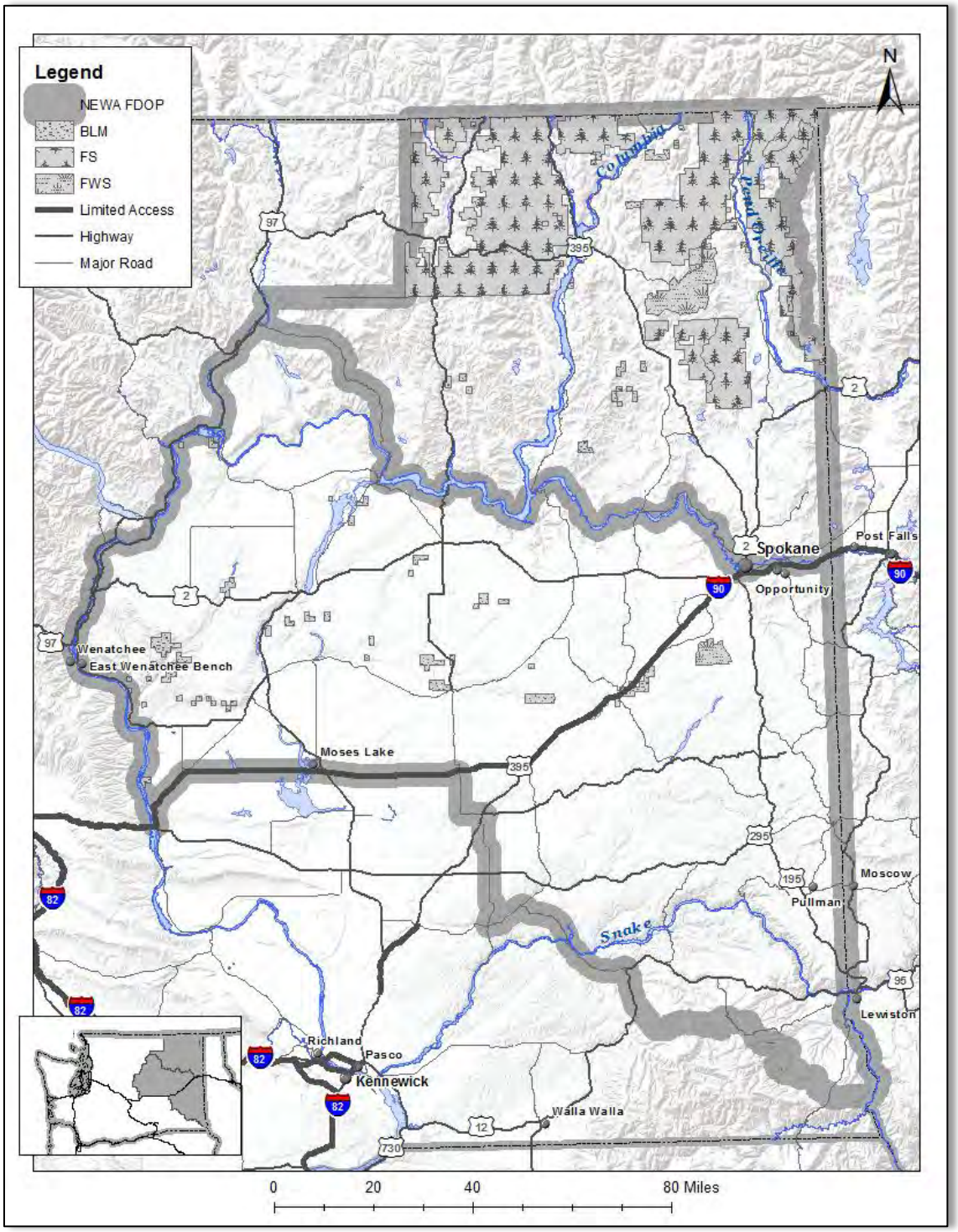
Northeast Washington Interagency

National Fire Danger Rating – Fire Danger Operating Plan

2014



USDA Forest Service, Bureau of Land Management, US Fish and Wildlife Service

Northeast Washington Interagency
Fire Danger Operating Plan – 2014

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I. INTRODUCTION

This plan is intended to document a decision-making process for agency administrators, fire managers, dispatchers, agency cooperators, and firefighters by establishing agency planning and response levels using the best available scientific methods and historical weather/fire data.

An appropriate level of preparedness to meet wildland fire management objectives is based upon an assessment of vegetation, climate, and topography utilizing the National Fire Danger Rating System (NFDRS) modeling.

The scope of the analysis area was determined by interested parties, existing NFDRS plan areas, and National Weather Service fire weather zones and Predictive Service Areas (PSAs). The Fire Danger Operating Plan covers approximately 12.4 million acres in Northeast Washington.

This Operating Plan has been developed for use by:

- Inland Northwest National Wildlife Refuge Complex which includes: Little Pend Oreille and Turnbull National Wildlife Refuges.
- Colville National Forest - Three Rivers, Newport, Sullivan Lake and Republic Ranger Districts
- Spokane District, Bureau of Land Management

Guidance and policy for development of a Fire Danger Operating Plan can be found in the *Interagency Standards for Fire & Aviation Operations* (Red Book).

This plan helps quantify elements in the decision-making process for agency administrators, fire managers, dispatchers, agency cooperators, and firefighters by establishing agency planning and response levels using the best available scientific methods and historical weather/fire data. In addition, this plan outlines procedures for developing seasonal risk analysis and defines fire severity trigger points. Most importantly, this plan addresses fire fighter and public safety and the *Thirty Mile Fire Accident Prevention Action Items* and other policy by providing the direction necessary to convey fire danger awareness to fire management personnel. This awareness is critical when wildland fire danger levels are at severe thresholds and could significantly compromise safety and control.

This is a dynamic document and will be revisited annually to revalidate and edit as needed.

It is important to note that this plan follows the design and much of the wording of the Northern Utah Interagency Fire Danger Operating plan which has been developed and tested over the course of many years with the efforts of a professional interagency workforce in conjunction with its use as a training template for the Advanced NFDRS course taught at the National Advanced Fire and Resource Institute (NAFRI). The Northern Utah plan has been utilized as an example for many other Fire Danger Operating Plans throughout the United States.

II. OBJECTIVES

- Provide a tool for agency administrators, fire managers, dispatchers, agency cooperators, and firefighters to correlate fire danger ratings with appropriate fire business decisions in Northeast Washington State.
- Delineate fire danger rating areas (FDRAs) in Northeast Washington State with similar climate, vegetation, and topography.
- Maintain a fire weather-monitoring network consisting of Remote Automated Weather Stations (RAWS) which comply with *NFDRS Weather Station Standards* (PMS 426-3).
- Determine fire business thresholds using the Weather Information Management System (WIMS), National Fire Danger Rating System (NFDRS), Fire Family Plus software, and by analyzing historical weather and fire occurrence data.

- Define roles and responsibilities to make fire preparedness decisions, manage weather information, and brief fire suppression personnel regarding current and potential fire danger.
- Determine the most effective communication methods for fire managers to communicate potential fire danger to cooperating agencies, industry, and the public.
- Identify seasonal risk analysis criteria and establish general fire severity thresholds.
- Identify the season-ending event using the Term module of the Fire Family Plus software.
- Identify the development and distribution of fire danger pocket cards to all personnel involved with fire suppression activities within Northeast Washington.
- Identify program needs and suggest improvements for the Fire Danger Operating Plan.

III. INVENTORY AND ANALYSIS

In order to apply a system which will assist managers with fire management decisions, the problems must be inventoried and analyzed to determine the most appropriate management control mechanism which will adequately address the issues.

A. Involved Parties

This plan will affect a wide range of entities. However, these entities can be grouped into three primary categories:

1. Agency

Employees of the federal, state, and local governments involved in the cooperative effort to suppress wildland fires. This includes FWS, BLM, USFS, DOE, BIA, Tribal, State and County Fire District personnel.

2. Industry

Are defined as organizations that either utilize the natural resources or have permits to conduct activities on federal, state, or private lands for commercial purposes. These entities include utility companies (power/phone), farmers, hazardous material disposal sites, railroads, building construction, etc.

3. Public

Individuals who use the land for recreational purposes such as hiking, birding/wildlife viewing, hunting, fishing or general travel. This group also includes those living within the wildland/urban interface and adjacent to public lands.

B. Fire Problem Analysis

Sixty three percent of all fires in the analysis area are human caused. The main sources appear to be debris burning, downed power lines, roadside incidents/car fires, warming fires used by hunters and other users, and fireworks. While car and train fires are more difficult to prevent, education and prevention messages can have a big impact on problem fire types.

The following Problem Analysis table demonstrates the differences between the target groups (Agency, Industry, and Public). The ability to regulate, educate, or control a user group will be based upon the interface method and how quickly they can react to the action taken. In addition, each action will result in positive and/or negative impacts to the user groups. Consequently, the decision tool which would be most appropriate would depend upon the sensitivity of the target group to the implementation of the action. In selecting a component and/or index, several factors must be considered:

1. Problem/Issue

This is the problem specific to the area of concern and includes ignition causes. The problem is "framed" to focus on the wildland fire management issue, such as the point when fire activity becomes a burden to the local suppression forces.

2. Management Action (Application)

This is the decision(s) which will affect the public, industry, or agency personnel. This includes fire management applications which can be used to formulate decisions regarding the potential issues which have been identified for the specific area. Management actions represent a way to link fire danger information with fire management decisions which affect specific target groups. Consider the appropriate set of decision thresholds to address the issue (i.e., Dispatch Level, Staffing Level, Preparedness Level, Adjective Rating, Public/Industrial Restrictions, etc.).

3. Target Group

The group of people commonly associated with the problem (Agency, Industry, or Public).

4. Degree of Control

This is a general description of how much control the agencies have over these entities (High Low) and how quickly a target group can respond to management actions.

5. Communication

Forms of communication used with the user group (face-to-face, radio, telephone, email, newspaper, television, signing/posting, text-messaging, etc.).

6. Potential Impacts

The potential impacts on the target group and the likely consequences of a good (or bad) decision.

7. Component/Index

Sensitivity of the NFDRS outputs should be consistent with the ability to react (or communicate) to the target group. Memory and variability of the selected component or index must be understood to appropriately match the task and user group. If a situation where control and ability to communicate with the target group is high, the component and/or index which would be most appropriate should also be highly reactive to changing conditions (i.e., Ignition Component, Spread Component). Conversely where the control and ability to communicate with the target group is low, the appropriate component and/or index should not vary significantly over time (i.e., Energy Release Component).

C. Fire Problem Analysis Chart

PROBLEM	MANAGEMENT ACTION (CONTROL MECHANISM)	TARGET GROUP			DEGREE OF CONTROL	COMMUNICATION	POTENTIAL IMPACTS	COMPONENT / INDEX
		AGENCY	INDUSTRY	PUBLIC				
Debris Burning escaped fires	State and local law enforcement	State and County – Federal staffing		Private Land Owners	Low - Moderate	As needed call with all agencies about IFPL levels. Fire danger signs based on common Adjective Rating.	Public Anger	Energy Release Component public – BI for fire staffing
Miscellaneous ignition fires – downed power lines – from wind events	Increase IA forces under wind event forecasts and power line corridor mitigation		Power company		Moderate	Calls with power companies on mitigation pre-wind event. Inform crews to watch for potential snag issues along power line corridors	Increased workload to power companies and fire staff	BI
Camp fires	Fire Restrictions/Post Signs/Increase staffing during high visitor use times	Federal		Campers Picnickers Hunters	Moderate	Roadside Prevention signs detailing fire danger/unattended campfire risk, personal contacts with campers at dispersed sites,	Public anger, increased workload to LEOs/FF's during restrictions	ERC/BI
Children	Prevention Presentations at local schools			School children	Moderate	Smoky Bear presentations on danger of fire/matches/WUI		ERC/Drought Monitor
Military Training Related Fires	Work with Liaison to inform military about fire danger	Military			Moderate	Ensure Liaison is briefed on current fire danger, and passes information to military		ERC
Suppression Resources committed to multiple fires	Preposition resources based on staffing level. Adjust crew schedules to position resources when need is anticipated. Order additional resources in cases where higher than normal IA is expected.	Duty Officers			High	Duty officers work together to preposition resources to area experiencing the most starts/Order backfill resources early. . Keep fire staff apprised of current conditions and weather forecasts or red flag warnings	Cost, reduced staffing at areas not experiencing fires	ERC/BI/ LAL
Fall extended fire seasons	Keep fire staff appraised of conditions/resource needs as typical lay off time approaches/secure extra funding outside of normal fire season	Fire Staff			Moderate	Extended fire seasons require staffing outside normal staffing requirements for season, will need extra funding to meet staffing needs commensurate with fire risk	Cost	ERC/BI

D. Wildland Fire Occurrence within the Analysis area

1. Fire Occurrence Analysis Data set

Twenty years (1992-2011) of interagency fire occurrence data was used for the statistical analysis. Fire occurrence data was obtained from Fire Program Analysis Fire Occurrence Database (Short, Karen C. 2013) and clipped to the analysis area (see Appendix DD); note that the analysis area is somewhat different from the final Operating Plan boundary. FireFamily Plus software was utilized to produce statistics and graphs.

2. Fire Occurrence Summary

For the period of record in this analysis (1992 – 2011), there are **492** fires per year on average within the 13 million acre analysis area. The largest number of fires occurred in 1994 at 763, with a low the previous year of 268 fires in 1993. Only 5% (95th percentile) of all fires were larger than 25 acres. Lightning caused fires make up 31% of all fires. Most fires (57%) occurred in July and August.

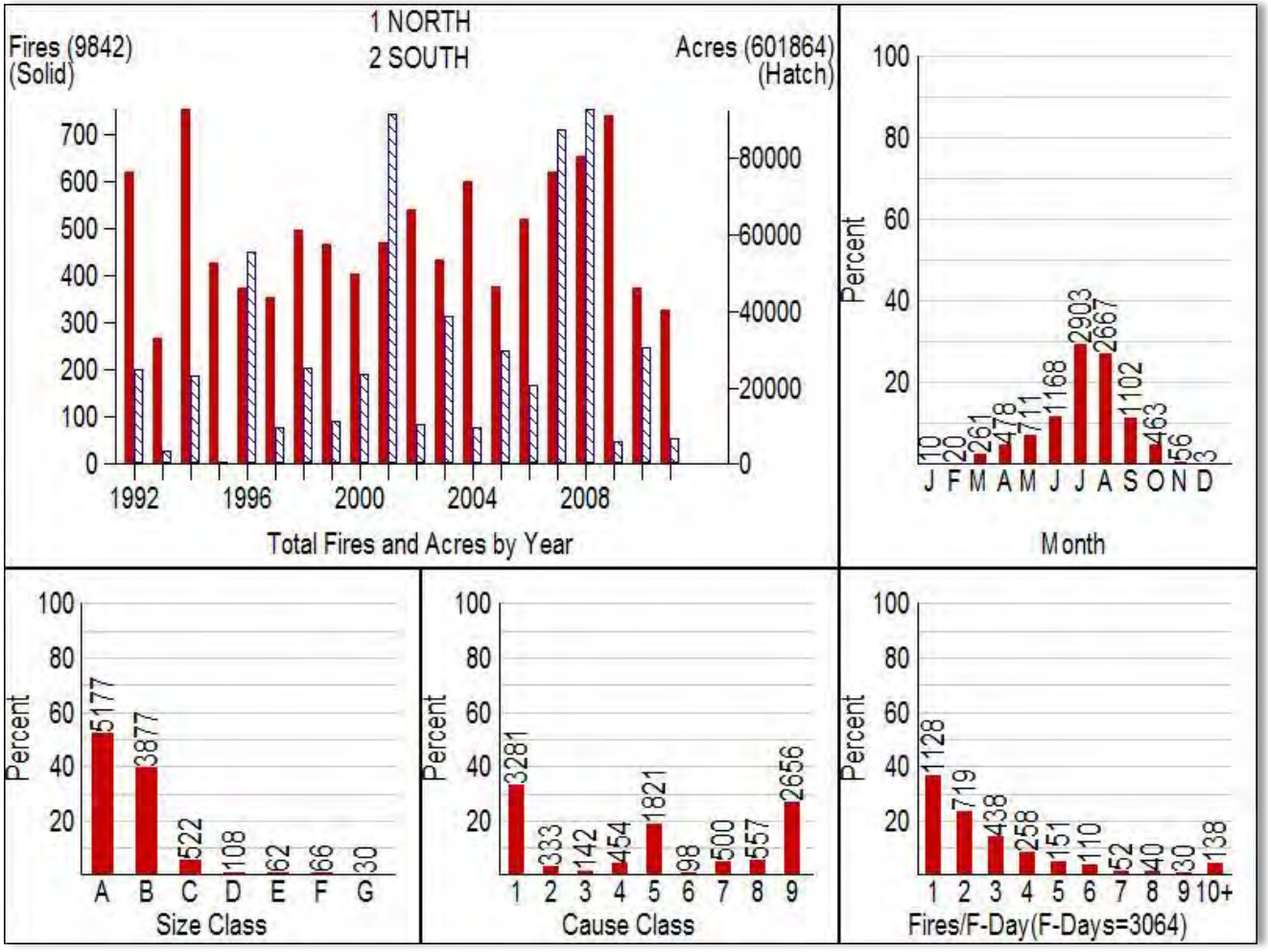


Chart 1 – Analysis area fire occurrence

3. Analysis Area Large Fire Occurrence Summary

Of the 10 largest fires in the fire record (1992 – 2011), three (3) occurred in July, six (6) in August and (1) in early September. The following is a table of the 10 largest fires on record for the analysis area:

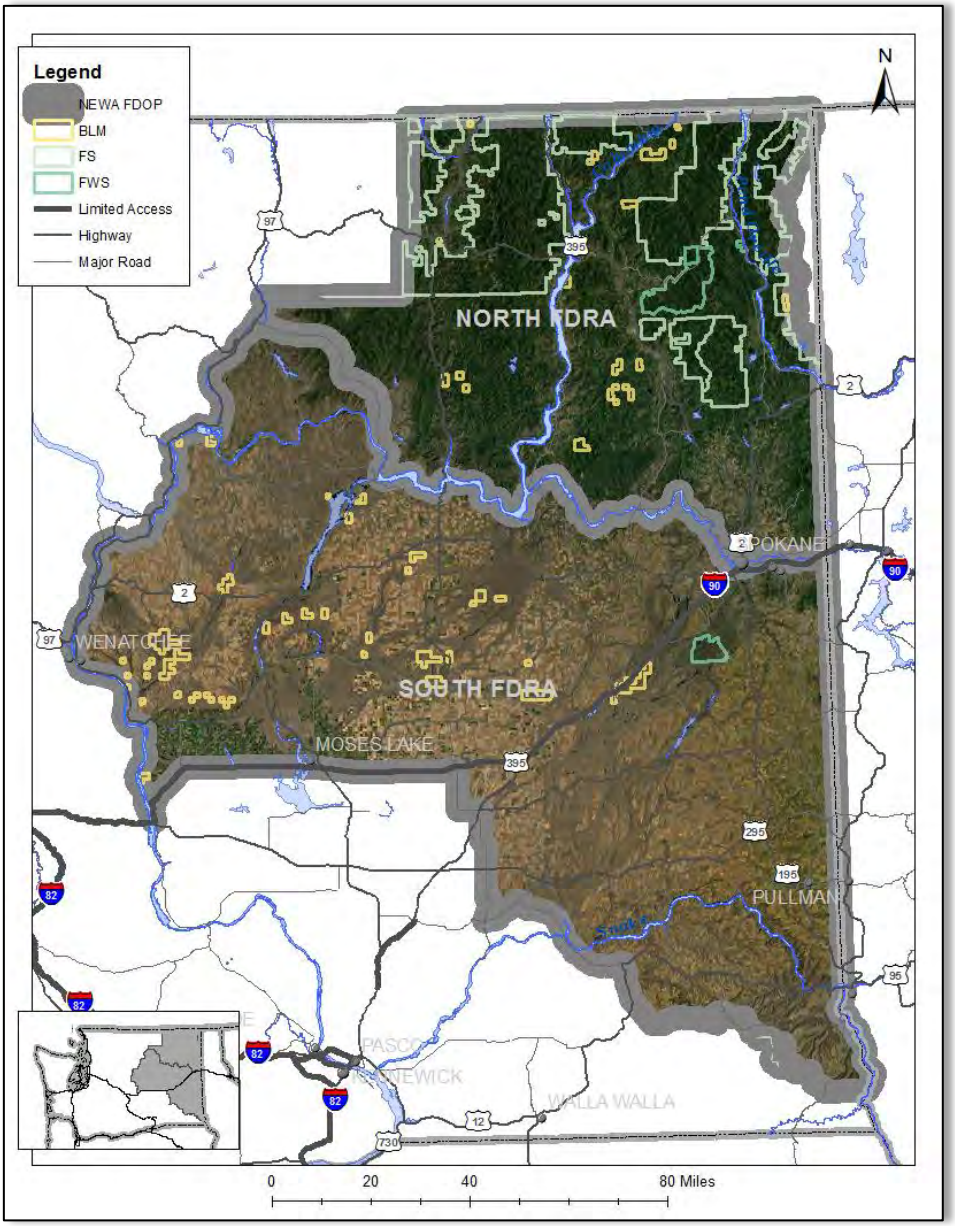
Discovery Date	Fire Name	Unit	Total Acres	Cause	FDRA
8/13/2001	VIRGINIA L	Colville Agency	36775	Lightning	South
8/14/2001	ST MARY'S	Colville Agency	32960	Smoking	South
9/10/2007	MANILA CREEK	Colville Agency	26805	Arson	North
8/7/2008	COLUMBIA RIVER ROAD	Colville Agency	22155	Arson	South
8/30/1996	LINCOLN	Spokane District	20080	Debris Burning	South
8/18/2008	SWANSON LAKES	Spokane District	19090	Missing/Not Specified	South
7/29/1998	TOKIO	Spokane District	18120	Railroad	South
7/6/2007	No Name	Washington State Headquarters	17420	Miscellaneous	South
7/14/2007	TUNK GRADE	Spokane District	15547	Lightning	North
8/24/1996	TIMBERLINE	Colville Agency	15238	Miscellaneous	North

Table 1 -10 largest fires in the analysis area 1992-2011

E. Fire Danger Rating Areas

A Fire Danger Rating Area (FDRA) is a geographic area relatively homogenous in *climate*, *vegetation* and *topography*. It can be assumed that the fire danger within a region is relatively uniform. The plan has identified two fire danger rating areas from the larger analysis area in Northeast Washington. The areas have a common name of *North FDRA* and *South FDRA*.

The wildland fire occurrences within these areas were identified and are used to determine the appropriate fire danger indices (from the correct weather stations) to use to best predict when individual and large fires may occur.



Map 1 – Fire Danger Rating Areas

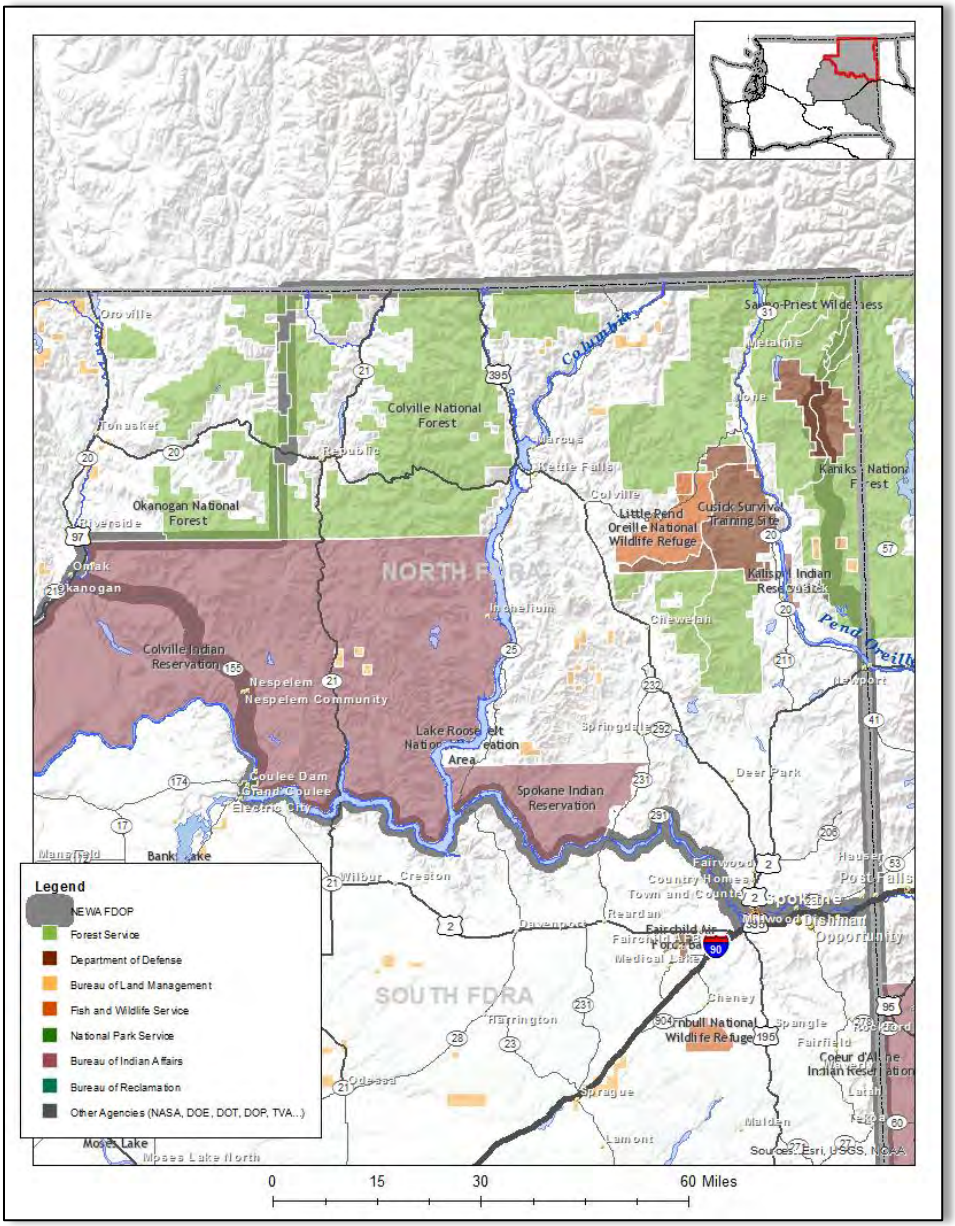
1. North FDRA Description

a) Location

The North FDRA is geographically defined as the northeast corner of Washington State, bounded to the north by the Canadian border, to the west by Highway 97 in the Okanagan River drainage, to the southwest by Highway 155, to the south by the Columbia and Spokane rivers, and by the Idaho border to the east. The North FDRA encompasses over 4.5 million acres; federally managed lands make up over 2,222,000 acres.

There is a unique climate, vegetation feature in the far Northeast section of the FDRA that has slightly wetter conditions (*see* Appendix W for location). The area was considered too small with too

few large fires to create a separate FDRA, but was significant enough to create a local Fire Danger Pocket card for manager's use.



Map 2 - North Fire Danger Rating Area

b) Vegetation and Fuels

The North FDRA is comprised of dry and moist forests from low elevation ponderosa pine which gradually becomes higher elevation mixed stands of Douglas-fir, grand fir, lodgepole pine, western white pine, western larch, western red cedar, western hemlock, Engelmann spruce and sub-alpine fir. Also present are riparian woodlands hardwood species including aspen, alder, willow, cottonwood, maple and birch; open fields, meadows, cliffs and talus slopes. Drier forests are in the rainshadow of the Cascade Mountain range on the western side of the FDRA and moist forests tend to the east side of the FDRA. Fuel models are grass, timber litter and timber understory.

