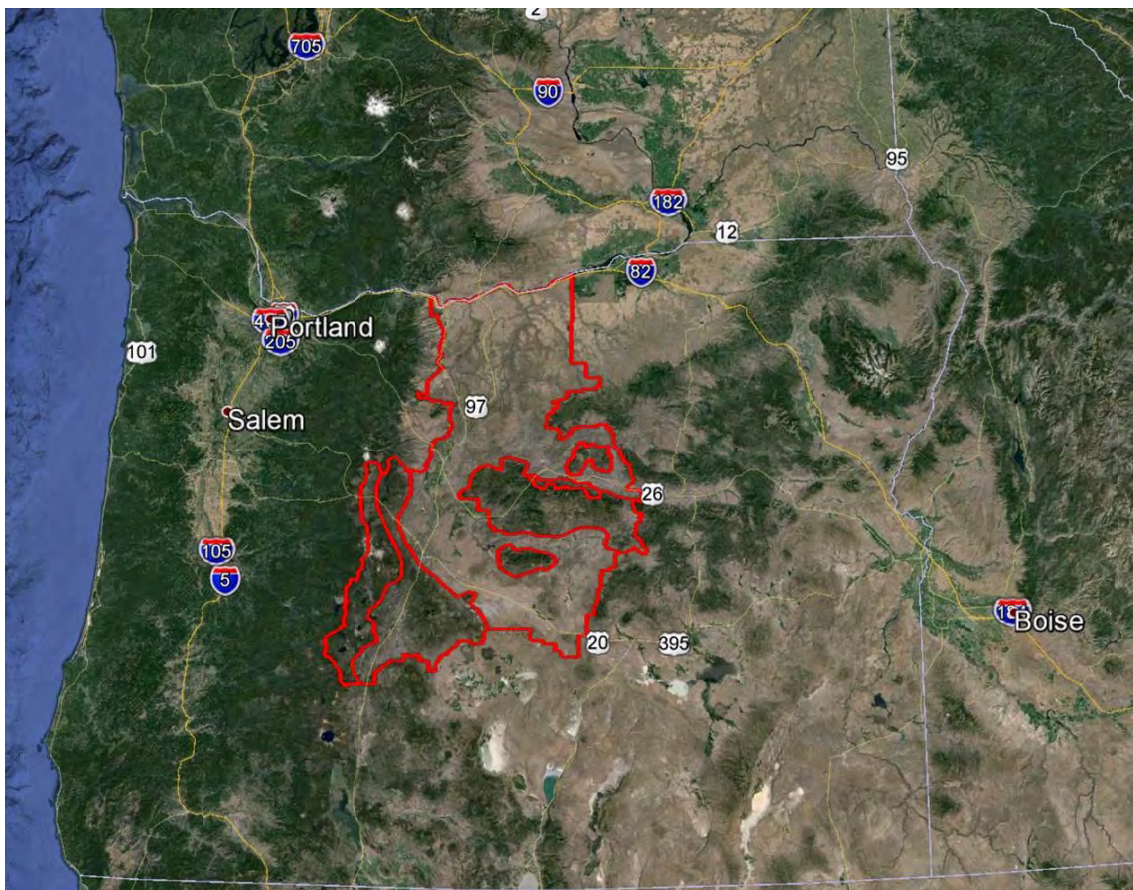


CENTRAL OREGON INTERAGENCY FIRE MANAGEMENT FIRE DANGER OPERATING PLAN

US Forest Service: Deschutes National Forest
Ochoco National Forest

Oregon Department of Forestry: Central Oregon District, Prineville/Sisters Unit

Bureau of Land Management: Prineville District



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2014 Plan Approval

This Fire Danger Operating Plan is approved and will remain in effect until rescinded or revised.



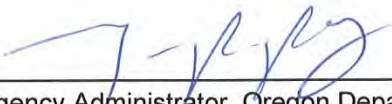
Agency Administrator, US Forest Service
Deschutes National Forest

5-30-14
Date




Agency Administrator, US Forest Service
Ochoco National Forest

May 30, 2014
Date



Agency Administrator, Oregon Department of Forestry
Central Oregon District

6/20/14
Date



Agency Administrator, Bureau of Land Management
Prineville District

6/16/14
Date

Plan Prepared
May 14, 2014
By
Central Oregon Fire Danger Technical Group

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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 8.3 million acres in Central Oregon. Agencies with wildfire protection responsibilities covered by this plan include:

- USFS, Deschutes National Forest (DEF)
- USFS, Ochoco National Forest (OCF)
- BLM, Prineville District (PRD)
- ODF, Central Oregon District, Prineville/Sisters Unit (COD)

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 Fire Danger Operating Plan (FDOP) has been developed to describe the setup and management of the National Fire Danger Rating System (NFDRS) for all wildland fire agencies in the Central Oregon Fire Management. This plan was prepared to assist in planning and operational decisions relative to fire danger, operational preparedness, resource needs, personnel briefings, and overall situational awareness.

The intent of this plan is to provide guidance to decision makers. The plan should be reviewed and updated triannually.

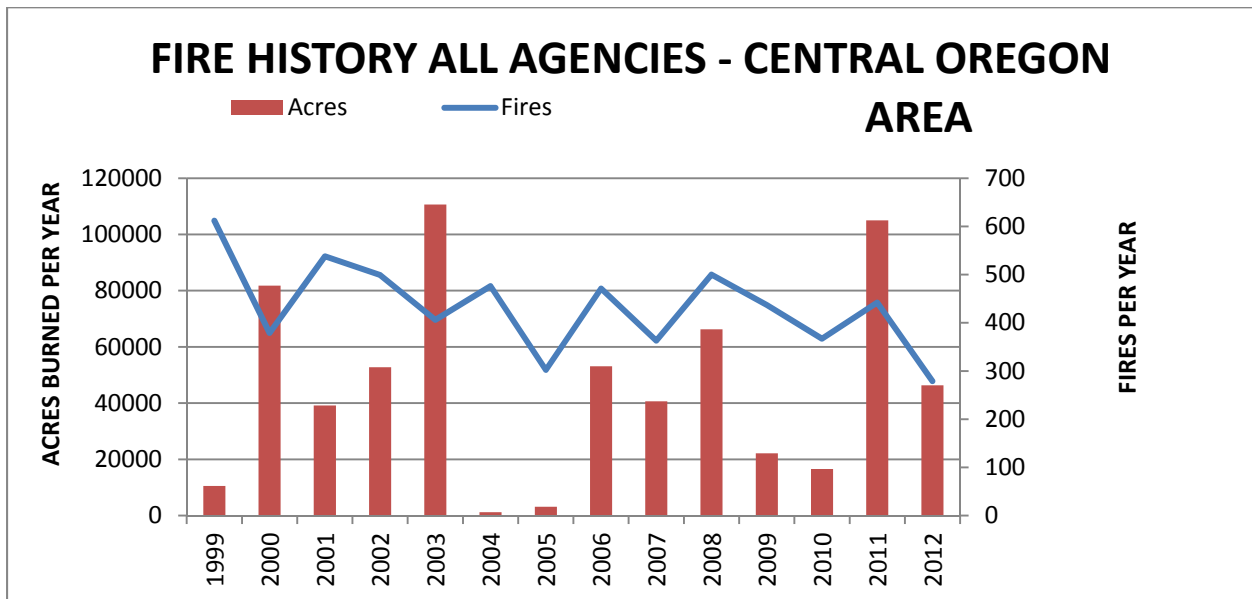
II. OBJECTIVES

1. Develop a coordinated approach to fire danger/preparedness decisions across Central Oregon, which ranges from the peak of the Cascade Mountains in the west, through some of the highest site productivity timber land in Oregon east of the Cascades, across scab rock flats and lava flows to the vast sagebrush desert to the east. 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 Central Oregon area has a heavy wildfire load both in numbers of fires and size of fires. For the period 1999 through 2012 there has been an average of 434 fires per year with an average annual acreage burned of 46,382 acres for the combined wildland fire agencies in the Central Oregon area. The minimum number of fires in a year was 279 in 2012 and the minimum number of acres burned in a year was 1221 in 2004. The maximum number of fires in a year was 612 in 1999 and the maximum number of acres burned in a year was 110,646 in 2003.



The majority (65%) of fires occur in July and August. Approximately 57% of fires are caused by lightning. Approximately 74% of fires are suppressed at a final size of 1/4 acre or less, with approximately 99% contained at less than 1,000 acres. A detailed set of graphs/tables of fire business is available in Appendix F.

To develop the combined fire history for all wildland agencies in the Central Oregon 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 Central Oregon area was acquired, quality control checked and duplicates and erroneous data eliminated is located under Appendix E.

B. Weather Stations

There are 16 permanent Remote Automated Weather Stations (RAWS) in the Central Oregon 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 15 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. One station (Tepee Draw) was not used due to poor historic data, missing data, instrument errors and 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 Central Oregon 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 10m Digital Elevation Model (DEM), LANDFIRE fuels/vegetation data and PRISM climate data.

A series of meetings were conducted with Central Oregon 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 those differences.

Initially the fire danger rating areas were delineated by combining polygons of the LANDFIRE existing 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 LANDFIRE 2010 40 Fuel Models, consistent with homogenous areas of vegetation, climate, and topography.

Climate - Chose Prism data over Koeppen as Prism includes precipitation.

Topography – Chose 1000 foot increments

Where FDRA boundaries were close to administrative boundaries, or boundaries easier to define for administrative purposes (including dispatch protocols), the FDRA boundaries were adjusted.

Details of the analysis are included in Appendix B.

