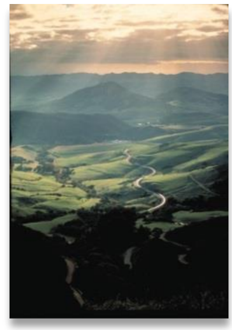







Fire Danger Operating Plan

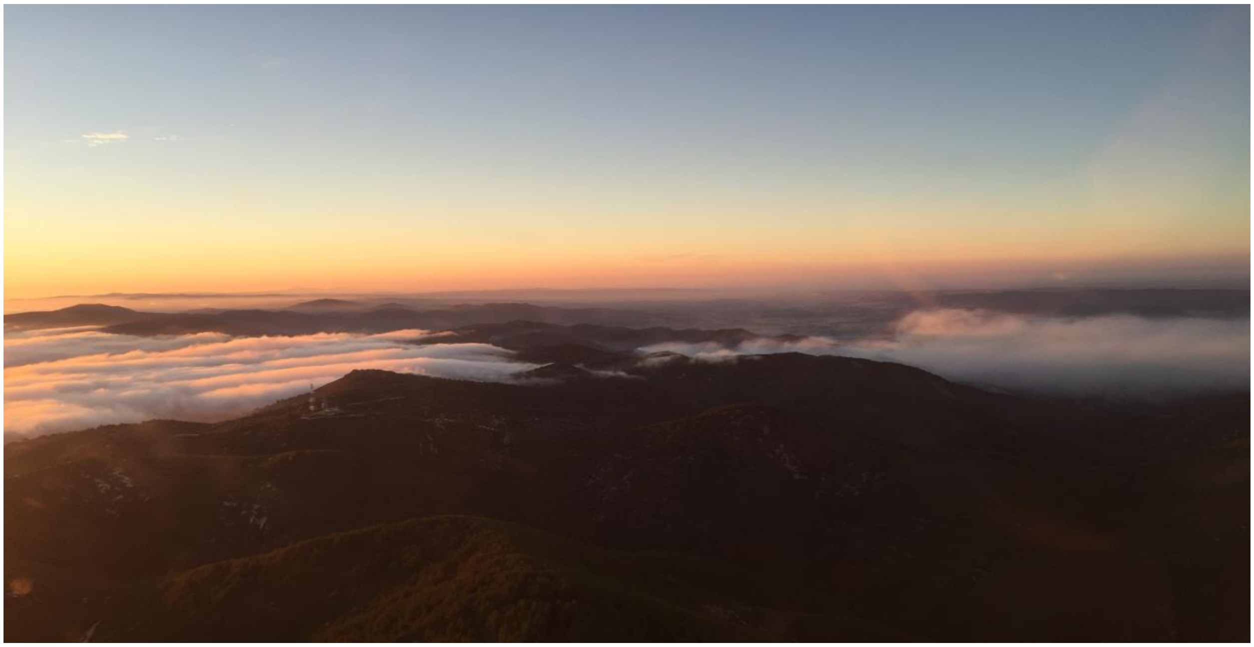
CAL FIRE/San Luis Obispo County Fire

May 2016

PLAN AMENDMENTS

Date	Section Updated	Page Numbers Updated	Description of Update	Updated By
03/02/2016	4	19, 21,22	Wind Speed/Relative Humidity Graphs	M. Marsh
03/12/2016	5	34	ERC/BI Graphs	M. Marsh
03/16/2016	4	17	Five-Year Ignition Data	M. Marsh
03/16/2016	4	24, 25	Fire Occurrence Graphs	M. Marsh
04/01/2016	6	12, 41	Pocket Cards	M. Marsh

Contents



SIGNATURES

San Luis Obispo Unit Fire Danger Operating Plan

Recommended By:

Pre-Fire Engineer: David Penery-Fowler

Approved By:

Unit Chief: Scott M. Jalbert

SECTION 1: INTRODUCTION

This plan is designed to help guide the application of the National Fire Danger Rating System (NFDRS) at the unit level. It will provide a framework for a consistent thought process to apply the Fire Danger Operating Plan in San Luis Obispo County for agency administrators, fire managers, dispatchers, agency coordinators, and firefighters using accurate and effective scientific methods and historical fire and weather data. Management decisions dealing with dispatch levels and staffing levels will be assessed based on vegetation, weather, and topography in conjunction with NFDRS modeling.

This operating plan is for San Luis Obispo County which encompasses two fire danger rating areas, including the Coastal FDRA and the Inland FDRA. These two geographic regions are our focus of study because each is composed of a unique combination of fuels, weather and topography.

This plan offers decision support and helps in quantifying elements that establish agency planning and response levels. Additionally, procedures for developing seasonal risk analysis and fire severity trigger points are outlined with the implementation and analysis process of this plan.

Please note that the design and much of the wording of this plan and document is based on a number of Fire Danger Operating Plans which have been utilized as examples for Fire Danger Operating Plans throughout the United States. Many of the resources and information supporting this document have been referenced from online repositories of information on the CAL FIRE/San Luis Obispo County Fire FDOP page under operations on the intranet.

SECTION 2: 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 San Luis Obispo County.
- Delineate fire danger rating areas (FDRAs) in San Luis Obispo County having similar weather, fuels, 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), FireFamilyPlus 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 development and distribution of fire danger pocket cards to all personnel involved with fire suppression activities within the San Luis Obispo Fire Danger Rating Areas.
- Identify program needs and suggest improvements for the Fire Danger Operating Plan.

SECTION 3: ROLES AND RESPONSIBILITIES

Fire Danger Operating and Preparedness Plan: The San Luis Obispo Unit will ensure that necessary amendments or updates to this plan are completed. Updates to this plan will be made annually, and approved by the Unit Chief.

Suppression Resources: During periods when local preparedness levels are high to extreme, the Duty Chief will strive to staff resources at levels appropriate with agency direction. This may require the pre-positioning of suppression resources. The Duty Chief may also determine the need to request out of unit resources or support personnel throughout the fire season.

Duty Officer: The San Luis Obispo Unit Duty Officer provides input and guidance regarding preparedness and Staffing Levels.

- **a.** It is the Duty Officer's role to interpret and modify the daily preparedness and staffing levels as required by factors of this plan. Modifications of the preparedness and/or staffing levels must be coordinated with the San Luis Obispo Unit Emergency Command Center (ECC), and local cooperators.
- **b.** It is the Duty Officer's role to ensure that the daily fire weather forecasts (including NFDRS indices) are retrieved and that the daily preparedness and dispatch levels are calculated (at least every two hours during fire season from 13:00 to 22:00) and stored.
- **c.** It is the Duty Officer's role to ensure the timely editing of daily the 1300-hr weather observations of

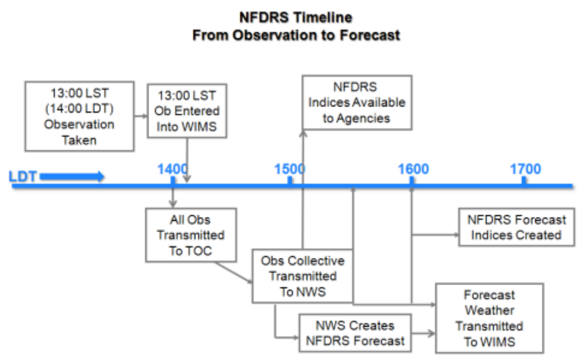
all stations.

d. The Duty Officer will keep CAL FIRE/San Luis Obispo County Fire and management staff updated of changes to dispatch levels during fire season. Dispatch levels are dictated by the recorded WIMS readings every 2 hours starting at 1300 and ceasing at 2200.Dispatch levels are reset to a low dispatch level at aircraft cut-off time until the following day at 1300 when they are re-evaluated based on WIMS records. The San Luis Obispo Unit is unique from others in that, although the dispatch levels are based on WIMS, the levels are ultimately up to the discretion of the Duty Officer. This act of discretion is also exercised in the event of a fire between 2200 until 1300 the next day.

Fire Weather Forecasting: Daily fire weather forecasts are developed by the [National Weather Service daily for San Luis Unit Emergency Command Center](http://www.wrh.noaa.gov/eccda/eccda.php?ecczone=24)[1].

Weather Station Maintenance: The San Luis Obispo ECC and CAL FIRE/San Luis Obispo County Fire are responsible for scheduling maintenance of the RAWS station sensors with Forest Technology Services.

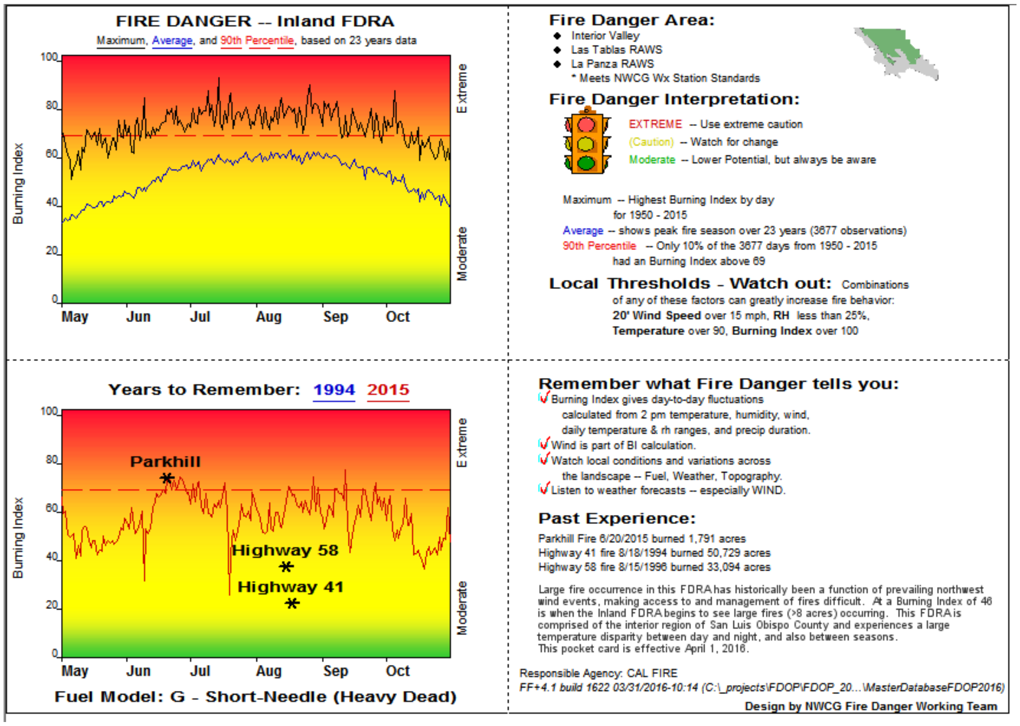
WIMS Access, Daily Observations, and Station Catalog Editing:



Fire Danger Pocket Cards: The FDOP coordinator will ensure that Pocket Cards are prepared every year in compliance with NWCG and/or agency standards. The cards will be published online at calfireslo.org for distribution to all interagency, local and incoming firefighters, and Incident Management Teams (IMTs). Fire suppression supervisors will utilize pocket cards to train and brief suppression personnel.

[1] http://www.wrh.noaa.gov/eccda/eccda.php?ecczone=24

EXAMPLE POCKET CARD:



SECTION 4: INVENTORY AND ANALYSIS

Fire Problem Analysis

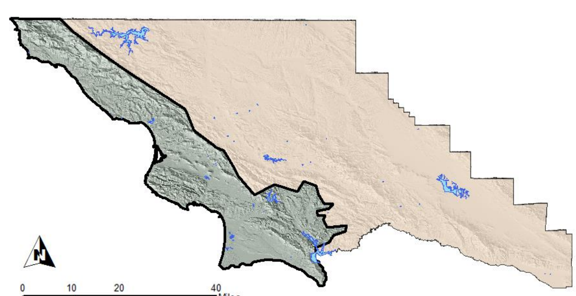
99% of all fires in San Luis Obispo County are human caused. The main sources are miscellaneous mishaps (42%) and Vehicles (24%). Other main sources of human caused ignitions include: arson, equipment use, electrical lines, and playing with fire. Although some of these fires may be difficult to prevent (such as vehicle and railroad fires), education and prevention messages can have a large impact on the remaining problem fire causes. It will be essential for CAL FIRE/San Luis Obispo County Fire to develop and implement their fire prevention plan and work to keep fire mindfulness in the public eye.

Historical Perspective: Looking at all fire occurrences in San Luis Obispo County, all of the largest fires have been a function of fuels, weather, and topography. With respect to NFDRS indices however, large fires in SLO are dependent chiefly on wind activity. As displayed and proved on the Inland FDRA pocket card (see appendix B), the largest fires in this county have occurred not as a function of the Burning Index, but due to topography and wind. In some cases, as the wind events continue to fuel the spread of fire, the topography of the region makes accessibility to the fire head difficult. This means that first responders may not have as much of an advantage, therefore allowing the fire to progress and grow in size. It is important to recognize and take into consideration the role of wind activity in this county as a driver of large fires in conjunction with fuels, topography, and climate.

Fire Danger Rating Areas

A Fire Danger Rating Area (FDRA) is a geographic area of relatively homogenous climate, fuels and topography, tens of thousands of acres in size, within which the fire danger can be assumed to be uniform. For San Luis Obispo, two fire danger rating areas have been defined: the 'Coastal' FDRA and the 'Inland' FDRA. All area that is neither 'Coastal' nor 'Inland' is defined for our purposes as 'Other'. The wildland fire occurrences within these areas were subsequently identified and this set of information is used to determine the appropriate fire danger indices used to best predict when individual and large fires may occur. The operational implication of line placement for each FDRA was determined with five elements of consideration. Predefined fire weather zones have been obtained from the National Ocean and Atmospheric Administration to help distinguish existing fire weather zones in San Luis Obispo. These fire weather zones were adjusted to meet specific criteria for the purposes of this plan and altered to correspond to the fuels, topography, and other weather anomalies of the region. These zones were then adjusted to accommodate operation reality and limitations. These FDRA boundaries were synced to our DPA, and our pre-planned Response Areas (otherwise known as our atoms layer). Matching these FDRAs with our Atoms layer ensures compatibility with our existing CAD system. Areas of the county that are not included in our DPA were disregarded in this analysis.

San Luis Obispo: Coastal FDRA description



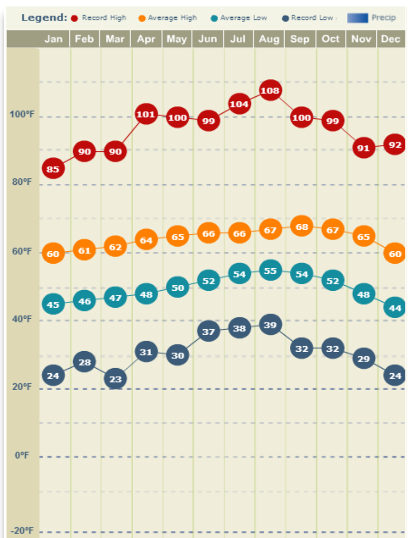
Location: This area encompasses the entire west coast of San Luis Obispo County and stretches the length from the northern to the southern boundaries of the county. It lies west of the Santa Lucia Range, and encompasses a portion of the Los Padres National Forest. This climate zone encompasses 480,716 acres.

