

**Medicine Bow-Routt National Forests
&
Thunder Basin National Grassland**



**Fire Danger Operating Plan
2014**

Medicine Bow-Routt National Forests & Thunder Basin National Grassland
Fire Danger Operating Plan

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Fire Danger Operating Plan

USDA Forest Service

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INTRODUCTION

The Fire Danger Operating Plan documents the management of the fire weather data systems and corresponding resource response on the Medicine Bow-Routt National Forest and Thunder Basin National Grassland (MBRTBG). This plan incorporates National Fire Danger Rating System (NFDRS) modeling, Preparedness Planning Levels, and Fire Family generated ERC graphs. This plan is intended to provide a basic framework to help guide Fire Manager and Line Officer decisions under typical fire season conditions on the MBRTBG. Other factors, not addressed in this plan such as resource availability, resource staffing levels, current fire activity, and current weather conditions may result in a deviation from pre-identified initial resource response for each Fire Danger Rating level.

ROLES AND RESPONSIBILITY

Fire Danger Technical Group

CPC (Casper Dispatch Center) CRC (Craig Dispatch Center)	NFDRS/WIMS/RAWS Observations WIMS owners and managers
Forest AFMO -Jay Miller with assistance from Mick Hood, Clay Westbrook	RAWS Station Maintenance
Forest Fire Mgmt. Officer	NFDRS/WIMS/RAWS Program Mgmt.
Regional Office NFDRS/ WIMS / RAWS Specialist	NFDRS/WIMS/RAWS Support

1/ NFDRS, WIMS, and RAWS data will be monitored to ensure inputs and observation such as time, State of Weather (SOW), wet flag, green-up and freeze dates are accurate and consistent.

Fire Danger Technical group will coordinate, communicate, and rectify any identified problems with local NFDRS, WIMS and/or RAWS.

Fire Station Owner / Manager

Seven permanent Remote Area Weather Stations (RAWS) are identified for fire danger rating forecasts on the MBRTBG (Table 1). The Station Owner is the primary contact for all issues regarding station management and/or maintenance. The station owner will notify the appropriate Technical Group member for issues outside their area of expertise.

FDRA (Fire Danger Rating Area) – **Thunder Basin** includes Thunder Basin NG.

FDRA – Laramie Range includes Laramie Peak area on the Douglas Ranger District and Pole Mountain area on the Laramie Ranger District.

FDRA – Sierra Madres includes the Brush Creek/Hayden District

FDRA – Snowy Range includes the Snowy Range on the Laramie District and Brush Creek Hayden District

FDRA – Routt Zone includes the Parks, Hahns Peak/Bears Ears and Yampa Ranger Districts on the Routt NF

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Table 1: Station Owners

Fire Danger Rating Area	Station Number	Station Name	Agency	Owner
Thunder Basin	480502	Rochelle Hills	FS	BLM 0414
Thunder Basin	480501	Echeta	BLM	BLM 0414
Laramie Range	482102	Esterbrook	FS	BLM 0414
Laramie Range	482106	Dodge Creek	BLM	BLM 2868
Laramie Range	481502	Casper Mountain	BLM	BLM 0414
Snowy Range/Sierra Madres	482102	Sawmill Park	FS	BLM 0414
*Sierra Madres	482012	Sandstone	FS	BLM 0414
Routt Zone/Sierra Madres	050207	Dry Lake	FS	BLM 2409
Routt Zone	050304	Willow Creek	FS	BLM 2409
Routt Zone	050406	Porcupine Creek	FS	BLM 2409
Routt Zone	050305	Independence Mtn.	BLM	BLM 2409
Routt Zone	051404	Dead Horse	FS	FS 12147

***Sandstone not used for NFRDS calculations in this plan**

Communications

Casper and Craig Interagency Dispatch Centers (CPC & CRC) personnel are responsible for entering daily observations into WIMS and updating the adjective fire danger rating. The dispatch centers disseminate via e-mail, fax, text messages, and radio broadcasts, daily weather, watch/warning, and fire danger forecasts for their respective zones. This information is also available at:

http://gacc.nifc.gov/rmcc/dispatch_centers/r2cpc/ for Casper Dispatch

http://gacc.nifc.gov/rmcc/dispatch_centers/r2crc/ for Craig Dispatch

Fire danger signs are managed by the District in which they reside.

Field Operations Managers

Zone Fire Management Officers (ZFMO), District Fire Management Officers (DFMO) and their Assistants (AFMO) will ensure fire personnel on their unit understand NFDRS outputs and how they are to be used. Fire Management is responsible for: 1) implementing the Fire Danger Operations Plan, 2) ensuring decisions are made consistent with the intent of the plan, 3) communicating any issues with NFDRS adjectives, weather/fuels observations, and 4) provide weather/fuels observations when necessary.

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Program Managers

The Forest FMO is responsible for ensuring this plan is maintained, utilized and communicated to Forest fire personnel and Agency Administrators.

FIRE DANGER RATING INVENTORY

Administrative Unit

The Medicine Bow-Routt National Forests and Thunder Basin National Grassland is a complex unit situated in two states, Colorado and Wyoming, and guided by three separate Land and Resource Management Plans, the Routt National Forest Land and Resource Management Plan 1997, the Medicine Bow National Forest Revised Land and Resource Management Plan December 2003, and the Thunder Basin National Grassland Land and Resource Management Plan 2001. The Forest FMO and AFMO are stationed in Laramie, Wyoming.

Routt National Forest – The Routt National Forest is a heavy use recreation Forest, which encompasses 1.1 million acres, (Map 1). The Routt also administers an additional 113,832 acres of the Arapaho-Roosevelt National Forest System lands. A variety of fuels, topography, and weather are found on the Forest and approximately 20% of the forest is designated as wilderness. The Forest has diverse topography consisting of high plateaus, rolling foothills, and mountains. Precipitation amounts and patterns vary greatly due to the topographic differences. Measured average annual precipitation ranges from 11.5 inches east of the Continental Divide at Walden to 24.1 inches west of the Continental Divide in the North Fork of the Fish Creek Drainage. The climate can be summarized by the statement “long, snowy winters and short, cool summers,” with elevations that exceed 12,000 feet in some areas. Extensive WUI is found in areas, especially in the area surrounding Steamboat Springs.

The fire management organization consists of a Zone FMO in Steamboat Springs, and an AFMO station at each of the three Ranger Districts (Parks, Yampa, and Hahn’s peak/Bears Ears). The FMO and AFMO’s have collateral duties in fuels management.

Fire management goals and objectives are identified and discussed in the Forest’s Fire Management Plan and are related to fire management strategies (Direct Control, Perimeter Control, and Prescription Control) which were identified in the Routt National Forest Land and Resource Management Plan, revised 1997. Reference the Forest’s Fire Management Plan for maps of Fire Planning Units and Fire Management Units.

Medicine Bow National Forest – The Medicine Bow National Forest includes three units in three distinct mountain ranges. The Medicine Bow portion of the Central Rockies includes the northern extension of the Colorado Front Range, which divides to include the Laramie Range on the east (the southern extension is known as the Sherman Mountains) and the Snowy Range of the Medicine Bow Mountains on the west. The Sierra Madre Mountains, which are the northern part of the Parks Range, occupy the westernmost portion of the district.

The Continental Divide bisects the Sierra Madres. The major river drainages flow from the Continental Divide: the Green River Basin flows west into the Colorado River system, and the western Dakota sub-Basin and Platte River Basin flow east (Map 1).

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All of the Medicine Bow National Forest is mountainous. Elevations range from 5,050 feet above sea level in the Northern Laramie Range to 12,013 feet at the Medicine Bow Peak in the Snowy Range of the Medicine Bow Mountains. The Southern Medicine Bow contains four relatively small Wilderness areas. The Encampment River Wilderness and Huston Park Wilderness are located on the Brush Creek Hayden Ranger District within the Sierra Madre Mountains. The Savage Run and Platte River Wilderness areas are located within the Snowy Range Mountains on both the Brush Creek Hayden and Laramie Ranger Districts.

As a result of past timber harvest, the forest is well roaded in most areas outside of the designated wilderness areas. WUI is present throughout the forest at varying levels with various small communities, numerous inholdings, ranches and agricultural interests within and along the forest boundaries.

The fire management organization consists of a District FMO at each of the three Ranger Districts (Laramie, Brush Creek/Hayden & Douglas), with AFMO's in Douglas and Laramie. All DFMO's have collateral duties in fuels management.

Fire management goals and objectives are identified and discussed in the Forest's Fire Management Plan and are related to fire management strategies (Direct Control, Perimeter Control, and Prescription Control) which were identified in the Medicine Bow National Forest Revised Land and Resource Management Plan, revised 2003. Reference the Forest's Fire Management Plan for maps of Fire Planning Units and Fire Management Units.

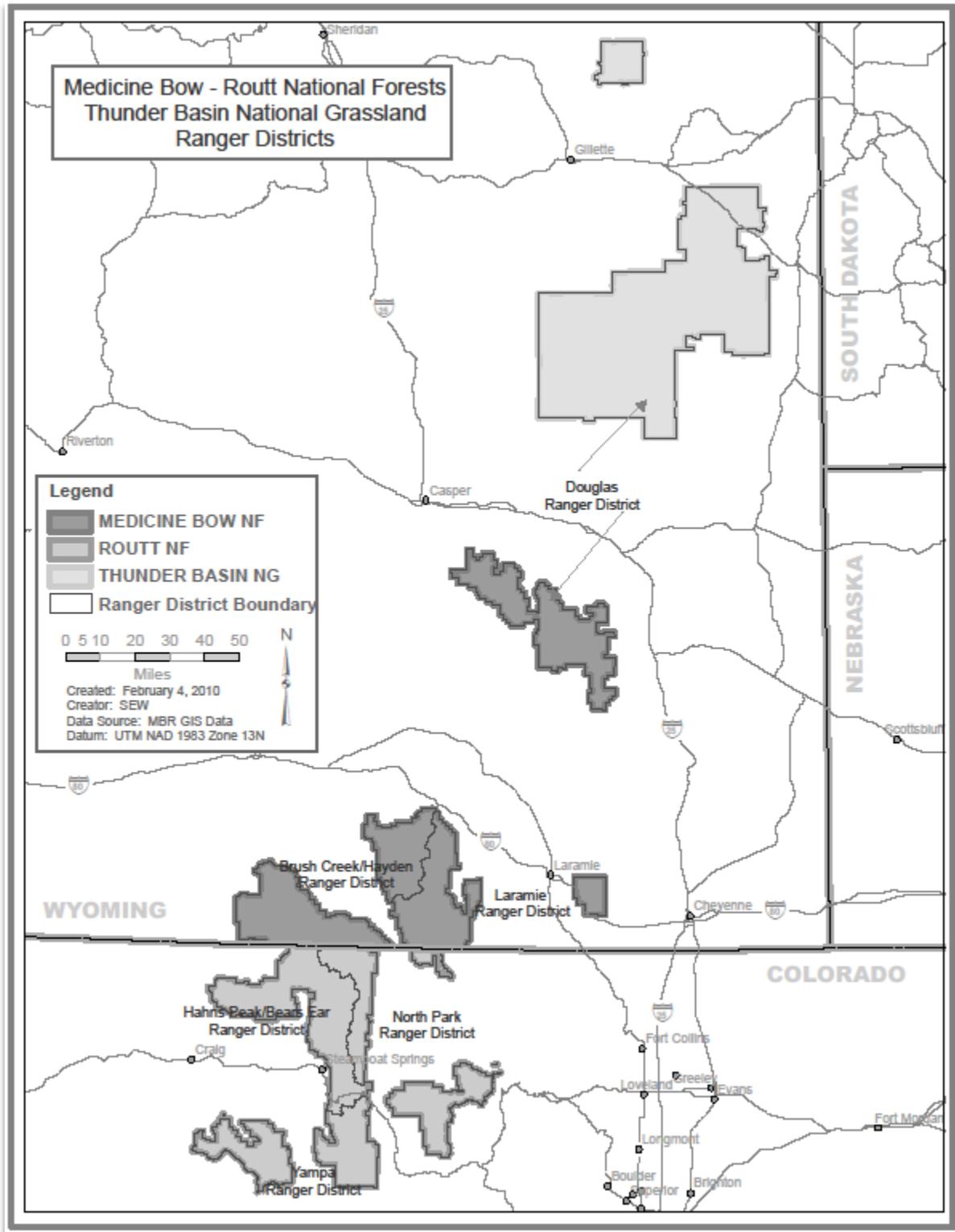
Thunder Basin National Grassland – The Thunder Basin National Grassland is located in northeastern Wyoming and occupies about 553,300 acres of land among a mosaic of state, federal, and private lands. These lands generally lie between Douglas on the south, Newcastle on the east, to the Montana boarder on the north and Wright on the west. This unit is administered by the Douglas Ranger District (Map 1).

The Grassland unit is blend of mixed-grass grassland, sagebrush grassland, cottonwood, greasewood, and ponderosa pine/juniper vegetation, within rolling plains, escarpment, dissected plains and shale upland landscapes. The grassland is home to big game species such as mule deer, whitetail deer, pronghorn antelope, elk, small mammals including prairie dogs, blacktail ferrets and upland game birds such as sage grouse. Coal is also mined on the grassland including the largest coal strip-mine operation in the nation and oil and gas drilling takes place throughout the area.

Fire Management for the Grassland is provided by a District FMO and AFMO located on the Douglas Ranger District.

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Map 1: MBRTB Ranger Districts



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Vegetation

Generally speaking, the MBRTB has three predominant vegetation zones; the lower elevation 4000-7000', mid-elevation 7000-10,000', and high elevation above 10,000'. The lower elevations include grass and shrubland communities with scattered ponderosa pine at varying levels, juniper, limber pine, Douglas fir and lodgepole pine. The mid-elevations are a mix of upper montane, sub-alpine, and alpine plant communities including aspen, Douglas-fir, lodgepole pine, limber pine, Engelmann spruce, sub-alpine fir, and meadows. Lodgepole and spruce/fir old growth forest exists in substantial amounts throughout the mid-elevations. High mortality exists at this elevation due to insect infestations in the lodgepole pine (also involving limber pine) and Engelmann spruce. High elevation is a mix of sub-alpine, alpine, and upper montane plant communities consisting of Engelmann spruce, sub-alpine fir, lodgepole pine, aspen, alpine meadows, and tundra. Portions of the higher elevation areas are above timberline.

Climate

The Medicine Bow-Routt National Forest includes the most climatically diverse forested areas in Region 2 with regard to precipitation. The Routt area, consisting mainly of high elevation, western slope country receives high precipitation amounts, especially as winter snow. The Sierra Madre Mountains on the Medicine Bow National Forest have a similar climate pattern but less snow. The rest of the Medicine Bow National Forest is cold and dry with the exception of the area immediately around Medicine Bow Peak. Steep precipitation and temperature gradients extend downward from the alpine environments of Medicine Bow Peak.

The annual precipitation across **Medicine Bow** Mountains varies with elevation. SNOTEL site data for annual precipitation 1981-2010 was used for the comparison. Cinnabar Park (elevation 9574 feet) SNOTEL in the Snowy Range averages 37.9 inches of annual precipitation. In the Sierra Madres the Sandstone SNOTEL (elevation 8150 feet) site has an annual average precipitation of 29.3 inches. Pole Mountain (elevation 8530 feet) in the Sherman Mountains only receives about 25.8 inches of annual precipitation, in the Laramie Mountains; the Laprele Creek SNOTEL (elevation 8375 feet) receives about 24.2 inches. The Laramie Mountains are the most interior continental mountains in the country, except for the Black hills which are influenced by different air masses. Gulf moisture and the Arizona Monsoon, which are important sources of precipitation for Front Range ecosystems in Colorado, contribute weakly to the moisture regime in the Laramie Mountains. Storms from the southwest which consistently bring moisture to the western slope in Colorado and Wyoming also contribute low amounts of precipitation to both the Laramie and Sherman Mountains. Thus, the Laramie Mountains likely have the most variable climatic regime within the Medicine Bow National Forest, and possibly in Region 2.

The climate on the **Routt NF** is a temperate semi-arid steppe regime in which precipitation falls in winter despite considerable variation with altitude. Total precipitation is moderate but is greater than on the plains to the west and the east. In the highest mountains, a considerable part of the annual precipitation is snow; however, permanent snowfields cover relatively small areas. Bases of these mountains receive only 10 to 20 inches of rainfall. With elevation, precipitation increases to 40 inches and up to 50 inches at the higher elevations, and temperatures decrease. Climate is influenced by the prevailing west winds and the general north-south orientation of the mountain ranges. East slopes are much drier than west slopes. Within this region, the individual mountain ranges have similar east-west slope differences. Average annual temperatures are mainly 35 to 45 degrees Fahrenheit, but reach 50 degrees Fahrenheit (10 degrees Celsius) in lower valleys.