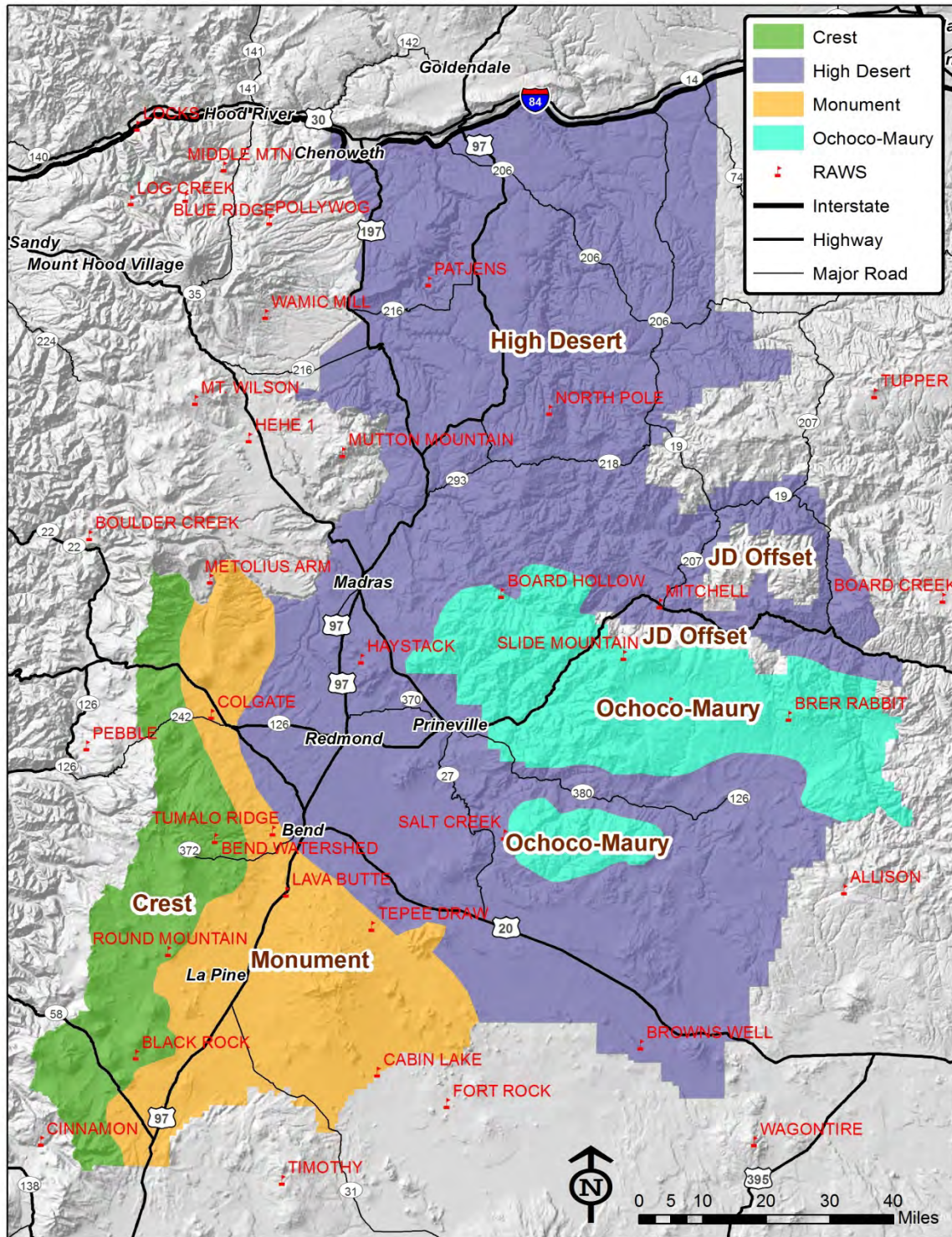
Four fire danger rating areas have been delineated for the 2014 plan, refined from the five areas that were analyzed in the effort at producing a plan draft in 2011/2012. The contribution of fuels, or weather, or topography was weighed as to which would have the greatest effect on wildfire. Following is a table with descriptive parameters:

FDRA	FDRA Name	Acres	ELEVATION (FT)			
			MEAN	MIN	MAX	RANGE
1	Crest	709,990	5,266	2,979	10,295	7,316
2	Monument	1,258,773	4,596	1,942	7,946	6,004
3	High Desert	5,141,937	3,186	157	6,375	6,218
4	Ochoco	1,008,298	4,340	2,303	8,652	6,349
4	Mauzy	141,154	4,166	1,380	7,924	6,544
	Total	8,260,152				

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 – Crest:** Mostly moist forest types (fir and hemlock), including significant areas of pine forest and regeneration, with a wide range of moderate to higher elevations and steep slopes characterize this area. The Mount Jefferson, Mount Washington, Three Sisters, Waldo Lake and Diamond Peak Wilderness Areas are also included in the FDRA. A relatively high number of lightning fires correspond with a fairly low number of large fires. NFDRS Fuel Model U. Fire Behavior Prediction System (FBPS) Fuel Model 8. Scott & Burgan FBPS Fuel Models 165/TU5, 185/TL5.
2. **FDRA 2 – Monument:** Mostly Ponderosa pine – Lodgepole pine forest types on pumice soils, with a significant amount of pine forest regeneration on USFS ownership. Understory vegetation commonly consists of brush such as manzanita or bitterbrush, and/or grasses. 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. NFDRS Fuel Model H. FBPS fuel models 2, 6, 9. S&B FBPS fuel models 122/GS2, 183 TL3.

3. FDRA 3 – **High Desert**: This is generally lower elevation and drier country. Primary vegetation is juniper and sagebrush and mostly fine fuel. This FDRA includes both the Deschutes and Lower John Day River valleys. There are some large blocks of agricultural area within the FDRA; these are included for convenience, but are not part of the analysis. NFDRS Fuel Model T. FBPS fuel model 6. S&B FBPS 101/GR1, 102/GR2, 122/GS2.
4. FDRA 4 – **Ochoco-Maury**: Predominantly Ponderosa pine forest and woodland with some mixed conifer forest interspersed. Understory vegetation commonly consists of brush, such as manzanita or bitterbrush, and/or grasses. NFDRS Fuel Model G. FBPS fuel models 2, 6, 9. S&B FBPS 165/TU5, 188/TL8.



2014 Central Oregon Fire Danger Rating Areas

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. The publication “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 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 agencies 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 fires that exhibit high resistance to control.

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

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) 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.

Fire Danger Rating and Color Code	Description	Central Oregon Analysis
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 woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.	Historically, there have been few to no fires at this range of index values.
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.	Historically, fires have occurred during this range of index values, but few to no large fires (as defined in the analysis) have occurred.
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 attacked successfully while small.	Historically, large fires have occurred during this range of index values. There may be a lower probability of high intensity and high resistance to control fires than in the Extreme category. Large fires that occur during this range of index values may be most related to fine fuels parameters.
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 into heavier fuels.	Not Used
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.	Historically, large fires have occurred at a higher rate, more fires for a given number of days, than during the High range of index values. Large fires may 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 fuels being more available to burn.

V. FIRE-DANGER BASED DECISIONS/PRODUCTS

A. Public Fire Danger Signs – Adjective Rating

A coordinated adjective level based on fire danger will be utilized by all agencies within the Central Oregon 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.

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 May 1 and October 31, during the analysis period (1999-2012), that had a value within that range.

FDRA	1		2		3		4	
FDRA Name	Crest		Monument		High Desert		Ochoco-Maury	
Stations/SIG	Round Mountain Blackrock		Lava Butte Colgate Cabin Lake		North Pole Ridge Patjens		Brer Rabbit Board Hollow	
Fuel Model	U		H		T		G	
Index	ERC	% DAYS	ERC	% DAYS	ERC	% DAYS	ERC	% DAYS
LOW	0	18	0	15	0	18	0	18
MODERATE	18	33	18	23	5	25	37	30
HIGH	33	32	26	41	12	35	57	30
EXTREME	42	17	36	21	19	22	74	22

B. Preplanned/Incident Dispatching

A coordinated dispatch level based on fire danger will be utilized by all agencies within the Central Oregon area using a four level system described by colors, delineated by fire danger rating area and tracked by Central Oregon Interagency Dispatch Center (COIDC). The dispatch level color categories indicate expected differences in fire business. As dispatch levels change, production capabilities of firefighting 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 May 1 and October 31, during the analysis period (1999-2012), that had a value within that range.

FDRA	1		2		3		4	
FDRA Name	Crest		Monument		High Desert		Ochoco-Maury	
Stations/SIG	Round Mountain Blackrock		Lava Butte Colgate Cabin Lake		North Pole Ridge Patjens		Brer Rabbit Board Hollow	
Fuel Model	U		H		T		G	
Index	BI	% DAYS	BI	% DAYS	BI	% DAYS	BI	% DAYS
GREEN	0	14	0	14	0	19	0	19
BLUE	14	28	12	28	18	26	39	29
YELLOW	23	34	16	40	40	32	54	30
RED	30	24	21	18	57	23	68	22

C. Fire Danger Pocket Cards for Firefighter Safety

There is one Pocket Card for each of the four FDRAs comprising the Central Oregon area. The Pocket Cards include four charts, one for each FDRA. The Pocket Cards are 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

Central Oregon Interagency Dispatch Center will post all seasonal charts updated weekly to the website: <http://www.fs.fed.us/r6/centraloregon/fire/conditions/nfdrs/index.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 COIDC 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. The Dispatch Levels identified in this Central Oregon Fire Danger Operating Plan may serve as a guide in making this determination.

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 aid 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. The Dispatch Levels identified in this Central Oregon Fire Danger Operating Plan may serve as a guide in making this determination.

F. Public Use Restrictions/Closures

Determined by agency/unit. The Adjective Ratings identified in this Central Oregon Fire Danger Operating Plan may serve as a guide in making this determination. Participating agencies may coordinate implementation of Public Use Restrictions to increase public awareness regarding current fire danger potential and to deliver a consistent fire prevention message to the public.

G. Industrial Restrictions/Closures

Determined by agency/unit. The Adjective Ratings identified in this Central Oregon Fire Danger Operating Plan may serve as a guide in making this determination. Participating agencies may coordinate implementation of Industrial Restrictions to provide a consistent fire danger message to the industrial partners/cooperators.

H. Public News Releases

Public news releases related to fire danger should utilize information consistent with this Fire Danger Operating Plan. During periods of significant fire danger potential, participating agencies may coordinate news releases to deliver a consistent fire danger awareness message to the public.

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) Pocket Card Analysis - A large fire threshold has been analyzed and described for the Pocket Card by FDRA.
- b) Adjective Level Analysis - The adjective level thresholds are based on analyzed and described historic fire occurrence by FDRA.

A 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 97th percentile and frequently below the 90th percentile.