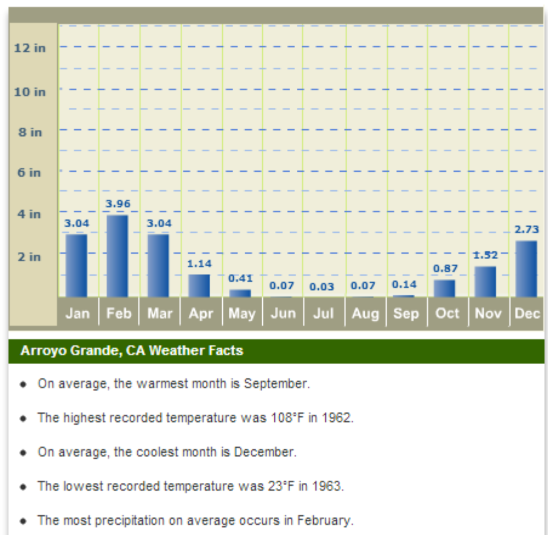
Vegetation and Fuels: This FDRA is dominated (in terms of area) by urban, agriculture, grasslands, coastal sage scrub, and chaparral.

Topography: The San Luis Obispo Central Coast is the area of lowest elevation and is separated from the two other FDRA's by the Santa Lucia Range.

Climate: The San Luis Obispo Central Coast is unique from the other parts of the county in that is maintains fairly moderate and consistent temperatures due to the influence of the Pacific Ocean. The coastal communities experience on-shore and off-shore breezes due to the changing air pressures and temperatures of the land and ocean from day to night. Fog events are also likely to occur in this region during the summer months as a result of warm air masses traveling over cold ocean water. Climate Class can be used to prolong or shorten the Green Up and subsequent curing of dead fuels. The following table shows the Climate Class and the corresponding green up periods. The WIMS Coordinator will monitor spring Green Up conditions and be the only person allowed to modify climate class within WIMS. The second table shows the Climate Class that is used in the Inland FDRA.

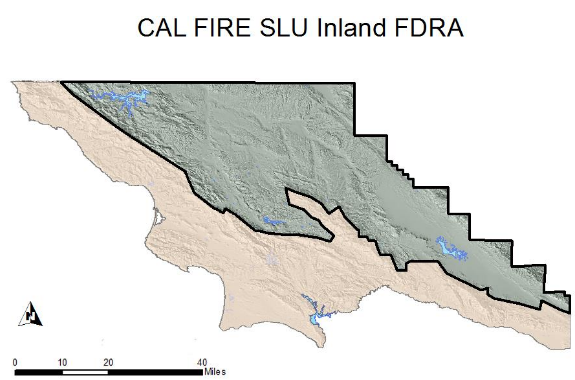
FDRA	NFDRS Climate Class	Green Up Period
Coast	2 – Sub Humid	14 Days





(http://imwx.com/weather/wxclimatology/monthly/graph/USCA0045)

San Luis Obispo: Inland FDRA description



Location: This area stretches from the northern limit of the county to the eastern limit of the county. The west boundary follows the back range of the Santa Lucia Range to Cuesta Pass and also includes portions of the Los Padres National Forest. This climate zone encompasses 702,979 acres.

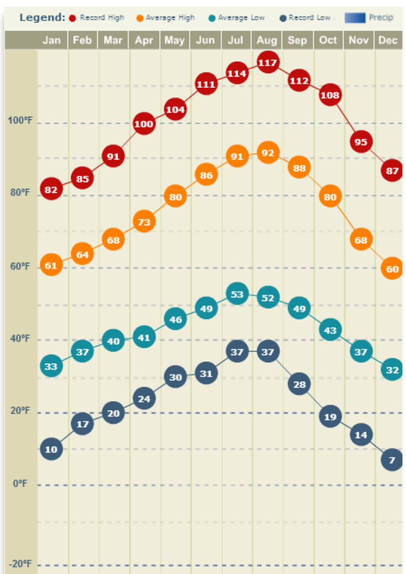
Vegetation and fuels: This FDRA is dominated (in terms of area) by urban, agriculture (Vineyards), grasslands, chaparral, and oak woodlands.

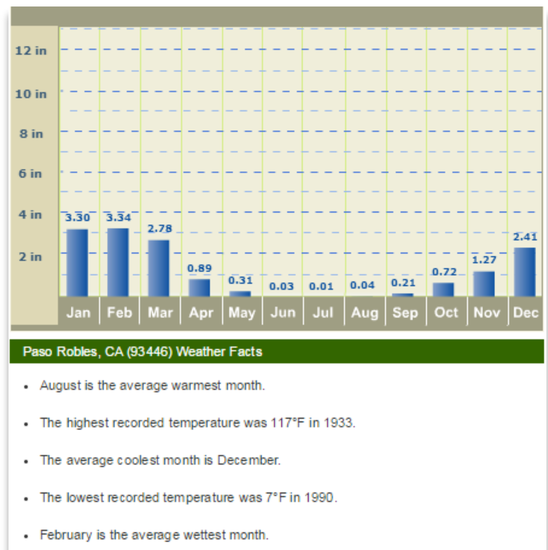
Topography: This FDRA has a large variety of topographic features i.e. slope, aspect, and fuel type. This FDRA is bounded by a few mountain ranges. To the West is the Santa Lucia Range and to the South are the La Panza and Caliente Ranges. All of which contribute to wind patterns and events for the interior Valley region.

Climate: The interior valleys of San Luis Obispo County experience a greater amount of temperature disparity due to the more inland location and situation amongst surrounding topography. Relative to the other regions in San

Luis Obispo County, this region is subject to much lower winter temperatures, and in the summer experiences much higher temperatures.

FDRA	NFDRS Climate Class	Green Up Period
Inland: La Panza	1 – Arid, Semiarid	7 Days
Inland: Las Tablas	2 – Sub humid	14 Days





(http://wxstore.weather.com/outlook/homeandgarden/schoolday/wxclimatology/monthly/graph/93446)

Wildland Fire Occurrence within the Analysis Area

Fire weather data

i. Quality control: The quality of the data was evaluated for each FDRA. The consistency of the observations and the overall quality of the data was reviewed and edited in order to project the most accurate data set for the years 2006-2015.

ii. Rationale for selection of weather stations: The determination of what RAWS[2] station to collect fire weather data from was based on its proximity and situation in the FDRA. Since the Arroyo Grande RAWS station sits in the Coastal FDRA, it was deemed representative of that geographic region. The La Panza and Las Tablas RAWS stations both sit within the Inland FDRA and therefore, were both used in the statistical analysis of that geographic region.

***Fire occurrence analysis data set*:** Ten years (2006-2015) of fire occurrence data was used for statistical analysis. Fire occurrence data was obtained from the FAM-WEB[3] fire weather data system and from the National

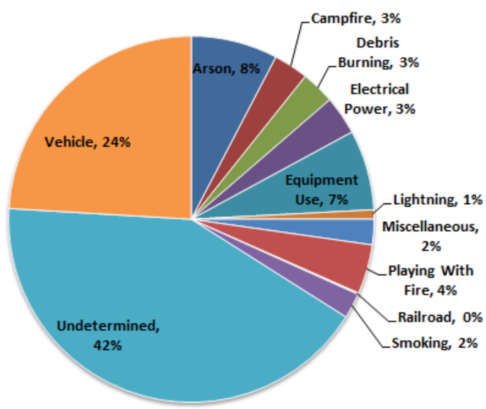
[2] http://raws.fam.nwcg.gov/
[3] https://fam.nwcg.gov/fam-web/

Interagency Fire Management Integrated Database (NIFMID) via Kansas City Fire Access Software (KCFAST)[4]. Fire occurrence data for 2013, 2014 and 2015 was gathered from CAIRS reports. The quality of the fire data was evaluated for all years (2006-2015). Ignitions were cross-referenced using FC34 reports. FireFamilyPlus[5] software was utilized to create statistics and graphs. The fire plan data only considers ignitions that have caused a vegetation fire.

Fire occurrence summary: For the period of record in this analysis (2006-2015), 76 vegetation fires a year on average either threatened or occurred in San Luis Obispo County. The largest number of fires occurred in 2007 (128 fires), with the most acreage burned in 2015 (4,453 acres). Most fires occurred in June (16%) and July (17%). In preparation for statistical analysis, the CAL FIRE/San Luis Obispo County Fire cause code must be translated to the federal cause code for use in FireFamilyPlus software.

Five Year Ignition Data**:** The graphic below represents the occurrence of vegetation fire causes in San Luis Obispo County by percent for the past 5 years. The most common cause of ignitions has been accounted for in 'Undetermined' causes (42%). 'Vehicle' (24%), 'Arson' (8%), 'Equipment Use' (7%) and 'Playing with Fire' (4%) are also common ignition causes for vegetation fires in San Luis Obispo.

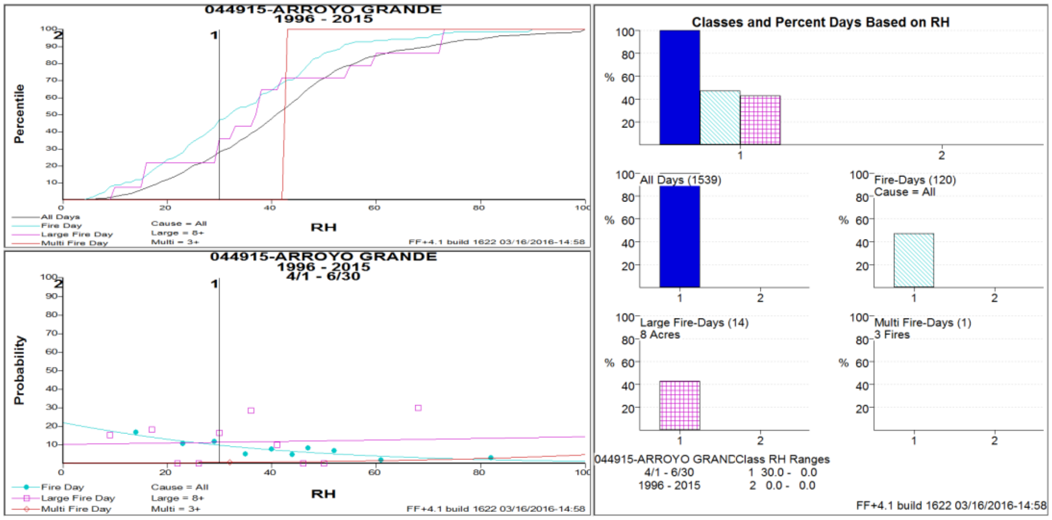
Cause Totals 2011-2015[6]



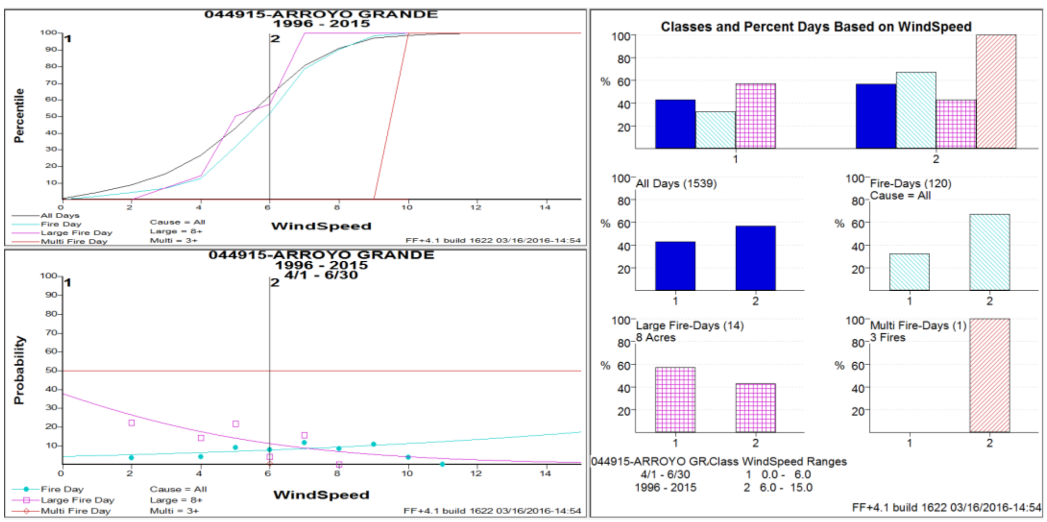
Local Ignition Analysis**:** CAL FIRE encourages the safe and prudent use of burning during certain times of the year where there are no alternative methods of vegetation disposal. Methods used for removing excess vegetation and reducing fire hazard include: residential debris burning, hazard reduction burning, agricultural burning, development burning, and range improvement burning. It is crucial to burn only when conditions are favorable- keeping fire danger and risk of escape to an absolute low. In this analysis we use Wind Speed and Relative Humidity to gauge the parameters of when it is appropriate to have a Burn Day for each FDRA. Due to the limitations of FireFamilyPlus, the outputs generated based on the Arroyo Grande RAWS represent the Burn Day decisions for the Coastal FDRA and the outputs generated for the Las Tablas RAWS represent the Burn Day decisions for the Inland FDRA. Decision Criteria for CAL FIRE/San Luis Obispo County Fire Burn Days was developed using Wind Speed and Relative Humidity breakpoint criteria for each FDRA within the unit. Each FDRA in CAL FIRE/San Luis Obispo County Fire will use Wind Speed and Relative Humidity for supporting Burn Days and the suspension of Burn Days throughout fire season.

A. Arroyo Grande Breakpoints and Graphs for Wind Speed and Relative Humidity

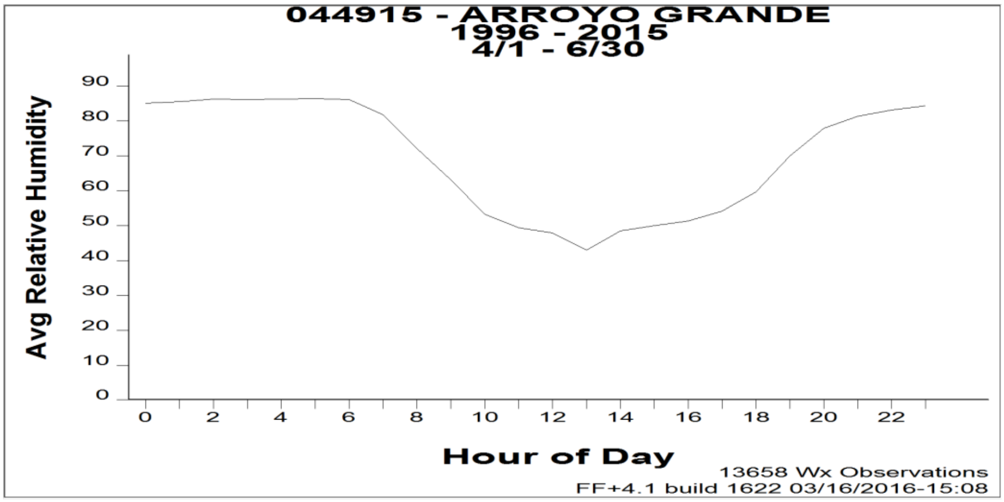
[4] https://fam.nwcg.gov/fam-web/kcfast/mnmenu.htm
[5] http://www.firelab.org/project/firefamilyplus
[6] https://slu.cartodb.com/viz/4cbe8edc-f11f-11e5-b7ed-0e31c9be1b51/public_map



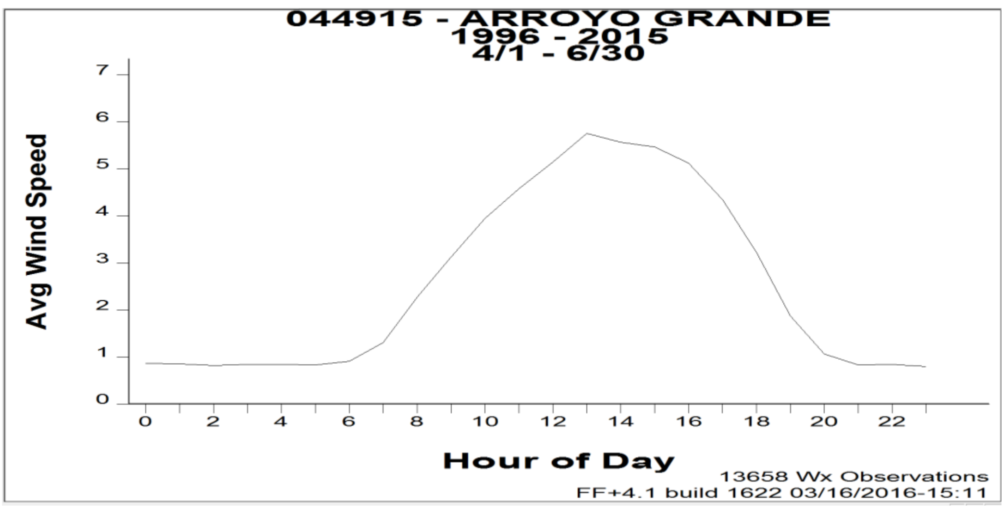
The Graphs above illustrate the thresholds created for the Coastal FDRA when considering Relative Humidity. When Relative Humidity approaches 30, Fire Days, Large Fires, and Multi-Fire Days begin to occur. When the Relative Humidity reaches 30 during the months of April, May, and June burning should be suspended.



