Small and Large Impact Areas, but there may occasionally be opportunities to designate a wildfire as a WFU fire elsewhere at USAG FC to achieve IWFMP objectives. The following policies apply to WFU fires:

- Only the IC may transition a wildfire to a WFU fire.
- The WFPM and the DES Fire Chief will be briefed before any wildfire is transitioned to a WFU fire. The WFPM or the DES Fire Chief must approve any wildfire's transition to a WFU fire. This decision may not be delegated.
- DES must coordinate with the DPW Conservation Branch Chief, the Cultural Resources Manager, the DPTMS Range Officer, and the PAO prior to transitioning any wildfire to a WFU fire.
- Wildfires managed as WFU fires will not be allowed to burn across any significant road, nor will they be allowed to burn across the perimeter firebreak at Fort Carson. They will be contained within the compartment(s) they were in upon designation as a WFU fire. The compartment will be defined in the IAP and may be a burn unit, FMU, or other compartment as defined by the IC.
- Firefighter and public safety will be considered the first and foremost priority. The second priority will be containment of the wildfire within USAG FC boundaries. Other considerations may also be addressed, but no wildfire will be converted to a WFU fire if control of the wildfire to meet these requirements is in doubt.
- Every WFU fire will have a clearly defined objective. WFU fires should be suppressed once the objective is met.
- The decision to convert to a WFU fire, and management throughout the wildfire's life, will consider current and predicted weather conditions, fire behavior, and tactical considerations, including the use of indirect attack and burnout and backfiring operations. No wildfire will be designated a WFU fire if control of the fire is in doubt.
- WFU fires may be suppressed at any time at the discretion of the IC.

4.7.3. Inaccessible Fires

In some cases, fires cannot be suppressed due to UXO-related safety concerns. Although these are allowed to burn as there is no viable suppression option, they are not prescribed fires and may not be designated as a WFU fire. These fires do require an IAP. Consideration should be made in the IAP for how to address the wildfire if it enters an area where firefighters can safely address it.

4.8. Prescribed Fire Application

4.8.1. Authorized Locations

Prescribed fire may be applied anywhere at USAG FC, though most prescribed fires are related to risk reduction and therefore are concentrated on and near live-fire ranges.

4.8.2. Ignition Patterns and Aerial Ignition

Ignition patterns will be determined by individual prescribed burn plans. Aerial ignition is not generally used at Fort Carson, but may be utilized if desired with proper planning, implementation, and NWCG-compliant training to support it.

4.8.3. Burn Unit Pre-Treatment

Most burns are in relatively light grassland fuels. Generally, little or no pre-treatment of these fuels is necessary. In some cases, containment lines will need to be cleaned up prior to burn day to improve containment. This may include grading or otherwise scraping the road surface and/or hand or mechanical fuels removal/reduction along road edges. Burns in forested fuels may require pre-treatment with more regularity for a variety of reasons, including to improve containment and to prevent overly-severe fire effects. These treatments may include mastication, limbing, or thinning of understory or canopy vegetation.

The specific pre-treatment required for each burn will be detailed in pre-burn plans for the unit.

4.8.4. Coordination and Notifications

The PAO will be notified 14 days ahead of the first burn in spring and the fall prescribed burn seasons. The Prescribed Fire Coordinator will update the PAO at least once every seven days during burn season. The PAO will ensure that notifications and news releases meet CDPHE smoke permit requirements.

Each burn will be scheduled in the Range Facilities Management Support System (RFMSS) as far ahead of the burn as is reasonable. Burns may be carried out even if they are not scheduled in RFMSS, but every burn must be coordinated with Range Control.

Forty-eight hours prior to each burn, the Prescribed Fire Coordinator will send notification of the intent to carry out a burn(s) to the DES Fire Chief, Assistant Fire Chiefs, WFPM, DPW Conservation Branch Chief, Cultural Resources Manager, DPTMS Range Officer, and PAO.

4.8.5. Scheduling

Prescribed fires are primarily carried out in October and November, with a secondary peak in activity in March and April. However, burns can be executed every month of the year if conditions and the training schedule allow.

The Prescribed Fire Coordinator will work with Range Control personnel to determine times when prescribed fire operations can fit into the range schedule. A large amount of flexibility will be required as days amenable to executing prescribed fires cannot be predicted more than a few days in advance and air quality often restricts days available for prescribed burning. Holidays and weekends may sometimes be the only viable times to carry out prescribed burns if the training schedule is full.

4.8.6. Fire Containment and Declaration of Wildfire Status

If a prescribed burn crosses the prescribed perimeter, immediate action by the holding crews must be taken to control it. The individual prescribed burn plan will allow the Burn Boss to take limited holding actions on fires outside the planned perimeter before it is declared a wildfire. The prescribed burn may continue as long as the holding forces identified in the individual prescribed burn plan are sufficient to maintain control of the fire. The capability to hold the prescribed burn shall not be jeopardized by moving essential holding forces to fight a spot fire or slopover.

A prescribed fire that exceeds, or is anticipated to exceed, control capacity must be declared a wildfire and cannot be redesignated as a prescribed fire. Once a prescribed burn has been declared a wildfire, any escaped portion of the fire, as well as the prescribed burn itself, will be fully suppressed.

5. Suppression Actions

5.1. Fire Response Protocols

5.1.1. Fire Detection, Reporting, and Dispatch Procedures

Early fire detection is critical to an effective initial attack on wildfires. Any agency, unit leader, or individual noticing a fire is responsible for reporting it immediately. Units will cease fire immediately upon detection of a fire.

Any military unit witnessing a fire or detecting smoke must report it immediately by contacting Range Control. Civilian personnel may report fires to Range Control or via 911. Range Control will notify the Fire Department of every fire. Notification of the Fire Department will be through the Emergency Services Response System.

Failure to report any fire will result in termination of scheduled training and responsible individuals will be subjected to administrative disciplinary action in accordance with applicable regulations.

5.1.2. Initial Attack

Immediate and aggressive attack is the primary response to all fires on USAG FC lands, providing for safety first. In addition to protecting infrastructure such as power lines and training resources, containing fires within the installation boundary is a primary goal. Fire size will be minimized to the greatest degree possible after considering personnel and public safety. Financial considerations will be secondary to minimizing fire size and damage.

After calling a cease fire and reporting the fire, the unit OIC will determine if it is safe for the unit fire detail to engage the fire. Unit fire details will engage fires only in the managed fuels of a range, not in unmanaged fuels on the edges of a range or beyond the target area, nor will they engage fires in training areas where fuels are generally not managed. The unit fire detail will not take risks when fighting fires. If flames are more than waist high, the unit should not engage the fire. If there is any question at all about the safety of engaging a fire, the firefighting detail should stand down and wait for the fire department to arrive.

Once the Fire Department arrives on scene, the Fire Department IC will take control of the fire. Range Control will close ranges as necessary to allow firefighters to safely access and fight the fire. Fire response will take precedence over training and other concerns other than personnel safety until such time as the IC determines the best course of action.

Firefighters will use direct and/or indirect attack at the discretion of the IC to contain and extinguish fires.

Firefighters will not enter UXO-contaminated areas to fight fires without the approval of the IC. The IC will consider how recently the roads have been cleared of UXO, whether the fire behavior is too intense for firefighting efforts to have a good chance of success, whether the roads allow access to locations where firefighting efforts may be effective, and whether EOD can escort firefighting crews. In some situations, aerial bucket drops are the only option for direct attack on fires in UXO-contaminated areas. This includes much of the Large Impact Area at Fort Carson. If firefighting is to be carried out in the Large Impact Area, firefighters will only travel on, walk on, and fight fires from the maintained roads.

Heavy equipment is to be used only as a last resort in sensitive areas. It will be employed in areas containing protected cultural resources only with the recommendation of the Cultural Resources Manager. The IC must coordinate with the Installation Safety Officer before deploying heavy equipment in UXO-contaminated areas. Heavy equipment will not be used in the Large Impact Area.

The IC will call for aerial resources as needed.

Burnouts and backfiring must be led by NWCG-qualified individuals (Firing Boss equivalent or higher qualified).

The DPW Conservation Branch Chief and/or the Cultural Resources Manager, and/or READs, may be present at the Incident Command post to assist in identifying sensitive areas. READs who are properly trained and equipped as defined in this IWFMP and in the DPW Resource Advisor Instruction (Appendix 7) may be on the fireline at the discretion of the IC. The DPW Conservation Branch Chief and/or the Cultural Resources Manager shall ensure support to the IC is provided when fires threaten federally protected natural or cultural resources.

Some fires may pose a threat to human safety. The IC will evacuate any areas/buildings considered threatened by the fire. Firefighters have the authority to evacuate civilians or military personnel during wildfires when following the instructions of the IC. Military Security Officers may enter recently burned areas in order to secure an area or may enter actively burning areas with a NWCG certified firefighter escort at the discretion of the IC.

All fires, regardless of size or outcome will be recorded by the IC or Burn Boss on an ICS-209 "Incident Status Summary" form or other appropriate form designated for the task by the DES Fire Chief. In addition to the information required by the ICS-209, the fire will be mapped using GPS if reasonable to do so, or the perimeter roughly drawn on a map. See Section 6.1 for post-fire reporting requirements.

5.1.3. Extended Attack

Any fire exceeding the capacity of initial attack resources will be transitioned to an extended attack. All fires transitioned to extended attack will be documented with an ICS-209 in addition to Fire Department documentation procedures.

In the event a fire escapes initial attack, the IC will implement an extended attack plan or fire escape contingency plan. Incident complexity will be assessed, and higher-qualified ICs will be ordered through the Fire Department as necessary. If an IC from outside of USAG FC is to be utilized, a Delegation of Authority will be signed (example in Appendix 5).

The IC will request additional assistance for any fire exceeding the suppression capabilities of on-site resources. Additional requested resources will be deployed under the Incident Command System (ICS). The IC will establish a command post and communications plan.

In the event that the IC must transfer command, a face-to-face transfer and in-briefing must occur per standard ICS procedures. A clear transfer will be communicated to all incident personnel. If an Incident Management Team (IMT) takes control of the fire, the USAG FC Agency Administrator will work with the incoming IMT to provide information about local resources, safety concerns (e.g., UXO), and protection priorities. For details, consult the Wildland Fire Incident Management Field Guide[31].

5.1.4. Command and Control

Upon arrival on scene, the senior Fire Department firefighter will take control of the fire and declare their status as IC. The IC or designee will keep Range Control and the Fire Duty Officer aware of ongoing suppression efforts. The IC may be replaced with a higher-ranking Fire Department firefighter, or one with higher wildland fire qualifications, as conditions dictate.

The IC will establish a command post when a fire exceeds or is anticipated to exceed initial attack.

The IC will initiate action requesting mutual aid support from other fire agencies in accordance with established Cooperative Agreements when required.

[31] https://www.nwcg.gov/publications/210

Once resources have been committed to firefighting, including aerial resources, they are under the control of the IC and will not be relieved of those duties except at the direction of the IC. The IC directs the employment of all firefighting resources to contain and extinguish the fire.

The IC will coordinate with Range Control and/or training units when requesting military assistance for combating major fires. In this situation, the primary mission of the unit commanders assigned to the fire will shift from training objectives to fire control.

5.1.5. Communications

Radio communication is essential for safety and effective wildfire response. Wildfire operations at USAG FC are subject to the added complexity of coordinating not only with dispatch and local fire authorities but also with Range Control. It is expected that firefighters will maintain radio contact with the Fire Duty Officer and Range Control. If contact is expected to be lost for any reason including interference from topography, this must be communicated up the chain of command.

All firefighting crews will be in vocal or radio contact at all times within a chain of communication reaching to the IC. At a minimum, communications equipment and procedures will allow the ability to:

1) Conduct routine operations required for normal fire management.
2) Communicate clearly and effectively with a wide variety of firefighting agencies and material resources, including aerial resources, in the fire suppression effort.
3) Perform (1) and (2) simultaneously.

Radio is the primary means of communications during firefighting operations. It allows communication between fixed facilities and mobile fire response vehicles, helicopters, or ground forces. Firefighters will use USAG FC radio networks per standard USAG FC Fire Department protocols to communicate.

Range Control will monitor all radio transmissions during normal duty hours. Range Control will be prepared to transmit information useful to the IC and firefighting forces.

All wildland fire personnel will conduct daily radio checks. Incoming resources will be briefed on assigned frequencies for USAG FC.

All air operations will have direct communication with ground forces. In the absence of an option allowing direct communication between ground forces and aircraft pilots, communications may be relayed through Range Control. No aerial operations shall be undertaken without a means of direct or indirect communication with ground forces.

5.1.6. Air Operations

Army and contract aircraft will be provided at the request of the IC, pending availability. Aerial resources, once committed, are under the operational control of the IC. Ordering of aerial resources will be conducted through the installation ECC. The ECC Chief is responsible for ensuring ECC Dispatchers understand how to request aerial resources from 4th CAB and civilian aerial resources.

Military training hazards to aerial firefighting should be mitigated through coordination with Range Control and clear communication with aerial resources.

Air-to-ground radio communication must be established between the IC and aerial resources involved in fire suppression activities.

5.1.7. Logistics

Logistics will be handled per standard USAG FC Fire Department protocols. The Fire Department maintains numerous vehicles to provide logistical support.

Upon request, Range Control will also provide logistical support. This could involve anything from directing responding resources to the fire scene or Incident Command Post to hauling equipment using Range Control vehicles.

5.1.8. Mop-Up

Fires will be mopped up to standards determined by the IC. Fires should be mopped up to 100 ft from the containment line. However, numerous situations may preclude achieving this standard, including the need to vacate downrange areas in order to allow training to resume. Additionally, some fires may not be accessible at all, such as in the Large Impact Area at Fort Carson where UXO may make mop-up unsafe. However, fires outside the Fort Carson Small and Large Impact Areas and Range 9 and the Impact Area at PCMS should be mopped up unless there are extenuating circumstances.

5.1.9. Minimum Impact Suppression Tactics

The IC will select suppression tactics sufficient to effectively control the fire while having the lightest possible environmental impact. This is referred to as Minimum Impact Suppression Tactics (MIST). Appendix T of the Interagency Red Book[32] specifies MIST guidelines. MIST emphasizes minimizing effects of suppression measures on the vegetation, soils, and watershed while allowing sufficient suppression impact to effectively control a wildfire.

[32] https://www.nifc.gov/policies/red_book/archive/2003RedBook.pdf

6. Post-Fire Actions

6.1. Records and Reports

Appropriate record keeping is critical to effective fire planning. Comprehensive, high-quality data collected over a period of years can illuminate important patterns in fire ignition, location, size, and other factors. It also provides a written record of the effort level required to carry out prescribed fires and suppress wildfires.

6.1.1. Internal Fire Reporting

Data from every wildfire and prescribed fire will be entered into a system that records the spatial perimeter of the fire as well as pertinent information about the fire. It is recommended that the DES Fire Chief ensure every fire be entered into the Wildland Fire Management Application,[33] a web application supported by the Army Installation Management Command (IMCOM) for tracking wildland fire activity (see Section 6.1.2). Alternatively, the DES Fire Chief will ensure copies of all wildland fire reports for the month are provided to the DPW Conservation Branch Chief for entry into a GIS. Fire reporting will be completed no later than the 10th of the following month.

Every fire report will include at a minimum:

- Map of the final fire perimeter. Perimeters should be mapped using GPS when reasonable. They should not be mapped using GPS when doing so will increase training downtime, require walking/driving in a UXO-contaminated area, or when firefighters did not respond to the scene, such as when the fire is extinguished by the military unit firefighting detail. When not mapped using GPS, fires should be roughly drawn on a map to record the general footprint and acreage of the fire.
- Final acreage of the fire.
- Cause of the fire (if wildfire).
  - At a minimum, define whether the fire was started by military training activities (e.g., live-fire, pyrotechnic use, a unit improperly discarding a cigarette) or by non-training activity (e.g., power lines, catalytic converter, lightning).
  - If military in origin and if possible, identify whether the fire was caused by live-fire or non-live-fire activity.
  - Ideally, identify the specific cause of the fire (e.g., smoke grenade, small arms tracers, demolition, simulator, etc.).
- The primary objective of the burn (if prescribed fire). One of the four categories below must be used.
  - Fuels reduction (e.g., fire risk mitigation)
  - Mission (e.g., line of site maintenance, UXO clearing)
  - Ecological management/restoration (e.g., habitat maintenance)
  - Forest resource management (e.g., site preparation, slash burning)
- If using an internal GIS, the following additional information will be recorded:
  - The fire danger and the FIRECON at the time of the fire (if wildfire).
  - The objective of the fire (if a WFU fire).

[33] https://wfmap.cemml.colostate.edu/

6.1.2. Wildland Fire Management Application (WFMAP)

WFMAP is a web-based application to track wildland fire activity throughout Army IMCOM installations. Prospective users can request access to the system at https://wfmap.cemml.colostate.edu/. WFMAP records the spatial fire perimeter as well as a variety of metrics for every fire. Data entry is easy and quick, and the data is accessible to installation personnel and retained indefinitely.

Prescribed fires must be entered into WFMAP to ensure USAG FC receives proper credit from IMCOM for its prescribed burn efforts. Wildfires should be entered to ensure USAG FC can officially document the number, size, and locations of wildfires. In both cases, this data will help justify future funding for both prescribed burns and wildfire suppression.

6.1.3. National Fire Incident Reporting System

The Fire Department uses software compliant with the National Fire Incident Reporting System (NFIRS). All USAG FC Fire Department responses are recorded, including an extensive array of data for each incident. This data is of use to wildland fire planning as it is an official record of wildland fire responses by the Fire Department.

The Fire Department will ensure that each wildland fire that is entered into their NFIRS compliant system includes the acreage of the fire, even if it is a rough estimate. There are extensive additional elements available in the wildland fire module of NFIRS, but only the acreage entry is required by this IWFMP. Other entries may be required at the discretion of the DES Fire Chief.

6.2. Reviews and Formal Investigations

6.2.1. Informal After Action Reviews

It is recommended that after every wildfire or prescribed burn, an informal After Action Review (AAR) be conducted. AARs can also be conducted during incidents, for example at the end of operational periods, or at other times deemed appropriate by the IC. Informal AARs will be short (often 10 minutes or less) and focus on providing constructive feedback (e.g., what went well, where can we improve?). A standard informal AAR format is provided in the Incident Response Pocket Guide, although numerous alternate formats are available.

It is important that informal AARs include all active participants on the fire response. Generally, it will not be possible to include Range Control Firing Desk personnel, but DES and DPW personnel on the fire should be included. Informal AARs should not be limited to DES personnel. Informal AARs that result in suggested improvements to Range Control performance/procedures should be conveyed through the WFPM or, at a minimum, addressed at the next Wildland Fire Working Group meeting.

6.2.2. Informal Reviews

The DES Fire Chief, DPW Conservation Branch Chief, or the Range Officer may require a review immediately after the conclusion of any fire, but reviews are generally limited to fires on which serious deficiencies were noted. Fire reviews are required for any wildfires during which any of the following occurred:

- The fire grows to greater than 1,000 acres
- Failure to follow instructions
- Damage or loss of real property exceeding $10,000
- Fires outside of live-fire areas burning within 1,000 feet of the installation boundary
- Excessive response time as defined by the DES Fire Chief
- Damage to protected cultural resources
- Fires burning in ecologically sensitive locations

An informal review will result in a written final report. The purpose is to identify ways to improve fire prevention, response, and safety during future incidents. It is similar to an AAR but delves deeper into the events of the fire and may take some time to draw conclusions.

6.2.3. Investigations

The Garrison Commander (GC) may decide if a formal investigation is necessary at the conclusion of major incidents, or incidents on which unusual events occurred. The GC may base this decision on advice or recommendations from the fire investigator(s), DES Fire Chief, Range Officer, DPW Conservation Branch Chief, Provost Marshal, Staff Judge Advocate, or Inspector General. If the GC deems a formal investigation necessary, an investigating officer or review board shall be assigned to conduct a formal investigation. Formal investigations will be carried out in accordance with AR 15-6, "Procedures for Investigating Officers and Board Officers"[34]. The GC shall review the findings and recommendations of the assigned investigating officer or review board. All formal investigations will include an AAR.

An investigation will determine some or all of the following:

- The effectiveness of the suppression resources and measures used
- The effectiveness of the ICS
- A safety review of suppression actions

Formal investigations are required for fires involving any of the following:

- Any fire ignited on USAG FC that grows to greater than 10,000 acres
- Training-related fires escaping or starting outside of the installation boundary
- Damage or loss of real property exceeding $100,000
- Entrapments or fire shelter deployments
- Major injury or fatality
- Arson

6.2.4. Wildfire Lessons Learned Center

If lessons are learned during an incident or during a series of incidents, these should be recorded and filed with the Wildland Fire Lessons Learned Center as appropriate and at the discretion of the DES Fire Chief.

6.3. Post-Fire Analysis and Restoration

6.3.1. Surveys

In addition to the reports and reviews that may be completed immediately after a wildfire, a post-fire survey and analysis of the burned area may be required, depending on the fire's location and damage caused. Surveys will be performed at the discretion of the WFPM, DPW Conservation Branch Chief, Cultural Resources Manager, or Range Officer.

A post-fire survey may be combined with any of the formal or informal reviews or investigations. A post-fire survey will determine all or part of the following:

- The effect the fire may have had on installation infrastructure, native or invasive flora and fauna, and cultural resources.
- The effectiveness of pre-suppression measures including fuel modifications and firebreaks.
- UXO contamination or potential for UXO cleanup operations.

[34] https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/r15_6.pdf

Soliciting support from other cooperators or subject matter experts is encouraged when internal expertise is lacking to appropriately assess a fire's effects. If a UXO survey is desired, coordination with the Explosive Ordnance Disposal unit is necessary.

The effects of fire on federally protected resources that may result in punitive actions against USAG FC or additional training restrictions, or effects from catastrophic fire events (e.g., severe erosion or water pollution) must be surveyed at the earliest opportunity.

6.3.2. Monitoring

It is important to ensure the Prescribed Fire Program is not harming the landscape, particularly in reference to invasive species and erosion. The DPW Pest and Invasive Species Program Manager will monitor the effects of prescribed fire on non-native species locations and populations. The DPW Wildland Fire Lead will coordinate with other subject matter experts to monitor effects on other resources. It is not possible to thoroughly survey every burn before and afterwards, but coarse-level site assessments, anecdotal observations, and rapid reconnaissance of individual burn areas will be utilized to track impacts. Similarly, erosion impacts will be assessed via anecdotal reports from personnel in the field and broad-scale or rapid reconnaissance of burn units.

If negative impacts are suspected, or positive impacts of particular note are suspected, the DPW Conservation Branch Chief will ensure the area of concern is documented, at a minimum with photos and with more intensive and rigorous survey methods if the DPW Conservation Branch Chief deems it necessary. The DPW Conservation Branch Chief will ensure that burn units where negative impacts are suspected are discussed at the next meeting of the Wildland Fire Working Group, and that consideration is given to addressing those impacts.

More broadly, post-fire monitoring of vegetation may be appropriate on some fires. Fires can provide opportunities to investigate the effects of burning on native plants, invasive plants, and the dynamics between the two. Post-fire monitoring may be incorporated into routine natural resources condition studies at the discretion of the DPW Conservation Branch Chief and/or the ITAM Coordinator.

6.3.3. Post-Fire Restoration

Some fires may require post-fire restoration, rehabilitation, and/or revegetation to prevent long-term problems with soil erosion, stormwater runoff, water quality, loss of cover and concealment, and conversion from native to invasive species. Examples may include steep slopes or important riparian habitat. Restoration will be at the discretion of the DPW Conservation Branch Chief or the ITAM Coordinator as appropriate to the location, amount of funding, and purpose of the restoration.

When large-scale restoration efforts are necessary, the U.S. Department of Agriculture. Forest Service Burned Area Emergency Rehabilitation (BAER) program should be contacted to identify whether that program can provide support. The BAER program works throughout the country to mitigate post-fire effects and rehabilitate burned areas and fireline that was built during suppression of the fire.

7. Budget and Implementation

Implementation of this IWFMP will require funding for:

- Labor, equipment, and in some cases contracts, for firebreak and fuels management implementation and maintenance.
- Labor, and equipment supplies for studies, surveys, or monitoring that result from the requirements of the IWFMP.
- Equipment for wildland firefighters and apparatus.
- Training time for wildland firefighters.

The funding, responsibility, and rough timeline for each major task in the IWFMP are listed in Table 33. Tasks may include a variety of sub-tasks; please refer to the noted section(s) for details.

Table 33. IWFMP table of responsibilities.

Task	Responsible Party	Timeline	Additional Funding Required	Reference Section
Ensure sufficient fire bucket trained pilots are available to support firefighting missions.	4th CAB Commander	As needed	N	3.11
Approve all Prescribed Fire Burn Plans.	Agency Administrator	As needed	N	4.3.1
Ensure the WFPM is made aware of individuals expected to fight fires who require training.	Commanders, Directors, Supervisors, and Leaders	Ongoing	N	3.13.4.1
Provide wildfire protection services throughout USAG FC.	DES Fire Chief	Ongoing	N	2.4.1.4
Ensure that the day's fire danger and recommended training restrictions are determined via the methods in Appendix 2 every morning.	DES Fire Chief	Daily	N	3.2.3.2
Include the recommended fire danger in the daily Fire Weather Briefing.	DES Fire Chief	Daily	N	3.2.3.2
Maintain staffing, equipment, and apparatus to meet requirements of DODI 6055.06 and maintain a cache of wildland fire specific equipment.	DES Fire Chief	Ongoing	N	3.6.3.1, 3.6.4, 3.6.5
Increase staffing as necessary and as constraints allow to meet wildfire response requirements.	DES Fire Chief	As needed	Y	3.6.3.2
Replace aerial buckets when they are no longer repairable.	DES Fire Chief	As needed	Y	3.11
Ensure there is at least one air-to-ground compatible radio available at each fire station.	DES Fire Chief	Ongoing	Y	3.12.1
Ensure that the personnel executing prescribed fires meet minimum NWCG requirements.	DES Fire Chief	Ongoing	N	4.3.4
Ensure that prescribed fire responsibilities in combination with other resource commitments do not exceed USAG FC containment capabilities and are coordinated with Command fire suppression needs.	DES Fire Chief	As needed	N	4.3.4
Designate the Prescribed Fire Coordinator.	Agency Administrator	As needed	N	4.3.1
Ensure proper PPE is worn at all times when personnel are actively engaged in firefighting duties.	DES Fire Chief, IC, DPW Wildland Fire Lead, Firefighting Personnel	As needed	N	3.8.3
Record all wildfires and prescribed fires.	DES Fire Chief/DPW Wildland Fire Lead	Ongoing	N	6.1.1

Task	Responsible Party	Timeline	Additional Funding Required	Reference Section
Ensure all wildland fire management activities occurring on the ranges and training areas are in compliance with USAG FC safety policies.	DPTMS Safety Officer	Ongoing	N	2.4.1.16
Ensure that all prescribed fires are compliant with the National Environmental Policy Act.	DPW Conservation Branch Chief	As needed	N	4.3.6
Identify locations and objectives for ecological burns and support the Fire Department in planning and executing ecological burns.	DPW Conservation Branch Chief	As needed	N	4.3.6
Conduct post-fire monitoring.	DPW Conservation Branch Chief/DPW Wildland Fire Lead	As needed	N	6.3.2
Review any fire intended to be used for Wildland Fire Use.	DPW Conservation Branch Chief and Cultural Resources Manager	As needed	N	4.7.2
Rehabilitate burned areas.	DPW Conservation Branch Chief/ITAM Coordinator	As needed	Y	6.3.3
Provide cultural oversight, technical support, and planning assistance to the WFPM.	DPW Cultural Resources Manager	Ongoing	N	2.4.1.9
Provide environmental oversight, technical support, and planning assistance to the WFPM.	DPW Conservation Branch Chief	Ongoing	N	2.4.1.7
Ensure roadways throughout USAG FC are navigable.	DPW O&M Division Chief	Ongoing	N	2.4.1.8
Ensure the firebreak is maintained in a fuel-free condition no less than three times per year.	DPW O&M Division Chief	Three Times/Year	N	3.5.1
Ensure vegetation along the edges of the firebreak is maintained per listed standards.	DPW Wildland Fire Lead, DPW O&M Division Chief, and DPW Forester	East completed by FY 2027, West by 2032, then ongoing	Y	3.5.1
Establish the Fire Condition (FIRECON) and training restrictions for the day.	G3	Daily	N	3.2.3.2, 3.2.3.4
Approve the Integrated Wildland Fire Management Plan.	Garrison Commander	When Revised	N	2.4.1.1
Designate the installation Wildland Fire Program Manager.	Garrison Commander	When IWFMP is signed	N	2.4.1.1
Designate the installation Agency Administrator.	Garrison Commander	When IWFMP is signed	N	2.4.1.1
Approve the deployment of USAG FC civilian firefighters to off-installation incidents.	Garrison Commander	As needed	N	2.4.1.1

Task	Responsible Party	Timeline	Additional Funding Required	Reference Section
Ensure that all responders are qualified for the duties assigned to them.	IC	As needed	N	3.13.4.5
Ensure that an Incident Action Plan is developed for any fire that is intended to be used for Wildland Fire Use.	IC	As needed	N	4.7.2
Ensure all personnel on a wildfire or prescribed fire are aware of known high-hazard UXO areas.	IC, Burn Boss	As needed	N	3.8.1
Ensure LCES is in place for every wildfire and prescribed burn.	IC, Burn Boss	Ongoing	N	3.8.4
Provide DES Fire Chief with roads/trails that were maintained in the past year and the projections for the coming year.	Integrated Training Area Management Coordinator	Ongoing	N	3.5.1
Inspect and repair buckets.	Logistic Readiness Center	Quarterly	N	3.11
Ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces downrange.	OIC, IC	As needed	N	3.8.2
Ensure compliance with State of Colorado and EPA air quality standards.	Prescribed Fire Coordinator	Ongoing	N	4.4.2
Ensure that the Significant User of Prescribed Fire Planning Document is updated in accordance with CDPHE policies every 10 years or as required by CDPHE.	Prescribed Fire Coordinator	Every 10 years	Y	4.4.2
Provide the DPW Air Quality Manager with copies of all smoke permits.	Prescribed Fire Coordinator	As needed	N	4.4.2
Develop the annual prescribed burn tasks as part of the Annual IWFMP Implementation Plan in coordination with the WFPM and the Wildland Fire Working Group.	Prescribed Fire Coordinator	Annually	N	4.3.3
Track prescribed burn projects to ensure that all prescribed burn planning requirements and prescribed fire program objectives are being met.	Prescribed Fire Coordinator	As needed	N	4.3.3
Write Prescribed Fire Burn Plans, organize, and coordinate prescribed fires.	Prescribed Fire Coordinator	As needed	N	4.3.3, 4.4.2, 4.8.4, 4.8.5,
Acquire smoke permits for prescribed burns	Prescribed Fire Coordinator	As needed	N	4.4.2
Record and report accomplishments of the prescribed fire program and recommend improvements to the WFPM.	Prescribed Fire Coordinator	As needed	N	4.3.3

Task	Responsible Party	Timeline	Additional Funding Required	Reference Section
Ensure land users are familiar with fire prevention requirements.	Range Control	Ongoing	N	3.2.1
Ensure compliance with fire prevention and reporting measures.	Range Officer	Ongoing	N	3.2.2
Ensure that the FIRECON and associated restrictions are communicated to all units using the ranges each day, including requirements for fire details.	Range Officer	Daily	N	3.2.3.2
Maintain a cache of 200 fire flappers and 200 shovels at Fort Carson and 50 of each at PCMS for use by military unit firefighting details and replace equipment as necessary.	Range Officer	Ongoing	Y	3.6.5.2
Ensure each unit occupying a range when the FIRECON is MODERATE or above is provided fire flappers and shovels when occupying the range.	Range Officer	As needed	N	3.6.5.2
Within the constraints of meeting training requirements, ensure that days for prescribed fires are scheduled in order to meet IWFMP management goals.	Range Officer	As needed	N	4.3.5
Ensure fire precautions are in place, including a firefighting detail as appropriate.	Unit OIC	Ongoing	N	3.2.2
Disseminate to the public and media information about wildfires and prescribed fires.	USAG FC PAO	As needed	N	3.12.2
Conduct post-fire reviews and investigations.	Various	As needed	N	6.2
Conduct post-fire surveys.	Various	As needed	N	6.3.1
Track fire occurrences at PCMS as they relate to the FDRS. Upon the 5-year update for the plan, consider adjusting FDRS break points base on fire data.	WFPM	Ongoing, 5 years	N	3.2.3.2
Convene the Wildland Fire Working Group twice annually.	WFPM	Twice annually	N	3.4
Work closely with the DPW Forester to consider fire mitigation and fire reintroduction on the landscape in forestry planning.	WFPM	As needed	N	3.5.2
Oversee the wildland fire training program, including documentation of individuals' fire certifications and issuing red cards.	WFPM	Ongoing	N	3.13.4.2
Coordinate UXO safety training for firefighters.	WFPM	Annually	N	3.8.1

Task	Responsible Party	Timeline	Additional Funding Required	Reference Section
Conduct periodic checks of the military firefighting detail equipment.	WFPM	Annually	N	3.6.5.2
When the PCMS RAWS is not working, the Fire Department will use tools and methods to estimate the fire danger and establish a FIRECON each day including National Weather Service spot forecasts.	WFPM, DES Fire Chief	As needed	N	3.6.7
Ensure that annual prescribed burn tasks are included in the Annual IWFMP Implementation Plan developed by the Wildland Fire Working Group.	Prescribed Fire Coordinator	Annually	N	4.3.3
Ensure that prescribed fires are planned and scheduled in coordination with other directorates.	Prescribed Fire Coordinator	As needed	N	4.3.3
Develop and implement an Annual IWFMP Implementation Plan.	Wildland Fire Working Group	Annually	N	3.3
Document work completed under the Annual IWFMP Implementation Plan.	Wildland Fire Working Group	Annually	N	3.3
Update the IWFMP annually and ensure the IWFMP is revised at least once every five years.	Wildland Fire Working Group	Annually	N	3.4

Appendix 1 – Fire Management Unit Descriptions

This is a standalone appendix designed for firefighters and managers to take into the field with them. It can be downloaded onto a laptop or other portable device or printed. FMUs shown in yellow in Figure A1 - 1 represent areas where the default strategy is to fully suppress wildfires, within the constraints of access and safety. When fires cannot be fully suppressed, firefighters should consider fallback positions with the goal of containing the wildfire within the FMU.

FMUs shown in blue in Figures A1 - 1 and A1 - 2 represent areas where the default strategy is to monitor wildfires and allow them to burn. These fires should be allowed to burn out or be suppressed from roads or other defendable boundaries. Again, the goal should be containment within the FMU. The FMUs in blue contain designated impact areas. Firefighters should refer to the Personnel Safety and Initial Attack sections of the IWFMP regarding fighting fires in UXO-contaminated areas.

Default strategies do not preclude a decision to use a different strategy. The default is the starting point from which a final decision is made. That decision will vary depending on the circumstances of the particular fire.

Data for fire frequency, flame length, and integrated fire hazard were incorporated from the 2017 Fort Carson and 2018 Piñon Canyon Maneuver Area Wildfire Risk Assessments. Based on fire history, in terms of occurrence and location, and historical weather conditions, tens of thousands of simulated wildfires were allowed to burn across the landscape for a period of 24 hours. The landscape was represented by standard fire behavior fuels models[35], which were quality controlled by CSU staff. Upon the conclusion of the wildfire simulations, an aggregate of fire frequency and flame length was calculated for each 30 m by 30 m cell covering the entire installation. For a more in-depth discussion, refer to the 2017 and 2018 Wildfire Risk Assessments.

The fire frequency and flame length described for each FMU are an average for the portion of the FMU being described, or in some cases for the whole FMU. Fire frequency was broken down into four categories: low, moderate, high, and very high. These values differ between Fort Carson and PCMS, so low fire frequency at Fort Carson is not the same as low fire frequency at PCMS where there are far fewer fire ignitions.

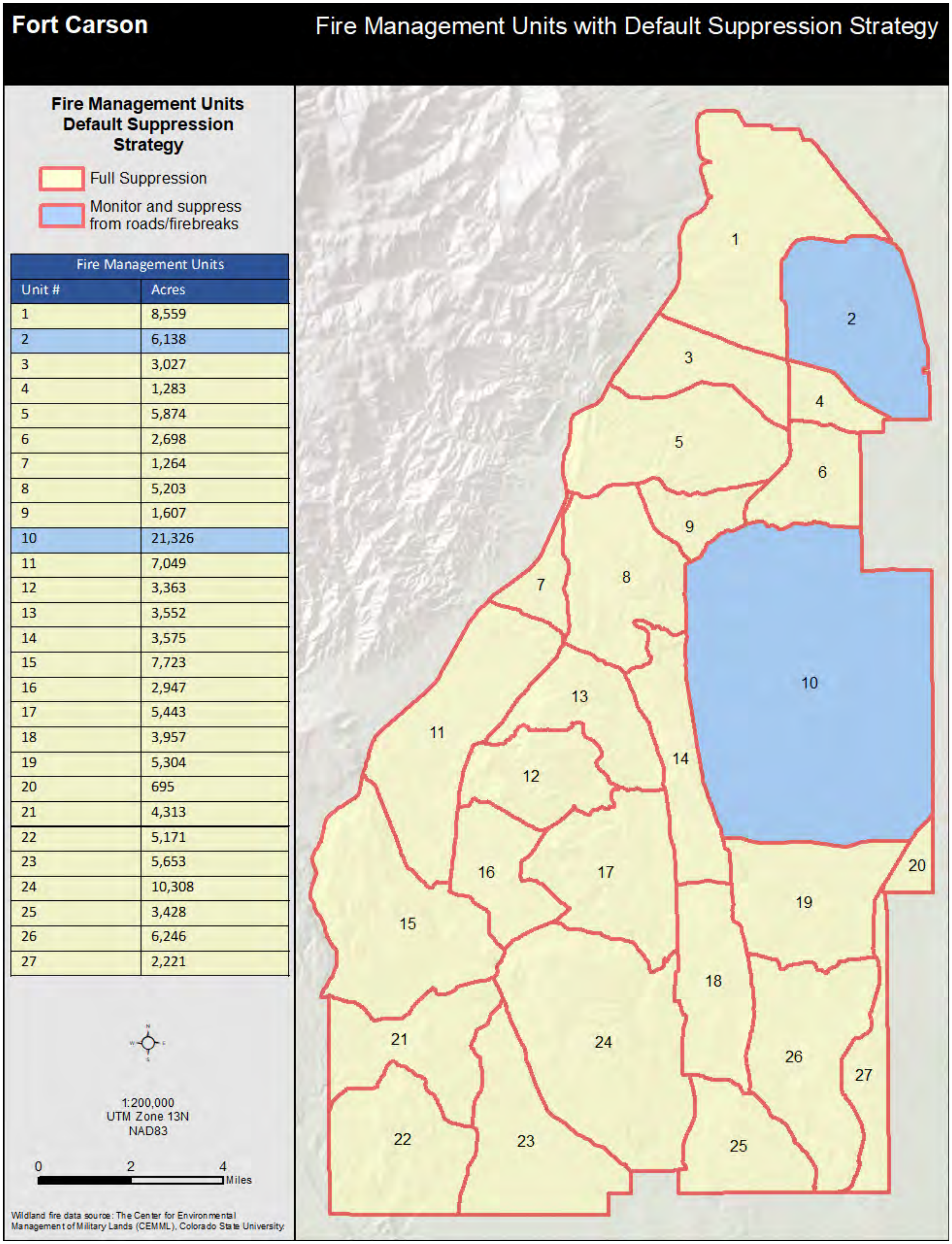
Integrated Fire Hazard (IFH) is used as a base map in the FMU maps. It combines measures of the fire frequency and the flame length. Areas with low fire frequency and low flame lengths will have low IFH. Areas where flame lengths are high and fire frequency is also high will have high IFH. The IFH is useful because it highlights those areas where fires are likely to occur as well as to be of higher intensity, allowing fire managers to identify the highest fire hazard areas prior to a fire occurring. The IFH is also not the same between Fort Carson and PCMS.

The pages below describe each FMU. The physical aspects of each FMU, such as topography and fuel characteristics are described, including a table of the acreage of each fuel model in the FMU. This acreage is based on raster data, rather than vector data, and the total acreage will vary slightly from the total acreage of the FMU shown in Figures A1 - 1 and A1 - 2. Fuel models representing typical and extreme conditions are provided. The first set represents the fuels when weather conditions are considered typical. The extreme set applies when relative humidity is less than 10% and wind speeds are greater than 20 mph

[35] Per Scott, J. H. and R. E. Burgan. 2005. Standard fire behavior fuel models: a comprehensive set for use with Rothermel's surface fire spread model. General Technical Report RMRS-GTR-153, United States Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

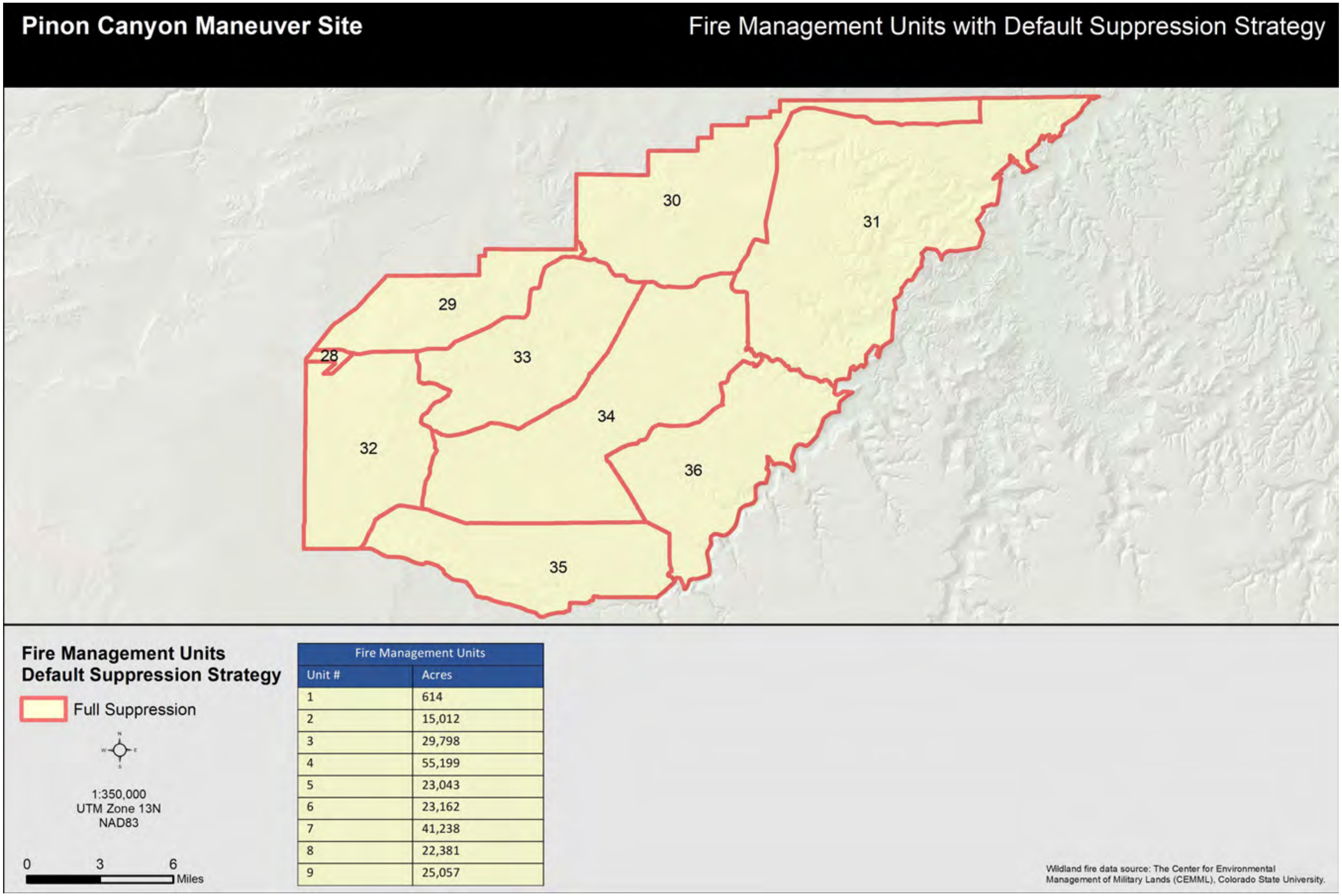
for at least one hour within a 24-hour period. At USAG FC, fires in piñon-juniper often exhibit limited fire behavior until wind speed increases and relative humidity decreases below threshold levels. At that point, fires are more likely to spread rapidly through the crowns. Therefore, piñon-juniper woodlands are modeled as low-load grasslands (GR2) in fires burning under typical weather conditions, and very high load shrubs (SH7) in fires burning under extreme conditions. Only fuels related to piñon-juniper woodlands change fuel models from typical conditions to extreme conditions; all other fuel models remain the same regardless of the weather conditions.

Many of the secondary roads shown on the FMU maps are not maintained on a regular basis and can be hazardous for travel by engines and tenders, or may be overgrown and may not serve as viable control lines.



Fire Management Units	
Unit #	Acres
1	8,559
2	6,138
3	3,027
4	1,283
5	5,874
6	2,698
7	1,264
8	5,203
9	1,607
10	21,326
11	7,049
12	3,363
13	3,552
14	3,575
15	7,723
16	2,947
17	5,443
18	3,957
19	5,304
20	695
21	4,313
22	5,171
23	5,653
24	10,308
25	3,428
26	6,246
27	2,221

Figure A1 - 1. Map of Fort Carson Fire Management Units with the default suppression strategy



Fire Management Units	
Unit #	Acres
1	614
2	15,012
3	29,798
4	55,199
5	23,043
6	23,162
7	41,238
8	22,381
9	25,057

Figure A1 - 2. Map of PCMS Fire Management Units with the default suppression strategy.

FMU 1
Wildfire Response: Full Suppression

Fuel Characteristics

Slightly under half (41%) of the area in FMU 1 is classified as non-burnable, the remaining fuels are grasslands and scrublands. GR2 and GS2 together comprise approximately 57% of the total wildland fuels within FMU 1. In addition to these fuels, an area of roughly 45 acres of piñon-juniper woodlands are located in the southern portion of FMU 1, south of the homes along Bayonet Circle.

Table A1- 1. Spatial extent, in acres and percentage of total FMU 1 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	3,243.26	37.86%	3,180.99	37.13%
122	GS2	Moderate load; dry climate grass-shrub	1,650.65	19.27%	1,650.65	19.27%
91	NB1	Urban	1,220.31	14.25%	1,220.31	14.25%
61	NB61	Major roads or firebreaks	733.92	8.57%	733.92	8.57%
99	NB9	Barren	647.85	7.56%	647.85	7.56%
62	NB62	Intermediate roads	626.95	7.32%	626.95	7.32%
63	NB63	Minor roads	261.76	3.06%	261.76	3.06%
121	GS1	Low load; dry climate grass-shrub	96.52	1.13%	96.52	1.13%
81	CU1	Custom - burnable developed	41.14	0.48%	41.14	0.48%
104	GR4	Moderate load; dry climate grass	34.69	0.41%	34.69	0.41%
182	TL2	Low load broadleaf litter	4.89	0.06%	4.89	0.06%
98	NB8	Water	2.89	0.03%	2.89	0.03%
161	TU1	Low load dry climate timber grass-shrub	1.56	0.02%	1.56	0.02%
147	SH7	Very high load; dry climate shrub	0.00	0.00	62.27	0.73%

Topography

This portion of the installation is flat to moderately hilly. There are several drainages that restrict overland vehicle travel.

Fire Frequency

The fire frequency for the majority of this FMU is low. Areas closer to the Small Impact Area can expect moderate fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2) may see up to 6-foot flame lengths. The drainage south of Titus Boulevard and west of Butts Road, which has a taller and denser grass fuel load and is represented by fuel model GR4, may see up to 8-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero (where there are no fuels) to low integrated fire hazard. The IFH is elevated in the hilly area behind the 4th BDB Motor pool and the Vehicle Washing Facility, and in the drainage south of Titus Boulevard and west of Butts Road.

Values at Risk

FMU 1 contains the Fort Carson cantonment area, which includes administrative buildings, shopping centers, barracks, and base housing. Supporting infrastructure includes power lines and communication nodes. Many of these resources are within a built-up urban area where wildfires are unlikely. However, much of the base housing borders wildland fuels which are mostly grasslands.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 1 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials. Additional safety factors for FMU 1 include higher traffic volume than seen elsewhere on the installation and large numbers of people.

While the landscape within FMU 1 is not conducive to large fires due to the numerous roads and short response times, there is an abundance of grasses, shrubs, and forbs in portions of the unit, and in those areas wildfires can spread rapidly.

Fuels Management Actions

The firebreak runs along portions of the west and east sides of FMU 1. While the firebreak does not exist along the entire FMU 1 boundary, several major roads or highways are adjacent to its boundary. Currently, there are no prescribed burns within FMU 1. It is unlikely prescribed burns will be carried out within this FMU.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 1 are to be extinguished as rapidly as possible using full suppression methods with engines. There are numerous hydrants/water sources throughout the cantonment area.

Fire Escape Potential

The highest potential for fires to escape FMU 1 is along the southeastern boundary of FMU 1, where some of the only wide-open expanses of fuels exist in the unit. The south-central portion of the unit also contains an acute area where heavy vegetation is immediately adjacent to the primary control line (the tank road).