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Thunder Basin National Grassland precipitation ranges from 5.5 to 19.5 inches per year for Dull Center (approximate center of TBNG) over last 64 years. Temps range from below zero to over 100 degrees F (personal observations). Average temp is 47 degrees (range of 43 to 50 degrees) and wind reaches 30 to 40 miles per hour with gusts to 50 or 60.

Up valley, up canyon diurnal winds may be relatively strong and persistent at lower elevations. Down valley diurnal winds at night may be anticipated. West of the Continental Divide, alignment of westerly winds and west facing aspect can create strong up valley, up canyon winds. Nighttime diurnal winds can be very light with pooling in the high mountain valleys. Several major deep drainages lie perpendicular to westerly winds and create large-scale eddy effects and upslope winds on the lee side. The Thunder Basin National Grassland has prevailing West winds.

Topography

The four mountain ranges of the Medicine Bow NF are the Snowy Range, Sierra Madre, Sherman Mountains and the Laramie Peak Range. NFS lands generally lie at elevations of 7,000 to 12000 feet in the Sierra Madre and Snowy Range and 4,000 to 10000 feet in the southern and northern portions of the Laramie Range..

The Snowy Range and Sierra Madre ranges have glaciated mountains as high as 13,000 feet with areas of alpine tundra at the highest elevations. The Sherman Mountains rise to around 9,000 feet in elevation. The Laramie Peak Range rises to 10,000 feet and has steep incised canyons not common in the other ranges.

All four mountain ranges that make up the Medicine Bow National forest trend towards North-South. All except the Sherman Mountains have steeper east aspects and more gently sloping west aspects. The Sherman Mountains have steep slopes to the west and grade gradually into the Great Plains to the east.

The Routt National Forest is composed of parts of several mountain ranges that rise to over 12,000 feet in elevation. The Elkhead Mountains are an east-west trending mountain range attached to the Parks Range. The Parks Range is a north-south trending mountain range with steep glaciated peaks and valleys carved by past glaciers. The Troublesome Range is an east-west trending mountain range with less topographic relief than most of the Routt NF. The Troublesome range attaches to the Never Summer Mountains on the east.

The Gore Range is attached to the southern end of the Parks Range and has similar but less steep and glaciated topography. The Flattops area of the Routt NF is part of the White River Plateau, a steep sided relatively flat plateau with occasional peaks that rise above the plateau.

The Routt has a small sliver of the Medicine Bow Range and the Never Summer Mountain that trend north-south and have steep west slopes and connect to the Front Range of Colorado

The Thunder Basin is mostly a gently east sloping landscape of rolling hills with low topographic relief but contains isolated features of greater topographic relief such as the Rochelle Hills and the badland type hills near the TBNG work center. Geological substrates create unstable slopes and badland topography in some areas. In areas the topography is shaped by clinker that is formed where the heat from underground coal fires have sintered the rock and made it resistant to erosion. Also in the north eastern portions of the TBNG near Upton and Osage, the topography is shaped by the uplifts that created the Black Hills of South Dakota and these areas are forested with ponderosa pine.

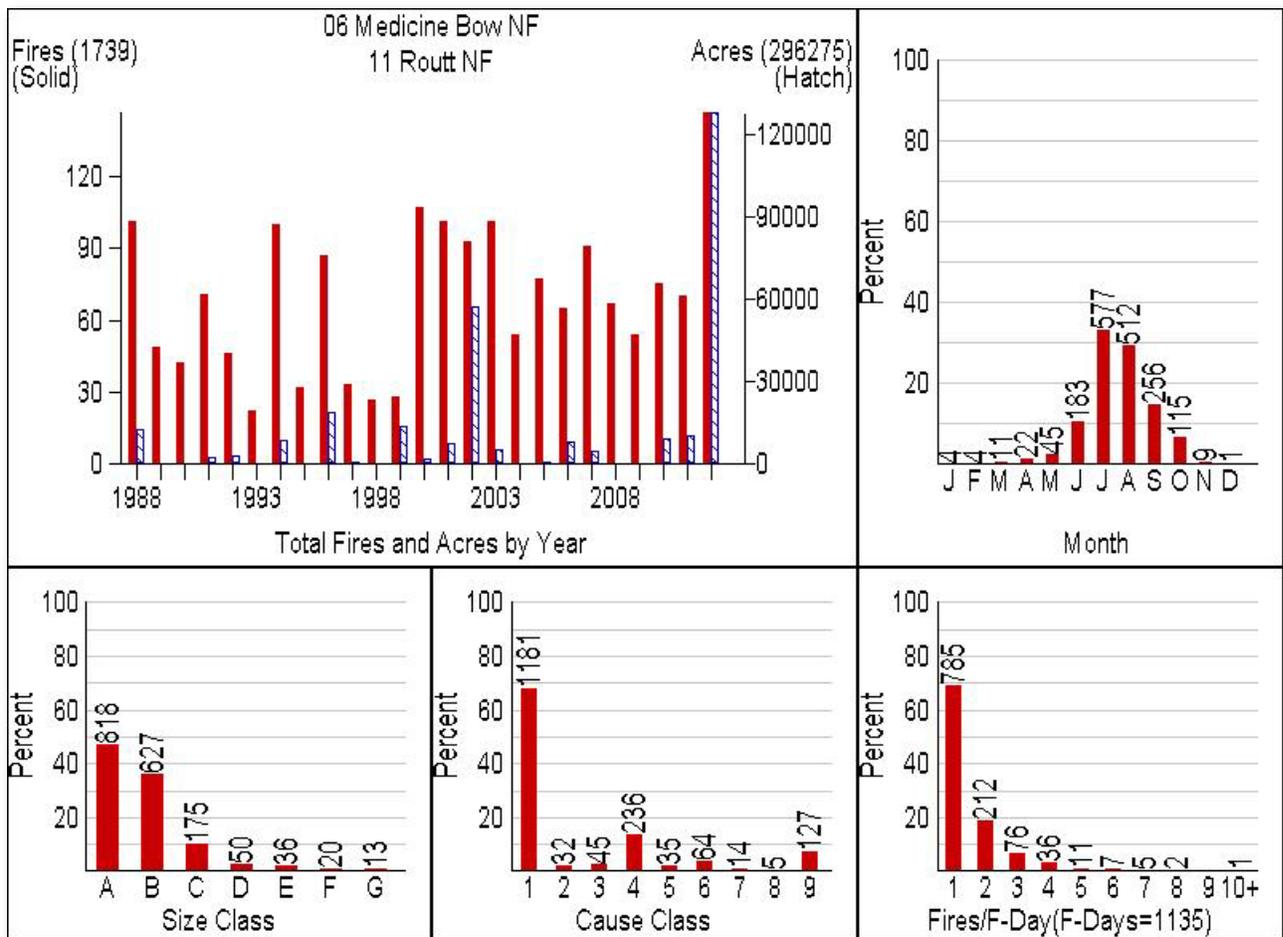
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Fire Problem Identification

The MBRTBG 24 year fire occurrence (from 1988 to 2012) is 1,739 ignitions with an annual average of 70 fires per year. Of the 1,739 ignitions, 68 percent are lightning caused and 32 percent human caused. Typically, ignitions are contained at size class A or B (less than 10 acres).

The MBRTBG has experienced high tree mortality due to insect infestation in the lodgepole pine forest type. The infestation began in Colorado and infested trees on the Routt NF early on. The pine beetle epidemic is spreading north and currently most of the Routt and Medicine Bow have experienced heavy mortality in all tree species which poses a variety of situations that could increase or decrease fire activity dependent on the amount of mortality and how the fuels profile continues to evolve post epidemic.

Table 2: MBRTB Fire Occurrence 1988-2012



Size Classes:

- A: <= 0.25 acres
- B: 0.26 to 9.9 acres
- C: 10 to 99.9 acres
- D: 100 to 299 acres
- E: 300 to 999 acres
- F: 1000 to 4999 acres
- G: >= 5000 acres

Cause Classes

- 1 - Lightning
- 2 - Equipment Use
- 3 - Smoking
- 4 - Campfire
- 5 - Debris Burning
- 6 - Railroad
- 7 - Arson
- 8 - Children

9 - Miscellaneous

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Fire Danger Decision Levels

NFDRS utilizes the WIMS processor to analyze weather data and forecasted data stored in the NIFMID database to produce fire danger ratings for corresponding weather stations (RAWS). NFDRS outputs from the WIMS processor can be used to determine various levels of fire danger rating. The system is designed to calculate worst-case scenario fire danger. NFDRS will be utilized in three ways for the purpose of this plan: 1) To determine the **Preparedness Level**, which will help agency personnel determine an appropriate state of readiness of suppression forces; 2) To determine the **Response Level**, which is a function of ERC, and is a decision tool for dispatchers to assign initial attack resources to reported fires; and 3) To compute the **Adjective Fire Danger** for the purpose of communicating fire danger to public and industrial interests, (e.g. fire danger signs). Although not used for making fire business decisions, Climatological Percentiles are discussed in this section.

In order to determine the Preparedness Level, Dispatch Level and Adjective Fire Danger, “break points” for each need to be calculated. Preparedness Level Break Points are thresholds that correspond to changes in historical fire activity based on a correlation of ERC and historical fires (termed “fire business”). Dispatch Level Break Points correspond to changes in historical fire activity based on BI and historical fires (fire business), and Adjective Fire Danger Rating (AFDR) Break Points are based on staffing classes (divisions of fire danger) and ERC, Thunder Basin NG uses BI. Preparedness Level Break Points differ from AFDR Break Points in that they take fire history into account in addition to weather data.

The FireFamily Plus software package was used to establish the fire business breakpoints. A statistical analysis based on historical weather adjusted for fire activity determines the appropriate staffing index and associated break points for each FDRA. Refer to Appendix B for information regarding the Firefamily Plus analysis.

Preparedness Level Break Points: Table 3 details the break points and items analyzed for the five FDRAs. The final Preparedness Level determination will also incorporate fire activity, live fuel moistures in the sagebrush and ERC's. Daily index/component values will be obtained from WIMS and used in Preparedness and Dispatch Level worksheets.

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Table 3: Preparedness Level: Fire Family Plus Analysis Factors and Determination										
Rating Area	RAWS	RWAS Data Years	Data Years	Weight Factors	Fuel Model	NFRDS Index	Preparedness Level (Staffing Level)		Response Level Break Points	
Snowy Range	<u>SIG:</u> Sawmill Park	1987-2012	May 1-Oct 30 1987-2012	1	G	ERC	PL 1	0-12	Low	0-25
							PL 2	13-25		
							PL 3	26-51	Mod	26-51
							PL 4	52-57		
							PL 5	58 +	High	52+
Sierra Madres	<u>SIG:</u> Sawmill Park Dry Lake	1987-2012 1984-2012	May 1-Oct 30 1987-2012	70 30	G	ERC	PL 1	0-13	Low	0-28
							PL 2	14-28		
							PL 3	29-56	Mod	29-56
							PL 4	57-62		
							PL 5	63+	High	57+
Laramie Range	<u>SIG:</u> Casper Mountain Dodge Creek Esterbrook	1992-2012 1988-2012 1965-2012	May 1-Oct 30 1992-2012	1	G	ERC	PL 1	0-17	Low	0-35
							PL 2	18-35		
							PL 3	36-71	Mod	36-71
							PL 4	72-77		
							PL 5	78+	High	72+
Thunder Basin	<u>SIG:</u> Echeta Rochelle Hills	1988-2012 1992-2012	May 1-Oct 30 1992-2012	1	T	B.I.	PL 1	0-16	Low	0-32
							PL 2	17-32		
							PL 3	33-65	Mod	33-65
							PL 4	66-83		
							PL 5	84+	High	66+
Routt Zone	<u>SIG:</u> Dry Lake Willow Creek Porcupine Dead Horse Independence Mtn.	1985-2012 1985-2012 1984-2012 1984-2012 2009-2012	May 1-Oct 30 1985-2012	1	G	ERC	PL 1	0-15	Low	0-30
							PL 2	16-30		
							PL 3	31-61	Mod	31-61
							PL 4	62-69		
							PL 5	70+	High	62+

Weather Stations

There are seven permanent Remote Automated Weather Stations (RAWS) in the MBRTB administrative unit and all are Forest Service stations. In addition, the MBRTB has two portable RAWS that are primarily utilized for site specific weather information for prescribed fire projects. Locations of the RAWS are identified on Map 2.

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Table 4: MBRTB Zone Weather Stations

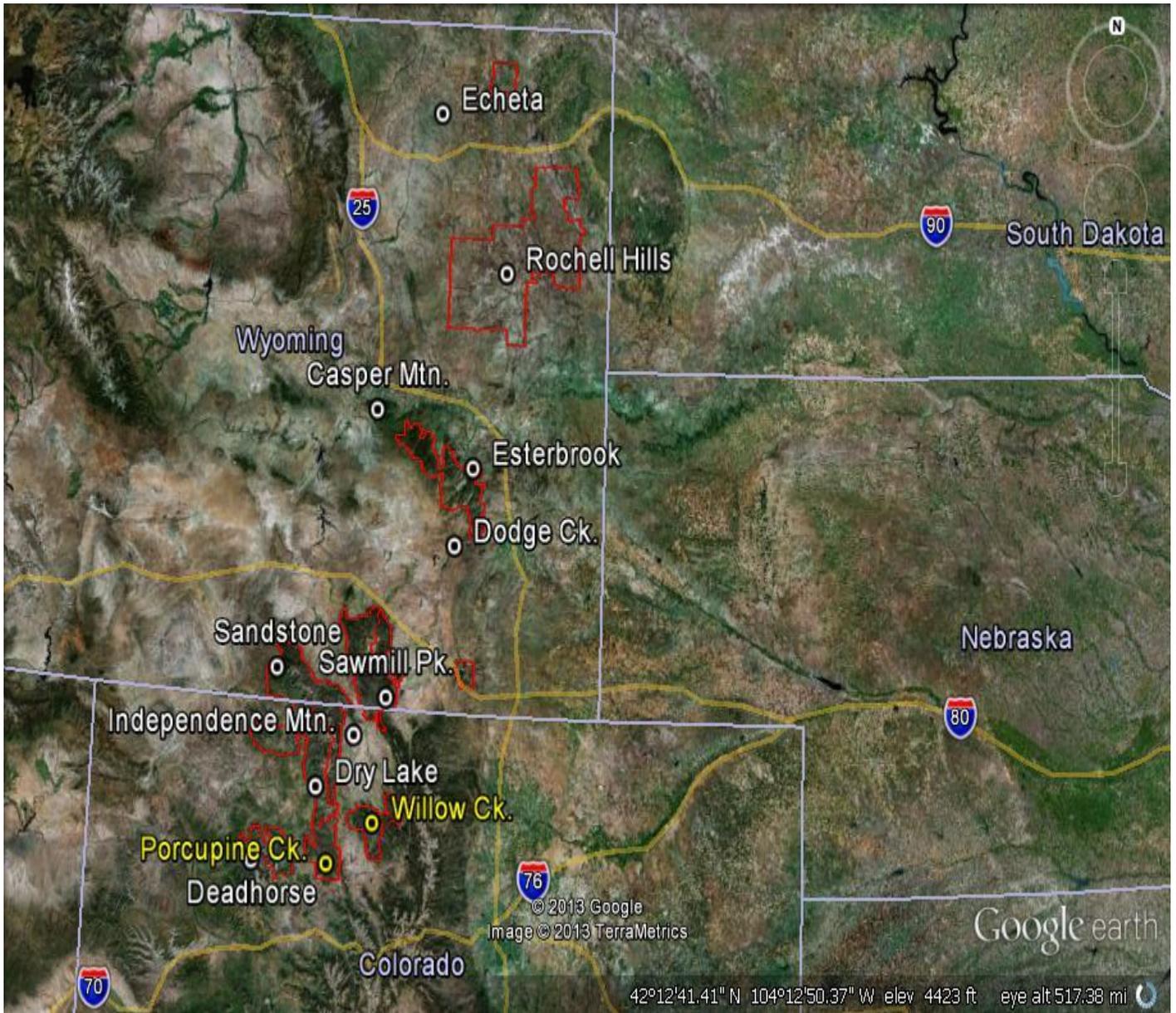
Station Name	Station Number	NESS ID	Operating Since	WIMS Obs. Period	Fuel Model	Location	Elevation
Rochelle Hills	480502	323036F0	1992	Until station is frozen in fall or pre-green in spring	T	43° 33' 02" 105° 05' 32"	5199 feet
Echeta	480501	3278318A	1988	Until station is frozen in fall or pre-green in spring	T	44° 28' 12" 105° 49' 48"	4320 feet
Esterbrook	482102	3240A63E	1970	Until station is frozen in fall or pre-green in spring	G	42° 24' 55" 105° 21' 40"	6530 ft.
Casper Mountain	481502	3264B19C	1992	Until station is frozen in fall or pre-green in spring	G	42° 43' 12" 106° 21' 00"	7740 feet
Dodge Creek	482106	3276E38A	1988	Until station is frozen in fall or pre-green in spring	G	41° 57' 58" 105° 30' 57"	7100
Sawmill Park	482105	323504AA	1987	Until station is frozen in fall or pre-green in spring	G	41° 04' 29" 106° 07' 55"	9055 ft.
Dry Lake	050207	3235E758	1984	Until station is frozen in fall or pre-green in spring	G	40° 32' 06" 106° 46' 51"	8320 ft.
Willow Creek	050304	3235F42E	1985	Until station is frozen in fall or pre-green in spring	G	40° 21' 06" 106° 12' 55"	9720 ft.
Porcupine Creek	050406	3235D2C2	1984	Until station is frozen in fall or pre-green in spring	G	40° 05' 52" 106° 38' 47"	8900 ft.
Dead Horse	051404	233603A4	1984	Until station is frozen in fall or pre-green in spring	G	40° 04' 43" 107° 22' 43"	8960 ft.
Independence Mtn.	050305	325B0F0	2009	Until station is frozen in fall or pre-green in spring	G	40° 51' 49" 106° 25' 51"	9000 ft.
*Sandstone	482012	32D51256	2012	Until station is frozen in fall or pre-green in spring	G	41° 11' 50" 107° 13' 10"	8100 ft.