The Graphs above illustrate the thresholds created for the Coastal FDRA when considering Wind Speed. When Wind Speed approaches 6 mph, Fire Days, Large Fires, and Multi-Fire Days begin to occur. When the Wind Speed reaches 6 mph during the months of April, May, and June burning should be suspended.

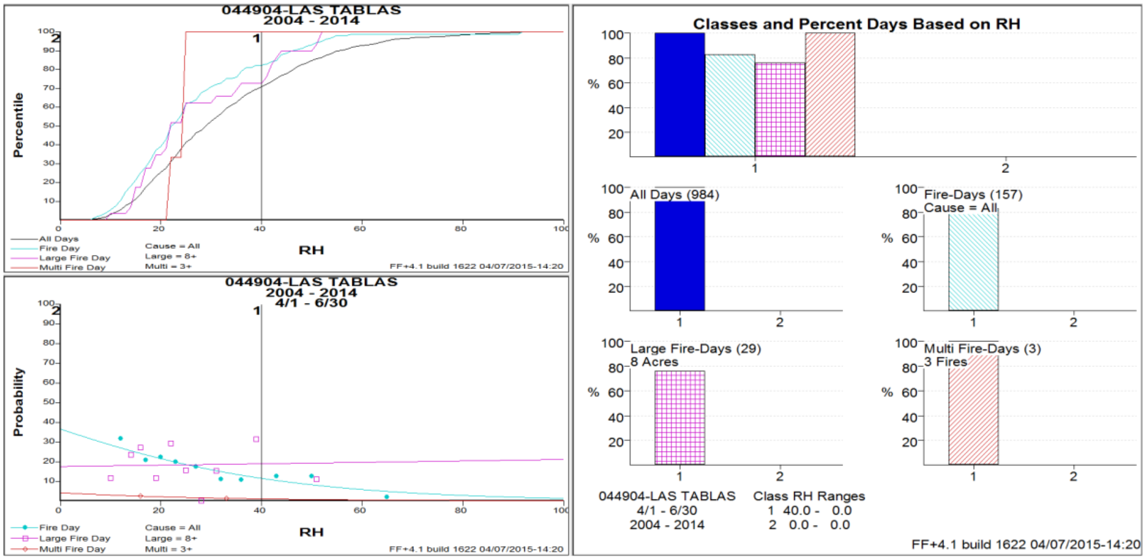


San Luis Obispo fire occurrence history shows that the most active span of time during a fire event is generally between 10:00 and 18:00. This pattern corresponds with the decline in Relative Humidity by the hour. The most drastic decrease in Relative Humidity occurs at about 10:00 and its' low persists until about 18:00. As Relative Humidity decreases, fire danger increases. Given this condition, it is not recommended to allow burning between the hours of 10:00 and 18:00 during the months of April, May, and June.

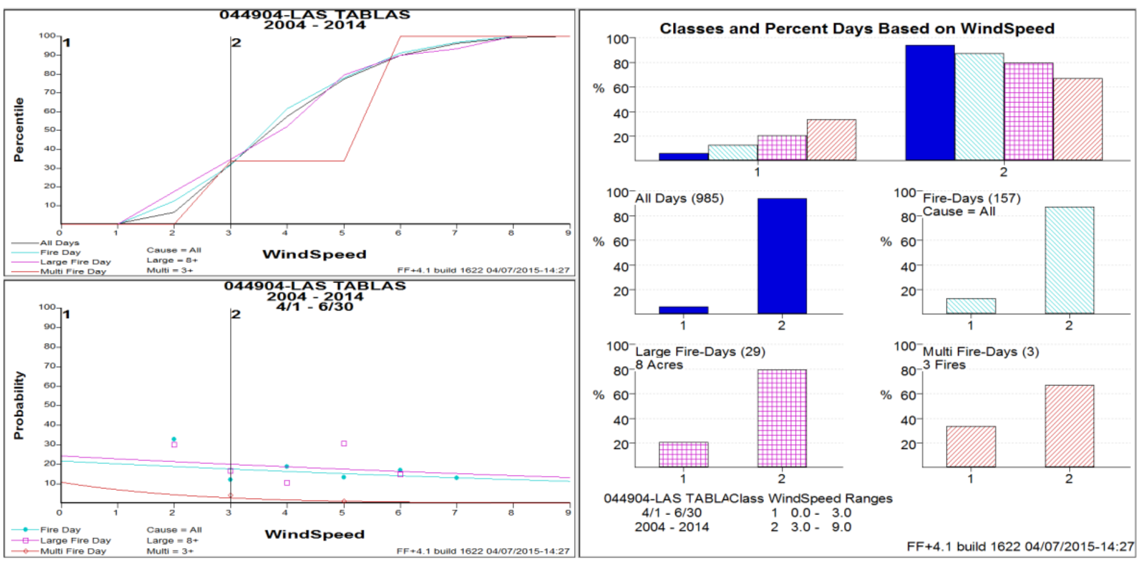


The graph above illustrates the historic occurrence of Wind Speed by hour. It is shown over the past 20 years Wind Speed increases around 10:00 and continues to increase until about 16:00 where it then begins to taper off. Wind events are a significant factor in the behavior and suppression of a fire. In order to reduce fire danger, burning should not be allowed between 10:00 and 16:00 during the months of April, May, and June because that is when Fire Days, Large-Fire-Days, and Multi-Fire-Days begin to occur.

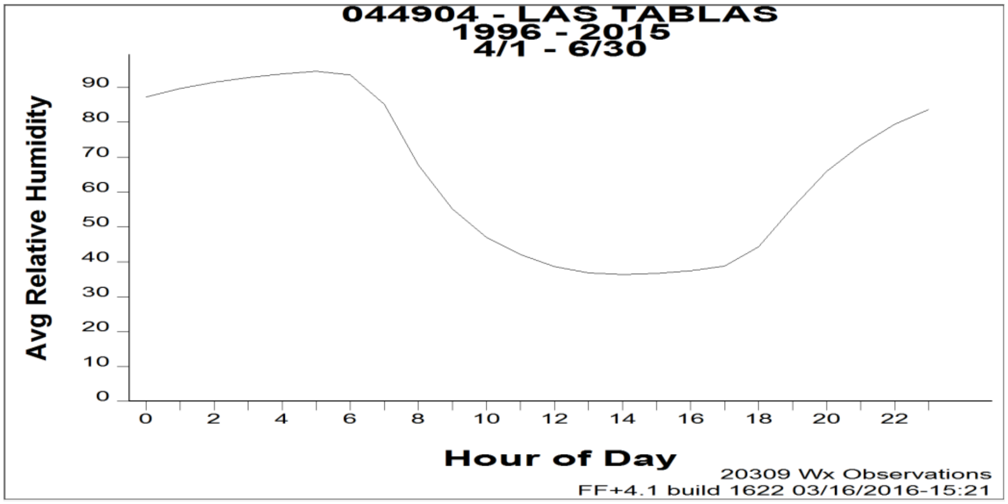
B. Las Tablas Breakpoints and Graphs for Wind Speed and Relative Humidity



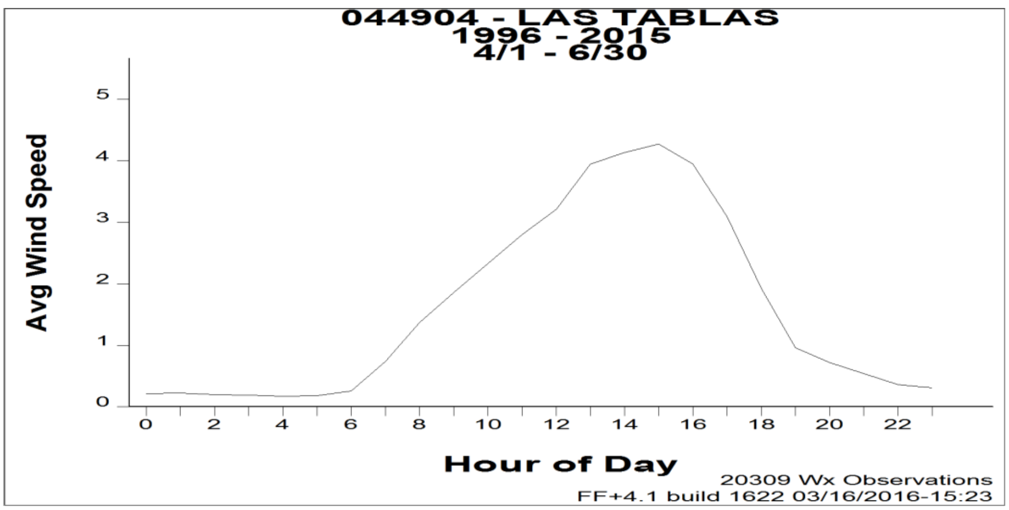
The Graphs above illustrate the thresholds created for the Inland FDRA when considering Relative Humidity. When Relative Humidity approaches 40, Fire Days, Large Fires, and Multi-Fire Days begin to occur. When the Relative Humidity reaches 40 during the months of April, May, and June burning should be suspended.



The Graphs above illustrate thresholds created for the Inland FDRA when considering Wind Speed. When Wind Speed approaches 3 mph, Fire Days, Large Fires, and Multi-Fire-Days begin to occur. When the Wind Speed reaches 3 mph during the months of April, May, and June burning should be suspended.



San Luis Obispo fire occurrence history shows that the most active span of time during a fire event is generally between 10:00 and 18:00. This pattern corresponds with the decline in Relative Humidity by the hour. The most drastic decrease in Relative Humidity occurs at about 9:00 and its' low persists until about 18:00. As Relative Humidity decreases, fire danger increases. Given this condition, it is not recommended to allow burning between the hours of 10:00 and 18:00 during the months of April, May, and June.



The graph above illustrates the historic occurrence of Wind Speed by hour. It is shown over the past 20 years Wind Speed increases as the day approaches 10:00 and continues to increase until about 15:00 where it then begins to taper back off. Wind events are a huge factor in the behavior and suppression of a fire. In order to reduce fire danger, burning should not be allowed between 10:00 and 18:00 during the months of April, May, and June because that is when Fire Days, Large Fire Days, and Multi-Fire Days begin to occur.

C. Wind Speed Statistics Table by RAWS

Month	Mean	High by Year		Average High
		Arroyo Grande		
January	4.1	13.0	2010	9.1
February	4.5	15.0	2009	9.3
March	5.1	14.0	2002	9.5
April	5.6	14.0	2004	10.1
May	5.9	15.0	2013	9.7
June	5.8	12.0	2012	8.9
July	5.5	10.0	2008	8.2
August	5.6	11.0	2011	8.4
September	5.6	12.0	2009	8.7
October	5.3	13.0	2012	9.6
November	4.5	12.0	2002	8.6
December	4.3	13.0	2010	9.6
		Las Tablas		
January	2.5	15.0	2005	7.7
February	3.0	13.0	1998	7.7
March	3.4	10.0	1996	7.3
April	3.8	9.0	2011	7.3
May	3.9	9.0	2008	7.0
June	4.2	10.0	2015	7.3
July	4.2	9.0	2007	6.9
August	4.1	9.0	2004	6.8
September	3.8	9.0	2007	6.7
October	3.2	9.0	2015	6.1
November	2.5	10.0	2012	5.5
December	2.4	10.0	2006	7.7

The 'Mean' describes the average Wind Speed over our analysis period from 1996 -2015. The 'High by Year' field illustrates the highest value of Wind Speed recorded by month and year. The 'Average High' field depicts the average value of the maximum Wind Speed recorded over the 20 year span. In each instance, the highest mean values recorded and calculated for Wind Speed have occurred in the months of April, May, and June. These are the months which pose the highest risk of fire danger.

10 Largest Fires Recorded in the Inland FDRA

Discovery Date	Fire Name	Total Acres	(USFS) Cause Codes
08/16/2015	Cuesta	2,446	2 (Vehicle)
06/20/2015	Parkhill	1,791	2 (Vehicle)
09/03/2011	Soda	1,528	5 (Debris Burning)
08/10/2003	Chimney incident	1,500	5 (Debris Burning)
07/20/2003	Parkhill	1,200	2 (Vehicle)
08/21/2010	Pozo	1,200	9 (Miscellaneous)
07/23/2006	'y'	660	5 (Debris Burning)
07/16/2012	Calf	640	2 (Equipment Use)
08/01/2006	Antelope	400	9 (Miscellaneous)
06/24/2011	Highway	387	5 (Debris Burning)

Of the 10 largest fires in the Inland FDRA, (0) occurred in May, (2) occurred in June, (3) occurred in July, (4) occurred in August, and (1) occurred September.

Historic Fires for Reference and Insight Depicted on the Inland FDRA Pocket Card

Discovery date	Fire Name	Total Acres	Cause (USFS)
07/03/1950	Pilitas 1	84,271	2 (Equipment Use)
08/18/1994	Highway 41	50,729	2 (Equipment Use)
08/15/1996	Highway 58	33,094	5 (Debris Burning)

The fires listed above are the most well-known fires in our region. Having these fires illustrated on the pocket card will give the viewer some context and insight as to the local climate of our region and the fact that conditions do not have to be ideal or predictable for a large fire to occur.

10 Largest Fires Recorded in the Coastal FDRA

Discovery Date	Fire Name	Total Acres	Cause (USFS)
06/26/2010	Creek	250	9 (Miscellaneous)
10/27/2003	Cuesta	150	5 (Debris Burning)
05/05/2004	Nipomo	100	5 (Debris Burning)
09/24/2013	Creek	94	2 (Equipment Use)
07/16/2003	State	52	5 (Debris Burning)
10/12/2009	North	45	6 (Railroad)
08/19/2005	Gilardi	38	5 (Debris Burning)
08/15/2008	SLU lightning series	37	1 (Lightning)
08/16/2003	Creek fire	30	9 (Miscellaneous)
07/01/2003	State	25	5 (Debris Burning)

Of the 10 largest fires recorded in the Coastal FDRA, (1) occurred in May, (1) occurred in June, (2) occurred in July, (3) occurred August, (1) occurred in September, and (2) occurred in October.