Insect and disease mortality in the timbered stands are beginning (2013) to change the fuel conditions in the FDRA. This mortality will create a change in the fuel profile and potential fire behavior.

Greenup typically occurs around April 15 at the lower elevations and later at upper elevations and a killing frost occurs in mid-September.

c) Climate

Northeast Washington experiences influences of both maritime and continental climates because it receives air masses from the Pacific Ocean and the continental interior. Due to the prevailing westerly winds in northeast Washington, maritime air from the Pacific dominates during most of the year which helps to moderate temperatures year round. Precipitation is higher on the east side of the FDRA with movement away from the strong rainshadow of the Cascade Mountain range.

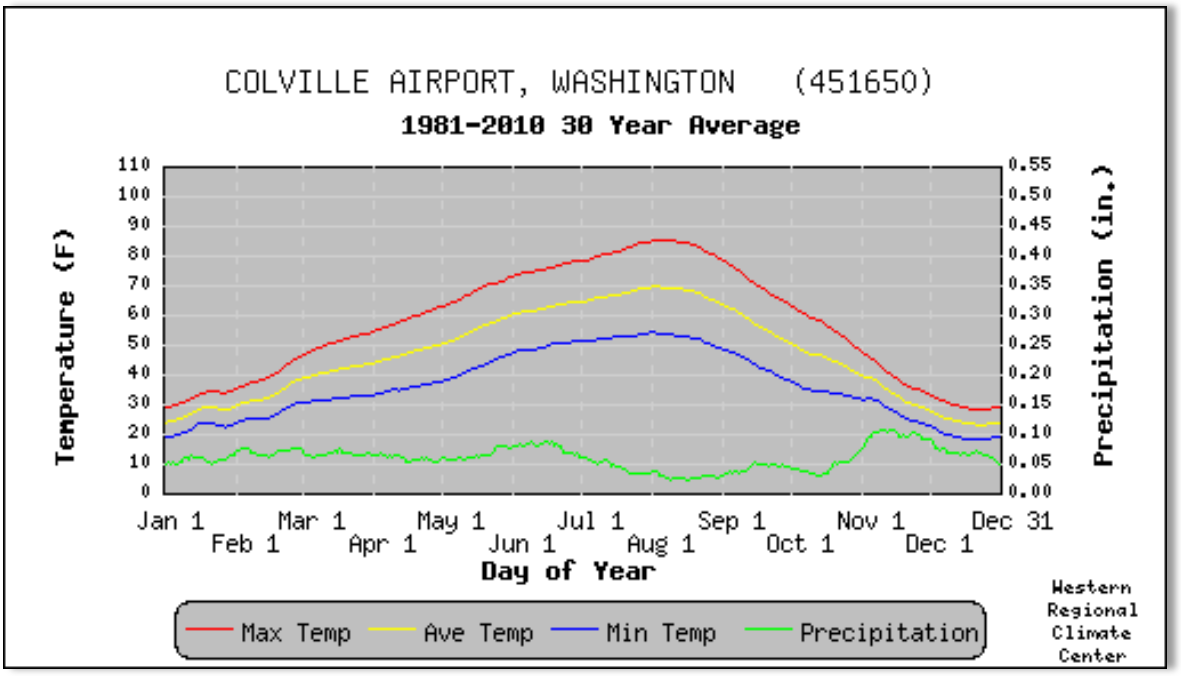
The North FDRA is characterized by NFDRS climate class 1-2, semiarid to sub-humid. Average annual rainfall for the for the river valleys is 15-25 inches annually and increases in the mountains to 30-50 inches annually. The majority of precipitation occurs in winter and spring months.

d) Fire Weather Forecast Zones and Predictive Service Areas

Fire Weather Zones (FWZs) are used by the National Weather Service to categorize areas for more detailed fire weather forecasting. Predictive Service Areas (PSAs) are defined by the Northwest Coordination Center Predictive Services Office as areas with relatively homogeneous groups of RAWs stations that react similarly to daily weather regimes. The following table identifies the areas and zones in the North Fire Danger Rating Area (see Appendix DD):

PSAs	FWZs
NW9/E2	686
NW8/E1	687

Colville Washington Climate Graph



30 year average 1981-2010

Colville Washington Average Temperature and Precipitation

Annual average high temperature	**57.5 °F**
Annual average low temperature	**36.7 °F**
Average annual precipitation	22.3 in.

http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa1650

e) Topography:

Topographically the area is defined by north-south trending mountain ranges and the Okanagan, Kettle, Columbia and Pend Oreille river valleys. Overall, fire occurrence in this area is considered in slope class 2. The North FDRA ranges in elevation from 580 feet in the Columbia River drainage to over 7300 feet in the Selkirk Mountains.

f) North FDRA Fire Occurrence

Fire occurrence is well distributed across the FDRA with concentrations along roadways and river valleys. Fire occurrence point maps are found in Appendix BB.

Over a twenty year period (1992 – 2011), the North FDRA has averaged 387 fires annually with an average size of 26 acres. Jun, July, August and September have 79% of the annual total fire occurrence, July and August alone make up 56%. Lightning is the primary cause at 36%.

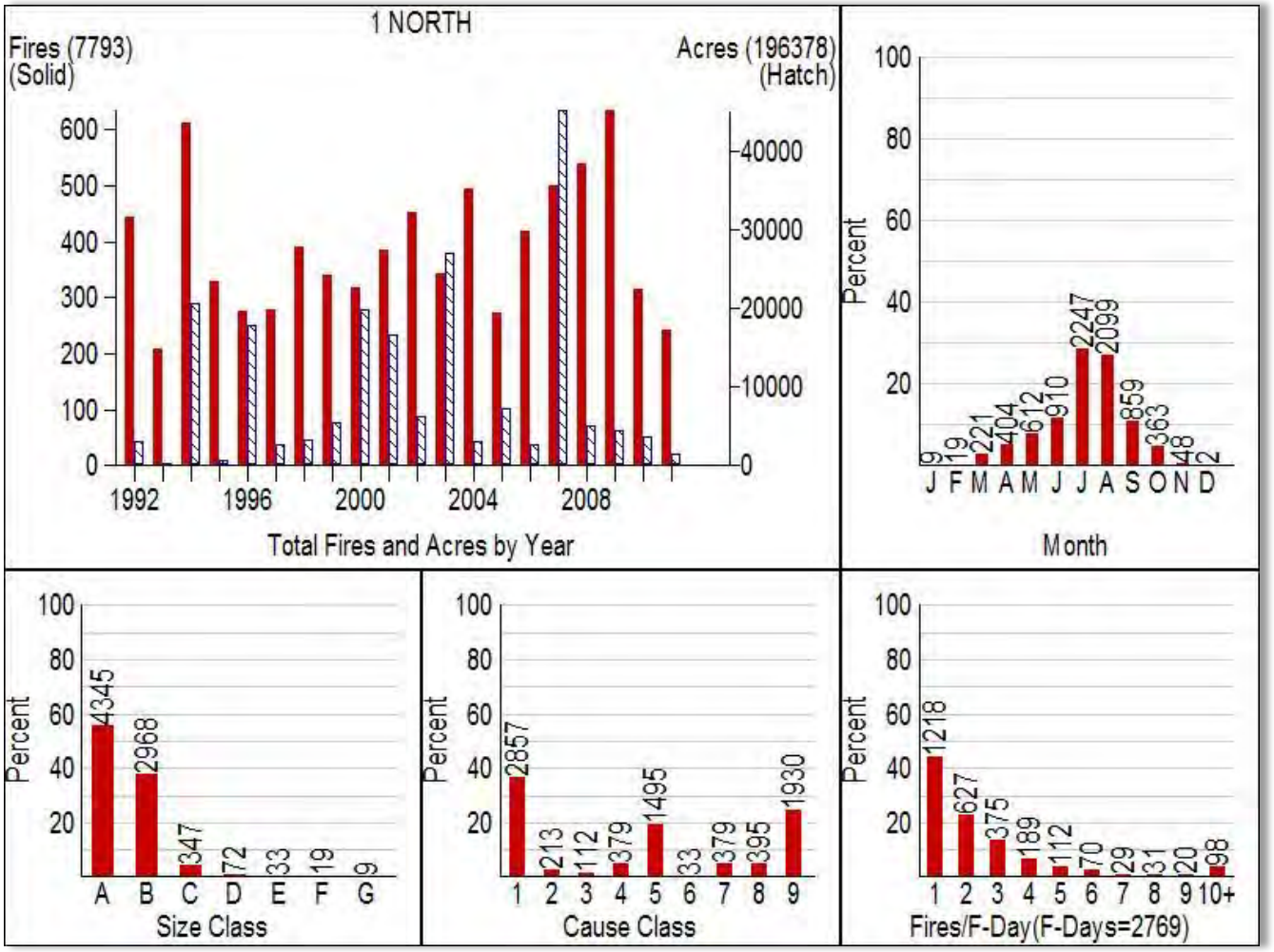


Chart 1 - North FDRA fire occurrence

g) Fire Season Ending Event Criteria for the North FDRA

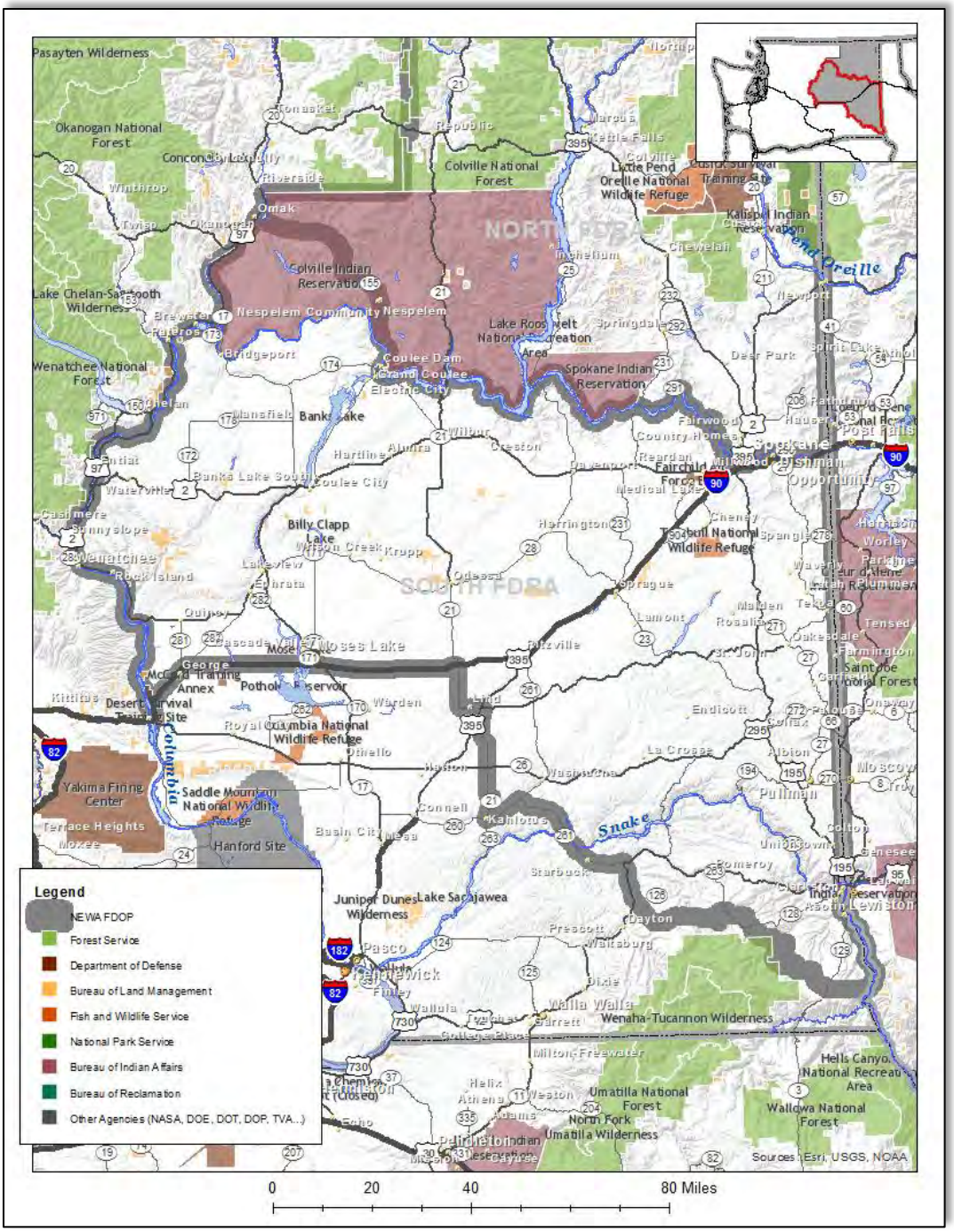
Season Ending Event Criteria: When the ERC for the North SIG falls below the 70th percentile (ERC value = 54) and does not recover. This criterion was developed by analyzing fire occurrence and the corresponding NFDRS climatological information, in this case Energy Release Component (ERC). The 70th percentile ERC was identified as the point where historically 75% of the fires in the season have already occurred and all of the previous large fires were ignited earlier in the year.

Based on the criteria above, annually on October 15th there is an 80% probability the fire season has ended for the year. (See Appendix J)

2. South FDRA Description

a) Location:

The South FDRA is bounded to the north by the North FDRA and to the west by Highway 97 and the Columbia River, to the southwest by I-90 and to the southeast by various county lines, roads and to the east by the Idaho border. The South FDRA encompasses over 7.8 million acres; federally managed lands make up over 572,600 acres.



Map 3 - South Fire Danger Rating Area

b) Vegetation and Fuels

The vegetation complex of the South FDRA encompasses wetlands, aspen/shrub riparian forests, grasslands, open ponderosa pine forests and agricultural lands. Fire behavior fuel models are largely grass and shrub types. Much of the agricultural lands are classified as non-burnable, often these agricultural lands will burn as a slower grass fuel. Areas that have been converted to non-agricultural

use under the USDA Conservation Reserve Program will have considerably more violate fuels than identified under the purely agricultural use.

c) Climate:

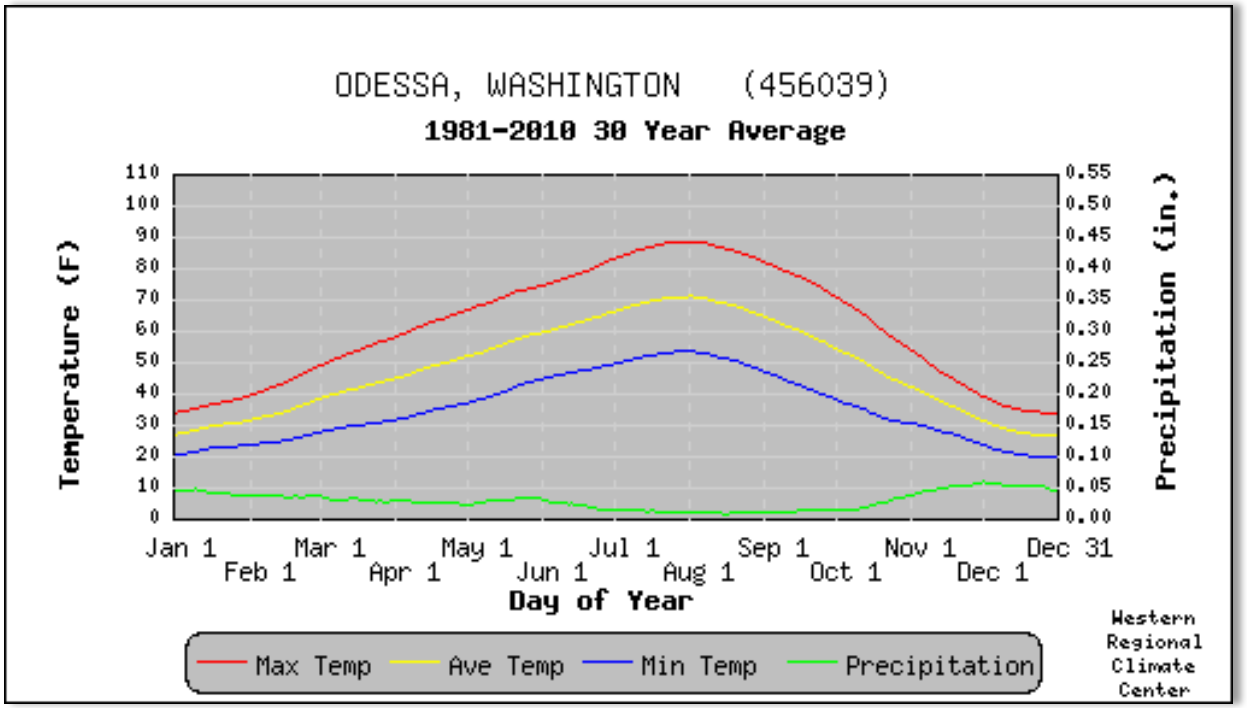
The climate of the South FDRA is semi-arid, NFDRS Climate Class 1. Average annual precipitation ranges from 6" on the west side in the rain shadow of the Cascade Mountain range to 20" on the east side. Summers are warm and dry with average daily highs above 80 degrees Fahrenheit. Winter months are cool with mean daily temperatures between 25 and 30 degrees Fahrenheit. The wettest months are December and January and the driest months are July and August. High and low temperatures follow that same trend.

d) Fire Weather Forecast Zones and Predictive Service Areas

Fire Weather Zones (FWZs) are used by the National Weather Service to categorize areas for more detailed fire weather forecasting. Predictive Service Areas (PSAs) are defined by the Northwest Coordination Center Predictive Services Office as areas with relatively homogeneous groups of RAWs stations that all react similarly to daily weather regimes. The following table identifies the areas and zones in the South Fire Danger Rating Area (also see Appendix DD):

PSAs	FWZs
NW10	673
	686
	631

Odessa Washington Climate Graph



Annual average high temperature	**61.9 °F**

Annual average low temperature	**35.9 °F**
Average annual precipitation	10.9 in.

http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa6039

e) Topography:

The South FDRA is located within a globally unique geological area known as the Channeled Scablands, created by massive scouring from Ice Age floods 15,000 years ago. An extensive complex of deep permanent sloughs, semi-permanent potholes and seasonal wetlands formed in the depressions left in the scoured landscape, while soils only centimeters thick on upland sites, support primarily ponderosa pine intermixed with grasslands (steppe) and exposed basalt cliffs.

Aspen is scattered throughout the area. This unique pattern is often referred to as biscuit and swale topography. Elevations in the FDRA range from 1,500 to 2,400 ft. Fire occurrence in this area is generally considered in slope class 1.

f) South FDRA Fire Occurrence

Due to the higher percentage of private ownership in the South FDRA, fire records are not as complete as the records for the North FDRA. Washington County records tend to be incomplete and held by a large number of widely scattered local fire departments. Fire occurrence maps are located in Appendix DD.

Over a twenty year period (1992 – 2011), the South FDRA has averaged 102 fires annually with an average size of 198 acres. June, July, August and September make up 84% of the total annual fire occurrence, July and August alone make up 60%. Miscellaneous fires make up the largest percentage of fires at 36%.

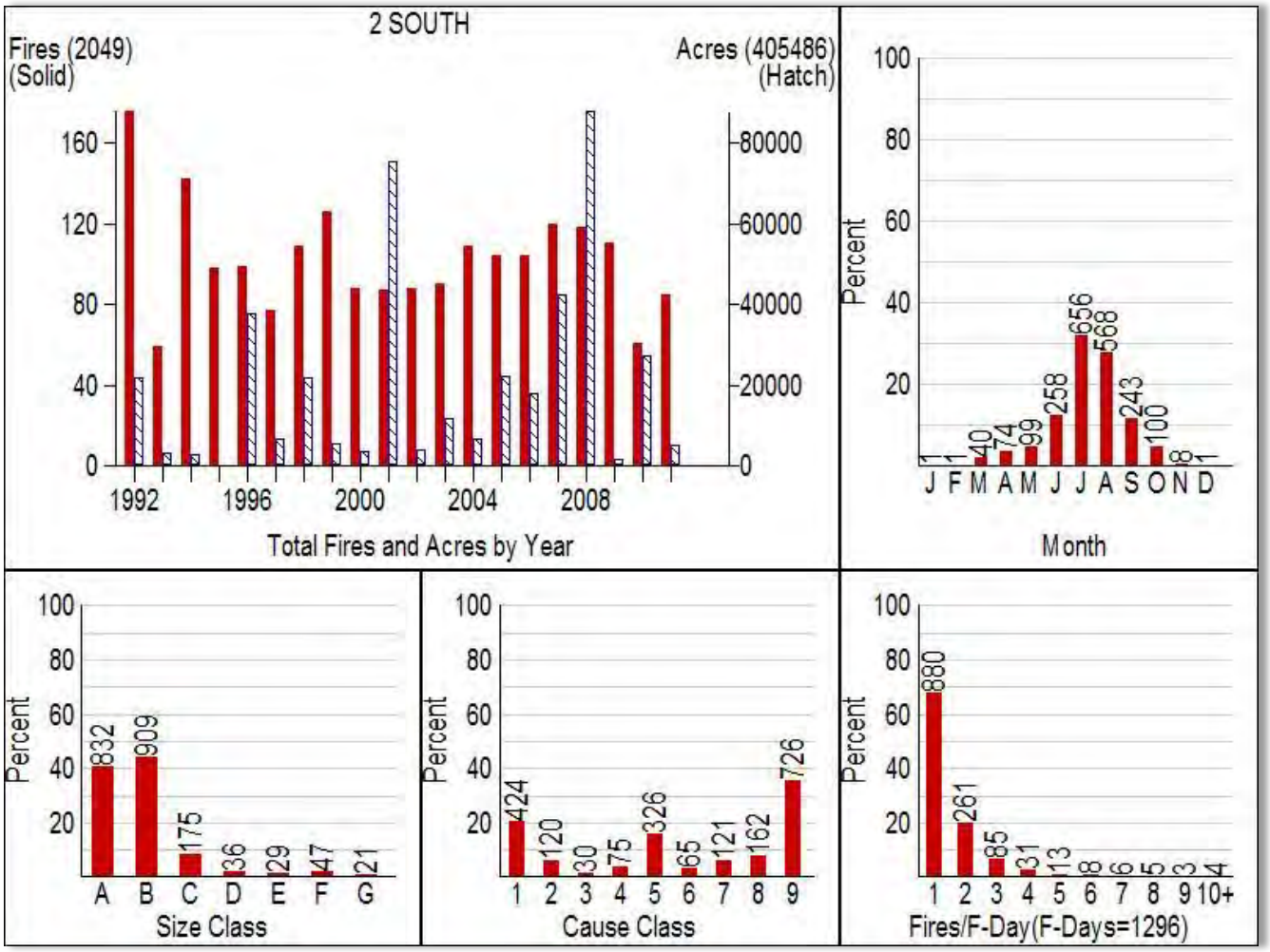


Chart 2 - South FDRA fire occurrence

g) Fire Season Ending Event Criteria for the South FDRA

Season Ending Event Criteria: When the ERC for the South SIG falls below the 70th percentile (ERC value = 38) and does not recover. This criterion was developed by analyzing fire occurrence and the corresponding NFDRS climatological information, in this case Energy Release Component (ERC). The 70th percentile ERC was identified as the point where historically 75% of the fires in the season have already occurred and all of the previous large fires were ignited earlier in the year.

Based on the criteria above, annually on October 15th there is an 80% probability the fire season has ended for the year. (See Appendix N)

F. Weather Patterns that Influence Fire Growth across Northeast Washington

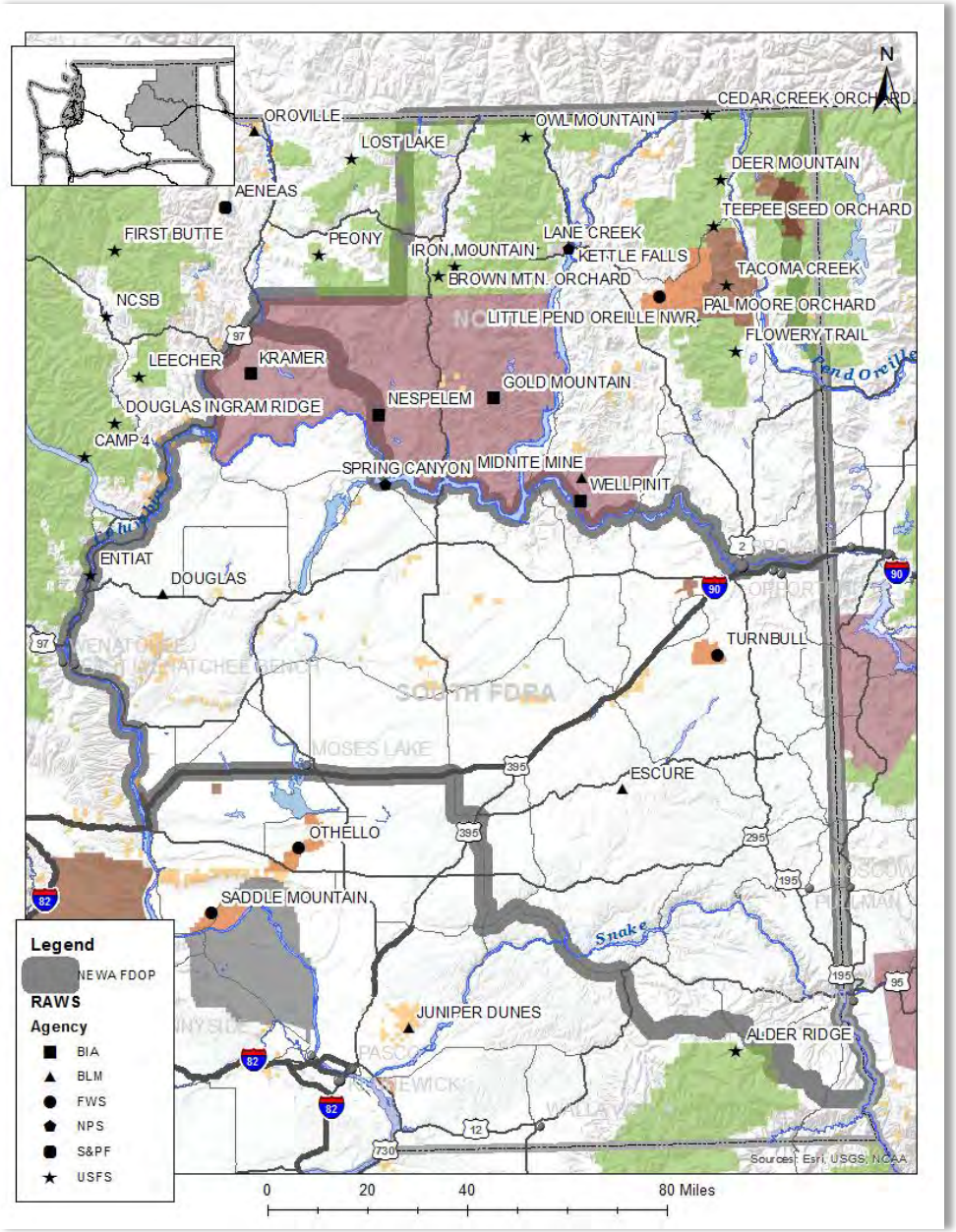
In Northeast WA, the breakdown of the upper ridge is going to be the most important of the critical weather patterns.

