

Klamath Falls 2014 and 2015 Exceptional Event EPA Concurrence Request

Submitted to: EPA, Region 10

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Executive Summary

Klamath Falls has experienced smoke from wildfire events that have in part caused violations of the National Ambient Air Quality Standards in 2014 and 2015. Klamath Falls achieved attainment with the PM_{2.5} standard based on 2012-2014 data and met the federal regulatory deadline. Klamath Falls must continue to show compliance with the standard under its federally approved PM_{2.5} attainment plan. DEQ evaluated two days during 2015 that are of regulatory significance because it affects Klamath Falls' compliance with the standard. However, DEQ has also included an analysis of four additional days (one in 2014 and three in 2015) that when removed from the data record will ensure Klamath Falls meets the standard in 2014 and continues to meet the standard in 2015. This document provides information to demonstrate the days leading to violations of the standard were predominantly due to the wildfire smoke intrusions into Klamath Falls. DEQ requests EPA concur with our findings that these wildfire events caused exceptional events that meet EPA's criteria in the Exceptional Event Rule (EER).

In DEQ's analysis, we used all the elements of the EER to analyze the causal relationship, conceptual model and the effect on air quality caused by these wildfire events. In addition, we continued to show that the exceedance of the standard was not reasonably controllable or preventable and that the exceedance was a natural event unlikely to recur.

In 2014, there was one day where smoke from a wildfire event caused the highest 24-hour impact of 31.4 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of fine particulate matter (PM_{2.5}) during the entire year. Historical air quality typically shows the highest values during the winter months and typical values during early August are normally 7 $\mu\text{g}/\text{m}^3$ for PM_{2.5} without a wildfire smoke intrusion. Further, DEQ shows that the wildfire in Oregon, the Oregon Gulch Fire of over 35,000 acres, which was part of the larger Beaver Complex Fire, sent smoke on a northeastern path towards Klamath Falls. This event was lightning caused, creating a natural wildfire event.

In 2015, there were five impacted days where wildfire smoke traveled from the west side of the Cascade Mountains to the east side, again settling in the Klamath Basin. These days were impacted from two separate fires – primarily the Stouts Creek Fire and the National Creek Complex. Smoke from the Stouts Creek Fire caused the highest 24 hour impact of 84.8 $\mu\text{g}/\text{m}^3$ during an early August episode. Smoke from the Stouts Creek Fire of over 26,000 acres of fires and the Big Windy Complex of fires of over 20,000 acres of fires combined and drifted over the Cascade Mountains inundating Klamath Falls. Historical air quality during this time of year again is between 6 and 8 $\mu\text{g}/\text{m}^3$ for a 24 hour period excluding wildfire smoke. The National Creek Fire was lightning caused and a natural event; the Stouts Creek Fire was human caused although fire mitigation measures were in place. Tinder dry fuel caused a series of events in SW Oregon to erupt into flame overwhelming local firefighters. 2015 was an active fire season, with many wildfires impacting much of Oregon, particularly Klamath Falls and many communities on the west side of the Cascade Mountains as well. Even with full control and the aggressive fire fighting measures used by the USFS and other cooperators to put out the fires, the effort was no match for the intensity of the Stouts Creek Fire, the National Creek Complex fires and others in Northern California. Firefighters were overwhelmed by the events. Smoke from all fires converged and settled in the Klamath Basin.

Table 1 shows the key fires causing event days in Klamath Falls associated with our request of EPA to concur with our findings.

Table 1. 2014 and 2015 PM_{2.5} sample days impacted by wildland smoke.

Year of Event	Site ID and POC	Date	$\mu\text{g}/\text{m}^3$	Wildfire Event
2014	-Klamath Falls, Peterson School -EPA# 41-035-0004 -POC 1	8/3/2014	31.4	Oregon Gulch Fire – OR, Beaver Complex - OR

2015	-Klamath Falls, Peterson School -EPA# 41-035-0004 -POC 1	8/1/2015	84.8	Stouts Creek Fire - OR
		8/4/2015	44.4	Stouts Creek Fire - OR
		8/19/2015	44.2	Stouts Creek Fire - OR
		8/25/2015	25.2	National Creek Complex - OR
		8/28/2015	29.5	National Creek Complex – OR, River Complex - CA

Table 2 summarizes the Exceptional Event Rule elements used to determine DEQ’s findings.

Table 2: Summary of DEQ demonstration based on Exceptional Event Rule elements.

EER Element	Section	Summary
Conceptual model	1	The conceptual model describes the affected area, meteorological conditions of the region and the source causing the violation. It includes a discussion of how emissions from the wildfire event led to the violation at the Klamath Falls monitor.
Clear causal relationship (CCR)	2	The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation. Wildfires were the cause of the high concentrations in 2015 and 2014. Evidence includes satellite images of wildfire smoke drifting toward Klamath Falls; back and forward-trajectories linking the wildfires with the monitor in Klamath Falls; wind roses and other meteorological data showing the direction and impact to the monitors. The analysis also includes information comparing the event-influenced concentrations to concentrations at the same monitoring site at other times.
Not reasonably controllable or preventable (nRCP)	3	The event satisfies the “not reasonably controllable and not reasonably preventable” criteria in 40 CFR 50.1(j); 40 CFR 50.14(c)(3)(iv)(D). The 2014 and 2015 wildfires were predominantly lightning caused (although one fire was human caused but reasonable controls such as fire restrictions were in place) and full suppression techniques were predominately used to control the fires once ignited. There was little preventative work that could have been done to anticipate these significant lightning caused wildfires. The natural nature of the ignitions and the inability to prevent these fires from becoming established indicate they are <i>not reasonably controllable or preventable</i> (nRCP). In addition, there are no other anthropogenic sources capable of contributing smoke levels as high as those experienced during these events.
Natural event or human activity unlikely to recur (NE/HAUR)	4	The <i>natural event/human activity unlikely to recur</i> (NE/HAUR) criterion is met by demonstrating that the event is a natural event. The majority of these wildfires were started by lightning which meets this definition. The one exception was the Stouts Fire which was human caused, however existing fire restrictions were in place which were not heeded and the result sparked a huge wildfire.
Mitigation	5	If wildfires continue to affect this area, 3 times within a 3 year period, then EPA will need to make a finding that a mitigation plan is required. In the meantime, ODEQ works with other agencies following the Oregon Wildfire Smoke Protocol. This includes assigning onsite smoke coordinators, public advisories, and additional monitoring.
EER procedures	6	ODEQ met EER procedural requirements for flagging, demonstration, and public comment as summarized in this section.

DEQ requests that EPA concur with our findings that the events identified in Table 1 were exceptional events and that they meet the criteria in the EER as summarized in Table 2.

1. Conceptual Model

This section describes the wildfires in SW Oregon in 2015 and how they affected Klamath Falls, Oregon during July, August and September of those years. While only two days in 2015 would be categorized as having regulatory significance, DEQ is including additional days during 2014 and 2015 that were affected by wildfires and have an overall effect of raising the 98th percentile design value. The weather conditions antecedent to the fire season and during the fires are discussed as well as conceptual models for transport pathways between the wildfire sources and the monitor in Klamath Falls.

Days of Concern

DEQ has identified two days in 2015 as those affected by wildfires that affected the Klamath Falls area and are regulatory significant.

Date	PM2.5 Concentration	Cause
August 1, 2015	84.8 ug/m ³	Human caused
August 4, 2015	44.4 ug/m ³	Human caused

DEQ has also included the following days have been identified as wildfire caused events that have an overall effect of raising the 98th percentile design value.

Date	PM2.5 Concentration	Cause
2014		
August 3, 2014	31.4 ug/m ³	Lightning
2015		
August 19, 2015	44.2 ug/m ³	Human caused
August 25, 2015	25.2 ug/m ³	Lightning
August 28, 2015	29.5 ug/m ³	Lightning

1.1 Overview

Wildfires occur every year in the Western United States, primarily in the summer and fall seasons. The 2014 and 2015 wildfire season were the most active in the western United States in recent years as a result of unusually hot, dry summertime conditions. The 2015 fire season was below normal for number of reported wildfires (93 percent of the 10-year annual average).¹ There were 68,151 wildfires reported nationally (compared to 63,612 wildfires reported in 2014). The number of acres burned in 2015 was 10,125,149 acres or 145 percent of the national 10-year average. Based on an annual 10-year average, the Northwest² (130%), and Northern California³ (111%) reported above average fire occurrences

¹ https://www.predictiveservices.nifc.gov/intelligence/2015_Statsumm/wildfire_charts_tables15.pdf

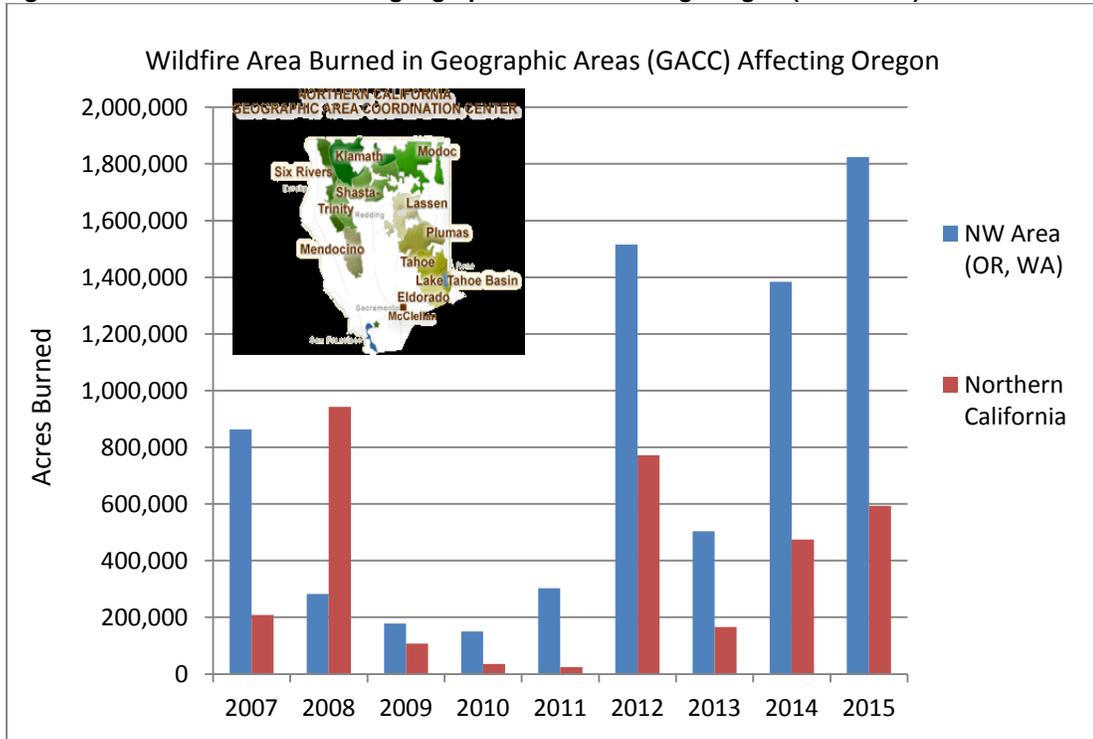
² Consists of Oregon and Washington

³ Consists of the area from the Oregon border to San Francisco (including the Lake Tahoe Basin)

in 2015. The Northwest (229%), Northern California (163%) and Northern Rockies (139%) were the only Geographic Areas to experience above average acres burned.⁴

Figure 1 shows the amount of acres burned from wildfires in 2014 and 2015. As shown from the graph, the Northwest area experienced over 1 million acres of land burned due to wildfires.

Figure 1: Wildfire acres burned in geographic areas affecting Oregon (2007-2015)



Weather and precipitation

The summer of 2015 was characterized by an intense ridge that sat over the western half of North America, bringing very hot and dry conditions to much of the western U.S. and Alaska. (starting in June through August).⁵ The Northwest remained much drier than normal under the intense ridge. The warm and dry winter and spring led to very dry fuels across the Northwest. Fire danger was unusually high.

Oregon experienced temperature and precipitation extremes in 2015, where the annual temperature was above average and it was recorded as the warmest year on record. June was particularly warm with a temperature 2.9° F above average, the second warmest June on record. Average August temperatures were 1-5 degrees above normal. (Figure 2)

⁴ https://www.predictiveservices.nifc.gov/intelligence/2015_Statsumm/wildfire_charts_tables15.pdf

⁵ <https://www.ncdc.noaa.gov/sotc/national/201513>

Daily Mean Temperature Anomaly: August 2015
 Period ending 7 AM EST 31 Aug 2015
 Base period: 1981-2010
 (Map created 12 Feb 2016)

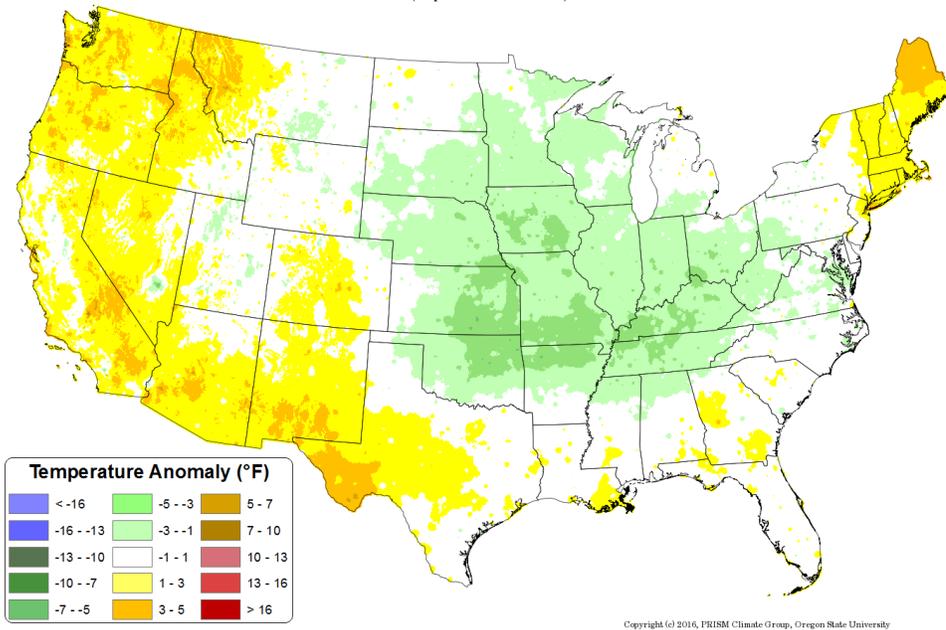


Figure 2. August 2015 daily mean comparison to the 30 yr average

<http://prism.oregonstate.edu/comparisons/>

Conditions leading up to this included a limited winter snowpack and precipitation which contributed to summer drought and a record-breaking wildfire season.⁶ Below-average precipitation fell across the Northwest where in Oregon it was less than 4 inches from average. Severe to exceptional drought remained over most of southern Oregon.⁷

1.2 Source Area

The exceptional event requests are for a wildfire that affected two days in 2015 and were regulatorily significant. DEQ is also including additional wildfires in 2014 and 2015 that resulted in high values at the Klamath Falls monitor.

2014 Wildfire season

In 2014, there were over 3,000 fires in the state with 846,945 acres were consumed by wildfire. Figure 3 shows a map of wildfires in Oregon. 58 fires met the classification of a large fire, where at least 100 acres timber or 300 acres grass or brush were burned. The NW stayed at Preparedness Level 5 for 31 days; the previous record was set in 2006 for 24 days.⁸ The total cost of fighting the wildfires was approximately \$280M in Oregon. Despite a dip in the number of wildfires in Oregon in 2014, the fires burned more acreage than any other region in the country. Oregon's wildfire season started early with at the beginning of June. A large swath of southern Oregon remained in extreme drought, Oregon and Washington logged 3,270 fires that scorched 1,284,013 acres on federal, state and private lands, according to the latest figures from the National Interagency Fire Center. Although that's fewer than the 10-year average of 3,877 fires in both states, the acres burned was nearly triple the 10-year average of 452,039 acres.⁹

⁶ <https://www.ncdc.noaa.gov/sotc/national/201513>

⁷ https://www.predictiveservices.nifc.gov/intelligence/2015_Statsumm/intro_summary15.pdf

⁸ <http://wildfireoregondeptofforestry.blogspot.com/2014/10/pacific-northwest-2014-highlight-fire.html>

⁹ http://www.oregonlive.com/wildfires/index.ssf/2014/09/pacific_northwest_wildfire_sea.html

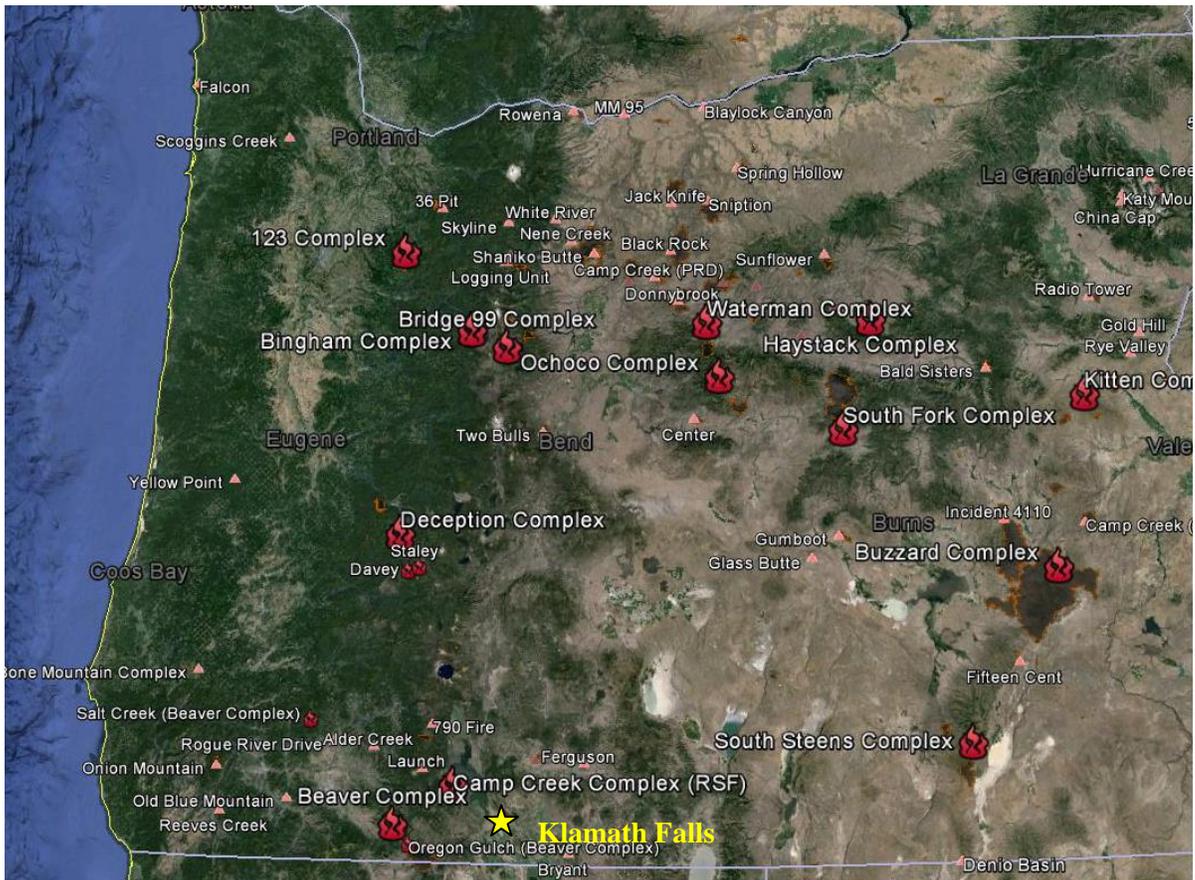


Figure 3: Map of 2014 wildfires in Oregon

2015 wildfire season

The 2015 fires most directly influencing Oregon during the period when exceptional events affected the Klamath Falls monitor are shown in Figure 4, a map of the satellite fire detects in the region. In 2015, there were 2,588 fires in the state, with approximately 685,000 acres burned. The entire region in southwestern Oregon was affected by smoke from the widespread fires, including those from Northern California.

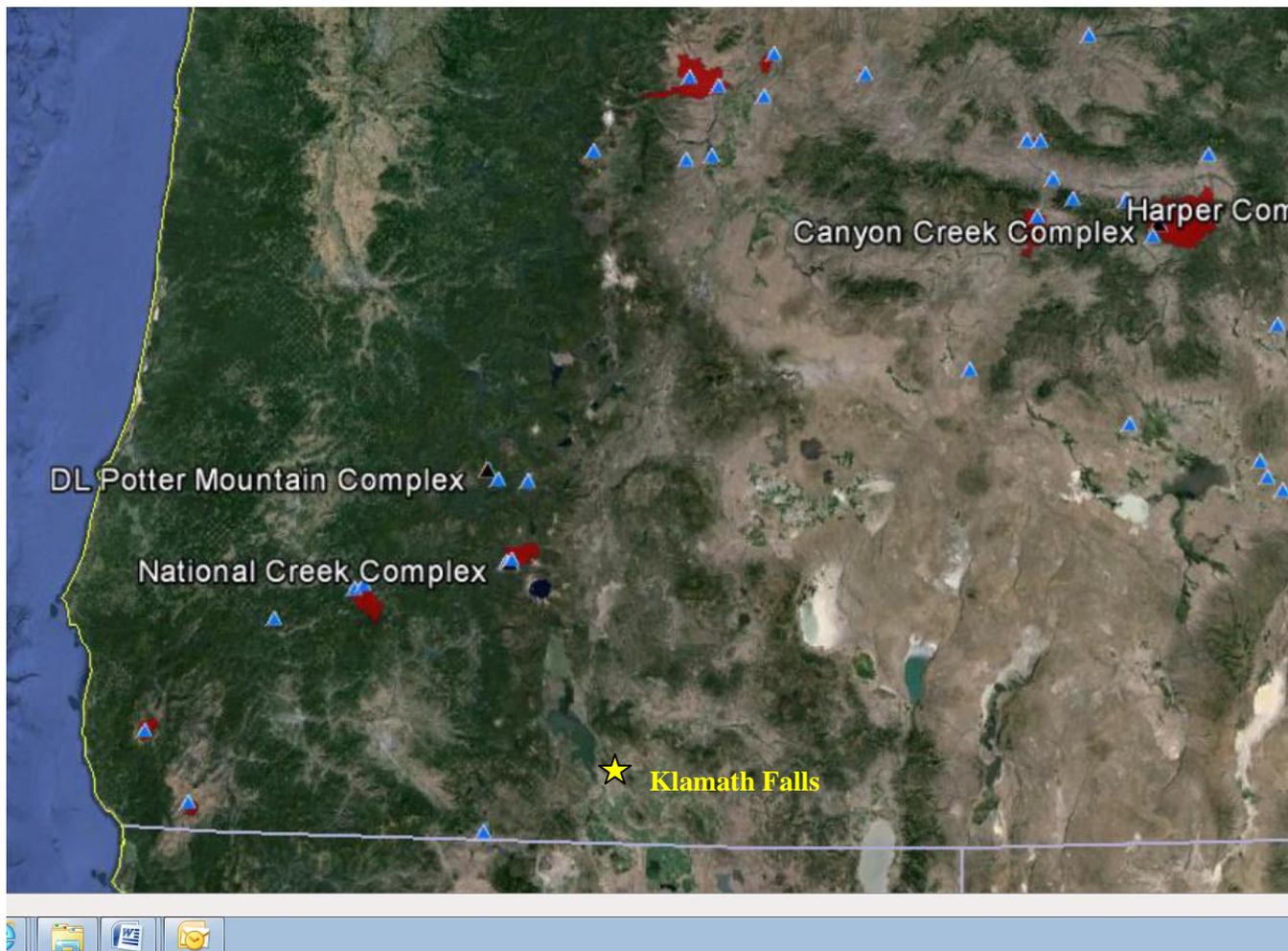


Figure 4: 2015 Fires in Oregon

http://gacc.nifc.gov/nwcc/content/pdfs/archives/2015_NWCC_Annual_Fire_Report.pdf

According to the Oregon Department of Forestry’s 2015 fire season report, 2015 was a particularly bad fire year due in part to the dry winter weather conditions. The 2015 fire season was characterized by multiple destructive and challenging large wildfires that displayed extreme fire behavior and exponential growth, and resulted in significant losses to public infrastructure, private property and structures, commercial timberlands, and other forestland.¹⁰ 2,524 of these fires were in Oregon, which burned a total of 633,048 acres. The number of acres burned has risen over the years, as the 2005-2014 the average number of fires was 987 and average acres burned was 27,599. For 2006-2015, the 10-year average is now 1,013 fires and 35,101 acres burned.