2. Episode – Forecast Event Considerations

- a) Multiple ignitions such as forecast lightning, especially when not accompanied by precipitation, are 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 Initial Attack 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 accompanied by dry fuel conditions.
- d) Prolonged low relative humidity events, such as provided by subsidence inversions.
- e) Ignitions 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. The annual cycle is for stations to have the herbaceous 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 herbaceous 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 station catalogs are tracked in WIMS; station catalogs should be coordinated with the Fire Danger Technical Group.

B. Daily Schedule

Personnel at Central Oregon Interagency Dispatch Center (COIDC) will access WIMS daily and enter observations for stations in the 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 which could possibly indicate instrument errors.

2. Enter Observations

All observations will be for the hourly weather record closest to 1300 hours. For stations with transmit times more than 30 minutes after the hour, a 1200 hour reading will be the observation time, all the rest will be a 1300 hour observation time. State of the weather will be selected by WIMS based on solar radiation readings. WIMS will also automatically set the "Wet Flag" to "Y" when appropriate, as described in the most current WIMS Technote or Help Desk guidance. WIMS tasks should be accomplished by 1500 hours each day, so that the observations will be available to the National Weather Service to enter trend forecasts which will allow 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 Central Oregon_NFDRS_Tracking will be opened, the "Import_DIDX_DOBS" macro executed which will automatically update the workbook. Instructions will be stored with the Excel Workbook.

C. Large Fire Support

1. Data used for this 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 Central Oregon 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 NFDRS technical specialists to participate in the maintenance, review, and update of this plan. The following are specific individuals by agency or Dispatch Center:

- o COFMS (Central Oregon Fire Management Service = Deschutes NF, Ochoco NF, Prineville BLM):
Katharine Hetts, Nate LeFevre, Kevin Stock, Dave Robertson, Jeff Bishop, Don Tschida, James Osborne
- o ODF, Central Oregon District, Prineville/Sisters Unit: Boone Zimmerlee, Gordon R. Foster, Kevin Benton
- o COIDC (Central Oregon Interagency Dispatch Center): Valerie Reed, Lael Gorman
- o Walker Range Fire Protection Association: Mike Carlson

Members of the Fire Danger Technical Group will monitor NFDRS to ensure validity, coordinate/communicate 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: appropriate observation selection (time, SOW, wet flag, consistency), station management in WIMS (herbaceous state, catalog information), station maintenance (instrument errors, transmit times) and station siting (eliminate redundant/inappropriate sites, propose new sites where necessary/appropriate).

The technical group will coordinate with fire managers from their unit/s 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

Personnel responsible for maintenance of weather stations in the plan area:

- o COFMS: Phil Henderson
- o ODF: Gordon R. Foster

The station owner is the contact for all issues regarding station management in WIMS and station maintenance.

D. Dispatch Center

Central Oregon Interagency Dispatch Center (COIDC) 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/BLM Division 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. The aforementioned DFMOs/Unit Foresters, known collectively as “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

The COFMS Fire Staff Officer, the Deschutes NF and Ochoco NF Forest Supervisors, Prineville BLM District Manager, and the ODF District Forester will use this Fire Danger Operating Plan and NFDRS outputs as a tool to coordinate and to make informed fire related decisions. The program managers/agency administrators are ultimately responsible for ensuring this plan is maintained, utilized and communicated.

VIII. PROGRAM NEEDS

A. Weather Station 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.

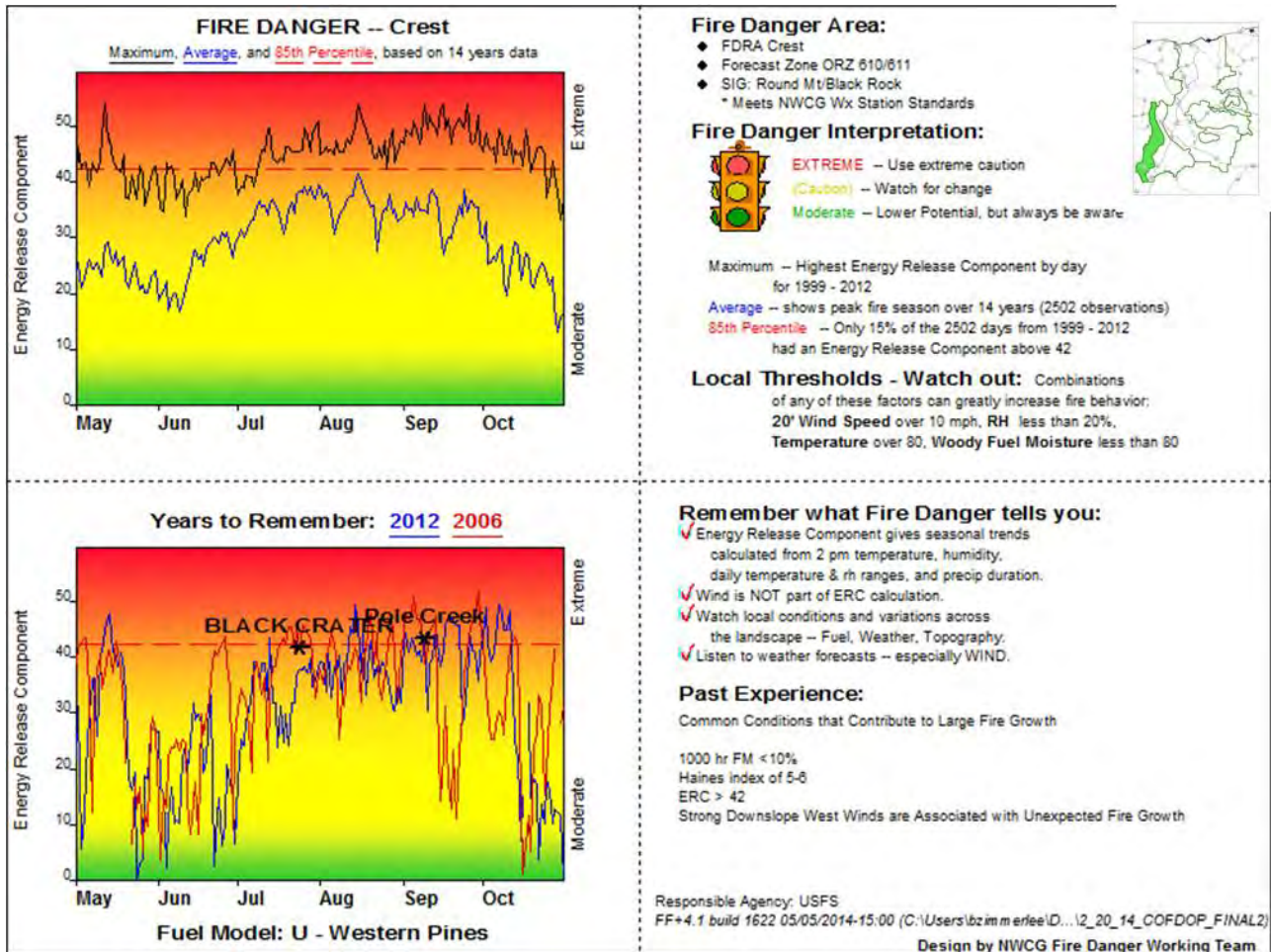
B. Training

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.