Sandstone RAWs was not used in the any calculations in this plan because it is a new station

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FIRE DANGER AND FIRE BUSINESS ANALYSIS

Map 2: RAWs Locations & Fire Danger Area Map



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Fire Danger Rating Areas

There are five, Fire Danger Rating Areas (FDRA) MBRTB (see Map 2):

FDRA – Thunder Basin includes Thunder Basin NG. This area is unique from the rest of the Forest in terms of fire behavior as the climate is drier, predominately grass and shrub type fuels, rolling topography with elevations generally at 4000-5000 feet. Fire occurrence in this zone has historically been higher than the rest of the forest.

FDRA – Laramie Range includes the Douglas RD and the Pole Mountain area on the Laramie RD. This area consists of the northernmost mountains of the Front Range of Colorado and Wyoming. Historically, the fire occurrence has been lower than in the Thunder Basin, but higher than the rest of the FDRAs on the forest. Due to an extensive pine beetle epidemic, this area will likely experience more fires due to the higher tree mortality at least in the short term, post epidemic .

FDRA – Snowy Range includes the Laramie RD except the Pole Mountain area, the Brush Creek area of the Brush Creek/Hayden RD and the Kings Canyon/Pinkham Mountain of the Parks RD. This area differs from the northern FDRAs (Thunder Basin and Laramie Range) as this part of the forest is more “mountainous” in nature. Historically, the fire occurrence has been lower than in the northern zone however, due to an extensive pine beetle epidemic the southern zone (Snowy Range, Sierra Madres and Routt Zone) is experiencing this may change depending on how receptive the fuel bed becomes to ignition(s) following the insect epidemic.

FDRA – Sierra Madres includes the Hayden area of the Brush Creek/Hayden RD. Historically, the fire occurrence has been lower than in the northern FDRAs however, due to an extensive pine beetle epidemic the southern zone is experiencing this may change depending on how receptive the fuel bed becomes to ignition(s) following the insect epidemic.

FDRA – Routt Zone includes the Routt National Forest. Historically, the fire occurrence has been lower than in the northern FDRAs however, due to an extensive pine beetle epidemic the southern zone is experiencing this may change depending on how receptive the fuel bed becomes to ignition(s) following the insect epidemic.

Fire Weather Data

Historical weather data collected by the six RAWS stations on the Forest are used for a variety of purposes such as: (1) fire severity requests, (2) pocket card development, (3) NEPA fire/fuels project analysis, (4) Fire Danger calculations, (5) monitoring NFDRS indices, and (6) a variety of other fire and fuels applications.

Access to the historic weather database is obtained through Fire and Aviation Management Web Page using KCFast to access the database. Historic weather data is processed/analyzed using Fire Family Plus software. During fire season, weather data is processed and NFDRS indices such as 1,000 hour fuel moisture, Energy Release Component (ERC), Burning Index (BI), etc. are monitored. These NFDRS indices aid in making preparedness decisions based on our MBRTB Preparedness Plan. NFDRS indices may be calculated for a single RAWS or for a SIG (a combination of RAWS), depending upon the local factors occurring at the time (i.e., drought, fire occurrence, etc.).

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Fire Occurrence Data

Historical fire occurrence data is downloaded from KCAST, and downloaded into the FireFamily Plus program. The MBRTB typically uses the historic yearly start date for each RAWS as the cutoff date for historical records when producing ERC and 1000 hour fuel graphs. Data is constrained based on the usability of historical data (missing information), movement of RAWS locations, and modernization and functionality of RAWS equipment.

Parameters Used to Calculate Fire Danger

1. **Slope Class:** National Fire Danger Rating System groups slope into five classes: 1) 0-25, 2) 26-40, 3) 41-55, 4) 56-75, and 5) greater than 75%. The MBRTB uses slope class 1 or 2 depending upon the RAWS.
2. **Climate Class:** The NFDRS uses four Climate Classes, numbered 1 through 4. The MBRTB uses climate class 2 or 3 depending upon the area the RAWS represents. Climate class 2 represents semiarid, steppe (short grass and shrubs, including interior west short grass prairie, sagebrush and juniper regions. Climate class 3 represents a semi-humid climate where summertime precipitation is adequate to sustain plant growth most of the season (typical of the mountain West).
3. **Green-Up:** We use 1978 NFDRS fuel models where the NFDRS processor assumes a length of green-up period according to climate class. The green-up rate for climate class 2 is 14 days for the climate class 3 is 21 days. The MBTB will green-up a station (RAWS) when grasses begin to green and trees/bushes start to bud out at elevations similar to each RAWS location, typically in May, but could be earlier depending upon snowpack and spring temperatures.

Climatological Percentiles

Climatological breakpoints are points on the cumulative distribution of one fire weather/danger index computed from climatology without regard for associated fire occurrence/business. For example, the value of the 90th percentile ERC is the climatological breakpoint at which only 10 percent of the ERC values are greater in value. The percentiles for climatological breakpoints predetermined by agency directive are shown below.

BLM - 80th and 95th percentiles

FWS - 90th and 97th percentiles

NPS - 90th and 97th percentiles

FS - 90th and 97th percentiles

It is equally important to identify the period or range of data analysis used to determine the agency percentiles. The percentile values for 12 months of data will be different from the percentile values for the fire season. Year round data should be evaluated for percentiles involving severity-type decisions and percentiles based on fire season data for staffing levels and adjective fire danger rating.

FIRE DANGER BASED DECISIONS

Adjective Fire Danger Rating (AFDR)

The Adjective Fire Danger Rating will be used by agency personnel to inform the public of the current level of fire danger associated with a specific Fire Danger Rating Area. The amount of public interaction will depend on the magnitude of the adjective fire danger. NFDRS processors (such as WIMS) will automatically calculate the daily adjective class rating.

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Five staffing class intervals (1-5) that correspond with five levels of adjective fire danger (low, moderate, high, very high and extreme) will be used for all five FDRAs.

Operations and Applications

The resultant Preparedness and Dispatch Levels for the different FDRAs will be broadcast in conjunction with the morning information report and documented on the daily resource status report. The Adjective Fire Danger Ratings will be updated daily via the dispatch websites.

Although fire danger ratings do not predict human-caused fires, a strong effort should be made to communicate the fire danger as it changes throughout the fire season. The social, political, and financial impacts of wildfires on agency, public, and industrial entities can be far-reaching. Loss of life, property, and financial resources can potentially be associated with any wildfire. As the fire danger fluctuates, agency personnel need to have pre-planned and appropriate responses. These actions should not only focus on appropriate fire suppression, but also mitigation/education.

Preparedness Level

The Preparedness Level is a five-tier (1-5) fire danger rating system that will be based on Energy Release Component and Burning Index for the Thunder Basin NG and indicators of fire business. The break points for the Preparedness Level are set using an historical analysis (Fire Family Plus) of fire business and its relationship to 1300 RAWs observations entered into the NIFMID database and processed by WIMS, which calculates the staffing index values (BI, IC, SC, ERC, etc).

Preparedness Level I – Little or no fire activity, preseason preparedness duties being accomplished, IA Resources less than 25% committed according to the dispatch availability page.

Preparedness Level II – Low to moderate fire activity, interagency involvement occurring, potential for Class B or C fire exists, IA Resources 50% committed according to the dispatch availability page.

Preparedness Level III – Multiple fires occurring, increased potential for escaped fires Class C or larger, IA resources 75% committed according to the dispatch availability page.

Preparedness Level IV – Multiple A, B, C and large fires, extended attack occurring, all IA Resources committed according to the dispatch availability page, predicted LAL 3 or red flag conditions exist.

Preparedness Level V – Multiple large fires, all IA resources committed according to the dispatch availability page, significant LAL and red flag conditions.

Response Level

Agency personnel use the Response Level to assign initial attack resources based on pre-planned interagency “Run Cards.” Combined with predefined Suppression Areas which are identified in the MBRTB Initial Attack Plan, the Response Level is used to assign an appropriate mix of suppression resources to a reported wildland fire based upon fire danger potential. The Response Levels is a fire danger rating system that is based on ERC, BI for the Thunder Basin, and the current Preparedness Level. In all FDRAs, ERC in NFDRS Fuel Model G, BI in NFDRS Fuel Model T for Thunder Basin, has been determined to be the best NFDRS index that statistically correlates to the potential for large fires to occur. Due to the ability of ERC to reflect the most current fire danger potential, and the Dispatch Center’s ability to manage agency personnel throughout the course of any given day, Response Level

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will be computed and implemented for initial attack response levels until a qualified Incident Commander arrives on scene to validate the need for the dispatched resources, (**Table 3**).

Response Level is comprised of three levels, low, moderate and high. Low response level includes preparedness level 1 & 2. Moderate response level includes preparedness level 3 and High response level includes preparedness level 4 & 5.

OPERATIONAL PROCEDURES

Adjective Fire Danger Rating

In 1974, the USFS, BLM and State Forestry organizations established a standard adjective description for five levels of fire danger for use in public information releases and fire prevention signage. For this purpose only, fire danger is expressed using the adjective levels and color codes described below.

Fire Danger Class and Color Code	Description
Low (L) (Green)	Fuels do not ignite readily from small firebrands, although a more intense heat source such as lightning may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but timber fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.
Moderate (M) (Blue)	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H) (Yellow)	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are hit hard and fast while small.
Very High (VH) (Orange)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high intensity characteristics such as long-distance spotting and fire whirlwinds when they burn in heavier fuels.
Extreme (E) (Red)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

Agency personnel will use the resultant adjective fire danger information to maintain the awareness of public and industrial entities. The amount of interaction between agency and public/industry entities will depend on the magnitude of the adjective fire danger.

Adjective Fire Danger Rating Determination

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The “adjective fire danger” is analogous to “Smokey’s arm” or other media used to convey fire danger to the public. The “adjective fire danger” is based on a combination of the staffing level, which can be driven by any NFRDS output; and the ignition component (the probability that a firebrand would cause a wildland fire requiring some form of suppression response). Typically, the “adjective fire danger” is in the “moderate” and “high” ranges about 70 percent of the time during the fire season. “Low” occurs about 25 percent of the time, with the remainder of the days in the “very high” or “extreme” range. This adjective class should only be utilized for public information. Staffing level (SL) is used for in-house fire readiness.

Using the IC, the SL, and the adjective fire-danger matrix, WIMS determines the fire-danger rating (R). Adjective fire-danger is expressed as one of five levels

NFRDS processors automatically calculate the adjective class rating. The adjective rating calculations use the staffing index (such as ERC or BI) of the first priority fuel model listed in the station record in the processor.

The actual determination of the daily adjective rating is based on the current or predicted value for a user-selected staffing index and ignition component using the table below. The staffing index used in the plan is ERC.

Staffing Levels	Adjective Fire Danger Rating				
1-, 1, 1+	L	L	L	M	M
2-, 2, 2+	L	M	M	M	H
3-, 3, 3+	M	M	H	H	VH
4-, 4, 4+	M	H	VH	VH	E
5	H	VH	VH	E	E
Ignition Component	0-20	21-45	46-65	66-80	81-100

Given the same weather inputs, the NFRDS processor will calculate the adjective fire danger for the selected fuel models. **For the purpose of this plan Staffing Level and Response Level are treated the same.**

Seasonal Risk Analysis

Seasonal risk analysis is a comparison of the historic weather/fuels records with current and forecasted weather/fuels information. Seasonal risk analysis is an on-going responsibility for fire program managers. The most reliable indicators of seasonal fire severity have been measurements of fine fuel loading, live fuel moisture, 1000-hour (dead) fuel moisture, and ERC. These levels will be graphically compared to historical maximum values and the average. The graphs will be routinely updated and distributed to fire suppression personnel and dispatch. Seasonal risk analysis information will be used as a basis for pre-positioning critical resources, dispatching resources, and requests for fire severity funding. The following are specific indicators that are useful in accurately predicting fire season severity and duration in the Thunder Basin, Laramie Range, Snowy Range, Sierra Madres, and Routt Zone Fire Danger Rating Areas.

Fire Activity: The presence (or absence) of fire activity can be tracked and compared to historical occurrences in order to anticipate severity conditions. The Fire Summary module of FireFamily Plus provides an efficient means to compare monthly fire activity.

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Live Fuel Moisture: Live fuel moisture plots have been established in each FDRA. Vegetation sampled at each site varies depending on the representative vegetation in the area. While sampling has not been consistent in the past so correlation can be seen between fire intensity and live moisture levels. Consequently, fire severity is determined by comparing current trends to historical averages. Comparison of fuel moisture to historical conditions at various locations within Wyoming, Colorado and surrounding areas can be located on the National Live Fuels Moisture web site:
<http://72.32.186.224/nfmd/public/index.php>

NFDRS Indicators: ERC and 1000-hr (3" – 8" diameter dead) fuel are used as the primary indicators to track seasonal trends of fire danger potential. NFDRS fuel model G has been chosen due to its good "fit" with the ERC and 1000-hour models. Other fuel models that might seem to be more appropriate due to their classification (grass/brush) do not correlate very well statistically with the NFDRS models. Consequently, fuel model G was chosen due to its ability to predict fire occurrence, specifically a day when a large fire is likely to occur.

Weather Trends: Seasonal weather assessments rely upon long-range (30-90 day) forecasts. This information is available on the Rocky Mountain Area Predictive Services Web Site. The site also contains daily and weekly fire danger assessments.

Thresholds (EXTREME FIRE DANGER)

Seasonal risk escalation in fuel complexes of the MBRTB area relies upon a combination of factors that will ultimately trigger an extreme state of fuel volatility and a high potential for large fire growth or multiple ignition scenarios. These factors are:

Fire Activity: The occurrence of large/multiple fires is the best indicator of severity conditions and the potential for seasonal risk. Any one incident reaching type one or two complexity would be an indicator of severity. Two or more type three incidents within a two to four week period would also be a strong indicator. Three or more initial attack fires in the same day indicate a point where resources are scarce. A progressive approach to assessing seasonal risk will prepare the local unit for these occurrences and the necessary tools will already be in place.

Live Fuel Moisture -Sagebrush: The average herbaceous fuel moisture of sagebrush in all MBRTB FDRAs fluctuates between 200% (June) and 70% (August). Readings below 75% indicate increased risk relating to large fire growth and severity conditions. Below average readings may indicate an early or extended fire season. **Evergreens:** The average foliar moisture of the evergreens in all MBRTB FDRAs is 105% across the forest.