1.3 Affected Region

In 2015 smoke from the Stouts Creek fire impacted Klamath Falls on August 1st, and August 4th. The Stouts Creek Fire started July 31st, and was human-caused by a resident using a lawnmower during hours prohibited by fire restrictions. The fire was fully suppressed by August 30th, 2015. The fire burned 26,452 acres. It was a huge fire, requiring over 800 firefighters, resulted in Level 3 evacuations (Go) and road closures in the area surrounding the fire.¹¹

The fire was located 11 miles east of Canyonville, OR; about 130 miles to the northwest of Klamath Falls near the community of Milo on forestlands protected by the Douglas Forest Protective Association (DFPA) before spreading onto the Umpqua National Forest. The map below from Inciweb shows the Stouts Creek fire location.

¹⁰ https://www.oregon.gov/ODF/Documents/Fire/2015_Protection_Division_Fire_Season_Report.pdf

¹¹ <http://nwccinfo.blogspot.com/2015/08/812015-stouts-fire-morning-update.html>

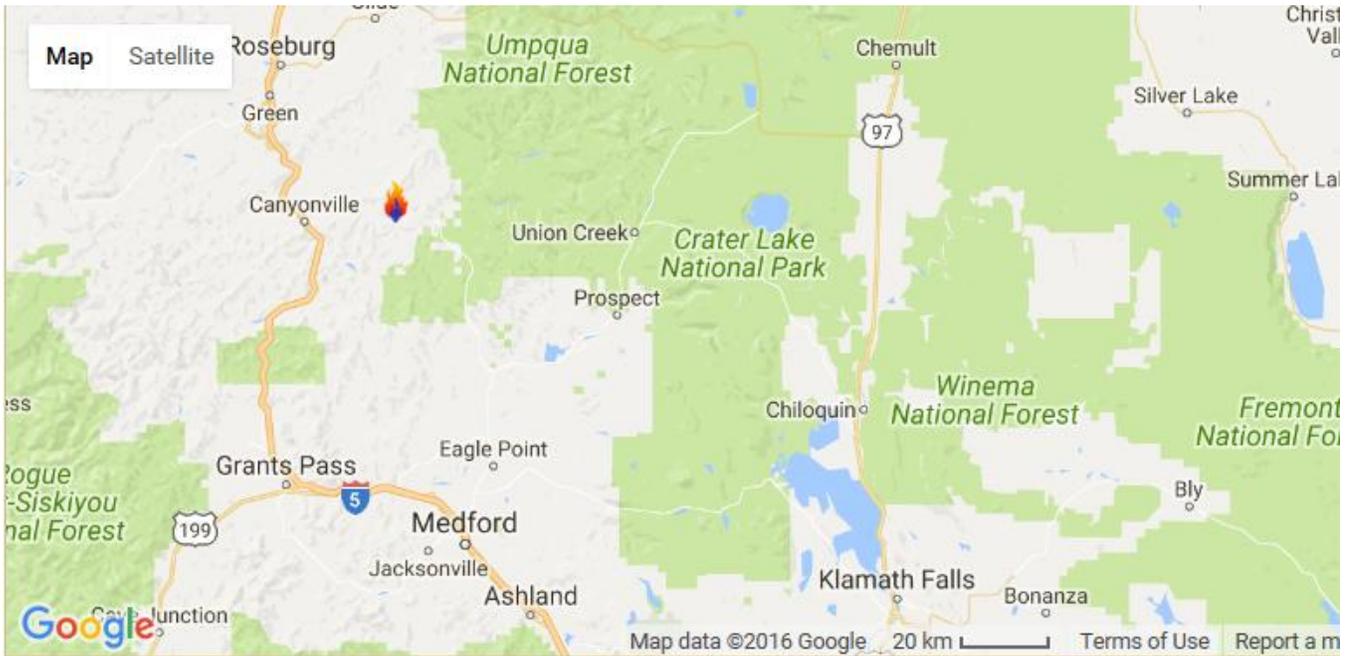


Figure 5: Map of Stouts Creek fire
Inciweb incident information system <http://inciweb.nwcg.gov/incident/4426/>

The map below shows the extent of the Stouts Creek fire and the primary area where it burned.

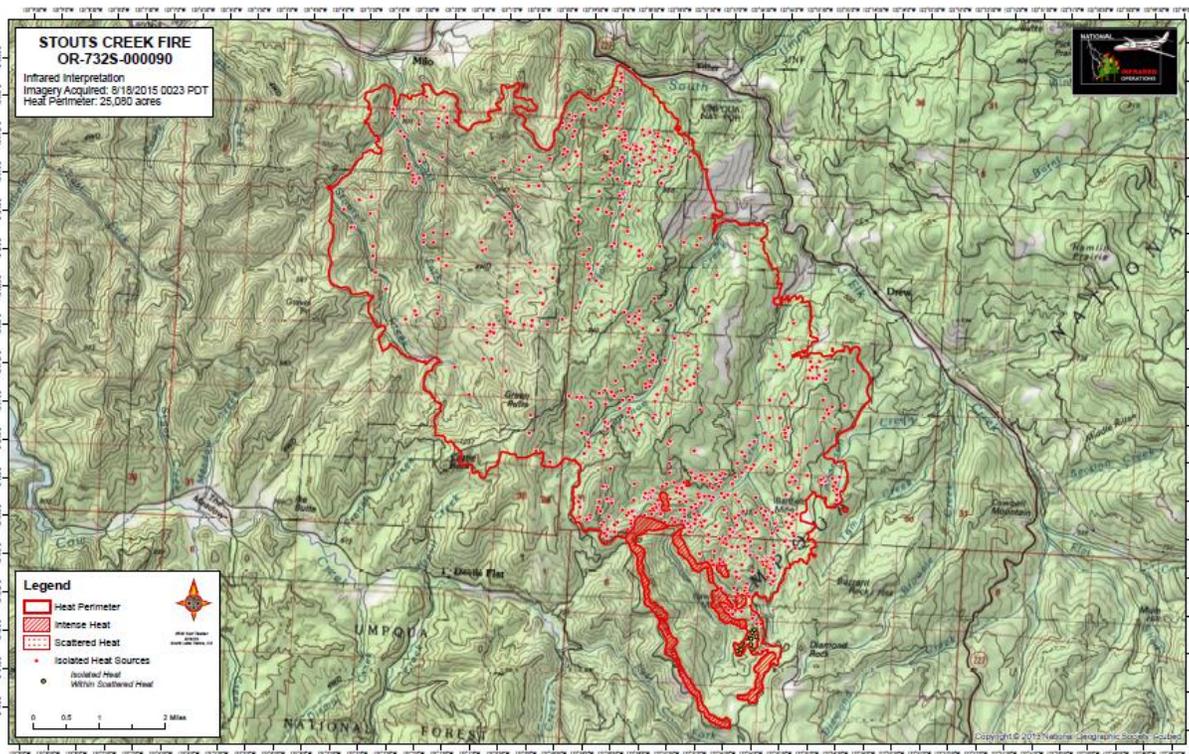


Figure 6: Stouts Creek Fire burn area
http://inciweb.nwcg.gov/photos/OR73S/2015-07-30-2022-Stouts-Fire/picts/2015_08_18-22.44.02.766-CDT.pdf

Smoke from the Stouts Creek Fire traveled southeast and impacted Klamath Falls. The satellite photo below shows this fire. The smoke impacting Klamath Falls in 2015 came from the fires in the northwest. The smoke impact was large as it State of Oregon Department of Environmental Quality

remained in the area for three weeks and continued to hang in the atmosphere. Particulate matter from the wildfires led to poor air quality in Klamath Falls during this time, and peaked as wind directions changed bringing in additional smoke from the fire. (Figures 7 & 8)

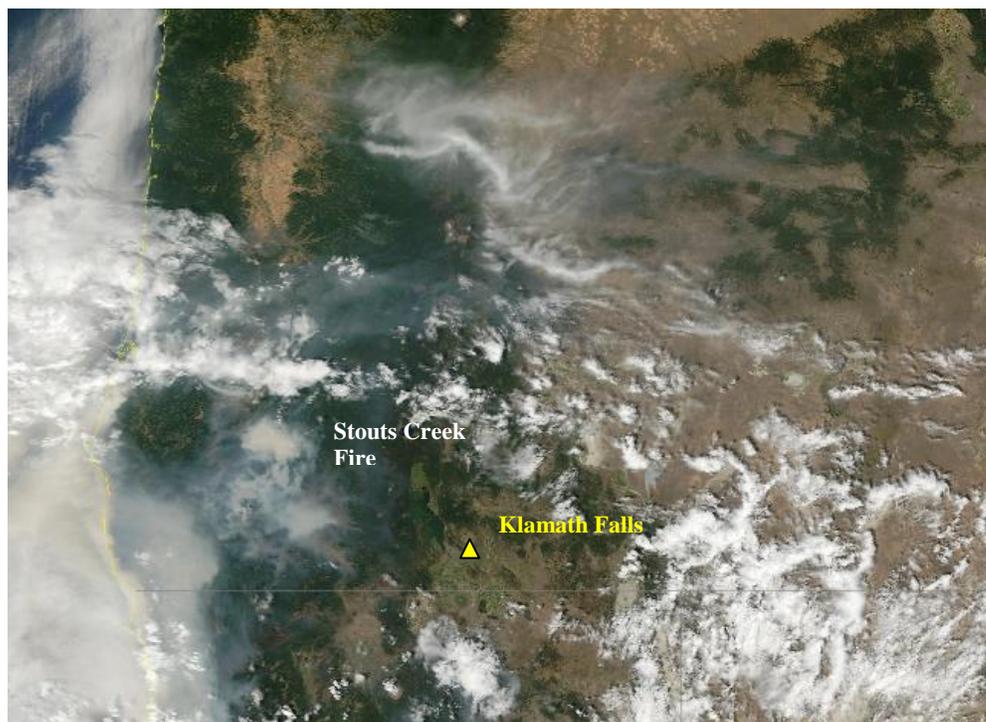


Figure 7: 2015 August 4th Wildfire Satellite Photo (TERRA)

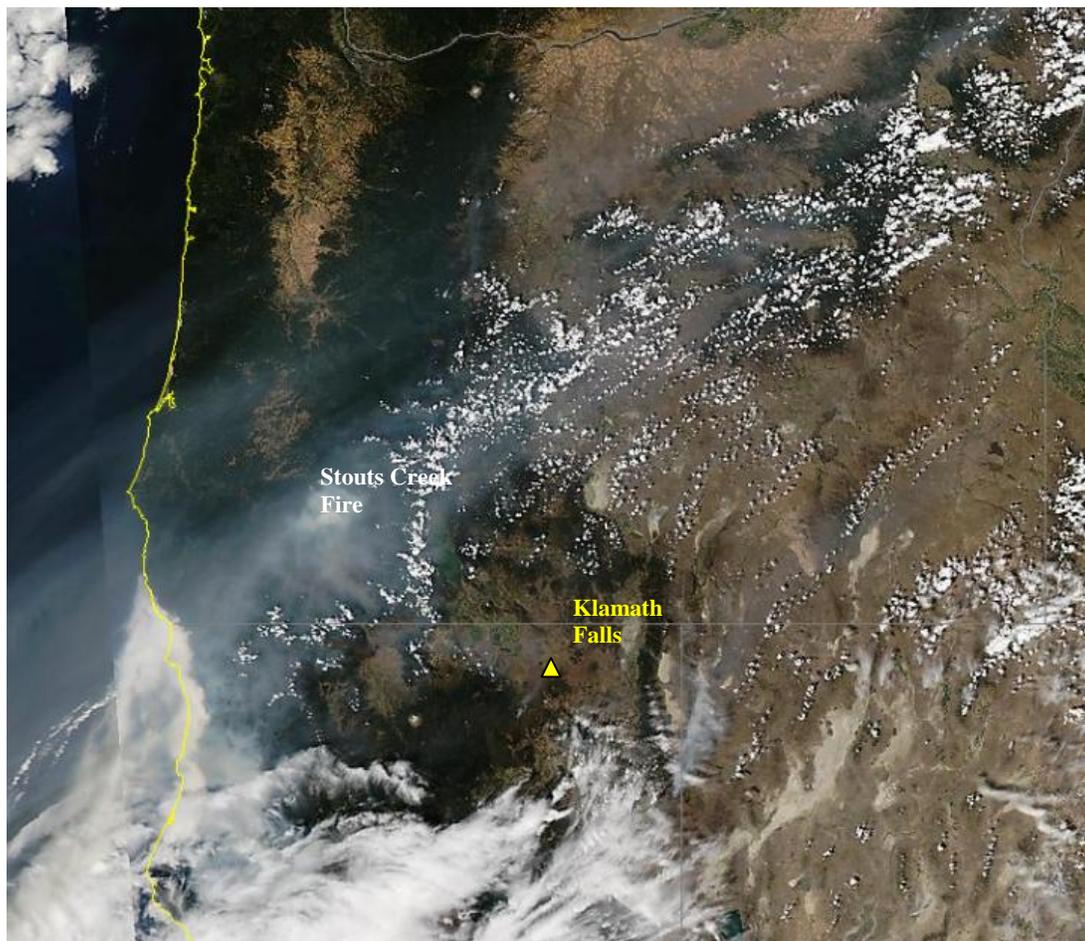


Figure 8: 2015 August 4th Wildfire Satellite Photo (AQUA)

After 8/2/15, weather conditions improved resulting in lower temperatures, higher humidity, cloud cover, and smoke inversions.¹² The smoke inversion remained for a few days until about 8/4/15, where heavy smoke impacts occurred.¹³ In the weeks following the event, low humidity and high winds continued to affect the area, as firefighters conducted burnouts to contain the fire.

Other fires that affected PM2.5 levels in Klamath Falls (but are not regulatory significant at this time)

As mentioned earlier, the 2015 smoke from the Stouts Creek fire impacted Klamath Falls on August 1st and 4th (for which DEQ is requesting an exceptional event due to its regulatory significance) and the smoke also impacted Klamath Falls on August 19th.

Smoke from the Stouts Creek Fire traveled southeast and impacted Klamath Falls. The smoke impacting Klamath Falls in 2015 came from the fires in the northwest. The smoke impact was large as it remained in the area for three weeks and continued to hang in the atmosphere. Klamath Falls' air quality remained elevated during this time, and peaked as wind directions changed bringing in additional smoke from the fire. In the weeks following the event, low humidity and high winds continued to affect the area, as firefighters conducted burnouts to contain the fire. Beginning on the afternoon of August 14th, a new ignition occurred of 1,800 acres along the southern edge of the fire and continued for the next several days as firefighters tried to complete the last phase of the containment effort. It was expected that smoke would be noticeable and persist in the following days until the burnout was completed.¹⁴ Most of the smoke drifted in a south/southeast direction from the fire. The area continued to experience high temperatures and low humidities with an inversion above the fire. This affected the Klamath Falls area during the period of August 19, 2015 (Figure 15).

¹² <http://nwccinfo.blogspot.com/2015/08/832015-stouts-fire-am-update.html>
¹³ <http://nwccinfo.blogspot.com/2015/08/342015-stouts-fire-am-update.html>
¹⁴ <http://nwccinfo.blogspot.com/2015/08/stouts-creek-evening-update-8-15-15.html>

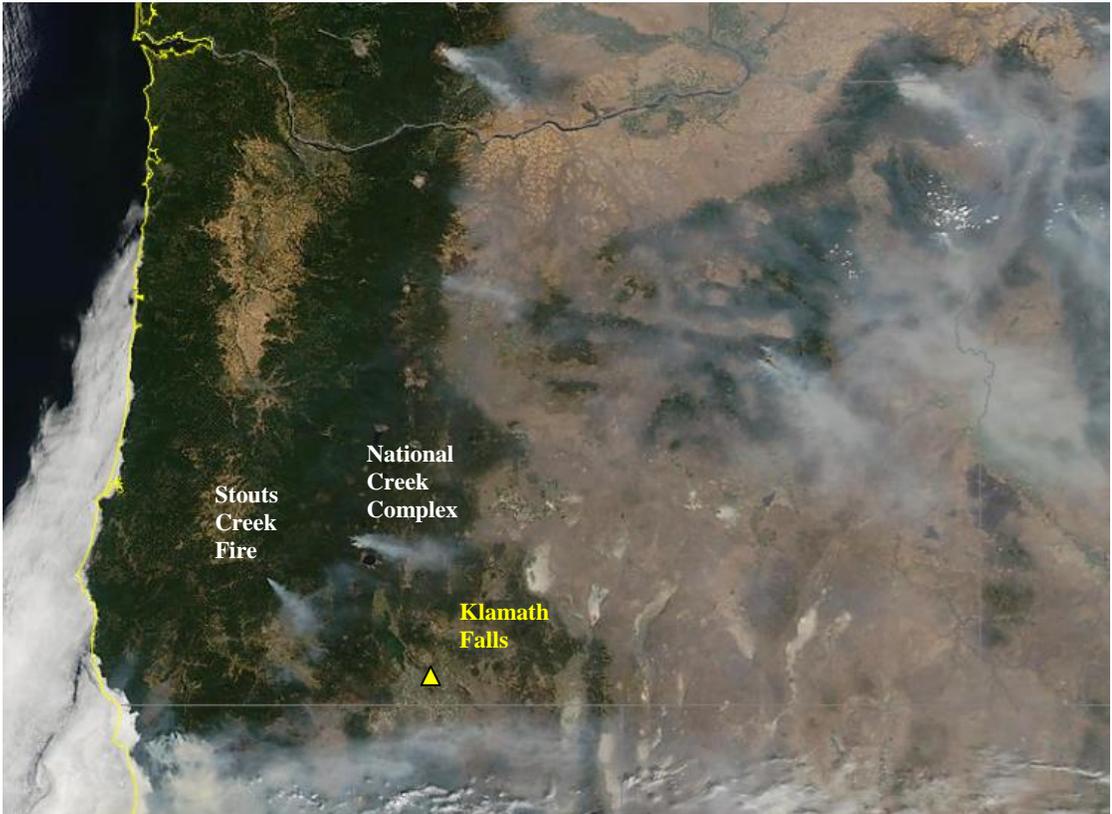


Figure 9: 2015 August 19th Wildfire Satellite Photo (AQUA)

The fire was in a forested area with mature Douglas fir and a heavy component of timber litter such as large standing and downed trees. The area contains both old slash and brush. These materials produce sufficient smoke to impact communities at some distance. The photos below show the type of material and the fire.

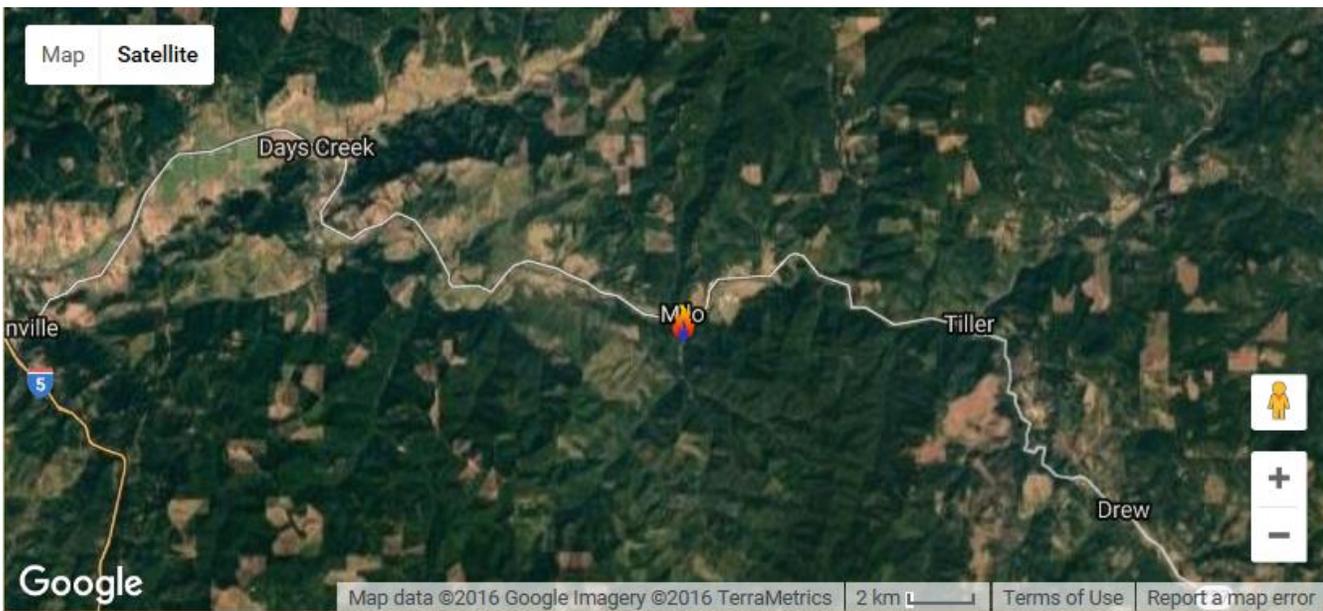


Figure 10: Photo of fuel type of the Stouts Creek Fire

National Creek Complex

The National Creek Complex consisted of two fires: the National Fire burning on the Rogue River -Siskiyou National Forest and the Crescent Fire located in the northwest corner of Crater Lake National Park. Both fires were started during a series of lightning strikes on August 1, 2015 and continued through mid-October 2015. The fires burned a total of 20,960 acres. These fires impacted the Klamath Falls area on August 25 and August 28, 2015.

The map below (Figure 17) shows the location of the fire.



Figure 11: Map of National Creek Complex Fire

<http://inciweb.nwcg.gov/incident/4463/>

The fire spread through old growth red fir and hemlock, as well as forest litter of lodgepole pine caused by beetle destruction. Figure 18 shows a picture of the terrain.



Figure 12: Photo of fuel type of National Creek Complex fire

<http://inciweb.nwcg.gov/incident/4463/>

The fire forced the closure of the north entrance to Crater Lake from August 16-28th.¹⁵ To contain the fire, firefighters lit controlled fires around the Crater Lake area and along the major highways. Smoke from the fire lingered in the area, with stagnant conditions causing the smoke to remain at the lower elevations and at upper elevations the smoke drifted in a north/northeast direction. In the evenings, nighttime inversions would force the smoke down over the Cascades and into the Klamath Falls basin.