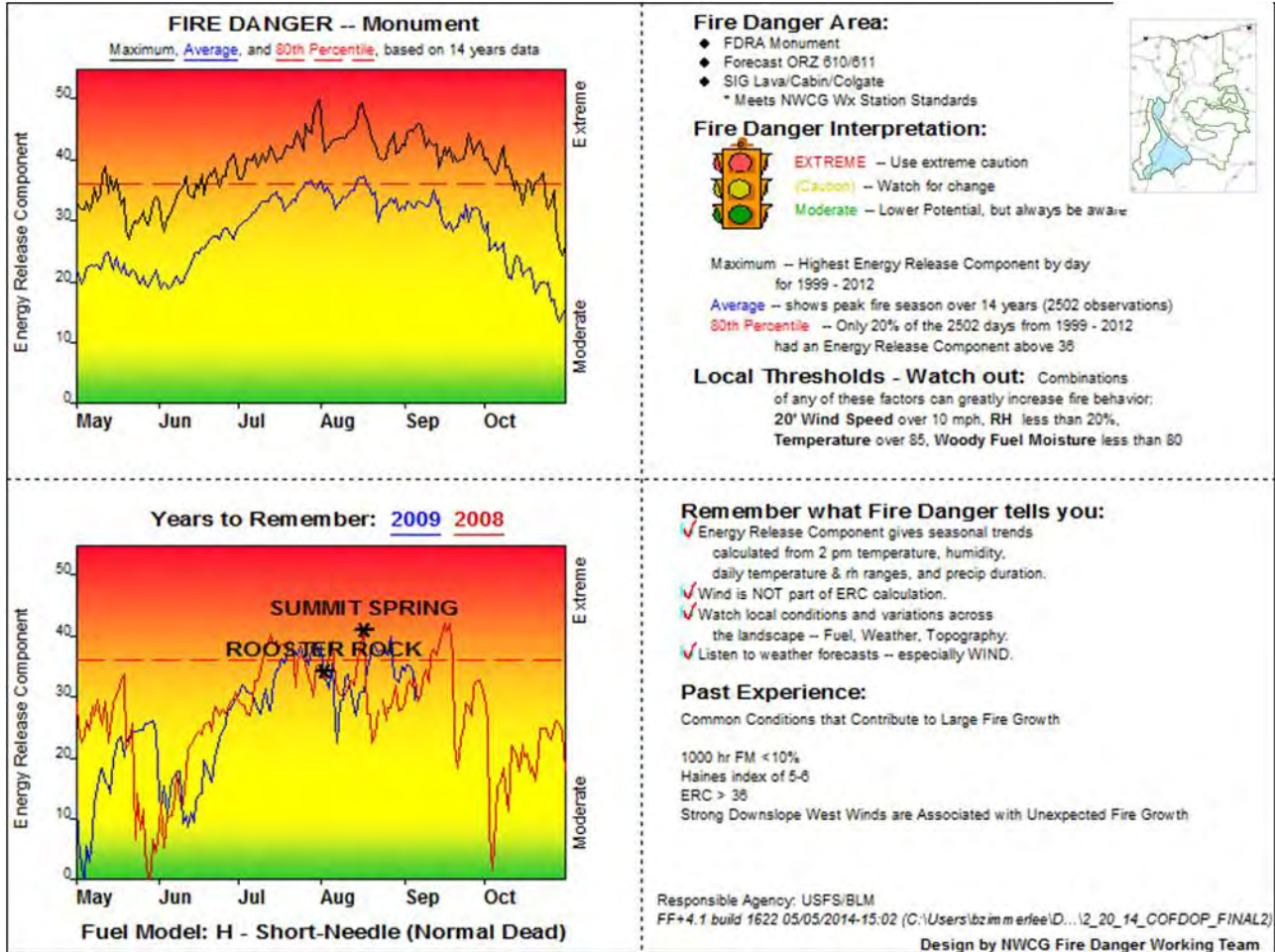
IX. APPENDIX

A. Pocket Cards

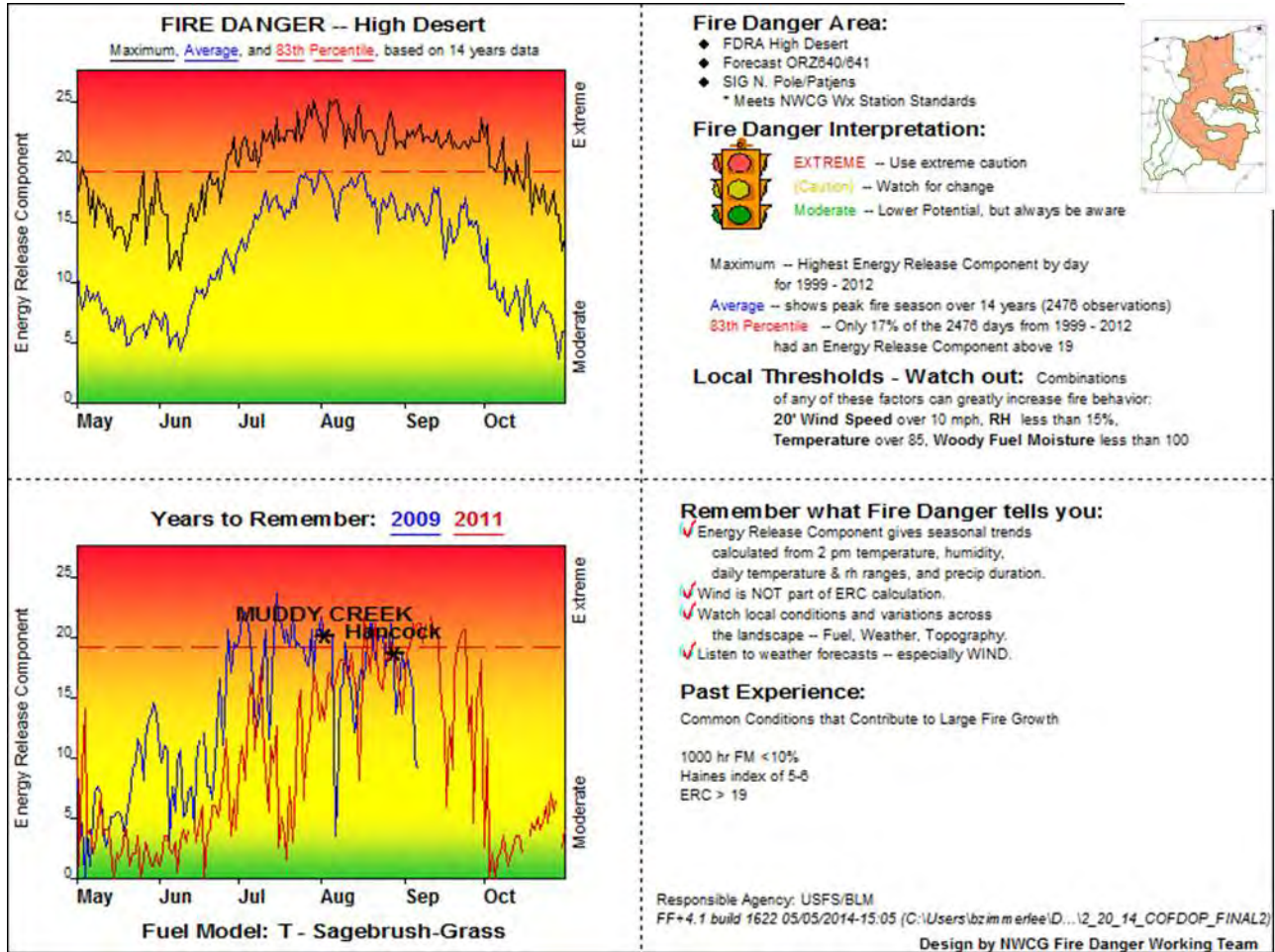
1. Pocket Card – Crest



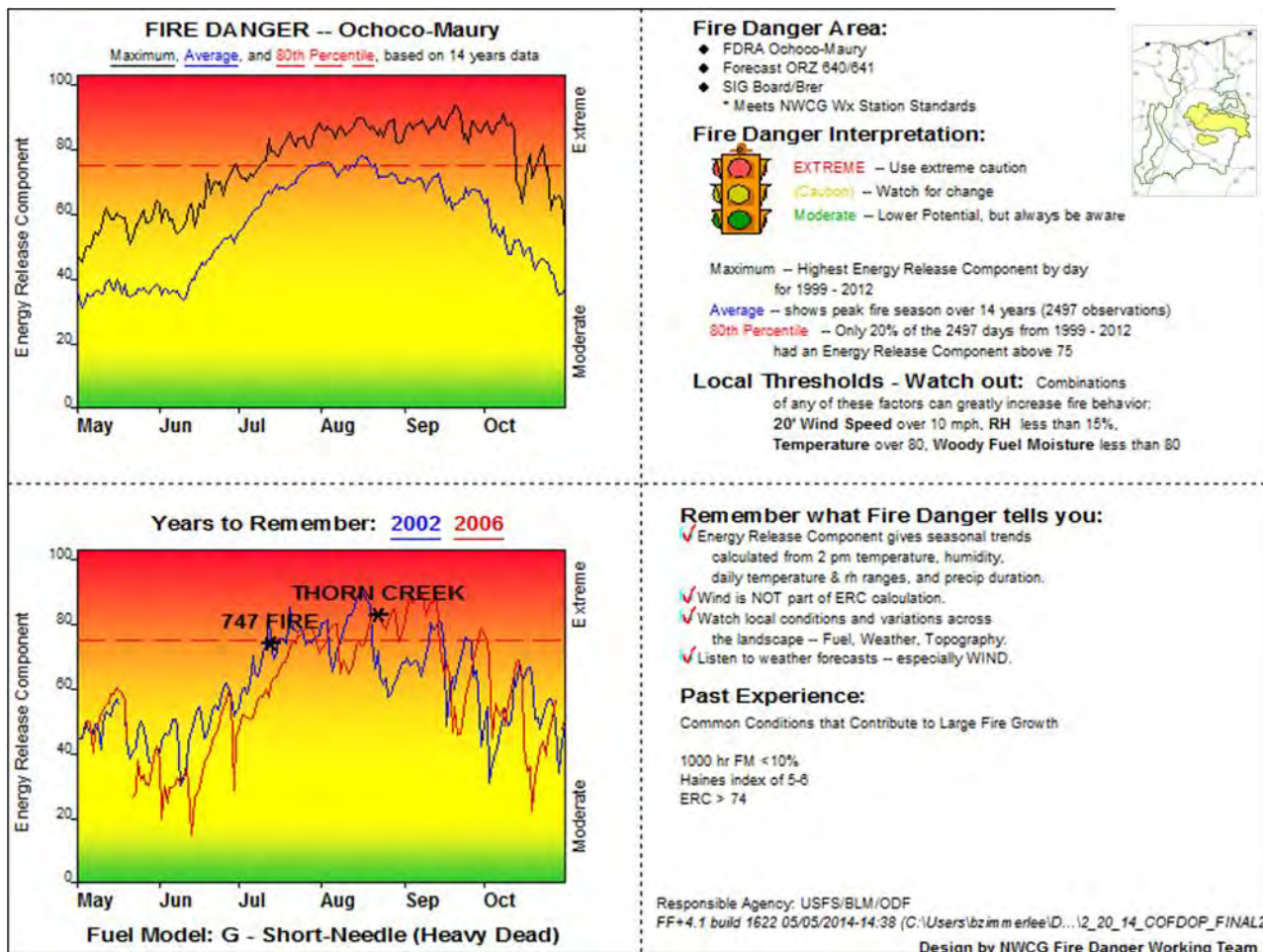
2. Pocket Card – Monument



3. Pocket Card – High Desert



4. Pocket Card – Ochoco – Maury



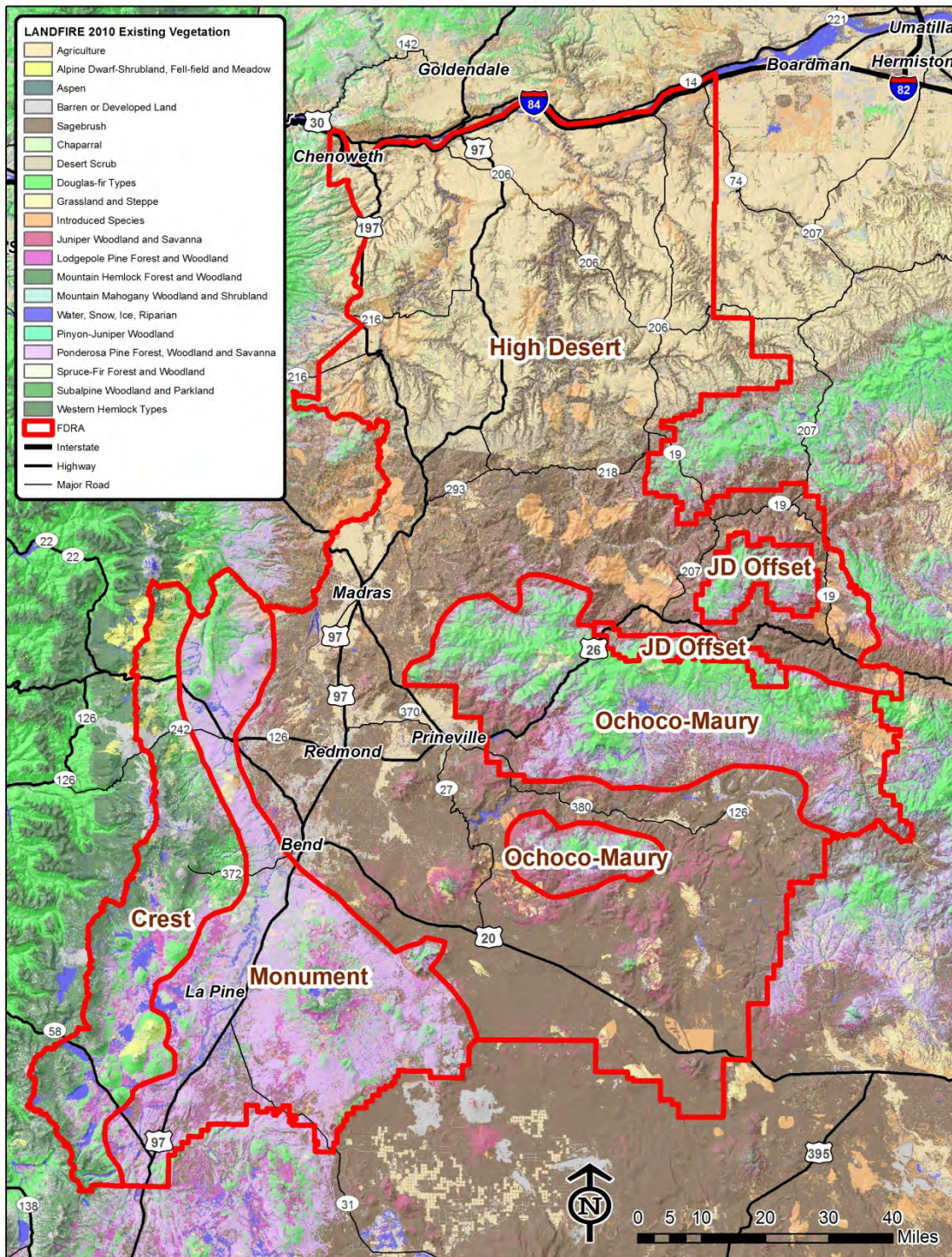
B. Fire Danger Rating Analysis

1. Vegetation

