BLUE MOUNTAIN INTERAGENCY
FIRE DANGER OPERATING PLAN

USFS National Forests: Malheur, Umatilla, Wallowa-Whitman
Oregon Department of Forestry Units: John Day, La Grande, Pendleton, Wallowa
Bureau of Land Management: portions of: Burns, Prineville, and Vale Districts
Washington Department of Natural Resources: portions of Southeast Region
May 1, 2013

2013 Plan Approval

This Fire Danger Operating Plan is approved and will remain in effect until rescinded or revised.

____ ______________

Fire Staff Officer - USFS, Malheur NF Date

____ ______________

Fire Staff Officer - USFS, Umatilla NF Date

Bret L Ruby _May 1, 2013_

Fire Staff Officer - USFS, Wallowa-Whitman NF Date

____ ______________

District Forester - ODF, Northeast Oregon District Date

____ ______________

District Forester - ODF, Central Oregon District Date

____ ______________

Fire Program District Manager WA DNR, Southeast Region Date

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Michael R. Haddock — 4/30/13
Fire Staff Officer - USFS, Malheur NF — Date

[signature] — 4/30/13
Fire Staff Officer - USFS, Umatilla NF — Date

Fire Staff Officer - USFS, Wallowa-Whitman NF — Date

[signature] — 4/30/13
District Forester - ODF, Northeast Oregon District — Date

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District Forester - ODF, Central Oregon District — Date

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District Forester - ODF, Northeast Oregon District — Date

District Forester - ODF, Central Oregon District — Date

Matt Eberlein — 4/29/2013

Fire Program District Manager WA DNR, Southeast Region — Date

Table of Contents

I. INTRODUCTION

This plan documents an operational planning and decision-making process for agency administrators, fire managers, dispatchers, and firefighters based on the best available scientific methods and historical fire/weather analysis.

This plan encompasses an area of approximately 10.5 million acres in Northeast Oregon, Southeast Washington, and far Western Idaho. Agencies with wildfire protection responsibilities covered by this plan include:

- USFS, Malheur National Forest (MAF)
- USFS, Umatilla National Forest (UMF)
- USFS, Wallowa-Whitman National Forest (WWF)
- ODF, Northeast Oregon District (NEO)
- ODF, Central Oregon District, John Day Unit (COD)
- WA DNR, portions of Southeast Region (WA DNR)

Guidance and policy for development of a Fire Danger Operating Plan can be found in the Interagency Standards for Fire & Aviation Operations (Red Book), Wildland Fire and Aviation Program and Management and Operation Guide (Blue Book), and Forest Service Manual (FSM) 5120.

The process used to develop this plan is consistent with what is taught in the National Wildfire Coordinating Group (NWCG) courses:

- S491 - Intermediate National Fire Danger Rating System (NFDRS), and
- Advanced NFDRS (taught at National Advance Fire and Resource Institute).

The process generally involves:

1. Acquire and quality control historic fire history and weather data.
2. Delineate fire danger rating areas (FDRA) based on vegetation, climate, and topography.
3. Assign historic fire history and weather data to fire danger rating areas.
4. Perform analysis for statistical correlation of historic fire occurrence with historic NFDRS outputs by FDRA, and identify basis for future decisions.
5. Develop decision thresholds based on the NFDRS output and historic fire occurrence that best matches the intent of the decision.
6. Document the analysis, operation, communication, maintenance, and re-evaluation process in a Fire Danger Operating Plan.

This is the first revision of the Blue Mountain Interagency Fire Danger Operating Plan initially approved in 2011.

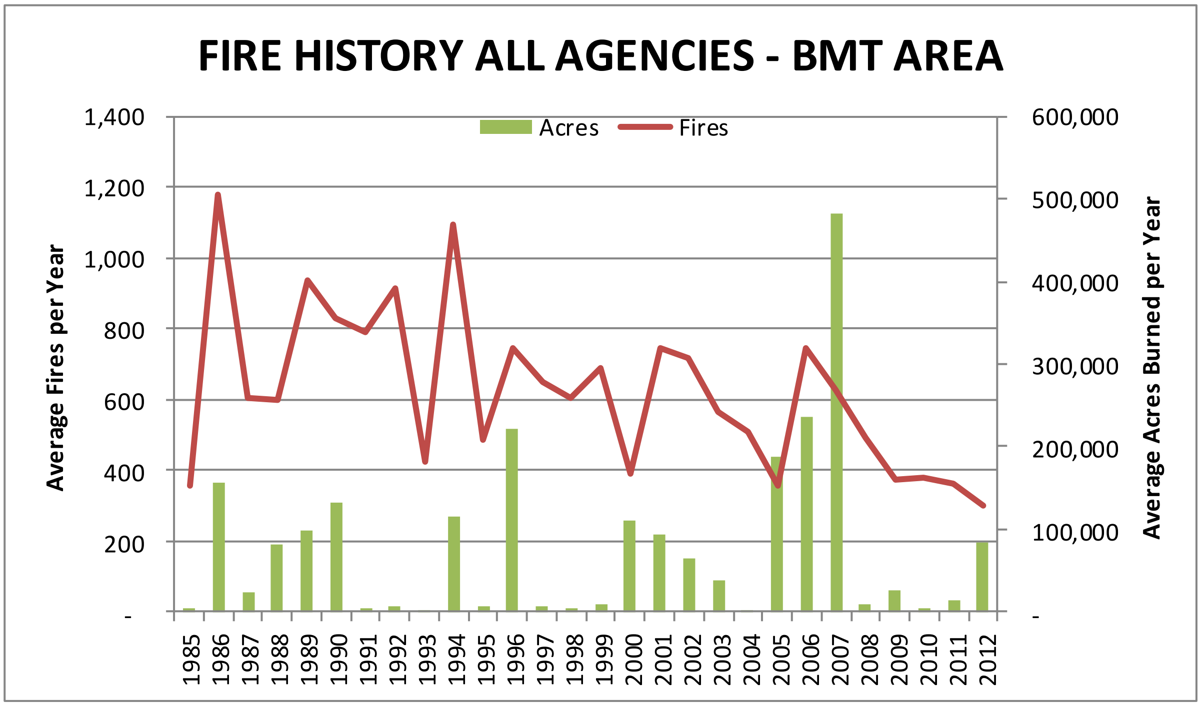
II. OBJECTIVES

1. Develop a coordinated approach to fire danger/preparedness decisions across the Blue Mountains of Northeast Oregon, Southeast Washington, and Western Idaho. It is recognized that a coordinated approach may limit some individual unit flexibility, but will result in better overall safety, preparedness, and effectiveness.
2. Provide a tool for agency administrators, fire managers, dispatchers, agency cooperators, and firefighters to correlate fire danger ratings with appropriate fire business decisions.
3. Delineate fire danger rating areas (FDRAs) with similar climate, vegetation, and topography.
4. Establish an interagency fire weather-monitoring network consisting of Remote Automated Weather Stations (RAWS) which comply with NFDRS Weather Station Standards (PMS 426-3).
5. Determine fire business thresholds using the Weather Information Management System (WIMS), National Fire Danger Rating System (NFDRS), FireFamilyPlus software by analyzing an integrated database of historical weather and fire occurrence data.
6. Define roles and responsibilities to make fire preparedness decisions, manage weather information, and brief fire personnel regarding current and potential fire danger.
7. Determine the most effective communication methods for fire managers to communicate potential fire danger to cooperating agencies, industry, and the public.
8. Provide guidance to interagency personnel outlining specific daily actions and considerations at each preparedness level.
9. Identify seasonal risk analysis criteria and establish general fire severity thresholds.
10. Develop and distribute fire danger pocket cards to all personnel involved with fire suppression activities within the Fire Danger Operating Plan area.
11. Identify program needs and suggest improvements for the Fire Danger Operating Plan.

III. FIRE DANGER INVENTORY

A. Fire Activity/History

The Blue Mountain area has a heavy wildfire load both in numbers of fires and size of fires. For the period 1985 through 2012 there has been an average of 623 fires per year with an average annual acreage burned of 79,491 acres for the combined wildland fire agencies in the Blue Mountain area. The minimum number of fires in a year was 299 in 2012, and the minimum acres burned in a year were 804 in 1993. The maximum number of fires in a year was 1,179 in 1986, and the maximum acres burned in a year were 482,068 in 2007.



The majority (80%) of fires occur July through September. Approximately 74% of fires are caused by lightning. Approximately 93% of fires are controlled at a final size of 1 acre or less, with approximately 99% controlled at less than 1,000 acres. A detailed set of graphs of fire business is available in Appendix F.

To develop the combined fire history for all wildland agencies in the Blue Mountain area, historical fire origin points and report information from each agency were combined into a single database and manipulated to a common format. Agency cause codes were converted to ensure consistent reporting of fire causes (see crosswalk in Appendix E). Fires with obvious errors in either data or location were eliminated. Duplicate fires where more than one agency reported the same fire were eliminated where possible, especially for fires larger than 5 acres. Fire points were assigned a fire danger rating area based on the location of the fire origin. A description of how the interagency fire history for the Blue Mountains area was acquired, quality control checked, duplicates and erroneous data eliminated is located under Appendix E.

B. Weather Stations

There are 24 permanent Remote Automated Weather Stations (RAWS) in the Blue Mountains area. A table of the RAWS as well as a description of each RAWS is included in Appendix D.

A quality control process was developed and utilized on 20 RAWS, producing the most consistent, least erroneous historic weather data available. A report of the quality control process and results is included in Appendix C. Four stations (Minam Lodge, La Grande 1, Mitchell, Fall Mtn) were not used due to poor historic data, missing data, instrument errors, or short record history.

The fire danger rating area map exhibits RAWS locations, a table displaying a summary of RAWS utilized and quality control data results is included in Appendix D.

C. Fire Danger Rating Areas

A fire danger rating area (FDRA) is defined as: "A geographic area relatively homogenous 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 management decisions are made based on fire danger ratings. Weather is represented by one or more NFDRS weather stations." (NWCG Fire Danger Working Team. 2002. Gaining an Understanding of the National Fire Danger Rating System. NWCG, PMS 932, Boise, Idaho. 72 pp.)

A comprehensive analysis of the Blue Mountain area was conducted using Geographic Information Systems (GIS) programs and data. All of the data sources utilized were developed consistently across the entire area, not unique by ownership.

The primary data utilized includes Digital Elevation Model (DEM), EPA Level IV Ecoregions, Oregon and Washington GAP Vegetation, and climate data produced by Oregon Climate Services and distributed by The Climate Source (CSI). Climate data included average monthly (for the period 1960-1991): Maximum Temperature, Average Temperature, Minimum Temperature, Relative Humidity, and Precipitation.

A series of meetings were conducted with Blue Mountain area fire managers to get input on what locations were different enough from other locations to possibly warrant a different fire danger related decision. A discussion of what the differences were led to utilizing data (vegetation, climate, or topography) that displayed the difference.

Initially the fire danger rating areas were delineated by combining polygons of the GAP vegetation data, where it made sense based on vegetation, climate, and topography. The boundaries between the FDRAs were not very smooth, especially where boundaries were in areas with considerable variation in topography. FDRA boundaries were smoothed by basing the polygons on groups of EPA Level IV ecoregions consistent with homogenous areas of vegetation, climate, and topography.

Where FDRA boundaries were close to administrative boundaries, or boundaries easier to define for administrative purposes, the FDRA boundaries were moved.