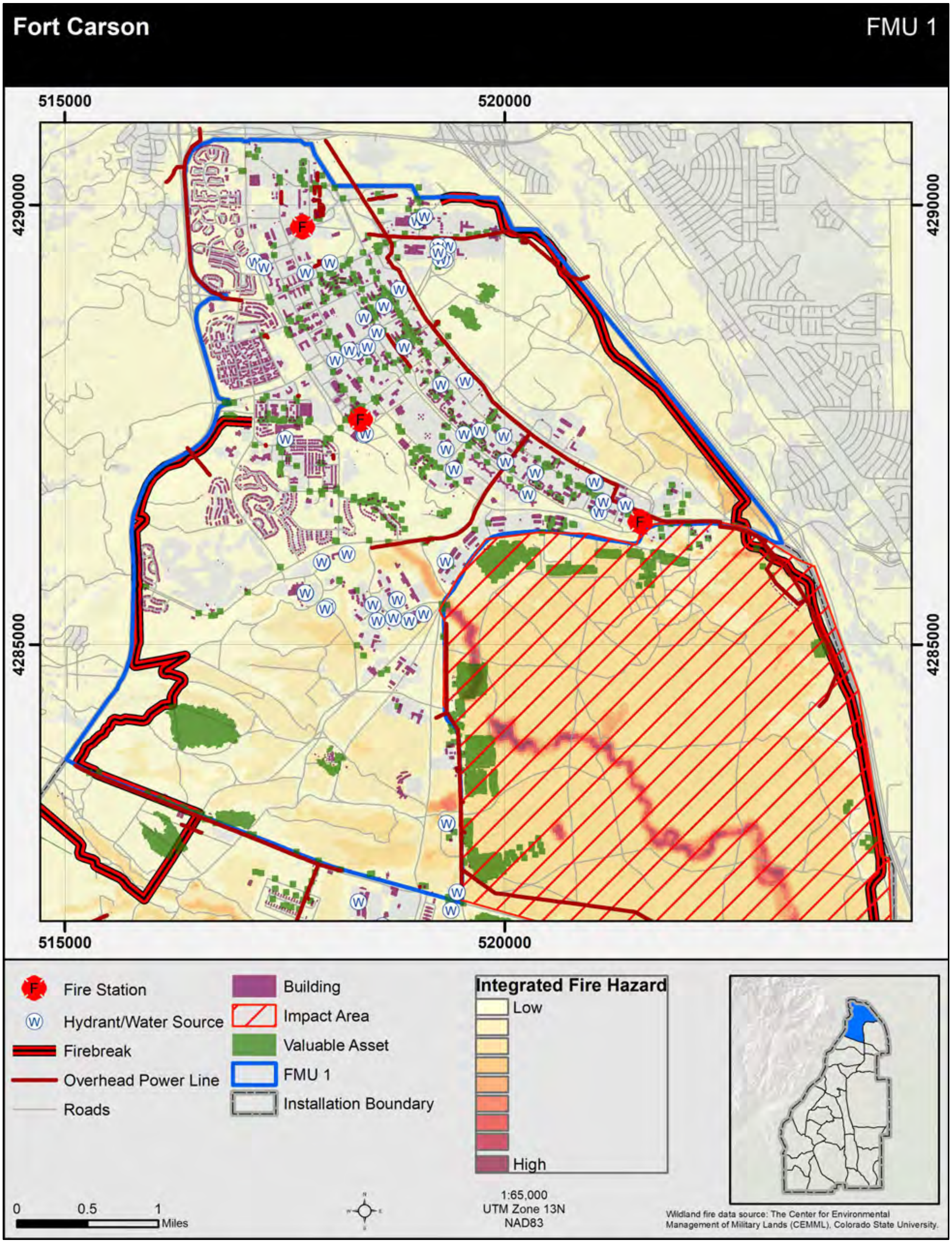


Figure A1 - 3. Map of Fort Carson FMU 1.

FMU 2
Wildfire Response: Monitor and suppress from roads/firebreaks

Fuel Characteristics

FMU 2 encompasses the Small Impact Area which is almost all grass, with GR2 and GR4 together comprising approximately 93% of the total fuels for FMU 2. Unburnable fuels make up roughly 4% of the remaining fuels.

Table A1- 2. Spatial extent, in acres and percentage of total FMU 2 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	5,539.09	90.19%	5,539.09	90.19%
104	GR4	Moderate load; dry climate grass	175.70	2.86%	175.70	2.86%
62	CU62	Intermediate roads	162.13	2.64%	162.13	2.64%
122	GS2	Moderate load; dry climate grass-shrub	151.90	2.47%	151.90	2.47%
61	CU61	Major roads or firebreaks	32.69	0.53%	32.69	0.53%
63	CU63	Minor roads	31.36	0.51%	31.36	0.51%
81	CU81	Custom - burnable developed	28.91	0.47%	28.91	0.47%
98	NB8	Water	12.01	0.20%	12.01	0.20%
91	NB1	Urban	6.23	0.10%	6.23	0.10%
161	TU1	Low load dry climate timber grass-shrub	0.89	0.01%	0.89	0.01%
99	NB9	Barren	0.22	0.00%	0.22	0.00%
103	GR3	Low load; very coarse; humid climate grass	0.22	0.00%	0.22	0.00%
121	GS1	Low load; dry climate grass-shrub	0.22	0.00%	0.22	0.00%

Topography

FMU 2 is flat to moderately hilly. Infantry Creek runs from the northwest corner to the southeast corner and roughly cuts the FMU in half diagonally. Additional drainages are located throughout the FMU and may restrict overland vehicle travel.

Fire Frequency

The fire frequency for the majority of this FMU is very high. The fire frequency for areas along the southern and eastern boundary of the FMU is slightly less with a high fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas within the Infantry Creek drainage, which contain dry climate grass-shrubs (GS2) and taller and denser grasses (GR4) than seen elsewhere within the FMU, may see up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has low to moderate IFH. The entire Infantry Creek drainage has elevated IFH. This area of the FMU represents the highest IFH levels found anywhere on the installation.

Values at Risk

FMU 2 contains the Small Impact Area which includes range buildings, targets, ammo supply points and communication nodes. The buildings, communication nodes, and ammo supply points are located within the maintained portion of the ranges and risks from wildfires are low. The targets pose the biggest risk from wildfires; however, vegetation maintenance around them should lessen the risk. There are also numerous cultural/natural resources in this unit.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 2 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials. Other safety factors for FMU 2 include higher traffic volume than seen elsewhere on the installation and large numbers of people.

Additional safety factors for FMU 2 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area) during live-fire operations. Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

The firebreak runs along the eastern edge of this FMU. The north, west, and southern portion of the FMU are confined by roads.

Per Section 4.1.2 of the IWFMP, the Small Impact Area should be burned at least once every three years.

Wildfire Management

Default Suppression Strategy: Monitor and suppress from roads/firebreaks

The default suppression strategy for wildfires occurring within FMU 2 will be to monitor and suppress them from roads or firebreaks. There are numerous hydrants/water sources along Butts Road as well as at the airfield.

Fire Escape Potential

The highest potential for fires to escape FMU 2 is along the eastern boundary. The southeastern corner represents a significant concern, considering potential ignitions from the ranges and the proximity of off-installation buildings, although these are largely protected by paved parking lots. In addition, a gulley in that area makes for difficulty in maintaining the firebreak and the fuels alongside it. However, the firebreak represents a significant barrier to fire.

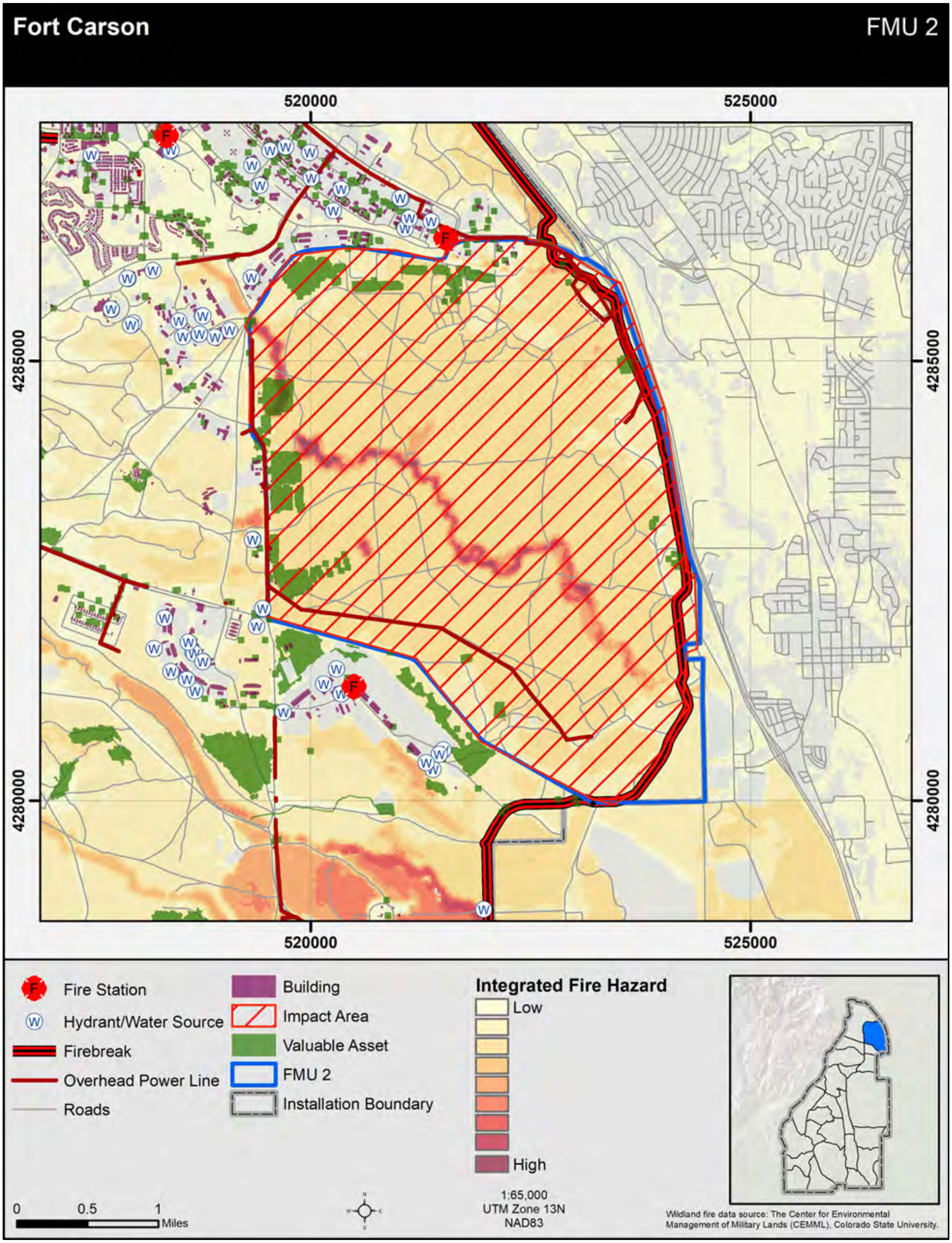


Figure A1 - 4. Map of Fort Carson FMU 2.

FMU 3
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within FMU 3 are grasses, with GR2 making up approximately 70% of the total fuels. The fuels are considerably different within the Rock Creek drainage, consisting of a grass-shrub community with GS4 and GS2 dominating this area.

Table A1- 3. Spatial extent, in acres and percentage of total FMU 3 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	2,141.49	70.69%	2,141.49	70.69%
62	CU62	Intermediate roads	234.41	7.74%	234.41	7.74%
124	GS4	High load; humid climate grass-shrub	219.29	7.24%	219.29	7.24%
122	GS2	Moderate load; dry climate grass-shrub	144.78	4.78%	144.78	4.78%
99	NB9	Barren	139.67	4.61%	139.67	4.61%
81	CU81	Custom - burnable developed	47.82	1.58%	47.82	1.58%
63	CU63	Minor roads	36.70	1.21%	36.70	1.21%
61	CU61	Major roads or firebreaks	28.91	0.95%	28.91	0.95%
98	NB8	Water	15.79	0.52%	15.79	0.52%
104	GR4	Moderate load; dry climate grass	11.79	0.39%	11.79	0.39%
121	GS1	Low load; dry climate grass-shrub	6.89	0.23%	6.89	0.23%
182	TL2	Low load broadleaf litter	0.89	0.03%	0.89	0.03%
183	TL3	Moderate load conifer litter	0.89	0.03%	0.89	0.03%
188	TL8	Long needle litter	0.22	0.01%	0.22	0.01%

Topography

The most significant topographic feature is Rock Creek, which runs from the northwest corner to the southeast corner of the FMU. Several smaller drainages feed into the Rock Creek drainage. The land north and south of Rock Creek within the FMU is generally flat and slopes down towards Rock Creek. Portions of Rock Creek may inhibit overland vehicle travel, although a few roads cross it. Travel elsewhere within the FMU should not be impacted by the terrain.

Fire Frequency

The fire frequency for the majority of this FMU is low. Areas closer to the Small Impact Area and MSR 5 will experience moderate fire frequency.

Flame Length

The majority of this FMU, besides the Rock Creek drainage, can typically expect flame lengths up to 4 feet. Areas within the Rock Creek drainage have higher fuel loads and include high load grass-shrub (GS4) and to a lesser extent moderate load grass-shrub (GS2). These fuels within the creek may see 10-foot flame lengths or higher.

Integrated Fire Hazard

The majority of this FMU has low to moderate IFH. The entirety of the Rock Creek drainage has increased IFH. Areas near the 2nd Brigade Combat Team Fighting Complex where there are no fuels have an IFH of zero.

Values at Risk

FMU 3 contains the main Fort Carson Ammo Supply Point as well as the 2nd Brigade Combat Team Fighting Complex. The Fort Carson Falcon Campground is located on western edge of the FMU near highway 115. There is also supporting infrastructure such as power lines and communication nodes. Many of these resources are within a built-up urban area where wildfires are unlikely. There are also numerous cultural/natural resources in this unit.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 3 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials. Other safety factors for FMU 3 include higher traffic volume than seen elsewhere on the installation and large numbers of people.

There is an Ammunition Supply Point and a Bulk Fuel Facility in this FMU. Both of these would represent serious risks if they were to burn, but both have fire mitigation measures in place.

Fuels Management Actions

The firebreak runs along portions of the western edge of this FMU. The north, west, and southern portion of the FMU are confined by roads.

The FMU contains 8 prescribed burn units, with 2 to be burned for environmental purposes, 5 for fuel reduction reasons, and 1 for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 3 are to be extinguished as rapidly as possible using full suppression methods with engines. There are numerous hydrants/water sources near the 2nd Brigade Combat Team Fighting Complex. Townsend Reservoir is a reliable source of water as well, including for aerial buckets.

Fire Escape Potential

The highest potential for fires to escape FMU 3 is in the southeastern corner of the FMU. The fuels here, high load grass-shrub (GS4), present the greatest potential for extreme fire behavior. Combined with a moderate fire frequency, this area poses the greatest threat of fires leaving the FMU boundary.

An additional area of concern is in the northwest corner of the FMU. Like the southeast corner, the fuels can support high intensity fire behavior. This area is west of the firebreak and the only barrier to the west is highway 115. However, fire frequency is low in this area and the proximity to firefighting resources should allow for quick response times.

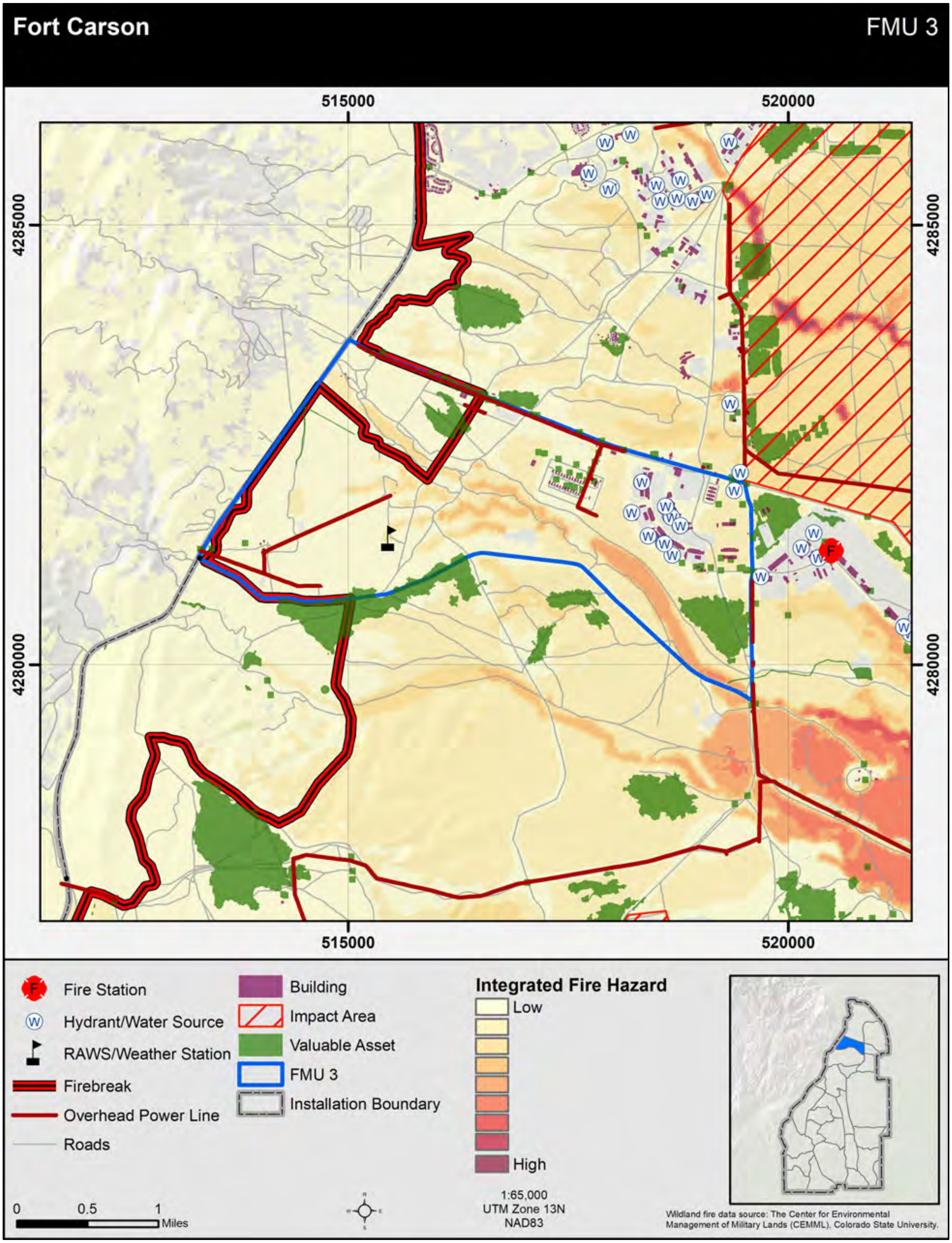


Figure A1 - 5. Map of Fort Carson FMU 3.

FMU 4
Wildfire Response: Full Suppression

Fuel Characteristics

Just over 35% of the area in FMU 4 is classified as non-burnable; the remaining fuels are grasslands and shrublands. GR2 and GS2 together comprise approximately 62% of the total wildland fuels within FMU 4.

Table A1- 4. Spatial extent, in acres and percentage of total FMU 4 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	646.52	50.34%	646.52	50.34%
99	NB9	Barren	242.86	18.91%	242.86	18.91%
122	GS2	Moderate load; dry climate grass-shrub	154.12	12.00%	154.12	12.00%
62	CU62	Intermediate roads	77.62	6.04%	77.62	6.04%
60	CU60	Airfield	69.83	5.44%	69.83	5.44%
104	GR4	Moderate load; dry climate grass	28.69	2.23%	28.69	2.23%
61	CU61	Major roads or firebreaks	27.58	2.15%	27.58	2.15%
91	NB1	Urban	13.79	1.07%	13.79	1.07%
98	NB8	Water	13.34	1.04%	13.34	1.04%
88	CU8	Custom unburnable	6.23	0.48%	6.23	0.48%
121	GS1	Low load; dry climate grass-shrub	3.78	0.29%	3.78	0.29%

Topography

FMU 4 contains the Butts Army Airfield that has been developed, resulting in much of the FMU being flat. There are several small drainages south of the airfield running north to south. There is also a more significant drainage that parallels the south side of the airfield and runs northwest to southeast. These drainages may inhibit overland vehicle travel. Also, travel may be impacted in and around the airfield due to active runways and helipads.

Fire Frequency

The fire frequency for the majority of this FMU is moderate. Areas closer to the Small Impact Area can expect high fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2) may see up to 6-foot flame lengths. A drainage south of the airfield, which has a tall dense grass fuel load and is represented by fuel model GR4, may see up to 8-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero (where there are no fuels) to moderate integrated fire hazard. The drainages south of the airfield have the highest IFH, but they still are in the moderate category.

Values at Risk

FMU 4 contains the Butts Army Airfield, which includes administrative buildings, medical buildings, maintenance shops, a fire station, and hangars. Supporting infrastructure includes power lines and communication nodes. Many of these resources are within a built-up urban area where wildfires are unlikely. Outside of the developed area, and south of the airfield, a solar panel array is located the along the eastside of MSR 5.

There are also numerous cultural and natural resources in this unit.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 4 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials. Additional safety factors for FMU 4 include higher traffic volume than seen elsewhere on the installation and large numbers of people.

Other hazards include those associated with an active airfield, including fuel, helicopters, and planes. In the event a wildfire occurs within FMU 4, especially near the runways, responding firefighters should receive clearance from the airfield prior to proceeding to the wildfire.

While the landscape within FMU 4 is not conducive to large fires due to the numerous roads and short response times, there is an abundance of grasses, shrubs, and forbs in portions of the unit, and in those areas wildfires can spread rapidly.

Fuels Management Actions

The firebreak runs through the southeast corner of FMU 4. While the firebreak does not exist along the entire FMU 4 boundary, several major roads or highways are adjacent to its boundary.

The FMU itself is one prescribed burn unit, and the main purpose of burning this unit is to reduce fuel loads.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 4 are to be extinguished as rapidly as possible using full suppression methods with engines. There are numerous hydrants/water sources throughout the FMU.

Fire Escape Potential

There is little escape potential from FMU 4 considering the airfield represents a large unburnable area protecting the northern boundary and there are significant roads/firebreaks on the southern and western sides. The highest potential is in the southeast corner if a fire were to ignite east of the firebreak, as there are no barriers to fire spread.

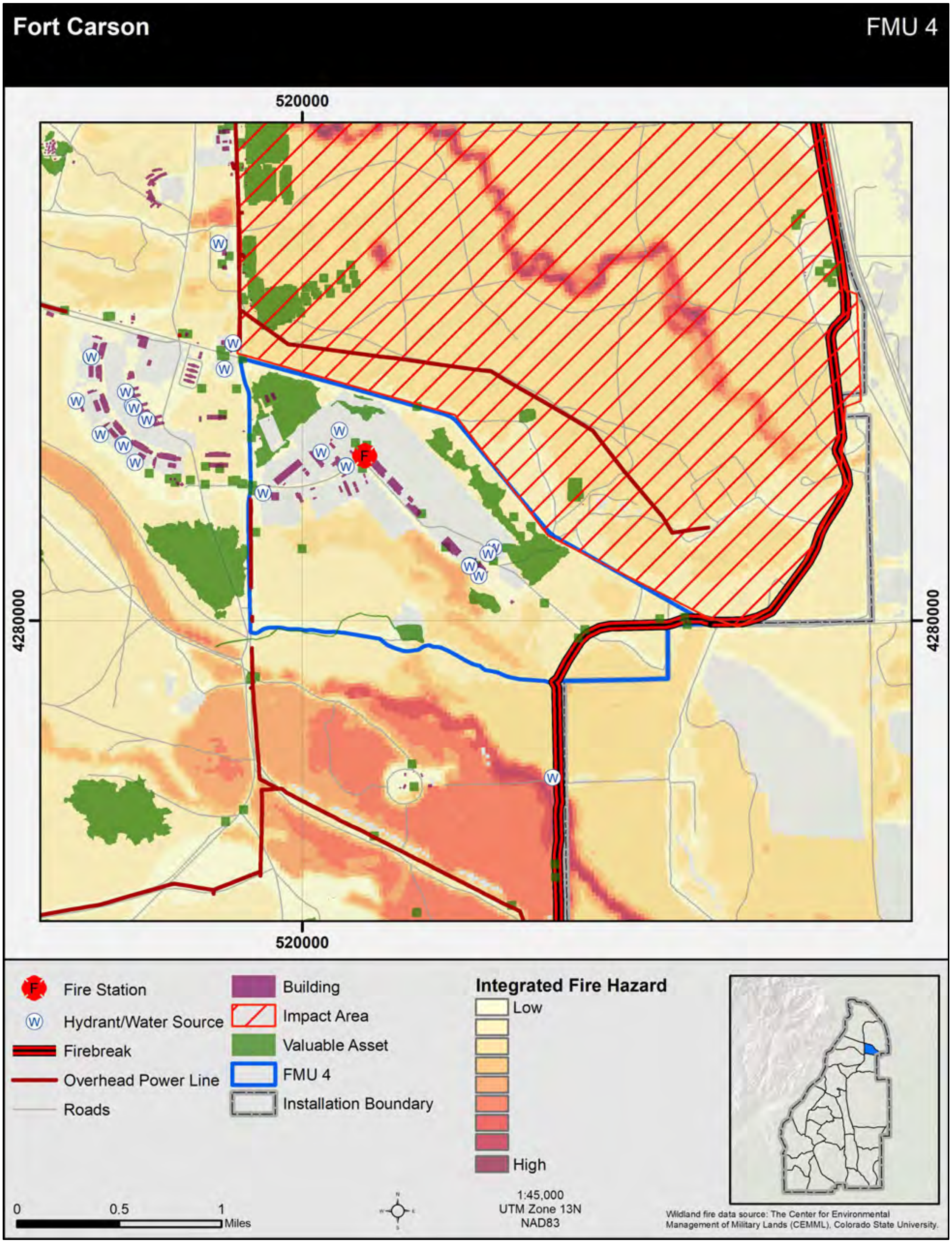


Figure A1 - 6. Map of Fort Carson FMU 4.

FMU 5
Wildfire Response: Full Suppression

Fuel Characteristics

Just over 5% of the area in FMU 5 is classified as non-burnable; the remaining fuels are grasslands, shrublands, and some forested areas. GR2 and GS2 together comprise approximately 79% of the total wildland fuels within FMU 5. Timber litter and timber understory fuel models combine to make up less than 1.5% of the total fuels.

Table A1- 5. Spatial extent, in acres and percentage of total FMU 5 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	4,168.67	70.89%	3,688.06	62.72%
122	GS2	Moderate load; dry climate grass-shrub	960.10	16.33%	960.10	16.33%
104	GR4	Moderate load; dry climate grass	331.15	5.63%	331.15	5.63%
62	CU62	Intermediate roads	231.52	3.94%	231.52	3.94%
63	CU63	Minor roads	46.04	0.78%	46.04	0.78%
188	TL8	Long needle litter	36.47	0.62%	36.47	0.62%
81	CU81	Custom - burnable developed	28.47	0.48%	28.47	0.48%
161	TU1	Low load dry climate timber grass-shrub	22.24	0.38%	22.24	0.38%
101	GR1	Short; sparse dry climate grass	15.12	0.26%	15.12	0.26%
183	TL3	Moderate load conifer litter	13.79	0.23%	13.79	0.23%
98	NB8	Water	12.90	0.22%	12.90	0.22%
61	CU61	Major roads or firebreaks	2.89	0.05%	2.89	0.05%
165	TU5	Very high load; dry climate shrub	2.89	0.05%	2.89	0.05%
182	TL2	Low load broadleaf litter	2.89	0.05%	2.89	0.05%
145	SH5	High load; dry climate shrub	2.22	0.04%	2.22	0.04%
91	NB1	Urban	1.78	0.03%	1.78	0.03%
99	NB9	Barren	0.44	0.01%	0.44	0.01%
124	GS4	High load; humid climate grass-shrub	0.44	0.01%	0.44	0.01%
121	GS1	Low load; dry climate grass-shrub	0.22	0.00%	0.22	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	480.61	8.17%

Topography

Little Fountain Creek, which runs west to east, roughly splits the FMU in half. The area north of the creek is relatively flat with several small drainages that feed into Little Fountain Creek. The area south of the creek consists of several drainages that start from a flat plateau and drop in elevation as they feed into the creek. Overland vehicle travel from north to south in the western portion of the FMU is not possible due to steep and rugged terrain.

Fire Frequency

The fire frequency for the majority of the FMU is low. Areas along the eastern portion of Little Fountain Creek and along MSR 5 can expect moderate fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths of 2 - 4 feet. Areas with a grass-shrub component (GS2) may see up to 6-foot flame lengths. The eastern portion of Little Fountain Creek, which has a taller and denser grass fuel load and is represented by fuel model GR4, may see up to 8-foot flame lengths. An area of tall dense grass, represented by GR4, near MSR 5 may see up to 10-foot flame lengths or greater.

Integrated Fire Hazard

The majority of this FMU has low to moderate integrated fire hazard. The Little Fountain Creek drainage has an elevated IFH, but still in the moderate category. The taller and denser area of grass near MSR 5 has the highest IFH within the FMU, with moderate to high IFH.

Values at Risk

FMU 5 is largely absent of infrastructure as the area is primarily used for maneuver training. Some communication nodes can be found along the periphery of the FMU along roads. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Additional safety factors for FMU 5 include pedestrian traffic along MSR 6, as this is a popular area for physical training (PT).

The steep slopes on the southern portion of the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events.

Fuels Management Actions

The firebreak runs through the western portion of FMU 5. While the firebreak does not exist along the entire FMU 5 boundary, several major roads or highways are adjacent to its boundary.

The FMU contains six is prescribed burn units, all of which have the main purpose of reducing fuel loads.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 5 are to be extinguished as rapidly as possible using full suppression methods with engines. The closets hydrants/water sources are located near the 2nd Brigade Combat Team Fighting Complex within FMU 5. Haymes Reservoir is a reliable water resource, including for aerial buckets.

Fire Escape Potential

The highest potential for fires to escape FMU 5 is along the central portion of the eastern FMU boundary. The fuels here, tall dense grasses (GR4), present potential for high intensity fire behavior. Combined with a moderate fire frequency, this poses the greatest threat of fires leaving the FMU boundary.

An additional area for potential fire escape is in the northwest corner of the FMU. The fuels in this area, a combination of grass (GR2) and grass-shrub (GS2), can produce substantial fire behavior when weather conditions permit, and this area is west of the firebreak. However, potential fire frequency is low in this area and proximity to fire resources should allow for quick response times.

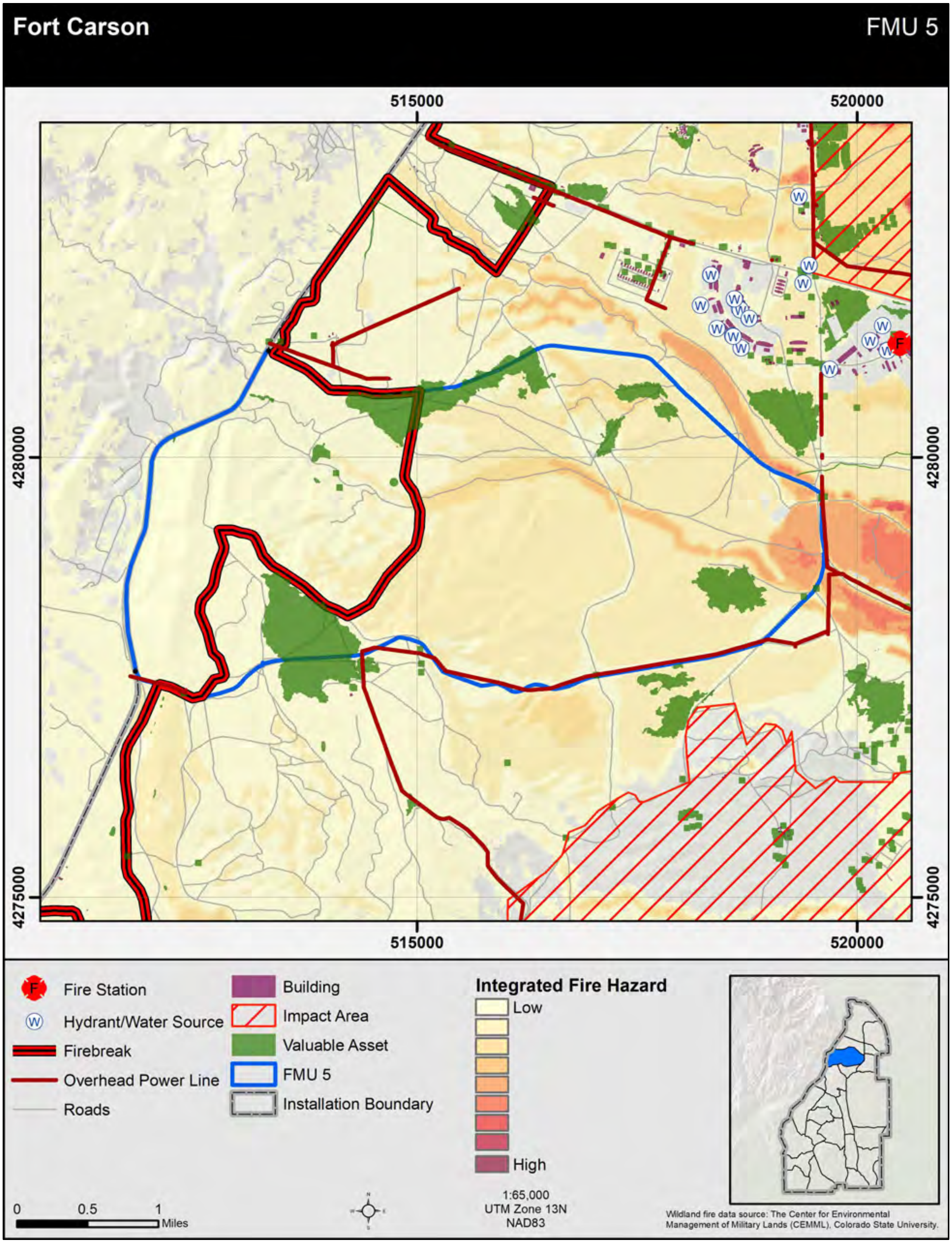


Figure A1 - 7. Map of Fort Carson FMU 5.

FMU 6
Wildfire Response: Full Suppression

Fuel Characteristics

Less than 10% of the area in FMU 6 is classified as non-burnable; the remaining fuels are grasslands. GR2, GR4, and GR1 together comprise approximately 84% of the total wildland fuels within FMU 6. Shrublands and timber fuel models combine to make up less than 3.5% of the total fuels.

Table A1- 6. Spatial extent, in acres and percentage of total FMU 6 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
101	GR1	Short; sparse dry climate grass	1,014.59	37.58%	1,014.59	37.58%
104	GR4	Moderate load; dry climate grass	845.12	31.31%	845.12	31.31%
102	GR2	Low load; dry climate grass	467.93	17.33%	467.93	17.33%
62	CU62	Intermediate roads	139.89	5.18%	139.89	5.18%
124	GS4	High load; humid climate grass-shrub	66.05	2.45%	66.05	2.45%
63	CU63	Minor roads	55.82	2.07%	55.82	2.07%
61	CU61	Major roads or firebreaks	52.93	1.96%	52.93	1.96%
122	GS2	Moderate load; dry climate grass-shrub	24.69	0.91%	24.69	0.91%
81	CU81	Custom - burnable developed	18.01	0.67%	18.01	0.67%
91	NB1	Urban	11.12	0.41%	11.12	0.41%
121	GS1	Low load; dry climate grass-shrub	1.78	0.07%	1.78	0.07%
98	NB8	Water	0.89	0.03%	0.89	0.03%
182	TL2	Low load broadleaf litter	0.44	0.02%	0.44	0.02%
161	TU1	Low load dry climate timber grass-shrub	0.22	0.01%	0.22	0.01%

Topography

Both Rock Creek and Little Fountain Creek pass through the FMU running from west to east. The northern two-thirds is relatively flat while the southern third has rolling hills. Many roads throughout the FMU make much of the area reachable by overland vehicles.

Fire Frequency

The fire frequency for the majority for this FMU is moderate. Areas along the eastern portion of the FMU along MSR 1 can expect high fire frequency.

Flame Length

The areas north of Rock Creek and south of Little Fountain Creek can typically expect flame lengths up to 4 feet. The areas between the creek, which have tall and dense grasses represented by GR4, may see flame lengths of 6 – 10 feet. Fuels within the Rock Creek drainage, which are high load grass-shrubs represented by GS4, can produce flame lengths of 10 feet or more.

Integrated Fire Hazard

The area south of Little Fountain Creek has zero to low integrated fire hazard. The area between Little Fountain Creek and Rock Creek has moderate to High IFH. In fact, the Rock Creek drainage within FMU 6 has some of the highest IFH values found throughout Fort Carson.

Values at Risk

FMU 6 is home to the installations Ammo Holding Area (AHA), which consists of several buildings, structures, and several areas with berms for ammunition storage. Additionally, communication nodes can be found throughout the FMU. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Additional, hazards are associated with the AHA. Ammunition may be exposed to fire when it is in the open, firefighters must use extreme caution while fighting wildfires within or adjacent to the AHA boundary.

Fuels Management Actions

The firebreak runs along the eastern boundary of FMU 6. While the firebreak does not exist along the entire FMU 6 boundary, several major roads or highways are adjacent to its boundary.

The FMU contains four prescribed burn units, three of which are meant for fire protection and environmental purposes, while the burn unit surrounding the AHA is meant to reduce fuel loads.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 6 are to be extinguished as rapidly as possible using full suppression methods with engines. Hydrants/water sources are located along MSR 1.

Fire Escape Potential

The highest potential for fires to escape FMU 6 is along the eastern portion of the Rock Creek drainage. The fuels here are high load grass-shrub (GS4) and tall dense grasses (GR4) and present potential for extreme fire behavior. Combined with a moderate fire frequency, this area poses a significant threat to the FMU and the installation boundary.

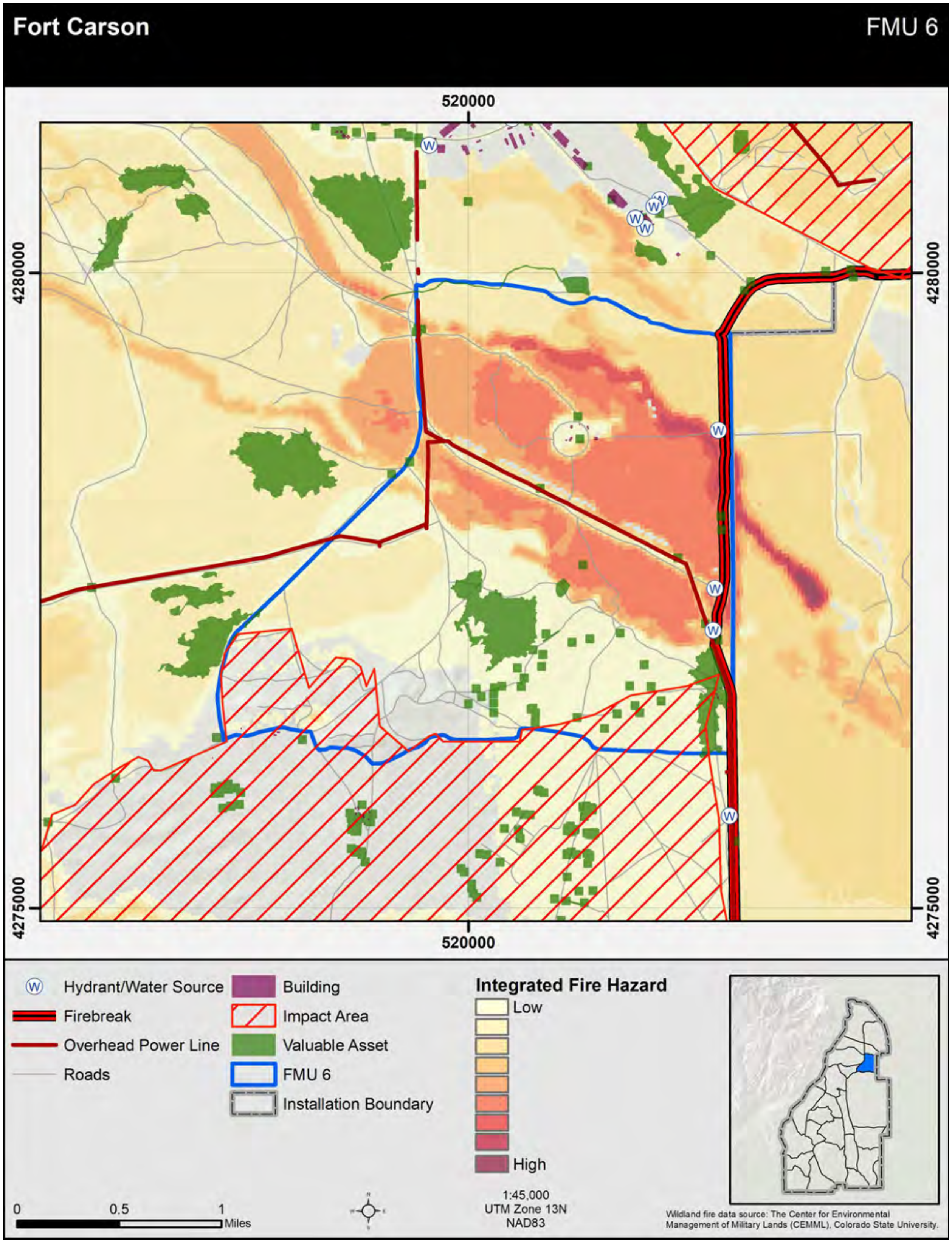


Figure A1 - 8. Map of Fort Carson FMU 6.

FMU 7
Wildfire Response: Full Suppression

Fuel Characteristics

The majority of fuels within the FMU are grasslands. GR1, GR4, and GR2 together comprise approximately 84% of the total wildland fuels within FMU 7. Shrublands fuel models combine to make up less than 8% of the total fuels. Just under 8% of the area in FMU 7 is classified as non-burnable. In addition to these fuels, roughly 187 acres of piñon-juniper woodlands are located throughout the FMU.

Table A1- 7. Spatial extent, in acres and percentage of total FMU 7 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	934.52	73.99%	746.82	59.13%
62	CU62	Intermediate roads	92.07	7.29%	92.07	7.29%
104	GR4	Moderate load; dry climate grass	81.62	6.46%	81.62	6.46%
101	GR1	Short; sparse dry climate grass	45.15	3.57%	45.15	3.57%
121	GS1	Low load; dry climate grass-shrub	40.92	3.24%	40.92	3.24%
145	SH5	High load; dry climate shrub	27.80	2.20%	27.80	2.20%
142	SH2	Moderate load dry climate shrub	26.24	2.08%	26.24	2.08%
161	TU1	Low load dry climate timber grass-shrub	3.11	0.25%	3.11	0.25%
98	NB8	Water	2.89	0.23%	2.89	0.23%
63	CU63	Minor roads	2.67	0.21%	2.67	0.21%
181	TL1	Low load compact conifer litter	2.22	0.18%	2.22	0.18%
141	SH1	Low load dry climate shrub	2.00	0.16%	2.00	0.16%
182	TL2	Low load broadleaf litter	1.11	0.09%	1.11	0.09%
183	TL3	Moderate load conifer litter	0.22	0.02%	0.22	0.02%
185	TL5	High load conifer litter	0.22	0.02%	0.22	0.02%
186	TL6	Moderate load broadleaf litter	0.22	0.02%	0.22	0.02%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	187.71	14.86%

Topography

A series of hills run from the north to the south along the western boundary of the FMU. Near the southern boundary of the FMU, Turkey Creek runs from west to east. The area between the creek and the hills is mostly flat with a few minor drainages running from the northwest towards Turkey Creek. The northern portion of the FMU has steep terrain and a few drainages, making overland travel in vehicles very difficult if not impossible. The rest of the FMU has roads throughout, making access to most of this area reasonable for vehicle traffic.

Fire Frequency

The fire frequency within this FMU is low.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. An area of tall and dense grass represented by GR4, in the southern corner along MSR 11 can expect flame lengths of 4 – 10 feet.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. The grassy area represented by GR4 along MSR 11 has a slightly elevated IFH, but is still considered to be on the lower end.

Values at Risk

FMU 7 contains the Turkey Creek Ranch Historic District and Turkey Creek Recreation Area. The ranch consists of several buildings, barns, storage sheds, and corrals, as well as communication nodes. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 7 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

Fuels Management Actions

The firebreak runs the entire length of the eastern boundary of the FMU and a small section of the FMU's southern boundary. Then it runs north through the FMU to the midpoint of the installation's western boundary and continues along the western boundary south. While the firebreak does not exist along the entire FMU 7 boundary, several major roads or highways are adjacent to its boundary.

The FMU contains three prescribed burn units, all of which are meant to be burned for environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 7 are to be extinguished as rapidly as possible using full suppression methods with engines. Hydrants/water sources and a fire station are located within the ranch area.

Fire Escape Potential

The highest potential for fires to escape FMU 7 is within a narrow strip in the northern portion of the FMU. The fuels here, dry climate shrubs (SH5), present the greatest potential for extreme fire behavior. However, fire frequency in this area is low and the firebreak and highway 115, reduces the likelihood of fires escaping this portion of the FMU.

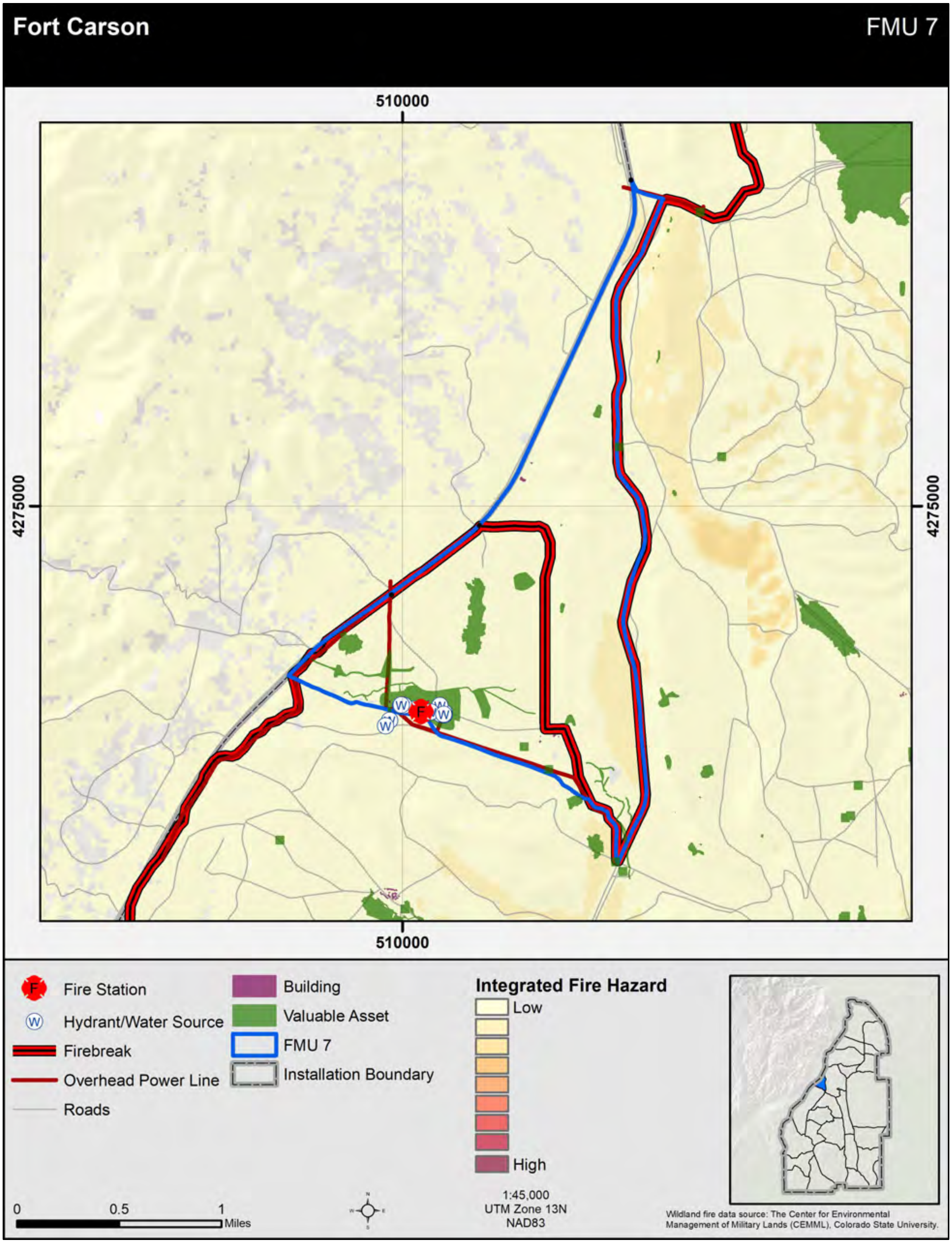


Figure A1 - 9. Map of Fort Carson FMU 7.

FMU 8
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within the FMU are grasslands and grass-shrublands. GR2, GS2, and GR1 together comprise approximately 81% of the total wildland fuels within FMU 8. An area of about 358 acres primarily consisting of gamble oak is represented by SH5. Just over 8% of the area in FMU 8 is classified as non-burnable. In addition to these fuels, roughly 976 acres of piñon-juniper woodlands are located throughout the FMU.