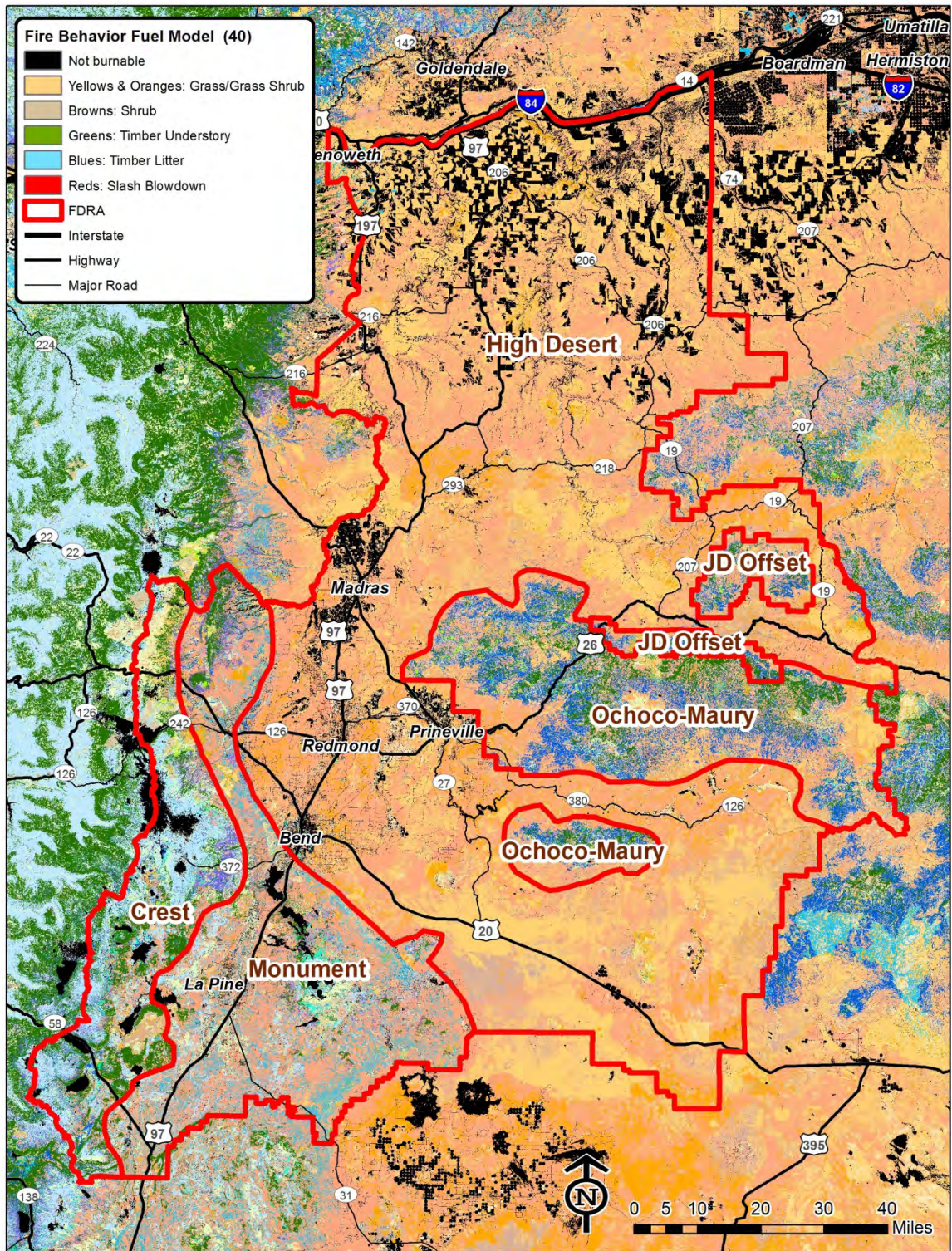
Following is a map with LANDFIRE 2010 Existing Vegetation.

Vegetation was delineated based on these categories, combined with categories based on Scott & Burgan's 40 Standard Fire Behavior Fuel Models (Map 2 below). Existing Vegetation and the 40 Fuel Models occupied a large enough area to warrant a different fire danger decision than adjacent areas.

