

# Wolverine Fire

## Okanogan / Wenatchee National Forest

### Long-term Assessment (August 27, 2015)

By Rob Beery, Long Term Fire Behavior Analyst (LTAN)



## Executive Summary

This analysis is intended to aid Agency Administrators and fire managers in planning for the Wolverine fire as the season continues. Specifically this report describes the climate, fuels, and general fire environment, analyzes historic fire and weather conditions that contribute to fire growth, and examines historic conditions to identify season slowing and ending events.

The Wolverine fire started on June 29<sup>th</sup> 2015 in the Lake Chelan National Recreation Area approximately 2.5 miles West of Lucerne landing. The fire was initially a small fire on a ridgetop, ignited by lightning and was managed by a Type 3 IMT. Due to steep terrain and high fuel loading, a decision was made to provide site protection using indirect tactics. On July 30<sup>th</sup> the communities of Holden and Lucerne were evacuated as well as workers on the Holden Mine remediation project. A Type 2 IMT was ordered due to the changing complexity. On August 1<sup>st</sup> the fire escaped containment lines and burned to the south around Domke Lake. A Type 1 IMT was ordered the same day. By August 3<sup>rd</sup> the fire had grown to 24,500 acres along Lake Chelan. By August 16<sup>th</sup> the fire had moved west into the Glacier Peaks Wilderness and increased in size to 40,500 acres. On August 17<sup>th</sup> the fire escaped containment lines and started traveling South in the Entiat drainage. This drainage has predominate Southerly winds and the fire moved South through the drainage at 1-3 miles per day. As of the end of August it has moved down drainage approximately 16 miles and is currently 62,000 acres. The fire is currently located on the Okanogan/Wenatchee National Forest, the Glacier Peaks Wilderness, and the North Cascades National park.

The potential for extreme fire behavior and significant fire spread remains throughout the fire area. Small amounts of precipitation will diminish fire spread potential for a short time. A season slowing event is likely to occur sometime in mid to late October. A season ending event will be when the area receives significant snowfall this winter.

## Wind Trends

Wind patterns around the Wolverine fire are very complex due to the competing influence of Lake Chelan and numerous other glacial valleys. The predominate Columbia River Valley winds are from the South while in the Entiat Valley which is nine miles to the east the winds are from the North. The majority of fire growth to date has occurred during wind events with spotting distances of up to ½ mile.

## Topography/Fuels

Topography ranges from steep glacier passes in the upper elevations to rolling alluvial plains further to the South. Elevation ranges from 7,800' to 700' in the lower Entiat Valley. This area has a history of numerous large fires with some areas of high severity timber kill.

This variable topography greatly affects the fuel conditions and type of fuels throughout the fire area. Fuel types range from heavy grass in the lower elevations to sub-alpine fuels and rock outcroppings at the highest elevations. The fuels in the upper Entiat river valley are predominantly heavy conifer with a high percentage of dead and down timber. The fuel moistures in the large dead (standing/down) fuels is calculated to be in the 5-7% range, while the timber fuels have decreased to approximately 115%.