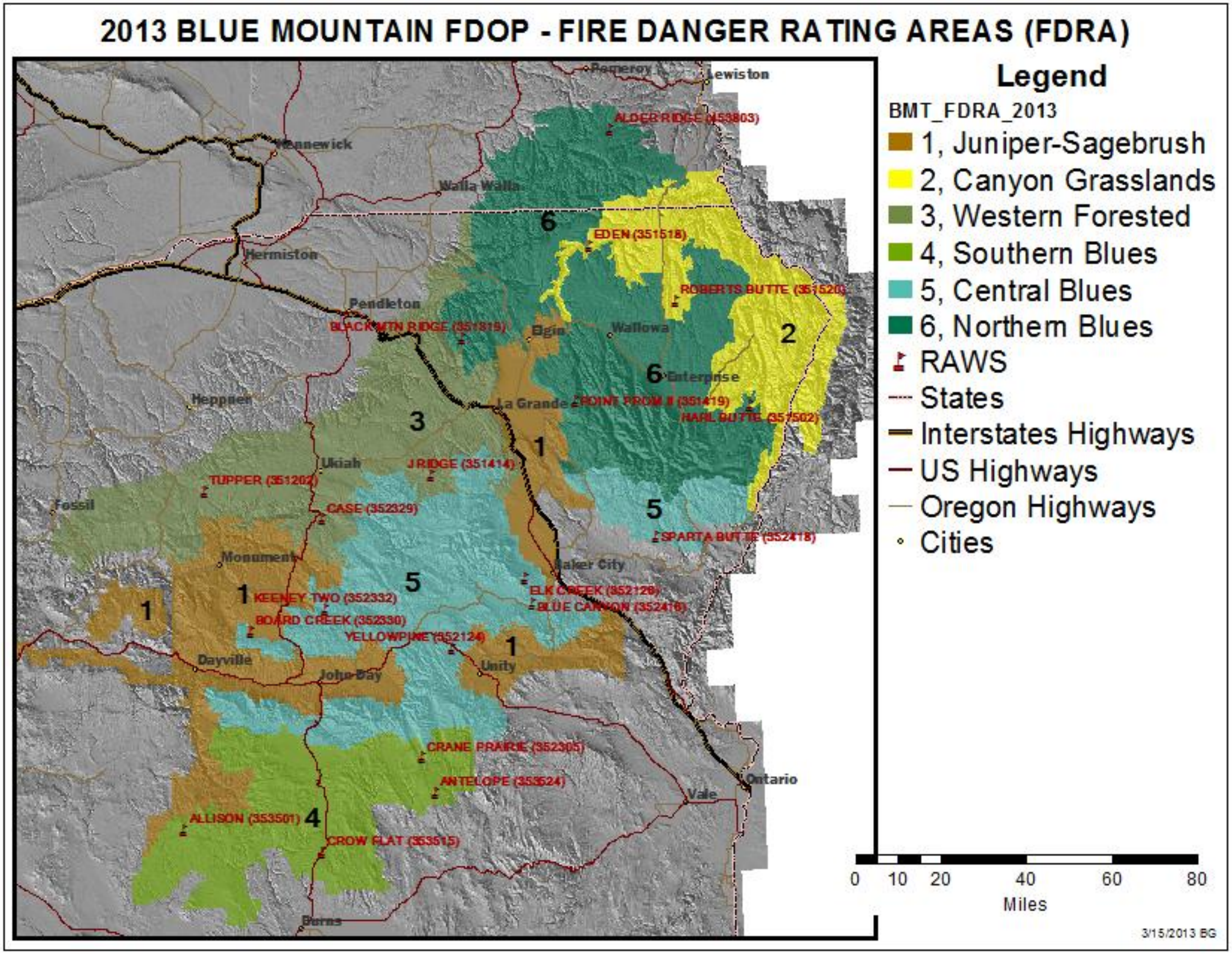
Details of the analysis are included in Appendix B.

Six fire danger rating areas have been delineated for the 2013 plan, refined from the 9 areas in the 2011 plan. The contribution of fuels, or weather, or topography was weighed as to which would have the greatest effect on wildfire. Following is a table with descriptive parameters:

FDRA	FDRA Description	Local Area	Acres	ELEVATION (FT) MEAN	MIN	MAX	RANGE
1	Juniper-Sagebrush	Iron Mountain	112,361	4,370	2,500	5,889	3,389
1	Juniper-Sagebrush	Unity	274,315	4,404	2,664	6,454	3,790
1	Juniper-Sagebrush	La Grande Baker	427,712	3,238	2,513	5,499	2,986
1	Juniper-Sagebrush	John Day Valley	1,185,183	3,951	1,814	6,867	5,053
2	Canyon Grasslands	Hells Canyon	1,100,725	3,882	796	9,400	8,604
3	Western Forested	Fossil Ukiah	1,754,993	3,980	1,380	6,270	4,890
4	Southern Blues	Emigrant Creek	1,239,988	5,251	3,511	7,166	3,655
5	Central Blues	S Eagle Caps	304,217	4,736	1,939	8,652	6,713
5	Central Blues	Granite	1,724,766	5,395	3,101	9,079	5,978
6	Northern Blues	PomeroyTollgate	1,007,523	4,082	1,650	6,379	4,729
6	Northern Blues	Enterprise	1,336,397	5,095	2,313	9,813	7,500
			10,468,180				

Following is a brief description of some of the criteria which defined each FDRA, relative to the other FDRAs within the operating plan area:

1. FDRA 1 – Juniper-Sagebrush: This is generally lower elevation, and drier country. Primary vegetation is juniper and sagebrush, mostly fine fuel. There are some large blocks of agricultural area within the FDRA; these are included for convenience and not part of the analysis.
2. FDRA 2 – Canyon Grasslands: Hells Canyon is the primary feature, with the primary vegetation being grasses, although there are strings, or strips of forested areas. Much of the area consists of steep slopes with a very wide range of elevations, from the lowest elevations in the plan area to nearly the highest. Fire history in this area is notable in that it has relatively few fires, but has the highest number of large fires of the FDRAs.
3. FDRA 3 – Western Forested: Mostly dry forest type, but also includes the Western foothills of the Blue Mountains which are mostly grass and brush. Large areas have not had frequent fires in the past few decades, so despite being vegetation conducive to frequent, low severity fires, fires can be severe. This area has the highest number of 10 to 300 acre fires.
4. FDRA 4 – Southern Blues: Mostly dry forests, and a moderate or higher elevation, and mostly flat, not a lot of elevation change or slope. There is a large block of agricultural area within the FDRA; this was included for convenience and not part of the analysis.
5. FDRA 5 – Central Blues: Mostly moist forest type, and having the highest average elevation of all of the areas. Due to a wide range of elevations and topography, there is some dry forest as well as a significant amount of subalpine forest types within this area. This area gets nearly twice the number of lightning fires as the other areas and also has historically had a high number of large fires.
6. FDRA 6 – Northern Blues: Mostly moist forest types with a wide range of moderate to higher elevations and steep slopes characterizes this area. This area includes a large area of agricultural land that was not part of the analysis. The Eagle Caps are also included in the FDRA but may not be well represented by the analysis. A relatively high number of lightning fires correspond with a fairly low number of large fires.


2013 BLUE MOUNTAIN FDOP - FIRE DANGER RATING AREAS (FDRA)
Legend
BMT_FDRA_2013
1, Juniper-Sagebrush
2, Canyon Grasslands
3, Western Forested
4, Southern Blues
5, Central Blues
6, Northern Blues
RAWS
States
Interstates Highways
US Highways
Oregon Highways
Cities
0 10 20 40 60 80
Miles
3/15/2013 BG
Lewiston
Pomeroy
Kennewick
Walla Walla
Hermiston
Pendleton
Heppner
Ukiah
Fossil
Monument
Dayville
John Day
Unity
Elgin
Wallowa
Enterprise
La Grande
Baker City
Ontario
Vale
Burns
ALDER RIDGE (453803)
EDEN (351518)
ROBERTS BUTTE (351520)
BLACK MTN RIDGE (351815)
POINT PROM II (351419)
HARL BUTTE (351502)
J RIDGE (351414)
TUPPER (351202)
CASE (352329)
SPARTA BUTTE (352418)
KEENEY TWO (352332)
BOARD CREEK (352330)
ELK CREEK (352126)
BLUE CANYON (352416)
YELLOWPINE (352124)
CRANE PRAIRIE (352305)
ANTELOPE (353524)
ALLISON (353501)
CROW FLAT (353515)
1
2
3
4
5
6

IV. FIRE-DANGER INDEXES AND FIRE BUSINESS ANALYSIS

A. Adjective Fire Danger Rating Definitions and Analysis

The following table describes how fire business was used to indicate thresholds for adjective fire danger. The ADJECTIVE CLASS USED column describes the relationship between the adjective level and historic fire occurrence under the same fire danger conditions as a result of the analysis and utilized in this plan. "Gaining an Understanding of the National Fire Danger Rating System" provides a description of the five adjective levels, and is considered the national standard. This plan does not follow the national standard descriptions because the fire business analysis conducted provides more detail and a clearer distinction between levels than described in the national standards. The level "VERY HIGH" was not used because the majority of agencies involved in this plan currently use a four level system, some have signs that will only work with four levels.

ERC was selected because it is relatively stable, displays a seasonal trend, and is indicative of high resistance to control fires.

Energy Release Component (ERC) does not include wind in calculation of the index and is heavily weighted to large fuel moistures. ERC displays the cumulative effect of weather on large fuels over time, a seasonal trend. Large fuel moistures are a key factor in fire intensity and contribute to fires having a high resistance to control.

Fire Danger Rating and Color Code	**Blue Mountain Plan** **ADJECTIVE CLASS USED**
Low	**Historically there have been few fires at this range of index values. Less than 16% of all fires, and less than 6% of 20+ acre fires have occurred historically in this range.**
Moderate	**Historically fires have occurred during this range of index values, but few large fires have occurred. Approximately 25% of 20+ acre fires and a minimal number of 300+ acre fires have occurred historically in this range.**
High	**Historically large fires have occurred during this range of index values. There is less probability of high intensity, high resistance to control fires than in the Extreme category. Approximately 35-50% of 300+ acre fires have occurred historically in this range, and 15-25% of 1,000+ acre fires.**
Very High	**Not Used**
Extreme	**Historically large fires have occurred at a higher rate than during the High range of index values. Large fires have a higher resistance to control due to greater intensity, more fuel (large and live fuels) participating in the fire due to all components of fuel being more available to burn.**

B. Dispatch Level Analysis

The following table describes how fire business was used to indicate thresholds for dispatch decisions. The intent was to identify categories at which fire business would be different, and would tend to require different resource mixes and tactical considerations to successfully control the fire. A Burning Index (BI) for a fuel model G was used to set dispatch levels.

The Burning Index is a combination of Energy Release Component (ERC) and Spread Component (SC). ERC does not include wind in calculation of the index and is heavily weighted to large fuel moistures. SC is very sensitive to wind and is weighted to fine fuel moistures. The BI can fluctuate from day to day, but does tend to have an underlying seasonal trend. Fires can occur at a BI of 0, but would have little spread potential as long as conditions on the fire were similar to conditions at the weather station from where the index value was computed.

BI was selected because it considers wind and is indicative of initial attack fire business, both with daily fluctuations in fine fuels and wind, and in the seasonal trend and potential for high resistance to control fires. A forecasted index value, available in the afternoon, will be used to set dispatch levels for the next day.

Dispatch Level Color Code	Blue Mountain Plan Analysis
Green	Historically few fires (as defined in the analysis) have occurred.
Blue	Historically fires have occurred during this range of index values, but few large fires (as defined in the analysis) have occurred.
Yellow	Historically large fires have occurred during this range of index values. There is less probability of high intensity, high resistance to control fires than in the Extreme category.
Red	Historically large fires have occurred at a higher rate than during the High range of index values. Large fires have a higher resistance to control due to greater fire intensity resulting from more fuel being available (dry) and participating in the fire.

V. FIRE-DANGER BASED DECISIONS/PRODUCTS

A. Public Fire Danger Signs – Adjective

A coordinated adjective level based on fire danger will be utilized by all agencies within the Blue Mountain area using a four level system displayed on signs throughout the area. Signs will be set based on adjective rating for the particular fire danger rating area best represented by the sign.

Signs for each fire danger rating area will be changed when the observed ERC falls within a different level than currently displayed, and weather forecast trends indicate that the ERC is likely to remain in that level for five or more days.

FDRA	1		2		3		4		5		6	
FDRA Name	Juniper Sagebrush		Canyon Grasslands		Western Forested		Southern Blues		Central Blues		Northern Blues	
Station/SIG	Board Creek Sparta Butte		Harl - Eden - Roberts		Tupper - J Ridge - Case		Crane - Crow - Antelope		J Ridge - Blue Cyn - Keeney		Black Mtn - Roberts - Alder	
Index	ERC	% Days	ERC	% Days	ERC	% Days	ERC	% Days	ERC	% Days	ERC	% Days
LOW	0	25%	0	28%	0	25%	0	20%	0	27%	0	28%
MODERATE	39	32%	41	30%	38	33%	38	40%	41	33%	40	35%
HIGH	58	27%	60	26%	58	28%	58	27%	60	23%	61	25%
EXTREME	74	16%	77	15%	74	14%	72	14%	72	17%	76	12%

For each fire danger rating area, the column on the left describes the adjective class threshold value, the percent value on the right is the average number of days between June 1 and October 31, during the analysis period (mostly 1993-2012), that had a value within that range.

B. Preplanned/Incident Dispatching

A coordinated dispatch level based on fire danger will be utilized by all agencies within the Blue Mountain area using a four level system described by colors, delineated by fire danger rating area, and tracked by dispatch centers. The dispatch level color categories indicate expected differences in fire business. As dispatch levels change, production capabilities of suppression resources should change. Specific resources to be dispatched will be addressed with dispatch operating plans.

For each fire danger rating area, the column on the left describes the dispatch level threshold value, the percent value on the right is the average number of days between June 1 and October 31, during the analysis period (mostly 1993-2012), that had a value within that range.

