Exceptional Events Demonstration for Ozone Exceedances

Northern California 2020 Wildfire Events

November 18, 2021

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Acronyms

amsl	Above Mean Sea Level
AOD	Aerosol Optical Depth
APCD	Air Pollution Control District
AQMD	Air Quality Management District
AQS ID	U.S. EPA Air Quality System Identification
BLM	Bureau of Land Management
CAA	Clean Air Act
CalFire	California Department of Forestry and Fire Protection
CARB	California Air Resources Board
CBSA	Census Core-based Statistical Area
CFR	Code of Federal Regulations
CMAQ	Community Multiscale Air Quality
CMAS	Community Modeling and Analysis System
CO	Carbon Monoxide
DV	Design Value
EER	Exceptional Events Rule
EKA	NWS Eureka Forecast Office
F	Fahrenheit
FCCS	Fuel Characteristic Classification System
FEMA	Federal Emergency Management Agency
FEPS	Fire Emissions Production Simulator
FR	Federal Register
FRAP	Fire and Resource Assessment Program
GIS	Geographic Information System
HMS	(NOAA) Hazard and Mapping System
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory
ISU	Iowa State University
m	meters

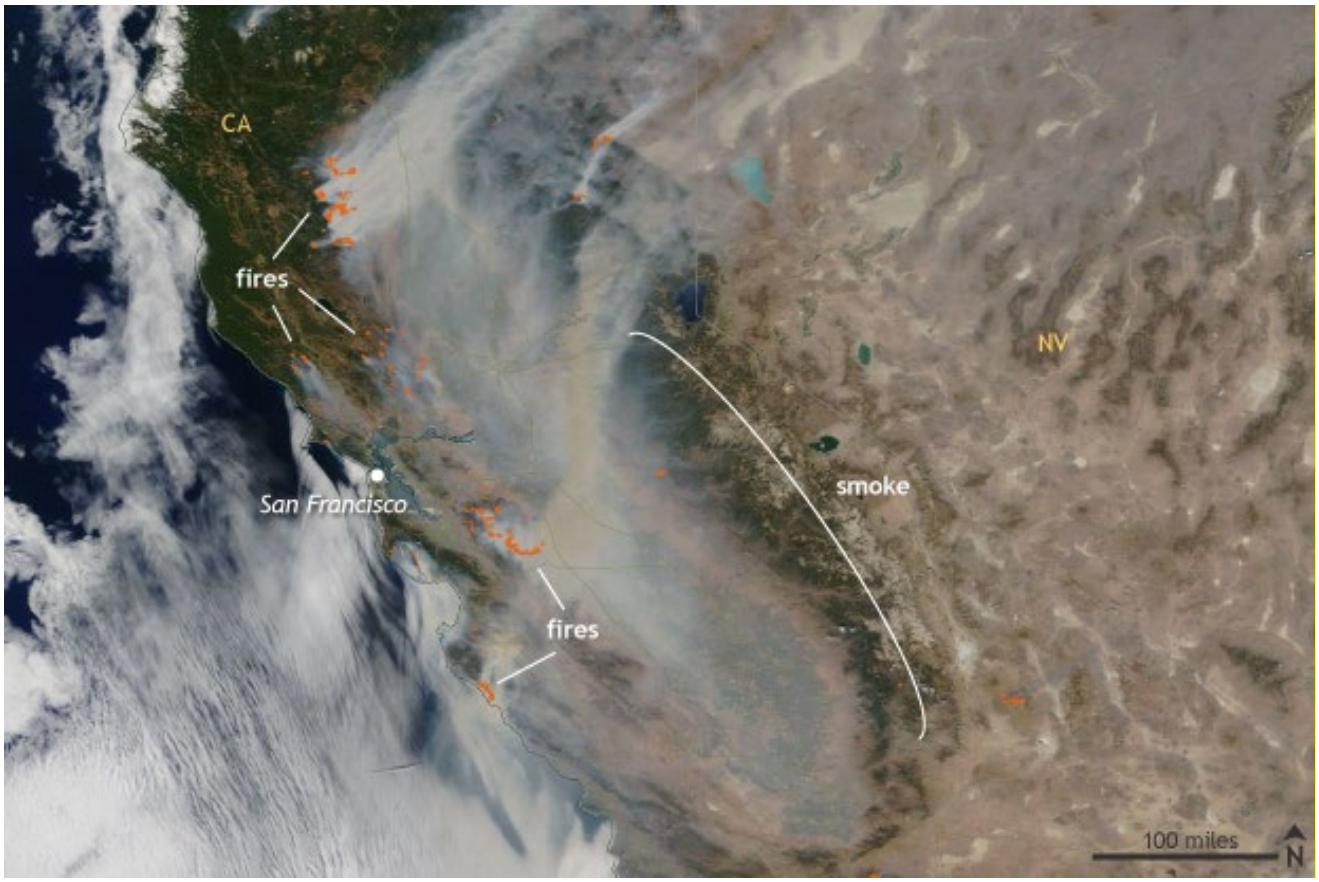
mb	millibars
MODIS	Moderate Resolution Imaging Spectroradiometer
mph	miles per hour
MSA	Metropolitan Statistical Area
NAAPS	Navy Aerosol Analysis and Prediction System
NAAQS	National Ambient Air Quality Standard(s)
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NIFC	National Interagency Fire Center
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOx	Oxides of Nitrogen
NPP	National Polar-orbiting Partnership
NPS	National Park Service
NWCC	Northwest Interagency Coordination Center
NWS	National Weather Service
O_3	Ozone
PM	Particulate Matter
PM_{10}	Particulate Matter less than or equal to 10 microns in aerodynamic diameter
$PM_{2.5}$	Particulate Matter less than or equal to 2.5 microns in aerodynamic diameter
POC	Parameter Occurrence Code
ppm	parts per million
PQAO	Primary Quality Assurance Organization
PST	Pacific Standard Time
Q/D	Emissions divided by Distance
ROG	Reactive Organic Gas, used interchangeably with Volatile Organic Compound (VOC) in this report
SF2	SmartFire2

SIP	State Implementation Plan
SMOKE	Sparse Matrix Operator Kernel Emissions
SPECIATE	U.S. EPA repository of organic gas and particulate matter speciation emission source profiles
SSEC	Space Science and Engineering Center
STO	NWS Sacramento Forecast Office
UNC	University of North Carolina
U.S. EPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
UTC	Coordinated Universal Time
UWM	University of Wisconsin, Madison
VOC	Volatile Organic Compound
WRCC	Western Regional Climate Center

I. Overview/Introduction

During the summer of 2020, extreme fuel conditions in California created an extreme fire season. Almost all of Northern California and large portions of Southern California were affected (Figure I-1), with smoke and haze lingering for weeks. As expected, numerous monitoring sites recorded elevated particulate matter (PM) concentration levels, with many days above the National Ambient Air Quality Standards (NAAQS) for both $PM_{2.5}$ and PM_{10}. Ozone concentrations were also impacted, with levels above and beyond that normally seen during the summer high ozone season.

Figure I-1: NASA MODIS Terra satellite image - August 21, 2020[1]



A. NAAQS and Attainment Status

To protect public health and the environment, the U.S. Environmental Protection Agency (U.S. EPA) has set a NAAQS (or standard) for ozone (O_3) that specifies the maximum allowed concentration to be present in outdoor ambient air. The national ozone standard, first being set in 1979, has been periodically reviewed and revised, resulting in stricter and more health

[1] *https://www.climate.gov/news-features/event-tracker/over-million-acres-burned-california-second-half-august-2020,* last accessed 10/20/21

protective standards set at lower and lower concentrations. Areas determined not to meet these standards are considered nonattainment areas. An 8-hour ozone standard was initially promulgated in 1997, and further revised in 2008 and 2015 as noted in Table I-1. Due to its high population, urban density, and unique geography, California is home to a significant number of ozone nonattainment areas.

Table I-1: 8-Hour Ozone NAAQS

Final Rule/Decision	**Level (ppm – parts per million)**
1997	0.08
2008	0.075
2015	0.070

The Sutter Buttes in Sutter County and the entirety of Tuolumne County were designated as Marginal nonattainment areas for the 2015 Ozone NAAQS. The western portion of Nevada County was designated as a Serious nonattainment area for the 2008 Ozone NAAQS. The impacted site(s) and upcoming regulatory determination(s) are indicated in Table I-2.

Table I-2: Ozone nonattainment areas in Northern California with upcoming regulatory determinations

Nonattainment Area	Ozone NAAQS	Classification	Regulatory Determination	Impacted Site	AQS ID
Sutter Buttes	2015	Marginal	Attainment	Sutter Buttes	06-101-0004
Tuolumne County	2015	Marginal	Attainment	Sonora	06-109-0005
Western Nevada County	2008	Serious	Attainment	Grass Valley-Litton Building	06-057-0005

B. Clean Air Act and Exceptional Event Rule Requirements

The Clean Air Act (CAA)[2] defines an exceptional event as:

1. The event affected air quality;
2. The event was not reasonably controllable or preventable;
3. The event was caused by human activity that is unlikely to recur at a particular location or was a natural event; and

[2] CAA Section 319(b)

4. There exists a clear causal relationship between the specific event and the monitored exceedance.

On October 3, 2016, the EPA finalized revisions to the "Treatment of Data Influenced by Exceptional Events",[3] also known as the Exceptional Events Rule (EER). These regulations govern exclusion of event-influenced air quality data from certain regulatory determinations of the U.S. EPA Administrator under the CAA Regulatory determinations applicable under the revised EER which are:

- An action to designate or redesignate an area as attainment, unclassifiable/attainment, nonattainment, or unclassifiable for a particular NAAQS;
- The assignment or re-assignment of a classification category to a nonattainment area;
- A determination regarding whether a nonattainment area has attained a NAAQS by its CAA deadline, including a "clean data determination";
- A determination that an area has data for the specific NAAQS that qualify the area for an attainment date extension under the CAA provisions;
- A finding of SIP inadequacy leading to a SIP call; and
- Other actions on a case-by-case basis.

U.S. EPA regulations[4] state that exceptional events demonstrations must address and include the following elements:

1. A narrative conceptual model;
2. A demonstration that the event was both not reasonably controllable and not reasonably preventable;
3. A demonstration that the event was a human activity unlikely to recur at a particular location or was a natural event; and
4. A demonstration 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.

C. Actions Requested

Although a significant number of ozone nonattainment areas were impacted by the historic 2020 wildfires, not all areas have upcoming regulatory determinations applicable under the revised EER. The California Air Resources Board (CARB) is submitting this Exceptional Event demonstration to U.S. EPA for days in the summer and fall of 2020 that impacted the ozone nonattainment areas of the Sutter Buttes in Sutter County, Tuolumne County, and the Western Portion of Nevada County. These days, along with impacted days in 2018 that were addressed in CARB's Demonstration for the Northern Region 2018 Ozone Exceptional Events[5], will affect the upcoming attainment year determinations for the pertinent 2008 and 2015 ozone NAAQS for areas which have otherwise met the level of the standards (Figure I-2, Table I-3). The specific exceedances of the standards requested for concurrence at the

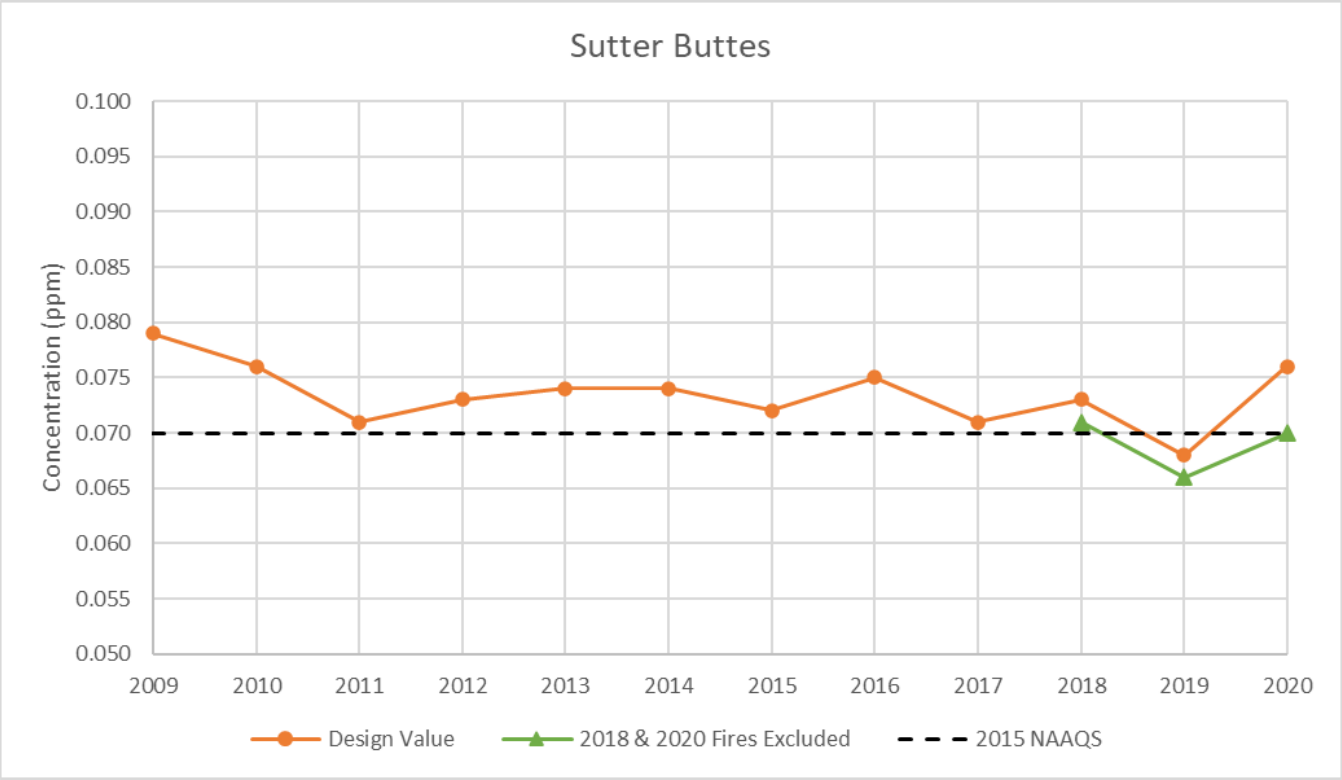
[3] 81 FR 68216

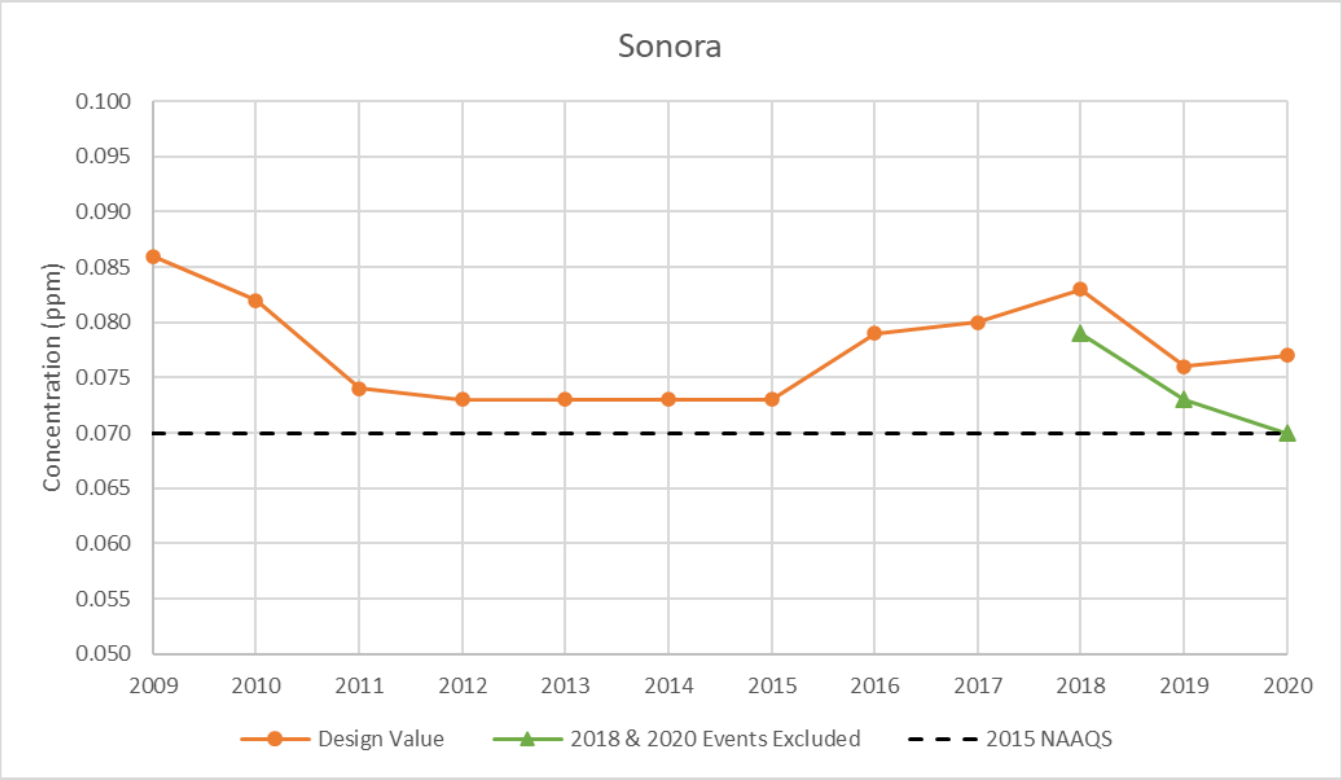
[4] 40 CFR 50.14(c)(3)(iv)

[5] *https://ww2.arb.ca.gov/our-work/programs/state-and-federal-area-designations/exceptional-events*

Sutter Buttes, Sonora (Tuolumne County), and Grass Valley (Western Part of Nevada County) monitors are listed in Table I-4.

Figure I-2: 8-hour ozone design values at Sutter Buttes, Sonora, and Grass Valley




Sonora
Concentration (ppm)
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Design Value
2018 & 2020 Events Excluded
2015 NAAQS

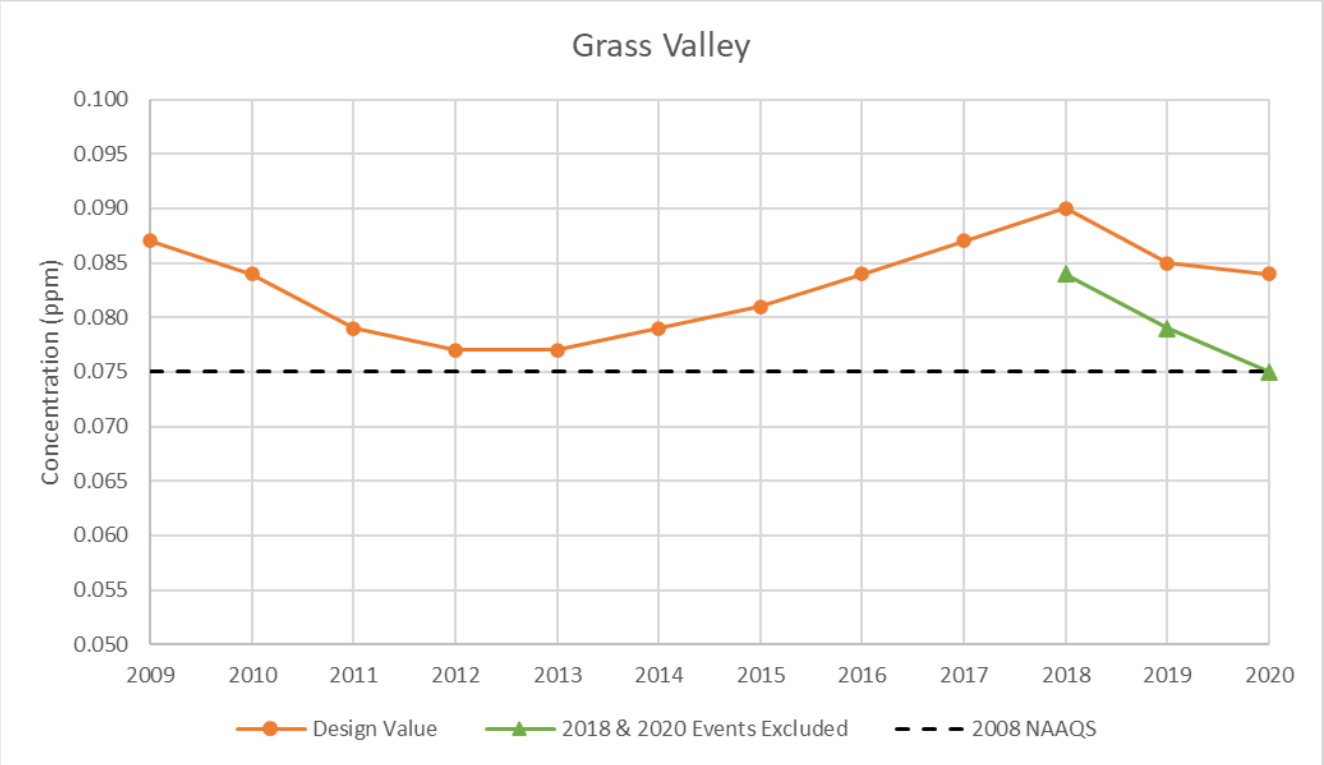

Grass Valley
Concentration (ppm)
0.100
0.095
0.090
0.085
0.080
0.075
0.070
0.065
0.060
0.055
0.050
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Design Value
2018 & 2020 Events Excluded
2008 NAAQS

Table I-3: 8-hour ozone design values with and without U.S. EPA concurrence (2018 and 2020 events)

Design Value Without Concurrence

Site	2018	2019	2020
Sutter Buttes	0.073	0.068*	0.076
Sonora	0.083	0.076	0.077
Grass Valley[#]	0.090	0.085	0.084

[#] 8-hour design value for 2008 (0.075 ppm) NAAQS

* Invalid design value due to insufficient data in 2017

Design Value With Concurrence

Site	2018	2019	2020
Sutter Buttes	0.071	0.066*	0.070
Sonora	0.079	0.073	0.070
Grass Valley[#]	0.084	0.079	0.075

Table I-4: Summary of 2020 8-Hour ozone exceedances influenced by wildland fires

Air District	Monitoring Site	AQS ID	POC	Date	8-Hour Concentration
Feather River	Sutter Buttes	06-101-0004	1	8/21/2020	0.090
Feather River	Sutter Buttes	06-101-0004	1	8/22/2020	0.089
Tuolumne	Sonora	06-109-0005	1	8/20/2020	0.081
Tuolumne	Sonora	06-109-0005	1	8/21/2020	0.083
Tuolumne	Sonora	06-109-0005	1	8/22/2020	0.081
Northern Sierra	Grass Valley	06-057-0005	1	8/20/2020	0.122
Northern Sierra	Grass Valley	06-057-0005	1	8/21/2020	0.104
Northern Sierra	Grass Valley	06-057-0005	1	9/12/2020	0.086

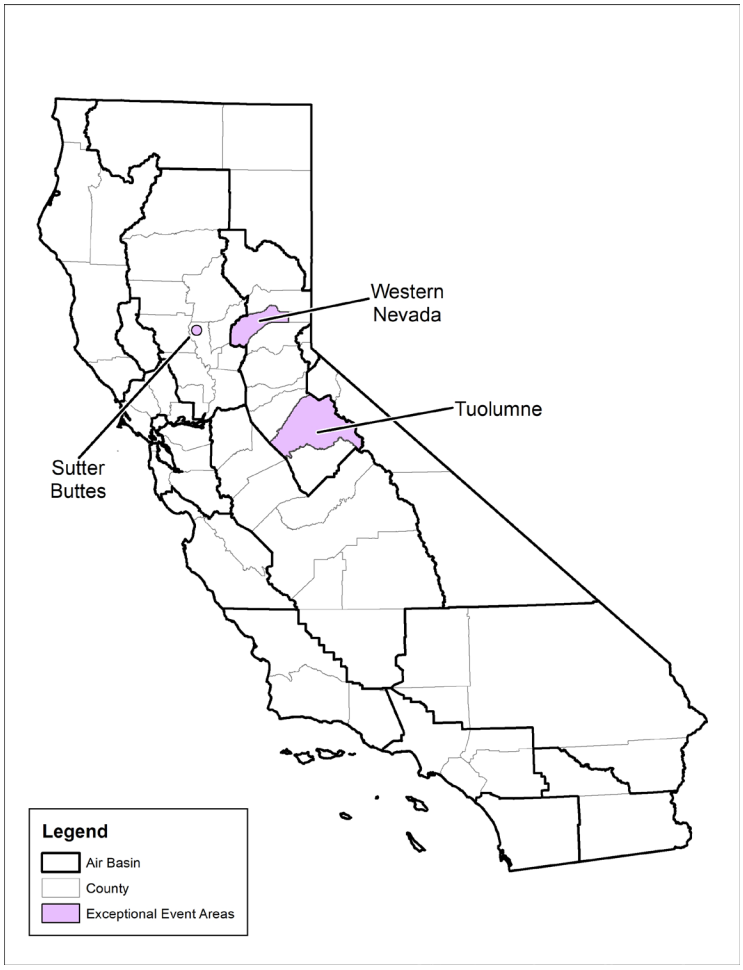
Air District	Monitoring Site	AQS ID	POC	Date	8-Hour Concentration
Northern Sierra	Grass Valley	06-057-0005	1	9/13/2020	0.081
Northern Sierra	Grass Valley	06-057-0005	1	9/14/2020	0.079

II. Background

California is divided geographically into air basins to manage the air resources of the State on a regional basis. An air basin generally has similar meteorological and geographic conditions throughout. The State is currently divided into 15 air basins, and further subdivided into 35 local air pollution control districts (APCD(s) or district(s)) or air quality management districts (AQMD(s) or district(s)).

Almost the entire State of California was impacted by wildfires from August to September of 2020. It is estimated that almost 95 percent of the population of the State experienced one or more days impacted by unhealthy smoke from these fires.

Figure II-1: Map of nonattainment areas with exceptional events addressed in this document



D. Regional Descriptions

This demonstration covers nonattainment areas in two air basins, the Sacramento Valley and the Mountain Counties.

The Sacramento Valley Air Basin (SVAB) is bounded on the north and west by the Coastal Mountain Range, on the east by the southern portion of the Cascade Mountain Range, and the northern portion of the Sierra Nevada Mountains. These mountain ranges reach heights in excess of 6,000 feet above mean sea level, with individual peaks rising much higher. The mountains provide a substantial barrier to both locally created pollution and the pollution that has been transported northward on prevailing winds. The air basin is shaped like an elongated bowl.

The Mountain Counties Air Basin (MCAB) lies along the northern Sierra Nevada mountain range, close to or contiguous with the Nevada border, and covers an area of roughly 11,000 square miles. Elevations range from several hundred feet in the foothills to over 10,000 feet above mean sea level along portions of the Sierra crest. Topography is highly variable,

including rugged mountain peaks and valleys with extreme slopes and differences in elevation in the Sierras, as well as rolling foothills to the west. The general climate of the MCAB varies considerably with elevation and proximity to the Sierra range. Regional wind flows are affected by the mountains and hills, which direct surface air flows, cause shallow vertical mixing, and create areas of high pollutant concentrations by hindering dispersion.

1. Sutter Buttes / Sutter County / Feather River AQMD

The Feather River AQMD (FRAQMD) includes both Sutter and Yuba counties and is located in the SVAB. The FRAQMD is bordered by Butte County to the north, Colusa and Yolo Counties to the west, and Sacramento and a portion of Placer County to the south, all in the SVAB. The FRAQMD is bordered to the east by the MCAB, specifically Sierra and Nevada Counties (Figure II-1).

Although part of the FRAQMD is at elevations higher than 1,000 feet above sea level, the vast majority of its populace lives and works below that elevation. The four incorporated cities of Marysville (population just over 12,000), Wheatland (population just above 3,000), Yuba City (population approximately 65,000), and Live Oak (population of about 8,000) are located on the valley floor between 59-92 feet elevation.

Summers are typically dry and warm. Most of the precipitation occurs during the winter months from December to March with an average rainfall of 21 inches. Average summer temperatures range from an average high of 93◦F to an average low of 60◦F. Average winter temperatures range from an average high of 57◦F to an average low of 39◦F[6].

The Sutter Buttes ozone monitor was established in 1993 and is located on the top of South Buttes in the Sutter Buttes Mountain Range, a circular complex of eroded volcanic lava domes which rise to a maximum elevation of 2,115 feet and cover a roughly circular area about 11 miles in diameter.[7] The surrounding area is a broad, flat agricultural plain at elevation 65 feet, over 2000 feet lower than the monitor.

The Sutter Buttes monitor was placed to detect pollutant transport at high elevations and measured ozone levels aloft that exceed the standard. U.S. EPA designated the Sutter Buttes mountain top area as a nonattainment area for the 8-hour ozone standard, separate from the rest of FRAQMD as the other air quality monitor intended to measure population exposure in Sutter and Yuba Counties is located in Yuba City at a considerably lower elevation of 60 feet. This monitor was designated as attainment of the 8-hour ozone standard. The limited nonattainment area was not intended to be subject to control requirements, with a regional

[6] Climate data obtained from https://wrcc.dri.edu/ covering 1981-2010 measurements from the Marysville station.

[7] U.S. EPA, HYPERLINK *https://www.epa.gov/sites/default/files/2017-12/documents/ca_120d_tsd_combined_final.pdf California Intended Area Designations for the 2015 Ozone National Ambient Air Quality Standards Technical Support Document (TSD),* p.290, last accessed 8/31/21

modeling demonstration showing that this elevated site would attain the standard as a result of upwind controls and the comprehensive statewide emission control program.

South Sutter County is designated as a Moderate nonattainment area for the 2015 Ozone NAAQS and is part of the Sacramento Metro Ozone Nonattainment Area. This nonattainment area requested to be bumped up to Serious nonattainment and the request granted by the U.S. EPA[8] effective November 29, 2021. The Sutter Buttes is designated as a Marginal nonattainment area for the 2015 Ozone NAAQS. The remainder of Sutter County and all of Yuba County is in attainment for the ozone NAAQS.

2. Tuolumne County (Sonora)

The Tuolumne County APCD includes all of Tuolumne County, located along the western slope of the central Sierra Nevada mountain range. The county is bordered on the north by Calaveras and Alpine Counties, on the east by Mono County, on the south by Mariposa and Merced Counties, and on the west by Stanislaus County (Figure II-1). Tuolumne County is one of seven districts that make up the MCAB. According to the U.S. Census Bureau Tuolumne County comprises 2,274 square miles with approximately 75 percent of land under the jurisdiction of government agencies, most of that land being in the Stanislaus National Forest and Yosemite National Park.

Tuolumne County has a population of approximately 55,000 people with the City of Sonora being the only incorporated city with a population of almost 5,000. The unincorporated county is predominantly rural with dispersed small-town communities primarily located on three State highways (Highways 49, 120, and 108). The county ranges in elevation from 200 to 13,000 feet and is home to the two highest mountain passes through the Sierra Nevada, Tioga pass (9,945 feet) and Sonora Pass (9,628 feet)

The general climate of Tuolumne County varies with elevation but is considered a Mediterranean climate with dry summers and mild or cool winters. The local terrain creates a wide range of temperatures, rainfall, and localized winds. Predominate surface winds during ozone season (Summer through early Fall) are westerly, with occasional northerly or southerly variations. Like most foothill counties, Tuolumne County experiences up-slope winds during the day and down-slope winds at night, a diurnal trend typically seen during the Spring, Summer, and Fall months, which can affect pollutant transport. Temperature inversions also play a critical role in preventing dispersion of smoke and other air pollutants.

Tuolumne County is a Marginal nonattainment area for the 2015 Ozone NAAQS. In 2001, CARB identified several counties in the MCAB impacted by significant ozone transport from upwind urban areas[9]. This led to a classification of these counties for the California Ambient Air Quality Standards, including Tuolumne County, as being nonattainment due to

[8] *86 FR 59648*

[9] *https://ww2.arb.ca.gov/our-work/programs/resource-center/technical-assistance/air-quality-and-emissions-data/ozone*

"overwhelming transport"[10]. The upwind areas that have been established as contributing to Tuolumne County's violations are the San Joaquin Valley, San Francisco Bay Area, and the Broader Sacramento Area. To date, this classification has not changed. Tuolumne County's one ozone monitor is located in Sonora.

3. Western Part of Nevada County (Grass Valley) / Northern Sierra AQMD

The Northern Sierra AQMD includes the California counties of Nevada, Sierra, and Plumas. Nevada County spans the Sierra Nevada mountain range and is bordered on the north by Sierra County and the south by Placer County, in the MCAB. To the east is the State of Nevada and to the west is the Feather River AQMD in the SVAB (Figure II-1).

Nevada County has a population of approximately 100,000 with more than 80 percent of the population and emissions in the western, nonattainment portion. The largest town in the nonattainment area is Grass Valley, with an estimated population of 12,817 as of 2019[11].

The predominant wind direction in western Nevada County, especially during the summer months, is from southwest to northeast. This pattern is conducive to the transport of pollutants from the Bay Area and the Sacramento Area into Nevada County. On most summer mornings the "delta breeze" moves from the Carquinez Strait northeast towards Sacramento and then veers northward and continues into the northern Sacramento Valley and into the foothills of the northern Sierra Nevada, including Western Nevada County. High ozone days are typically associated with light to moderate winds blowing from the direction of Sacramento. In the absence of a significant weather system affecting the area, summertime winds in Nevada County typically flow up-slope in the daytime and down-slope at night (referred to as a diurnal flow pattern).

Most ozone exceedances happen on hot, dry, clear afternoons and evenings. High summer temperatures and low relative humidity play a big role in ozone formation. Sunlight is another factor, with exceedance days being relatively concentrated in the long, clear days of June through August. The combination of a hot, dry summer and little to no cloud cover favors photochemical ozone formation. As a result of conditions encouraging ozone formation and the transport of both ozone and ozone precursors from upwind metropolitan areas, ozone concentrations tend to be the highest in July and August. The monthly average of ozone concentrations at the Grass Valley[12] air monitoring site gradually rise from the beginning of the year toward the summer where levels peak in July and August when temperatures are usually the hottest, then decline during the fall.

The Western Part of Nevada County Nonattainment Area is located in northern California's Sierra Nevada foothills. Although the nonattainment area is relatively small (802.41 square

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[10] *https://www.arb.ca.gov/aqd/transport/summary/transportsummary.pdf*, last accessed on 11/8/21

[11] *https://www.census.gov/quickfacts/grassvalleycitycalifornia* , last accessed on 8/27/21

[12] Data obtained from Northern Sierra AQMD maintained Ozone monitoring site at 200 Litton Drive in Grass Valley

miles), it rises from near 300 feet above mean sea level in the west to over 9,000 feet above mean sea level near the eastern boundary. The eastern boundary is a line running north/south that more or less follows rugged mountain tops that form the "Sierra Crest." The line crosses Interstate-80 slightly east of the town of Soda Springs. The nonattainment area is bordered on the north by the Middle Yuba River and is bisected by the South Yuba River. Most of the southern border is defined by the Bear River. The massive scenic canyons created by these rivers run predominantly east/west and are more than 2,000 feet deep in some places.

E. Overview of Monitoring Network

The CARB Primary Quality Assurance Organization (PQAO) is comprised of 32 of the 35 air districts in California. The three remaining districts, the Bay Area Air Quality Management District, San Diego County Air Pollution Control District, and South Coast AQMD, represent their own PQAOs.

California's ambient air monitoring network includes over 250 sites and more than 700 monitors, making it one of the most extensive in the world. Many regions in California are characterized by complex terrain, variable meteorological conditions, and diverse emission sources. A large monitoring network is critical for assessing the State's progress in meeting clean air objectives, understanding spatial and temporal variation in air pollutants, and evaluating pollutant exposure. Monitors are operated by CARB, local air districts, and other entities including the National Park Service, private contractors, and tribal authorities.

In the SVAB, there is one nonattainment area covered by this demonstration (Figure II-2, Table II-1). The Sutter Buttes in Sutter County has one ozone monitor.

The MCAB has two nonattainment areas covered by this demonstration (Figure II-2, Table II-1). The Western Part of Nevada County has one ozone monitor at Grass Valley and Tuolumne County has one ozone monitor at Sonora.

Figure II-2: Ozone and $PM_{2.5}$ monitoring in Sacramento Valley and Mountain Counties Air Basins

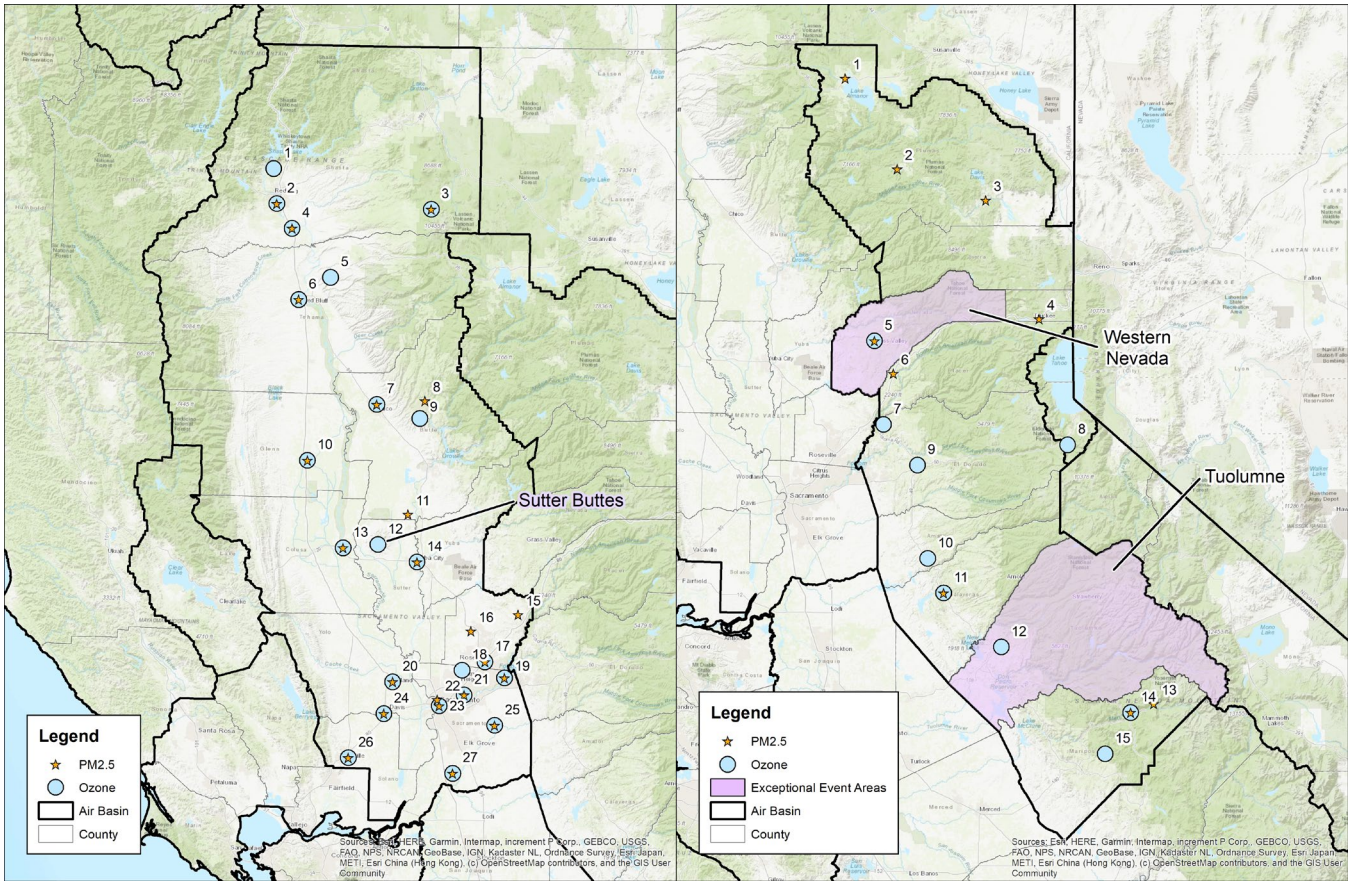


Table II-1: Monitoring sites in Sacramento Valley and Mountain Counties Air Basins

Number	Monitoring Site	Ozone	PM2.5
1	Shasta Lake-Lake Blvd	X	
2	Redding-Health Dept	X	X
3	Lassen Volcanic Natl Park-Manzanita Lake	X	X
4	Anderson-North St	X	X
5	Tuscan Buttes	X	
6	Red Bluff-Walnut St	X	X
7	Chico-East Ave	X	X

Number	Monitoring Site	Ozone	PM2.5
8	Paradise-Theater		X
9	Paradise-Airport Rd	X	
10	Willows-N Colusa St	X	X
11	Gridley-Cowee Ave		X
12	Sutter Buttes	X	
13	Colusa-Sunrise Blvd	X	X
14	Yuba City-Almond St	X	X
15	Auburn-Atwood Ave		X
16	Lincoln-Moore Rd		X
17	Roseville-N Sunrise Blvd	X	X
18	North Highlands-Blackfoot Way	X	
19	Folsom-Natoma St	X	X
20	Woodland-Gibson Rd	X	X
21	Sacramento-Del Paso Manor	X	X
22	Sacramento-Bercut Dr		X
23	Sacramento-T St	X	X
24	Davis-UCD Campus	X	X
25	Sloughhouse	X	X
26	Vacaville-Ulatis Dr	X	X
27	Elk Grove-Bruceville Rd	X	X

Number	Monitoring Site	Ozone	PM2.5
1	Chester-1st Ave		X
2	Quincy-N Church St		X
3	Portola-Gulling St		X
4	Truckee-Fire Station		X
5	Grass Valley-Litton Building	X	X
6	Colfax-City Hall		X
7	Cool-Highway 193	X	
8	Echo Summit	X	
9	Placerville-Gold Nugget Way	X	
10	Jackson-Clinton Rd	X	
11	San Andreas-Gold Strike Rd	X	X
12	Sonora-Barretta St	X	
13	Yosemite Village-Visitor Center		X
14	Yosemite-Turtleback Dome	X	X
15	Jerseydale-6440 Jerseydale	X	

The ambient air monitoring networks in these areas meet the minimum monitoring requirements for all criteria pollutants pursuant to Title 40, Part 58 of the Code of Federal Regulations (CFR), Appendix D. The monitoring network in each area is reviewed annually to fulfill the requirements defined in 40 CFR 58.10 to ensure the networks meet the monitoring objectives defined in 40 CFR 58, Appendix D. Data was collected and quality assured as per 40 CFR 58 and submitted to the Air Quality System (AQS).

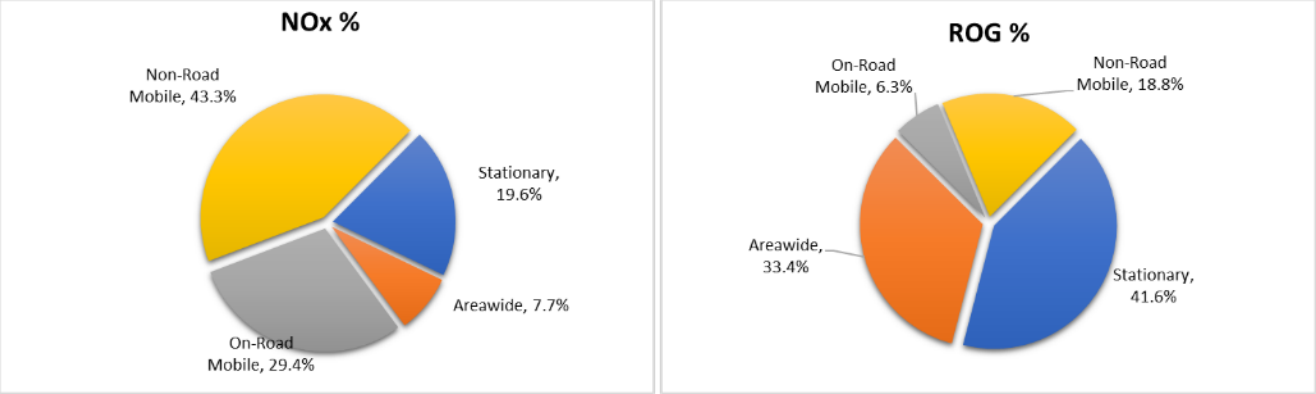
F. Characteristics of Non-Event O_3 Formation

Ground-level ozone is formed by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (ROG or VOC) in the presence of heat and sunlight. Further discussion is separated by area.

1. Sutter Buttes / Sutter County / Feather River AQMD

The non-road mobile and stationary source categories are the largest sources of anthropogenic NO_x and ROG emissions (known ozone precursors) in Sutter County, respectively (Figure II-3).

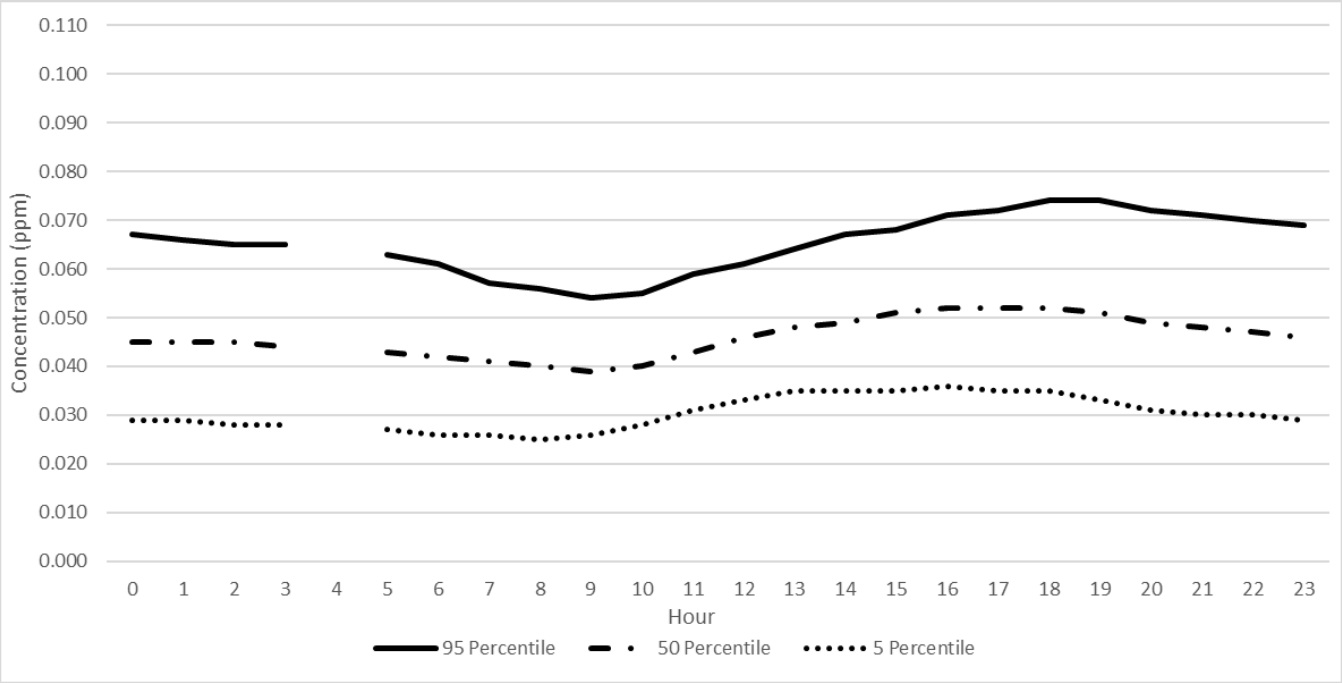
Figure II-3: Sutter County anthropogenic daily summer 2020 NO_x and ROG emissions estimates.[13]



The highest ozone values occur from April through October, with exceedances during the remainder of the year extremely rare. Ozone concentrations at the Sutter Buttes typically peak in the late afternoon to early evening (Figure II-4) and are lowest in the late morning. Daily calibration checks frequently occurred during the early morning in 2015-2019, so data for hour 4 was excluded from the calculation of percentiles.