**Figure 1. Typical Fuel Loading in the Entiat Valley**



**Figure2 Active Fire Behavior in This Fuel Type**

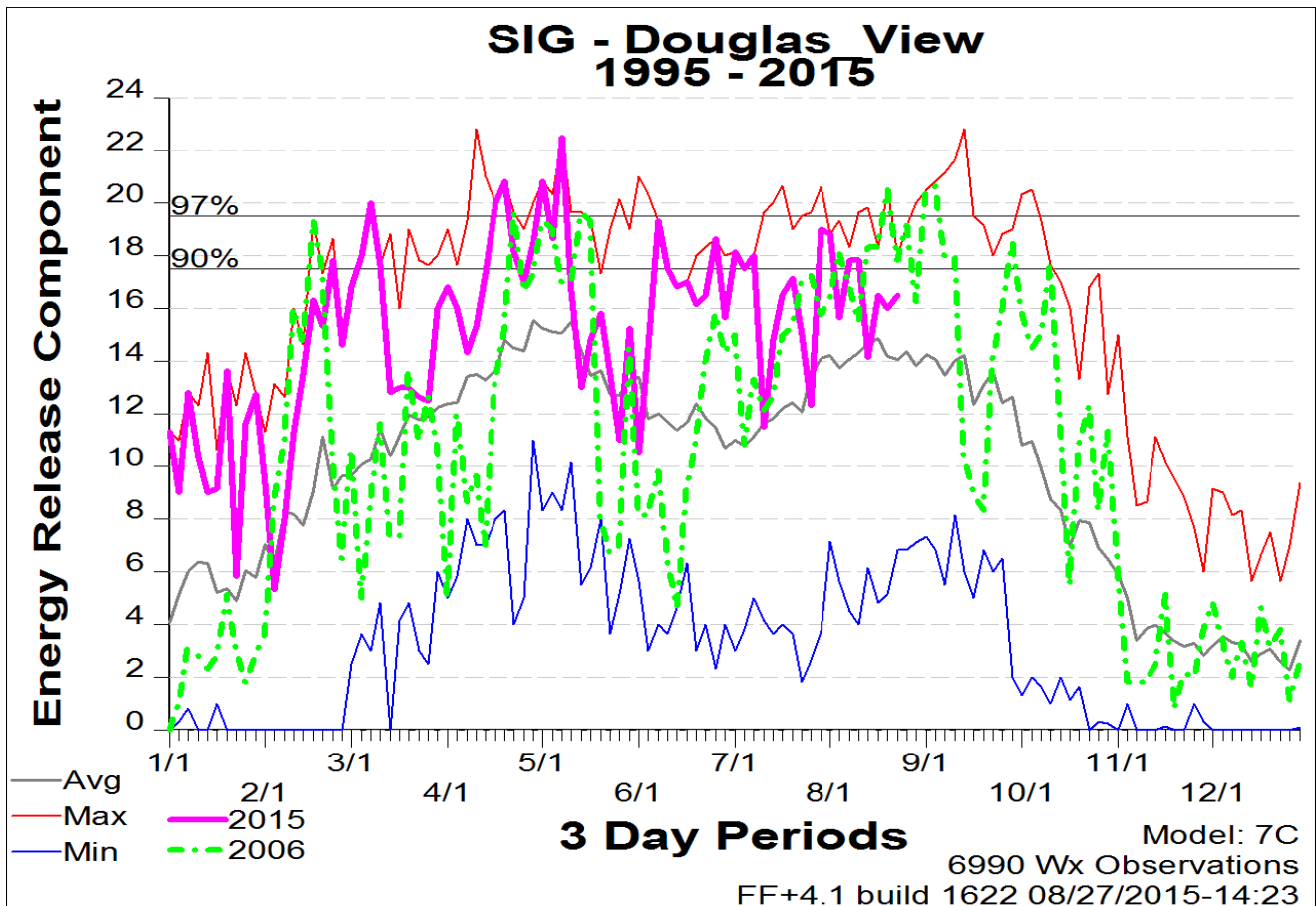




### Local and Regional Conditions

Energy Release Component (ERC) values from the Wolverine weather stations demonstrate a trend of higher than average ERC values, this has been reflected in sustained fire behavior in the 1,000 hour fuels along with the dry live fuels. During May 2015 new high ERC records were recorded. In late May and early June this area received some precipitation along with lightning, this dropped the ERC values to the average range. It has been dry since and the ERC values have rebounded. The 2006 indices are included because that year trended close to what we have seen in 2015.

Figure 1. Energy Release Component (ERC) graph for Wolverine





### Fire History and Fuels

The fire scars in the area play different roles in fuels available for fire spread depending on fire severity. The Tinpan fire which started in July of 2006 was a high severity slope driven fire and the returning fuels are predominantly grass. The Duncan and Klone fires which burned within the last three years did not burn as severely and have large areas of dead and standing fire-killed timber.