FDRA	1		2		3		4		5		6	
FDRA Name	Juniper Sagebrush		Canyon Grasslands		Western Forested		Southern Blues		Central Blues		Northern Blues	
Station/SIG	Board Creek Sparta Butte		Harl - Eden - Roberts		Tupper - J Ridge - Case		Crane - Crow - Antelope		J Ridge - Blue Cyn - Keeney		Black Mtn - Roberts - Alder	
Index	BI	% Days	BI	% Days	BI	% Days	BI	% Days	BI	% Days	BI	% Days
GREEN	0	21%	0	26%	0	22%	0	17%	0	22%	0	25%
BLUE	33	24%	36	21%	30	27%	35	32%	33	28%	33	25%
YELLOW	45	21%	47	32%	42	29%	50	29%	46	22%	44	25%
RED	54	33%	62	22%	54	22%	63	23%	55	28%	55	25%

C. Fire Danger Pocket Card for Firefighter Safety

There is one PocketCard for all six FDRAs comprising the Blue Mountain area. The PocketCard is two-sided on an 8½”x11” page that includes six charts, one for each FDRA. The PocketCard is located in Appendix A and B; and posted on the NWCG, Fire Danger Working Team, Pocket Card website at: http://famweb.nwcg.gov/pocketcards/default.htm

D. Seasonal Fire Danger Tracking

Blue Mountain Interagency Dispatch Center will post all seasonal charts updated daily to the website: http://bmidc.org/erc.shtml

A Microsoft Excel workbook has been developed which includes an automated process to import data exported from the Weather Information Management System (WIMS), post the data to appropriate worksheets, and automatically update numerous charts for display. Adjective class charts in the workbook can be used to easily see, and to easily communicate, current season tracking. Data Select charts in the workbook, and the station worksheets, can be used for validation of model outputs and station inputs. The Excel workbook will be maintained by BMIDC and JDIDC, and available to anyone who would like more detailed information.

E. Daily Staffing Levels

1. Personnel and Initial Attack Resources

   Staffing levels are currently determined by agency/unit.

2. Aircraft – detection

   Detection aircraft and aerial observer(s) are utilized as needed and ordered by the agency/unit duty officer through dispatch. Fire danger levels can aide in identifying conditions and areas at most risk for large fires, where aerial detection may be most beneficial following ignition events.

3. Lookouts

   Lookout staffing is determined by agency/unit.

F. Public Use Restrictions/Closures

Determined by agency/unit.

G. Industrial Restrictions/Closures

Determined by agency/unit.

H. Public News Releases

Public news releases related to fire danger should utilize information consistent with this Fire Danger Operating Plan.

I. Severity Funding/Resources

1. Season - A brief methodology is described in “Interagency Standards for Fire and Fire Aviation Operations” (Red Book) within chapter 10, Preparedness.

The fire business analysis allows the opportunity to look at the conditions (fire danger) under which large fires have occurred in the past.

a) PocketCard Analysis - A large fire threshold has been analyzed and described for the PocketCard by FDRA.

b) Adjective Level Analysis - The adjective level thresholds are based on analyzed and described historic fire occurrence by FDRA.

Key point is that the days that we have typically had some of the largest and most expensive fires occurred at fire danger conditions well below the 97^{th} percentile, and frequently below the 90^{th} percentile.

2. Episode – Forecast Event Considerations

a) Multiple ignitions such as forecast lightning, especially when not accompanied by precipitation – forecast as a Lightning Activity Level (LAL) of 6. Most thunderstorm events, forecast as LAL 2-5, are accompanied by precipitation; these episodes certainly increase the workload for initial attack modules but typically do not account for large fires. Forecast conditions for lightning episodes when the adjective class is High or dispatch level is Yellow or higher should prompt consideration for additional IA resources.

b) Unstable atmospheric conditions (little resistance to vertical air movement) as indicated by a forecasted Haines Index of 5 or 6, or the presence of the thermal trough.

c) Forecast high wind events along with dry fuel conditions.

d) Prolonged low relative humidity events, such as provided by subsidence inversions.

e) Ignition sources believed to be Arson.

VI. OPERATIONAL PROCEDURES

A. Seasonal Schedule

1. Station Initialization

   Each station needs to have seasonal conditions managed within the WIMS model. Annual cycle would be for stations to have the herb state at frozen during the winter. Approximately mid-May, initiate green-up based on the expectation that the peak of green-up across the landscape is generally in early June. Normalized Difference in Vegetative Index (NDVI) imagery can be used to monitor greenness. Once a killing frost has occurred in the fall, the station herb state should be set to frozen. A killing frost involves several days with minimum temperatures at approximately 28 degrees or less, for several hours.

2. Station Catalog inputs in WIMS

   The station owner is responsible to ensure appropriate catalogs are tracked in WIMS; catalogs should be coordinated with the Fire Danger Technical Group.

B. Daily Schedule

Personnel at the Blue Mountain Interagency Dispatch Center (BMIDC) and the John Day Interagency Dispatch Center (JDIDC) will access WIMS daily and enter observations for stations in their respective dispatch area.

1. Quality Control Station Data

   Weather readings for the previous 24 hours will be checked by looking at hourly readings (DRAWS fastpath in WIMS) for abnormal or inappropriate readings, possibly indicating instrument errors.

2. Enter Observations

   All observations will be for the hourly weather record closest to 13:00 hours. For stations with transmit times more than :30 minutes after the hour, a 12 hour reading will be the observation time, all rest will be a 13 hour observation time. State of the Weather will be selected based on conditions at 14:00 hours (daylight savings time) for the majority of the fire danger rating area the station represents, not necessarily just the station. The Wet Flag will be set to "Y" when appropriate, as described in the latest WIMS Technote or Help Desk guidance. Tasks associated with selecting an observation should be accomplished by 15:00 hours each day, so that the observations will be available to the National Weather Service to enter trend forecasts, allowing forecasted indices to be available for the next day.

3. Fire Danger Chart

   DIDX and DOBS will be downloaded from WIMS daily after forecasted indices become available, then the Microsoft Excel Workbook for BMT_NFDRS_Tracking will be opened, the "Import_DIDX_DOBS" macro executed, automatically updating the workbook. Instructions will be stored with the Excel Workbook.

C. Large Fire Support

1. Data used for analysis is available to share.
2. Seasonal Chart - Pocket Card – Posters

VII. ROLES AND RESPONSIBILITIES

A. Fire Weather Program

Weather forecasts and products for the Blue Mountain area are provided by the National Weather Service, Pendleton, OR office. The annual Fire Weather Operating Plan with contact information and product listing (including NFDRS point and trend forecast products) can be found at: http://www.wrh.noaa.gov/firewx/tablinks.php?wfo=pdt&tab=admin

B. Fire Danger Technical Group

Each participating agency will be responsible for providing an NFDRS technical specialist to participate in the maintenance, review, and update of this plan. The following are specific individuals by agency or Dispatch Center:

- For USFS, UMF it will be Brian Goff.
- For USFS, WWF it will be Mark Johnson.
- For USFS, MAF it will be Brian Sines.
- For ODF NEO it will be Dennis Perilli.
- For ODF, John Day Unit it will be Unit Forester.
- For WA DNR it will be Tom Schoenfelder.
- For BMIDC it will be Jerry Garrett.
- For JDIDC it will be Theresa Youmans.

Members of the Fire Danger Technical Group will monitor NFDRS to ensure validity, coordinate/communiate any problems identified, review plan implementation, coordinate plan revisions, present the plan, and be available for NFDRS technical consultation. Some specific elements to monitor and coordinate are ensuring observations are selected appropriately (time, SOW, wet flag, consistent), station management in WIMS (herb state, catalog), station maintenance (instrument errors, transmit times), station siting (eliminate redundant/inappropriate, propose new sites where appropriate).

The technical group will coordinate with fire managers from their unit for updates and additions to the plan. The technical group will meet annually to review plan implementation, decide if revisions are necessary, and accomplish revisions.

C. Fire Weather Station Responsibility

Following is the list of personnel responsible for maintenance of weather stations in the plan area:

- For USFS WWF, it will be Russ Hurst.
- For USFS MAF, it will be James Smarr.
- For USFS UMF it will be Steve Garza.
- For ODF it will be Nick Yonker.

The station owner is the contact for all issues regarding station management in WIMS and station maintenance for stations under their control. See Appendix G for the dispatch office to contact regarding station owner.

D. Dispatch Center

Blue Mountain Interagency Dispatch Center (BMIDC) and John Day Interagency Dispatch Center (JDIDC) personnel are responsible for entering observations daily in WIMS for stations in their area, updating the NFDRS tracking workbook, and communicating outputs (i.e. phone, web, radio).

E. Field Operations Managers

USFS District Fire Management Officers (DFMOs)/ODF Unit Foresters and their assistants will assure that their personnel understand NFDRS outputs and how they are to be used. Field Operation Managers are responsible for implementing this plan, and ensuring decisions are made consistent with the intent of the plan.

F. Program Managers/Agency Administrators

USFS Forest Fire Staff Officers and Forest Supervisors, ODF District Foresters, and WA DNR Fire Program District Manager will use this Fire Danger Operating Plan and NFDRS outputs as a tool to coordinate and to make informed fire related decisions. The program manager/agency administrator is ultimately responsible for ensuring this plan is maintained, utilized, and communicated.

VIII. PROGRAM NEEDS

A. Weather Stations Sites

Weather station siting, maintenance, and data management is to be evaluated annually to ensure the stations are meeting the intent and needs of fire danger rating and weather forecasting.

B. Training

1. Fire Danger Technical Specialists - Development of Fire Danger Technical Specialists takes a number of years to become proficient. Developing technical specialists requires forethought so that they are available when needed.
2. Fire Managers – Interpreting NFDRS data appropriately and utilizing NFDRS to make decisions within a fire program requires some understanding of NFDRS. S-491 is recommended for all area fire managers.

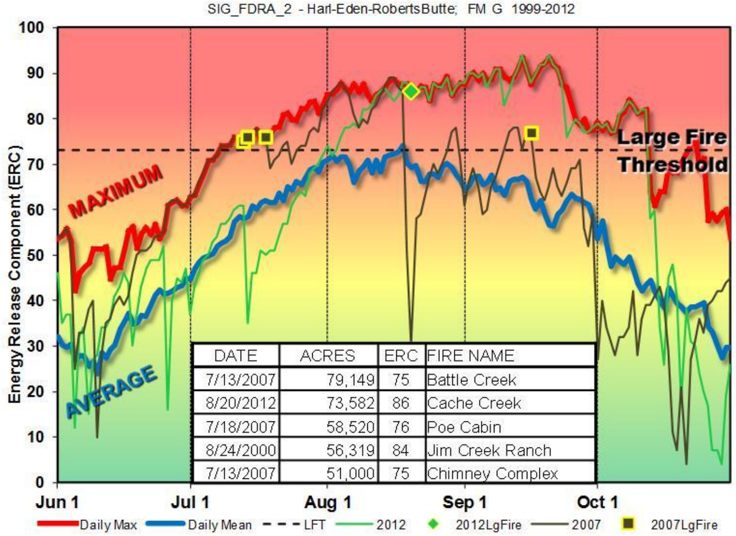
IX. APPENDIX

A. PocketCard

1. PocketCard - Front

2013 Blue Mtn PocketCard - FDRA 2: Canyon Grasslands

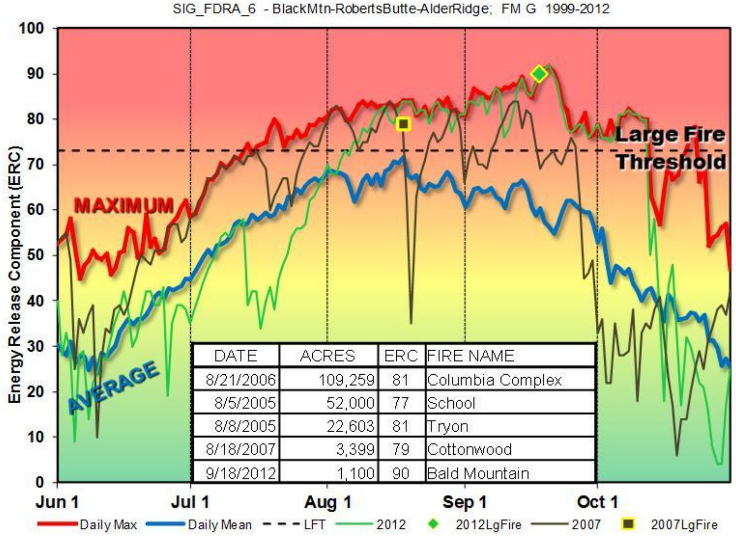
SIG_FDRA_2 - Harl-Eden-RobertsButte; FM G 1999-2012



DATE	ACRES	ERC	FIRE NAME
7/13/2007	79,149	75	Battle Creek
8/20/2012	73,582	86	Cache Creek
7/18/2007	58,520	76	Poe Cabin
8/24/2000	56,319	84	Jim Creek Ranch
7/13/2007	51,000	75	Chimney Complex

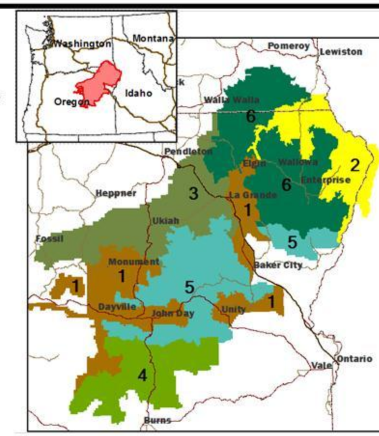
2013 Blue Mountain PocketCard - FDRA 6: Northern Blues

SIG_FDRA_6 - BlackMtn-RobertsButte-AlderRidge; FM G 1999-2012



DATE	ACRES	ERC	FIRE NAME
8/21/2006	109,259	81	Columbia Complex
8/5/2005	52,000	77	School
8/8/2005	22,603	81	Tryon
8/18/2007	3,399	79	Cottonwood
9/18/2012	1,100	90	Bald Mountain

Blue Mountain Interagency Fire Danger PocketCard 2013



- National Forests: Malheur, Umatilla, Wallowa-Whitman
- ODF Units: John Day, LaGrande, Pendleton, Wallowa
- Wa DNR: portions of SE Region
- 6 Fire Danger Rating Areas (FDRA)
- **All 15 weather stations (RAWS) utilized meet NWCG Standards.**

Interpretation of Charts:

⇒ Title—Describes the Fire Danger Rating Area (FDRA) the chart applies to.