[13] CEPAM: Version 1.03 Planning Inventory Tool. *http://outapp.arb.ca.gov/cefs/2019ozsip/fcemssumcat_2019sip103.php*

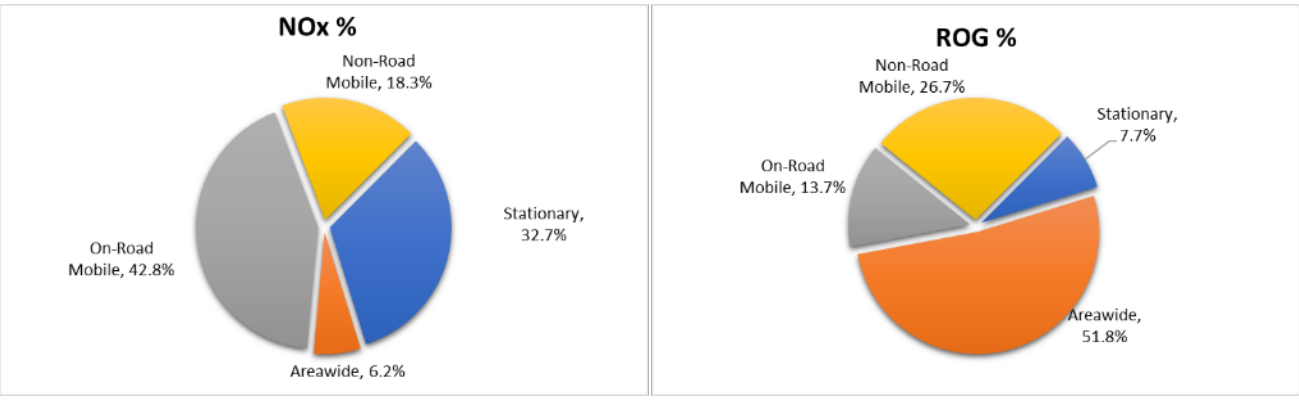
Figure II-4: Typical April-October 1-hour ozone diurnal pattern at Sutter Buttes (2015-2019)



2. Tuolumne County (Sonora)

The on-road mobile and areawide source categories are the largest sources of anthropogenic NO_x and ROG emissions (known ozone precursors) in Tuolumne County, respectively (Figure II-5).

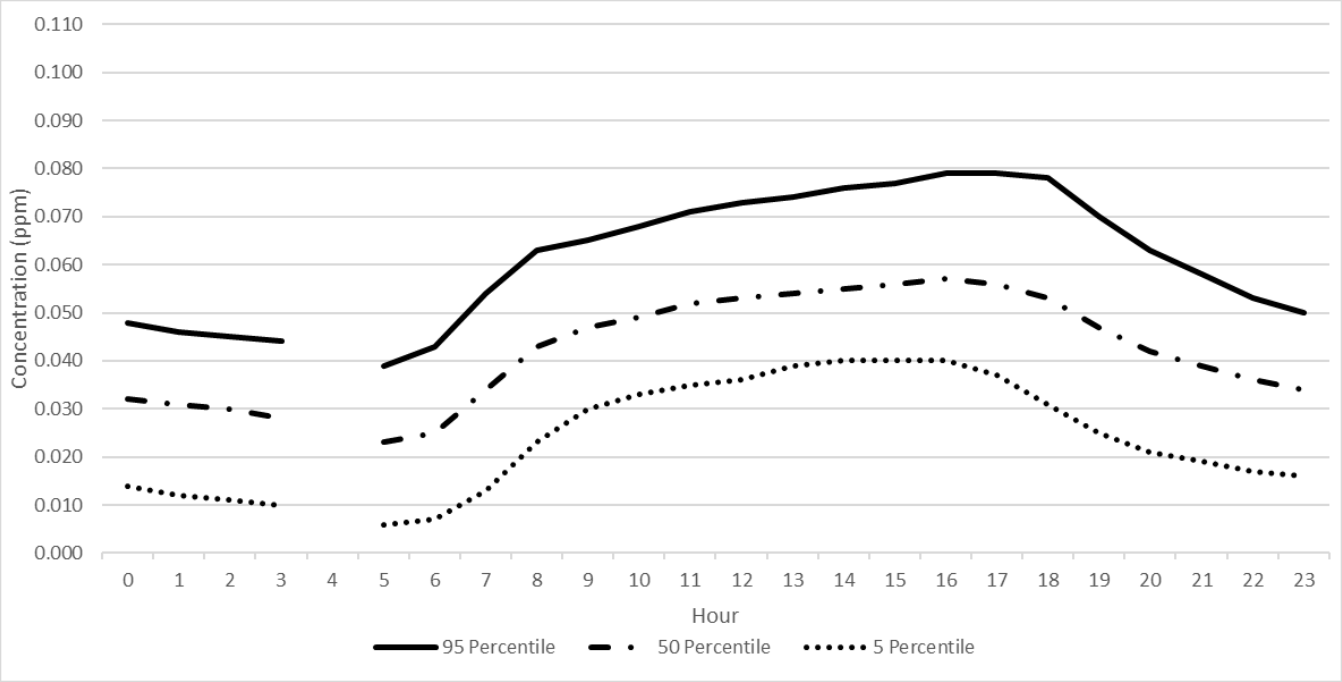
Figure II-5: Tuolumne County anthropogenic daily summer 2020 NO_x and ROG emissions estimates.[14]



[14] CEPAM: Version 1.03 Planning Inventory Tool.
http://outapp.arb.ca.gov/cefs/2019ozsip/fcemssumcat_2019sip103.php

The highest ozone values occur from April through October, with exceedances during the remainder of the year extremely rare. Ozone concentrations at Sonora typically peak in the late afternoon (Figure II-6) and are lowest in the early morning. Daily calibration checks frequently occurred during the lower concentration time period in 2015-2019, so data for hour 4 was excluded from the calculation of percentiles.

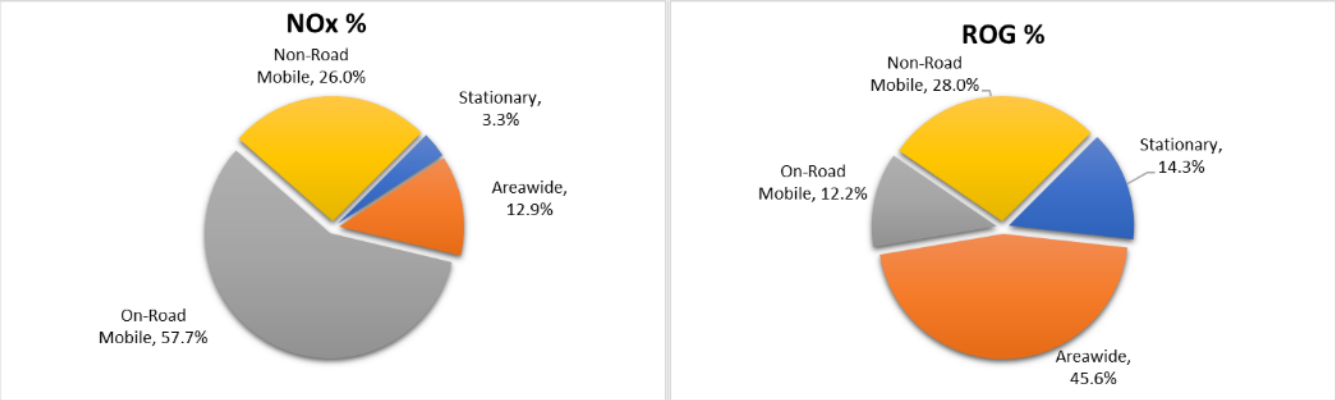
Figure II-6: Typical April-October 1-hour ozone diurnal pattern at Sonora (2015-2019)



3. Western Part of Nevada County (Grass Valley) / Northern Sierra AQMD

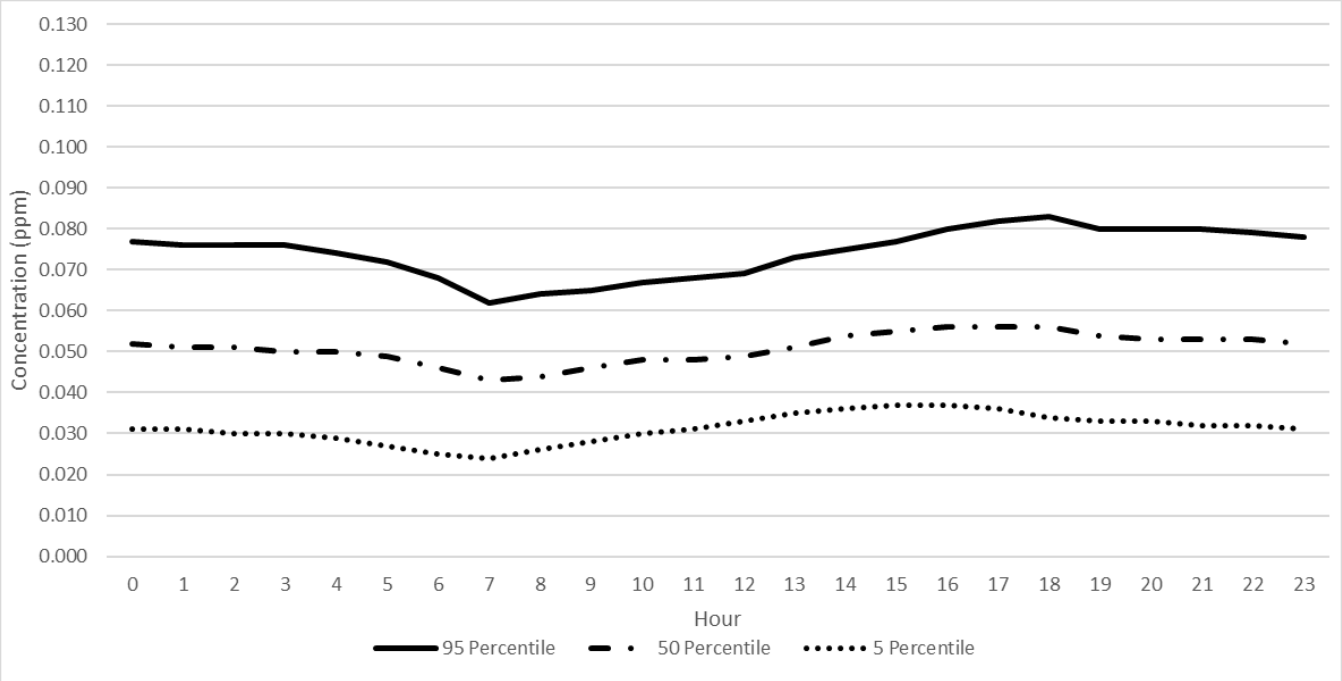
The on-road mobile and areawide source categories are the largest sources of anthropogenic NO_x and ROG emissions (known ozone precursors) in Nevada County, respectively (Figure II-7).

Figure II-7: Western Part of Nevada County anthropogenic daily summer 2020 NO_x and ROG emissions estimates.[15]



The highest ozone values occur from April through October, with exceedances during the remainder of the year extremely rare. Ozone concentrations are typically low early morning, peaking during late afternoon into early evening hours (Figure II-8).

Figure II-8: Typical April-October 1-hour ozone diurnal pattern at Grass Valley (2015-2019)



[15] CEPAM: Version 1.03 West Nevada Ozone Nonattainment Area Tool. *http://outapp.arb.ca.gov/cefs/2019ozsip/fcemssumcat_sip19wnoz103.php*

G. Characteristics of Event O_3 Formation

Although wildfires occur in California every year, the number of wildfires and the amount of acreage burned has increased substantially, from an average of less than 5,000 fires burning 200,000 acres,[16] to a record 9,917 incidents and 4,257,863 acres burned in 2020.[17] The impact of these wildfires on air quality has been dramatic. Smoke from large fires has caused extreme concentrations of PM and ozone, especially in the western United States.[18]

Wildfires generate large amounts of ozone precursors, including NOx and ROG, which can contribute to elevated ozone levels in California. However, there are large variations in the amount of emissions (depending on the fuel type and combustion temperature), plume heights, smoke density, and meteorological conditions during different wildfires. All of these factors can significantly impact subsequent ozone production.[19]

Additionally, the amount of ozone within a smoke plume also varies with distance from the fire.[20] Due to the titration by nitric oxide (NO) from fire emissions and the blocking of sunlight by PM emissions, which hinders photochemical reactions, ozone concentrations near active fires are sometimes even lower relative to baseline concentrations. As the ozone precursors transport downwind along with the other air pollutants such as PM, ozone is produced within the smoke plume which could result in ozone exceedances at the surface in downwind areas. Research studies found that distant wildfires can raise ground-level ozone concentrations to unhealthy levels even at large distances from the fire location.[21]

III. Narrative Conceptual Model

The Narrative Conceptual Model describes the events causing the exceedances or violations seen at the monitor and includes a discussion of how the events led to concentrations above the NAAQS during the periods of August 20 to 22 and September 12 to 14.

A. Wildfire Information

2020 was another extreme year for wildfires, with numerous wildfires active during the time of the exceedances discussed in this demonstration (Figure III-1, Table III-1); although not all wildfires impacted each monitor on any given day. Hot and dry conditions at the surface combined with mid-level moisture resulted in elevated instability. The ensuing thunderstorms ignited multiple wildfires, resulting in smoke that accumulated throughout northern and central California. The accumulating smoke layers made identification of the impact of just

[16] CalFire, *2017 Statistics and Events (5 year average)*, last accessed 8/20/21
[17] California Department of Forestry and Fire Protection (CalFire); *https://www.fire.ca.gov/incidents/2020/*
[18] Gong et al., 2017; Laing and Jaffe, 2019; Mass and Ovens, 2019; Jaffe et al., 2020
[19] Jaffe and Wigder, 2012; Faloona et al., 2020
[20] Faloona et al., 2020
[21] Pfister et al., 2008

one particular wildfire difficult. The majority of these fires, and all of the megafires, occurred on wildland or in the urban/wildland interface.

Figure III-1: Active major wildfires, August and September 2020

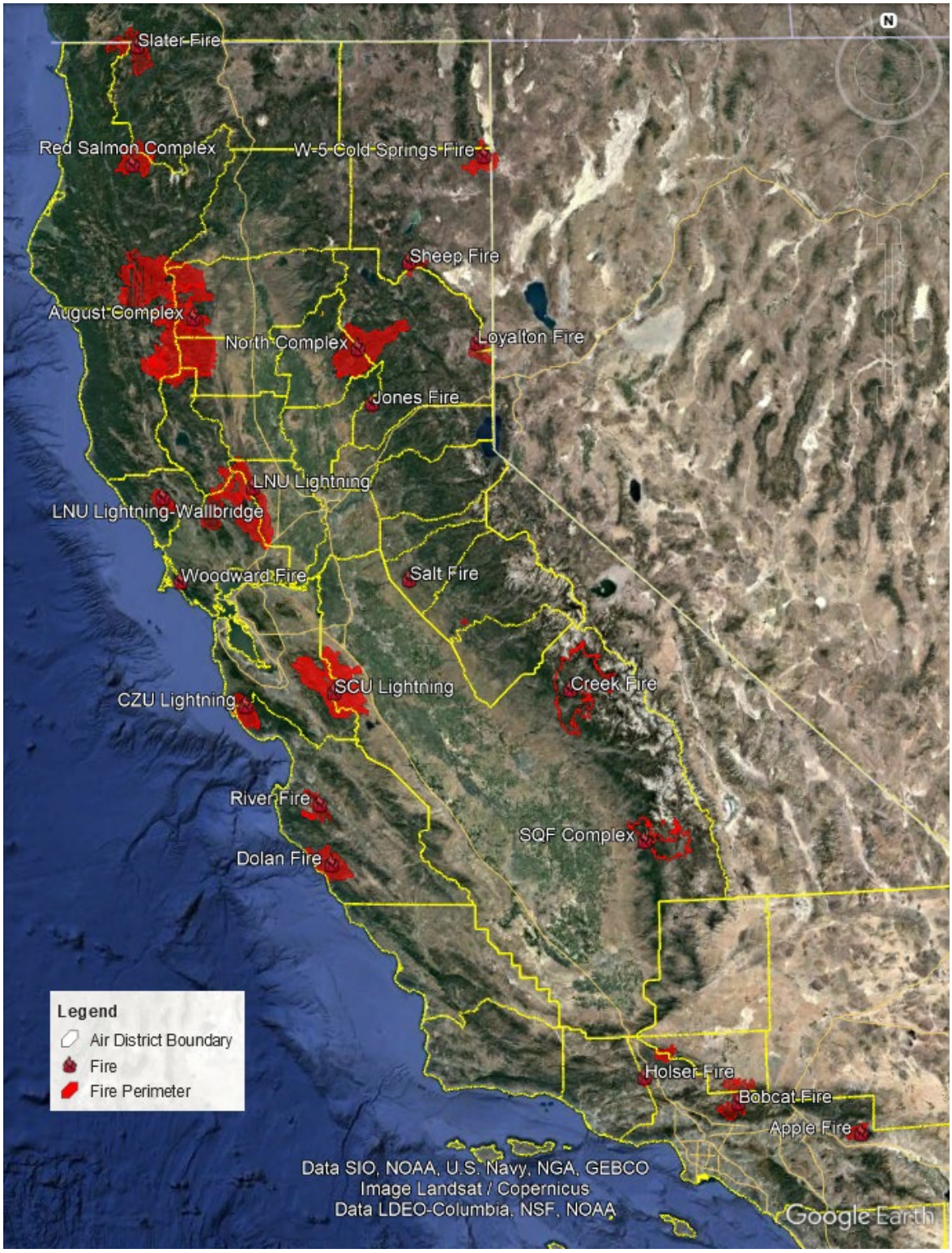


Table III-1: Major wildfires active during August 18-September 14, 2020 events[22]

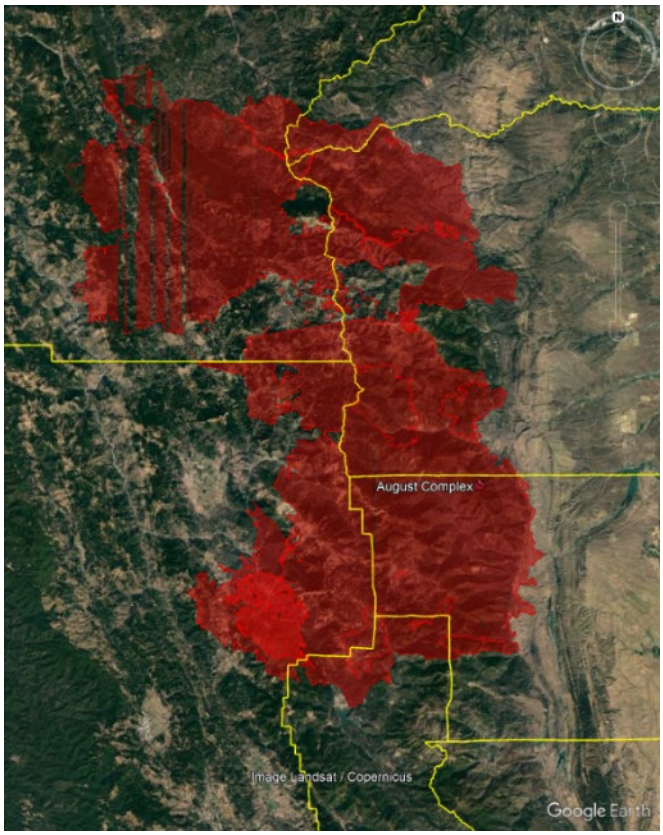
Name	Source	Start Date	Containment	Lat	Long	Acres
Red Salmon Complex	Lightning	7/27/2020	11/17/2020	41.16800	-123.40700	144,679
Loyalton Fire	Lightning	8/14/2020	9/14/2020	39.70244	-120.14347	47,029
CZU Lightning Complex	Lightning	8/16/2020	9/22/2020	37.17162	-122.22275	86,509
August Complex	Lightning	8/16/2020	11/11/2020	39.77600	-122.67300	1,032,648
River Fire	Lightning	8/16/2020	9/4/2020	36.60239	-121.62161	48,088
Jones Fire	Lightning	8/17/2020	8/28/2020	39.29241	-121.10035	705
LNU Lightning Complex	Lightning	8/17/2020	10/2/2020	38.48193	-122.14864	363,220
North Complex Fire	Lightning	8/18/2020	12/3/2020	39.69072	-121.22718	318,935
Salt Fire	UI	8/18/2020	8/24/2020	38.02792	-120.76326	1,789
Woodward Fire	UI	8/18/2020	10/2/2020	38.01809	-122.83670	4,929
Carmel Fire	Vehicle	8/18/2020	9/4/2020	36.44630	-121.68181	6,905
SCU Lightning Complex	Lightning	8/18/2020	10/1/2020	37.43944	-121.30435	396,624
Dolan Fire	Unknown	8/19/2020	12/31/2020	36.12300	-121.60200	124,924
Butte/Tehama/Glenn Lightning Complex	Lightning	8/19/2020	10/9/2020	40.09571	-122.43930	19,609
Moc Fire	Equipment	8/20/2020	8/30/2020	37.81378	-120.31257	2,857
SQF Complex Fire (Includes Castle and Shotgun Fires)	Lightning	8/21/2020	1/6/2021	36.25500	-118.49700	174,178
Sheep Fire	Lightning	8/22/2020	9/9/2020	40.27400	-120.75700	29,570
Creek Fire	UI	9/4/2020	12/24/2020	37.19147	-119.26118	379,895
Slater Fire (includes Devil Fire)	UI	9/7/2020	12/10/2020	41.86889	-123.44963	157,229

UI = Under Investigation

The August Complex[23] fire started as 38 separate fires, most of which were small (Figure III-2 and Table III-2). The four main fires were the Doe, Tatham, Glade and Hull fires, which merged by August 30. The fires began during a lightning strike on August 16 and 17, 2020 and actively burned in Mendocino, Shasta-Trinity, and Six Rivers National Forests. The fires burned 1,032,648 acres, 935 structures, and caused one death before full containment on November 15, 2020. The August Complex fire is the largest fire complex in recorded California history[24].

The Butte/Tehama/Glenn Lightning Complex[25] fire included the Elkhorn and Hopkins fires and began on August 19, 2020 due to lighting and actively burned in Tehama and Glenn counties. By September 9, the Elkhorn and Hopkins fires had merged with the August Complex, forming the North Zone of the August Complex, and dropping the Butte/Tehama/Glenn Fire from 66,959 acres to 19,069 acres. The Butte/Tehama/Glenn Lightning Complex was fully contained on October 9, 2020.

Figure III-2: August Complex Fire Perimeter Map



[23]August Complex, accessed 10/11/2021. *https://inciweb.nwcg.gov/incident/6983/*
[24]Top 20 Largest California Wildfires. Access 11/01/2021. *https://www.fire.ca.gov/media/4jandlhh/top20_acres.pdf*
[25] Butte/Tehama/Glenn Lightning Complex. *https://data.statesmanjournal.com/fires/ca-fire/f6aba342-3b28-460b-a88a-96ccbdcb3c14/buttetehamaglenn-lightning-complex-tehamaglenn-zone/*

Table III-2: August Complex Fire Daily Acreage[26]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/16/2020	N/A	N/A	Date of Origin
8/20/2020	117,365	117,365	6%
8/21/2020	26,298	143,663	6%
8/23/2020	16,342	160,005	11%
8/25/2020	21,046	181,051	11%
8/26/2020	19,414	200,465	17%
8/29/2020	15,123	215,588	18%
9/1/2020	27,353	242,941	20%
9/2/2020	18,263	261,204	20%
9/3/2020	25,902	287,106	23%
9/4/2020	11,523	298,629	23%
9/5/2020	7,044	305,673	23%
9/6/2020	19,499	325,172	24%
9/8/2020	31,140	356,312	24%
9/10/2020	114,873	471,185	24%
9/11/2021	20,054	491,239	25%
9/12/2020	383,820	875,059	25%
9/13/2020	2,418	877,477	28%
9/15/2020	-82,676*	794,801	30%

[26] August Complex Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20201011180835/https://inciweb.nwcg.gov/incident/6983*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/16/2020	23,151	817,952	30%
9/18/2020	6,166	824,118	30%
9/20/2020	12,753	836,871	34%
9/21/2020	9,861	846,732	34%
9/22/2020	166	846,898	38%
9/26/2020	23,302	870,200	43%
9/29/2020	67,844	938,044	43%
10/1/2020	17,469	955,513	51%
10/2/2020	15,050	970,563	51%
10/3/2020	8,823	979,386	51%
10/5/2020	24,001	1,003,387	58%
10/7/2020	5,203	1,008,590	60%
10/9/2020	12,886	1,021,476	65%
10/10/2020	2,616	1,024,092	67%
10/11/2020	4,437	1,028,529	74%
10/13/2020	508	1,029,037	76%
10/14/2020	73	1,029,110	77%
10/17/2020	3,154	1,032,264	82%
10/21/2020	0	1,032,264	91%
10/25/2020	384	1,032,648	93%
11/5/2020	0	1,032,648	96%

Date	Fire Growth (Acres)	Total Acres	Percent Contained
11/12/2020	0	1,032,648	100%

* Fire acreage estimate was adjusted, and dropped, by reporting agency.

The LNU Lightning Complex[27] fire (Figure III-3 and Table III-3) started as many small separate fires. The main fires were the Hennessey fire, which merged with the Gamble Green, Markley, Spanish, and Morgan fires burning 305,651 acres, as well as the Walbridge, and Meyers fires. These fires began due to lightning on August 16 and 17, 2020 and actively burned in six counties: Solano, Napa, Sonoma, Yolo, Lake, and Colusa. The fires burned on the hills surrounding several large cities including Napa, Fairfield, and Vacaville and burned 363,220 acres, 1,491 structures, and lead to six confirmed fatalities before full containment on October 2, 2020. The LNU lighting complex is the sixth largest California wildfire in recorded history[28].

Figure III-3: LNU Lightning Complex Fire Perimeter Map

[27] Solano County 2020 LN Lightning Complex Fire. Accessed 10/11/2021. *https://www.solanocounty.com/depts/rm/lnu_fire_cleanup_n_rebuilding/default.asp*
[28] Top 20 Largest California Wildfires. Access 11/01/2021. *https://www.fire.ca.gov/media/4jandlhh/top20_acres.pdf*

Table III-3: LNU Lightning Complex Fire Daily Acreage[29]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/17/2020	N/A	N/A	Date of Origin
8/21/2020	302,388	302,388	0%
8/22/2020	22,740	325,128	15%
8/23/2020	22,502	347,630	15%
8/24/2020	4,187	351,817	21%
8/26/2020	5,229	357,046	33%
8/27/2020	11,822	368,868	33%
8/28/2020	2,381	371,249	35%
8/29/2020	2,075	373,324	41%
8/30/2020	1,885	375,209	56%
8/31/2020	0	375,209	66%
9/2/2020	0	375,209	78%
9/3/2020	0	375,209	81%
9/4/2020	0	375,209	87%
9/5/2020	0	375,209	89%
9/7/2020	0	375,209	91%
9/8/2020	0	375,209	91%
9/9/2020	-11,989*	363,220	93%

[29]LNU Complex Fire – Archived fire.ca.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200824125845/https://www.fire.ca.gov/incidents/2020/8/17/lnu-lightning-complex-includes-hennessey-gamble-15-10-spanish-markley-13-4-11-16-walbridge/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/10/2020	0	363,220	95%
9/12/2020	0	363,220	96%
9/14/2020	0	363,220	97%
9/16/2020	0	363,220	98%
9/30/2020	0	363,220	98%
10/2/2020	0	363,220	100%

* Fire acreage estimate was adjusted, and dropped, by reporting agency.

Loyalton Fire[30] (Figure III-4 and Table III-4) began due to a lightning strike on August 14, 2020 and actively burned in the Tahoe and Humboldt-Toiyabe Nation Forests in Lassen, Plumas, and Sierra counties, burning a mix of timber, sagebrush, and grasses. The fire burned 47,029 acres, and damaged 35 structures before being contained on September 14, 2020.

[30] Loyalton Fire. *https://inciweb.nwcg.gov/incident/6975/*

Figure III-4: Loyalton Fire Perimeter Map

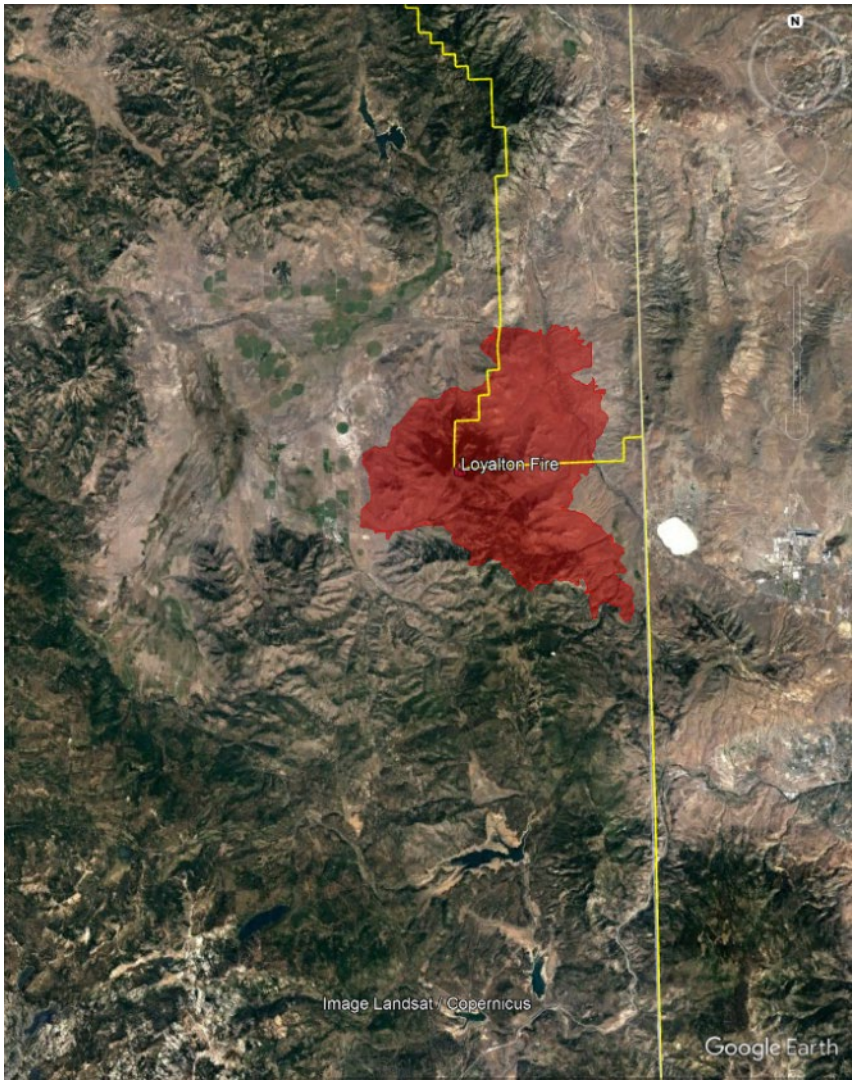


Table III-4: Loyalton Fire Daily Acreage[31]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/14/2020	N/A	N/A	Date of Origin
8/15/2020	20,000	20,000	0%
8/17/2020	19,723	39,723	10%

[31] Loyalton Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200816215528/https://inciweb.nwcg.gov/incident/6975/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/18/2020	4,424	44,147	30%
8/22/2020	2,881	47,028	75%
8/23/2020	1	47,029	93%
9/14/2020	0	47,029	93%

CZU Lightning Complex[32] fire (Figure III-5 and Table III-5) started as many small fires including the Warnella fire and three fires that would become the norther edge of the CZU complex. The Northern edge fires merged, a few days after they began, due to changing wind patterns and quickly grew to over 40,000 acers. These fires began due to a lightning strike on August 16, 2020 and actively burned in Butano and Big Basin Redwoods state parks in San Mateo and Santa Cruz counties. The fires burned 86,509 acers, destroyed 1,490 structures, damaged an additional 140 structures, and lead to one confirmed fatality before being fully contained on September 22, 2020.

[32] CZU Lightning Complex (Including Warnella Fire). *https://www.fire.ca.gov/incidents/2020/8/16/czu-lightning-complex-including-warnella-fire/*

Figure III-5: CZU Lightning Complex Fire Perimeter Map

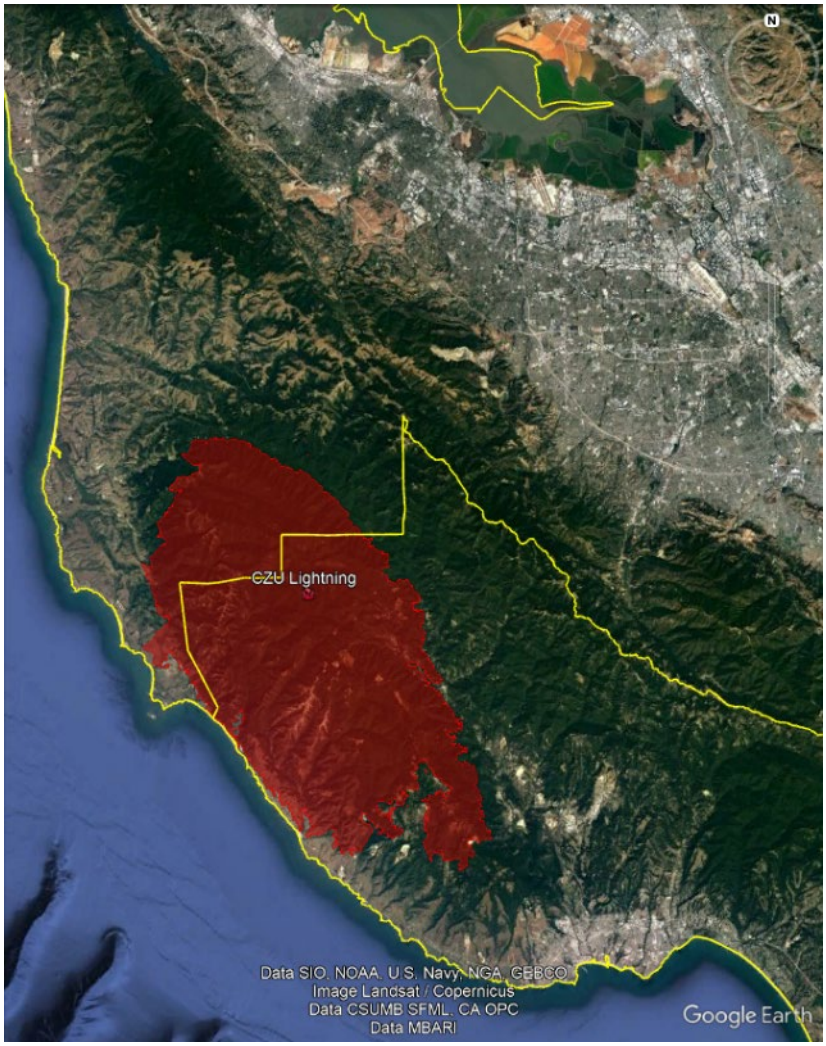


Table III-5: CZU Lightning Complex Fire Daily Acreage[33]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/16/2020	N/A	N/A	Date of Origin
8/25/2020	78,869	78,869	17%
8/26/2020	2,268	81,137	21%

[33] CZU Lightning Complex Fire – Archived fire.ca.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200830105017/https://www.fire.ca.gov/incidents/2020/8/16/czu-lightning-complex-including-warnella-fire/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/27/2020	342	81,479	24%
8/28/2020	1,654	83,133	27%
8/29/2020	1,205	84,338	33%
8/30/2020	302	84,640	35%
9/1/2020	578	85,218	43%
9/2/2020	249	85,467	46%
9/3/2020	635	86,102	51%
9/4/2020	407	86,509	58%
9/6/2020	0	86,509	68%
9/7/2020	0	86,509	80%
9/10/2020	0	86,509	84%
9/13/2020	0	86,509	87%
9/14/2020	0	86,509	89%
9/15/2020	0	86,509	93%
9/16/2020	0	86,509	95%
9/17/2020	0	86,509	97%
9/19/2020	0	86,509	98%
9/20/2020	0	86,509	99%
9/22/2020	3,000	89,509	100%

River Fire[34] (Figure III-6 and Table III-6) began due to a lightning strike on August 16, 2020 and actively burned in a wildland urban interface zone within Monterey county. The fire

[34] River Fire. *https://www.fire.ca.gov/incidents/2020/8/16/river-fire/*

burned 48,088 acres, destroyed 30 structures, and damaged 13 before full containment on September 4, 2020.

Figure III-6: River Fire Perimeter Map

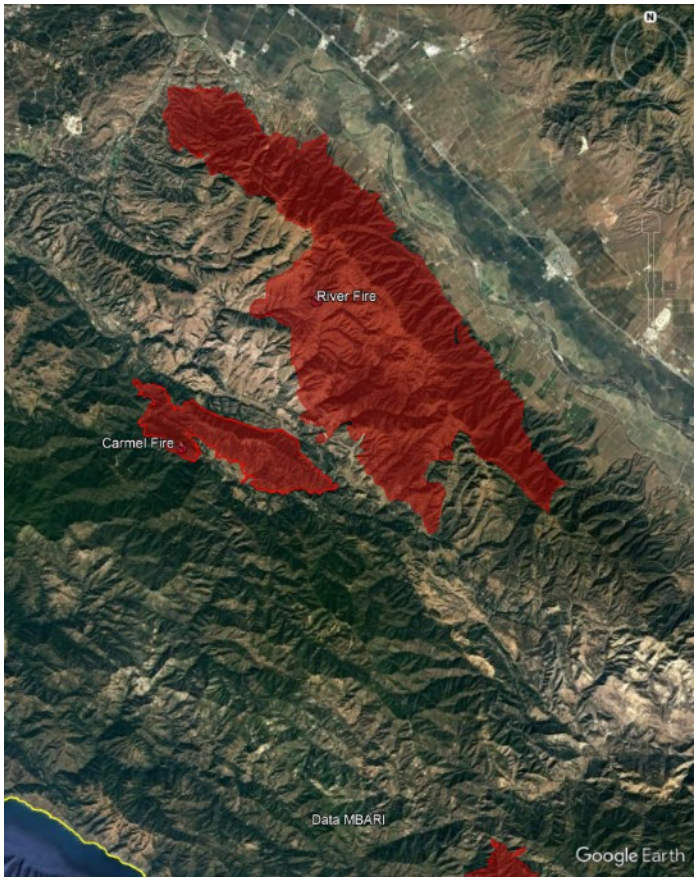


Table III-6: River Fire Daily Acreage[35]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/16/2020	N/A	N/A	Date of Origin
8/17/2020	3,793	3,793	10%
8/20/2020	29,860	33,653	7%
8/21/2020	8,930	42,583	12%
8/22/2020	5,190	47,773	15%

[35] River Fire – Archived fire.ca.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200818121429/https://www.fire.ca.gov/incidents/2020/8/16/river-fire/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/23/2020	651	48,424	20%
8/25/2020	0	48,424	33%
8/26/2020	0	48,424	58%
8/28/2020	308	48,732	66%
8/29/2020	0	48,732	73%
8/30/2020	-644*	48,088	87%
8/31/2020	0	48,088	96%
9/2/2020	0	48,088	98%
9/4/2020	0	48,088	100%

* Fire acreage estimate was adjusted, and dropped, by reporting agency.

Salt Fire[36] (Figure III-7 and Table III-7) began on August 18, 2020 due to a source that is under investigation and actively burned near the Salt Springs Valley Reservoir in a wildland urban interface zone within Calaveras county. The fire burned 1,789 acers before full containment on August 24, 2020.

[36] Salt Fire. *https://www.fire.ca.gov/incidents/2020/8/18/salt-fire/*

Figure III-7: Salt Fire Perimeter Map

Table III-7: Salt Fire Daily Acreage[37]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/18/2020	N/A	N/A	Date of Origin
8/22/2020	1789	1,789	85%
8/24/2020	0	1,789	100%

Carmel Fire[38] (Figure III-8 and Table III-8) began on August 18, 2020 due to a vehicle malfunction and actively burned in a wildland urban interface zone within Monterey county. The fire burned 6,905 acres, destroyed 73 structures, and damaged 7 before full containment on September 4, 2020.

[37] Salt Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://www.fire.ca.gov/incidents/2020/8/18/salt-fire/*
[38] Carmel Fire. *https://www.fire.ca.gov/incidents/2020/8/18/carmel-fire/*

Figure III-8: Carmel Fire Perimeter Map

Table III-8: Carmel Fire Daily Acreage[39]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/18/2020	N/A	N/A	Date of Origin
8/21/2020	4,732	4,732	0%
8/22/2020	1,963*	6,695	7%
8/23/2020	0	6,695	15%
8/25/2020	0	6,695	30%
8/26/2020	0	6,695	55%

[39] Carmel Fire – Archived fire.ca.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200822035015/https://www.fire.ca.gov/incidents/2020/8/18/carmel-fire/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/28/2020	72	6,767	71%
8/29/2020	0	6,767	81%
8/30/2020	138	6,905	86%
8/31/2020	0	6,905	98%
9/2/2020	0	6,905	98%
9/4/2020	0	6,905	100%

* Fire acreage estimate was adjusted, and dropped, by reporting agency.

SCU Lightning Complex[40] (Figure III-9 and Table III-9) began as the Deer, Canyon, and Santa Clara fires, by August 26 the Deer fire was fully contained and the Canyon and Santa Clara fires merged. These fires began during a lightning strike on August 18, 2020 and actively burned in the Diablo mountain range in Santa Clara, Alameda, Contra Costa, San Joaquín, and Stanislaus counties. The fires burned 396,624 acres, destroyed 222 structures, and damaged 26 before full containment on October 1, 2020. The SCU Lighting complex is the 4th largest California wildfire in recorded history[41].

[40] SCU Lightning Complex. *https://www.fire.ca.gov/incidents/2020/8/18/scu-lightning-complex/*
[41] *https://www.fire.ca.gov/media/4jandlhh/top20_acres.pdf*

Figure III-9: SCU Lightning Complex Fire Perimeter Map

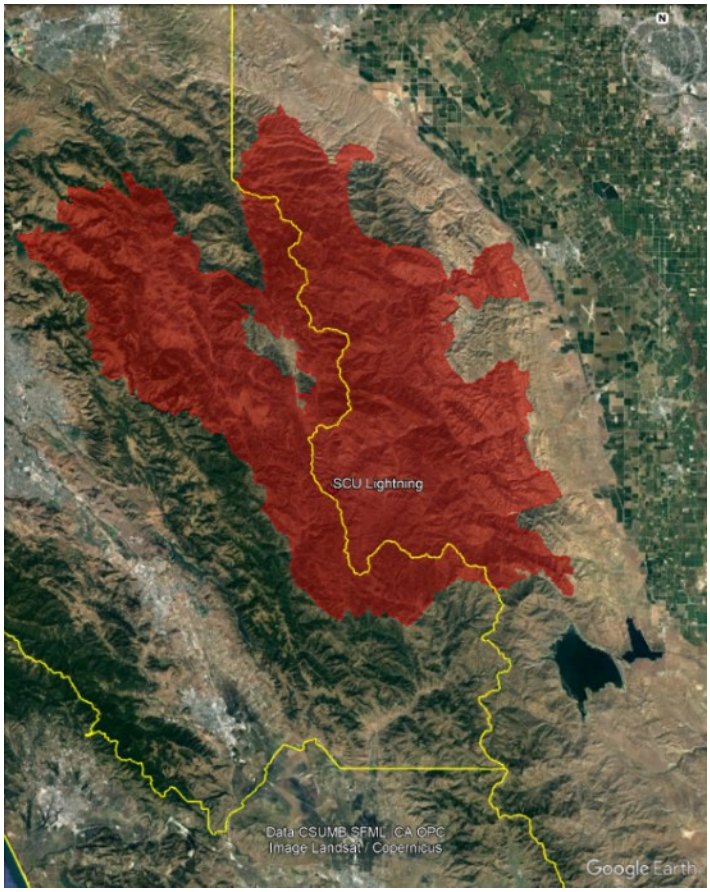


Table III-9: SCU Lightning Complex Fire Daily Acreage[42]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/18/2020	N/A	N/A	Date of Origin
8/20/2020	137,475	137,475	5%
8/21/2020	92,493	229,968	10%
8/22/2020	110,000	339,968	10%
8/23/2020	3,997	343,965	10%

[42] SCU Lightning Complex Fire – Archived fire.ca.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200821013706/https://www.fire.ca.gov/incidents/2020/8/18/scu-lightning-complex/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/25/2020	16,090	360,055	15%
8/26/2020	5,716	365,771	20%
8/27/2020	3,700	369,471	35%
8/28/2020	5,000	374,471	40%
8/29/2020	2,000	376,471	45%
8/30/2020	1,000	377,471	50%
9/1/2020	12,686	390,157	70%
9/2/2020	1,421	391,578	72%
9/3/2020	0	391,578	78%
9/4/2020	5,046	396,624	84%
9/5/2020	0	396,624	88%
9/7/2020	0	396,624	93%
9/8/2020	0	396,624	95%
9/10/2020	0	396,624	97%
9/11/2020	0	396,624	98%
10/1/2020	0	396,624	100%

Dolan Fire[43] (Figure III-10 and Table III-10) began on August 19, 2020 with the source of the fire still unknown. The fire actively burned in state parks and animal sanctuaries in Monterey county and burned 124,924 acres before being fully contained on December 31, 2020.

[43] Dolan Fire. *https://inciweb.nwcg.gov/incident/7018/*

Figure III-10: Dolan Fire Perimeter Map

Table III-10: Dolan Fire Daily Acreage[44]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/18/2020	N/A	N/A	Date of Origin
8/21/2020	8,500	8,500	0%
8/24/2020	11,591	20,091	10%
8/27/2020	1,770	21,861	20%
9/8/2020	51,228	73,089	40%
9/9/2020	20,945	94,034	26%
9/10/2020	17,348	111,382	26%

[44] Dolan Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200822103236/https://inciweb.nwcg.gov/incident/7018/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/12/2020	4,058	115,440	30%
9/13/2020	1,802	117,242	40%
9/14/2020	1,223	118,465	40%
9/15/2020	1,023	119,488	40%
9/16/2020	2,690	122,178	40%
9/18/2020	5,546	127,724	45%
9/19/2020	326	128,050	46%
9/20/2020	211	128,261	46%
9/21/2020	155	128,416	46%
9/22/2020	1	128,417	44%
9/23/2020	0	128,417	46%
9/24/2020	0	128,417	46%
9/26/2020	0	128,417	57%
9/28/2020	0	128,417	71%
10/1/2020	-3,493*	124,924	90%
10/2/2020	0	124,924	90%
10/5/2020	0	124,924	91%
10/9/2020	0	124,924	98%
10/11/2020	0	124,924	98%
10/13/2020	0	124,924	98%
10/16/2020	0	124,924	98%

Date	Fire Growth (Acres)	Total Acres	Percent Contained
10/20/2020	0	124,924	98%
10/29/2020	0	124,924	98%
11/2/2020	0	124,924	98%
11/15/2020	0	124,924	98%
12/3/2020	0	124,924	98%
12/28/2020	0	124,924	98%
12/31/2020	0	124,924	100%

* Fire acreage estimate was adjusted by reporting agency.

Moc Fire[45] (Figure III-11 and Table III-11) began on August 20, 2020 due to equipment malfunction. The fire actively burned in a wildland urban interface zone within Tuolumne County. The fire burned 2,857 acres before full containment on August 30, 2020.

[45] Moc Fire. *https://www.fire.ca.gov/incidents/2020/8/20/moc-fire/*

Figure III-11: Moc Fire Perimeter Map

Table III-11: Moc Fire Daily Acreage[46]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/20/2020	N/A	N/A	Date of Origin
8/21/2020	2,800	2,800	0%
8/22/2020	0	2,800	5%
8/24/2020	0	2,800	20%
8/25/2020	0	2,800	40%
8/26/2020	0	2,800	70%

[46] Creek Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200908190210/https://inciweb.nwcg.gov/incident/7147/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/27/2020	0	2,800	90%
8/29/2020	0	2,800	98%
8/30/2020	57	2,857	100%

Creek Fire[47] (Figure III-12 and Table III-12) began on September 4, 2020 with the source currently under investigation. Within the first four days of starting the Creek Fire grew anywhere between 20,000 to 50,000 acres due to the strong winds in the area. The fire activity burned in the Sierra National Forest in Fresno and Madera counties, burning 379,895 acres and destroying 853 structures, including many homes in Big Creek, before full containment on December 24, 2020. The creek fire is the fifth largest California wildfire and the second largest single California wildfire in recorded history[48].