NFDRS Thresholds: The BI threshold for extreme fire potential is 66 (or higher) for the Thunder Basin FDRA, 72 (or higher) for ERC for the Laramie Range FDRA, and 57 or higher for ERC for the Snowy Range FDRA, 62 (or higher) for ERC for the Sierra Madres FDRA and Rout Zone FDRA. It has been statistically proven that large fire events will occur proportionally more often when these thresholds are exceeded. Early or late-season readings that trend above average may indicate an extension of the normal fire season.

Fire Danger Pocket Cards

The Fire Danger Pocket Card is a tool which can help fire suppression personnel to interpret NFDRS outputs and understand fire danger thresholds for a local area. Pocket cards can relate current NFDRS outputs with the historical average and worst-case values in a specific geographic location. Visiting resources can use the pocket card to familiarize themselves with local fire danger conditions.

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ERC is a measure of fire controllability (Deeming et al. 1978). NFDRS fuel model G was selected for all FDRAs as it provides the best statistical correlation with large fire occurrence and responds to changing weather and fuel conditions (See Appendix B for Fire Analysis). Refer to Appendix E for pocket card examples.

Fire Danger Operating and Preparedness Plan

The MBRTB FMO will ensure that necessary amendments or updates to this plan are completed. Updates to this plan will be made at least every two years and approved by the line officers (or delegates) from each agency.

Suppression Resources

During periods when local preparedness levels are High to Extreme, the Fire Management Officer will strive to achieve the most efficient and effective organization to meet the Fire Management Plan objectives. This may require the pre-positioning of suppression resources. The FFMO/FAFMO will also determine the need to request/release off unit resources or support personnel throughout the fire season.

Duty Officer

For the purposes of this plan, a MBRTB Duty Officer will be identified to the Casper and Craig Interagency Dispatch Centers. The Duty Officer is a designated fire operations specialist, who provides input and guidance regarding preparedness and dispatch levels. It is the Duty Officer's role to interpret and modify the daily preparedness and dispatch levels as required by factors not addressed by this plan. Modifications of the preparedness and/or dispatch levels must be coordinated through the Dispatch Center Manager. The Duty Officer will keep their respective agency's fire and management staff updated (as needed).

Fire Weather Forecasting

Daily fire weather forecasts will be developed by the National Weather Service, Riverton, Cheyenne, Boulder and Grand Junction Weather Forecast Offices, and posted on the Internet and in WIMS for the Casper and Craig Interagency Dispatch Centers to retrieve.

NFDRS Outputs and Indices

The Center Managers will ensure that the daily fire weather forecast (including NFDRS indices) is retrieved and that the daily preparedness, dispatch, and adjective levels are calculated and distributed.

Risk Analysis Information

The FFMO will ensure that seasonal risk assessments are conducted during the fire season. The risk analysis will include information such as live fuel moisture, 1000-hour fuel moisture, fuel loading, NFDRS (BI/IC/ERC) trends, and other pertinent data. This information will be distributed to agency staff and the Casper and Craig Interagency Dispatch Center Managers. The Center Manager and District/Zone FMO's or AFMO's will ensure information is posted at fire suppression duty stations.

Weather Station Maintenance

To ensure the accuracy of the data retrieved from each RAWS several processes have been established for Remote Area Weather Station (RAWS) monitoring and maintenance:

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- Each weather station is monitored on a daily basis by Dispatch staff to ensure data is transmitted on schedule.
- If any station is not transmitting hourly data then notification is sent to the Dispatch Center Manager and the Forest FMO and/or AFMO are notified.
- Each RAWS is monitored for quality of data. If data transmitted does not reflect current conditions such as 20 degree temperatures @1300 on July 7th, no variation in wind speeds over several hours, or RH of 90% when no rain has occurred for 2 weeks, then issues need to be communicated to the appropriate Dispatch Center Manager. Again, if situations arise with the quality of data from a RAWS, the Forest FMO/AFMO and/or DZFMO/DZAFMO should be contacted.
- Each RAWS receive an annual maintenance service check by the Forest RAWS Maintenance personnel.
- RAWS Maintenance personnel from the Forest also will also service any specific RAWS during the course of a year if problems develop with the station.

WIMS Access, Daily Observations, and Station Catalog Editing

To ensure the accuracy of data in WIMS throughout the year several processes have been established:

- Station's herbaceous condition should be set to "Frozen" at the end of each fire season and after the first hard freeze. The timing of the actual freeze date is coordinated with field units.
- When either dispatch center is not staffed 7 days a week: make sure weekend (Sat & Sun) weather data is enter into WIMS on the following Monday; this will ensure carryover values remain accurate.
- Approximately 45 days prior to green up change the herbaceous condition to pre-green and make sure regular daily entries are made. The dates for green up are coordinated with field units.
- In early April the Dispatch center(s) staff will begin to solicit information from Field resources as to the beginning of actual "green up".
- As stations are greened up the dispatch Center Manager will send out notification.

To ensure the accuracy of the daily data in WIMS several processes have been established:

- WIMS data is collected daily, by dispatch center personnel, beginning at 13:00 local time.
- State of Weather (SOW) is collected by utilizing a variety of resources including: satellite imagery, radar, webcams, and on site observations by field personnel.
- After 14:00 hours dispatch personnel will edit the 12:00 observations in WIMS; averages and actual indices will be retrieved from each RAWS and saved and uploaded to the dispatch center website. After 15:30 dispatch personnel will retrieve the forecasted indices (next day's 14:00 observations) for each RAWS and save and upload them to their appropriate website.

Preparedness, Dispatch, and Adjective Level Guidelines

The MBRTB fire management staff along with the Center Manager will be responsible for establishing and reviewing the preparedness, dispatch, and adjective level guidelines on a bi-annual basis (as a minimum).

Public and Industrial Awareness

Education and mitigation programs will be implemented by the agency Public Information Officers, Law Enforcement Officers, FMOs, AFMOs, Fire Wardens, and Prevention Specialists based on Preparedness Level Guidelines and direction provided by the agency FFMO and Duty Officer.

NFDRS and Adjective Fire Danger Break Points

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The MBRTB FMO/AFMO will review weather and fire data at least every two years (when the FDOP is re-analyzed). The MBRTB FMO/AFMO will ensure that the break points reflect the most accurate information with the concurrence of the FMO's.

Fire Danger Pocket Cards

The FMO will ensure that pocket cards are prepared at least every two years and are in compliance with NWCG standards. The cards will be distributed to all interagency, local and incoming firefighters and Incident Management Teams (IMTs). The pocket cards will be posted on Casper and Craig Dispatch and National Wildfire Coordinating Group (NWCG) pocket card web site (<http://fam.nwcg.gov/fam-web/pocketcards/default.htm>). Fire suppression supervisors will utilize pockets cards to train and brief suppression personnel.

Program Improvements

Training

- Provide FDOP training to cooperators including county fire FMOs, cooperating dispatch centers, and fire departments.
- Work with local cooperators and other Federal agency fire managers to develop an interagency FDOP.
- Train more personnel as first responders to RAWs malfunctions.
- Emphasize NFDRS training (S-491) at the geographic area level for mid-level fire management personnel.
- Inform agency fire suppression supervisors of FDOP applications by integrating the training in unit orientation meetings. At a minimum, this should include FMOs, Engine Captains, and District Rangers.

RAWS

- Maintain portable RAWS when needed.
- Report errors of weather data to the station's owner.

Technology & Information Management

- Integrate preparedness and response level flow charts into a web based package.
- Improve the Casper Interagency Dispatch Center Internet Site where pertinent seasonal risk assessment information can be reviewed.

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Drawdown Levels

At the various Preparedness Levels, the following resources will be held within the MBRTB Area:

Preparedness LEVEL 1	
Initial Attack Operations	Duty Officer available 24-7 Minimum Drawdown: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Duty Officer: 3 DZFFDO/0 FFDO, (DZFFDO – District or Zone Fire Duty Officer/ FFDO – Forest Fire Duty Officer <input checked="" type="checkbox"/> 3 FS engines Normal Staffing Hours
Preparedness LEVEL 2	
Initial Attack Operations	Duty Officer available 24-7 Minimum Drawdown: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Duty Officer: 3 DZFFDO/0 FFDO, <input checked="" type="checkbox"/> 4 FS engines Normal Staffing Hours
Preparedness LEVEL 3	
Initial Attack Operations	Duty Officer available 24-7 Minimum Drawdown: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Duty Officer: 3 DZFFDO/1 FFDO <input checked="" type="checkbox"/> 5 FS engines, 1 FS WFM-T2 (Wildland Fire Module Type 2) <input checked="" type="checkbox"/> 1 ICT3 <input checked="" type="checkbox"/> Check for availability of detection flight Normal Staffing Hours unless extended by DZFFDO/FFDO
Preparedness LEVEL 4	
Initial Attack Operations	HDD ODO available 24-7 Minimum Drawdown: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Duty Officer: 4 DZFFDO/1 FFDO <input checked="" type="checkbox"/> 2 ICT3 <input checked="" type="checkbox"/> 7 FS engines, 1 FS WFM-T2 <input checked="" type="checkbox"/> Check for availability of detection flight <input checked="" type="checkbox"/> 2 Dozers 7 day coverage Normal Staffing Hours unless extended by DZFFDO/FFDO
Preparedness LEVEL 5	
Initial Attack Operations	Duty Officer available 24-7 Minimum Drawdown: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Duty Officer: 6 DZFFDO/2 FFDO <input checked="" type="checkbox"/> 2 ICT3 (Can be coordinated with Inter-agency partners.) <input checked="" type="checkbox"/> 8 FS engines, 1 FS WFM-T2 <input checked="" type="checkbox"/> 2 Dozers 7 day coverage On Duty during Holidays Normal Staffing Hours unless extended by DZFFDO/FFDO. Preposition resources in areas of concern based on lightning activity. Additional resources will be ordered to back fill for committed resources. Order severity resources as determined by FFDO. Consider severity request for Fire Recon: additional aviation needs (Helicopter, SEAT, etc), Hand Crews, patrols, additional engines, extended hours. Check with Inter-agency partners on availability of the Type 3 Teams.

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Appendix A – Glossary

10-Hr Timelag Fuels	Dead fuels consisting of roundwood in the size range of 1/4 to 1 inch in diameter and, very roughly, the layer of litter extending from just below the surface to roughly 3/4 of an inch below the surface.
100-Hr Timelag Fuels	Dead fuels consisting of roundwood in the size range of 1 to 3 inches in diameter and, very roughly, the forest floor from 3/4 of an inch to 4 inches below the surface.
1000-Hr Timelag Fuels	Dead fuels consisting of roundwood 3 to 8 inches in diameter or the layer of the forest floor more than about 4 inches below the surface or both.
Adjective Rating	A public information description of the relative severity of the current fire danger situation.
Annual Plant	A plant that lives for one growing season, starting from a seed each year.
Burning Index (BI)	BI is a number related to the contribution of fire behavior to the effort of containing a fire. The BI (difficulty of control) is derived from a combination of Spread Component (how fast it will spread) and Energy Release Component (how much energy will be produced). In this way, it is related to flame length, which, in the Fire Behavior Prediction System, is based on rate of spread and heat per unit area. However, because of differences in the calculations for BI and flame length, they are not the same. The BI is an index that rates fire danger related to potential flame length over a fire danger rating area. The fire behavior prediction system produces flame length predictions for a specific location (Andrews, 1986). The BI is expressed as a numeric value related to potential flame length in feet multiplied by 10. The scale is open-ended which allows the range of numbers to adequately define fire problems, even during low to moderate fire danger.
Climatological Breakpoints	Points on the cumulative distribution of one fire weather/fire danger index without regard to associated fire occurrence/business. They are sometimes referred to as exceedence thresholds.
Duff	The partially decomposed organic material of the forest floor that lies beneath the freshly fallen twigs, needles and leaves. (The F and H layers of the forest soil profile.)
Energy Release Component (ERC)	ERC is a number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. Since this number represents the potential “heat release” per unit area in the flaming zone, it can provide guidance to several important fire activities. It may also be considered a composite fuel moisture value as it reflects the contribution that all live and dead fuels have to potential fire intensity. The ERC is a cumulative or “build-up” type of index. As live fuels cure and dead fuels dry, the ERC values get higher thus providing a good reflection of drought conditions. The scale is open-ended or unlimited and, as with other NFDRS components, is relative. Conditions producing an ERC value of 24 represent a potential heat release twice that of conditions resulting in an ERC value of 12.
Equilibrium Moisture Content	The moisture content that a fuel particle will attain if exposed for an infinite period in an environment of specified constant temperature and humidity. When a fuel particle has reached its equilibrium moisture content, the net exchange of moisture between it and its environment is zero.
Fire Business Thresholds	Values of one or more fire weather/fire danger indexes that have been statistically related to occurrence of fires (fire business). Generally, the threshold is a value or range of values where historical fire activity has significantly increased or decreased.
Fire Danger	The resultant descriptor of the combination of both constant and variable

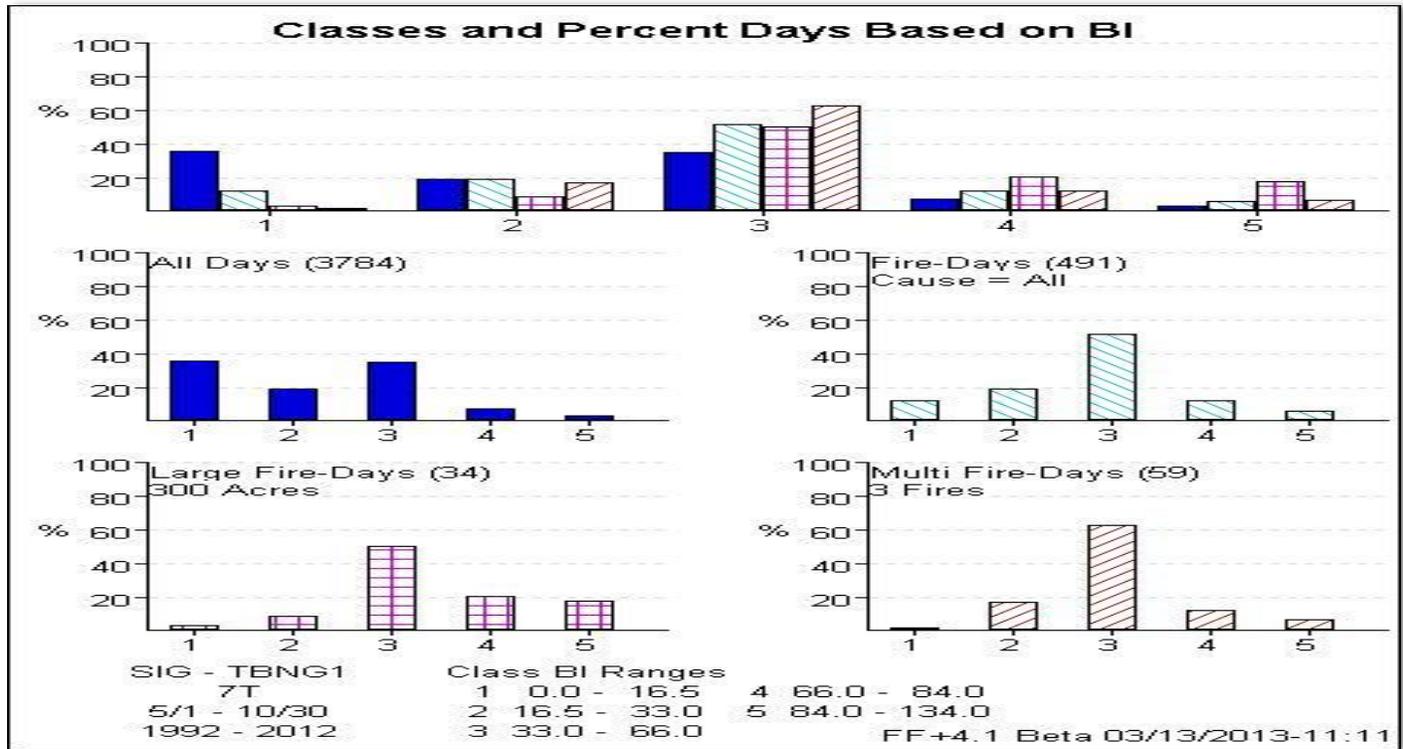
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	factors that affect the ignition, spread, and control difficulty of control of wildfires on an area.
Fire Danger Continuum	The range of possible values for a fire danger index or component, given a set of NFDRS parameters and weather input.
Fire Danger Rating	A system that integrates the effects of existing and expected states of selected fire danger factors into one or more qualitative or numeric indices that reflect an areas protection needs.
Fire Danger Rating Area	A geographic area relatively homogeneous in climate, fuels and topography, tens of thousands of acres in size, within which the fire danger can be assumed to be uniform. Its size and shape is primarily based on influences of fire danger, not political boundaries. It is the basic, on the ground unit for which unique fire danger decisions are made based on fire danger ratings. Weather is represented by one or more NFDRS weather (RAWS) stations.
Fire Weather Forecast Zone	A grouping of fire weather forecast stations that experience the same weather change or trend. Zones are developed by the National Weather Service to assist NWS production of fire weather forecasts or trends for similar stations. Fire weather forecast zones are best thought of as a list of similar weather stations, rather than an area on a map.
Forb	A non- grass-like herbaceous plant.
Fuel Class	A group of fuels possessing common characteristics. In the NFDRS, dead fuels are grouped according to their timelag (1, 10, 100, and 1000 hr) and live fuels are grouped by whether they are herbaceous (annual or perennial) or woody.
Fuel Model	A simulated fuel complex for which all fuel descriptions required by the mathematical fire spread model have been supplied.
Fuel Moisture Content	The water content of a fuel particle expressed as a percent of the oven-dry weight of the particle. Can be expressed for either live or dead fuels.
Fuels	Non-decomposed material, living or dead, derived from herbaceous plants.