Figure 13: Photo of National Creek Complex Fire

<http://www.mailtribune.com/article/20150820/NEWS/150829941>

¹⁵ <http://www.bendbulletin.com/localstate/3480130-151/crater-lake-fire-makes-history>
State of Oregon Department of Environmental Quality



Figure 14: Photo of National Creek Complex Fire

<http://kval.com/news/local/national-creek-complex-70-contained-over-15k-acres-burned-11-12-2015>

River Complex

The River Complex fire occurred in Northern California. This fire had smoke that impacted the Klamath Falls area. Figure 21 shows the location of the River Complex Fire. The River Complex fire began on July 30, 2015, was lightning caused, burned 77,081 acres, and occurred in Trinity Alps Wilderness, specifically near the communities of Salyer, Hoboken, and Denny in northern California. The fire was fully contained by October 29, 2015.

Approximate Location

40.913 latitude, -123.437 longitude

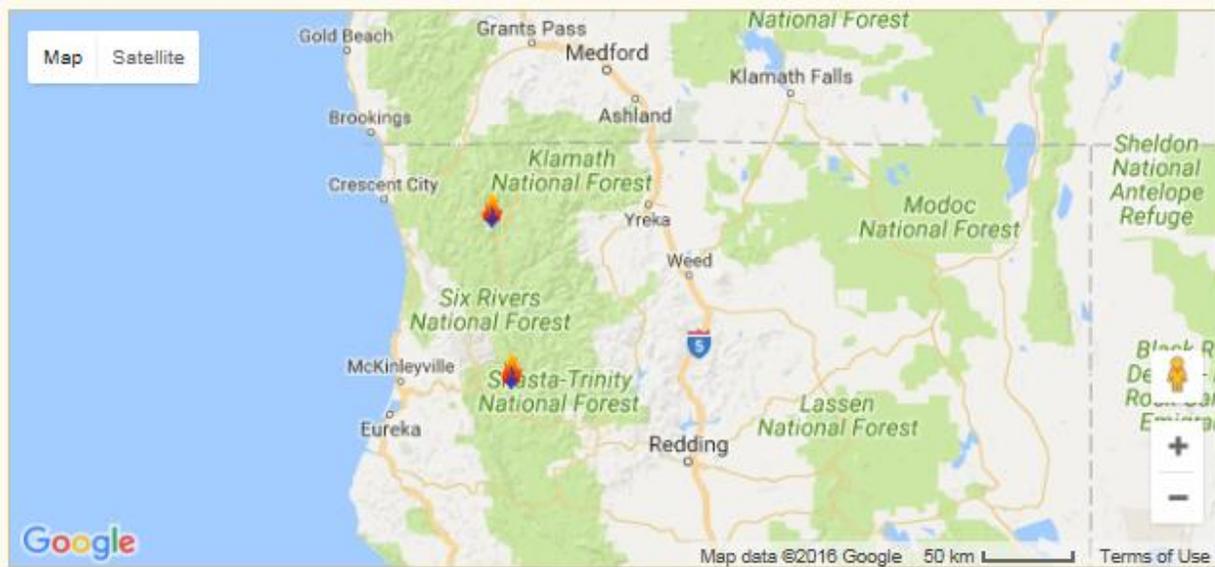


Figure 15: Map of the River Complex Fire

Satellite images (Figures 22 & 23) show how the numerous fires in the area were affecting Klamath Falls. The existing Stouts Creek Fire, plus the nearby National Creek Complex Fire and River Complex Fire were all producing smoke.

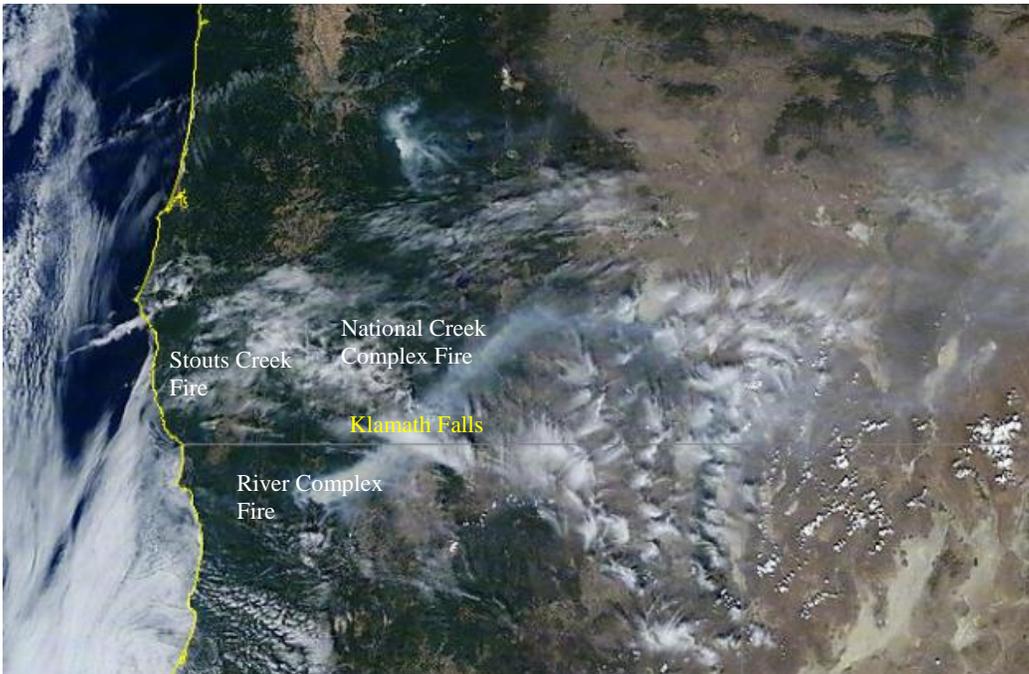


Figure 16: Satellite image on August 25, 2015, TERRA

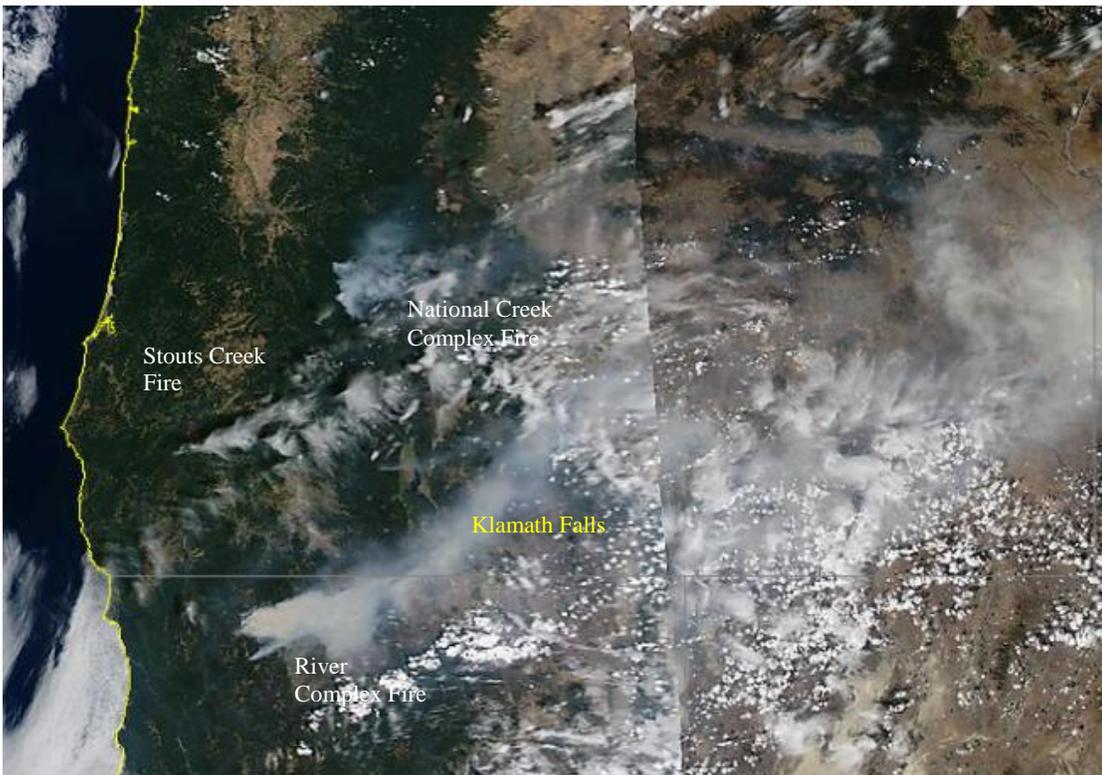


Figure 17: Satellite image on August 25, 2015, AQUA

The River Complex fire was fueled by timber (grass and understory) and brush. The fire was located in remote steep backcountry terrain (Figure 24).

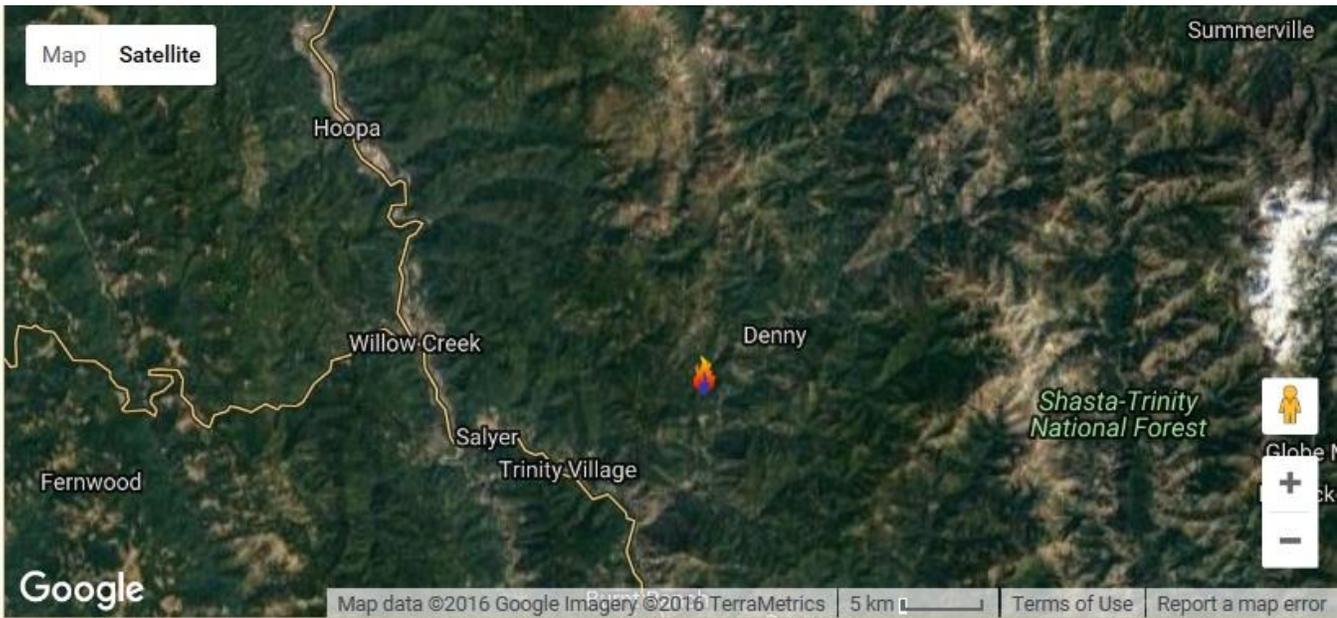


Figure 18: Photo of fuel type at the River Complex Fire

The fire was quite large, forcing mandatory and voluntary evacuations in the surrounding area. It required the resources of many fire crews, helicopters, and over 600 people assigned to the fire.



Figure 19: Photo of River Complex, Posted 8/30/15, noon, inciweb

All of the fires mentioned earlier, in addition to the fact that a burn ban was in effect, there was no large residue from crop burning or prescribed burning in these areas, and that no other significant source is capable of causing the high monitor values, demonstrates that this is an exceptional event.

2014 Fires

Beginning August 1, 2014, smoke from the southwest impacted Klamath Falls, Oregon. The smoke originated from the Oregon Gulch Fire, 18 miles southeast of Ashland, and burned across the California-Oregon border. It was part of the



Figure 21: Map of the Oregon Gulch Fire

The smoke impacting Klamath Falls came from the southwest and stayed in the area for several days. The smoke was transported northeast from the Oregon Gulch Fire and caused unhealthy air quality on August 2nd and unhealthy for sensitive groups on August 3rd. The smoke rose in the atmosphere and slowly traveled over the Cascades, and into the Klamath Falls area.

Also in support of impact from wildfire smoke, ODEQ found no other sources of smoke around Klamath Falls during this time. There were no known industrial impacts or other burning activities identified during this time. The USFS, BLM, the Oregon Department of Forestry, and the Wildlife refuges to the south reported they did no burning. Also, the non-forest fire PM2.5 levels are historically very low during August because no prescribed burning or slash burning is done during July and August because of the danger that a controlled fire could get out of control and become a wildland fire because of the low humidity and the abundance of dry fuel.

The fuel type at the Oregon Gulch Fire was ponderosa pine and open brush mixed with some logged areas. The fire burned through a mix of shrub, vegetation, oak woodland, pine, and mixed conifer. The Google Earth image below shows the area adjacent to the burn.

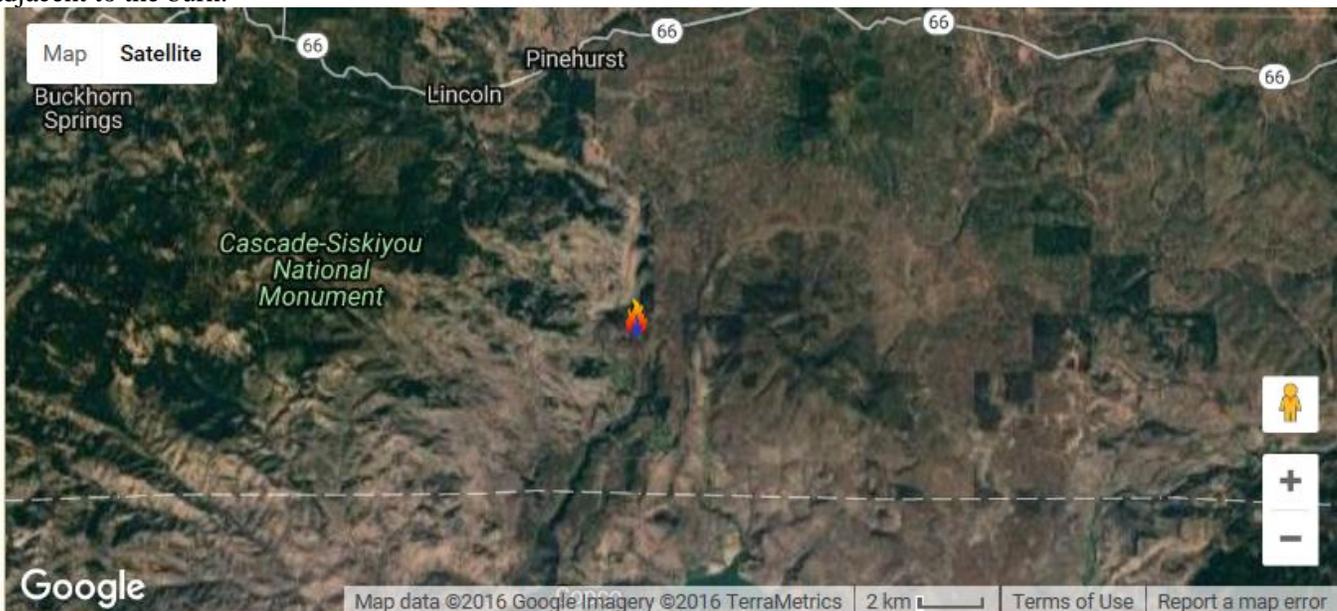


Figure 22: Photo of fuel type of the Oregon Gulch Fire

Figures 12-14 show photos of the Oregon Gulch Fire show the amount of smoke that the fire generated.



Figure 23: August 4th, 2014, forest fire smoke inundation in Klamath Falls



Figure 24: Beaver Complex/Oregon Gulch Fire

<http://inciweb.nwcg.gov/incident/4034/>

http://www.slate.com/blogs/future_tense/2014/08/05/oregon_gulch_fire_photos_show_pyrocumulus_clouds_and_fighter_jets_over_wildfire.html



Figure 25: Smoke from the Beaver Creek Fire

<http://wildfiretoday.com/wp-content/uploads/2014/08/Oregon-Gulch-Fire-photo-by-Joseph.jpg>

2. Not reasonably controllable or preventable

2.1 Introduction

This section demonstrates that the exceptional events were from lightning-caused or human caused wildfires and were not reasonably controllable or preventable. There were no other unusual anthropogenic PM2.5 emissions at this time that impacted Klamath Falls, such as industrial sources or prescribed fire. The primary wildfires impacting Klamath Falls were lightning caused and one human caused wildfire managed under suppression and fire management strategies, either full suppression or point zone protection consistent with each specific forest’s Fire Management Plan. Section 1 of this document evaluates whether other types of PM2.5 sources, such as prescribed burning, could have caused or contributed significantly to the elevated concentrations on the requested days. Section 6 of this document discusses the mitigation measures DEQ implemented to notify the public of deteriorating air quality as well as to control other sources of PM2.5 emissions.

As the 2016 Exceptional Events rules states, “Wildfires on wildland are unplanned, fire management agencies generally have either no advanced notice or limited and uncertain notice of wildfire ignition and location. In addition, many areas of wildland are very remote and rugged and not easily reached and transversed.” This is the case with all of the events for which DEQ is requesting an exceptional events approval, as they were all wildfires and meet EPA’s “not reasonably controllable or preventable” criterion.

2.2 Source Areas Contributing to the Event

The Stouts Creek Fire, 11 miles east of Canyonville, Oregon was the predominant cause of elevated PM2.5 concentrations in 2015.

For the other fires that contributed to high values in 2014 and 2015, they consist of the Oregon Gulch Fire, located 18 miles southeast of Ashland in 2014. In 2015, the Stouts Creek Fire and the National Creek Complex Fire near Crater Lake contributed to high monitored values in Klamath Falls. Other fires which may have contributed smoke were the Gasquet Fire and River Complex Fire in Northern California. The start and end dates¹⁰ for each fire are shown in Table 3. Additional fires are also shown because they all helped contribute to regional smoke and are considered as partial contributors. The management strategy applied to each fire by the incident is also included.

Table 3. Fire cause, date, and management strategy for each wildfire incident

Name	Management Strategy	State	Start Date	Controlled Date	Size acres	Cause Estimated	Cost Estimated
2014							
Oregon Gulch/Beaver Complex	ODF	OR	7-30-14	8-18-14	35,302	Lightning	\$22 million
2015							
Stouts Creek	ODF	OR & CA	7-30-15	9-24-15	26,452	Human caused	\$38 million
National Creek	USFS	OR-only	8-1-15	10-21-15	20,960	Lightning	\$21 million

Complex							
River Complex	USFS	CA & OR	7-30-15	10-29-15	75,028	Lightning	unknown
Gasquet Fire	USFS	CA	7-31-15	10-15-15	30,361	Lightning	unknown

USFS = U.S. Forest Service

ODF = Oregon Department of Forestry

2.3 Basic Control and Prevention Analysis

The Stouts Creek fire was ignited by an individual using a lawn mower. The fire began on the afternoon of July 30, 2015, and ignited private lands protected by the Douglas Forest Protective Association before spreading onto the Umpqua National Forest. In total, the fire burned private, BLM and USFS lands. The Stouts Creek Fire was managed by the Oregon Department of Forestry. Two separate Incident Management Teams from the Oregon Department of Forestry were deployed to the fire and were in unified command between ODF and the Umpqua National Forest (USFS). The Oregon Office of State Fire Marshal Green Team was also deployed and assumed joint command of the fire from July 31 until August 8. A type 3 Team from the Florida Forest Service took command of the fire on August 25.¹⁶ The fire was declared 100 percent contained on September 24th. Full suppression was conducted throughout the conflagration.

Full suppression except for wilderness protection values and national park management were used in each of the fire suppression techniques, using reasonable control techniques at every step of the way. The fire for the most part were in areas of difficult terrain and preventative measures were difficult to undertake. The human caused fire did have restrictions regarding prohibited activities in place; unfortunately they were disregarded and the person's actions sparked the fire. As DEQ will demonstrate in the clear causal relationship discussion in Section 3, the not reasonably controllable or preventable criterion is satisfied by the fact that the event was of a character that could not have been prevented and could not have been controlled and there were no contributions of event related emissions from anthropogenic sources.

Additional analysis for other wildfire events in 2014 and 2015

Lightning caused the Oregon Gulch, National Creek Complex, and Gasquet/River Complex fires and contributed the vast majority of smoke influencing the Klamath Falls monitor. The only human-caused fire, the Stouts Creek Fire, burned for over a month and contributed large amounts of smoke to the area.

The Oregon Gulch Fire was managed under the Oregon Department of Forestry. The Oregon Gulch Fire was part of the larger Beaver Complex Fire, which also comprised the Salt Creek Fire (located 20 miles northwest of Medford). Both of these lightning-started fires started on July 30-31, 2014. An Incident Management Team 2 assumed command of the complex on July 31, with ODF Incident Management Team 3 dispatched to assist on August 1, and, due to the complexity of this complex, a unified management structure with the Oregon Department of Forestry, CalFire, and the Oregon State Fire Marshal's Office was established. The fire was a mix of private and BLM forest lands. It also burned through two timber areas.¹⁷ The fire burned across the Oregon/California border and entered Klamath County. On August 14, 2014, the command was transitioned to the ODF Southwest Oregon District – Medford unit and declared 100 percent contained on August 18, 2014. Full suppression was conducted throughout the conflagration.

The National Creek Complex fire was a combination of three fires – the National Fire in Southwestern Oregon, and the Crescent and Crescent 2 fires in Crater Lake National Park, approximately one mile east of the National Fire. The Crescent and Crescent 2 fires were located in close proximity and burned together. These fires were ignited by lightning on August 1, 2015. The fire was managed by the USFS as the burning occurred primarily on federal lands. Fire managers contained the fire within areas where natural barriers and roads facilitated the safe and effective halt of fire spread. This achieved the fire management goals of providing for firefighter safety along with abiding by management policies of the National Park Service. During the next two months, the National Creek Complex was managed by a series of Incident Commanders and

¹⁶ http://www.wfmrda.nwccg.gov/docs/Reference_Materials/2015_Timeline_PNW_Season_FINAL.pdf

¹⁷ https://www.blm.gov/or/districts/lakeview/plans/files/Scoping_Letter_Oregon_Gulch_EA.pdf

Incident Management Teams. The fire was declared contained on October 21. The complex became the largest fire in the recorded history of Crater Lake National Park.¹⁸

The major fires that impacted Klamath Falls with smoke were started by lightning, nonanthropogenic causes. The federal agencies responsible for managing fire programs expend much effort on prevention of wildfires through educational efforts like Smokey the Bear advertising and fire hazard signs. Limitation on campfires is also a tool that forest management agencies use. In view of the fact that lightning caused the primary fires affecting Klamath Falls, the fact that all the fires were managed by Federal Land Managers under a form of suppression strategy (full suppression or point zone protection) and that a tremendous amount of human and material resources were spent to control or contain these fires, it is clear that emissions from these wildfires were not reasonably controllable or preventable.

3. Clear causal relationship

In this section we will provide evidence that the PM2.5 levels we are asking for EPA exception event concurrence on and in the table below were caused by smoke from wildland fires.

3.1 Comparison to historical fluctuations

Klamath Falls is a nonattainment area because of elevated PM2.5 between November and February. The ambient PM2.5 levels during the rest of the year rarely approach the daily PM2.5 standard, as seen in Figure 26.