⇒ Subtitle—Identifies weather stations (RAWS) utilized, NFDRS fuel model, and years analyzed for that particular FDRA.

⇒ MAXIMUM—Highest ERC recorded for that day during the analysis period.

⇒ AVERAGE—Average ERC recorded for that day during the analysis period.

⇒ Large Fire Threshold—The majority of past fires >300 acres occurred above this ERC value.

⇒ Year (2007 and 2012) are the ERC values recorded for that season.

⇒ Large Fire Symbol—Day fire discovered that resulted in a fire >1,000 ac.

⇒ **Fuel Model G**—Short Needle Conifer with Heavy Dead Down (FM10)

Remember what Fire Danger tells you:

☑ **Energy Release Component** (ERC) Indicates fire season severity trends. Calculated from 2pm and 24hr min/max temperature and humidity, and 24hr precipitation duration. (Wind is **NOT** part of calculation)

☑ PAY ATTENTION to local conditions and variations across the landscape: **Fuel, Weather, and Topography**.

☑ LISTEN to weather forecasts and local weather readings—especially **WIND**.

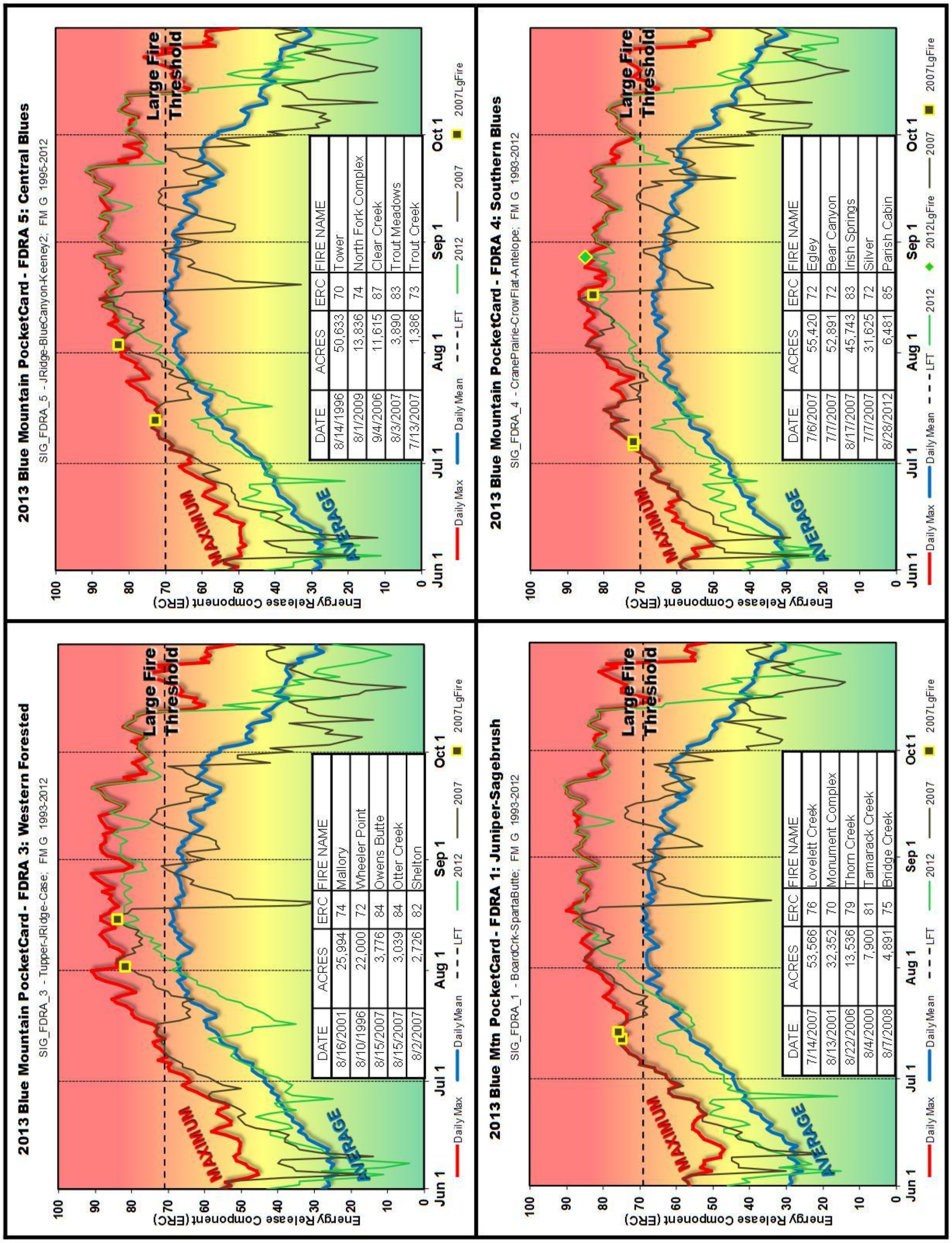
Critical Thresholds:

- **Winds >12 MPH**
- **Temperature > 90**
- **RH < 20%**
- **1000 hr fuels < 11%**
- **Live Woody FMC < 80%**
- **Haines Index 5 or 6**

Watchouts: Red Flag Warnings or Very Dry Fuels combined with one of the following:

- **Lightning with little or no precipitation.**
- **Strong Winds combined with Low Humidity,** including Dry Cold Front passage.
- **Dry Unstable Air Mass—Haines Index 5 or 6,** including Surface Thermal Trough Passage.

2. PocketCard – Back

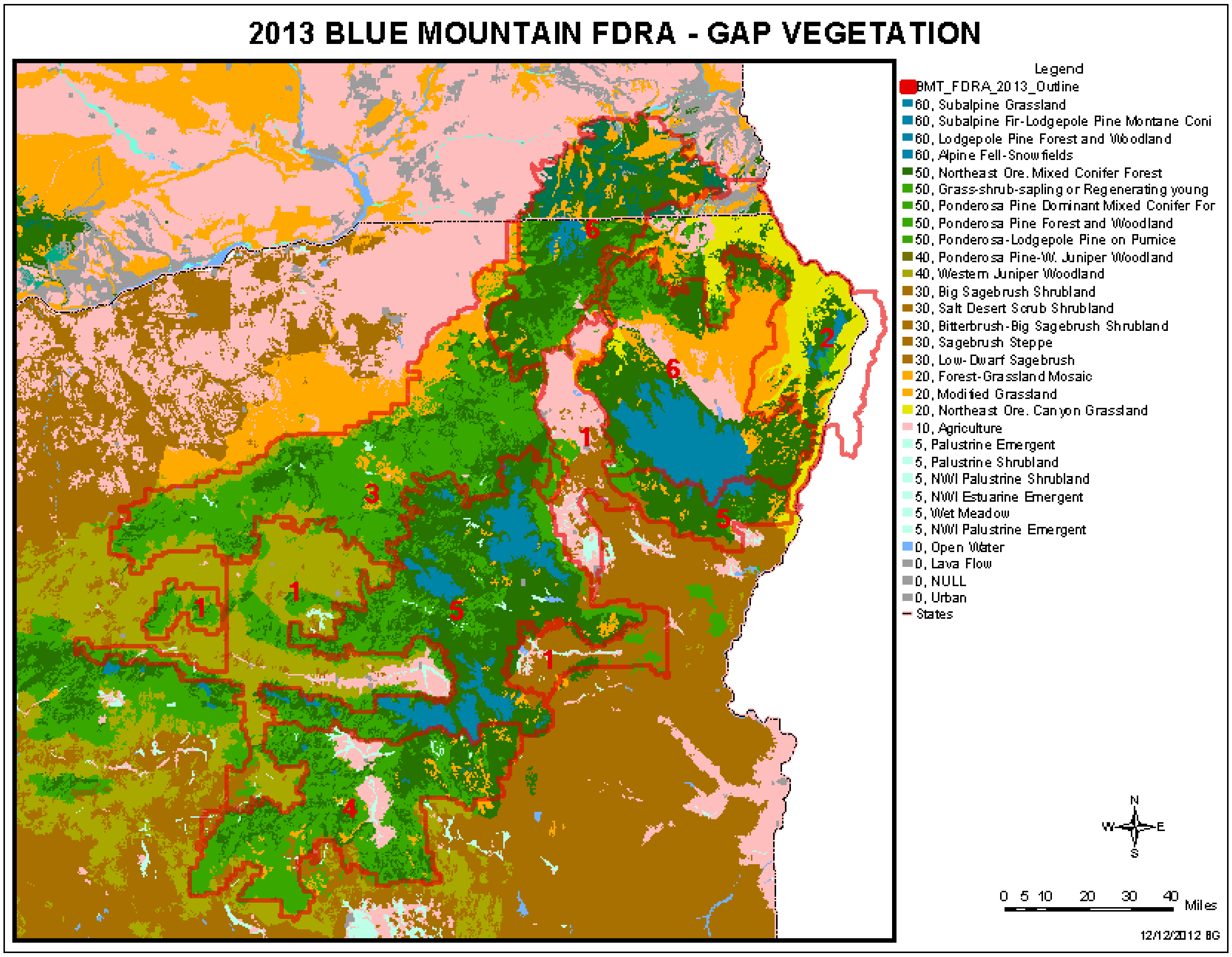


B. Fire Danger Rating Area Analysis

1. Vegetation

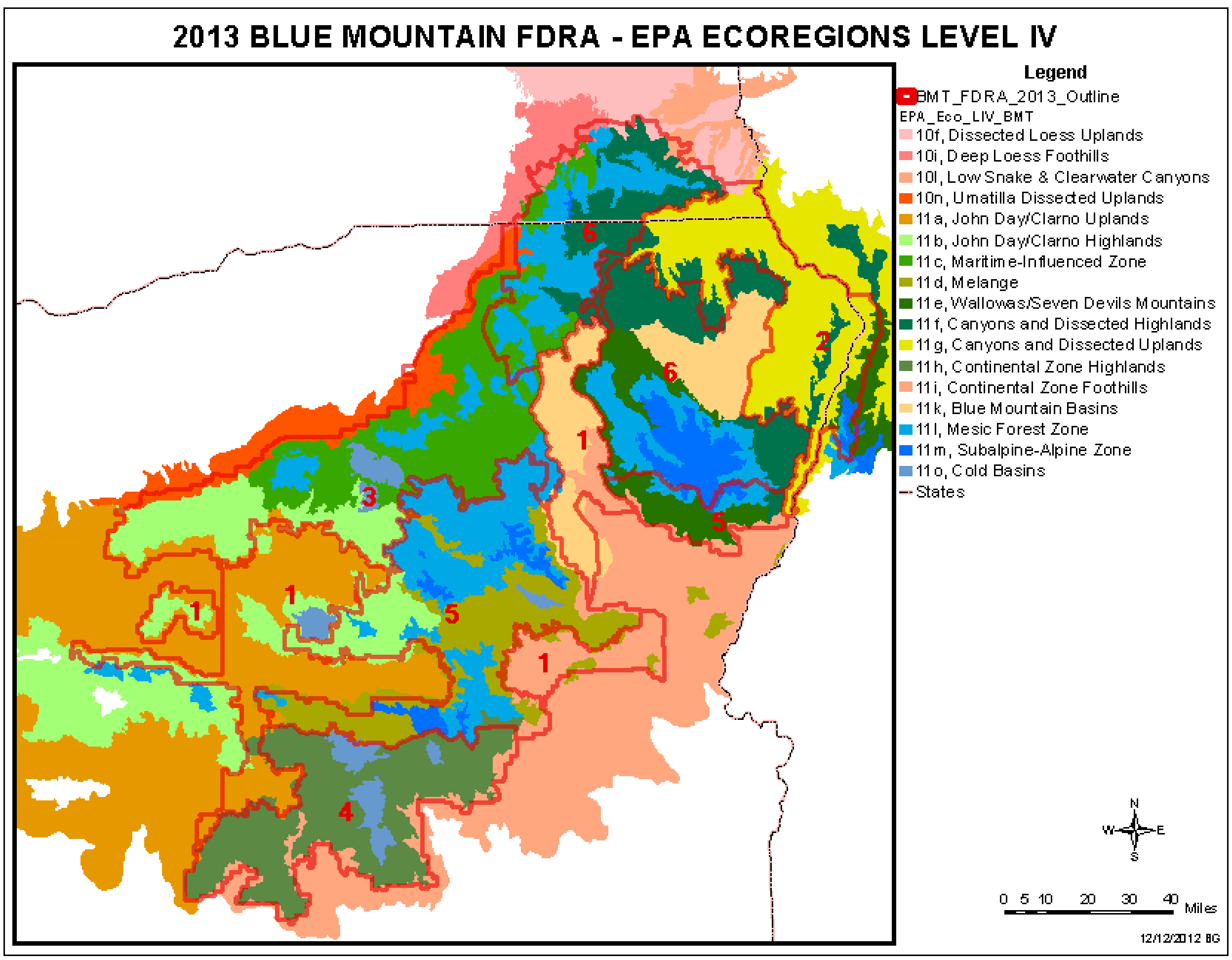
   Following is a map with GAP vegetation; polygons are shaded generally as follows:
   - Pink – agriculture
   - Yellow – grasslands
   - Orange – shrub/sage
   - Brown – juniper
   - Light green – dry forest (i.e. Ponderosa Pine)
   - Dark green – moist forest (mixed conifer, fir)
   - Blue – alpine, subalpine

   Generally vegetation was delineated based on these categories, where vegetation occupied a large enough area to warrant a different fire danger decision than adjacent areas.