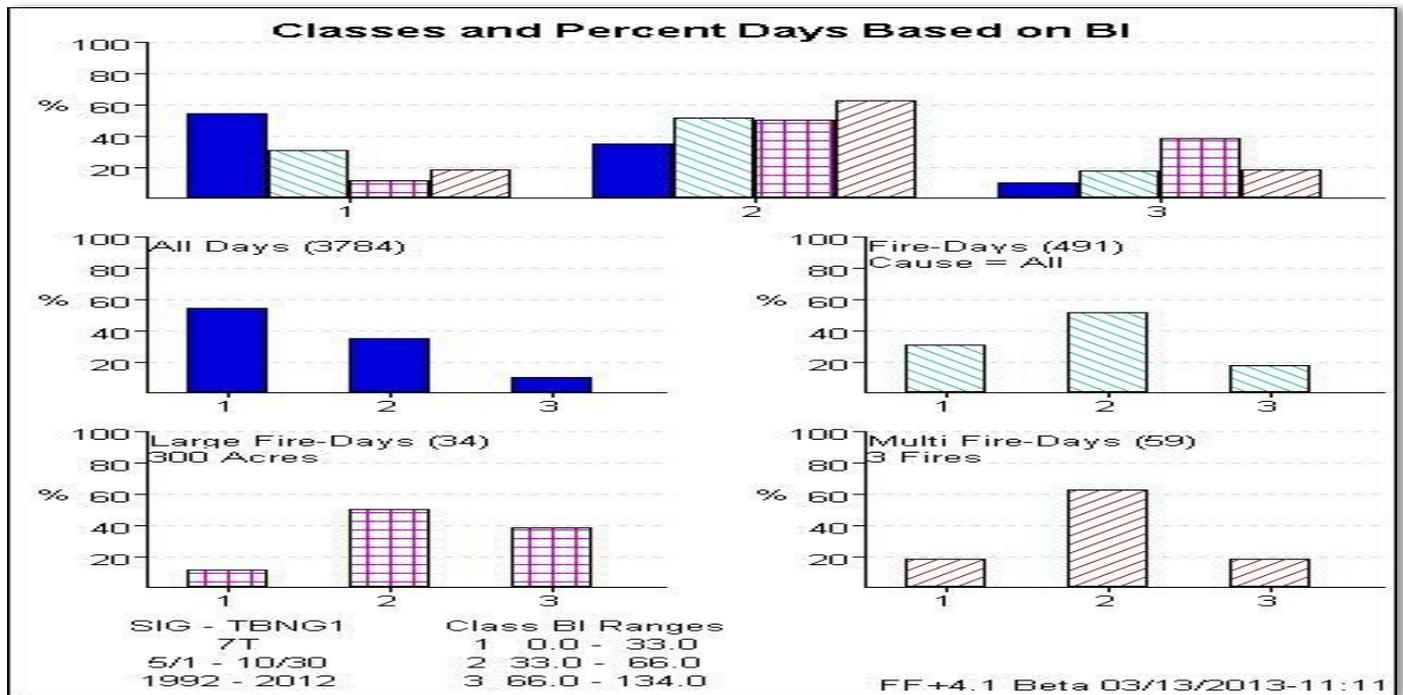
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Appendix B – Fire Risk Analysis Charts

Thunder Basin FDRA Preparedness Levels

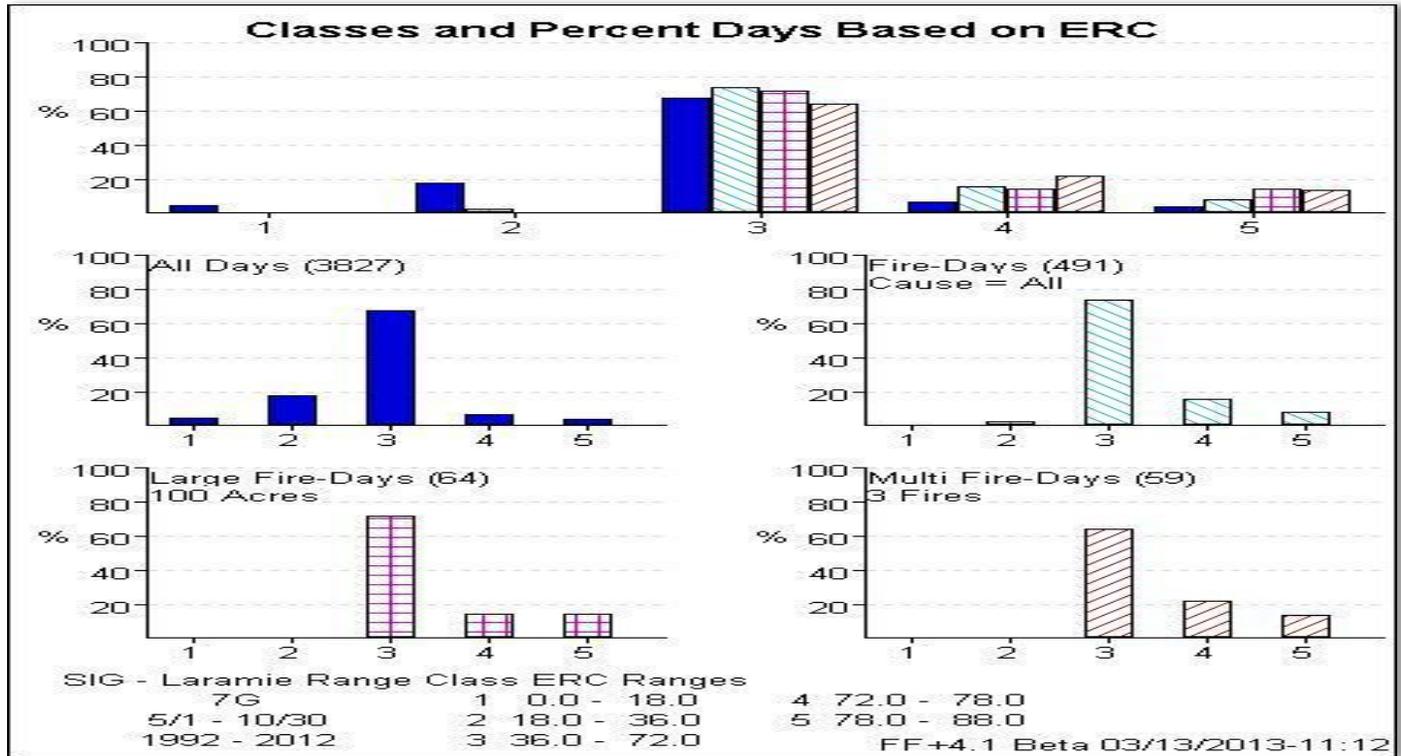


Thunder Basin FDRA Response Levels

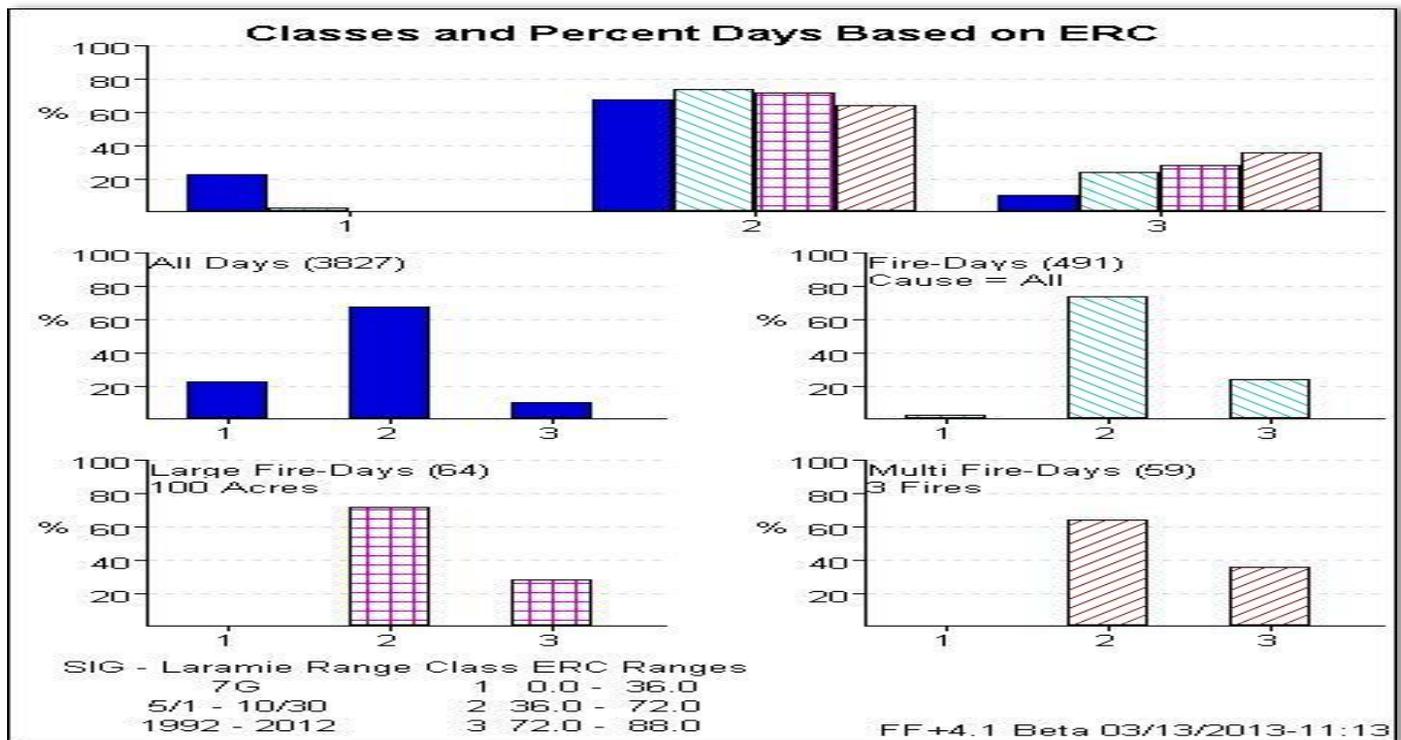


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Laramie Range FDRA Preparedness Levels

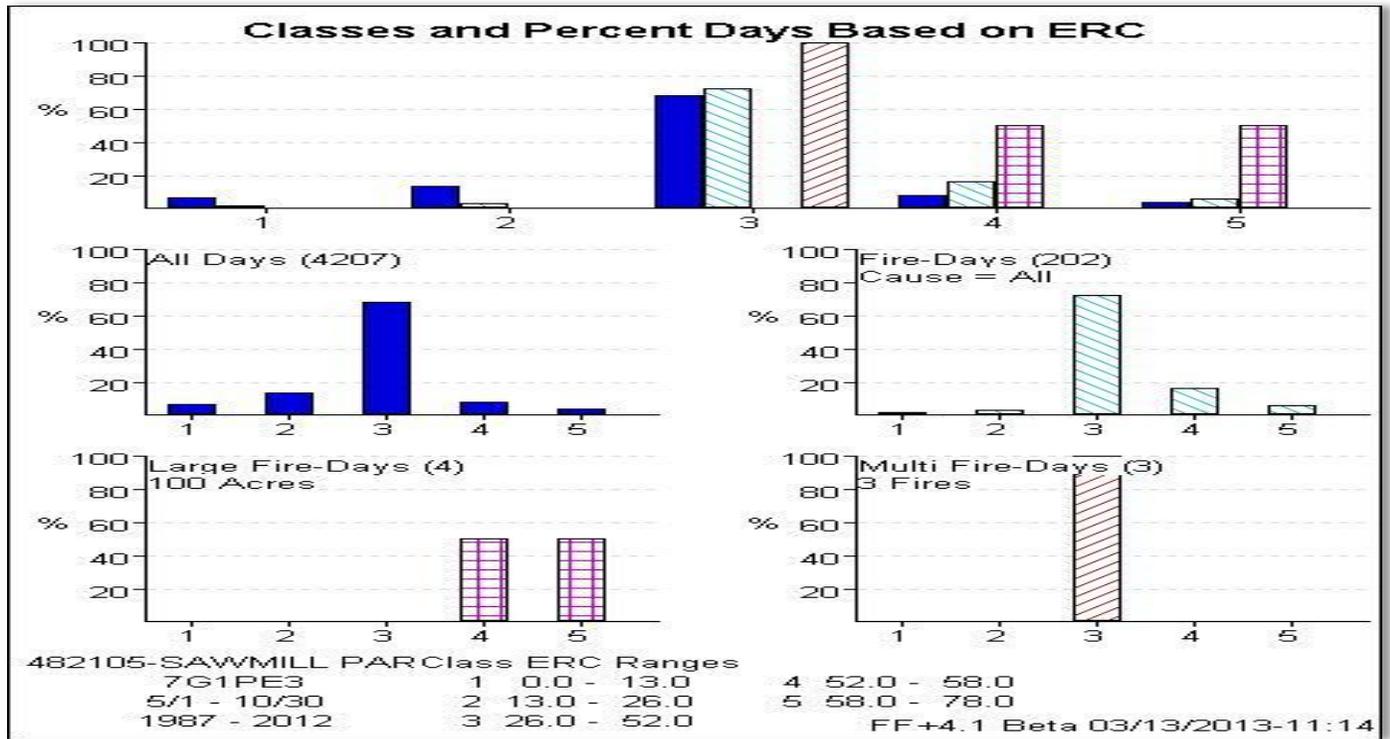


Laramie Range FDRA Response Levels

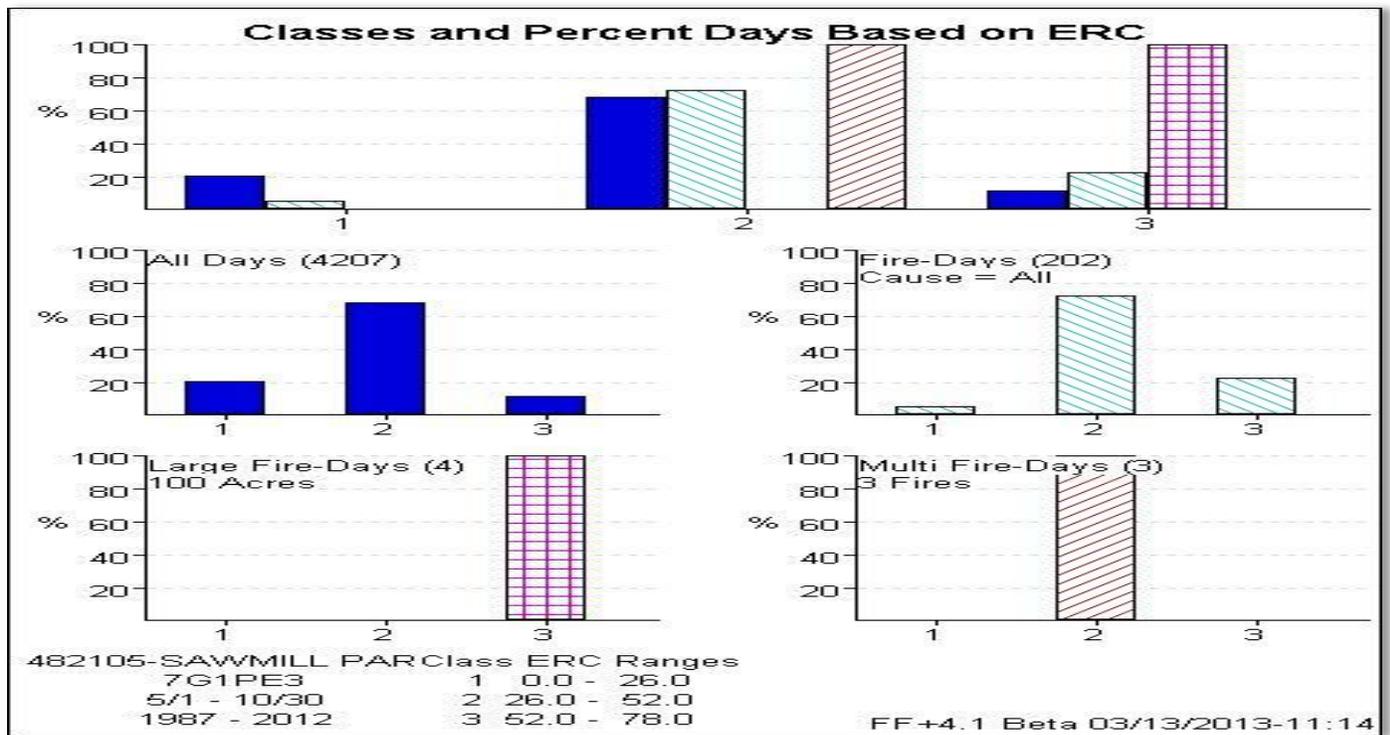


Medicine Bow-Routt National Forests & Thunder Basin National Grassland
Fire Danger Operating Plan