Figure 4. Fire History Around the Fire Area

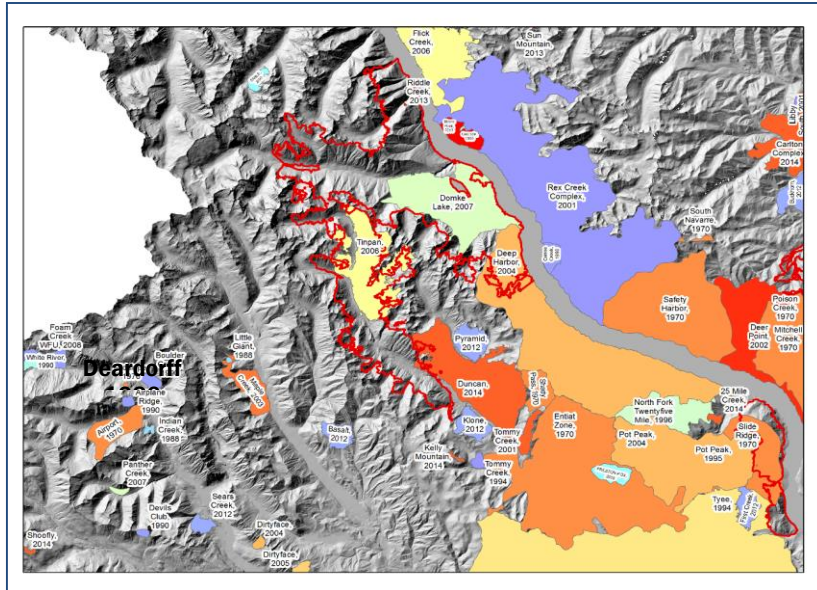
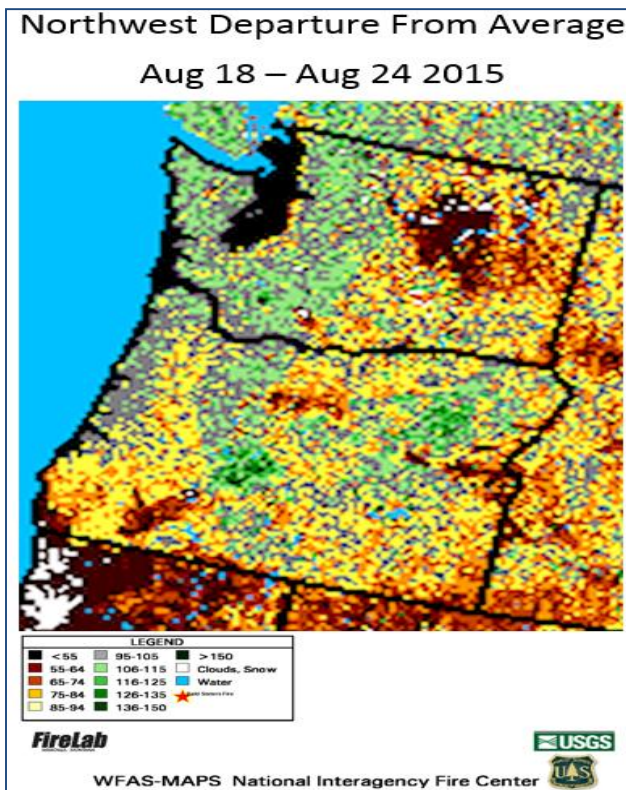