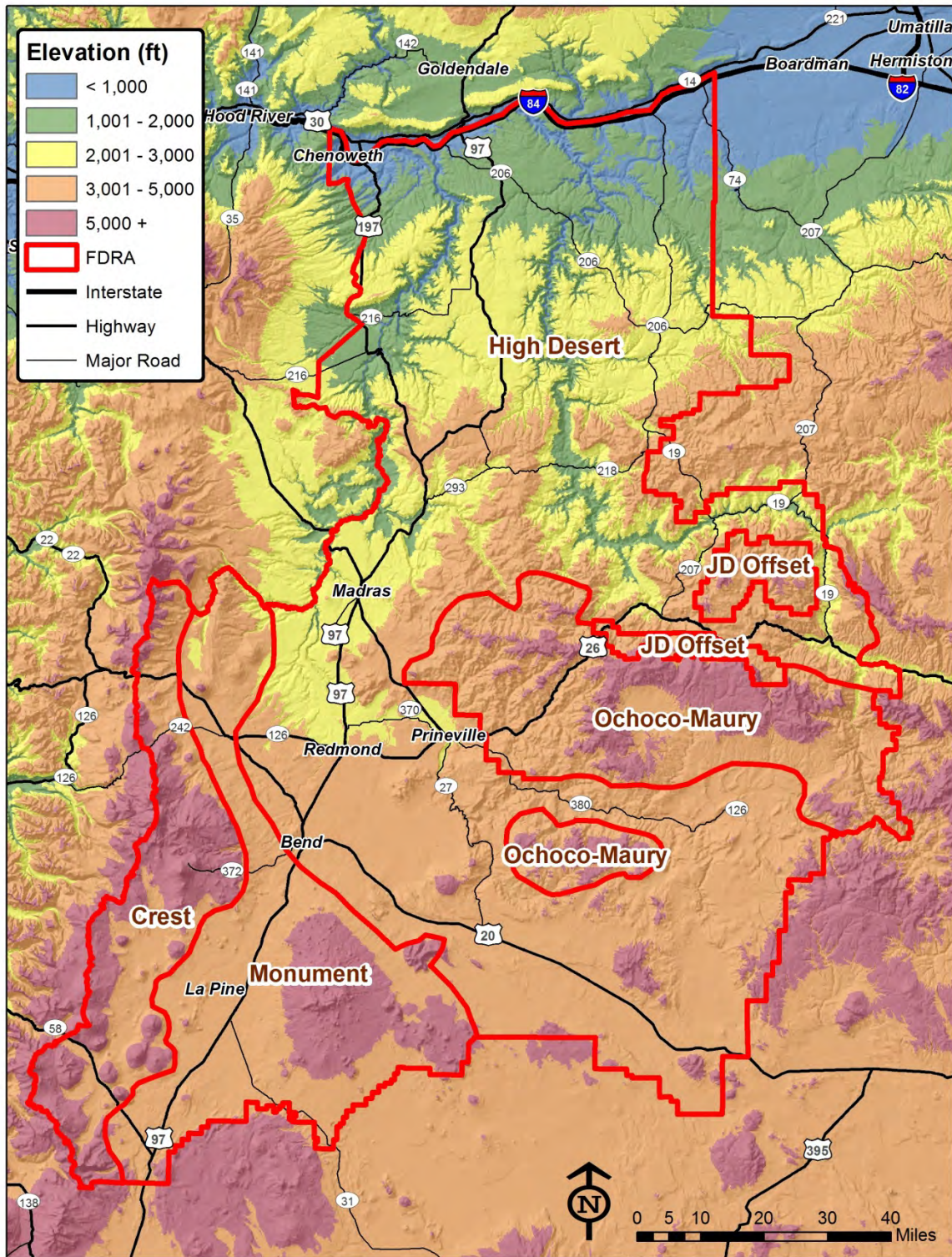
2014 Central Oregon FDRAs - Vegetation



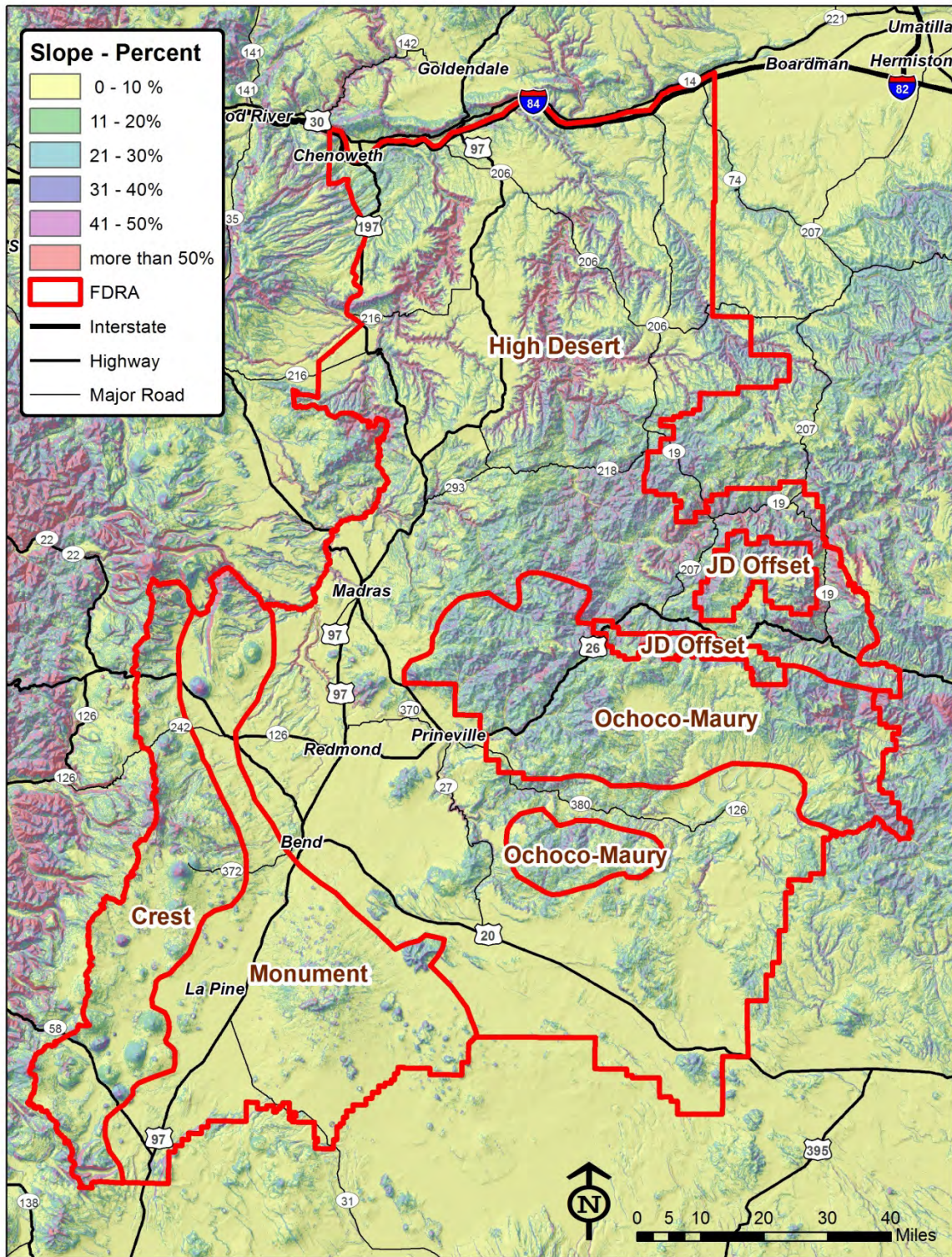
2. Vegetation: (Scott & Burgan 40 Fire Behavior Fuel Models)



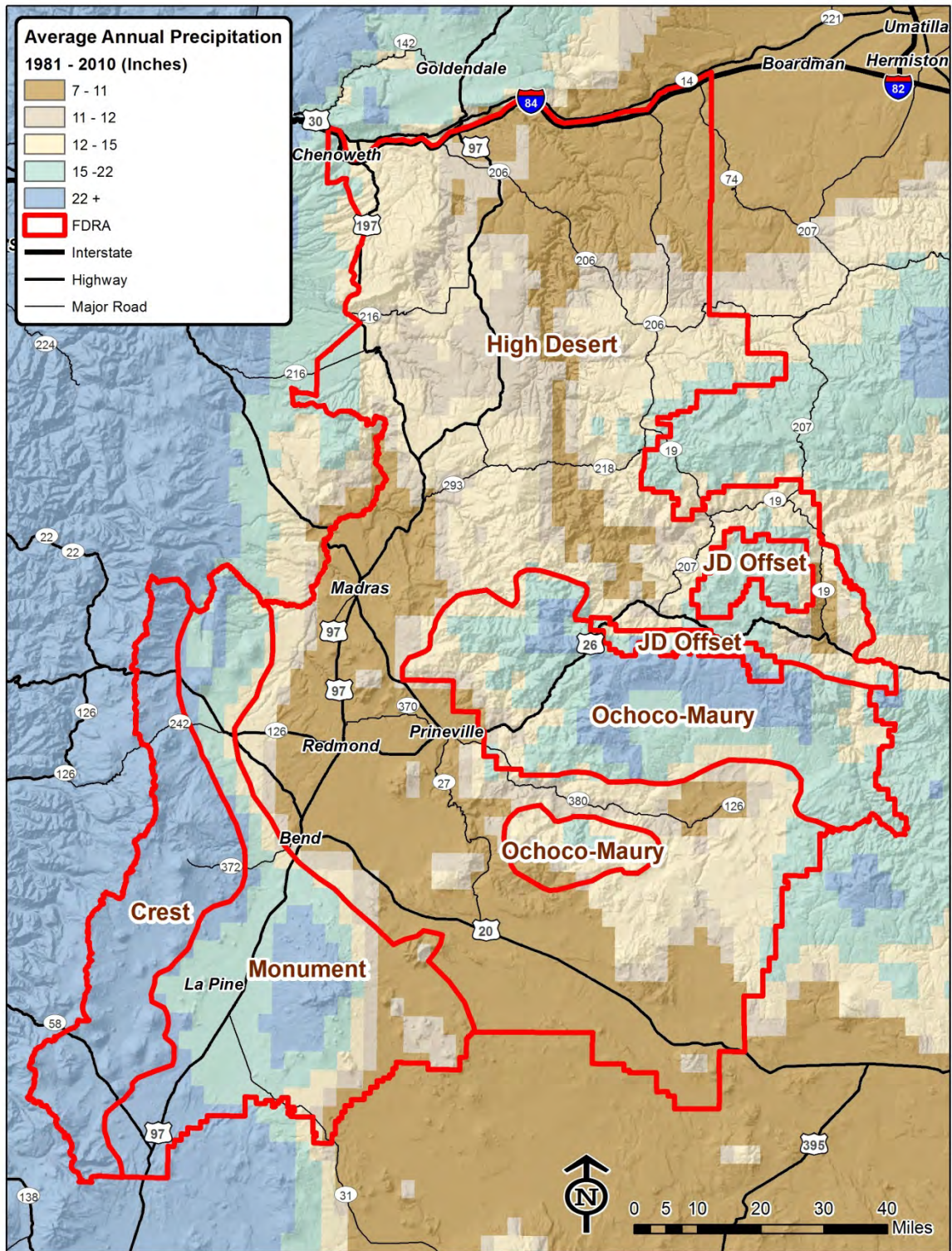
3. Elevation (10m Digital Elevation Model – DEM)