[47]Creek Fire. *https://inciweb.nwcg.gov/incident/7147/*
[48]Top 20 Largest California Wildfires. Access 11/01/2021. *https://www.fire.ca.gov/media/4jandlhh/top20_acres.pdf*

Figure III-12: Creek Fire Perimeter Map

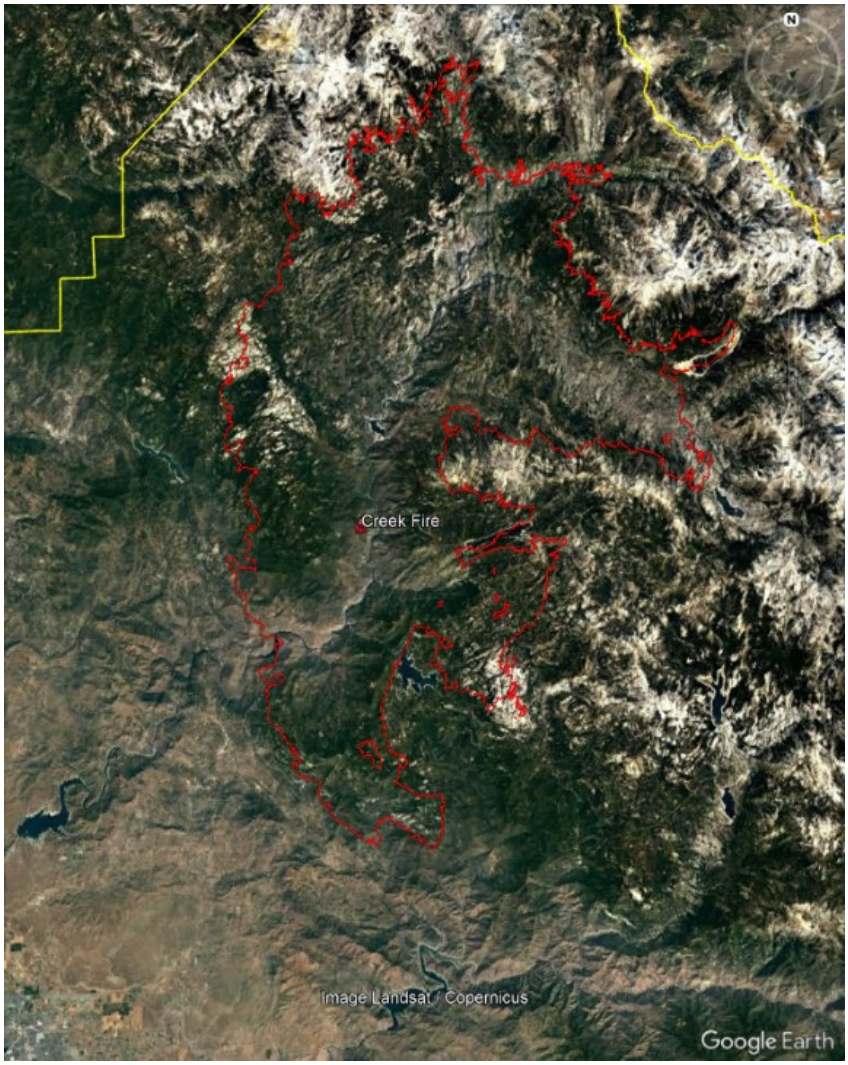


Table III-12: Creek Fire Daily Acreage[49]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/4/2020	N/A	N/A	Date of Origin
9/5/2020	36,000	36,000	0%
9/7/2020	42,790	78,790	0%

[49]Creek Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200908190210/https://inciweb.nwcg.gov/incident/7147/https://web.archive.org/web/20200908190210/https://inciweb.nwcg.gov/incident/7147/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/8/2020	65,139	143,929	0%
9/10/2020	31,964	175,893	0%
9/11/2020	0	175,893	6%
9/12/2020	20,774	196,667	6%
9/13/2020	5,241	201,908	8%
9/14/2020	10,836	212,744	10%
9/15/2020	7,281	220,025	18%
9/17/2020	24,731	244,756	18%
9/18/2020	3,500	248,256	20%
9/21/2020	32,169	280,425	30%
9/22/2020	3,299	283,724	30%
9/24/2020	7,702	291,426	34%
9/25/2020	0	291,426	36%
9/26/2020	746	292,172	39%
9/27/2020	10,698	302,870	39%
9/28/2020	1,770	304,640	39%
9/29/2020	600	305,240	44%
10/1/2020	3,793	309,033	44%
10/2/2020	3,030	312,063	45%
10/3/2020	1,597	313,660	49%
10/5/2020	8,429	322,089	48%

Date	Fire Growth (Acres)	Total Acres	Percent Contained
10/6/2020	4,617	326,706	49%
10/9/2020	5,260	331,966	49%
10/11/2020	1,914	333,880	55%
10/12/2020	-530*	333,350	55%
10/13/2020	4,305	337,655	55%
10/16/2020	6,387	344,042	60%
10/17/2020	2,435	346,477	60%
10/18/2020	1,608	348,085	60%
10/19/2020	2,246	350,331	61%
10/20/2020	2,008	352,339	61%
10/21/2020	0	352,339	61%
10/26/2020	17,023	369,362	63%
10/29/2020	10,209	379,571	70%
10/30/2020	0	379,571	70%
10/31/2020	431	380,002	70%
11/2/2020	661	380,663	70%
11/4/2020	-1,933*	378,730	70%
11/6/2020	986	379,716	70%
11/8/2020	13	379,729	70%
11/17/2020	166	379,895	78%
11/23/2020	0	379,895	95%

Date	Fire Growth (Acres)	Total Acres	Percent Contained
12/3/2020	0	379,895	96%
12/24/2020	0	379,895	100%

* Fire acreage estimate was adjusted by reporting agency.

Slater Fire[50] (Figure III-13 and Table III-13), includes the Devil Fire, began on September 8, 2020 with the source currently under investigation. The fire actively burned in the Klamath, Six Rivers and Rogue Siskiyou National forests in Siskiyou and Del Norte counties in California and Josephine county in Oregon. The fire burned 157,229 acres before full containment on December 10, 2020.

[50] Slater/Devil Fire. *https://inciweb.nwcg.gov/incident/7173/*

Figure III-13: Slater Fire Perimeter Map

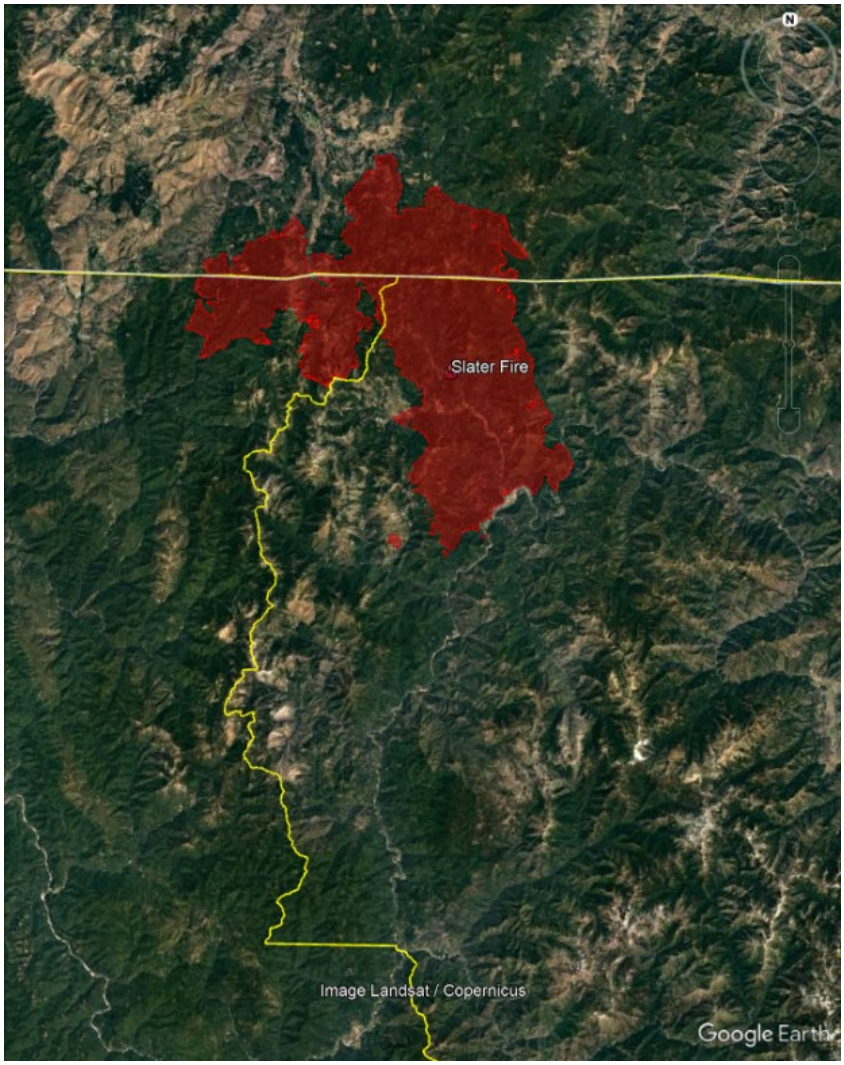


Table III-13: Slater Fire Daily Acreage[51]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/7/2020	N/A	N/A	Date of Origin
9/10/2020	120,000	120,000	0%
9/13/2020	10,482	130,482	0%
9/14/2020	0	130,482	5%

[51]Slater Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20200913125145/https://inciweb.nwcg.gov/incident/7173/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/16/2020	17,862	148,344	10%
9/17/2020	1,655	149,999	10%
9/19/2020	3,843	153,842	25%
9/20/2020	-5,257*	148,585	18%
9/21/2020	92	148,677	22%
9/22/2020	1,553	150,230	24%
9/25/2020	3,620	153,850	27%
9/29/2020	295	154,145	45%
9/30/2020	0	154,145	48%
10/2/2020	452	154,597	51%
10/3/2020	217	154,814	55%
10/5/2020	282	155,096	65%
10/8/2020	630	155,726	70%
10/11/2020	691	156,417	75%
10/12/2020	0	156,417	78%
10/16/2020	195	156,612	80%
10/26/2020	76	156,688	85%
10/29/2020	144	156,832	85%
10/30/2020	263	157,095	85%
11/1/2020	39	157,134	85%
11/4/2020	95	157,229	86%

Date	Fire Growth (Acres)	Total Acres	Percent Contained
11/28/2020	0	157,229	100%

* Fire acreage estimate was adjusted by reporting agency.

Jones Fire[52] (Figure III-14 and Table III-14), began on August 17, 2020 during a lightning strike. The fire actively burned in a wildland urban interface zone within Nevada County. The fire burned 705 acres, destroying 21 structures, and damaging 3 before full containment on August 28, 2020.

Figure III-14: Jones Fire Perimeter Map

[52] Jones Fire. *https://www.fire.ca.gov/incidents/2020/8/17/jones-fire/*

Table III-14: Jones Fire Daily Acreage[53,54]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/17/2020	N/A	N/A	Date of Origin
8/22/2020	N/A	340	N/A
8/23/2020	365	705	65%
8/28/2020	0	705	100%

North Complex Fire[55] (Figure III-15 and Table III-15) began during a lightning strike on August 17, 2020 and actively burned in Plumas National Forest in Plumas, Butte, and Yuba Counties. By September 5, 2020 all the individual fires had been contained except for the Claremont and Bear fires. These two fires merged on September 5, 2020 and due to strong winds rapidly grew spreading to the Southwest and leveling the towns of Berry Creek and Feather Falls. The fires burned 318,935 acres, damaging or destroying 2,352 structures, and causing 15 fatalities before full containment on December 3, 2020. The North Complex Fire is the seventh largest California wildfire in recorded history[56].

[53] CBS Local News. Nevada City Brush Creek Grass Fire Evacuations. *https://sacramento.cbslocal.com/2020/08/17/nevada-city-brush-creek-grass-fire-evacuations/*

[54] ABC News. Jones Fire. *https://www.abc10.com/article/news/local/wildfire/jones-fire-friday-august-21-2020/103-25d59531-c6d5-4535-9c5a-78db1185983f*

[55] North Complex Fire. *https://inciweb.nwcg.gov/incident/6997/*

[56] *https://www.fire.ca.gov/media/4jandlhh/top20_acres.pdf*

Figure III-15: North Complex Fire Perimeter Map

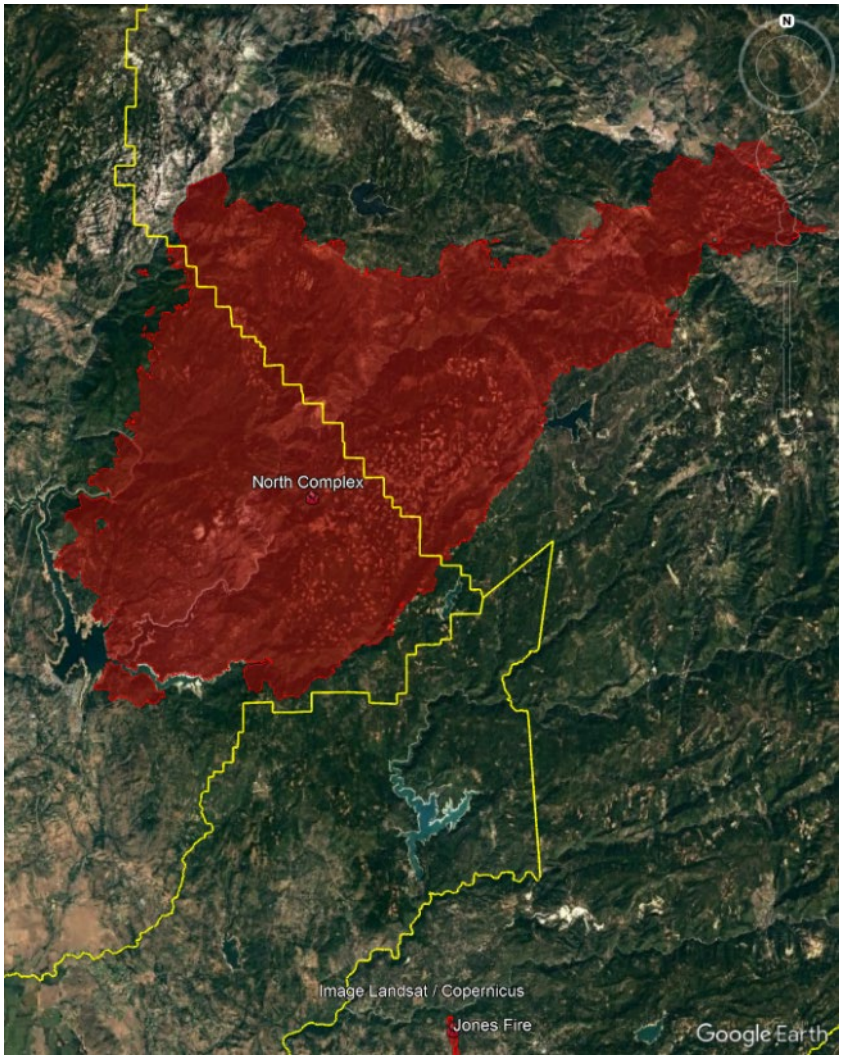


Table III-15: North Complex Fire Daily Acreage[57]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/17/2020	N/A	N/A	Date of Origin
8/27/2020	54,993	54,993	21%
9/9/2020	95,147	150,140	24%
9/10/2020	94,063	244,203	23%

[57] North Complex Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. https://web.archive.org/web/20200828141537/https://inciweb.nwcg.gov/incident/6997/

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/12/2020	8,110	252,313	21%
9/13/2020	6,489	258,802	26%
9/14/2020	5,572	264,374	38%
9/15/2020	4,984	269,358	32%
9/16/2020	3,977	273,335	36%
9/17/2020	7,440	280,775	36%
9/19/2020	9,176	289,951	58%
9/21/2020	3,892	293,843	64%
9/22/2020	5,880	299,723	74%
9/23/2020	2,029	301,752	78%
9/26/2020	3,129	304,881	78%
9/29/2020	4,114	308,995	76%
10/1/2020	5,954	314,949	79%
10/2/2020	2,510	317,459	79%
10/3/2020	0	317,459	83%
10/5/202	1,265	318,724	86%
10/9/2020	206	318,930	90%
10/11/2020	0	318,930	91%
10/12/2020	0	318,930	94%
10/14/2020	0	318,930	94%
10/16/2020	0	318,930	94%

Date	Fire Growth (Acres)	Total Acres	Percent Contained
10/18/2020	0	318,930	94%
10/19/2020	0	318,930	95%
10/29/2020	5	318,935	96%
11/25/2020	0	318,935	98%
12/4/2020	0	318,935	100%

Woodward Fire[58] (Figure III-16 and Table III-16) began during a lightning strike on August 17, 2020 and was initially named the 4-5 Fire and on August 18, 2020 a second fire initially named the 4-6 Fire was found nearby, these were later renamed to the Woodward Fire[59]. These fires quickly grew due to winds and actively burned in the Point Reyes National Seashore. The fires burned 4,929 before full containment on October 1, 2020.

[58] Woodward Fire. *https://inciweb.nwcg.gov/incident/maps/7062/*
[59] National Park Service. Point Reyes – National Seashore California. *https://www.nps.gov/pore/learn/management/firemanagement_woodwardfire.htm*

Figure III-16: Woodward Fire Perimeter Map

Table III-16: Woodward Fire Daily Acreage[60]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/18/2020	N/A	N/A	Date of Origin
8/23/2020	2,487	2,487	5%
8/26/2020	373	2,860	8%
8/31/2020	1,605	4,465	25%
9/6/2020	348	4,813	93%

[60] Woodward Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20201003104531/https://inciweb.nwcg.gov/incident/7062/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/10/2020	92	4,905	95%
9/12/2020	5	4,910	95%
9/14/2020	0	4,910	95%
9/15/2020	0	4,910	95%
9/16/2020	19	4,929	96%
9/18/2020	0	4,929	97%
9/25/2020	0	4,929	97%
10/2/2020	0	4,929	100%

SQF Complex Fire[61] (Figure III-17and Table III-17) began as the Castle and Shotgun fires during a lightning strike on August 19, 2020. The Castle fire actively burned in Sequoia National Forest and Giant Sequoia National Monument, Inyo National Forest, Sequoia National Park, lands managed by the Bureau of Land Management, State, County, and private lands with the Shotgun fire actively burning in the Golden Trout Wilderness and Sequoia National Forest. The fires burned 174,178 acres and destroyed 228 structures before full containment on January 5, 2021.

[61] SQF Complex Fire. *https://inciweb.nwcg.gov/incident/7048/*

Figure III-17: SQF Complex Fire Perimeter Map

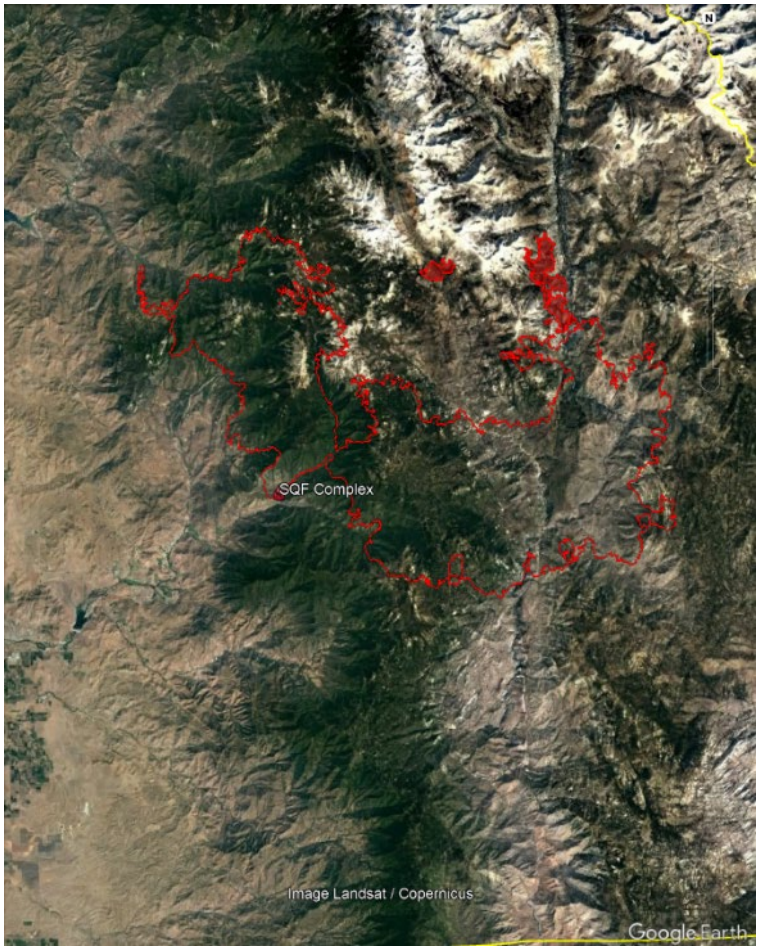


Table III-17: SQF Complex Fire Daily Acreage[62]

Date	Fire Growth (Acres)	Total Acres	Percent Contained
8/19/2020	N/A	N/A	Date of Origin
8/24/2020	12,000	12,000	0%
8/27/2020	8,979	20,979	0%
8/31/2020	16,749	37,728	0%
9/2/2020	4,846	42,574	1%

[62] SQF Complex Fire – Archived inciweb.nwcg.gov pages. Accessed 10/25/2021. *https://web.archive.org/web/20211011183538/https://inciweb.nwcg.gov/incident/7048/*

Date	Fire Growth (Acres)	Total Acres	Percent Contained
9/6/2020	13,387	55,961	7%
9/8/2020	6,926	62,887	7%
9/10/2020	4,642	67,529	12%
9/11/2020	564	68,093	12%
9/13/2020	6,211	74,304	12%
9/14/2020	16,541	90,845	12%
9/15/2020	16,256	107,101	12%
9/16/2020	7,219	114,320	12%
9/17/2020	8,515	122,835	12%
9/19/2020	10,653	133,488	12%
9/20/2020	2,314	135,802	18%
9/21/2020	1,706	137,508	33%
9/22/2020	4,092	141,600	33%
9/23/2020	3,226	144,826	35%
9/25/2020	4,024	148,850	39%
9/29/2020	1,950	150,800	58%
9/30/2020	636	151,436	61%
10/2/2020	1,790	153,226	61%
10/3/2020	3,209	156,435	60%
10/5/2020	1,623	158,058	65%
10/6/2020	887	158,945	65%

Date	Fire Growth (Acres)	Total Acres	Percent Contained
10/9/2020	6,048	164,993	65%
10/11/2020	2,853	167,846	65%
10/12/2020	-367*	167,479	70%
10/16/2020	434	167,913	70%
10/20/2020	682	168,595	73%
10/21/2020	378	168,973	75%
10/25/2020	715	169,688	75%
10/28/2020	344	170,032	75%
10/31/2020	133	170,165	80%
11/16/2020	4,013	174,178	83%
11/19/2020	0	174,178	90%
12/1/2020	0	174,178	90%
1/5/2020	0	174,178	100%

* Fire acreage estimate was adjusted by reporting agency.

These fires occurred in areas that meet the definition of wildland which is "an area in which human activity and development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered." Wildlands can include forestland, shrubland, grassland, and wetlands and includes lands that are predominantly wildland, such as land in the wildland-urban interface, as specified in the preamble of the Exceptional Events Rule.[63] Figure III-18 and Figure III-19 indicate these areas with the fire perimeters outlined in red.

[63] 81 FR 68248

Figure III-18: California land ownership map with 2020 wildfire boundaries (red)

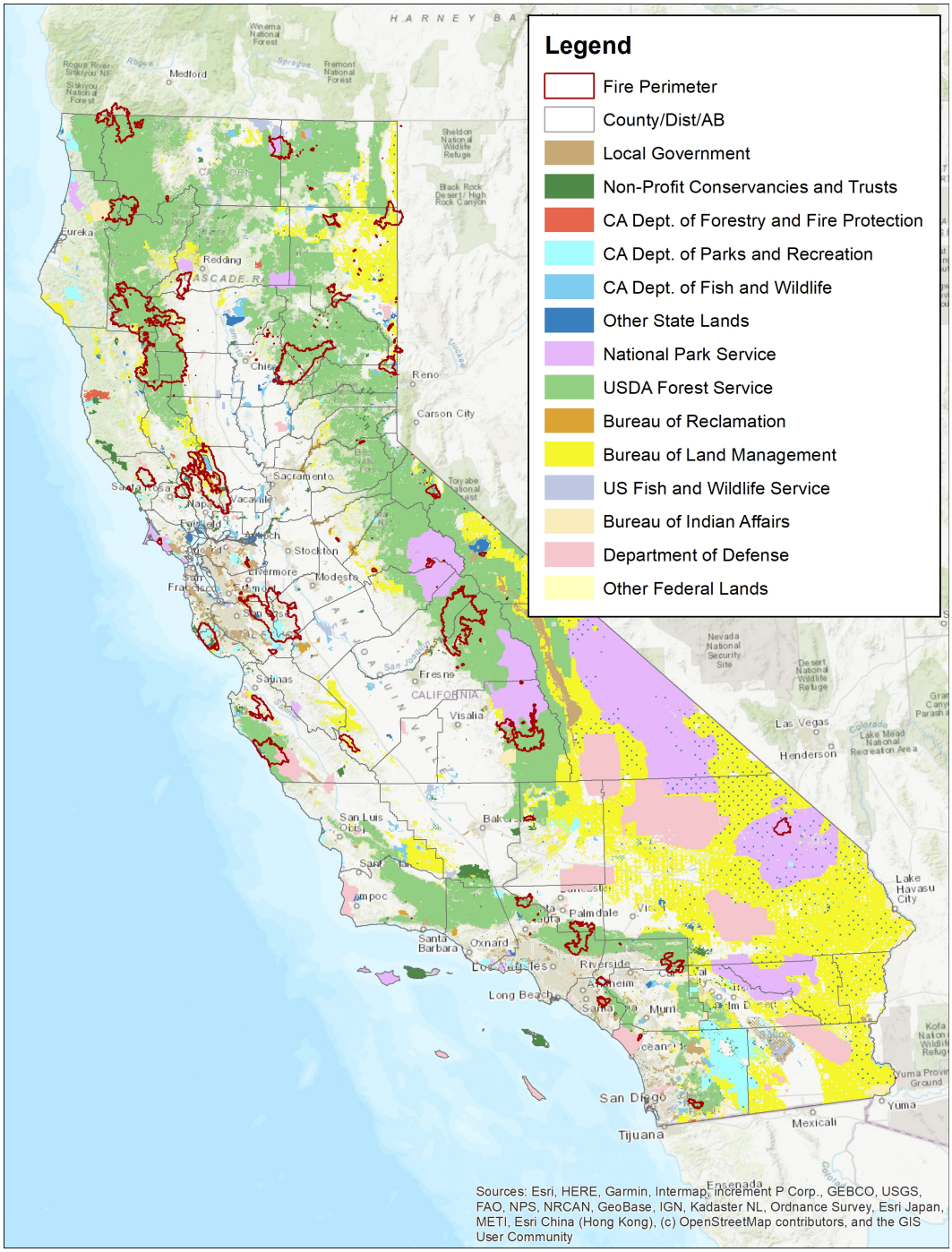
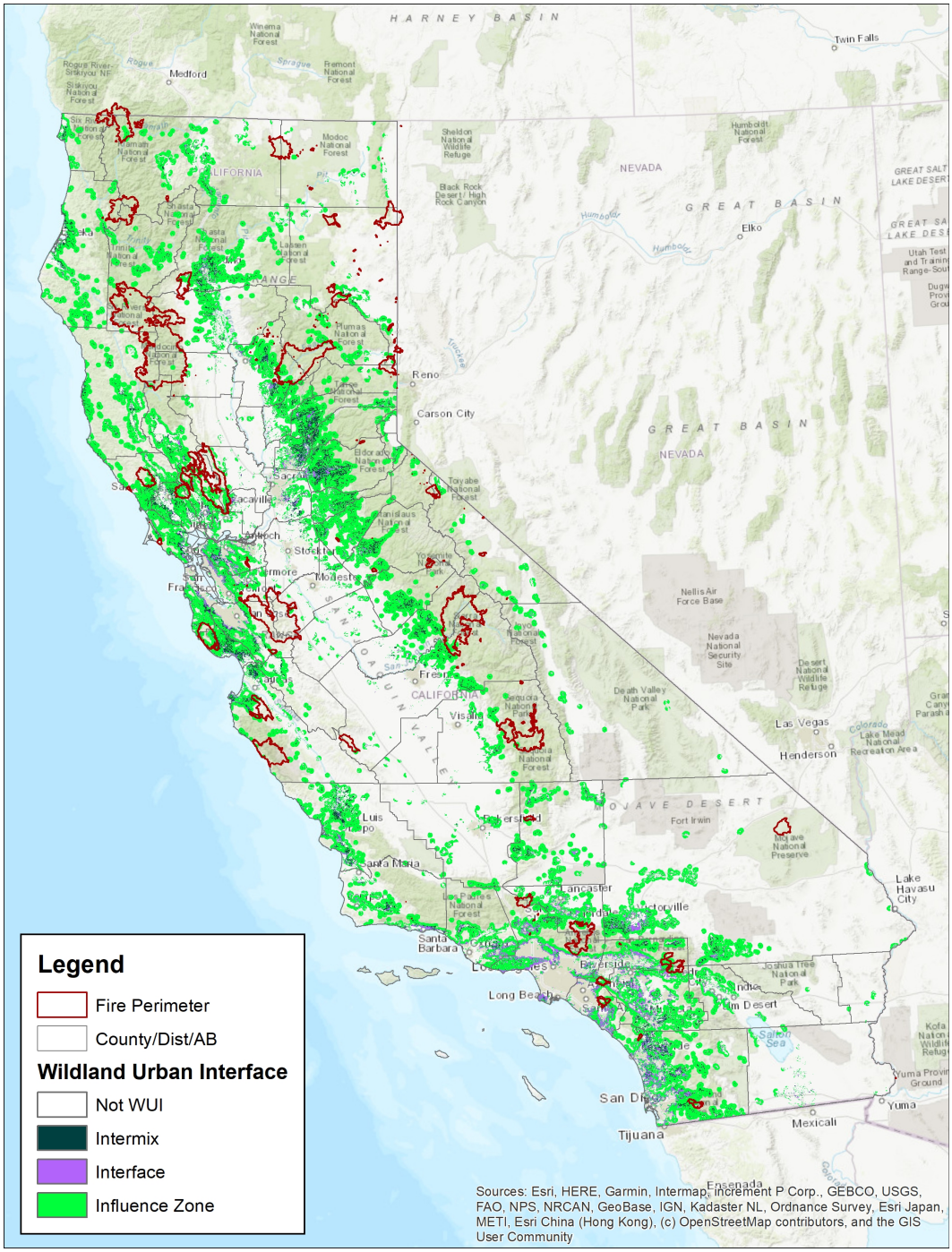


Figure III-19: Wildland-urban interface map with 2020 wildfire boundaries (red)



B. Summary of Event

A series of large wildfires were ignited across California from mid-August to early November 2020. The majority of these fires occurred in the northern portion of the State, including the August Complex Fire, which burned 1,032,648 acres and resulted in one fatality, and the North Complex Fire, which burned 318,935 acres and resulted in fifteen fatalities. On

August 22, 2020, a national disaster was first declared for the State of California[64], due to the extensive wildfires burning there.[65]

The following section provides evidence of the impact of these exceptional events on the Grass Valley, Sonora, and Sutter Buttes ozone monitors from August 20 to 22, and September 12 to 14, 2020. The evidence shows the source wildfires that collectively contributed emissions impacting these sites in the Sacramento Valley and Mountain Counties Air Basins.

NOAA's HYSPLIT[66] model was used to determine simple back-trajectories showing the path that an air parcel took for a specified period of time (here, 36 hours), starting at each monitor at times of peak concentrations on each day. Three height levels (red: 100 meters (m); blue: 500m; green: 1000m) were used to indicate transport near the surface and in the upper atmosphere. Additional trajectories can be found in Appendix D.

The HYSPLIT model was also used to indicate how emissions from the wildfires were transported toward the monitor (forward trajectory). Trajectories in this section are shown from the fire(s) estimated to have the highest contribution. The trajectories were initiated from each major fire at 12z (04PST). These model runs provide insight into the most likely center path a parcel of air (and smoke) from each fire would take in the 36 hours after the 12z start time. This provides a simplified understanding of smoke transport from a fire across the region, connecting these wildfires with smoke seen in satellite imagery, and indicating potential correlations at a site through analysis of parcel transport timing and backwards trajectories when they overlap. These forward trajectories, overlaid on satellite images from the MODIS[67] Aqua or Terra platforms using Google Earth, provide a visual analysis of the smoke emitting from the fires and impacting the monitors. Additional trajectories can be found in Appendix D.

Google Earth was used as a platform to combine the HYSPLIT back-trajectories and the NOAA Hazard and Mapping System (HMS) Fire and Smoke Product[68] smoke layers and fire locations. The back-trajectories for each monitor shown in the following sections traced back from the time of the maximum ozone concentration in the exceeding 8-hour period. Since different monitors will have maximum concentrations at different times, a table of the monitoring sites presented in the back-trajectory figures is included, indicating in both PST and UTC, the hours each trajectory began. Back-trajectories from the hour of the maximum ozone concentration in the exceeding 8-hour period for all exceptional event dates that are requested in this document are included in Appendix D.

The HYSPLIT trajectory model results, as well as Suomi satellite layers from the NASA Worldview application,[69] and HMS smoke plume analyses, show impacts from multiple

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[64] 85 FR 53428, *Presidential Declaration of a Major Disaster for the State of California*, dated 8/22/20
[65] FEMA, *California Wildfires and High Winds, DR-4558-CA*
[66] HYbrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT)
[67] UWM, SSEC, *MODIS Today*, last accessed 7/29/21
[68] *https://www.ssd.noaa.gov/PS/FIRE/smoke.html*
[69] *NASA Worldview*, *https://worldview.earthdata.nasa.gov/*. Last accessed 10/6/21

California wildfires dispersed throughout the northern and central portions of the State. Although the model results can show potential influence from specific fires, they do not always show the cumulative effect of continuing wildfire emissions that impacted California from August to early November.

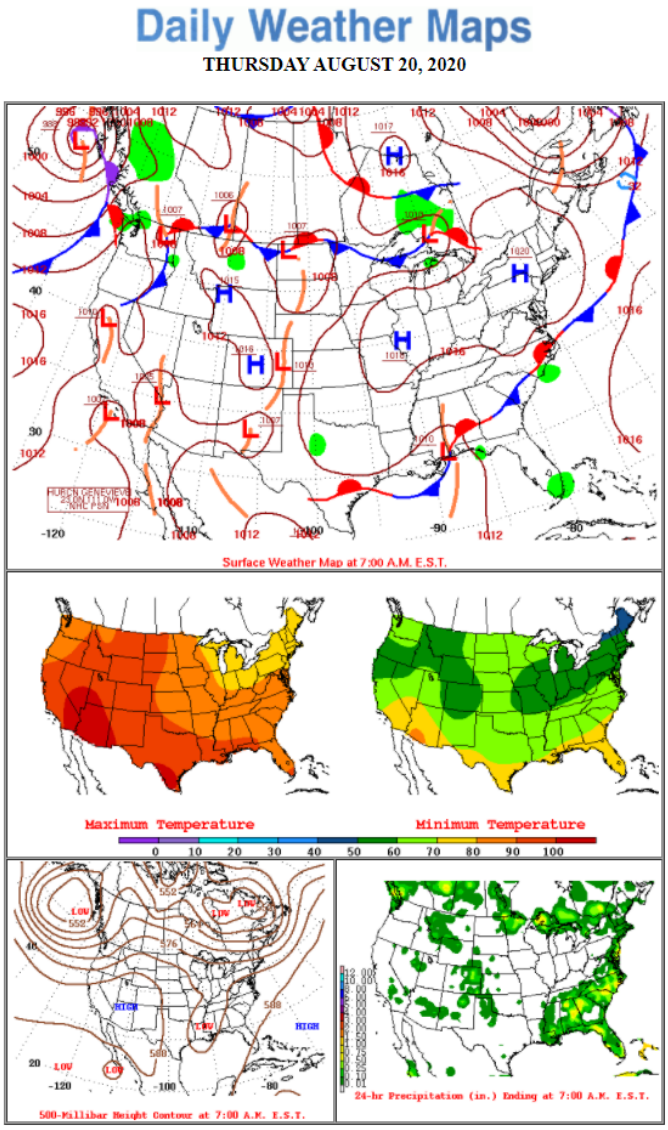
1. August 20-22, 2020

Strong 500mb high pressure was centered over the Great Basin area of Nevada and Utah (Figure III-20) providing for hot, near-record high temperatures and periods of strong winds across northern California in the days leading up to this event. Relatively dry thunderstorms initiated multiple wildfires in very dry vegetation across northern and central California during August 16-18 which rapidly spread and grew in size due to strong winds and low humidity across much of the region. 500mb low pressure and associated frontal system tracked towards southwestern Canada and northwestern United States during August 20-21 as the Great Basin high weakened which provided for some cooling of high temperatures closer to normal with additional widespread cooling and poor air quality due to dense smoke spread across much of northern California. Then late August 21 into August 22, the upper-level high pressure strengthens over the southwestern United States leading to slightly warmer temperatures on August 22, except where inhibited by denser smoke.

Concurrently, dense wildfire smoke from numerous lightning caused wildfires, which combined to form the August, LNU, SCU, CZU, and North Complexes, as well as individual fires such as the Jones Fire close to Grass Valley, and the Salt and MOC Fires near the Sonora monitoring site, spread across the Sacramento Valley and into portions of the Sierra Nevada foothills as seen in Figure III-21. This smoke limited daytime solar heating in these areas, leading to slightly lower temperatures from reduced solar heating across large portions of the impacted Sacramento Valley and Sierra Nevada Mountains. This decreased solar heating should have led to decreased ozone production at the ground under normal circumstances. However, these wildfires also produced significant ozone precursor emissions leading to elevated ozone concentrations where dispersion and downwind transport were favorable.

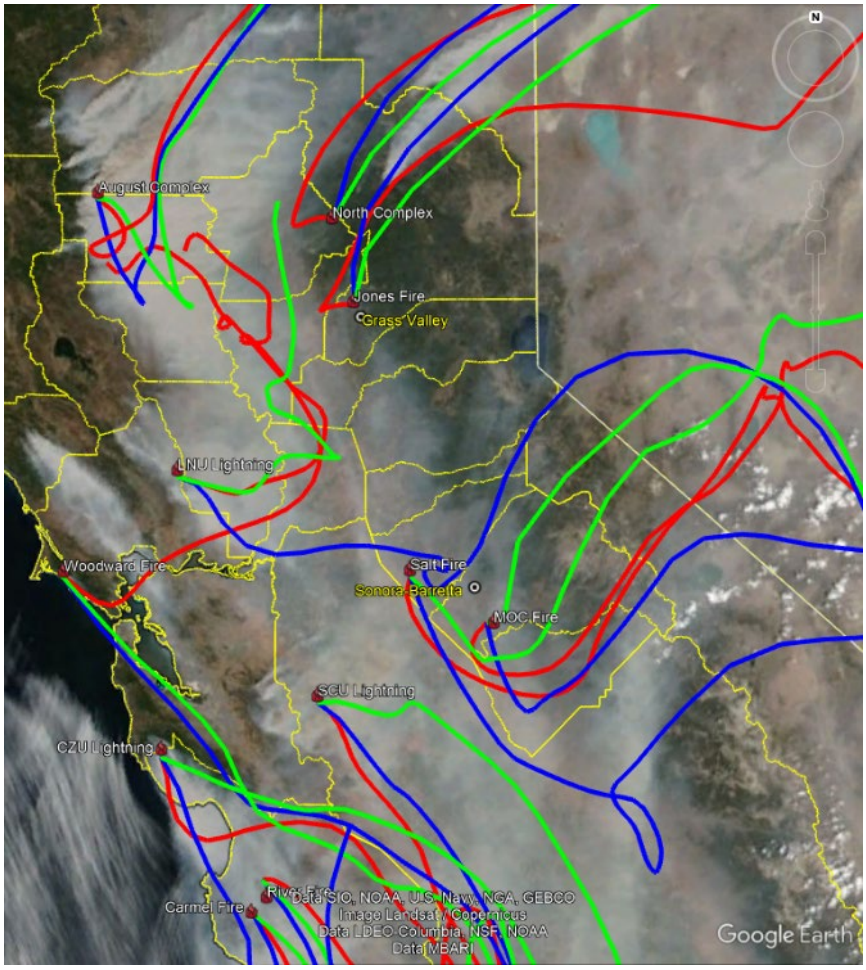
Widespread smoke and hot temperatures continued on August 23-24, though gusty winds and increased vertical mixing provided for a well-mixed boundary layer leading to a slight reduction in ozone concentrations as ozone exceedances were less extreme. While wildfire smoke also contributed to elevated ozone concentrations on these days, these dates are not being sought to be excluded as part of a demonstration at this time.

Figure III-20: Meteorological conditions on August 20, 2020[70]



[70] *https://www.wpc.ncep.noaa.gov/dailywxmap/index.html*

Figure III-21: Forward trajectories 12z (4am PST) from fires (Suomi satellite image, August 20, 2020)



Thick smoke covered most of Northern California, as shown in above Figure III-21 as well as the HMS smoke layers in Figure III-22 below. Back-trajectories, beginning at the time of the maximum ozone concentrations for the exceeding 8-hour period for each site on August 20, are overlaid on the HMS smoke layer. The surface trajectories (red, 100m), as well as those higher in the atmosphere and more indicative of transport (blue, 500m; green, 1000m), were influenced by the wildfire emissions. Table III-18 indicates the time of the start of the back-trajectory for each site.

Figure III-22: August 20, 2020 Back trajectories from exceeding monitors at time of maximum ozone concentration with HMS smoke layers

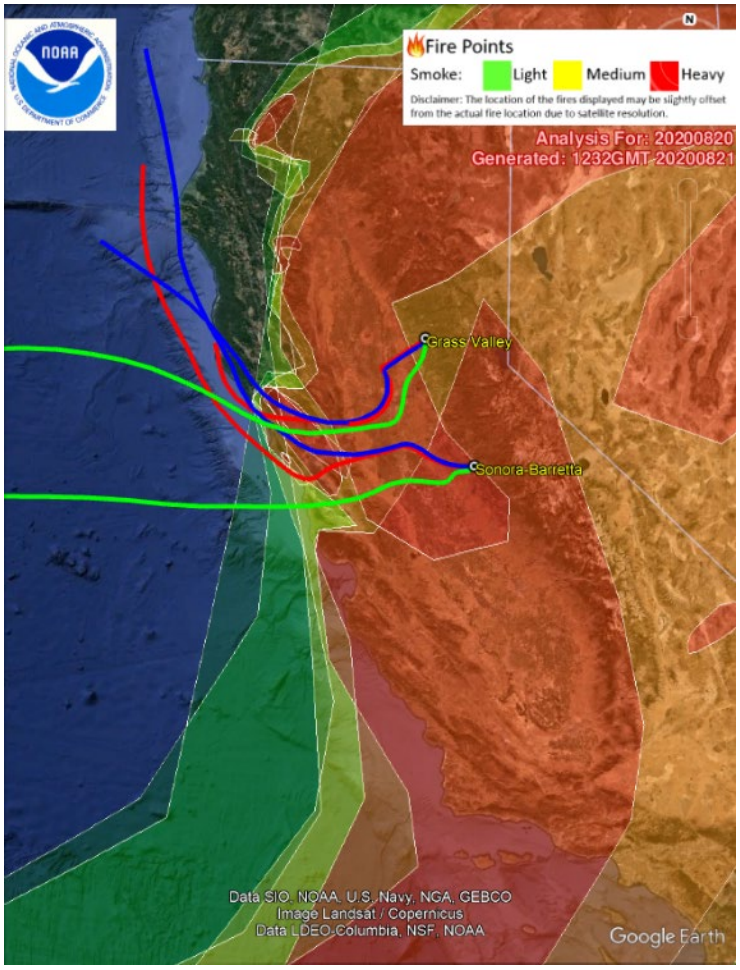


Table III-18: Exceeding monitoring sites and times of maximum ozone concentrations

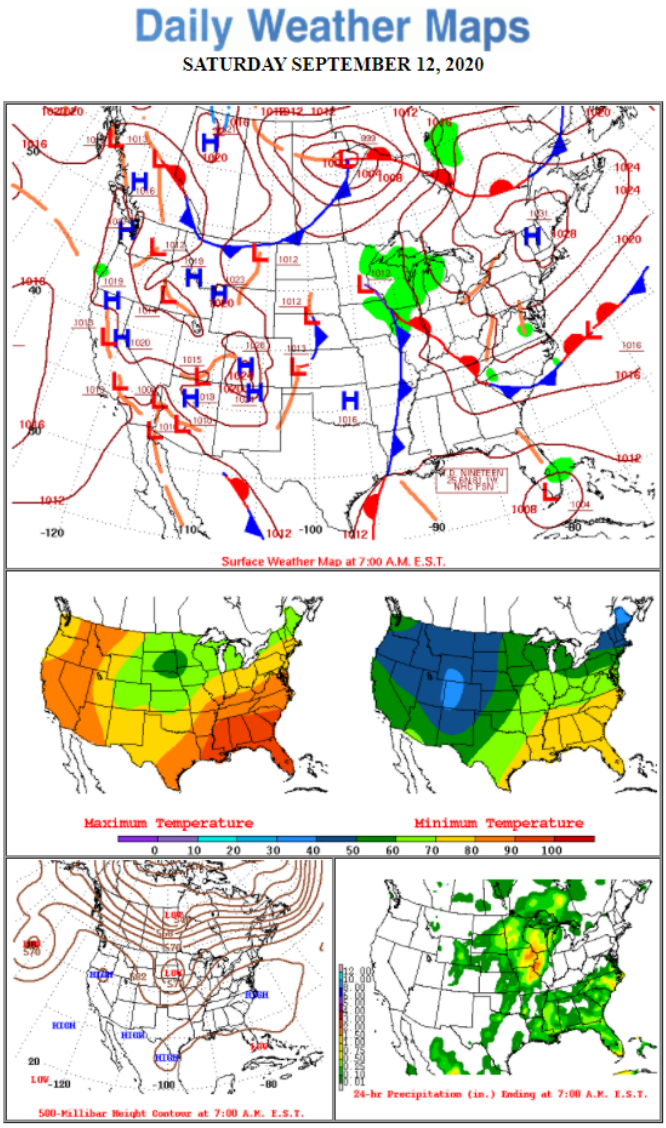
Site	Date (PST)	Max Hour (PST)	Date (UTC)	Max Hour (UTC)
Sonora	8/20/2020	15	8/20/2020	23
Grass Valley	8/20/2020	18	8/21/2020	2

2. September 12-14, 2020

In the days leading up to September 12, a widespread thick blanket of smoke blocks sunlight from reaching near the surface across most of the state of California, significantly limiting ozone concentrations across the state. The 500mb high pressure over the Pacific Coast was pushed slowly eastward by an East Pacific low pressure trough during September 12-16 (Figure III-23), which provided for generally near normal temperatures. Wildfire smoke thinned aloft as each day progressed while strong winds in the afternoon and evening hours

would enhance fire emissions and increase smoke coverage overnight. Complicating the situation, widespread smoke continued across the Sacramento Valley and into the mountains (Figure III-24), which limited heating in many areas but also provided ample ozone precursors, contributing to elevated ozone concentrations across much of the region. This provided for increased sunlight penetration during the day to moderate elevations such as the Sierra Nevada Mountain foothills, which boosted near-surface ozone production while interacting with wildfire smoke and led to transported ozone causing ozone exceedances at Grass Valley. The exceedance for September 12 occurred during the evening (starting hour 1800 PST) then remained above the 0.075 ppm standard and the historical hourly 95th percentile overnight leading into the September 13 (starting hour 0000 PST) exceedance. September 14-16 continued with thinning smoke aloft and enhanced wildfire smoke generation due to breezy winds in the afternoon and evening hours, which caused elevated ozone concentrations during the afternoon and evening through entrainment into the boundary layer as the mixing height increased with daytime heating. Upper-level trough began moving into the area during the evening of September 17 into September 18, which brought in cleaner marine air and cleared out most smoke across northern California.

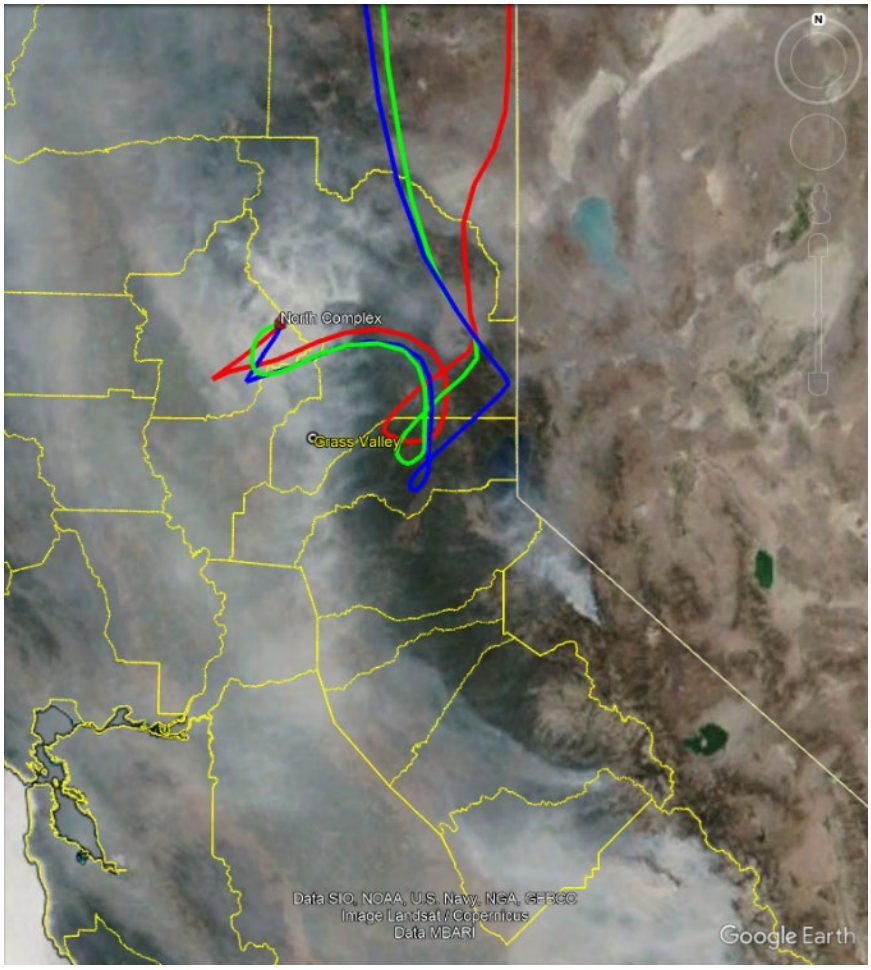
Figure III-23: Meteorological conditions on September 12, 2020[71]



Continued thick smoke covered the northern portion of the State. The combined fires that made up the August and LNU Complexes, as well as the numerous other individual fires, contributed to emissions from the North Complex just north of Grass Valley adding to the smoke impacting the Sacramento Valley and the Mountain Counties Air Basins (Figure III-24), and directly impacted the monitor at Grass Valley.