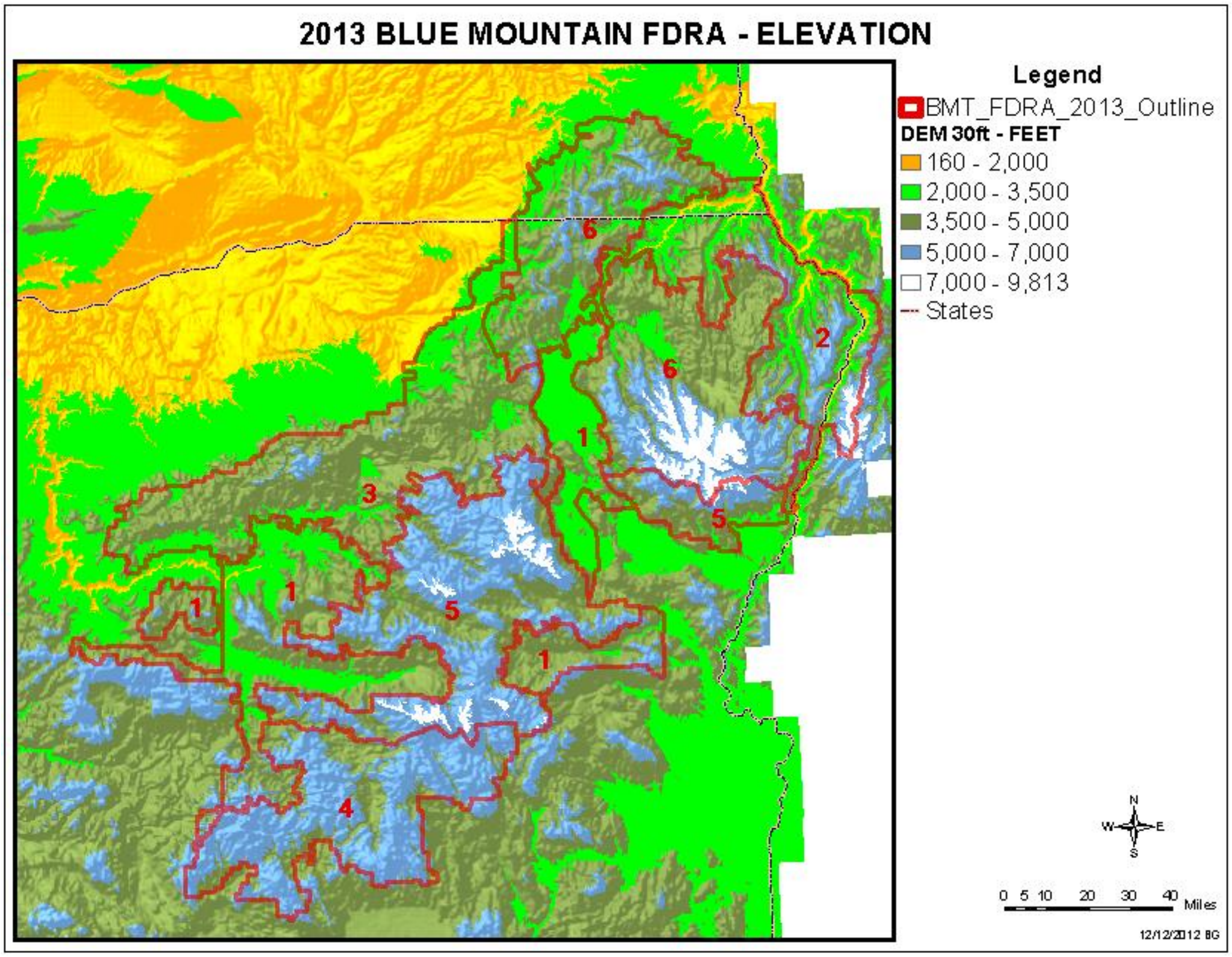
2. EPA Ecoregions – Level IV

a) Abstract: Ecoregions by EPA region were extracted from the seamless national shapefile. Ecoregions denote areas of general similarity in ecosystems and in the type, quality, and quantity of environmental resources. They are designed to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components. These general purpose regions are critical for structuring and implementing ecosystem management strategies across federal agencies, state agencies, and nongovernment organizations that are responsible for different types of resources within the same geographical areas. The approach used to compile this map is based on the premise that ecological regions can be identified through the analysis of patterns of biotic and abiotic phenomena, including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another. A Roman numeral hierarchical scheme has been adopted for different levels for ecological regions. Level I is the coarsest level, dividing North America into 15 ecological regions. Level II divides the continent into 52 regions (Commission for Environmental Cooperation Working Group, 1997). At Level III, the continental United States contains 104 regions whereas the conterminous United States has 84 (U.S. Environmental Protection Agency, 2005). Level IV ecoregions are further subdivisions of Level III ecoregions. Methods used to define the ecoregions are explained in Omernik (1995, 2004), Omernik and others (2000), and Gallant and others (1989).

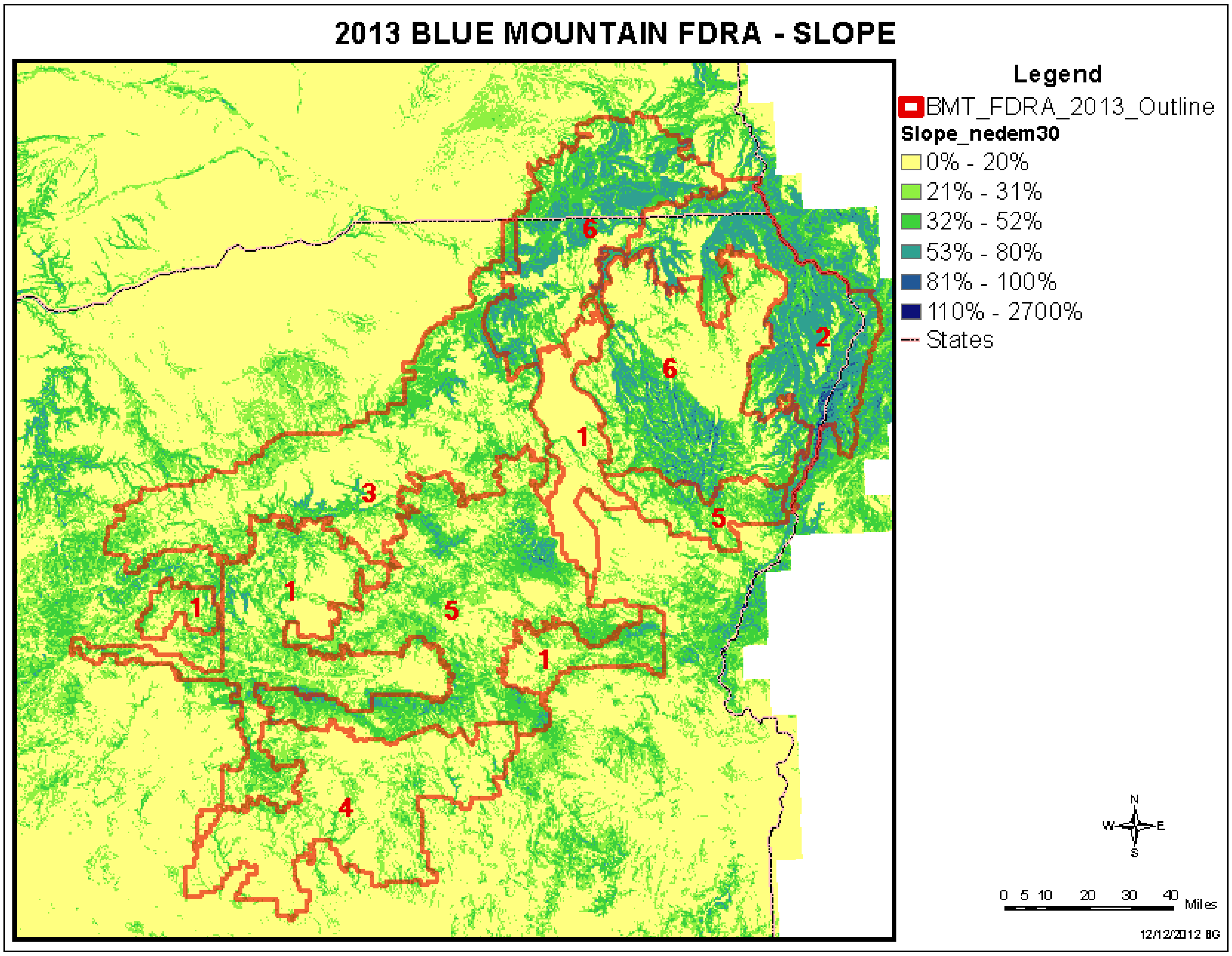


3. Topography – Based on 30m Digital Elevation Model (DEM) data.

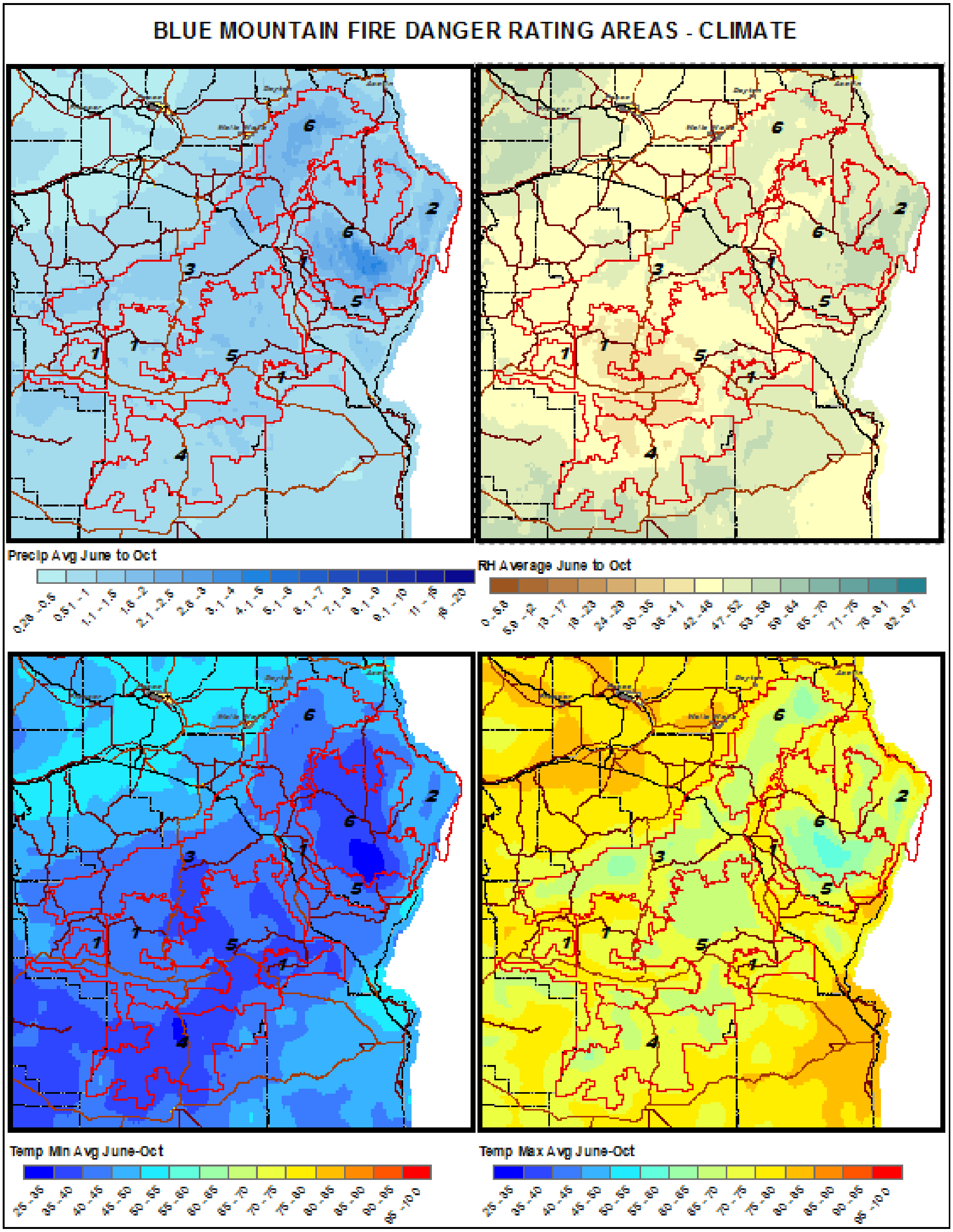
   The following map shows elevation divided into 5 bands. Although FDRA 6 has the highest elevation, FDRA 5 has the highest mean elevation. FDRAs 1, 2, and 3 have generally the lowest elevations.