4. Slope (Percent)

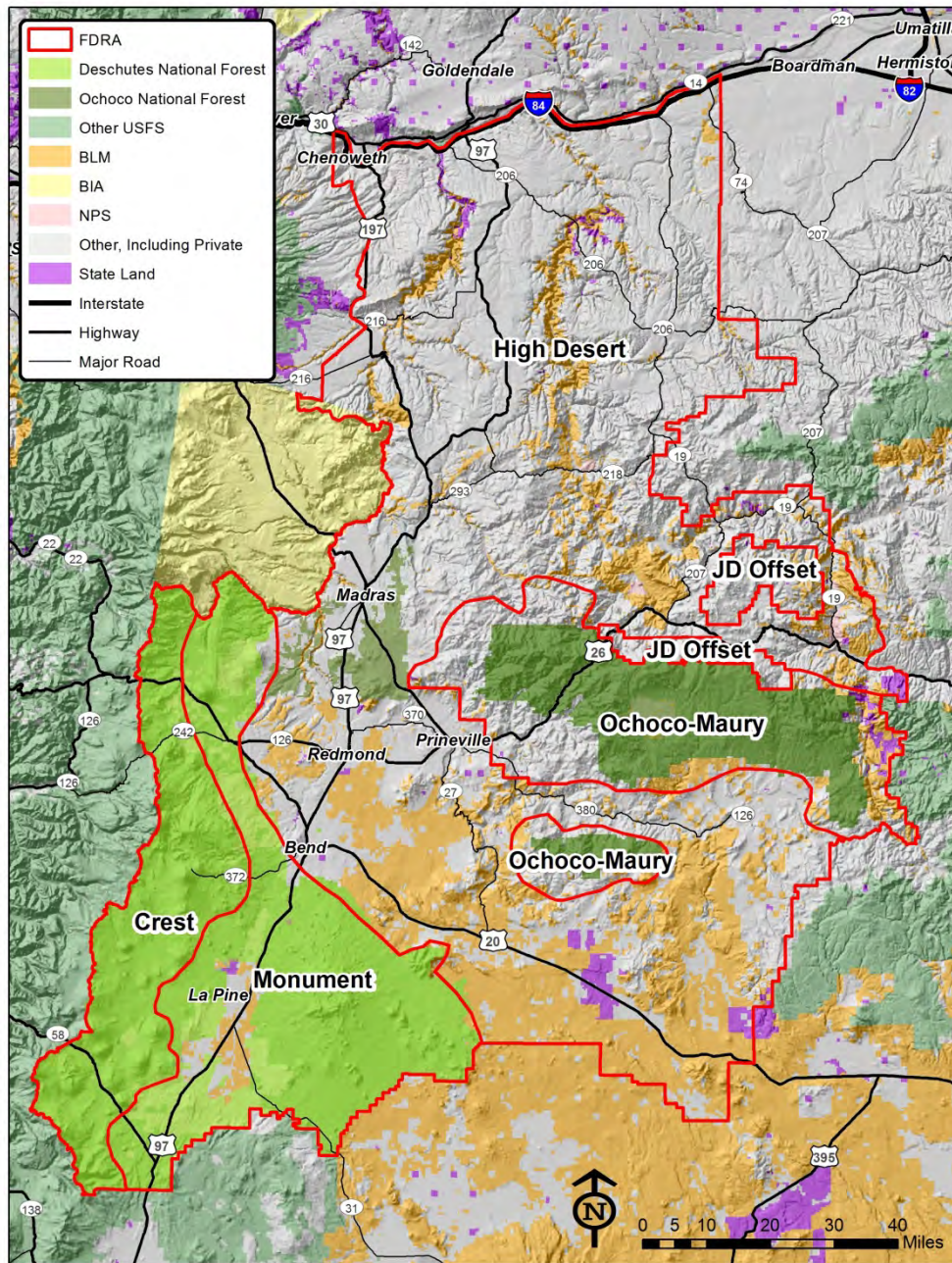


5. Climate – 30 year average annual precipitation, PRISM data



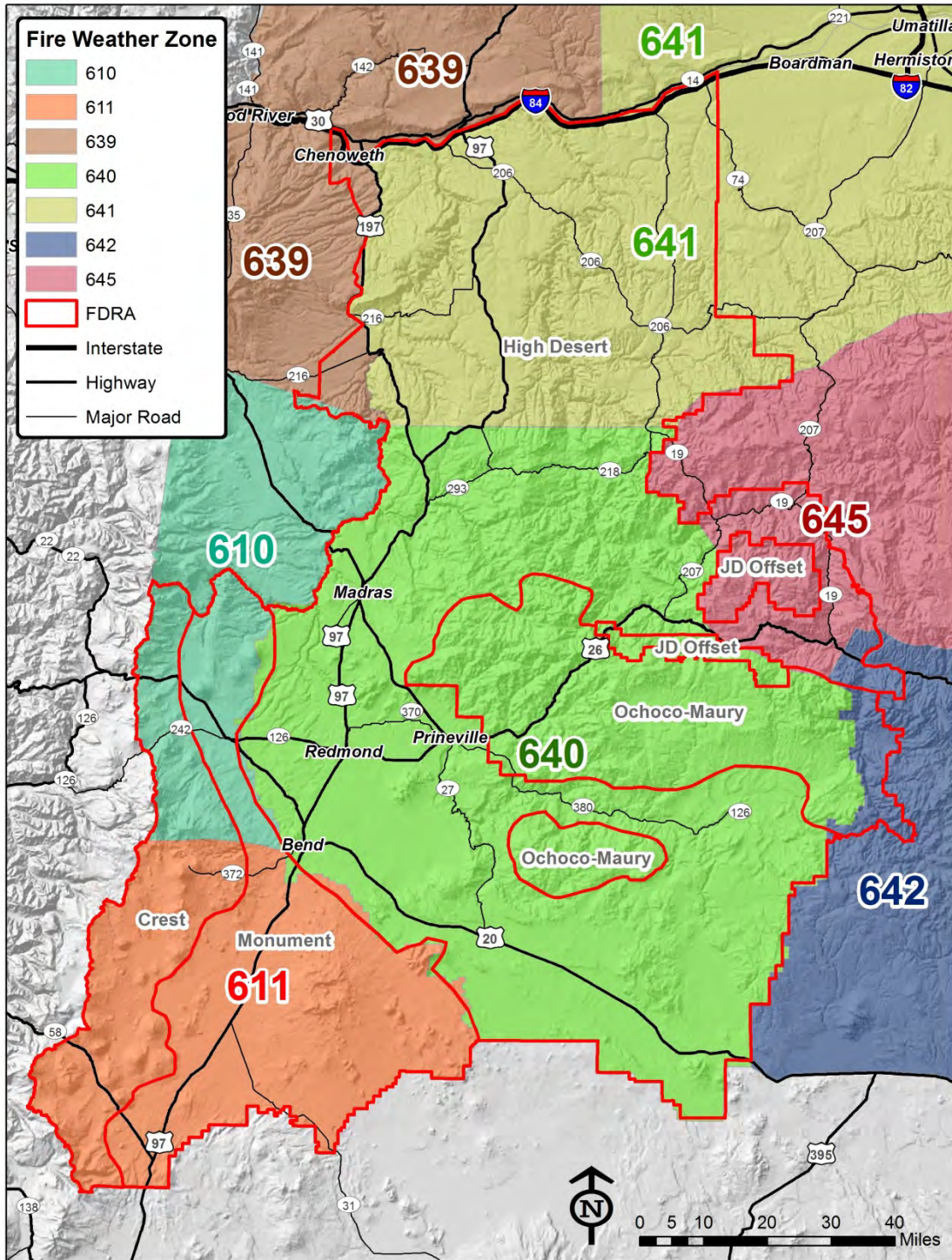
6. Ownership / Protection / Administrative Boundaries

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 were 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 desirable 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.



7. Fire Weather Forecast Zones

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



8. Fire Danger Rating Area comparison:

FDRA	FDRA Name	Acres	ELEVATION (FT)			
			MEAN	MIN	MAX	RANGE
1	Crest	709,990	5,266	2,979	10,295	7,316
2	Monument	1,258,773	4,596	1,942	7,946	6,004
3	High Desert	5,141,937	3,186	157	6,375	6,218
4	Ochoco	1,008,298	4,340	2,303	8,652	6,349
4	Maury	141,154	4,166	1,380	7,924	6,544
	Total	8,260,152				

C. Weather Data Quality Control Processing

Central Oregon 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 approximately 6/15/2001 data is observations only, and hourly data from approximately 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 a manual deletion of impossible readings and flagging of unlikely readings based on specific criteria.
- Allows manual checking, 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.

The following table is the summary of the stations analyzed and narrative of the highlights.

D. RAWS Network

Station #	Station Name	Elev	FDRA	Owner	WRCC dates	QC	QC Weather Data Comments
353402	Cabin Lake	4545	2	FS	1985-2012	yes	no outliers, generally good data
353342	Black Rock	4880	1	FS	1985-2012	yes	replaced missing data with averages from 3 other stations which leveled out 7/16/08 woody, herb & 1000hr. Generally good data.
352711	Badger	5680	4	FS	1985-2012	yes	replaced missing data with averages from 3 other stations which leveled out 9/2/04 woody, herb & 1000hr. Generally good data.
352701	Cold Springs	4695	4	FS	1985-2012	yes	no outliers, generally good data, except for a block of missing data that was not in fire season
352620	Colgate	3280	1	FS	1987-2012	yes	basically good data
352618	Lava Butte	4655	2	FS	1987-2012	yes	basically good data, several minimum temp outliers corrected, 2000, 2001, 2005
352208	Brer Rabbit	5900	4	FS	1993-2012	yes	replaced missing data 1/25/06-8/9/06 which leveled the woody, herb & 1000hr.
352207	Slide Mtn	5700	4	FS	1985-2012	yes	lots of missing data
352107	Haystack	3240	3	FS	1985-2012	yes	several minimum temp outliers corrected, 2002. precip outlier correction 2005
351001	Patjens	2230	3	BLM	1990-2012	yes	no outliers, pretty good data
350915	North Pole Ridge	3500	3	BLM	1990-2012	yes	pretty good data
352109	Board Hollow	4200	4	ODF	1986-2012	yes	some outliers corrected, pretty good data
352605	Round Mtn	5900	1	FS	1990-2012	yes	pretty good data
352622	Tepee Draw	4740	2	FS	2004-2012	no	new station since 2004, lots of missing data and several outliers
352712	Salt Creek	4200	3, 4	BLM	1986-2012	yes	
353428	Browns Well	4500	3, 4	FS	1990-2012	yes	several outliers corrected, basically good data

E. Fire History Quality Control Processing

Central Oregon Fire Danger Operating Plan Description of Fire History Quality Control Processing 1/27/2014

Central Oregon Fire History Data Sources:

To create the fire history data for the Central Oregon Fire Danger Operating Plan Area, two datasets were used. One was created by the Oregon Climate Change Research Institute (OCCRI) and covered the years 1992-2010. The other dataset was a Central Oregon Interagency Dispatch Center (COIDC) export from Wildcad and covered the years 2011 and 2012.

OCCRI Dataset

The OCCRI dataset was created using several sources representing several agencies. For the fires that went into the Central Oregon Fire Danger Operating Plan Area the sources are listed below. All of the data acquired from the sources below were converted into a common file format to address adjustments of cause codes to align the agencies and problems with duplication between agencies. 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 are common, especially in older records.

OCCRI Data Sources

Forest Service, fire history data NIFMID

Acquired data from NIFMID for years 1992-2010, via KCFast in the .raw format, for the National Forests in Oregon. This was then saved as a .csv file format for manipulation and for comparison to other fire datasets to help reduce duplication and increase accuracy. Eventually this .csv file was combined with the datasets from the other Agencies.

Oregon Department of Forestry (ODF)

Fire history point data were acquired from ODF Salem GIS shop as a geodatabase. Years 1962 through 2010 were available, but only the years 1992-2010 were used for compiling fire data. The same data set is also available through the ODF internet site at http://www.odf.state.or.us/DIVISIONS/protection/fire_protection/fires/FIREfamilyplus.asp. This fire data was also saved as a .csv file to be combined with other data sources to view and eliminate duplicates.

BLM:

Fire history data was acquired from the FAMWEB internet site at: <http://fam.nwcg.gov/fam-web/weatherfirecd/> for fire years 1992-2010. The text file was converted to a file format that allowed for deletion of records that were not a fire incident, based on the FireTypeCode and/or ProtectionTypeCode. The BLM fire data were also saved as a .csv file to be combined with the other data sources.

COIDC Wildcad Dataset

A direct export from Wildcad was used to gather fire data for years 2011 and 2012. Each incident in Wildcad is assigned a unique incident number that is very useful in viewing and ensuring the quality of the data being used. Using the Wildcad export reduced the duplication of fires being reported by more than one agency. The export was manipulated using Excel to sort and remove all incidents that were not a fire incident, such as “smoke chases” and public assists. The final file was saved as a .csv file for import into ArcMap.