[71] *https://www.wpc.ncep.noaa.gov/dailywxmap/index.html*

Figure III-24: Forward trajectories 12z (4am) from fires (Suomi satellite image, September 12, 2020)



The back-trajectories for September 12, shown in Figure III-25, are overlaid on the September 12 HMS smoke layer, and again indicate that the surface trajectories (red, 100m), as well as those indicative of transport (blue, 500m; green, 1000m), were influenced by the wildfire emissions. Table III-19 indicates the time of the start of the back-trajectory at the Grass Valley site.

Figure III-25: September 12, 2020 Back trajectories from exceeding monitor at time of maximum ozone concentration with HMS smoke layer

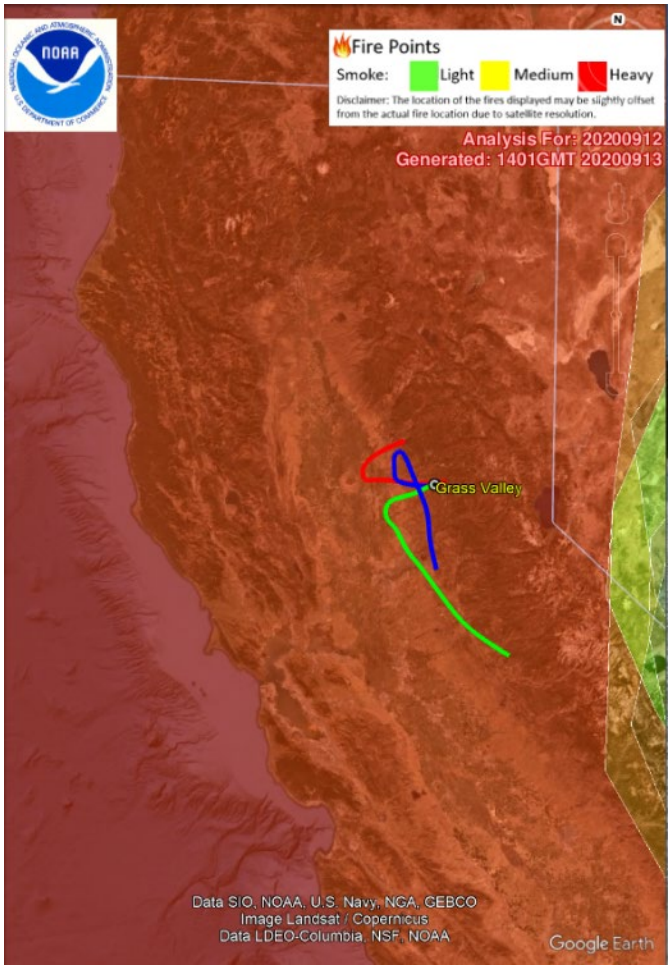


Table III-19: Exceeding monitoring sites and times of maximum ozone concentrations

Site	Date (PST)	Max Hour (PST)	Date (UTC)	Max Hour (UTC)
Grass Valley	9/12/2020	21	9/13/2020	5

C. Event Related Concentrations and Long-Term Trends

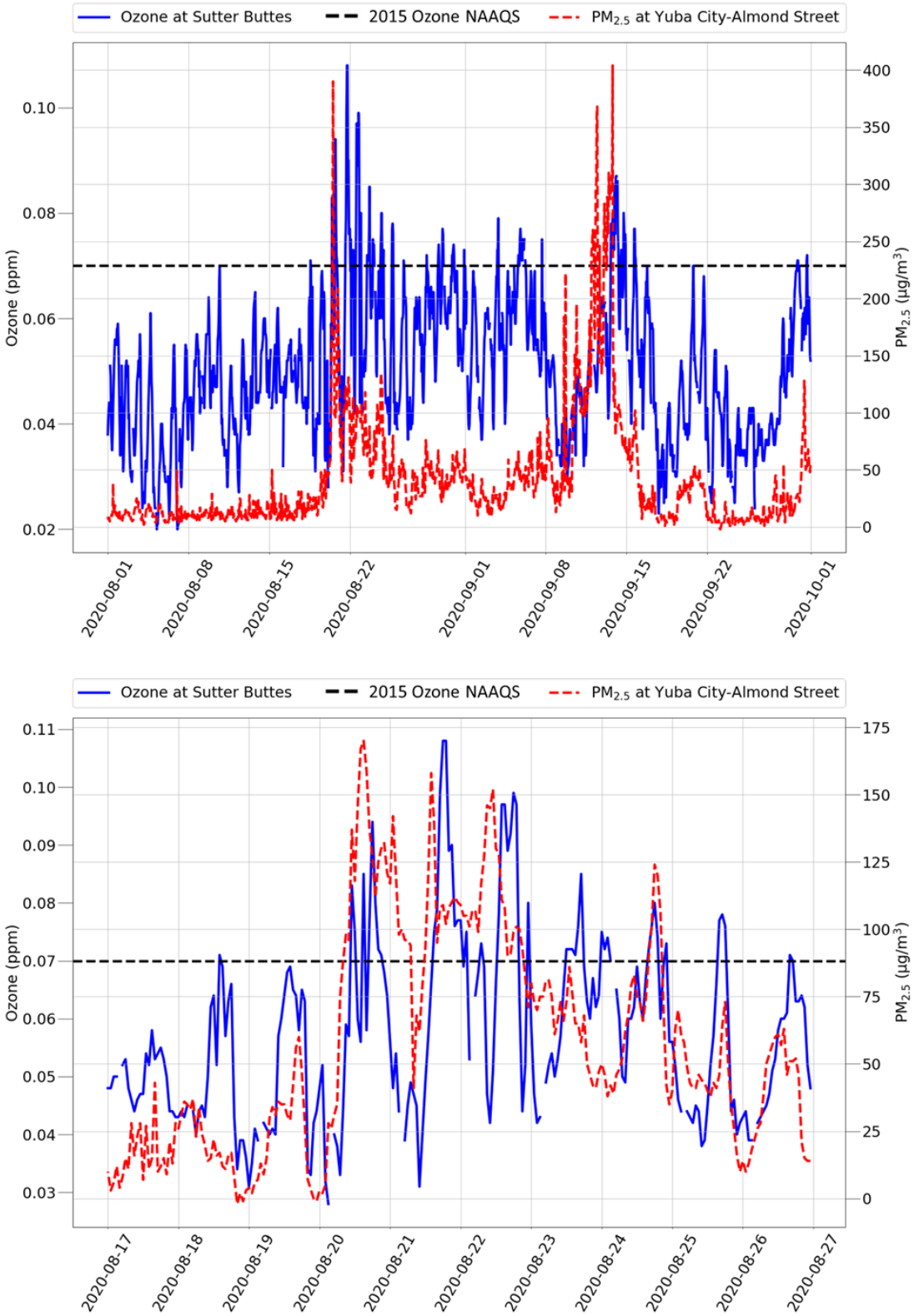
1. Sutter Buttes / Sutter County / Feather River AQMD

Multiple wildfires impacted the Sutter Buttes site depending on the day, but generally winds transported wildfire smoke and ozone precursors from the August, LNU Lightning Complex, North Complex, Woodward, CZU Lightning Complex, and SCU Lightning Complex wildfires in California causing elevated ozone concentrations at the Sutter Buttes monitoring site. Elevated $PM_{2.5}$ concentrations and ceilometer backscatter data (Section IV-C-4) at the nearby Yuba City-Almond St monitoring site and associated timing support the presence of wildfire

smoke at the Sutter Buttes site even with Sutter Buttes' elevation being over 2000 feet higher than the Yuba City site. Due to this difference in elevation, during many nights the $PM_{2.5}$ concentrations at Yuba City decrease as the polluted layer becomes elevated and decouples from the surface when a nocturnal surface boundary layer develops along the valley floor due to the radiational cooling of the ground. When this occurs, the Sutter Buttes site continues to experience the polluted airmass while Yuba City benefits from a cleaner surface boundary layer. Then during the day, the surface layer quickly becomes polluted due to the growth of the boundary layer from radiational heating, transport of wildfire smoke emissions into the area, and entrainment of emissions from elevated polluted airmasses.

Figure III-26 shows the ozone and $PM_{2.5}$ concentration encompassing August 1 to September 30 (top) and a zoomed in range of August 17 to August 27 (bottom), which includes the requested exceptional events on August 21 and August 22. The timing of relative $PM_{2.5}$ elevated concentrations show strong connections with ozone increases and prolonged elevated concentrations.

Figure III-26: 1-hour Ozone and 1-hour $PM_{2.5}$ Concentrations, 8/1-9/30/2020 (top) and 8/17-8/26/2020 (bottom).



Recent trends show a general decrease in 8-hour ozone design values at the Sutter Buttes monitoring site as shown in Figure III-27. The 2020 design value did not follow this trend, staying above the standard. Annual 4th highs (Figure III-28) have shown a relatively flat trend during the past ten years, with a slight increase exacerbated by large year-to-year variations elevated in part due to wildfire impacts during several years that have not previously been pursued as exceptional events due to a lack of regulatory impact for those years. A caveat to the data and trends must be noted, as more than 5 months of data was invalidated during the Summer 2017 ozone season which likely led to a lower 4th high in 2017 and may have impacted the design values in 2017 to 2019. Concurrence of the requested exceptional event dates for both 2018 and 2020 demonstrations will bring the area into attainment of the 2015 ozone standard, which better fits the historical trend lines.

Figure III-27: 8-hour Ozone Design Values with Trend at Sutter Buttes

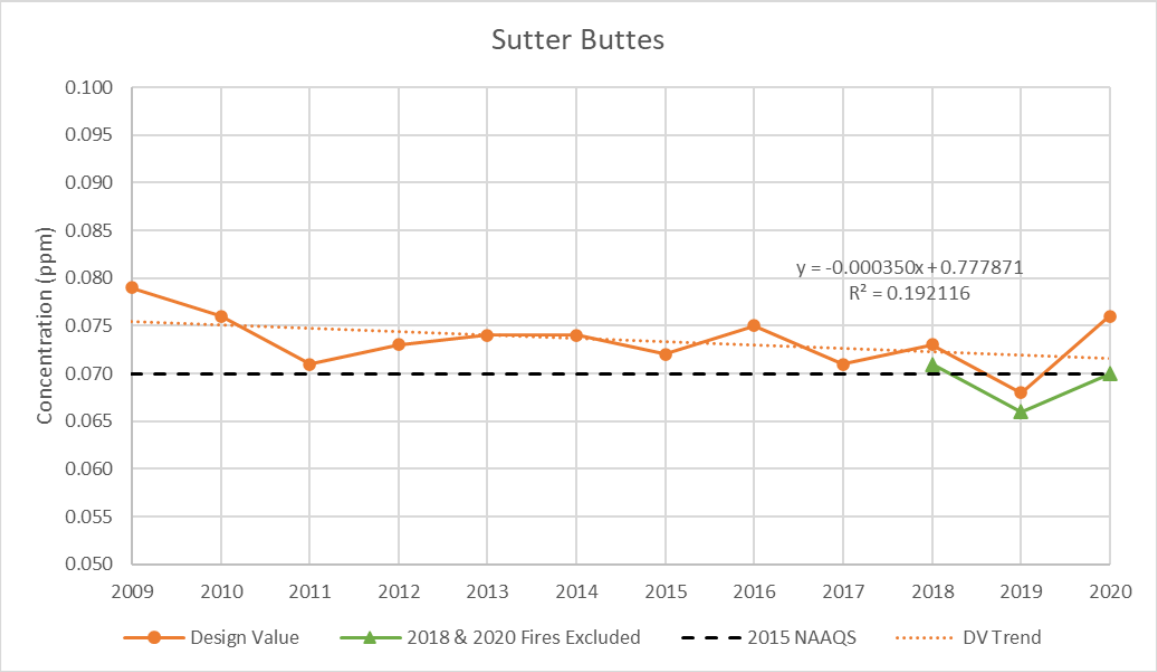
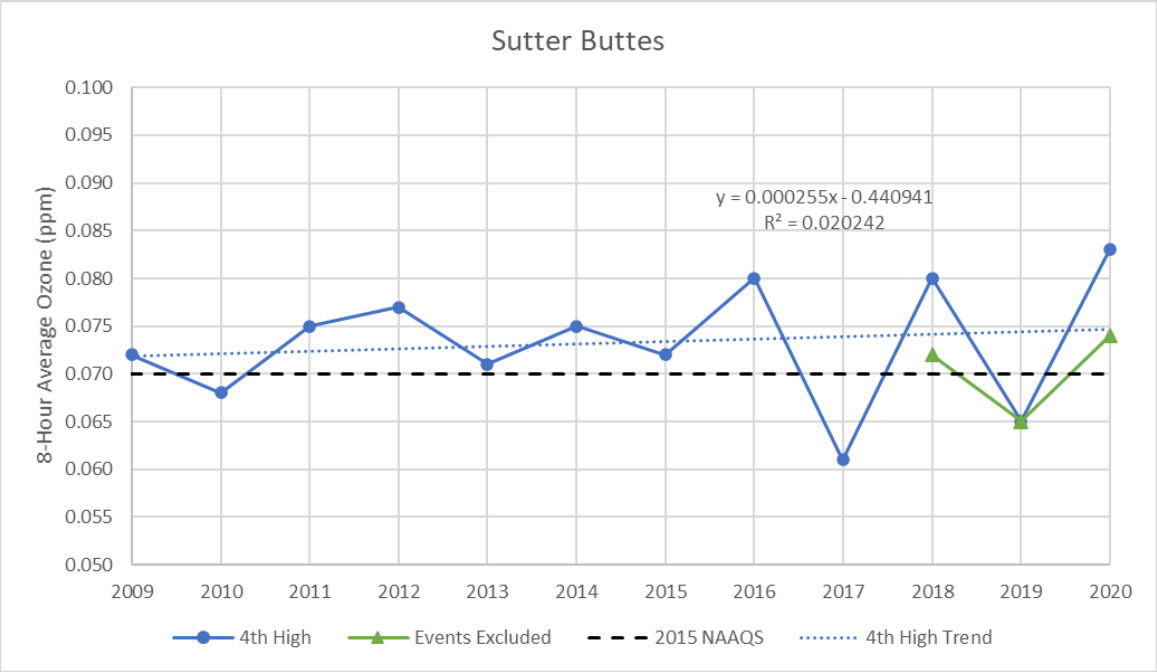


Figure III-28: Annual 4th High 8-Hour Average Ozone with Trend at Sutter Buttes

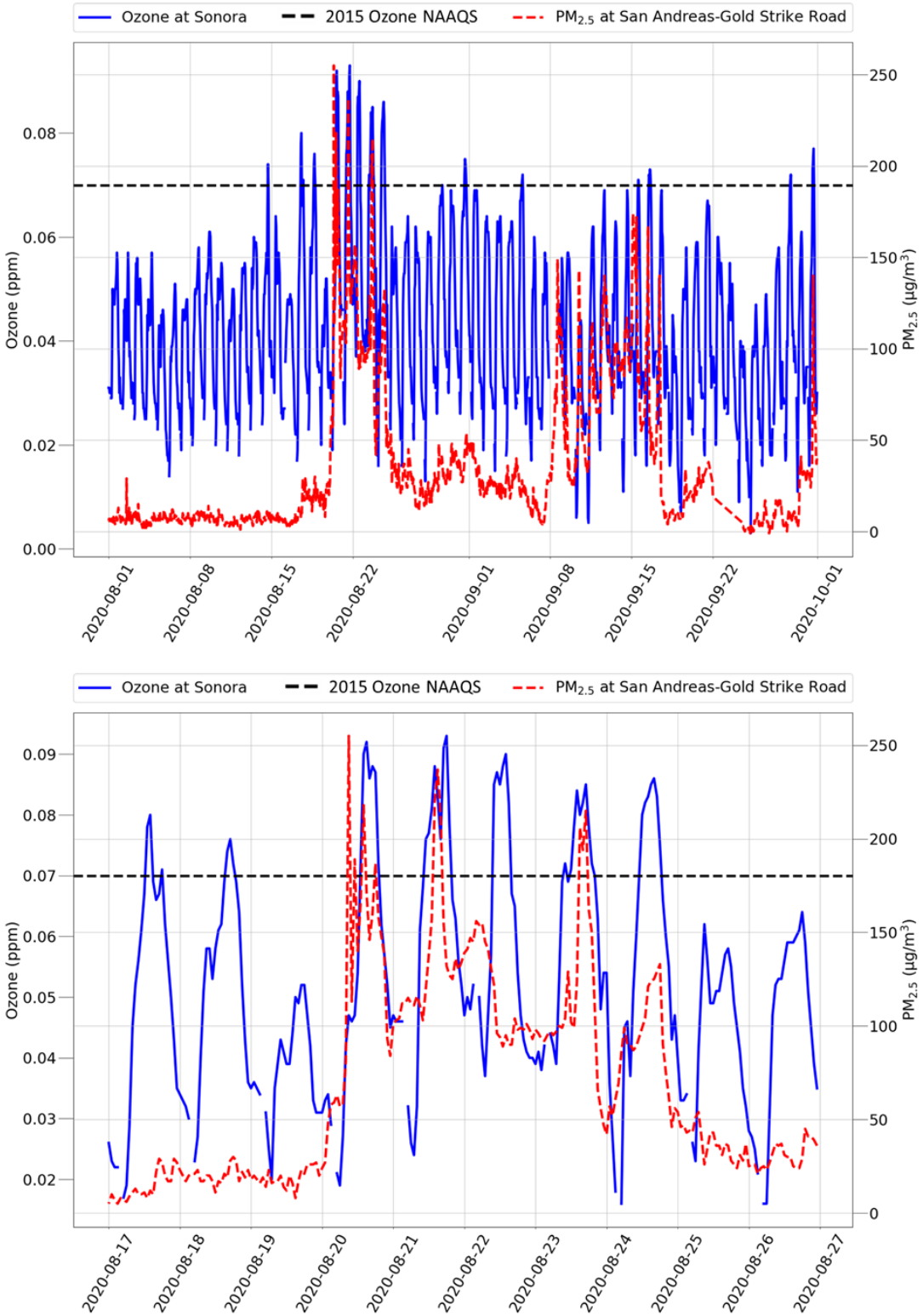


2. Tuolumne County (Sonora)

Multiple wildfires impacted the town of Sonora depending on the day, but winds were have found to have transported wildfire smoke and ozone precursors from the Moc, Salt, SCU Lightning Complex, CZU Lightning Complex, August Complex, LNU Lightning Complex, North Complex, Woodward, River, Carmel, and Dolan wildfires in California causing elevated ozone concentrations at the Sonora-Barretta St monitoring site during exceedance days. Elevated $PM_{2.5}$ concentrations at the nearest $PM_{2.5}$ monitor at San Andreas-Gold Strike Rd, which is 22 miles northwest of the Sonora site, and associated timing support the presence of wildfire smoke in the nearby area which also impacted the town of Sonora.

Figure III-29 shows the ozone and $PM_{2.5}$ concentration encompassing August 1 to September 30 (top) and a zoomed in range of August 17 to August 27 (bottom), which includes the requested exceptional events between August 20 through August 22. The timing of relative $PM_{2.5}$ elevated concentrations show strong connections with ozone increases and prolonged elevated concentrations.

Figure III-29: 1-hour Ozone and 1-hour $PM_{2.5}$ Concentrations, 8/1-9/30/2020 (top) and 8/17-8/26/2020 (bottom).



Recent trends show a general decrease in 8-hour ozone design values at the Sonora monitoring site as shown in Figure III-30. Annual 4th highs (Figure III-31) have shown an increasing trend during the past ten years, believed to be caused by greater year-to-year variations due in large part by wildfires during several recent years. Influence from wildfires in 2016 are believed to have led to a significantly higher 2016 4th high and inflated design values for 2016-2018, but has not been pursued for exceptional events due to a lack of regulatory impact. Similar impacts from wildfires in 2018 and 2020 led to higher 4th highs and design values during 2018-2020. Concurrence of the requested exceptional event dates for both 2018 and 2020 demonstrations will bring the area into attainment of the 2015 ozone standard.

Figure III-30: 8-hour Ozone Design Values with Trend at Sonora (Tuolumne County)

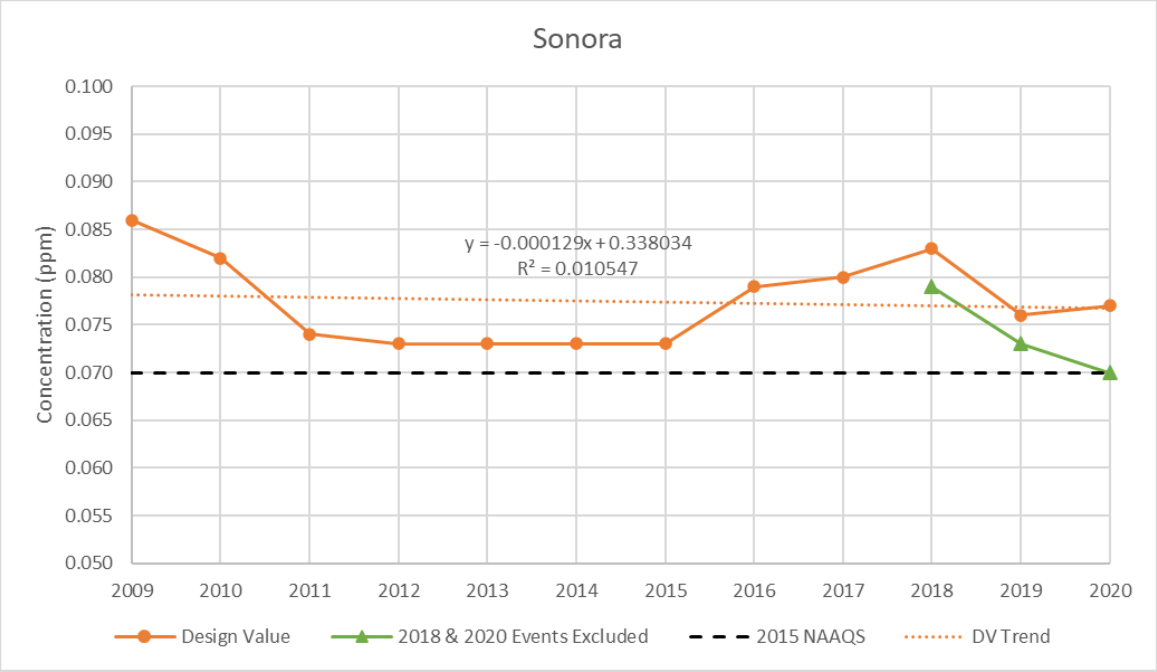
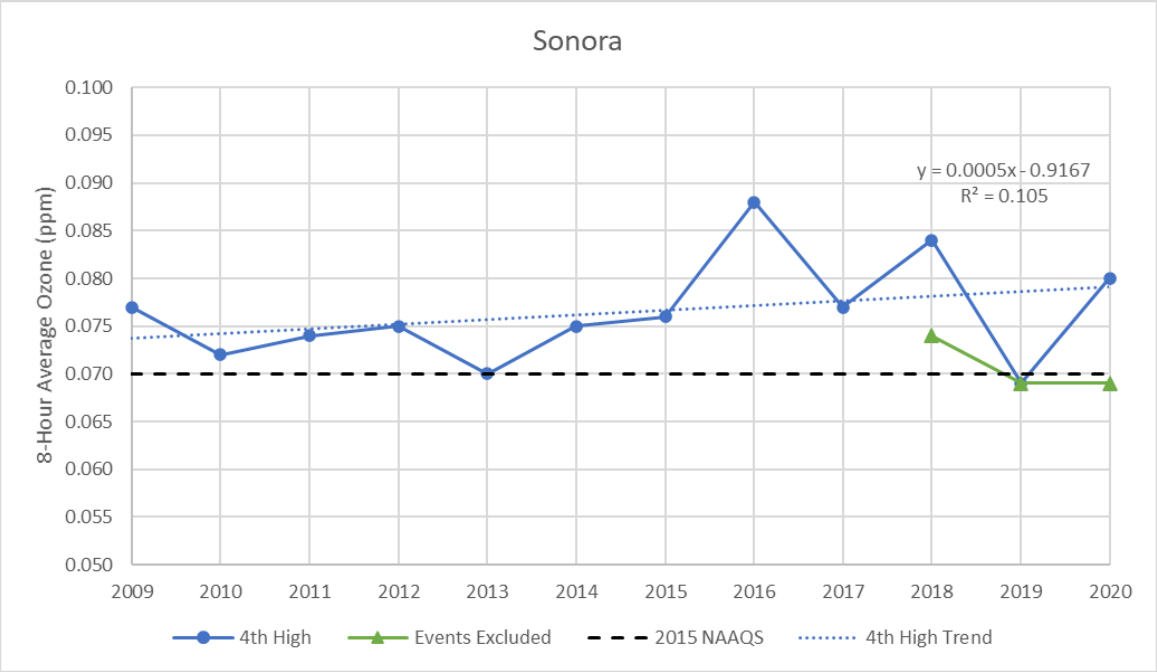


Figure III-31: Annual 4th High 8-Hour Average Ozone with Trend at Sonora



3. Western Part of Nevada County (Grass Valley) / Northern Sierra AQMD

Multiple wildfires impacted the town of Grass Valley depending on the day, but generally winds transported wildfire smoke and ozone precursors from the Jones, August, LNU Lightning Complex, SCU Lightning Complex, North Complex, Creek, and SQF Complex wildfires in California causing elevated ozone concentrations at the Grass Valley-Litton Building monitoring site. Elevated $PM_{2.5}$ monitor concentrations and associated timing support the presence of wildfire smoke in the town of Grass Valley.

Figure III-32 shows the ozone and $PM_{2.5}$ concentration encompassing August 1 to September 30 and Figure III-33 shows a zoomed in range of August 17 through August 26 (top) and September 9 through September 17 (bottom), which includes the requested exceptional events between August 20 through September 14. The timing of relative $PM_{2.5}$ elevated concentrations show strong connections with ozone increases and prolonged elevated concentrations. At the start of the August event (Figure III-33 top), $PM_{2.5}$ and ozone concentrations rapidly rose by more than 65 µg/m^3 and 0.059 ppm, respectively, during the afternoon on August 20 and remained elevated throughout August 21. Overall, ozone concentrations were greater than 0.080 ppm for all hours where the $PM_{2.5}$ values were greater than 100 µg/m^3, regardless of time of day. During the September event (Figure III-33 bottom), ozone concentrations were greater than 0.050 ppm for all hours where the $PM_{2.5}$ values were greater than 50 µg/m^3, regardless of time of day.

Both of the event periods show a consistent relationship between high $PM_{2.5}$ and elevated ozone values which is supportive of a strong influence by wildfire smoke. The $PM_{2.5}$

concentration during both event periods is also well above the federal 24-hour $PM_{2.5}$ standard of 35 µg/m^3.

Data is missing for the August 21 0700 PST hour due to a precision check during the 0700-0800 PST hour and from 1200 PST on August 21 through 1000 PST on August 24 and 1300 PST on August 26 through 0900 PST on August 26, 2020 due to a power failure at the monitoring site.

Figure III-32: 1-hour Ozone and 1-hour $PM_{2.5}$ Concentrations at Grass Valley

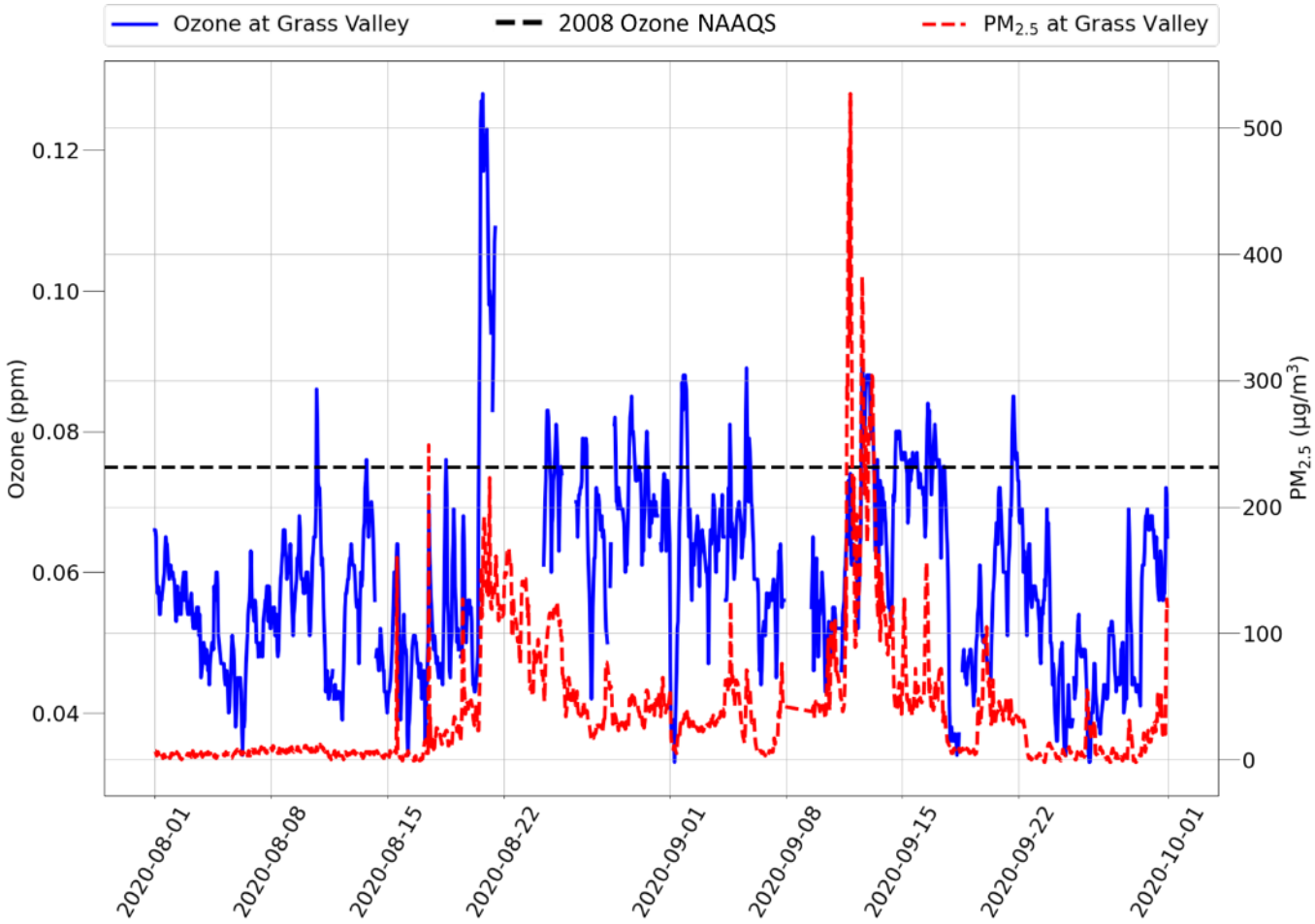
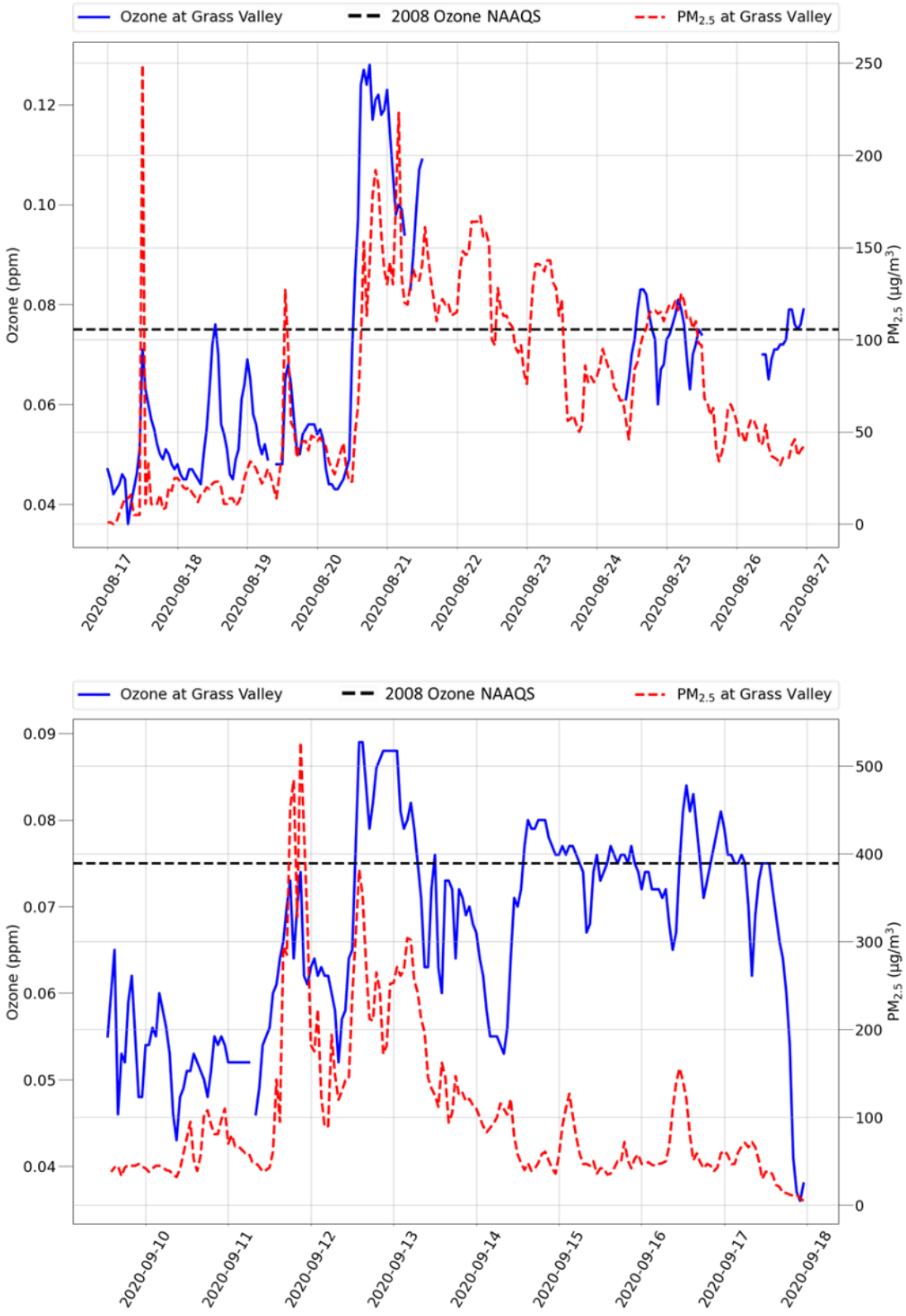


Figure III-33: 1-hour Ozone and 1-hour $PM_{2.5}$ Concentrations on the Requested Exceptional Event and Surrounding Days, 8/17-8/26/2020 (top) and 9/9-9/17/2020 (bottom).



Recent trends show an increase in 8-hour ozone design values at the Grass Valley monitoring site as shown in Figure III-34. Annual 4th highs (Figure III-35) have shown a slowly increasing trend during the past ten years though concentrations are believed to have been heavily influenced by year-to-year variation likely due in large part by wildfire impacts. Influence from wildfires in recent years are believed to have led to a notably higher 4th highs and inflated design values for 2016-2018. For further consideration, 2019 was a relatively quiet wildfire year in California, leading to a significantly lower 4th high as the site experienced little to no ozone enhancement from wildfire impacts. Concurrence of the requested exceptional event dates for both 2018 and 2020 demonstrations will bring the area into attainment of the 2008 ozone standard.

Figure III-34: 8-hour Ozone Design Values with Trend at Grass Valley (West Nevada County)

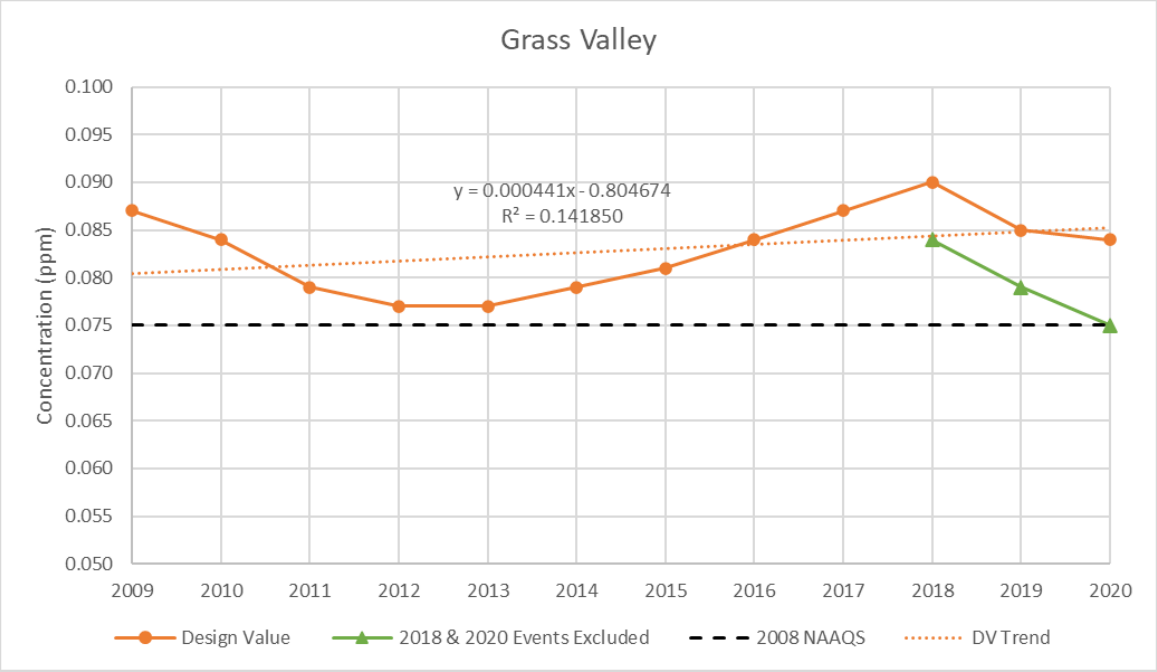
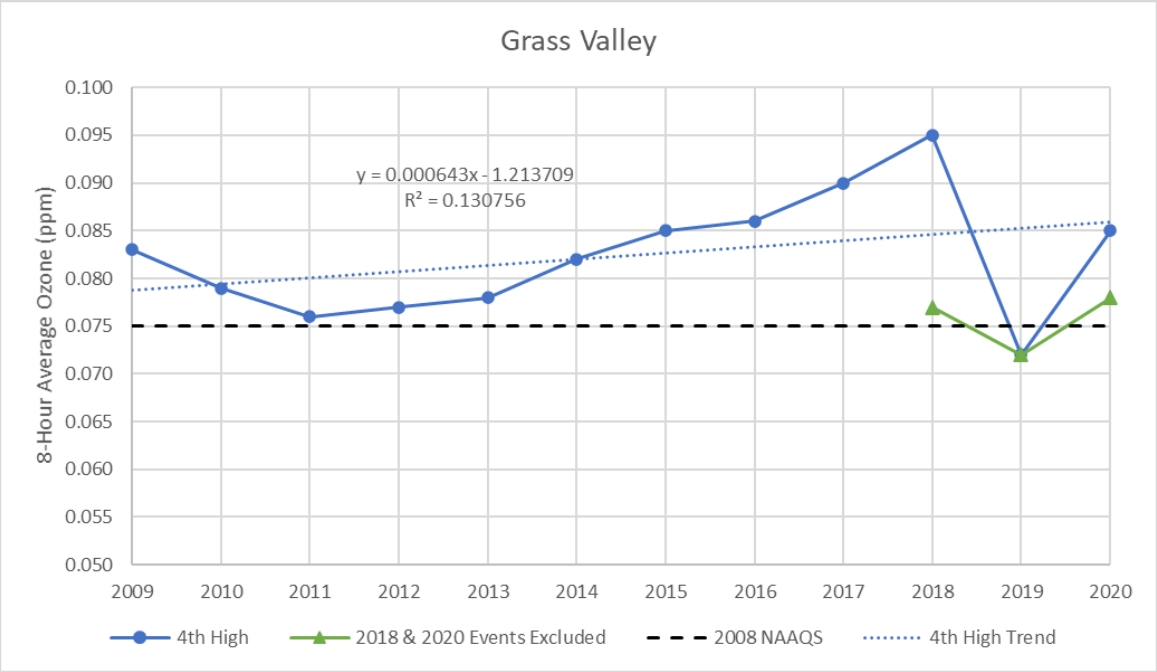


Figure III-35: Annual 4th High 8-Hour Average Ozone with Trend at Grass Valley



D. Meteorological Conditions

Table III-20 and Table III-21 lists the averages and standard deviations of the daily maximum temperatures and wind speeds on the exceptional event periods (August 17-August 26 for all sites and September 9-September 17 for Grass Valley), normal (non-event) days, and all days in August 2020 at each monitoring site and for September 2020 for Grass Valley monitoring site. Details of the meteorological conditions on each exceptional event day are discussed in the following sections.

Table III-20: Averages and Standard Deviations (SD) of Temperatures (°F) on Exceptional Event Period (8/17-8/26 for all Sites and 9/9-9/17 for Grass Valley), Normal (Non-Event) Days, and All Days in August and September 2020.

Exceptional Event Period	Sutter Buttes		Sonora		Grass Valley	
	Average	SD	Average	SD	Average	SD
August EE Days	89.56	4.56	93.72	3.94	92.68	4.25
August Normal Days	88.09	6.04	92.50	5.14	91.12	5.08
August All	88.57	5.65	92.89	4.82	91.62	4.88
September EE Days	-	-	-	-	85.78	2.11
September Normal Days	-	-	-	-	88.86	7.62
September All	-	-	-	-	87.91	6.59

Table III-21: Averages and Standard Deviations (SD) of Wind Speeds (mph) on Exceptional Event Period (8/17-8/26 for all Sites and 9/9-9/17 for Grass Valley), Normal (Non-Event) Days, and All Days in August and September 2020.

Exceptional Event Period	Sutter Buttes		Sonora		Grass Valley	
	Average	SD	Average	SD	Average	SD
August EE Days	21.26	8.31	5.12	1.85	5.28	1.22
August Normal Days	18.60	5.07	4.14	1.67	5.07	0.66
August All	19.46	6.42	4.45	1.79	5.14	0.86
September EE Days	-	-	-	-	4.44	1.29
September Normal Days	-	-	-	-	5.65	1.88
September All	-	-	-	-	5.27	1.78

1. Sutter Buttes / Sutter County / Feather River AQMD

Table III-22: Maximum Daily Values of Ozone, Temperature, and Wind Speed on Exceptional Event and Surrounding Days at Sutter Buttes Monitoring Site.

Date	8/17	8/18	8/19	8/20	8/21*	8/22*	8/23	8/24	8/25	8/26
1hr Ozone (ppm)	0.059	0.071	0.070	0.095	0.109	0.099	0.086	0.080	0.079	0.072
8hr Ozone (ppm)	0.053	0.063	0.064	0.075	0.090	0.089	0.072	0.071	0.064	0.064
Temperature (°F)	92.7	99.9	94.8	84.9	86.9	89.8	87.8	85.6	87.1	86.2
Wind Speed (mph)	40.2	32.6	15.4	19.6	12.2	16.6	17.4	18.3	15.9	24.6

* Denotes Exceptional Event Dates Requested for Data Exclusion

2. Tuolumne County (Sonora)

Table III-23: Maximum Daily Values of Ozone, Temperature, and Wind Speed on Exceptional Event and Surrounding Days at Sonora Monitoring Site.

Date	8/17	8/18	8/19	8/20*	8/21*	8/22*	8/23	8/24	8/25	8/26
1hr Ozone (ppm)	0.080	0.077	0.052	0.093	0.093	0.090	0.086	0.086	0.062	0.064
8hr Ozone (ppm)	0.070	0.068	0.046	0.081	0.083	0.081	0.078	0.080	0.053	0.059
Temperature (°F)	100.9	101.1	94.1	93.6	91.9	92.7	91.4	92.7	89.6	89.2
Wind Speed (mph)	8.1	8.6	6.3	4.8	2.9	3.5	3.9	4.0	5.1	4.0

* Denotes Exceptional Event Dates Requested for Data Exclusion

Maximum daily temperatures were generally in the 90s throughout most of the event with August 17 and 18 being over 100°F and then temperatures cooling off into the 80s on August 25 and 26. Maximum daily resultant wind speeds generally remained light at 2-8 mph. Maximum ozone concentration varied significantly with a range of 41 ppb and 37 ppb for the 1-hour and 8-hour ozone, respectively.

The weather data supports that ozone directly related to wildfire smoke from the wildfires in California affected the Sonora monitor and increased ozone concentrations. Unusual weather, other than the transport of ozone and related wildfire smoke, was not a factor contributing to the exceptional event.

3. Western Part of Nevada County (Grass Valley) / Northern Sierra AQMD

Table III-24: Maximum Daily Values of Ozone, Temperature and Wind Speed on Exceptional Event and Surrounding Days, 8/17-8/26/2020, at Grass Valley Monitoring Site.

Date	8/17	8/18	8/19	8/20*	8/21*	8/22	8/23	8/24	8/25	8/26
1hr Ozone (ppm)	0.071	0.076	0.069	0.128	0.123	N/A	N/A	0.083	0.081	0.079
8hr Ozone (ppm)	0.057	0.062	0.058	0.122	0.104	N/A	N/A	0.078	0.075	0.076
Temperature (°F)	101.7	98.6	92.3	91.2	91.6	93.2	93.6	87.8	88.7	88.2
Wind Speed (mph)	8.1	4.9	5.1	5.8	3.6	4.5	4.3	5.8	4.9	5.8

* Denotes Exceptional Event Dates Requested for Data Exclusion

Table III-25: Maximum Daily Values of Ozone, Temperature and Wind Speed on Exceptional Event and Surrounding Days, 9/9-9/17/2020, at Grass Valley Monitoring Site.

Date	9/9	9/10	9/11	9/12*	9/13*	9/14*	9/15	9/16	9/17
1hr Ozone (ppm)	0.065	0.06	0.074	0.089	0.088	0.08	0.077	0.084	0.079
8hr Ozone (ppm)	0.056	0.055	0.067	0.086	0.081	0.079	0.076	0.078	0.075
Temperature (°F)	86.9	81.5	85.28	85.1	88.16	87.98	87.8	85.82	83.48
Wind Speed (mph)	5.8	4	5.8	2.9	2.2	4.7	4.5	4.3	5.8

* Denotes Exceptional Event Dates Requested for Data Exclusion

Table III-24 shows the daily values for the event period of August 17 to 26, 2020. Maximum temperatures were generally in the 90s throughout most of the event with August 8 being over 100°F and temperatures cooling off into the 80s on August 24, 2020. Maximum daily resultant wind speeds generally remained light at 3-8 mph. Maximum ozone concentration varied significantly with a range of 59 ppb and 65 ppb for the 1-hour and 8-hour ozone, respectively.

Table III-25 shows the daily values for the event period of September 9 to September 17, 2020. Maximum temperatures were in the 80s throughout the event. Maximum daily resultant wind speeds remaining light at 2-6 mph. Maximum ozone concentration varied moderately with a range of 29 ppb and 31 ppb for the 1-hour and 8-hour ozone, respectively.

The weather data, for both event periods, supports that ozone directly related to wildfire smoke from the wildfires in California affected the Grass Valley monitor and increased ozone concentrations. Unusual weather, other than the transport of ozone and related wildfire smoke, was not a factor contributing to the exceptional event.

E. Air Quality/Health Advisories

Air quality alerts and advisories were issued by all of the affected districts.

The Feather River AQMD maintains a webpage[72] that keeps the public informed of wildfire smoke and air quality impacts as well as utilizing the AirNow Enviroflash Air Quality Notification System through their Air Quality Health Advisory webpage.[73] The District issued an air quality advisory jointly with the public health officers of both Sutter and Yuba Counties, which is included in Appendix B.

Although the Northern Sierra AQMD does not host a webpage specifically dedicated to wildfire smoke impacts, the public is kept informed via their general air quality information page[74] as well as the Greater Portola Blog.[75] Air quality advisories are prominently displayed on the District main webpage[76] and the public can request to be directly informed of any advisories through the Air Quality Health Advisory E-mail Subscription Service[77] or through social media accounts for each individual county within the air district.

Tuolumne County APCD maintains a webpage with the rest of the County of Tuolumne and does not have one specifically devoted to wildfire smoke, including a document available for download from the Public Health portion of the website with smoke-related health tips.[78] The county also maintains a citizen alert notification system, through the Office of Emergency Services, to inform citizens of air quality issues in the event it becomes necessary.[79] The District released an air quality advisory at the beginning of the event on August 19, 2020, included in Appendix B.