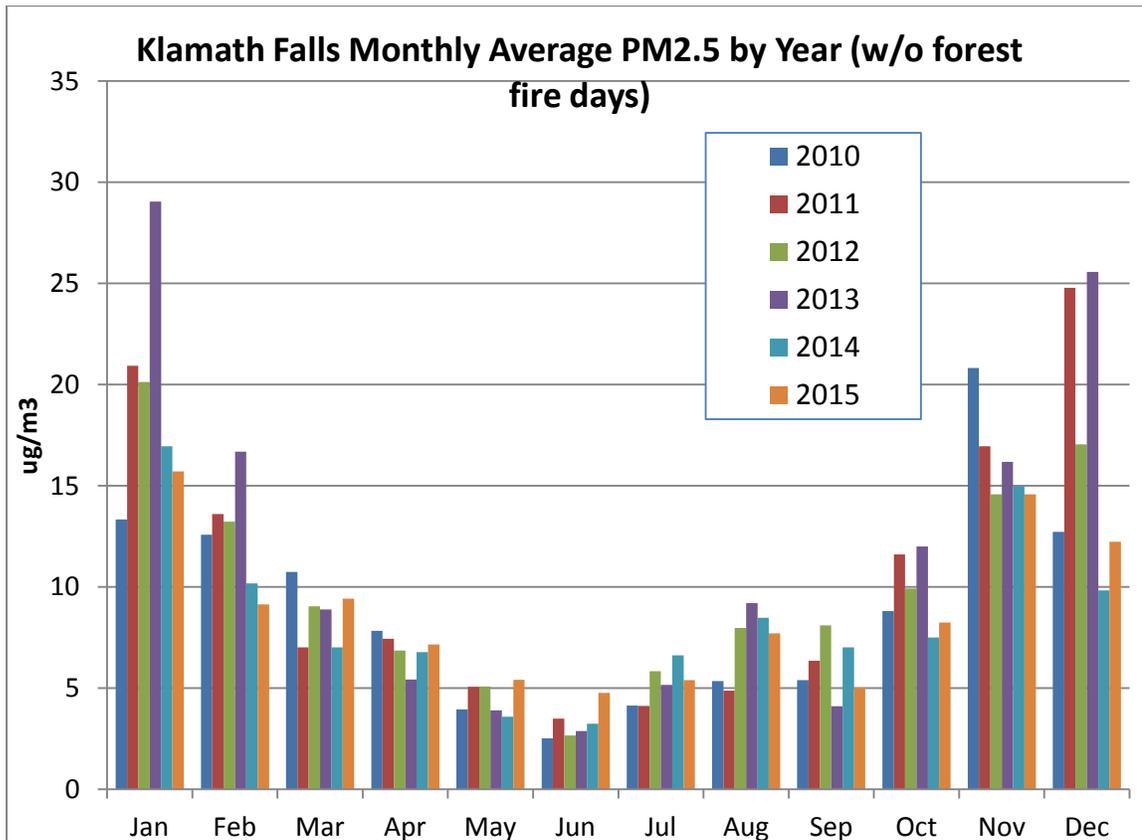


Figure 26: Klamath Falls Monthly Average PM2.5 by Year without forest fire days

¹⁸ http://www.wfmrda.nwcg.gov/docs/Reference_Materials/2015_Timeline_PNW_Season_FINAL.pdf

The exception is when there are wildland fire smoke incursions during the summer months. In this section we show that the summer background PM2.5 levels are below 12ug/m3 on 89% of days. Of the 11% of remaining days, ODEQ believes many of these are influenced by wildland smoke to some extent. June through September data was analyzed for 2002 through 2015 to establish a background level. The FRM data was used when there was a sample day, otherwise PM2.5 estimates from the nephelometer were used.

From June to September, 2002 to 2015 there were 1,941 days where PM2.5 was measured (Table 4). Of these days, 37 were over the daily standard. In general, when there were a vast amount of acreage burned from wildfires (above 300,000) the area sees exceedances of the daily standard. Low annual acres burned tend to show fewer days over the NAAQS for both the daily and annual standard. Of these, 24 days were from 2002 which was a historically bad forest fire season. Seven days are in 2012 and 2013 were over the standard (of which EPA concurred were exceptional events). Three days were greater than the daily standard in 2015, that affect the overall PM2.5 design value in Klamath Falls and in achieving compliance with the federal standard.

Table 4. Number of Summer days over the NAAQS

Year	Number of days > 12.5	Number of days > 35.5	Acres Burned	Comments
2002	46	24	1,010,952	Exceptional Event Request was concurred with for these days.
2003	8	0	160,191	
2004	4	0	30,018	
2005	7	0	155,331	
2006	13	0	545,870	
2007	2	0	648,046	
2008	31	1	136,572	Exceptional Event Request was submitted to EPA but the values were not deemed to effect the regulatory status
2009	7	2	100,668	Exceptional Event Request was concurred with by EPA
2010	1	0	93,731	
2011	0	0	285,712	
2012	15	3	1,256,049	Exceptional Event Request was concurred with by EPA
2013	22	4	350,786	Exceptional Event Request was concurred with by EPA
2014	6	0	984,629	
2015	6	3	685,809	Exceptional Event Request for those over daily standard.
Total	168	37		

Summer is defined here as June 1 to September 30.

Comparison to Air Quality Index Health Categories

It is also helpful to compare the background data using the air quality index (AQI) health levels because this helps provide more perspective on what the background air quality levels are during the summer. From 2000 to 2015 there were only 37 days in June through September that would have been in the current EPA “Unhealthy for Sensitive Groups” or worse health categories. There were 158 moderate days, and 1716 were good days. Table 5 shows the percentages of each category of health days during this time for this data.

Table 5: Number of Summer days by AQI break points

PM2.5 Concentration (ug/m3)	AQI Health Level	Number of days	%
> 35	Unhealthy for Sensitive Groups or higher	37	2%
Between 12 and 35	Moderate	158	8%
< 12	Good	1716	90%
Total		1911	100%

Establishing Baseline Values

It is also useful to establish a July and August baseline values based on the yearly number of acres burned. The information in Table 4 above shows that 2003-2005, 2010, 2011 are the years with less than 300,000 acres burned. The average, standard deviation, 95th percentile, 99th percentile for July and August, during these years provides an idea of what the PM2.5 concentration is expected to be during the time of the forest fire smoke impact days. These values are shown in Table 6 below.

Table 6. Klamath Falls baseline PM2.5 for July and August for years with less than 300,000 acres burned

July & August 2003-2005, 2010, & 2011 PM2.5 statistics	Average	Stddev	95th Percentile	99th Percentile	Number of Days Used for the calculation
Klamath Falls	6.9	±3.3	11.7	16.5	306

3.2 Analysis showing Wildfire Influence on Affected Days

Using MODIS satellite photos, Hysplit trajectory modeling, wind data, and temperature data all show a causal relationship between the monitor and the fire. The Modis satellite photos give visual evidence of the size and direction of the smoke plume on the effected days. The Hysplit model show the forward trajectory from the fire and the back trajectory of the monitor to show that the fires smoke did travel over the monitored area. The Hysplit model also shows the trajectory of smoke at ground level and aloft. The wind speed and direction at the monitor and at the fire show the direction of the smoke when it impacted the monitor.

Table 7. PM2.5 samples impacted by wildland smoke.

Year of Event	Site # and POC	Date	µg/m3	Wildfire Event
2014	Klamath Falls, Peterson School, -41-035-0004 -POC 1	8/3/14	31.4	Oregon Gulch Fire - OR
2015	Klamath Falls, Peterson School, -41-035-0004 -POC 1	8/1/15	84.8	Stouts Creek Fire - OR
		8/4/15	44.4	Stouts Creek Fire - OR
		8/19/15	44.2	Stouts Creek Fire - OR
		8/25/15	25.2	National Creek Complex Fire - OR

		8/28/15	29.5	National Creek Complex Fire, River Complex Fire – CA, Gasquet Fire - CA
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2015 Fires

Stouts Creek Fire (August 1st, 4th)

August 1

The Stouts Creek Fire started July 30th, in the afternoon. At around 7 p.m. on August 1, 2015 smoke from the Stouts Creek fire 110 miles to the northwest of Klamath Falls impacted the monitoring site at Peterson School. Satellite photos on August 1st show the smoke plume heading southeast from the Stouts Creek fire into Klamath Falls. On August 1st, Klamath Falls saw the highest impact from the fires. According to Inciweb, the smoke rapidly moved southeast from the Cascade Siskiyou National Monument in Jackson County into Klamath County, and then into California. The photos in Figures 27 and 28 show smoke entering the Klamath Falls area on August 1st from the Stouts Creek Fire. The Modis photos are taken twice a day from two satellites, Aqua and Terra. The smoke is diffuse and shows the smoke being dispersed over a large area.

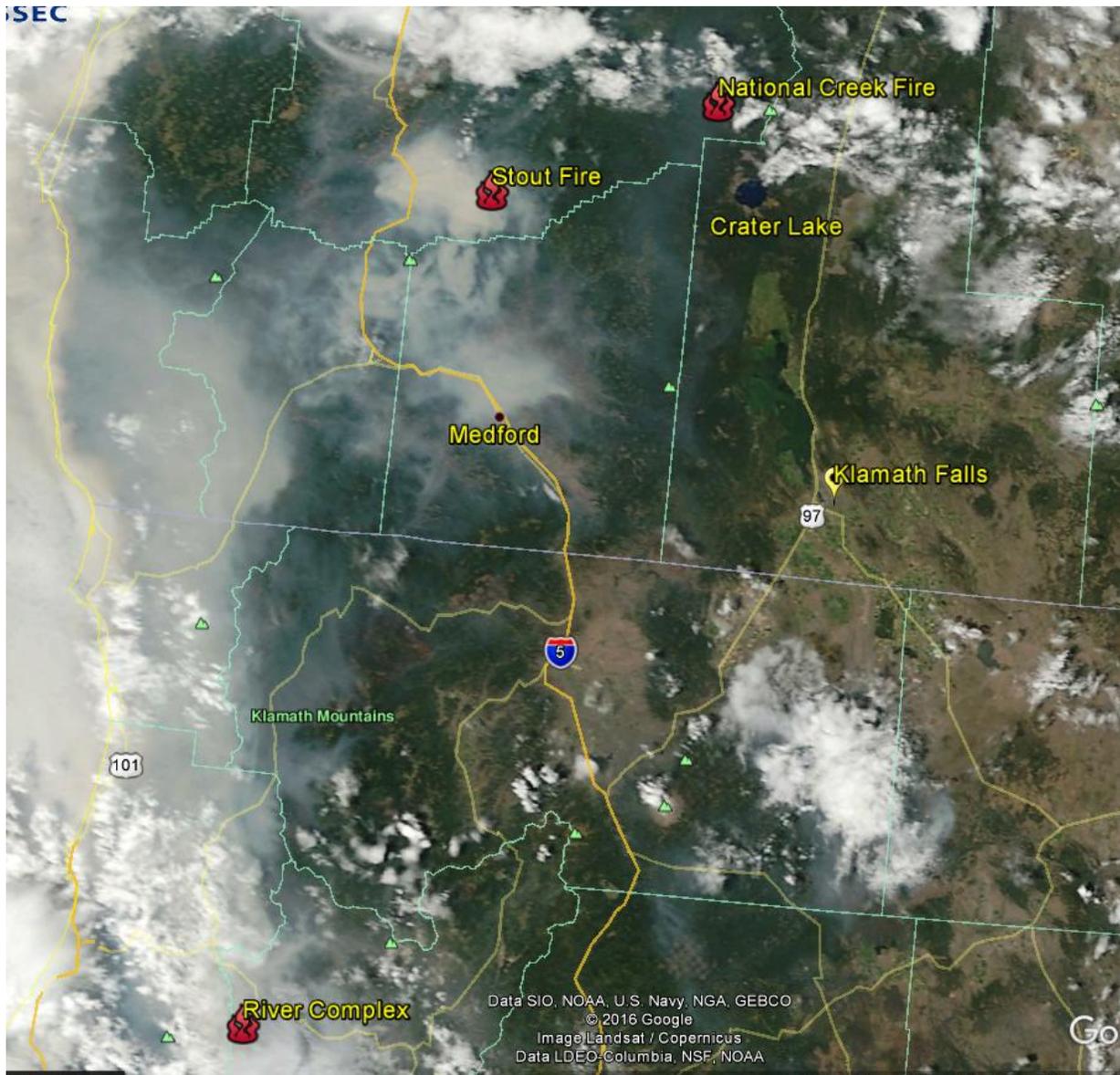


Figure 27: 2015 August 1st Wildfire Satellite Photos (10:33 PST), TERRA



Figure 28. 2015 August 1st Wildfire Satellite Photos (12:15 PST), AQUA

Smoke from the fire begins to infiltrate the Klamath Falls area beginning August 1, 2015. As seen in Figure 29, for most of the day on August 1st, the PM_{2.5} levels are low, but there is also little to no wind to bring any smoke into the area. At around 5 p.m., the winds start to pick up to 5 mph and higher and the winds were coming from the northwest. On August 2nd, the winds cleared the smoke out of the area and hourly levels began to drop back to below the standard.

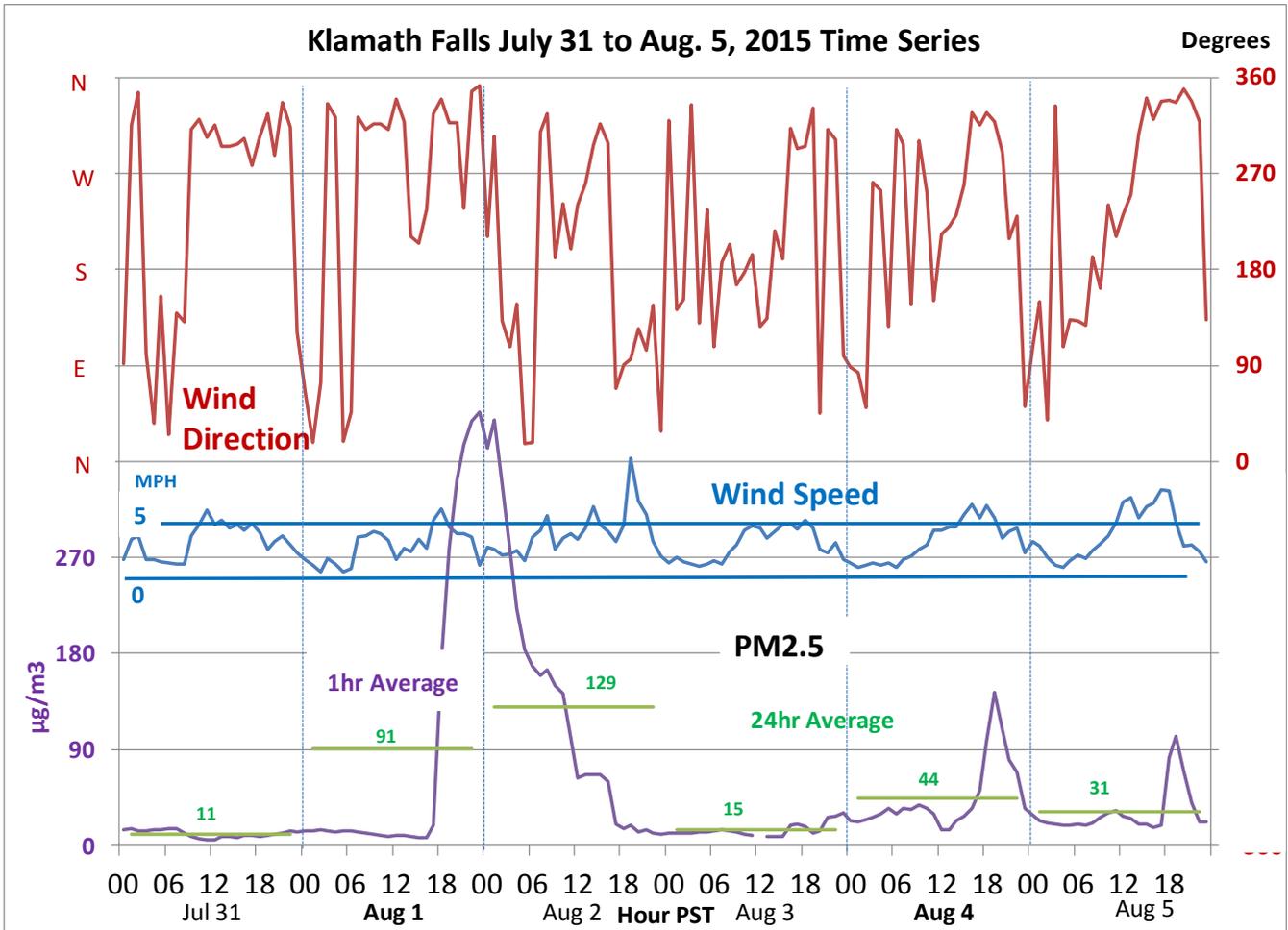


Figure 29: Time series data plot for August 1, 2015

Figure 30 shows the temperature profile for the time period before and after the exceedance on August 1st. The PM2.5 values are not related to temperature, in that there is no PM increase associated with decreasing temperatures, a signature that is typically associated with woodsmoke. Instead, the high PM2.5 values are associated to the wind direction from the direction of the wildfires.

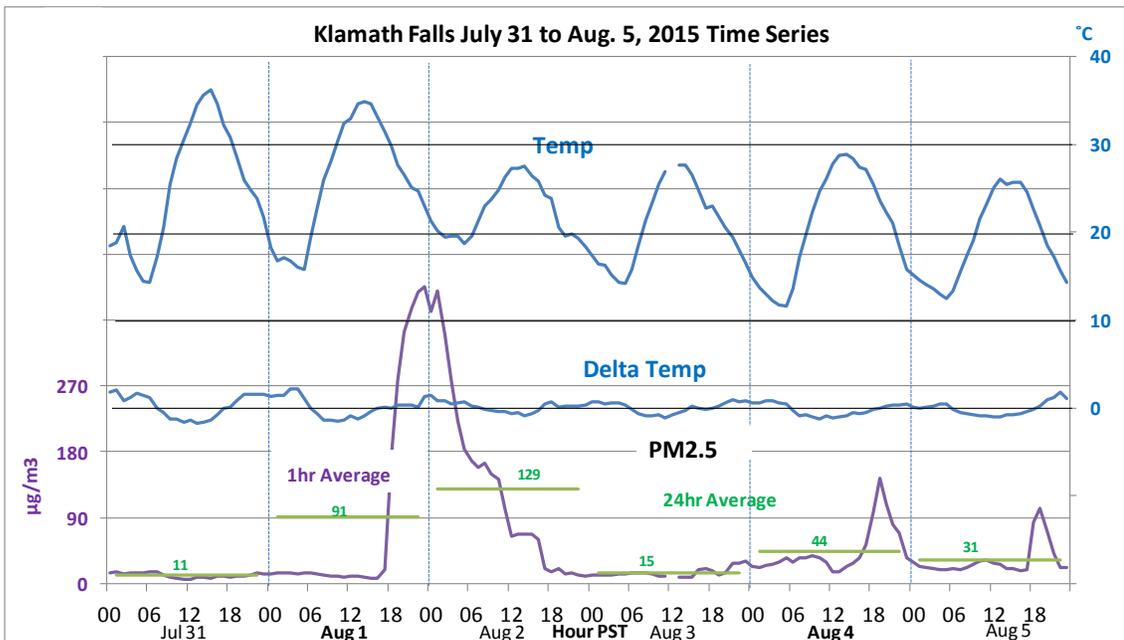


Figure 30: Time series temperature and PM2.5 data plot for August 1, 2015

Hysplit model

The Hysplit model is a useful tool to display the forward trajectory wind directions for forest fire smoke plumes and the back trajectory wind direction for receptors (monitoring sites). The Hysplit model also can show wind trajectories at different elevations. For this demonstration 50 meters, 500 meters, and 1000 meters was selected. The trajectories were run for 12 hour durations. The Hysplit model on EPA AIRNow Tech, Navigator was used to show the hourly trajectories and receptor PM2.5 concentrations recorded at the time (see figure notes below). The Hysplit model from NOAA was used to show the trajectories and the plume elevation.

AIRNow Tech Hysplit Figure Notes:

1. The AIRNow AQI and PM2.5 concentrations are shown on the model run as dots and numbers respectively. There are numerous monitors in California and Oregon which show areas that are being impacted by smoke.
2. The trajectory lines from the fires are forward trajectory (ft) and are over 12 hours. The lines from the receptors (cities) are back trajectories (bt) for 12 hours. The dots on the lines denote six hour intervals.
3. The trajectory lines are at 50 meters above the surface (green), 500 meters above the surface (blue), and 1000 meters above the surface (red). These different heights are used to show wind direction and intensity at different elevations.
4. The grayed out areas show modeled smoke plumes. The darker gray the higher concentration of smoke.
5. The red triangles indicate active fires. A clump of red triangles is a complex of smaller fires making up a larger fire area.

The Hysplit models in Figures 31 and 32 also indicate smoke from the fire, which started in the afternoon of July 30th, had traveled enough distance to impact the Klamath Falls area. Smoke was carried by the northwest winds and into the area, completely inundating Klamath Falls with smoke.