GIS Data Processing

Both datasets, OCCRI and Wildcad, were in .csv file format and imported into ArcMap as a table using “Display X,Y data” to display their locations. The two tables were saved as shape files with the same projection. These two files were then merged. Once merged, X,Y data was added before clipping the file by the entire fire danger operating plan area boundaries. Clipping the fire dataset was done to delete all fires that occurred outside of the FDOP area. The next step was joining, in ArcMap, the new fire list and the Fire Danger Rating Areas. The final fire file was saved as a shape file (All_Fires_2_12_13). From the shape file the .dbf file was opened and saved as a .csv file (All_Fires_2_12_13) The final .csv file enabled saving each agency by FDRA as a separate .csv file that would be used in Fire Family Plus. Each of the final .csv files required attribute sequence formatting for import into Fire Family Plus.

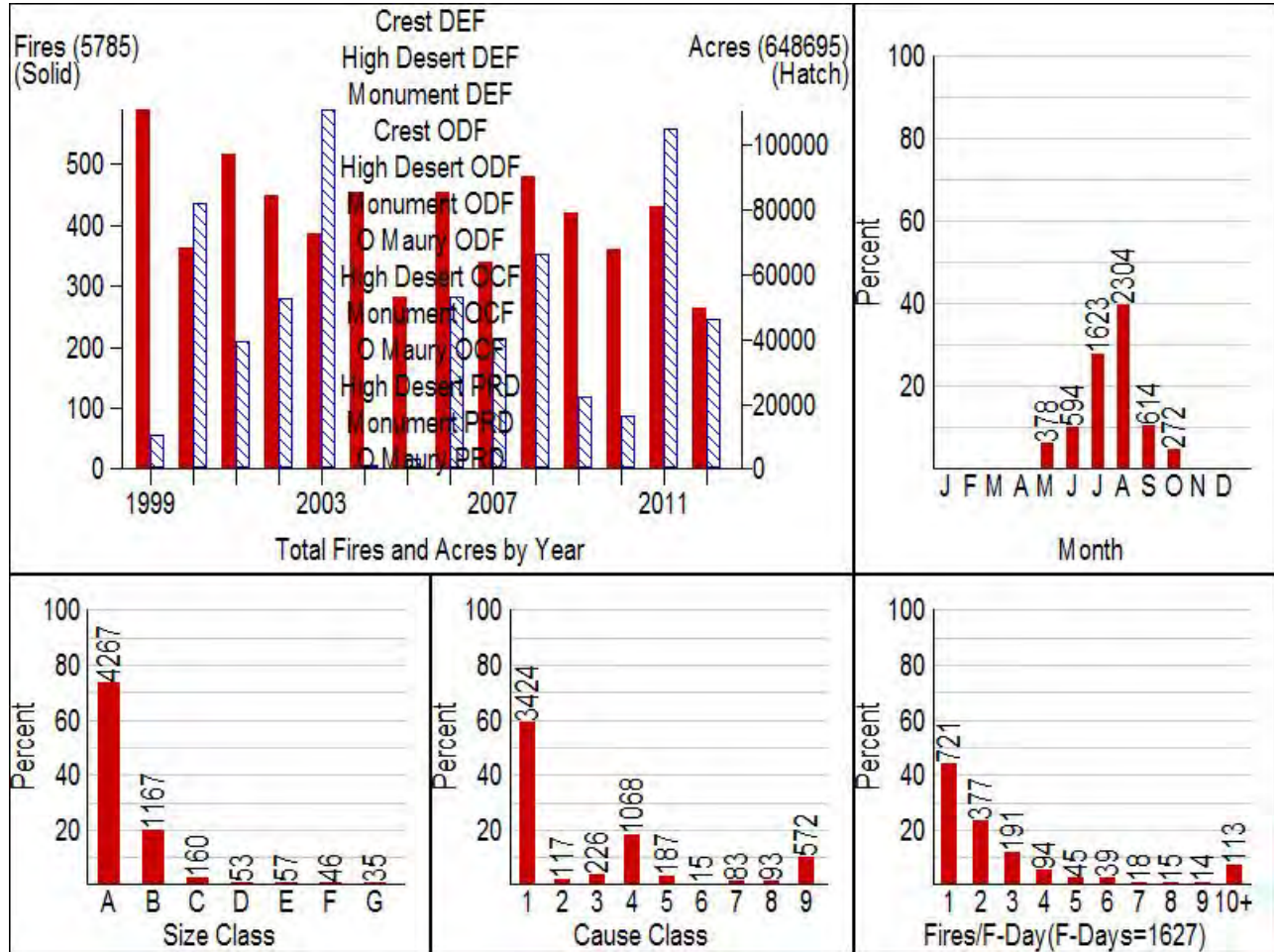
Modified cause codes for non-USFS agencies in accordance with the following crosswalk table:

	USFS	DOI	OR STATE
UNIDENTIFIED		00*	10*
LIGHTNING	1	1	1
EQUIPMENT USE	2	6	3
SMOKING	3	3	5
CAMPFIRE	4	2	04*
DEBRIS BURNING	5	4	6
RAILROAD	6	7	2
ARSON	7	05*	7
CHILDREN	8	8	08*
MISCELLANEOUS	9	9	9

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

F. Fire History described by FDRA

The following table includes ALL fires (within the designated May 1 – October 31 fire season) for ALL agencies for ALL Fire Danger Rating Areas in Central Oregon for the period 1999-2012 (14 years). Quality control processing is described in Appendix E.



Central Oregon Fire Summary Chart (1999-2012)

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 table displays the number of fires by size class by Fire Danger Rating Area:

Numbers by Size Class

	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	166,455	745	164	5	2	4	2	7	929
2	17,507	1635	401	28	8	3	3	1	2079
3	394,224	1116	300	95	39	46	36	23	1655
4	70,509	771	302	32	4	4	5	4	1122
	648,695	4267	1167	160	53	57	46	35	5785
	Average	1067	292	40	13	14	12	9	1446

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) 59% of the fires less than 10 acres in size have occurred in FDRAs 2 and 3, which are also the largest FDRAs. FDRA 3 (High Desert) has the greatest number of fires larger than 5,000 acres, while FDRA 2 (Monument) has the greatest number of fires total.
- (2) FDRA 1 (Crest) has historically had the least number of fires, but has had the greatest number of 5000+ acre fires in timber fuel types.

Percentages by Size Class

FDRA	Acres	A	B	C	D	E	F	G	Grand Total
1	166,455	12.88%	2.83%	0.09%	0.03%	0.07%	0.03%	0.12%	16.06%
2	17,507	28.26%	6.93%	0.48%	0.14%	0.05%	0.05%	0.02%	35.94%
3	394,224	19.29%	5.19%	1.64%	0.67%	0.80%	0.62%	0.40%	28.61%
4	70,509	13.33%	5.22%	0.55%	0.07%	0.07%	0.09%	0.07%	19.39%
		73.76%	20.17%	2.77%	0.92%	0.99%	0.80%	0.61%	100.00%
	Average	18.44%	5.04%	0.69%	0.23%	0.25%	0.20%	0.15%	25.00%

2. Fire statistical cause by Fire Danger Rating Area:

a) The following table displays the number of fires by statistical cause by Fire Danger Rating Area:

		Acres by Cause Codes									
		Lightning	Equip. Use	Smoking	Campfire	Debris Burning	Railroad	Arson	Children	Misc.	
FDRA	Acres	Statistical Cause 1	Cause 2	3	4	5	6	7	8	9	Grand Total
1	166455	546	4	63	213	11	0	14	7	71	929
2	17507	822	43	132	610	111	3	49	55	254	2079
3	394224	1160	60	17	127	42	11	12	29	197	1655
4	70509	896	10	14	118	23	1	8	2	50	1122
		3424	117	226	1068	187	15	83	93	572	5785
	Average	856	29	57	267	47	4	21	23	143	1446

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

- (1) More than 59% of the fires historically have been lightning caused. FDRA 3 (High Desert) has had the greatest number of lightning caused fires by far, while FDRA 1 (Crest) has had the fewest.
- (2) Campfires have historically accounted for more than 18% of wildfires, the next most common cause following lightning. All other causes account for a much smaller percentage of fires. FDRA 2 (Monument) historically has had the largest number of campfire related wildfires.

		Percentage by Cause Codes									
		Lightning	Equip. Use	Smoking	Campfire	Debris Burning	Railroad	Arson	Children	Misc.	
FDRA	Acres	Statistical Cause 1	Cause 2	3	4	5	6	7	8	9	Grand Total
1	166455	9.44%	0.07%	1.09%	3.68%	0.19%	0.00%	0.24%	0.12%	1.23%	16.06%
2	17507	14.21%	0.74%	2.28%	10.54%	1.92%	0.05%	0.85%	0.95%	4.39%	35.94%
3	394224	20.05%	1.04%	0.29%	2.20%	0.73%	0.19%	0.21%	0.50%	3.41%	28.61%
4	70509	15.49%	0.17%	0.24%	2.04%	0.40%	0.02%	0.14%	0.03%	0.86%	19.39%
		59.19%	2.02%	3.91%	18.46%	3.23%	0.26%	1.43%	1.61%	9.89%	100.00%
	Average	14.80%	0.51%	0.98%	4.62%	0.81%	0.06%	0.36%	0.40%	2.47%	25.00%

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 May 1 – October 31.
- Data Years: use 14 years when available, 1999-2012.
- Analysis Period Length: 1 day
- Fire Cause: use all causes (both lightning & human cause)
- Large Fire Day: 10 acres (Crest and High Desert); 50 acres (Monument); 20 acres (Ochoco-Maury)
- Multiple Fire Day: 3 Fires
- Fuel Models: Crest – Fuel Model U; Monument – Fuel Model H; High Desert – Fuel Model T; Ochoco-Maury – Fuel Model G
- Variables: ERC for adjective rating; BI for dispatch level

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) in combination with many Fuel Models . 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 Large 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 19% .
 - b. The breakpoint from moderate to high was selected at the point where approximately 50% of the fire days occurred.
 - c. The breakpoint from high to extreme was generally selected when approximately 80% of the fire days occurred.
3. 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 larger percent of the Large Fire Days (10+ acres – Crest and High Desert; 50+ acres – Monument; 20+ acres – Ochoco-Maury) than the Adjective Class thresholds. Red dispatch level was generally set when 18-24% of the Large Fire Days occurred and yellow dispatch level when 30 – 40% of the Large Fire Days occurred.