F. Media Coverage

Media coverage of the wildfires that occurred throughout the State in 2020 was extensive. Subsequent coverage included the impacts of smoke in communities throughout the districts discussed in this document. Two examples are given below, Figure III-36 from local news media and Figure III-37 from a Twitter post from an affected district. Other examples can be found in Appendix F.

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[72] Feather River AQMD, *Wildfire Smoke*, last accessed 8/27/21
[73] Feather River AQMD, *Air Quality Health Advisory*, last accessed 8/27/21
[74] Northern Sierra AQMD, *AIr Quality Information*, last accessed 8/30/21
[75] Northern Sierra AQMD, *Greater Portola Blog*, last accessed 8/30/21
[76] *Northern Sierra AQMD*, last accessed 8/30/21
[77] Northern Sierra AQMD, *Air Quality Advisory E-mail Subscription*, last accessed 8/30/21
[78] Tuolumne County, Public Health, *Wildfire Smoke Health Tips*, last accessed 10/20/21
[79] Tuolumne County, Office of Emergency Services, *Citizen Alert Notification*, last accessed 8/30/21

Figure III-36: Example of News Media Coverage

Tahoe Daily Tribune action Serving Lake Tahoe

News Coronavirus Entertainment Weather & Roads Environment Sports Healthy Tahoe Business Marketplace Magazines This Week's Local

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Loyalton Fire burns through 43,000 acres, sends smoke throughout Lake Tahoe region (video)

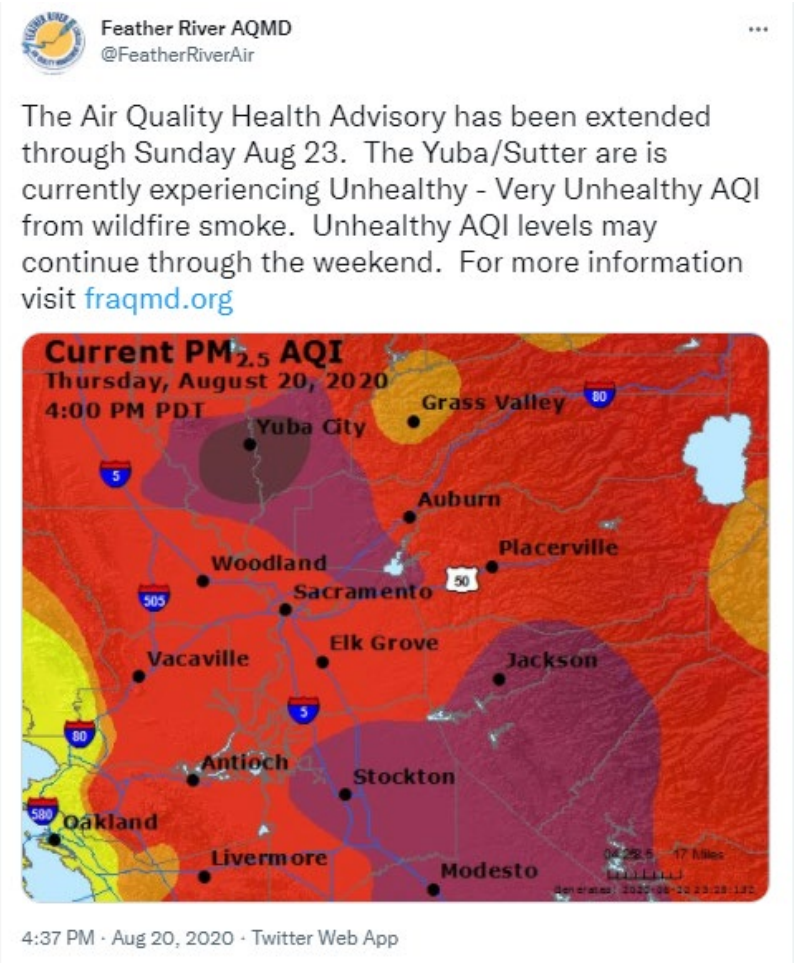
News FOLLOW NEWS | August 20, 2020

Sierra Sun Report

A map of the Loyalton Fire.
Provided

As wildfires rage through Northern California this week after an early Monday storm with dry lightning and strong winds, a blaze sparked one week ago today by a lightning strike in the Sierra Valley — the Loyalton Fire — has consumed over 43,000 acres, burned through homes and helped blanket much of the Tahoe region in smoke.

Figure III-37: Example of Social Media Coverage



IV. Clear Causal Relationship

This section addresses the "clear causal relationship" criterion as per U.S. EPA's exceptional events guidance by providing 1) a comparison of the ozone data requested for exclusion with historical concentrations at the air quality monitor, 2) demonstrating that the wildfire's emissions were transported to the monitor, 3) show the emissions from the wildfire influenced the monitored concentrations, and in some cases 4) quantifying the contribution of the wildfire's emissions to the monitored ozone exceedance or violation.

For wildfire ozone events, U.S. EPA has defined a tiered approach that apply to the "clear causal relationship" criterion based on key factors and is intended to lessen the evidence required for more obvious and/or extreme events. These tiers require analyses to establish the existence of wildfire emissions, transport to the exceeding monitor, and impact at the monitor. Each tier is to be taken in order and are summarized below. Specific information that is presented to satisfy these criteria can be found in the individual tier sections.

- Tier 1: Exceedances are clearly higher than non-event related concentrations and have occurred from a fire in close proximity to the exceeding monitor during a time or place of historically low ozone concentrations;
- Tier 2: This tier is used when impacts do not qualify for Tier 1 analysis, but exceedances are higher than non-event related exceedances although may not be "clearly" higher, and large fire emissions relative to the distance of the fire to the monitor indicate a clear causal relationship; and
- Tier 3: This tier encompasses wildfires or impacts that are more complex and do not qualify for Tier 1 or Tier 2 analysis, but additional analyses submitted as part of a weight-of-evidence showing can establish a clear causal relationship.

This demonstration meets the purpose of U.S. EPA's published guidance and provides the evidence needed to concur on all requested exceptional event dates in 2020.

A. Tier 1 Key Factor Analysis

This section provides the documentation requested for a Tier 1 analysis per the *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations.*[80] The Tier 1 analysis is for wildfires that clearly influence monitored ozone exceedances or violations when they occur in an area that typically experiences lower ozone concentrations. This includes establishing the seasonality and/or distinctive level of the monitored ozone concentration as well as providing evidence that the wildfire emissions were transported to the monitors. Analyses presented in this document include 2015-2020 8-hour maximums (Figure IV-1) to show seasonality and non-event related concentrations, proximity of wildfires (Section B of the Narrative Conceptual Model chapter), and transport of emissions from wildfires to the exceeding monitors (Section B of the Narrative Conceptual Model chapter and Section C of this chapter).

The key factor for Tier 1 requires establishing the seasonality and/or distinctive level of the monitored ozone concentration. The event-related exceedance occurs during a time of year that typically has no exceedances or is clearly distinguishable (at least 0.005 ppm higher) from non-event exceedances. Additionally, ozone impacts should be accompanied by clear evidence that the wildfire's emissions were transported to the location of the monitor.

Figure IV-1 through Figure IV-3 show that the exceedances occurred during the time of year where ozone concentrations tend to be higher for all monitoring sites, and that some of these exceedances are clearly distinguishable from non-event exceedances as defined by guidance.

Both 2020 event days requested for Sutter Buttes of August 21, 2020 (0.090 ppm) and August 22, 2020 (0.089 ppm) are at least 0.005 ppm higher than the greatest maximum 8-hour concentration in the prior five years (0.084 ppm on August 18, 2016) and thus qualify for Tier 1 analysis. The Grass Valley event dates of August 20, 2020 (0.122 ppm) and August

[80] U.S. EPA, *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations*, p. 13, last accessed 7/26/21

21, 2020 (0.104 ppm) qualify for Tier 1 analysis when the 2018 event days are excluded from comparison. While the remainder of the exceedances were high for the season at Sonora and Grass Valley, they do not qualify for a Tier 1 analysis.

Figure IV-1: Sutter Buttes 8-Hour Daily Ozone Maximums by Day of the Year for 2015-2020

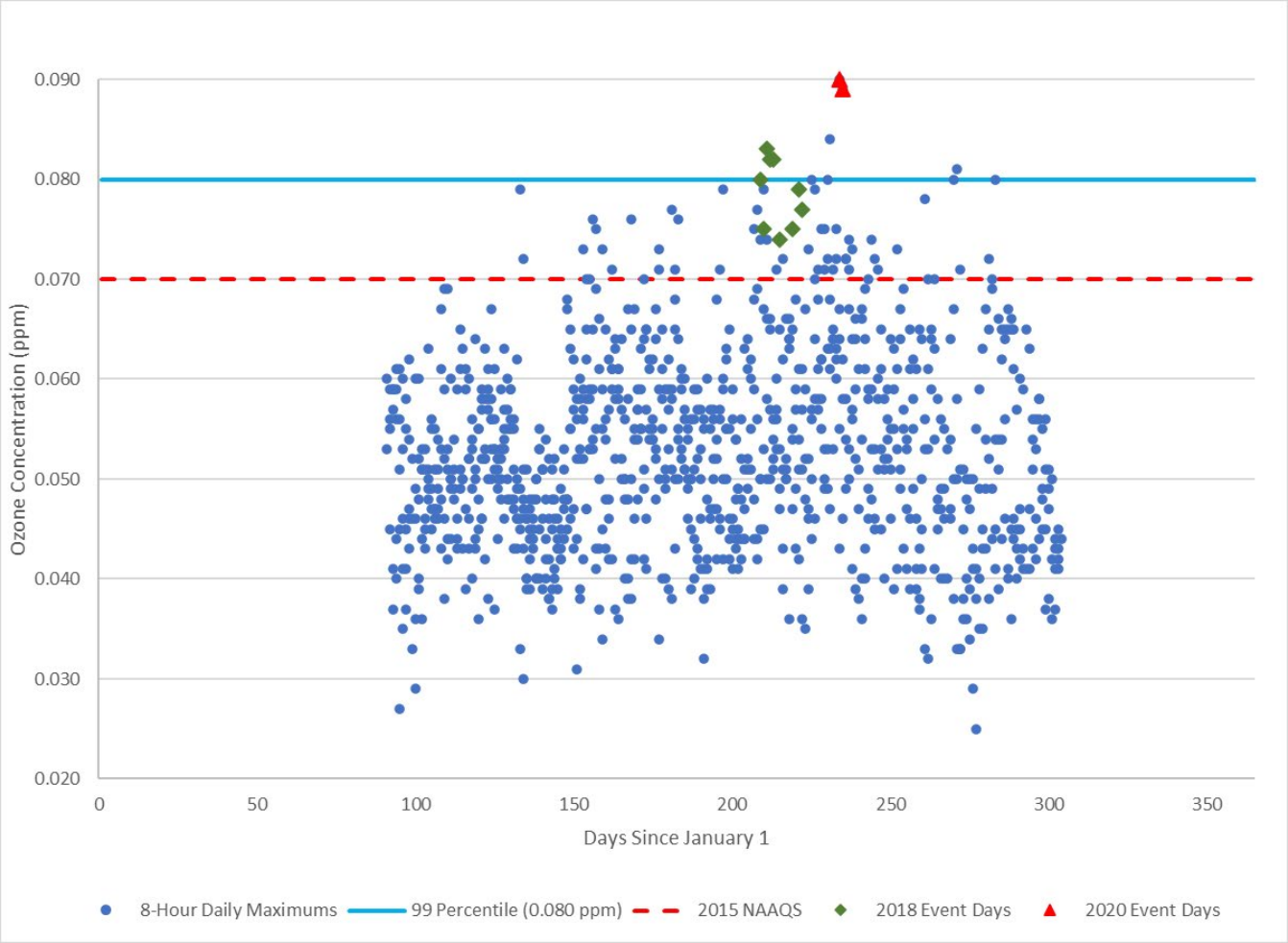


Figure IV-2: Sonora 8-Hour Daily Ozone Maximums by Day of the Year for 2015-2020

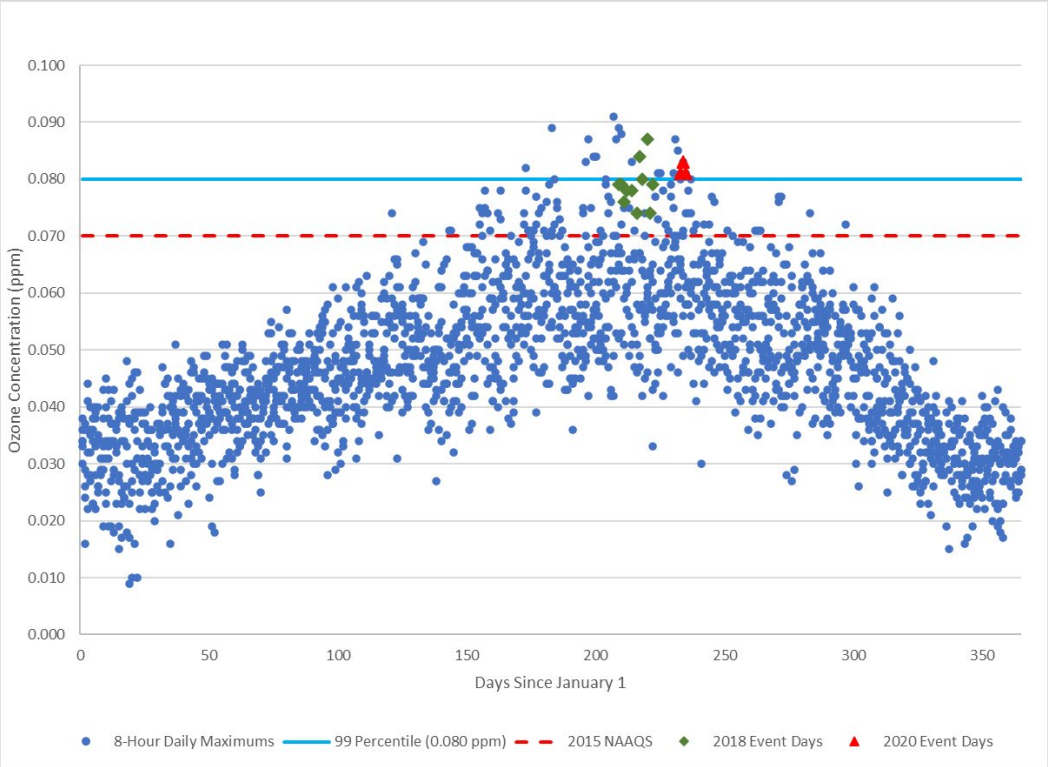
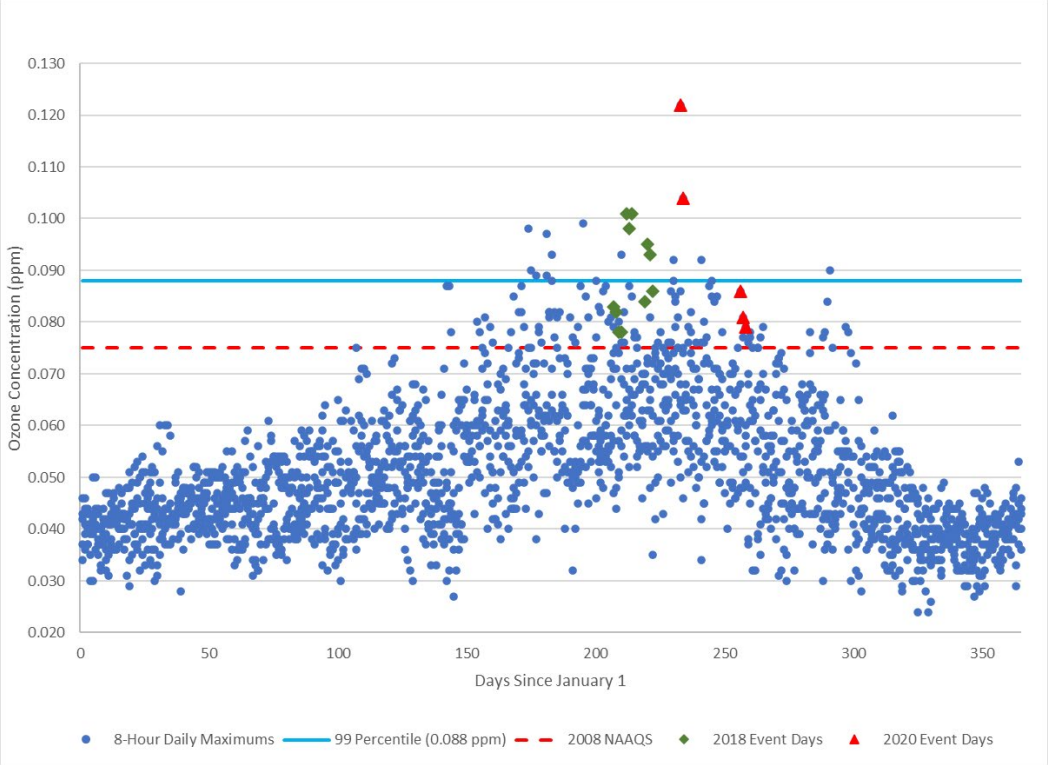


Figure IV-3: Grass Valley 8-Hour Daily Ozone Maximums by Day of the Year for 2015-2020



Although the exceedances at Sonora and some at Grass Valley do not qualify for Tier 1, evidence that the wildfire emissions were transported to the monitors is needed for further Tier 2 analyses. Transport evidence is provided in Section B of the Narrative Conceptual Model chapter and Section C of this chapter as part of the Additional Evidence.

B. Tier 2 Key Factor Analysis

This section provides the documentation requested for a Tier 2 analysis, where ozone concentrations are not clearly higher than non-event related concentrations nor do they occur outside of the area's normal ozone season, in effect not meeting Tier 1 requirements. Tier 2 requires a demonstration that the impacts of the wildfire event on ozone are higher than a non-event related concentration and that fire emissions compared to the fire's distance from the monitor indicate a clear causal relationship. Analyses include those indicated in Section A of this chapter for Tier 1 as well as Q/D estimations, a more detailed comparison of the event-related ozone concentrations with non-event-related high ozone concentrations, and evidence that the emissions affected the monitor. The following sections provide the documentation requested for a Tier 2 analysis per U.S. EPA guidance.[81]

> Key Factor #1 – Fire emissions and distance of fire(s) to affected monitoring site location(s), and
>
> Key Factor #2 – Comparison of the event-related ozone concentrations with non-event related high ozone concentrations.

Evidence that the fire emissions impacted the exceeding monitor are also required. This evidence is provided with satellite evidence of smoke at the monitor (Narrative Conceptual Model chapter and Section C of this chapter), graphs of nearby $PM_{2.5}$ concentrations nearby and in the same airshed (Section C of this chapter), and $PM_{2.5}$ speciation data near the wildfires impacting the monitor (Section C of this chapter), and differences in spatial and temporal patterns (Section C of this chapter).

1. Key Factor #1 (Q/D)

Key factor 1 requires determining the fire emissions (Q) and the distance (D) between the wildfires to the affected monitor. CARB staff worked with U.S. EPA staff, and provided shapefiles delineating perimeters, start dates, and end dates of all California wildfires in 2020 retrieved from the National Interagency Fire Center (NIFC). U.S. EPA modeled the wildfires and emissions, produced emissions estimates for the fires for each date, and calculated the summed aggregate of emissions divided by the distance (Q/D) for each day for each monitoring site.

[81] Ibid, p. 15

a) Wildland Fire Emissions

Wildland fire emissions inside and outside the United States are estimated with the Fire Inventory from National Center for Atmospheric Research (NCAR)[82] for 2020. Other years (such as 2018 and 2019) were based on SmartFire2[83] (SF2) and the BlueSky[84] systems. U.S. EPA has been using the Satellite Mapping Automated Reanalysis Tool for Fire Incident Reconciliation version 2 (SmartFire2; SF2) and BlueSky Framework to estimate emissions in the United States from wildland fires since 2005. SF2 is an algorithm and database system that combines multiple sources of fire information and reconciles them into a unified GIS database. It reconciles fire data from satellite sensors and ground-based reports, thus drawing on the strengths of both data types while avoiding double-counting of fire events[85].

The BlueSky Framework estimates fuel type, fuel loading, fuel consumption, and emissions based on the location, type, and size information provided by SF2 for each wildland fire in the contiguous U.S. and Alaska. Fuel loading is based on the Fuel Characteristic Classification System[86] (FCCS) module and fuel consumption is based on the CONSUME[87] module. The Fire Emissions Production Simulator[88] (FEPS) in the BlueSky Framework generated emission factors for wildland fires.

Daily emissions estimates for each wildland fire are processed for input to photochemical models using the Sparse Matrix Operator Kernel Emissions[89] (SMOKE). SMOKE is used to apply a fire type-specific diurnal profile and allocates total emissions of NOx, ROG, and $PM_{2.5}$ to specific model species needed for chemical mechanisms. Speciation profiles are based on those available in the SPECIATE[90] database.

b) Q/D Estimation

One approach to provide screening level information about wildland fire emissions' impact on ozone levels is to sum NO_X and ROG emissions for each fire and divide by distance between the fire and location of interest. Q/D is calculated using wildland fire emissions input files for the Community Multiscale Air Quality (CMAQ) modeling system. Wildland fire emissions input files for CMAQ have hourly emissions for each modeled species provided in files for specific days. Each day of the year has a different CMAQ input file for wildland fire

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[82] Wiedinmyer et al., 2011
[83] FireSmoke Canada, *SMARTFIRE Algorithm Description*, last accessed 7/29/21
[84] USDA Forest Service, *BlueSky Framework*, last accessed 7/29/21
[85] Larkin et al., 2020; Larkin et al., 2010
[86] USDA Forest Service, Pacific Northwest Research Station, *Fuel Characteristic Classification System*, last accessed 7/27/21
[87] USDA Forest Service, Pacific Northwest Research Station, *CONSUME*; last accessed 7/27/21
[88] USDA Forest Service, Pacific Northwest Research Station, *Fire Emission Production Simulator (FEPS)*, last accessed 7/27/21
[89] UNC, Institute for the Environment, CMAS, *Sparse Matrix Operator Kernel Emissions (SMOKE) Modeling System*, last accessed 7/29/21
[90] U.S. EPA, Air Emissions Modeling, *SPECIATE*, last accessed 7/29/21

emissions. Each emissions release point on the wildland fire CMAQ input file has daily total emissions of NO, NO_2, and ROG species summed. A set of gridded receptors is developed that often matches a commonly used model domain like the 12 km contiguous U.S. domain or 4 km California domain. The distance from each wildland fire is then calculated to each gridded receptor. This process is repeated for each fire on each day specific emissions input file. The Q/D for each fire in each grid cell is kept and then summed over all fires for that day to derive a daily Q/D at each receptor location from all fires for that day. The CMAQ input files do not have names associated with each of the wildland fire emissions release points so tracking fire specific emissions with this process is not possible. It does however provide a conservative estimate of wildland fire impacts since all fires are aggregated and it is possible to window the emissions so that only a subset of the emissions input file emission release points are used as part of the Q/D calculation (e.g., a box covering just the Pacific Northwest region).

c) Q/D Method Discussion and Results

The summed aggregate Q/D approach agreed upon by CARB and U.S. EPA staff differs from the published guidance, as the guidance weighted aggregate approach can lead to days where calculations for multiple fires impacting a site can lead to aggregate Q/D values that are less than an individual fire's calculated Q/D. A summed aggregate Q/D approach is one where emissions from wildfires are divided by the distance to a monitoring site, then summed together without any weighting for days when supported by indications of transport. This is a more accurate indication of when multiple wildfires impact a site.

Further improving upon the summed aggregate Q/D approach, an "Effective Q/D" was calculated to account for periods where multiple days of wildfire smoke buildup impacts the monitoring site, with a cap of three days (present day + two preceding days) in an attempt to account for emission dispersion at the site limiting perceived impact of older emissions – but could actually be longer if emissions are trapped during prolonged specialized conditions such as smoke transported downslope into a bowl valley while meteorological conditions minimize ventilation of the region for multiple days. This Effective Q/D is calculated at the site for each day leading up to and including the days of the event for screening.

For the purpose of this analysis, the "Daily Q/D" is defined as the summed aggregate emissions of California based wildfires divided by each wildfire's centroid distance to the monitoring site. The Effective Q/D is the calculated adjustment of Q/D accounting for multiple days of emissions buildup at the location, allowing for better approximation for screening emissions impacts at a site.

In Table IV-1, the Effective Q/D value at Sutter Buttes was elevated for all dates being requested for exclusion and all dates exceeded the required Q/D criteria threshold value 100. All requested dates qualify under the requirements for Tier 2 – Key factor #1.

Table IV-1: Estimated Q/D at Sutter Buttes

Date	Exclusion Request	Daily Q/D	Dates Included	Effective Q/D	Rationale
8/19/2020		140.16	8/19	140.16	Moderate to heavy smoke with buildup across Sacramento Valley from August Complex, LNU Lightning Complex, and North Complex fires.
8/20/2020		95.015	8/19-8/20	235.175	Heavy smoke with buildup across Sacramento Valley from August Complex, LNU Lightning Complex, and North Complex.
8/21/2020	Yes	70.144	8/20-8/21	165.159	Heavy smoke with buildup across Sacramento Valley from North Complex, August Complex, Woodward, and LNU Lightning Complex. Apparent wind promotes mixing while lessening surface buildup.
8/22/2020	Yes	67.056	8/21-8/22	137.2	Heavy smoke with moderate buildup and transport across Sacramento Valley from August Complex, LNU Lightning Complex, SCU Lightning, Woodward, and CZU Lightning fires.
8/23/2020		57.622	8/22-8/23	124.678	Heavy smoke with transport from August Complex, LNU Lightning Complex, CZU Lightning, Woodward, and SCU Lightning fires.
8/24/2020		71.421	8/22-8/24	196.099	Dense smoke across the valley with fresh transport from LNU Lightning Complex, Woodward, CZU Lightning, River, Carmel, Dolan, and SCU Lightning fires.
8/25/2020		45.934	8/23-8/25	174.977	Dense smoke across the valley with fresh transport from LNU Lightning Complex, Woodward, CZU Lightning, River, Carmel, Dolan, and SCU Lightning fires.

In Table IV-2, the Effective Q/D value at Sonora was elevated for all dates being requested for exclusion and all dates exceeded the required Q/D criteria threshold value 100. All requested dates qualify under the requirements for Tier 2 – Key factor #1.

Table IV-2: Estimated Q/D at Sonora

Date	Exclusion Request	Daily Q/D	Dates Included	Effective Q/D	Rationale
8/18/2020		61.903	8/18	61.903	Moderate to heavy smoke across the valley and Sierra foothills. Transport from Salt Fire, North Complex, Loyalton, Jones, August Complex, LNU Lightning Complex, Woodward, CZU Lightning, Carmel, River, and SCU Lightning.
8/19/2020		85.966	8/18-8/19	147.869	Smoke persists across the basin with very thick smoke apparent aloft. Low level transport from Salt Fire, August Complex, Woodward, and LNU Lightning Complex.
8/20/2020	Yes	54.874	8/18-8/20	202.743	Moderate to heavy smoke continues across the valley and Sierra foothills. Transport from Salt Fire, North Complex, August Complex, LNU Lightning Complex, Woodward, CZU Lightning, and SCU Lightning. Nearby Moc Fire started near Moccasin, CA at 226pm.
8/21/2020	Yes	36.136	8/19-8/21	176.976	Moderate to heavy smoke continues across the valley and Sierra foothills. Transport from Moc, North Complex, August Complex, Woodward, LNU Lightning Complex, CZU Lightning, and SCU Lightning.
8/22/2020	Yes	33.576	8/20-8/22	124.586	Heavy smoke across the valley and Sierra foothills. Transport from Salt, Moc, SCU Lightning, Carmel, River, Dolan, and CZU Lightning with mixed smoke in the valley.
8/23/2020		27.902	8/21-8/23	97.614	Heavy smoke across the valley and Sierra mountains. Diurnal near-surface smoky transport along foothills with additional transport from Salt, Moc, SCU Lightning, CZU Lightning, Woodward, and LNU Lightning Complex.
8/24/2020		32.137	8/22-8/24	93.615	Moderate to heavy smoke across the valley and Sierra mountain valleys. Transport from Salt, Moc, SCU Lightning, CZU Lightning, Woodward, and LNU Lightning Complex.

Date	Exclusion Request	Daily Q/D	Dates Included	Effective Q/D	Rationale
8/25/2020		21.764	8/23-8/24	53.901	Initially heavy smoke across the valley and foothills. Supplemental GOES-17 imagery appears to indicate significant ventillation allowing for decreasing smoke during the day. Transport from Moc, SCU Lightning, CZU Lightning, and LNU Lightning Complex for peak hours.

As seen below in Table IV-3, the Effective Q/D value at Grass Valley (Nevada County) was elevated for all dates being requested for exclusion and all dates exceeded the required Q/D criteria threshold value 100. All requested dates qualify under the requirements for Tier 2 – Key factor #1.

Table IV-3: Estimated Q/D at Grass Valley

Date	Exclusion Request	Daily Q/D	Dates Included	Effective Q/D	Rationale
8/18/2020		87.859	8/18	87.859	Heavy smoke along foothills with transport from Jones, North Complex, August Complex, and LNU Lightning Complex.
8/19/2020		112.94	8/19	112.94	Wind shift appears to clear out most smoke early. Fresh very dense, heavy smoke from August Complex is transported into the area with nearby Jones Fire.
8/20/2020	Yes	73.286	8/19-8/20	186.226	Dense smoke across the Sacramento Valley and thinner near-surface smoke along the northern Sierra foothills/mountains with transport from Jones Fire, LNU Lightning Complex, and August Complex.
8/21/2020	Yes	57.972	8/19-8/21	244.198	Heavy to moderate smoke across the region. Transport from LNU Lightning Complex, SCU Lightning Complex, and Jones Fire.
8/22/2020		53.456	8/21-8/22	111.428	Light to moderate smoke visible with transport from SCU Lightning Complex, Jones Fire, CZU Lightning, and Dolan Fires.

Date	Exclusion Request	Daily Q/D	Dates Included	Effective Q/D	Rationale
8/23/2020		46.396	8/21-8/23	157.824	Moderate to heavy smoke with transport from SCU Lightning Complex, CZU Lightning, Jones Fire, and LNU Lightning Complex.
8/24/2020		52.465	8/22-8/24	152.317	Heavy smoke with transport from SCU Lightning Complex, CZU Lightning, Jones Fire, and LNU Lightning Complex.
9/10/2020		138.4	9/10	138.4	Extremely heavy smoke aloft blankets most of California. Near-surface backwards trajectories indicate likely transport from August Complex, North Complex, Dolan, SQF Complex, and Creek fires.
9/11/2020		138.12	9/10-9/11	276.52	Moderate to heavy smoke persists along foothills with transport from North Complex and Creek fires.
9/12/2020	Yes	101.8	9/10-9/12	378.32	Moderate to heavy smoke continues along foothills with transport from North Complex and Creek Fire.
9/13/2020	Yes	122.48	9/11-9/13	362.4	Heavy smoke persists with transport from North Complex, Creek, and SQF Complex fires.
9/14/2020	Yes	95.411	9/13-9/14	217.891	Light smoke visible and residual denser mountain valley trapped smoke with newer transport from Creek and SQF Complex Fires.
9/15/2020		94.623	9/14-9/15	190.034	Light to moderate smoke with fringe transport from North Complex, Creek, and SQF Complex fires.
9/16/2020		100.78	9/15-9/16	195.403	Light to moderate smoke persists along foothills with some dispersion from North Complex fire for much of the day. Wind shifts during afternoon, clearing out most smoke later in the day.

2. Key Factor #2 (Event vs Non-Event Ozone Concentrations)

Key factor #2 in a Tier 2 demonstration requires a comparison of the event related ozone concentration with non-event related high ozone concentrations. Statistical analyses of the exceedances must either demonstrate that exceedance concentrations are in the 99th percentile of the 5-year distribution of ozone monitoring data, or one of the 4 highest ozone concentrations within the year.

Due to the large number of dates impacted by the multiple large wildfires burning historically large amounts of acreage and producing massive amounts of emissions, CARB believes it reasonable to include all dates whereby wildfire emissions caused exceedances of the appropriate ozone NAAQS up to the adjusted 4th high, as noted in the tables below. Dates that are impacted by exceptional events should not count against the tally of "the 4 highest ozone concentrations within the year" as they were exceedances caused by contributions from wildfire emissions. This list also does not preclude the non-exceptional event requested dates from future consideration as wildfire related exceptional events, only that they are not being demonstrated as such as part of this exceptional events demonstration.

The 99th percentile value for the 5-year (2015-2019) distribution of ozone monitoring data at Sutter Buttes is 0.080 ppm. All dates being requested for exclusion due to wildfire exceptional events are in the top 2 concentrations in 2020 and in the 99th percentile for concentrations during the prior 5-year distribution of data as shown below in Table IV-4. After accounting for the exceptional event dates being requested the adjusted 4th high is 0.070 ppm, below all requested exceptional event dates. All requested dates qualify under the requirements for Tier 2 – Key factor #2.

Table IV-4: Top 10 max daily 8-hour ozone concentrations in 2020 at Sutter Buttes

Date	8-hr Ozone	2020 Rank	5-year Percentile	Event?
8/21/2020	0.090	1	99%	EE
8/22/2020	0.089	2	99%	EE
8/20/2020	0.075	3	97%	
8/23/2020	0.072	4	95%	
8/24/2020	0.071	5	94%	
8/30/2020	0.070	6	93%	Adjusted 4th High
8/29/2020	0.069	7	93%	

Date	8-hr Ozone	2020 Rank	5-year Percentile	Event?
8/28/2020	0.066	8	89%	
8/19/2020	0.064	9	86%	
8/25/2020	0.064	10	86%	

The 99th percentile value for the 5-year (2015-2019) distribution of ozone monitoring data at Sonora is 0.081 ppm. All dates being requested for exclusion due to wildfire exceptional events are in the top 3 concentrations in 2020 and in the 99th percentile or higher for concentrations during the prior 5-year distribution of data as shown below in Table IV-5. After accounting for the exceptional event dates being requested the adjusted 4th high is 0.069 ppm, below all requested exceptional event dates and is necessary to reach an attaining design value for 2020. All requested dates qualify for Tier 2 – Key factor #2.

Table IV-5: Top 10 max daily 8-hour ozone concentrations in 2020 at Sonora

Date	8-hr Ozone	2020 Rank	5-year Percentile	Event?
8/21/2020	0.083	1	99%	EE
8/20/2020	0.081	2	99%	EE
8/22/2020	0.081	3	99%	EE
8/24/2020	0.080	4	98%	
8/23/2020	0.078	5	98%	
8/17/2020	0.070	6	93%	
8/31/2020	0.069	7	93%	Adjusted 4th High
8/18/2020	0.068	8	92%	
9/16/2020	0.068	9	92%	
10/1/2020	0.068	10	92%	

The 99th percentile value for the 5-year (2015-2019) distribution of ozone monitoring data at Grass Valley is 0.088 ppm. All dates being requested for exclusion due to wildfire exceptional events are in the top 7 concentrations in 2020 and in the 96th percentile or higher for concentrations during the prior 5-year distribution of data as shown below in Table IV-6.

After accounting for the exceptional event dates being requested the adjusted 4th high is 0.078 ppm, below all requested exceptional event dates. All requested dates qualify under the requirements for Tier 2 – Key factor #2.

Table IV-6: Top 20 max daily 8-hour ozone concentrations in 2020 at Grass Valley

Date	8-hr Ozone	2020 Rank	5-year Percentile	Event?
8/20/2020	0.122	1	99%	EE
8/21/2020	0.104	2	99%	EE
9/12/2020	0.086	3	98%	EE
9/1/2020	0.085	4	98%	
9/13/2020	0.081	5	97%	EE
8/29/2020	0.080	6	96%	
9/14/2020	0.079	7	96%	EE
9/21/2020	0.079	8	96%	
8/24/2020	0.078	9	96%	Adjusted 4th High
9/5/2020	0.078	10	96%	

C. Additional Evidence

The following sections provide additional evidence as required to support a Tier 2 analysis for all requested exceptional event dates. All dates requested for exclusion qualify for Tier 2 Analysis as discussed in prior sections Tier 2 – Key Factor #1 and Tier 2 – Key Factor #2. This utilizes a "weight of evidence" approach with additional analyses to show a clear causal relationship between wildfire emissions and the ozone concentrations at the sites. Additional evidence for a Tier 2 weight of evidence requires at least one piece of additional evidence in each of the following categories:

1. Evidence that the emissions from the wildfire affected the exceeding monitor.

This requirement is met through evidence shown in Sections B and C of the Narrative Conceptual Model chapter and Section C of this chapter, and particularly in the evidence of an ozone/$PM_{2.5}$ correlation (Figure III-26, Figure III-29, Figure III-32, Figure III-33) and the unusual ozone diurnal patterns seen in many of the figures from Figure IV-4 to Figure IV-14. Social media reports of smoke in the vicinity can also be found in Appendix F.

2. Evidence that the emissions were transported to the monitor.

This requirement is met through evidence given in the Narrative Conceptual Model chapter and this chapter using both backward trajectory analysis from the monitor as well as forward trajectory modeling from individual wildfires, satellite imagery and HMS satellite-derived smoke layers, ceilometer data, and meteorological analyses.

3. Additional evidence that the emissions caused the exceedance by reaching the ground and affecting the monitors.

This requirement is met through the $PM_{2.5}$ analysis, biomass burning indicators, and black carbon in the following section as well as media reports of smoke at ground level.

1. 1-Hour Ozone (Diurnal Comparison)

The following figures compare the daily diurnal pattern for each exceedance day with the hourly diurnal percentiles for ozone from 2015-2020. For each site except Grass Valley (discussed in the Grass Valley section below), data is missing for the 0400 PST hour due to running daily quality check routines during the 0400-0500 PST hour. These figures show that during many of the days for each site the pattern was unusual compared to the percentiles of each site's typical diurnal pattern with unusually timed peaks or spikes. Some days were extremely high throughout the day due to the ongoing presence of wildfire emissions with ozone precursors and ozone impacting these sites. These diurnal ozone figures support that the ozone exceedance days were unusual compared to historical patterns and act as supporting evidence that wildfire emissions directly impacted ozone concentrations at each site.

a) Sutter Buttes

Figure IV-4: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 8/21/2020

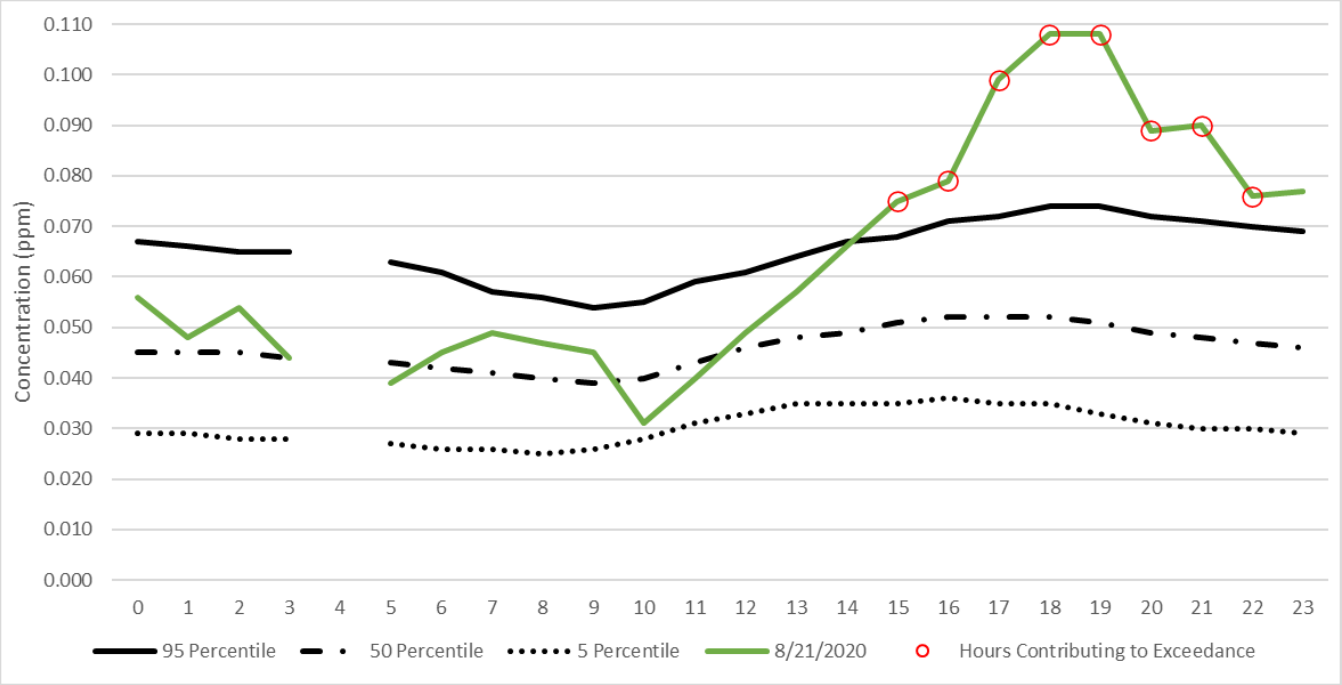
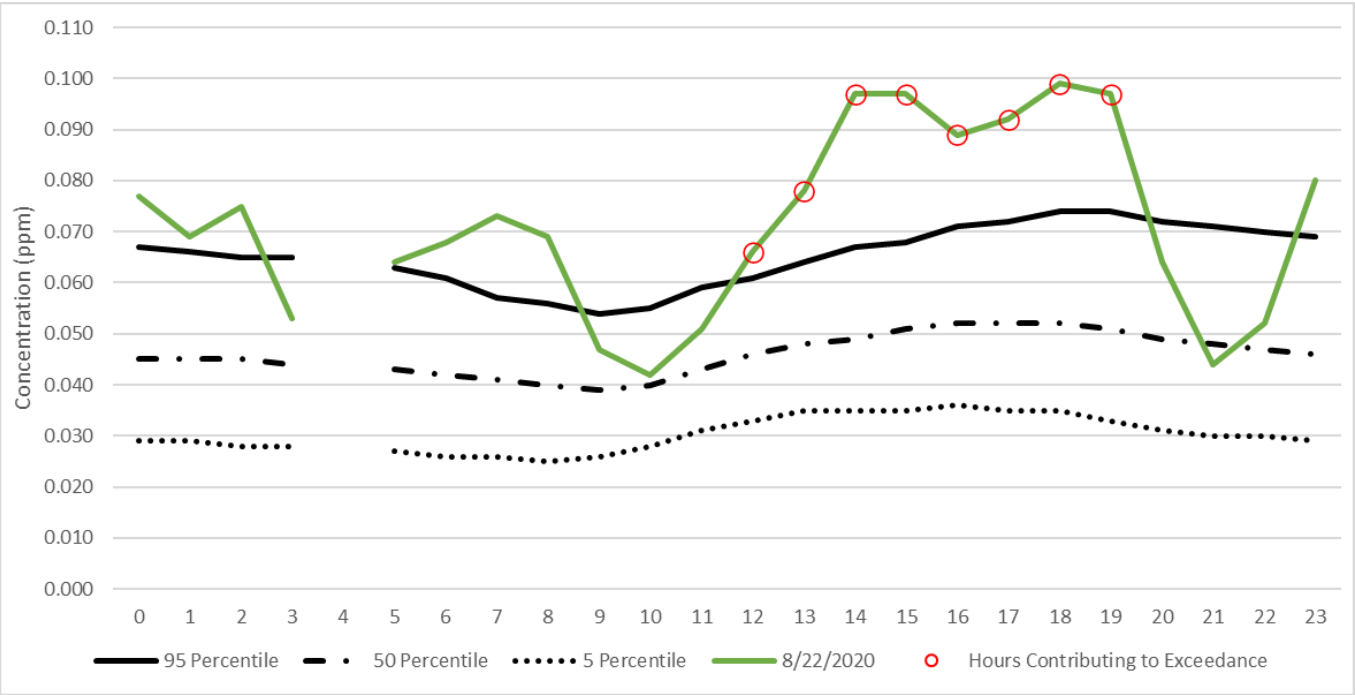


Figure IV-5: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 8/22/2020

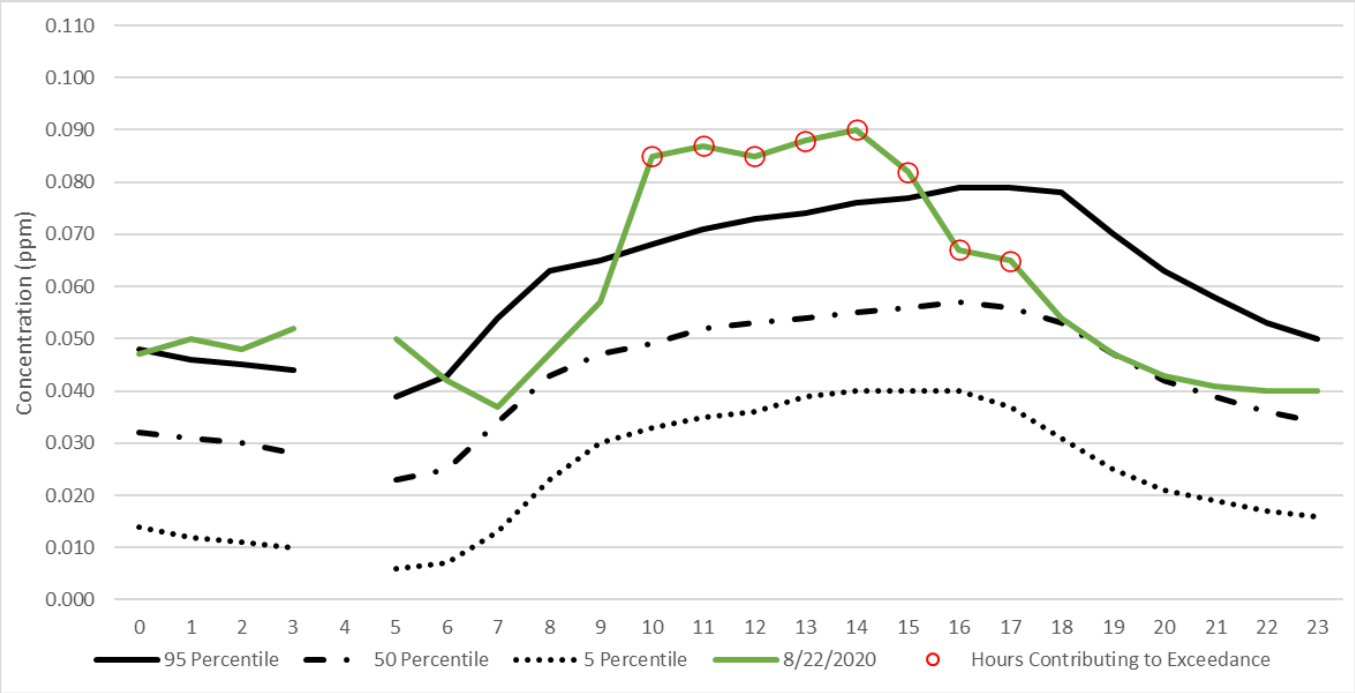


b) Sonora

Figure IV-6: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 8/20/2020

Figure IV-7: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 8/21/2020

Figure IV-8: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 8/22/2020



c) Grass Valley

Unlike the other sites in this demonstration, the Grass Valley ozone monitor's daily quality check routine is able to be completed quickly enough that there are no missing data associated with the daily quality check routine. Data is missing for the August 21 0700 PST hour due to a precision check during the 0700-0800 PST hour and from 1200-0000 PST due to a power failure at the monitoring site.

For the exceedance day on September 12, the start of the 8-hours that contributed to the exceedance (red circles in Figure IV-11) started at 1800 PST, this led to the last two hours of the 8 hours being on September 13 (Figure IV-12). September 13 was also its own exceedance day with the start of the 8-hour that contributed starting at 0000 PST and going through 0700 PST (Figure IV-13).