G. Weather Stations

a) Description

There are 26 Remote Automatic Weather Stations (RAWS) in or very near the analysis area. The US Forest Service (USFS) manages thirteen, the Bureau of Land Management (BLM) manages four stations, the Bureau of Indian Affairs (BIA) manages four stations, the US Fish and Wildlife (FWS) manages three stations and the National Park Service (NPS) has two. Not all of these stations currently comply with NWCG NFDRS Weather Station Standards (*http://www.nwcg.gov/pms/pubs/PMS426-3.pdf*).

b) Map of the Locations of Remotely Automated Weather Stations



Map 4 - RAWS station

c) RAWS Summary Table

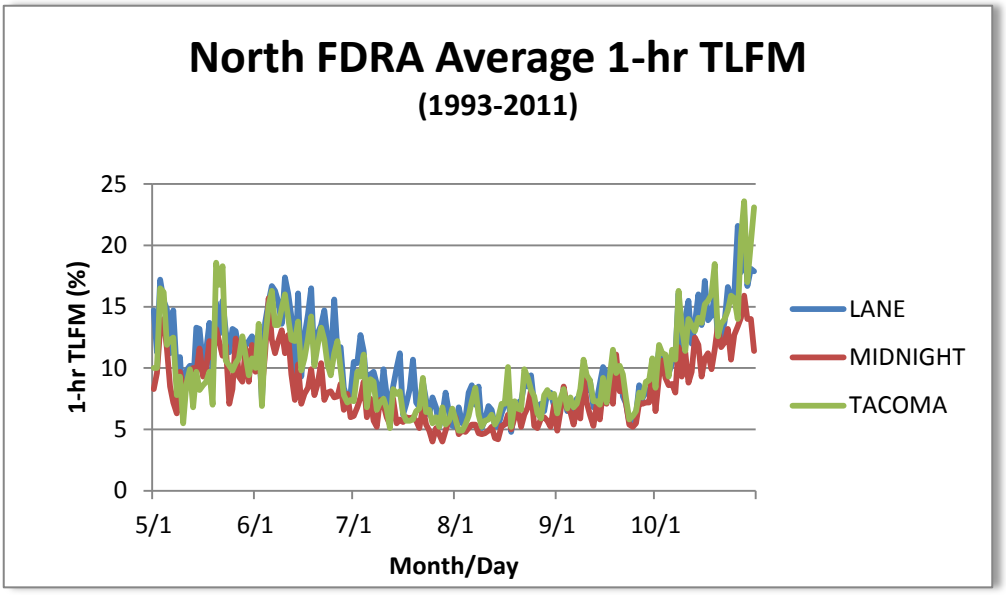
	NWS ID	Name	Elevation	Agency	Data	Go/NoGo	FDRA
1	452009	NESPELEM	1,900	BIA	1969-2012	Good	South
2	452029	LOST LAKE	3,876	USFS	1969-2012	Good	North
3	452038	PEONY	3,804	USFS	1992-2012	Missing 1992	North
4	452039	OROVILLE	1,360	BLM	1992-2012	Good	North
5	452040	KRAMER	2,720	BIA	1993-2012	Good	South
6	452136	ENTIAT	796	USFS	1998-2012	Record too short	South
7	452510	GOLD MOUNTAIN	4,686	BIA	1969-2012	Good	North
8	452511	LANE CREEK	4,430	USFS	1981-2012	Good	North
9	452512	IRON MOUNTAIN	4,350	USFS	1981-2012	1994-2003 missing	North
10	452513	OWL MOUNTAIN	3,560	USFS	1981-2012	Good	North
11	452514	BROWN MTN. ORCHARD	3,150	USFS	1993-2010	Not Current	North
12	452601	DOUGLAS	2,530	BLM	1990-2012	Good	South
13	452913	MIDNITE MINE	2,693	BLM	1991-2012	Good	North
14	452915	PAL MOORE ORCHARD	3,120	USFS	1993-2012	Good	North
15	452916	KETTLE FALLS	1,310	NPS	1995-2012	Most of 1996-1998 missing	North
16	452917	CEDAR CREEK ORCHARD	4,300	USFS	2002-2008	Not Current	North
17	452918	WELLPINIT	2,240	BIA	1992-2012	Most of 1995-2002 missing	Both
18	453002	SPRING CANYON	1,340	NPS	1994-2012	Most of 1996-1998 missing	South
19	453102	COLUMBIA	855	FWS	1993-2012	Good	South
20	453145	FLOWERY TRAIL	2,680	USFS	2002-2008	Not Current	North
21	453412	DEER MOUNTAIN	3,340	USFS	1981-2012	Good	North
22	453413	TACOMA CREEK	3,240	USFS	1981-2012	Missing 1996	North
23	453414	TEEPEE SEED ORCHARD	3,280	USFS	2005-2008	Not Current	North
24	453416	LITTLE PEND OREILLE NWR	2,015	FWS	1996-2012	Good	North
25	453506	TURNBULL	2,230	FWS	1993-2012	Missing 1997-2001	South
26	453601	ESCURE	1,653	BLM	2001-2012	Record too short	South

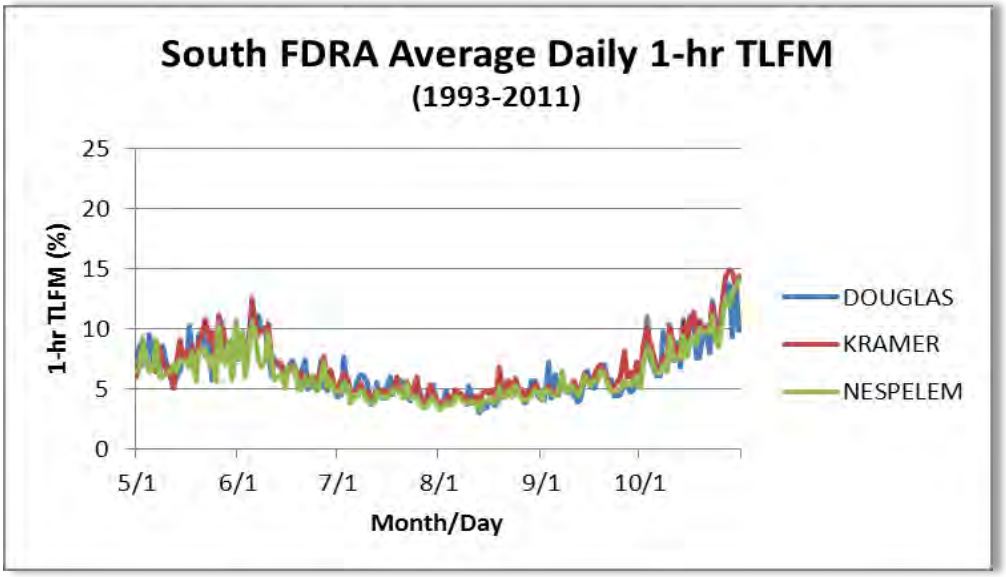
Table 2 - RAWS data information summary (green shaded areas indicate stations that met the analysis criteria)

H. Special Interest Groups (SIGs)

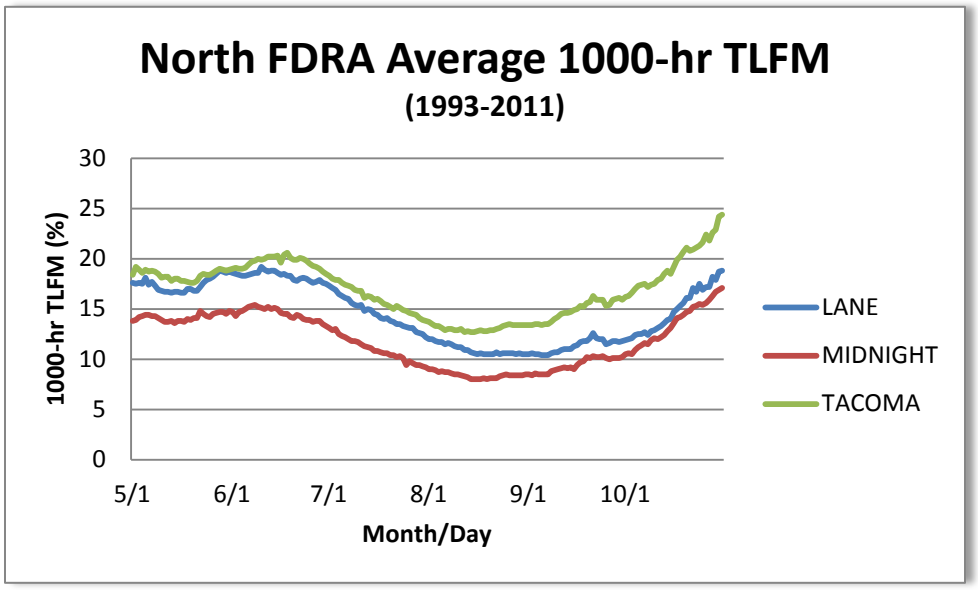
Remote Automated Weather Stations located in different geographical locations with common sensitivity to NFDRS model inputs can be grouped together to form a SIG. A technique developed by Michael Fosberg and William Furman utilizes the 1-hour timelag fuel moisture as the integrator of temperature and relative humidity to help define fire climate zones. One-hour fuel moistures along with 1000 hour timelag fuel moisture were analyzed to determine the level of correlation between the stations in this fire danger rating area and to look for potential outliers that should not be grouped in to SIG's. The following stations correlated well.

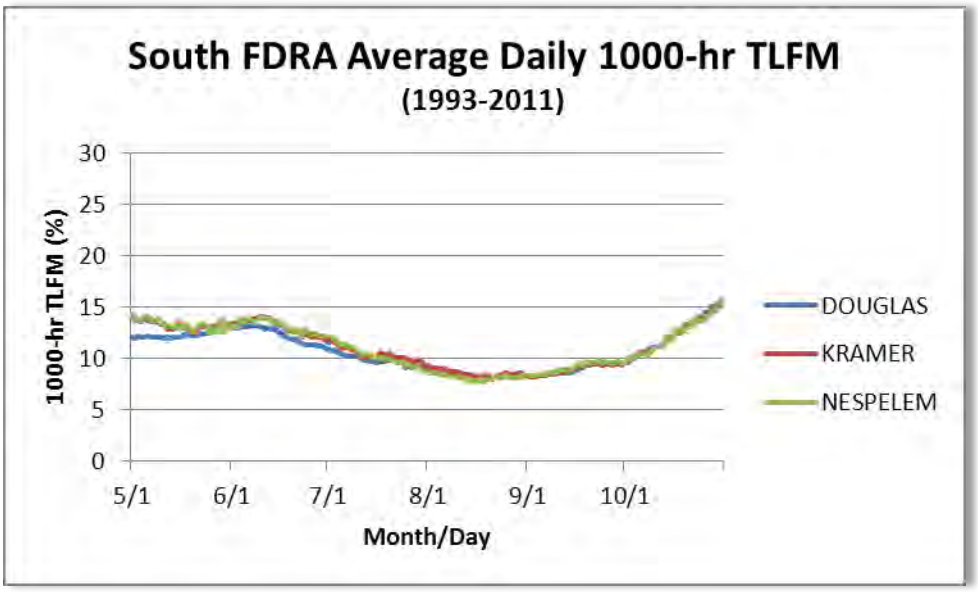
1. 1-hour Percent Time Lag Fuel Moisture (Station Comparison





2. 1000-hr Percent Time Lag Fuel Moisture (Station Comparison)





I. Fire and Weather Station Analysis Summary

The FireFamilyPlus FIRES regression analysis was performed to determine statistically which combination of weather station observations from a wide range and combination of weather stations, NFDRS fuel models, and NFDRS index best correlates to historic fire occurrence (both individual occurrence and large fire) in both the North and South FDRAs NE Washington. Twenty three single weather stations for the North FDRA and four stations for the South FDRA were considered, along with virtually every possible combination of those weather stations grouped into Special Interest Groups (SIGs) of two or more stations. The single stations and SIGs were then run in the FIRES analysis with all 20 NFDRS fuel models for Burning Index (BI) and Energy Release Component (ERC). Canadian Forest Fire

Danger Rating indexes were also evaluated for correlation with historic fires to encompass the widest possible range of variables.

The FIRES analysis uses a logistic regression and the goal is to rate models (indexes) by reviewing;

1. Chi-square

Goodness of fit. For Chi-square lower is better, less than 13 is considered excellent and less than 20 is good, but over 26 is not good.

2. R – Squared

For R-squared, the closer the value is to one, the better the logistic model fits the data.

3. P – Range

Range of probabilities over the range of the predictor variable (P-Range). A range of 0.1 to 0.9 is very good, while a range of 0.2 to 0.3 is useless.

4. Distribution

A wider range of data points allows more flexibility in setting levels. Having 90 percent of the observations in only one or two classes does not allow much decision space. See Appendix G for a sample of the best results of the FIRES data analysis.

Table below is an excerpt from Appendix G Weather Station Data Analysis

			FIRE DAY				LARGE FIRE DAY					MULTIPLE FIRE DAY				
SIG	Variable	Model	R^2	Chi^2	P-Val	P-Range	Acres	R^2	Chi^2	P-Val	P-Range	Fires	R^2	Chi^2	P-Val	P-Range
SIG - Mid_Peo_Gol	BI	7G	0.96	8.24	0.4102	0.30 - 0.96	10 (C)	0.96	2.83	0.9447	0.01 - 0.48	3 (C)	0.77	9.94	0.2693	0.22 - 0.62
SIG - Mid_Oro	BI	7G	0.98	3.76	0.8779	0.31 - 0.98	10 (C)	0.94	2.2	0.9741	0.02 - 0.50	3 (C)	0.7	7.58	0.4752	0.25 - 0.65
SIG - Mid_Tac	BI	7G	0.98	5.51	0.7021	0.33 - 0.99	10 (C)	0.93	4.43	0.8161	0.02 - 0.64	3 (C)	0.67	13.65	0.0913	0.25 - 0.68
SIG - Lit_Tac	BI	7G	0.95	11.24	0.1885	0.36 - 0.98	10 (C)	0.92	3.87	0.8685	0.02 - 0.50	3 (C)	0.61	25.13	0.0015	0.23 - 0.70
SIG - Mid_Oro_Tac	BI	7G	0.95	10.87	0.209	0.28 - 0.99	10 (C)	0.92	4.18	0.8406	0.02 - 0.68	3 (C)	0.5	22.13	0.0047	0.24 - 0.70
SIG - Mid_Tac_Lit	BI	7G	0.97	6.48	0.5938	0.30 - 0.97	10 (C)	0.92	4.97	0.7606	0.01 - 0.48	3 (C)	0.69	15.1	0.0572	0.23 - 0.64
SIG - Mid_Gol	BI	7G	0.99	1.27	0.9959	0.31 - 0.96	10 (C)	0.92	5.6	0.6917	0.01 - 0.46	3 (C)	0.75	11.04	0.1994	0.22 - 0.62
SIG - Mid_Dee	BI	7G	0.95	11.56	0.172	0.34 - 0.98	10 (C)	0.91	4.79	0.7797	0.02 - 0.50	3 (C)	0.5	22.5	0.0041	0.26 - 0.64
SIG - Mid_Lit	BI	7G	0.98	5.6	0.6923	0.30 - 0.98	10 (C)	0.91	5.16	0.7401	0.02 - 0.48	3 (C)	0.57	21.42	0.0061	0.25 - 0.65
SIG - Mid_Tac_Lan	BI	7G	0.95	12.53	0.1291	0.33 - 0.97	10 (C)	0.91	5.71	0.6797	0.02 - 0.49	3 (C)	0.65	17.91	0.0219	0.24 - 0.64
SIG - Mid_Tac	BI	7H	0.95	11.87	0.1569	0.39 - 0.98	10 (C)	0.91	5.82	0.6674	0.02 - 0.60	3 (C)	0.69	13.17	0.1062	0.27 - 0.66
SIG - Owl_Gol	ERC	7H	0.93	16.7	0.0334	0.45 - 0.94	10 (C)	0.96	2.02	0.9804	0.03 - 0.29	3 (C)	0.68	17.53	0.025	0.26 - 0.58
SIG -																

Table 3 - Fire and NFDRS indices correlation excerpt

J. Fire Danger Decision Levels

The National Fire Danger Rating System (NFDRS) utilizes the Weather Information Management System (WIMS) processor to manipulate weather data and forecasted data stored in the National Interagency Fire Management Integrated Database to produce fire danger ratings for corresponding weather stations (RAWS). NFDRS outputs from the WIMS processor can be used to determine various levels of fire danger rating to address the fire problems identified previously in the Fire Problem Analysis Chart. The Fire Danger Rating system is designed to calculate worst-case scenario fire danger. Outputs from NFDRS will be utilized in three ways for the purpose of this plan.

The Preparedness Level will assist fire managers with long-term (or seasonal) decisions with respect to fire danger. The Staffing Level will be used for appropriate day-to-day suppression resource staffing. Adjective Fire Danger levels are intended to communicate fire danger to the public, such as fire

danger signs. Although not used for making fire business decisions, Climatological Percentiles are discussed in this section.

K. Preparedness Level Analysis

Preparedness Levels are established to assist fire managers with weekly or monthly planning decisions based upon seasonal fire danger elements. The Fire Family Plus software has been used to establish the fire business thresholds. A statistical analysis of fire occurrence and historical weather has been completed for each Fire Danger Rating Area. The correlation of various combinations of NFDRS outputs with weather records is listed in Preparedness Level Actions by Responsible PartyAppendix H. The Preparedness Level will be determination by determining the current fire danger, reflected by the Energy Release Component (ERC) then incorporating fire workload reflected through complexity and commitment of fire management resources to on-going incident and finely incorporating the 7-day significant fire potential outlook forecast for the Predictive Service Area by the northwest GACC.

Preparedness Level: Fire Family Plus Analysis Factors and Determinations

Fire Danger Rating Area	RAWS	Data Years Used	Weight Factor	Fuel Model	NFDRS Index	Class	Range
North FDRA	Midnight Mine Lane Creek Tacoma Creek	1992 – 2011 1992 – 2011 1992 - 2011	1.0 1.0 1.0	7G	ERC	1 2 3 4 5	0 – 23 24 –39 40 – 54 55 – 66 67 +
South FDRA	Nespelem Kramer Douglas	1992 – 2011 1992 – 2011 1992 – 2011	1.0 1.0 1.0	7H	ERC	1 2 3 4 5	0 – 15 16 – 26 27 – 36 37 – 43 44 +

L. Staffing Level Analysis

Staffing Levels are established to assist fire managers with daily staffing decisions. The Fire Family Plus software has been used to establish the Staffing Level thresholds. A statistical analysis of fire occurrence and historical weather has been completed for the North and South Fire Danger Rating Area. The correlation of various combinations of NFDRS outputs with weather records is listed in Appendix H.

Staffing Level: Fire Family Plus Analysis Factors and Determinations

Fire Danger Rating Area	RAWS	Data Years Used	Weight Factor	Fuel Model	NFDRS Index	Class	Range
North FDRA	Midnight Mine Lane Creek Tacoma Creek	1992 – 2011 1992 – 2011 1992 - 2011	1.0 1.0 1.0	7G	BI	1 2 3 4 5	0 – 20 21 –33 34 – 42 43 – 51 52 +
South FDRA	Nespelem Kramer Douglas	1992 – 2011 1992 – 2011 1992 – 2011	1.0 1.0 1.0	7H	BI	1 2 3 4 5	0 – 13 14 – 19 20 – 24 25 – 30 31 +

M. Adjective Fire Danger Rating

The Adjective Fire Danger Rating will be used by agency personnel to inform the public of the current level of fire danger associated with a specific Fire Danger Rating Area. The amount of interaction will depend on the magnitude of the adjective fire danger. Although NFDRS processors (such as WIMS) will automatically calculate the adjective class rating, the local interagency fire managers will manually determine Adjective Fire Danger Rating based upon the Preparedness Level for the FDRA and Washington DNR Industrial Fire Protection Level (IFPL) considerations.

N. Climatological Percentiles

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

BLM - 80th and 95th percentiles
FWS - 90th and 97th percentiles
NPS - 90th and 97th percentiles
USFS - 90th and 97th percentiles

It is equally important to identify the period or range of data analysis used to determine the agency percentiles. The percentile values for 12 months of data will be different from the percentile values for the fire season. Year round data should be evaluated for percentiles involving severity-type decisions (per Interagency Standards for Fire and Fire Aviation Operations). For season and daily calculations fire season will be used.

IV. OPERATIONS AND APPLICATIONS

Worksheets (flowcharts) will be used to determine the daily Staffing and Preparedness Rating levels. Adjective rating levels will be determined in coordination with local cooperators. The resultant staffing levels for each FDRA will be broadcast in conjunction with the morning information report and documented by Northeast Washington Communication Center (NEWICC) on the daily resource status report. The preparedness, staffing, adjective fire danger rating and Industrial Fire Precaution Level will be broadcast and documented in the same manner.

Although fire danger ratings do not prevent human-caused fires, categorizing local fire danger as it changes throughout the fire season provides fire managers information to step-up prevention efforts based on fire danger conditions. The social, political, and financial impacts of wildfires on agency, public, and industrial entities can be far reaching. Loss of life, property, and financial resources can potentially be associated with any wildfire. As the fire danger fluctuates, agency personnel need to have pre-planned and appropriate responses. These actions should not only focus on appropriate fire suppression response, but also wildland fire mitigation, prevention and education.

This plan is intended to provide local Fire Managers and Agency Administrators the best available information to make decisions for wildland fire preparedness and staffing based on historical fire occurrence and weather conditions. For this plan to be effective, local agency fire managers must adapt preparedness and staffing levels based on current conditions that are not represented by the analysis contained.

The Agency Duty Officers have the authority to adjust preparedness and staffing levels based on current conditions.

A. WIMS Setup and Application

The Weather Information Management System (WIMS) is a comprehensive system that enables users to manage weather information.

WIMS can be accessed at *http://fam.nwcg.gov/fam-web/*.

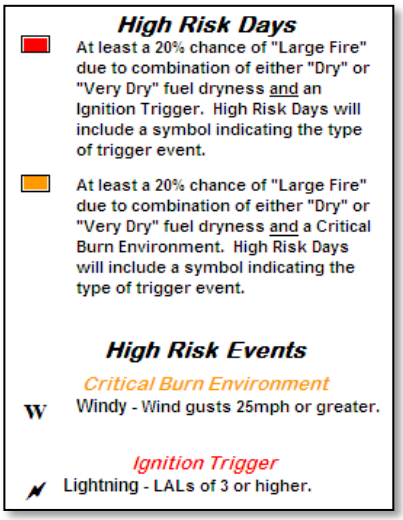
The WIMS User Guide can be downloaded from the following web site:
http://www.fs.fed.us/fire/planning/nist/wims_web_ug/wims__ug_complete061803.pdf

1. Preparedness Level

The preparedness levels are intended to recognize one – week and seasonal fire danger conditions. The Preparedness Level is a five-tier (1-5) fire danger rating system that will be based on Energy Release Component (ERC) and indicators of the severity of the fire season. Several procedures and guidelines are to be followed and/or considered once the preparedness level has been determined (See Resource allocation considerations and Appendix L). The thresholds for the preparedness level are set using an historical analysis (Fire Family Plus) of fire business and its relationship to 1300 RAWS observations. These threshold values are evaluated by fire managers after the daily observations are entered into the NIFMID database and processed by WIMS, which calculates the NFDRS index values (i.e. BI, IC, SC, ERC, etc).

Worksheet Instructions:

a) North FRDA Preparedness Level Definition



(1) ERC Index Value

Place a checkmark in Row One indicating the appropriate index value (Energy Release Component, Fuel Model G). These indices are based on the 1300 (daily) RAWS observations from the North FDRA SIG, which are input to the WIMS processor by Agency fire personnel.

(2) Incident activity

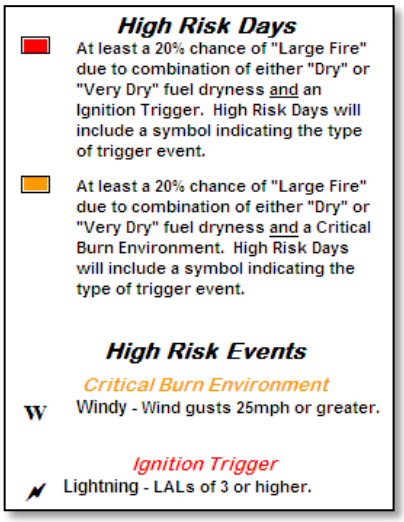
Place a check mark in the yes cell if: any type 4 incidents (or higher complexity) incidents are not contained within the North FDRA. Incident activity is a key element for fire managers to consider as they plan and respond to wildland fire danger. If any type 4 complexity incidents or any type 3 or more complex incidents are occurring in the FDRA then that situation is consider a good surrogate for both resource availability and workload.

(3) PNW 7-day Significant fire Potential Outlook

Place a checkmark in Row Three indicating if the PNW 7-Day Significant Fire Potential Outlook for Predictive Service Area NW8 or NW9 is in a High Risk category. Place the check mark in the "yes" column if any day "Y" in any of the 7 following days is forecast for either an Orange or Red high risk category. The Northwest Coordination Center will issue a High Risk day for NW8 or NW9 when forecasters expect conditions to exist that historically have resulted in approximately a 20% or greater chance for a large fire. These days will be indicated on the NW Coordination Center Predictive services 7-Day significant fire potential Chart in red (when the causal agent is an ignition trigger event) or orange

(when the causal agent is a critical burn environment). A symbol will be included to indicate the reason for the high risk. NWCC Outlooks

b) South FRDA Preparedness Level Definition



(1) ERC Index Value

Place a checkmark in Row One indicating the appropriate index value (Energy Release Component, Fuel Model H). These indices are based on the 1300 (daily) RAWS observations from the South FDRA SIG, which are input to the WIMS processor by Agency fire personnel.

(2) Incident activity

Place a check mark in the yes cell if any type 3 incident is not contained within the South FDRA. Incident activity is a key element for fire managers to consider as they plan and respond to wildland fire danger. If any Type 3 incidents are not contained in the FDRA then that condition is a good surrogate for both resource availability and workload.

(3) PNW 7-day Significant fire Potential Outlook

Place a checkmark in Row Three indicating if the PNW 7-Day Significant Fire Potential Outlook for Predictive Service Area NW10 is in a High Risk category. Place the check mark in the “yes” column if any day range in any of the 7 following days is forecast for either an Orange or Red high risk category. The Northwest Coordination Center will issue a High Risk day for NW10 when forecasters expect conditions to exist that historically have resulted in approximately a 20% or greater chance for a large fire. These days will be indicated on the NW Coordination Center Predictive services 7-Day significant fire potential Chart in red (when the causal agent is an ignition trigger event) or orange (when the causal agent is a critical burn environment). A symbol will be included to indicate the reason for the high risk. NWCC Outlooks

2. Preparedness Level Worksheet - North FDRA

ERC – Model 7G – North SIG (Midnight Mine, Lane Creek, Tacoma Creek)	0-47 Below 50%		48-53 50-59%		54-70 60-89%		71-78 90-96%		79+ Above 97%
(1) ✓ ⇨									
Yes if: any T3 (or higher) complexity incidents are not contained within the FDRA	No	Yes	No	Yes	No	Yes	No	Yes	All
(2)✓ ⇨									
7-day Significant Fire Potential Outlook (NW8 or NW9)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
(3)✓ ⇨									
Preparedness Level	I		II		III		IV		V

3. Preparedness Level Worksheet – South FDRA

ERC – 7H South Sig (Nespelem, Cramer, Douglas)	0 – 15		16 – 26		27 – 36		37 – 43		44 +
(1) ✓ ⇨									
Yes if: if any T3 (or higher) complexity incidents are not contained within the FDRA	No	Yes	No	Yes	No	Yes	No	Yes	All
(2)✓ ⇨									
7-day Significant Fire Potential Outlook	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
(3)✓ ⇨									
Preparedness Level	I		II		III		IV		V

Resource allocation considerations by Preparedness level

The tables below are used by the USFWS and Spokane BLM as a standard for unit capability by Preparedness Level. Funded response capability (FRC) is described in annual budget allocation. Managers must incorporate forecast conditions and adjust capability accordingly. The Colville National Forest will follow the staffing guide in Appendix Q.