Table A1- 8. Spatial extent, in acres and percentage of total FMU 8 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	3,259.94	62.57%	2,284.05	43.84%
122	GS2	Moderate load; dry climate grass-shrub	609.15	11.69%	609.15	11.69%
101	GR1	Short; sparse dry climate grass	371.63	7.13%	371.63	7.13%
145	SH5	High load; dry climate shrub	358.73	6.89%	358.73	6.89%
99	NB9	Barren	207.72	3.99%	207.72	3.99%
62	CU62	Intermediate roads	174.36	3.35%	174.36	3.35%
121	GS1	Low load; dry climate grass-shrub	88.29	1.69%	88.29	1.69%
63	CU63	Minor roads	57.16	1.10%	57.16	1.10%
161	TU1	Low load dry climate timber grass-shrub	35.58	0.68%	35.58	0.68%
142	SH2	Moderate load dry climate shrub	32.47	0.62%	32.47	0.62%
104	GR4	Moderate load; dry climate grass	10.23	0.20%	10.23	0.20%
188	TL8	Long needle litter	1.56	0.03%	1.56	0.03%
141	SH1	Low load dry climate shrub	1.33	0.03%	1.33	0.03%
181	TL1	Low load compact conifer litter	0.89	0.02%	0.89	0.02%
186	TL6	Moderate load broadleaf litter	0.67	0.01%	0.67	0.01%
185	TL5	High load conifer litter	0.22	0.00%	0.22	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	975.89	18.73%

Topography

FMU 8 features varied terrain with a series of ridges and drainages along its western boundary. In some areas of the FMU, the terrain is steep enough that direct north-south travel is not possible in wildland fire vehicles. Additionally, the western portion of the FMU is rugged with steep terrain and vehicle travel may not be possible. Several intermittent streams run from the northwest to the southeast. Turkey Creek runs along a portion of the FMU’s southern boundary.

Fire Frequency

The fire frequency for the majority of this FMU is low. Some areas in the southwest and southern portion of the FMU can expect moderate fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2) may see up to 6-foot flame lengths. An area of approximately 358 acres of gamble oak, represented by SH5, in northern portion of the FMU along MSR 11, can expect flames lengths of 8 – 10 feet if not more.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. Areas with a grass-shrub component (GS2), as well as areas with gamble oak represented as SH5, have a slightly elevated IFH but still fall into the low range.

Values at Risk

FMU 8 contains portions of ranges 127, 127A, 131A, 131B, and 131C. Each range consists of range buildings, targets, and communication nodes. Unlike many of the buildings found in and around the Small Impact Area, many of these range buildings and infrastructure are located in the midst of wildland fuels, creating a true wildland urban interface. The targets found downrange are at the greatest risk from wildfires; however, vegetation maintenance around them should lessen the risk.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 8 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

Additional safety factors for FMU 8 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

The firebreak runs the entire length of the western boundary and a small section of the northern boundary. While the firebreak does not exist along the entire FMU 8 boundary, several major roads are adjacent to its boundary.

The FMU contains 10 prescribed burn units, with 6 to be burned for environmental purposes, 3 for fuel reduction reasons, and one for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 8 are to be extinguished as rapidly as possible using full suppression methods with engines. The closets hydrants/water sources are located within the Turkey Creek Ranch area in FMU 7.

Fire Escape Potential

The highest potential for fires to escape FMU 8 is along two portions of its western boundary, totaling approximately 1.2 miles, where the boundary does not follow a road. In these areas, there are continuous fuels from FMU 8 into FMU 10. In both cases, most of the fuels are short sparse grass represented by GR1, which do not typically produce intense fire behavior. This, combined with the fact that are there are numerous roads in this part of the installation, should allow firefighters to minimize fires escaping the FMU.

An additional location for potential fire escape is in the northwest corner of FMU 8. The fuels in this area are Gambel oak represented by SH5 and pose the greatest risk for extreme fire behavior. However, fire frequency in this area is low and close proximity to the firebreak reduces the likelihood of fires escaping this portion of the FMU.

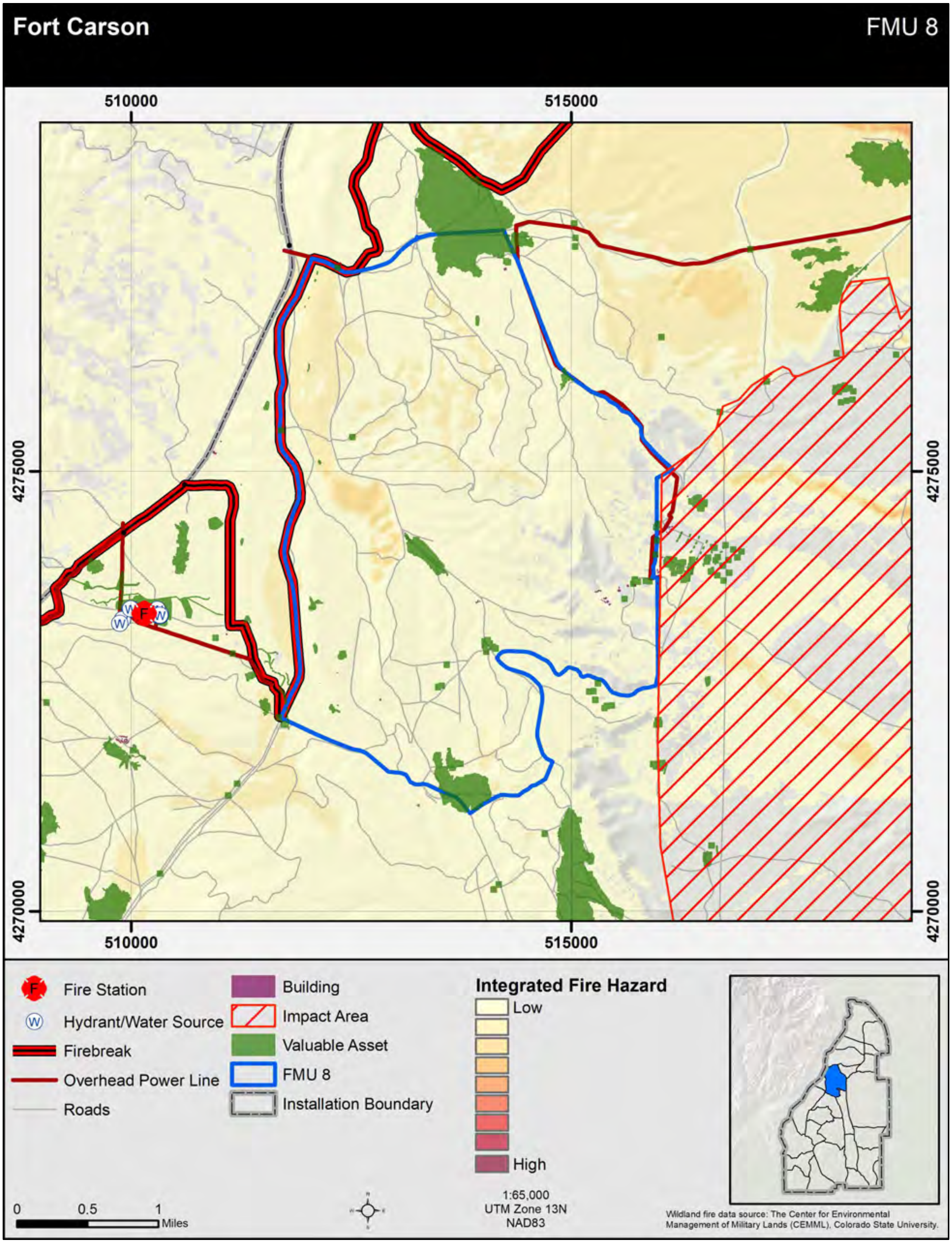


Figure A1 - 10. Map of Fort Carson FMU 8.

FMU 9
Wildfire Response: Full Suppression

Fuel Characteristics

Most of the fuels within the FMU are grasslands and grass-scrublands. GR2, GS2, and GR1 together comprise approximately 93% of the total wildland fuels within FMU 9. Just over 7% of the area in FMU 9 is classified as non-burnable. In addition to these fuels, roughly 219 acres of piñon-juniper woodlands are located throughout the FMU.

Table A1- 9. Spatial extent, in acres and percentage of total FMU 9 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	975.45	60.67%	755.94	47.02%
122	GS2	Moderate load; dry climate grass-shrub	304.91	18.97%	304.91	18.97%
101	GR1	Short; sparse dry climate grass	213.73	13.29%	213.73	13.29%
62	CU62	Intermediate roads	106.53	6.63%	106.53	6.63%
63	CU63	Minor roads	6.89	0.43%	6.89	0.43%
98	NB8	Water	0.22	0.01%	0.22	0.01%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	219.51	13.65%

Topography

Sand Canyon Creek runs from the northwest to the southeast along the western third of the FMU. The western portion of the FMU also features numerous ridges and drainages. A small portion of the very western corner and portions of the western boundary are flat.

Numerous drainages flowing from the west to east in the eastern portion of the FMU will make overland vehicle travel very difficult if not impossible.

Fire Frequency

The fire frequency for the majority of this FMU is moderate. The northwest corner and western portion can typically expect a low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2), in the center of the FMU, may see up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. Areas with a grass-shrub component (GS2) have a slightly elevated IFH but still fall into the low range.

Values at Risk

FMU 9 is largely absent of infrastructure as the area is primarily used for maneuver training. Some communication nodes can be found along the periphery of the FMU along roads. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Additional safety factors for FMU 9 include pedestrian traffic along MSR 6, as this is a popular area for physical training (PT).

The steep slopes on the central portion of the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events.

Fuels Management Actions

As an interior FMU, the firebreak does not share a boundary nor traverse through any portions of the FMU.

The FMU contains 3 prescribed burn units, with all 3 intended to be burned for environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 9 are to be extinguished as rapidly as possible using full suppression methods with engines. The closets hydrants/water sources are located near the 2nd Brigade Combat Team Fighting Complex in FMU 3.

Fire Escape Potential

The entire FMU boundary aligns with well-maintained gravel or paved roads. The one exception is in the southern most portion of the FMU, where a small length of the FMU 9 boundary is approximately 300 feet north of a road where a fire could easily escape to the south. Fires are not likely to escape the remainder of the FMU boundary during typical weather conditions. During times of more extreme fire weather conditions, a portion along the northern FMU boundary, where MSR 6 begins to climb up a hill, the fuels are more robust (GS2) and could represent an area where fires could escape the FMU boundary.

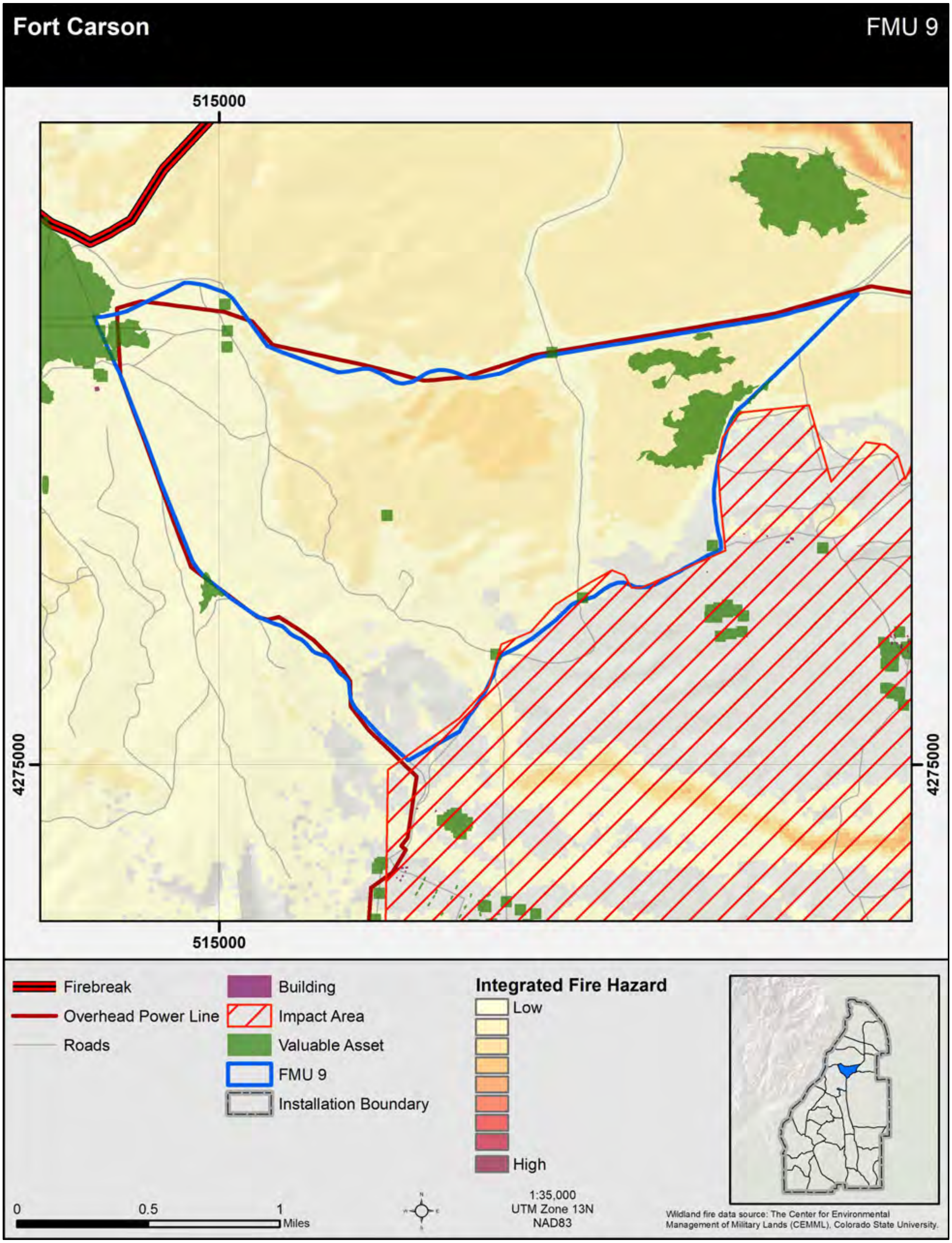


Figure A1 - 11. Map of Fort Carson FMU 9.

FMU 10
Wildfire Response: Monitor and suppress from roads/firebreaks

Fuel Characteristics

Most fuels within the FMU are grasslands. GR1, GR2, and GR4 together comprise approximately 77% of the total wildland fuels within FMU 10. Grass-shrub fuel models combine to make up approximately 16% of the total fuels. Just under 7% of the area in FMU 10 is classified as non-burnable. In addition to these fuels, roughly 17 acres of piñon-juniper woodlands are located primarily along the western border of the FMU.

Table A1- 10. Spatial extent, in acres and percentage of total FMU 10 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
101	GR1	Short; sparse dry climate grass	15,467.48	72.47%	15,467.48	72.47%
121	GS1	Low load; dry climate grass-shrub	1,782.09	8.35%	1,782.09	8.35%
122	GS2	Moderate load; dry climate grass-shrub	1,649.99	7.73%	1,649.99	7.73%
102	GR2	Low load; dry climate grass	930.97	4.36%	914.29	4.28%
99	NB9	Barren	736.14	3.45%	736.14	3.45%
62	CU62	Intermediate roads	552.00	2.59%	552.00	2.59%
63	CU63	Minor roads	182.15	0.85%	182.15	0.85%
104	GR4	Moderate load; dry climate grass	22.02	0.10%	22.02	0.10%
61	CU61	Major roads or firebreaks	21.13	0.10%	21.13	0.10%
147	SH7	Very high load; dry climate shrub	0.00	0.00	16.68	0.08%

Topography

FMU 10 is the largest FMU and has varied terrain. Areas along the eastern boundary are flat to moderately hilly. The western portion of the FMU has more rolling hills than the eastern portion. Numerous intermittent streams, including Young Hollow Creek, Crooked Canyon Creek, and Sand Canyon Creek, run from the west to the east through the FMU. These drainages, plus more without names, may restrict overland vehicle travel. Additionally, this FMU contains the Large Impact Area, which contains UXO that will limit overland vehicle travel to maintained roads.

Fire Frequency

The western and southern portion of this FMU can typical expect low to moderate fire frequency. The central and western boundary experience can typical expect high to very high fire frequency. The Large Impact Area along with the Small Impact Area typically experience the most wildfires on the installation.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2), primarily in the southern portion of the FMU, may see up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. Areas with a grass-shrub component (GS2) have a slightly elevated IFH but is still considered to be on the low end. A small area along MSR 1 with tall dense grass represented by GR4, has the highest IFH within the FMU, ranging from moderate to high.

Values at Risk

FMU 10 contains portions of 27 ranges. Many of the ranges contains range buildings, targets, ammo supply points, and communication nodes. The buildings, communication nodes, and ammo supply points are located within the maintained portion of the ranges and risks from wildfires are low. The targets found throughout the impact area have the greatest risk from wildfires.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 10 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

Additional safety factors for FMU 10 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

An additional hazard found within FMU is unexploded ordnance (UXO). UXOs can detonate when they are disturbed or heated. Traditional firefighting techniques often require surface disturbance (e.g., cutting fireline, dozer operations) and navigation in roadless areas or on rarely used roads on foot or in vehicles (e.g., scouting the fire, placing lookouts, etc.). These activities can detonate UXO. Additionally, the heat from a fire is more than sufficient to cause detonations. Even aerial resources can be harmed by detonations if they are at a low altitude, as is common when engaging a fire.

Due to the presence of UXO within FMU 10, firefighters will not enter unexploded ordnance (UXO) contaminated areas to fight fires without the approval of the IC. In some situations, aerial bucket drops are the only option for direct attack on fires in UXO-contaminated areas. This includes much of the Large Impact Area. If firefighting is to be carried out in the Large Impact Area, firefighters will only travel on and fight fires from the maintained roads.

Fuels Management Actions

The firebreak runs the entire length of the eastern boundary of the FMU.

The Large Impact Area will have a buffer burned along the Large Impact Area boundary, with every reasonably burnable portion of the buffer burned at least once every three years.

Wildfire Management

Default Suppression Strategy: Monitor and suppress from roads/firebreaks

The default suppression strategy for wildfires occurring within FMU 10 will be to monitor and suppress them from roads or firebreaks. Hydrant/water sources are located along MSR 1.

Fire Escape Potential

The highest potential for fires to escape FMU 10 is along its eastern boundary. The high to very high fire frequency along this portion of the FMU represents a significant potential for fire escapes and the proximity of high ignition probability ranges to the FMU and installation boundary increases the concern. Additionally, fire history shows that fires have left the FMU and installation boundary along this border in the past.

The second highest potential for fires to escape FMU 10 is along three portions of its western boundary, two areas in the north totaling approximately 1.2 miles, and one area along the southern part of the western boundary totaling approximately 3.25 miles. These three areas of the FMU boundary do not coincide with a road, although there is a small road in the immediate vicinity of the FMU boundary.

In the two areas on the northern part of the western boundary, most of the fuels are short sparse grasses represented by GR1, which do not typically produce intense fire behavior. Combined with the numerous roads in this part of the installation, firefighters should have a good chance at keeping fires inside this portion of the FMU boundary.

The fuels along the southern portion of the western boundary are more robust and are represented by GR2 and GS2. These fuels, combined with areas of rugged and steep terrain along the immediate edge of the FMU, represent potential escape areas.

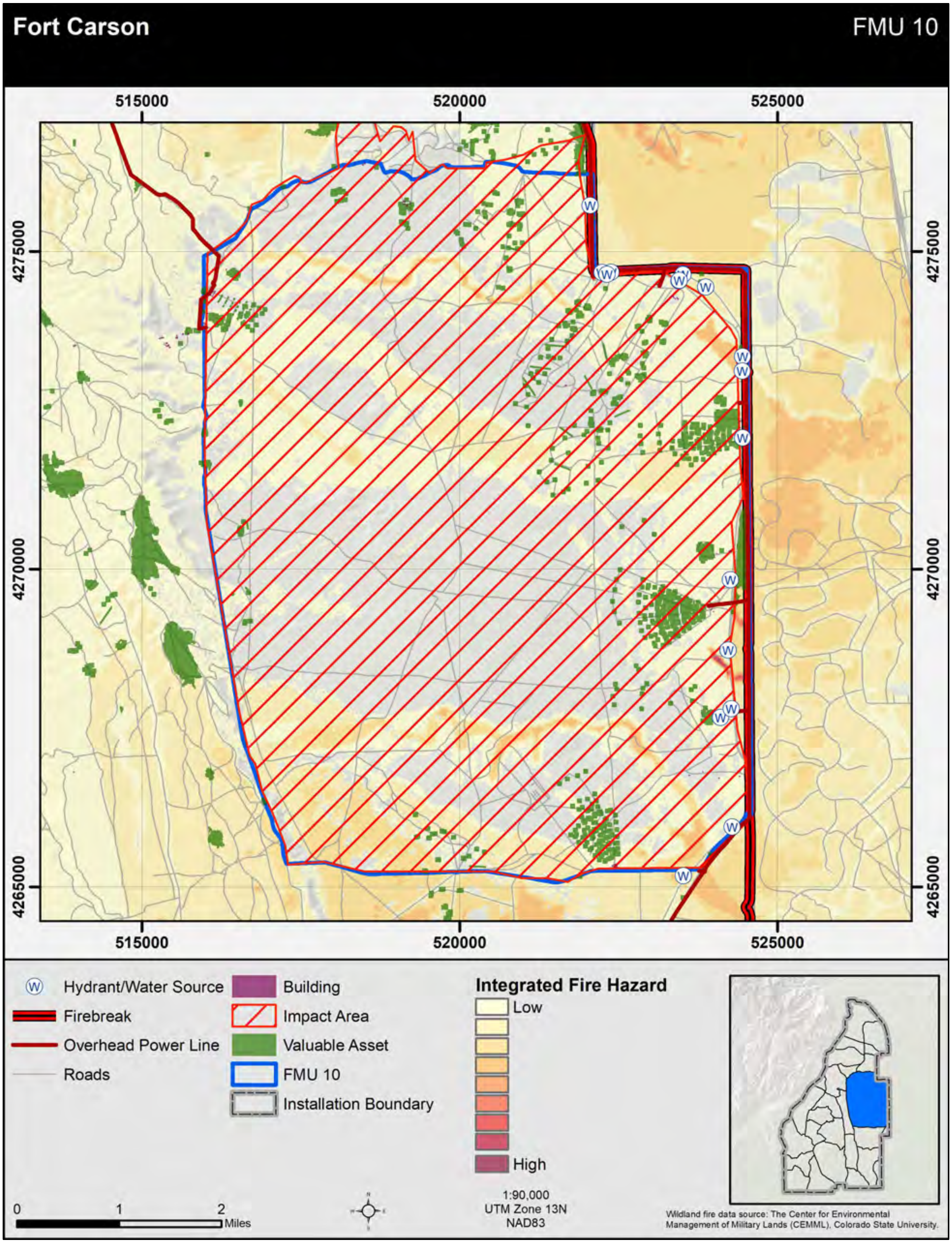


Figure A1 - 12. Map of Fort Carson FMU 10.

FMU 11
Wildfire Response: Full Suppression

Fuel Characteristics

Most of the fuels within the FMU are grasslands. GR2 and GR4 together comprise approximately 90% of the total wildland fuels within FMU 11. Grass-shrub fuel models combine to make up less than 3% of the total fuels. Just over 5% of the area in FMU 11 is classified as non-burnable. In addition to these fuels, roughly 1,750 acres of piñon-juniper woodlands are located throughout the FMU.

Table A1- 11. Spatial extent, in acres and percentage of total FMU 11 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	6,040.16	85.60%	4,290.10	60.80%
104	GR4	Moderate load; dry climate grass	357.84	5.07%	357.84	5.07%
62	NB62	Intermediate roads	178.59	2.53%	178.59	2.53%
122	GS2	Moderate load; dry climate grass-shrub	142.11	2.01%	142.11	2.01%
99	NB9	Barren	107.64	1.53%	107.64	1.53%
101	GR1	Short; sparse dry climate grass	102.97	1.46%	102.97	1.46%
98	NB8	Water	34.92	0.49%	34.92	0.49%
161	TU1	Low load dry climate timber grass-shrub	30.02	0.43%	30.02	0.43%
61	NB61	Major roads or firebreaks	24.69	0.35%	24.69	0.35%
63	NB63	Minor roads	19.79	0.28%	19.79	0.28%
121	GS1	Low load; dry climate grass-shrub	12.23	0.17%	12.23	0.17%
142	SH2	Moderate load dry climate shrub	3.11	0.04%	3.11	0.04%
141	SH1	Low load dry climate shrub	0.89	0.01%	0.89	0.01%
183	TL3	Moderate load conifer litter	0.67	0.01%	0.67	0.01%
182	TL2	Low load broadleaf litter	0.44	0.01%	0.44	0.01%
186	TL6	Moderate load broadleaf litter	0.44	0.01%	0.44	0.01%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	1,750.07	24.80%

Topography

FMU 11 features varied terrain; the northern portion consists of small ridges running from west to east and from northwest to southeast. Between the west-east ridges and northwest-southeast ridges is a large relatively flat area.

The southern portion of the FMU consists of several drainages including, both the East and West Fork Red Creek. These drainages run from north to south in this portion of FMU 11. These drainages and others may restrict overland vehicle travel.

Fire Frequency

The entire FMU can typically expect low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2) may see up to 6-foot flame lengths. Areas of tall dense grass, represented by GR4, can expect flame lengths of 4 – 8 feet.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. Areas represented by GR4 have a slightly elevated IFH but still fall into the low range.

Values at Risk

FMU 11 contains portions of Range 150 (Camp Red Devil) and Range 24. Camp Red Devil consists of buildings, storage sheds, and communication nodes. Most of the infrastructure located in and around Camp Red Devil is located within the maintained portion of the range and risks from wildfires are low.

Range 24 is used as a MOUT and consists of mostly metal shipping containers. Any wooden facade in this area would potentially be at risk from a wildfire. However, the MOUT is located in an area that is almost void of vegetation.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 11 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

Both Camp Red Devil and Range 24 are non-live ranges and the hazards associated with live-fire ranges are not present within FMU 11.

Fuels Management Actions

The firebreak runs the entire length of the FMU's western boundary. While the firebreak does not exist along the entire FMU 11 boundary, several major roads are adjacent to its boundary.

The FMU contains 23 prescribed burn units, with 4 to be burned for environmental purposes, 1 for fuel reduction reasons, and 18 for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 11 are to be extinguished as rapidly as possible using full suppression methods with engines. The closest hydrants/water sources are located within the Turkey Creek Ranch area in FMU 7.

Fire Escape Potential

The highest potential for fires to escape FMU 11 is in the northeast corner. Tall dense grasses represented by GR4 butt up against the boundary. Additionally, during extreme fire behavior events, some of the fuels in this area are represented by very high load shrubs (SH7), meant to represent piñon and juniper woodlands. During extreme fire weather conditions, these fuels could cause spot fires to cross the FMU boundary.

A second area with fire escape potential is along the southern portion of the western boundary. A small drainage vegetated with tall dense grasses, represented as GR4, is surrounded by piñon and juniper woodlands. The combination of flashy fuels in the drainage with dense piñon-juniper woodlands that could burn in a crown fire, or at least torch, may create difficult firefighting conditions near the installation boundary.

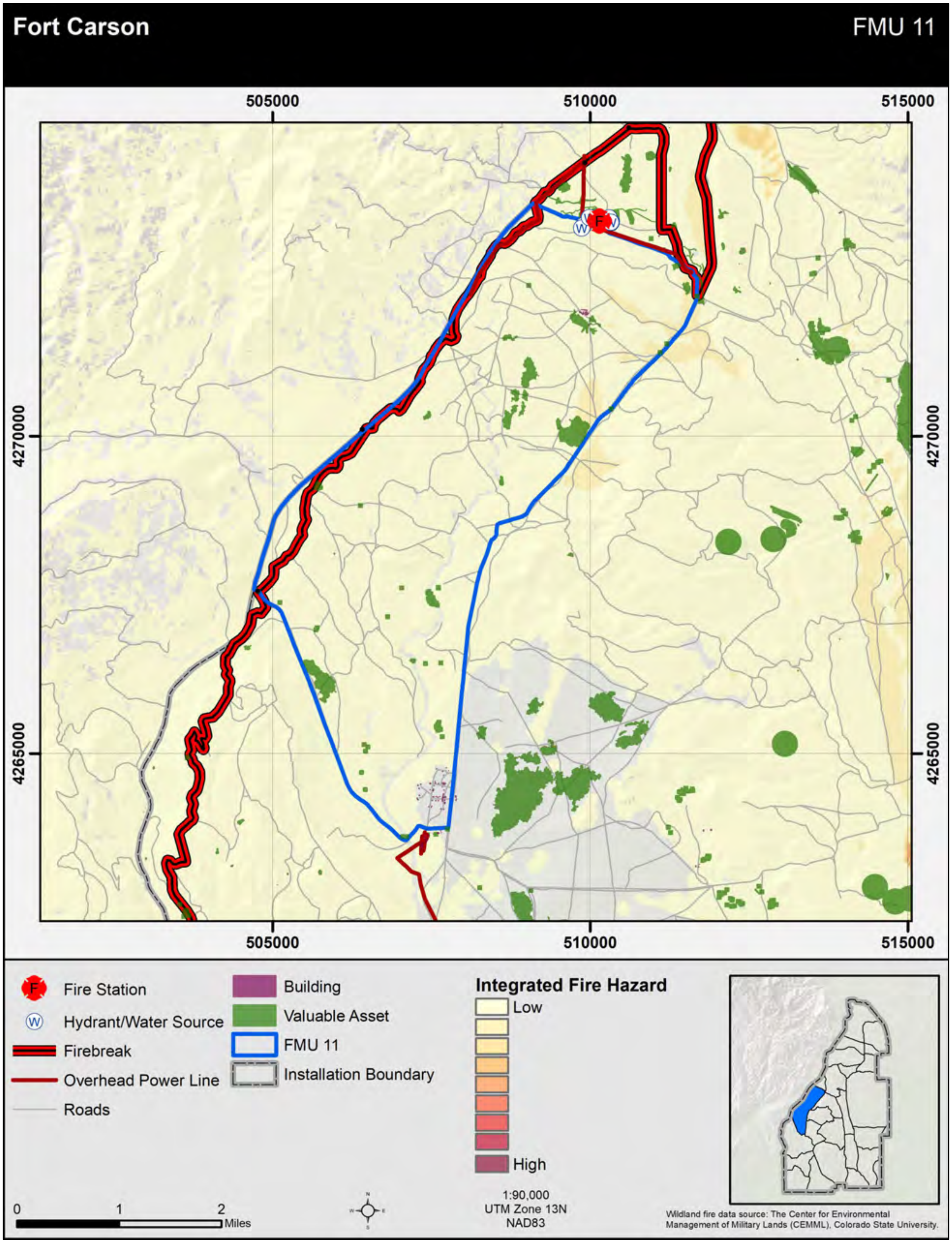


Figure A1 - 13. Map of Fort Carson FMU 11.

FMU 12
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within the FMU are piñon-juniper woodlands, represented by GR2 during normal weather conditions and SH7 during extreme weather conditions. Just under 2% of the area in FMU 12 is classified as non-burnable.

Table A1- 12. Spatial extent, in acres and percentage of total FMU 12 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	3,078.91	91.47%	1,001.69	29.76%
101	GR1	Short; sparse dry climate grass	220.84	6.56%	220.84	6.56%
104	GR4	Moderate load; dry climate grass	26.91	0.80%	26.91	0.80%
63	CU63	Minor roads	22.46	0.67%	22.46	0.67%
62	CU62	Intermediate roads	12.45	0.37%	12.45	0.37%
99	NB9	Barren	4.23	0.13%	4.23	0.13%
147	SH7	Very high load; dry climate shrub	0.00	0.00	2,077.22	61.71%

Topography

The majority of FMU 12 features prominent ridges and rolling hills. Some valleys between the ridges are fairly flat. Several drainages, which generally flow from north to south, may restrict overland vehicle travel.

Fire Frequency

The entire FMU can typically expect low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas of tall dense grass, represented by GR4, can expect flame lengths of 4 – 8 feet.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. Areas represented by GR4 have a slightly elevated IFH but still fall into the low range.

Values at Risk

FMU 12 is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Steep slopes throughout the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events.

Fuels Management Actions

As an interior FMU, the firebreak does not share a boundary nor traverse through any portions of the FMU.

The FMU contains 9 prescribed burn units, with 6 to be burned for environmental purposes, 1 for fuel reduction reasons, and 2 for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 12 are to be extinguished as rapidly as possible using full suppression methods with engines. The closest hydrant/water sources are located near the Turkey Creek Ranch area within FMU 7.

Fire Escape Potential

Fires are most likely to escape FMU 12 along its northern border, where there is a roughly half-mile section that does not coincide with a road. There are also portions of the northern border that are both steep and vegetated with dense forest. These locations may represent control difficulties during a fire. The fuels throughout much of FMU 12 are GR2 and GR4, with SH7 representing the forested areas during extreme fire weather conditions. The GR4 and SH7 in particular will produce substantial fire behavior that may strain containment at the boundaries on the north and east sides.

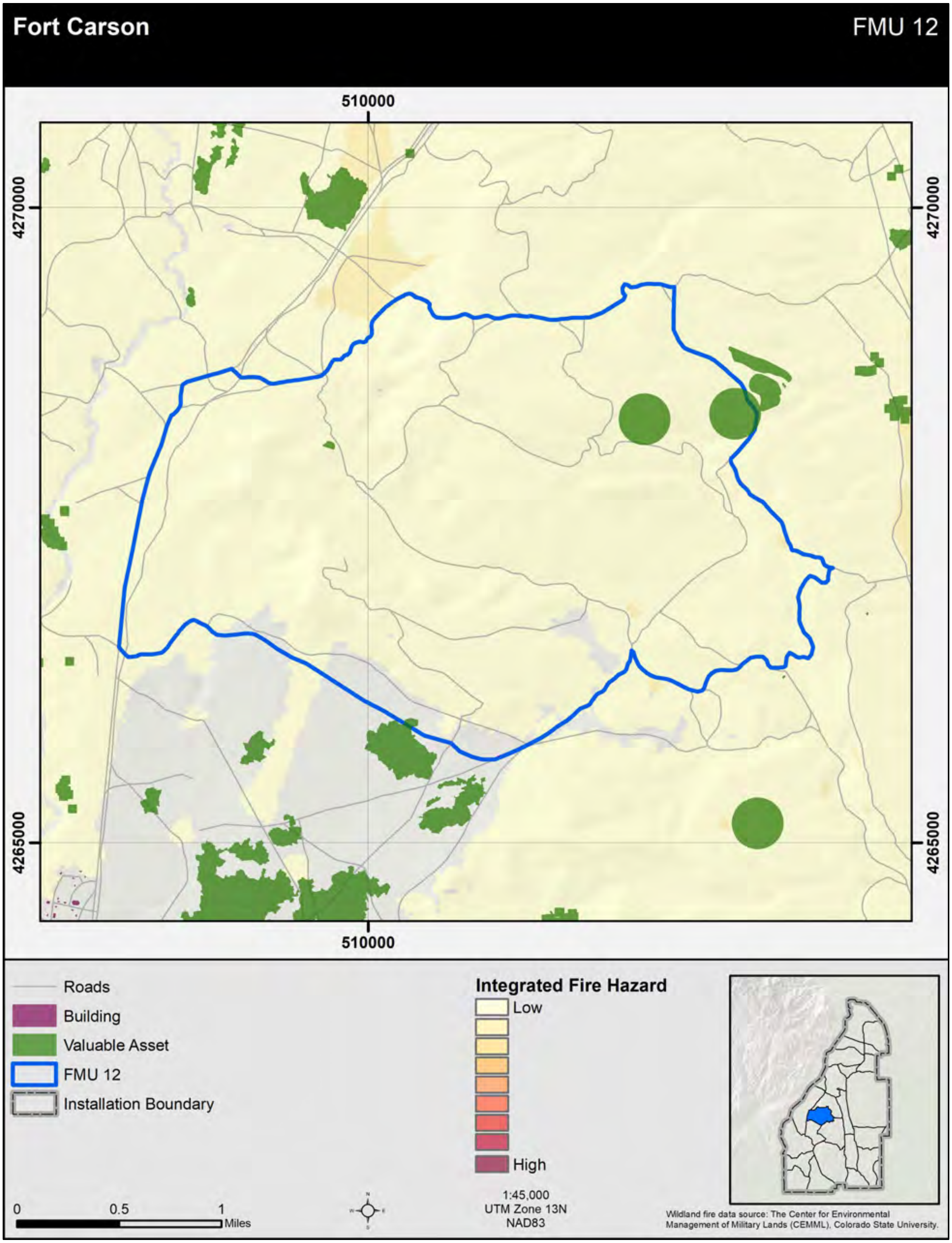


Figure A1 - 14. Map of Fort Carson FMU 12.

FMU 13
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within the FMU are piñon-juniper woodlands, represented by GR2 during normal weather conditions and SH7 during extreme weather conditions. Just under 2.5% of the area in FMU 13 is classified as non-burnable.

Table A1- 13. Spatial extent, in acres and percentage of total FMU 13 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	3,234.14	91.02%	1,337.51	37.64%
104	GR4	Moderate load; dry climate grass	228.85	6.44%	228.85	6.44%
62	CU62	Intermediate roads	55.82	1.57%	55.82	1.57%
63	CU63	Minor roads	32.03	0.90%	32.03	0.90%
101	GR1	Short; sparse dry climate grass	2.00	0.06%	2.00	0.06%
99	NB9	Barren	0.22	0.01%	0.22	0.01%
161	TU1	Low load dry climate timber grass-shrub	0.22	0.01%	0.22	0.01%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	1,896.63	53.38%

Topography

The majority of FMU 13 features ridges and rolling hills. A prominent valley runs north to south along the eastern boundary, with the Turkey Creek drainage running down the middle of the valley. Portions of the more hilly area of the FMU may restrict overland vehicle travel, especially where roads do not exist.

Fire Frequency

The entire FMU can typically expect low to moderate fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas represented by tall dense grass (GR4), found along the western boundary of the FMU, can expect flame lengths of 4 – 8 feet.

Integrated Fire Hazard

The majority of this FMU has low integrated fire hazard. Areas represented by tall dense grassy areas (GR4) have a slightly elevated IFH but still fall into the low range.

Values at Risk

FMU 13 contains portions of Range 127, which contains both mobile and stationary targets. The targets found throughout the range have the greatest risk from wildfires.

The land outside of the range footprint is largely absent of infrastructure, as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Steep slopes throughout the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events.

Additional safety factors for FMU 13 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

As an interior FMU, the firebreak does not share a boundary nor traverse through any portions of the FMU.

The FMU contains portions of 6 prescribed burn units, with 2 to be burned for environmental purposes and 4 for fuel reduction reasons.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 13 are to be extinguished as rapidly as possible using full suppression methods with engines. The closest water resources are located near the Turkey Creek Ranch area within FMU 7.

Fire Escape Potential

Portions of the southern border of FMU 13 are vegetated with dense forest that may pose containment issues when winds are from the north. Along the western boundary in the northwest corner, heavy GR4 grass fuels also present an opportunity for escape, although historical wind patterns are not conducive to pushing the fire to the northwest.

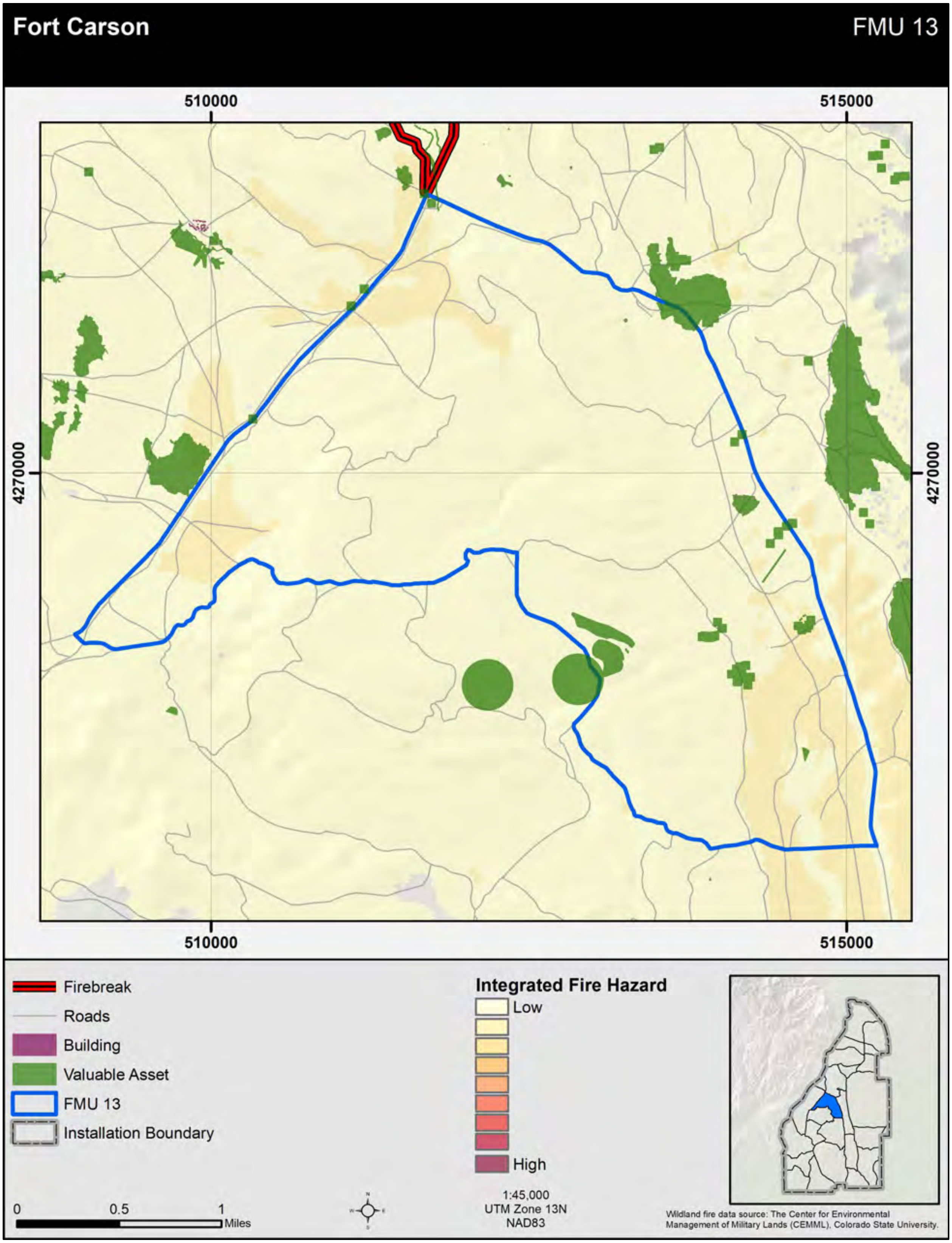


Figure A1 - 15. Map of Fort Carson FMU 13.

FMU 14
Wildfire Response: Full Suppression

Fuel Characteristics

The majority of fuels within the FMU are grasslands. GR2 and GR1 together comprise approximately 80% of the total wildland fuels within FMU 14. Grass-shrub and shrub fuel models combine to make up less than 6% of the total fuels. Just under 14% of the area in FMU 14 is classified as non-burnable. In addition to these fuels, roughly 284 acres of piñon-juniper woodlands are located primarily in the northwest corner of the FMU.

Table A1- 14. Spatial extent, in acres and percentage of total FMU 14 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	2,754.87	77.00%	2,470.42	69.05%
99	NB9	Barren	322.70	9.02%	322.70	9.02%
62	NB62	Intermediate roads	154.35	4.31%	154.35	4.31%
122	GS2	Moderate load; dry climate grass-shrub	150.12	4.20%	150.12	4.20%
101	GR1	Short; sparse dry climate grass	121.43	3.39%	121.43	3.39%
121	GS1	Low load; dry climate grass-shrub	42.92	1.20%	42.92	1.20%
63	NB63	Minor roads	17.35	0.48%	17.35	0.48%
104	GR4	Moderate load; dry climate grass	7.78	0.22%	7.78	0.22%
161	TU1	Low load dry climate timber grass-shrub	4.45	0.12%	4.45	0.12%
141	SH1	Low load dry climate shrub	1.56	0.04%	1.56	0.04%
142	SH2	Moderate load dry climate shrub	0.22	0.01%	0.22	0.01%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	284.45	7.95%

Topography

The majority of FMU 14 features ridges and rolling hills. However, the northern half of the FMU contains more rugged terrain. Multiple gullies and steep sided drainages impede vehicle travel there.

Fire Frequency

The FMU can typically expect low to moderate fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2), found along the southeastern boundary of the FMU, may see up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. Areas represented by grass-shrub fuel models (GS2), have a slightly elevated IFH but still fall into the low range.

Values at Risk

FMU 14 contains portions of Range 127A, which contains both mobile and stationary targets. The targets found throughout the range are the greatest risk from wildfires.

The land outside of the range footprint, is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Steep slopes throughout the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events.

Additional safety factors for FMU 14 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

As an interior FMU, the firebreak does not share a boundary nor traverse through any portions of the FMU.

The FMU contains portions of 6 prescribed burn units, with all 6 to be burned for fuel reduction reasons.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 14 are to be extinguished as rapidly as possible using full suppression methods with engines. For the northern portion of the FMU, the closest water resources are located near the Turkey Creek Ranch area within FMU 7. Fort the southern portion of the FMU, the closest water resources are located in FMU 19.

Fire Escape Potential

Steep terrain and dense piñon-juniper woodlands on the northern boundary may result in high intensity fire when it is windy and dry. The topography could also create unpredictable winds as well as difficult off-road firefighting conditions.

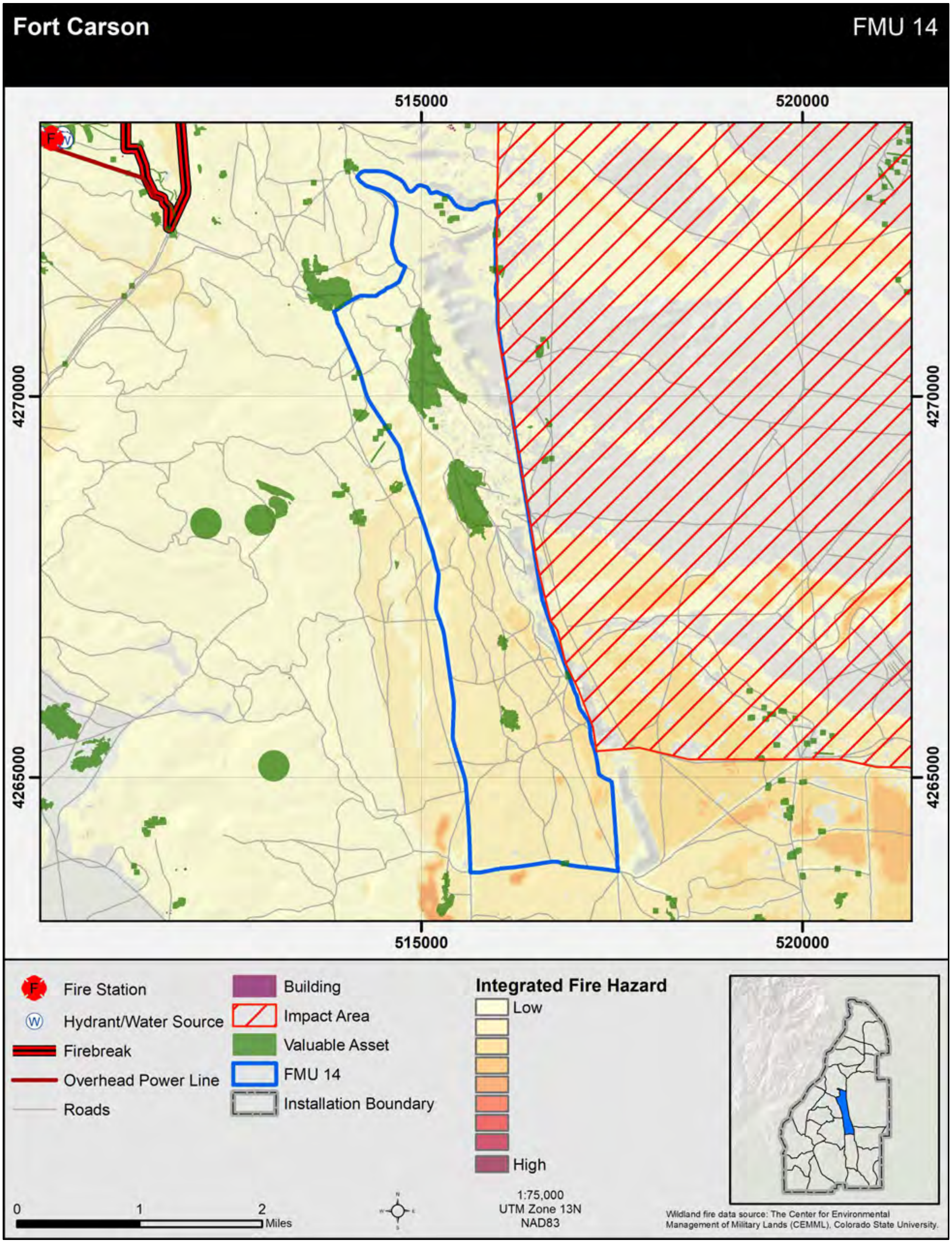


Figure A1 - 16. Map of Fort Carson FMU 14.

FMU 15
Wildfire Response: Full Suppression

Fuel Characteristics

The majority of fuels within the FMU are grasslands. GR2 and GR1 together comprise approximately 92% of the total wildland fuels within FMU 15. Just under 7% of the area in FMU 15 is classified as non-burnable. In addition to these fuels, an area of roughly 2,991 acres of piñon-juniper woodlands are located throughout the FMU.