Figure IV-9: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 8/20/2020

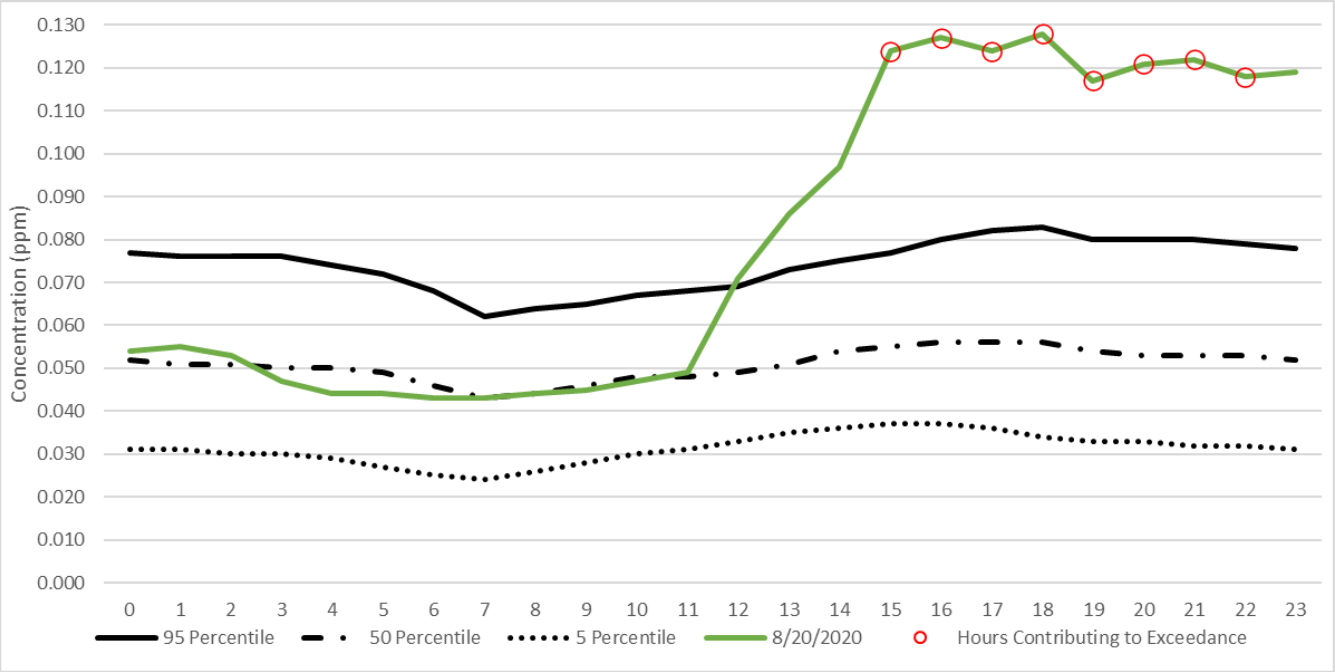


Figure IV-10: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 8/21/2020

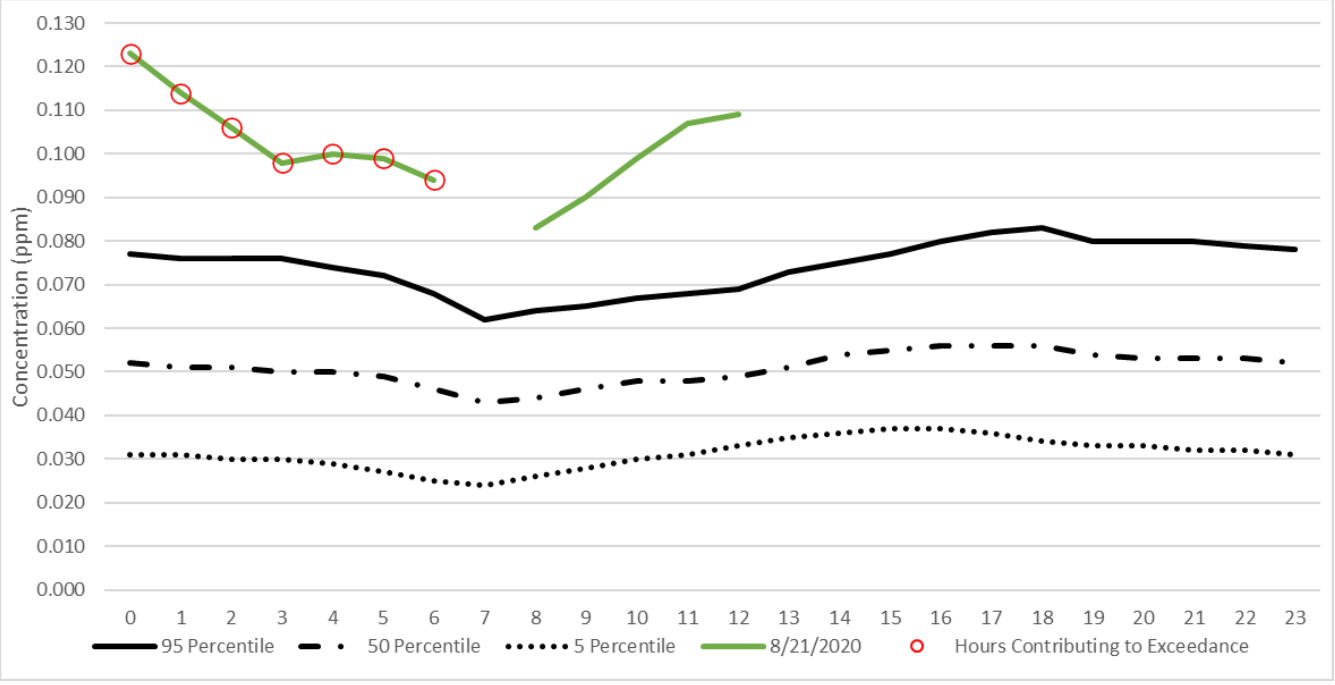


Figure IV-11: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 9/12/2020

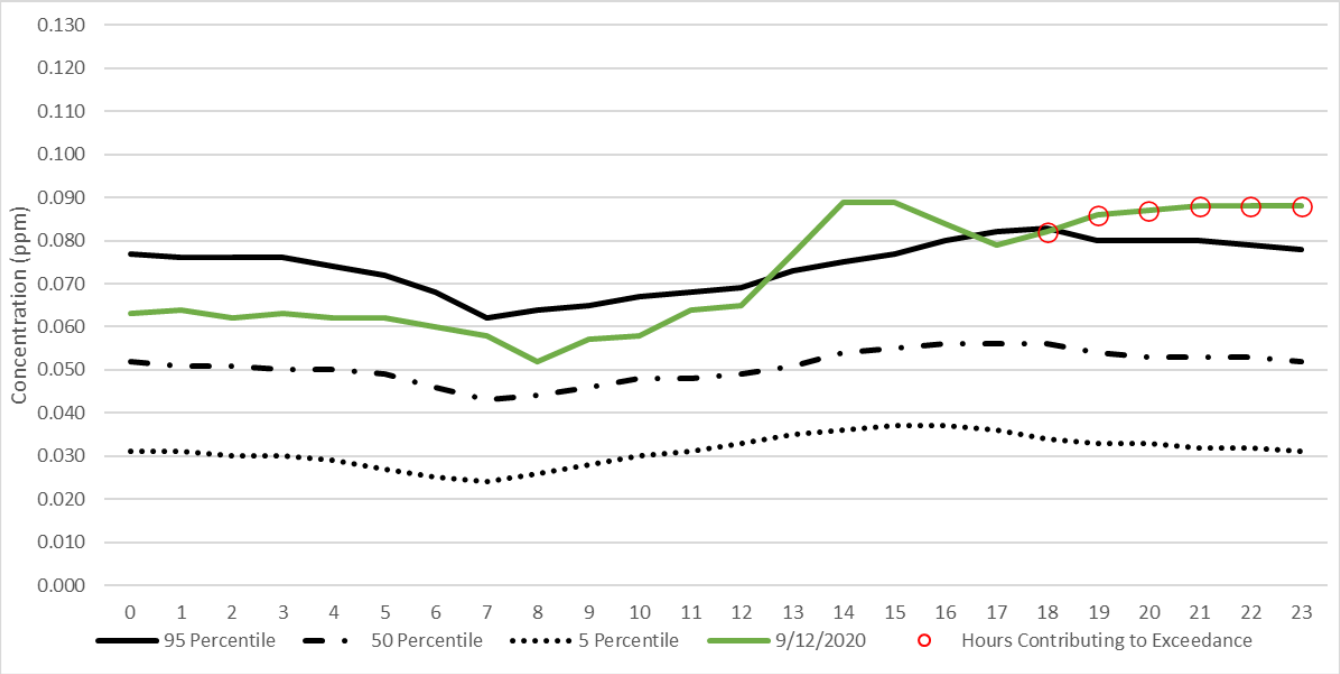


Figure IV-12: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 9/13/2020 for the exceedance day on 9/12/2020

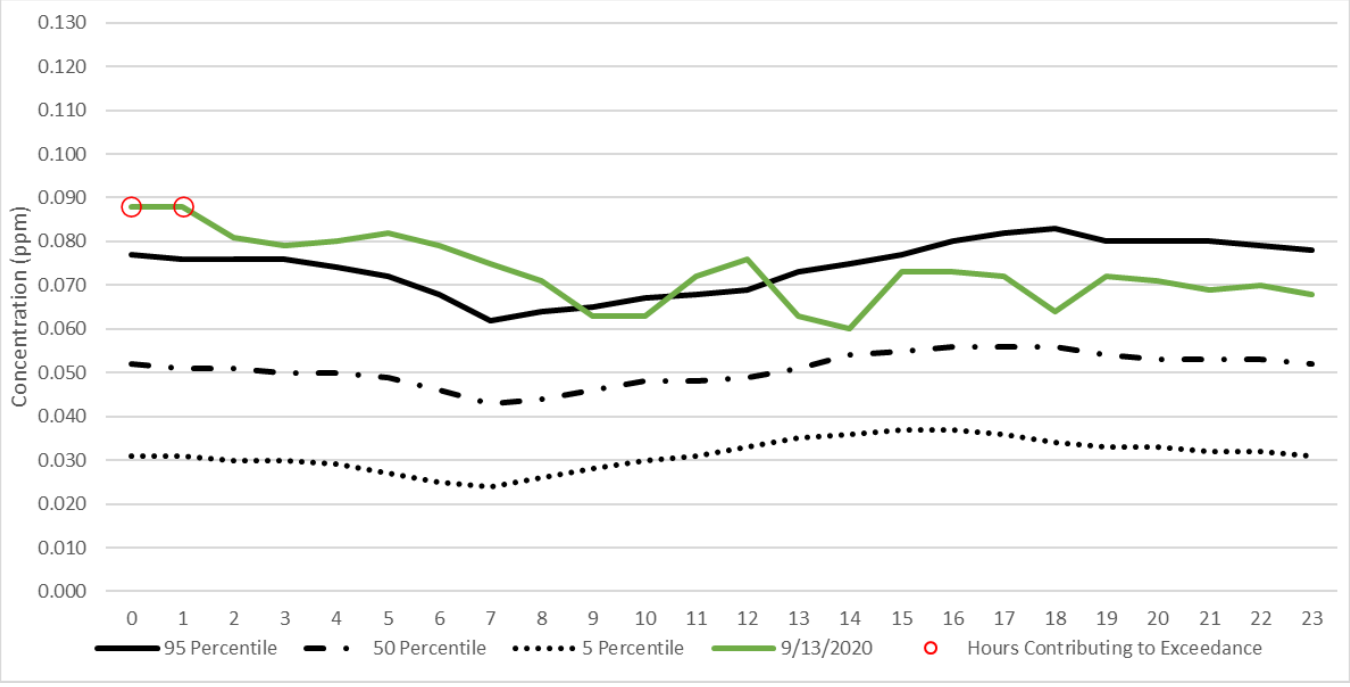


Figure IV-13: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 9/13/2020

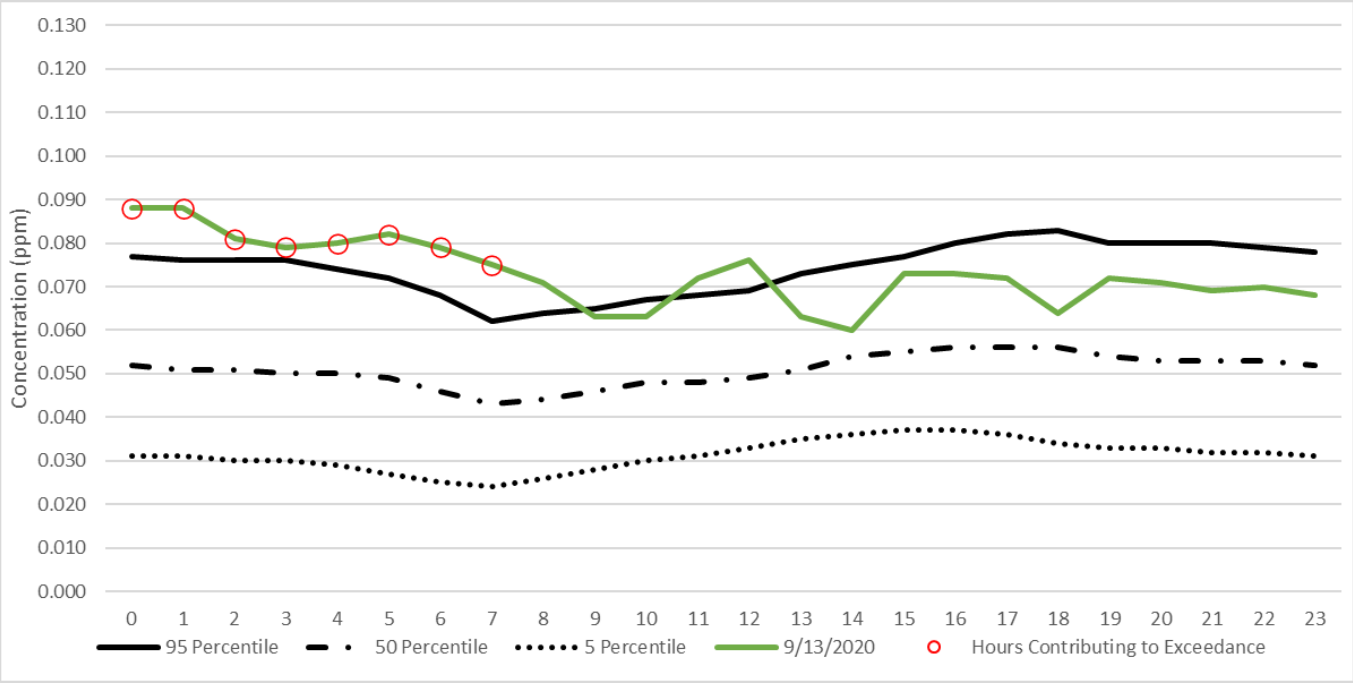
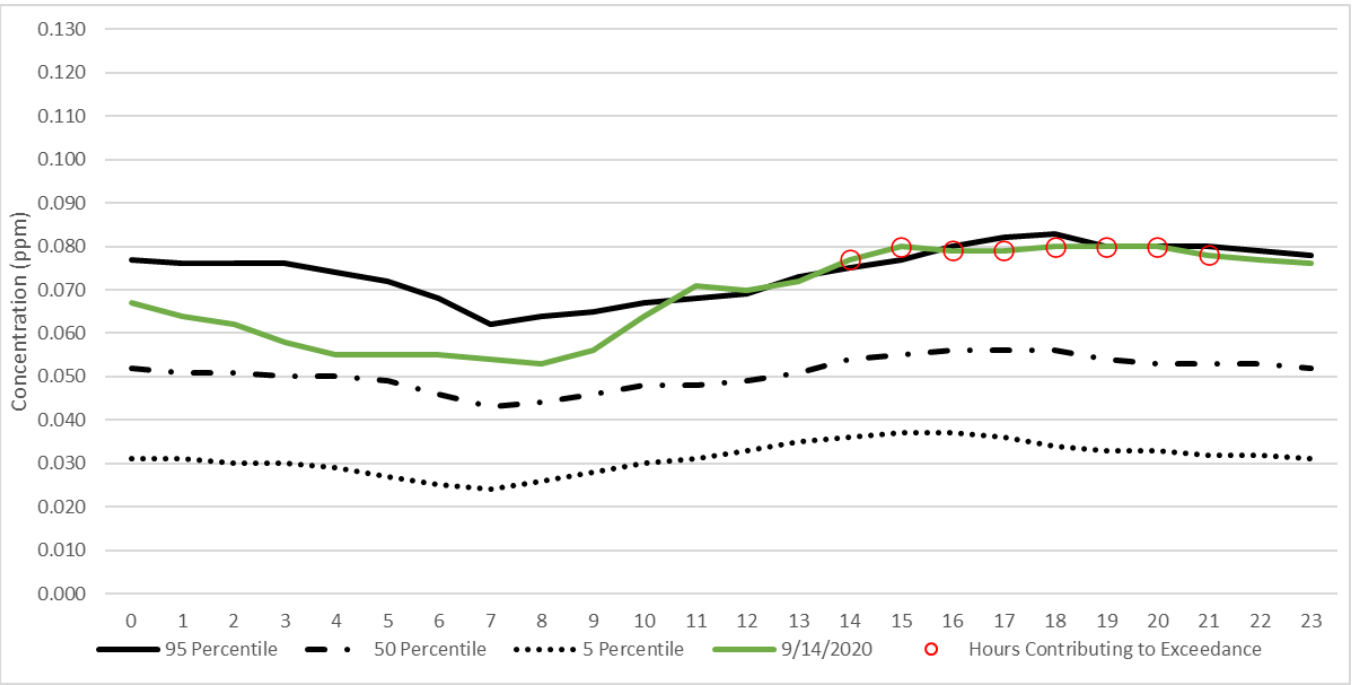


Figure IV-14: Percentiles for seasonal 1-hour ozone for 2015-2019 compared with 9/14/2020



2. $PM_{2.5}$

Evidence of ground-level impacts of smoke on the monitor can also be indicated through analysis of PM, as well as other speciated components.

The following figures show elevated $PM_{2.5}$ concentrations at multiple sites across northern and central California during the time of the exceptional events, which were a direct result of smoke and emissions from the wildfires in northern California. This supports that the wildfire smoke and emissions were widespread across the region and directly impacted monitors at the surface during the period.

Figure IV-15: Daily $PM_{2.5}$ at selected sites in the Mountain Counties Air Basin

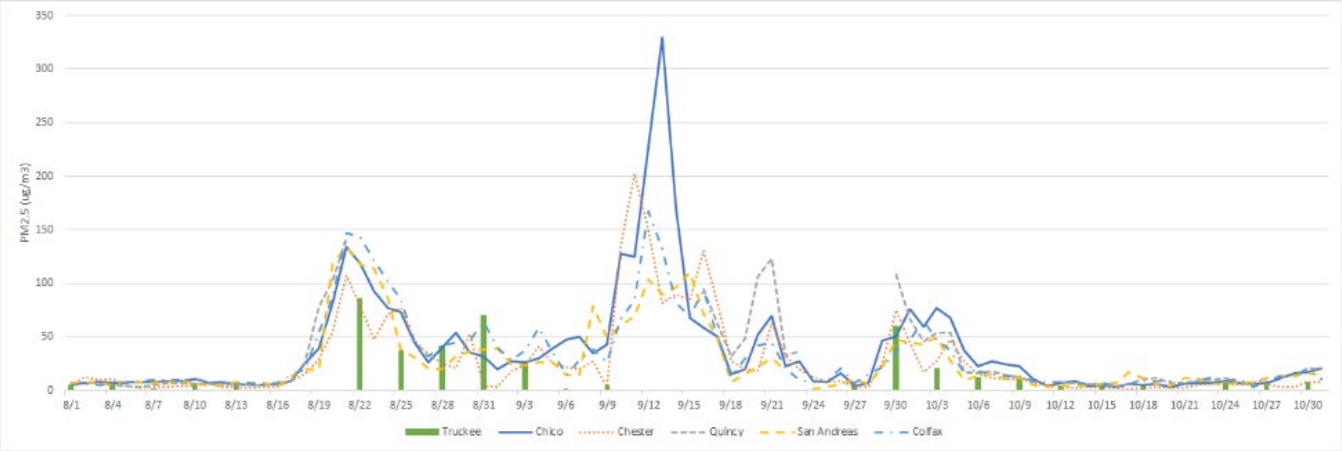


Figure IV-16: Daily $PM_{2.5}$ at selected sites in the Sacramento Valley Air Basin

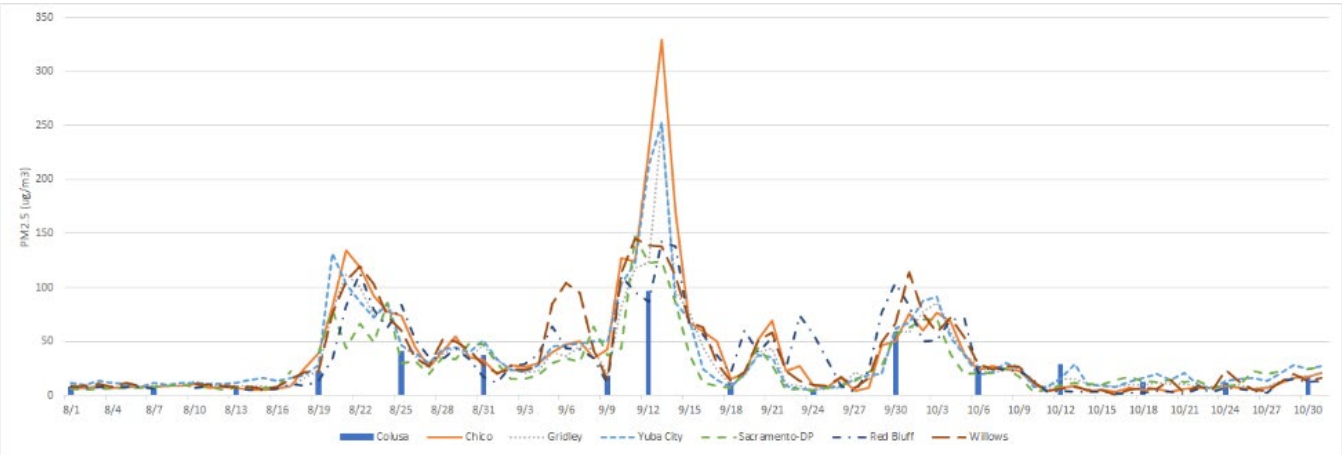
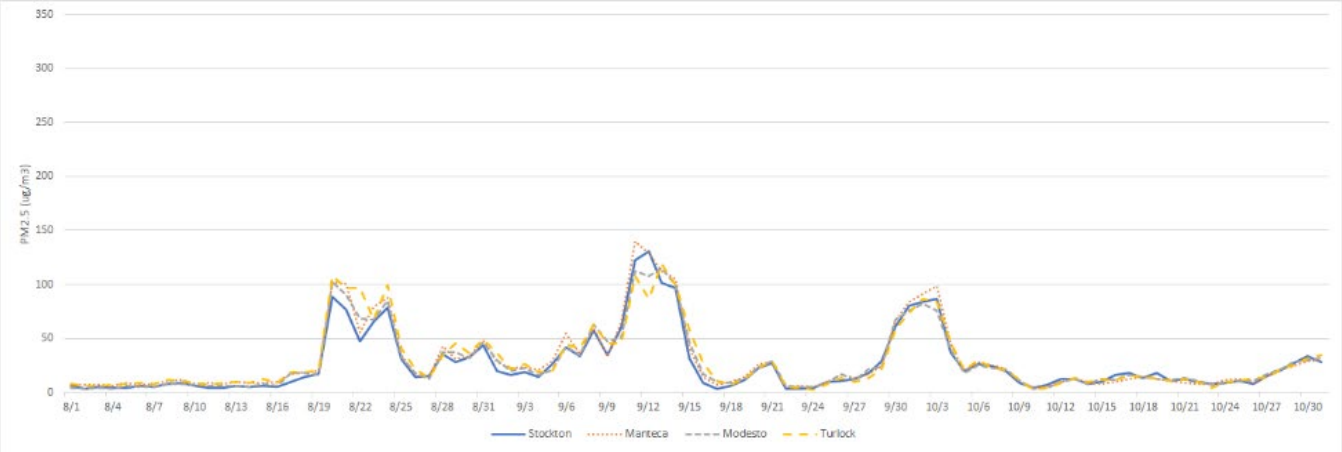


Figure IV-17: Daily $PM_{2.5}$ at selected sites in the northern San Joaquin Valley Air Basin



3. Biomass Burning Indicators

Levoglucosan, Mannosan, and Galactosan, organic compounds produced during biomass combustion, are commonly used as woodsmoke tracers. Sites with monitors that measure these compounds were placed at Portola in Plumas County in the MCAB and in Chico and Sacramento-T Street in the SVAB, to aid in the analysis of woodstove use. These sites do not consistently monitor during the summer months and in 2020, speciated monitors were shut down and samples were not analyzed due to Covid-19 restrictions.

a) Black Carbon

Fires that burn at relatively low temperatures and smolder in moist fuels are the most likely to produce black carbon and other toxic pollutants because they tend to burn less completely than hotter fires burning through dry fuels.

The map below (Figure IV-18) shows the plumes of black carbon associated with the CZU Lightning Complex, SCU Lightning Complex, LNU Lightning Complex, August Complex, North Complex, Dolan, and other wildfires. The map shows black carbon data from the GEOS-5 forward processing model, which assimilates information from several sources.[91] Wildfires are a major source of black carbon emissions in California, far surpassing vehicle emissions, wood stoves, industrial emissions, agricultural fires, and other sources of the pollutant.[92]

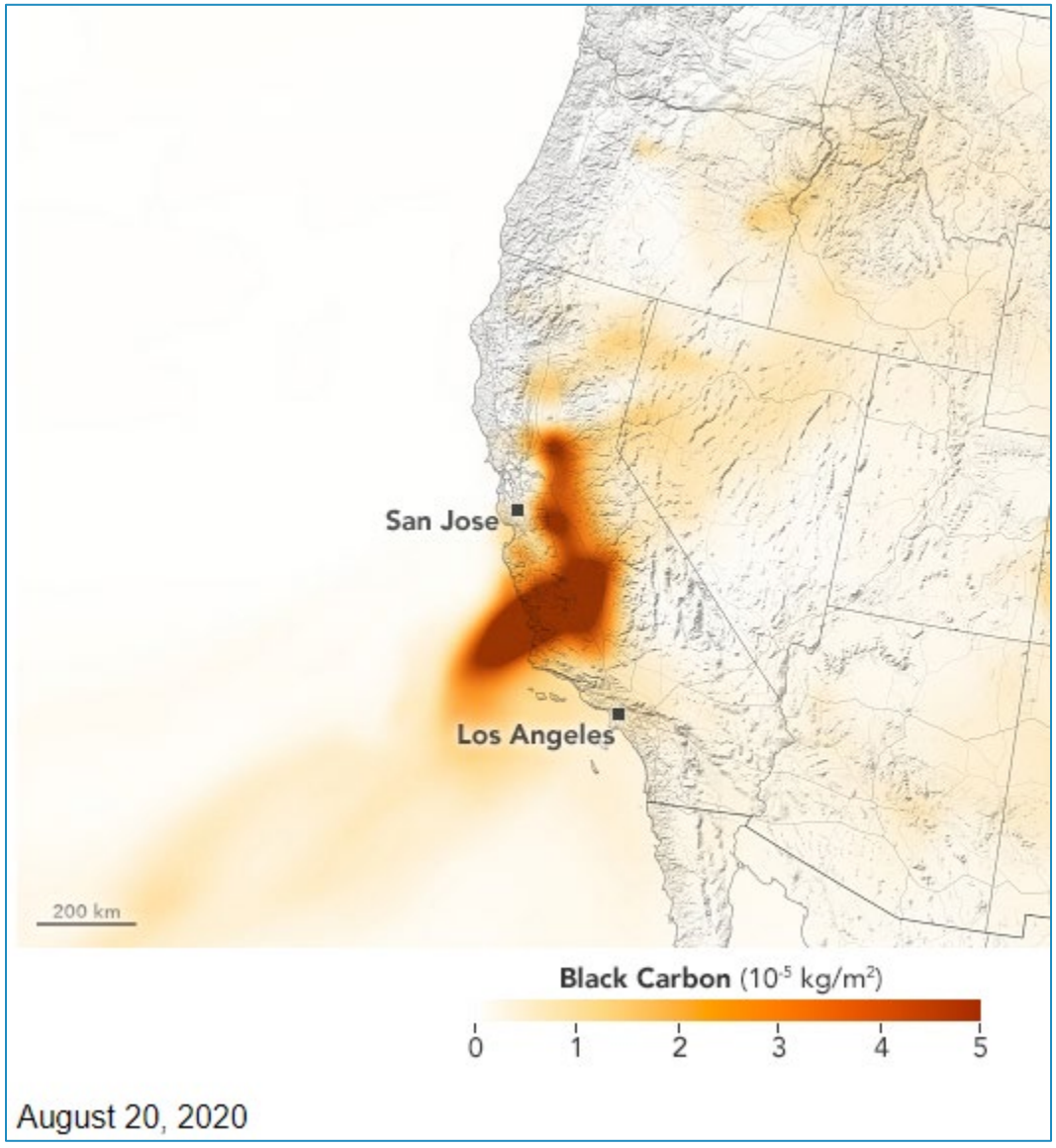
Black carbon is measured as a form of PM, with an increase in black carbon contributing to an increase in PM measurements. The map indicates a large amount of wildfire smoke, which contains ozone precursors, in the Sacramento and San Joaquin Valleys where $PM_{2.5}$ was also

[91] NASA, Earth Observatory, *Wildfire Smoke Shrouds the U.S. West, Plumes Tower Over California*. (August 20, 2020) Retrieved September 27, 2021

[92] Proposed Short-Lived Climate Pollutant Reduction Strategy (April 2016, page 49) *https://ww2.arb.ca.gov/sites/default/files/2021-01/ProposedStrategy-April2016.pdf*

elevated during on this day and the days after. This supports the presence of wildfire smoke in large amounts spreading across the region, available to be transported and mixed to the surface, impacting monitors during the period.

Figure IV-18: August 20, 2020 black carbon detected over California

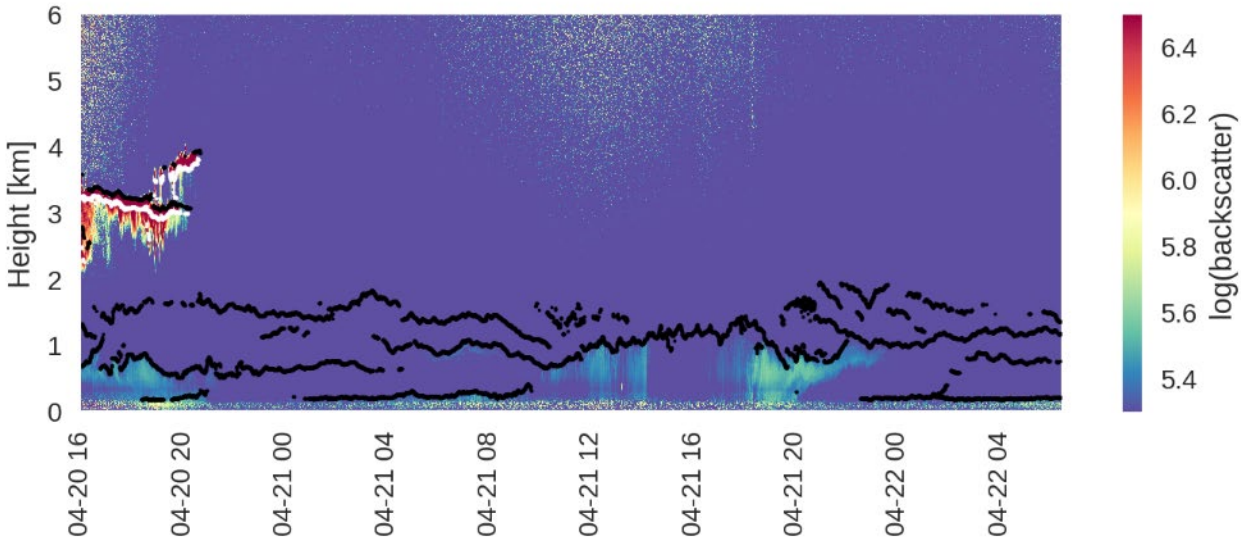


4. Ceilometer

a) Ceilometer Data

A ceilometer is an automatic, active, remote-sensing instrument primarily for detecting the presence of clouds overhead and measuring the height of their bases.[93] LiDAR ceilometers are also able to detect aerosols such as wildfire smoke aloft, with the density of aerosols being relative to the measured backscatter values. The example in Figure IV-19 shows a typical ceilometer backscatter plot with clouds between 2-4km during the afternoon of August 20 and otherwise clean air.

Figure IV-19: Ceilometer data for April 20, 2020 at 4pm through April 22, 2020 at 4am at Yuba City station.



During the fires on August 20 through 22 (Figure IV-20 through Figure IV-22) the ceilometer data shows high density aerosol backscatter close to the ground and aloft within the atmosphere reaching up to 1.5km in elevation. This indicates that there was a widespread increase in smoke aerosol density, due to the fires, mixed within the atmosphere.

Figure IV-20 and Figure IV-21 indicates that there was well mixed wildfire smoke below 1km altitude (with some periods smoke reaching up to 3km altitude) on August 20 and 21, 2020. Backwards trajectories from the Grass Valley site have indicated transport from the vicinity of Yuba City. This suggests that Grass Valley was impacted by the wildfire smoke on these days.

Figure IV-21 and Figure IV-22 indicates that there was wildfire smoke mixed within the first 1 to 1.5km of the atmosphere on August 21 and 22, 2020. This suggests that the smoke was well mixed within the atmosphere such that Sutter Buttes was also impacted by the smoke, even with the increased elevation when compared to Yuba City. Also, notice that during the

[93] *https://glossary.ametsoc.org/wiki/Ceilometer*, accessed 10/19/21

overnight hours on August 21 and August 22 from approximately midnight to 8am the smoke layer rises while a relatively cleaner surface layer forms near the ground at Yuba City, likely due to smoke transport remaining above the formation of a nocturnal boundary layer. This correlates well with other monitoring data indicating cleaner air overnight at the Yuba City monitor, while the nearby Sutter Buttes monitor at over 600m higher elevation samples wildfire smoke polluted air that maintains elevated ozone concentrations leading to exceedances of the standard.

Figure IV-20: Ceilometer data for August 19, 2020 at 4pm through August 21, 2020 at 4am at Yuba City station.

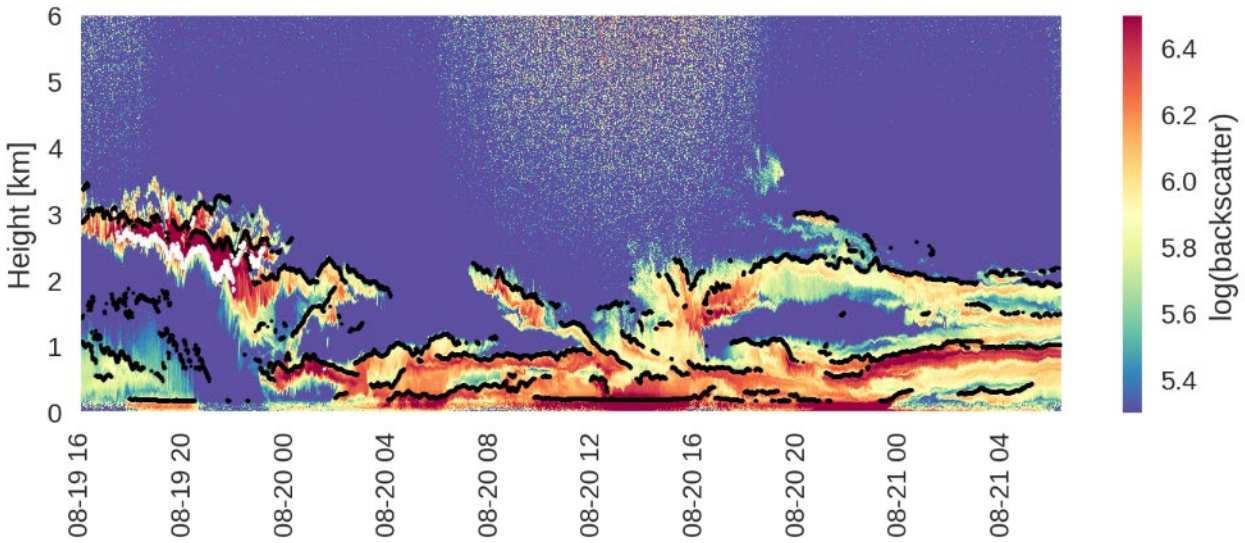


Figure IV-21: Ceilometer data for August 20, 2020 at 4pm through August 22, 2020 at 4am at Yuba City station.

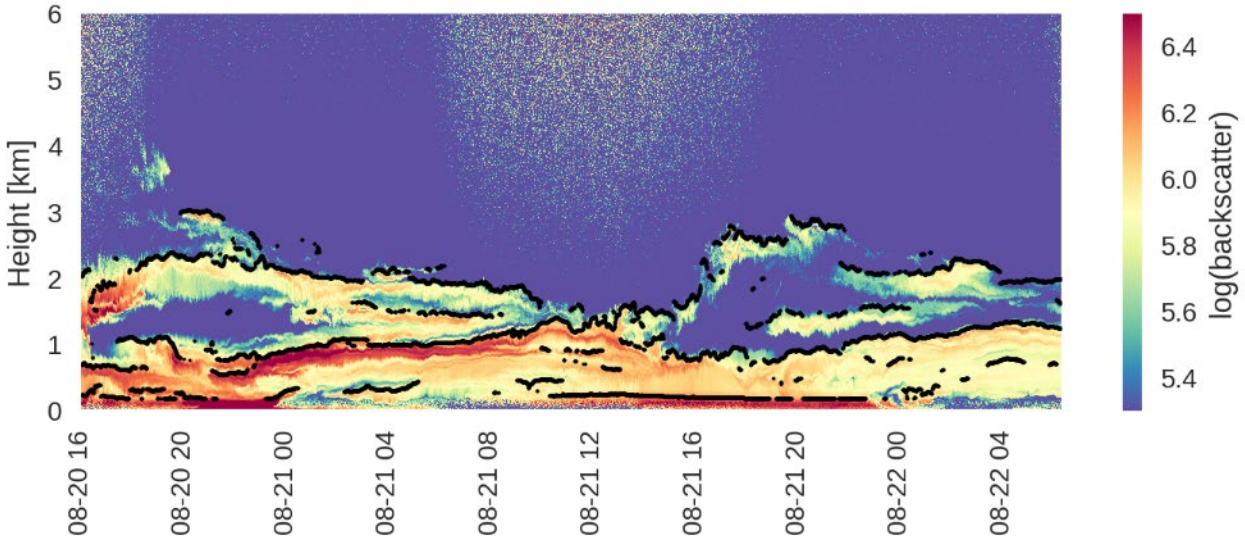
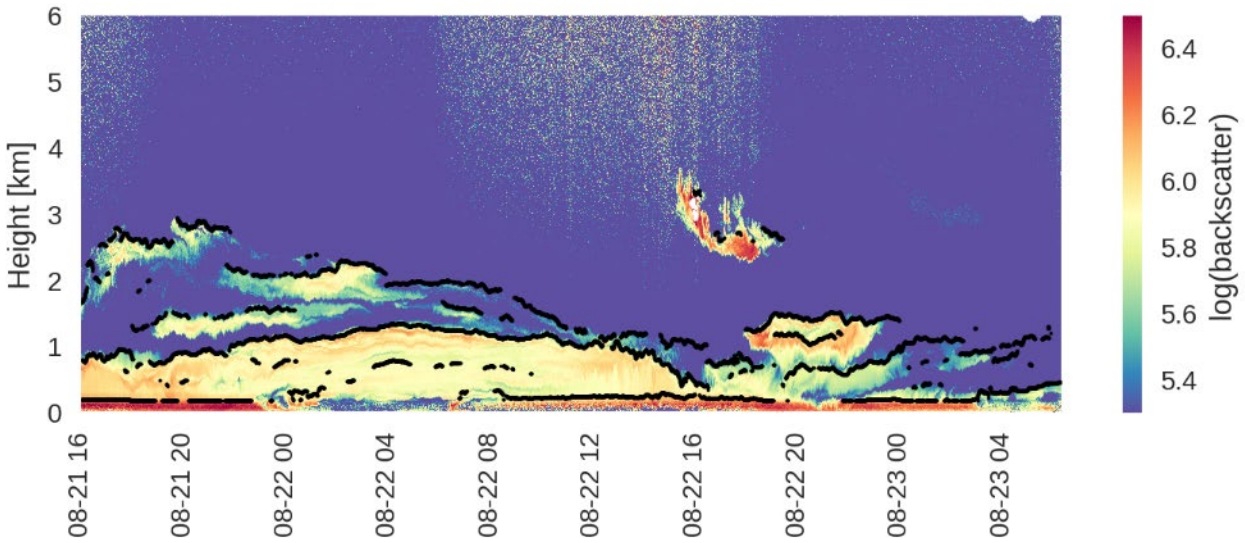


Figure IV-22: Ceilometer data for August 21, 2020 at 4pm through August 23, 2020 at 4am at Yuba City station.



5. Additional Supporting Ground-Level Evidence

a) Area Forecast Discussions

In the days prior to the two periods exceptional events are being requested for wildfire smoke events in northern California, Area Forecast Discussions issued by the National Weather Service (NWS) Sacramento Office (STO) focused on high temperatures and the potential for thunderstorms. Although there were fires along the Oregon-California border, smoke impacts were primarily from the LNU, SCU, and CZU Lightning Complexes on the western side of the Central Valley, as well as the North Complex in the northern Sierras. The lightning-ignited wildfires in mid-August were discussed by the NWS Eureka Office (EKA) but smoke was not noted, with the exception of some lingering impacts from the Red-Salmon Complex in Humboldt County. The wildfires, and associated smoke, began to impact forecast discussions at STO early on August 19 with indications that the smoke would allow for cooler temperatures over portions of the forecast area. By that afternoon, the widespread smoke blanketing the central and northern portions of the State were part of the discussions, noting that the smoke would prevent temperatures from rising as previously expected.[94] A sampling of Area Forecast Discussions from the NWS Sacramento forecast office are included in Appendix C, with below Figure IV-23 shown as an example.

[94] Iowa State University, Mesonet, *Area Forecast Discussions, AFDSTO 2020-08-19 20:57 UTC*, last accessed 10/8/21

Figure IV-23: NWS Area Forecast Discussion – August 20, 2020, 03:15 PDT

```
861
FXUS66 KSTO 201015
AFDSTO

Area Forecast Discussion
National Weather Service Sacramento CA
315 AM PDT Thu Aug 20 2020

.SYNOPSIS...
Hot and dry weather with areas of smoke persist for at least the
remainder of the week. Thunderstorm chances return to the Sierra
Nevada early next week.

&&

.DISCUSSION...
Numerous large wildfires depicted on IR satellite imagery across
NorCal. The strongest heat signatures currently for fires in the
CWA are occurring over western Stanislaus and western Glenn
Counties. Weather conditions remain warm and dry, though not as
extreme as early Wednesday. RH's along the western edge of the
Central Valley are in the teens and 20s (up around 10 percent
compared to 24 hours ago) and westerly wind gusts are considerably
lighter over most of that area. Coastal profiler data indicate the
marine layer remains shallow (under 1000 ft in depth), but that's
an improvement compared to yesterday and IR difference imagery
shows some areas of stratus along the coast.

High pressure retreats a bit today and Friday as a series of
short-waves pivot through the PacNW. This will bring minor
synoptic cooling to the region and maintain some onshore flow with
locally breezy conditions at times, especially in the afternoons
and evenings. RH's will remain low, but trend up slightly for most
areas.

Smoke from the numerous wildfires will continue to blanket the
region, so air quality will be a real problem through at least the
end of the week. The smoke will also continue to have significant
impact on temperatures, both highs and lows.
```

b) Satellite Smoke Indications

The smoke that enhanced the ozone reaching the exceeding monitors in late-August and mid-September 2020 was primarily from wildfires in the western portion of the State, along with the North Complex fire in Plumas and Butte Counties. Smoke from these fires blanketed

central and northern portions of California. Several tools are available to look at smoke in the areas that impacted the monitors.

The NOAA Hazard and Mapping System (HMS) Fire and Smoke Product is an analysis of various satellite imagery to map out the scope and even to some extent thickness of smoke layers. These products were extensively utilized in the Narrative Conceptual Model and Clear Causal Relationship chapters of this document.

NOAA Smoke Text Product[95] is a text-based analysis of satellite imagery. These products are used to give an overall view of smoke origins, current locations, and potential transport. Smoke Text Products are not available from May through August 2020, but those issued from September 12 through September 14 are in Appendix E, with below Figure IV-24 shown as an example.

Figure IV-24: NOAA Smoke Text Product – September 12, 2020 18UTC (10PST)

Saturday, September 12, 2020

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 1746Z September 12, 2020

SMOKE:
Very Large Area from the Eastern Pacific, Western United States extending through the southwest and into the Southern Plains, northwest Gulf of Mexico and northeast towards the Upper Midwest….
The ongoing very large wildfires burning primarily in Washington, Oregon, and California were producing a very large area of moderate to high density smoke that was extending from as far east as portions of the Midwest US and then extending southwest through the Southern Plains and Southwest United States and then through the West Coast States from California north to Washington. The smoke then extended offshore into portions of the eastern and northeastern Pacific Ocean.

6. Conclusion

Beginning in mid-August 2020, smoke from several large wildfires in northern and central California generated emissions that directly resulted in elevated concentrations at the ozone monitors in the ozone nonattainment areas of the Sutter Buttes in Sutter County, Tuolumne County, and the Western Portion of Nevada County. Inspection of $PM_{2.5}$ concentrations, satellite-derived smoke layers, and modeled trajectories indicate pathways for the transport of smoke and associated precursors from the wildfires in northern and central California downrange and into the surface boundary layer. This supports both the transport of smoke, ozone precursors, and generated ozone that mixed down to the surface at the exceeding monitoring sites.

All requested dates for exceptional events were in the 96th percentile or higher of the prior 5-year distribution of 8-hour ozone data and fall in the adjusted top 4 rank for 2020 when excluding the requested exceptional events days. Area forecast discussions, satellite smoke products, biomass burning indicators, black carbon, and ceilometer data all indicated periods of wildfire smoke aloft and at the surface during the requested event dates. Daily diurnal

[95] NOAA Hazard and Mapping System (HMS), *Fire and Smoke Text Product*, last accessed 7/29/21

comparison graphs show many days with abnormal patterns and unusually timed peaks due to the impacts of wildfire emissions.

The comparisons and analyses provided in the Narrative Conceptual Model and Clear Causal Relationship chapters of this demonstration support our conclusion that the numerous wildfire events affected air quality in such a way that there exists a clear causal relationship between the monitoring exceedances or violations as listed in Table I-4 and thus satisfies the clear causal relationship criteria.

V. Natural Event/Human Activity Unlikely to Recur

The Background and Narrative Conceptual Model chapters of this document provide evidence that the event qualifies as a "Natural Event" as defined in 40 CFR 50.1(k). The fires that impacted the exceeding ozone monitors occurred on wildlands that meet the definition in 40 CFR 50.1(n) and (o). When considering fire cause, "wildfires on wildland initiated by accident or arson are considered natural events, and on a case-by-case basis this treatment for wildfires may bear on the appropriate treatment of accidental and arson-set structural fires."[96]

U.S. EPA generally considers the emissions of ozone precursors from wildfires on wildland to meet the regulatory definition of a natural event at 40 CFR 50.1(k), and accordingly, CARB has shown that this event is a natural event and may be considered for treatment as an exceptional event.

VI. Not Reasonably Controllable and/or Not Reasonably Preventable

The Background and Narrative Conceptual Model chapters of this document provide evidence the wildfires impacting the ozone monitors at Sutter Buttes in Sutter County, Sonora in Tuolumne County, and Grass Valley in Nevada County were natural events predominantly occurring on wildland in California. CARB is not aware of any evidence clearly demonstrating that prevention or control efforts beyond those actually made would have been reasonable. Therefore, emissions from the wildfires were not reasonably controllable or preventable.

VII. Public Notification

As presented in Sections E and F of the Narrative Conceptual Model chapter, all affected districts maintain public alert systems as well as publicly available information via their websites to keep residents informed of potential wildfire smoke impacts. Examples of the information released to the public is included in Appendix B and F.

[96] 81 FR 68233, Footnote 35

CARB will hold a 30-day public comment period to solicit public input regarding this demonstration. Notification of the public comment period will be posted on CARB's website and emailed to interested stakeholders. Any comments received, and CARB's responses, will be submitted to U.S. EPA at the end of the 30-day public comment period.

VIII. Summary/Conclusion

The 16 wildfires in Table VIII-1 below were discussed as part of the retroactive analyses as direct, significant contributors to the exceptional events being requested in this demonstration. These fires were all active producers of vast amounts of wildfire smoke and emissions and ultimately consumed over three million acres of wildlands in California.

Table VIII-1: Total Acreage Consumed by Wildfire

Fire Name	**Acreage**
August Complex	1,032,648
LNU Lightning Complex	363,220
Loyalton Fire	47,029
CZU Lightning Complex	86,509
River Fire	48,088
Salt Fire	1,789
Carmel Fire	6,905
SCU Lightning Complex	396,624
Dolan Fire	124,924
Moc Fire	2,857
Creek Fire	379,895
Slater Fire	157,229
Jones Fire	705
North Complex Fire	318,935
Woodward Fire	4,929

Fire Name	Acreage
SQF Complex Fire	174,178

During the event timeframes of August 20 to August 22 and September 12 to September 14, wildfires were particularly active, producing enormous amounts of wildfire smoke and emissions, including ozone precursors, which blew downwind blanketing vast portions of northern California and often settling into valleys and foothills when conditions allowed. Wildfire smoke generally led to cooler temperatures and less sunlight reaching the surface across much of the region than weather conditions and forecast models otherwise predicted. This cooling and decrease in sunlight normally would have led to lower ozone concentrations at Sutter Buttes, Sonora, and Grass Valley; but for the wildfire smoke, associated precursors, and transported ozone which instead caused higher ozone concentrations and exceedances of the 8-hour ozone standard. Air quality monitors across the region showed elevated $PM_{2.5}$ throughout the Sacramento Valley and Mountain Counties Air Basins, indicating smoke impacts at the surface. Biomass burning indicators such as black carbon further identified the wildfires as source of the emissions impacting surface sites. Ceilometer data detected wildfire smoke being transported aloft and at the surface. National Weather Service Area Forecast Discussions and Satellite Smoke products advised of widespread smoke across California impacting surface locations and regional weather. Elevated ozone concentrations correlated well with the elevated $PM_{2.5}$ concentrations at collocated or nearby monitors (as available) during the event at each of the impacted sites.