Figure 4. Greenness Departure From Average



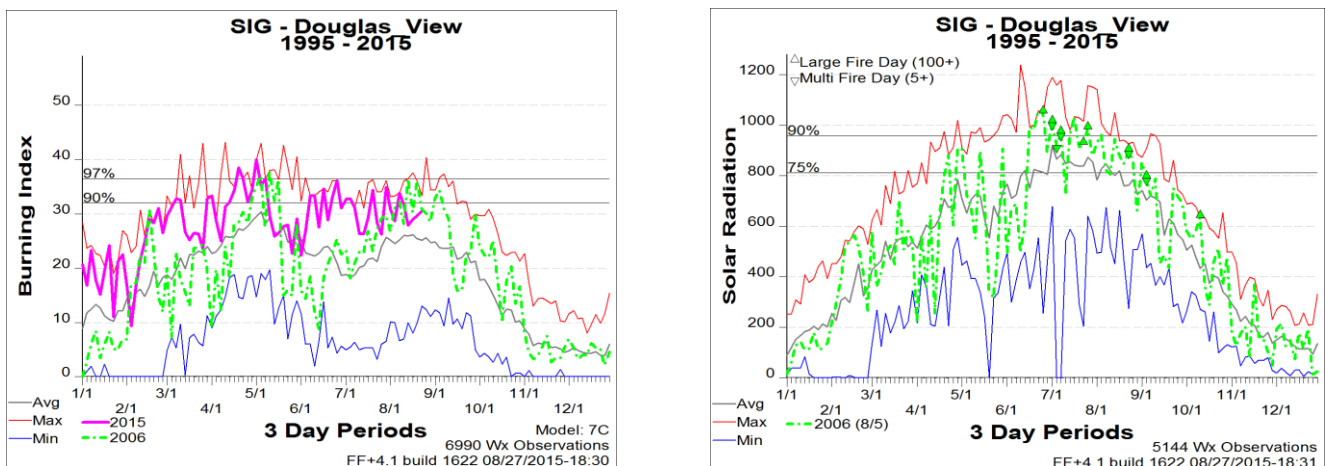
## Seasonal Events Outlook

The potential length of the fire season is important to operational and other management decisions, as the number of burn days left in the season have a direct effect on the likelihood that a fire will reach any point of concern. The fire season on the Okanogan/Wenatchee often continues into late fall but as days shorten, temperatures drop, and periods of precipitation increase the opportunities for fires to grow diminish. For example, in early September, the burn period can begin mid-morning, end near sunset on very warm and dry days, and extend well into the night in thermal belts. Between September 1<sup>st</sup> and November 1<sup>st</sup> at the latitude of Chelan, WA, the day shortens by 3 hours 30 minutes and the maximum sun angle declines by 22.7°. These changes reduce the potential burn period and are enough to affect the probability that the lower 1/3 of slopes will carry fire, especially on northerly and easterly aspects. These slope positions are also less likely to dry out sufficiently to carry fire should a precipitation event, even a relatively small one, occur around mid-October. These factors along with changes in weather patterns combine to cause season slowing and later season ending events. Trends in fuel and weather conditions can be monitored to help managers recognize these events and use them for long-term planning purposes.

## Season Slowing Events

Many things can create a season slowing event, and it is typically a combination of factors that do this. When looking ahead for trends to indicate potential slowing events, Solar Radiation minimums below 600 and the Burning Index topping at 30 correlate well. Atmospheric instability includes many factors that contribute to fire spread and is ultimately related to differences in surface and air temperature. Solar radiation helps capture this along with the influence of the changed solar angles during the year. The Burning Index (difficulty of control) is derived from a combination of Spread Component and Energy Release Component, creating a balance of short and long term trends that contribute to fire growth. The graphs below reflect trends based on 20 years of weather data and a similar fire season (2006).