Table A1- 15. Spatial extent, in acres and percentage of total FMU 15 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	6,661.99	86.18%	3,670.71	47.49%
101	GR1	Short; sparse dry climate grass	491.06	6.35%	491.06	6.35%
99	NB9	Barren	272.66	3.53%	272.66	3.53%
62	NB62	Intermediate roads	167.69	2.17%	167.69	2.17%
104	GR4	Moderate load; dry climate grass	77.40	1.00%	77.40	1.00%
63	NB63	Minor roads	46.48	0.60%	46.48	0.60%
61	NB61	Major roads or firebreaks	5.56	0.07%	5.56	0.07%
122	GS2	Moderate load; dry climate grass-shrub	2.67	0.03%	2.67	0.03%
91	NB1	Urban	1.33	0.02%	1.33	0.02%
121	GS1	Low load; dry climate grass-shrub	1.11	0.01%	1.11	0.01%
183	TL3	Moderate load conifer litter	0.89	0.01%	0.89	0.01%
103	GR3	Low load; very coarse; humid climate grass	0.44	0.01%	0.44	0.01%
182	TL2	Low load broadleaf litter	0.44	0.01%	0.44	0.01%
161	TU1	Low load dry climate timber grass-shrub	0.22	0.00%	0.22	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	2,991.28	38.70%

Topography

FMU 15 features varied terrain; the northern portion consists of ridges and valleys running from north to south. These ridges are fairly steep and do not allow for west to east travel in vehicles. Travel for most of the FMU will be restricted to roads. The FMU begins to flatten out starting roughly two-thirds of the way south. The East Fork Red Creek drainage flows through the southern portion of the installation from the north to the southwest.

Fire Frequency

The entire FMU can typically expect low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas of tall dense grass represented by GR4, can expect flame lengths of 4 – 8 feet.

Integrated Fire Hazard

The entire FMU has zero to low integrated fire hazard.

Values at Risk

FMU 15 contains portions of Range 150 (Camp Red Devil) and Range 152. Camp Red Devil consists of buildings, storage sheds, and communication nodes. Most of the infrastructure located in and around Camp Red Devil is located within the maintained portion of the range and risks from wildfires are low.

Range 152 is used for land navigation and maneuver training, and as such is largely absent of infrastructure.

There are also numerous cultural and natural resources found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 15 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

Both Camp Red Devil and Range 152 are non-live-fire ranges and the hazards associated with live-fire ranges are not present within FMU 15.

The steep slopes within the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events.

Fuels Management Actions

The firebreak runs adjacent to the western boundary. While the firebreak does not exist along the entire FMU 15 boundary, several major roads are adjacent to its boundary.

The FMU contains 14 prescribed burn units, with 4 to be burned for environmental purposes, 5 for fuel reduction reasons, and 5 for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 15 are to be extinguished as rapidly as possible using full suppression methods with engines. The closets hydrants/water sources are located within the Turkey Creek Ranch area in FMU 7.

Fire Escape Potential

Should a fire burn to the west of the firebreak, which ranges from 0.2 miles to 0.5 miles away from the western boundary of the FMU, there is a substantial risk of escape to the west. Much of this area between the FMU western boundary and the firebreak is piñon-juniper woodlands, represented as SH7 during extreme weather conditions. These fuels are capable of crown fires and causing spot fires, both of which can lead to fire escapes.

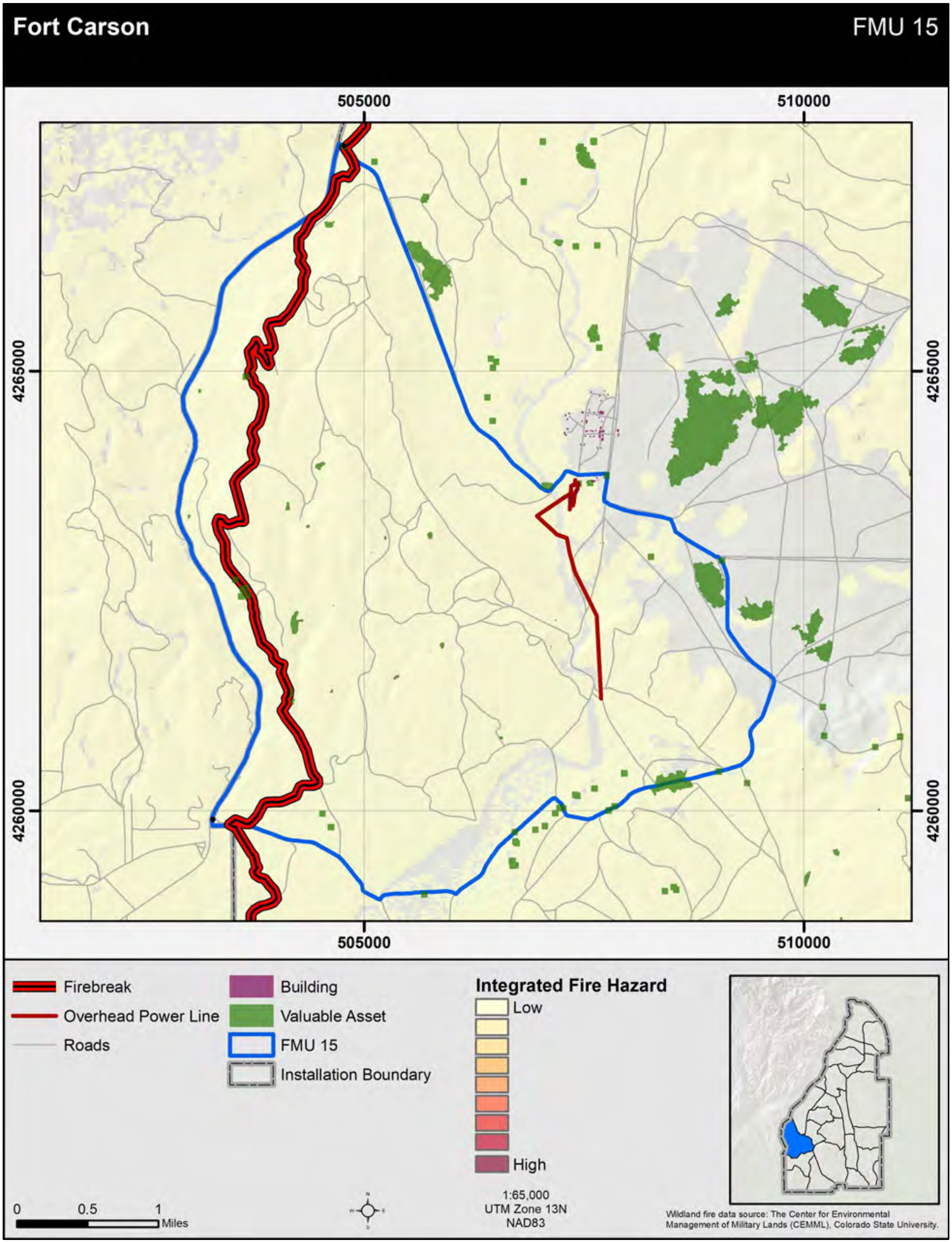


Figure A1 - 17. Map of Fort Carson FMU 15.

FMU 16
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within the FMU are grasslands. GR1 and GR2 together comprise approximately 94% of the total wildland fuels within FMU 14. Just over 4% of the area in FMU 16 is classified as non-burnable. In addition to these fuels, roughly 15 acres of piñon-juniper woodlands are located primarily in the northwest corner of the FMU.

Table A1- 16. Spatial extent, in acres and percentage of total FMU 16 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
101	GR1	Short; sparse dry climate grass	2,667.69	90.47%	2,667.69	90.47%
102	GR2	Low load; dry climate grass	131.22	4.45%	115.65	3.92%
62	CU62	Intermediate roads	69.17	2.35%	69.17	2.35%
63	CU63	Minor roads	36.47	1.24%	36.47	1.24%
104	GR4	Moderate load; dry climate grass	29.13	0.99%	29.13	0.99%
60	CU60	Airfield	12.90	0.44%	12.90	0.44%
61	CU61	Major roads or firebreaks	1.11	0.04%	1.11	0.04%
99	NB9	Barren	0.89	0.03%	0.89	0.03%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	15.57	0.53%

Topography

The majority of FMU 16 is relatively flat with one prominent hill located in the central portion of the FMU near the western boundary. There are numerous roads throughout the FMU and topography should not hinder overland vehicle travel.

Fire Frequency

The entire FMU can typically expect low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Small areas with tall dense grass represented by GR4 may see up to 8-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard.

Values at Risk

FMU 16 contains portions of range 150 (Camp Red Devil), range 149 and 157. Camp Red Devil consists of buildings, storage sheds, and communication nodes. Most of the infrastructure located in and around Camp Red Devil is located within the maintained portion of the range and risks from wildfires are low.

Range 149, the air defense missile firing range, does not have any infrastructure.

A small portion of range 157 is within the FMU, although most of its infrastructure is not within the FMU 16 boundary.

The land outside of the range footprint, is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 16 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

Camp Red Devil is a non-live-fire range, while ranges 149 and 157 are live-fire.

Additional safety factors for FMU 16 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

As an interior FMU, the firebreak does not share a boundary nor traverse through any portions of the FMU.

The FMU contains 5 prescribed burn units, with 4 for fuel reduction reasons, and 1 for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 16 are to be extinguished as rapidly as possible using full suppression methods with engines. The closets hydrants/water sources are located within the Turkey Creek Ranch area in FMU 7.

Fire Escape Potential

The northern and eastern boundaries are defined by two-track roads, which imagery indicates sometimes contain fuels within the roadbed. In these locations, fires could escape the FMU.

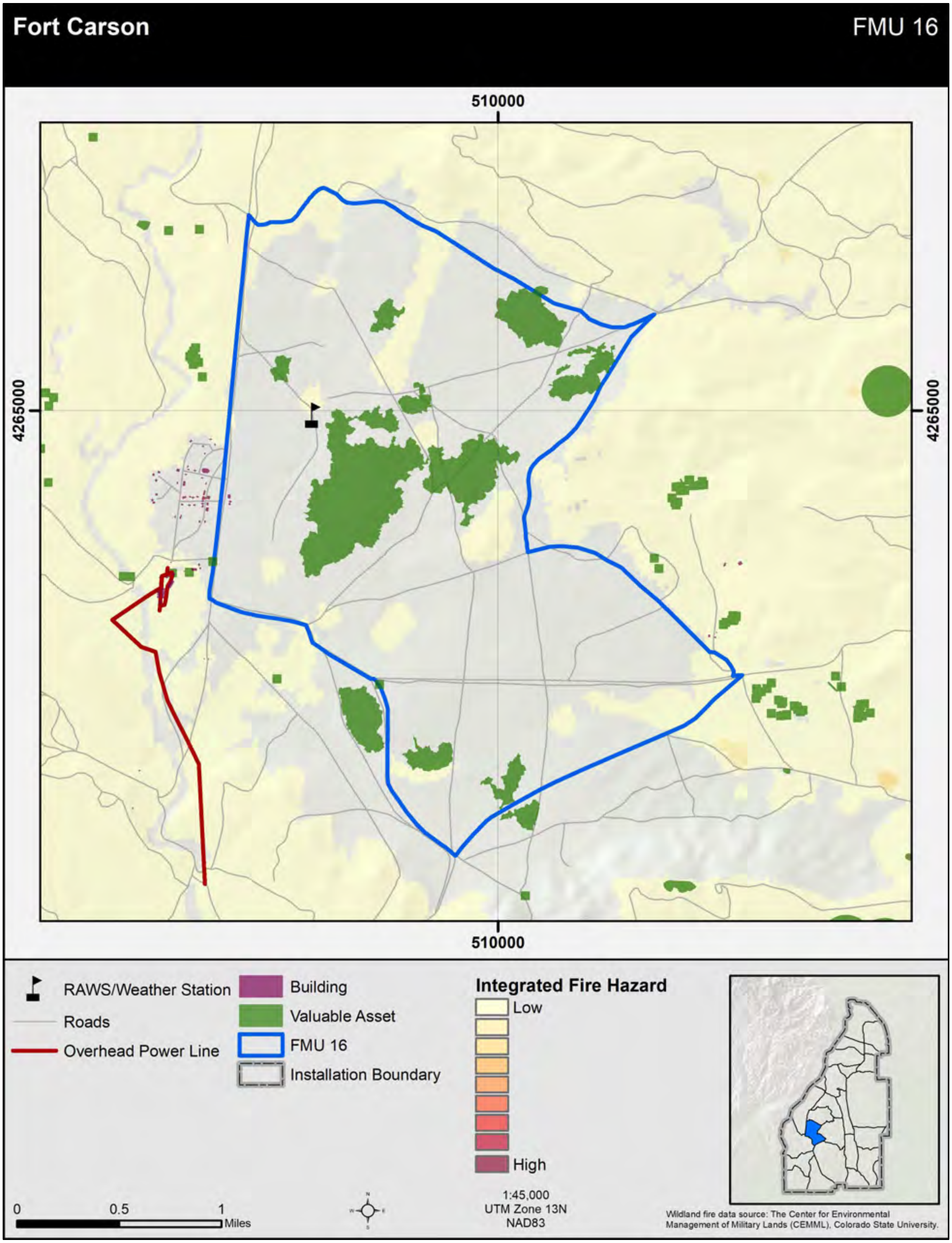


Figure A1 - 18. Map of Fort Carson FMU 16.

FMU 17
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within the FMU are piñon-juniper woodlands, represented by GR2 during normal weather conditions and SH7 during extreme weather conditions. Less than 2% of the area in FMU 17 is classified as non-burnable.

Table A1- 17. Spatial extent, in acres and percentage of total FMU 17 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	4,861.00	89.22%	2,006.72	36.83%
101	GR1	Short; sparse dry climate grass	239.97	4.40%	239.97	4.40%
104	GR4	Moderate load; dry climate grass	229.96	4.22%	229.96	4.22%
62	CU62	Intermediate roads	62.72	1.15%	62.72	1.15%
122	GS2	Moderate load; dry climate grass-shrub	32.03	0.59%	32.03	0.59%
63	CU63	Minor roads	10.45	0.19%	10.45	0.19%
99	NB9	Barren	10.23	0.19%	10.23	0.19%
98	NB8	Water	2.22	0.04%	2.22	0.04%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	2,854.28	52.39%

Topography

The western portion of the FMU is comprised of hills, ridge lines, valleys, and drainages. The western portion is higher in elevation and gradually drops going east towards Turkey Creek. The terrain is varied and in some areas fairly steep. The many ridges and drainages found throughout the middle of the FMU will make overland vehicle travel difficult if not impossible for large portions of the FMU.

The area along Turkey Creek and the southern portion of the FMU are relatively flat when compared to the rest of the FMU.

Fire Frequency

The western portion of this FMU can typically expect low fire frequency. The central and eastern portion can typically expect low to moderate fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas along the Turkey Creek drainage, with tall dense grass represented by GR4, may see up to 8-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. Areas represented by GR4, have an elevated IFH and fall into the moderate category.

Values at Risk

FMU 17 contains portions of Ranges 127, 143, 157, 159, 161, 163, and 165. These ranges mostly consist of just targets, although Ranges 157 and 159 do have buildings within their footprints.

The land outside of the range footprints is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 17 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

The steep slopes within the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events.

All seven ranges that have portions of their footprints within FMU 17 are live-fire ranges.

Additional safety factors for FMU 17 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

As an interior FMU, the firebreak does not share a boundary nor traverse through any portions of the FMU.

The FMU contains portions of nine prescribed burn units, with two to be burned for environmental purposes, three for fuel reduction reasons, and four for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 17 are to be extinguished as rapidly as possible using full suppression methods with engines. The closets hydrants/water sources for the northern portion of the FMU are located within the Turkey Creek Ranch area in FMU 7. For the southern portion the closets hydrants/water sources are located within FMU 18 and FMU 19.

Fire Escape Potential

The highest potential for fires to escape FMU 17 is in the southeast corner of the FMU where Turkey Creek crosses the southern boundary. The tall dense grasses (GR4) could push across the road, particularly under northerly wind conditions.

Much of the northern boundary is defined by a rarely maintained road that imagery indicates is sometimes overgrown. The lack of maintenance on this road, the high potential for southerly winds during high fire danger periods, and the potential for individual tree torching in the piñon-juniper woodlands all facilitate fires crossing the northern boundary.

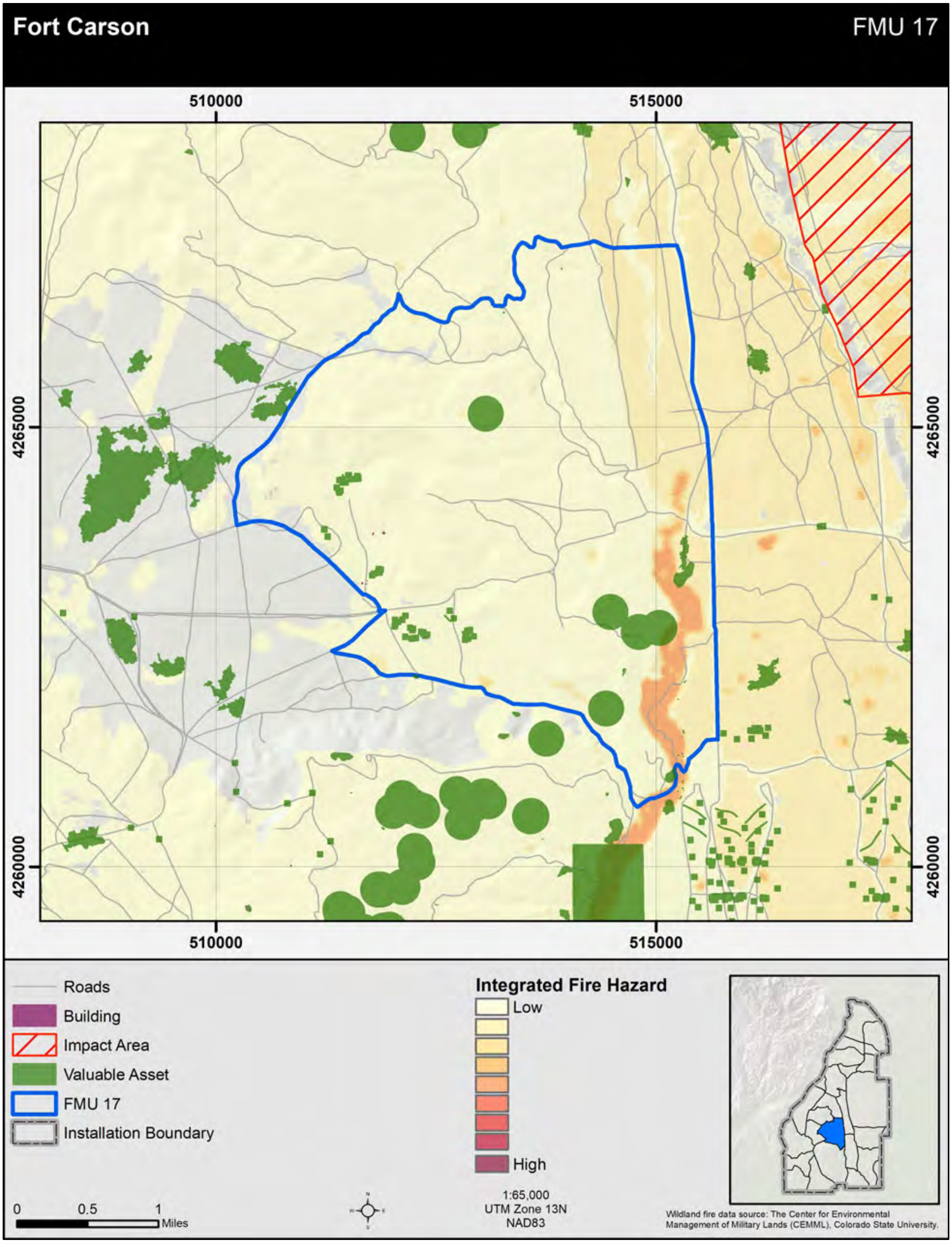


Figure A1 - 19. Map of Fort Carson FMU 17.

FMU 18
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within FMU 18 are grasses, with GR2 making up approximately 89% of the total fuels. Just under 11% of the area in FMU 18 is classified as non-burnable.

Table A1- 18. Spatial extent, in acres and percentage of total FMU 18 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	3,529.71	89.17%	3,529.71	89.17%
62	NB62	Intermediate roads	243.08	6.14%	243.08	6.14%
63	NB63	Minor roads	127.44	3.22%	127.44	3.22%
99	NB9	Barren	40.70	1.03%	40.70	1.03%
104	GR4	Moderate load; dry climate grass	17.35	0.44%	17.35	0.44%

Topography

The northern portions of the FMU have a few small hills with some drainages. The southern portion is fairly flat, with one prominent hill in the south-central portion of the FMU. Topography for the most part will not be a barrier for overland vehicle travel.

Fire Frequency

The FMU can typically expect moderate to high fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. A few small areas spread throughout the FMU, with tall dense grasses represented by GR4, may see up to 8-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. A few small areas represented by fuel model GR4 have an elevated IFH and fall into the low to moderate category.

Values at Risk

The majority of range 143 falls within FMU 18 boundaries. The range consist of buildings, targets, and communication nodes. The targets, both mobile and stationary, found throughout the range footprint have the greatest risk from wildfires.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions.

Additional safety factors for FMU 18 include hazards associated with live-fire ranges. Live-fire range facilities are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

As an interior FMU, the firebreak does not share a boundary nor traverse through any portions of the FMU.

The FMU contains portions of three prescribed burn units, with two to be burned for fuel reduction reasons, and one for the dual purpose of fire protection and environmental. The vast majority of FMU 18, where most targets are located, is not a burn unit.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 18 are to be extinguished as rapidly as possible using full suppression methods with engines. Hydrants/water sources are located at the southern portion of the FMU near the buildings.

Fire Escape Potential

The highest escape potential is in the northern half of the eastern edge of the FMU, where there is high fire frequency and a single containment road.

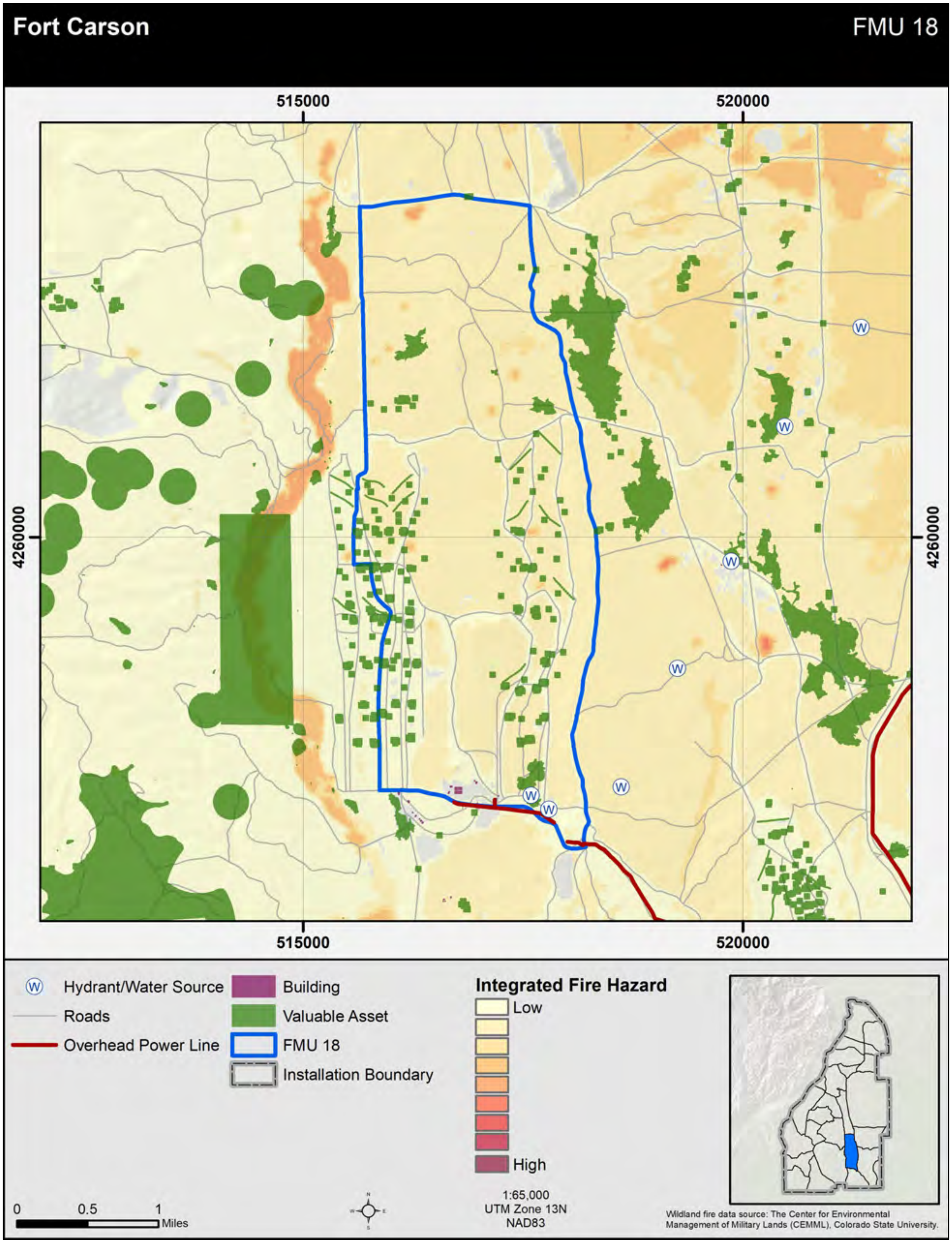


Figure A1 - 20. Map of Fort Carson FMU 18.

FMU 19
Wildfire Response: Full Suppression

Fuel Characteristics

The majority of fuels within FMU 19 are grass and grass-shrub fuel models, with GR2 and GS2 making up approximately 90% of the total fuels. Just over 10% of the area in FMU 19 is classified as non-burnable.

Table A1- 19. Spatial extent, in acres and percentage of total FMU 19 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	3,602.21	67.84%	3,602.21	67.84%
122	GS2	Moderate load; dry climate grass-shrub	1,161.37	21.87%	1,161.37	21.87%
99	NB9	Barren	221.07	4.16%	221.07	4.16%
63	CU63	Minor roads	163.69	3.08%	163.69	3.08%
62	CU62	Intermediate roads	155.90	2.94%	155.90	2.94%
104	GR4	Moderate load; dry climate grass	4.00	0.08%	4.00	0.08%
98	NB8	Water	1.11	0.02%	1.11	0.02%
103	GR3	Low load; very coarse; humid climate grass	0.22	0.00%	0.22	0.00%

Topography

The western portion of the FMU is an elevated plateau dropping in elevation as it moves east. There are several drainages that run from west to east. The southern third of the FMU is relatively flat. There are many roads throughout the FMU, so overland travel should not be hindered except along the FMU’s western boundary.

Fire Frequency

The majority of the FMU can typically expect moderate to high fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2), may see up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. A few small areas represented by fuel model GS2 have an elevated IFH and fall into the low to moderate category.

Values at Risk

Most of range 155 falls within FMU 19 boundaries. The range consist of targets, and communication nodes. The targets found throughout the range footprint are the greatest risk from wildfires. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Steep slopes throughout the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events

Additional safety factors for FMU 19 include hazards associated with live-fire ranges. Live-fire range facilities are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

As an interior FMU, the firebreak does not share a boundary nor traverse through any portions of the FMU.

The FMU contains portions of 12 prescribed burn units, with all 12 to be burned for fuel reduction reasons.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 19 are to be extinguished as rapidly as possible using full suppression methods with engines. Hydrants/water sources are located at the southern portion of the FMU.

Fire Escape Potential

The highest potential for fires to escape FMU 19 is along a 1.6 mile stretch on the northern boundary near the northwest corner. The road defining the boundary is a two-track road, except for the last 0.37 miles where there is no road at all. Combined with GS2 fuels and moderate fire frequency, this area represents the highest likelihood for an escape from the FMU.

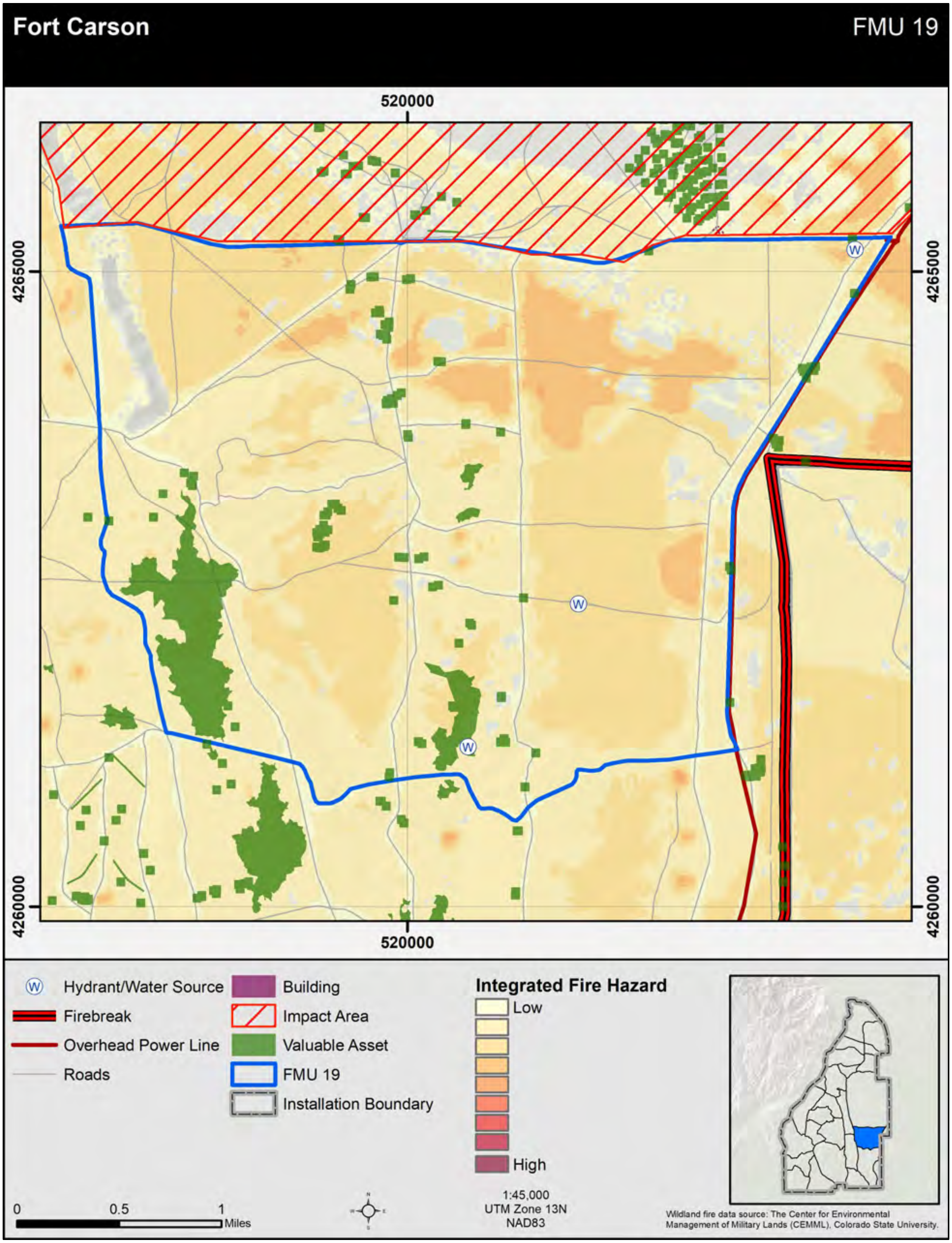


Figure A1 - 21. Map of Fort Carson FMU 19.

FMU 20
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within FMU 20 are grass and grass-shrub fuel models, with GR2 and GS2 making up approximately 91% of the total fuels. Just under 9% of the area in FMU 20 is classified as non-burnable.

Table A1- 20. Spatial extent, in acres and percentage of total FMU 20 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	351.17	50.48%	351.17	50.48%
122	GS2	Moderate load; dry climate grass-shrub	282.00	40.54%	282.00	40.54%
62	CU62	Intermediate roads	46.48	6.68%	46.48	6.68%
99	NB9	Barren	16.01	2.30%	16.01	2.30%

Topography

This is the smallest of the FMUs, covering less than 700 acres. There are two drainages running through the FMU, Young Hollow Creek in the north and another in the south. The FMU is flat; however, the two drainages may limit overland vehicle travel.

Fire Frequency

The majority of the FMU can typically expect moderate fire frequency. A few areas along the eastern boundary of the FMU may experience high fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2), may see up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. Areas represented by fuel model GS2, have an elevated IFH and fall into the low to moderate category.

Values at Risk

A weather station is located in the southeast corner and communication nodes can be found along MSR 1.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. MSR 1 makes up the western boundary of FMU 20 and sees a higher amount of traffic compared to many other roads in the southern portion of the installation.

Fuels Management Actions

The firebreak runs along the entire eastern and southern border of the FMU.

The FMU contains portions of two prescribed burn units, with both to be burned for fuel reduction reasons.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 20 are to be extinguished as rapidly as possible using full suppression methods with engines. Hydrants/water sources are located just north of MSR 1.

Fire Escape Potential

The highest fire escape potential is in drainages along eastern and southern boundary. Small groups of shrubs and trees in these areas could produce spotting across containment lines, particularly with the tendency of winds to blow from the southwest.

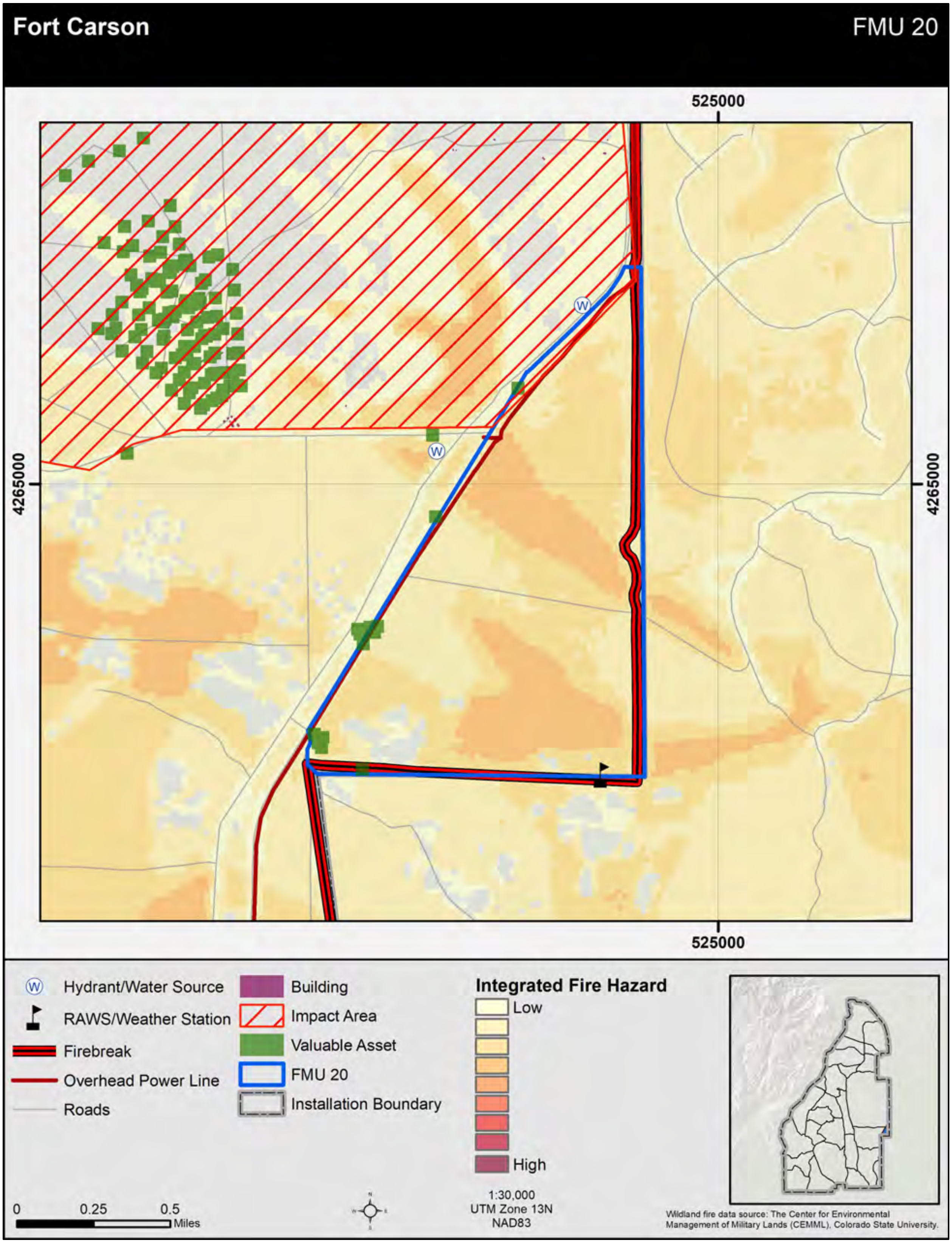


Figure A1 - 22. Map of Fort Carson FMU 20.

FMU 21
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within FMU 21 are grasses, with GR2 making up approximately 88% of the total fuels. Just over 11% of the area in FMU 21 is classified as non-burnable.

Table A1- 21. Spatial extent, in acres and percentage of total FMU 21 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	3,815.94	88.43%	3,688.50	85.48%
99	NB9	Barren	291.12	6.75%	291.12	6.75%
62	CU62	Intermediate roads	149.45	3.46%	149.45	3.46%
63	CU63	Minor roads	43.15	1.00%	43.15	1.00%
104	GR4	Moderate load; dry climate grass	15.35	0.36%	15.35	0.36%
122	GS2	Moderate load; dry climate grass-shrub	0.22	0.01%	0.22	0.01%
147	SH7	Very high load; dry climate shrub	0.00	0.00	127.44	2.95%

Topography

The East Fork Red Creek drainage runs through the northwest corner of the FMU from the northeast to the southwest. East of the drainage is a relatively flat valley. The eastern portion of the FMU is a series of ridges and drainages that flow from northwest to southeast. Numerous roads throughout the FMU provide access to most of the areas. However, areas in eastern portion of the FMU may have access issues due to the numerous drainages and hills.

Fire Frequency

The entire FMU can typically expect low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas of tall dense grasses, represented by GR4, can expect flame lengths of 4 – 8 feet.

Integrated Fire Hazard

The entire FMU has zero to low integrated fire hazard.

Values at Risk

FMU 21 is largely absent of infrastructure as the area is primarily used for maneuver training. A few communication nodes are located in the FMU.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Steep slopes throughout the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act as chimneys during extreme fire events.

Fuels Management Actions

The firebreak runs north to south, east of the FMU 21 western boundary.

The FMU contains portions of eight prescribed burn units, with five to be burned for environmental purposes, one for fuel reduction reasons, and two for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 21 are to be extinguished as rapidly as possible using full suppression methods with engines. The closet hydrants/water sources are located within the Turkey Creek Ranch area within FMU 7 or within FMU 18.

Fire Escape Potential

Although fire frequency in FMU 21 is projected to be low, the highest fire escape potential is along the western boundary. The firebreak is in the interior of the FMU, anywhere from 0.05 miles to 0.6 miles from the western boundary of the FMU. Much of this area between the FMU western boundary and the firebreak is piñon-juniper woodlands, represented as SH7 during extreme weather conditions. These fuels are capable of crown fires and causing spot fires, both of which can lead to fires escaping the FMU and in this case the installation. Fires west of the firebreak would be difficult to contain in many circumstances.

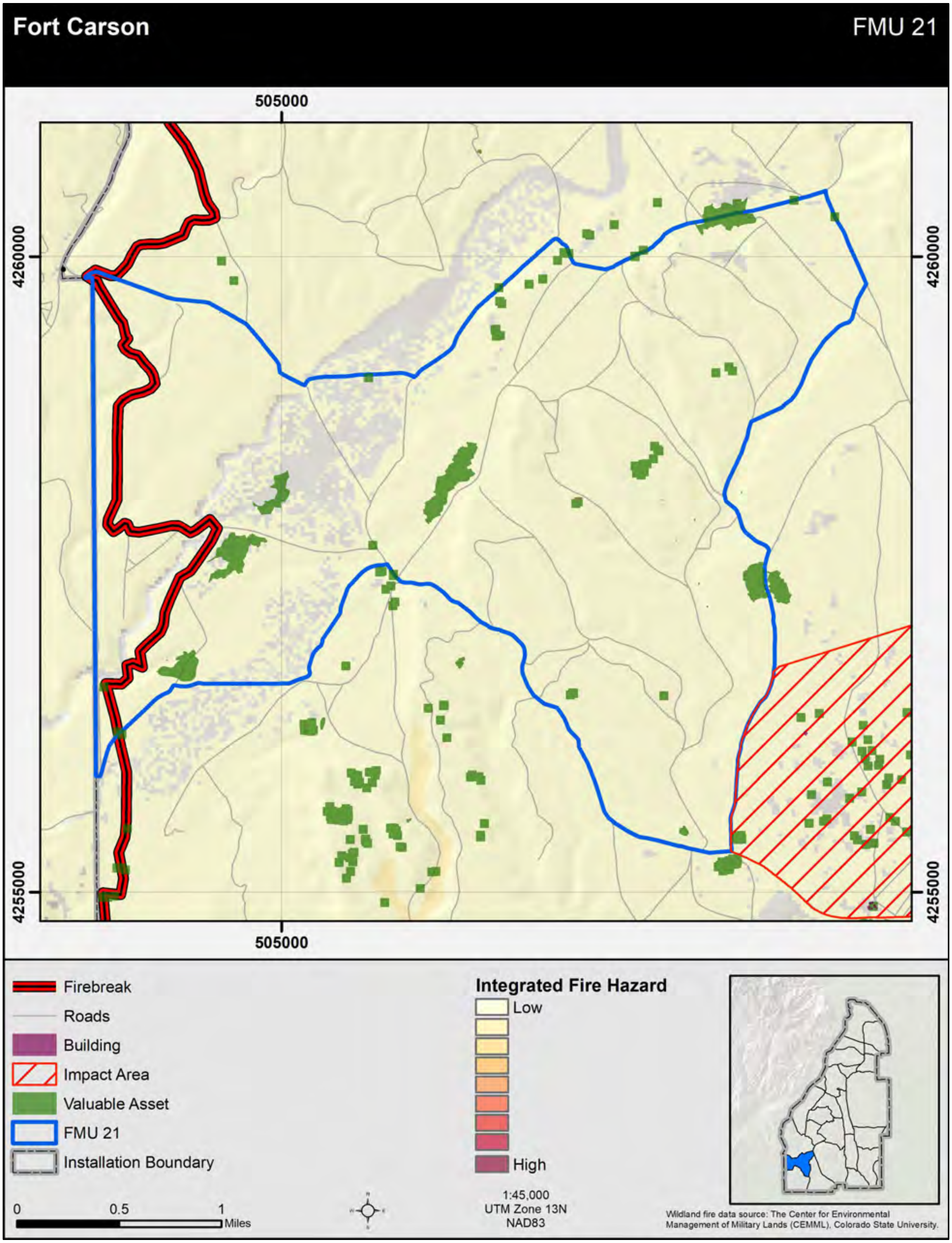


Figure A1 - 23. Map of Fort Carson FMU 21.

FMU 22
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within FMU 22 are grasses, with GR2 making up approximately 91% of the total fuels. Just under 7% of the area in FMU 22 is classified as non-burnable.

Table A1- 22. Spatial extent, in acres and percentage of total FMU 22 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	4,715.99	91.11%	4,685.08	90.51%
99	NB9	Barren	162.35	3.14%	162.35	3.14%
104	GR4	Moderate load; dry climate grass	119.87	2.32%	119.87	2.32%
62	CU62	Intermediate roads	93.19	1.80%	93.19	1.80%
63	CU63	Minor roads	80.51	1.56%	80.51	1.56%
91	NB1	Urban	2.22	0.04%	2.22	0.04%
122	GS2	Moderate load; dry climate grass-shrub	1.33	0.03%	1.33	0.03%
98	NB8	Water	0.89	0.02%	0.89	0.02%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	30.91	0.60%

Topography

The FMU consists of a series of drainages and ridges running from the north to south. Beaver Creek runs through the southwest corner of the FMU. The terrain throughout the FMU will not allow overland travel in vehicles except on established roads.

Fire Frequency

The entire FMU can typically expect low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas of tall dense grasses, represented by GR4, can expect flame lengths of 4 – 8 feet. Most of these grasses are located in a drainage in the center of the FMU.

Integrated Fire Hazard

The majority of the FMU has zero to low integrated fire hazard. Areas represented as GR4 in some of the drainages have a slightly elevated IFH but still are considered in the low range.

Values at Risk

FMU 22 is largely absent of infrastructure as the area is primarily used for maneuver training.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Steep slopes throughout the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act as chimneys during extreme fire events.

Fuels Management Actions

The firebreak runs north to south, east of the FMU western boundary. It also runs adjacent to the FMU southern boundary.

The FMU contains portions of 13 prescribed burn units, with 5 to be burned for environmental purposes, and 8 for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 22 are to be extinguished as rapidly as possible using full suppression methods with engines. The closest hydrant/water source is within FMU 18.

Fire Escape Potential

Few fires are likely in FMU 22, but the highest fire escape potential is along its eastern boundary. Here an often poorly maintained road serves as the containment line and with westerly winds, fires may push across it.

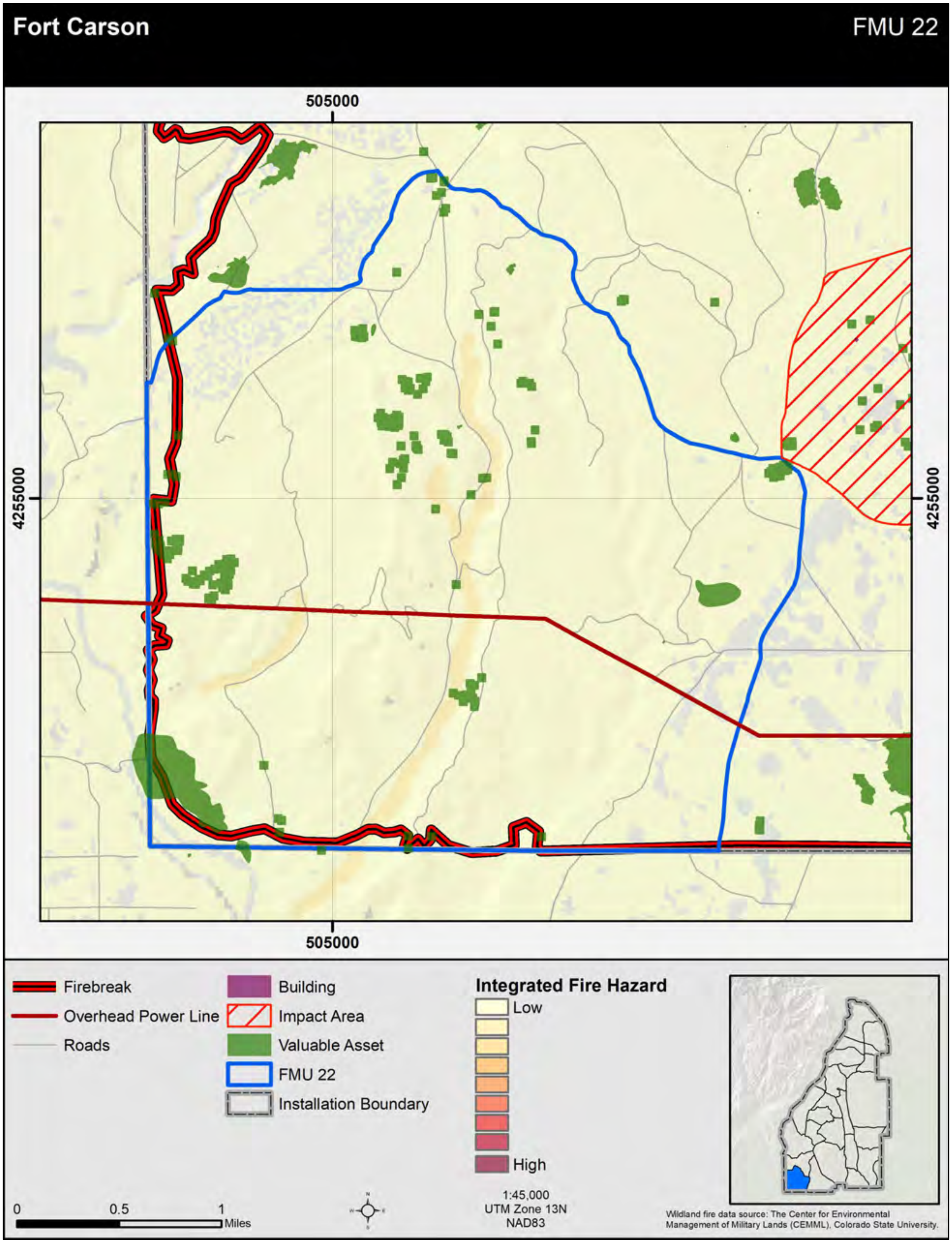


Figure A1 - 24. Map of Fort Carson FMU 22.

FMU 23
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within FMU 23 are grasses, with GR2 making up approximately 86% of the total fuels. Just over 13% of the area in FMU 23 is classified as non-burnable.