Snowy Range FDRA Preparedness Levels

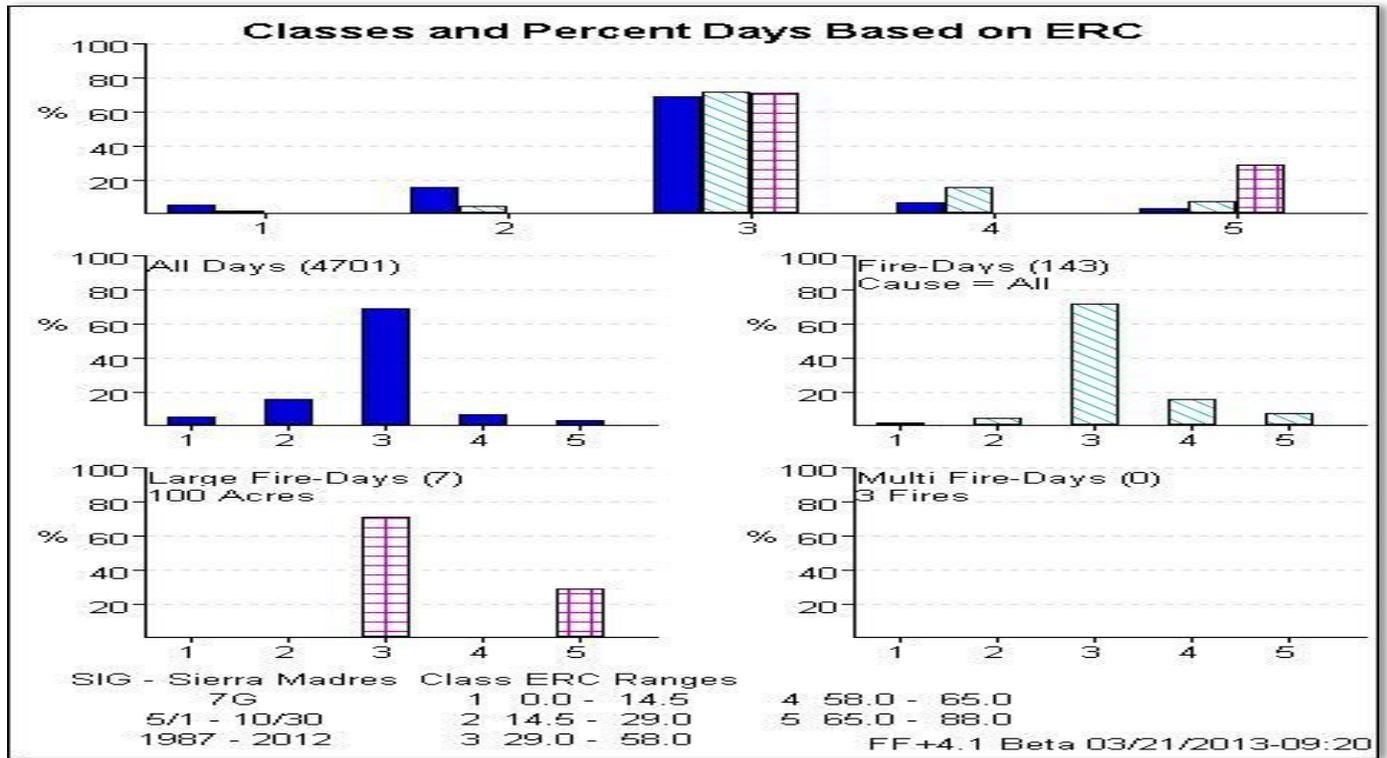


Snowy Range FDRA Response Levels

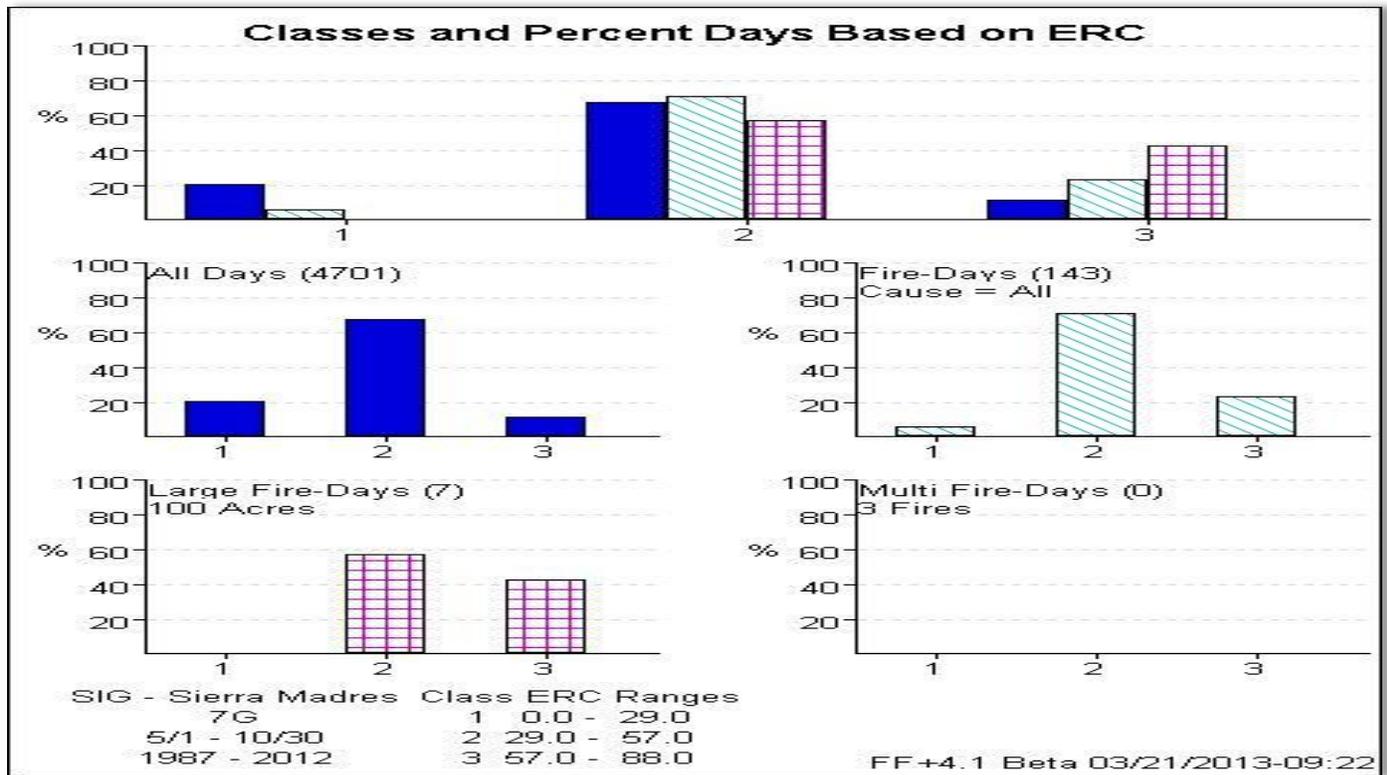


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Fire Danger Operating Plan

Sierra Madres FDRA Preparedness Levels

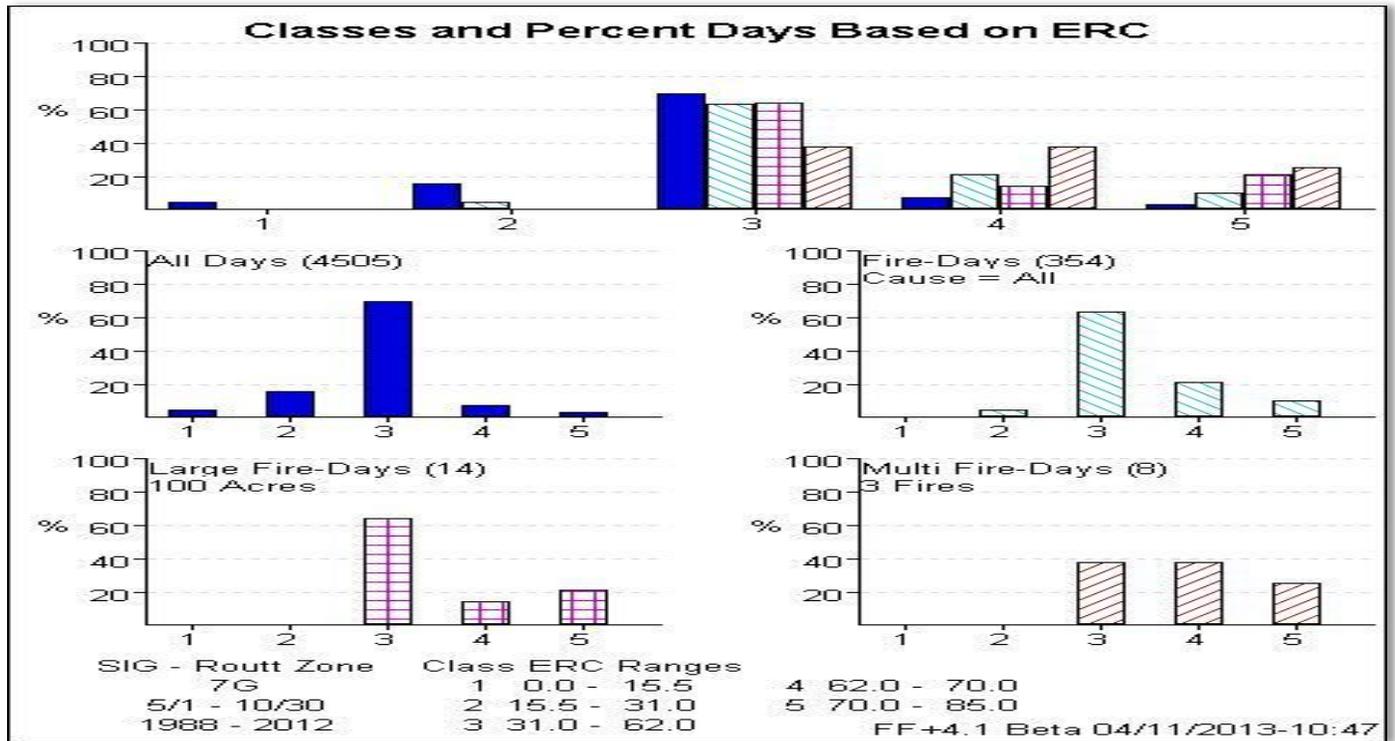


Sierra Madres FDRA Response Level

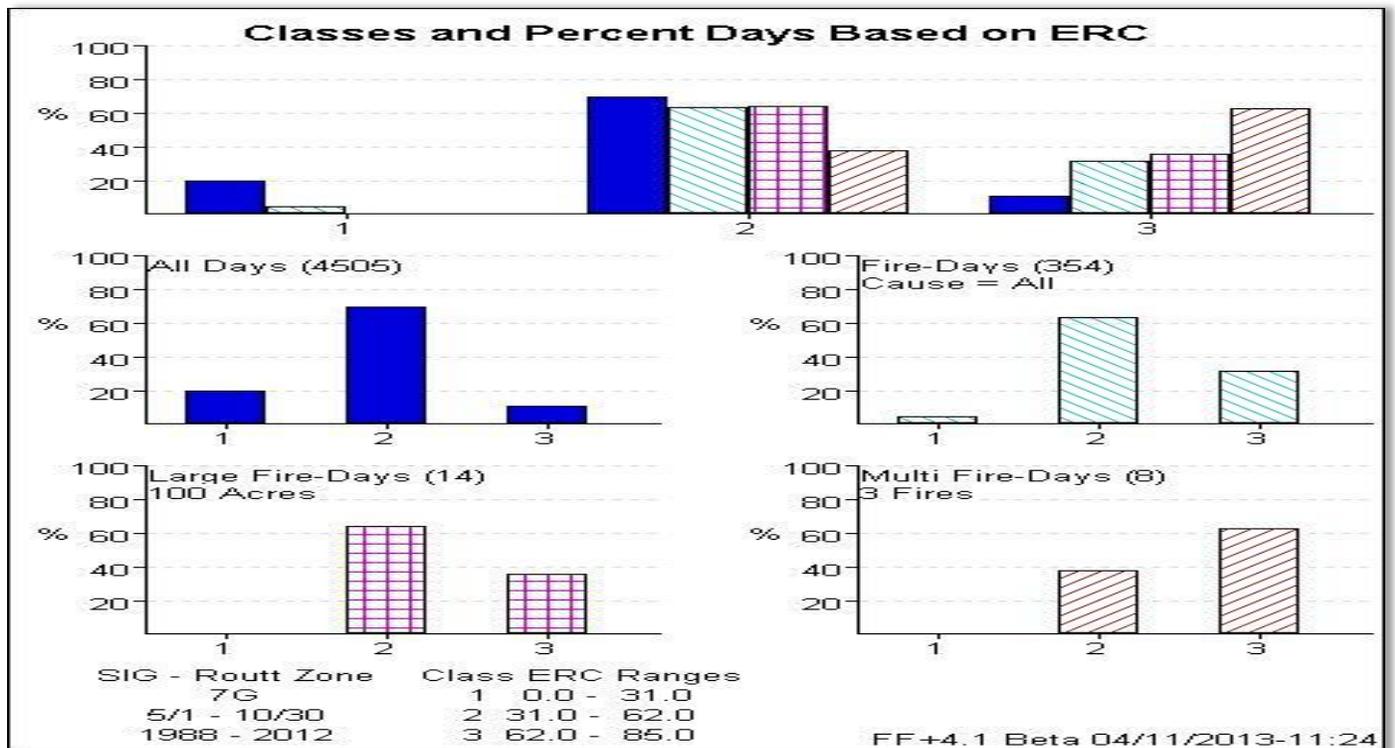


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Routt Zone FDRA Preparedness Levels