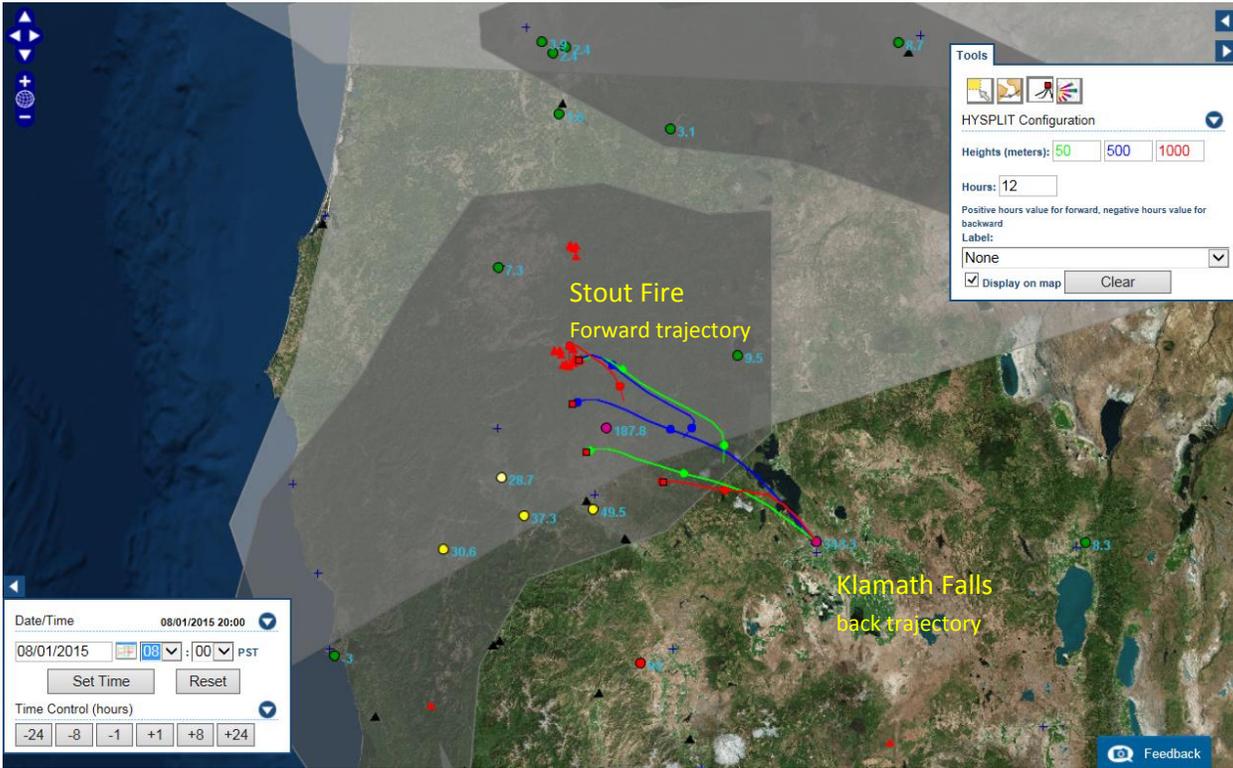


Figure 31: Aug 1, 2015, 8:00 PST, Hysplit Run forward and back trajectories

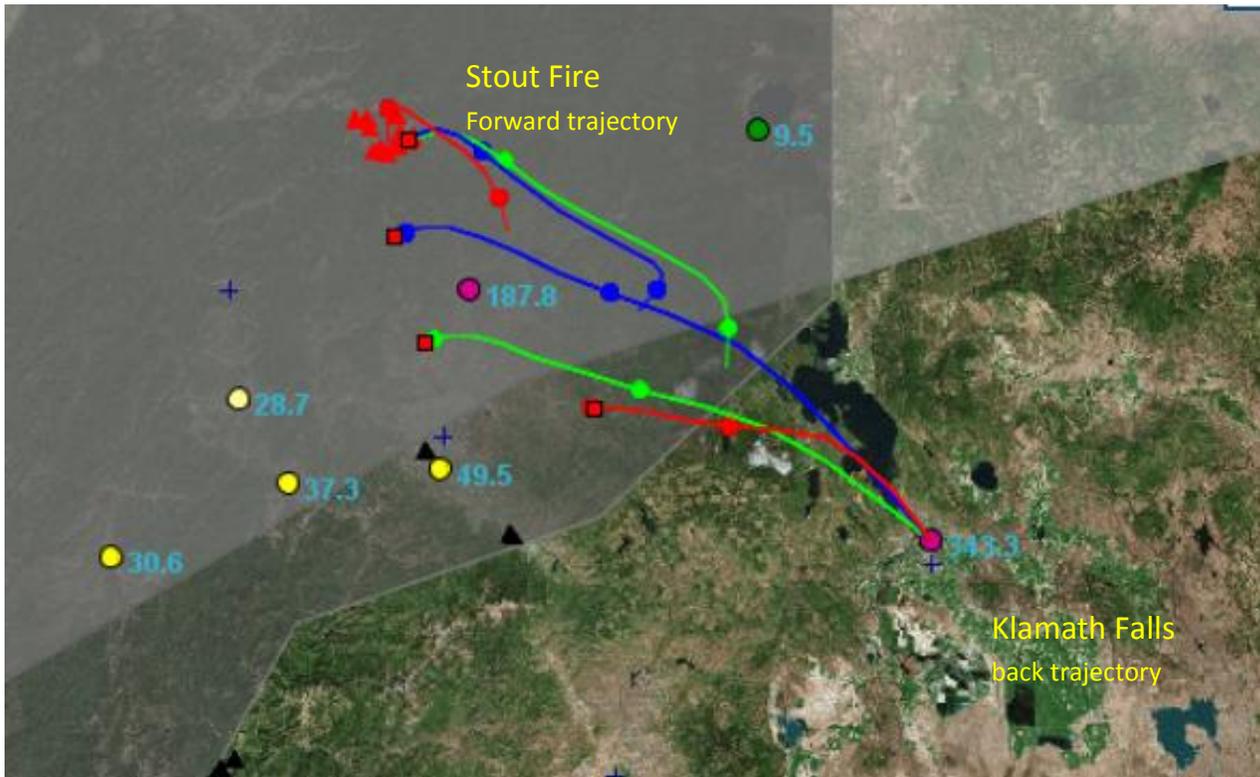


Figure 32. Aug 1, 2015, 8:00 PST, Hysplit Run forward and back trajectories (close up)

Impacts from the Stouts Creek fire continued throughout the month of August. The satellite photo (Figure 33) on August 4 shows smoke from the fire encompassing much of the area and continuing to linger in Klamath Falls.

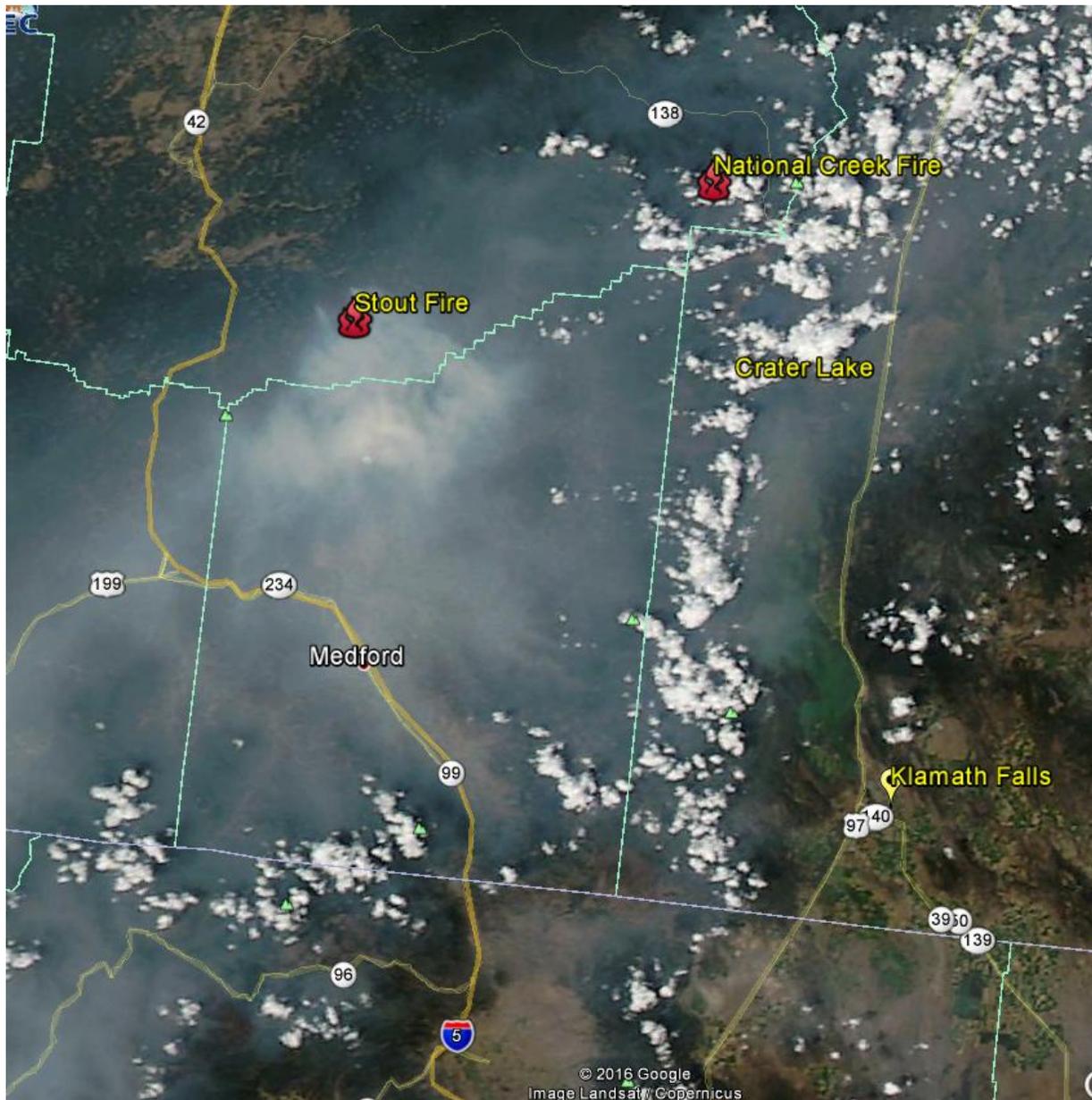


Figure 33. 2015 August 4th Wildfire Satellite Photo (12:45 PST) AQUA
(Terra not available)

The smoke from the fire continues to linger in the area, but wind speed and direction mostly prevent the area from seeing much elevated levels of smoke until the evening of August 3rd into the early morning hours of August 4th as seen in Figure 29. Smoke continues to be present all day with PM_{2.5} levels at or above the standard. Figure 34 shows that stagnant conditions exist in the area for much of the day until noon, until the wind starts to pick up and come from the south and southwest direction clearing the air a little. However, around 5 p.m. the wind changes direction to come from the northwest and causes another intrusion of smoke to affect the area. This is from the direction of the Stouts Creek fire and brings more smoke into the area. Around 9p.m. – 10 p.m., the wind shifts again to the west and southwest, bringing in air not from the fires and the PM_{2.5} levels begin to drop again.

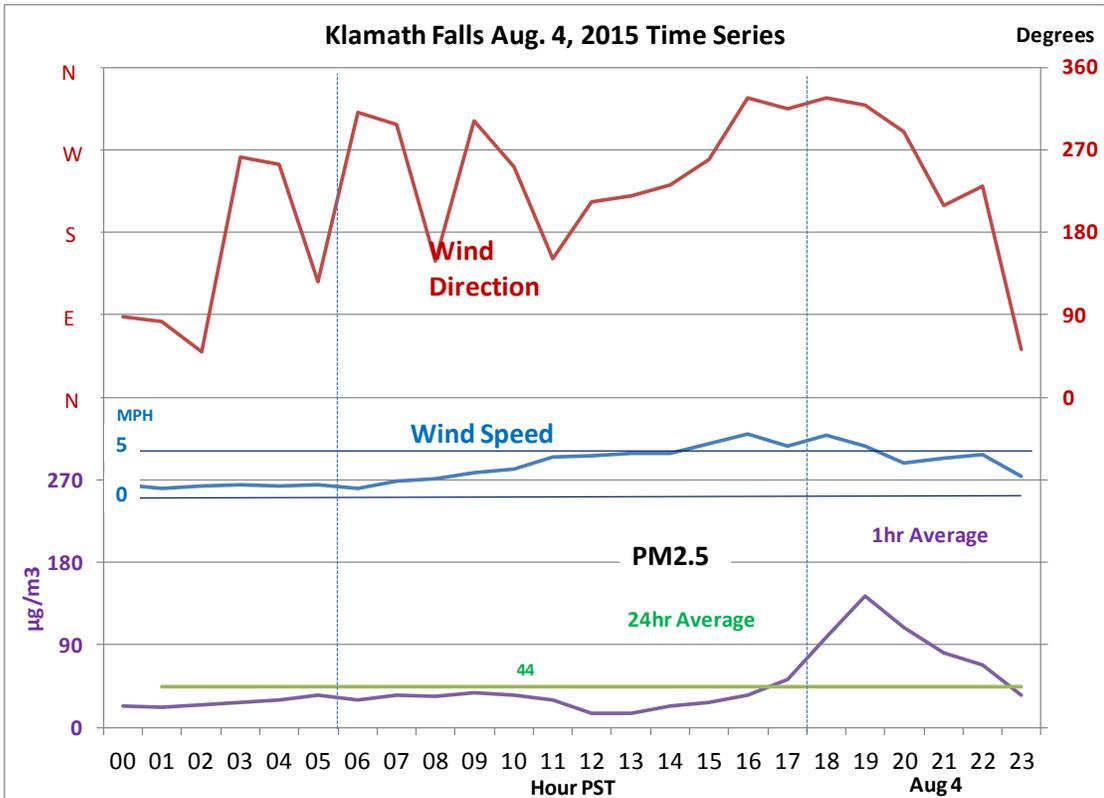


Figure 34: Time Series Data Plot for August 4, 2015

Figure 35 shows the temperature profile for the time period before and after the exceedance on August 4th. As stated earlier, the PM2.5 values are not related to temperature, in that there is no PM increase associated with decreasing temperatures, a signature that is typically associated with woodsmoke. Instead, the high PM2.5 values are associated to the wind direction from the direction of the wildfires.

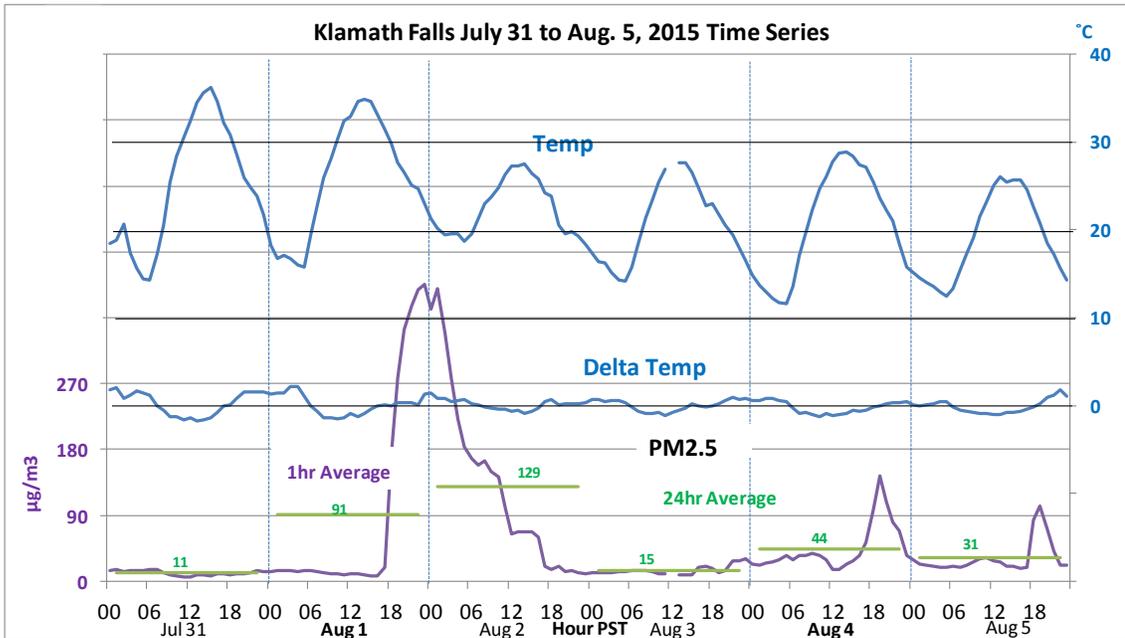


Figure 35: Time series temperature data plot for August 4, 2015

Figures 36 and 37 show how smoke from the Stouts Creek Fire continue to impact the Klamath Falls area.

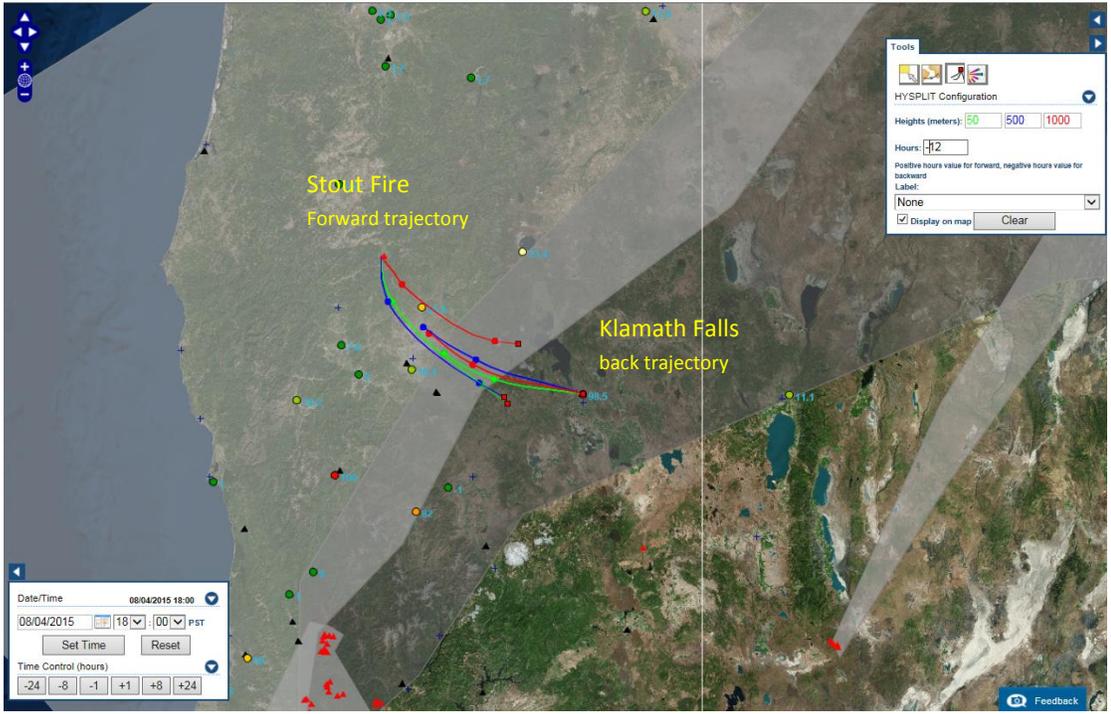


Figure 36. Aug 4, 2015, 18:00 PST, Hysplit Run, Stouts Creek Fire forward trajectory

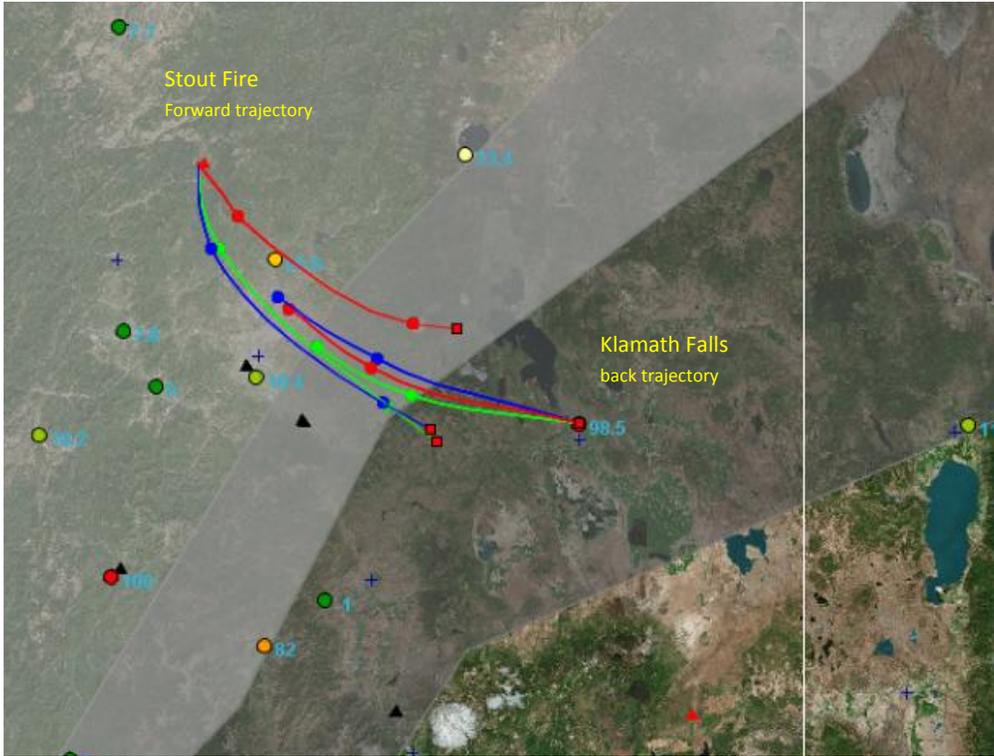


Figure 37. Aug. 4, 2015 Hysplit model back trajectories from the Stout's Creek Fire (closeup), 18:00 PST.

Analysis for additional days affected by wildfires

2014 Fires

Oregon Gulch Fire

The Oregon Gulch Fire began July 31, 2014, located 55 miles to the southwest of Klamath Falls. Smoke from the Oregon Gulch fire impacted the monitoring site at Peterson School beginning August 1st and caused high monitored concentrations throughout the next few days, including a sampling day on August 3rd. According to Inciweb, the fire initially moved southeast from the Cascade Siskiyou National Monument in Jackson County into Klamath County, and then into California. Satellite photos on August 3rd show the smoke plume heading northeast from the Oregon Gulch fire into Klamath Falls. Smoke from the California and Oregon fires moved north and northwest with some “eddying” in the southeast part of the plume. This eddying impacted Klamath Falls.

The photos in Figures 37 and 38 show smoke entering the Klamath Falls area on August 3rd

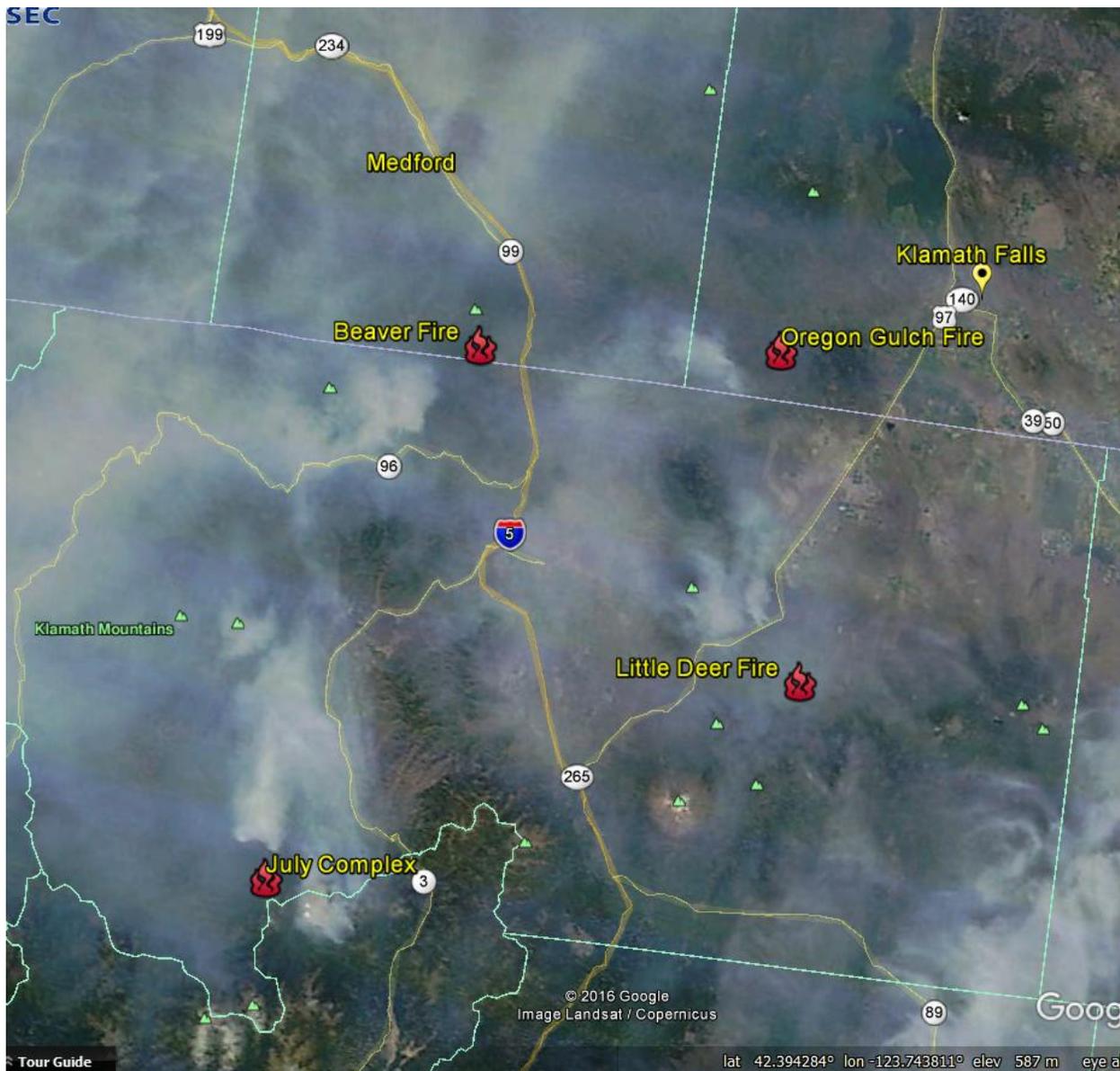


Figure 38: August 3, 2014 Terra satellite image (11:04 PST)



Figure 39: August 3, 2014 Aqua satellite image (12:45 PST)

Based on the monitored data, smoke entered the area on August 1st and continued to impact the area. On August 3rd, 2014, (the sampling day) the concentrations continued to fluctuate, as the hourly PM2.5 concentrations ranged from a low of 18.1 µg/m³ to a high of 62.9 µg/m³. The average for the day was 31.4 µg/m³. Figure 39 shows that on that day, PM2.5 levels continued to build and rise around noon, when the PM2.5 level jumped from 23 µg/m³ to 45.2 µg/m³ in one hour. The winds during this period were coming from the west and southwest, bringing in smoke from the Oregon Gulch Fire. Around 5 p.m., when the winds switched back to the northwest and wind speeds went above 5 mph, the PM2.5 levels dropped as the wind began clearing out the area. The wind data indicates the smoke intrusion came from the west and southwest from the direction of the Oregon Gulch Fire.