Preparedness Level	I	II	III	IV	V
Fire Management resource allocation	Funded response capability (FRC) at 25%. Off unit assignments available for 75% of the FRC.	Funded response capability (FRC) at 75%. Off unit assignments available for 25% of the FRC.	Funded response capability (FRC) at 100% All FRC are fire ready for Initial attack.	Funded response capability (FRC) at 100% All FRC are fire ready for Initial attack. Consider additional long term severity resources assigned to increase response to 125% of FRC	Funded response capability (FRC) at 100% All FRC are fire ready for Initial attack. Consider additional long term severity resources assigned to increase response to 150% of FRC

B. Staffing Level

The Staffing Level forms the basis for decisions regarding the "degree of readiness" of initial attack (IA) resources and support resources. The Staffing Level is based on an analysis of the value of Burning Index (BI) as they relate to a Local Preparedness Level. Staffing Levels are expressed as numeric values where 1 represents the low end of the fire danger continuum and 5 the high end. Staffing Level is intended to provide fire managers with day-to-day decision support regarding staffing of suppression resources. Staffing Level will be used to determine staffing which requires employee overtime associated with working people beyond their normal schedules (i.e., days off, after hours). In addition, the extended staffing of shared resources such as air tankers, helicopters, hotshot crews and other large fire support resources will be linked to the Staffing Level.

1. North FDRA Staffing Level Determination

a) BI Value

Place a checkmark in Row One indicating the appropriate index value (North FDRA Sig, Burning Index, Fuel Model G). These indices are based on the 1300 observed for afternoon staffing or the 1600 forecast indices for next day staffing.

b) Red Flag Watch or Warning

Place a checkmark in row two indicating if a Red flag Watch or Warning in the following 24 hours.

Staffing Level is determined by the output of a combination of Burning index and the National weather Service forecast of a Red Flag Watch or Warning.

2. South FDRA Staffing Level Determination

a) BI Value

Identify the appropriate index value (South FDRA Sig, Burning Index, with Fuel Model H) on the top row of the South FDRA worksheet. These indices are based on the 1300 observed for afternoon staffing or the 1600 forecast indices for next day staffing.

3. Staffing Level Worksheet - North FDRA

BI (G) North Sig (Midnight Mine, Lane Creek, Tacoma Creek)	0 – 20		21 –33		34 – 42		43 – 51		52 +	
(1) ✓ ⇨										
Red Flag Watch or Warning in the next 24 hours NWS FWZ (686 or 687)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
(2)✓ ⇨										
Staffing Level	I		II		III		IV		V	

4. Staffing Level Worksheet - South FDRA

Staffing Level	BI (7H) South FDRA SIG (Nespelem, Kramer, Douglas)
I	0-13
II	14-19
III	20-24
IV	25-30
V	31+

Resource staffing guidance by Staffing level

The tables below are to be used as a general guide for unit capability by Staffing Level. Managers (Duty Officers) must incorporate and document local conditions/circumstances and adjust staffing accordingly.

Staffing Level	I	II	III	IV	V
Fire Management Staffing Guidance	Normal work periods	Normal work periods All resources fire ready	Normal work periods All resources fire ready Fire prevention patrols and contacts	Flexible work schedule - Shift to afternoon work periods (1000 – 1830) All resources fire ready Fire prevention patrols and documented contacts Funded response capability staffing on regular days off	Flexible work schedule - Shift to afternoon work periods (1000 – 1830) All resources fire ready Fire prevention patrols and documented contacts Extend daily staffing as conditions warrant to 2000 or longer

5. Adjective Fire Danger Rating Description

Adjective Fire Danger Rating Description

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

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

6. Adjective Fire Danger Rating Determination

Although NFDRS processors (i.e., WIMS) will automatically calculate the adjective class rating, the Adjective Fire Danger Rating is based upon the Washington Department of Natural Resources (DNR) Industrial Fire Protection Level (IFPL). The actual determination of the weekly adjective rating is based on the past weeks average ERC and the fire weather forecast trend for the next week. Incorporating the Washington DNR IFPL process will ensure a consistent fire danger message is put out to the public.

Descriptions of Wa DNR Industrial Fire Protection Levels:

- Level I: Closed Fire Season – fire equipment and firewatch service is required.
- Level II: Partial Hootowl – limits certain activities to between the hours of 8 p.m. and 1 p.m.
- Level III: Partial Shutdown – prohibits some activities altogether and limits other activities between the hours of 8 p.m. and 1 p.m.
- Level IV: General Shutdown – All operations prohibited.

Contact WDNR Chuck Johnson, Assistant Regional Manger Wa DNR (509- 684-7474), for current Washington DNR IFPL Ratings.

Wa DNR IFPL	North or South FDRA Relative Adjective Fire Danger Rating
NA	L
I	M
II	H
III	VH
IV	E

a) Daily Timeline

b) Weather Information Management Application (WIMS) processing

Weather stations finish transmitting data by 14:30. Data are available for editing within five minutes of transmission. NEC personnel publish raw data in WIMS by 15:00 (convert R to O). Obtain O (observed) and F (Forecasted) ERC and BI for FDOP SIG by 16:00. Enter data into matrix for Observed and Forecasted Preparedness and Staffing Levels.

c) Preparedness Level determination process timeline

Daily Preparedness Level — effective from 16:00 (today) to 15:59 (tomorrow). Inputs will be taken from the following:

- Observed SIG Energy Release Component (ERC-G North, ERC-H South) issued for that day and available in WIMS by 14:40.
- If the North or South FDRA has incident activity that meets the defined criteria for the FDRA, North or South FDRA is a “Y”; otherwise, it is an “N” input.
- If a High Risk Event for wind or lightning is forecasted for any of the following 7 days, Significant Fire Potential is a “Y” input; otherwise, it is an “N” input

d) Staffing Level determination process for this afternoon timeline

Current Afternoon - Daily Staffing Level — effective from 16:00 (today) to 06:00 (tomorrow). Inputs will be taken from the following:

- Observed SIG Burning Index (BI) for that day from the North or South FDRA.
- North - Determine if a NWS Red Flag Warning or Watch for zone 686 or 687, use North FDRA Staffing matrix to determine staffing level.
- South – Determine the Max forecast temperature for zone 673, use South FDRA Staffing Table to determine Staffing Level.

e) Predicted Staffing Level determination process for following day

Following Day - Daily Staffing Level — effective from 06:00 (tomorrow) to 15:59 (tomorrow). Inputs will be taken from the following:

- Forecast SIG Burning Index (BI) for that day from the North or South FDRA.
- North - Determine if a NWS Red Flag Warning or Watch for zone 686 or 687, use North FDRA Staffing matrix to determine staffing level.
- South – Determine the Max forecast temperature for zone 673, use South FDRA Staffing Table to determine Staffing Level.

f) Adjective Rating Level determination Process

Weekly Adjective Rating Level —Issued by NEWICC. Developed from information within this plan and inputs from all cooperators every Monday during fire season and distributed by in coordination with Washington Department of Natural Resources

g) Additional Seasonal Risk Analysis Considerations

Seasonal risk analysis is a comparison of the historic weather/fuels records with current and forecasted weather/fuels information. Seasonal risk analysis is an on-going responsibility for fire program managers. The most reliable indicators of seasonal fire severity have been measurements of fine fuel loading, live fuel moisture, 1000-hour (dead) fuel moisture, and ERC. These levels will be graphically compared to historical maximum values and the average; these graphs will be routinely updated and distributed to fire suppression personnel and dispatch. Seasonal risk analysis information will be used as a basis for pre-positioning critical resources, dispatching resources, and requesting fire severity funding.

At minimum, a Fire Family Plus Energy Release Component Statistical Graph for the associated FDRA will be produced and posted at duty stations and ready rooms weekly. These graphs with current data should be used in reference to the published fire danger pocket card (Appendix I)

h) Thresholds (Extreme Fire Danger)

Seasonal fire risk escalation in NE Washington relies upon a combination of factors, which will ultimately trigger an extreme state of fuel volatility and a high potential for large fire growth. These conditions are reflected in the Staffing and Preparedness matrixes, but fire personnel should also be versed in these thresholds for fire line application.

Fire Danger Pocket Cards describe local thresholds for extreme fire danger to be aware of:

North FDRA – ERC or BI over the 90th percentile, wind speed over 6 MPH, Relative Humidity below 16%, Temperatures over 89 degrees, Haines Index 5 or 6.

South FDRA – ERC or BI over the 90th percentile, wind speed over 13 MPH, Relative Humidity below 13%, Temperatures over 93 degrees, Haines Index 5 or 6.

Tacoma North – ERC or BI over the 90th percentile for the North FDRA, wind speed over 8 MPH, Relative Humidity below 16%, Temperatures over 89 degrees, Haines Index 5 or 6.

A progressive approach to assessing seasonal risk will prepare the local unit for these occurrences and the necessary resources will already be in place.

(1) Live Fuel Moisture

Live herbaceous (sagebrush) fuel moisture plots would provide valuable data with a direct correlation between fire intensity (controllability) and live moisture levels. Fire severity can be determined by comparing current trends to historical averages. Comparison of fuel moisture to historical conditions at various locations can be located on the National Fuel Moisture Database at National Live Fuel Moisture Database.

(2) Cheat Grass and Fine Fuel Loading

Fuel load determinations made on an annual basis and compared to historical averages can determine the potential intensity of wildfires. However, based on experiences from around the country, generally fine fuel loading over .5 tons/acre indicates a fire controllability problem. If plots exhibit significant amounts of carry-over fuel and/or matted grass, it will contribute to continuity and fuel bed density, resulting in control problems and increased fireline intensity.

(3) NFDRS Thresholds

ERC and 1000-hr (3" – 8" diameter dead) fuel are used as the primary indicators to track seasonal trends of fire danger potential. NFDRS fuel model G and H have been chosen due to good "fit" with the BI models. Other fuel models which might seem to be more appropriate due to their classification (grass/brush) do not correlate very well statistically with the NFDRS models.

(4) Weather Thresholds

Seasonal weather assessments rely upon long-range (30-90 day) forecasts. This information is available in two formats: seasonal long-lead outlooks and 30-90 day outlooks. This information is provided by NOAA Climate Prediction Center. Any of these factors significantly increase the potential for extreme fire behavior and large fire growth. According to NWS Spokane area fire weather forecaster, the breakdown of the upper ridge is going to be the most important of the critical weather patterns. Managers must consider these weather patterns along with NFDRS indices in Staffing and Preparedness levels.

(5) Drought Indicators

The Keetch-Byrum Drought Index (KBDI) and Palmer Drought Index track soil moisture and have been tailored to meet the needs of fire risk assessment personnel. Current KBDI information is located on the Wildfire Assessment System (WFAS) Internet site (*http://www.wfas.us/*). Tracking and comparing 1000-hour fuel moisture is another method to assess drought conditions. Palmer Drought Index graphics display current drought conditions while KBDI values of 500-800 indicate the potential for rapid curing and drying of the fine fuels and potential for live fuel moisture to drop. The 1000-hour fuel moisture is

also a good drought indicator. Values between six and ten percent indicate the potential risk for extreme burning conditions.

(6) Normalized Difference Vegetation Index (NDVI)

NDVI data is satellite imagery, which displays vegetative growth and curing rates of live fuels. The WFAS Internet site (http://www.wfas.us/) provides several different ways to analyze current and historical greenness imagery, which can be a significant contributor to seasonal risk assessments. An analysis of this imagery will assist in the assessment of current fuel moisture conditions and provide historical as well as average greenness comparisons.

(7) Season Ending Event

Utilizing the Term Module of the FIREFAMILY Plus software, the Weibull waiting-time distribution was developed from historical season-ending dates. The probability graphs along with the event locator parameters from the FireFamily Plus software dialog box are contained in Appendix M. From this analysis, it can be estimated that there is an equal probability of a season-ending event occurring before or after the 50th percentile date. For the North FDRA, this occurs near October 1st and for the South FDRA, this also occurs near 1st.

Historical fire records were examined for all FDRAs to determine the combination of weather parameters which would indicate the end of the fire season. The following season-ending events have been identified:

(a) North FDRA: When the ERC for the North SIG falls below the 70th percentile (≥ 54) and does not recover.

(b) South FDRA: When the ERC for the South Sig falls below the 70th percentile (≥ 38) and does not recover.

7. Fire Danger Pocket Cards

The Fire Danger Pocket Card is a tool which can aid fire suppression personnel to interpret NFDRS outputs and understand local fire danger thresholds for a local area. Pocket cards can relate current NFDRS outputs with the historical average and worst-case values in a specific geographic location. NFDRS fuel model G was selected for the North FDRA and NFDRS fuel model U was selected for the South FDRA as they provide a good statistical correlation to large fire occurrence.

Burning Index (BI) was the NFDRS output chosen as a measure of fire controllability (Deeming et al. 1978) and responds quickly to changing weather and fuel conditions. Energy Release Component (ERC) is also displayed on the NE Washington Pocket Card for a reference to current conditions and historic trends of fire danger.

Because of some localized temperature, precipitation and fuels anomalies compared to the balance of the North FDRA, a localized pocket card was created for the far Northeast corner of the analysis area – Tacoma North and is included in Appendix I.

Visiting resources can use the pocket card to familiarize themselves with local fire danger conditions. The NE Washington NFDRS operating plan Pocket Card meet NWCG guidelines and is posted on the interagency web site: *http://fam.nwcg.gov/fam-web/pocketcards/*

V. Roles Responsibilities

A. Fire Danger Operating and Preparedness Plan

The NE Washington Fire managers that are part of this plan will ensure that necessary amendments or updates to this plan are completed. Updates to this plan will be made at least every three years, reviewed by the appropriate State or Regional Office and approved by the local line officer. Until updated, the period of record (1992-2011) for preparing ERC and BI charts will remain the same with current year plotted.

B. Suppression Resources

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

C. Duty Officer

The Agency Duty Officer is a typically a designated Agency fire management staff member, who provides input and guidance regarding preparedness and staffing levels.

It is the Duty Officer's role to interpret and modify the daily preparedness and Staff levels as required by factors of this plan. Modifications of the preparedness and/or staffing levels must be coordinated with the NE Washington Interagency Communications Center Manager and local cooperators.

It is the Duty Officer's role to ensure that the daily fire weather forecast (including NFDRS indices) is retrieved and that the daily preparedness, staffing, and are calculated, distributed and stored.

It is the Duty Officers role to ensure the timely editing of daily 1300 weather observations of all stations. During periods when a Duty Officer is not assigned, that responsibility falls to the Agency FMO.

The Duty Officer will keep agency fire and management staff updated (as needed).

D. Fire Weather Forecasting

Daily fire weather forecasts will be developed by the National Weather Service, Pendleton and Spokane Fire Weather Forecast Offices, and posted on the Internet and in WIMS for the Agency Duty Officer to retrieve.

E. Risk Analysis Information

The risk analysis will include information such as live fuel moisture, 1000-hour fuel moisture, fuel loading, NFDRS (BI/IC/ERC) trends, NDVI imagery, and other pertinent data. This information will be distributed to agency staff as necessary. The agency fire management staff will ensure information is posted at all of the fire suppression duty stations.

F. Weather Station Maintenance

The Remote Sensing Laboratory located at the National Interagency Fire Center (NIFC) calibrates the RAWS sensors on an annual basis. The Agency FMO is responsible for RAWS maintenance and compliance with RAWS maintenance schedules. Support for RAWS maintenance is available at the Regional Fire Branch.

G. WIMS Access, Daily Observations, and Station Catalog Editing

Typically, the Agency FMO is listed as the station owner for the unit RAWS. The owner maintains the WIMS Access Control List (ACL). The station owner will ensure appropriate editing of the RAWS catalogs.

H. Adjective Level Guidelines

The FMO working with local cooperators will be responsible for establishing and reviewing the preparedness, staffing, and adjective level guidelines every three years (as a minimum).

I. Public and Industrial Awareness

The FMO or Duty Officer will implement education and mitigation programs as directed by the agency Public Information Officers, Law Enforcement Officers, FMOs, AFMOs, and Fire Education/Mitigation Specialists based on Preparedness Level Guidelines and direction provided by the agency's prevention and mitigation plan.

J. NFDRS and Adjective Fire Danger Break Points

The FDOP team will review weather and fire data at least every three years (when the FDOP is re-analyzed). The team will ensure that the thresholds reflect the most accurate information with the concurrence of the FMOs.

K. Fire Danger Pocket Cards

The agency FMO will ensure that pocket cards are prepared at least every two years and are in compliance with NWCG standards. The cards will be approved per Agency policy and distributed to all interagency, local and incoming firefighters and Incident Management Teams (IMTs). The pocket cards will be posted on the National Wildfire Coordinating Group (NWCG) pocket card web site (*http://fam.nwcg.gov/fam-web/pocketcards/*). Fire suppression supervisors will utilize pockets cards to train and brief suppression personnel ensuring that they are posted at their respective fire stations.

Appendix A. Program Improvements

Integration

- Work with other Tribal, Federal and State agencies to introduce them to plan components

Training

- Train local responders in the appropriate use of NFDRS
- Provide FDOP training for cooperators including WA State DNR, fire wardens, cooperating dispatch centers, and fire departments.
- Provide refresher training on the FDOP each year, emphasizing the differences between BI, ERC, Staffing, Preparedness, and Adjective Rating Levels.
- Train more personnel as first responders to RAWS malfunctions.
- Establish local WIMS/NFDRS training courses for agency personnel.
- Inform agency fire suppression supervisors of FDOP applications by integrating the training in unit orientation and Incident Qualification Card meetings. At a minimum, this should include Fire Management Officers, Fire Operations Supervisors, Area Managers, and Fire Wardens.

Data

- Acquire complete cooperator fire occurrence data.

RAWS

- Analyze the effect of weighting RAWS within each SIG to better represent the potential fire danger for each FDRA.

Technology & Information Management

- Add information to the Northeast Washington Interagency Communication Center Internet Site where pertinent seasonal risk assessment information can be reviewed.

Northeast Washington Land Managers
CHARTER
Fire Danger Operating Plan Working Team

I. Background

The purpose of a the National Fire Danger Rating System is used to assist in operational fire management decisions, produce fire danger staffing guidelines, engage or relax fire restrictions, provide fire prevention information to the public and summarize the wildland fire environment. A National Fire Danger Rating Operations plan (NFDRS Ops plan) will identify these elements for a specific area and is created to directly support fire management objectives.

II. Purpose

The purpose of this charter is to identify how the wildland fire agencies in the Northeast Washington state will organize themselves for the successful development of a NFDRS ops plan. This charter establishes the structure by identifying each agency or support function that will participate in the preparation and implementation of the NFDRS Ops plan. This structure is intended to solidify and enhance working relationships to promote a useful, coordinated interagency plan.

III. Name

The Northeast Washington Fire Danger Operating Plan development team hereinafter referred to as the Team.

IV. Authority

This Team is established pursuant to the charter authority granted to the parent group, the Northeast Washington fire managers through the respective agency fire management leadership.

The Team has the authority to develop and execute a program of work identified by this charter. The Team Chair has authority to make contacts, assign work within the Team, make commitments on behalf of the Team and commit such resources that are available within the Team.

V. Objectives

The Team will create a National Fire Danger Operating Plan for Northeast Washington that meets the needs of the wildland fire management community by:

- Identifying and developing Fire Danger Rating Area boundaries, through team analysis of fires, precipitation patterns, vegetation patterns etc.
- Identifying weather stations and associated weather data that provide the information needed to conduct an accurate fire danger analysis
- Establishing Fire Danger Break Points that provide information to provide appropriate level of fire prevention and fire response
- Identify NFDRS operating plan roles and responsibility to ensure the implementation of the plan best meets the user's needs
- Develop staffing and planning levels that meet the unit's needs
- Create or adopt Fire Danger Pocket Cards for the Analysis areas
- Identify the specific conditions that created the environment for large fire development in the past
- Identify the conditions that created historic fire season ending events
- Narrative about how seasonal patterns can reflect themselves in fire behavior for the local area
- Promoting consistency between user units whenever possible through the development and distribution of tools, aids and guidelines

VI. Membership

Members include a minimum of one representative from each of the following units:

- USDA Forest Service – Colville National Forest
- USDOI Fish and Wildlife Service – Inland Northwest Refuge Complex
- USDOI Bureau of Land Management – Spokane District

Project Manager

- USDOI Fish and Wildlife Service – Pacific Regional Office

Analysts

- Primary Subject Matter Expert – Scott Tobler
- USDA Forest Service – Pacific Northwest Regional Office – Brian Maier
- National Weather Service – Spokane Forecast Office – Bob Tobin
- Fire Predictive Services – Pacific Northwest Coordination Center _ John Saltenberger

State members should include representative from the following state agency:

- Washington Department of Natural Resources

VII. Organization

The Team functions under the direction provided by this charter. The Team will identify a Chairperson (from the local unit), individual team members and analysts. A Project Manager works with the Chairperson to ensure plan completion. Analysts, steered by the Project Manager, provide the team with data for product development. Each participating Unit will identify a Team member.

VIII. Team Responsibilities

Chair:

- Organizes and schedules meetings
- Coordinates with all participating units to provide continuous input opportunities
- Serves as Team spokesperson.
- Presides over the meetings
- Manages work to task groups
- Selects ad hoc subject matter experts to assist in issue resolution.
- Prepares and signs correspondence approved by the majority of the voting members.
- Sends meeting announcements, agenda items, etc., to membership.

Project manager

- Functions as Chair in the event the Chair is unavailable.
- Tracks timelines and task responsibilities.
- Coordinates with analysts in data preparation.
- Responsible for plan formatting, editing and distribution.

Members:

- Solicit input from their Unit stake holders for inclusion in the meeting agendas.
- Participate in all scheduled meetings or send a designated representative Members
- Submit in advance any issues or concerns issues to be included on the upcoming meeting's agenda.
- Relay team activities and developments to Unit stake holders.

Analysts

- The Primary Subject Matter Expert is the focal point for most of the analysis
- Analysts provide primary input on plan substance.
- Identify conditions that affect fire behavior that should be identified in the plan to promote the understanding of how wildland fire has historically behaved in NE Washington

IX. Timeline

Initial Meeting	Data management	Data analysis	Data summary	Plan Initial	Plan Draft	Plan Final	Plan Publish
2/25/13	3/1/13	4/1/13	4/5/13	5/1/13	6/1/13	9/1/13	10/1/13

X. Charter Amendment

If amendments are required, a new charter with be developed for review and signature.

/s/ Daniel L. Mallet Date 2-28-2013

For Lisa Langilier, Project Leader
Inland Northwest National Wildlife Complex

/s/ Laura Jo West Date 3/11/13

Laura-Jo West, Forest Supervisor
Colville National Forest

/s/ Date 2/22/13

Daniel Picard, District Manager
Bureau of Land Management, Spokane District

Appendix C. Plan Development Team Members

Ben Curtis, Republic AFMO, US Department of Agriculture, US Forest Service, Colville National Forest, Republic Ranger District, Republic, WA.

Bob Tobin, Journeyman Forecaster / IMET, National Weather Service, Spokane Or.

Brett Fay, Assistant Regional Fire Management Coordinator, US Department of the Interior, Fish and Wildlife Service – Pacific Region, Portland Or.

Brian Maier, Fire Planner, Forest Service, US Department of Agriculture, Pacific Northwest Region, Wenatchee WA.

Cyndi Sidles, Fire Ecologist, US Department Of the Interior, Fish and Wildlife Service – Pacific Region, Portland Or.

Dennis Strange, Fire Management Officer, US Department of the Interior, Bureau of Land Management, Spokane District, Spokane WA.

Scott Tobler, Fire Planner, Forest Service, US Department of the Agriculture, Dixie and Fishlake National Forests, Cedar City UT

Steve Pietroburgo, Fire Management Officer, US Department of the Interior, Fish and Wildlife Service, Inland Northwest National Wildlife Refuge, Colville, WA.

Appendix D. Primary distribution list for this plan

Name	Title	Agency	E-mail
Laura Jo West	Forest Supervisor	USFS Colville NF	ljwest@fs.fed.us
Tim Sampson	Forest FMO	USFS Colville NF	tsampson@fs.fed.us
Dan Matiatos	Acting Project Leader	Inland NW NWRC	Dan_Matiatos@fws.gov,
Doug Frederick	FMO	Turnbull NWR	Doug_Frederick@fws.gov
Brett Fay	Asst. Fire Coordinator	FWS Pacific Region	Brett_Fay@fws.gov
Daniel Picard	District Manager	Spokane District, BLM	dpicard@blm.gov
Dennis Strange	FMO	Spokane District, BLM	dstrange@blm.gov

The above list indicates key personnel associated with this plan. Copies of the FDOP will also be distributed to Washington DNR, and surrounding county and local cooperators.

Appendix E. Terminology

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

Equilibrium Moisture Content	The moisture content that a fuel particle will attain if exposed for an infinite period in an environment of constant temperature and humidity. When a fuel particle has reached its equilibrium moisture content, the net exchange of moisture between it and its environment is zero.
Fire Business Thresholds	Values of one or more fire weather/fire danger indexes that have been statistically related to occurrence of fires (fire business). Generally, the threshold is a value or range of values where historical fire activity has significantly increased or decreased.
Fire Danger	The resultant descriptor of the combination of both constant and variable factors that affect the ignition, spread, and control difficulty of control of wildfires on an area.
Fire Danger Continuum	The range of possible values for a fire danger index or component, given a set of NFDRS parameters and inputs.
Fire Danger Rating	A system that integrates the effects of existing and expected states of selected fire danger factors into one or more qualitative or numeric indices that reflect an areas protection needs.
Fire Danger Rating Area	A geographic area relatively homogeneous in climate, fuels and topography, tens of thousands of acres in size, within which the fire danger can be assumed to be uniform. Its size and shape is primarily based on influences of fire danger, not political boundaries. It is the basic, on the ground unit for which unique fire danger decisions are made based on fire danger ratings. Weather is represented by one or more NFDRS weather (RAWS) stations.
Fire Weather Forecast Zone	A grouping of fire weather stations that experience the same weather change or trend. Zones are developed by the National Weather Service to assist NWS production of fire weather forecasts or trends for similar stations. Fire weather forecast zones are best thought of as a list of similar-weather stations, rather than an area on a map.
Forb	A non- grass-like herbaceous plant.
Fuel Class	A group of fuels possessing common characteristics. In the NFDRS, dead fuels are grouped according to their timelag (1, 10, 100, and 1000 hr) and live fuels are grouped by whether they are herbaceous (annual or perennial) or woody.
Fuel Model	A simulated fuel complex for which all the fuel descriptors required by the mathematical fire spread model have been supplied.
Fuel Moisture Content	The water content of a fuel particle expressed as a percent of the oven-dry weight of the particle. Can be expressed for either live or dead fuels.
Fuels	Non-decomposed material, living or dead, derived from herbaceous plants.
Green-up	Green-up within the NFDRS model is defined as the beginning of a new cycle of plant growth. Green- up occurs once a year, except in desert areas where rainy periods can produce a flush of new growth more than once a year. Green- up may be signaled at different dates for different fuel models. Green-up should not be started when the first flush of green occurs in the area. Instead, the vegetation that will be the fire problem (represented by the NFDRS fuel model associated with the weather station) when it matures and cures should be identified. Green- up should start when the majority of this vegetation starts to grow.
Herb	A plant that does not develop woody, persistent tissue but is relatively soft or succulent and sprouts from the base (perennials) or develops from seed (annuals) each year. Included are grasses, forbs, and ferns.