The following map displays the area slope classes, based on percent slope. Areas with the most and greatest slope are FDRA 2, then 6, and then 5.

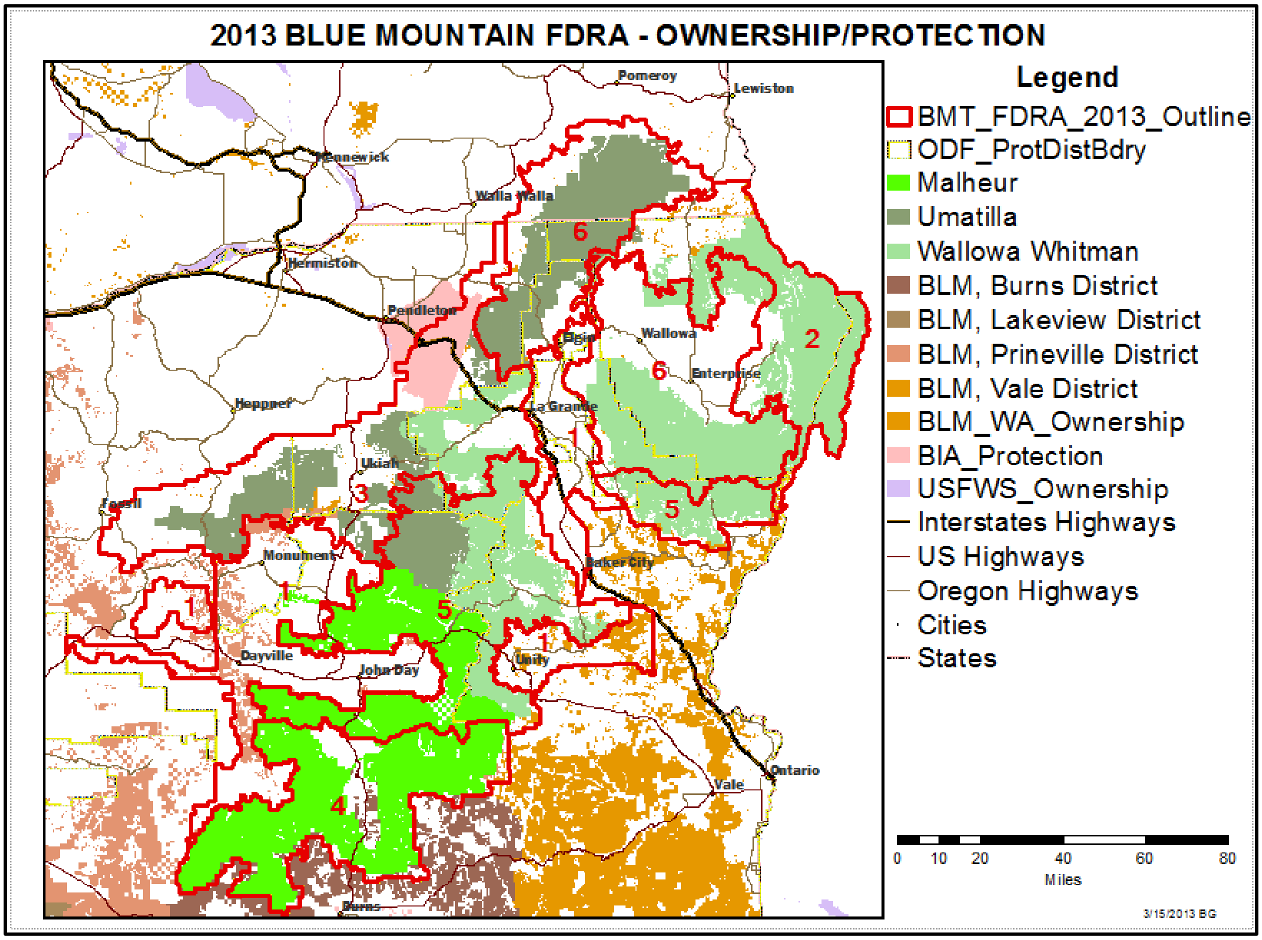


4. Climatology – Based on Oregon Climate Services 1960-1991 average monthly climate data, averaged by fire season – June through October.



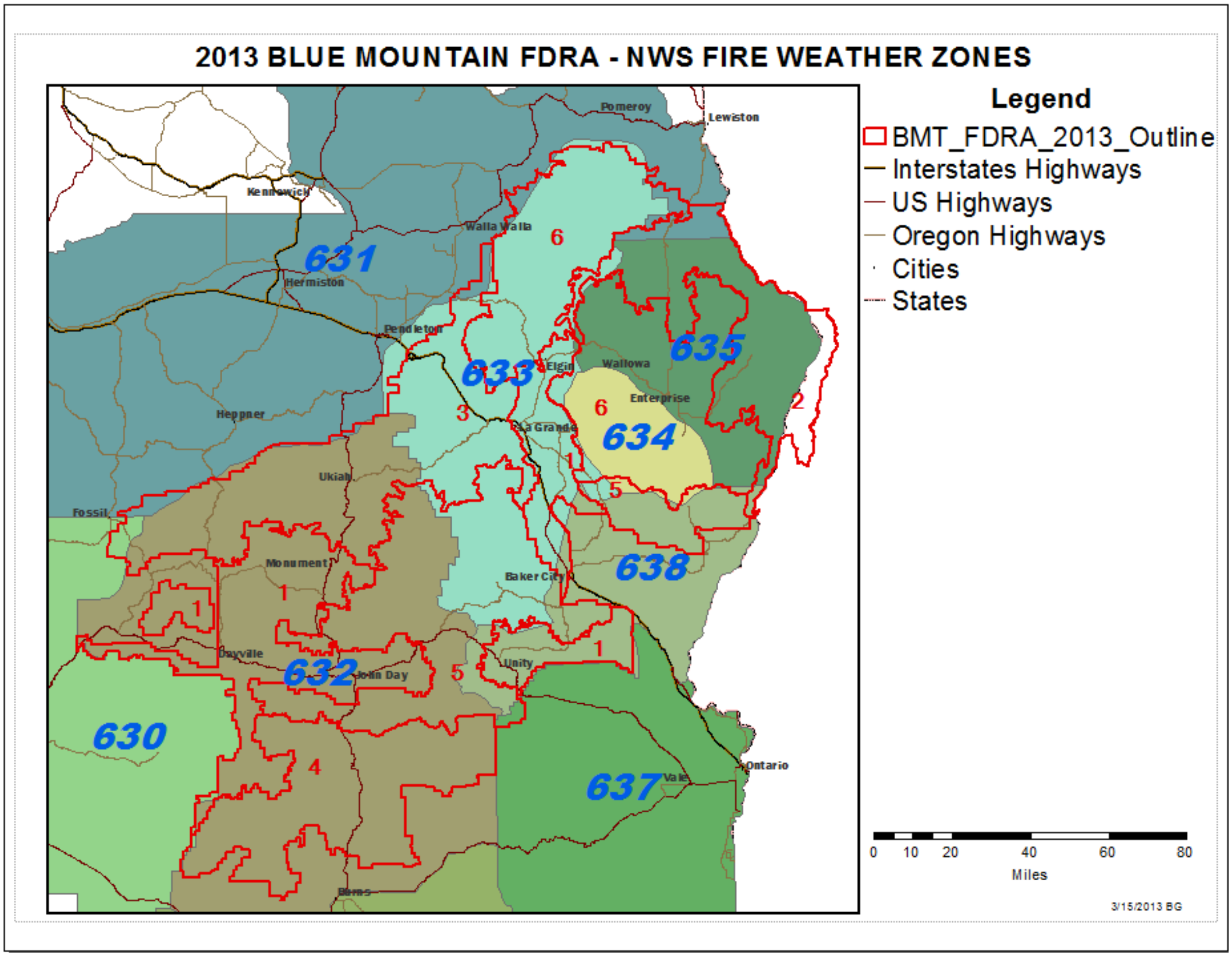
5. Ownership – Protection – Administrative Boundaries

The fire danger rating area analysis focused on vegetation, climate, and topography first. As polygon lines were being finalized, if a line was close to an administrative boundary it may have been moved to that boundary. There may be other situations where a landmark or terrain feature was going to be a better boundary. Some features like roads were intentionally avoided for boundaries. It was not desired to set up a situation where one side of a road was in one level of restriction, while the other side was in a different level.



6. Fire Weather Forecast Zones

National Weather Service, Pendleton office, Fire Weather Forecast Zones are shown in the following map.



7. Comparison among the Fire Danger Rating Areas:

				ELEVATION (FT)			
FDRA	Description		Acres	MEAN	MIN	MAX	RANGE
1	Juniper-Sagebrush	Iron Mountain	112,361	4,370	2,500	5,889	3,389
1	Juniper-Sagebrush	Unity	274,315	4,404	2,664	6,454	3,790
1	Juniper-Sagebrush	LaGrande Baker	427,712	3,238	2,513	5,499	2,986
1	Juniper-Sagebrush	John Day Valley	1,185,183	3,951	1,814	6,867	5,053
2	Canyon Grasslands	Hells Canyon	1,100,725	3,882	796	9,400	8,604
3	Western Forested	Fossil Ukiah	1,754,993	3,980	1,380	6,270	4,890
4	Southern Blues	Emigrant Creek	1,239,988	5,251	3,511	7,166	3,655
5	Central Blues	S Eagle Caps	304,217	4,736	1,939	8,652	6,713
5	Central Blues	Granite	1,724,766	5,395	3,101	9,079	5,978
6	Northern Blues	PomeroyTollgate	1,007,523	4,082	1,650	6,379	4,729
6	Northern Blues	Enterprise	1,336,397	5,095	2,313	9,813	7,500
			10,468,180				

C. **Weather Data Quality Control Processing**

Blue Mountain Fire Danger Operating Plan
RAWS data Quality Control Narrative

The following report describes the results of utilizing a method, developed in Microsoft Access 2000, for an individual to build a quality control (QC) weather dataset in the latest data format designed for use with wildland fire analysis software. This process is intended to provide the least erroneous and most consistent quality data available for historical analysis of weather data as it relates to wildland fire.

The process requires acquiring historical weather data from the Western Region Climate Center (WRCC) and from the National Interagency Fire Management Integrated Database (NIFMID). Remote Automated Weather Stations (RAWS) record hourly weather readings consisting of at least: Temperature, Relative Humidity, Wind Speed, Wind Azimuth, and Precipitation (Cumulative). The RAWS data is transmitted initially via satellite, then through a complex network where a Date/Time are added, and is finally stored in at least two locations, WRCC and NIFMID.

RAWS data stored at the WRCC begins from about 1985-86, when the move was made from RAWS transmitting data via modem to satellite transmission, and is essentially in the same format as transmitted. NIFMID stores data processed through the Weather Information Management System (WIMS) where a 24-hour minimum and maximum for temperature and relative humidity is calculated, and the cumulative precipitation is converted into a 24-hour precipitation duration and precipitation amount. NIFMID stores the WIMS processed RAWS data in two different formats.

The NIFMID 1972 data format has an “fwx” file extension, it is non-Y2k compliant (years stored in 2 digits), and consists of one reading per day called an observation. The observation was set manually by an individual going into the WIMS and changing the Type field for a particular record from an “R” to an “O” and entering a value for State of Weather (SOW). Historically, after 18 months, the observation readings were moved to and stored in NIFMID, all readings that didn’t include an observation were not maintained. The 1972 data format does not include the time for that particular reading.

The NIFMID 1998 data format (W98) has an “fw9” file extension and was designed to replace the 1972 data format and provide for the future uses of fire weather analysis. W98 format stores hourly data, is Y2k compliant, and the format includes a field for Solar Radiation (new required instrument for RAWS). Because the W98 format stores hourly data, all of the readings are stored, not just the manually triggered observation. NIFMID has available weather data in the W98 format beginning about April 1993, although from 1993 to about 6/15/2001 data is observations only, and hourly data from about 6/15/2001 to date. There is not generally enough data stored in the W98 format to do a quality historical fire weather analysis, therefore it is necessary to use the 1972 format to obtain the earlier years.

The quality control (QC) weather data process:

- Begins with the basic WRCC RAWS data.
- Conducts an automated deletion of impossible readings and flagging of unlikely readings based on specific criteria.
- Allows manual checking flagged, unlikely readings, and deleting of erroneous readings when appropriate.

- Estimates values under specific conditions by filling or linear interpolation, ensuring not to create new data, but to fill gaps with a known beginning and ending.
- Builds 24-hour summaries such as minimum and maximum values.
- Selects observations consistently at the correct hour first, and then to ensure the most complete dataset with one observation per day where reasonably available.
- Transferring manually entered State of Weather (SOW) where available from NIFMID datasets and estimating when not.
- Exporting a dataset conforming to the 1998 data format (W98).
- The final product includes two datasets, one including hourly records and the other with just daily observations, both directly importable into current fire analysis software. The resulting Access database allows tracing back to the source each individual field for each individual record. Documentation reports available include: summary reports describing the number of fields and percentages of the entire dataset affected by the QC process, comparisons between the QC weather data and with NIFMID products identifying general differences and similarities, and documentation of the program steps.