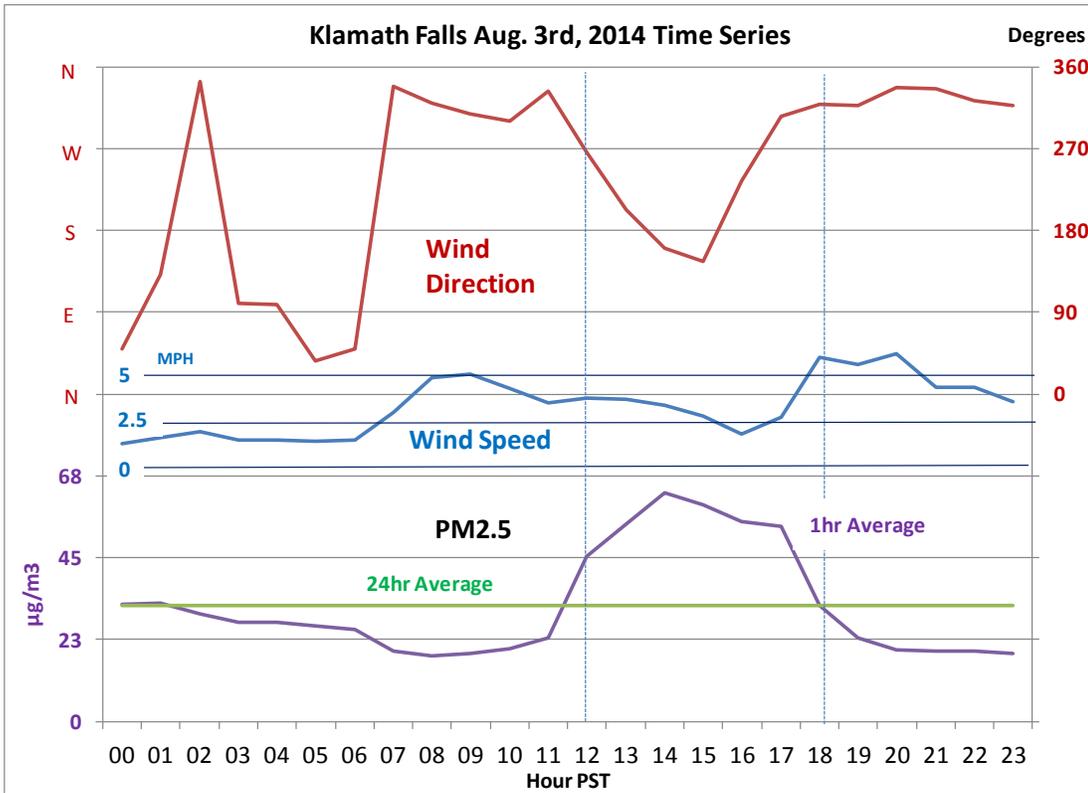


Figure 40: PM2.5 Time Series data plot on August 3, 2014

The Hysplit model in Figure 40 shows that on August 3rd the smoke from the Oregon Gulch Fire moved in a northeast direction, towards Klamath Falls. This is consistent with the southwest wind direction measured in Klamath Falls at the time of the highest impacts (13:00 to 18:00 hours). The smoke lingered at a lower concentration in Klamath Falls outside of those hours.

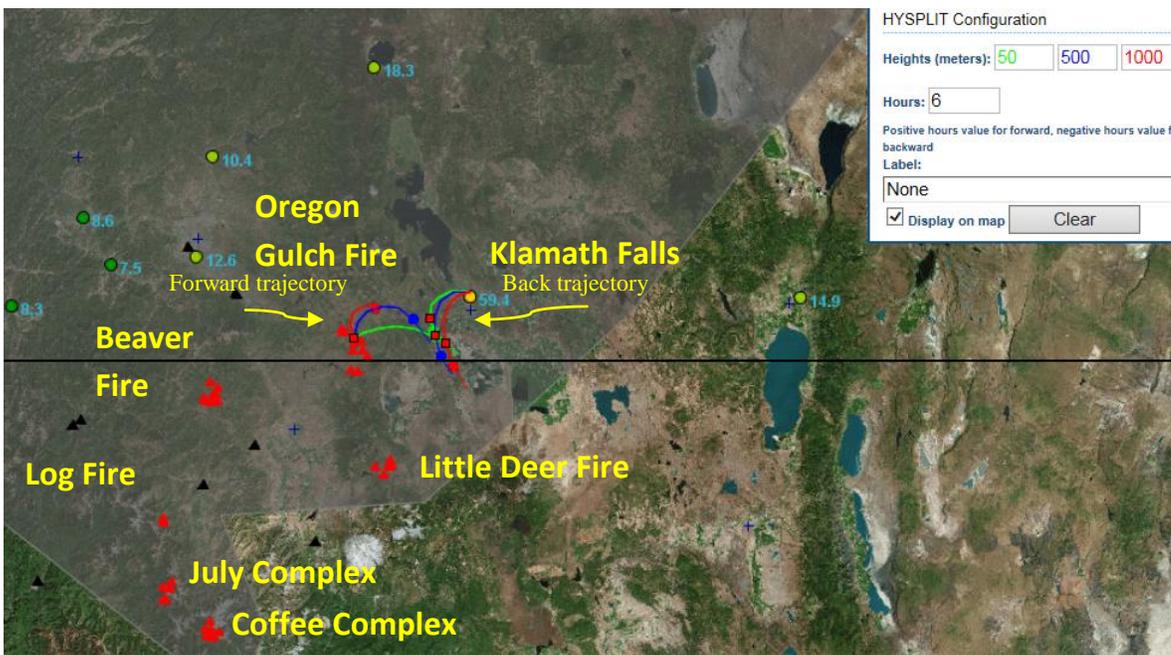


Figure 41: Hysplit model trajectory for the Oregon Gulch Fire (8/3/14, 13:00 PST) and Klamath Falls (8/3/14, 17:00 PST).

2015

August 19

As stated earlier, smoke from the Stouts Creek Fire continued to impact Klamath Falls. The satellite photo (Figure 41) on August 19th shows Klamath continuing to be primarily impacted from the Stouts Creek Fire, but other neighboring wildfires are also contributing to the smoke in the area.

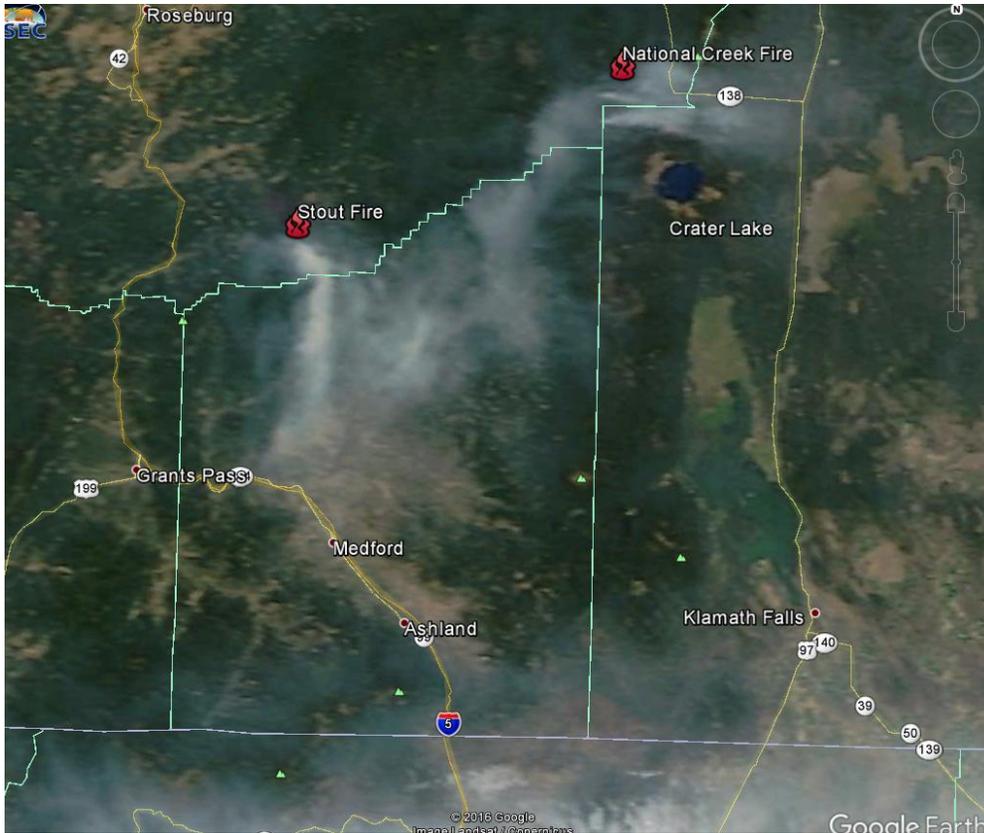


Figure 42. 2015 August 19th Wildfire Satellite Photos (11:55 PST)

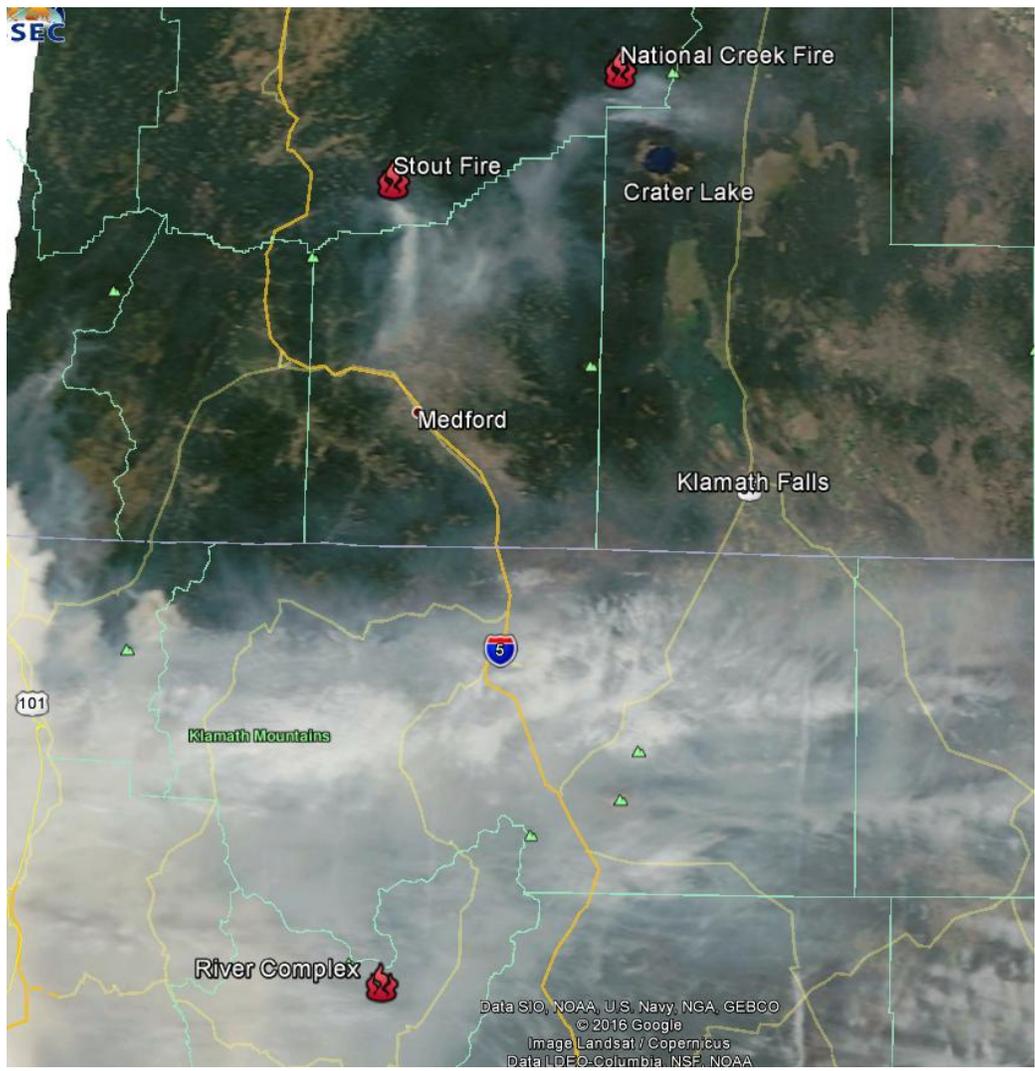


Figure 43. 2015 August 19th Wildfire Satellite Photos AQUA (13:40 PST)

On August 19th, the PM2.5 levels start the day out elevated from the previous day. Figure 43 shows how for much of the morning of the 19th, the winds are stagnant, causing the smoke that was brought into the area from the previous day to remain. Once the winds pick up around noon, the PM2.5 levels drop, and the southeast and southwest direction of the winds also bring in air that is not from the fires. However, around 4 p.m., the winds change direction and higher winds above 5 mph from the northwest bring smoke into the are from the Stout Creek fire.

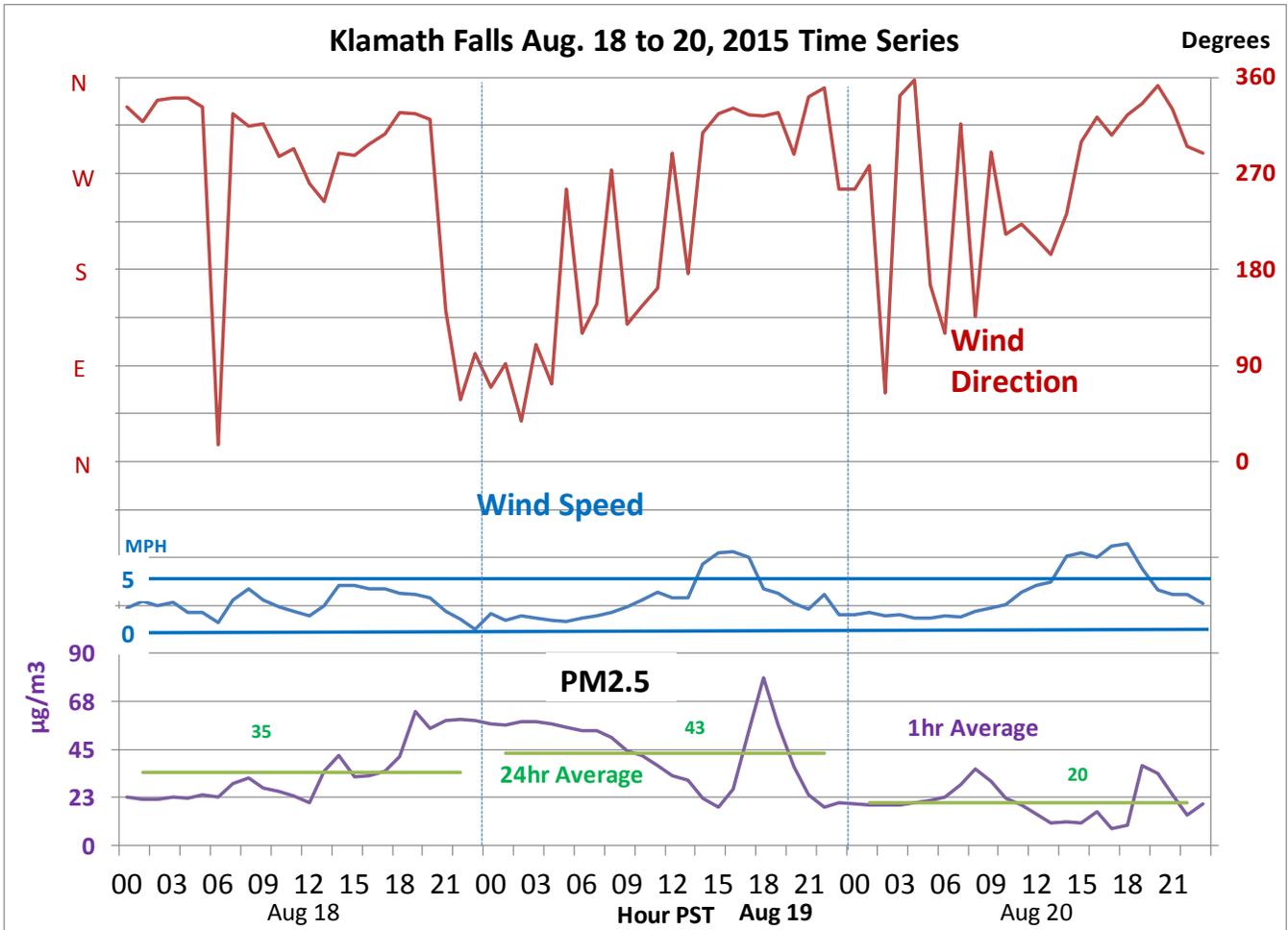


Figure 44: Time Series Data plot for August 19, 2015

Figure 44 shows the temperature profile in relation to PM2.5 levels. Again, higher levels of PM2.5 do not correspond to lower temperatures as would typically see from woodsmoke, but instead are influenced by wildfire smoke in the area and stagnant wind conditions during during the day.

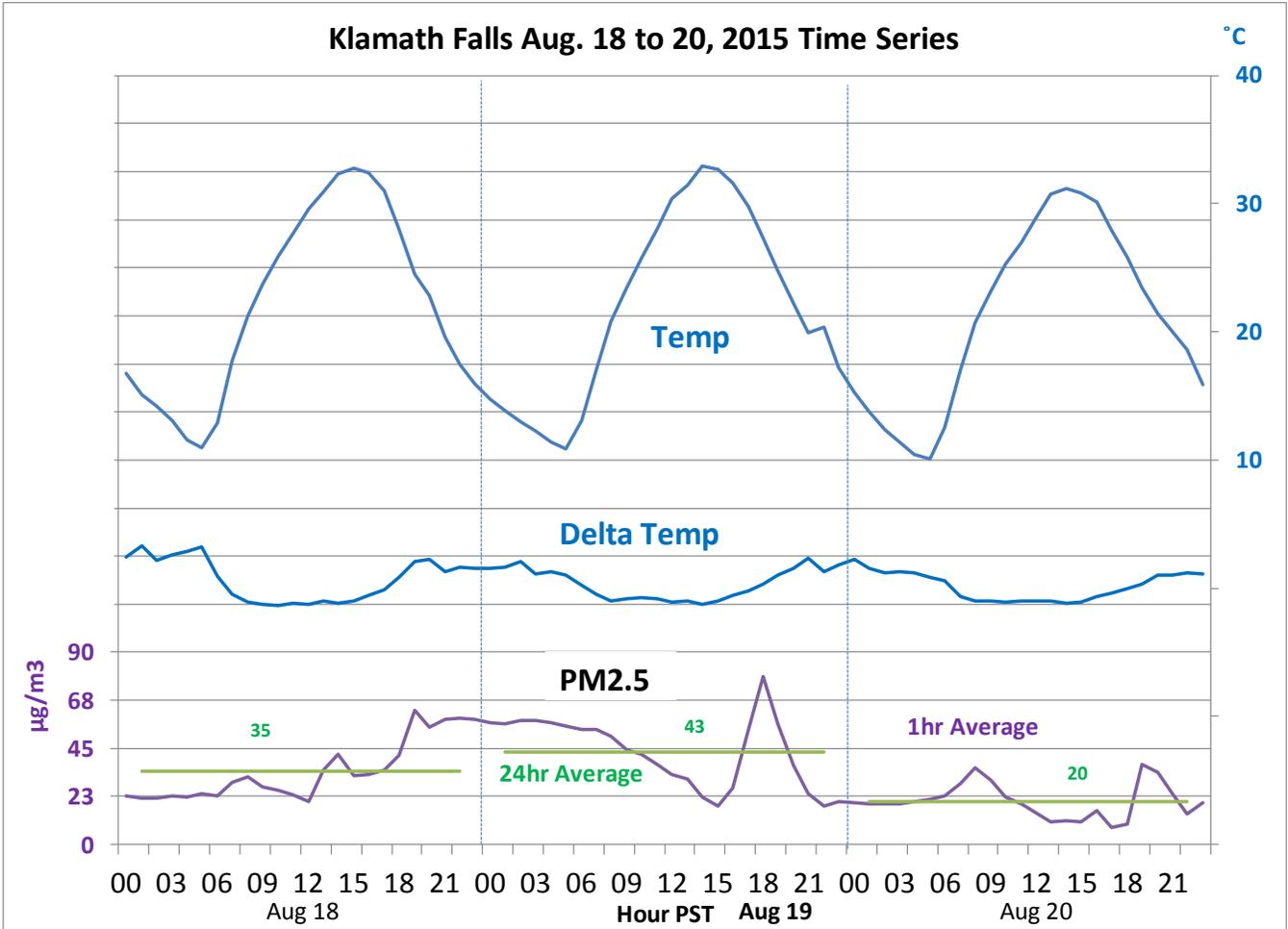


Figure 45: Time series temperature data plot for August 19, 2015

The Hysplit model runs in Figures 45 and 46 also demonstrate how the Stouts Creek fire is the primary cause of smoke in the Klamath Falls area, although the nearby National Creek Complex fire is burning just to the northwest.