Herbaceous Vegetation Moisture Content	The water content of a live herbaceous plant expressed as a percent of the oven-dry weight of the plant.
Ignition Component (IC)	IC is a rating of the probability that a firebrand will cause a fire requiring suppression action. Since it is expressed as a probability, it ranges on a scale of 0 to 100. An IC of 100 means that every firebrand will cause a fire requiring action if it contacts a receptive fuel.
Keetch-Byram Drought Index (KBDI)	KBDI is a stand-alone index that can be used to measure the effects of seasonal drought on fire potential. The actual numeric value of the index is an estimate of the amount of precipitation (in 100ths of inches) needed to bring the soil back to saturation (a value of 0 is complete saturation of the soil). Since the index only deals with the top 8 inches of the soil profile, the maximum KBDI value is 800 or 8.00 inches of precipitation would be needed to bring the soil back to saturation. The Keetch-Byram Drought Index's relationship to fire danger is that as the index value increases, the vegetation is subjected to increased stress due to moisture deficiency. At higher values, desiccation occurs and live plant material is added to the dead fuel loading on the site. Also, an increasing portion of the duff/litter layer becomes available fuel at higher index values.
Litter	The top layer of the forest floor, typically composed of loose debris such as branches, twigs, and recently fallen leaves or needles; little altered in structure by decomposition. (The layer of the forest soil profile.)
Live Fuels	Naturally occurring fuels whose moisture content is controlled by the physiological processes within the plant. The National Fire Danger Rating System considers only herbaceous plants and woody material small enough (leaves, needles and twigs) to be consumed in the flaming front of a fire.
Moisture of Extinction	The theoretical dead fuel moisture content above which a fire will not spread.
Perennial Plant	A plant that lives for more than two growing seasons. For fire danger rating purposes, biennial plants are classed with perennials.
Roundwood	Boles, stems, or limbs of woody material; that portion of the dead wildland fuel which is roughly cylindrical in shape.
Shrub	A woody perennial plant differing from a perennial herb by its persistent and woody stem; and from a tree by its low stature and habit of branching from the base.
Slash	Branches, bark, tops, cull logs, uprooted stumps, and broken or uprooted trees left on the ground after logging; also debris resulting from thinning or wind storms.
Slope	The rise or fall in terrain measured in feet per 100 feet of horizontal distance measurement, expressed as a percentage.
Spread Component (SC)	SC is a rating of the forward rate of spread of aheadfire. Deeming, et al., (1977), states that "the spread component is numerically equal to the theoretical ideal rate of spread expressed in feet-per-minute". This carefully worded statement indicates both guidelines (it's theoretical) and cautions (it's ideal) that must be used when applying the Spread Component. Wind speed, slope and fine fuel moisture are key inputs in the calculation of the spread component, thus accounting for a high variability from day-to-day. The Spread Component is expressed on an open-ended scale; thus it has no upper limit.
Staffing Index	Adjective rating calculations are keyed off the first priority fuel model listed in your station record in the processor. It uses the staffing index (such as ERC or BI) the user associates with the first fuel model/slope/grass type/climate class combination.

Staffing Level	The basis for decision support for daily staffing of initial attack resources and other activities; a level of readiness and an indicator of daily preparedness.
Surface-Area-to-Volume Ratio	The ratio of the surface area of a fuel particle (in square- ft) to its volume (in cubic-ft). The "finer" the fuel particle, the higher the ratio; for example, for grass this ratio ranges above 2,000; while for a ½ inch diameter stick it is 109.
Timelag	The time necessary for a fuel particle to lose approximately 63 percent of the difference between its initial moisture content and its equilibrium moisture content.
Timelag Fuel Moisture Content	The dead fuel moisture content corresponding to the various timelag fuel classes.
X-1000 Hr Fuel Moisture	X-1000 is the live fuel moisture recovery value derived from the 1000-hr fuel moisture value. It is an independent variable used in the calculation of the herbaceous fuel moisture. The X-1000 is a function of the daily change in the 1000-hour timelag fuel moisture, and the average temperature. Its purpose is to better relate the response of the live herbaceous fuel moisture model to the 1000-hour timelag fuel moisture value. The X-1000 value is designed to decrease at the same rate as the 1000-hour timelag fuel moisture, but to have a slower rate of increase than the 1000-hour timelag fuel moisture during periods of precipitation, hence limiting excessive herbaceous fuel moisture recovery.

Appendix F. WIMS User ID List

Name	WIMS User ID
Dennis Strange	BLM1101
Brett Fay	FS7088, BFAY
Cyndi Sidles	FS7175, Csidles
Ben Curtis	Bcurtis
Brian Maier	Bmaier
Doug Frederick	FWS0083
Tim Sampson	FS6489
Dan Brauner	FWS0036
Troy Kinghorn	FS8663, Tkinghorn

For assistance with passwords you may contact the WIMS help desk at 1-800-253-5559 or 208-387-5290, fax 208-387-5292, email: **fire_help@fs.fed.us**.

Appendix G. Weather Station Data Analysis

North FDRA Analysis excerpt*

			FIRE DAY				LARGE FIRE DAY					MULTIPLE FIRE DAY				
SIG	Variable	Model	R^2	Chi^2	P-Val	P-Range	Acres	R^2	Chi^2	P-Val	P-Range	Fires	R^2	Chi^2	P-Val	P-Range
SIG - Mid_Peo_Gol	BI	7G	0.96	8.24	0.4102	0.30 - 0.96	10 (C)	0.96	2.83	0.9447	0.01 - 0.48	3 (C)	0.77	9.94	0.2693	0.22 - 0.62
SIG - Mid_Oro	BI	7G	0.98	3.76	0.8779	0.31 - 0.98	10 (C)	0.94	2.2	0.9741	0.02 - 0.50	3 (C)	0.7	7.58	0.4752	0.25 - 0.65
SIG - Mid_Tac	BI	7G	0.98	5.51	0.7021	0.33 - 0.99	10 (C)	0.93	4.43	0.8161	0.02 - 0.64	3 (C)	0.67	13.65	0.0913	0.25 - 0.68
SIG - Lit_Tac	BI	7G	0.95	11.24	0.1885	0.36 - 0.98	10 (C)	0.92	3.87	0.8685	0.02 - 0.50	3 (C)	0.61	25.13	0.0015	0.23 - 0.70
SIG - Mid_Oro_Tac	BI	7G	0.95	10.87	0.209	0.28 - 0.99	10 (C)	0.92	4.18	0.8406	0.02 - 0.68	3 (C)	0.5	22.13	0.0047	0.24 - 0.70
SIG - Mid_Tac_Lit	BI	7G	0.97	6.48	0.5938	0.30 - 0.97	10 (C)	0.92	4.97	0.7606	0.01 - 0.48	3 (C)	0.69	15.1	0.0572	0.23 - 0.64
SIG - Mid_Gol	BI	7G	0.99	1.27	0.9959	0.31 - 0.96	10 (C)	0.92	5.6	0.6917	0.01 - 0.46	3 (C)	0.75	11.04	0.1994	0.22 - 0.62
SIG - Mid_Dee	BI	7G	0.95	11.56	0.172	0.34 - 0.98	10 (C)	0.91	4.79	0.7797	0.02 - 0.50	3 (C)	0.5	22.5	0.0041	0.26 - 0.64
SIG - Mid_Lit	BI	7G	0.98	5.6	0.6923	0.30 - 0.98	10 (C)	0.91	5.16	0.7401	0.02 - 0.48	3 (C)	0.57	21.42	0.0061	0.25 - 0.65
SIG - Mid_Tac_Lan	BI	7G	0.95	12.53	0.1291	0.33 - 0.97	10 (C)	0.91	5.71	0.6797	0.02 - 0.49	3 (C)	0.65	17.91	0.0219	0.24 - 0.64
SIG - Mid_Tac	BI	7H	0.95	11.87	0.1569	0.39 - 0.98	10 (C)	0.91	5.82	0.6674	0.02 - 0.60	3 (C)	0.69	13.17	0.1062	0.27 - 0.66
SIG - Owl_Gol	ERC	7H	0.93	16.7	0.0334	0.45 - 0.94	10 (C)	0.96	2.02	0.9804	0.03 - 0.29	3 (C)	0.68	17.53	0.025	0.26 - 0.58
SIG -																

South FRDA Analysis excerpt*

Table 2: All Results sorted by System, Variable, and Fuel Model

			Fire Day			Large Fire Day			Multi Fire Day		
System	Variable	Model	FD_R^2	FD_Chi^2	FD_P-Val	LFD_R^2	LFD_Chi^2	LFD_P-Val	MFD_R^2	MFD_Chi^2	MFD_P-Val
CNFDRS	BUI		0.45	145.30	0.00	0.30	12.43	0.13	0.11	9.91	0.27
CNFDRS	DC		0.05	141.25	0.00	0.01	18.57	0.02	0.02	12.26	0.14
CNFDRS	DMC		0.43	160.58	0.00	0.35	10.51	0.23	0.16	11.63	0.17
CNFDRS	DSR		0.82	66.87	0.00	0.85	5.76	0.67	0.68	4.79	0.78
CNFDRS	FFMC		0.70	122.11	0.00	0.47	18.25	0.01	0.63	3.70	0.72
CNFDRS	ISI		0.84	52.75	0.00	0.90	3.38	0.91	0.47	11.50	0.18
NFDRS	BI	7A	0.95	17.90	0.02	0.65	11.60	0.17	0.44	6.74	0.57
NFDRS	BI	7B	0.79	71.64	0.00	0.69	8.52	0.38	0.17	18.70	0.02
NFDRS	BI	7C	0.89	37.91	0.00	0.72	8.68	0.37	0.36	11.63	0.17
NFDRS	BI	7D	0.90	30.70	0.00	0.60	12.53	0.13	0.37	9.54	0.30
NFDRS	BI	7E	0.88	35.38	0.00	0.74	8.88	0.35	0.45	8.43	0.39
NFDRS	BI	7F	0.73	91.07	0.00	0.69	8.63	0.37	0.16	14.23	0.08
NFDRS	BI	7G	0.89	32.75	0.00	0.52	16.08	0.04	0.48	9.08	0.34
NFDRS	BI	7H	0.92	25.85	0.00	0.84	5.07	0.75	0.66	4.09	0.85
NFDRS	BI	7I	0.91	27.78	0.00	0.86	4.02	0.86	0.51	6.07	0.64
NFDRS	BI	7J	0.91	24.81	0.00	0.91	2.43	0.97	0.63	3.77	0.88
NFDRS	BI	7K	0.92	22.94	0.00	0.80	5.42	0.71	0.65	3.84	0.87
NFDRS	BI	7L	0.95	14.91	0.06	0.69	10.59	0.23	0.38	12.21	0.14
NFDRS	BI	7N	0.89	28.50	0.00	0.84	3.41	0.91	0.48	7.41	0.49
NFDRS	BI	7O	0.89	37.84	0.00	0.87	3.23	0.92	0.38	13.69	0.09

*complete analysis data is contained in the project file maintained by the US FWS Pacific Regional Office

Appendix H. Preparedness Level Actions by Responsible Party

The following Preparedness Level actions are guidelines for agency personnel. They are discretionary in nature and usually will require a consensus between agency personnel prior to implementation.

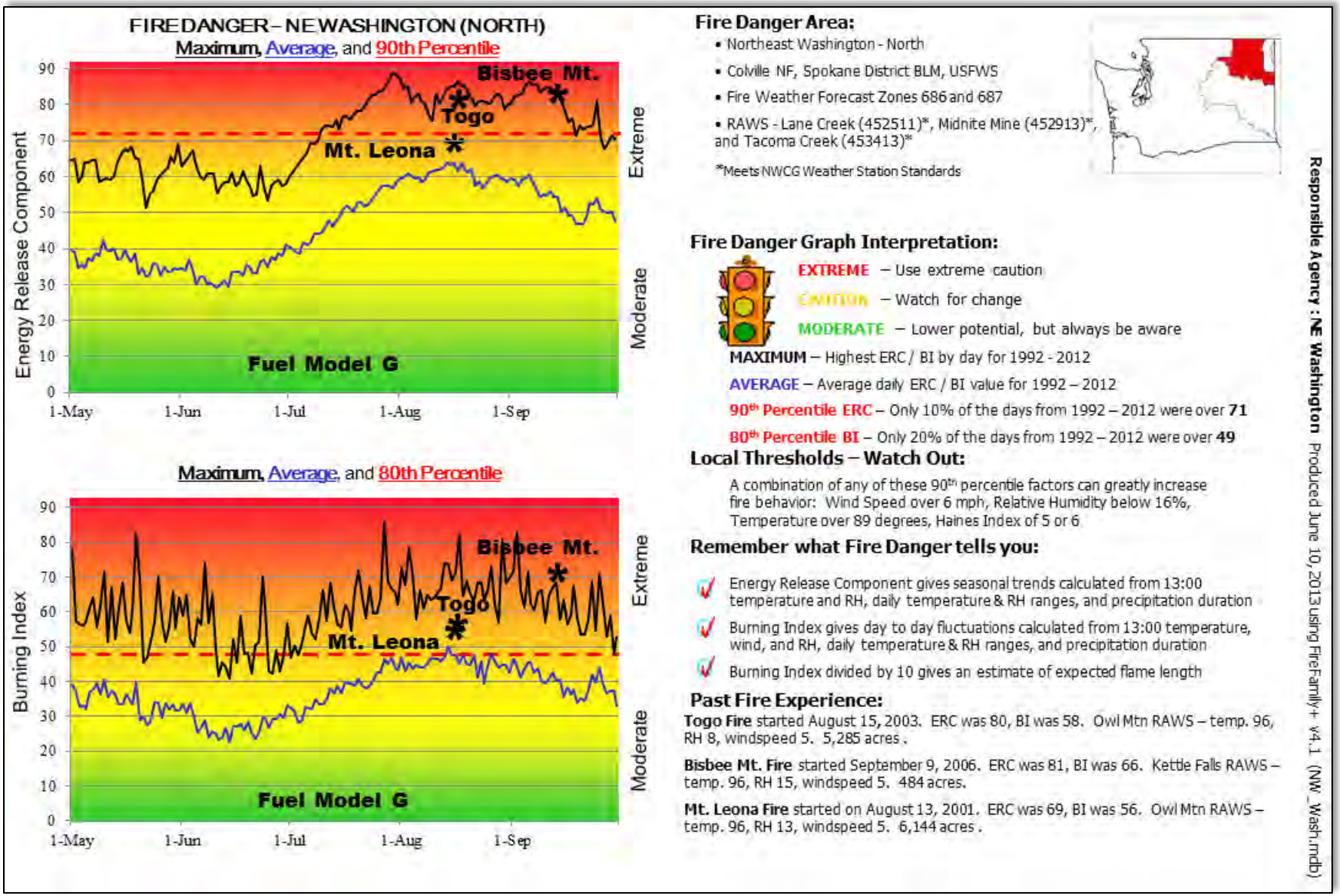
Responsible Party	Suggested Action	PL 1	PL 2	PL 3	PL 4	PL 5	Affected Entity
Agency Administrator	Ensure supervisors approve fire availability of staff and notify Duty Officer.	●	●	●	●	●	Agency
	Ensure resource advisors are designated and available for fire assignments.	●	●	●	●	●	Agency
	Evaluate work/rest needs of fire staff.		●	●	●	●	Agency
	Consider need for fire restriction or closures.				●	●	Public Industry
	Provide appropriate political support to fire staff regarding the implementation of preparedness level actions.			●	●	●	Agency Public Industry
	Review and transmit severity requests to the appropriate level.				●	●	Agency
	Issue guidance to respective agency staff indicating severity of the season and increased need and availability for fire support personnel.				●	●	Agency
FMO	Evaluate season severity data (BI and ERC trends for season, fuel loadings, live FM, drought indices, and long term forecasts).	●	●	●	●	●	Agency
	Evaluate fire staff work/rest requirements.		●	●	●	●	Agency
	Brief agency administrator on burning conditions and fire activity.			●	●	●	Agency
	Review geographical and national preparedness levels and evaluate need to suspend local prescribe fire activities.			●	●	●	Agency
	Ensure Education/Mitigation personnel have initiated media contacts and public notification.				●	●	Public Industry
	Ensure agency staff is briefed on increasing fire activity.				●	●	Agency
	Brief next higher level of fire management on increasing/decreasing fire activity.				●	●	Agency
	Consider fire severity request and pre-positioning of resources including: suppression resources, aerial support, aerial supervision, command positions, dispatch, logistical support, and prevention.				●	●	Agency

Responsible Party	Suggested Action	PL 1	PL 2	PL 3	PL 4	PL 5	Affected Entity
	Coordinate with interagency partners the need for fire restrictions or closures.					●	Public Industry
	Request that the Agency Administrator issue guidance to respective agency staff regarding the need for increased fire availability in support positions.				●	●	Agency
	Pre-position a Type 3 organization/Type 2 Team.					●	Agency
Duty Officer	Confirm (or adjust) the Preparedness and Staffing Levels with Dispatch.	●	●	●	●	●	Agency
	If preparedness level is decreasing, consider releasing pre-positioned and detailed resources.	●	●	●			Agency
	Evaluate work/rest needs of IA crews, dispatchers, & aviation bases.			●	●	●	Agency
	Evaluate need to change or shift duty hours of IA resources.				●	●	Agency
	Evaluate draw-down levels for suppression, command, and oversight positions.				●	●	Agency
	Consider extending staffing beyond normal shift length.				●	●	Agency
	Brief FMO on severity of conditions and consider severity request.				●	●	Agency
	Consider pre-positioning and/or detailing of additional IA resources.				●	●	Agency
	Consider bringing in local IA resources from scheduled days off.				●	●	Agency
	Consider patrols and pre-positioning of local IA resources in high risk areas.				●	●	Agency
	Consider automatic dispatch of helicopter, SEAT and/or heavy air tankers for IA				●	●	Agency
Dispatch	Determine and broadcast the morning and afternoon preparedness, dispatch, and adjective fire danger levels to interagency fire personnel.	●	●	●	●	●	Agency
	Evaluate work/rest needs of center staff.			●	●	●	Agency
	If preparedness level is decreasing, consider release of pre-positioned or detailed dispatchers and logistical support personnel.	●	●	●			Agency
	Consult with Duty Officer concerning potential for extended staffing beyond normal shift length.				●	●	Agency
	Contact local fire chiefs to make them aware of fire danger.				●	●	Agency
	Consider pre-positioning or detail of off-unit IA dispatchers and logistical support personnel.				●	●	Agency

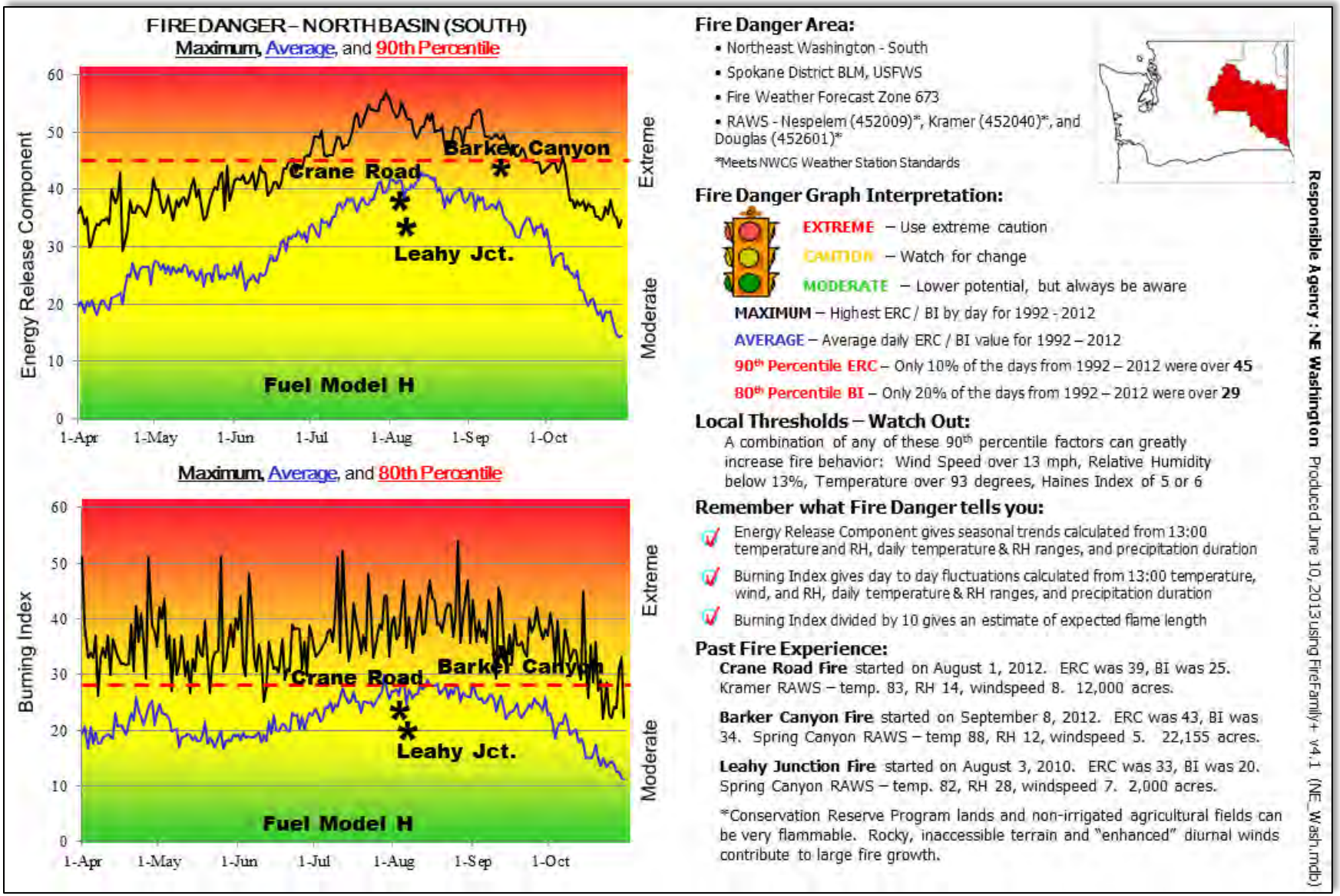
Responsible Party	Suggested Action	PL 1	PL 2	PL 3	PL 4	PL 5	Affected Entity
	Consider discussing activation of local area MAC Group.					●	Agency
	Consider ordering a Fire Behavior Analyst.					●	Agency
	Consult with duty officer and FMO regarding potential need for severity request.				●	●	Agency
	Consider bringing additional dispatch personnel in from scheduled days off.					●	Agency
	Consult with Pacific Northwest Coordination Center (EGBCC) regarding availability of resources at the geographical and national levels.			●	●	●	Agency
AFMO	Ensure that roadside fire danger signs reflect the current adjective fire danger rating.	●	●	●	●	●	Public
	Ensure IA crews are briefed on local preparedness level, burning conditions, and availability of IA resources and air support.	●	●	●	●	●	Agency
	Ensure incoming pre-position or detailed personnel are briefed on local conditions.	●	●	●	●	●	Agency
	Evaluate work/rest needs of crews.			●	●	●	Agency
	Increase patrols in camping and recreation areas.				●	●	Public
	Coordinate fire prevention patrol and enforcement with Agency LEO				●	●	Agency
	Consider suspension of project work away from station.					●	Agency
	Provide duty officer with feedback regarding unique/unexpected fire behavior and severity conditions and the need to increase IA capabilities.				●	●	Agency
Engine Captains and Engine Crew	Ensure that roadside fire danger signs reflect the current adjective fire danger rating.	●	●	●	●	●	Public
	Initiate press release to inform public/industry of the potential fire danger.				●	●	Public Industry
	Ensure the public and industrial entities are aware of the policy regarding fire trespass investigations for human-caused fires and cost recovery for suppression action.				●	●	Public Industry
	Consider need for increased prevention patrols.				●	●	Public Industry
	Consider door to door contacts in rural communities or ranch areas.					●	Public Industry

Responsible Party	Suggested Action	PL 1	PL 2	PL 3	PL 4	PL 5	Affected Entity
	Post signs and warnings in camp and recreation areas.				●	●	Public
	Consult with FMO regarding severity request and potential need for additional prevention personnel.				●	●	Public Industry
	Consult with AFMO and FMO regarding need for fire restrictions, closures and the need to order a Fire Prevention Team.				●	●	Agency Public Industry