Table A1- 23. Spatial extent, in acres and percentage of total FMU 23 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	4,870.34	86.08%	4,870.34	86.08%
62	CU62	Intermediate roads	390.31	6.90%	390.31	6.90%
99	NB9	Barren	341.16	6.03%	341.16	6.03%
104	GR4	Moderate load; dry climate grass	22.68	0.40%	22.68	0.40%
101	GR1	Short; sparse dry climate grass	19.79	0.35%	19.79	0.35%
61	CU61	Major roads or firebreaks	8.23	0.15%	8.23	0.15%
63	CU63	Minor roads	5.34	0.09%	5.34	0.09%

Topography

A ridge runs along the eastern boundary going from the northwest to the southeast. South of the ridge is relatively flat all the way to the southern boundary of the installation. There are numerous roads throughout the FMU allowing access for overland vehicles. Range 123 is located within the FMU and will restrict vehicle travel within the range.

Fire Frequency

The entire FMU can typically expect low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with tall dense grasses, represented by GR4, may see up to 8-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero to low integrated fire hazard. A few small areas represented by fuel model GR4 have an elevated IFH and fall into the low to moderate category.

Values at Risk

Range 123, the aerial bombing range, is completely within FMU 23. The range consists of range buildings, communication nodes, and targets. The targets found throughout the impact area have the greatest risk from wildfires.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Steep slopes throughout the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events

Additional safety factors for FMU 23 include hazards associated with live-fire ranges. Live-fire range facilities are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

An additional hazard found within FMU is unexploded ordnance (UXO). UXOs can detonate when they are disturbed or heated. Traditional firefighting techniques often require surface disturbance (e.g., cutting fireline, dozer operations) and navigation in roadless areas or on rarely used roads on foot or in vehicles (e.g., scouting the fire, placing lookouts, etc.). These activities can detonate UXO. Additionally, the heat from a fire is more than sufficient to cause detonations. Even aerial resources can be harmed by detonations if they are at a low altitude as is common when engaging a fire.

Due to the presence of UXO within FMU 23, firefighters will not enter unexploded ordnance (UXO) contaminated areas to fight fires without the approval of the IC. In some situations, aerial bucket drops are the only option for direct attack on fires in UXO-contaminated areas. If firefighting is to be carried out in the impact area, firefighters will only travel on and fight fires from the maintained roads.

Fuels Management Actions

The firebreak runs along the southern boundary of the FMU and portions of its eastern boundary.

The FMU contains portions of nine prescribed burn units, with one to be burned for environmental purposes, two for fuel reduction reasons, and six for the dual purpose of fire protection and environmental.

Wildfire Management

Default Suppression Strategy: Monitor and suppress from roads/firebreaks

The default suppression strategy for wildfires occurring within FMU 23, will be to monitor and suppress them from roads or firebreaks. The closets hydrants/water sources are located in FMU 18.

Fire Escape Potential

The highest fire escape potential is where the southern and eastern boundaries meet. A small acreage of tall, dense grass represented by GR4 has the potential to produce extreme fire behavior, which could pose containment difficulties.

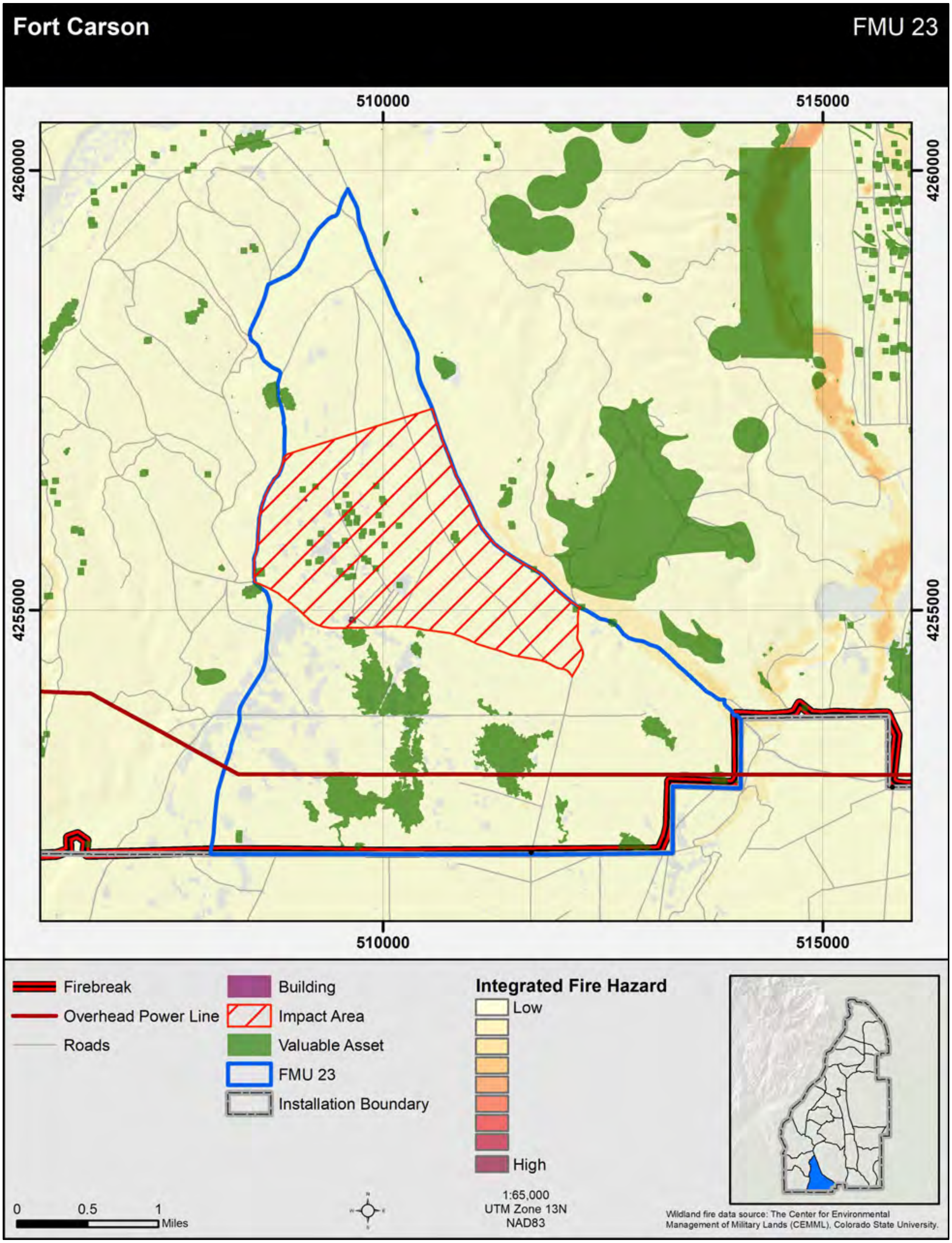


Figure A1 - 25. Map of Fort Carson FMU 23.

FMU 24
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within the FMU are piñon-juniper woodlands, represented by GR2 during normal weather conditions and SH7 during extreme weather conditions. Less than 4% of the area in FMU 24 is classified as non-burnable.

Table A1- 24. Spatial extent, in acres and percentage of total FMU 24 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	8,205.23	79.56%	2,401.92	23.29%
101	GR1	Short; sparse dry climate grass	1,044.17	10.12%	1,044.17	10.12%
104	GR4	Moderate load; dry climate grass	620.27	6.01%	620.27	6.01%
62	CU62	Intermediate roads	137.22	1.33%	137.22	1.33%
63	CU63	Minor roads	106.53	1.03%	106.53	1.03%
99	NB9	Barren	77.40	0.75%	77.40	0.75%
98	NB8	Water	57.82	0.56%	57.82	0.56%
122	GS2	Moderate load; dry climate grass-shrub	51.15	0.50%	51.15	0.50%
161	TU1	Low load dry climate timber grass-shrub	8.01	0.08%	8.01	0.08%
91	NB1	Urban	4.89	0.05%	4.89	0.05%
182	TL2	Low load broadleaf litter	0.44	0.00%	0.44	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	5,803.31	56.27%

Topography

Booth Mountain (6454 ft.) is the most prominent topological feature in the northwest corner of the FMU. The terrain is varied and generally drops in elevation heading east and south from Booth Mountain. The area is made up of ridges and drainages, both of which make overland vehicle travel difficult if not impossible. Turkey Creek flows from north to south in the western third of the FMU.

Fire Frequency

The western portion of the FMU can typically expect low fire frequency. The central and eastern portion can expect low to moderate fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Within the Turkey Creek drainage, areas with tall dense grass represented by GR4, may see up to 8-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has no to low integrated fire hazard. The Turkey Creek drainage has elevated IFH, low to moderate, due to a heavier grass load represented by GR4.

Values at Risk

Portions of range 143 are located within FMU 24. The range consists of range buildings, communication nodes, and targets. The targets found throughout the impact area have the greatest risk from wildfires.

Atop of Booth Mountain is the Booth Mountain Repeater, which is used for communications. Areas outside of the range footprint and Booth Mountain are largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Steep slopes throughout the FMU may have uneven footing and loose and rolling rocks. Some of these areas may act like chimneys during extreme fire events.

Additional safety factors for FMU 24 include hazards associated with live-fire ranges. Live-fire range facilities are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

The firebreak runs along the southern boundary of the FMU.

The FMU contains portions of 12 prescribed burn units, with 2 to be burned for fuel reduction reasons, and 10 for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 24 are to be extinguished as rapidly as possible using full suppression methods with engines. The closets hydrants/water sources are within FMU 18. Teller Reservoir may be a source of water at times, but is often empty.

Fire Escape Potential

One of the areas with highest fire escape potential is in the southwestern corner. This area includes a shallow valley vegetated by tall, dense grass represented by GR4. There is potential for extreme fire behavior in these fuels, which could strain containment resources.

Another potential escape location is along Turkey Creek where it crosses the northern boundary. The combination of moderate to high fire frequency and tall dense grasses (GR4) make this area susceptible to fire escapes from the FMU.

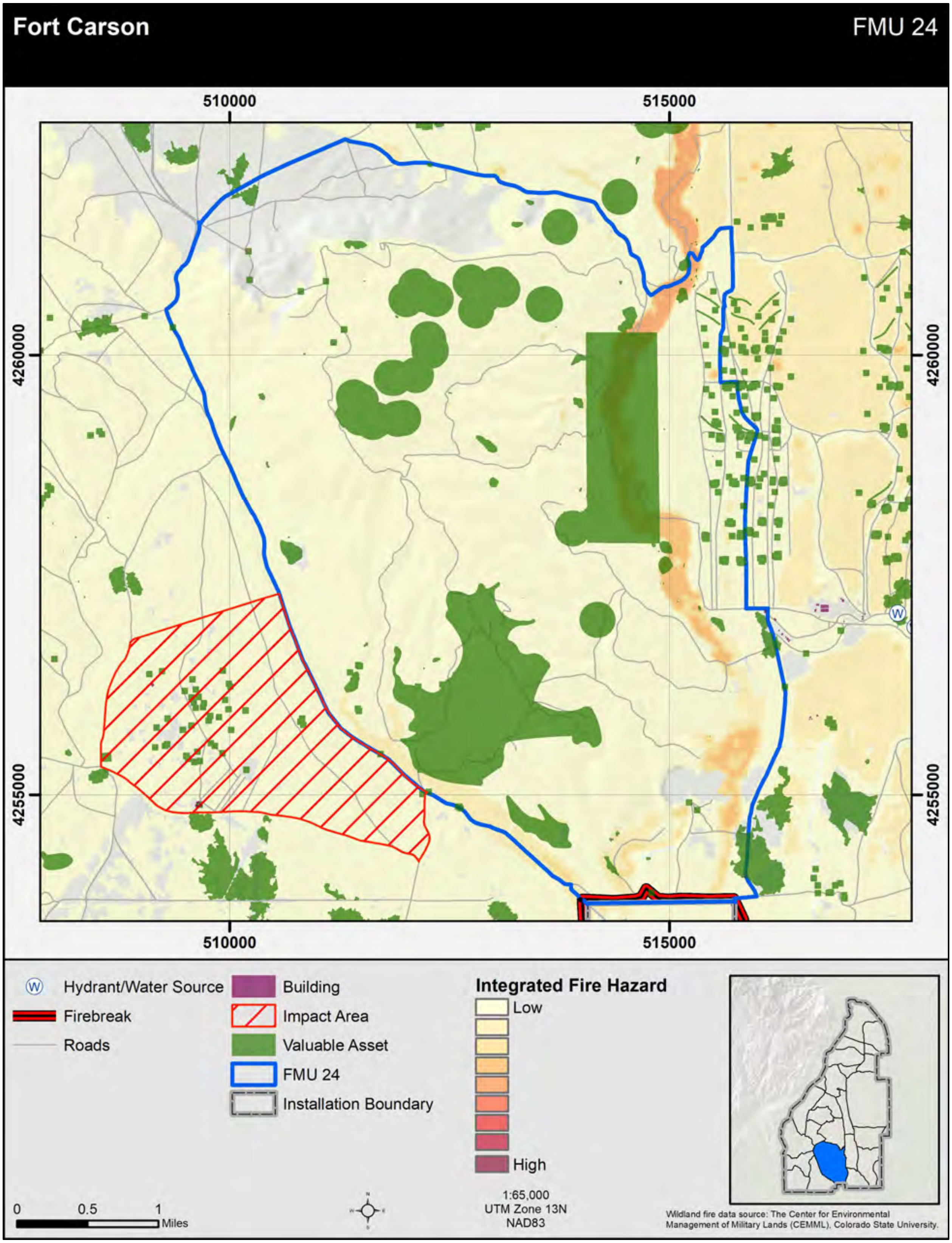


Figure A1 - 26. Map of Fort Carson FMU 24.

FMU 25
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within FMU 25 are grasses, with GR2 making up approximately 83% of the total fuels. Just under 14% of the area in FMU 25 is classified as non-burnable.

Table A1- 25. Spatial extent, in acres and percentage of total FMU 25 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	2,856.51	83.20%	2,856.51	83.20%
99	NB9	Barren	264.21	7.70%	264.21	7.70%
62	CU62	Intermediate roads	158.35	4.61%	158.35	4.61%
122	GS2	Moderate load; dry climate grass-shrub	94.30	2.75%	94.30	2.75%
63	CU63	Minor roads	55.38	1.61%	55.38	1.61%
104	GR4	Moderate load; dry climate grass	4.45	0.13%	4.45	0.13%

Topography

The northern portion of the FMU contains rolling hills and drainages running from north to south. Along the western boundary, a ridgeline runs almost the entire length of the FMU. East of the ridgeline in the south are numerous small hills. Between the hills in the northeast corner and the hills in the southwest corner is a large area of flat land. The terrain within the FMU should not typically inhibit overland vehicle travel.

Fire Frequency

The northern portion of the FMU can typically expect moderate fire frequency, while the southern portion can expect low fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2) may see up to 6-foot flame lengths.

Integrated Fire Hazard

The entire FMU has zero to low integrated fire hazard.

Values at Risk

Portions of Range 143 are located within FMU 25. The portion of the range within FMU 25 has range buildings and communication nodes located within FMU 25. No targets are located in FMU 25. Areas outside of the range are largely absent of any infrastructure as it is primarily used for maneuver training.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 25 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

Additional safety factors for FMU 25 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

The firebreak runs along the southern boundary of the FMU, as well as a small portion of the western boundary in the southwest corner of the FMU.

The FMU contains portions of eight prescribed burn units, with four to be burned for fuel reduction reasons, and four for both fire protection and environmental purposes.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 25 are to be extinguished as rapidly as possible using full suppression methods with engines. Hydrants/water sources are located just north of the FMU boundary as well as along the south-central portion of the FMU.

Fire Escape Potential

The highest fire escape potential is at the midpoint of its eastern boundary. A shallow drainage containing grass-shrub fuels (GS2) could lead to higher fire intensities, allowing fires to jump containment lines.

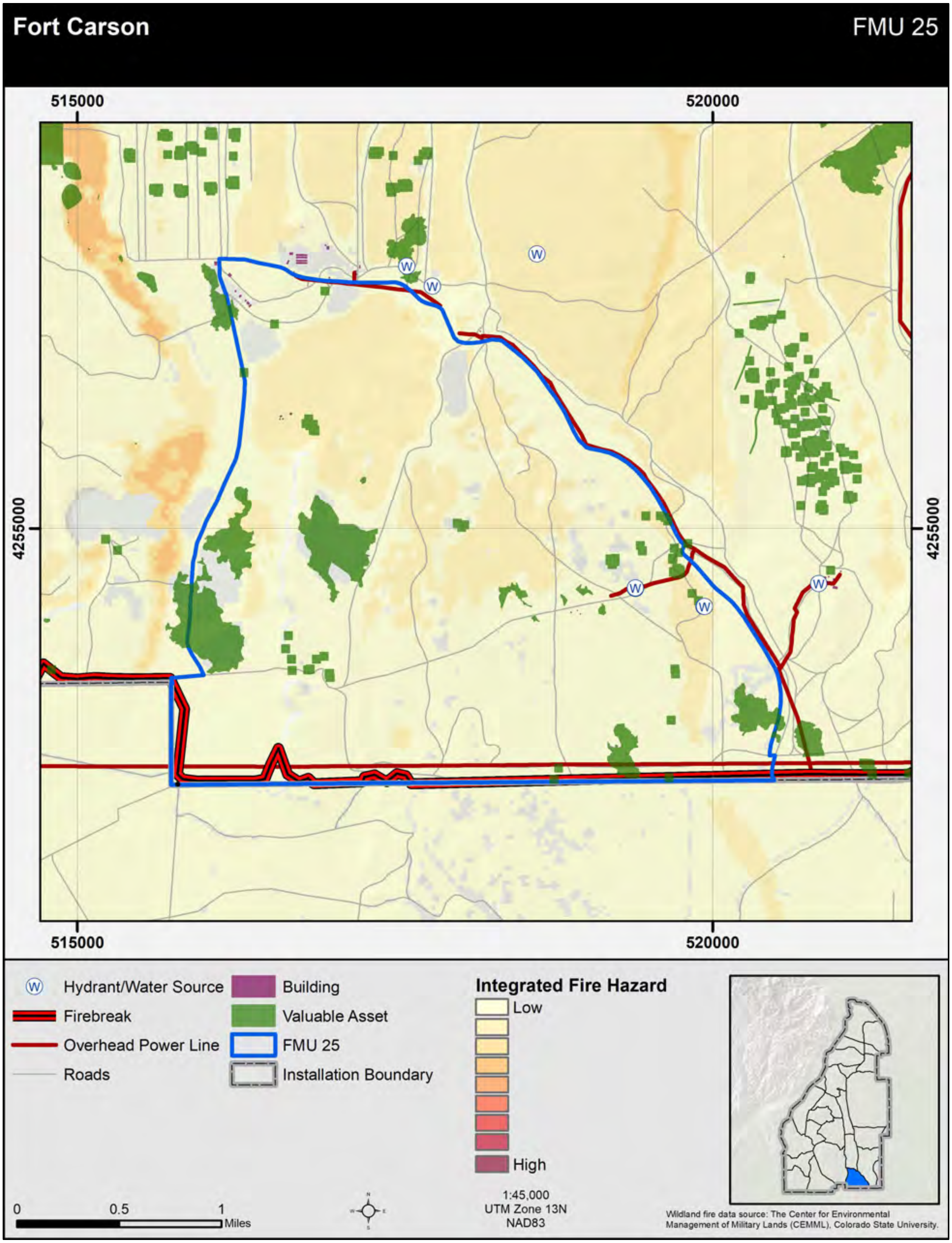


Figure A1 - 27. Map of Fort Carson FMU 25.

FMU 26
Wildfire Response: Full Suppression

Fuel Characteristics

The majority of fuels within FMU 26 are grasses, with GR2 making up approximately 88% of the total fuels. Just under 9% of the area in FMU 26 is classified as non-burnable.

Table A1- 26. Spatial extent, in acres and percentage of total FMU 26 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	5,517.74	88.27%	5,517.74	88.27%
62	CU62	Intermediate roads	403.88	6.46%	403.88	6.46%
122	GS2	Moderate load; dry climate grass-shrub	159.68	2.55%	159.68	2.55%
63	CU63	Minor roads	113.87	1.82%	113.87	1.82%
99	NB9	Barren	30.47	0.49%	30.47	0.49%
104	GR4	Moderate load; dry climate grass	23.57	0.38%	23.57	0.38%
91	NB1	Urban	0.89	0.01%	0.89	0.01%
121	GS1	Low load; dry climate grass-shrub	0.67	0.01%	0.67	0.01%

Topography

The northern portion of the FMU is relatively flat with some small hills. The southern portion has a more varied terrain with rolling hills and several drainages flowing either northwest to southeast or north to south. A series of ridges makes a horseshoe around the southern portion of Range 145. There are numerous roads throughout the FMU allowing access to most of the area. Topography should not significantly hinder overland vehicle travel.

Fire Frequency

The southern portion of the FMU can typically expect low to moderate fire frequency. The northern portion can typically expect moderate to high fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2) may see up to 6-foot flame lengths. Areas with tall dense grasses represented by GR4, may see up to 8-foot flame lengths.

Integrated Fire Hazard

The majority of the FMU has zero to low integrated fire hazard. Small areas with fuel models represented as GR4 have moderate to high IFH.

Values at Risk

Portions of Ranges 145, 155, and 004 are located within FMU 26. The ranges consist of range buildings, communication nodes, and targets. The targets found throughout the range footprints represent the greatest risk from wildfires.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 26 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials.

Additional safety factors for FMU 26 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area). Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a "check fire" or "cease fire" condition before sending fire suppression forces down range.

Fuels Management Actions

The firebreak runs along the southern boundary of the FMU.

The FMU contains portions of 16 prescribed burn units, with 14 to be burned for fuel reduction reasons, and 2 for both fire protection and environmental purposes. A large portion of the FMU, primarily around targets within Range 145, is not designated as a prescribed burn unit.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 26 are to be extinguished as rapidly as possible using full suppression methods with engines. Hydrants/water sources are located throughout the FMU.

Fire Escape Potential

The highest fire escape potential is where Wild Horse Creek crosses south into FMU 25. The topography and the fuels, GS2, in this area make it susceptible to fires leaving the FMU.

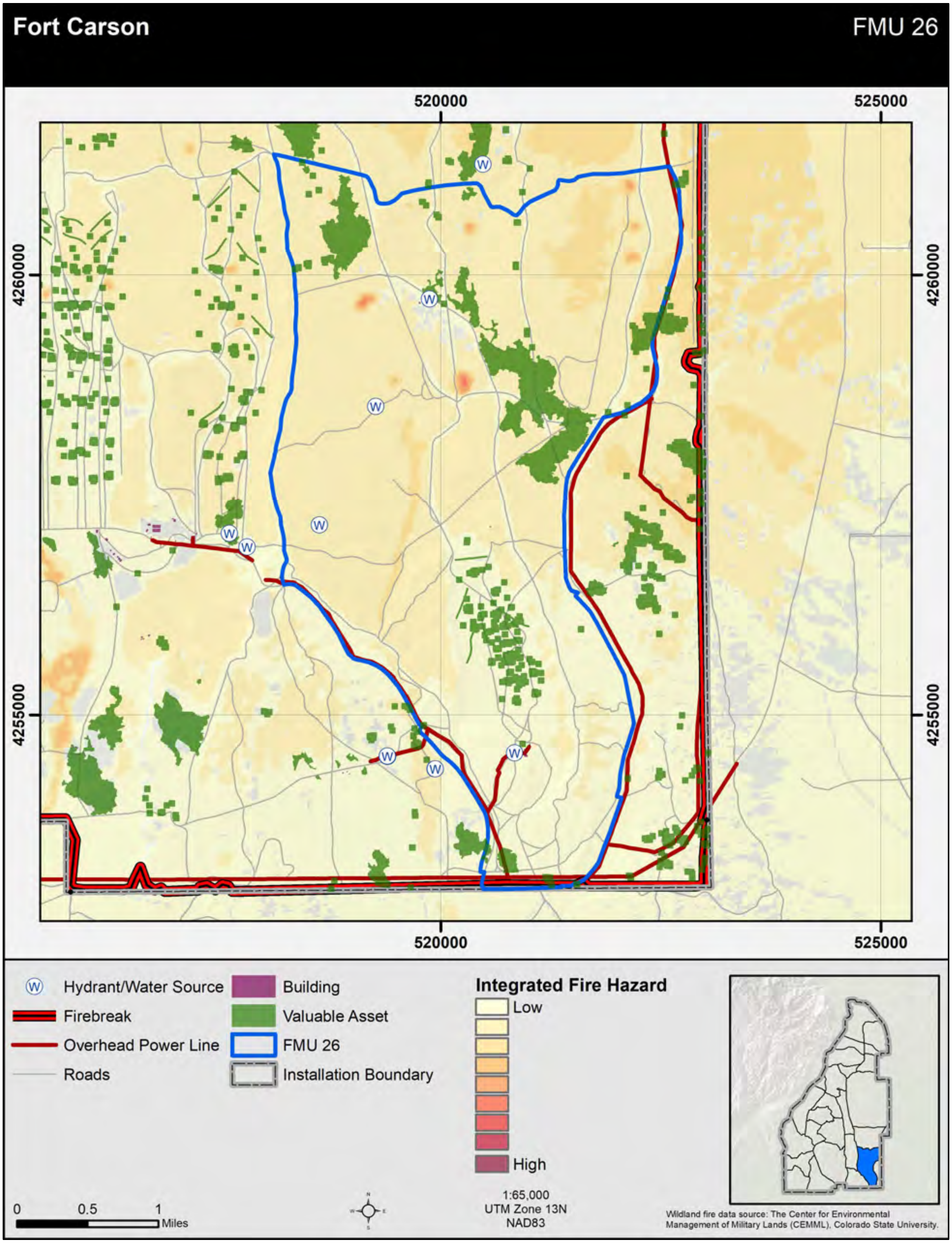


Figure A1 - 28. Map of Fort Carson FMU 26.

FMU 27
Wildfire Response: Full Suppression

Fuel Characteristics

Most fuels within FMU 27 are grass and grass-shrub fuel models with GR2 and GS2 making up approximately 88% of the total fuels. Just under 12% of the area in FMU 27 is classified as non-burnable.

Table A1- 27. Spatial extent, in acres and percentage of total FMU 27 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	1,463.84	65.85%	1,463.84	65.85%
122	GS2	Moderate load; dry climate grass-shrub	490.39	22.06%	490.39	22.06%
62	CU62	Intermediate roads	205.28	9.23%	205.28	9.23%
99	NB9	Barren	48.04	2.16%	48.04	2.16%
63	CU63	Minor roads	12.45	0.56%	12.45	0.56%
104	GR4	Moderate load; dry climate grass	3.11	0.14%	3.11	0.14%

Topography

The FMU has varied terrain with rolling hills and several drainages flowing either northwest to southeast or west to east into Dry Creek. Overland vehicle travel will be limited to maintained roads for most of the FMU.

Fire Frequency

The southern portion of the FMU can typically expect low fire frequency, while the central and north can typically expect low to moderate fire frequency.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Areas with a grass-shrub component (GS2), may see up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of the FMU has zero to low integrated fire hazard. Small areas with fuel models represented as GS2 have low to moderate IFH.

Values at Risk

Range 004 is almost entirely within FMU 27 boundaries. The range is used for intermediate land navigation and is a non-live-fire range. Communication nodes are located within the FMU boundary.

Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. MSR 1 makes up the western boundary of FMU 27 and sees a higher amount of traffic compared to many other roads in the southern portion of the installation.

Fuels Management Actions

The firebreak runs along the southern and eastern boundaries of the FMU.

The FMU contains portions of five prescribed burn units, with one to be burned for fuel reduction reasons, and four for the dual purpose of fire protection and environmental.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 27 are to be extinguished as rapidly as possible using full suppression methods with engines. Hydrants/water sources are located west the FMU.

Fire Escape Potential

The highest fire escape potential is along eastern boundary. Grass-shrub fuels represented by GS2 may produce significant fire behavior and the piñon-juniper woodland is a source for spot fires that could loft across the firebreak.

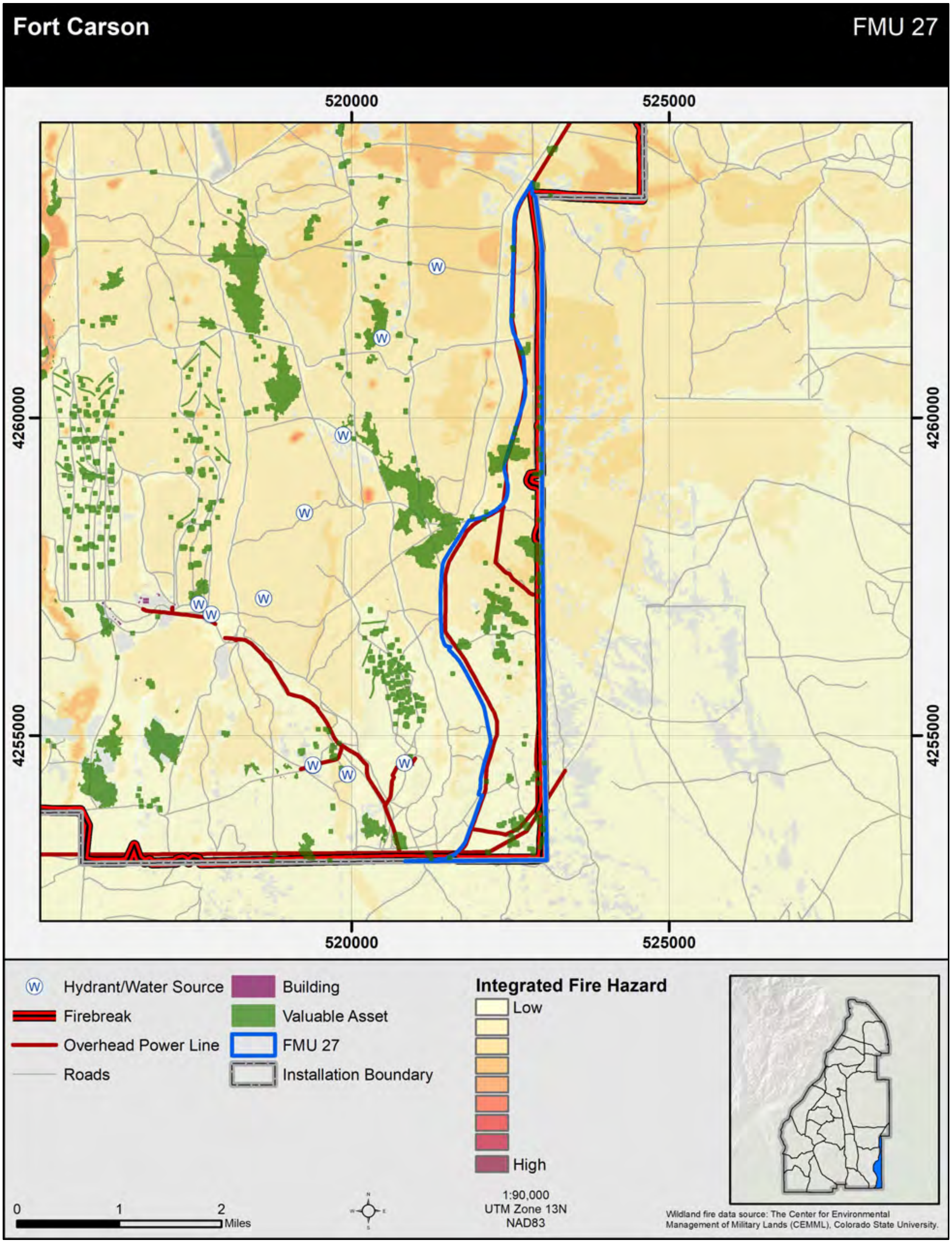


Figure A1 - 29. Map of Fort Carson FMU 27.

FMU 28
Wildfire Response: Full Suppression

Fuel Characteristics

Slightly under a quarter (22%) of the area in FMU 28 is classified as non-burnable. The remaining fuels are grasslands and to a lesser extent grass-shrublands (GS1 and GS2). GR2 and GR1 together comprise approximately 75% of the total wildland fuels within FMU 28.

Table A1- 28. Spatial extent, in acres and percentage of total FMU 28 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	422.78	68.70%	422.78	68.70%
62	CU62	Intermediate roads	61.38	9.97%	61.38	9.97%
101	GR1	Short; sparse dry climate grass	41.81	6.79%	41.81	6.79%
91	NB1	Urban	40.25	6.54%	40.25	6.54%
60	CU60	Airfield	38.03	6.18%	38.03	6.18%
121	GS1	Low load; dry climate grass-shrub	9.79	1.59%	9.79	1.59%
63	CU63	Minor roads	1.11	0.18%	1.11	0.18%
122	GS2	Moderate load; dry climate grass-shrub	0.22	0.04%	0.22	0.04%

Topography

This portion of the installation has been developed and is flat. The only barrier to overland travel is infrastructure.

Fire Frequency

The fire frequency is low in much of the FMU. In areas where there are no fuels, the fire frequency is zero.

Flame Length

The majority of this FMU can typically expect flame lengths of up to 4 feet. A small area near the western fence with a grass-shrub fuel model (GS1) can see up to 6-foot flame lengths. Additionally, the area southwest of the airfield can expect up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has zero (where there are no fuels) to low integrated fire hazard. An area just to the southwest of the airfield has low to moderate IFH.

Values at Risk

FMU 28 contains the PCMS cantonment area, which includes administrative buildings, barracks, and fuel storage. Supporting infrastructure includes power lines, communication nodes, and a substation. Many of these resources are within a built-up urban area where wildfires are unlikely.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 28 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials. Additional safety factors for FMU 28 include higher traffic volume than seen elsewhere on the installation.

Fuels Management Actions

The FMU contains one prescribed burn unit. Currently, there are no prescribed burns within FMU 28. It is unlikely prescribed burns will be carried out within this FMU.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 28 are to be extinguished as rapidly as possible using full suppression methods with engines. There are numerous hydrants/water sources throughout the cantonment area.

Fire Escape Potential

The highest potential for fires to escape FMU 28 is along the western boundary of FMU 28, where some of the only wide-open expanses of fuels exist in the unit. The southeastern portion of the unit, south of the airfield, also contains an acute area where heavy vegetation is immediately adjacent to the FMU boundary. This portion of the FMU boundary does not have a barrier such as a road. The fuels are continuous from FMU 28 to FMU 32.

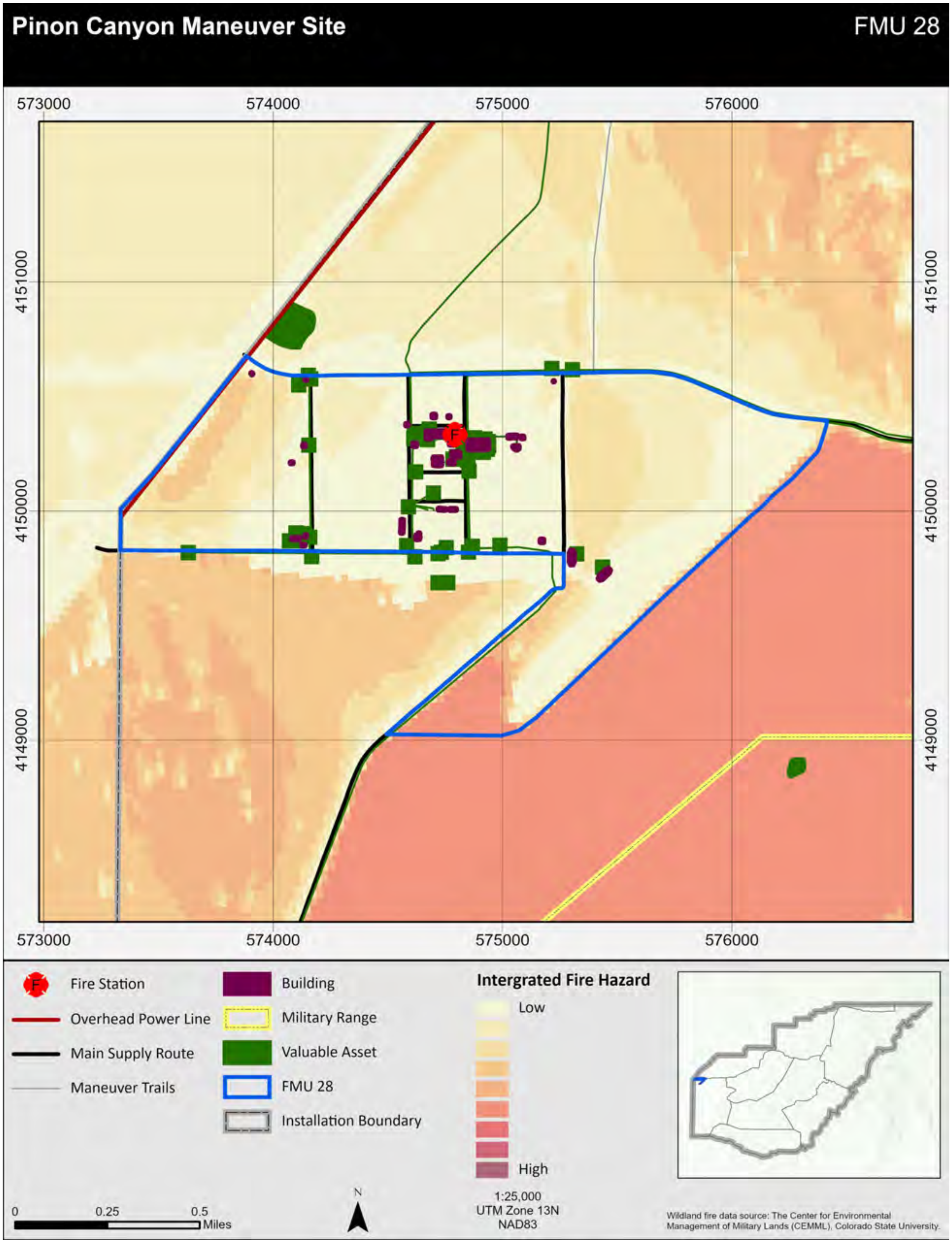


Figure A1 - 30. Map of PCMS FMU 28.

FMU 29
Wildfire Response: Full Suppression

Fuel Characteristics

The vast majority of the fuels within the FMU are grasslands, with GR2 and GR1 making up approximately 86% of the total fuels. Less than 2% of the area in FMU 29 is classified as non-burnable. Just under 11% of the FMU is made up of piñon-juniper woodlands, which is represented as GR1 during normal weather conditions and SH7 during extreme weather conditions.

Table A1- 29. Spatial extent, in acres and percentage of total FMU 29 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	8,962.72	59.69%	8,962.72	59.69%
101	GR1	Short; sparse dry climate grass	5,713.23	38.05%	4,064.80	27.07%
62	CU62	Intermediate roads	124.32	0.83%	124.32	0.83%
121	GS1	Low load; dry climate grass-shrub	97.19	0.65%	97.19	0.65%
63	CU63	Minor roads	58.05	0.39%	56.93	0.38%
122	GS2	Moderate load; dry climate grass-shrub	53.15	0.35%	53.15	0.35%
103	GR3	Low load; very coarse; humid climate grass	4.00	0.03%	4.00	0.03%
99	NB9	Barren	2.22	0.01%	2.22	0.01%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	1,649.54	10.99%

Topography

FMU 29 is flat with some rolling hills. Timpas Creek runs from the northeastern portion of the FMU to the southwestern portion of the FMU and roughly cuts the FMU in half. This drainage, and additional smaller ones found throughout the FMU, may restrict overland vehicle travel.

Fire Frequency

The fire frequency for much of the northern portion of this FMU is moderate. The fire frequency for areas along the southern and western boundary of the FMU is high.

Flame Length

The majority of this FMU can typically expect flame lengths up to 4 feet. Some areas along the northern boundary, where there are large patches of continuous grasses (GR2), may see up to 6-foot flame lengths.

Integrated Fire Hazard

The majority of this FMU has low to moderate IFH. The large areas of continuous grasses (GR2) have moderate IFH.

Values at Risk

FMU 29 contains the FAA tower and nearby electrical lines. There are also some buildings along the western boundary near highway 350. The rest of the FMU is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions. The Range 9 SDZ extends into the southern half of this FMU. Anyone responding to a wildfire within the FMU must ensure that all ranges affecting the area of the fire are in a "check fire" or "cease fire" condition before sending fire suppression forces down range.

Fuels Management Actions

A small section in northwest corner of the FMU, along the installation boundary, is targeted for mastication work. The FMU contains four prescribed burn units.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 29 are to be extinguished as rapidly as possible using full suppression methods with engines.

Fire Escape Potential

The highest potential for fires to escape FMU 29 is along the northern boundary of FMU, where there are large, unbroken expanses of grasslands crossing the northern installation boundary.

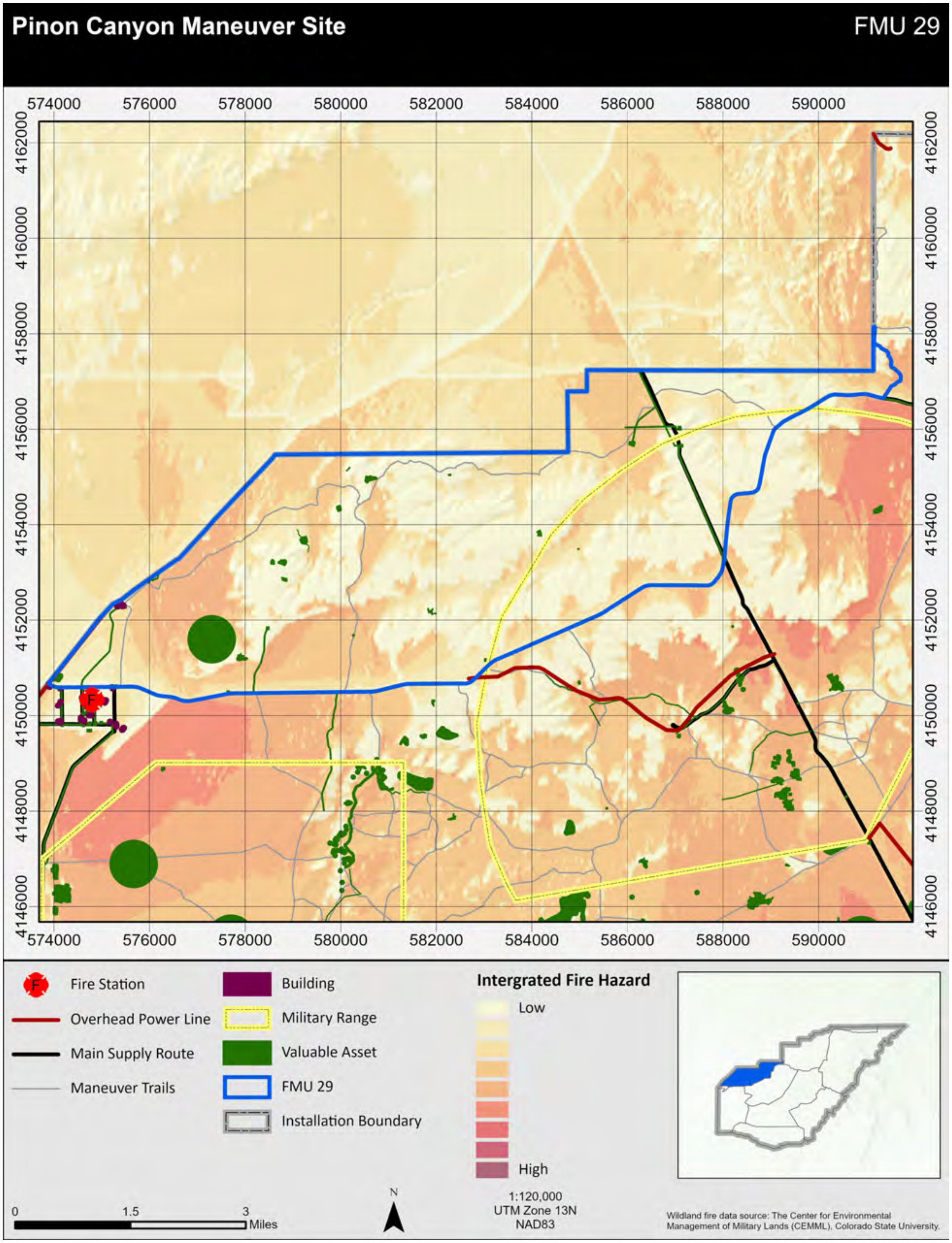


Figure A1 - 31. Map of PCMS FMU 29.

FMU 30
Wildfire Response: Full Suppression

Fuel Characteristics

The vast majority of the fuels within the FMU are grasslands, with GR2 and GR1 making up approximately 96% of the total fuels. Just over 1% of the area in FMU 30 is classified as non-burnable. Just under 1.5% of the FMU is made up of dense piñon-juniper woodlands, which is represented as GR1 during normal weather conditions and SH7 during extreme weather conditions.

Table A1- 30. Spatial extent, in acres and percentage of total FMU 30 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	23,686.04	79.49%	23,686.04	79.49%
101	GR1	Short; sparse dry climate grass	5,576.90	18.72%	5,185.26	17.40%
121	GS1	Low load; dry climate grass-shrub	175.03	0.59%	175.03	0.59%
62	CU62	Intermediate roads	162.13	0.54%	162.13	0.54%
63	CU63	Minor roads	141.67	0.48%	141.45	0.47%
122	GS2	Moderate load; dry climate grass-shrub	38.92	0.13%	38.92	0.13%
99	NB9	Barren	16.90	0.06%	16.90	0.06%
103	GR3	Low load; very coarse; humid climate grass	1.33	0.00%	1.33	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	391.87	1.32%

Topography

The majority of FMU 30 is relatively flat. The northwest corner of the FMU contains some rolling hills, which contain most of the piñon-juniper woodlands. Numerous small drainages run primarily from north to south and may restrict overland vehicle travel.

Fire Frequency

The fire frequency for much of the northeast portion of this FMU is low to moderate. The fire frequency for western portion of the FMU is moderate to high.

Flame Length

The northeastern portion of the FMU can expect flame lengths up to 4 feet. The western portion of the FMU, where there are large patches of continuous grasses (GR2), may see up to 6-foot flame lengths. The piñon-juniper woodlands tend to have lower flame lengths because they are represented as GR1 during normal weather conditions.

Integrated Fire Hazard

The IFH mirrors the flame lengths of the FMU with lower IHF in the northeastern portion of the FMU, while the western portion has low to moderate IFH. This is due to fire frequency decreasing from west to east.

Values at Risk

FMU 30 contains gas regulator sites that are above ground and run along the natural gas pipeline. The rest of the FMU is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions.

Fuels Management Actions

A large section in the northwest corner of the FMU, as well as a section of the northern boundary, is targeted for mastication work along the installation boundary. The FMU contains three prescribed burn units.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 30 are to be extinguished as rapidly as possible using full suppression methods with engines.

Fire Escape Potential

The highest potential for fires to escape FMU 30 is along the central portion of the northern boundary of FMU, where large expanses of unbroken grasslands cross the installation boundary.

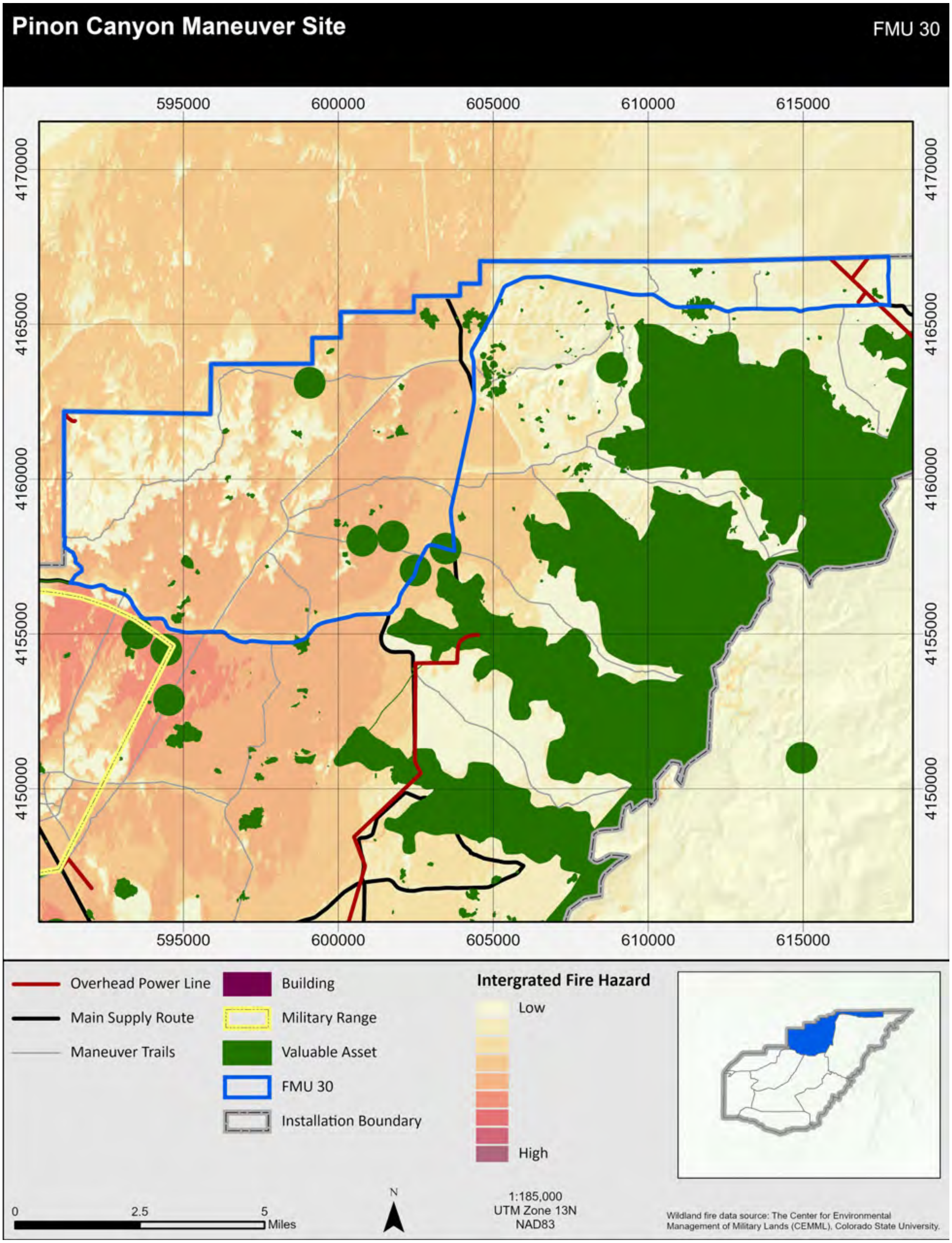


Figure A1 - 32. Map of PCMS FMU 30.