Historic Fires for Reference and Insight Depicted on the Costal FDRA Pocket Card

Discovery Date	Fire Name	Total Acres	Cause (USFS)
06/26/2010	Creek	250	9 (Miscellaneous)
10/27/2003	Cuesta	150	5 (Debris Burning)
05/05/2004	Nipomo	100	5 (Debris Burning)

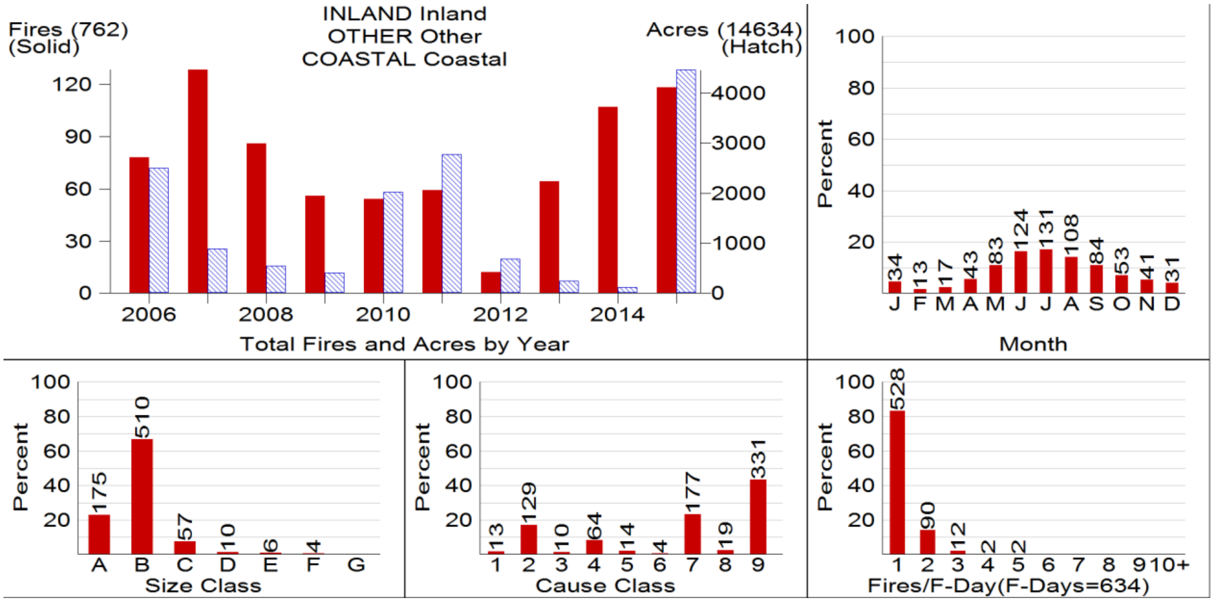
Because the three largest fires in the Coastal FDRA are relatively small, the three large historic fires that will be displayed on the Coastal Pocket Card will be the three largest fires that exist within the dataset.

Size Class Codes

Size Class Code	Fire Size
A	0.10 to 0.25 acres
B	0.26 to 9.9 acres
C	10 to 99.9 acres
D	100 to 299 acres
E	300 to 999 acres
F	1000 to 4999 acres
G	>= 5000 acres

**Please note that fires below 0.10 acres (low end of Size Class ‘A’) are null in both FDRAs because a fire <0.10 acres is interpreted by FireFamilyPlus as ‘0’ acres. If ‘0’ values are included in a data set that you are running statistics on, it will skew your results. In Statistical analysis a ‘0’ value will skew your results and for this reason, all fires that were ‘0’ acres were adjusted to 0.10 acres.

SLU Fire Occurrence

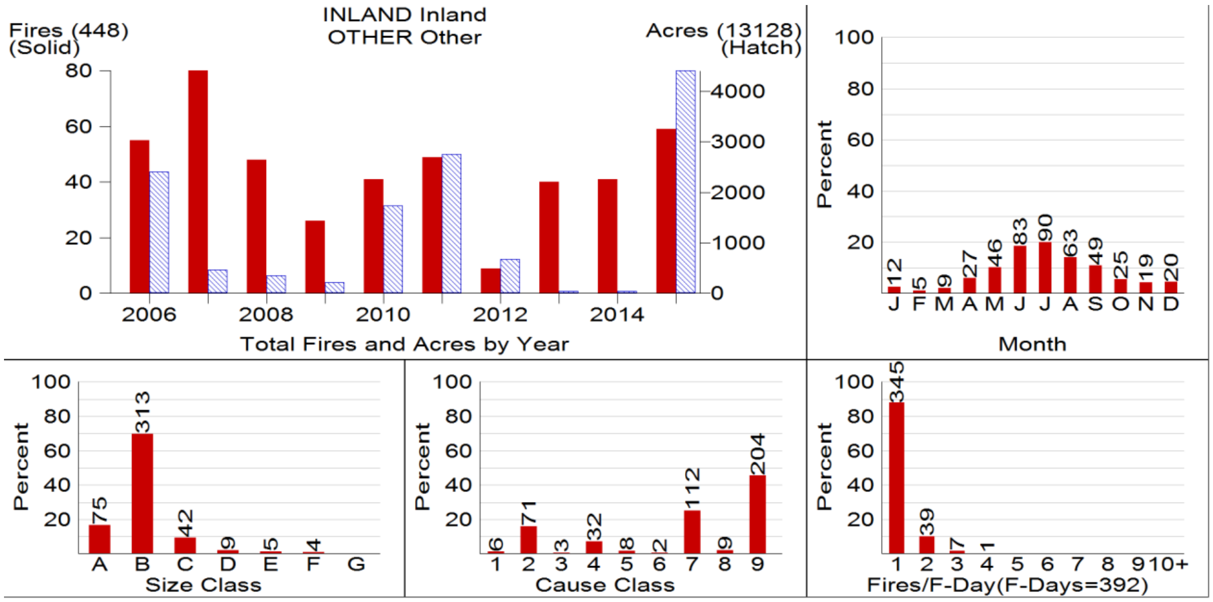


1. Lightning
2. Equipment Use/Vehicle/Power line
3. Smoking
4. Campfire
5. Debris Burning `
6. Railroad
7. Arson
8. Playing with Fire
9. Miscellaneous/Unknown/Undetermined

The graph above and those that follow show fire occurrence in San Luis Obispo County's Coastal and Inland FDRAs for the past 10 years, respectively. The bars in red represent fires in quantity while the blue hatched bars represent amount of acres burned. Furthermore, the above unit-wide perspective of fire occurrence has been separated geospatially (as follows) to be analyzed temporally and spatially.

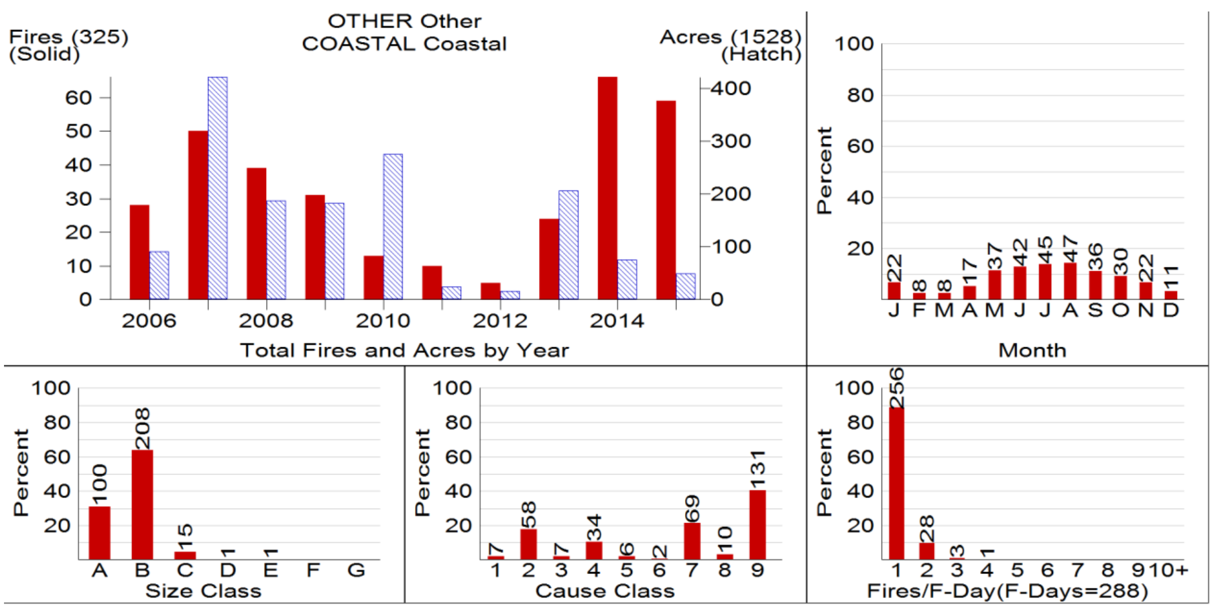
The following points can be drawn from the graph above:

1. In 2011 there were few reported fires, yet a relatively significant amount of acres burned in these fires. Conversely, 2013 and 2014 had many ignitions, but a very small number of acres burned relative to years prior.
2. 67% of fires in the San Luis Unit have been between .26 to 9.9 acres.
3. 43% of fires in the San Luis Unit have been attributed to miscellaneous causes and 17% of fires have been a result of vehicle use.
4. 83% of fire days have been single fire days, 14% of all fire days have had 2 fires per day, and 3% of fire days have had 3+ fires per day.



The following points can be drawn from the graph above:

1. Relative to the Coastal FDRA, the Inland FDRA experiences a much higher volume of fires per year, as well as a greater amount of acres burned (~90%) as a result of those fires.
2. 70% of all Inland FDRA fires are between .26 and 9.9 acres in size.
3. 46% of fires in the Inland FDRA have been attributed to miscellaneous causes and 25% of fires have been a result of arson.
4. 88% of fire days have been single fire days, 10% of all fire days have had 2 fires per day, and 2% of fire days have had 3+ fires per day.



The following points can be drawn from the graph above:

1. The Coastal FDRA experiences a relatively low number of fire occurrences and those fire occurrences typically do not yield large acreage fires.
2. 64% of all fires are between .26 and 9.9 acres in size.
3. 40% of fires in the Coastal San Luis Unit have been a result of miscellaneous reasons and 18% of fires have been attributed to vehicle use.
4. 89% of fire days have been single fire days, 10% of all fire days have had 2 fires per day, and 1% of fire days have had 3+ fires per day .

Weather Stations

Description: San Luis Obispo County has 5 RAWS: La Panza, Arroyo Grande, Las Tablas, Branch Mountain, and Carrizo. For our analysis we used data from La Panza, Arroyo Grande, and Las Tablas because these stations are owned by the San Luis Obispo Unit.

The data from these five stations are utilized for rating daily fire danger levels. The San Luis Obispo ECC has the responsibility of managing and editing daily weather observations that are required within the Weather Information Management System[6] (WIMS). The action of data entry into WIMS is required on a daily basis for the NFDRS decision support tool to function properly. The 1400-hour observation in WIMS may be the observation closest to the required observation time of 1300 hours local standard time (LST). All observations must be converted in WIMS prior to 1430 hours LST. Through the process of the FDOP analyses, it is clear that there have been station maintenance issues in the past. These issues are apparent in the data and multiple anomalies have occurred.

The purpose of NFDRS is to rate relative fire danger as a worst-case scenario for a given Fire Danger Rating Area. The San Luis Obispo Unit is unique in the complexity of weather, fuels and topography. A concerted effort was made to account for these complexities with the goal of providing a baseline for decision-making. It is important to note that each FDRA has areas that will be well represented by its RAWS indices.

Ideally, each FDRA has a primary weather station that best represents the fire danger. Some FDRA's may have more than one weather station to represent the climate of the region. Analysis for the Inland FDRA, for example, is executed based on the data from La Panza and Las Tablas weather stations.

All RAWS stations, regardless of ownership, are maintained the same way and their data is made available for all inter-agency applications.

RAWS Summary Table

Station ID	Station Name	Status	Agency/Owner	Data Years	Elevation	Reporting Time	Latitude	Longitude
044914	La Panza	Active	CAL FIRE/San Luis Obispo County Fire	1986; 1989-1992 (HIWX) 1993-2016 (WIMS)	1630'	1300	35.380725	-120.188094
044915	Arroyo Grande	Active	CAL FIRE/San Luis Obispo County Fire	1993-1998; 2000-2016 (WIMS)	615'	1300	35.179347	-120.392719
044904	Las Tablas	Active	CAL FIRE/San Luis Obispo County Fire	1983-1992(HIWX) 1994-1995; 1997-2016 (WIMS)	1300'	1300	35.656447	-120.9241
044901	Branch Mountain	Active	USFS	1961-1969; 1972-1991; 1992 (HIWX) 1997-2016 (WIMS)	3770'	1300	35.185233	-120.084989
044916	Carrizo	Active	USFS	1991-1995 (HIWX) 1997-2016(WIMS)	2490'	1300	35.096528	-119.773222

*HIWX data was recorded prior to WIMS and was not used in this analysis. *WIMS data is the most recent data. Some years are excluded from the 'Data Years' category due to a lack of observations. This may be attributed to station malfunction or poor quality control.

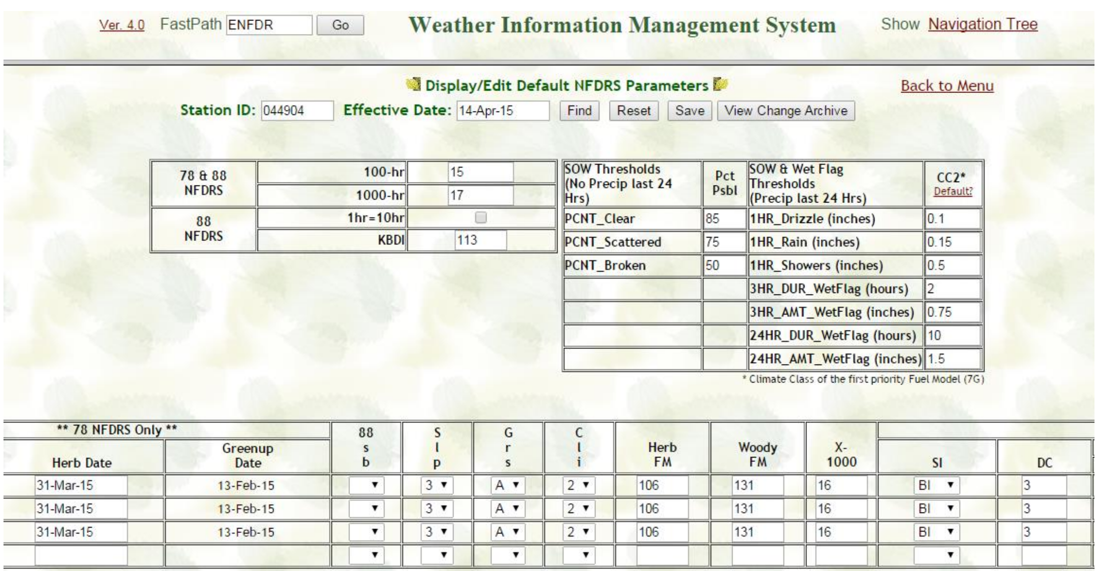
[6] https://nap.nwcg.gov/NAP/#moduleID=NAPHomeModule

Weather Station Catalogs:

A station catalog is a component of WIMS which tells NFDRS processors the characteristics of a station and FDRA.