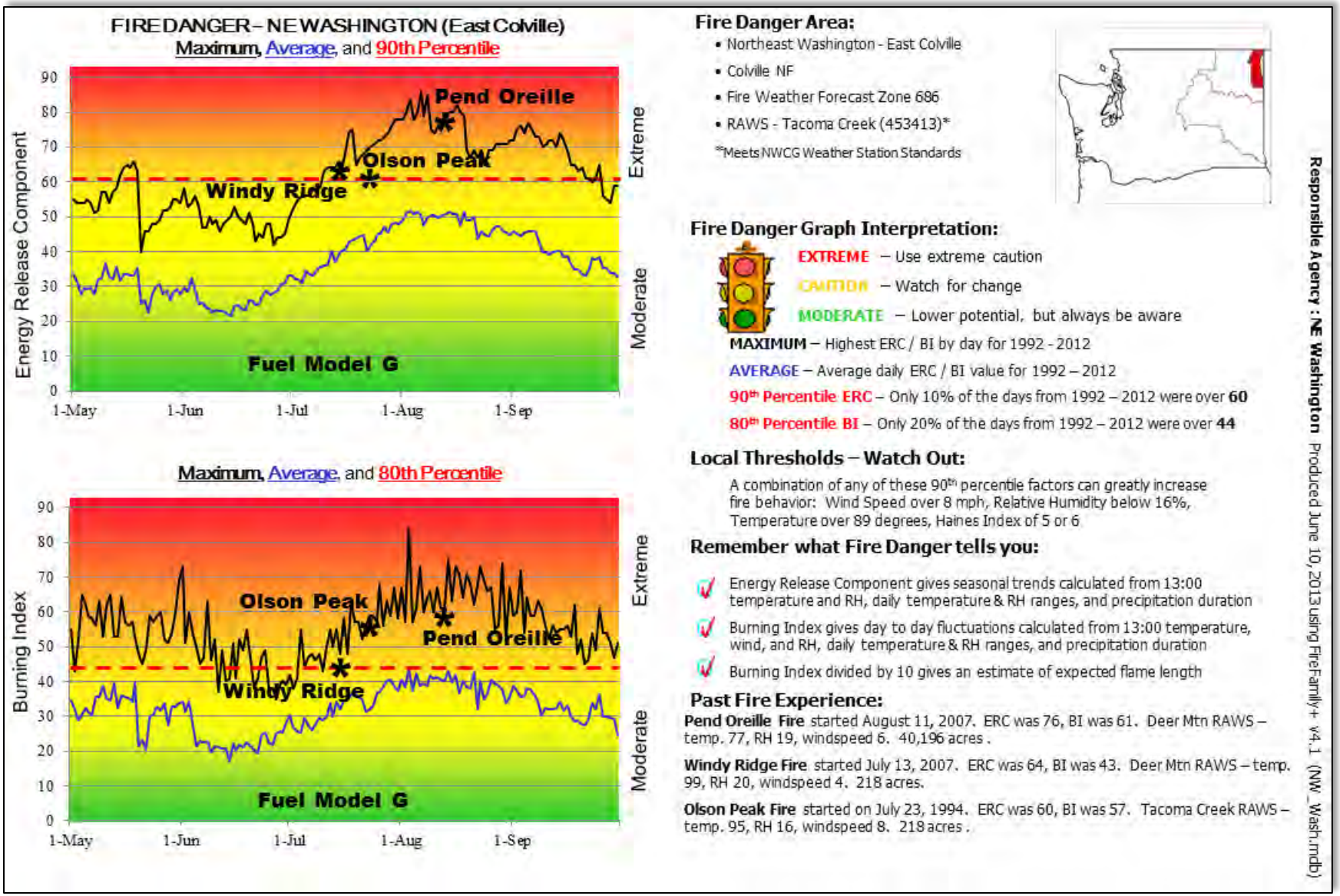
Appendix I. North FDRA Pocket Card



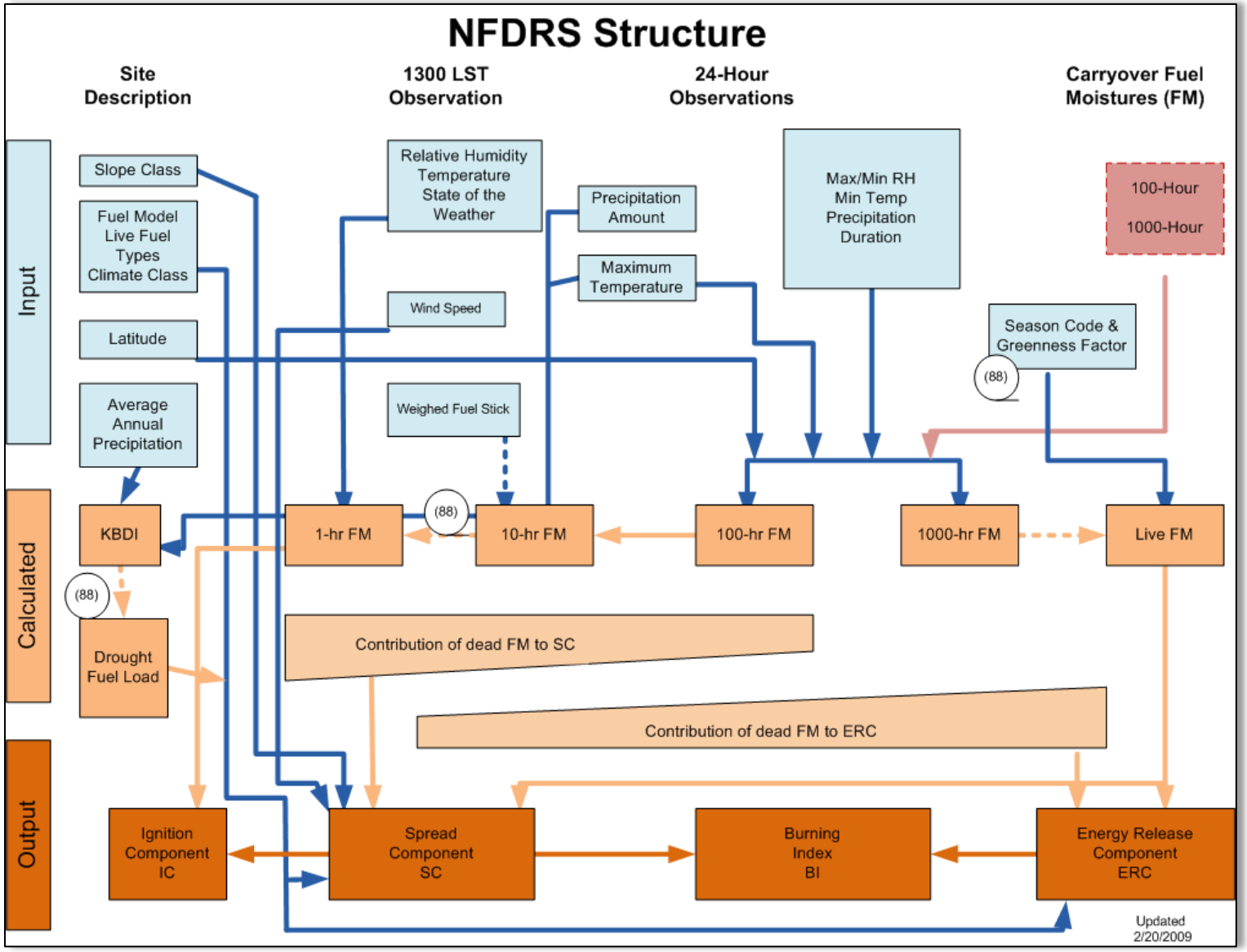
Appendix J. South FDRA Pocket Card

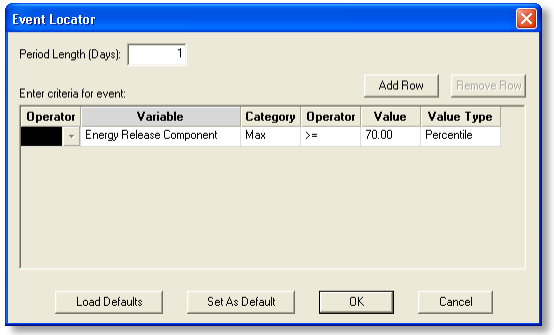


Appendix K. Eastside Colville NF Pocket Card



Appendix L. NFDRS Structure Chart





Term Report

Season Start Date:	6/1
Alpha Value:	13.8
Beta Value:	0.0079
R Squared:	0.97
File name:	north.trm

Date	# days
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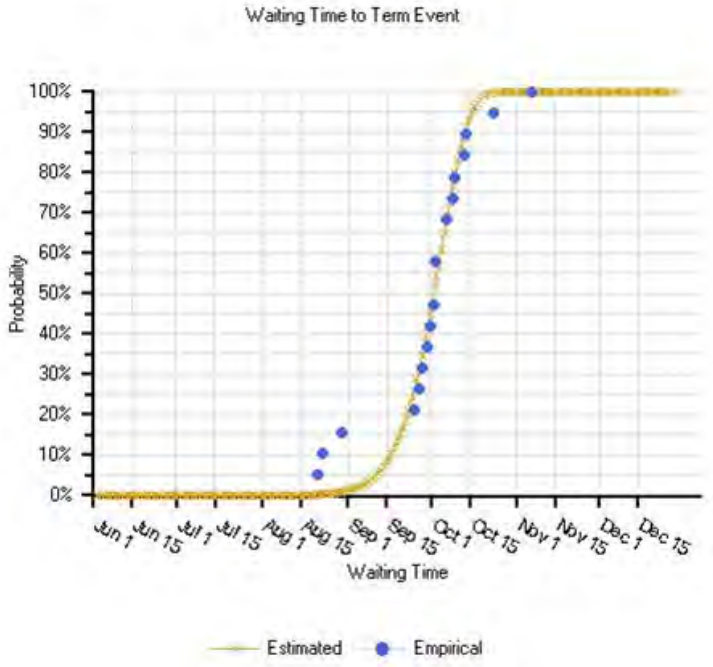
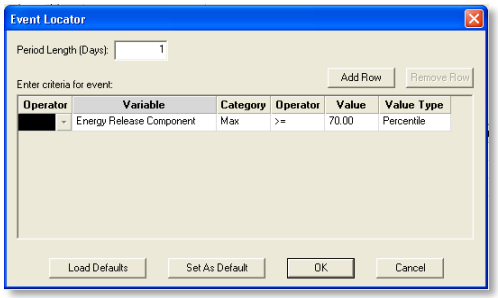
10/10/1994	131
9/25/1995	116
10/3/1996	124
8/23/1997	83
9/30/1998	121
10/24/1999	145
10/9/2000	130
10/7/2001	128
11/7/2002	159
10/7/2003	128
8/21/2004	81
9/28/2005	119
10/14/2006	135
9/27/2007	118
10/1/2008	122
10/13/2009	134
8/30/2010	90
10/3/2011	124





Term Report

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File name:	south.trm

Date	# days
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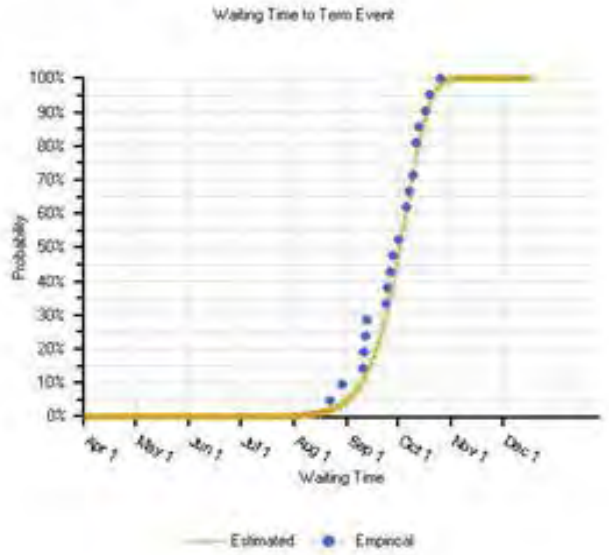
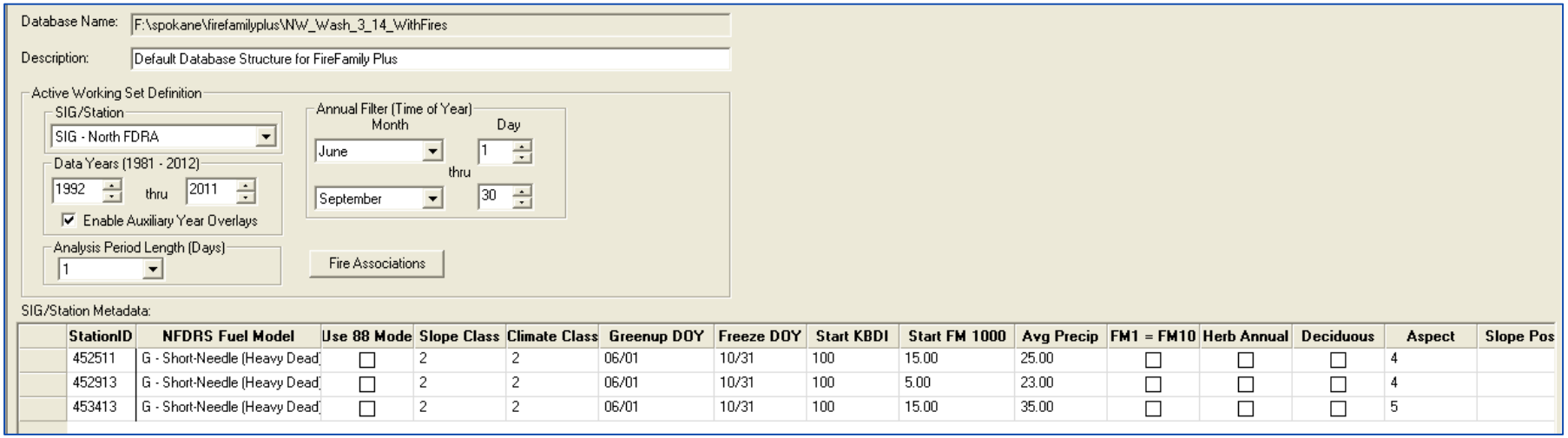
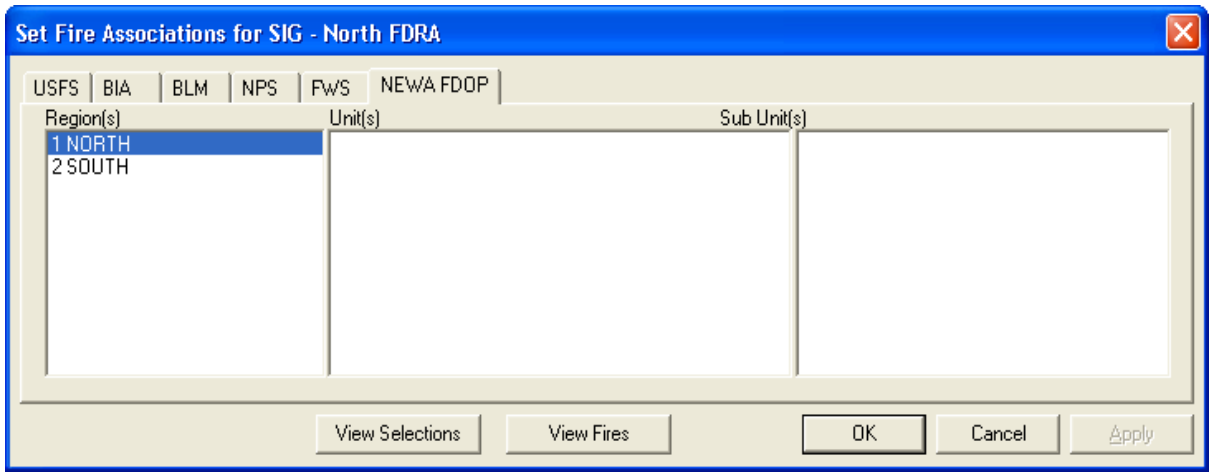
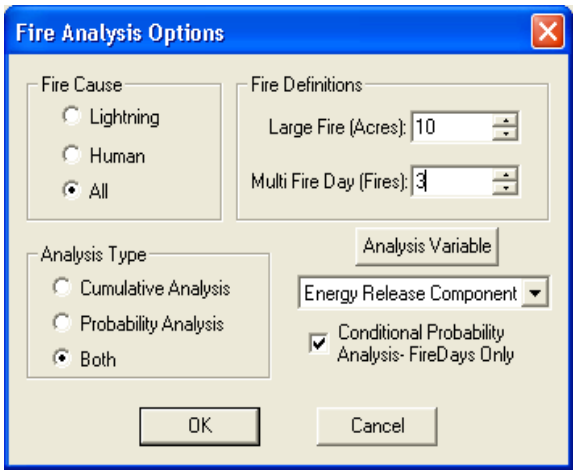
9/12/1993	164
10/7/1994	189
9/25/1995	177
9/11/1996	163
8/22/1997	143
10/19/1998	201
10/17/1999	199
10/11/2000	193
10/6/2001	188
10/26/2002	208
10/6/2003	188
9/10/2004	162
9/28/2005	180
9/13/2006	165
9/26/2007	178
10/1/2008	183
10/11/2009	193
8/29/2010	150
9/24/2011	176
10/10/2012	192



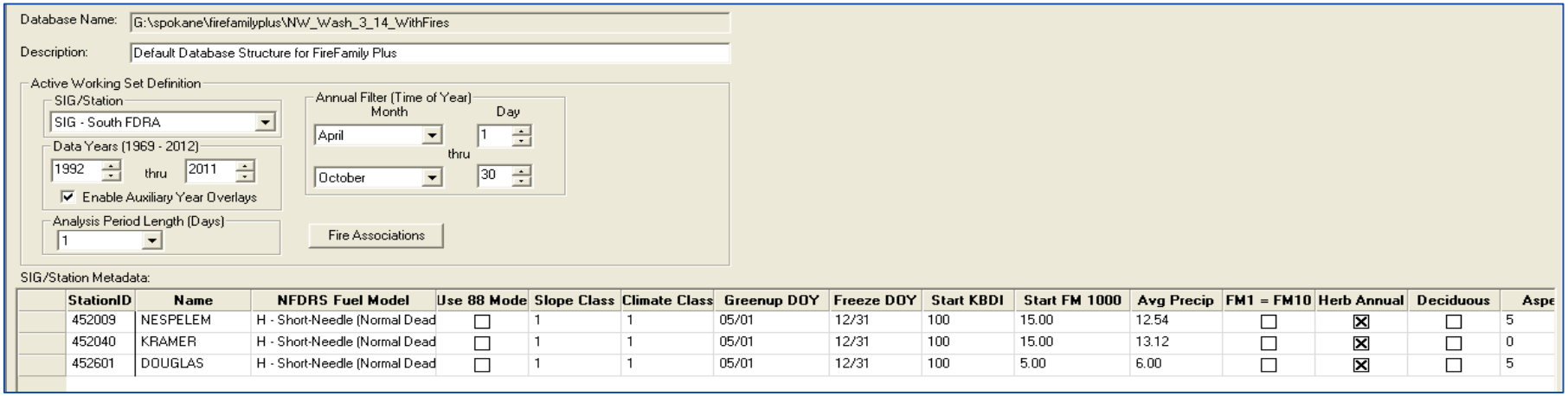
Appendix O. FireFamily Plus Analysis Working Set (North FDRA)

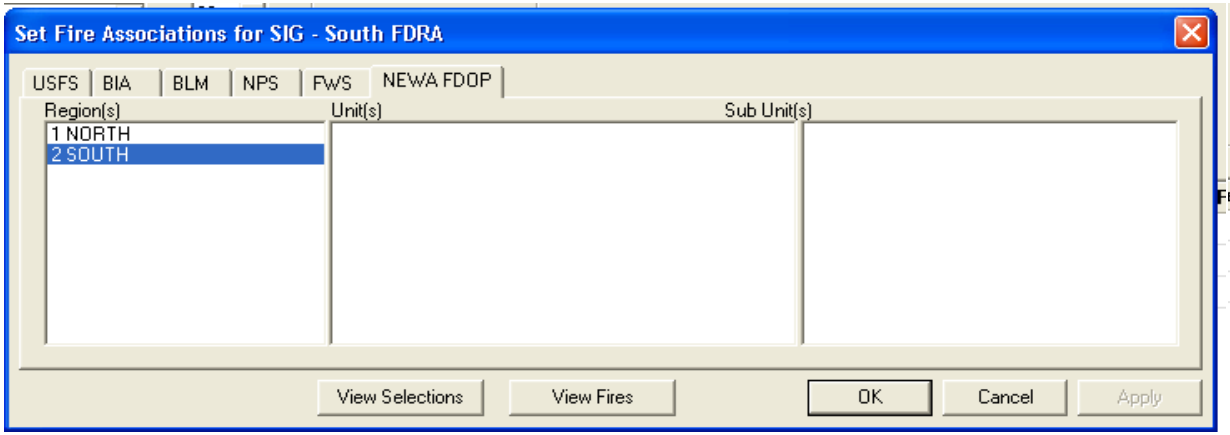


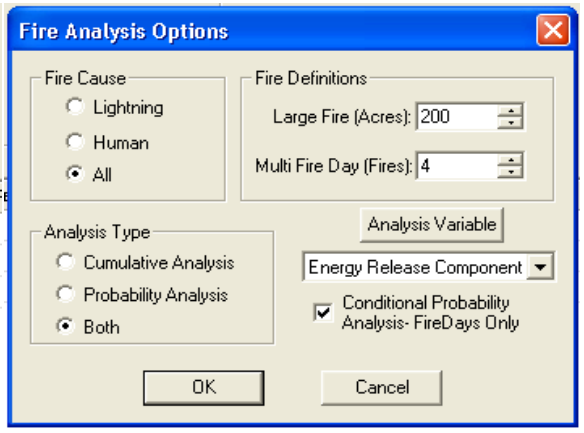




Appendix P. FireFamily Plus Analysis Working Set (South FDRA)







Appendix Q. Colville National Forest Preparedness and Staffing Guide

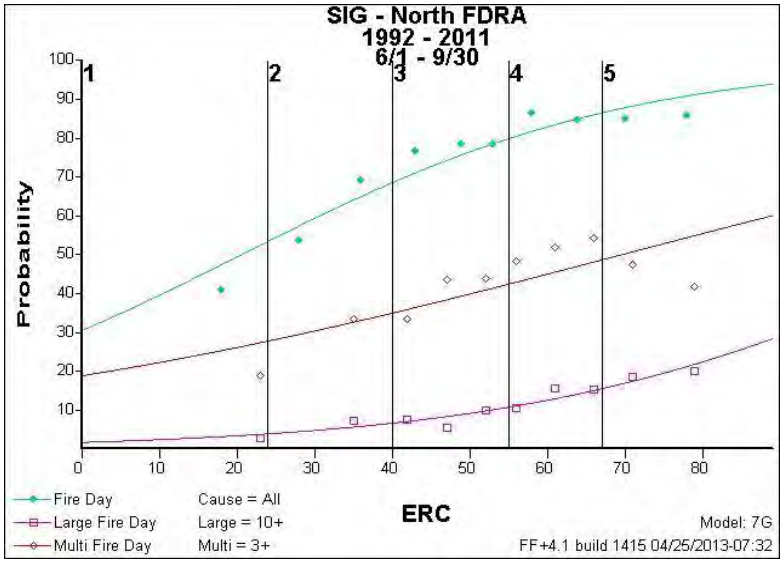
PREPAREDNESS LEVEL	1	2	3	4	5
Ground Resources					
Engines	2 engines or 2 IA modules on forest	1 engine per district/zone or 1 IA module per district/zone	1 per district/zone	**7 on forest with min 1 per district/zone**	10 on forest with min 2 per district/zone
IA Module (3 to 5)			1 per district/zone	**5 on forest with min 1 per district/zone**	5 on forest with min 1 per district/zone
Dozers				**consider**	1 on forest
Extended Attack Overhead (DIVS,ICT3,SOFR)				consider	1 ICT3, 1 DIVS, 1 SOFR on forest
IA Personnel (extra non fire FFT2)			notify potential need's	fire ready	organized with fire crews
Crews (Type 1 or 2)			consider	1 crew on forest	2 crews on forest
Water Tenders				consider	1 on forest
Air Resources and Detection					
Helicopter (med or light)				1 helicopter	2 helicopter
Helicopter (med) with Rappel Module				consider	consider
Helicopter (heavy)				consider	consider
SEAT's with Base				consider	consider
Air Attack with Platform				1 air attack	2 air attack
Management and Dispatch Preparedness:					
Forest Conference Calls	as scheduled	weekly	weekly	two per week	daily
Severity			consider	request	request
Forest Duty Officer			5 day staffing (2 hr call)	7 day staffing	7 day staffing
Aviation Officer	forest AFMO	forest AFMO	forest AFMO	consider forest aviation officer assistance	forest aviation officer assistance
NEWICC Hours	0800-1800	0800-1800	0800-1800 extend as needed	0800 to 2300 extend as needed	0800 to 2300 consider 24 hour staffing
Local Buying Team			consider	available	staffed
Expanded Dispatch			consider	available	staffed
Line Officer Staffing			1 journeyman (8 hr call)	1 journeyman (2 hr call)	1 advanced LO authority and consider additional
Grants and Agreements Contact			consider	available	staffed
WFDSS Support			consider	available	staffed
Logistics Support			consider	available	staffed

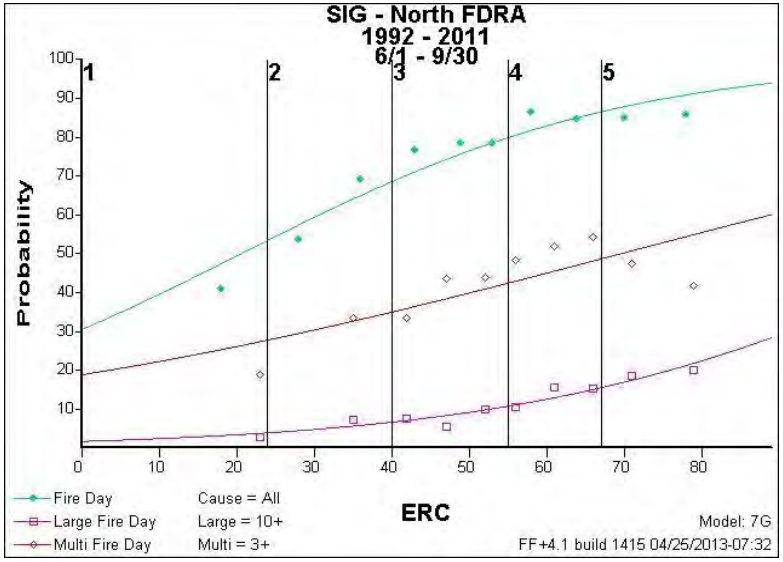
This staffing guide is the recommended minimum needs for the Colville NF during fire season. Fire season is defined as June 1st to October 1st. District duty officers will be in service when fire personnel are in service.