This 2020 Northern California Ozone Exceptional Events Demonstration supports the criteria for an exceptional event as detailed in the 2016 Exceptional Events Rule[97] and Wildfire Ozone Guidance.[98] This documentation used the following evidence to demonstrate the exceptional event:

- Ambient air monitoring data
- HYSPLIT forward and backward trajectory analyses
- Satellite imagery and narratives
- Wildfire smoke emissions estimates
- Statistical historical concentration comparisons
- Meteorological conditions
- Air Quality District alerts and advisories
- NOAA and HMS smoke products

This Exceptional Events Demonstration clearly demonstrates justification for exclusion of data as listed in Table I-4 due to an exceptional event under 40 CFR 50.14(c)(3)(iv). The 2020 Northern California Ozone Exceptional Events Demonstration has provided evidence that:

[97] 81 FR 68216

[98] U.S. EPA, *Final Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations*, p.25, last accessed 7/29/21

- Describes the events causing the exceedance and a discussion of how emissions from the event led to the exceedance at each monitor;
- Demonstrates a clear causal relationship between the wildfire emissions and the ozone exceedances at each monitor for their respective requested dates;
- Shows that event-influenced concentrations were unusual and above normal historical concentrations;
- Demonstrates the event was neither reasonably controllable nor reasonably preventable; and
- Verifies the event was multiple wildfires, all natural events or human activity that is unlikely to recur at a particular location, all occurring predominantly on wildlands.

Table VIII-2: Summary of Demonstration Criteria based on EER Requirements

Demonstration Requirement	Reference	Chapter
Narrative conceptual model	40 CFR 5.014(c)(3)(iv)(A)	III
Clear causal relationship	40 CFR 50.14(c)(3)(iv)(B)	III, IV
Historical analysis	40 CFR 50.14(c)(3)(iv)(C)	II, III, IV
Human Activity Unlikely to Recur or Natural Event	40 CFR 50.14(c)(3)(iv)(E)	III, IV, V
Not Reasonably Controllable and Not Reasonably Preventable	40 CFR 50.14(c)(3)(iv)(D)	III, IV, VI

Table VIII-3: Summary of Procedural Criteria Based on EER Requirements

Procedural Requirement	Reference	Chapter
Prompt Public Notification	40 CFR 50.14(c)(1)(i)	III, VII, Appendix B, Appendix E
Initial Notification of Potential Exceptional Event Process	40 CFR 50.14(c)(2)(i)	0, Appendix A
Public opportunity to review and comment on demonstration	40 CFR 50.14(c)(3)(v)]	VII

CARB recommends that U.S. EPA Region 9 concur with the 2020 Northern California Ozone Exceptional Events Demonstration and, pending the previously submitted 2018 Northern California Exceptional Event Demonstration submission, exclude the requested data from comparison to the NAAQS.

References/Sources

A. References

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Appendices

A. Initial Notification and Air Quality Data

1. Sutter Buttes

a) Ozone Initial Notification Submitted to U.S. EPA on March 16, 2021. EEPID671

EE Initial Notification Summary Information
Submitting Agency: Feather River Air Quality Management District
Agency Contact: Sondra Spaethe
Date Submitted: March 2, 2021
Applicable NAAQS: 2015 Ozone NAAQS
Affected Regulatory Decision[1]: Attainment determination
(for classification decisions, specify level of the classification with/without EE concurrence)
Area Name/Designation Status: Sutter Buttes/marginal nonattainment classification
Design Value Period (list three year period): 2018, 2019, 2020
(where there are multiple relevant design value periods, summarize separately)

A) Information specific to each flagged site day that may be submitted to EPA in support of the affected regulatory decision listed above

Date of Event	Type of Event (high wind, volcano, wildfires/prescribed fire, other[2])	AQS Flag	Site AQS ID	Site Name	Exceedance Concentration (with units)	Notes (e.g. event name, links to other events)
7/28/2018	Wildfire	IT	061010004	Sutter Buttes	0.08 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
7/29/2018	Wildfire	IT	061010004	Sutter Buttes	0.075 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
7/30/2018	Wildfire	IT	061010004	Sutter Buttes	0.083 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
7/31/2018	Wildfire	IT	061010004	Sutter Buttes	0.082 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
8/1/2018	Wildfire	IT	061010004	Sutter Buttes	0.082 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
8/2/2018	Wildfire	IT	061010004	Sutter Buttes	0.071 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
8/3/2018	Wildfire	IT	061010004	Sutter Buttes	0.074 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
8/7/2018	Wildfire	IT	061010004	Sutter Buttes	0.075 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
8/9/2018	Wildfire	IT	061010004	Sutter Buttes	0.079 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
8/10/2018	Wildfire	IT	061010004	Sutter Buttes	0.077 ppm	Carr Fire, Shasta Co + Mendocino Complex, Lake Co
8/20/2020	Wildfire	IT	061010004	Sutter Buttes	0.075 ppm	August Complex, LNU, and other regional fires
8/21/2020	Wildfire	IT	061010004	Sutter Buttes	0.09 ppm	August Complex, LNU, and other regional fires
8/22/2020	Wildfire	IT	061010004	Sutter Buttes	0.089 ppm	August Complex, LNU, and other regional fires
8/23/2020	Wildfire	IT	061010004	Sutter Buttes	0.072 ppm	August Complex, LNU, and other regional fires
8/24/2020	Wildfire	IT	061010004	Sutter Buttes	0.071 ppm	August Complex, LNU, and other regional fires
8/30/2020	Wildfire	IT	061010004	Sutter Buttes	0.070 ppm	August Complex, LNU, and other regional fires
9/5/2020	Wildfire	IT	061010004	Sutter Buttes	0.074 ppm	August Complex, LNU, and other regional fires
9/13/2020	Wildfire	IT	061010004	Sutter Buttes	0.083 ppm	August Complex, North Complex, and other regional fires
9/14/2020	Wildfire	IT	061010004	Sutter Buttes	0.072 ppm	August Complex, North Complex, and other regional fires

[1] designation, classification, attainment determination, attainment date extension, or finding of SIP inadequacy leading to SIP call
[2] Provide additional information for types of event described as "other"

10/1/2020	Wildfire	IT	061010004	Sutter Buttes	0.084 ppm	August Complex, Zogg Fire, North Complex, and other regional fires

B) Violating Sites Information

(listing of all violating sites in the planning area, regardless of operating agency, and regardless of whether or not they are impacted by EEs)

Site/monitor (AQS ID and POC)	Design Value (without EPA concurrence on any of the events listed in table A above)	Design Value (with EPA concurrence on all events listed in table A above)
Sutter Buttes/061010004-1	0.076 ppm	0.068 ppm

C) Summary of Maximum Design Value (DV) Site Information (Effect of EPA Concurrence on Maximum Design Value Site Determination)

(Two highest values from Table B)

Maximum DV site (AQS ID) **without EPA concurrence** on any of the events listed in table A above	Design Value 0.076 ppm	Design Value Site **Sutter Buttes**	Comment
Maximum DV site (AQS ID) **with EPA concurrence** on all events listed in table A above	Design Value 0.068 ppm	Design Value Site **Sutter Buttes**	Comment

D) List of any sites (AQS ID) within planning area with invalid design values (e.g., due to data incompleteness)
N/A

[1] designation, classification, attainment determination, attainment date extension, or finding of SIP inadequacy leading to SIP call
[2] Provide additional information for types of event described as "other"

b) Sutter Buttes AQS AMP350 Data

Ozone Data is currently flagged with the REQEXC Code “rt-Wildfire-U.S.”

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
RAW DATA REPORT

Nov. 9, 2021

(44201) Ozone

SITE ID: 06-101-0004 POC: 1
COUNTY: (101) Sutter
CITY: (77378) Sutter
SITE ADDRESS: TOP OF SOUTH BUTTE,SUTTER BUTTES, CA
SITE COMMENTS: ARB SITE NAME (NUMBER) IS SUTTER BUTTES (5100899). ACCESS ROAD ABOUT 50 METERS SC
MONITOR COMMENTS: SEASONAL OZONE MONITORING FOR THE REGION.

STATE: (06) California
AQCR: (028) SACRAMENTO VALLEY
URBANIZED AREA: (0000) NOT IN AN URBAN AREA
LAND USE: AGRICULTURAL
LOCATION SETTING: RURAL

CAS NUMBER: 10028-15-6
LATITUDE: 39.2055720009
LONGITUDE: -121.820362
UTM ZONE:
UTM NORTHING:
UTM EASTING:
ELEVATION-MSL: 640
PROBE HEIGHT: 7

SUPPORT AGENCY: (0145) California Air Resources Board
MONITOR TYPE: SLAMS
COLLECTION AND ANALYSIS METHOD: (087) INSTRUMENTAL ULTRA VIOLET ABSORPTI
PQAO: (0145) California Air Resources Board

REPORT FOR: AUGUST 2020

DURATION: 1 HOUR
UNITS: Parts per million
MIN DETECTABLE: .005

DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MAXIMUM
1	.038	.041	.043	.044	BD	.051	.049	.040	.037	.035	.038	.043	.047	.051	.054	.056	.056	.056	.055	.058	.058	.059	.056	.051	23	.059
2	.044	.039	.034	.045	BD	.051	.043	.038	.031	.033	.038	.042	.046	.051	.051	.052	.049	.050	.051	.041	.042	.036	.033	.031	23	.052
3	.030	.030	.029	.031	BD	.039	.037	.034	.034	.036	.038	.042	.045	.048	.049	.050	.052	.049	.052	.057	.053	.039	.034	.029	23	.057
4	.024	.025	.027	.027	BD	.025	.030	.033	.031	.031	.034	.037	.041	.045	.048	.051	.053	.061	.054	.048	.046	.040	.036	.027	23	.061
5	.028	.026	.024	.024	BD	.023	.020	.021	.021	.023	.026	.030	.032	.033	.037	.040	.040	.040	.036	.035	.033	.031	.032	.030	23	.040
6	.029	.029	.029	.029	BD	.030	.028	.025	.022	.026	.030	.033	.038	.043	.041	.044	.049	.054	.055	.051	.042	.043	.039	.028	23	.055
7	.023	.020	.021	.021	BD	.033	.039	.035	.029	.028	.031	.035	.038	.042	.044	.044	.045	.052	.055	.054	.054	.047	.040	.037	23	.055
8	.043	.042	.044	.045	BD	.045	.041	.040	.035	.037	.042	.046	.049	.052	.051	.051	.055	.057	.057	.055	.054	.054	.047	.050	23	.057
9	.042	.044	.045	.044	BD	.049	.048	.047	.045	.043	.048	.052	.054	.057	.057	.057	.057	.057	.064	.060	.054	.045	.043	.050	23	.064
10	.048	.050	.046	.051	BD	.051	.048	.048	.047	.049	.047	.047	.052	.056	.057	.060	.067	.070	.060	.052	.048	.040	.041	.037	23	.070
11	.036	.037	.037	.034	BD	.035	.035	.035	.031	.028	.031	.035	.038	.041	.046	.048	.051	.051	.045	.045	.042	.041	.039	.040	23	.051
12	.038	.041	.040	.038	BD	.038	.034	.030	.028	.027	.031	.036	.037	.039	.042	.049	.053	.056	.055	.052	.047	.047	.042	.041	23	.056
13	.048	.043	.045	.039	BD	.038	.040	.038	.040	.045	.049	.049	.043	.045	.053	.059	.062	.063	.064	.065	.053	.044	.046	.046	23	.065
14	.044	.044	.045	.046	BD	.046	.048	.053	.054	.054	.055	.056	.059	.060	.060	.060	.057	.057	.056	.048	.046	.049	.052	.051	23	.060
15	.045	.050	.052	.054	BD	.043	.043	.046	.046	.049	.052	.053	.055	.055	.047	.044	.058	.061	.062	.058	.054	.051	.048	.046	23	.062
16	.047	.046	.047	.046	BD	.032	.044	.048	.046	.049	.045	.047	.049	.052	.052	.052	.053	.054	.055	.054	.054	.056	.050	.048	23	.056
17	.048	.048	.050	.050	BD	.052	.053	.048	.046	.044	.046	.047	.047	.054	.052	.058	.053	.054	.055	.053	.050	.044	.044	.043	23	.058
18	.043IT	.044IT	.043IT	.045IT	BD	.044IT	.040IT	.044IT	.045IT	.043IT	.050IT	.062IT	.064IT	.052IT	.071IT	.069IT	.057IT	.063IT	.066IT	.043IT	.034IT	.039IT	.039IT	.036IT	23	.071
19	.031IT	.035IT	.041IT	.039IT	BD	.042IT	.041IT	.040IT	.041IT	.040IT	.057IT	.060IT	.064IT	.068IT	.069IT	.065IT	.064IT	.058IT	.065IT	.063IT	.034IT	.033IT	.042IT	.044IT	23	.069
20	.048IT	.052IT	.032IT	.028IT	BD	.040IT	.038IT	.033IT	.044IT	.059IT	.057IT	.083IT	.075IT	.060IT	.056IT	.085IT	.058IT	.077IT	.094IT	.080IT	.072IT	.071IT	.068IT	.064IT	23	.094
21	.056rt	.048rt	.054rt	.044rt	BD	.039rt	.045rt	.049rt	.047rt	.045rt	.031rt	.040rt	.049rt	.057rt	.066rt	.075rt	.079rt	.099rt	.108rt	.108rt	.089rt	.090rt	.076rt	.077rt	23	.108
22	.077rt	.069rt	.075rt	.053rt	BD	.064rt	.068rt	.073rt	.069rt	.047rt	.042rt	.051rt	.066rt	.078rt	.097rt	.097rt	.089rt	.092rt	.099rt	.097rt	.064rt	.044rt	.052rt	.080rt	23	.099
23	.059IT	.047IT	.042IT	.043IT	BD	.049IT	.052IT	.054IT	.050IT	.053IT	.057IT	.065IT	.072IT	.072IT	.072IT	.071IT	.076IT	.085IT	.069IT	.063IT	.060IT	.067IT	.062IT	.064IT	23	.085
24	.075IT	.072IT	.074IT	.070IT	BD	.065IT	.060IT	.050IT	.049IT	.060IT	.060IT	.062IT	.069IT	.063IT	.060IT	.067IT	.072IT	.076IT	.080IT	.074IT	.060IT	.069IT	.073IT	.056IT	23	.080
25	.056IT	.052IT	.046IT	.044IT	BD	.044IT	.043IT	.042IT	.045IT	.044IT	.038IT	.039IT	.045IT	.052IT	.057IT	.066IT	.077IT	.078IT	.076IT	.061IT	.044IT	.046IT	.040IT	.042IT	23	.078
26	.043IT	.044IT	.039IT	.039IT	BD	.042IT	.043IT	.044IT	.045IT	.047IT	.051IT	.053IT	.058IT	.060IT	.060IT	.061IT	.071IT	.070IT	.063IT	.063IT	.064IT	.062IT	.052IT	.048IT	23	.071
27	.040IT	.037IT	.041IT	.044IT	BD	.045IT	.039IT	.039IT	.040IT	.040IT	.040IT	.043IT	.046IT	.052IT	.057IT	.062IT	.062IT	.058IT	.064IT	.059IT	.058IT	.062IT	.062IT	.062IT	23	.064
28	.064IT	.064IT	.056IT	.055IT	BD	.050IT	.057IT	.050IT	.045IT	.044IT	.048IT	.055IT	.055IT	.060IT	.066IT	.065IT	.072IT	.068IT	.069IT	.068IT	.062IT	.062IT	.058IT	.061IT	23	.072
29	.065IT	.066IT	.064IT	.061IT	BD	.060IT	.065IT	.063IT	.054IT	.052IT	.048IT	.050IT	.053IT	.056IT	.060IT	.068IT	.072IT	.074IT	.071IT	.064IT	.064IT	.059IT	.062IT	.063IT	23	.074
30	.070IT	.077IT	.076IT	.070IT	BD	.066IT	.062IT	.060IT	.059IT	.060IT	.059IT	.058IT	.062IT	.063IT	.064IT	.062IT	.061IT	.061IT	.064IT	.068IT	.067IT	.072IT	.072IT	.073IT	23	.077
31	.074IT	.072IT	.068IT	.065IT	BD	.066IT	.069IT	.069IT	.062IT	.054IT	.051IT	.056IT	.057IT	.058IT	.057IT	.053IT	.052IT	.052IT	.050IT	.053IT	.054IT	.062IT	.073IT	.058IT	23	.074
NO.:	31	31	31	31		31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31		
MAX:	.077	.077	.076	.070		.066	.069	.073	.069	.060	.060	.083	.075	.078	.097	.097	.089	.099	.108	.108	.089	.090	.076	.080		
AVG:	.0470	.0463	.0455	.0441		.0451	.0452	.0442	.0425	.0427	.0442	.0486	.0518	.0540	.0565	.0594	.0604	.0630	.0635	.0597	.0534	.0517	.0501	.0488		

MONTHLY OBSERVATIONS: 713 MONTHLY MEAN: .0508 MONTHLY MAX: .108

Note: Qualifier codes with regional concurrence are shown in upper case, and those without regional review are shown in lower case. An asterisk (**) indicates that the region has reviewed the value and does not concur with the qualifier.

2. Tuolumne County

a) Ozone Initial Notification Submitted to U.S. EPA on March 16, 2021. EEPID676

EE Initial Notification Summary Information O_3

Submitting Agency: **TUOLUMNE COUNTY AIR POLLUTION CONTROL DISTRICT**
Agency Contact: **KELLE SCHROEDER, APCO**
Date Submitted: **FEBRUARY 16, 2021**
Applicable NAAQS: **2015 OZONE 8 - HOUR**
Affected Regulatory Decision[1]: **ATTAINMENT DETERMINATION**
(for classification decisions, specify level of the classification with/without EE concurrence)
Area Name/Designation Status: **TUOLUMNE COUNTY NONATTAINMENT AREA**
Design Value Period (list three year period): **2018 - 2020**
(where there are multiple relevant design value periods, summarize separately)

A) See attached spreadsheet titled "Federal Exceptional Event Initial Notification Sheet"

B) Violating Sites Information
(listing of all violating sites in the planning area, regardless of operating agency, and regardless of whether or not they are impacted by EEs)

Site/monitor (AQS ID and POC)	Design Value (without EPA concurrence on any of the events listed in attached spreadsheet)	Design Value (with EPA concurrence on all events listed in attached spreadsheet)
Sonora-Barrett Street (061090005-1)	77	69

C) Summary of Maximum Design Value (DV) Site Information (Effect of EPA Concurrence on Maximum Design Value Site Determination)
(Two highest values from Table B)

Maximum DV site (AQS ID) **without EPA concurrence** on any of the events listed in attached spreadsheet	Design Value 77	Design Value Site **Sonora - Barretta Street (061090005-1)**	Comment Site would not be in attainment. Area would be bumped up to Moderate classification.
Maximum DV site (AQS ID) **with EPA concurrence** on all events listed in attached spreadsheet	Design Value 69	Design Value Site **Sonora - Barretta Street (061090005-1)**	Comment Site and area would be in attainment.

D) List of any sites (AQS ID) within planning area with invalid design values (e.g., due to data incompleteness)

Not applicable, only one Site in Tuolumne County - Sonora-Barretta Street

[1] designation, classification, attainment determination, attainment date extension, or finding of SIP inadequacy leading to SIP call
[2] Provide additional information for types of event described as "other"

Federal Ozone NAAQS Exceptional Event Initial Notification Sheet

Tuolumne County Air Pollution Control District

Event Date	Type of Event	AQS Flag	Monitor AQS ID	AQS POC	Site Name	Pollutant	Concentration	Units	Event Name	Notes
7/18/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.084	ppm	Ferguson Wilfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
7/19/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.084	ppm	Ferguson Wilfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
7/28/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.079	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
7/29/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.079	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
7/30/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.076	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
7/31/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.078	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/2/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.078	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/3/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.071	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/4/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.074	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/5/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.084	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/6/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.080	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/8/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.087	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/9/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.074	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/10/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.079	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/24/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.074	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/25/2018	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.074	ppm	MendocinoComplex & Donnell Wildfire	Wildfire smoke from Ferguson Wildfire impacted O3 conc.at site; https://www.fire.ca.gov/incidents/2018/;
8/20/2020	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.081	ppm	CZU, LNU, SCU, and SQF Complex Wildfires	Wildfire smoke from multiple complex wildfires impacted O3 conc at site; https://www.fire.ca.gov/incidents/2020/
8/21/2020	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.083	ppm	CZU, LNU, SCU, and SQF Complex Wildfires	Wildfire smoke from multiple complex wildfires impacted O3 conc at site; https://www.fire.ca.gov/incidents/2020/
8/22/2020	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.081	ppm	CZU, LNU, SCU, and SQF Complex Wildfires	Wildfire smoke from multiple complex wildfires impacted O3 conc at site; https://www.fire.ca.gov/incidents/2020/
8/23/2020	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.078	ppm	CZU, LNU, SCU, and SQF Complex Wildfires	Wildfire smoke from multiple complex wildfires impacted O3 conc at site; https://www.fire.ca.gov/incidents/2020/
8/24/2020	Wildfire	IT	061090005	1	Sonora-Barretta Street	Ozone-8 hr	0.080	ppm	CZU, LNU, SCU, and SQF Complex Wildfires	Wildfire smoke from multiple complex wildfires impacted O3 conc at site; https://www.fire.ca.gov/incidents/2020/

b) Sonora AQS AMP350 Data

Ozone Data is currently flagged with the REQEXC Code “rt-Wildfire-U.S.”

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
RAW DATA REPORT

Oct. 26, 2021

(44201) Ozone

SITE ID: 06-109-0005 POC: 1
COUNTY: (109) Tuolumne
CITY: (72674) Sonora
SITE ADDRESS: 251 S BARRETTA, SONORA, CA 95370
SITE COMMENTS: LOCATED ON DARIO CASSINA HIGH SCHOOL GROUNDS. ARB SITE NAME (NUMBER) IS SONORA-BA
MONITOR COMMENTS: DASIBI MODEL 1003AH O3 ANALYZER (UV PHOTOMETRY METHOD).

STATE: (06) California
AQCR: (031) SAN JOAQUIN VALLEY
URBANIZED AREA: (0000) NOT IN AN URBAN AREA
LAND USE: RESIDENTIAL
LOCATION SETTING: URBAN AND CENTER CITY

CAS NUMBER: 10028-15-6
LATITUDE: 37.98178
LONGITUDE: -120.378551
UTM ZONE:
UTM NORTHING:
UTM EASTING:
ELEVATION-MSL: 571
PROBE HEIGHT: 6

SUPPORT AGENCY: (0145) California Air Resources Board
MONITOR TYPE: SLAMS
COLLECTION AND ANALYSIS METHOD: (087) INSTRUMENTAL ULTRA VIOLET ABSORPTI
PQAO: (0145) California Air Resources Board

REPORT FOR: AUGUST 2020

DURATION: 1 HOUR
UNITS: Parts per million
MIN DETECTABLE: .005

DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MAXIMUM
1	.031	.031	.030	.030	BD	.029	.029	.038	.050	.048	.048	.048	.047	.050	.050	.051	.053	.057	.055	.048	.039	.036	.030	.033	23	.057
2	.029	.028	.028	.028	BD	.027	.030	.036	.046	.044	.048	.048	.041	.040	.043	.050	.057	.053	.042	.037	.038	.034	.032	.029	23	.057
3	.031	.032	.031	.028	BD	.025	.026	.043	.052	.055	.052	.056	.050	.047	.047	.049	.051	.052	.049	.045	.040	.035	.030	.030	23	.056
4	.027	.027	.026	.025	BD	.025	.028	.034	.045	.042	.048	.046	.044	.043	.044	.045	.052	.057	.051	.043	.036	.032	.030	.029	23	.057
5	.028	.028	.027	.025	BD	.023	.027	.038	.043	.043	.040	.035	.039	.045	.043	.045	.046	.045	.042	.035	.032	.028	.023	.022	23	.046
6	.020	.018	.018	.017	BD	.014	.018	.028	.037	.036	.039	.039	.040	.041	.043	.046	.049	.051	.049	.043	.035	.032	.031	.028	23	.051
7	.027	.028	.026	.023	BD	.022	.019	.030	.042	.046	.046	.046	.044	.044	.045	.046	.047	.048	.048	.043	.034	.032	.034	.029	23	.048
8	.029	.027	.027	.022	BD	.020	.023	.035	.041	.043	.049	.050	.049	.050	.050	.052	.054	.057	.058	.052	.045	.043	.038	.036	23	.058
9	.033	.031	.029	.029	BD	.025	.029	.042	.049	.047	.050	.053	.052	.053	.055	.059	.061	.061	.060	.055	.050	.048	.046	.038	23	.061
10	.034	.030	.028	.027	BD	.020	.024	.036	.047	.044	.052	.051	.049	.048	.050	.051	.052	.055	.054	.050	.046	.041	.036	.032	23	.055
11	.029	.027	.025	.024	BD	.019	.023	.031	.042	.043	.044	.040	.040	.043	.045	.048	.050	.048	.050	.048	.040	.034	.029	.027	23	.050
12	.025	.025	.026	.024	BD	.018	.025	.033	.045	.042	.047	.050	.054	.054	.053	.054	.054	.055	.054	.048	.044	.037	.034	.035	23	.055
13	.035	.031	.029	.028	BD	.023	.029	.043	.054	.050	.051	.055	.060	.058	.058	.058	.059	.058	.055	.046	.041	.042	.042	.039	23	.060
14	.038	.035	.033	.030	BD	.024	.026	.038	.045	.049	.049	.052	.053	.055	.057	.053	.065	.074	.070	.053	.040	.037	.039	.040	23	.074
15	.037	.033	.035	.035	BD	.034	.030	.041	.052	.064	.062	.055	.051	.053	.055	.057	.055	.053	.045	.035	.029	.026	.027	.025	23	.064
16	.025	.027	.027	.027	BD	.036	.039	.042	.044	.047	.048	.047	.047	.047	.048	.049	.048	.048	.047	.044	.039	.036	.034	.030	23	.049
17	.026	.023	.022	.022	BD	.017	.019	.029	.045	.052	.056	.061	.067	.078	.080	.069	.066	.067	.071	.062	.056	.050	.043	.035	23	.080
18	.034	.033	.032	.030	BD	.023	.027	.040	.051	.058	.058	.053	.058	.061	.062	.069	.074	.076	.072	.069	.064	.052	.043	.036	23	.076
19	.035	.036	.035	.034	BD	.031	.025	.020	.035	.039	.043	.041	.039	.039	.044	.050	.049	.052	.052	.047	.042	.033	.031	.031	23	.052
20	.031rt	.033rt	.034rt	.029rt	BD	.021rt	.019rt	.027rt	.042rt	.047rt	.046rt	.047rt	.054rt	.072rt	.090rt	.092rt	.086rt	.088rt	.087rt	.072rt	.062rt	.057rt	.052rt	.045rt	23	.092
21	.047rt	.046rt	.046rt	.046rt	BD	.032rt	.026rt	.024rt	.032rt	.061rt	.068rt	.076rt	.077rt	.081rt	.088rt	.083rt	.076rt	.091rt	.093rt	.078rt	.066rt	.063rt	.056rt	.052rt	23	.093
22	.047rt	.050rt	.048rt	.052rt	BD	.050rt	.042rt	.037rt	.047rt	.057rt	.085rt	.087rt	.085rt	.088rt	.090rt	.082rt	.067rt	.065rt	.054rt	.047rt	.043rt	.041rt	.040rt	.040rt	23	.090
23	.039rt	.041rt	.038rt	.042rt	BD	.044rt	.042rt	.039rt	.053rt	.069rt	.072rt	.069rt	.071rt	.078rt	.084rt	.080rt	.082rt	.085rt	.078rt	.072rt	.070rt	.063rt	.048rt	.054rt	23	.085
24	.054rt	.036rt	.027rt	.018rt	BD	.016rt	.045rt	.046rt	.037rt	.051rt	.060rt	.070rt	.080rt	.082rt	.083rt	.085rt	.086rt	.083rt	.075rt	.066rt	.060rt	.055rt	.043rt	.047rt	23	.086
25	.040	.033	.033	.034	BD	.026	.023	.041	.052	.062	.056	.049	.049	.051	.051	.054	.057	.058	.055	.049	.045	.041	.035	.032	23	.062
26	.028	.027	.025	.021	BD	.016	.016	.031	.047	.052	.053	.053	.056	.059	.059	.059	.060	.061	.064	.059	.051	.045	.039	.035	23	.064
27	.035	.032	.029	.028	BD	.024	.021	.033	.050	.051	.062	.060	.057	.057	.057	.055	.056	.055	.049	.041	.042	.038	.031	.029	23	.062
28	.028	.027	.026	.025	BD	.017	.013	.026	.043	.048	.052	.058	.061	.059	.059	.060	.059	.060	.052	.047	.047	.040	.039	.036	23	.061
29	.032	.035	.035	.031	BD	.030	.026	.031	.043	.051	.056	.060	.066	.066	.068	.068	.068	.070	.068	.063	.057	.048	.048	.039	23	.070
30	.037	.038	.036	.035	BD	.032	.030	.036	.051	.054	.055	.069	.065	.066	.065	.066	.065	.062	.057	.052	.046	.041	.039	.040	23	.069
31	.042	.037	.035	.033	BD	.030	.026	.031	.044	.055	.062	.064	.065	.064	.067	.072	.075	.074	.072	.069	.064	.059	.053	.049	23	.075
NO.:	31	31	31	31		31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31		
MAX:	.054	.050	.048	.052		.050	.045	.046	.054	.069	.085	.087	.085	.088	.090	.092	.086	.091	.093	.078	.070	.063	.056	.054		
AVG:	.0333	.0318	.0305	.0291		.0256	.0266	.0348	.0454	.0500	.0535	.0545	.0552	.0572	.0591	.0599	.0606	.0619	.0590	.0522	.0465	.0419	.0379	.0355		

MONTHLY OBSERVATIONS: 713 MONTHLY MEAN: .0453 MONTHLY MAX: .093

Note: Qualifier codes with regional concurrence are shown in upper case, and those without regional review are shown in lower case. An asterisk (**) indicates that the region has reviewed the value and does not concur with the qualifier.

3. Western Nevada County

a) Ozone Initial Notification Submitted to U.S. EPA on March 15, 2021. EEPID688

Ozone Exceptional Events, 2018-2020

EE Initial Notification Summary Information

Submitting Agency: Northern Sierra Air Quality Management District
Agency Contact: Sam Longmire
Date Submitted: 3/12/2021
Applicable NAAQS: 2008 8-Hour Ozone
Affected Regulatory Decision[1]: Attainment Determination
(for classification decisions, specify level of the classification with/without EE concurrence)
Area Name/Designation Status: Nevada County (Western Part)/Serious Nonattainment
Design Value Period (list three year period): 2018-2020
(where there are multiple relevant design value periods, summarize separately)

A) Information specific to each flagged site day that may be submitted to EPA in support of the affected regulatory decision listed above

Date of Event	Type of Event (high wind, volcano, wildfires/prescribed fire, other[2])	AQS Flag	Site AQS ID	Site Name	Exceedance Concentration (with units)	Notes (e.g. event name, links to other events)
7/26/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	83 ppb	Multiple Wildfires
7/27/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	82 ppb	Multiple Wildfires
7/28/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	78 ppb	Multiple Wildfires
7/29/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	78 ppb	Multiple Wildfires
7/31/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	101 ppb	Multiple Wildfires
8/1/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	98 ppb	Multiple Wildfires
8/2/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	101 ppb	Multiple Wildfires
8/7/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	84 ppb	Multiple Wildfires
8/8/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	95 ppb	Multiple Wildfires
8/9/2018	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	93 ppb	Multiple Wildfires
8/20/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	122 ppb	Multiple Wildfires
8/21/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	104 ppb	Multiple Wildfires
8/24/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	78 ppb	Multiple Wildfires
8/25/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	75 ppb	Multiple Wildfires
8/26/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	76 ppb	Multiple Wildfires
8/28/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	74 ppb	Multiple Wildfires
8/29/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	80 ppb	Multiple Wildfires
9/1/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	85 ppb	Multiple Wildfires
9/5/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	78 ppb	Multiple Wildfires
9/12/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	86 ppb	Multiple Wildfires
9/13/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	81 ppb	Multiple Wildfires
9/14/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	79 ppb	Multiple Wildfires

[1] designation, classification, attainment determination, attainment date extension, or finding of SIP inadequacy leading to SIP call
[2] Provide additional information for types of event described as "other"

9/15/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	76 ppb	Multiple Wildfires
9/16/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	78 ppb	Multiple Wildfires
9/17/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	75 ppb	Multiple Wildfires
9/21/2020	Wildfire	IT	06-057-0005	Grass Valley-Litton Building (POC 1)	79 ppb	Multiple Wildfires

B) Violating Sites Information

(listing of all violating sites in the planning area, regardless of operating agency, and regardless of whether or not they are impacted by EEs)

Site/monitor (AQS ID and POC)	Design Value (without EPA concurrence on any of the events listed in table A above)	Design Value (with EPA concurrence on all events listed in table A above)
Grass Valley-Litton Building 06-057-0005-1	0.084 ppm	0.073 ppm

C) Summary of Maximum Design Value (DV) Site Information (Effect of EPA Concurrence on Maximum Design Value Site Determination)

(Two highest values from Table B)

Maximum DV site (AQS ID) **without EPA concurrence** on any of the events listed in table A above	Design Value 0.084 ppm	Design Value Site Grass Valley-Litton Building	Comment Area would be required to bump-up to Severe.
Maximum DV site (AQS ID) **with EPA concurrence** on all events listed in table A above	Design Value 0.073 ppm	Design Value Site Grass Valley-Litton Building	Comment Area would be in attainment for 2008 Ozone NAAQS.

D) List of any sites (AQS ID) within planning area with invalid design values (e.g., due to data incompleteness)

[1] designation, classification, attainment determination, attainment date extension, or finding of SIP inadequacy leading to SIP call

[2] Provide additional information for types of event described as "other"

b) Grass Valley AQS AMP350 Data

Western Nevada County Ozone Data is in process of being flagged with the REQEXC Code "rt-Wildfire-U.S."

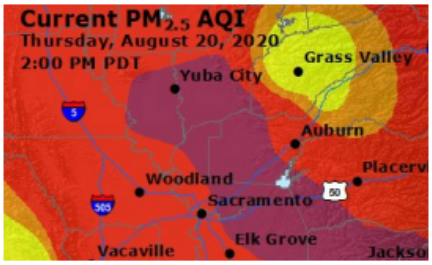
B. District Alerts/Advisories

1. Sutter Buttes / Sutter County / Feather River AQMD

Air Quality Health Advisory
EFFECTIVE AUGUST 20 – AUGUST 23, 2020

The Public Health Departments for Yuba and Sutter counties and the Feather River Air Quality Management District are issuing a joint air quality health advisory to notify the public of poor air quality conditions from wildfire smoke. The smoke impacting the area is from the August Complex, the LNU Lightning Complex, and other regional wildfires.

The current Air Quality Index levels are in the Unhealthy to Very Unhealthy range. Smoke from the fires may continue to cause unhealthy air quality in Yuba and Sutter counties through Sunday, August 23.



The Sutter and Yuba Public Health Departments advise residents with lung or heart disease, and the elderly to leave areas where levels of particulate matter are high. For everyone else, when you smell smoke, or see smoke around you, you should consider staying indoors and avoiding heavy exertion.

Smoke density can vary widely from one local area to another and also with time of day. "Air quality conditions depend on a number of factors, which include proximity to the fire, wind speed and direction, and whether inversions are present," warns Christopher D. Brown, Air Pollution Control officer.

You can check current conditions online at www.airnow.gov or www.spareheair.com. Residents can also sign up for air quality forecasts and alerts at www.fraqmd.org that can be sent by email or text message. Residents that do not have internet access may also check particulate matter levels by listening to reports from local radio stations, local news, checking the local newspaper such as the Appeal-Democrat (during extended wildfire smoke impacts), or by using the distance/visibility table at the bottom of this advisory.

Residents who see or smell smoke should consider these precautionary measures:

- Healthy people should delay strenuous exercise, particularly when they can smell smoke.

- Children and elderly people should consider avoiding outdoor activities, particularly prolonged outdoor exertion. Parents of children involved in youth sports programs should consider whether their children be allowed to participate when smoke is in the air.
- People with health-related illnesses, particularly respiratory problems, should remain indoors.
- Keep windows and doors closed as much as possible. Use the recycle or recirculate mode on the air conditioner in your home or car.
- Masks, such as cloth masks worn to prevent the spread of the novel coronavirus, are not capable of filtering extra fine particles found in wildfire smoke.
- Do not rely on HEPA (N-95) respirators to do unnecessary outdoor activities.
- Keep airways moist by drinking lots of water. Breathing through a warm, wet washcloth can also help relieve dryness, but does not filter out the hazardous smoke particles.
- Avoid the fire areas and watch for emergency equipment.

Wildfire smoke may contain particulate matter, ozone, carbon monoxide, and toxic air contaminants. While all persons may experience varying degrees of symptoms, more sensitive individuals, such as the young, aged and those with respiratory conditions are at greatest risk of experiencing more aggravated symptoms. Symptoms may include, but are not limited to, coughing, watery and itchy eyes, and difficulty breathing. Persons experiencing questionable or severe symptoms should seek professional medical advice and treatment.

The following index may also assist in assessing the air quality based on the visibility in your area. To assess visibility:

- Face away from the sun. Determine visibility range by looking for targets that are at known distances (miles). You can use an electronic device map app or a map of the local area that has a mile scale.
- The visible range is the point where even high-contrast objects disappear.

Distance you can see	**Recommended action if you are a healthy adult, teenager, or other child**	**Recommended action if you are age 65 and over, pregnant, a young child or have asthma, respiratory illness, or lung or heart disease**
10 + miles	Watch for changing conditions and moderate outdoor activity based on personal sensitivity	
5 – 10 miles	Moderate outdoor activity	Minimize or avoid outdoor activity
Less than 5 miles	Minimize or avoid outdoor activity	Stay inside or in a location with good air quality

Some examples of local distances: From the junction of Hwy 99 and Hwy 20 to the South Butte in the Sutter Buttes is about 11 miles; from the 10th Street bridge to Township Road is about 5 miles; from the intersection of Hwy 20 and Acacia Avenue to the South Butte is about 5.5 miles; and the distance between the 5th Street and 10th Street bridges is about 0.5 mile.

County officials will continue to monitor air quality in Sutter and Yuba County and provide updates on this advisory as needed. For current information, or to sign up for air quality alerts and forecasts, go to the Feather River Air Quality Management District website http://www.fraqmd.org/ or check the Sutter County and Sutter County Public Health Facebook pages or Yuba County website.

2. Tuolumne County (Sonora)

County of Tuolumne

Agricultural Commissioner • Weights & Measures
Animal Control • Air Pollution Control

Kelle Schroeder
Agricultural Commissioner
Director of Weights & Measures
Director of Animal Control
Air Pollution Control Officer

For Immediate Release: August 19, 2020

Joint Message on Wildfire Smoke Impacts from Tuolumne County Public Health Department and the Air Pollution Control District

Sonora, Calif. - Tuolumne County as with many counties in California are experiencing or may experience moderate to poor air quality due to the many wildfires throughout the state. The Tuolumne County Public Health Department and the Air Pollution Control District would like to remind the public that wildfire smoke can be hazardous to a person's health. While all people may experience varying degrees of symptoms due to exposure, the health risk to an individual depends on age, health status, and length of exposure. For the young and elderly or those with underlying health conditions, it is imperative that measures be taken to minimize your exposure to wildfire smoke. Anyone experiencing serious symptoms should contact their health care provider or the emergency department.

The following are recommendations to reduce your exposure to smoke:

- If you can see or smell smoke, limit all unnecessary outdoor activities;
- Stay indoors, closing all windows and doors and use the air conditioner on the recirculation setting;
- Limit even indoor physical activities;
- Keep in mind that healthy individuals can be negatively impacted by the pollutants from smoke;
- Wearing a mask indoors is not considered adequate protection for smoke related impacts;
- Smoking, using the vacuum, fireplace, or candles are not advised due to the buildup of particulate matter from these activities; and
- Check on your loved ones and neighbors;

For more information, visit https://www.cdc.gov/nceh/features/wildfires/index.html
You can also contact the Tuolumne County Public Health Department at 533-7401, or the Air Pollution Control District at 533-5691, or visit our websites: www.tuolumnecounty.ca.gov

3. Western Part of Nevada County (Grass Valley) / Northern Sierra AQMD

AIR QUALITY HEALTH ADVISORY -- SMOKE
Monday, August 17, 2020 through Thursday, August 20, 2020
Nevada County

The Northern Sierra Air Quality Management District and the Nevada County Public Health Department are issuing a joint Air Quality Health Advisory to notify the public of the possibility of poor air quality conditions through at least August 20, 2020 resulting from numerous wildfires, including the Jones Fire. Air quality is expected to vary greatly throughout the advisory period depending on fire behavior and weather conditions, with smoke settling in low areas at night.

Exposure to elevated PM2.5 (fine particulate matter in smoke) concentrations can result in eye and throat irritation, headaches, nausea, shortness of breath, congestion, coughing, impaired lung function and chest pain, especially among sensitive individuals such as the elderly, children, people with asthma, people with heart or lung conditions, pregnant women and anyone who is exercising or working hard outdoors. People who are affected by, or susceptible to, COVID-19 may be at increased risk from wildfire smoke due to cardiovascular symptoms or a compromised or suppressed immune system.

If you smell or see smoke around you, the following actions are recommended:

- Minimize outdoor activities even if you are healthy;
- Stay indoors with doors and windows closed as much as possible; run the air conditioner on the "recirculate" setting if that is an option;
- People with asthma should follow their asthma management plan;
- People with heart disease, respiratory conditions or chronic health issues should stay indoors;
- Contact your doctor if you have symptoms of cough, shortness of breath, chest pain, or severe fatigue;
- Keep airways moist and stay hydrated by drinking plenty of water;
- Avoid breathing additional smoke, such as from cigarettes or barbecues.

Near real-time air quality conditions for Quincy, Portola, Chester, Truckee and Grass Valley may be found at www.myairdistrict.com (click on your location of interest in the "Local Air Quality" portion). As you view the most recent data, take into consideration that conditions can change rapidly due to wind shifts; it is wise to monitor the smoke throughout the day and make plans accordingly. The smoke may be visible in satellite imagery, available via www.weather.gov/sto (near the bottom of the page).

Additional information about air quality can be found on the following website: www.airnow.gov/

Smoke mapping can be found at: https://fire.airnow.gov/

To sign up for the Air Quality Health Advisory email list, please visit www.myairdistrict.com.

SERVING THE COUNTIES OF NEVADA, PLUMAS AND SIERRA

AIR QUALITY HEALTH ADVISORY -- SMOKE
Monday, August 17, 2020 through Thursday, August 20, 2020
Plumas and Sierra Counties

The Northern Sierra Air Quality Management District and the Public Health Agencies of Plumas and Sierra Counties are issuing a joint Air Quality Health Advisory to notify the public of the possibility of poor air quality conditions through at least August 20, 2020 resulting from numerous wildfires, including the Loyalton Fire in eastern Sierra County. Loyalton, Portola and surrounding communities are especially likely to be affected. Air quality is expected to vary greatly throughout the advisory period depending on fire behavior and weather conditions, with smoke settling in low areas at night.

Exposure to elevated PM2.5 (fine particulate matter in smoke) concentrations can result in eye and throat irritation, headaches, nausea, shortness of breath, congestion, coughing, impaired lung function and chest pain, especially among sensitive individuals such as the elderly, children, people with asthma, people with heart or lung conditions, pregnant women and anyone who is exercising or working hard outdoors. People who are affected by, or susceptible to, COVID-19 may be at increased risk from wildfire smoke due to cardiovascular symptoms or a compromised or suppressed immune system.

If you smell or see smoke around you, the following actions are recommended:

- Minimize outdoor activities even if you are healthy;
- Stay indoors with doors and windows closed as much as possible; run the air conditioner on the "recirculate" setting if that is an option;
- People with asthma should follow their asthma management plan;
- People with heart disease, respiratory conditions or chronic health issues should stay indoors;
- Contact your doctor if you have symptoms of cough, shortness of breath, chest pain, or severe fatigue;
- Keep airways moist and stay hydrated by drinking plenty of water;
- Avoid breathing additional smoke, such as from cigarettes or barbecues.

Near real-time air quality conditions for Quincy, Portola, Chester, Truckee and Grass Valley may be found at www.myairdistrict.com (click on your location of interest in the "Local Air Quality" portion). As you view the most recent data, take into consideration that conditions can change rapidly due to wind shifts; it is wise to monitor the smoke throughout the day and make plans accordingly. The smoke may be visible in satellite imagery, available via www.weather.gov/sto (near the bottom of the page).

Additional information about air quality can be found on the following website:
https://fire.airnow.gov/

Smoke mapping can be found at: https://fire.airnow.gov/

To sign up for the Air Quality Health Advisory email list, please visit www.myairdistrict.com.

AIR QUALITY HEALTH ADVISORY -- SMOKE
Issued: Thursday, August 20, 2020
Nevada, Plumas and Sierra Counties

The Northern Sierra Air Quality Management District and the Public Health Departments of Nevada, Plumas and Sierra Counties are extending a joint Air Quality Health Advisory to notify the public of the possibility of poor air quality conditions throughout the Air District resulting from numerous wildfires. Poor air quality is expected to persist until these wildfires reach a level of containment. Smoke density and location will vary greatly, depending on fire behavior and weather conditions, with smoke settling in low areas at night.

Exposure to elevated PM2.5 (fine particulate matter in smoke) concentrations can result in eye and throat irritation, headaches, nausea, shortness of breath, congestion, coughing, impaired lung function and chest pain, especially among sensitive individuals such as the elderly, children, people with asthma, people with heart or lung conditions, pregnant women and anyone who is exercising or working hard outdoors. People who are affected by, or susceptible to, COVID-19 may be at increased risk from wildfire smoke due to cardiovascular symptoms or a compromised or suppressed immune system.

While cloth face coverings offer protection against COVID-19 virus spread, they do not provide protection against smoke particles. People who must be outdoors for long periods, in areas with heavy smoke, or where ash is disturbed, may want to wear an N95 respirator mask. Those with existing respiratory, lung or heart conditions should limit their exposure by staying indoors. Since wearing a respirator mask can make it harder to breathe, those with lung or heart conditions should check with their doctor before using one

If you smell or see smoke around you, the following actions are recommended:

- Minimize outdoor activities even if you are healthy;
- Stay indoors with doors and windows closed as much as possible; run the air conditioner on the "recirculate" setting if that is an option;
- People with asthma should follow their asthma management plan;
- People with heart disease, respiratory conditions or chronic health issues should stay indoors;
- Contact your doctor if you have symptoms of cough, shortness of breath, chest pain, or severe fatigue;
- Keep airways moist and stay hydrated by drinking plenty of water;
- Avoid breathing additional smoke, such as from cigarettes or barbecues.

Near real-time air quality conditions for Quincy, Portola, Chester, Truckee and Grass Valley may be found at www.myairdistrict.com (click on your location of interest in the "Local Air Quality" portion). As you view the most recent data, take into consideration that conditions can change rapidly due to wind shifts; it is wise to monitor the smoke throughout the day and make plans accordingly. The smoke may be visible in satellite imagery, available via www.weather.gov/sto (near the bottom of the page).

Additional information about air quality can be found at: www.airnow.gov/

Smoke mapping can be found at: https://fire.airnow.gov/

To sign up for the Air Quality Health Advisory email list, please visit www.myairdistrict.com.

AIR QUALITY HEALTH ADVISORY – SMOKE & OZONE
Issued: Monday, September 14, 2020
Nevada, Plumas and Sierra Counties

The Northern Sierra Air Quality Management District and the Public Health Departments of Nevada, Plumas and Sierra Counties are extending a joint Air Quality Health Advisory due to the prolonged and widespread smoke from numerous wildfires. Poor air quality (possibly reaching hazardous levels) is expected to persist as long as these wildfires are active. Smoke density and location will vary greatly, depending on fire behavior and weather conditions, with smoke settling in low areas at night.