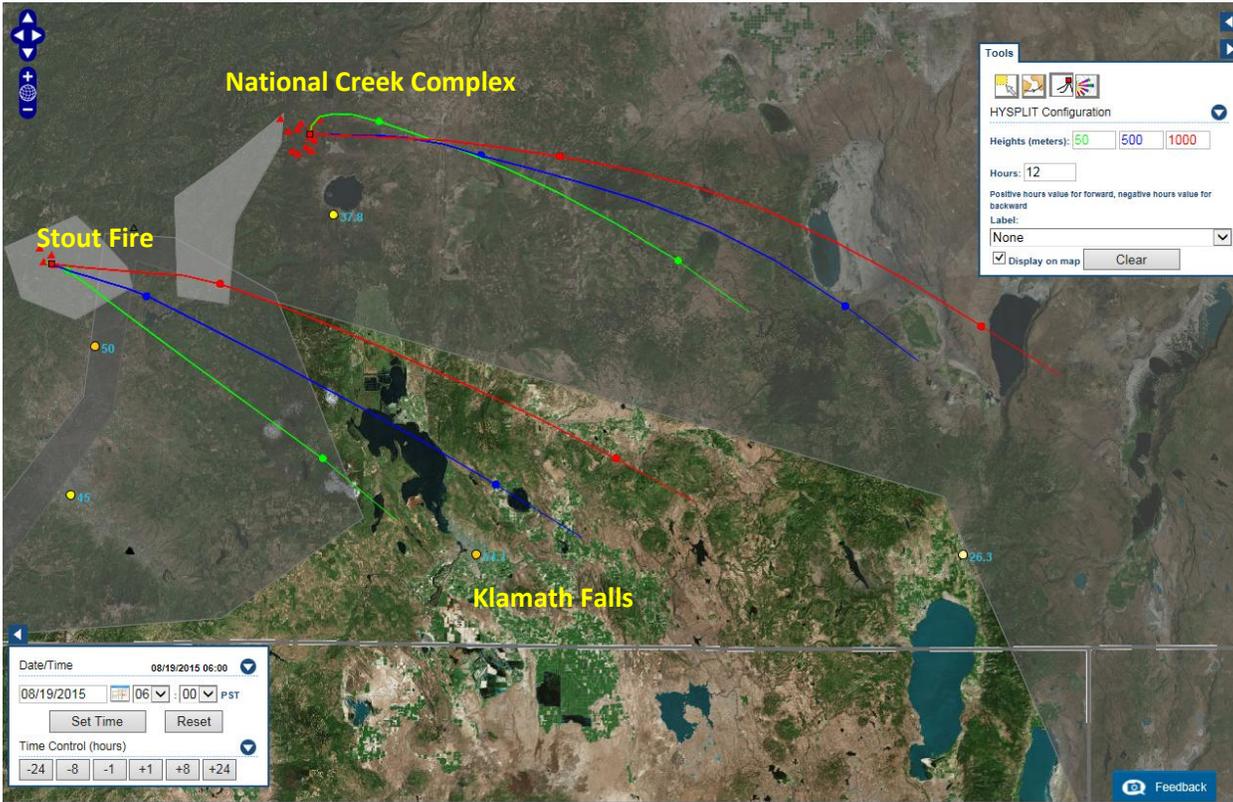


Figure 46: Aug 19th, 6am Hysplit Run, Stout fire forward trajectory

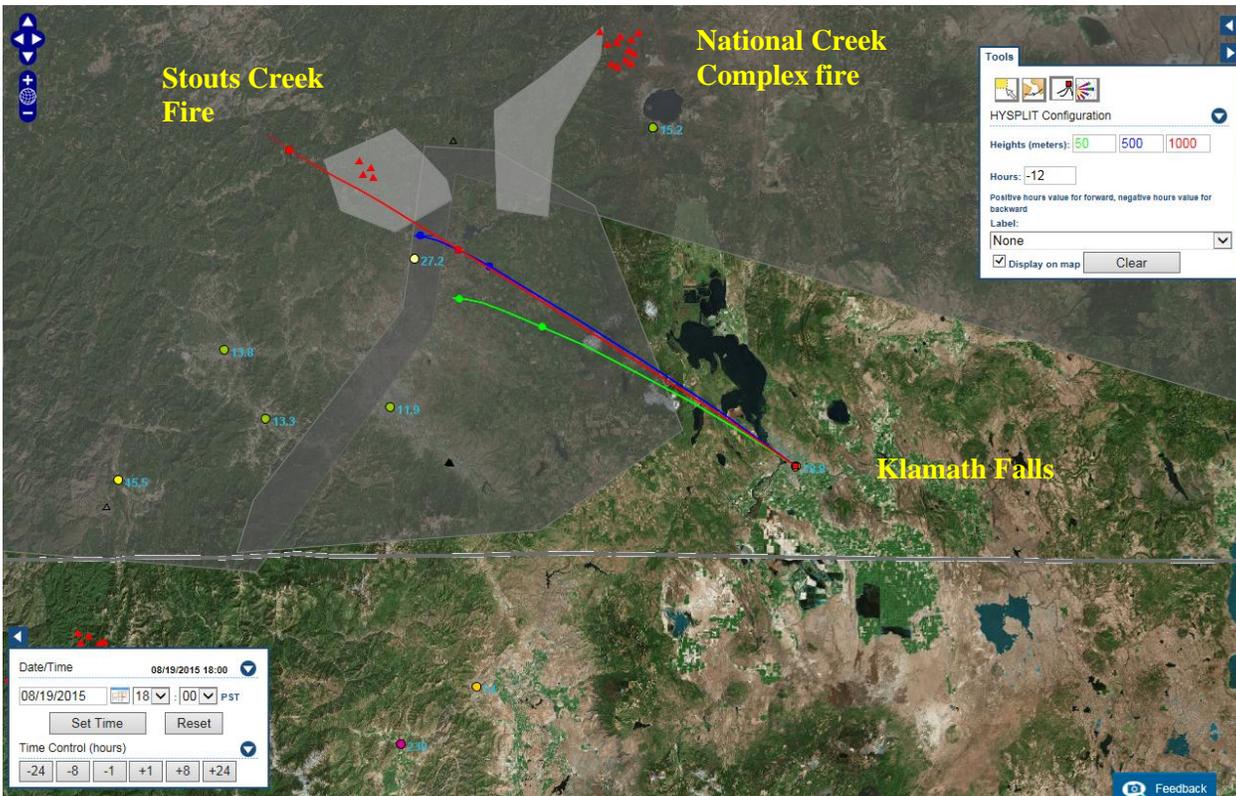


Figure 47: Klamath Falls back trajectory 8/19/15 18:00 PST

National Creek Complex Fire (August 25, 28, 2015)

August 25

During this period there were a number of wildfires surrounding Klamath Falls. Wildfire smoke from the surrounding National Creek Complex fire and the River Complex fire contributed to elevated PM2.5 levels. Figure 47 shows PM2.5 levels on August 24th were high for most of the day and continued into the early morning hours of August 25th. Stagnant conditions in the very early morning hours of the 25th caused the existing smoke to linger. Additionally, in the early morning hours the general wind direction was from the northwest generally bringing in smoke from the National Creek Complex fire. Once the winds picked up around 10 a.m., they came from a southwest direction and caused the smoke to clear out of Klamath Falls.

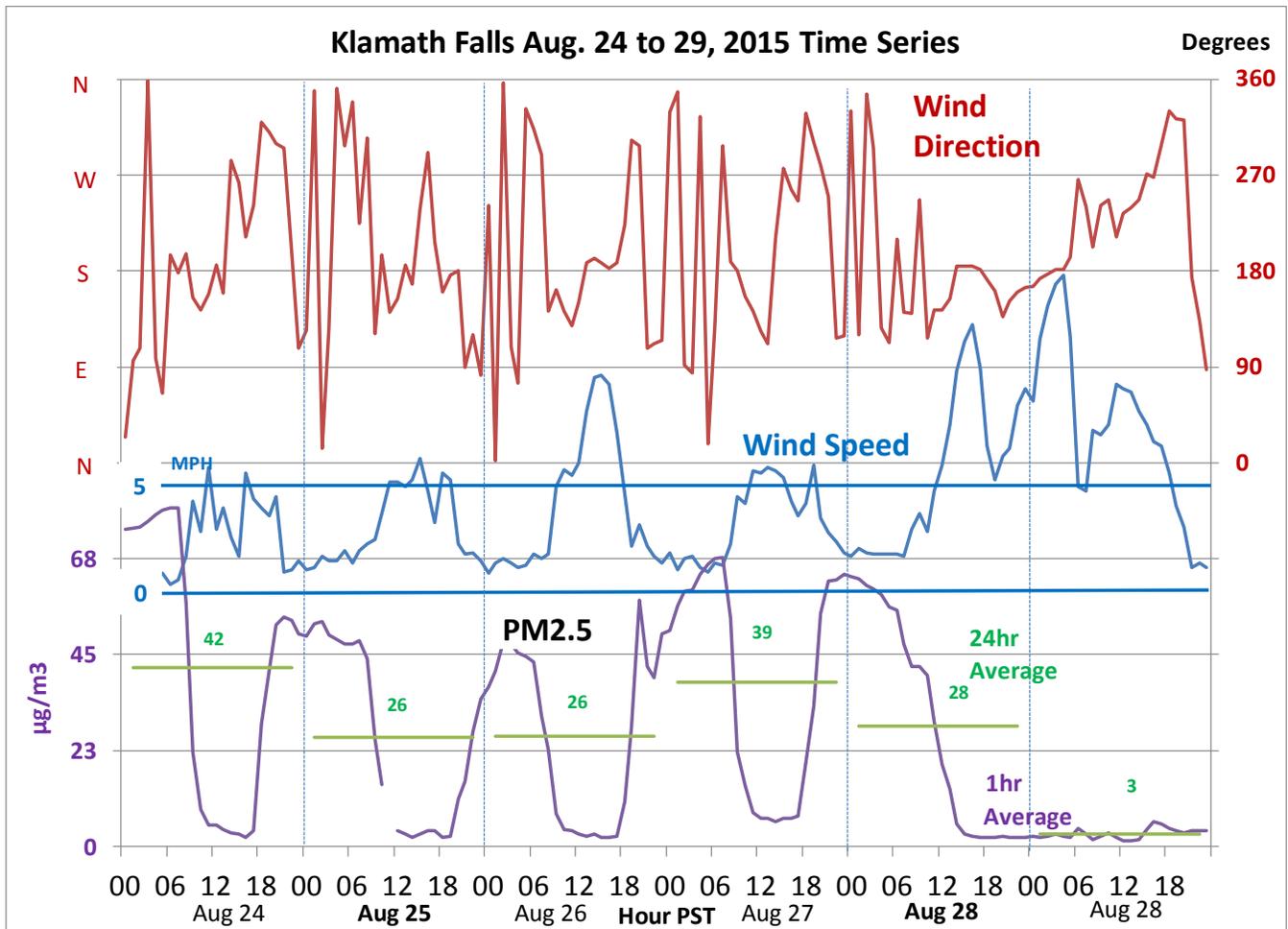


Figure 48: Time series data plot for August 25, 2015

Hysplit models show the forward trajectories of the fires and how smoke from the River Complex and National Creek Complex fires are all moving in a north, northeast direction creating a large plume of smoke near the Klamath Falls area (Figures 48 and 49). Backtrajectories show that the upper level smoke (1000 meters) is drifting in from the River Complex fire. However, it is likely most of the smoke impact is from the National Creek Complex fire, based on the higher monitored levels at the Crater Lake monitor and at the Klamath Falls monitor. The backtrajectories indicate the low level air at 50 meters and 500 meters, that the smoke is draining down from the National Creek Complex fire, over the Cascades, and into the Klamath Falls basin.

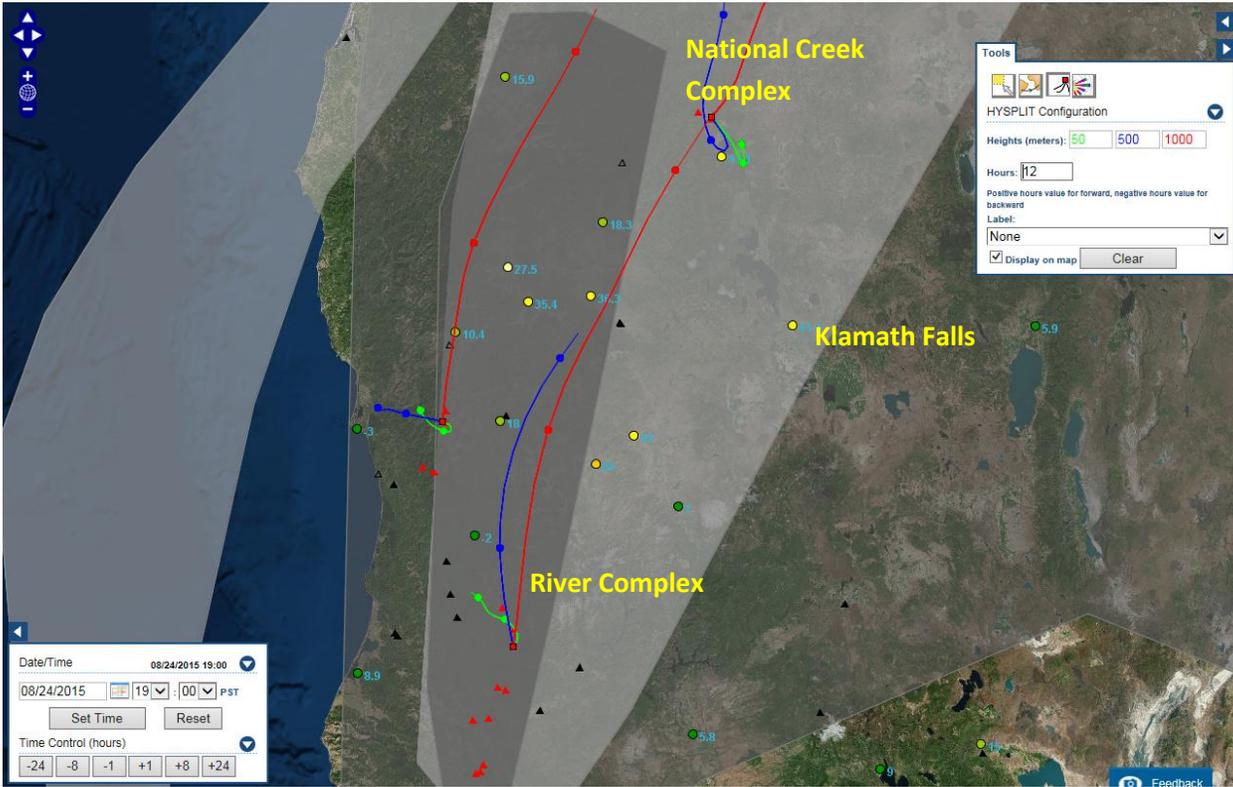


Figure 49: National Creek Fire forward trajectory 8/24/15 19:00 PST

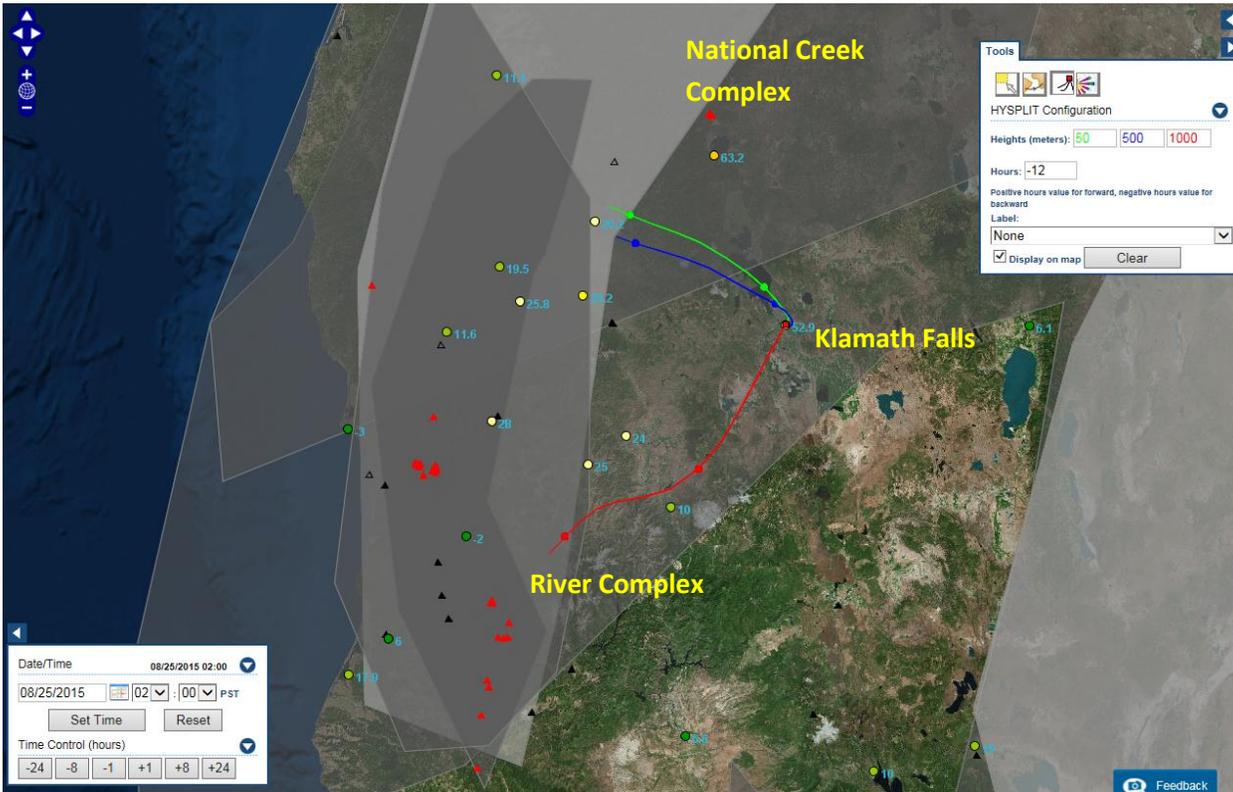


Figure 50: Klamath Falls back trajectory 8/25/15 02:00 PST

August 28

Smoke from the National Creek Complex fire continued to infiltrate the area on August 28th. In the early morning hours of the 28th, the area is impacted by an inversion causing the smoke to linger in the area. (Figure 50) By 10 a.m., the winds begin to increase in speed and are coming from the south, clearing out the area of smoke.

Much of the smoke in the area is caused by the multiple forest fires occurring around the Klamath Falls area, including the National Creek Complex, the River Complex, and the Gasquet Fire. The smoke was pervasive but at low levels, until the daily nighttime inversions would cause the smoke to build up overnight, particularly during the timeframe of August 25-28, as seen in Figure 50.

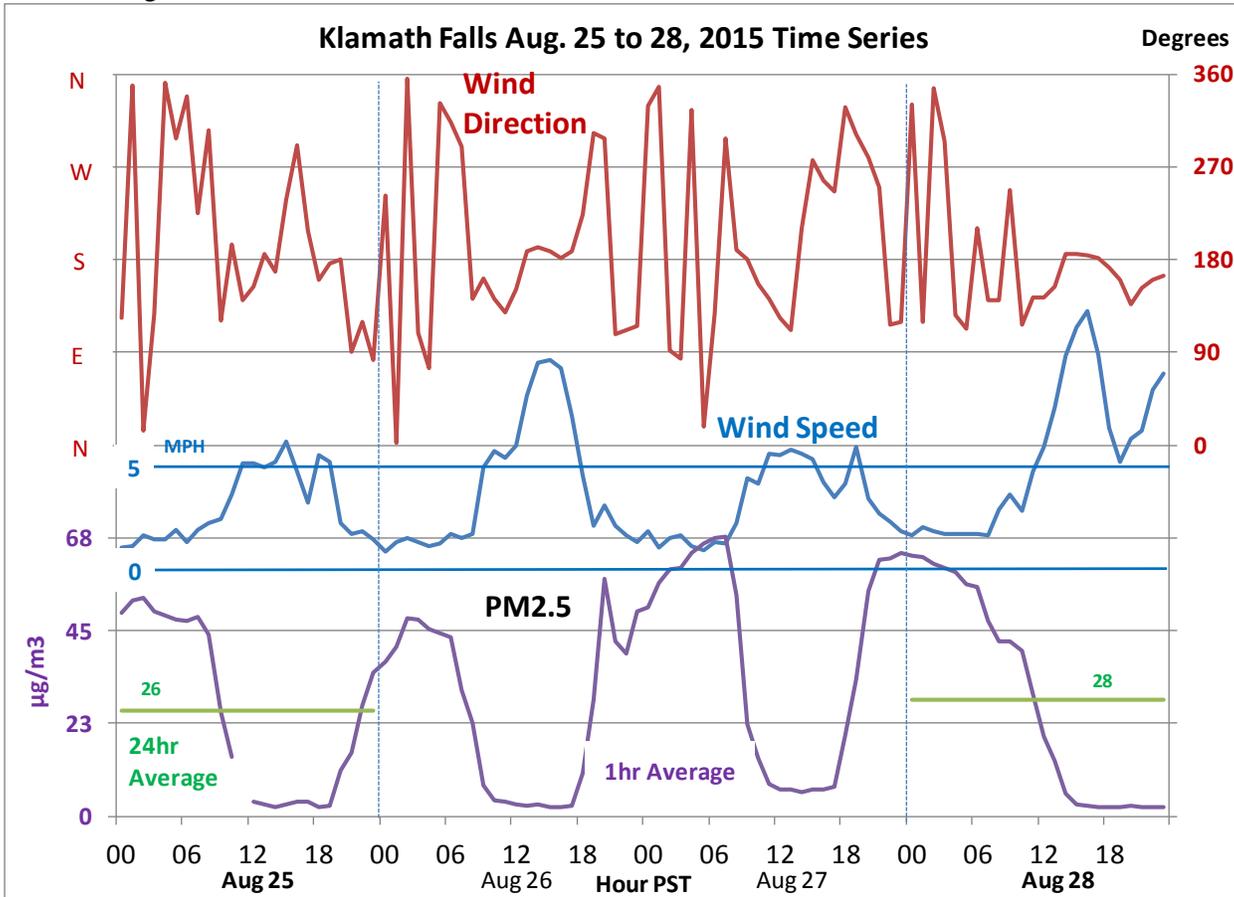


Figure 51: Time series data plot for August 25-28, 2015

The Hysplit runs in Figures 51 and 52 show how the smoke from the surrounding fires (National Creek Complex, River Complex, Gasquet Complex) are contributing to a swath of smoke covering much of southwest Oregon. Upper level smoke (1000m trajectory) from the River Complex and Gasquet Complex are contributing to the large general plume near Klamath Falls, and at lower elevations, the smoke is staying closer to the fires. The National Creek Complex fire shows some of the smoke dipping down to the southeast on the crest of the Cascade mountains. It is likely this smoke is most impacting Klamath Falls, with the smoke draining down the hill into the area. Also the monitor at Crater Lake shows elevated smoke impacts. The backtrajectories from Klamath Falls shows that the smoke is coming from the larger National Creek Complex plume and a little from the River Complex – likely the upper level smoke drifts into the area and comes down during the nighttime inversions.