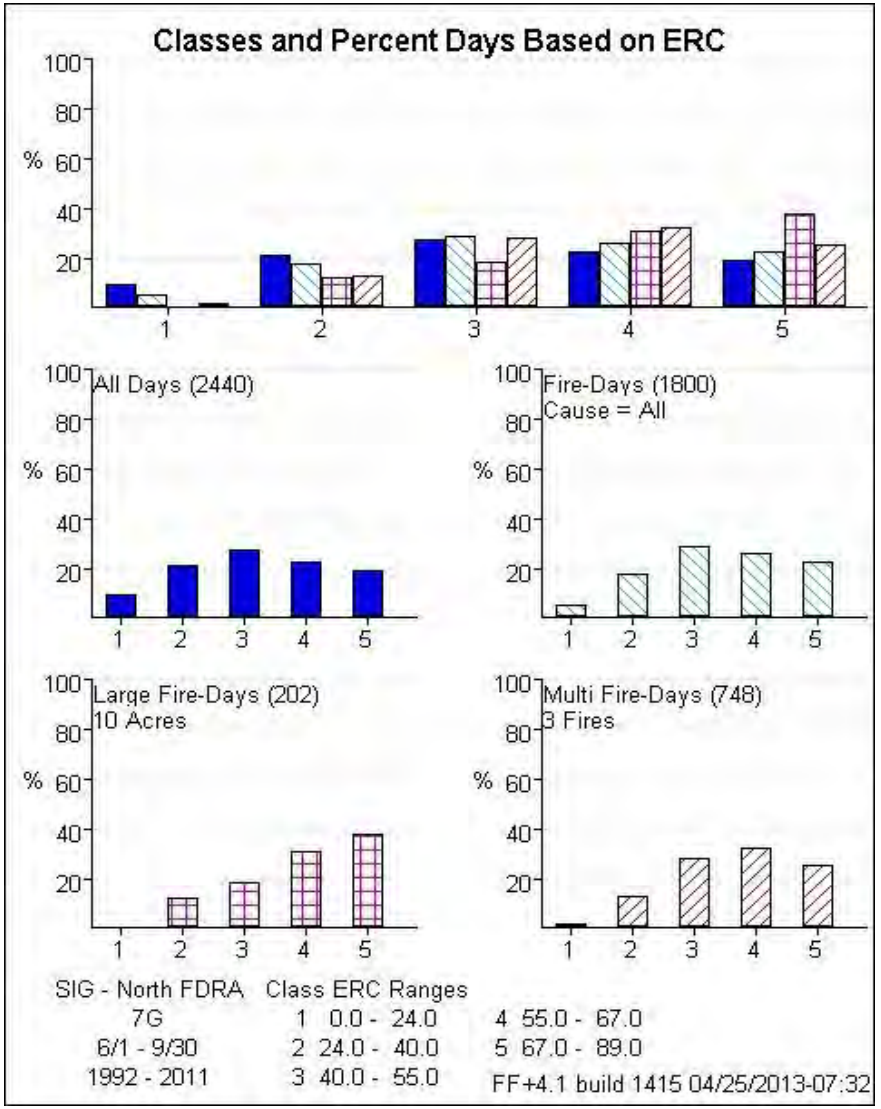
Staffing Level Guide

Staffing Level	1	2	3	4	5
IA Response Time	30 min.	30 min.	15 min./5 min. after lightning	2 min.	2 min.
Extended Staffing			As needed	Consider	Implement based on ignition risk
Air Patrol			Lightning	Lightning	Daily Patrol Scheduled
Lookouts			Consider following lightning	Lightning/consider staffing daily	Staffed Daily

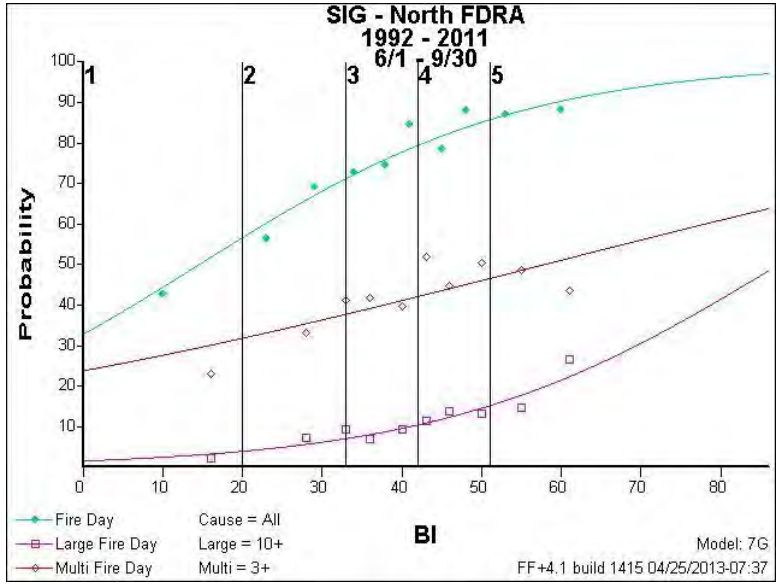
Appendix R. Preparedness Level Decision Points (North FDRA)

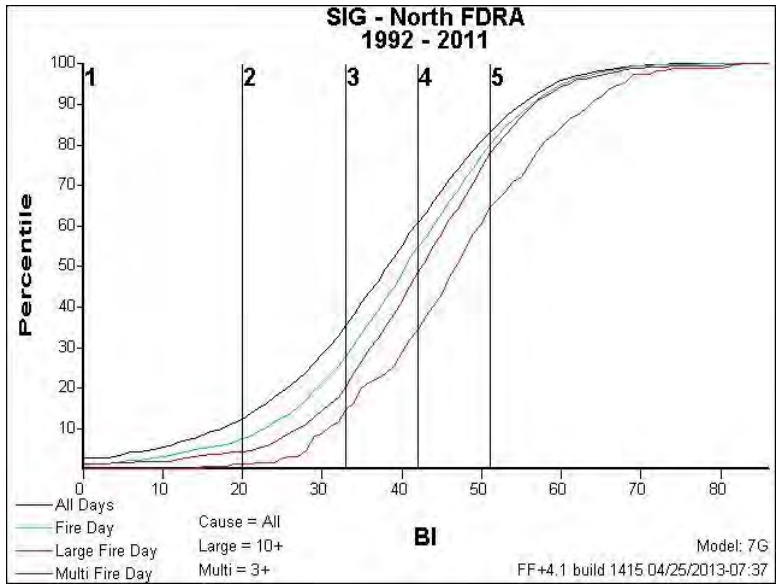


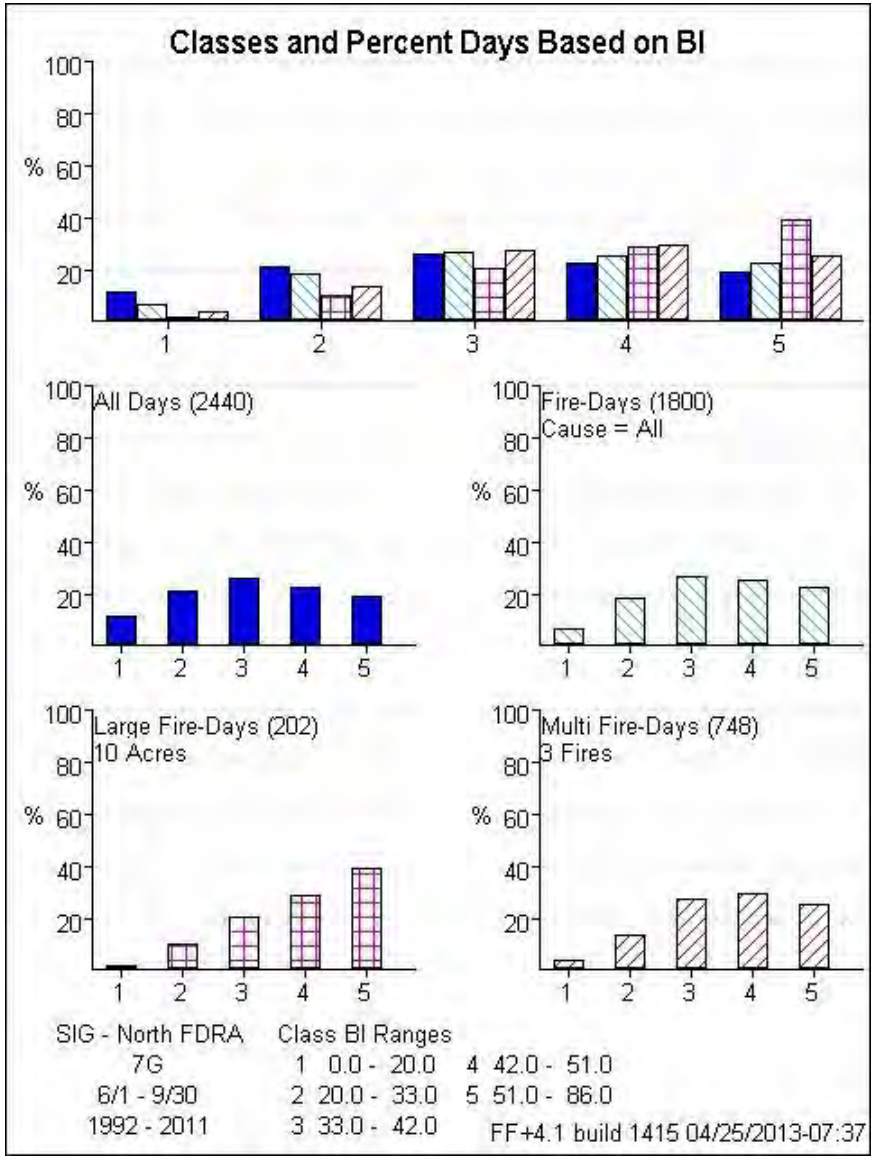




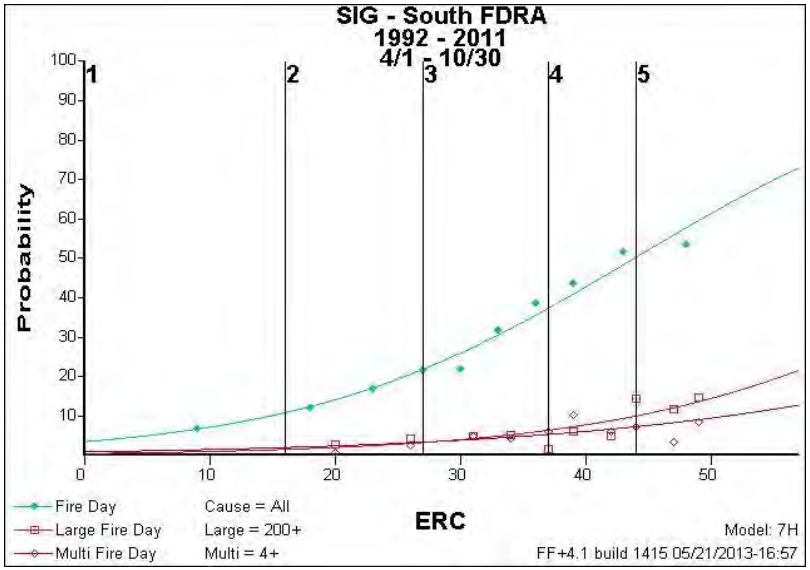
Appendix S. Staffing Level Decision Points (North FDRA)

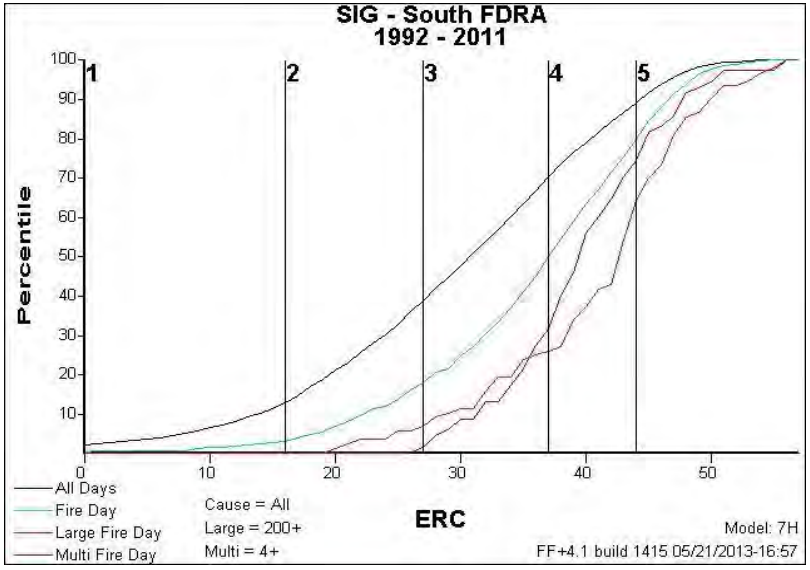


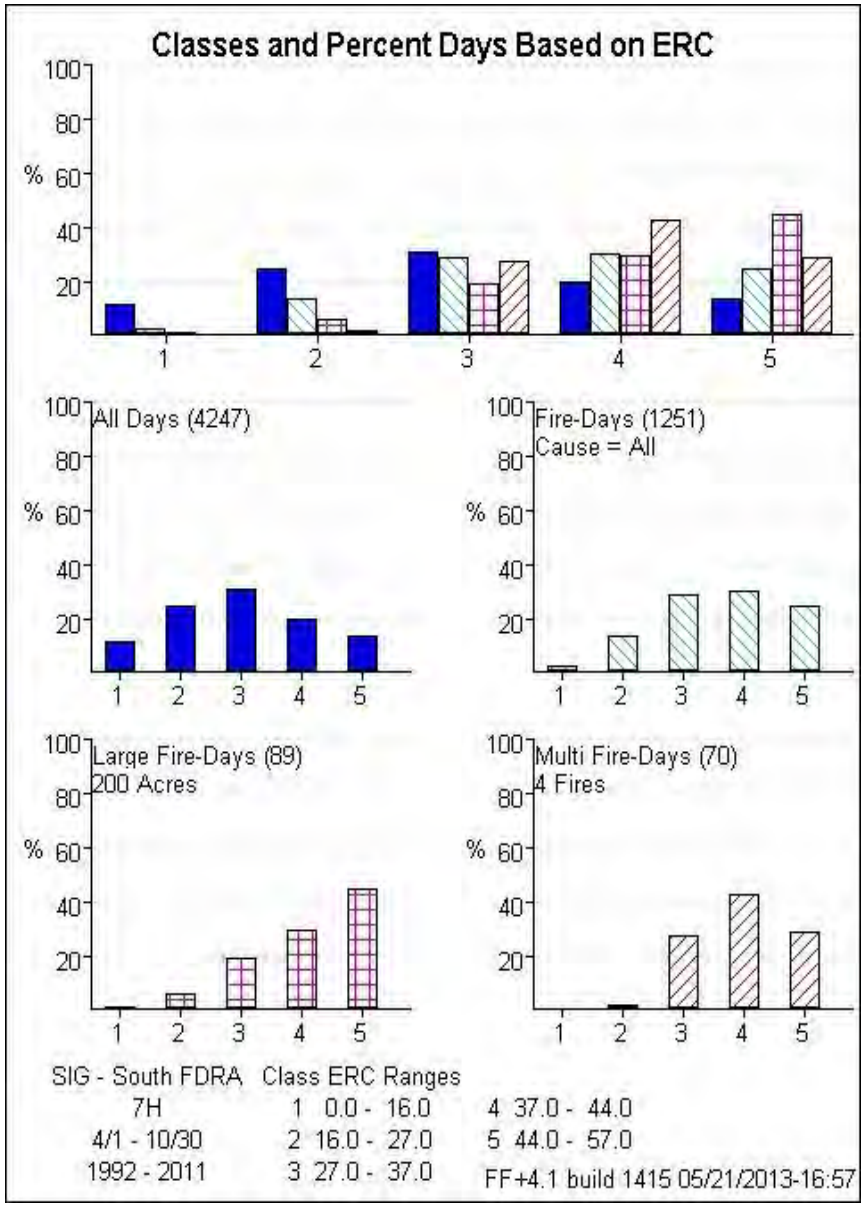




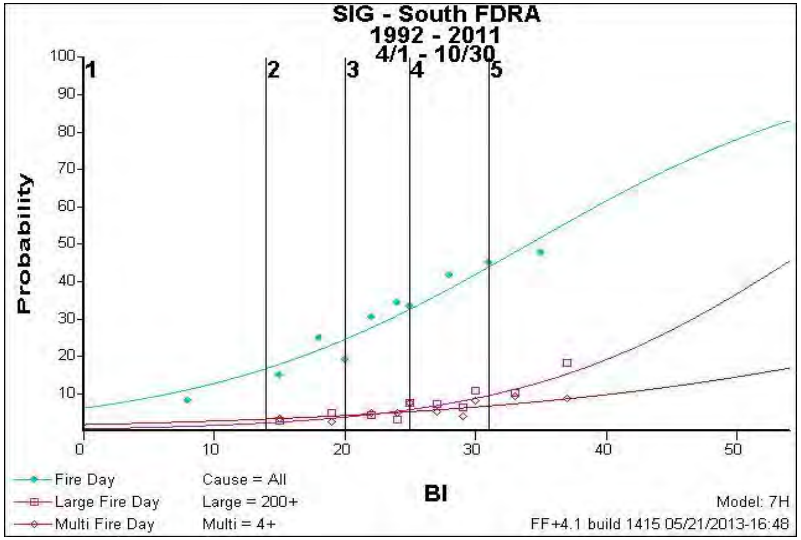
Appendix T. Preparedness Level Decision Points (South FDRA)

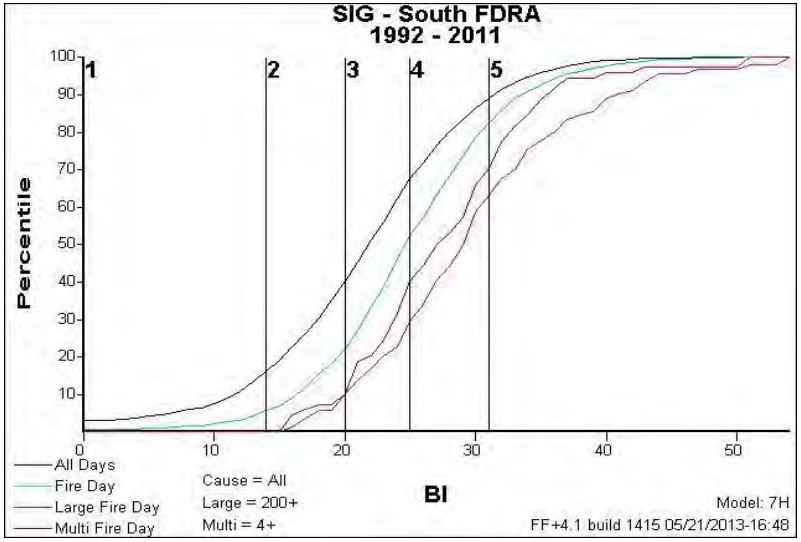


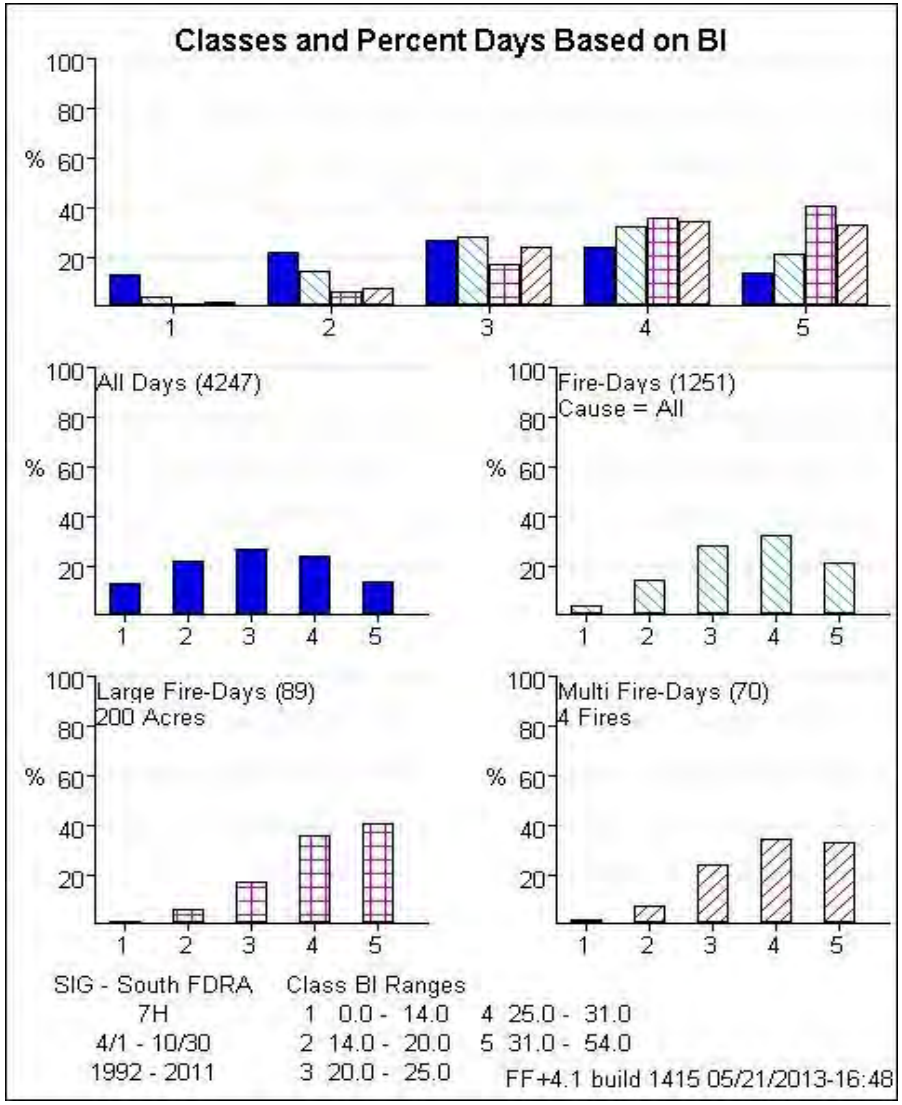




Appendix U. Staffing Level Decision Points (South FDRA







Appendix V. Fire Behavior modeling information for the analysis area

This Appendix is included to provide fire and fuels manager with local information for fire behavior modeling. It is not designed to be all inclusive, but intended to be useful to shorten calibration time for on-going fires and fuel treatment modeling.

- Watch the GS fuel models, they seem to be over represented in LANDFIRE 2008
- If you're using the models in WFDSS, pay close attention the wind roses, most of our local stations on the Colville NF don't accurately reflect wind due to their sheltered locations.

Appendix W. Weather Information Management Application (WIMS)

WIMS Setup and Application

The Weather Information Management System (WIMS) is a comprehensive system that enables users to manage weather information.

WIMS can be accessed at *http://fam.nwcg.gov/fam-web/*.

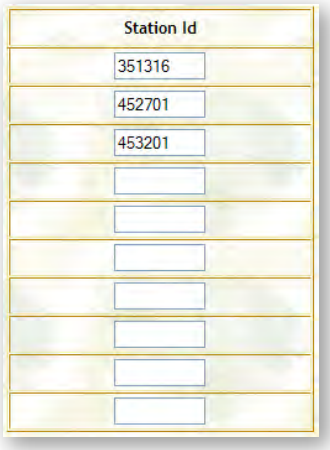
The WIMS User Guide can be downloaded from the following web site:

http://www.fs.fed.us/fire/planning/nist/wims_web_ug/wims__ug_complete061803.pdf

1. NSIG: Create a Special Interest Groups (SIG)

Enter SIG name (i.e., "FDOP") and select Setup

Enter the associated station numbers for the SIG. . . . then select Save



EAVG: Assign NFDRS Weighted Avg.

Enter the SIG name and select Display

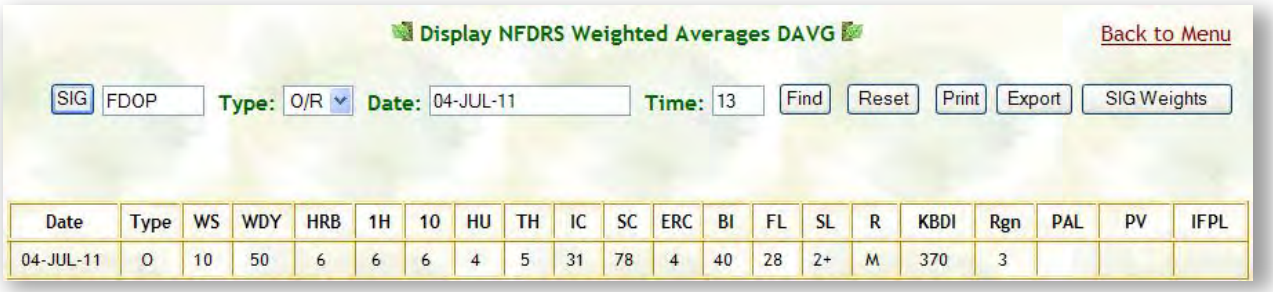
By default, each station is weighted equally for the first priority fuel model. Keep the default value by selecting Save

If successful, the following message will be displayed: Weighted average for SIG 'XXXXX' has been successfully updated.

Repeat these steps for each SIG.

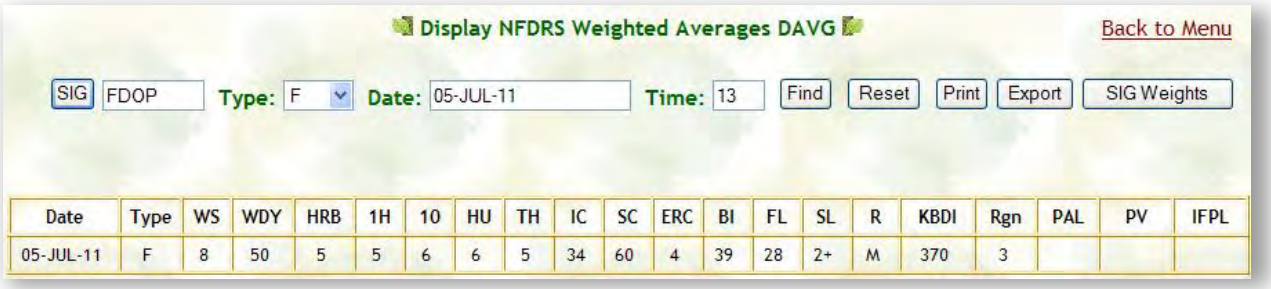
2. DAVG: Display NFDRS Weighted Averages

Enter the SIG name, Type "O", and current date for daily indices, then select Find



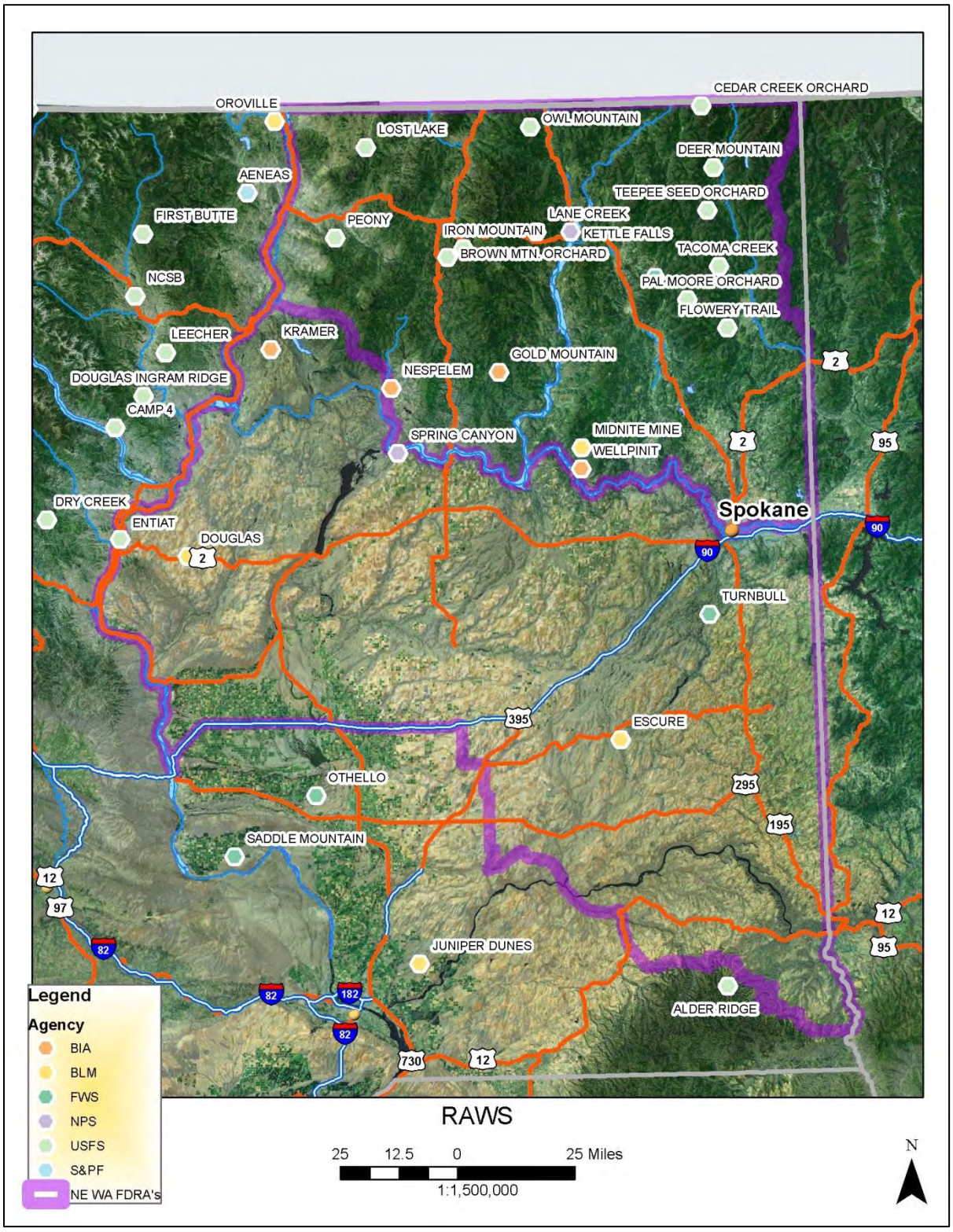
Date	Type	WS	WDY	HRB	1H	10	HU	TH	IC	SC	ERC	BI	FL	SL	R	KBDI	Rgn	PAL	PV	IFPL
04-JUL-11	O	10	50	6	6	6	4	5	31	78	4	40	28	2+	M	370	3			