Catalog Information	Arroyo Grande	La Panza	Las Tablas
WIMS ID	044915	044914	044904
Mean Precipitation	19 in	12 in	17 in
Latitude	35.17889	35.38056	35.65639
Longitude	-120.39167	-120.18806	-120.92389
Aspect	4-S	4-S	2-E
Elevation	1048	1633	994
Site	Mid Slope	Mid Slope	Upper Slope
Time Zone	PST	PST	PST
Observation Time	13:00	13:00	13:00
FDRA	Coastal	Inland	Inland

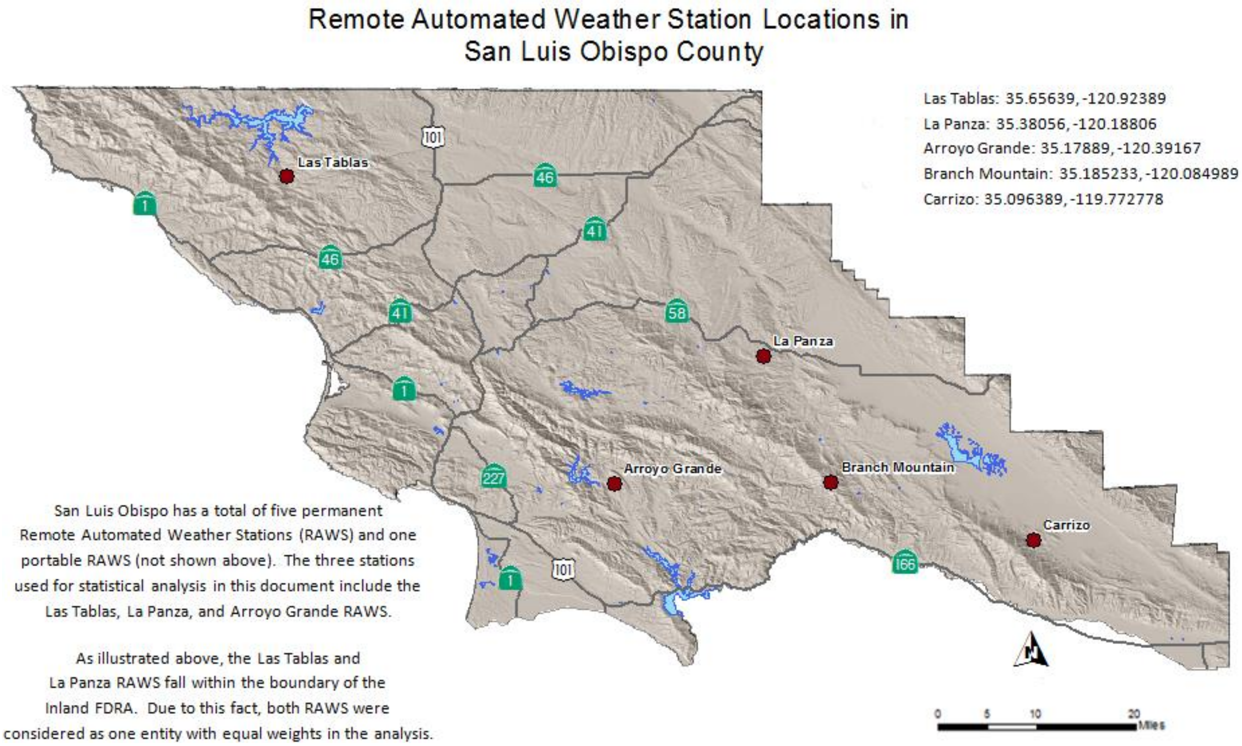
WIMS station catalogs need to be updated annually to reflect the staffing level breakpoints and to properly calculate adjective class. The screen capture below displays the information that the personnel in the Emergency Command Center adjust for the La Panza RAWS.



RAWS Site Description and Photos

RAWS Site Description and Photos		
Arroyo Grande	La Panza	Las Tablas
		
The Arroyo Grande RAWS is located in a valley on the East side of Saucelito Creek Road. Large Oak trees are present on the East side of this RAWS site, which may obstruct the wind gauge and solar radiation panel from total exposure to the elements. Limb trimming is reccomended in the near future. This is the only RAWS site of the three that is not enclosed in a fence, which may expose this equipment to interaction with either people or wildlife. However, this site is located on private property which requires gate access. This station is not situated in the most ideal location to represent SLU's Coastal FDRA. Burning Index values reported from this RAWS do not represent the coast as a whole and historically do not seem to be characteristic of this particular location.	This RAWS station is enclosed in a fence prohibiting any disturbance to the equipment and is placed in an ideal location as far as representation of the FDRA and clearance is concerned. There is no vegetation of any kind that will hinder the accuracy of data collected.	The Las Tablas RAWS station is located on a hill south of Lake Nacimiento. This is an ideal location, as it captures the climate characteristic of the Inland FDRA region. This station is enclosed in a fence which prohibits any outside disturbance to the equipment. There are (2) large trees to the south and east of this station which are interfering with solar radiation and wind data collection. These will need to be removed as soon as possible. In the future, large branches growing towards the station may also need to be limbed.

Map of the location of Remotely Automated Weather Stations (RAWS)



Fire Weather Station Analysis Summary

The FireFamilyPlus regression analysis was performed to statistically determine which combination of weather station observations, NFDRS fuel model, and NFDRS index best correlates to historic fire occurrence (both individual occurrence and large fire) for Inland and Coastal FDRAs. Three weather stations were considered, along with every possible combination of those weather stations grouped into Special Interest Groups (SIGS). The single station of Arroyo Grande and the SIG combination of La Panza and Las Tablas were then run in the FIRES analysis with all 20 NFDRS fuel models for Burning Index (BI). Burning Index was the chosen NFDRS index in our analysis to determine dispatch and staffing levels because it takes into account both Energy Release Component and Spread Component. Its relatively moderate sensitive nature makes it suitable for both of San Luis Obispo's FDRAs. The FIRES analysis uses logistic regression to rate models (indices) by reviewing:

Chi-square: The chi-square value provides a way to quantify the visual graphs and models created in FireFamilyPlus. It serves as the "goodness of fit" of the data points. A chi-square value less than 13 is considered to be best, less than 20 is good, and anything over 26 is not acceptable.

R-square: The R-squared value is used to describe how well a regression line fits a set of data. The closer the R-squared value is to one, the better. It is a way to measure how well the applied model can predict future outcomes.

Distribution of the Inland and Coastal FDRAs: A wider range of data points allows for more flexibility in setting dispatch levels. Having 90 percent of the observations in only one or two classes does not allow much flexibility for decision-making. BI was used when considering the "goodness of fit" of data for both FDRAs for fire season from 2006-2015. The constraints used in this analysis consisted of RAWS weather data from 2006-2015, fuel model G (NFDRS Fuel Model: Short-Needle [Heavy Dead]), Large Fires (Acres) defined as 8, and Multi-Fire-Days (Fires) defined as 3.

The visual nature of the data is also considered when choosing the Fuel Model that will be used for each FDRA. The data must be bell-curved in nature and should not have any inversions. Graphical outputs illustrating a bell curve are important for our consideration because they imply a normal distribution of data. More specifically for our purposes, there are few occurrences of All Days, Fire Days, Large-Fire-Days, and Multi-Fire-Days that are associated with either an extremely low or high BI. The majority of these occurrences should be observed somewhere in the middle of the data set. Inversions in the data would mean that Fire Days, Large-Fire-Days and Multi-Fire-Days do not have a positive correlation against each other, which would be a contradiction. You cannot have data displaying a decrease in large or Multi-Fire-Days while illustrating an increasing trend in Fire Days. In this portion of the analysis we defined an acceptable BI range of 0-100.

Although the aforementioned parameters are heavily considered when choosing the appropriate fuel model, it is important to recognize that one particular fuel model may not possess all favorable conditions. There is discretion involved when choosing the fuel model that best represents each FDRA as a whole.

Statistical Parameters Generated for the Inland FDRA (Fire days)				
NFDRS Fuel Model	Chi-square value	R-square value	Bell Curve: Y or N	BI-Range
A - Western Annual Grasses	3.5	0.97	N	0-64
B - California Chaparral	49.1	0.79	N	0-179
C - Pine Grass Savannah	5.8	0.95	N	0-58
D - Southern Rough	5.7	0.95	N	0-122
E - Hardwood Litter (Winter)	3.2	0.97	N	0-58
F - Intermediate Brush	55.4	0.825	N	0-132
G - Short-Needle (Heavy Dead)	8.4	0.94	Y	0-93
H - Short-Needle (Normal Dead)	10.7	0.94	N	0-42
I - Heavy Slash	8.9	0.93	Y	0-288
J - Intermediate Slash	8.6	0.93	Y	0-188
K - Light Slash	8.8	0.93	Y	0-84
L – Western Perennial Grasses	6.5	0.94	N	0-80
N – Sawgrass	13.3	0.88	N	0-122
O – High Pocosin	28.1	0.83	N	0-161
P – Southern Pine Plantation	9.7	0.91	N	0-49
Q – Alaskan Black Spruce	8.7	0.94	Y	0-124
R – Hardwood Litter (Summer)	7.9	0.94	N	0-29
S – Tundra	13.2	0.89	N	0-47
T – Sagebrush	22.2	0.85	N	0-82
U – Western Pines	13.8	0.88	Y	0-59

Statistical Parameters Generated for the Coastal FDRA (Fire days)				
NFDRS Fuel Model	Chi-square value	R-square value	Bell Curve: Y or N	BI-Range
A - Western Annual Grasses	7.7	0.78	Y	0-68
B - California Chaparral	5.0	0.87	N	0-154
C - Pine Grass Savannah	6.8	0.82	Y	0-56
D - Southern Rough	4.1	0.87	Y	0-116
E - Hardwood Litter (Winter)	2.6	0.92	Y	0-57
F - Intermediate Brush	5.3	0.86	N	0-103
G - Short-Needle (Heavy Dead)	4.7	0.86	Y	0-88
H - Short-Needle (Normal Dead)	7.4	0.81	Y	0-39
I - Heavy Slash	5.4	0.82	Y	0-285
J - Intermediate Slash	5.0	0.82	Y	0-187
K - Light Slash	7.6	0.74	Y	0-84
L – Western Perennial Grasses	7.4	0.79	Y	0-83
N – Sawgrass	8.1	0.73	Y	0-119
O – High Pocosin	5.5	0.85	N	0-151
P – Southern Pine Plantation	2.0	0.93	Y	0-48
Q – Alaskan Black Spruce	3.0	0.90	Y	0-117
R – Hardwood Litter (Summer)	1.4	0.95	Y	0-28
S – Tundra	3.1	0.89	Y	0-45
T – Sagebrush	10.8	0.77	N	0-77
U – Western Pines	5.1	0.86	Y	0-57

The statistics above were based on Fire Days for each FDRA. This means these values were derived by comparing the number of Weather Days against the number of Fire Days. Running statistics on Fire Days gives us a better idea of the appropriate fuel model to apply to the FDRA rather than the statistics derived from Large-Fire-Days or Multi-Fire-Days. Since both Large-Fire-Days and Multi-Fire-Days occur at a lesser frequency than Fire Days there would be less data contributed and considered in analysis. It is preferable to consider more data than less data in analysis. Therefore, using Fire Days as the parameter for our statistics was appropriate.

Fuel models were chosen based on the distribution of fire and weather data. After having adjusted for data that was inadequate for statistical analysis, every NFDRS fuel model had been run against the dataset in order to determine which had the best statistical fit for our purposes. Both FDRAs proved to have been best represented by fuel model G. This fuel model is most appropriate for our FDRAs because it is a universal fuel model as it considers all fuel types. It yields a good distribution of fire and weather data over an appropriate continuum, and it is a good example of how fuels react to moisture as the model reacts to both live and dead fuel moisture readily.

Limitations: The process of obtaining the necessary weather data required quality control. Due to human and mechanical errors, some data had to be omitted in order to keep the statistical analysis representative of their geographic regions. In one case, 554 consecutive weather records spanning from November 16, 2003 to May 15, 2005 had to be omitted from the database due to inaccurate data which could not be adequately or effectively edited. In this specific instance all 554 records of data had reported a relative humidity of 4%, which for the span of time and time of year considered, cannot be accurate.

Like weather data, fire data also requires quality control. Some ignition records gathered from raw ignition data from CAIRS do not always provide the values necessary for import into FireFamilyPlus. If all the necessary attributes of an ignition are not possible to obtain when cross-referencing the data, some fires are eliminated from the database. This has to be the case because incomplete data will negatively affect the statistical analysis of the rest of the complete dataset.

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 time lag fuel moisture as the integrator of temperature and relative humidity to help define fire climate zones. BI was analyzed to determine the level of correlation between the stations in the Inland FDRA and to look for potential outliers that should not be grouped into SIGs.

The La Panza and Las Tablas RAWS stations were combined with equal weight into a SIG to compute Fire Danger Indices for the Inland FDRA. Analysis allows the user to view the trend information for each station within the SIG group. The trending weather and spatial locations support and justify why these stations were combined into a SIG.

SECTION 5: FIRE DANGER BASED DECISIONS

Fire business thresholds and climatic breakpoints: A breakpoint is a threshold which corresponds to a change in historical fire activity. Preparedness levels differ from adjacent fire danger ratings because they take fire history into account, in addition to weather data.

The FireFamilyPlus software package was used to establish the fire business breakpoints. A statistical analysis based on historical weather adjusted for fire activity determines the appropriate staffing index and associated break points for each FDRA.

NFDRS Definitions, Indices, and Outputs

The following list represents the array of NFDRS indices that are used to quantify Fire Danger.

- Spread Component[7] **(SC)** is a rating of the forward rate of spread at the head of the fire. It is projecting the potential rate of a fire's spread at its head, in feet per minute, under the assumed weather, fuels, and topographic conditions associated with the fire danger rating area. Spread component is a highly sensitive index that accounts for live and dead fine (1-hour) fuels, and is highly dependent on wind.

- Energy Release Component[8] **(ERC)** is a number related to the available energy BTU per unit area (sq. ft.) within the flaming front at the head of the fire. It evaluates the contribution of various fuel loadings represented mathematically in the NFDRS Fuel Models. ERC is utilized for modeling preparedness levels because it is a trending index which depicts seasonal conditions well.

- Burning Index[9] **(BI)** is a number that relates the contribution of a fire's behavior in containing the fire. Containment difficulty directly relates to fire line intensity (Btu/ft./sec). This is the heat release along the fire perimeter at its head. BI is an index that rates fire danger related to potential flame length over a fire danger rating area. This index is ideal to use when determining dispatch and staffing levels due to its moderate sensitivity. Since BI is a combination index that takes into account ERC and SC it is very good for determining variation during the day. The nature of BI makes it suitable for many different geographic locations and is a universal index.

- Ignition Component[10] **(IC)** is an expressed probability (0-100) that a firebrand will cause an actionable fire, one that requires suppression action. Ignition component is analogous to probability of ignitions, but takes into consideration small amounts of wind.