FMU 31
Wildfire Response: Full Suppression

Fuel Characteristics

The vast majority of the fuels within the FMU are grasslands, with GR2 and GR1 making up approximately 91% of the total fuels. Just under 1% of the area in FMU 31 is classified as non-burnable. Approximately 4,230 acres, or just over 7.5% of the FMU is made up of dense piñon-juniper woodlands, which is represented as GR1 during normal weather conditions and SH7 during extreme weather conditions.

Table A1- 31. Spatial extent, in acres and percentage of total FMU 31 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	32,048.73	58.07%	32,048.73	58.07%
101	GR1	Short; sparse dry climate grass	22,585.39	40.92%	18,358.01	33.26%
63	CU63	Minor roads	201.05	0.36%	196.16	0.36%
62	CU62	Intermediate roads	135.89	0.25%	135.66	0.25%
99	NB9	Barren	102.08	0.18%	102.08	0.18%
121	GS1	Low load; dry climate grass-shrub	48.93	0.09%	48.93	0.09%
122	GS2	Moderate load; dry climate grass-shrub	41.59	0.08%	41.59	0.08%
145	SH5	High load; humid climate grass-shrub	14.46	0.03%	14.46	0.03%
103	GR3	Low load; very coarse; humid climate grass	10.68	0.02%	10.68	0.02%
104	GR4	Moderate load; dry climate grass	5.34	0.01%	5.34	0.01%
182	TL2	Low load broadleaf litter	0.22	0.00%	0.22	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	4,232.49	7.67%

Topography

Most of FMU 31 is made up of canyons, including Minnie, Bent, Welsh, Red Rock, and part of Lockwood. The elevation difference between the floors of the canyons their rims is more than 250 feet. Overland travel in these areas is almost completely limited to maneuver trials. Many parts of the FMU are designated as dismounted training areas as much of the land is too rough for troop maneuver training.

Fire Frequency

The fire frequency for the eastern half of the portion of the FMU is low. The fire frequency for western portion of the FMU is mostly moderate, with an area of about 2,100 acres along the central portion of the western boundary where it is high.

Flame Length

The majority of the FMU can expect flame lengths up to 4 feet. The western portion of the FMU, where there are large patches of continuous grasses (GR2), may see up to 6-foot flame lengths. The denser piñon-juniper woodlands tend to have lower flame lengths because they are represented as GR1 during normal weather conditions.

Integrated Fire Hazard

The IFH mirrors the flame lengths of the FMU with lower IHF on the eastern half of the FMU while the western portion has low to moderate IFH. This is due to fire frequency decreasing from west to east.

Values at Risk

FMU 31 contains overhead power lines in the northern and southern corners of the FMU. The rest of the FMU is largely absent of infrastructure as the area is primarily used for dismounted maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions.

Additionally, because of the rough and rugged terrain, wildfire response is limited to maneuver trails. Many of these trails are in rough shape and egress for firefighters could be very slow. Extreme caution should be used when entering this area during a wildfire.

Fuels Management Actions

Currently fuels management is limited to the potential use of prescribed fire. The FMU contains eight prescribed burn units.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 31 are to be extinguished as rapidly as possible using full suppression methods with engines.

Fire Escape Potential

The highest potential for fires to escape FMU 31 is along the entire western boundary and the western part of the northern boundary. These boundaries are also installation boundaries. There are no barriers to fire except for intermittent cliffs on the western boundary. The terrain is exceedingly complex, precluding vehicle access to large portions of the boundary. Pockets of piñon-juniper add to the fire severity and spot-fire potential.

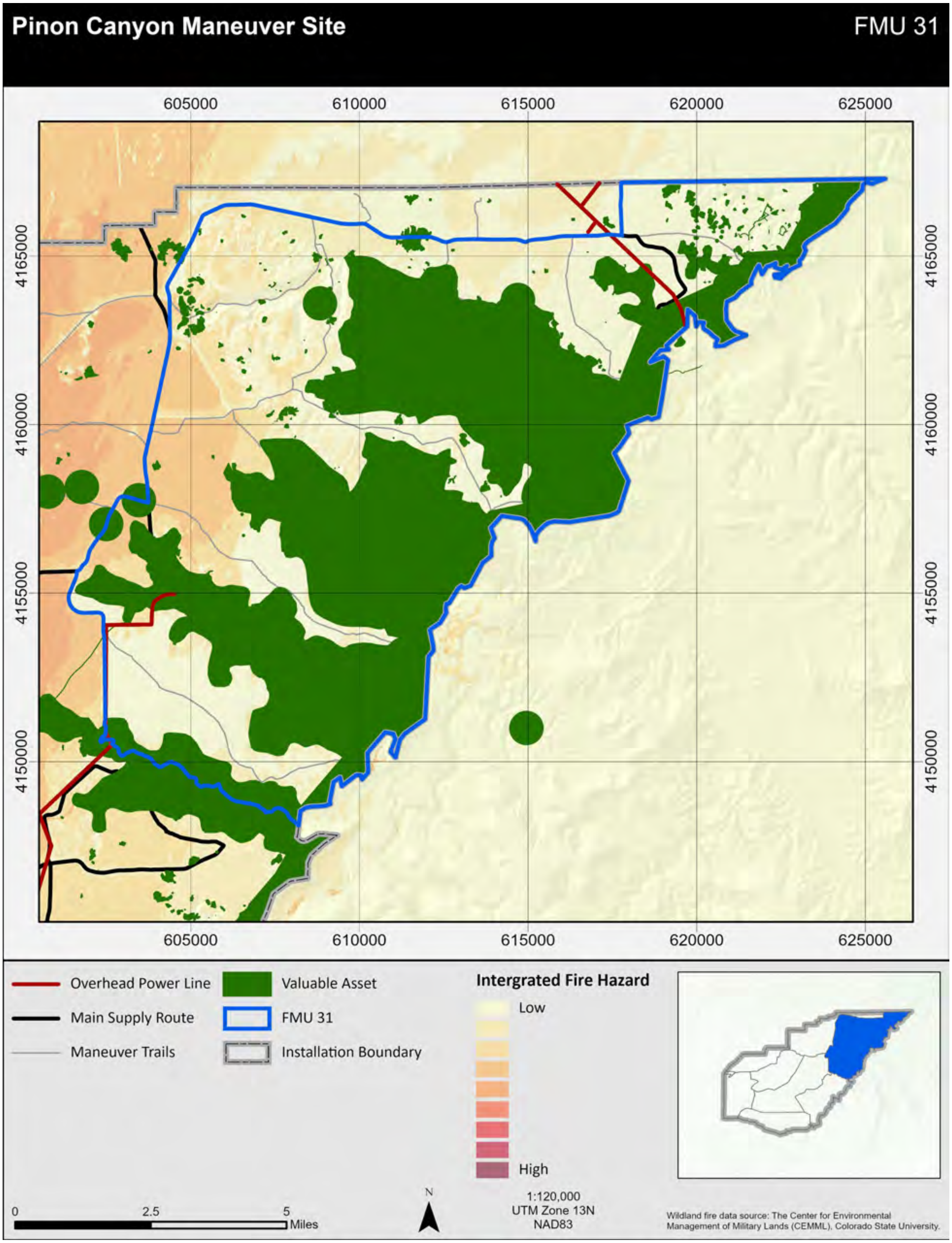


Figure A1 - 33. Map of PCMS FMU 31.

FMU 32
Wildfire Response: Full Suppression

Fuel Characteristics

The vast majority of the fuels within the FMU are grasslands, with GR2 and GR1 making up approximately 98% of the total fuels. Just under 1.5% of the area in FMU 32 is classified as non-burnable.

Table A1- 32. Spatial extent, in acres and percentage of total FMU 32 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	21,896.84	95.03%	21,896.84	95.03%
101	GR1	Short; sparse dry climate grass	755.72	3.28%	743.04	3.22%
62	CU62	Intermediate roads	182.37	0.79%	182.37	0.79%
99	NB9	Barren	83.62	0.36%	83.62	0.36%
124	GS4	High load; humid climate grass-shrub	30.91	0.13%	30.91	0.13%
122	GS2	Moderate load; dry climate grass-shrub	30.69	0.13%	30.69	0.13%
91	NB1	Urban	28.47	0.12%	28.47	0.12%
63	CU63	Minor roads	28.24	0.12%	28.24	0.12%
103	GR3	Low load; very coarse; humid climate grass	3.56	0.02%	3.56	0.02%
98	NB8	Water	1.11	0.00%	1.11	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	12.68	0.06%

Topography

The majority of the FMU is flat. Two small ridges running from northeast to southwest roughly cut the FMU in half lengthways. A small portion of elevated land, referred to as the hogback, is in the southern portion of the FMU. There are numerous maneuver trials throughout the FMU and terrain should not limit overland vehicle travel most of the time.

Fire Frequency

The fire frequency is high to very high throughout the FMU due to the presence of small arms ranges.

Flame Length

The majority of the FMU can expect flame lengths up to 4 feet. The northern portion of the FMU where fire frequency is less, resulting in a higher fuel load compared to areas that burn more frequently, may see up to 6-foot flame lengths.

Integrated Fire Hazard

IFH is moderate along the northern FMU boundary and low to moderate for the rest of the FMU. Van Bremer Arroyo in the southern portion of the FMU, where fuels are described as high load grass-shrubs represented as GR4, has the highest IFH anywhere on the installation. However, this area of high IFH is confined to the bottom of the drainage.

Values at Risk

FMU 32 contains the small arms ranges, which include buildings, targets, ammo supply points, and communication nodes. The buildings, communication nodes, and ammo supply points are located within the maintained portion of the ranges and risks from wildfires are low. The targets represent the largest wildfire risk due to their value for training. However, vegetation maintenance around them should reduce the risk. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 32 include those found in urban settings, such as propane tanks; overhead power lines; other electrical infrastructure; and a wide variety of hazardous materials, including smoke from burning plastics and other materials. Other safety factors for FMU 32 include higher traffic volume than seen elsewhere on the installation.

Additional safety factors for FMU 32 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area) during live-fire operations. Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

Currently fuels management is limited to the potential use of prescribed fire. The FMU contains six prescribed burn units. These burn units along with burn units in FMU 33 will be prioritized over other burn units throughout the installation.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 32 are to be extinguished as rapidly as possible using full suppression methods with engines.

Fire Escape Potential

The highest potential for fires to escape FMU 32 is along the western boundary, which is also the installation boundary. Fuels are continuous across the installation boundary with few impediments to fire spread.

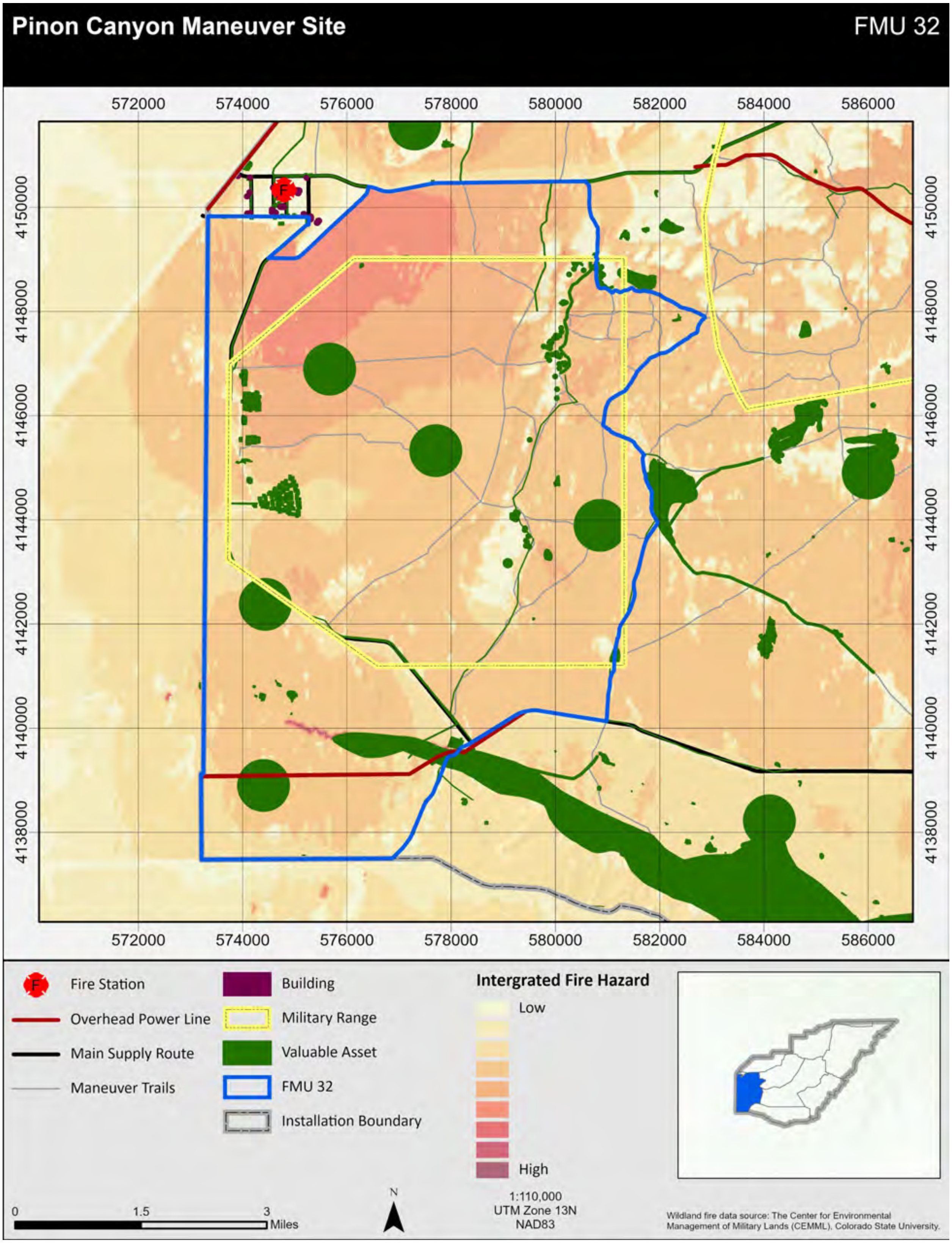


Figure A1 - 34. Map of PCMS FMU 32.

FMU 33
Wildfire Response: Full Suppression

Fuel Characteristics

The vast majority of the fuels within the FMU are grasslands, with GR2 and GR1 making up approximately 94% of the total fuels. Just under 1% of the area in FMU 33 is classified as non-burnable. Just over 4% of the FMU is made up of dense piñon-juniper woodlands, which is represented as GR1 during normal weather conditions and SH7 during extreme weather conditions.

Table A1- 33. Spatial extent, in acres and percentage of total FMU 33 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	17,922.33	77.38%	17,922.33	77.38%
101	GR1	Short; sparse dry climate grass	4,987.54	21.53%	4,037.67	17.43%
62	CU62	Intermediate roads	148.34	0.64%	148.34	0.64%
63	CU63	Minor roads	56.49	0.24%	56.49	0.24%
122	GS2	Moderate load; dry climate grass-shrub	40.25	0.17%	40.25	0.17%
103	GR3	Low load; very coarse; humid climate grass	6.45	0.03%	6.45	0.03%
121	GS1	Low load; dry climate grass-shrub	0.44	0.00%	0.44	0.00%
99	NB9	Barren	0.22	0.00%	0.22	0.00%
141	SH1	Low load dry climate shrub	0.22	0.00%	0.22	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	949.87	4.10%

Topography

The northern portion of the FMU has rolling hills running south of MSR 1. The rest of the FMU is relatively flat with some smaller hills. A few drainages, including Taylor Arroyo, may make overland vehicle travel difficult. However, there are numerous maneuver trails throughout the FMU.

Fire Frequency

The fire frequency is high to very high throughout the FMU due to a live-fire range that encompasses much of the FMU.

Flame Length

The majority of the FMU can expect flame lengths of up to 4 feet. The northeast portion of the FMU where fire frequency is lower, resulting in a higher fuel load compared to areas that burn more frequently, may see up to 6-foot flame lengths.

Integrated Fire Hazard

IFH is low along the northern FMU boundary just south of MSR 1. The northeast corner of the FMU has moderate IFH.

Values at Risk

FMU 33 contains Range 9, which includes targets and communication nodes. The communication nodes are found on the perimeter of the FMU. The targets represent the biggest risk from wildfires due to their value for training. However, vegetation maintenance around them should reduce the risk. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, and low humidity are found throughout the FMU and can contribute to hazardous conditions. Other hazards firefighters may face in FMU 32 include those found in urban settings such as propane tanks, overhead power lines and other electrical infrastructure, and a wide variety of hazardous materials, including smoke from burning plastics and other materials. Other safety factors for FMU 33 include higher traffic volume than seen elsewhere on the installation.

Additional safety factors for FMU 33 include live-fire ranges, which are hazardous whenever live-fire is occurring. The hazard is directional from the firing line forward (toward the impact area) during live-fire operations. Anyone responding to a wildfire within or adjacent to a range must ensure that all ranges affecting the area of the fire are in a “check fire” or “cease fire” condition before sending fire suppression forces down range.

Fuels Management Actions

Currently fuels management is limited to the potential use of prescribed fire. The FMU contains nine prescribed burn units. These burn units along with burn units in FMU 32 will be prioritized over other burn units throughout the installation.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 33 are to be extinguished as rapidly as possible using full suppression methods with engines.

Fire Escape Potential

The highest potential for fires to escape FMU 33 is along the southern and western boundaries, where only two-track roads could potentially stop fire spread.

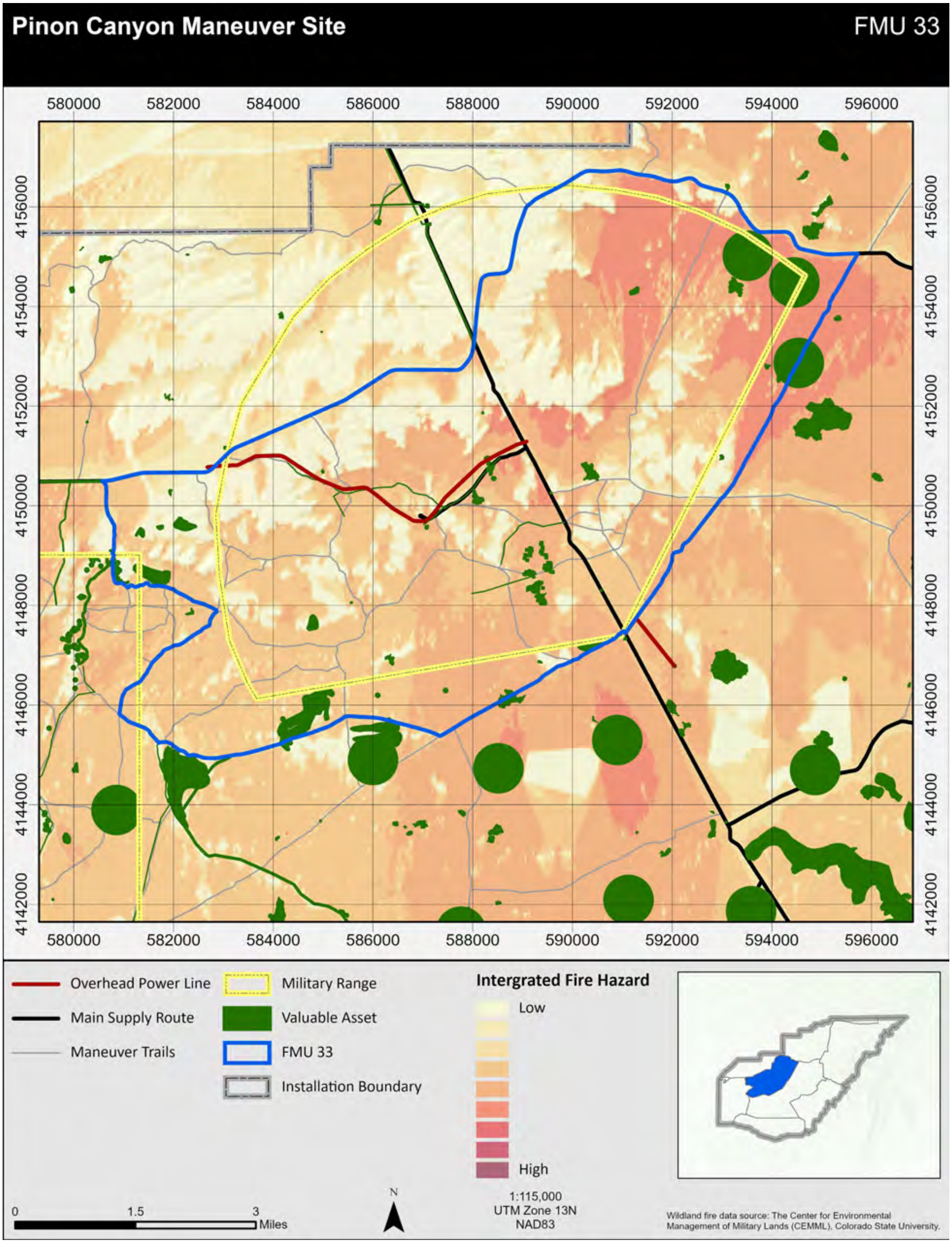


Figure A1 - 35. Map of PCMS FMU 33.

FMU 34
Wildfire Response: Full Suppression

Fuel Characteristics

Almost the entire area of the FMU is grasslands, with GR2 and GR1 making up approximately 98% of the total fuels. Just under 1% of the area in FMU 34 is classified as non-burnable.

Table A1- 34. Spatial extent, in acres and percentage of total FMU 34 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	38,346.43	92.98%	38,346.43	92.98%
101	GR1	Short; sparse dry climate grass	2,451.52	5.94%	2,329.20	5.65%
62	CU62	Intermediate roads	282.00	0.68%	281.34	0.68%
99	NB9	Barren	59.16	0.14%	59.16	0.14%
122	GS2	Moderate load; dry climate grass-shrub	56.93	0.14%	56.93	0.14%
63	CU63	Minor roads	37.81	0.09%	37.59	0.09%
103	GR3	Low load; very coarse; humid climate grass	3.34	0.01%	3.34	0.01%
145	SH5	High load; humid climate grass-shrub	2.00	0.00%	2.00	0.00%
98	NB8	Water	0.67	0.00%	0.67	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	123.21	0.30%

Topography

The majority of the FMU is flat with some rolling hills. The northern portion of Lockwood Canyon extends into the northern portion of the FMU. Several drainages may make overland vehicle travel difficult, including Taylor and Burke Arroyos. However, there are numerous maneuver trails throughout the FMU.

Fire Frequency

The fire frequency is high to very high throughout the FMU due to Range 9, which is just north of the FMU. A small area in the southeast corner has moderate to low fire frequency.

Flame Length

The majority of the FMU can expect flame lengths up to 4 feet. The northeast and southwest portion of the FMU where fire frequency is lower, resulting in a higher fuel load compared to areas that burn more frequently, may see up to 6-foot flame lengths.

Integrated Fire Hazard

IFH is low to moderate throughout the FMU, with the highest, still moderate, along the northwest boundary of the FMU.

Values at Risk

FMU 34 contains gas regulator sites that are above ground and run along the natural gas pipeline. It also has some overhead power lines. The rest of the FMU is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions.

Fuels Management Actions

Currently fuels management is limited to the potential use of prescribed fire. The FMU contains five prescribed burn units. The burn units just south of Range 9 will be a priority.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 34 are to be extinguished as rapidly as possible using full suppression methods with engines.

Fire Escape Potential

The highest potential for fires to escape FMU 34 is in the canyon that crosses the eastern boundary. Access and cross-country travel are both difficult in and near the canyon. Potential for escape stretches from the canyon south to the southern boundary as there is no proper road currently.

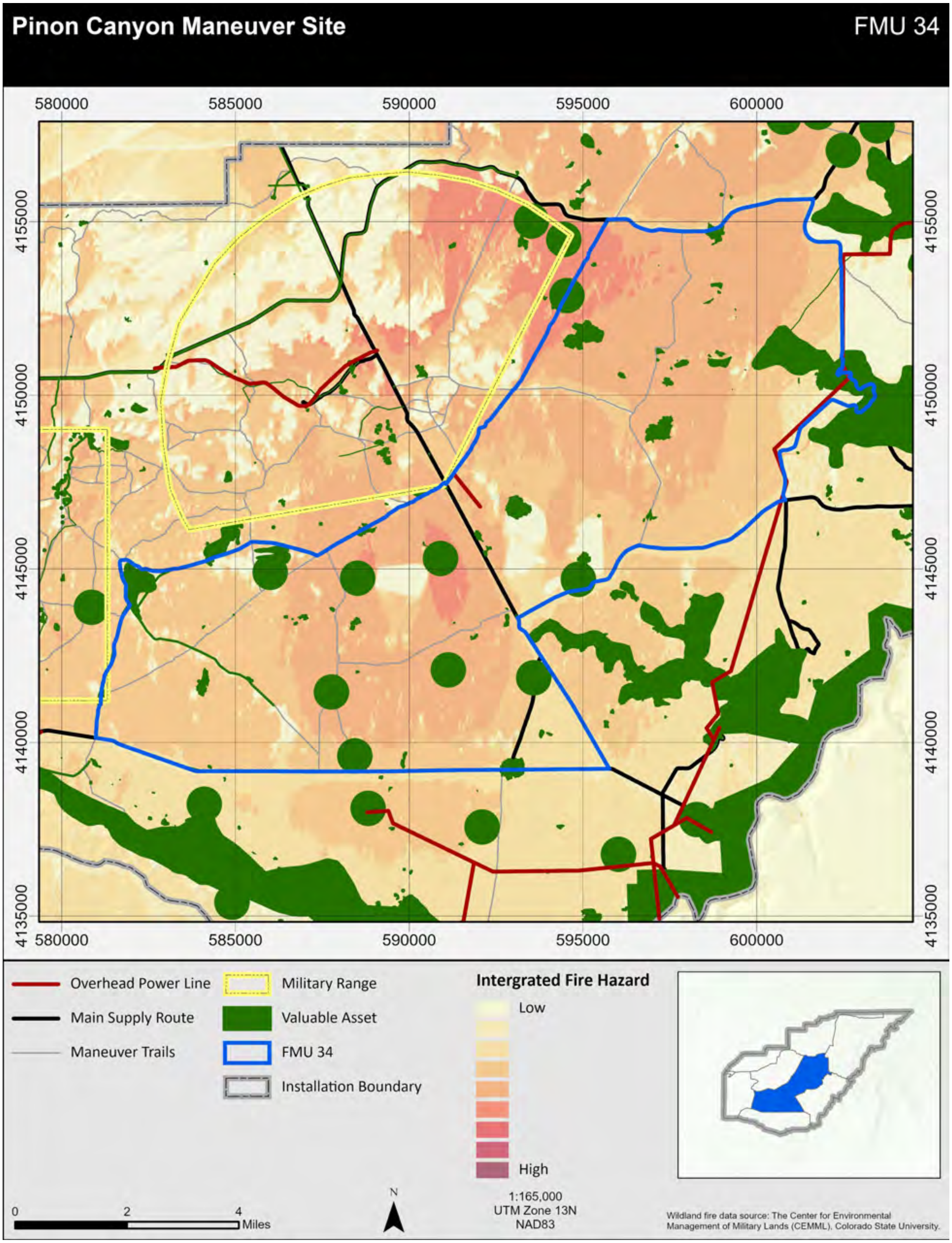


Figure A1 - 36. Map of PCMS FMU 34.

FMU 35
Wildfire Response: Full Suppression

Fuel Characteristics

Almost the entire area of the FMU is grasslands, with GR2 and GR1 making up approximately 98% of the total fuels. Just under 1% of the area in FMU 34 is classified as non-burnable.

Table A1- 35. Spatial extent, in acres and percentage of total FMU 35 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	21,253.21	94.95%	21,253.21	94.95%
101	GR1	Short; sparse dry climate grass	912.73	4.08%	769.28	3.44%
62	CU62	Intermediate roads	78.28	0.35%	78.28	0.35%
63	CU63	Minor roads	66.50	0.30%	66.50	0.30%
99	NB9	Barren	60.27	0.27%	60.27	0.27%
103	GR3	Low load; very coarse; humid climate grass	5.34	0.02%	5.34	0.02%
122	GS2	Moderate load; dry climate grass-shrub	5.34	0.02%	5.34	0.02%
98	NB8	Water	2.22	0.01%	2.22	0.01%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	143.45	0.64%

Topography

The most prominent topological feature is an area of elevated land referred to as the Hogback. It runs from the northwest corner to the southeast corner of the FMU. Numerous arroyos run from the north to the south of the FMU, including Van Bremer Arroyo. Overland vehicle travel will be affected by these arroyos and the Hogback.

Fire Frequency

The fire frequency is moderate for most of the FMU. A small area in the northwest corner, closest to the small arm ranges, has high fire frequency.

Flame Length

The majority of the FMU can expect flame lengths up to 4 feet. An area in the central portion of the FMU may see up to 6-foot flame lengths.

Integrated Fire Hazard

IFH is low along the Hogback and low to moderate for the rest of the FMU.

Values at Risk

FMU 35 contains some overhead power lines. The rest of the FMU is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions.

Fuels Management Actions

Currently fuels management is limited to the potential use of prescribed fire. The FMU contains three prescribed burn units.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 35 are to be extinguished as rapidly as possible using full suppression methods with engines.

Fire Escape Potential

The potential for fires to escape FMU 35 is highest on the eastern side where a small canyon crosses the boundary. Access within and near the canyon is difficult. Additionally, a drainage with heavier fuels that crosses the western boundary creates another potential location for escapes from the FMU.

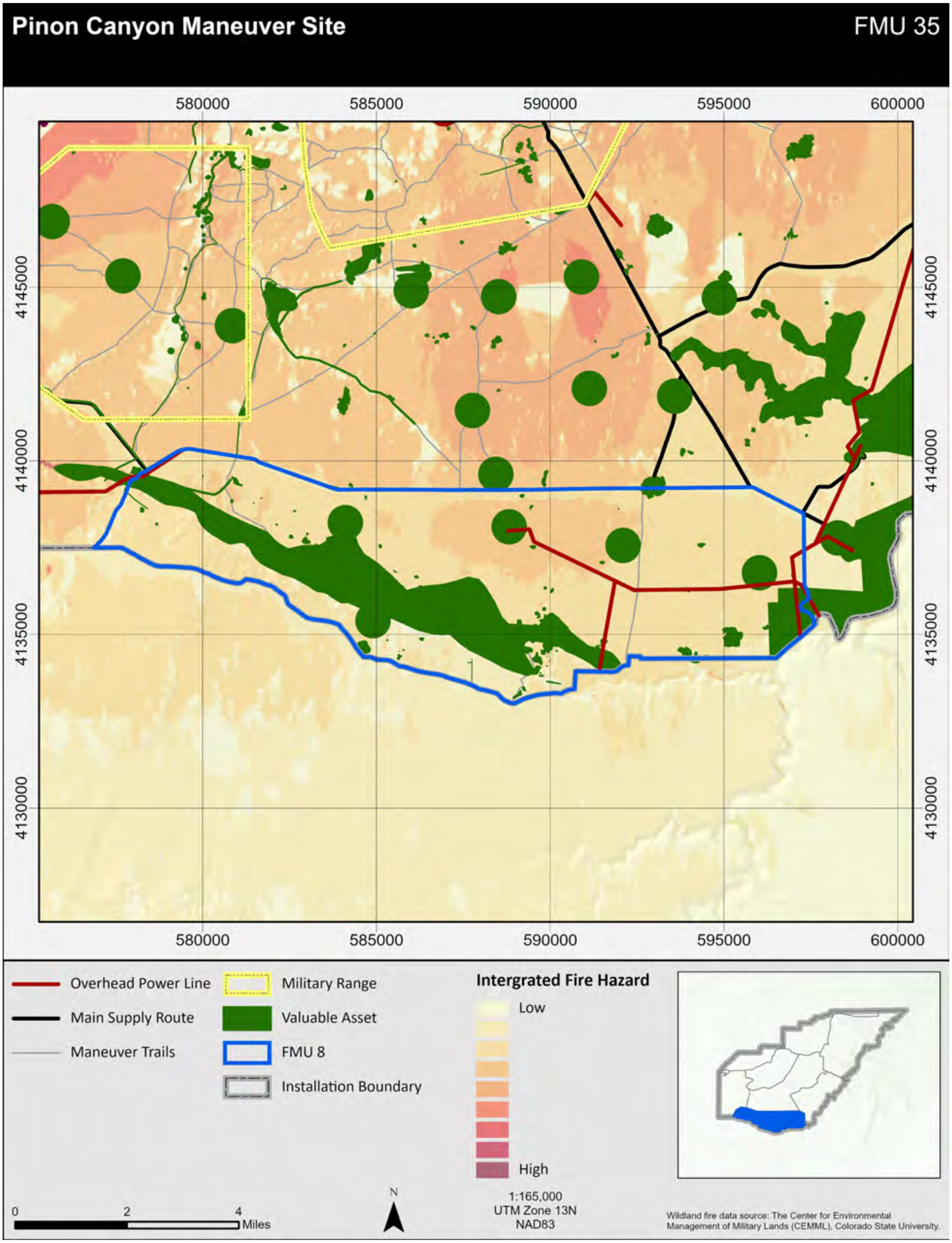


Figure A1 - 37. Map of PCMS FMU 35.

FMU 36
Wildfire Response: Full Suppression

Fuel Characteristics

The vast majority of the fuels within the FMU are grasslands, with GR2 and GR1 making up approximately 95% of the total fuels. Just under 1% of the area in FMU 36 is classified as non-burnable. Just under 3.5% of the FMU is made up of dense piñon-juniper woodlands, which is represented as GR1 during normal weather conditions and SH7 during extreme weather conditions.

Table A1- 36. Spatial extent, in acres and percentage of total FMU 36 area, of each fuel model.

Fuel Model #	Fuel Model Code	Fuel Model Description	Typical Conditions		Extreme Conditions	
			Area (ac)	Area (%)	Area (ac)	Area (%)
102	GR2	Low load; dry climate grass	22,014.71	87.86%	22,014.71	87.86%
101	GR1	Short; sparse dry climate grass	2,689.93	10.73%	1,823.90	7.28%
63	CU63	Minor roads	134.77	0.54%	134.77	0.54%
62	CU62	Intermediate roads	92.74	0.37%	91.63	0.37%
122	GS2	Moderate load; dry climate grass-shrub	91.18	0.36%	91.18	0.36%
99	NB9	Barren	10.68	0.04%	10.68	0.04%
103	GR3	Low load; very coarse; humid climate grass	7.78	0.03%	7.78	0.03%
104	GR4	Moderate load; dry climate grass	7.56	0.03%	7.56	0.03%
145	SH5	High load; humid climate grass-shrub	7.56	0.03%	7.56	0.03%
98	NB8	Water	0.67	0.00%	0.67	0.00%
147	SH7	Very high load; dry climate shrub	0.00	0.00%	867.14	3.46%

Topography

The most prominent topological feature is the Taylor Arroyo and the south half of Lockwood Canyon. The area between Taylor Arroyo and Lockwood Canyon is relatively flat, as is the rest of the FMU. The arroyo and the canyon will make overland vehicle travel difficult in those areas.

Fire Frequency

The majority of the fire frequency is moderate for the FMU. The northwest corner of the FMU has high fire frequency.

Flame Length

The majority of the FMU can expect flame lengths up to 4 feet. An area west of the Taylor Arroyo may see up to 6-foot flame lengths.

Integrated Fire Hazard

IFH is moderate along the northern boundary of the FMU and decreases south of Range 9.

Values at Risk

FMU 35 contains some overhead power lines. The rest of the FMU is largely absent of infrastructure as the area is primarily used for maneuver training. Numerous cultural and natural resources are found throughout the FMU.

Risks to Firefighters

Normal environmental factors of heat, cold, dust, wind, steep terrain, and low humidity are found throughout the FMU and can contribute to hazardous conditions.

Additionally, because of the rough and rugged terrain in the Taylor Arroyo and Lockwood Canyon areas, wildfire response is limited to maneuver trails. Many of these trails are in rough shape and egress for firefighters could be very slow. Extreme caution should be used when entering this area during a wildfire.

Fuels Management Actions

Currently fuels management is limited to the potential use of prescribed fire. The FMU contains one prescribed burn unit.

Wildfire Management

Default Suppression Strategy: Full Suppression

All wildfires in FMU 36 are to be extinguished as rapidly as possible using full suppression methods with engines.

Fire Escape Potential

The potential for fires to escape FMU 36 is high along the entire eastern boundary, with the highest potential in Taylor Arroyo and Lockwood Canyon. There are no roads in or near these canyons, and the terrain precludes off-road vehicle travel. There are also no barriers to fire burning towards the eastern boundary and fuels are contiguous throughout.

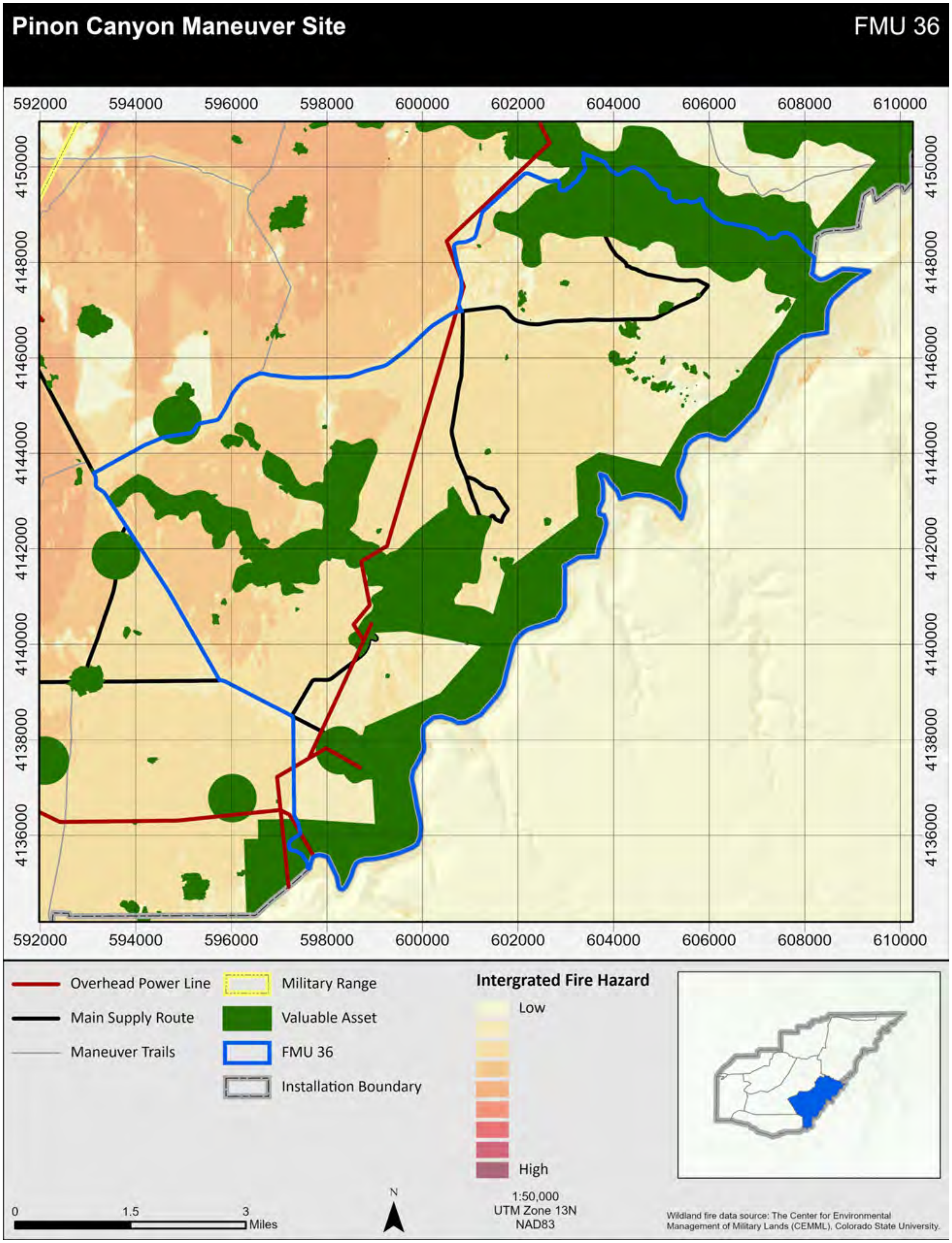
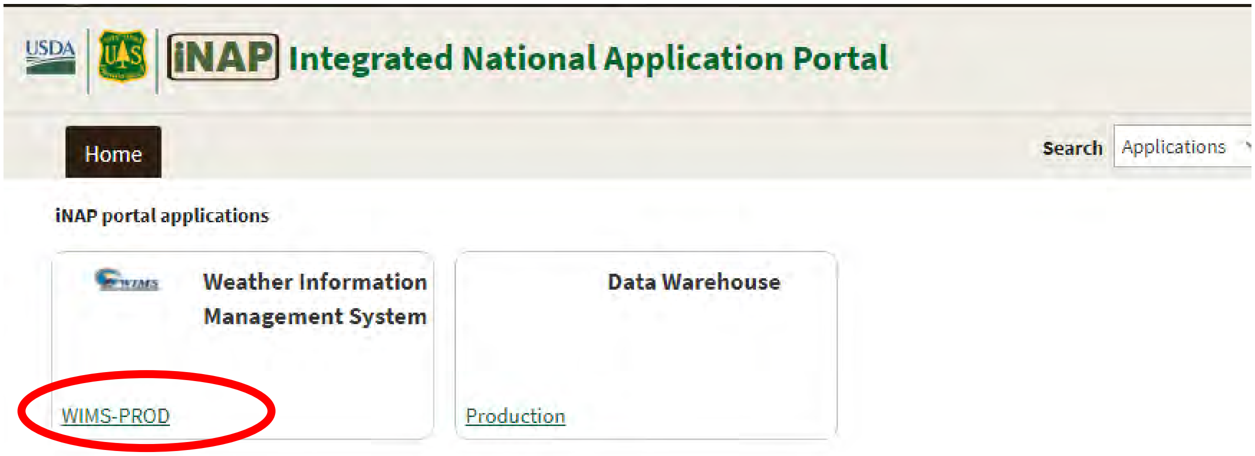


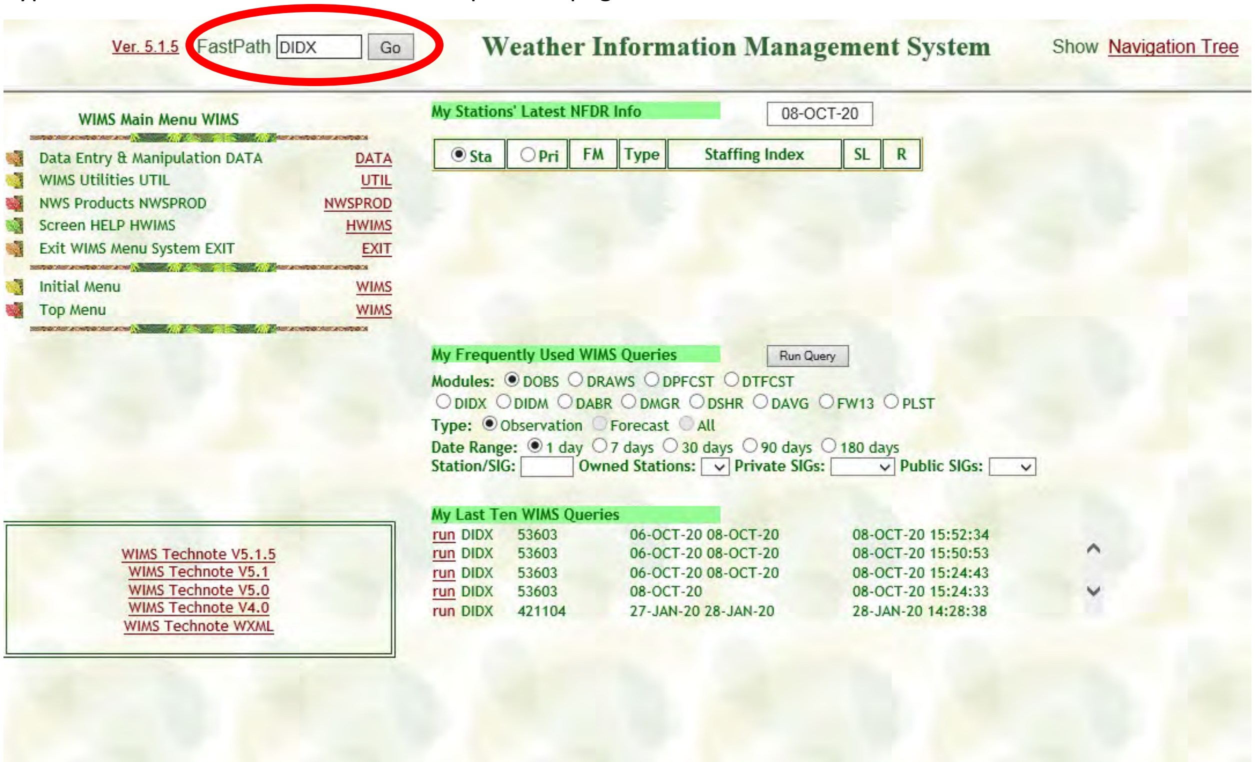
Figure A1 - 38. Map of PCMS FMU 36.

Appendix 2 – Fire Danger Rating System Instructions

To determine the day's fire danger, navigate to nap.nwcg.gov/NAP and log into the USAG FC WIMS account. Once logged in, click on the link to WIMS. Note that your page view may include other links.



Type "DIDX" into the FastPath at the top of the page:



Fort Carson - Enter the Station ID 053603. (If data for the current day is unavailable, switch to Station ID 054001.)

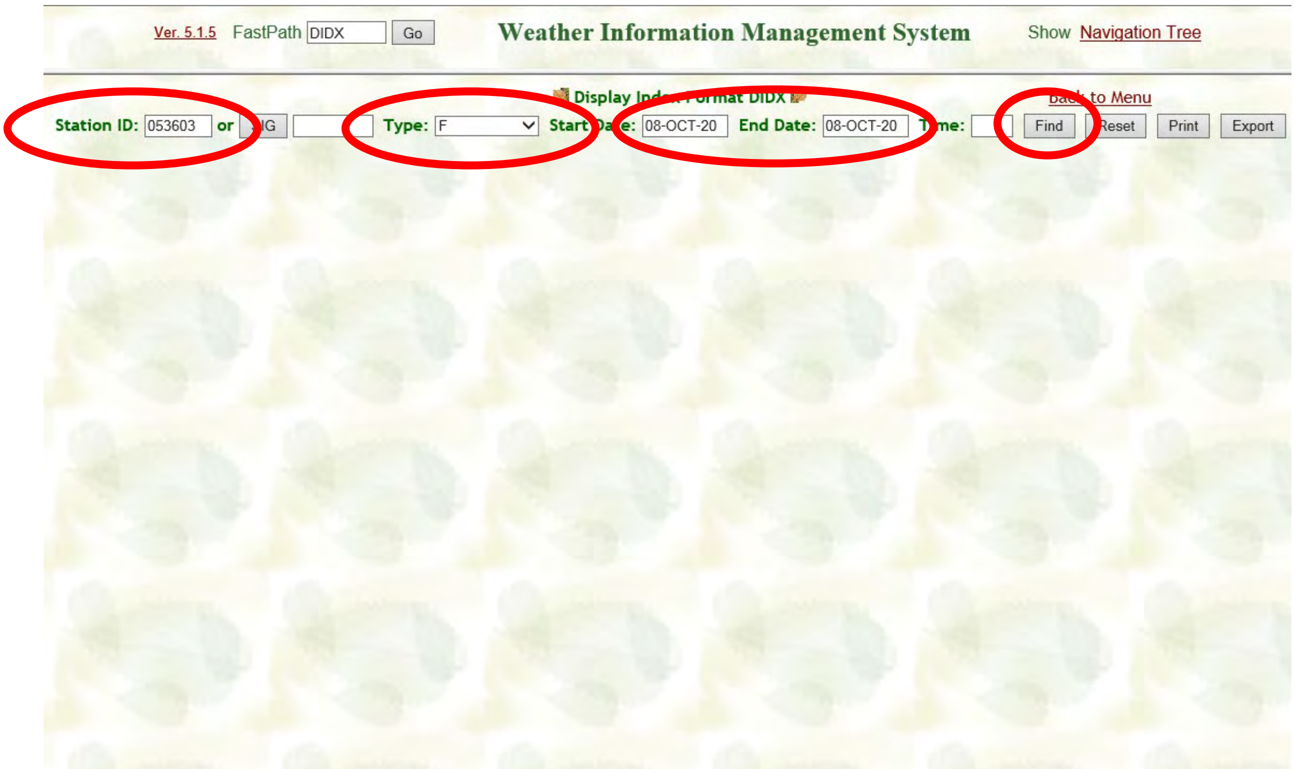
Piñon Canyon – Enter Station ID 056202. (If data for the current day is unavailable, switch to Station ID 142203.)