Enter the SIG name, Type “F”, and date of forecasted indices, then select Find

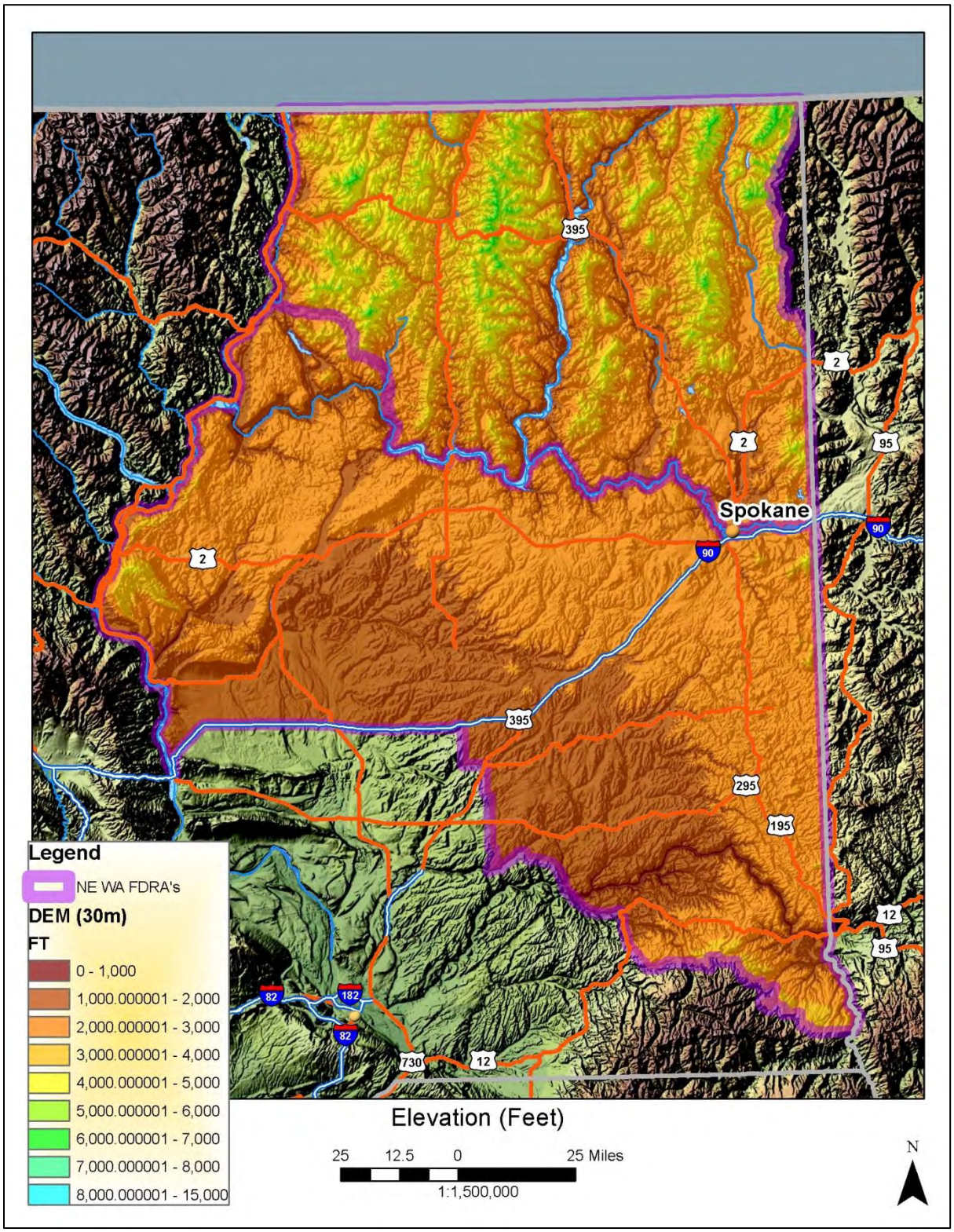


Date	Type	WS	WDY	HRB	1H	10	HU	TH	IC	SC	ERC	BI	FL	SL	R	KBDI	Rgn	PAL	PV	IFPL
05-JUL-11	F	8	50	5	5	6	6	5	34	60	4	39	28	2+	M	370	3			

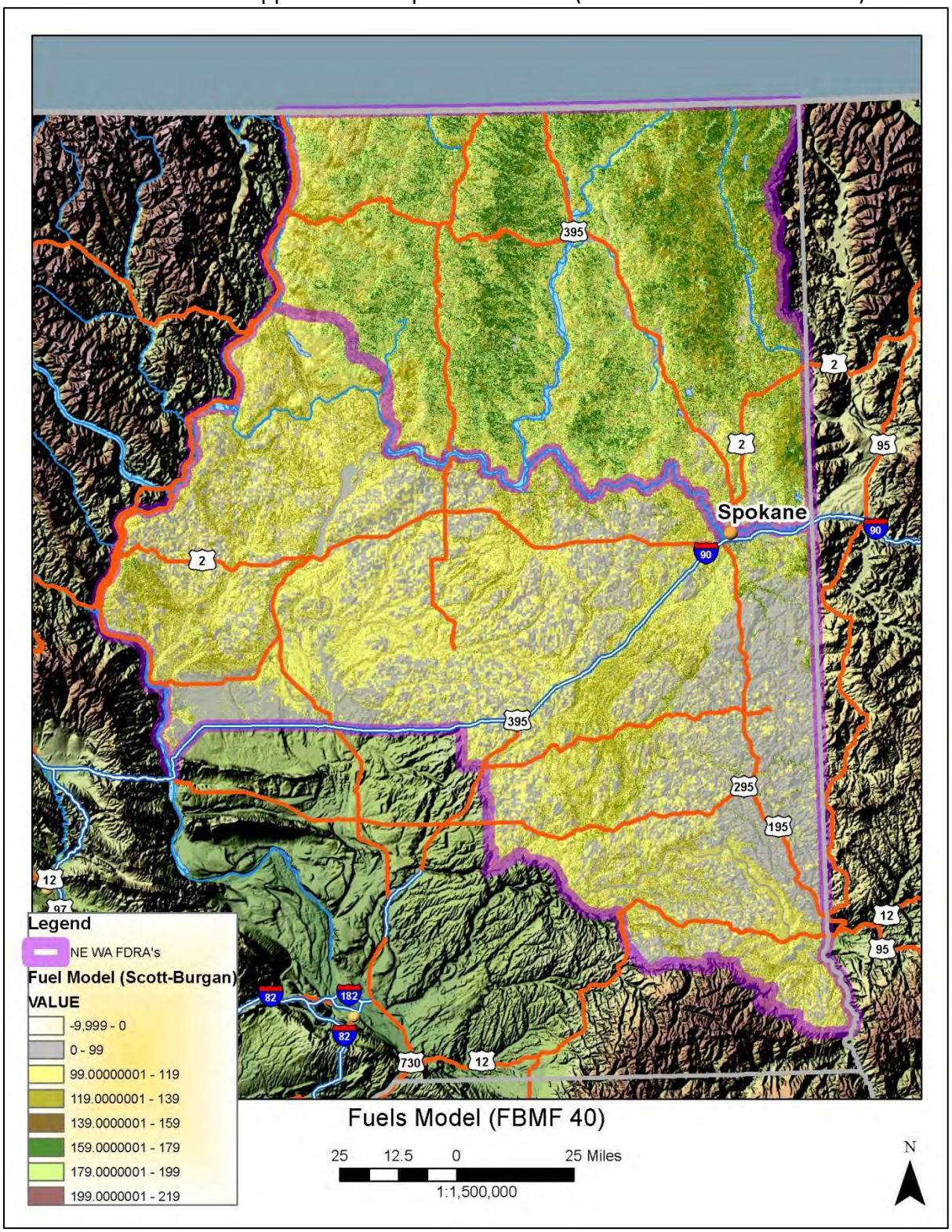
Appendix X. Map - Fire Danger Rating Areas Remote Automated Weather Stations (RAWS)



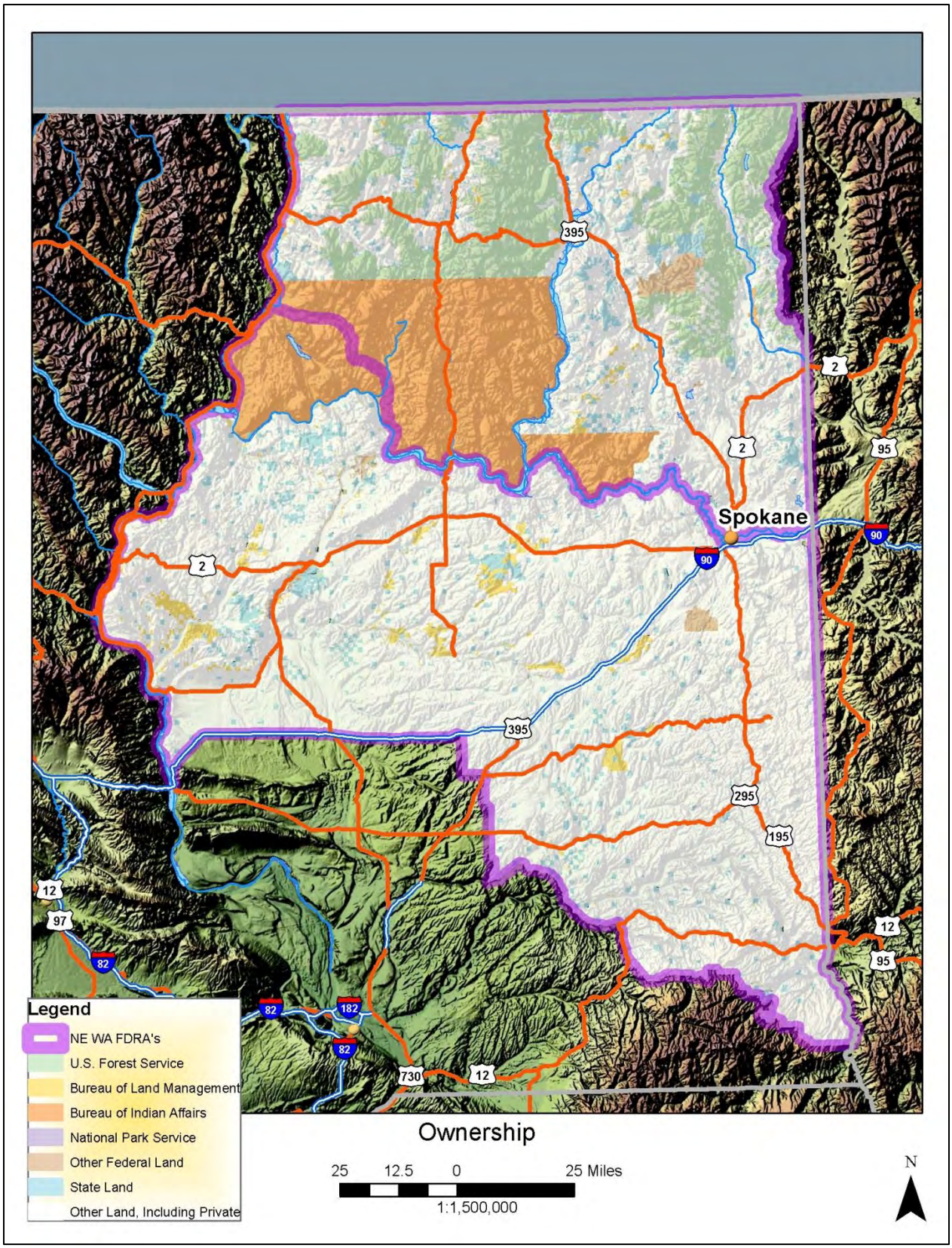
Appendix Y. Map – Elevation



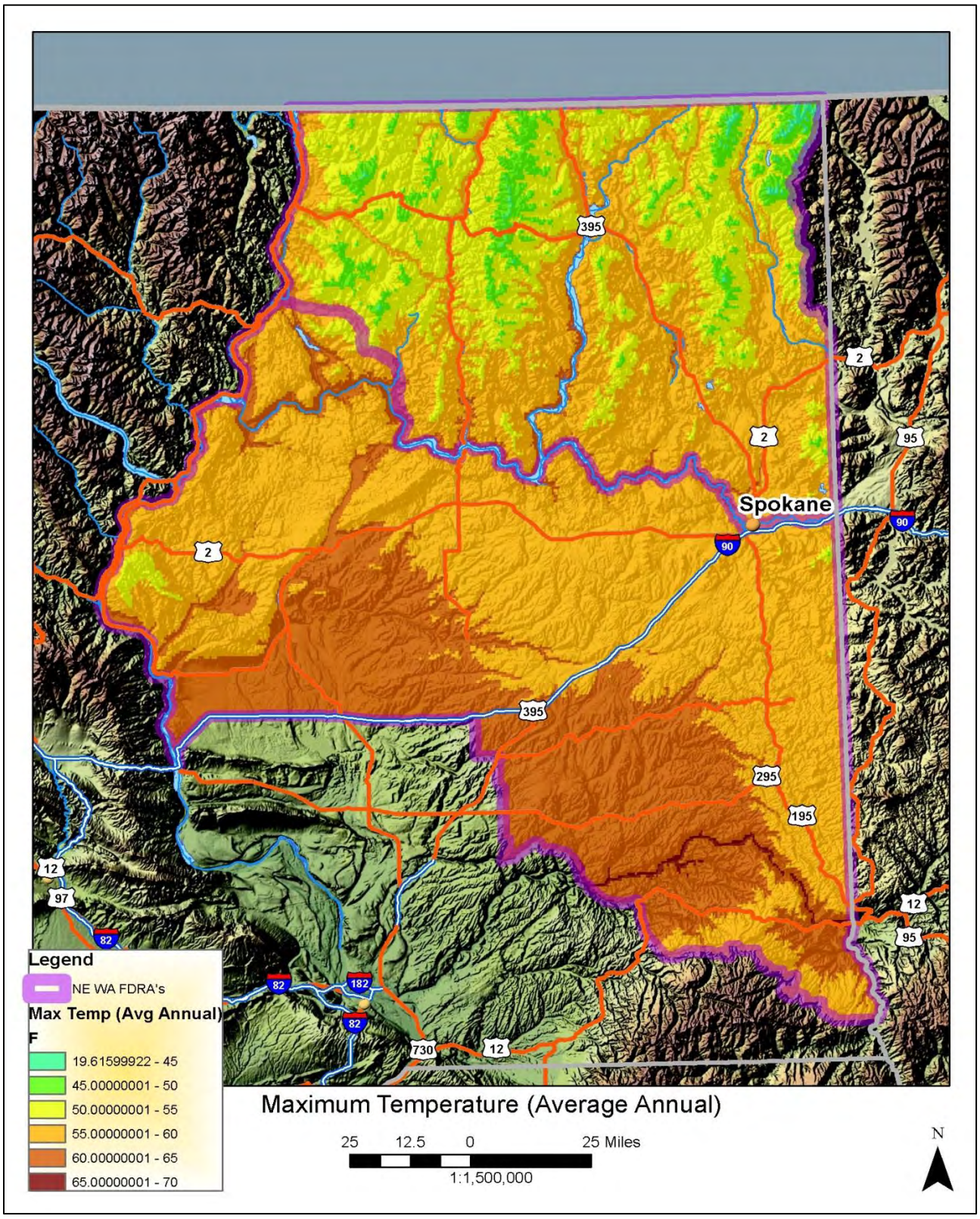
Appendix Z. Map - Fuel Models (LANDFIRE FBFM 40 - v2008)



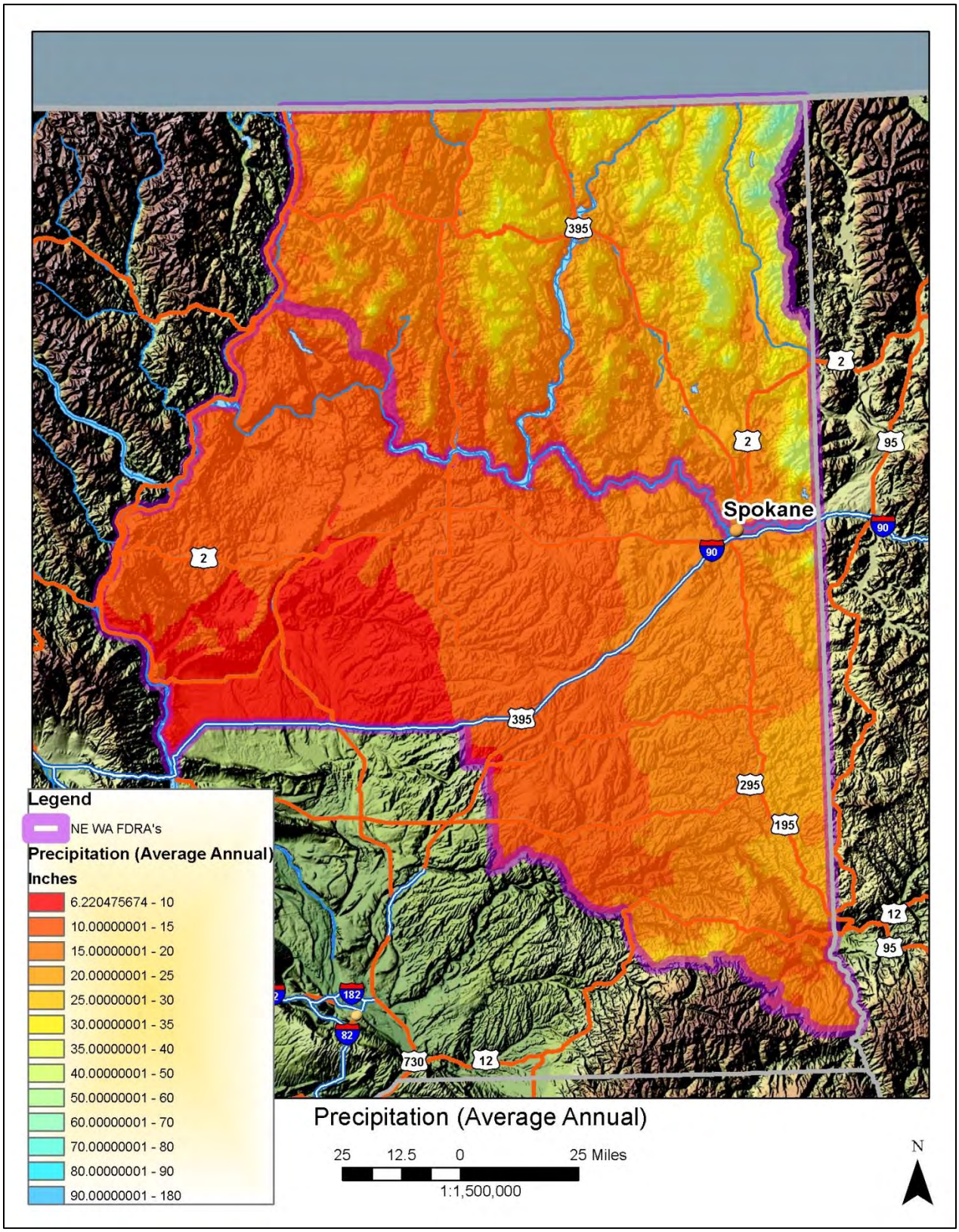
Appendix AA. Map - Ownership



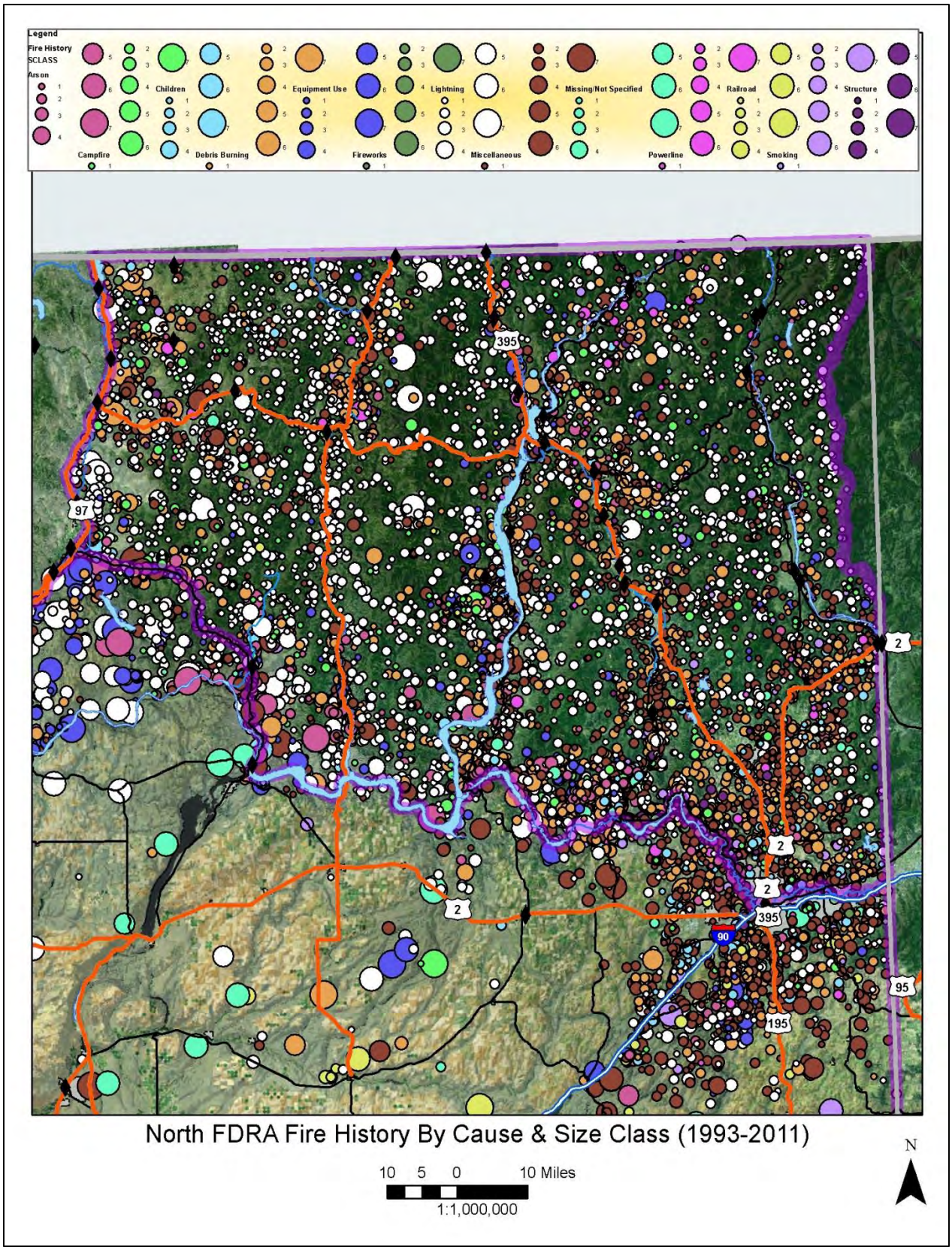
Appendix BB. Map - Climate (Annual Average Temperature)

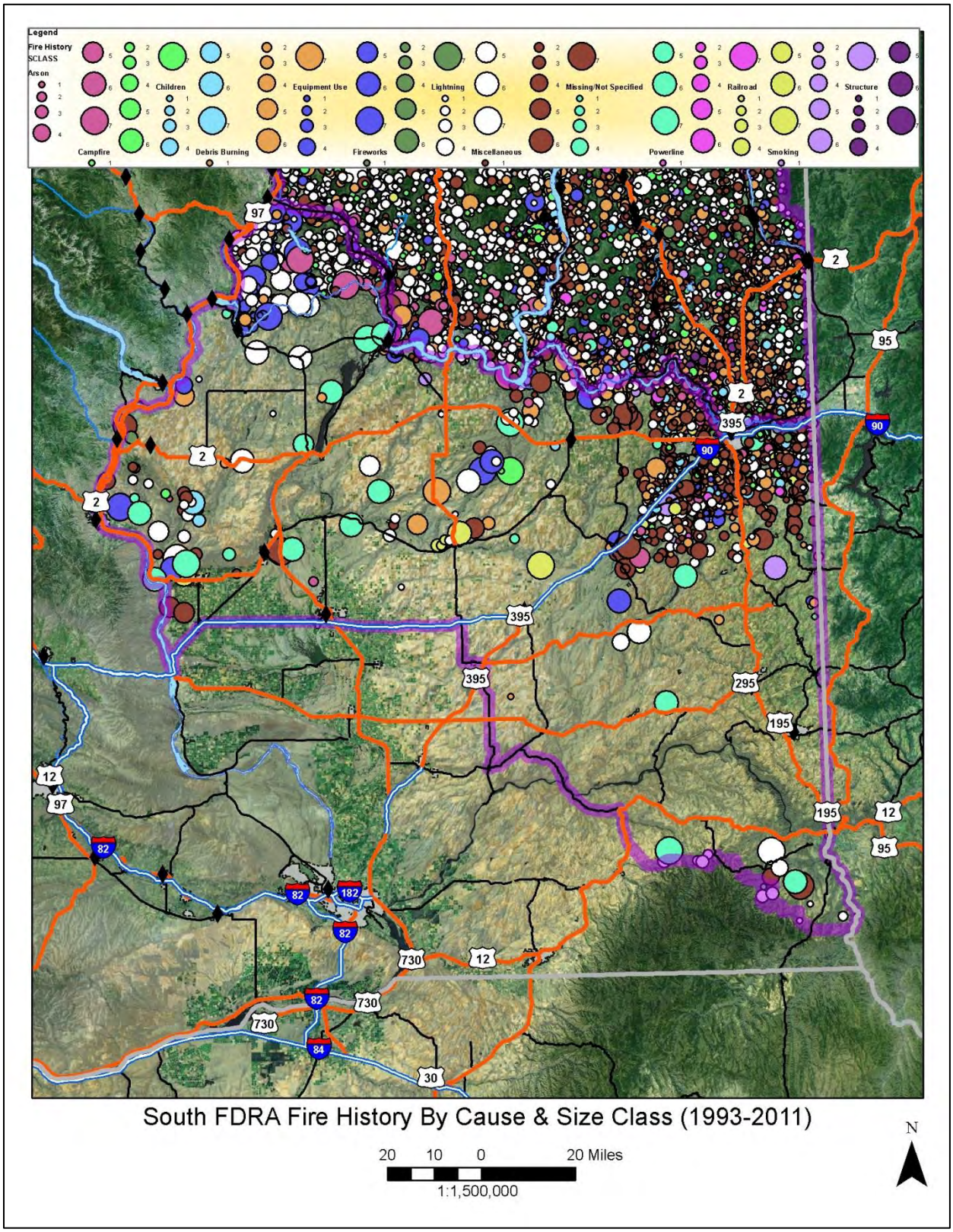


Appendix CC. Map -Climate (Annual Average Precipitation)



Appendix DD. Map -Fire Occurrence (Point Location by Cause)




Legend
Fire History
SCLASS
Arson
Campfire
Children
Debris Burning
Equipment Use
Fireworks
Lightning
Miscellaneous
Missing/Not Specified
Powerline
Railroad
Smoking
Structure
97
2
95
395
90
12
82
182
730
84
30
295
195
South FDRA Fire History By Cause & Size Class (1993-2011)
20 10 0 20 Miles
1:1,500,000
N

Appendix EE. Map - Fire Weather Zones and Predictive Service Areas