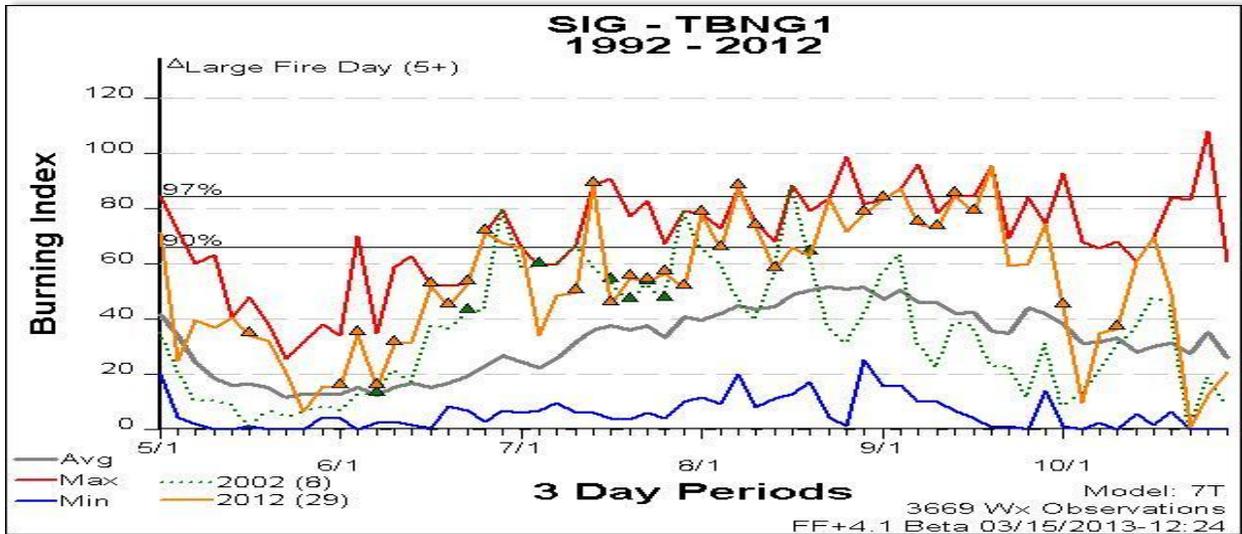
Routt Zone FDRA Response Level



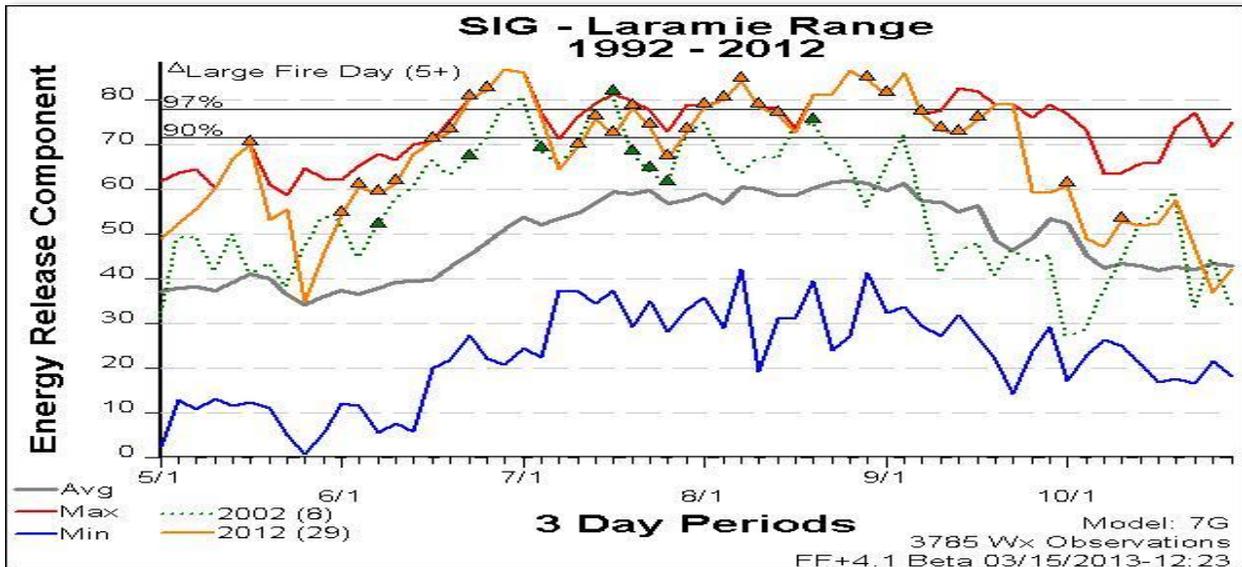
Medicine Bow-Routt National Forests & Thunder Basin National Grassland
Fire Danger Operating Plan

Appendix C – Climatology Reports

Thunder Basin FDRA Climatology Report

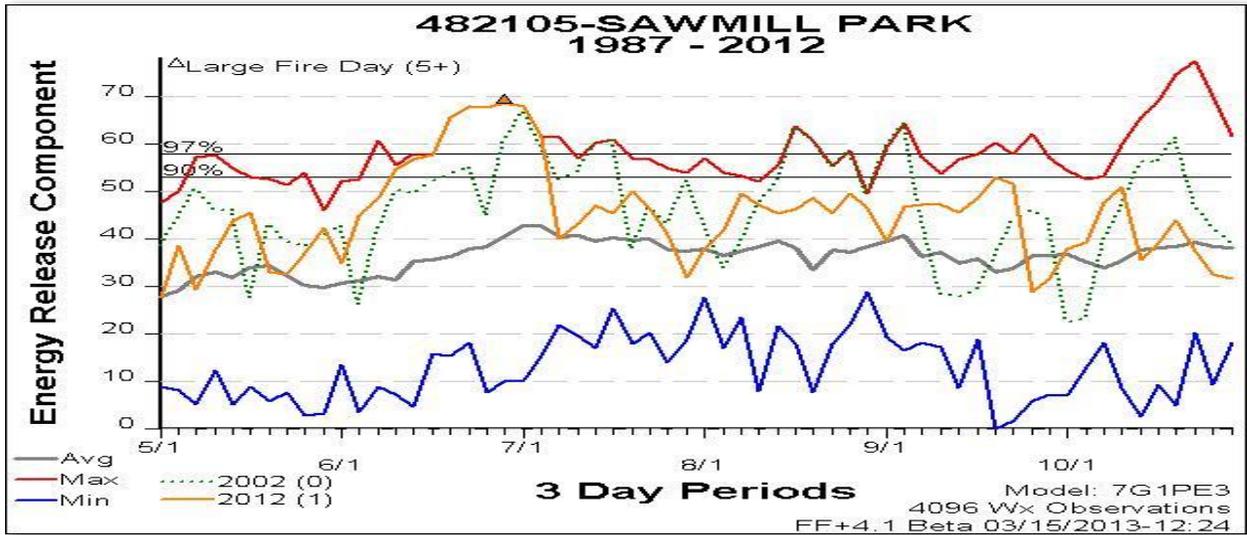


Laramie Range FDRA Climatology Report

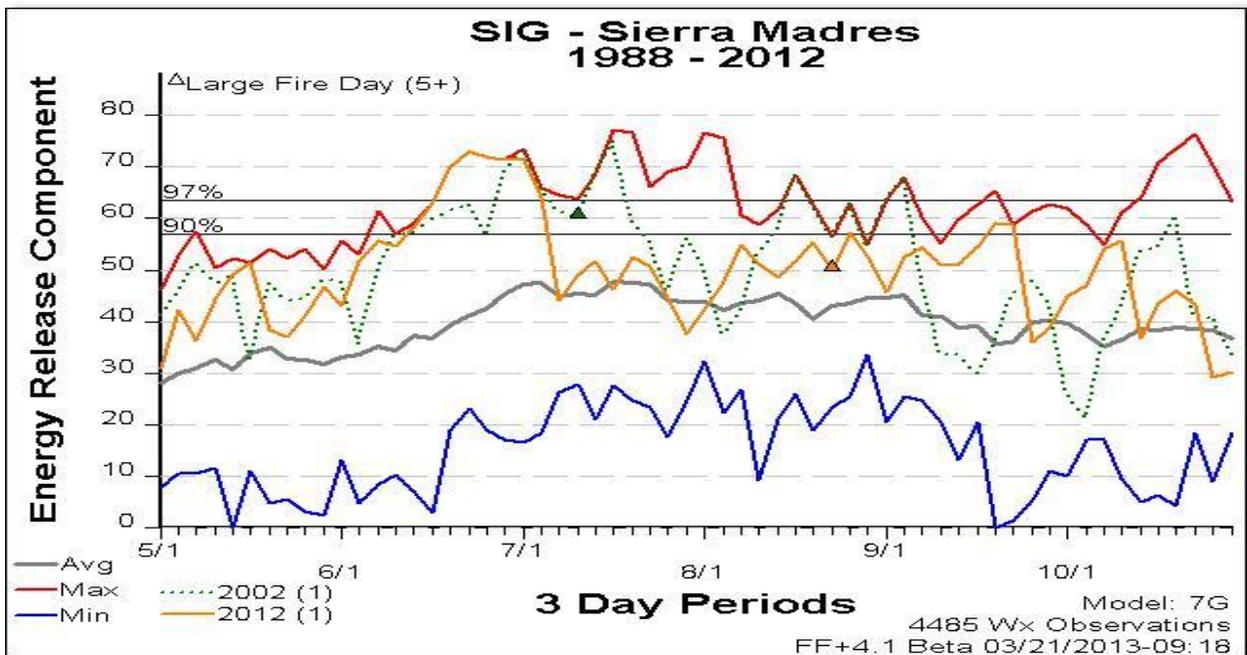


Medicine Bow-Routt National Forests & Thunder Basin National Grassland
 Fire Danger Operating Plan

Snowy Range FDRA Climatology Report

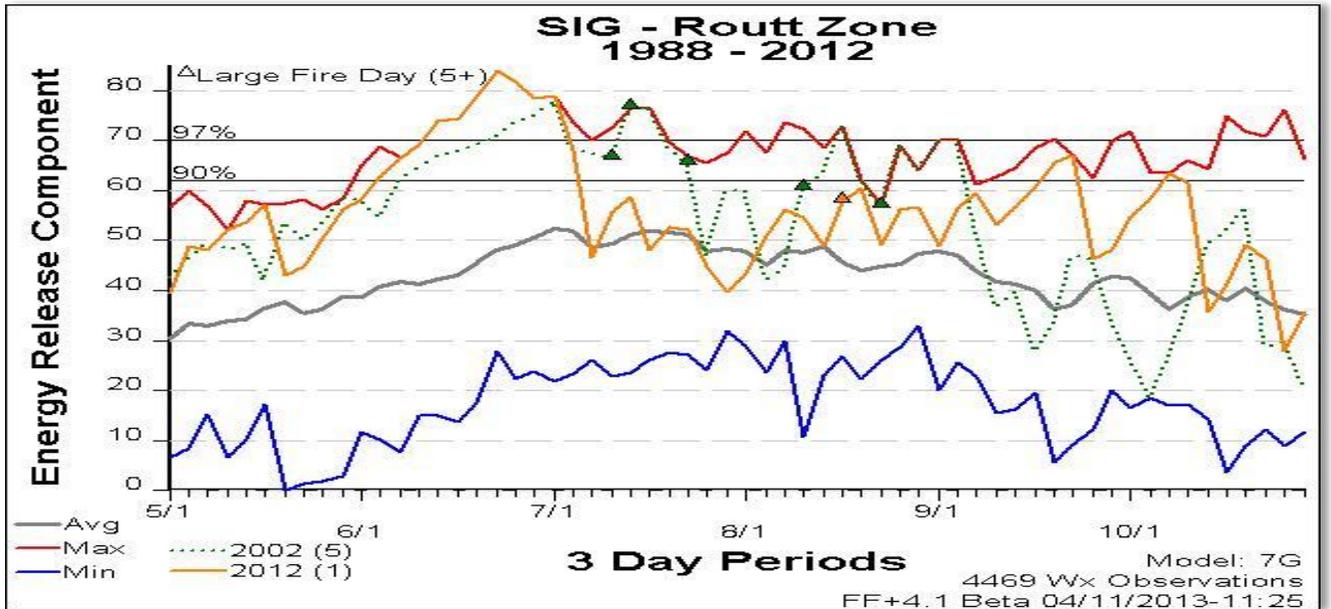


Sierra Madres FDRA Climatology Report



Medicine Bow-Routt National Forests & Thunder Basin National Grassland
Fire Danger Operating Plan

Routt Zone FDRA Climatology Report



Medicine Bow-Routt National Forests & Thunder Basin National Grassland
Fire Danger Operating Plan

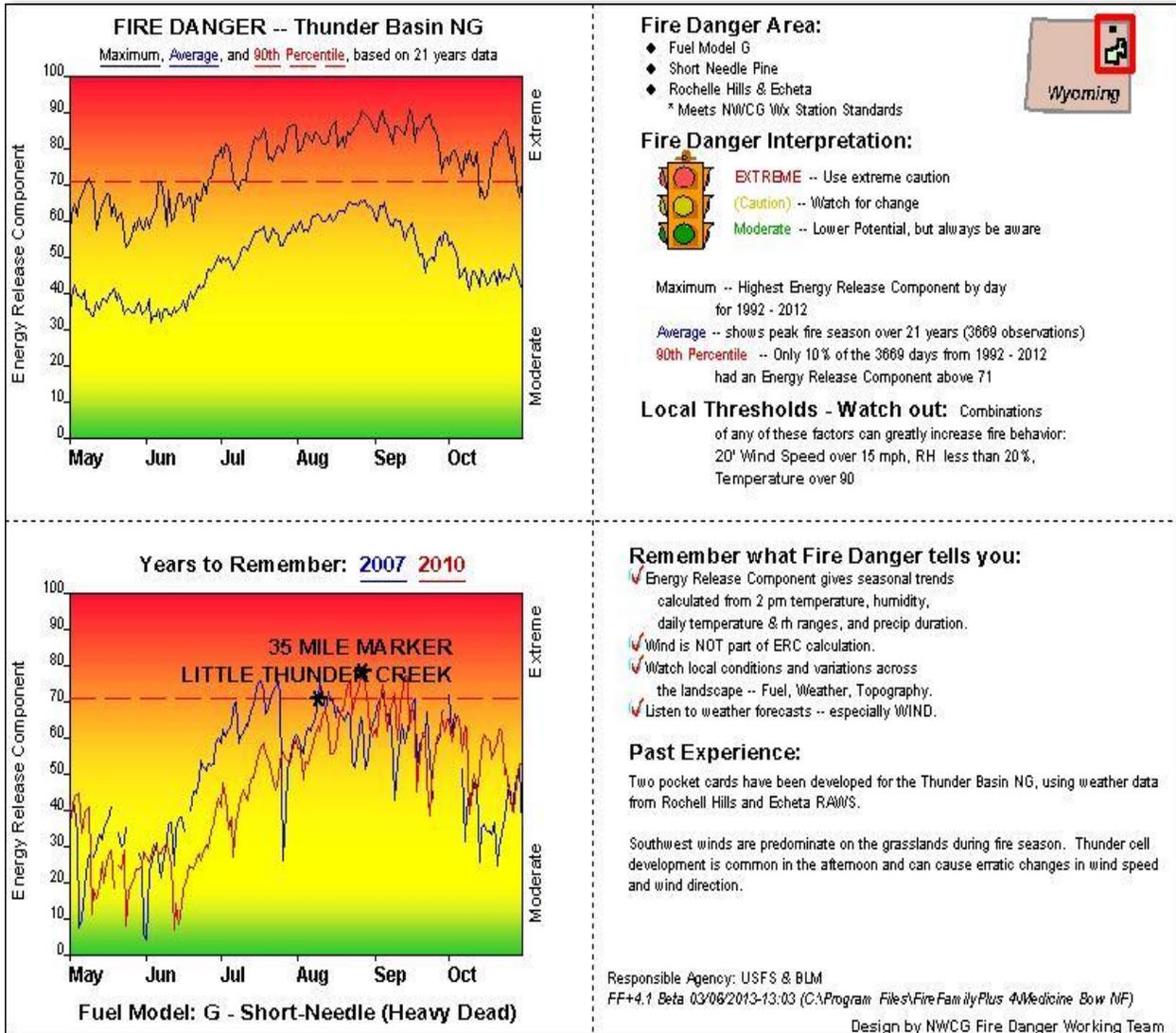
Appendix D – Pocket Cards

Thunder Basin FDRA Pocket Card – Fuel Model T

<p>FIRE DANGER -- Thunder Basin NG Maximum, Average, and 90th Percentile, based on 21 years data</p> <p>Burning Index</p> <p>Extreme</p> <p>Moderate</p> <p>May Jun Jul Aug Sep Oct</p>	<p>Fire Danger Area:</p> <ul style="list-style-type: none"> ◆ Fuel Model T ◆ Sagebrush - Grass ◆ Rochelle Hills & Echeta * Meets NWCG Wx Station Standards <p>Fire Danger Interpretation:</p> <p>EXTREME -- Use extreme caution (Caution) -- Watch for change Moderate -- Lower Potential, but always be aware</p> <p>Maximum -- Highest Burning Index by day for 1992 - 2012 Average -- shows peak fire season over 21 years (3669 observations) 90th Percentile -- Only 10% of the 3669 days from 1992 - 2012 had an Burning Index above 66</p> <p>Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior: 20' Wind Speed over 15 mph, RH less than 20%, Temperature over 90</p>
<p>Years to Remember: 2007 2010</p> <p>Burning Index</p> <p>Extreme</p> <p>Moderate</p> <p>May Jun Jul Aug Sep Oct</p> <p>Fuel Model: T - Sagebrush-Grass</p>	<p>Remember what Fire Danger tells you:</p> <ul style="list-style-type: none"> ✓ Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration. ✓ Wind is part of BI calculation. ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography. ✓ Listen to weather forecasts -- especially WIND. <p>Past Experience:</p> <p>Two pocket cards have been developed for the Thunder Basin NG, using weather data from Rochelle Hills and Echeta RAWS.</p> <p>Southwest winds are predominate on the grasslands during fire season. Thunder cell development is common in the afternoon and can cause erratic changes in wind speed and wind direction.</p> <p>Responsible Agency: USFS & BLM FF+4.1 Beta 03/06/2013-13:04 (C:\Program Files\FireFamilyPlus 4\Medicine Bow NF) Design by NWCG Fire Danger Working Team</p>