Select Type 'F'.

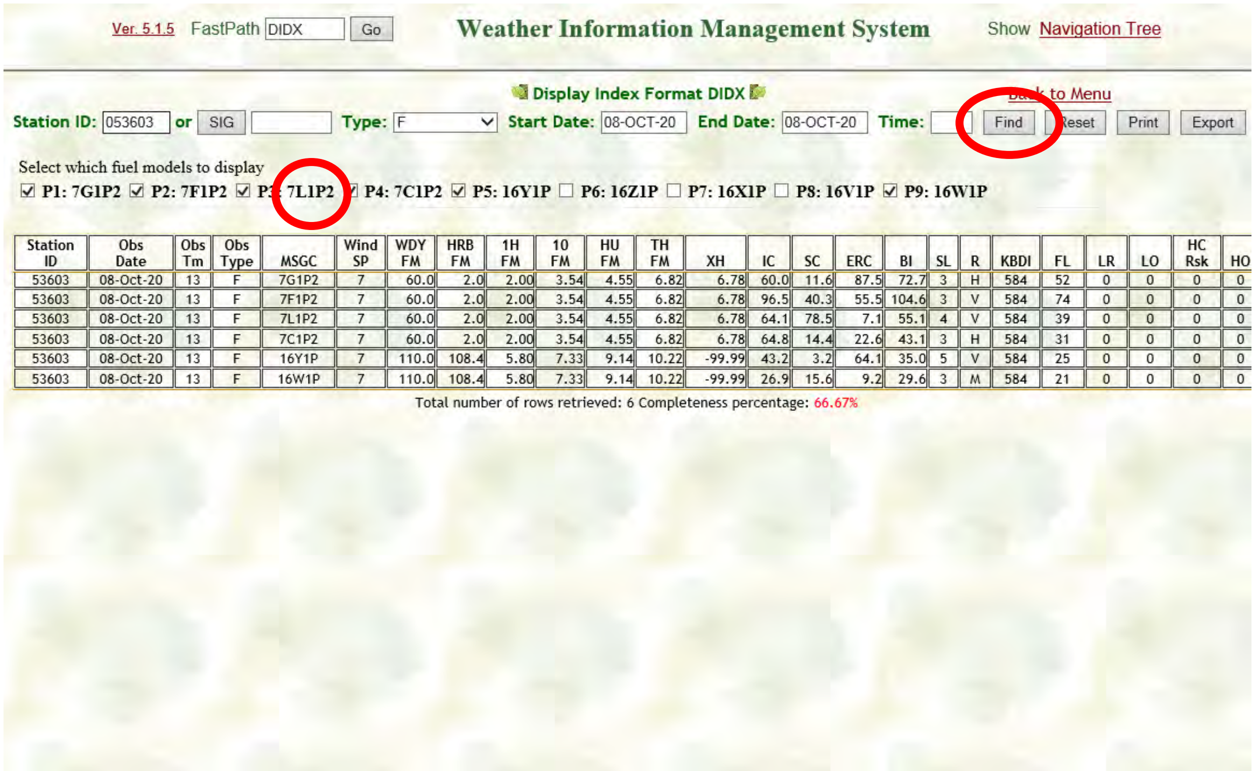
Ensure the current day's date is selected.

Make sure the box for 'P9: 16WIP' is checked and all other fuel model boxes are unchecked.

Then click 'Find'.



You should see something that looks like the below image. Unclick all of the fuel models except the choice that says '7L1P2'. Then click 'Find' again.

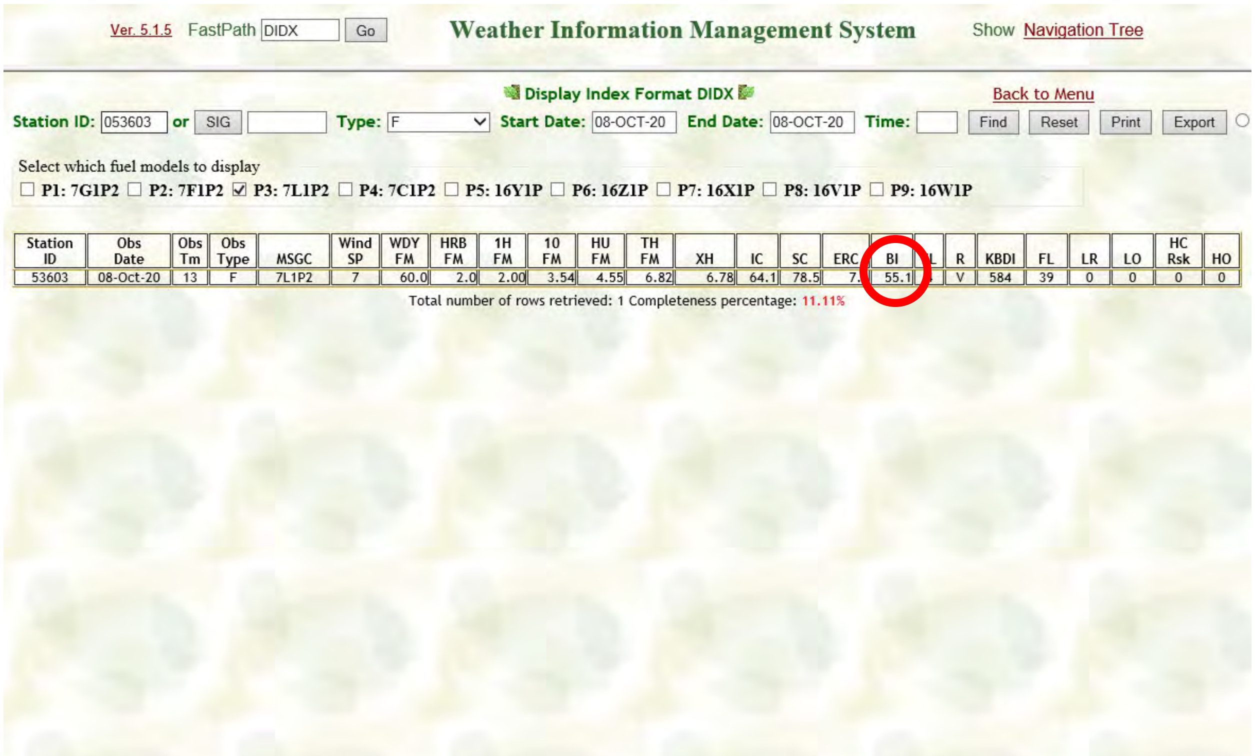


Station ID	Obs Date	Obs Tm	Obs Type	MSGC	Wind SP	WDY FM	HRB FM	1H FM	10 FM	HU FM	TH FM	XH	IC	SC	ERC	BI	SL	R	KBDI	FL	LR	LO	HC Rsk	HO
53603	08-Oct-20	13	F	7G1P2	7	60.0	2.0	2.00	3.54	4.55	6.82	6.78	60.0	11.6	87.5	72.7	3	H	584	52	0	0	0	0
53603	08-Oct-20	13	F	7F1P2	7	60.0	2.0	2.00	3.54	4.55	6.82	6.78	96.5	40.3	55.5	104.6	3	V	584	74	0	0	0	0
53603	08-Oct-20	13	F	7L1P2	7	60.0	2.0	2.00	3.54	4.55	6.82	6.78	64.1	78.5	7.1	55.1	4	V	584	39	0	0	0	0
53603	08-Oct-20	13	F	7C1P2	7	60.0	2.0	2.00	3.54	4.55	6.82	6.78	64.8	14.4	22.6	43.1	3	H	584	31	0	0	0	0
53603	08-Oct-20	13	F	16Y1P	7	110.0	108.4	5.80	7.33	9.14	10.22	-99.99	43.2	3.2	64.1	35.0	5	V	584	25	0	0	0	0
53603	08-Oct-20	13	F	16W1P	7	110.0	108.4	5.80	7.33	9.14	10.22	-99.99	26.9	15.6	9.2	29.6	3	M	584	21	0	0	0	0

Total number of rows retrieved: 6 Completeness percentage: 66.67%

Your page should look like the below, with one row of data. If you get more, you probably have more than one fuel model checked. Uncheck any fuel models other than the choice that includes '7L1P2' and click 'Find' again. If you still get more than one row, there may be more than one forecast available. Ensure you are looking at the data for the current date.

Write down the BI (Burning Index).



Go to the National Weather Service web page to check for Red Flag Warnings:

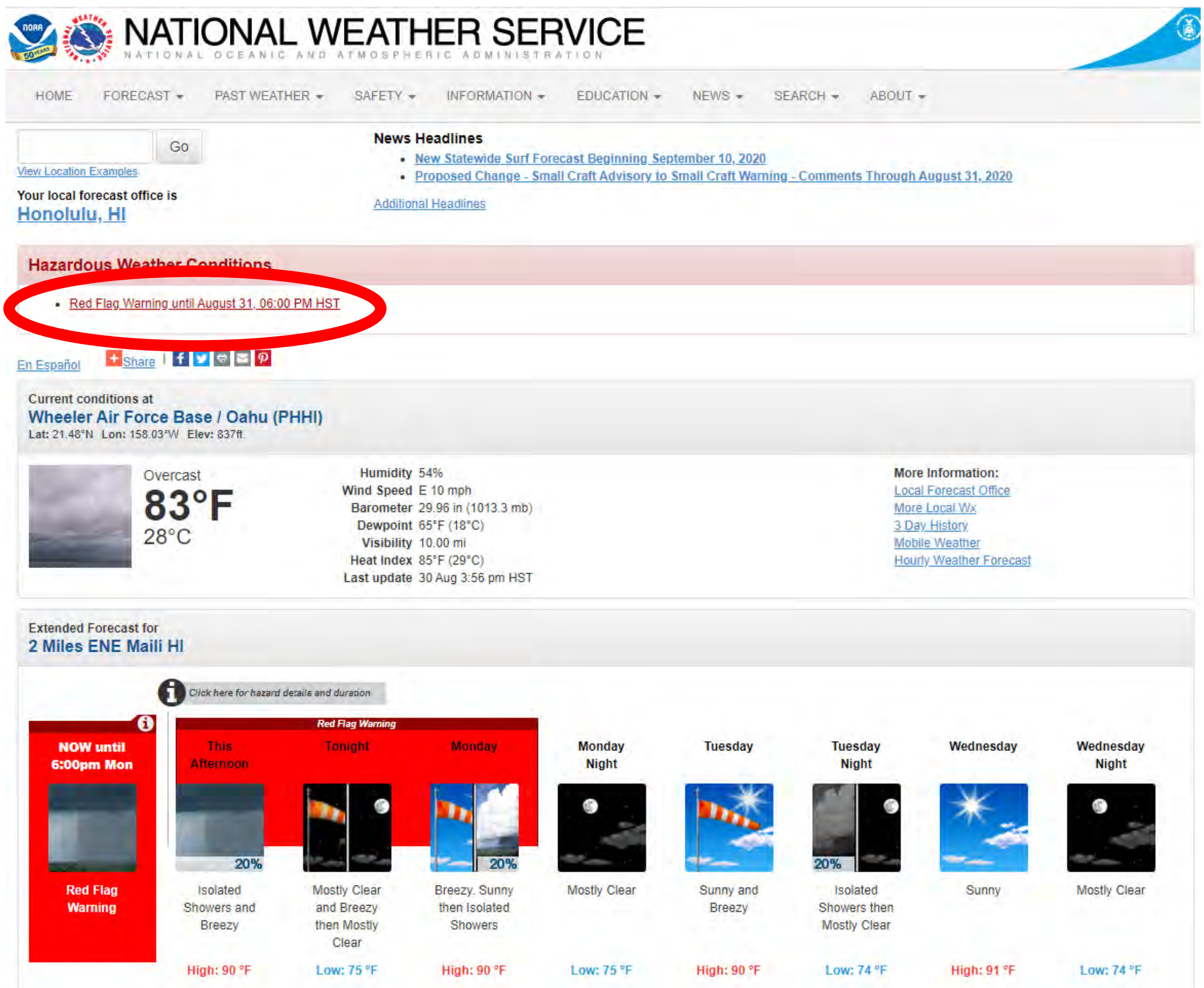
Fort Carson - This link will provide the forecast for the location of the Large Impact Area: https://forecast.weather.gov/MapClick.php?lon=-104.77729797363281&lat=38.647980792977904#.X7Kyy2hKhaQ.

Piñon Canyon – This link will provide the forecast for the location of Range 9:

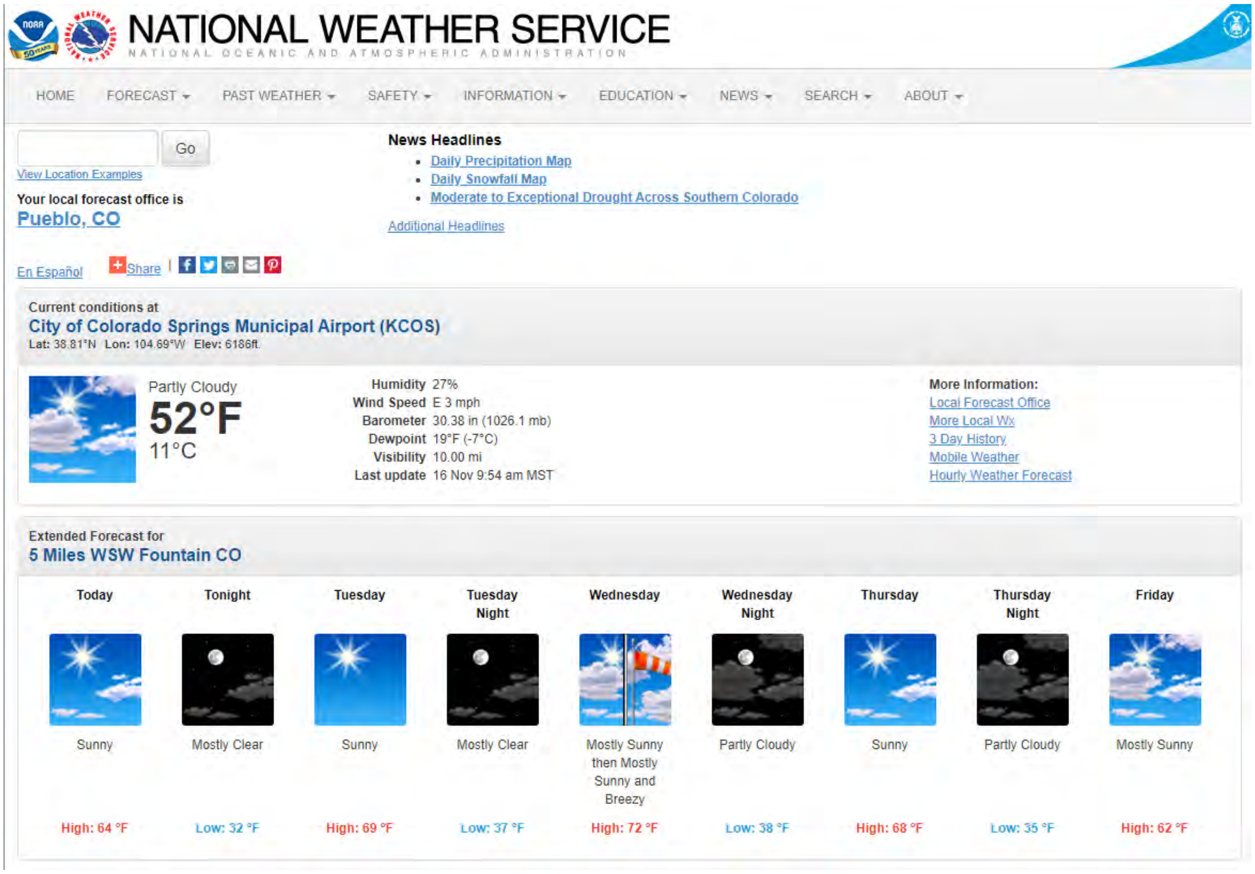
https://forecast.weather.gov/MapClick.php?lon=-103.97403538227081&lat=37.47223979250572#.YbOV_73MJaQ

Determine if a Red Flag Warning is in effect or projected for the day. If a Red Flag warning exists, it will be at the top of the page

Example of a day with a Red Flag Warning. If there is a Red Flag warning it will be located at the top of the page under a red 'Hazardous Weather Conditions' banner:



Example of a day with no Red Flag Warning. If there is no Red Flag warning, there will either be no ‘Hazardous Weather Conditions’ red banner, as is the case in this example, or there will be a banner, but no red flag warning is listed (other hazards may be listed):



Use the BI and Red Flag information to determine the day's fire danger by using the table below to determine which category it falls into. Then reference Table 25 in the IWFMP to determine the day's recommended training restrictions.

Burning Index	Recommended Fire Danger Rating
<14	**Low**
14-34	**Moderate**
35-62	**High**
63-80	**Very High**
>80 or Red Flag Warning	**Extreme**

Appendix 3 – U.S. Army Garrison Fort Carson Fire Safety Briefing

The following topics will be addressed in the safety briefing provided to units by Range Control prior to training (Appendix B of Fort Carson Regulation 385-63) under a new numbered item called 'Fire Prevention Measures'. The below measures will be added to those already included in FC Reg 385-63 Section 1-7.

1) Fires often result in range downtime to the unit causing the fire as well as to units using neighboring ranges and training areas. Fires can also damage training infrastructure or buildings and pose a safety hazard.
2) A Fire Danger Rating System restricts what types of training are authorized and where those restrictions apply. All users must know the day's fire danger and the restrictions applicable to the types of training and locations they intend to use. This policy is strictly enforced, and punitive measures may be applied for non-compliance including loss of training privileges.
3) Smoking on the ranges is prohibited except in approved areas and on roads. Dispose of all cigarettes in butt cans. Smoking downrange is prohibited.
4) Open fires are prohibited.
5) When approved for use, heat producing simulators, pyrotechnics, smoke, and other training aids must be deployed in areas free of vegetation for a radius of no less than 10 feet.
6) Heat tabs and similar products must be used inside metal containers.

In the event a fire is started, cease training immediately and notify Range Control. The fire detail will proceed down range to engage the fire only once the OIC determines it is safe to do so. The fire detail will not engage fires unless the fire is in managed (mowed) vegetation within the range.

Once firefighters arrive on scene, they will take command of the fire response. Do not resume training without authorization from Range Control.

Appendix 4 – Significant User of Prescribed Fire Planning Document

Fort Carson
Department of the Army
Prescribed Fire Planning Document

For compliance with the Colorado Air Quality Control Commission, Regulation No. 9

Prepared for:	Colorado Air Quality Commission
Date:	March 21, 2013

Prepared by: Andy Cullan
Prescribed Fire Coordinator, Fort Carson Fire and Emergency Services

Peter Wolf
Wildland Fire Management Officer, Fort Carson Fire and Emergency Services

I. EXECUTIVE SUMMARY

The Department of the Army operates both Fort Carson and the Piñon Canyon Maneuver Site (collectively referred to as Fort Carson) in southeastern Colorado. Its mission is to train soldiers for combat readiness, global peacekeeping efforts, and disaster response. The combined land area of 373,300 acres is managed primarily for military training, but also for multiple other uses, such as wildlife and habitat enhancement, recreational opportunities, and protection of threatened and endangered species. Sustaining a healthy environment parallels supporting the military mission. Careful planning for managing the land helps to both maintain a vigorous ecosystem and minimize environmental impacts from training exercises.

Fort Carson relies on an integrated planning and decision-making process that considers a variety of criteria and constraints, which in-turn determine the most practical fuel treatment method that can be utilized for a particular land area. Throughout the planning process the State standard is considered; therefore, the method selected must be one that is technologically feasible and economically reasonable to minimize or reduce the potential for air quality impacts.

To manage fuel loads and achieve specific resource management goals, a variety of fuel treatment alternatives (i.e., mechanical and cultural) are considered within the physical, technological, and fiscal confines. Often, prescribed fire is a preferred treatment method due to its overall ecosystem benefits, preserving native biota and endangered species' habitat, as well as its ability to minimize the potential for more intense and uncontrolled wildland fires from occurring and spreading to the surrounding community.

Careful planning is implemented prior to setting a prescribed fire, as well as constant monitoring during it, to ensure that air quality impacts and safety are not compromised. As prescribed fires reduce fuel loads and create firebreaks to help contain wildfires, the impacts of smoke from wildfires and the risk of wildfire damage to residential areas are minimized significantly.

II. INTRODUCTION

Fort Carson submits this planning document to comply with the requirements of the Colorado Air Quality Control Commission (AQCC) Regulation No. 9 (*Open Burning, Prescribed Fire and Permitting*). Pursuant to that regulation, this document summarizes Fort Carson's use of prescribed fire as a land management tool and its integrated planning process related to fuel management. As outlined in Regulation 9, Section VII.E.5, Fort Carson requests that this document be considered applicable for 10 years from the date it is accepted. Any revisions that directly affect it will be presented to the AQCC in a timely manner for appropriate review and comment.

As with other federal organizations, Fort Carson's activities must comply with numerous federal, state, and county laws and regulations, in addition to those policies set by the United States Department of the Army (DOA). Therefore, all of the Installation policies, procedures, and management actions must be consistent with environmental laws (e.g., the Endangered Species Act, Clean Air Act, and Clean Water Act).

There are several policies specific to wildland fire management on federal lands that Fort Carson must follow. The *1995/2001 Revised, Federal Wildland Fire Policy* directs federal land management agencies to achieve an integral balance between fire suppression and fire use. It also states that every area with burnable vegetation must have an approved Fire Management Plan. A second important document is the *Army Wildland Fire Policy Guidance* (August 2002), which supplements two Army Regulations (AR): AR 420-90 (*Fire and Emergency Services*) and AR 200-3 (*Natural Resources - Land, Forest and Wildlife Management*). This policy directs installations to develop and implement an *Integrated Wildland Fire Management Policy* (*IWFMP*) that will be amalgamated with several important plans [i.e., the *Integrated Natural Resources Management Plan* (*INRMP*), the Fire and Emergency Services operational guidelines, and the *Integrated Cultural Resources Management Plan (ICRMP*)].

Background

Fort Carson is located in the east central portion of Colorado at the foot of the Rocky Mountain Front Range, approximately eight miles south of Colorado Springs and 60 miles south of Denver. Established in 1942, Fort Carson occupies 137,403 acres in El Paso, Fremont, and Pueblo Counties, and it is an active military training facility for both weapons qualifications and field training. The post includes 92 ranges and training facilities, 56 training areas, an airfield, a dirt air strip and 12 drop zones. Fort Carson's served population during 2013 included more than 26000 active duty military, 5600 Department of the Army support staff, and 42000 family members.

In 1983, an additional 235,897 acres were acquired in Las Animas County, approximately 150 miles southeast of Fort Carson (Appendix B). The Piñon Canyon Maneuver Site (PCMS), provides valuable training land to U.S. Armed Forces who practice larger scale maneuver skills and operations on a year-round basis. The site has 8 ranges and training facilities, 30 training areas, 7 parachute drop zones and 1 dirt air strip. Although the PCMS has limited full-time personnel assigned there, the area is administratively part of Fort Carson and together they are referred to as Fort Carson.

Mission

The primary mission of Fort Carson is training all assigned and attached troops for combat readiness, global peacekeeping efforts, and disaster response. Fort Carson's mission ensures the rapid deployment of its various military components to anywhere in the world in support of national defense objectives. Much of the activity at Fort Carson is directly related to supporting and training the 4th Infantry Division (ID), 43rd Area Support Group, and 10th Special Forces Group. In addition, the Installation provides support to the U.S. Army Reserve, the National Guard, the Reserve Officers Training Corps, the U.S. Air Force Reserve, the U.S. Naval Reserve, and the U.S. Marine Corps Reserve.

Multiple Users and Management

The main management objective of Fort Carson and Pinon Canyon Maneuver Site is to provide and augment realistic training, with additional land management objectives for wildlife and associated habitat, recreational opportunities, and threatened and endangered species. To help meet these multiple, diverse management demands it is critical to have close coordination with numerous organizations on the Installation.

Organizational Structure

The Garrison Commander is responsible for several organizations that work for the Commanding General in support of the training readiness mission. These organizations include the Directorate of Public Works – Environmental Division (DPW-E) and the Directorate of Emergency Services (DES). These organizations also work with the Directorate of Plans, Training and Mobilization (DPTM). From these diverse organizations a holistic team is created as personnel integrate their expertise and resources to work on many environmental issues, such as wildfire management.

III. PLANNING PROCESS

Fort Carson manages its resources for multiple purposes, with the primary goal of providing multi-use training areas to support the military mission. However, sustaining a healthy environment is never compromised to support the mission; careful planning for managing the land helps to both maintain a vigorous ecosystem and minimize environmental impacts from training exercises.

The DES Fort Carson Fire and Emergency Services personnel work closely with the DPW–E's Air Quality Natural Resources and Cultural Resources programs to develop annual prescribed fire plans. Planning is coordinated before the fire season to allow for the development of opportune time periods when fire prescriptions and predominant climatic conditions allow fires to be conducted safely and with the least impact to air quality and visibility.

Due to the environmental complexity, and multiple factors and regulations involved, the Army Wildland Fire Policy Guidance requires that prescribed fire projects be planned and analyzed using an interdisciplinary approach. As outlined in Section I, the prescribed fire activities and fuel load management are a coordinated effort supported by resource and fire management professionals in both the DES-Fire and DPW-E. Primarily, the DES Fire is responsible for identifying hazardous fuels situations and managing both prescribed fire ignitions and wildland fire suppression activities. DPW-E is responsible for natural/cultural resource management and environmental compliance. It also maintains a supplemental Wildland Fire Team that complements and supports DES-Fire by providing regulatory and technical guidance, reviewing and requesting permits, and assisting wildland fire fighting and prescribed fire implementation and monitoring.

There are several major components of the planning process. Multiple criteria and constraints, such as the specific land management objectives (how the land is utilized), the location of the land area, and fuel load quantity/type will dictate the type of fuel treatment(s) chosen (see Section III). Also, a risk assessment is completed prior to all planned fires. This assessment identifies and evaluates the potential hazards and impacts to life and property, as well as any other significant factors, such as endangered species habitat or cultural resources that may be impacted. Planned prescribed fires will only be ignited after a current fire weather forecast has been obtained from the National Weather Service in Pueblo, Colorado (see Section V, Protecting Air Quality.) and a Go – No-Go Checklist is completed.

The planning process for the use of prescribed fire as a management tool also consists of suppression strategies in the event that weather conditions change and suppression is required. A broad spectrum of initial suppression actions are pre-planned to meet specific land management objectives (including imminent danger to life and property), the different values at risk, and the cost-effectiveness associated with various suppression strategies.

The National Environmental Policy Act (NEPA)

The NEPA requires all federal agencies to consider and document the potential adverse and beneficial environmental impacts associated with major federal actions. Agencies must evaluate and document alternatives, including a no-action alternative, before approving the project. NEPA requires that federal agencies take an interdisciplinary approach. Factors that agencies must consider include economic, socio-economic, and natural values. The NEPA process ensures that environmental factors are considered in conjunction with technological, economical and mission-related components of a decision, and that the public is informed and appropriately involved in the decision-making process (NEPA Manual, Installation Operations and Training, June 1998).

Proper NEPA compliance and management ensures regulatory compliance and integrates effective environmental stewardship with the military mission. Early on in the planning process, tentative issues and management practices or concerns (i.e., resource management activities or land uses that must be considered throughout the process) are identified. The NEPA process integrates the management of air, watersheds, riparian, vegetation, wildlife, cultural/historical, and fire with values such as aesthetic, wilderness, and social. Ultimately when a particular treatment or land use is analyzed, its impacts on these inter-related activities are considered carefully. Often, there will be impacts on one or more of these categories in a cumulative effects analysis.

All Fort Carson projects require an appropriate level of environmental analysis pursuant to federal laws, regulations, and Department of Defense/DOA policy, unless it is excluded specifically by regulation [32 CFR 651.11 (a) and (b)]. Fort Carson is required to prepare one of the following analyses: an Environmental Impact Statement (EIS), an Environmental Assessment (EA), or a Categorical Exclusion (CX). Other environmental documents may accompany these, such as a Record of Environmental Consideration (REC) or a Finding of No Significant Impact (FNSI).

IV. DECISION-MAKING CRITERIA/FACTORS/CONSTRAINTS RELATED TO FUEL MANAGEMENT

Fuel management on Fort Carson and PCMS involves several factors:

Funding

Providing realistic training areas, (needs to be some dense cover for concealment of troop movements, consequently this is also creates a hazardous fuel).

Increased number of soldiers on the ground reduces the time and access needed to plan and conduct fuels management activities.

Drought – being effective and conscientious stewards of the land.

Watershed management

Dust abatement

Monitoring fire effects - Monitoring ensures the objectives of fuels management and improved ecosystem health is being met.

FUEL TREATMENT ALTERNATIVES

<u>Prescribed Fire:</u>

A prescribed fire is a planned ignition that is defined as any fire ignited by management actions under certain pre-determined conditions to meet specific objectives related to hazardous fuels reduction or habitat improvement. Proper planning elements are identified and explained in the technically reviewed and approved prescribed fire plan. The prescribed fire plan is a document which provides the qualified Prescribed Fire Burn Boss (RXB2 for broadcast burns or RXB3 for pile burns) the information needed to implement an individual prescribed fire project.

Prescribed fires are ignited and managed within a “window” of very specific conditions including winds, temperatures, humidity, and other factors specified in the prescribed fire plan. This window” is referred to as the prescription or the measurable criteria that define conditions under which a prescribed fire may be ignited. The prescription guides the selection of appropriate management responses and indicates other required actions. Prescription criteria may include safety, economic factors, air quality, public health, and other environmental, geographic, administrative, social, or legal considerations. Due to weather conditions, training activities, and other factors, approximately 3,000 to 15,000 acres are burned by prescription each year on Fort Carson (with the exception of 2013 due to drought conditions).

Wildland fires ignite from natural sources (e.g., lightning storms) and live munitions training, occur with frequency, causing unacceptable damage to critical resources. Such fires are occurring more frequently, due to the compounded drought conditions the state continues to experience.

Fort Carson cannot conduct prescribed fires within the some areas of the base due to live, unexploded ordnance (UXO), which makes it too dangerous to ignite. Wildland fires in these areas are monitored and action is taken if needed to improve control features on the perimeter, either mechanically or with firing operations. Prescribed fires are regularly planned in and around the perimeters, creating a buffer zone. These firebreaks contain unintentional starts and allow training to occur without interruption. The Installation potentially saves hundreds of thousands of dollars in training time, which would otherwise be compromised or lost due to unmanaged wildland fire.

Buffer zones are created by burning a minimum 100-foot strip around the range perimeter to create a black line into which unplanned ignitions can burn up to and be extinguished without exceeding the boundary of the firing range. However, there is the potential for much larger fires to burn several thousand acres if a buffer zone is not established around the firing ranges.

Prescribed burning is an environmentally sound way of clearing areas for training purposes, preventing training land losses due to wildfire degradation, maintaining a healthy forest ecosystem, reducing fire suppression costs, and protecting our firefighters, as well as our neighbors.

Mechanical Fuel Treatments:
Mowing and clearing around military target mechanisms, as well as grading existing roads in military training areas, are used to create fuel breaks. These treatments are done annually, or more frequently as needed, to reduce the fuel loads and to improve the road network throughout the ranges.

Hydro Ax Treatment: Another method of fire control, used by the USFS as well, is a type of forest thinning that can be accomplished with a multi-purpose tractor, called the Hydro Ax. This machine cuts and shreds brush, trees, and stumps down to the ground, which are then left to decompose.

For example, approximately 72 miles of bladed firebreaks exist on Fort Carson that are maintained by removing the vegetation three to four times annually. However, this practice can result in increased fugitive dust and soil erosion problems, as well as an increased maintenance cost. There are numerous eroded areas along firebreaks that have resulted from the removal of vegetation.

Biomass Utilization:
Woody biomass utilization is defined as the harvest, sale, offer, trade, and/or use of woody biomass. This utilization results in the production of a full range of wood products, including timber, engineered lumber, paper and pulp, furniture and value-added commodities, as well as bio-energy and/or bio-based products such as plastics, ethanol and diesel. Commercial timber harvesting is one tool for managing forest vegetation that can provide a cost-effective means, in many situations, for reducing the risk of catastrophic wildfires or insect and disease outbreaks, ensuring the viability of native plant and animal species, protecting recreation settings, removing hazard trees from public areas, and providing forest products to support the economies of local communities and the region.

However, the forest products industry in Colorado is currently weak, with limited opportunities to sell and utilize wood for these purposes. All Fort Carson and PCMS forestry thinning projects cost Army to accomplish rather than make money. Additionally, the majority of the forested area is pinon pine and juniper, small diameter wood with little to no value. Wood products are sold as firewood to help offset thinning costs.

Biological Treatments:
A biological fuels treatment involves the use of living organisms to selectively suppress, inhibit, or remove herbaceous and woody vegetation. Biological treatments rely on the consumption of plants by grazing animals such as cows, goats, and sheep.

V. PROTECTING AIR QUALITY

The scenic mountains to the west of Fort Carson pose a special challenge to air quality since they act as a wall that prevents the dispersion of pollutants. The mountains and high altitude of the region also cause an atmospheric inversion which traps cold air beneath warm air, concentrating pollutants at lower levels. Air quality problems can be exacerbated on a regional basis and Fort Carson takes its role in the community seriously, working hard to minimize its impact on the surrounding community and overall environmental quality.

Fort Carson is committed to sound management, conservation, and stewardship of environmental resources, while providing for the sustained and enhanced opportunity to accomplish the military mission. When prescribed fire is the selected treatment method for hazard reduction, Fort Carson ensures that all available and feasible smoke management techniques are utilized to minimize air quality impacts and comply with the State standard. All applicable laws, regulations, agreements, and policy guidance documents are met through careful planning, coordination, and implementation.

Environmental Outreach and Partnerships:
Encroachment continues to minimize the distance between Fort Carson and its neighbors and thus there is the potential to impact public safety, health, and aesthetics. As described, every measure is taken to reduce that potential impact and to supplement an active environmental

education program that has been implemented. This augments community awareness, understanding, and acceptance of the need for managing fuels and executing different treatment methods.

As a community partner, the Installation participates in a variety of initiatives and partnerships to evaluate the effectiveness of the smoke management program. Fort Carson, a primary signatory to the Colorado Smoke Management Memorandum of Understanding, maintains an excellent relationship with the Colorado Air Pollution Control Division. Upon request, the Installation provides feedback to help refine and enhance the prescribed fire permitting process for significant users. The FCFES provide constant feedback to the National Weather Service about their predictive accuracy. Maintaining open communications with its staff is crucial to the success of the Fort Carson prescribed burn program. Additionally, the U.S. Army Environmental Center's Western Regional Environmental Office advises Fort Carson on relevant environmental issues and works to ensure greater coordination among the military at the regional, state, and local levels.

Meeting the State Standard:
There are several ways the Installation achieves compliance with the State standard for air quality. As described in Section III, an integral part of the planning process for assessing the use of prescribed fire and its air quality impacts is by conducting a thorough risk-assessment prior to any planned ignitions. Part of the Fort Carson Prescribed Fire Plan consists of a "Go-No-Go" checklist that requires confirmation of the following conditions prior to proceeding with a prescribed fire: obtain proper permits, make all of the appropriate public notifications, check that the fuel conditions and moisture are adequate, and document that the appropriate weather conditions for proper smoke dispersal exist. A certified and experienced prescribed fire burn boss (RXB2 or RXB3) will always supervise the prescribed fire, which helps ensure it is implemented efficiently and safely.

Due to air quality concerns, prescribed fires are not conducted during periods of high winds, inversion conditions, or air stagnation advisories. Spot weather forecasts from the National Weather Service are obtained prior to the prescribed fire. Spot forecasts provide the most accurate, localized weather data. Spot weather, current and long-range forecasts are used to determine if the direction and volume of smoke has the potential to impact public health and safety on highways and in populated areas. Wind patterns affecting the project area are monitored continuously for wind shifts that could impact these sensitive receptors.

A combination of weather conditions and fuel moisture content help the certified burn manager assess the expected behavior of the fire. In the interim between spot weather forecasts, the burn manager runs a fire behavior simulation model (BEHAVE) to determine if the planned burn is within the permitted fire prescription criteria. The burn is only initiated if the modeled fire behavior meets all applicable criteria and conditions for smoke dispersion are meeting permit requirements.

Upon the decision to proceed, the prescribed fire burn boss conducts a small test burn to examine the smoke dispersion and fire behavior. If, at that time, the fire still meets all prescription criteria, the prescribed fire burn boss will determine the appropriate block size and proceed with ignition. Burning smaller blocks on a project area enables weather and smoke conditions to be monitored closely and allows the burn manager to take immediate measures to protect the public, such as suppressing fires and implementing aggressive mop-up procedures if needed. Long-term fuel smokes, such as those produced by larger smoldering wood material, are mopped up to reduce emissions.

For burns conducted within El Paso County, Fort Carson follows the established Air Quality Regulations regarding open burning. The County requirements serve as an additional control measure in protecting local air quality and visibility.

To further understand the impacts of prescribed fire activities on air quality, Fort Carson is updating the PM monitoring network at the PCMS. This network will provide real-time data to demonstrate compliance with NAAQS not only for prescribed fire activities, but also for military smoke and obscurant training activities. Consequently, Fort Carson will utilize this real-time data as a tool to help factor air quality considerations within the realm of the burn planning process.

Fort Carson's land management strategies serve to protect and conserve both its natural and cultural resources. Through the deliberate, planned process of prescribed fires, the potential for both uncontrolled wildfires and negative impacts to air quality are minimized.

VI. SUSTAINABILITY

Ecosystem management is a multi-faceted, complex challenge. It involves maintaining healthy soils, rangelands, forests, and wetlands, as well as 1) preventing fuel load buildups that increase the incidence of wildfires, which can pose a threat to the community, and 2) eliminating invasive species of flora, which can choke out natives. Thinking holistically involves teamwork, long-term planning, and pro-active decision-making. Fort Carson must function effectively today, twenty-five years from now, and beyond. Infrastructure limitations, mission changes, and dwindling fiscal resources pose significant challenges in the future. For these reasons, if the Installation is to accomplish its mission, it must be able to integrate effectively the principle of sustainability into all aspects of how business is conducted and how its natural resources are managed.

Fort Carson is strongly committed to pursuing sustainability through the Installation's sustainability program. Two of the many sustainability challenges that pertain to this planning document are air quality and training lands.

Sustainability goals and principles will be fully integrated into the Installation's ecosystem and prescribed fire management program to ensure that current and long-term land management and military mission goals are achieved

Appendix 5 – Delegation of Authority, Turn-Back Standards, Current Status

The language on the following pages is suggested for use when an IC from another agency will take over the IC duties on a fire.

Delegation of Authority United States Army Garrison Fort Carson

As of [DATE, TIME], I have delegated authority to manage the [FIRE NAME], [INCIDENT NUMBER], [INSTALLATION (Fort Carson or Piñon Canyon Maneuver Site)], to Incident Commander [INCOMING IC'S NAME] and their Incident Management Team.

The fire, which originated on [DATE FIRE WAS REPORTED], is burning in the [GENERAL LOCATION]. My considerations for management of this fire are:

[EDIT THE BELOW AS APPLICABLE TO THE FIRE]

1) Provide for firefighter and public safety.
2) Contain the fire within U.S. Army Garrison Fort Carson Boundaries
3) Manage the fire with as little environmental damage as possible.
4) Key cultural features requiring priority protection are:

[LIST RESOURCES]

5) Key natural resources considerations are:

[LIST RESOURCES AND APPLICABLE CONSIDERATIONS]

6) Key infrastructure requiring protection are:

[LIST INFRASTRUCTURE]

7) Restrictions for suppression actions include:

[LIST RESTRICTIONS WITH SPECIAL FOCUS ON UXO AND LIVE-FIRE HAZARDS]

8) Minimum tools for use are:

[LIST AVAILABLE FIREFIGHTING RESOURCES]

9) My agency Resource Advisor will be:

[LIST NAMES AND CONTACT INFORMATION FOR NATURAL, CULTURAL, AND OTHER RESOURCE ADVISORS]

10) The fire borders are:

[GIVE GENERAL DESCRIPTION OF THE CURRENT BOUNDARIES OF THE FIRE]

11) Manage the fire cost-effectively for the values at risk.
12) Provide training opportunities for U.S. Army Garrison Fort Carson personnel to strengthen our organizational capabilities and work with the Wildland Fire Program Manager to identify opportunities for Priority Trainees.
13) Minimum disruption of military training within the constraints of the above considerations.
14) Efforts should be made to minimize smoke impacts to neighboring communities and ensure that communication is maintained with the Colorado Department of Public Health and Environment.

____________________________________ _________

Signature and Title of Agency Administrator Date

Amendment to Delegation of Authority

The Delegation of Authority dated [DATE OF ORIGINAL DOA], issued to Incident Commander [NAME OF IC DELEGATED] for the management of the [NAME OF FIRE], [INCIDENT NUMBER], is hereby amended as follows. This will be effective at [DATE AND TIME].

15) [ENTER AS MANY AMENDMENTS AS NECESSARY]

____________________________________ _________

Signature and Title of Agency Administrator Date

United States Army Garrison Fort Carson Turn-back Standards

These standards are provided in consideration for the concerns within the entire fire area. All agencies having jurisdictional responsibly have agreed to the following;

Fire Status

Standard for release is 100% controlled, perimeter will hold under all conditions, with suppression effort reduced to a level which can be managed by a Type 5 organization.

Mop up Standards

Mop up will be completed so that all areas of heat within 100 feet of the fire perimeter and existing structures have been extinguished. Due to risk exposure and detection capabilities, areas of heat that do not threaten the line may still be present. A map will be provided identifying areas where recent mop up has occurred.

Special Emphasis Areas

1. ____
2. ____
3. ____
4. ____
5. ____
6. ____

United States Army Garrison Fort Carson Cost Share Agreement

Incident Name:____

Date and Time:____

Jurisdictional Responsibility: ____

This cost share agreement is between United States Army Garrison Fort Carson and

____

(name of aiding agency)

Agency Representatives participating in the development and approving of the cost share agreement:

Agency: ____

Name: ____

Title: ____

Date: ____

Agency: ____

Name: ____

Title: ____

Date: ____

Agency: ____

Name: ____

Title: ____

Date: ____

It is hereby agreed that the cost basis on the_____________________________________ incident will be shared as follows:

1. ____

2. ____

3. ____

4. ____

5. ____

6. ____

7. ____

8. ____

9. ____

10. ____

______________________________________ Date:___________

U.S. Army Garrison Fort Carson Authority Signature

______________________________________ Date:___________

Aiding Agency Authority Signature

Appendix 6 – Prescribed Fire Ecological Considerations

Prescribed fire is often carried out for risk reduction but is an effective and sometimes crucial tool in maintaining healthy habitats and ecosystems. At USAG FC, some prescribed burns will be carried out with an ecological effect as the primary goal.

Objectives of ecological burns may include increasing native species diversity, improving rare species habitat, reducing invasive species cover, encouraging regeneration of plants, recycling of nutrients, improving ecological condition, promoting regeneration of overstory species, and others. Most of the habitat types at USAG FC are fire-adapted and require periodic fire for ecological health.

Natural resource staff will make decisions regarding application of prescribed fire based on published information about fire return intervals, fire intensity required to attain the desired goals, and the seasonality of prescribed fire necessary to achieve the desired goals. Other decision factors include preventing dangerous fuel build-up, preventing natural resource damage from the prescribed fires themselves as well as from wildfires, and potential detrimental effects to training lands.

The following describes some of the specifics about the various vegetation, wildlife, and other natural resources interactions with prescribed fire. Special focus is given to species of concern and invasive species. The objectives of ecological burns can vary widely depending on the desired effects and the individual burn objectives must reflect that diversity.

Vegetation/Habitat Types

For the purpose of ecological burns, vegetation/habitat types on Fort Carson and PCMS are grouped into six broad categories that respond similarly to fire within each category: ponderosa pine forest, piñon-juniper forest, shrubland, riparian, wetland, and grassland.

Forests

Generally, a low incidence of natural fire due to fire suppression and fire barriers both on and off post and insufficient prescribed burning have resulted in unnaturally high stand densities and fuel loads in all forest types. This leads to high intensity fires that damage forest resources and pose control problems. Overstory thinning and mechanical reduction of understory will likely be required, at least on burn unit boundaries, to safely re-introduce fire to forest stands on post. Applying fire in return intervals of perhaps five to ten years would maintain all forest types while avoiding damaging crown fires that would deteriorate training land, as well as increase erosion and lower surface water quality. Reproducing stand-replacing fires on Fort Carson or PCMS is not practical, due to an inability to control such fires, their possible spread to adjacent private lands, smoke impacts on post and off-post, violation of air quality permits, and long-term damage to training lands.

Ponderosa pine forest

Ponderosa pine forests throughout their range have increased from a density of 20 to 50 trees per acre historically (140 years ago), to a range of 500 to 1000 trees per acre today. Long-term tree stand and landscape health have been compromised because of overcrowding mainly due to natural fire exclusion (Fitzgerald 2005). Many of the stands on Fort Carson follow the range-wide trend of being overstocked and require overstory thinning, mastication, and herbicide application to reduce the understory in order to safely re-introduce fire and to reduce the frequency and intensity of damaging wildfire. McKinney (2019) reviewed 26 publications characterizing fire frequency in Colorado ponderosa pine systems. These publications suggest a fire regime predominately characterized by moderate to high frequency, low and mixed severity fires that occurred in late summer to fall, with fires occurring in drier than average years that were often preceded by two to three years of wetter than average conditions. Across all sites, the mean fire return interval was 21 years. Because of Fort Carson's elevation and adjacency to the western plains grassland community, the historic fire return interval in this forest type is estimated to be between five and fifteen years. Frequent, low intensity fire in ponderosa stands is restricted to the lowest elevations adjacent to grasslands (Sherriff and Veblen 2007). Ponderosa forest habitats cover approximately 5,366 acres on Fort Carson and PCMS.

Piñon-juniper forest

The piñon-juniper forest type covers approximately 80,498 acres on Fort Carson and PCMS. This forest type has been subdivided into three different categories: persistent piñon–juniper woodlands, wooded shrublands, and piñon-juniper savannas (Romme *et al.* 2009).

Persistent piñon–juniper woodlands are characterized by infrequent fire return intervals (290-600+ years), a canopy dominated by either piñon or juniper, and are commonly found on rugged uplands with shallow, coarse textured rocky soils with sparse herbaceous and shrub cover.

Wooded piñon-juniper shrublands are characterized by infrequent fire return intervals (interval unknown, but probably intermediate between persistent pinion-juniper woodlands and pinion-juniper savannas), a relatively dense to very sparse canopy, and are found on a variety of soil types from shallow rocky soils to deep soils of intermontane valleys. The understory is dominated by a well-developed shrub stratum with variable grass-forb cover.

Piñon-juniper savannas are characterized by low to moderate canopy densities of piñon or juniper or both. They support a well-developed and nearly continuous grass-forb groundcover with shrubs making up only a minor component. They are typically found on moderately deep, coarse to fine-textured soils in gentle upland or transitional valley settings. This type of habitat was probably historically defined and maintained by relatively frequent fires (as opposed to persistent piñon-juniper woodlands and wooded piñon-juniper shrublands), and the effects of drought and soil characteristics. The fire return interval for piñon-juniper savannas is unknown, but it is believed that the infiltration of juniper into shortgrass prairie systems and natural forest openings is at least partly caused by lack of fire. To maintain a mostly shrub-less condition, an estimated fire return interval of three to seven ten years is recommended.

Shrublands

Shrub-dominated habitats are widespread on Fort Carson and PCMS, covering about 18,800 acres on Fort Carson and 41,700 acres on PCMS (approximately 13.5% and 17.5% of land cover, respectively). On Fort Carson, the dominant shrubland species are fourwing saltbush (*Atriplex canescens*), skunkbush sumac (*Rhus trilobata*), and James' frankenia (*Frankenia jamesii*). The most common shrub species at PCMS are Bigelow sage (*Artemisia bigelovii*), fourwing saltbush, spiny greasebush (*Glossopetalon spinescens var. meionandrum*), and James' frankenia. On Fort Carson, much of the shrub cover is along the eastern installation boundary and on the edge of the cantonment area, making this habitat type an important component of the wildland-urban interface.

Fire is a natural part of foothill shrub habitat, but the historic return interval and severity likely varied widely based on component species and other local influences. Excluding fire from shrub-dominated habitats may allow encroachment by juniper and pine species and increase shrub density, both of which could increase the intensity of wildfires (Wyoming State Wildlife Action Plan 2017). Because of the diversity of shrub species found throughout the installations, it is difficult to generalize how prescribed fire should be applied to shrubland, and it would be best to consider the management needs of individual sites when planning both ecological burns and wildfire mitigation treatments.

Fourwing saltbush populations vary widely in growth form, response to disturbance, and other physiological characteristics (Howard 2003). In the plains grassland ecosystem found on Fort Carson and PCMS, fourwing saltbush populations likely evolved with a relatively high fire return interval (5 – 25 years), and may be well-adapted to survive (or quickly re-establish following) regular, low-intensity fires.

Skunkbush sumac is a component of many different shrub-dominated ecosystems, and therefore is not associated with any single fire regime. However, skunkbush sumac re-sprouts vigorously following fire and the high heat of fire may break seed dormancy (Anderson 2004), suggesting that it is fairly resistant to low-intensity fires.