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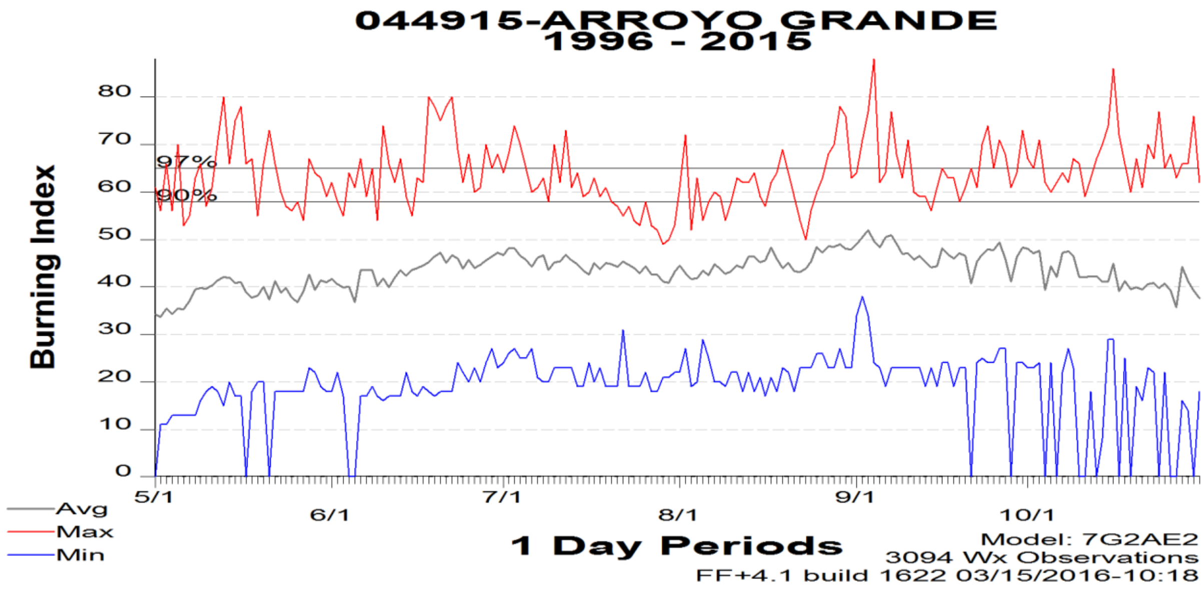
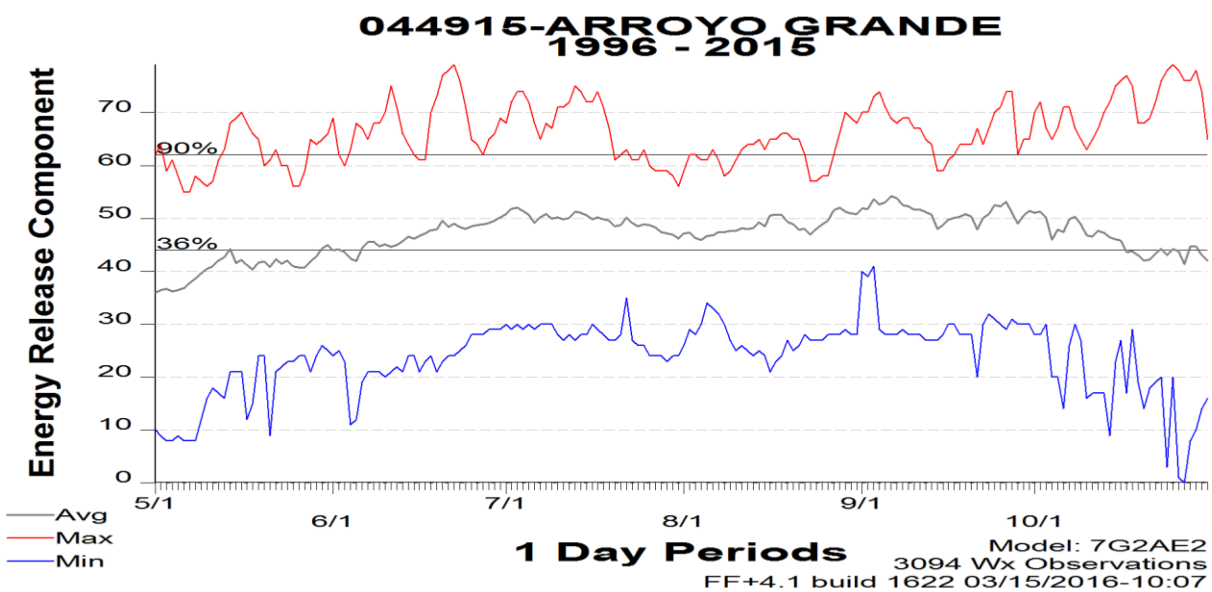
[7] http://www.nwcg.gov/glossary/a-z#letter_s
[8] http://www.nwcg.gov/glossary/a-z#letter_e
[9] http://www.nwcg.gov/glossary/a-z#letter_b
[10] http://www.nwcg.gov/glossary/a-z#letter_i

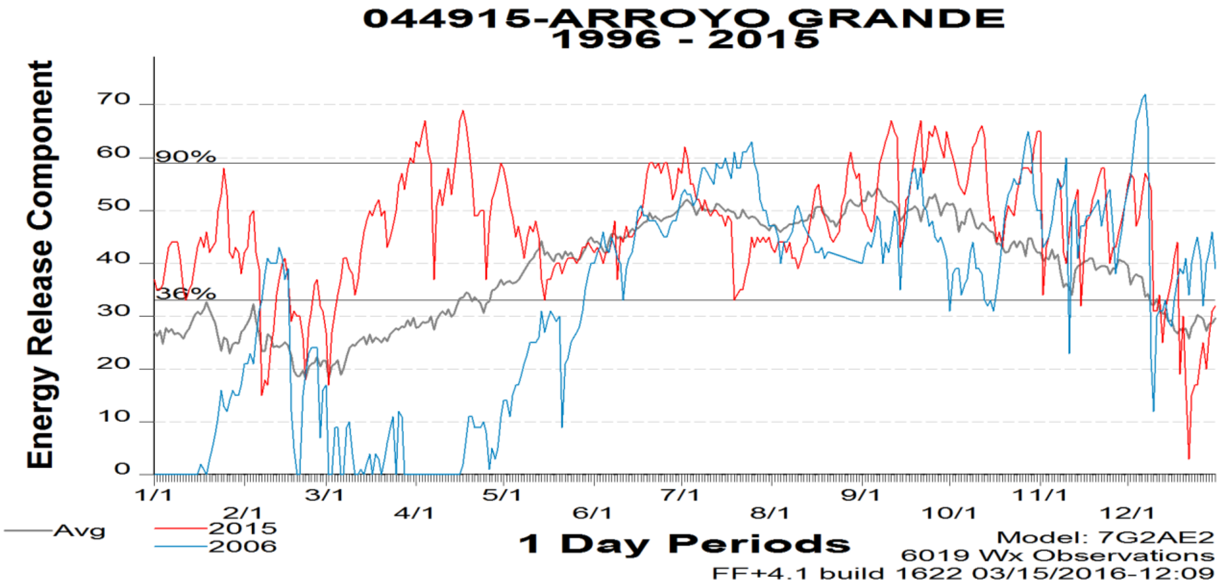
ERC/BI Graphs

Coastal FDRA, based on Arroyo Grande RAWS:



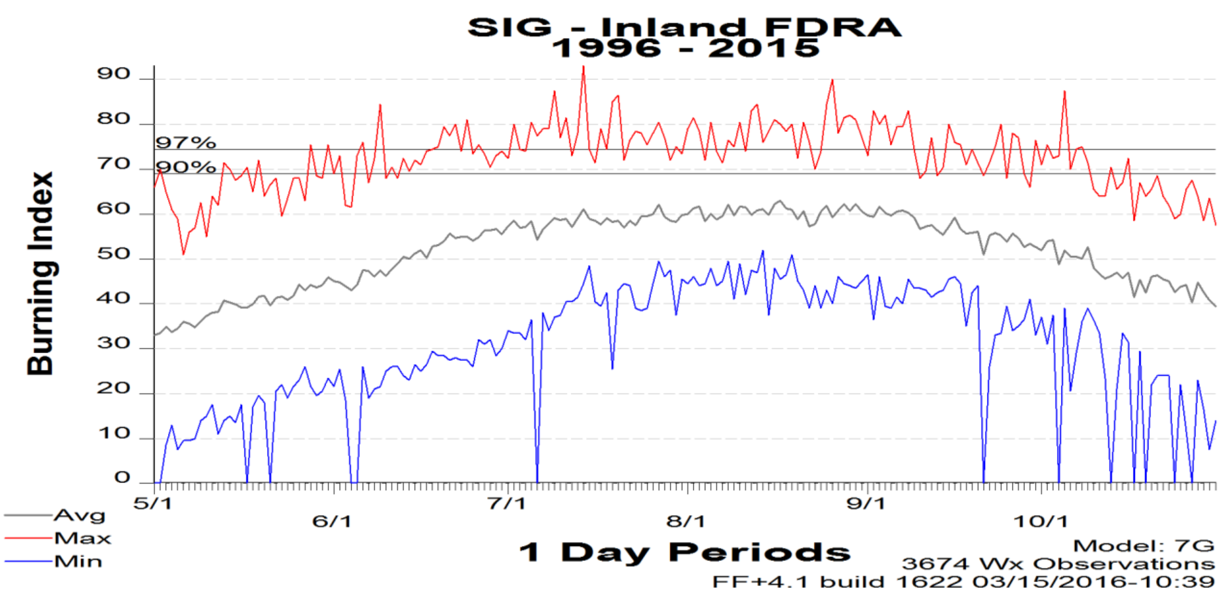


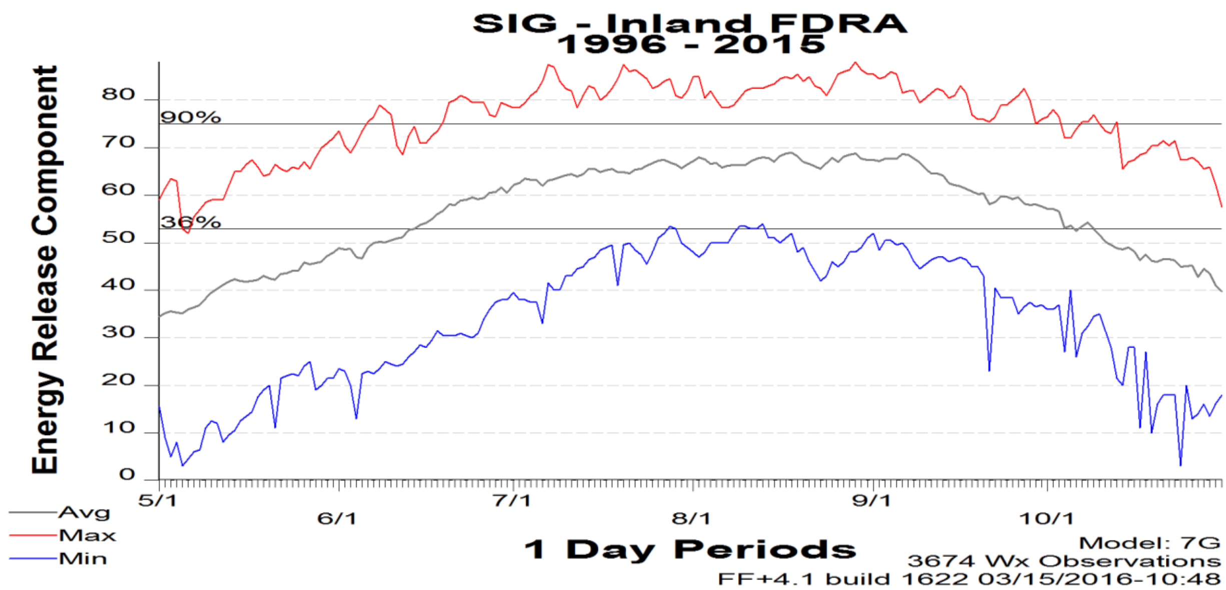
The ERC graph above depicts the threshold which coincides with the opening of fire season in the Coastal FDRA. For this FRDA an ERC of 36, the 50th percentile, is the critical point in which to gauge the occurrence or onset of fire season. The start of fire season can be described at the time in which large fires (8 acres or more) begin to take off. Reaching an ERC of 36 has been known to occur in Spring, and in some cases as early as the beginning of April. In the event that an ERC reaches 36 before spring, there is reason to consider cessation of burn days, the early onset of fire season, and adequate resources for these large fires.



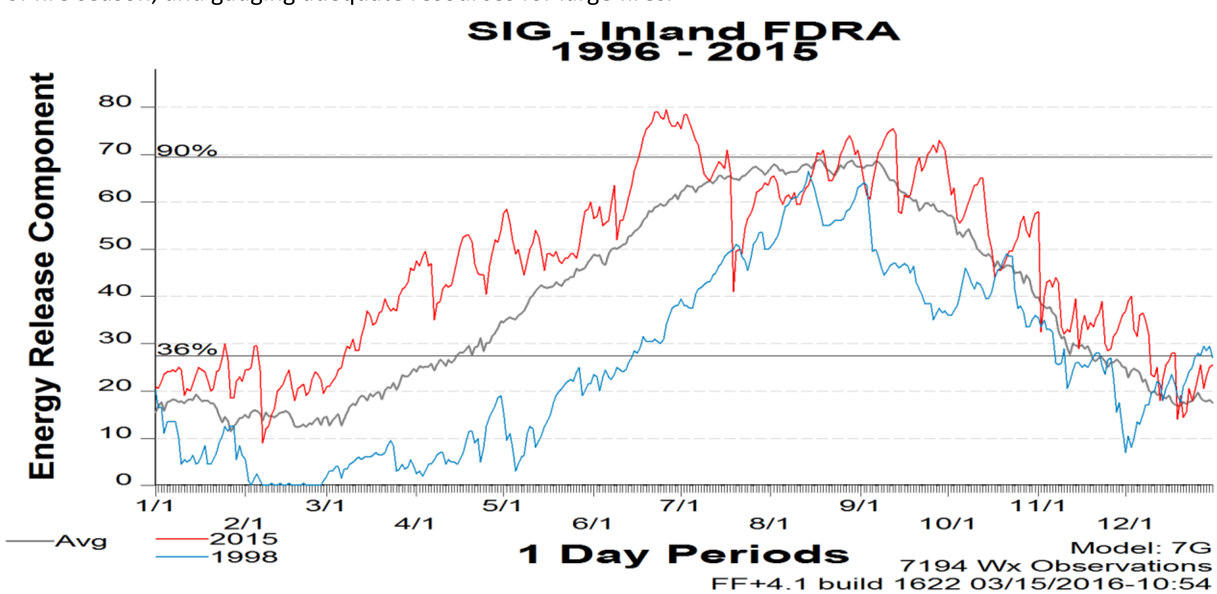
The graph of ERC for the entire calendar year above illustrates a case in which one year, 2015, reached the ERC threshold of 36 before spring. Large fire occurrence tends to increase as ERC approaches, for this geographic region, 36. At this point, consideration for early preparedness should take place. Conversely, there have been instances that the ERC threshold of 36 was not consistently achieved until after the traditional opening of fire season. In the graph above, the year 2006 depicts this phenomenon.

Inland FDRA, based on La Panza and Las Tablas RAWS:





The ERC graph above depicts the threshold, which coincides with the opening of fire season in the Inland FDRA. For this FRDA an ERC of 36, the 50th percentile, is the critical point in which to gauge the occurrence or onset of fire season. The start of fire season can be described at the time in which large fires (8 acres or more) begin to take off. Reaching an ERC of 36 has been known to occur before spring, in some cases as early as the beginning of April. In the event that an ERC reaches 36 before spring, there is reason to consider cessation of burn days, an early onset of fire season, and gauging adequate resources for large fires.



The graph of ERC for the entire calendar year above illustrates a case in which one year, 2015, reached the ERC threshold of 36 before spring. Large fire occurrence tends to increase as ERC approaches, for this geographic region, 36. At this point, consideration for early preparedness should take place. Conversely, there have been instances that the ERC threshold of 36 was not achieved until after the traditional opening of fire season. In the graph above, the year 1998 depicts this phenomenon.

Adjective Fire Danger Rating

The Adjective Fire Danger Rating[11] will be used by agency personnel to inform the public of the current level of fire danger associated with the San Luis Obispo Unit. These ratings are used to describe fire danger conditions over a large geographic area and reflect the potential for a fire to ignite and spread. The key inputs that go into determining these ratings include fuels, weather, and topography. Having this rating system allows decision makers the ability to better gauge an area's fire protection needs and links readiness levels to the potential fire danger of the day. The San Luis Obispo Unit will communicate these ratings to the public via the Smokey Bear sign located at the San Luis Obispo Headquarters.

Daily determinations of Adjective Fire Danger Ratings are calculated by the NFDRS processor which takes into consideration weather inputs and selected fuel models. The five fire danger levels: low, moderate, high, very high, and extreme are represented by five different colors- green, blue, yellow, orange, and red, respectively.