Weather data from RAWS in the Blue Mountain area was built using a custom Access database, quality control process, developed by Brian Goff. The following table is the summary of the stations analyzed and narrative of the highlights.

D. RAWS Network

	Station Information					Evaluation of Data resulting from Quality Control (QC) process				
	Station#	**Station Name**	**Elev**	**FDRA**	**OWNER**	**WRCC**	**QC**	**QC WEATHER DATA COMMENTS**	**1300**	**Missing Obs**
1	**101100**	PITTSBURG LND	1,398		WWF	1993-2006	YES	Corrected numerous observations from improper hour. Mostly missing 1993, 2000, first half of 1997, and last half of 1995 and 2002	99%	18%
2	**351202**	TUPPER	4,270	**3**	UMF	1986-2007	YES	Scattered missing days, wind speed data generally low (site?). Numerous corrections, generally good data.	99%	8%
3	**351319**	BLACK MTN RDG	5,275	**6**	UMF	1995-2007	YES	Linked previous stations 351314 (1995-1998), to 351317 (1997-2007), to 351319 (2008 -). Missing Jun-Jul 1996, and Aug-Sep 2007. Historical station locations not good for wind readings.	99%	12%
4	**351414**	J RIDGE	5,066	**3,5**	WWF	1986-2006	YES	Corrected numerous observations from improper hour. Mostly missing 1986. Many Temp sensor errors 2002. Some corrections, generally good data.	99%	4%
5	**351416**	MINAM LODGE	3,596		WWF	1986-2007	NO	NOT UTILIZED		
6	**351417**	LaGRANDE 1	3,146		ODF	1997-2006	NO	NOT UTILIZED		
7	**351419**	POINT PROM II	6,552		WWF	2000-2006	YES	Corrected numerous observations from improper hour. Missing June and half of July in 2000 and 2004. Wind readings generally low (site?). RH readings generally lower than expected.	99%	7%
8	**351502**	HARL BUTTE	4,685	**2**	WWF	1991-2006	YES	Corrected many observations from improper hour. WRCC data available only since 1991 for QC, WIMS data since 1986. Missing June and July 1991. Numerous corrections, generally good data.	99%	9%
9	**351518**	EDEN	3,460	**2**	UMF	1990-2007	YES	Numerous corrections, generally good data.	99%	7%
10	**351520**	ROBERTS BUTTE	4,304	**2, 6**	WWF	1999-2006	YES	Corrected many observations from improper hour. Eliminated numerous erroneous wind speed readings. Generally good data.	100%	1%
11	**352124**	YELLOWPINE	4,656		WWF	2000-2006	YES	Corrected many observations from improper hour. Generally good data.	99%	0%
12	**352126**	ELK CREEK	4,754		WWF	2000-2006	YES	Corrected many observations from improper hour. Generally good data.	99%	1%
13	**352209**	MITCHELL				2003-2006	NO	NOT UTILIZED		
14	**352305**	CRANE PRAIRIE	5,541	**4**	MAF	1986-2006	YES	Deleted years 1986 - 1989 due to bad data. Numerous corrections, generally good data.	98%	3%
15	**352327**	FALL MTN	5,876		MAF	1986-2006	NO	NOT UTILIZED		
16	**352329**	CASE	3,910	**3**	UMF	1986-2007	YES	Numerous corrections, especially Precip during 1997, generally good data.	99%	6%
17	**352330**	BOARD CREEK	4,498	**1**	MAF	1986-2007	YES	Mostly missing 1986. Corrected many observations from improper hour. Generally good data.	99%	3%
18	**352332**	KEENEY 2	5,098	**5**	MAF	1995-2006	YES	Mostly missing 1995. Generally good data.	99%	3%
19	**352416**	BLUE CANYON	3,960	**5**	WWF	1986-2006	YES	Mostly missing 1986. Corrected many observations from improper hour. Generally good data.	98%	4%
20	**352418**	SPARTA BUTTE	4,212	**1**	WWF	1989-2006	YES	Corrected many observations from improper hour. Numerous corrections, generally good data.	98%	4%
21	**353501**	ALLISON	5,320		MAF	1986-2006	YES	Numerous corrections, generally good data.	99%	3%
22	**353515**	CROW FLAT	5,130	**4**	MAF	1986-2006	YES	Numerous corrections, generally good data.	99%	4%
23	**353524**	ANTELOPE	5,905	**4**	MAF	1994-2006	YES	Numerous corrections, capable of recording high wind speeds, generally good data.	99%	5%
24	**453803**	ALDER RIDGE	4,565	**6**	UMF	1986-2007	YES	Numerous corrections, especially Precip 1998 - 2000. Capable of recording high wind speeds, generally good data.	98%	6%

E. Fire History Quality Control Processing

Blue Mountain Fire Danger Operating Plan
Description of Fire History Quality Control Processing

1/11/2013

Blue Mountain Fire History Data Sources:

Forest Service, corporate fire history point GIS data.

Acquired Fire History from USFS GIS server for CSA4 which is the Blue Mountain Province area. The data consists of fire points corrected for FPA through 2005 plus the KCFAST downloaded corporate GIS format data for 2006 through 2010. Acquired 2011-12 data from NIFMID, via KCFAST in the .raw format, for the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests. Imported into FireFamily Plus, then exported a shapefile of the data. Reprojected and clipped the data to the FDOP area.

Oregon Department of Forestry (ODF)

Acquired fire history point data from ODF Salem GIS shop as a geodatabase including the years 1962 through 2007. Reprojected, clipped to project area boundary. Removed the years prior to 1985 since those years will not be used in the FDRA analysis, and did not want to deal with quality control of the fire history data that was not going to be used in the analysis. The field FINALSIZE had acres for 1985 through 2005, and 0 acres for 2006 and 2007. The field Size_acres had 0 acres for 1985 through 2005, and had acres for 2006 and 2007. Copied acres from Size_acres for 2006 and 2007 and input into FINALSIZE. Received data for 2008 through 2012 and appended.

Washington Department of Natural Resources (WDNR)

In 2007, acquired fire history point data from internet at: http://fortress.wa.gov/dnr/app1/dataweb/dmmatrix.html In 2013, acquired 2008 through 2012 fire history point data from internet. Reprojected, clipped to project area boundary. Removed fires a significant distance from FDRAs. Crosswalked fire cause to be consistent with USFS fire causes. Fires with discovery dates prior to 1985 were removed so dataset included a fire history of 1985 through 2010.

BLM – Spokane, Burns, Prineville, Vale:

Acquired fire history data from FAMWEB internet site at: http://fam.nwcg.gov/fam-web/weatherfirecd/ Imported the text file into Excel; deleted records that were not "Action Fire" or "Natural Out" based on the FireTypeCode and ProtectionTypeCode and records with start time prior to 1985; added and filled fields for month, day year; saved as a dbf. Added the dbf file to ArcView and created an event layer, reprojecting the data, then clipping to BMT project area. For Prineville, there were a number of "Action Fire" designated records with no control acres, start time and control time were on the same day, so 0.1 acres were entered for control acres.

BIA – Umatilla Agency:

Acquired fire history data from FAMWEB internet site at: http://fam.nwcg.gov/fam-web/weatherfirecd/ Imported the text file into Excel; deleted records with no acres and records with start time prior to 1985; added and filled fields for month, day year; saved as a dbf. Added the dbf file to ArcView and created an event layer, re-projecting the data.

GIS Data Processing:

All of the fire point datasets listed previously were brought into a GIS project, utilizing the same projection (re-projected as necessary), and clipped (as necessary) to the FDOP analysis area. Where more than one dataset was available for a particular agency, the data was reviewed and a decision made as to which dataset would be used in the analysis. Where 2 or more datasets were available, the following datasets were used:

1. BIA, Umatilla Agency – FAMWEB download data.
2. BLM, ALL – FAMWEB download data. (Did not use the PCHA exported data for Vale BLM)
3. Umatilla NF – Corporate server GIS data plus downloaded KCFAST data in .raw format.
4. Wallowa-Whitman NF – Corporate server GIS data plus downloaded KCFAST data in .raw format.
5. Malheur NF –KCFAST downloaded data in .raw format. Did not use the corporate server GIS data because it was missing some years, included some fires that appeared to be other agencies (BLM), and was missing many discovery dates (included years but not date).
6. Ochoco NF – Malheur has protection responsibility for the Snow Mountain Ranger District of the Ochoco National Forest, and that area is included in this FDOP analysis area. The fire history for the Malheur includes fires for the period of analysis for this area, but not as many as expected. The Ochoco fire history includes fires for this area from 1986 through 2000, which are unique from the Malheur fire history, and are therefore included in the analysis.
7. ODF – ODF provided fire history point data.
8. WDNR – WDNR data available for public download from internet.

It is not uncommon for more than one agency to have filled out a fire report for the same fire. Both agencies may have responded, but generally the official fire record should reside in the database of the agency responsible for providing protection at the fire origin. Duplicate records of this nature were common, especially in the earlier years of the period fire records were used in this analysis. Also, final fire perimeters could legitimately be on more than one agencies protection, therefore the fire could be reported in more than one database. For the analysis, the goal was to have each fire accounted for once, and to make sure each large fire that had occurred was accounted for with the correct total acreage.

Added X Y coordinates (ArcToolbox, Data Management Tools, Features, Add XY Coordinates) for each record (fire point). The coordinates are for the current projection, this will allow manipulating the data outside of ArcView, and re-creating fire points in the correct location/projection with the manipulated data.

Modified cause codes for non-USFS agencies in accordance with the following crosswalk table:

FIRE CAUSE CODE CROSSWALK BETWEEN DIFFERENT AGENCIES

	USFS	DOI	OR STATE	WA STATE
UNIDENTIFIED		00*	10*	
LIGHTNING	01	01	01	01
EQUIPMENT USE	02	06	03	06*
SMOKING	03	03	05	04
CAMPFIRE	04	02	04*	03*
DEBRIS BURNING	05	04	06	05
RAILROAD	06	07	02	08
ARSON	07	05*	07	02*
CHILDREN	08	08	08*	07
MISCELLANEOUS	09	09	09	09

*Some of the causal terms had to be adjusted to align with other agencies

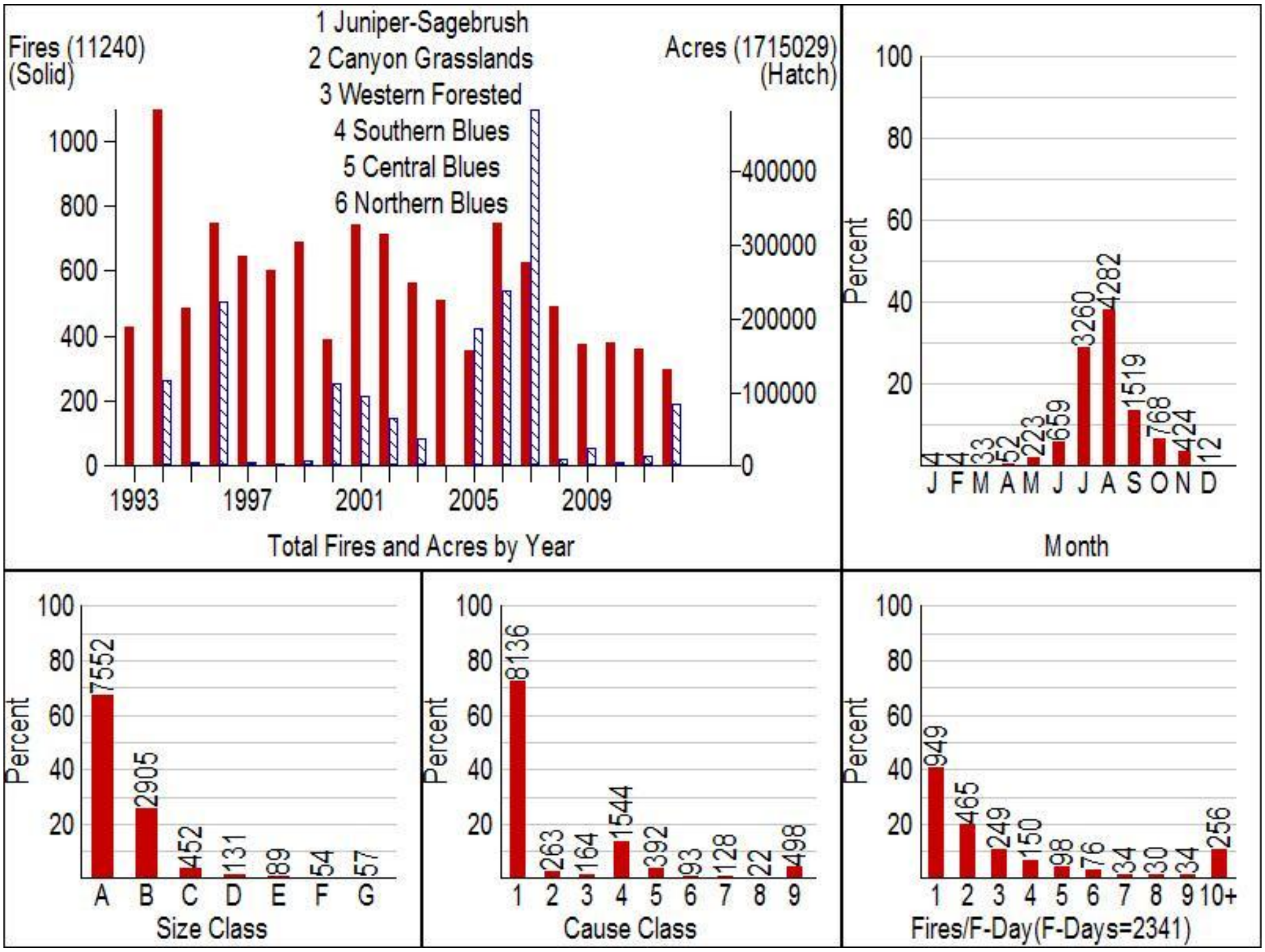
Created a new table in Access called “BMT_FDOP_FireHx” with the structure and information to be imported into FireFamily Plus. Created queries to write the appropriate data to the common table from each of the attribute tables. In most cases, each query was unique, some linked more than one data source in order to get the most complete final set of records.