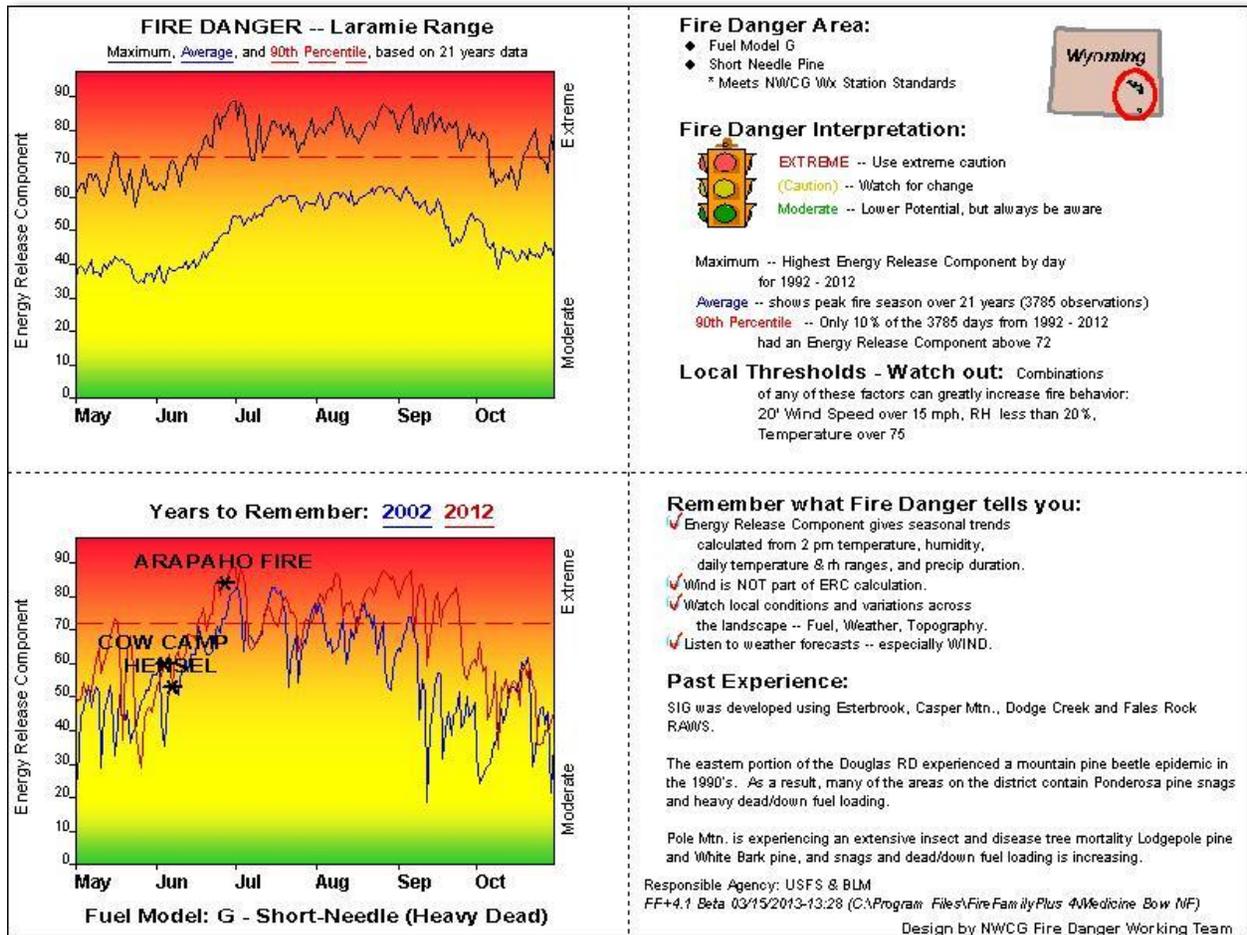
Medicine Bow-Routt National Forests & Thunder Basin National Grassland
 Fire Danger Operating Plan

Thunder Basin FDRA Pocket Card – Fuel Model G



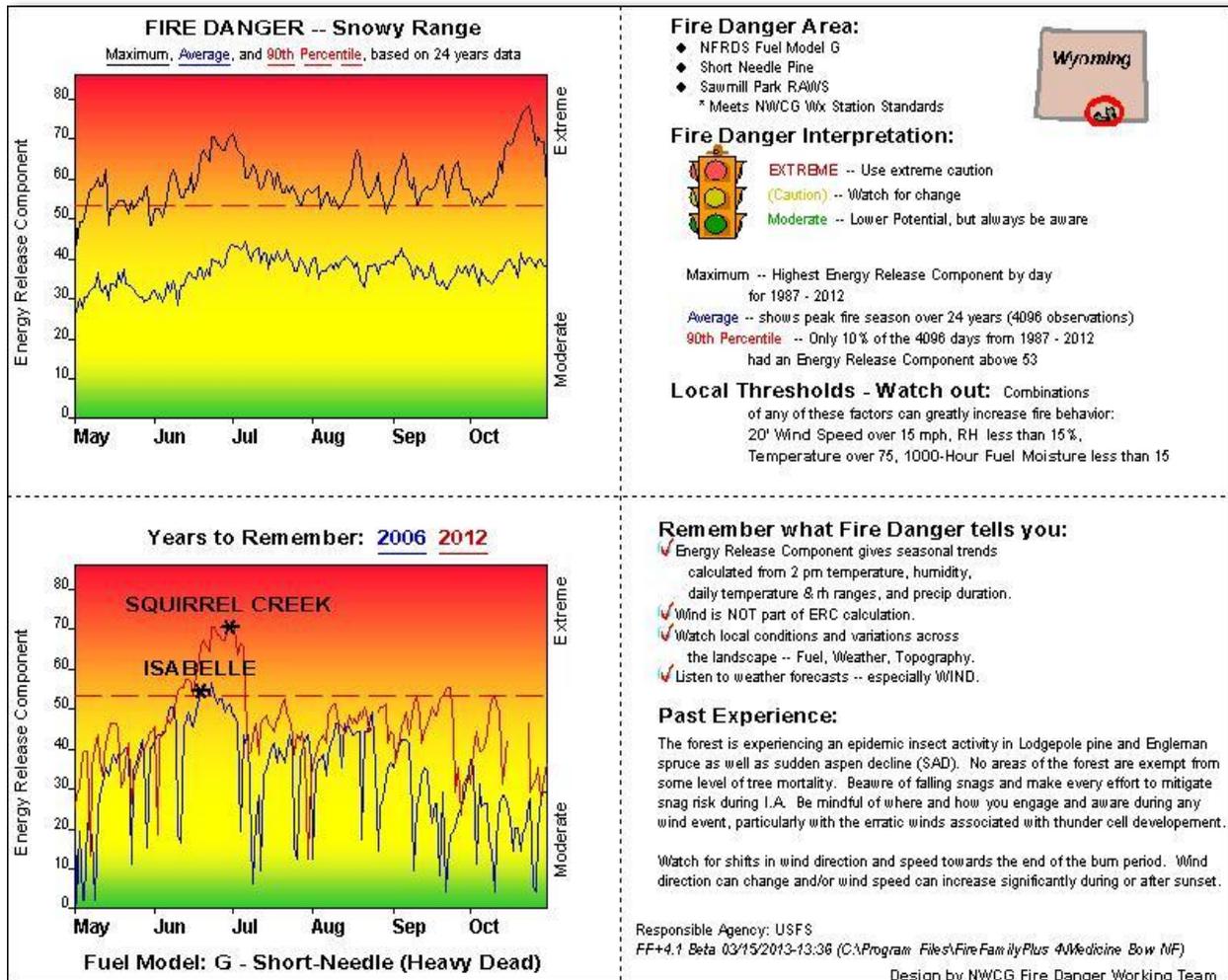
Medicine Bow-Routt National Forests & Thunder Basin National Grassland Fire Danger Operating Plan

Laramie Range FDRA Pocket Card



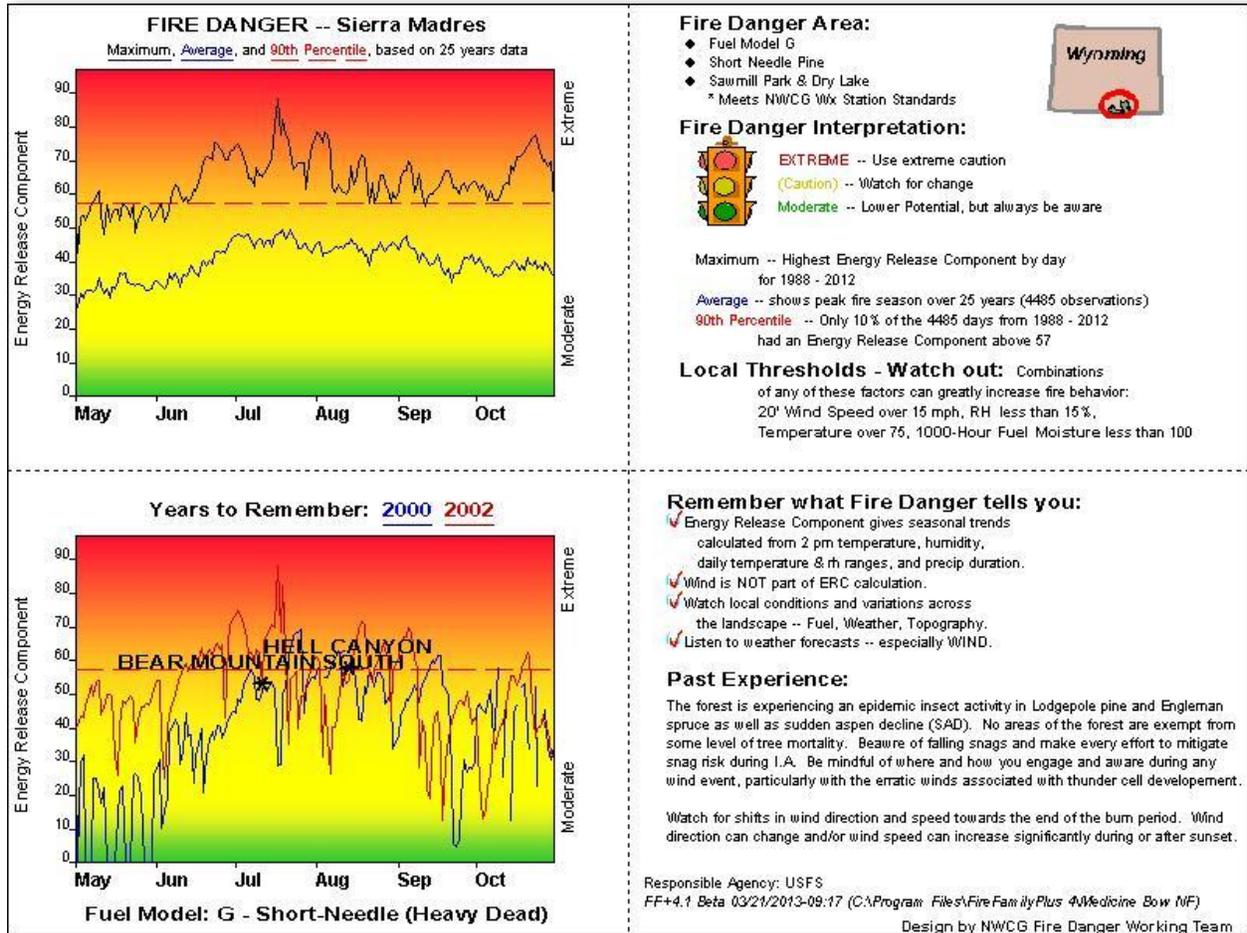
Medicine Bow-Routt National Forests & Thunder Basin National Grassland Fire Danger Operating Plan

Snowy Range FDRA Pocket Card



Medicine Bow-Routt National Forests & Thunder Basin National Grassland Fire Danger Operating Plan

Sierra Madres FDRA Pocket Card



Medicine Bow-Routt National Forests & Thunder Basin National Grassland Fire Danger Operating Plan

Routt Zone FDRA Pocket Card

FIRE DANGER -- Routt Zone

Maximum, Average, and 90th Percentile, based on 25 years data

May Jun Jul Aug Sep Oct

Fire Danger Area:

- ◆ Fuel Model G
- ◆ Short Needle Pine
- ◆ Routt SIG
- * Meets NWCG Wx Station Standards

Colorado

Fire Danger Interpretation:

- EXTRME** -- Use extreme caution
- (Caution)** -- Watch for change
- Moderate** -- Lower Potential, but always be aware

Maximum -- Highest Energy Release Component by day for 1988 - 2012
 Average -- shows peak fire season over 25 years (4469 observations)
 90th Percentile -- Only 10% of the 4469 days from 1988 - 2012 had an Energy Release Component above 62

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
 20' Wind Speed over 15 mph, RH less than 15%,
 Temperature over 75, 1000-Hour Fuel Moisture less than 15

Years to Remember: 2001 2002

May Jun Jul Aug Sep Oct

Fuel Model: G - Short-Needle (Heavy Dead)

Remember what Fire Danger tells you:

- ✓ Energy Release Component gives seasonal trends calculated from 2 pm temperature, humidity, daily temperature & rh ranges, and precip duration.
- ✓ Wind is NOT part of ERC calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:

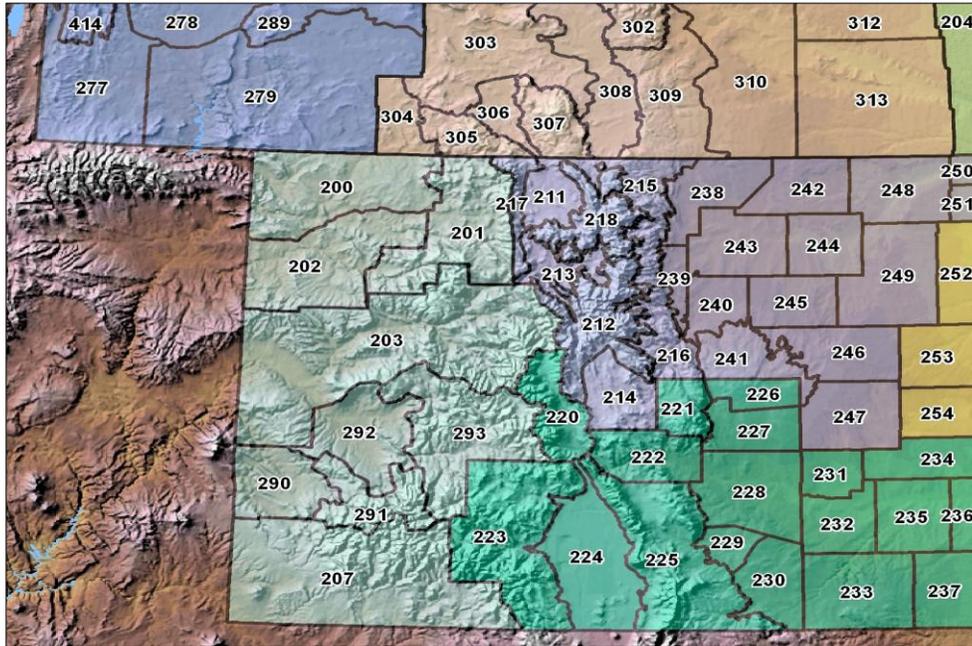
- Large fire growth experienced at or above 90% ERC as represented in 2002 fire season.
- Due to extensive beetle kill, torching and passive crown fire can be expected in most fires, regardless of indices.
- Active or independent crown fire can be expected with moderate wind component.
- Beetle killed stands present EXTRME snag hazard.

Responsible Agency: USFS
 FF+4.1 Beta 04/12/2013-10:24 (C:\Program Files\FireFamilyPlus 4\Medicine Bow NF)
 Design by NWCG Fire Danger Working Team

Medicine Bow-Routt National Forests & Thunder Basin National Grassland
Fire Danger Operating Plan

Appendix E – Fire Weather Zones

Colorado



Wyoming