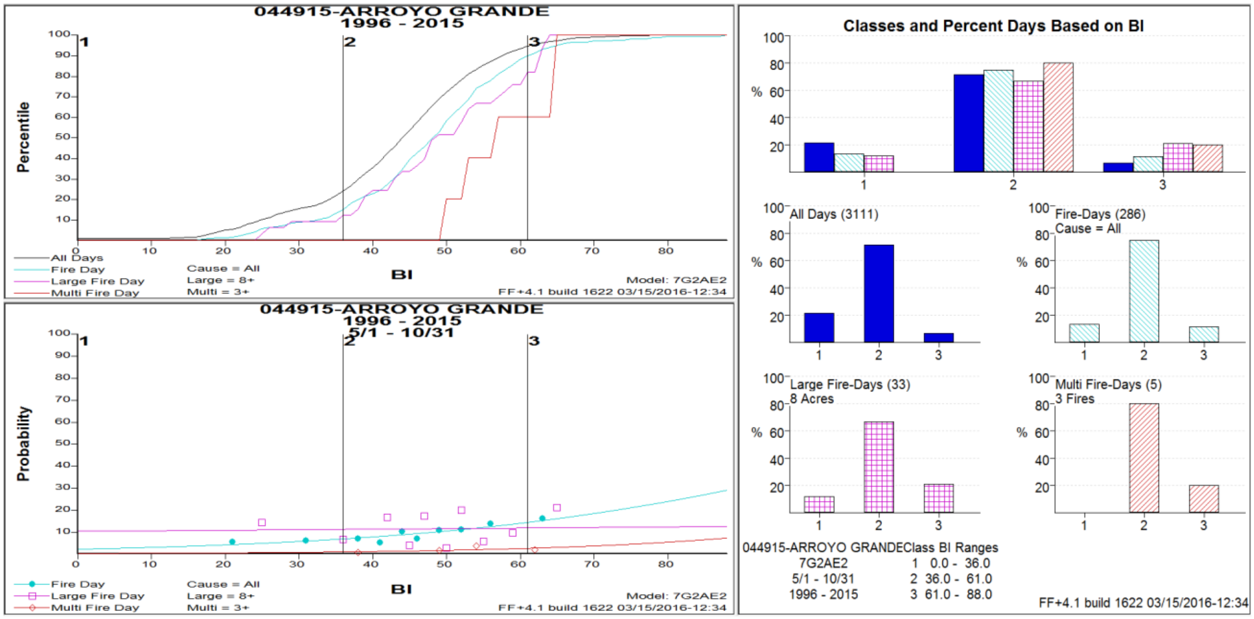
[11] http://ticc.tamu.edu/Documents/PredictiveServices/Fuels/adjective_fire_behavior.pdf

NWCG Adjective Fire Danger Ratings

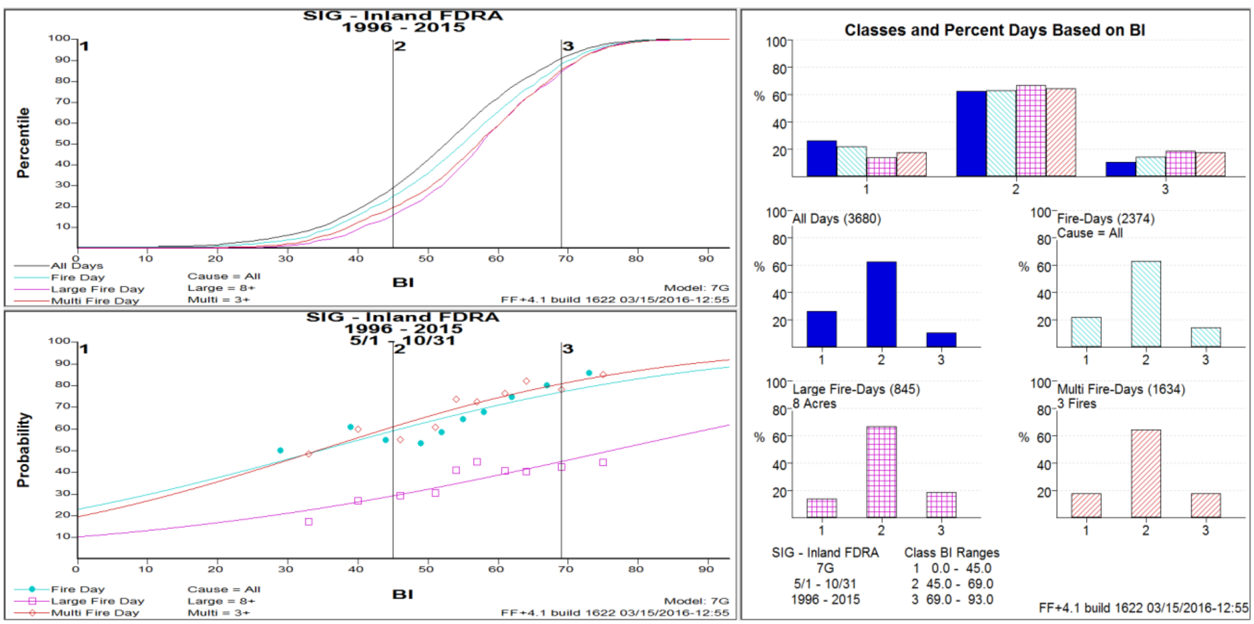
Fire Danger Rating and Color Code	Description
Low (L) (Green)	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread 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 attacked successfully 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 into 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.

http://fam.nwcg.gov/fam-web/pocketcards/adjective.htm

Decision Points for Dispatch Level



*The preparedness level (top right bar graph) is a three-tier (1-3) fire danger rating system



Decision Criteria for CAL FIRE/San Luis Obispo County Fire was developed using different breakpoint criteria for each FDRA within the Unit. All FDRAs in CAL FIRE/San Luis Obispo County Fire will use Burning Index (BI) for setting dispatch levels throughout the day.

Dispatch Level: FireFamilyPlus Analysis Factors and Determinations

						Index Break Points		
FDRA	RAWS	Data Years Used	Weight Factor	Fuel Model	NFDRS Index	Low	Medium	High
Inland	La Panza	1996-2015	1.0	7G	BI	0-45	45-69	69+
	Las Tablas	1996-2015	1.0	7G	BI			
Coastal	Arroyo Grande	1996-1998, 2000-2015	1.0	7G	BI	0-36	36-61	61+

Actions at different Decision Points

Preparedness Level: The preparedness level is a three-tier (1-3) fire danger rating system that will be based on BI and indicators of fire business. Several procedures and guidelines are to be followed once the preparedness level has been determined. The breakpoint for the planning levels are set using a historical analysis of fire business and its relationship to the 13:00 RAWS observations entered into the FFP database and processed by WIMS, and then calculates the staffing index values.

Staffing Level: Agency personnel can utilize the staffing level (response level) to assist in assigning initial attack resources. Combined with predefined dispatch zones, the staffing level is used to assist in assigning an appropriate mix of suppression resources to a reported wildland fire based upon fire danger potential. The different dispatch levels are derived from the most appropriate NFDRS index and/or components correlated to fire occurrences. In San Luis Obispo, BI has been determined to be the best NFDRS index that statistically correlates to fire spread and intensity. BI also considers components of live fuels and dead fuels, which is representative of the fuels found in our DPA.

How the levels will be communicated

During fire season, CAL FIRE/San Luis Obispo County Fire ECC will announce over the radio the current RAWS readings to better prepare the firefighter's situational awareness. These announcements are made at 10:30 and 14:30. The ECC also uses these times to determine dispatch levels.

Additionally, CAL FIRE/San Luis Obispo County Fire owns and updates a daily Smokey Bear Adjective Fire Danger Rating sign. The intent is to raise awareness of the potential fire danger in simple, easy to communicate terms. This is used as a fire prevention tool to alert the public to be fire safe.

A complement to the physical Smokey Bear Adjective Fire Danger Rating sign is the online access to daily fire danger. This is located on the CAL FIRE/ San Luis Obispo County incident dashboard website, ‘Fire Danger’ http://incidents.slocountyfire.org/ in the form of a digital Smokey the Bear sign.

Needs Assessment

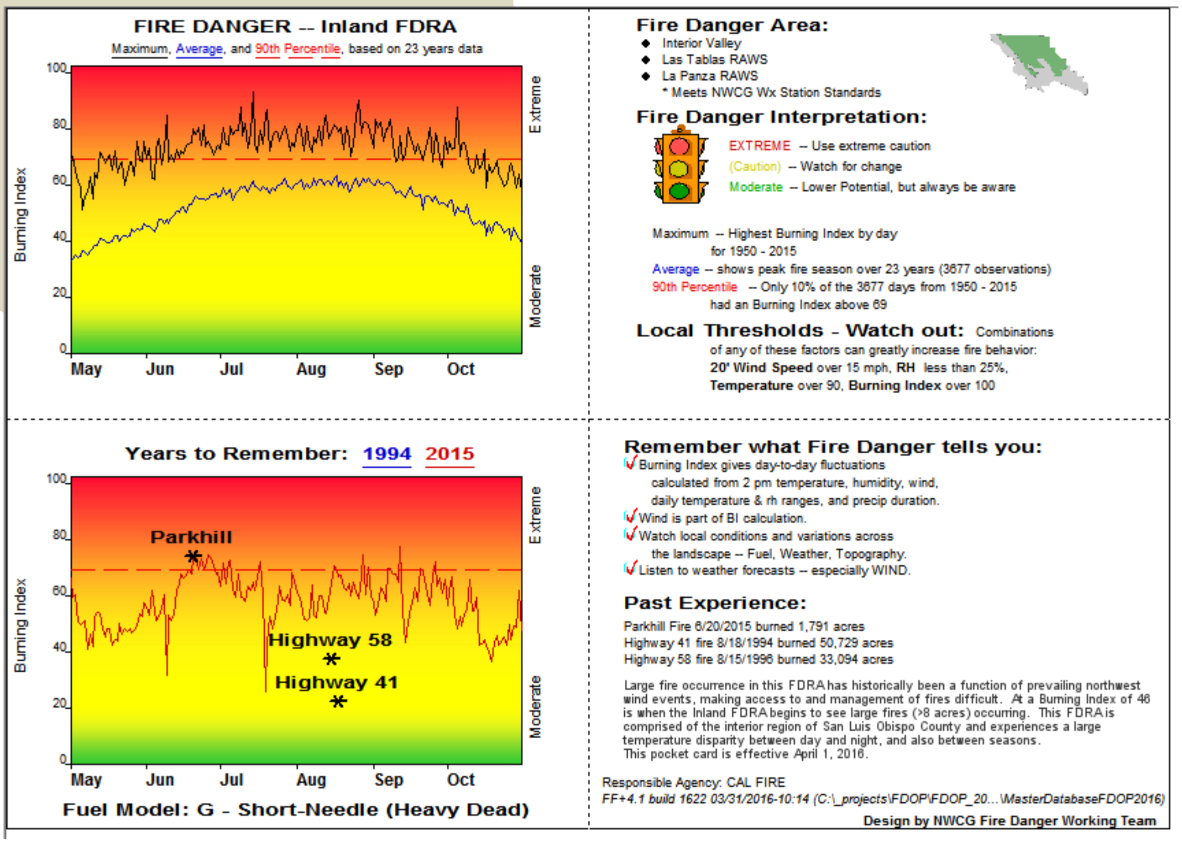
Weather Station Sites: The sole weather station site for the Coastal FDRA is not adequate. There is only one RAWS station available to CAL FIRE/San Luis Obispo County Fire that is utilized to represent this geographically diverse region. This FDRA would be better served and analyzed if it had additional RAWS stations in more representative locations to gather data and make more effective decisions. One of the largest hurdles in this analysis was assessing quality and locating anomalies in our data sets. For instance, due to either station malfunctions or user errors, 554 observations from the La Panza RAWS had to be omitted from our database to ensure accurate statistical analysis. It is evident that each of these RAWS sites requires regular maintenance. This maintenance should include controlling and maintaining clearance of the surrounding vegetation i.e., cutting back large trees that may obstruct wind direction and speed, and controlling brush or tall grass that may affect the readings for relative humidity. Each RAWS should be enclosed by a fence to avoid interaction with wildlife or people other than maintenance personnel. For the most efficient absorption of solar radiation to help power the equipment the degree of tilt should be adjusted not only to be equal to our degree latitude, but also should be adjusted between seasons for efficiency.

WIMS & NFDRS Training: WIMS and NFDRS training needs to be a priority for SLU staff, especially personnel that are charged with implementing or maintaining this plan. The ECC is the anchor point for the implementation of this Fire Danger Operating Plan. Communications Operators, ECC Captains, the ECC Chief, and Management will need to make training a priority. Further effort should be made to identify candidates for the Advanced National Fire Danger Rating course offered at National Advanced Fire & Research Institute (NAFRI) in Tucson, AZ. This course is the final course in the NFDRS series which provides the student with the tools needed to create and manage a NFDRS Fire Danger Rating Operating Plan.

Quality Assurance and Analysis: As is the case with any new tool, this Fire Danger Operating Plan must undergo continuous quality assurance and analysis to ensure the plan is functioning as needed to fulfill operational objectives. As this product is rolled out to the field it will require input from responding field staff to validate the appropriateness of the decisions that are made throughout the season. The evaluation must be as objective as possible and address the problems with a given incident or administrative decision in an honest manner. The field staff will be asked to provide written feedback throughout the first year to refine the decision making process.