Figure 2 Burning Index and Solar Radiation Graphs

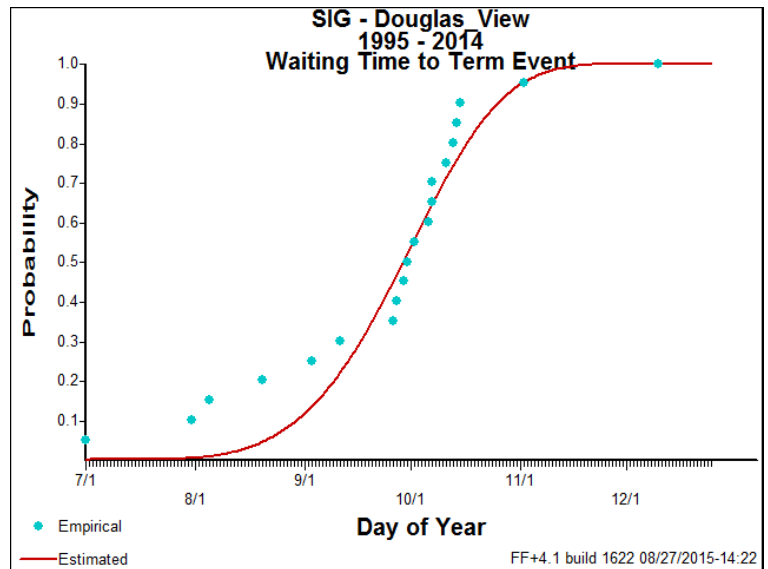


**Season Slowing Events**

When reviewing indices to define season slowing events, long term precipitation combined with Energy Release Component percentages of 80 and below correlated well. Precipitation over several days reflects good dead fuel moisture recoveries, reducing availability of fuels for a longer part of the burning period. Energy Release Component also reflects trends in fuel moistures influenced by weather conditions over longer periods of time. The following term file is based on maximum ERC's at or below 80% for 7 consecutive days and a total of 1" of precipitation for 7 consecutive days. According to those criteria the probability of a season ending event by September 29th is 50% and 75% by October 14<sup>th</sup>. These criteria were developed through discussions with local fire managers, analysis from Remote Automated Weather Stations (RAWS) and fire history records.

**Table 1. Key Probabilities for Season Ending Events**

Probability	Date
25%	September 14
50%	September 29
75%	October 14
90%	October 26
99%	November 14



**Table 2. RAWS Sites used for analysis**

Station	WIMS Number	Elevation	Area
Douglas Ingram Ridge	452035	3,566'	East of Chelan Complex
Viewpoint	452128	3,695'	NW of Lake Wenatchee

**Daylight Reduction and Solar Influence**

At this latitude, days shorten and the angle of the sun declines significantly as we transition into fall (see Table 3). This has a noticeable effect on the burning period and translates into a reduced potential for fire, fuels, and weather alignment to develop into extreme fire behavior. North and east aspects are affected more by these changes than south and west aspects. Positions on the lower third of the slope are also more affected than those on the upper third. These slope positions are also less likely through time to dry out sufficiently to carry fire should a precipitation event occur. By the end of October, the burning period will be limited to just a few hours in the afternoon.

**Table 3. Changing Day Lengths and Sun Angles**

Date	Solar Angle	Sunrise	Sunset	Daylight
9/01/2015	8.14	07:20	20:43	13:13
9/15/2015	2.88	07:39	20:15	12:24
10/01/2015	-3.33	08:01	19:42	11:28
10/15/2015	-8.65	08:21	19:14	10:39
11/01/2015	-14.56	08:47	18:44	09:43
11/15/2015	-18.57	09:08	18:25	09:02

**Smoke Management**

Class One Airsheds in the area include Glacier Peaks Wilderness, the North Cascades National Park, and the Lake Chelan National Recreation Area. These areas have all been impacted by the smoke from not just the Wolverine fire but other numerous fires in the area.

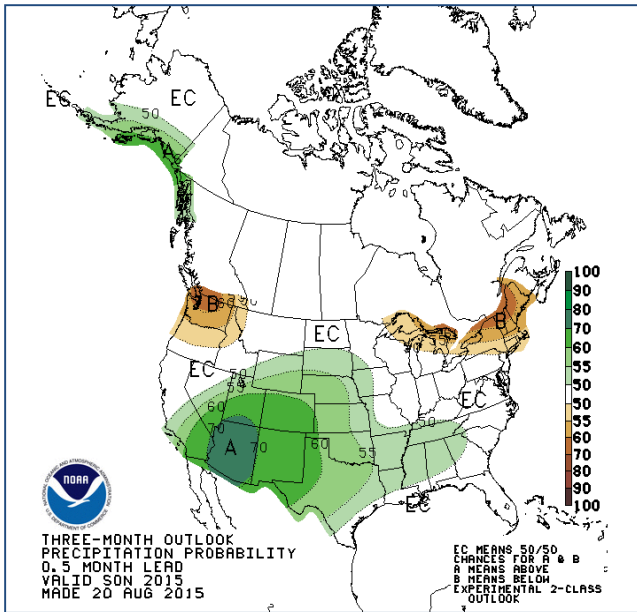
An Air Quality Resource Advisor’s (ARRA) was ordered for incidents in the vicinity. Smoke monitoring equipment has been set up in Twisp and Winthrop and permanent monitors are set up in Leavenworth and Wenatchee. Real time air quality monitoring data is available on the web at <https://fortress.wa.gov/ecy/enwiwa/>