Exported the BMT_FireHx table from Access to Excel, then saved it as a .csv file. Imported the file into GIS by adding x,y data, saved as a shapefile. Deleted 1,590 records that were greater than 1 miles from any of the FDRAs, and less than 1,000 acres. Deleted 53 records that were more than 5 miles away and 1,000 acres or greater, all were BLM fires. Deleted 103 records that were within 1 mile but less than 1 acre.

The table was sorted the table in several ways to highlight potential duplicate fires. Where identified, fires were deleted to eliminate duplicates, trying to base the fire to keep on the ownership of origin.

F. Fire History described by FDRA

The following table includes ALL fires for ALL agencies for ALL Fire Danger Rating Areas in the Blue Mountains for the period 1993-2012 (20 years). Quality control processing is described in Appendix E.



Size Class Table:

Size Class	More Than	Less Than
A	-	0.25
B	0.25	10
C	10	100
D	100	300
E	300	1,000
F	1,000	5,000
G	5,000	

Cause Code Table:

Fire Cause	USFS
LIGHTNING	1
EQUIPMENT USE	2
SMOKING	3
CAMPFIRE	4
DEBRIS BURNING	5
RAILROAD	6
ARSON	7
CHILDREN	8
MISCELLANEOUS	9

1. Fire size class by Fire Danger Rating Area:

   a) The following chart displays the number of fires by size class by fire danger rating area. For each size class column, blue highlights the fewest fires for that size class and red highlights the most fires.

	MIN	0	0.25	10	100	300	1000	5000	
	MAX	0.25	10	100	300	1000	5000	+	
		SIZE CLASS							
FDRA	**Acres**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**Grand Total**
1	1,999,571	755	328	96	31	27	17	4	1,258
2	1,100,725	301	134	44	15	10	12	21	537
3	1,754,993	1,405	558	146	48	23	8	3	2,191
4	1,239,988	1,169	524	29	5	6	3	9	1,745
5	2,028,983	2,339	908	72	18	12	6	14	3,369
6	2,343,920	1,583	453	65	14	11	8	6	2,140
	10,468,180	7,552	2,905	452	131	89	54	57	11,240
	AVERAGE	1,259	484	75	22	15	9	10	1,873

   b) The following chart displays the same data as above, but as a percentile of the total number of fires. This chart may be a little easier to interpret. Some observations:

   (1) 47% of the fires less than 10 acres have occurred in FDRA 5 and 6, which are also the largest FDRAs. These two FDRAs have the highest mean elevation, and mostly mixed conifer vegetation considered to be a moist forest type. FDRA 5 is second among the six FDRAs for having had fires greater than 5,000 acres, and historically has had the most number of fires.

   (2) FDRA 1 and 2 have a higher proportion of fine fuels (grasses and shrubs) than the other four FDRAs. Historically they have had the fewest numbers of fires in total, but have had a higher number of large fires comparatively. FDRA 2 has historically had the least number of fires.

FDRA	**Acres**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**Grand Total**
1	1,999,571	6.72%	2.92%	0.85%	0.28%	0.24%	0.15%	0.04%	11.19%
2	1,100,725	2.68%	1.19%	0.39%	0.13%	0.09%	0.11%	0.19%	4.78%
3	1,754,993	12.50%	4.96%	1.30%	0.43%	0.20%	0.07%	0.03%	19.49%
4	1,239,988	10.40%	4.66%	0.26%	0.04%	0.05%	0.03%	0.08%	15.52%
5	2,028,983	20.81%	8.08%	0.64%	0.16%	0.11%	0.05%	0.12%	29.97%
6	2,343,920	14.08%	4.03%	0.58%	0.12%	0.10%	0.07%	0.05%	19.04%
	10,468,180	67.19%	25.85%	4.02%	1.17%	0.79%	0.48%	0.51%	100.00%
	AVERAGE	11.20%	4.31%	0.67%	0.19%	0.13%	0.08%	0.08%	16.67%

2. Fire statistical cause by Fire Danger Rating Area:

a) The following chart displays the number of fires by statistical cause by fire danger rating area. For each statistical cause column, blue highlights the fewest fires for that statistical cause and red highlights the most fires.

		LIGHTNING	EQUIPMENT USE	SMOKING	CAMPFIRE	DEBRIS BURNING	RAILROAD	ARSON	CHILDREN	MISCELLANEOUS	
		Statistical Cause									
FDRA	**Acres**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Grand Total**
1	1,999,571	918	73	21	62	86	18	8	2	70	1,258
2	1,100,725	450	13	5	31	18	5	2	1	12	537
3	1,754,993	1,316	108	67	412	102	36	25	6	119	2,191
4	1,239,988	1,325	14	14	265	31	5	31	3	57	1,745
5	2,028,983	2,528	27	31	468	85	14	50	7	159	3,369
6	2,343,920	1,599	28	26	306	70	15	12	3	81	2,140
	10,468,180	8,136	263	164	1,544	392	93	128	22	498	11,240
	AVERAGE	1,356	44	27	257	65	16	21	4	83	1,873

b) The following chart displays the same data as above, but as a percentile of the total number of fires. This chart may be a little easier to interpret. Some observations:

(1) More than 72% of the fires historically have been lightning caused. FDRA 5 has had the most number of lightning caused fires by far, while FDRA 2 has had the least.

(2) Campfires have historically accounted for nearly 14% of fires, the next most common cause following lightning, all other causes account for a much smaller percentage of fires. FDRA 5 and 3 have historically had the highest numbers of campfire related fires.

FDRA	**Acres**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Grand Total**
1	1,999,571	8.17%	0.65%	0.19%	0.55%	0.77%	0.16%	0.07%	0.02%	0.62%	11.19%
2	1,100,725	4.00%	0.12%	0.04%	0.28%	0.16%	0.04%	0.02%	0.01%	0.11%	4.78%
3	1,754,993	11.71%	0.96%	0.60%	3.67%	0.91%	0.32%	0.22%	0.05%	1.06%	19.49%
4	1,239,988	11.79%	0.12%	0.12%	2.36%	0.28%	0.04%	0.28%	0.03%	0.51%	15.52%
5	2,028,983	22.49%	0.24%	0.28%	4.16%	0.76%	0.12%	0.44%	0.06%	1.41%	29.97%
6	2,343,920	14.23%	0.25%	0.23%	2.72%	0.62%	0.13%	0.11%	0.03%	0.72%	19.04%
	10,468,180	72.38%	2.34%	1.46%	13.74%	3.49%	0.83%	1.14%	0.20%	4.43%	100.00%
	AVERAGE	12.06%	0.39%	0.24%	2.29%	0.58%	0.14%	0.19%	0.03%	0.74%	16.67%

I. FIREFAMILY PLUS ANALYSIS

A. FireFamily Plus Analysis Settings

The following parameters were used to prepare each of the analysis runs:

Within a FDRA, run all weather stations and special interest groups (SIG) that make sense – some stations are not compatible to put into SIGS, others may limit the data years available to analyze.

- Fire Season (base): use June 1 – October 31.
- Data Years: use 20 years when available, 1993-2012, if less than 20 years available, use all available years.
- Analysis Period Length: 1 day
- Greenup Date: use 5/15
- Freeze Date: use 9/15
- Fire Cause: use all causes (both lightning & human cause)
- Large Fire Day: 20 acres and 300 acres used for statistical correlation; 300 acres used for fire business threshold setting.
- Multiple Fire Day: 3
- Fuel Models: For 2013 just used fuel model G; in 2011 ran fuel models C, G, H, K, T, U and determined that fuel model G generally performed best, or close to best.
- Variables: For 2013 used ERC for adjective, and BI for dispatch levels; in 2011 anlyzed dry bulb temperature, relative humidity, SC, ERC, BI, IC, 10hr, 100hr, 1000hr (temp, rh, 10, 100, 1000 hr are not fuel model dependent)

B. Threshold Setting

1. Using FireFamily Plus, statistical analysis was performed on several weather stations and SIGS (special interest groups, i.e., weather station combinations) for each FDRA (Fire Danger Rating Area) using Energy Release Component (ERC) Fuel Model G. Statistics were reviewed to eliminate stations/SIGS with poor correlation between ERC and fire history.

2. Potential adjective class thresholds were determined for the SIGs that possessed reasonable statistical correlation. For each FDRA, the SIG that required the least percentage of days to capture the highest percentage of 300 acre fire days was selected as the representative SIG.

   a) The breakpoint from low to moderate was selected at the point where a significant rate increase occurs in the number of fire days. This point is depicted by a slope change in the Cumulative Percentile Graph in FireFamily Plus. Additional sideboards included keeping the percentage of fire days in low below 16% and keeping the occurrence of 20+ acre fire days below 6%.

   b) The breakpoint from moderate to high was selected at the point where about 25% of the 20+ acre fire days occurred with the caveat of having a minimal percentage of 300+ acre fire days.

   c) The breakpoint from high to extreme was generally selected when 35-50% of the 300+ acre fire days occurred. For FDRAs 4, 100+ acre fire days were examined along with the number of 300+ fire days because of the low number of 300+ fire days in the analysis period. The breakpoint for 1000+ acre fires was also examined to determine if the breakpoint would be different than for 300+ acre fires. It was determined that the breakpoint selected for the 300+ acre fire days also worked well for the 1000+ acre fire days.

3. A separate breakpoint or Large Fire Threshold (LFT) was determined for PocketCard use. A more conservative approach for this threshold was established than for the extreme adjective class. Generally, this value was established when 15-35% of the 300+ acre fire days occurred so that firefighters would be aware that the 65-85% of the larger fires occurred once this threshold was reached.

4. The process used for selecting Dispatch Levels was similar to that used for Adjective Class. The threshold into high and extreme attempted to capture a higher percent of the 20+ acre and 300+ acre fires than the Adjective Class thresholds. Red dispatch level was generally set when 25-50% of the 300+ acre fire days occurred and yellow dispatch level when 15-20% of the 20+ acre fire days occurred.

Sta/SIG	Adj Class	bot range	top range	% AD	% FD	% LFD	LFD as % FD	% 20 ac
FDRA 1D	low	0	38	25%	10%	3%	2%	1%
90% 22 ac; 88 LFD	mod	39	57	32%	33%	21%	5%	23%
95% 193 ac; 50 LFD	high	58	73	27%	38%	46%	9%	44%
LF = 300 ac ; 39 LFD	extreme	74	99	16%	19%	31%	11%	32%
FDRA 2E	low	0	40	28%	9%	0%	0%	5%
90% 134 ac; 24 LFD	mod	41	59	30%	33%	11%	3%	18%
95% 3975 ac; 15 LFD	high	60	76	26%	39%	26%	8%	39%
LF = 300 ac ; 19 LFD	extreme	77	99	15%	20%	63%	27%	39%
FDRA 3B	low	0	37	25%	11%	0%		3%
90% 8.5 ac; 148 LFD	mod	38	57	33%	38%	5%		27%
95% 50 ac; 76 LFD	high	58	73	28%	35%	45%	3%	49%
LF = 300 ac; 22 LFD	extreme	74	99	14%	15%	50%	9%	21%
FDRA 4I	low	0	37	20%	15%	0%		0%
90% 1.5 ac; 105 LFD	mod	38	57	40%	41%	6%		8%
95% 4.2 ac; 66 LFD	high	58	71	27%	30%	25%	2%	29%
LF = 100 ac; 16 LFD	extreme	72	99	14%	14%	69%	13%	63%
FDRA 5M	low	0	40	27%	13%	0%		
90% 1.5 ac; 171 LFD	mod	41	59	33%	38%	4%	0%	12%
95% 5 ac; 106 LFD	high	60	71	23%	29%	38%	3%	41%
LF = 300 ac; 24 LFD	extreme	72	99	17%	20%	58%	7%	47%
FDRA 6H	low	0	39	28%	10%	0%		2%
90% 1.5 ac; 104 LFD	mod	40	60	35%	35%	14%	1%	22%
95% 6 ac; 62 LFD	high	61	75	25%	38%	21%	1%	42%
LF = 300 ac; 14 LFD	extreme	76	99	12%	17%	64%	9%	33%