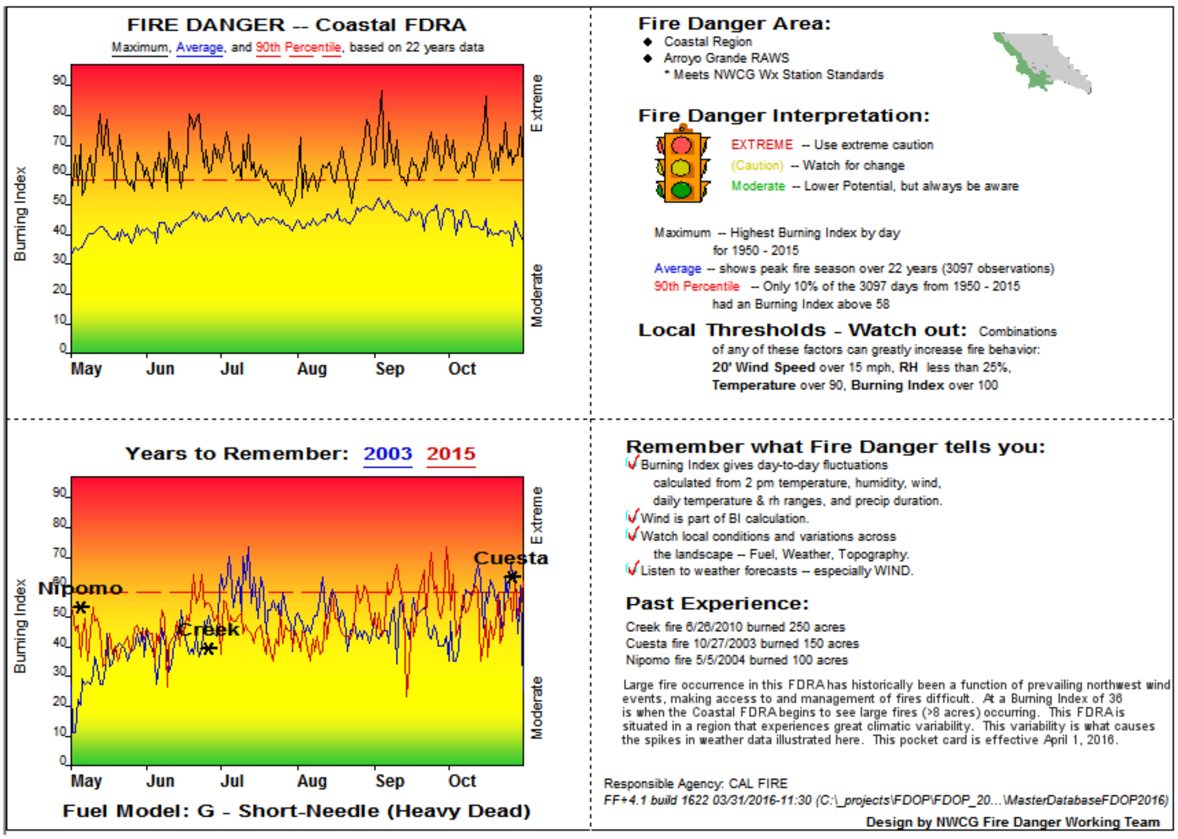
SECTION 6: APPENDICES

APPENDIX A: Inland FDRA Pocket Card



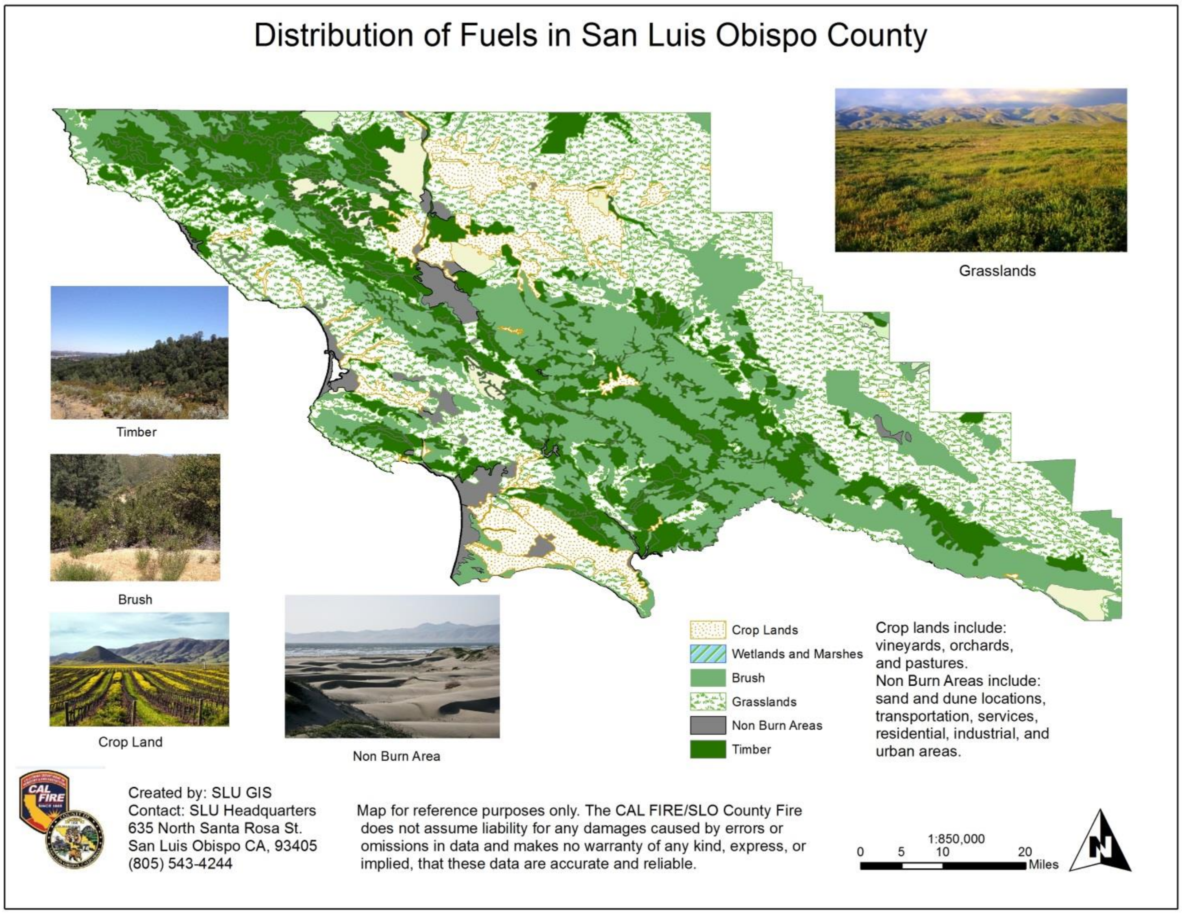
The Inland FDRA Pocket card displays three significant fires in San Luis Obispo County fire history. Two of these particular fires lie below the maximum and average Burning Index for the past twenty-three years. While, the 2015 Parkhill fire occurred on a day at the maximum Burning Index, after 4 consecutive drought years. This is an important illustration of fire behavior in San Luis Obispo County because it is evident that the assumed conditions for fire danger will not always be present for large fires to occur. The Highway 41 and 58 fires occurred at relatively low burning indices, but were sustained due to high prevailing winds. Wind is the largest predictor of large fire occurrence in San Luis Obispo County. In addition to wind activity, topography has a large effect on not only spread of a fire, but also the access and response to extinguish the fire. In some parts, these large fires were inaccessible and difficult to combat due to their topographic location.

APPENDIX B: Coastal FDRA Pocket Card



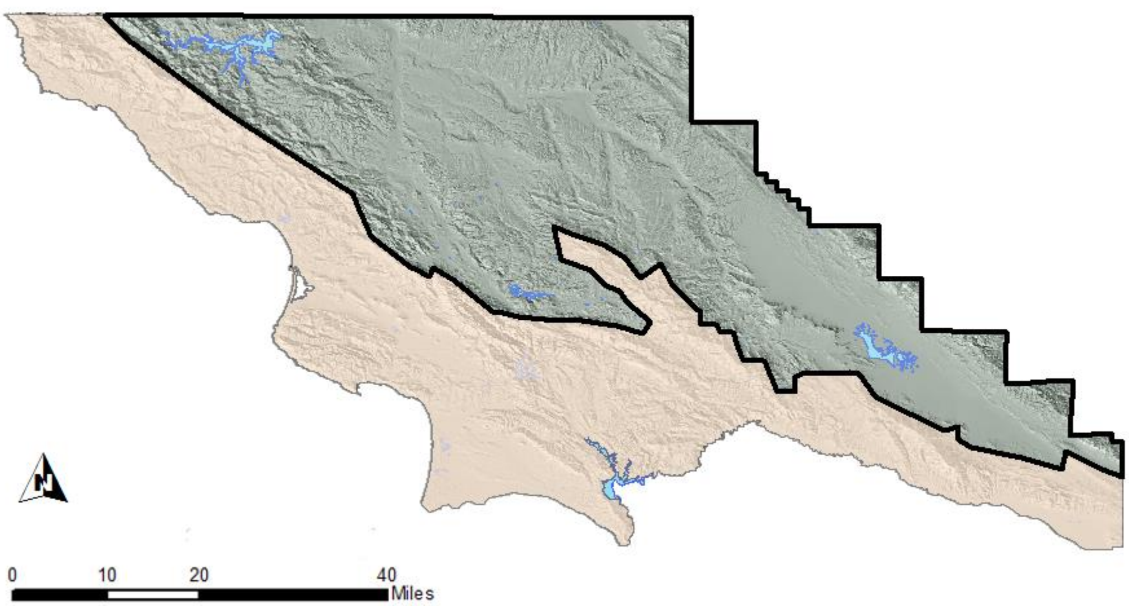
Since the Coastal FDRA is significantly smaller than the Inland FDRA, the three largest fires in the past twenty-two years within this FDRA are displayed on this Pocket card. These fires have occurred within the average or maximum Burning Index thresholds for this FDRA. Although there is a great deal of climate variation in this FDRA, the largest fires have still occurred within the expected range of Burning Index for large fire occurrence. This FDRA and pocket card is a valid depiction of expected fire activity in the geographic region of San Luis Obispo County.

APPENDIX C: Distribution of Fuels in San Luis Obispo County

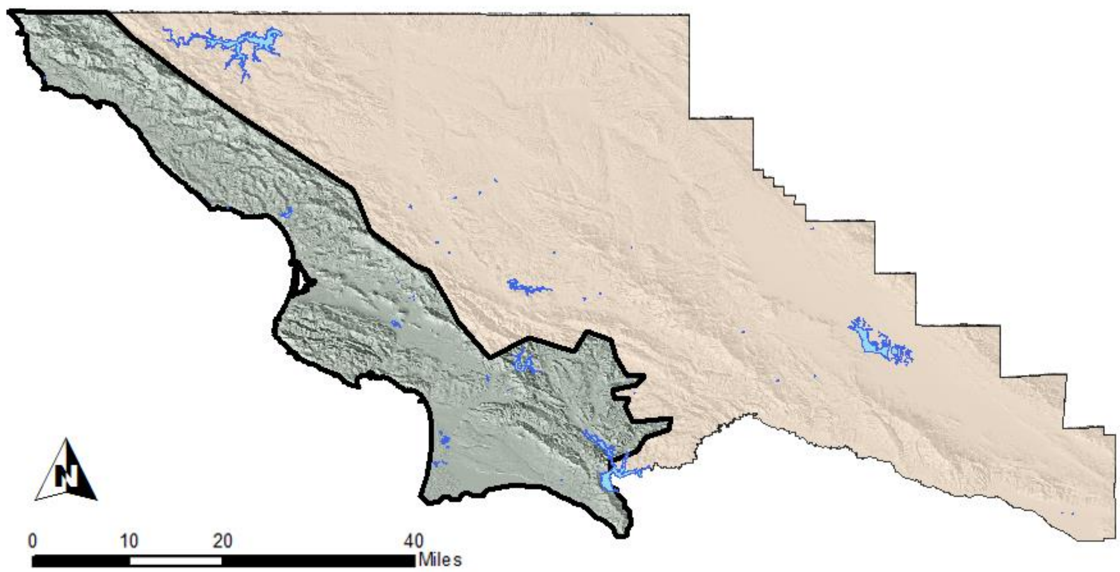


APPENDIX D: CAL FIRE/San Luis Obispo County Fire, Fire Danger Rating Areas

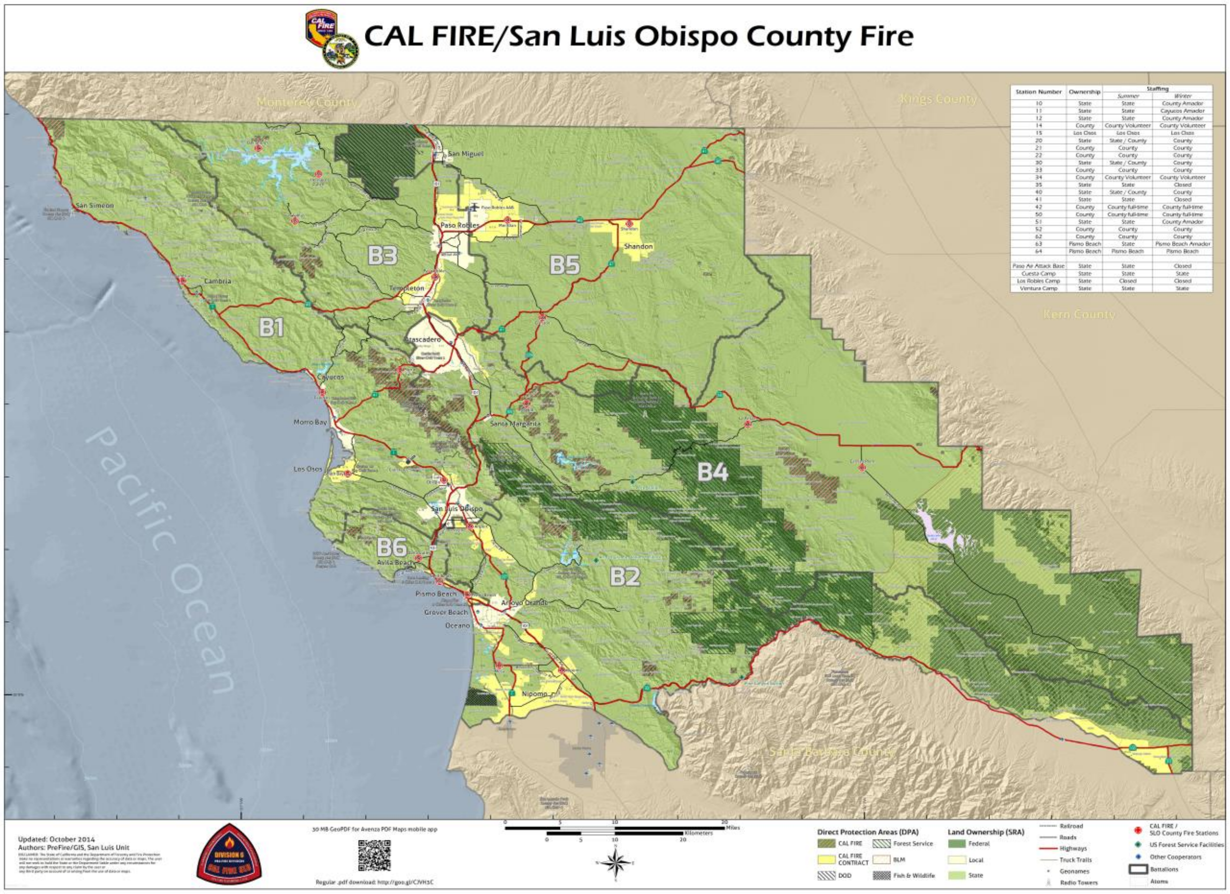
CAL FIRE SLU Inland FDRA



CAL FIRE SLU Coastal FDRA



APPENDIX E: CAL FIRE/San Luis Obispo County Fire Unit Wide Map



https://dl.dropboxusercontent.com/s/h2h5ilsx80l4a4f/2014_SLU_UnitMap_arch_e_land.pdf?dl=0

APPENDIX F: Physical Description Similarity Chart of NFDRS and FBO Fuel Models

PHYSICAL DESCRIPTION SIMILARITY CHART OF NFDRS AND FBO FUEL MODELS

NFDRS MODELS REALIGNED TO FUELS CONTROLLING SPREAD UNDER SEVERE BURNING CONDITIONS

NFDRS FUEL MODELS	FIRE BEHAVIOR FUEL MODELS													
	1	2	3	4	5	6	7	8	9	10	11	12	13	
A W. ANNUALS	X													GRASS
L W. PERENNIAL	X													
S TUNDRA	X					3rd			2nd					
C OPEN PINE W/GRASS		X							2nd					
T SAGEBRUSH W/GRASS		X			3rd	2nd								
N SAWGRASS			X											
B MATURE BRUSH (6FT)				X										SHRUB
O HIGH POCOSIN				X										
F INTER. BRUSH					2nd	X								
Q ALASKA BLACK SPRUCE						X	2nd							
D SOUTHERN ROUGH						2nd	X							
H SRT- NDL CLSD. NORMAL DEAD								X						TIMBER
R HRWD. LITTER (SUMMER)								X						
U W. LONG- NDL PINE									X					
P SOUTH, LONG- NDL PINE									X					
E HRWD. LITTER (FALL)									X					
G SRT- NDL CLSD. HEAVY DEAD										X				
K LIGHT SLASH											X			SLASH
J MED. SLASH												X		
I HEAVY SLASH													X	
	GRASS			SHRUB				TIMBER			SLASH			

Figure 3.- Similarity chart to align physical descriptions of fire danger rating fuel models with fire behavior models.

ACKNOWLEDGEMENTS:

This Report was made possible thanks to the support and advice of many individuals and organizations. The Fire Danger Operating Plan team would like to thank everyone who contributed to this endeavor.

Special thanks to;

Battalion Chief Chris Waters, CAL FIRE/ Amador- El Dorado Unit

Hannah Panno, Bachelor of Science: Anthropology and Geography, California Polytechnic State University, San Luis Obispo

Matthew Marsh, Bachelor of Science: Earth Sciences- Climatology, California Polytechnic State University, San Luis Obispo