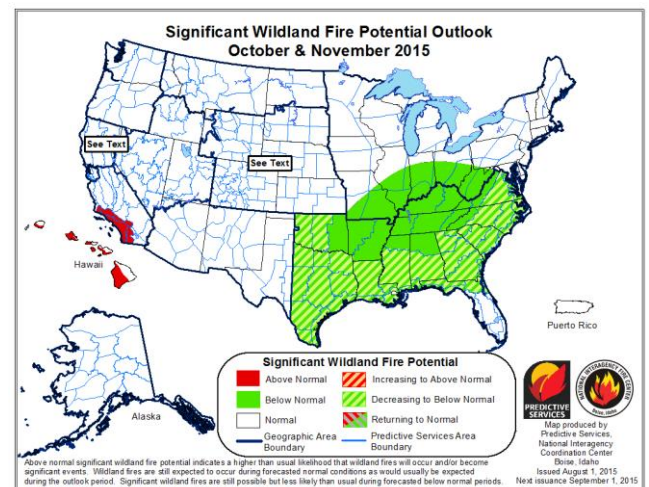
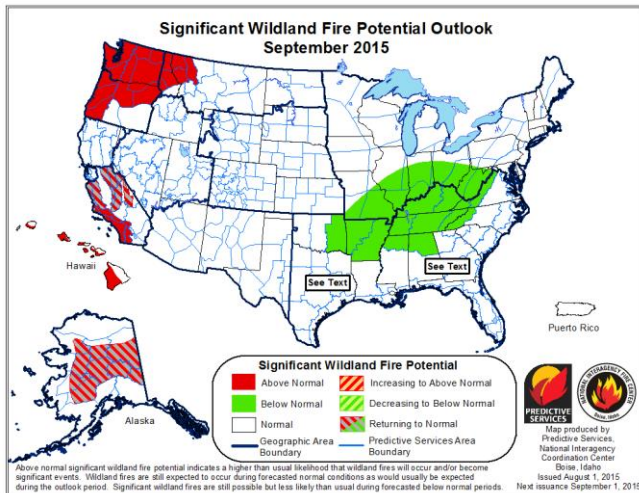
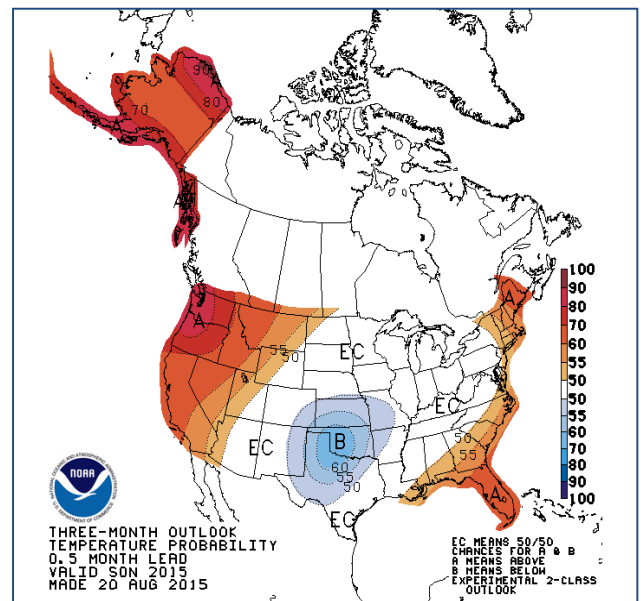
## Projected Climatic and Fuels Trends

Washington has experienced drought conditions over the last several years, especially in the Northern parts of the state. The Climate Prediction Center outlook for the next 3 months shows chances for below average precipitation with the possibility for above average temperature. However, current predictions indicate an above average precipitation and temperatures through November.

### 3 Month Precipitation Outlook



### 3 Month Temperature Outlook



*This document reflects conditions and data available on August 27<sup>th</sup> 2015 and should be updated on a regular basis or as fire or local weather conditions continue to change.*