Gambel oak is a fire-adapted species, evolving in systems that likely saw a <10-year fire return interval (Abella and Fulé 2008). Large-diameter oaks have high survivorship following low-intensity fires (Fulé *et al.* 2005), and top-killed small-diameter oak re-sprouts vigorously (Waring *et al.* 2016). If the goal is to control Gambel oak, repeated burning on the same site may be necessary, or managers may need to combine prescribed burning with either mechanical or chemical treatments (Jester *et al.* 2012).

Bigelow sagebrush is easily killed by fire (McArthur 1981), and burned areas must be recolonized by onsite or wind-borne seed (Wright *et al.* 1979). If there are unburned areas nearby to serve as seed sources, populations should recover following fire but may not tolerate a high fire return interval.

There is no published literature on the response of James' frankenia or spiny greasebush to prescribed burning or wildfire. If fire is applied in areas where either of these plants is abundant, USAG FC staff should carefully note how each species responds to fire.

Riparian Areas

Riparian areas are highly diverse and structurally complex. Caution is required when assessing ladder fuels, streambank slopes, streambed width, and fire intensity impacts on plant species and wildlife. Riparian trees on USAG FC are mainly cottonwoods (*Populus spp.*) and willow trees (*Salix spp.*) with tree-shrubs including chokecherry (*Prunus virginiana*), boxelder (*Acer negundo*), and common hoptree (*Ptelea trifoliate*). The shrub component includes willows, skunkbush sumac, common snowberry (*Symphoricarpos albus*), Woods' rose (*Rosa woodsia*), and golden currant (*Ribes aureum*). Often there is a dense herbaceous layer that can consist of sedges (*Carex spp.*), horsetails (*Equisetum spp.*), and tall grasses like Canada wildrye (*Elymus canadensis*). Fire in riparian areas is natural, occurred historically, and can be beneficial to the regeneration of grasses and other herbaceous vegetation. If it is not too intense, fire can also benefit forested wetland systems. Riparian areas burn less frequently than surrounding upland areas due to normally higher soil and fuel moistures. Fires may burn in a patchy manner or not burn these areas at all depending on site conditions. These areas naturally burn mainly late in the growing season when fuels are cured enough to burn. On USAG FC, the natural fire return interval is estimated to be between 14 and 100 years (USDA USFS 2012).

Riparian areas may be used as firebreaks when fuels are moist enough or when they hold surface water. Firebreaks should not be established next to riparian areas for water quality reasons. Rather, riparian areas should be burned with adjacent upland communities when low to moderate intensity fire can be maintained. Otherwise, built-up fuels can result in severe damage to these systems under severe fire conditions.

Irrigation ditches share characteristics similar to riparian corridors. Burning irrigation ditches is a common practice for removing seasonal vegetation, litter, and debris to maintain ditch capacity and unobstructed flow. It can also be used to control the establishment of woody plants in the ditch corridor. The use of prescribed fire is more efficient, less costly, and has less impact on erosion and ditch structures than some forms of mechanical vegetation control. The ideal timing to burn a ditch is the early spring prior to the release of irrigation water (Scasta *et al.* 2019). Winter burns are also acceptable given the narrow targeted area. Caution needs to be taken with select trees or shrubs that may be preserved along a ditch. Ditches with perennial grasses will recover quickly with very little risk of erosion. Smooth brome is a non-native, aggressive, difficult to control perennial that can be found along ditches. If smooth brome control is desired, repeat burning is required and is best timed during the tiller elongation stage in late spring or early summer (DiTomaso *et al.* 2006, Willson and Stubbendieck 1996).

Wetlands

A good understanding of the impact of fire upon wetland ecology is required when using fire as a management tool. Restoration and maintenance of natural communities using fire is a frequent goal, though usually at a limited scale due to few windows of opportunity to burn, and the difficult task of re-establishing natural communities amid ecosystems taken over with cattails (*Typha spp.*) and invasive plants, such as teasel (*Dipsacus spp.*) or Canada thistle (*Cirsium arvense*). Severely degraded communities will require more intensive manipulation and the simple application of fire may make conditions worse.

The effective use of fire in wetland restoration and management is challenging. Fuel load, smoke density, and accessibility in wetlands contribute to a more difficult burn procedure. Fuel loads are often considerably higher per unit area in wetlands than in uplands. This can create a much hotter burn that spreads rapidly. Firebreaks may need to be wider because the intensity of the updraft often carries embers farther. Smoke density and fire intensity create difficulties for burn crew members who often must depend on hand spraying from backpack-mounted water tanks, because larger mobile water tanks cannot maneuver through wetlands. At USAG FC, access to backpack-mounted water tanks is limited. Due to lack of accessibility, a burn crew in a wetland area may be limited to only the tools they can carry, and the burn inevitably requires more personnel (Robertson 1997).

Grasslands

Grasslands of the Great Plains evolved under a fire and grazing regime. However, fire suppression tactics and the transition of grazing from free-ranging bison to fenced cattle have resulted in a loss of health and vigor for many grassland ecosystems. Historically, the fire frequency of grasslands on the Great Plains was every 5 - 10 years (Schussman *et al.* 2006).

Prescribed fire can accomplish many rangeland improvement objectives: restoration of health and vigor to plants, control brush (*Juniperus spp.*) and noxious weeds, and improve wildlife habitat (McPherson *et al.* 1986). When carried out according to plan, burning is a safe, quick, and economical method of removing and restoring grassland vegetation. In addition, burning releases phosphorous and potassium from old vegetation, temporarily increasing quality in subsequent regrowth. While grass production can be reduced by as much as 16% the summer following a burn (Britton *et al.* 1987), experience has shown that the increase in forage quality compensates for the decreased quantity.

Prescribed fire can also be used to limit encroachment of *Juniperus* species onto grasslands. Control of juniper with fire is best used in combination with other range improvement techniques which reduce juniper canopy cover, thereby allowing herbaceous vegetation to increase fuel loads prior to burning. Mechanical treatment methods on juniper such as chaining, dozing, or mastication are the most common range improvement techniques used to improve fuel loads prior to burning (Rassmussen *et al.* 1986).

Prescribed burns can also very effectively reduce prickly pear (*Opuntia spp.*), cholla (*Cylindropuntia spp.*) and broom snakeweed (*Gutierezzia* spp.) on Great Plains grasslands (Britton *et al.* 1987)

On the Great Plains, burns should be conducted in early spring, just prior to green up. This minimizes the length of time the soil is without vegetative cover, which conserves moisture and reduces the possibility of a significant amount of soil erosion occurring. An important consideration prior to conducting any prescribed burn is soil moisture. If the soil is dry and/or the area in question is currently experiencing drought conditions, the burn should be postponed until conditions are more favorable. This could mean waiting until the next year or using a different method of removal. Burning under extremely dry conditions increases the possibility of damage to plant root crowns during the burn, slows or reduces plant response after a burn, and increases the possibility of severe soil erosion, particularly on sandy soils in areas subject to high winds (Riddle and Donges 1998).

Species of Concern and Wildlife

Prescribed fires can be used to enhance habitat and resources such as forage for species of concern and wildlife. Since species of concern have limited populations, caution is required to avoid negative impacts that may result in further population declines and future restrictions that can impact training. Risk reduction burns in areas with known populations or habitat for species of concern require consultation with a Resource Advisor.

Mexican spotted owl

The Mexican spotted owl (MSOW; *Strix occidentalis lucida*), a federally threatened species, is an occasional winter resident in the rugged mountainous habitat in the center of Fort Carson. A management plan for the MSOW, last revised in 2016, protects MSOW habitat from burning, logging, and other anthropogenic disturbance. Any intentional use of either prescribed fire or mechanical means to protect or improve MSOW habitat would need to be preceded by consultation with USFWS and possibly revision of the MSOW management plan. Areas around MSOW habitat should be managed to reduce the probability of severe fires by reducing fuel loads to decrease fire intensity.

Monarch butterfly

The monarch butterfly (*Danaus plexippus*) is currently being considered for listing under the U.S. Endangered Species Act, and is known to occur at PCMS and Fort Carson. Prescribed fire can be both beneficial and detrimental to the survival of monarch butterflies.

Fires that occur during the breeding season will likely result in the direct mortality of adults, eggs, larva and pupae. Furthermore, fires during this time will destroy the critical host plants, milkweeds (*Asclepias spp.*), and the nectar-producing plants that the monarchs require for survival. To avoid these detrimental impacts, prescribed burns should be scheduled in the spring prior to the arrival of the monarchs or in late fall after the adults have migrated.

It is also important to note that carefully planned prescribed burns can be an effective tool for improving monarch habitat (Baum *et al.* 2012). In forested areas, fires can create canopy gaps that allow sunlight to reach the forest floor and foster the growth of host and nectar-producing plants. In shortgrass prairie ecosystems, within fire-adapted communities, there is some evidence that prescribed fires may stimulate and increase the abundance and diversity of nectar-producing plants and milkweeds. Prescribed burns conducted in August or September, in areas where milkweeds are limited or absent, can create new populations of milkweeds (e.g., *A. viridis*). When timed correctly, these newly emergent milkweeds can benefit the monarch population by providing late season breeding opportunities for pre-migrant monarch butterflies.

Mountain plover

Mountain plovers (MOPL; *Charadrius montanus*), an Army Species at Risk, breed in short- and mixed-grass prairie throughout the western Great Plains. They preferentially nest in prairie dog colonies but may also use other habitats with a fine matrix of sparse vegetation and bare soil. Prescribed fire can be used to create suitable plover habitat in areas without prairie dogs or in areas where prairie dog densities have declined (Augustine and Skagen 2014). Mountain plovers rapidly abandon prairie dog colonies following plague outbreaks (Augustine *et al.* 2008). In plague-affected colonies, prescribed fire can be used to maintain suitable plover habitat until prairie dogs return. In these situations, research suggests that a high fire return interval (1 – 2 years) may be required to maintain the necessary mosaic of short vegetation and bare ground (Augustine and Skagen 2014).

On Fort Carson, the majority of historic MOPL records are from TAs 53 and 54, within a very large (~2,000 acre) prairie dog colony. That colony collapsed due to plague between 2011 and 2013, and MOPL have not been detected in the area since 2012. While the prairie dog colony is slowly recovering, prescribed burning in that area could encourage MOPL nesting while the prairie dogs continue toward a full recovery.

On PCMS, MOPL have been recorded in prairie dog colonies in Range 7 on multiple occasions and in the large colony along MSR 3. Prairie dog colonies on PCMS declined dramatically due to plague beginning in 2015 and are slowly starting to recover. No MOPL have been detected at PCMS since 2015. Prescribed burning on former prairie dog colonies could provide habitat for nesting MOPL until the colonies recover.

Pinyon jay

Pinyon jay (PIJA; *Gymnorhinus cyanocephalus*), an Army Species at Risk (SAR), is a semi-nomadic species that, in Colorado, is almost exclusively found in piñon pine and juniper habitat (Dexter 1998). They breed in colonies and rely on piñon nuts as their primary forage outside of the breeding season. Research on the effects of fire and mechanical vegetation thinning on PIJA has suggested that both treatments may negatively affect jays. Johnson *et al.* (2018) found that PIJA avoided nesting in areas subject to significant thinning, and Mason (1980) found higher numbers of PIJA in unburned versus burned piñon-juniper woodland. However, small-scale prescribed burning and vegetation removal within PIJA habitat may provide a net benefit by reducing the risk of catastrophic wildfire (Wiggins 2005). Current BMPs suggest avoiding vegetation thinning within a buffer of 500 meters around known breeding colonies in order to allow for typical colony shifts across years (Johnson *et al.* 2017).

Pinyon Jays have been detected on both FC and PCMS. The second Colorado Breeding Bird Atlas listed PIJA as confirmed breeders in a survey block adjacent to Fort Carson, southeast of the Stone City Area (Colorado Bird Atlas Partnership 2016). Previous wildlife biologists have found suspected breeding birds on Fort Carson, and have detected birds during the breeding season on PCMS (R. Bunn, personal communication). If prescribed burning or mechanical thinning is planned in piñon-juniper habitat, installation biologists will need to perform surveys for nesting colonies prior to any treatment. Regardless of whether breeding colonies are found, high-priority piñon pine trees (older, cone-bearing trees) should be preserved to provide forage for PIJA.

Plant Species at Risk

PCMS and Fort Carson are home to several Army Species At Risk (SAR) plants (CNHP 2007a and 2007b). Two species, dwarf milkweed (*Asclepias unicialis ssp. unicalis*) and Raven Ridge false rayless goldenweed (*Oonopsis foliosa var. monocephala*), prefer shortgrass prairie habitat. The other three species: roundleaf four-o'clock (*Mirabilis rotundifolia*), Pueblo goldenweed (*Oonopsis puebloensis*), and golden blazing star (*Mentzelia chrysantha*) favor barren cliffs and outcrops where human disturbance is minimal, and the overall sparse vegetation offers protection from fire. The primary impacts to most of these SAR plants are invasive species, development, and habitat loss. Very little is known about the influence of prescribed fire on these species at risk. However, to limit negative impacts, a survey for rare plants needs to be completed prior to any habitat modification (e.g., prescribed fires, dozer/mow lines, burn piles, equipment staging, chemical treatments, etc.). Surveys are best conducted when the plants are in bloom and can be most easily detected and accurately identified. During the implementation of prescribed burns, limit unnecessary ground disturbance. Minimize the spread of invasive species (especially to newly disturbed areas) by thoroughly cleaning vehicles and other equipment. Avoid mowing during the plants' flowering or fruiting season, but if it is necessary, mow with the blade set as high as possible. Although maintaining a natural disturbance regime may be beneficial to some of these species, it may be best to avoid prescribed burns within known SAR habitats during the peak growing and blooming season. The blooming seasons vary between species, but is as early as late April (dwarf milkweed) and as late as September (golden blazingstar).

Dwarf Milkweed is usually found on the shortgrass prairie, growing in open spaces between grass clumps at around 4,000-6,500 ft elevation. This species occurs in a variety of soil types (sandstone, limestone, and shale) but seems to favor sandy loamy soils on level to gentle slopes. It is not known to occur in disturbed areas including erosion channels, washes, and sand dunes or in pure sand. Dwarf milkweed is often found in association with blue grama and New Mexico feathergrass. Dwarf milkweed flowers in late April to the end of May, which makes it one of the earliest blooming milkweeds. In addition to being a SAR, dwarf milkweed also supports a rare moth species (*Pygarctia neomexicana*) and the monarch butterfly, a species that is pending an ESA listing. Global Rank: G3G4T2T3, State Rank: S2

Raven Ridge false rayless goldenweed is endemic to Las Animas County, and prefers sparsely vegetated areas within the shortgrass prairie where soils are dry, fine-grained and clayey. Rayless goldenweeds are often observed near shale and clay slopes, and other disturbed or eroded areas including gullies and two-tracks. This species has been documented on the southwestern portion of PCMS, in the Taylor and Van Bremmer Arroyo watersheds. Global Rank: G3G4T2, State Rank: S2

Round-leaf four-o'clock prefers barren shale outcrops but is occasionally found in sparse shrublands or woodlands with a barren aspect. Roundleaf four o'clock is often found in association with James' frankenia, oneseed juniper, and Arkansas feverfew. Roundleaf four o'clock has vivid trumpet-shaped magenta flowers that bloom June through mid-August. In addition to being a SAR, this plant is imperiled at a global and state level (G2/S2).

Pueblo goldenweed prefers barren shale outcrops, and sparse shrublands or piñon-juniper woodlands around 4,800-5,500 ft in elevation. This species has been documented on Fort Carson and has limited distribution in Fremont and Pueblo counties. Pueblo goldenweed has bright yellow ray and disk flowers that emerge in July. Global Rank: G2, State Rank: S2

Golden blazingstar is found on barren slopes of limestone, shale, or clay at around 4,751 - 6,854 ft elevation within a limited distribution in Fremont and Pueblo counties. This species favors lightly disturbed areas including moderately steep slopes, wasting slopes, highway rights-of-way, and road cuts. Golden blazingstar occasionally occurs in piñon-juniper woodland and juniper woodland communities. Associated species include James' frankenia, fourwing saltbush and several rare plants including Arkansas feverfew and roundleaf four-o'clock. Golden blazingstar has bright yellow flowers that open in the evening, and the plant blooms from July to early September. Global Rank: G2, State Rank: S2

Game species

Fire can significantly alter wildlife habitat and the benefits of periodic fire on habitat for game species are well documented. After a fire, large ungulates (such as deer, elk, pronghorn and bighorn sheep) will frequently concentrate on the burned area because new plant growth is more palatable, nutritious, and available (McPherson *et al.* 1986). Other animals such as quail, turkey, rabbit, coyote, and bobcat will also be attracted to the burned and unburned edges of a fire due to the change of habitat and increased forage production of plant species. However, there are significant differences between burning to benefit big game and burning for other ecological factors, such as brush control, mimicking “natural” fire regimes, or urban interface clearing.

Burning is commonly used to increase habitat quality for big game species, such as mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), and pronghorn (*Antilocapra americana*), and can be an economically viable alternative to more costly management practices for increasing the quality of wildlife habitat, such as forage plots or feeding (Bender 2012). Prescribed burns for big game are most common in the understory of piñon-juniper woodlands and other forest types, grasslands, and shrublands. Fire behavior for big game burns is highly dependent on the vegetation and topography, and thus need to be developed on a site-specific basis.

Because the freeing of nutrients is probably the most important advantage of fire over other land improvement practices, managers should burn early to increase availability of key nutrients for big game productivity at the critical time they are required if big game habitat is the primary reason for prescribed burns (Bender 2018). Late winter and spring burns (generally March to April, depending on the location) can provide a critical protein flush and increase mineral content of forages, thereby providing minerals during the period of rapid antler development in males (Bender 2018), increasing survival, productivity, and performance of big game. Big game will also consume ash following a burn, which provides a further, direct source of minerals in their diets. Burning in late winter will encourage production of forbs, which are important big game foods. Perennial grasses will remain and decrease coverage by 10 to 15% to open space for forbs.

Most forage benefits for big game in piñon-juniper come from increasing critical forage biomass (shrubs), cover (shrubs and trees), ecotones (i.e., edges), and species diversity by opening the piñon-juniper overstory and/or by increasing forage quality of the understory in more open woodlands (Van Hooser et al. 1993; Bender 2012). Two important considerations in burning piñon-juniper are frequency of burning and intensity of burning. Longer fire intervals, on the range of 8 to 12 years, favor the establishment of shrubs in the understory. Conversely, shorter intervals of 3 to 6 years can eliminate shrubs and favor grasses and forbs (Bender 2012). For big game species, such as deer and pronghorn, that require the highest-quality diets, shrubs are critical for maintaining adult survival in areas characterized by frequent drought (Bender 2012; Bender et al. 2011, 2013a, 2013b; Hoenes and Bender 2012). In these cases, longer fire intervals should be favored to maintain and enhance shrub communities. Similarly, smaller big game species, such as mule deer, depend on significant hiding cover, and all big game will use overstory thermal cover during the hotter months (Bender et al. 2011, 2012, 2013b). Consequently, it is not desirable to eliminate all overstory piñon-juniper or even a substantial portion of it in certain areas. Cooler late-winter to early spring fires that limit fire intensity should be used to maintain cover, as well as to maximize nutrient benefits of burning. However, because foliage moisture may be very low during these times (especially in late winter), fuel treatments may be necessary to limit scorching and tree mortality. These may include mowing around denser patches or even individual trees with ground-level branches that a manager wants to preserve for cover, eliminating high fuel loads under trees, or burning when some residual snow cover remains under trees due to shading. Higher winds also move ground fires faster, limiting ignition of trees.

Ideal burns for big game are low-intensity, cooler fires at low humidity with a 5 to 10 mph wind under a range of temperatures (i.e., 50-90°F) and fine fuel moisture content down to ca. 2% in arid and semi-arid habitats. These low intensity burns produce light ground char characterized by black ash in a mosaic of burned and unburned patches. Headfires will provide a fast, patchy burn that is ideal for minimizing mortality of woody species and creating a mosaic, which is often optimal for big game habitat. Burning across the wind (flankfire) or into the wind (backfire) results in progressively slower, hotter, and less patchy burns. These burns will usually result in increased shrub and tree mortality, and need to be balance with adequate cover for wildlife. Similarly, upslope burns are usually faster and patchier than downslope burns. Managers should therefore consider plant biomass (fuel load), topography, desired vegetation changes (i.e., high or low shrub kill), and weather when planning their burns for big game habitat (Bender 2018).

Flame lengths less than three feet reduce the danger of torching and crown fires (Whelan 1995, Lutz et al. 2003, Fulé et al. 2004). Where ground cover is extremely patchy, such as in desert grassland or in years of poor grass production, winds may have to be stronger to get a fire to carry. Fire intensity, and thus flame lengths, may also need to be higher if a significant kill of tall shrubs or overstory trees in piñon-juniper woodlands is a management objective. However, foliage moisture of conifers is usually low during late winter or early spring burns, so the difficulty is often keeping these conifers from burning. This is particularly true with juniper, which often shows a shrub-like growth form where the highly flammable foliage is in close or direct contact with the herbaceous ground cover. In these cases, woodlands may require fuel treatments to keep from having too much overstory kill.

As previously mentioned in the Grassland section of this document, fire is a predominant force in grassland management. In general, fire results in a short-term (1 to 3 years) decrease in overall production of shortgrass prairie. For shortgrass prairie, spring burns on a 3 to 6-year interval can facilitate an ideal balance of forbs and grasses, and along with fertilization effects can significantly enhance big game habitat quality. In more productive or ungrazed grasslands, live grass and other herbaceous cover may decline in the years following burning as litter increases, so ungrazed grasslands may require more frequent fire intervals. Fire can reduce woody plant cover (Ford and McPherson 1996), and because shortgrass prairie often lack cover for species such as mule deer, shortgrass prairie sites with woody cover (or where woody cover is being established) should be burned with very low intensity spring fires at longer intervals of 8 to 10 years or protected until shrubs are established if that is a management goal.

Invasive Species

Simulating natural fire regime through the use of prescribed burns in fire-adapted plant communities can help native plant species maintain a competitive advantage and limit the establishment of invasive plant species. However, using a prescribed burn as a tool to control existing populations of invasive plants may not always be efficient, and has the potential to even stimulate invasive plant regrowth. In established stands of invasive species, underground root structures and seeds existing in the soil often survive the initial fire and face less competition for limited resources once above ground plant growth is removed by fire. Reduced competition, paired with a pulse in nutrient cycling that often follows a fire event, can lead to rapid regeneration of invasive species that were already thriving in an area prior to the fire (Zouhar et al. 2008). For effective and long-lasting control of invasive species, prescribed burns must be implemented as part of an integrated management strategy.

There are a variety of invasive plant species established on Fort Carson and PCMS with different life cycles and growth patterns, which are likely to respond variably to fire. In general, annual species are most susceptible to management with prescribed fire. Since annual plants only grow for one season, fire can disrupt their life cycle and prevent seed production. However, repeated burning or the integration of other control methods may be necessary to effectively deplete the soil seed bank. Biennial and perennial species are typically more difficult to control with fire. Biennial species complete their life cycle over two years, growing in uneven-aged stands, and the basal rosette plants in the first year of growth are not readily controlled by fire (DiTomaso and Johnson 2006). Control of perennial invasive plants with fire is also difficult because these species have the ability to regrow from below ground rootstock, which is not often damaged by fire. Controlling woody invasive species through burning is generally most difficult due to the tendency of these species to re-sprout. Burning woody species during the dormant season is generally less effective since energy reserves are stored below ground at this time, and are protected from heat. Growing season burns would be more effective at depleting energy stored below ground, although consecutive years of burning may be necessary to achieve adequate control (DiTomaso and Johnson 2006). Ecological prescribed burns in natural areas are complex because a variety of these plant species are likely to co-occur, and the effectiveness of control will depend on variable factors, such as the size and density of invasive plant populations, and the longevity of their seed bank already established in the soil.

To account for the complexity of natural plant communities, prescribed burns should be used as a tool in an integrated approach to invasive plant management, combining mechanical, biological, cultural, and chemical control methods. For example, on Fort Carson there are areas with dense thickets of common teasel (*Dipsacus fullonum*), an invasive species that can impede navigation and make access to an area difficult. While broadcast burning is not generally considered a viable option for controlling common teasel because the high-density basal rosettes in these monocultures prevent a continuous and sustainable fire, burning could potentially remove the standing dead biomass and improve access for herbicide treatment of basal rosettes following the burn. Common teasel is an extremely competitive species, and seed viability is at least two years, so follow-up treatments will be required for several consecutive years to prevent surviving plants and new seedlings from going to seed. The choice of follow-up control methods for teasel depends on the density and location of the infestation (USDA USFS 2014).

Cheatgrass (*Bromus tectorum*), another invasive species present to varying degrees throughout the installation, is an invasive annual grass that benefits from disturbances such as fire by establishing and thriving in areas with short fire return intervals. Once established, this species often results in monocultures of low value to native species or animals, and even has the potential to increase fire frequency. When strategizing for prescribed burns in natural areas on Fort Carson and PCMS, a goal should be to prevent introducing cheatgrass to locations where it does not already occur or avoid promoting it with fire.

Conducting assessments for invasive plants prior to and after an ecological prescribed burn will be an essential planning tool. The surveys will allow natural resource managers to assess the potential need for pre-treatment or follow up treatment of weeds and grant a better understanding of the effect that prescribed burns have on invasive plant species. Through proper planning, and utilizing an integrated management approach, prescribed burns can be a valuable tool in achieving native plant diversity and improving habitat for wildlife.

Soils

Fires can create soil conditions that result in water and wind erosion. Since fire removes vegetation cover, this process exposes the soil to erosion from wind and water for a period of time, and to greater or lesser degrees also affects the water quality and sedimentation of surface water resources.

Hot fires have the potential to volatilize organic materials or kill microbes, sterilizing the soil which can hinder vegetation recovery. A 2018 review paper by Alcañiz *et al.* evaluated the impact of prescribed fire on a variety of soil properties. The review found that soil nitrogen generally increased after fire, though excessively high fire temperatures (>200 °C) may lead to nitrogen volatilization. Likewise, carbon stocks in the soil often increase after low-intensity fires due to the incorporation of partially burned organic matter, while high-intensity fires typically decreased carbon stocks. The effect of fire on soil organisms was extremely variable; these results ranged from complete elimination of soil organisms, to increased microbial activity resulting from the influx of ash materials. The effects of prescribed fires on soil properties are clearly variable, and depend on parameters such as fire regime, soil type, seasonality, residence time, and periodicity. It is important that effects on soils be considered during the prescribed fire planning process.

Cultural Resources

Though not an ecological resource, cultural resources must be considered when planning a prescribed burn. Fire can have a direct adverse effect on these resources through destruction of the significant features that contribute to their eligibility for inclusion in the National Register of Historic Places. This includes directly burning or charring the resource, or, if it is stone, causing it to crack or flake. Indirect and cumulative adverse effects due to increased soil erosion that may undercut or wash away cultural resources can also occur.

In coordination with the USAG FC Cultural Resources Manager, the risk to significant cultural resources can usually be easily reduced. Additionally, prescribed fire is a useful tool to protect these resources from potential adverse effects associated with wildfires.

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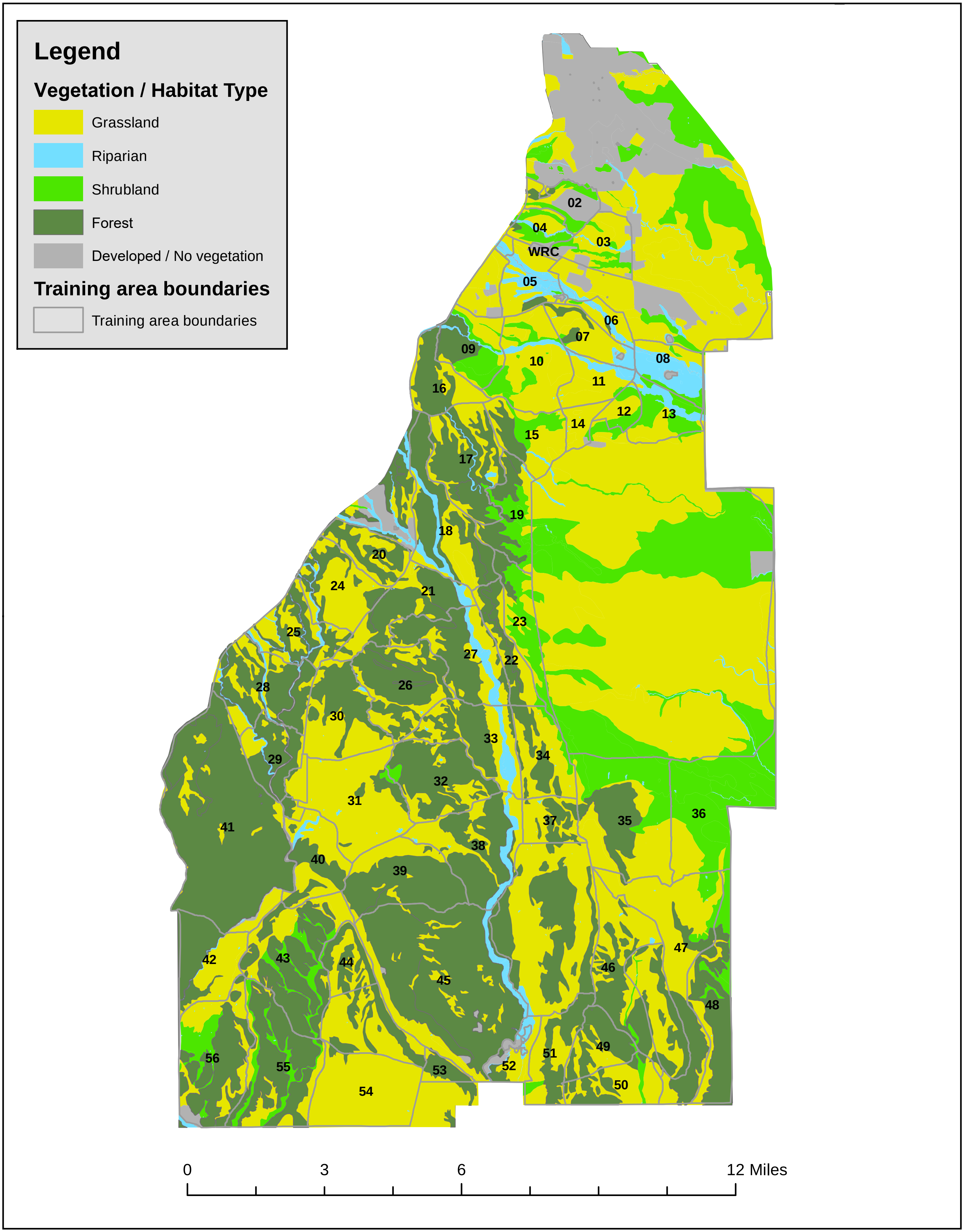
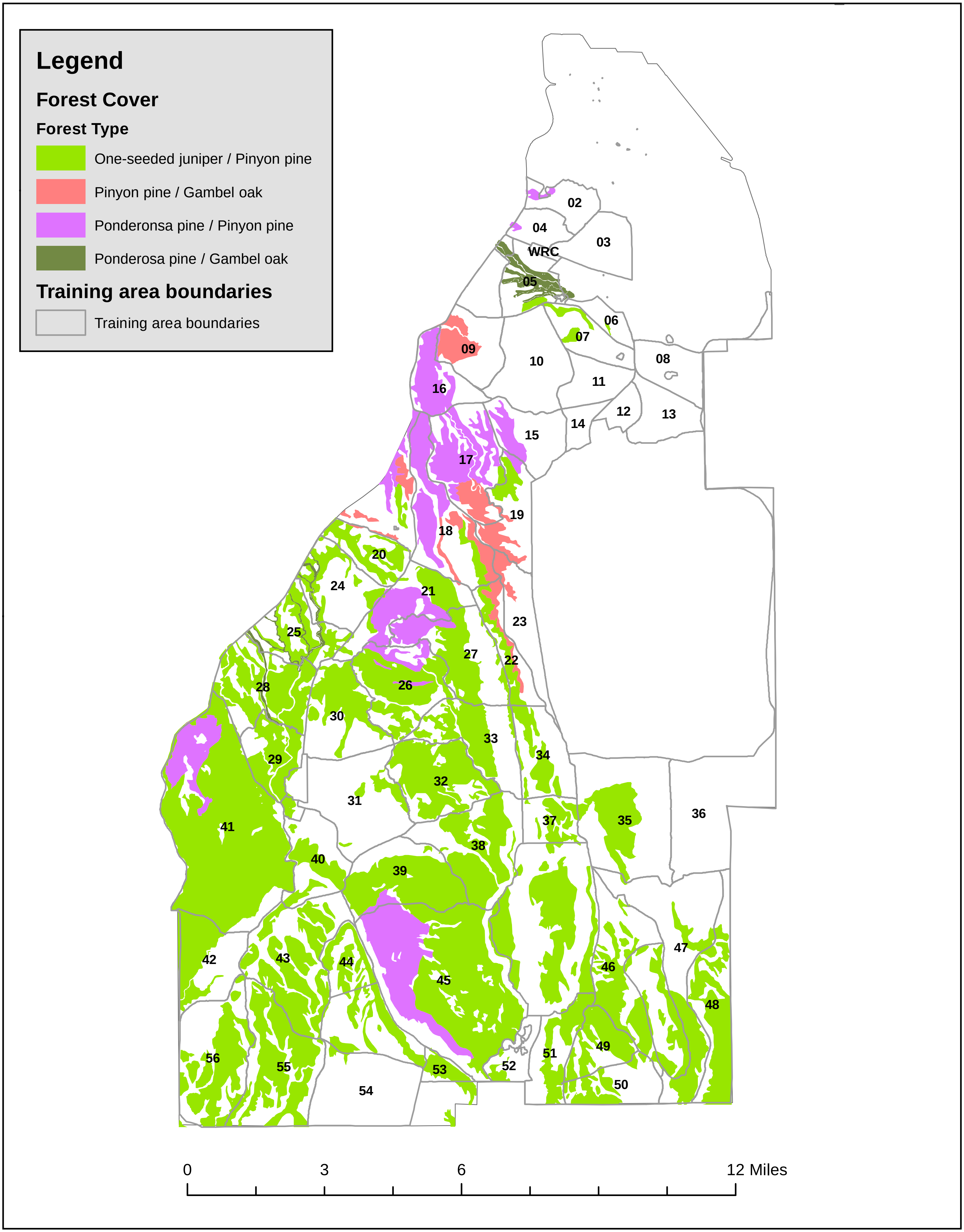
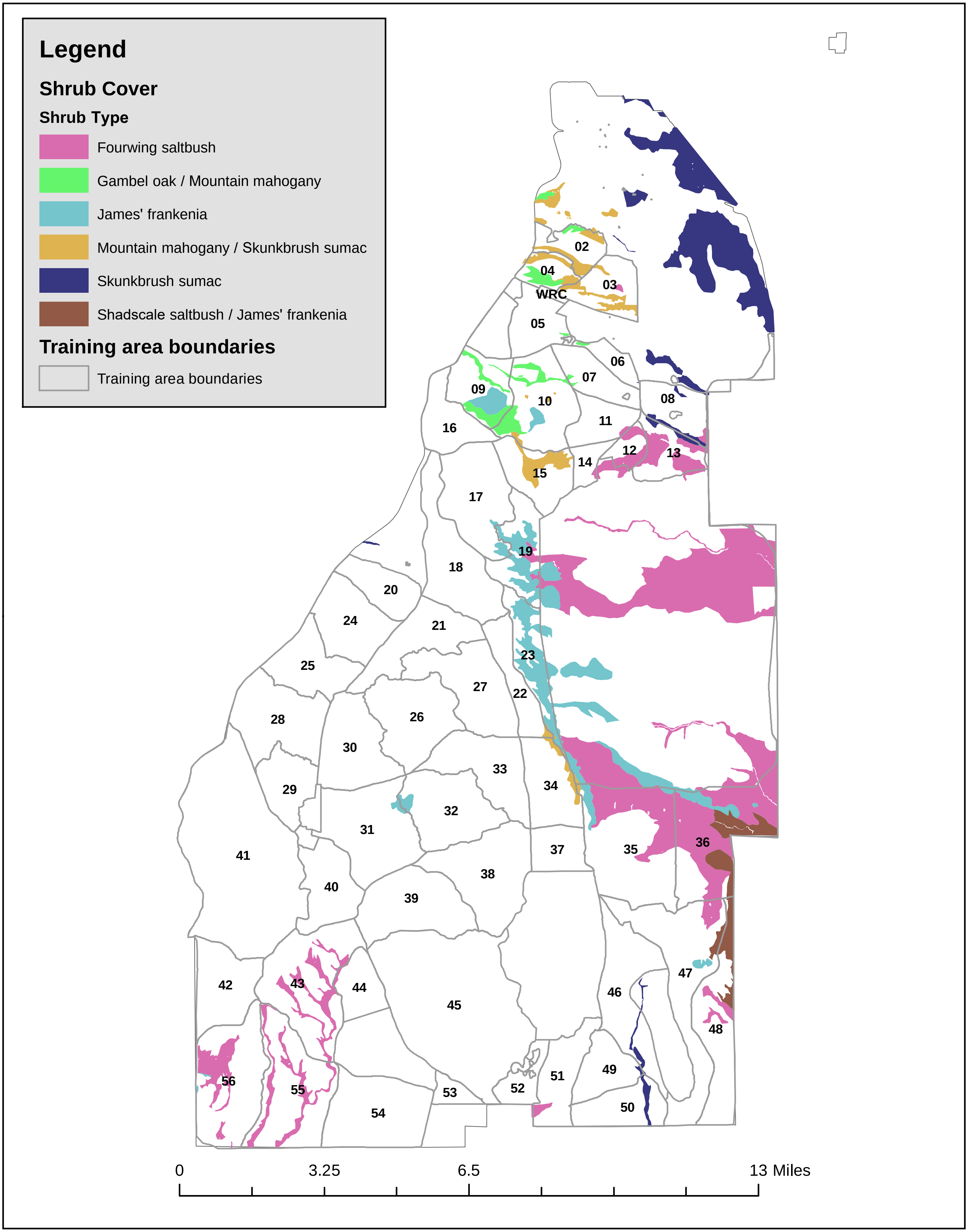
Vegetation / Habitat Types on Fort Carson



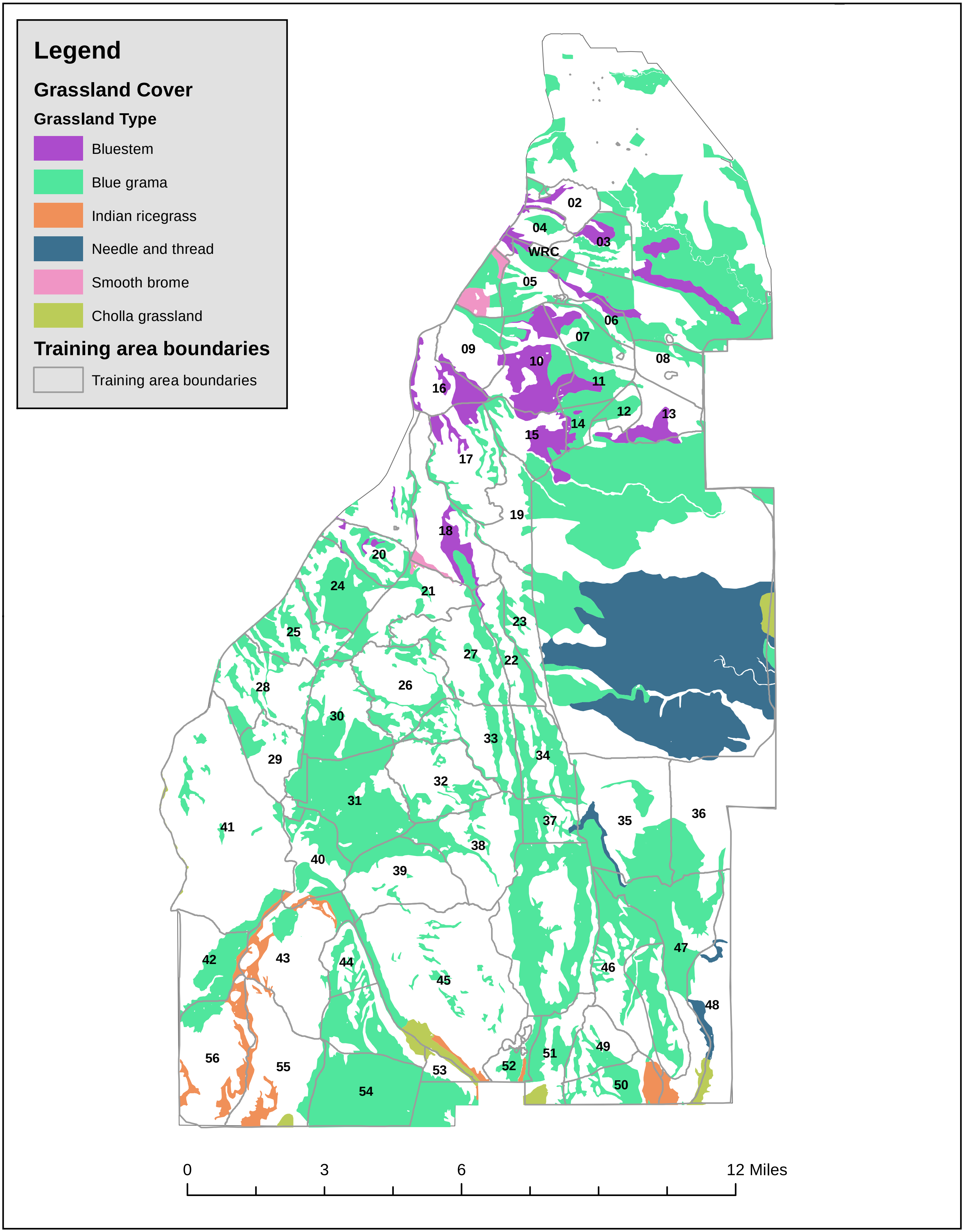
Forest Cover on Fort Carson



Shrub Cover on Fort Carson



Grassland Habitat on Fort Carson



Appendix 7 – DPW Resource Advisor Instruction

DPW Resource Advisor Instruction

The Resource Advisor (READ) follows the National Wildfire Coordinating Group (NWCG) PMS-313, The Resource Advisor Guide, which establishes NWCG standards for Resource Advisors to enable interagency consistency. Resource Advisors provide professional knowledge and expertise toward the protection of natural, cultural, and other resources on wildland fires and all-hazard incidents. The guide provides detailed information on decision-making, authorities, safety, preparedness, and rehabilitation concerns for Resource Advisors, as well as considerations for interacting with all levels of incident management. Additionally, the guide standardizes the forms, plans, and systems used by Resource Advisors for all land management agencies.

1. Duties:

- Ensure that safe operations are first and foremost in all incident management activities.
- Develops recommendations for fire suppression and rehabilitation of control lines.
- Monitors rehabilitation efforts.
- Provides guidance during the implementation of rehabilitation activities.
- Coordinates with local specialists (biologist, archaeologist, engineers, resource, recreation, etc.) to identify potential impacts.
- Identifies existing utilities, roads, pipelines, and other uses on the land that may be affected.
- Identifies potential resource issues that may occur as a result of the incident or incident activities.
- Develops a recommended fire suppression rehabilitation plan for the agency administrator and the incident commander.
- Documents potential and actual suppression/fire-related resource impacts and the rationale for protection of priority areas.
- Serves as liaison to agency administrator, resource users, and other affected parties.
- Establishes a procedure for long-term oversight, documentation and evaluation of rehabilitation efforts.
- Determines environmental restrictions within the fire area and provides input as to appropriate suppression actions.
- Anticipates impact on resources as the suppression or prescribed fire operation evolves.

- Communicates legal requirements for resource protection to the Incident Management Team.
- Ensures that planned mitigation measures are carried out effectively.
- Guides the development of short- and long-term natural and cultural resource rehabilitation documents.

2. Position Knowledge and/or Requirements:

- **Resource Management:** Knowledge of local politics and land use plans (general management plans, natural/cultural resource management plans, fire management plans, etc.); knowledge of the area (topographic features, vegetation types), critical areas, type of visitors and inhabitants, improvements, roads; understanding of potential effects of wildland fires upon significant natural and cultural resources; and basic map reading skills.
- **Fire Management:** Knowledge of both fire and fire suppression impact on natural and cultural resources; and completion of S-130 (Firefighting Training), S-190 (Introduction to Wildland Fire Behavior), I-100/200 (Incident Command System courses), S-110 (Basic Wildland Fire Orientation).
- **General:** Knowledge and experience in guidelines, policies and implementation for natural and cultural resource management including mitigation and protection measures; and good oral and written communication skills.

Resource Advisors assigned to a wildfire may be directly deployed to the fireline. At the other end of the spectrum, they may be giving their advice through meetings and briefings. An example of a READ being assigned to the fireline is a cultural resource specialist that is identifying archeological sites ahead of a crew building fireline. This type of line READ may be imbedded in a fire fighting crew and should meet a higher standard of qualifications, such as Fire Fighter Type II or a Resource Advisor Fireline (REAF). With this type of qualification, the fireline READ can work unescorted with the approval of the Incident Commander. READs that do not meet this higher standard can still visit the fire to assess resource concerns by meeting the escorted visits requirements outlined below.

3. READ Safety and Visits to the Fireline and Prescribed Burns

Visits (such as field assessments, media visits, or political/administrative tours) to hazardous areas of the fire or areas that pose a fire behavior threat will be managed by meeting the requirements below. These requirements are defined in the Interagency Standards for Fire and Fire Aviation, also known as the Red Book.

- Visits to the fireline must have the approval of the Incident Commander/Burn Boss.
- Visitors must maintain communications with the Division Supervisor or appropriate fireline supervisor of the area they are visiting.

- Visitors will have all of the following required Personal Protective Equipment (PPE):
  - Wildland fire boots
  - Fire shelter (M-2002)
  - Helmet with chinstrap
  - Goggles/safety glasses (as identified by Job Hazard Analysis/Risk Analysis [JHAs/RAs])
  - Ear plugs/hearing protection
  - National Fire Protection Association (NFPA) 1977 compliant long-sleeved, flame-resistant shirt
  - NFPA 1977 compliant flame resistant trousers
  - Leather or leather/flame resistant combination gloves. Flight gloves are not approved for fireline use
  - Additional PPE as identified by local conditions, or JHAs/RAs
- Visitors will have required field attire:
  - Undergarments made of 100 percent or the highest possible content of natural fibers or flame-resistant materials
- Visitors will have required equipment/supplies:
  - Hand tool
  - Water canteen

Visitors to the fireline and prescribed burns may be "Non Escorted" or "Escorted" depending on the requirements listed below. A list of DPW Wildland Fire Resource Advisors with listed qualifications is regularly updated and can be requested from the DPW Wildland Fire Team Lead.

a. <u>Non-Escorted Visits</u>

READ or visitors who are approved for non-escorted visits to the fireline or an active prescribed burn must meet the following criteria:

- Visitors must have an incident qualification with a minimum physical fitness level of "light" to visit the fireline unescorted.
- Completed the following training:
  - Introduction to Fire Behavior (S-190)
  - Basic Firefighter Training (S-130)
  - Annual Fireline Safety Refresher Training, including fire shelter training
- Deviation from this requirement must be approved by the Incident Commander or Burn Boss.

b. Escorted Visits

All visitors lacking the above non-escorted training AND physical requirements must be escorted while on the fireline.

- Escorts must be minimally qualified as Single Resource Boss.
- Visitors must receive training in the proper use of fireline PPE.
- Visitors must be able to walk in mountainous terrain and be in good physical condition with no known limiting conditions.
- Requirement for hand tool and water to be determined by the escort.
- Deviation from this requirement must be approved by the Incident Commander or Burn Boss.

4. READ Performing Fireline Duties

In order to perform fireline duties, READs must be Firefighters who meet all NWCG standards, including the Work Capacity Test and meet all fireline standards and qualifications described in the Wildland Fire Qualification System Guide, PMS-310-1. Even when READs are not qualified for fireline duties, they may be required to enter a dangerous environment while management actions are taking place. READs should base their actions on a critical assessment of their own abilities, knowledge, experience, and training and should understand relevant policy and standards. Safety is first and foremost.

a. Work Capacity Test

Personnel must meet established physical fitness levels for wildland fire assignments. Agencies may determine the method of evaluating the physical fitness level of their personnel. However, the testing method should be a measurable evaluation process.

Four levels of physical fitness have been established:

- **Arduous –** Duties involve fieldwork requiring physical performance calling for above-average endurance and superior conditioning. These duties may include an occasional demand for extraordinarily strenuous activities in emergencies under adverse environmental conditions and over extended periods of time. Requirements include running, walking, climbing, jumping, twisting, bending, and lifting more than 50 pounds; the pace of work typically is set by the emergency situation.
- **Moderate –** Duties involve fieldwork requiring complete control of all physical faculties and may include considerable walking over irregular ground, standing for long periods of time, lifting 25 to 50 pounds, climbing, bending, stooping, squatting, twisting, and reaching. Occasional demands may be required for moderately strenuous activities in emergencies over long periods of time. Individuals usually set

their own work pace.

- **Light –** Duties mainly involve office-type work with occasional field activity characterized by light physical exertion requiring basic good health. Activities may include climbing stairs, standing, operating a vehicle, and long hours of work, as well as some bending, stooping, or light lifting. Individuals can usually govern the extent and pace of their physical activity.
- **None required –** Positions that do not require a physical fitness level.

For any position assigned to the fireline for non-suppression tasks, such as resource assessment, the minimum required physical fitness level shall be “light.”

This instruction will be reviewed on an annual basis to ensure compliance with any new regulatory guidance.

The point of contact for this instruction is Leonard Cook, DPW Wildland Fire Team Lead, at leonard.j.cook.civ@mail.mil, 719-526-1696.

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Director of Public Works