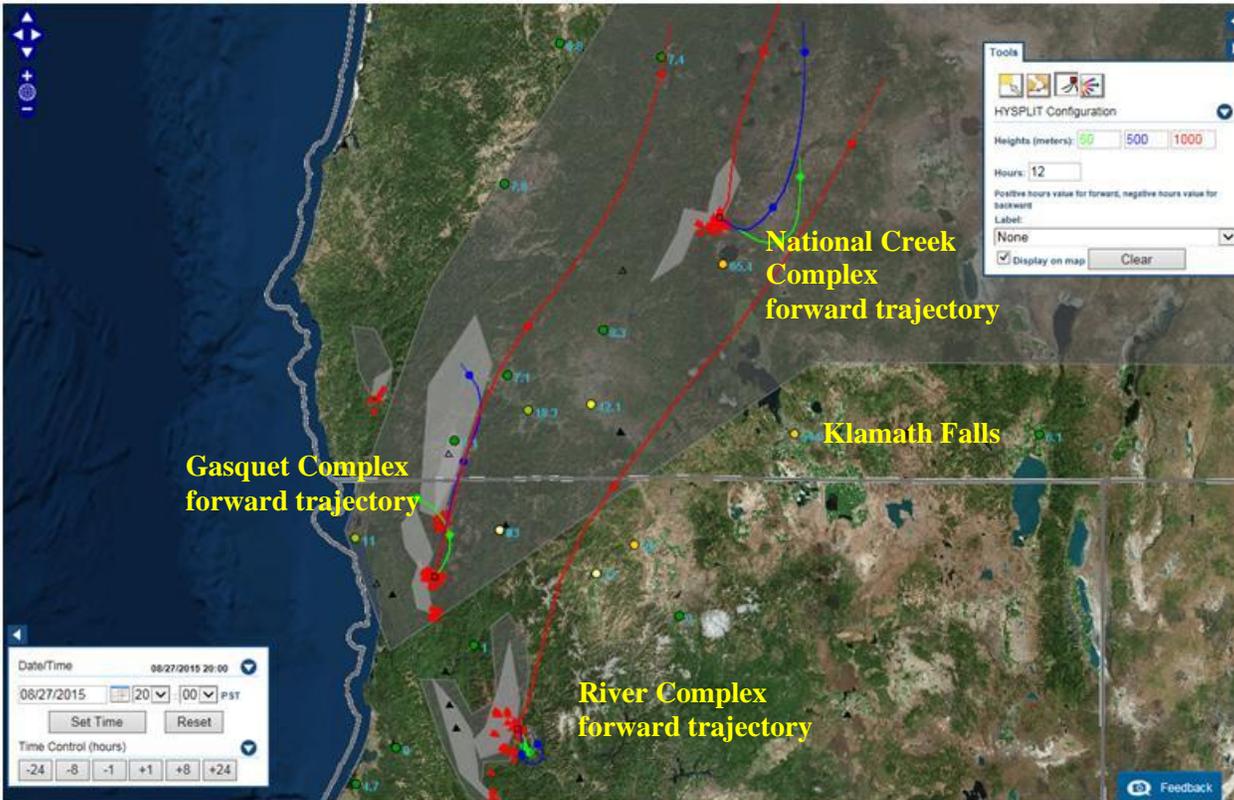


Figure 52: National Creek Fire forward trajectory 8/27/15 20:00 PST

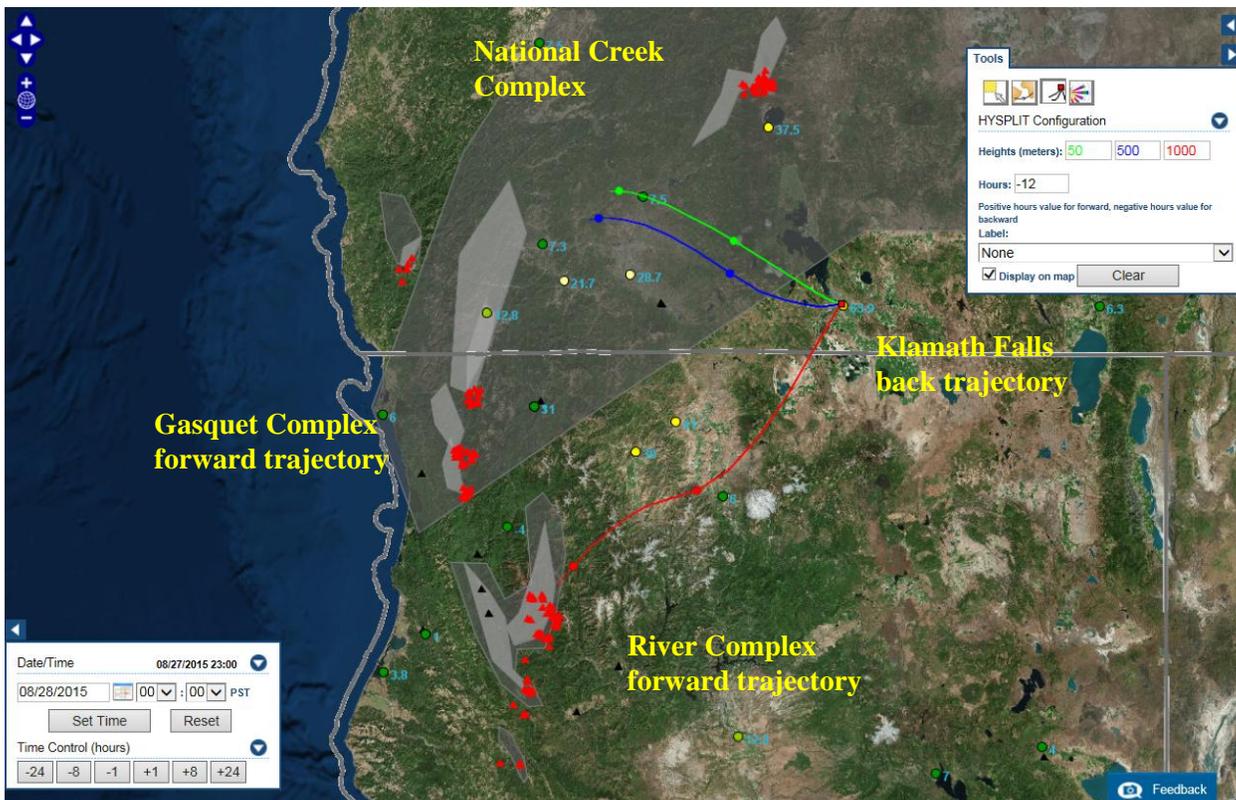


Figure 53: Klamath Falls back trajectory 8/27/15 23:00 PST

Overall, major wildfires affected the Klamath Falls area on August 3, 2014, and August 1, 4, 19, 25, and 28, 2015. These wildfires resulted in elevated concentrations at the Peterson School monitor. On average, the monitored PM_{2.5}

concentrations during the summertime (July-August) are 7.3 ug/m³. Meteorological conditions were not consistent with historically high concentrations. In addition to the comparison to historical concentrations showing, the analysis in Sections 2,3, and 4 support DEQ's position that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation and thus satisfies the clear causal relationship criterion.

4. Natural Event or Human Activity unlikely to Recur (NE/HAURL)

The EER requires that agencies must document that the identified source of an exceptional event is either a natural event (NE) or a human activity unlikely to recur at the same location (HAURL) such as to affect the monitors in question again. EPA's 2016 Exceptional Events rule indicates that if an agency has adequately demonstrated that the source is a *natural event* or, if not natural, is a human activity unlikely recur at the same location and that there is a *clear causal relationship* between the identified source (s) and the affected monitor, then the HAURL/Natural Event criterion is also satisfied.

The human-caused fire, the Stouts Creek Fire in 2015 was due to unlawful mowing outside of the burn ban restrictions. This human caused fire would be considered a natural event since it was an accidental human action that sparked the wildfire and restrictions were in place to control any potential burning. The detailed data included in Section 3, demonstrate a clear causal relationship between source and monitor for each day that ODEQ requests concurrence. Thus, the NE/HAURL criterion is also satisfied.

For the other days that caused high values at the monitor (but are not being considered for regulatory significance at this time), the primary fire affecting Klamath Falls in 2014 (Oregon Gulch Fire/Beaver Complex Fire) as well as the majority of the other fires in the region were caused by lightning and are therefore of natural origin. Similarly, the National Creek Complex and Gasquet Fire in 2015 in south western Oregon and the many of the other Oregon fires were all lightning caused.

5. Mitigation

5.1 Introduction

Control of Wildland fires is coordinated under the National Interagency Fire Center <http://www.nifc.gov/> Under their fire control policy they state: "Wildland fire recognizes no ownership or jurisdictional boundaries on the landscape; nor do the complex issues of fire management. As a result, perhaps nowhere is the practice of interagency and interdepartmental cooperation so prevalent and effective as in the nation's wildland fire community. Five federal agencies, including the Department of the Interior's Bureau of Land Management, Bureau of Indian Affairs, National Park Service, and U.S. Fish and Wildlife Service, along the Department of Agriculture's Forest Service, manage and have primary fire program responsibilities on more than 676 million acres. The U.S. Fire Administration works with county and local fire departments; while the states are represented by the National Association of State Foresters. The state, county and local jurisdictions provide primary fire protection on public and private lands covering additional hundreds of millions of acres across all 50 states.

As partners, they work together on fire management issues covering the spectrum from safety and planning, to science, preparedness, operations, strategy development, logistics, intelligence, emergency response, and more. They also collaborate on interagency strategies to manage wildfires, not only for single incidents but as a matter of policy."

In addition to the total effort of the various natural resource agencies, the specific USFS districts prepare fire management plans. For example, the Stouts Creek fire was on Oregon Department of Forestry (DOF) land which is covered by the 2010 Southwest Oregon, State Forests Management Plan. In the Air Quality section (2-14) the plan discusses prescribed burning as a deterrent for forest fires with much less smoke produced and says that the only methods for suppressing wildfires is to fight them. http://www.oregon.gov/odf/state_forests/docs/management/swfmp/sw_fmp_revised_april_2010_combined.pdf

In summary agencies expend tremendous efforts on fighting wildland fires when they have impacts on people. They also expend much effort on prevention of wildfires through educational efforts like Smokey the Bear advertising and fire hazard signs. Limitation on campfires is also a tool that forest management agencies use. The fire control agencies also expend tremendous effort in fighting the fires once they are started. The table below show the amount of people and money spent on fighting the Oregon Gulch Fire, Stouts Creek Fire, and the National Creek Complex.

Table 8. Wildfire suppression efforts totals

Incident Name	St	Size (acres)	Cost (\$Million)	Responsible Agency
Oregon Gulch	OR	35,302	22	OR DOF
Stouts Creek	OR	26,452	38	OR DOF
National Creek Complex	OR	20,960	21	USFS
Total		82,714	81	

National Interagency Fire Center www.predictiveservices.nifc.gov/IMSR/2013/20130805IMSR.pdf

The health agencies focus on the forest fire smoke from the fires. In Oregon during such events, several activities occur which are discussed below.

5.2 Oregon DEQ Mitigation Efforts

5.2.1 Wildfire Response Protocol

Oregon DEQ, Lane Regional Air Pollution Authority, Oregon Health Authority, Oregon OSHA, Oregon Emergency Management, Oregon Department of Forestry, US Forest Service created a wildfire response protocol¹⁵ which outlines the state, federal, and local response to dangerous smoke levels impacting Oregon communities. The protocol defines which agency is responsible for which activity and provides a guide for the coordination of emergency communication during extreme smoke events. The protocol has been used very effectively during 2013 but was improved for the 2014 season using lesson learned. The Protocol is available at <http://www.deq.state.or.us/AQ/burning/wildfires/index>

5.2.2 Oregon Smoke Blog

One of the main products from the protocol is the Oregon Smoke Blog. This blog is updated by the agencies listed in the protocol and is available to the public. It provides air quality index levels, links to fire maps, health alerts, and any other information that the health agencies deem valuable. This blog gets thousands of hits per day during forest fire events from the public.

<http://oregonsmoke.blogspot.com/>

5.2.3 Air Quality Index

Oregon DEQ has included hourly PM2.5 averages on our air quality index page to better track real time conditions during forest fire smoke inundations. Forest fire smoke is often in plumes and can change air quality quickly. The 24 hour average AQI does not respond quickly enough to capture this rapid change. The one hour average does. EPA uses a complex formula on AIRNow to calculate the AQI which can approximate the one hour average, but Oregon DEQ does not have the information technology resources to put this more elaborate calculation in place.

<http://www.deq.state.or.us/aqi/index>

5.2.4 Air Quality Health Advisories

Oregon DEQ issues air quality health advisories when we feel that the smoke levels are unhealthy and will remain so for over 72 hours. These advisories instruct the public on how to keep the smoke out of their homes or where to go if they feel their homes are not safe. The advisories also tell the public about the health impacts of smoke on various sensitivities. The advisories are submitted to the local news affiliates, posted on various web sites, and are emailed to sensitive people on the DEQ Gov. delivery list.

6. Exceptional Event Rule Procedures

The EER establishes specific procedural requirements that an air agency must follow to request data exclusion. Those requirements and ODEQ's actions to meet them are summarized in the table below.

Table 9. Exceptional Event Rule Procedure Requirements

Exceptional Event Rule Procedural Requirement	ODEQ Action/Intended Action
A State shall notify EPA of its intent to exclude one or more measured exceedances of an applicable ambient air quality standard as being due to an exceptional event by placing a flag in the appropriate field for the data record of concern which has been submitted to the AQS database... 40 CFR § 50.14(c)(2)(i).	ODEQ notified EPA that it placed flags on numerous the monitor values originally thought to be affected by wildfires above the level of concern in Oregon for PM2.5 of 25µg/m3 and that we intended to request EPA concurrence to exclude some or all of them from the AQS database.
A State that has flagged data as being due to an exceptional event and is requesting exclusion of the affected measurement data shall, after notice and opportunity for public comment, submit a demonstration to justify data exclusion to EPA. EPA shall respond with a due date for demonstration submittal that considers the nature of the event and the anticipated timing of the associated regulatory decision. 40 CFR § (50.14(c)(3)(i)).	DEQ made this package available for public comment and subsequently submitted it to EPA by June 1, 2017 so that it continues to demonstrate Klamath Falls is meeting the 24-hour PM2.5 standard.
With the submission of the demonstration, the air agency <i>must document that the public comment process was followed.</i> 40 CFR § (50.14(c)(3)(iv) and (v).	This document was available for a 30-day public comment from April 12 through May 15, 2017. See Appendix A for notifications of public comment. One public comment was received.

DEQ posted notice of this exceptional events demonstration on April 12, 2017 on the DEQ website. One public comment was received and has been included in Section 7, along with DEQs responses to these comments.

7. Public Comment

DEQ received the following public comment from Greg Beckman, Sr., of Klamath Falls:

"I live in the County so I am subject to many different rules and regulations than our neighbors to the South, California. One regulation that myself and all my neighbors, County and City have, is we get to pay for the particulate that will come drifting in to Oregon from California during times of low inversion and large forest fires. Any winds emanating from the South East to the South West and blowing North brings a tremendous amount of pollution to the Klamath Basin. We get to be punished for something that has NOTHING to do with our use of firewood. The majority of residents in this area are good, law abiding people that do their best to keep the air as clean as possible, but when the fires start, we ARE living in a "Basin" and the wind currents tend to always be at us. When I studied the images from the Weather Satellites over the past several years, I noticed the wind patterns

were circular in the Basin area. They came at us from all directions and settled here for weeks. I know this is bad for those that have respiratory conditions, in fact everyone knows this. But when it is an act of nature, I don't see why the residents should have to pay for it. Fires from lightning strikes, some vehicle accidents and acts of nature, I do NOT count human carelessness in this, tend to give us an unfair disadvantage. I am always willing to cut back on the use of wood for the sake of those suffering as are all of my neighbors, but those of us on a fixed income, we have a hard time keeping up with the rising cost of other heating methods. Thank you for the time you spent reading this, I hope it helps you understand our situation.”

DEQ appreciates the comment from Mr. Beckman. The purpose of the Exceptional Event request document is to request any wildfire impacts to be excluded, such as those from California, that could have affected the monitoring data if they result in violations of the National Ambient Air Quality Standards. DEQ acknowledges the hard work local citizens in Klamath Falls have undertaken to lower PM2.5 levels through various control measures such as woodstove curtailment.

8. Summary

With the weight of evidence discussed throughout this report, Oregon DEQ has shown that the smoke from the Stouts Creek Fire in 2015 caused the PM2.5 concentration collected on the ODEQ Federal Reference Method samplers on August 1st and 4th, 2015. ODEQ requests EPA's concurrence and that these values not be used to calculate the 2013-2015 design value for the Klamath Falls State Implementation Plan.

DEQ is also submitting information on the Oregon Gulch Fire in 2014 and the Stouts Creek Fire, National Creek Complex and surrounding fires in 2015 since they also caused the PM2.5 concentration collected on the ODEQ Federal Reference Method samplers on August 3, 2014 and August 19, 25, and 28 in 2015 to exceed the standard. If future analysis determines these dates to be regulatory significant, then DEQ will reference this document for concurrence to remove these dates from the 2013-2015 design value for Klamath Falls.

Appendix A: Notification of Public Comment Period

This document was available for a 30-day public comment period from April 12, 2017 through May 15, 2017. Notification of the public comment period was provided via GovDelivery Bulletin on April 12, 2017 to 2,424 recipients.

Subject: The Oregon Department of Environmental Quality invites the public to submit written comments on the Klamath Falls 2014 and 2015 Exceptional Event document

Sent: 04/12/2017 02:28 PM PDT

Sent By: hnidey.emil@deq.state.or.us

Sent To: Subscribers of DEQ Public Notices or Klamath Falls Air Pollution

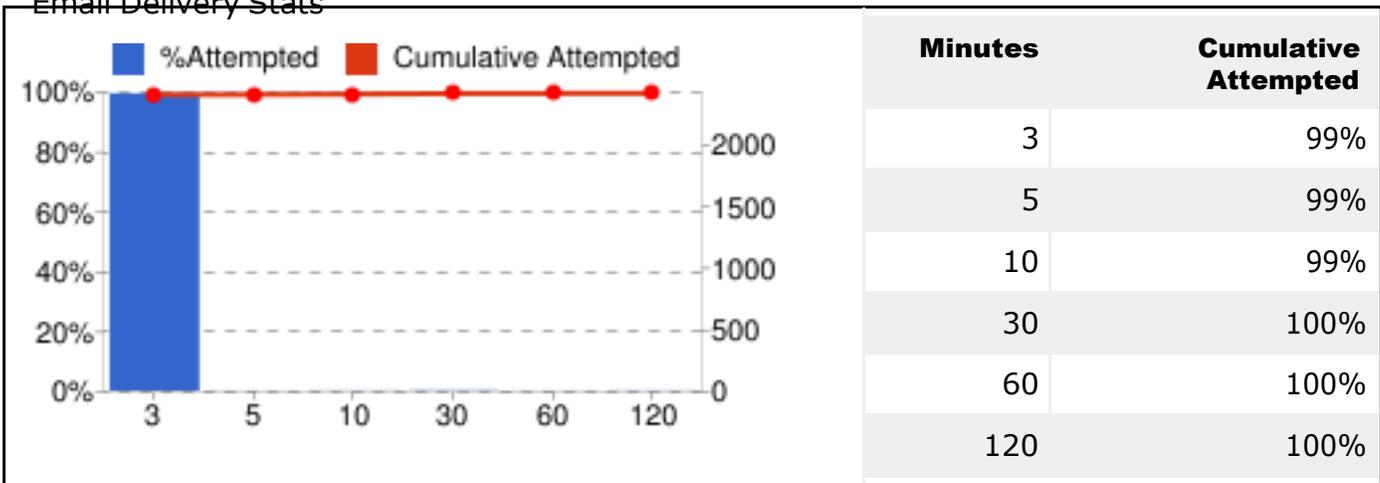
2,425
Recipients

- ✓ Email
- ✓ SMS
- ✗ Facebook
- ✗ Twitter
- ✓ RSS

99%
Delivered

- 0% Pending
- 1% Bounced
- 16% Open Rate
- 1% Click Rate

Email Delivery Stats



Delivery Metrics - Details

2,425	Total Sent
2,396 (99%)	Delivered
0 (0%)	Pending
29 (1%)	Bounced
2 (0%)	Unsubscribed

Bulletin Analytics

605	Total Opens
378 (16%)	Unique Opens
27	Total Clicks
19 (1%)	Unique Clicks
8	# of Links

	Progress	% Delivered	Recipients	# Delivered	Opened Unique	Bounced/Failed	Unsubscribes
Email Bulletin	Delivered	98.7%	2,170	2,141	337 / 15.7%	29	2
Digest	n/a	n/a	190	190	41 / 21.6%	0	0
SMS Message	Delivered	100.0%	65	65	n/a	0	n/a

Link URL	Unique Clicks	Total Clicks
http://www.oregon.gov/deq/get-involved/documents/051517...	17	25
https://public.govdelivery.com/accounts/ORDEQ/subscriber/o...	2	2
https://twitter.com/OregonDEQ	0	0
https://subscriberhelp.govdelivery.com/	0	0
http://www.oregon.gov/DEQ/	0	0
https://public.govdelivery.com/accounts/ORDEQ/subscriber/e...	0	0
https://www.facebook.com/oregondeq	0	0
http://www.oregon.gov/deq/	0	0

Klamath Falls 2014 and 2015 Exceptional Event Request

On DEQ's webpage:

<https://www.oregon.gov/deq/get-involved/documents/051517ExcepEventKFalls.pdf>

Public Notice

DEQ Requests Comments on Klamath Falls Exceptional Event EPA Concurrence Request for 2014 and 2015



State of Oregon
Department of
Environmental
Quality

**Air Quality -
Headquarters**
700 NE Multnomah St
Portland, OR 97232
Phone: 503-229-569
800-452-401
Fax: 503-229-695
Contact: Rachel Sakata

www.oregon.gov/DEQ

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Please include your full name and mailing address so that we can remove you from our print mailing list.

DEQ invites the public to submit written comments on the Klamath Falls 2014 and 2015 Exceptional Event EPA Concurrence Request document.

Summary

Klamath Falls has experienced smoke from wildfire events that have in part caused violations of the National Ambient Air Quality Standards in 2014 and 2015. DEQ has developed an Exceptional Event request document requesting that EPA exclude data related to these violations that are directly due to an exceptional event from use in regulatory determinations.

How do I participate?

To submit your comments for the public record, send them by mail, fax or email:

Rachel Sakata, Air Quality Planner
700 NE Multnomah St, Suite 600
Portland, OR 97232

Fax: 503-229-6954

Email: sakata.rachel@deq.state.or.us

Written comments are due by 5 p.m. May 15, 2017.

What is an exceptional event?

Exceptional events are unusual or naturally occurring events that can affect air quality but are not reasonably controllable. Exceptional events include wildfires, stratospheric ozone intrusions and volcanic and seismic activities.

Why is the concurrence request needed?

Klamath Falls has experienced smoke from wildfire events that have in part caused violations of the National Ambient Air Quality Standards in 2014 and 2015. Data that is over the standard and has regulatory implications can be removed by request, if it has been influenced by exceptional events. In order for Klamath Falls to show it has attained the standard under its federally approved attainment plan, this data needs to be excluded. DEQ has developed this exceptional events request document and will

submit it to EPA to request approval to exclude data related to violations of a NAAQS.

Which days are being requested as Exceptional Events?

In 2014, one day was affected primarily by the Oregon Gulch Fire. In 2015, there were five days where wildfire smoke affected the Klamath Basin. These days were impacted from two separate fires – primarily the Stouts Creek Fire and the National Creek Complex.

Year of Event	Date	Wildfire Event
2014	8/3/2014	Oregon Gulch Fire – OR, Beaver Complex - OR
2015	8/1/2015	Stouts Creek Fire - OR
	8/4/2015	Stouts Creek Fire - OR
	8/19/2015	Stouts Creek Fire - OR
	8/25/2015	National Creek Complex - OR
	8/28/2015	National Creek Complex – OR, River Complex - CA

What does the Exceptional Event concurrence request document contain?

The document contains an analysis of the exceedance days and how they were affected and influenced by wildfire events. It includes satellite images of smoke impacting the area, back and forward-trajectories linking the wildfires with the monitor in Klamath Falls; and other meteorological data showing the direction and impact to the monitors.

What happens after the public comment period ends?

DEQ will consider the public comment received and make changes to the document as needed. Once finalized, the Exceptional Events Request document will be submitted to EPA for their review and concurrence. If EPA concurs, they will exclude monitored exceedances of the NAAQS from the dataset and Klamath Falls will be able to show compliance with the standard.

Where can I get more information?

Find out more and [view the document](#), or contact Rachel Sakata, Air Quality Planner:

Klamath Falls 2014 and 2015 Exceptional Event Request

Phone: 503-229-5659

Fax: 503-229-6954

Email: sakata.rachel@deq.state.or.us

Accessibility information

Documents can be provided upon request in an alternate format for individuals with disabilities

or in a language other than English for people with limited English skills. To request a document in another format or language, call DEQ in Portland at 503-229-5696, or toll-free in Oregon at 1-800-452-4011, ext. 5696; or email deqinfo@deq.state.or.us.