Exposure to elevated PM2.5 (fine particulate matter in smoke) concentrations can result in eye and throat irritation, headaches, nausea, shortness of breath, congestion, coughing, impaired lung function and chest pain, especially among sensitive individuals such as the elderly, children, people with asthma, people with heart or lung conditions, pregnant women and anyone who is exercising or working hard outdoors. Smoke also leads to increased ozone formation, which exacerbates these symptoms. People who are affected by, or susceptible to, COVID-19 may be at increased risk from wildfire smoke due to cardiovascular symptoms or a compromised or suppressed immune system.

While cloth face coverings offer protection against COVID-19 virus spread, they do not provide protection against smoke particles. People who must be outdoors for long periods, in areas with heavy smoke, or where ash is disturbed, may want to wear an N95 respirator mask. Those with existing respiratory, lung or heart conditions should limit their exposure by staying indoors. Since wearing a respirator mask can make it harder to breathe, those with lung or heart conditions should check with their doctor before using one.

If you smell or see smoke around you, the following actions are recommended:

- Minimize outdoor activities even if you are healthy;
- Stay indoors with doors and windows closed tightly;
- Run the air conditioner on the "recirculate" setting if that is an option;
- People with asthma should follow their asthma management plan;
- People with heart disease, respiratory conditions or chronic health issues should stay indoors;
- Contact your doctor if you have symptoms of cough, shortness of breath, chest pain, or severe fatigue;
- Keep airways moist and stay hydrated by drinking plenty of water;
- Avoid breathing additional smoke, such as from cigarettes or barbecues.

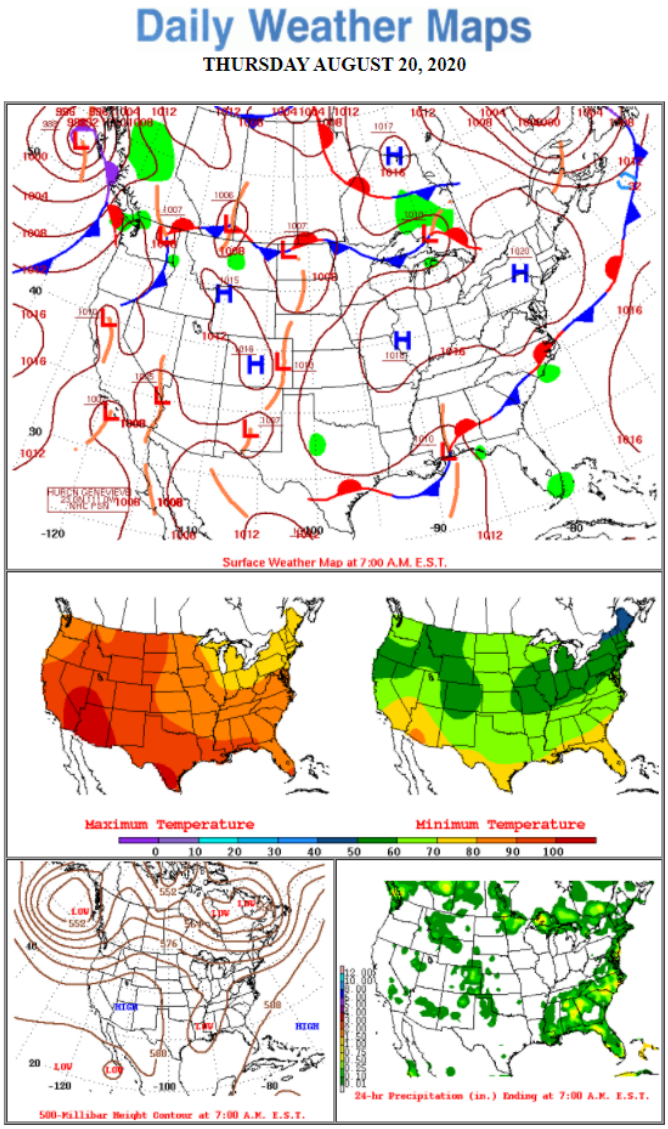
Near real-time air quality conditions for Quincy, Portola, Chester, Truckee and Grass Valley may be found at www.myairdistrict.com (click on your location of interest in the "Local Air Quality" portion). As you view the most recent data, take into consideration that conditions can change rapidly due to wind shifts; it is wise to monitor the smoke throughout the day and make plans accordingly. The smoke may be visible in satellite imagery, available via www.weather.gov/sto (near the bottom of the page).

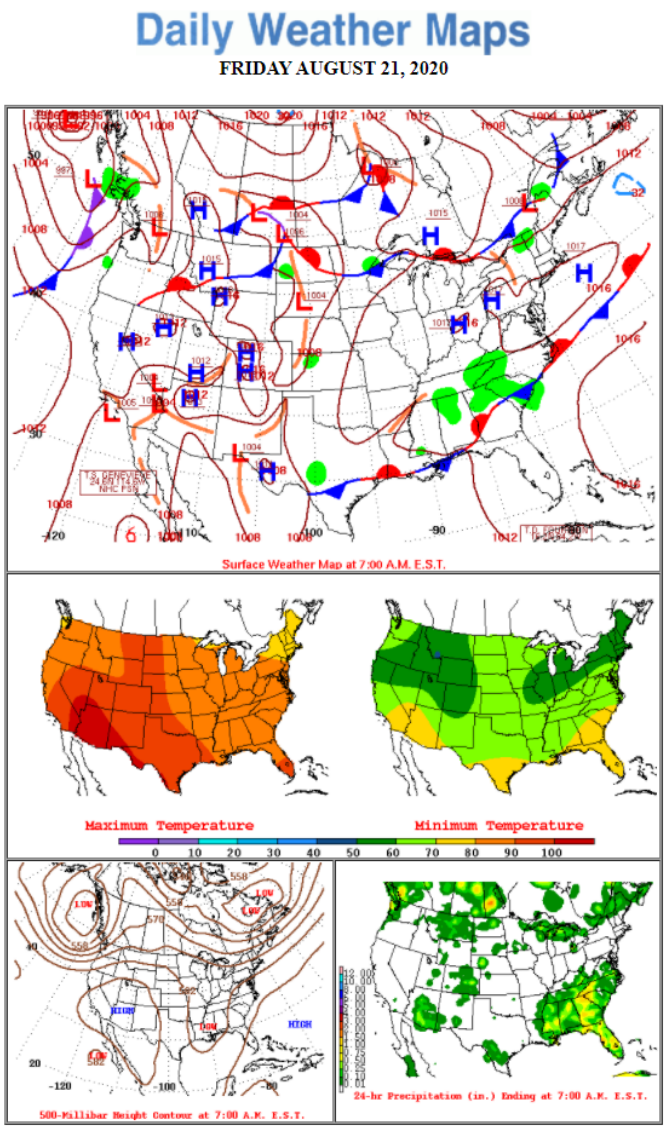
Additional information about air quality can be found at: www.airnow.gov/
Smoke mapping can be found at: https://fire.airnow.gov/
To sign up for the Air Quality Health Advisory email list, please visit www.myairdistrict.com.

C. Meteorological Information

1. NWS Daily Maps

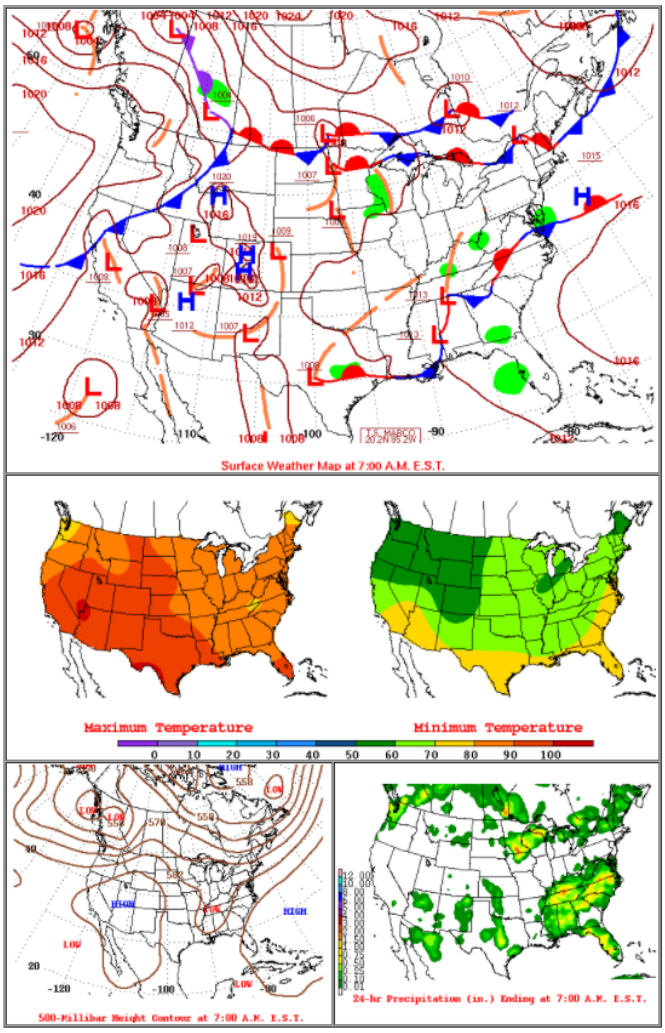
a) August 20-22, 2020



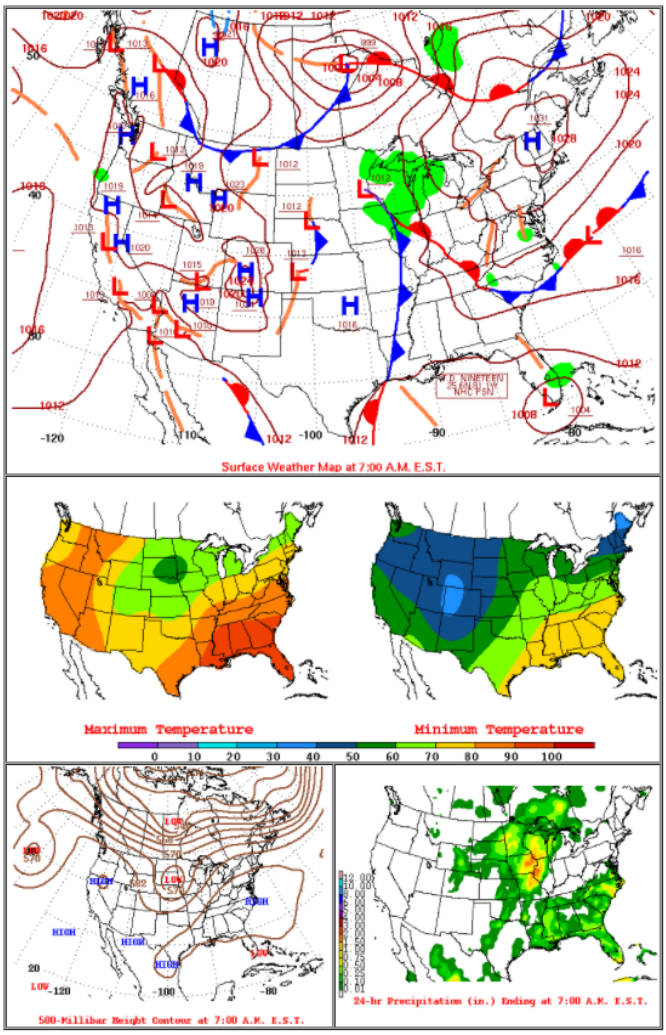


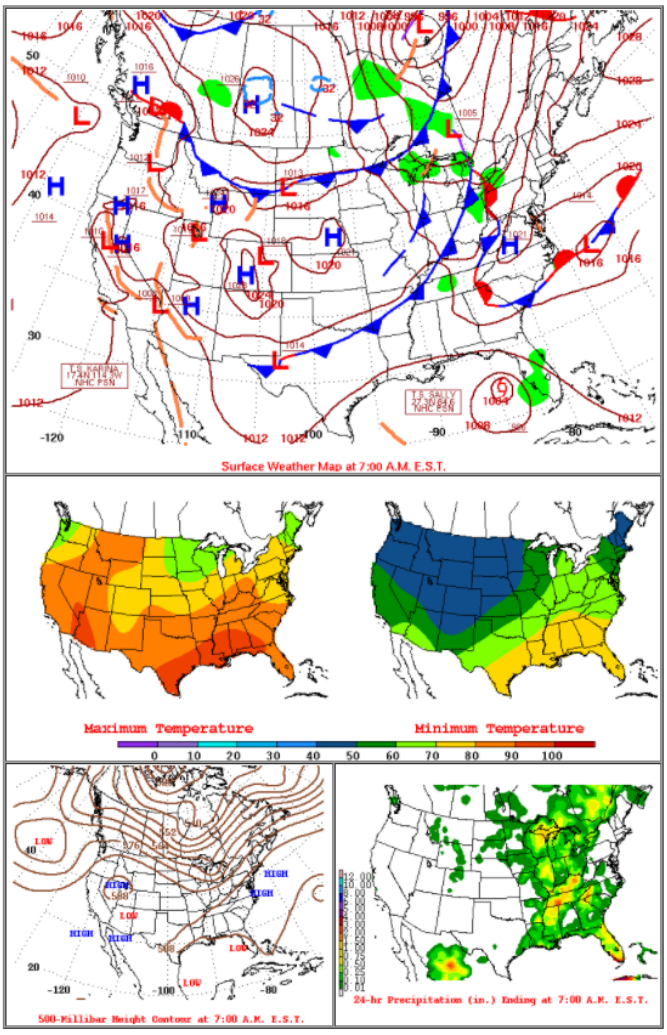
Daily Weather Maps

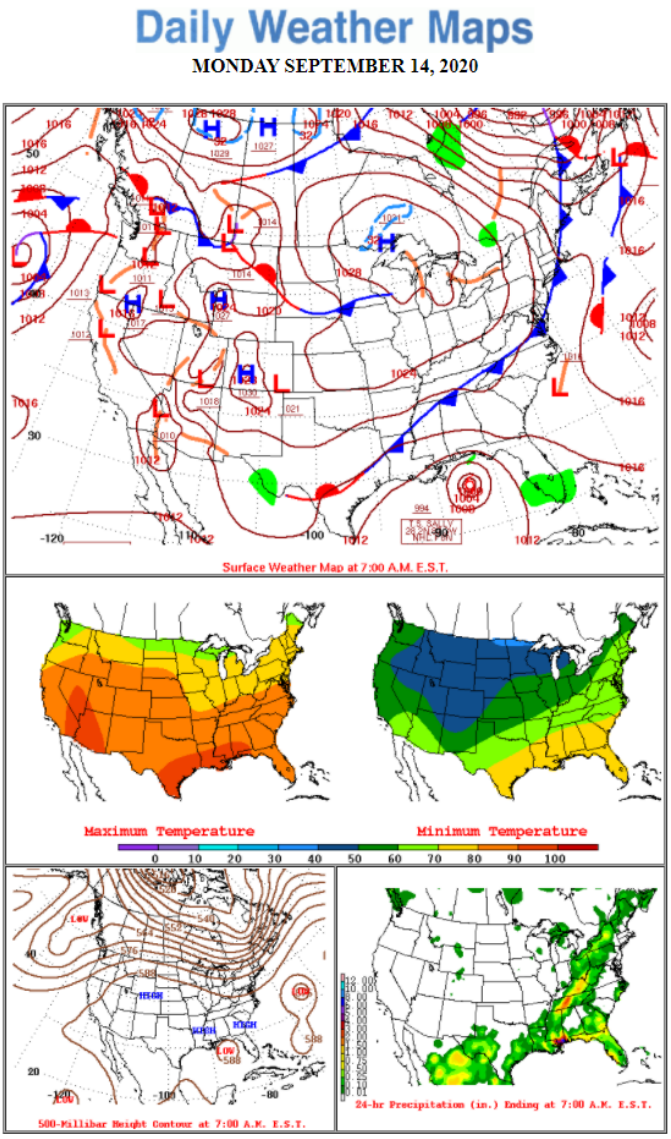
SATURDAY AUGUST 22, 2020



b) September 12-14, 2020







2. NWS Area Forecast Discussions

Excerpts from pertinent NWS Area Forecast Discussions are presented below, with discussions of the thunderstorms which began the wildfires, smoke impacts, and pertinent meteorological discussions highlighted. The complete AFDs can be found on the Iowa State University Mesonet site.[99]

a) August 19-22, 2020

969
FXUS66 KSTO 191030

[99] Iowa State University, Mesonet, *NWS Text Products*, last accessed 10/8/21

AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
330 AM PDT Wed Aug 19 2020

.SYNOPSIS...

Prolonged heat wave continues today with a break in the extreme heat Thursday and Friday. Areas of smoke will allow for cooler temperatures across portions of the region.

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.DISCUSSION...

IR imagery continues to show the heat from many large wildfires currently burning across interior NorCal. Two fires in particular are showing extreme heat signatures early this morning, the Hennesssy/LNU Lightning Complex (along the border of Napa, Yolo and Solano Counties) and the Doe Fire burning over western Glenn County.

Downslope westerly winds with gusts of 15-30 mph, along with temperatures in the upper 80s and 90s with humidity values in the upper single digits to low teens, continue along the western edge of the Sacramento and northern San Joaquin Valleys. Winds may relax a bit in this area this morning, but will likely increase again this afternoon and persist into tonight. Humidity values will remain very low. Red flag warning will be posted for this area into Thursday morning.

Hot and dry weather will continue today, though significant amounts of smoke may keep temperatures well below the forecast in certain areas.

Slight cooling expected late this week as upper trough off the PacNW coast nudges the ridge back to the southeast for a couple of days. Ridge forecast to extend back into NorCal beginning Saturday bringing a return of triple digit heat to the Central Valley.

Deeper moisture/elevated instability expected to be mainly east of the region the next several days.

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.EXTENDED DISCUSSION (Sunday THROUGH Wednesday)...

Upper ridging from the Desert SW high extends over interior NorCal this weekend. Heights then lower some early next week as short wave troughing enters the PacNW. Above normal temperatures continue through the extended forecast period. Guidance suggests highs will be in the upper 90s to around 103 for the Central

Valley with mainly 80s and 90s for the mountains and foothills. Progs indicate Tropical Storm Geneview off the Baja coast over theweekend, lifting NW early next week. Some of the associated moisture could be entrained in the upper level flow and drawn into NorCal leading to increased potential for convective storms. At this time some deep moist convection advertised over the higher elevations of the Sierra Nevada Sunday and Monday afternoon. Moisture could also impact temperature forecast early next week.

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.AVIATION...

VFR conds ovr intr NorCal nxt 24 hrs exc lcl MVFR conds poss in FU vcnty of wild fires. Lcl Wly sfc wnd gsts to 25 kts ovr hyr trrn.

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567
FXUS66 KSTO 192057
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
157 PM PDT Wed Aug 19 2020

.SYNOPSIS...

Prolonged heat wave continues today with a break in the extreme heat Thursday and Friday. Critical fire weather conditions will continue for parts of the region through tonight with areas of smoke.

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.DISCUSSION...

GOES-West visible satellite imagery reveals widespread smoke blanketing much of central and northern California as numerous wildfires impact the region. The complex presenting the greatest threats to life and property in the area is the the LNU Lightning Complex - comprised of several fires - which expanded and fanned into Yolo and Solano Counties last night as a result of the northwest winds. Residents are urged to listen to law enforcement for evacuation notices.

Winds are forecast to increase this afternoon, coinciding with peak heating while relative humidity values are at a minimum. Consequently, this combination will produce critical fire weather concerns for communities around the Delta, western portions of the Sacramento Valley, as well as the northern Sierra Nevada and foothills. Additionally, some locations will see poor overnight relative humidity recoveries. A Red Flag Warning remains in effectfor these locations through 9 AM PDT Thursday.

Wildfire smoke will likely prevent temperatures this afternoon from realizing their full potential. As a result, highs have been trimmed by a few degrees for most locations today. The Excessive Heat Warning that has been in effect for the last 6 afternoons for the Sacramento and northern San Joaquin Valley is scheduled to expire at 9 PM PDT this evening. Upper level ridge that was responsible for the nearly week-long excessive heat will gradually shift southeastward through the end of the week. While temperatures are forecast to cool by several degrees from now through Saturday, we'll still remain at least 5-10 deg F above normal with temperatures in the upper 90s to low 100s in the Valley. If wildfire smoke persists over the area into the weekend, afternoon highs may need to be trimmed back a bit and overnight lows may require boosting. // Rowe

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.EXTENDED DISCUSSION (Sunday THROUGH Wednesday)...

Ridge of high pressure from the Desert SW strengthens over the weekend, resulting in a warming trend. Heights then lower slightly early next week as short wave troughing enters the PacNW. Highs will remain 5 to 10 degrees above normal through the extended period, with some moderate heat risk impacts. Forecast highs will be in the 97-102 range in the Valley, with mainly 80s and 90s for the mountains and foothills. Dry weather is expected through the period. However, guidance shows another tropical system off the Baja coast over the weekend, lifting NW early next week. Remnant moisture could be entrained in the upper level flow and drawn into NorCal, bringing the potential for thunderstorms. At this point, thunderstorms are expected over the higher elevations of the Sierra Nevada Sunday and Monday afternoon. Associated cloud cover and wildfire smoke could also impact temperature forecast early next week.

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.AVIATION...

General VFR conditions next 24 hours, except for local MVFR/IFR

conditions possible due to wildfire smoke. Local west to southwest surface wind gusts 20 to 30 kts vicinity Delta and higher terrain.

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955
FXUS66 KSTO 200533
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
1030 PM PDT Wed Aug 19 2020

.SYNOPSIS...

Prolonged heat wave continues today with a break in the extreme heat Thursday and Friday. Critical fire weather conditions will continue for parts of the region through tonight with areas of smoke.

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.DISCUSSION...

Evening Update: Temps trending some 3 to 16 deg cooler than 24 hrs at 05z as the 4-Corners High weakens over Norcal as an upper-level trof approaches the Pac NW coast. Marine layer slow to return to the Bay area, but it is making progress. By morning there should be a sufficient deepening of the marine layer to cool max temps some 3 to 10 deg in our CWA as onshore flow continues with the trof moving into the Pac NW. As the trof moves

Ewd on Fri, onshore flow will weaken and most areas will see a slight rise in max temps, leading to some triple digits in the interior Vly on Sat. For now, the excessive heat has ended.

Numerous wild fires have blanketed much of the CWA in dense smoke so air quality will be a real problem for the next couple of days, and will have some affect on temps, both mins and maxes.

Looking ahead, remnants from HRCN Geneviev forecast to begin moving into the Srn portion of the CWA on Sat, with the main cloud shield moving into the area Sun nite. Looks eerily similar to Fausto, as it rides the Wrn periphery of the 4-Corners High. Nocturnal elevated convection from the SFO Bay area, coastal range into Shasta Co not out of the question. Instead of a closed low off the CA coast, there is a trof from Wrn B.C. back to the SW to also help steer the moisture into Norcal. JHM

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861
FXUS66 KSTO 201015
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
315 AM PDT Thu Aug 20 2020

.SYNOPSIS...

Hot and dry weather with areas of smoke persist for at least the remainder of the week. Thunderstorm chances return to the Sierra Nevada early next week.

&&

.DISCUSSION...

Numerous large wildfires depicted on IR satellite imagery across NorCal. The strongest heat signatures currently for fires in the CWA are occurring over western Stanislaus and western Glenn Counties. Weather conditions remain warm and dry, though not as extreme as early Wednesday. RH's along the western edge of the Central Valley are in the teens and 20s (up around 10 percent compared to 24 hours ago) and westerly wind gusts are considerably lighter over most of that area. Coastal profiler data indicate the marine layer remains shallow (under 1000 ft in depth), but that's an improvement compared to yesterday and IR difference imagery shows some areas of stratus along the coast.

High pressure retreats a bit today and Friday as a series of short-waves pivot through the PacNW. This will bring minor synoptic cooling to the region and maintain some onshore flow with locally breezy conditions at times, especially in the afternoons and evenings. RH's will remain low, but trend up slightly for most areas.

Smoke from the numerous wildfires will continue to blanket the region, so air quality will be a real problem through at least the end of the week. The smoke will also continue to have significant impact on temperatures, both highs and lows.

Widespread triple digit heat forecast to return to the Central Valley over the weekend as the Southwest ridge rebuilds over NorCal. We'll also be keeping an eye to the south as moisture from Genevieve works its way around the periphery of the Southwest high potentially bringing another round of elevated convection as early as Sunday.

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.AVIATION...

General VFR conditions the next 24 hours, except for local MVFR/IFR conditions possible due to wildfire smoke. Winds remain under 10 knots except for through the Delta and over higher elevations.

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062
FXUS66 KSTO 202149
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
249 PM PDT Thu Aug 20 2020

.SYNOPSIS...

Hot and dry weather with areas of smoke persist for at least the remainder of the week. Thunderstorm chances return to the Sierra Nevada early next week.

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.DISCUSSION...

Numerous large wildfires depicted on IR satellite imagery across NorCal. The strongest heat signatures currently for fires in the CWA are occurring over western Stanislaus and western Glenn Counties. Weather conditions remain warm and dry, though not as extreme as early Wednesday. RH's along the western edge of the Central Valley are in the teens and 20s (up around 10 percent compared to 24 hours ago) and westerly wind gusts are considerably lighter over most of that area. Coastal profiler data indicate the marine layer remains shallow (under 1000 ft in depth), but that's an improvement compared to yesterday and IR difference imagery shows some areas of stratus along the coast.

High pressure retreats a bit today and Friday as a series of short-waves pivot through the PacNW. This will bring minor synoptic cooling to the region and maintain some onshore flow with locally breezy conditions at times, especially in the afternoons and evenings. RH's will remain low, but trend up slightly for most areas.

Smoke from the numerous wildfires will continue to blanket the region, so air quality will be a real problem through at least the end of the week. The smoke will also continue to have significant impact on temperatures, both highs and lows.

Widespread triple digit heat forecast to return to the Central Valley over the weekend as the Southwest ridge rebuilds over NorCal. We'll also be keeping an eye to the south as moisture

from Genevieve works its way around the periphery of the Southwest high potentially bringing another round of elevated convection as early as Sunday.

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.AVIATION...

MVFR visibilities and/or ceilings are forecast over the next 24 hours as a result of wildfire smoke. Local IFR conditions are possible as well. Winds will generally remain at or under 10 kt, except through the Delta and over the higher elevations.

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103
FXUS66 KSTO 211015
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
315 AM PDT Fri Aug 21 2020

.SYNOPSIS...

Hot and dry weather with areas of smoke likely persist into next week. Thunderstorm chances potentially return to NorCal Sunday into Tuesday.

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.DISCUSSION...

Numerous large wildfires continue to be indicated on IR satellite imagery across NorCal. The strongest heat signatures currently for fires in the CWA are occurring over southwestern Stanislaus, and over western Glenn and Tehama Counties where drier conditions persist. Current temperatures are generally lower by around 5 degrees across most of the Central Valley and foothills compared to 24 hours ago, while the mountains are running about the same as early Thursday. Significantly higher humidity has spread into the southern half of the foothills of the Sacramento Valley where most areas are currently seeing readings of 40-60 percent.

IR difference imagery shows stratus has become well established along the coast, extending locally inland (a few patches indicated around Napa). However, coastal profilers show the marine layer remains quite shallow (less than 1000 ft deep).

Little change in the overall pattern expected today as high pressure remains centered over northern Arizona, and short-waves continue to pass to our north through the PacNW. This will maintain relatively weak onshore flow into the Central Valley with locally breezy conditions at times, especially this afternoon and evening. RH's are expected to continue to trend up a bit today for most areas.

Smoke from the numerous wildfires will continue to blanket the region, so air quality will be a significant problem today, and likely through the weekend. The smoke will also continue to have significant impact on temperatures, both highs and lows.

Slight warming possible over the weekend into early next week as the Southwest ridge extends westward, and we possibly see some thinning of overall smoke conditions.

Moisture from the remnants of Genevieve is working its way northward along and west of the Baja peninsula. We'll likely begin to see some high clouds, above the smoke, on Saturday. Appears there is increasing potential for another elevated convective event early next week. At this point, it's looking like Sunday night into Monday morning will be the best chance for dry thunderstorms, though poorly resolved remnant disturbances originating from large thunderstorm complexes over Arizona and northern Mexico may bring more isolated lightning potential as early as Sunday. We'll continue to monitor.

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.AVIATION...

MVFR visibilities and/or ceilings are forecast over the next 24 hours as a result of wildfire smoke. Local IFR conditions are possible as well. Winds will generally remain under 10 kt, except through the Delta and over the higher elevations.

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266
FXUS66 KSTO 212105 AAA
AFDSTO
Area Forecast Discussion...UPDATED
National Weather Service Sacramento CA
205 PM PDT Fri Aug 21 2020

.SYNOPSIS...

Hot weather and hazy conditions due to smoke likely persist into early next week. Chances for isolated thunderstorms with little to no rain return Sunday into Tuesday.

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.DISCUSSION...

Visible satellite imagery continues to show a blanket of smoke across interior Northern California as numerous wildfires burn across the state. Hot and dry weather will be seen this afternoon and again tomorrow as high pressure over the Four Corners region influences the area.

Lowered high temperatures slightly for this afternoon due to the continued smoky skies impacting diurnal heating. It does look like temperatures tomorrow will warm up a bit more

with highs in the Valley expected to range from the mid 90s to low 100s. Similar temperatures (perhaps a few degrees cooler in some areas) will be seen through Monday and moderate heat risk is expected impacting groups sensitive to heat, including outdoor workers. On top of the heat, poor air quality looks to continue as long as smoke lingers in the Valley and mountains.

Models continue to point to another elevated convective event Sunday continuing through early next week as remnants of moisture from Genevieve move northward across California. Soundings indicate the potential for little to no rain with these storms and dry lightning and gusty, erratic winds would be the main impacts. While storms are more likely in mountain areas, isolated storms across the Valley are not out of the question Sunday into Monday. The potential for storms moves north and east late Monday limited to the Sierra and northern half of the CWA. Adjustments timing andlocations likely as models continue to resolve this feature.

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.AVIATION...

MVFR visibilities and/or ceilings are forecast over the next 24 hours as a result of wildfire smoke. Local IFR conditions are possible at times. Winds will generally remain under 10 kt, except through the Delta and over the higher elevations.

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069
FXUS66 KSTO 221030
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
330 AM PDT Sat Aug 22 2020

.SYNOPSIS...

Smoke and haze from wildfires likely to continue to impact air quality and temperatures over interior Northern California through the weekend. Thunderstorms with little to no rain possible Sunday into Tuesday. Near to slightly above normal temperatures next week.

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.DISCUSSION...

Haze and smoke from numerous wild fires across Northern California will continue to impact air quality and temperatures over the weekend. Interior NorCal remains sandwiched between upper troughing in the EPAC and upper high over the Desert SW. 850 mb temperatures trend up about 2 degrees C today across the CWA but warming could be modified by amounts of smoke. Forecast temperatures attm look to be a few degrees warmer than Friday for most areas. High level cloudiness associated with elongated area of low pressure west of Baja, remnants of T.S. Geneviev, will spread up into southern portions of the CWA today.

As upper level moisture deepens tonight, increased 700-500 mb MU CAPE spreads into southern portions of the CWA. Modified TT's rise into the low 30s by Sunday morning across southern third of the CWA. Mid level moisture and instability then spread northward over interior NorCal Sunday into Monday. Thus potential for showers and thunderstorms during this period and with dry lower levels, thunderstorms may produce little to no precipitation. Gusty outflow wind also possible with elevated storms. These factors could result in additional wild fires and thus fire weather watch in place to cover this. Fire fighting effort and resultant smoke amounts will continue to determine impact on temperature forecast Sunday into Monday. Synoptic pattern however suggests a slight trend upward in high temperatures Sunday with little change Monday.

Shower and thunderstorm threat decreases Monday night into Tuesday as upper low off the Central CA coast weakens to trough and lifts to the NE. Slight cooling expected on Tuesday as 850 mb temps lower 1 to 3 degrees.

PCH

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.AVIATION...

MVFR/local IFR visibilities and/or ceilings are forecast over the next 24 hours as a result of wildfire smoke. Slant range visibility adversely affected by smoke. Winds will generally remain under 10 kt, except through the Delta and over the higher elevations.

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868
FXUS66 KSTO 222111
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
211 PM PDT Sat Aug 22 2020

.SYNOPSIS...

Smoke and haze from wildfires likely to continue to impact air quality and temperatures over interior Northern California this weekend. Thunderstorms with little to no rain possible Sunday into Tuesday. Near to slightly above normal temperatures next week.

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.DISCUSSION...

Smoky conditions continue to be apparent across interior NorCal this afternoon as wildfires burn across the state. Temperatures are still expected to be a few degrees warmer this afternoon than those of yesterday, although dense smoke may inhibit some locations from reaching these higher temps. Moderate to unhealthy air quality is seen across much of the state today, with this trend unfortunately also expected tomorrow. Also, some high clouds

have begun to stream over the southern portion of the CWA this afternoon as the remnants of Genevieve make their way northward today and tonight.

The main story of the forecast will be thunderstorm chances beginning tomorrow and continuing through Tuesday morning. Upper moisture makes its way northward into the area tonight along with increasing instability. Models indicate potential for a storm or two mainly over the Sierra in the morning, with the better chances for more widespread convection in the afternoon, continuing overnight into Monday. Storms will have little to no rain as very dry low levels are noted on soundings. Main threats with storms will then be lightning which may create new fire starts and gusty, erratic winds which may impact ongoing fires. A Red Flag Warning has been issued for the entirety of interior NorCal due to this thunderstorm potential. Chances for storms continues Monday afternoon and evening, although instability looks to decrease in the southern Sacramento Valley hinting at better chances for continued storms in the northern portion of the CWA and higher elevations. The threat for storms does look to decrease overnight Monday into Tuesday morning as the upper low lifts to the northeast.

The above normal temperatures seen through the weekend and Monday return to near average values by Tuesday.

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.AVIATION...

MVFR/local IFR visibilities and/or ceilings are forecast over the next 24 hours as a result of wildfire smoke. Slant range visibility adversely affected by smoke. Winds will generally remain under 10 kt, except through the Delta and over the higher elevations.

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b) September 12-14, 2020

094

FXUS66 KSTO 120952
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
252 AM PDT Sat Sep 12 2020

.SYNOPSIS...

Smoke and haze from wildfires will continue to impact air quality and temperatures. Weak weather system will bring onshore flow and periods of gusty winds Sunday through early next week as well as a chance of showers to the northern counties mid-week.

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.DISCUSSION...

To start off the weekend, Northern California will see another day of smoke and reduced air quality due to area wildfires across the state. Have continued to trend a few degrees lower than guidance as light winds today will likely not improve these conditions. Highs this afternoon across the Valley will generally range from the mid 80s to low 90s, with mountain temperatures peaking in the 70s. Similar temperatures are expected Sunday.

Upper ridging today will be replaced with a trough which begins to move over the west coast Sunday into next week. The main impact will be some breezy onshore winds and possibly cooler temperatures. Ensemble guidance has had a hard time with exact highs (with a range of roughly +/- 3 degrees) due to dense smoke, although would trend towards normal to below normal temperatures due to the troughing and any smoke in the area.

Onshore winds will begin to increase in the afternoon and evenings Sunday into early next week as the trough continues its slow progress towards the PacNW into NorCal. Valley winds may see gusts anywhere from 20-25 mph, locally stronger in the Delta and its vicinity. In the high Sierra, gusts up to 30-35 mph are possible with locally higher values in wind prone areas. These winds may bring some local fire weather concerns as fuels continue to be dry, although the onshore winds should help increase humidity a bit.

Models hint at the potential for light precipitation over the Coastal mountains as early as Tuesday, although the better chances look to hold off until later in the week.

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.AVIATION...

Widespread MVFR conditions continue next 24 hours due to wildfire smoke. Areas of IFR conditions with local LIFR possible at times. Surface wind gusts under 10 kts.

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246
FXUS66 KSTO 122141
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
241 PM PDT Sat Sep 12 2020

.SYNOPSIS...

Smoke and haze from wildfires will continue to impact air quality and temperatures. Weak weather system will bring onshore flow and periods of gusty winds Sunday through early next week as well as a chance of showers to the northern counties mid-week. A Fire Weather Watch is in effect Monday for the southern Cascades and foothills due to gusty winds and low RH.

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.DISCUSSION...

Visible satellite this afternoon shows upper level wildfire smoke is not as prevalent over northern California, though smoke is still relatively thick near the surface. Air quality remains Unhealthy to Hazardous for most of the area according to AirNow. This smoke is still impacting temperatures somewhat with high temperatures at most locations a few degrees below forecast guidance. Highs this afternoon across the Valley will generally range from the mid 80s to low 90s, with mountain temperatures peaking in the 70s. Similar temperatures are expected Sunday.

An upper level trough approaching the West Coast today is pushing the upper level ridge east. Ensembles continue to indicate that the main axis of this trough will remain offshore through mid to late week, with NorCal remaining on the lee side tomorrow through early next week. The main impact will be breezy onshore winds and possibly cooler temperatures. Ensemble guidance has had a hard time with exact highs (with a range of roughly +/- 3 degrees) due to the wildfire smoke, although would trend towards normal to below normal temperatures due to the troughing and any smoke in the area.

Onshore winds will begin to increase in the afternoon and evenings tomorrow into early next week as the trough continues its slow progress towards the PacNW into NorCal. The strongest winds are expected Monday. The Valley could see southerly gusts anywhere from 20-25 mph, locally stronger in the Delta and its vicinity. In the high Sierra, southwest to westerly gusts up to 30-35 mph are possible with locally higher values in wind prone areas. Although the onshore flow should slowly increase humidity, these winds will bring some local fire weather concerns as fuels continue to be dry. A Fire Weather Watch has been issued for the southern Cascades and adjacent foothills Monday morning through 8pm Monday evening where minimum daytime relative humidity will remain in the teens and active wildfires could be impacted by the gusty winds.

Ensembles have backed off on the chance of precipitation on Tuesday as models slow the progress of the trough. Temperatures will remain near or slightly below normal with continued localized gusty south to west winds. HEC

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.AVIATION...

Widespread MVFR conditions continue next 24 hours due to wildfire smoke. Areas of IFR conditions with local LIFR possible at times. Surface wind gusts under 10 kts.

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813
FXUS66 KSTO 130926
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
226 AM PDT Sun Sep 13 2020

.SYNOPSIS...

Smoke and haze from wildfires will continue to impact air quality and temperatures. Weak weather system will bring onshore flow and periods of gusty winds beginning today through early next week as well as a slight chance of showers in the northern counties by mid-week. A Fire Weather Watch is in effect Monday for the southern Cascades and foothills due to gusty winds and low RH.&&

.DISCUSSION...

Main concerns with the near term forecast continue to be smoke, breezy winds, dry humidity values, and possible precipitation in the far northern counties by mid-week.

Smoky skies cleared a bit in the Valley yesterday afternoon, with hires guidance suggesting this trend may continue today. Onshore flow develops this morning as upper level troughing begins to replace ridging over NorCal today. HRRRx guidance suggests only light smoke in the southern Sacramento Valley this morning, with conditions slightly improving in the northern Valley this evening. Expect haze and at least light smoke to continue across the area as wildfires continue across the state. Airnow forecasts for today still indicate areas of moderate to unhealthy air quality. Still expecting similar afternoon highs to those of yesterday, with the Valley in the upper 80s and low 90s, and mountain temperatures generally in the 70s.

Breezy winds are expected to develop this afternoon and evening continuing into early next week as this trough continues to amplify and move east. South to southwest winds in the Valley may gust up to 20-25 mph each afternoon with the strongest winds in the northern Sac Valley and the Delta. In the high Sierra, expect some west to southwest gusts up to 35 mph, with the stronger winds seen Monday afternoon. Although the onshore flow should slowly increase humidity, these winds will bring some local fire weather concerns as fuels continue to be dry. A Fire Weather Watch continues for the southern Cascades and adjacent foothills Monday morning through 8pm Monday evening where minimum daytime relative humidity will remain in the teens and active wildfires could be impacted by the gusty winds.

Stuck with NBM PoPs for mid-week chances for precipitation with only small chances in the Coastal mountains by mid-week. Relatively "better" chances seen later in the week as the trough finally moves onshore. Temperatures through mid-week remain near or slightly below normal with continued localized gusty south to west winds in the afternoons and evenings.

.AVIATION...

Widespread MVFR conditions continue next 24 hours due to wildfire smoke. Areas of IFR conditions with local LIFR possible at times. Surface wind gusts under 10 kts except local southwest gusts 10-20 kts vicinity Carquinez Strait and west Delta.

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199
FXUS66 KSTO 132135
AFDSTO
Area Forecast Discussion

National Weather Service Sacramento CA
235 PM PDT Sun Sep 13 2020

.SYNOPSIS...

Smoke and haze from wildfires will continue to impact air quality and temperatures. A weak weather system will bring onshore flow and periods of gusty winds beginning today through next week as well as a slight chance of showers in the northern counties late-week. A Red Flag Warning is in effect Monday for the southern Cascades and foothills due to gusty winds and low RH.

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.DISCUSSION...

Visible satellite is showing a stream of thick smoke moving through NorCal today originating from the SQF Complex wildfire in southern California. This smoke has kept much of the valley socked into smoke this morning. The valley is now beginning to clear as this stream is moving east into the foothills and Sierra. Expecting temperatures to behave similar to yesterday. Once the thicker smoke cleared in the afternoon, enough sun was able to penetrate through the smoke and raise surface temperatures to near model guidance forecast. So, temperatures are expected to peak in the upper 80s to low 90s across the Valley and foothills and 60s to 80s in the mountains.

Upper level ridging has been pushed over the Great Basin as an upper level trough begins to move onshore this afternoon. Ensemble guidance continues to indicate the main trough axis will slowly move through the eastern Pacific and form a closed low offshore through midweek. Northern California is expected to remain in the lee side of the trough with the main impact being a return of onshore flow and locally gusty winds in the afternoons and evenings this week. Winds are expected to be strongest today and tomorrow, mainly over the northern Sacramento Valley today and over the mountains. South to southwest winds in the Valley may gust up to 20-25 mph each afternoon with the strongest winds in the northern Sac Valley and the Delta. In the high Sierra, expect some west to southwest gusts up to 35 mph, with the stronger winds seen Monday afternoon. However, one caveat with the development of these winds is the wildfire smoke. If it is too thick, upper level winds may not be able to mix down to the surface, limiting the strength of near surface winds.

Although the onshore flow should slowly increase humidity, these winds will bring some local fire weather concerns as fuels continue to be dry and the areas where our wildfires are burning remain dry with poor overnight recoveries last night. Gusty winds are beginning to develop this afternoon, and GOES West satellite Fire Temperature RGB product is showing multiple wildfires flaring up along the edges, even with observed wind gusts only around 5 to 15 mph so far. The Fire Weather Watch has been upgraded for the southern Cascades and adjacent foothills for 11am through 8pm Monday where minimum daytime relative humidity will remain in the teens and active wildfires could be impacted by the gusty winds.

Another aspect with the upper trough is the stronger westerly winds aloft could possibly blow wildfire smoke to the east and begin to clear out parts of NorCal. However, this could also bring offshore smoke over the area initially, and smoke from active wildfires will continue

to impact areas nearby. For now, still expecting haze and areas of smoke to remain over much of the forecast area through midweek.

Ensembles continue to slow the movement of the trough moving onshore, so precipitation chances have diminished over NorCal for Wednesday. Otherwise, temperatures are expected to remain near or slightly below normal this week under the influence of the trough and potential wildfire smoke. -HEC

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.AVIATION...

Widespread MVFR conditions continue for the next 24 hours due to wildfire smoke. Areas of IFR conditions with local LIFR possible at times. Southerly winds up to 15 knots, up to 30 knots vicinity of Carquinez Strait and Delta.

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261
FXUS66 KSTO 141026
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
326 AM PDT Mon Sep 14 2020

.SYNOPSIS...

Smoke and haze from wildfires will continue to impact air quality and temperatures this week. A weak weather system will bring onshore flow and periods of gusty winds through the week as well as a slight chance of showers in the northern counties and mountains late-week. A Red Flag Warning is in effect today for the southern Cascades and foothills due to gusty winds and low RH.

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.DISCUSSION...

A trough over the Pacific resides roughly 600 mi west of NorCal and has begun to bring onshore flow and some high clouds over the area. This feature will remain over the EPac the next few days continuing to amplify before beginning to progress over the PacNW Thursday into Friday. The main impacts of this system will be some cooler temperatures and breezy winds through the week.

For today, some breezy winds are expected to develop this afternoon continuing into the evening hours mainly in the vicinity of the Delta and high Sierra. Southwest to west winds in the Delta may be up to 25 mph today, with southwest wind gusts in the Sierra up to 35-40 mph. While the onshore flow will help slightly with humidity values in the Valley, low RH and extremely dry fuels are still present in the mountains. With this said, a Red Flag Warning remains in effect for this afternoon for the southern Cascades and adjacent foothills for 11am

through 8pm Monday where minimum daytime relative humidity will remain in the teens and active wildfires could be impacted by the gusty winds.

Smoke will continue to impact the area today and through the week as area wildfires continue to burn. Airnow forecasts air quality to remain between moderate to very unhealthy across NorCal today, although the onshore flow may help improve conditions slightly in the Valley later this afternoon.

For the rest of the week, expect periods of breezy winds each afternoon and evening with average to slightly below average temperatures. As the trough makes its progression towards the coast Thursday, another round of stronger winds may develop over the Sierra which may create additional fire weather concerns.

Precipitation may creep into the Coastal/northern mountains Thursday afternoon and evening. Have kept only the mention of showers at this time, although if instability increases as the low moves in an embedded thunderstorm or two is not out of the question.

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.AVIATION...

Widespread MVFR conditions continue for the next 24 hours due to wildfire smoke. Areas of IFR conditions with local LIFR possible at times, mainly this morning, but improving to MVFR-VFR vsbys in the afternoon at the TAF sites. However, smoke will impact vsbys over coastal mtns and W Slope Sierra through the afternoon. Southerly winds up to 15 knots, except up to 22 kts vicinity of Carquinez Strait and Delta decreasing to 15 kts in the afternoon.

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708
FXUS66 KSTO 142136
AFDSTO
Area Forecast Discussion
National Weather Service Sacramento CA
236 PM PDT Mon Sep 14 2020

.SYNOPSIS...

A Red Flag Warning is in effect through 8 pm this evening for the southern Cascades and foothills due to gusty winds and low RH. A Delta breeze this evening will result in some minor clearing of Smoke and haze in the central and southern Sacramento and northern San Joaquin valleys this evening, but it will be short lived. The smoke and haze is expected to return Tuesday which will continue to impact air quality and temperatures. A weak weather system will bring bursts of onshore flow and periods of gusty winds through the Delta and higher terrain this week. On Thursday a cold front is expected to move across Northern CA bringing stronger winds, cooler air and a slight chance of showers and thunderstorms in the northern counties and mountains.

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.DISCUSSION...

A weather system off the Pacific Northwest Coast will influence our weather across NorCal this week. The first push of energy will arrive this afternoon/evening in the form of a return to onshore flow and the delta breeze. We may see some clearing in the Central and southern Sacramento and northern San Joaquin Valley as a result, but it will be short lived. In the higher terrain, the winds have increased, and we still have a pocket of low humidity values in the northern Sierra and Cascade mountains and Foothills. Therefore, a Red Flag warning remains in effect through 8 pm this evening. The weather system will park itself off the Pacific Northwest coast most of the week, finally moving inland toward the end of the week. As it moves ashore, a surface cold front will move through NorCal on Thursday, bringing breezy to locally gusty winds to much of the region. In addition, there will be a slight threat of showers and isolated Thunderstorms along and behind the front. The return of onshore flow will increase humidity across the region, so that will decrease the fire weather threat some.

Because of the return of onshore flow, the smoke will be fluctuating which will make the max temperature forecast in the valley tricky. The airmass supports highs in the valley at to slightly above normal, which is in the upper 80s for this time of year. With the expectation there will be periods of breezy winds each afternoon and evening the highs should reach their forecast High temperatures. Thursday and Friday, with the cold front, expect temperatures to cool to below average in the lower 80s Thursday and the upper 70s Friday throughout the valley.

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.AVIATION...

Widespread MVFR will continue for the TAF sites due to wildfire smoke with IFR possible at times. Visibility may improve to VFR for a time during the evening and overnight for the Sacramento area airports but MVFR conditions likely to return during the morning. Winds remain under 12 knots.

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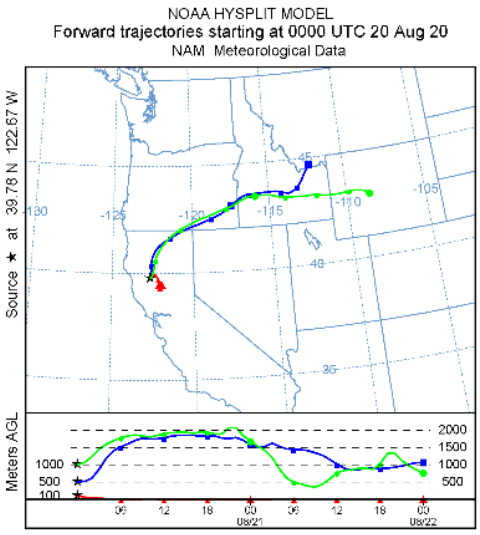
Transport

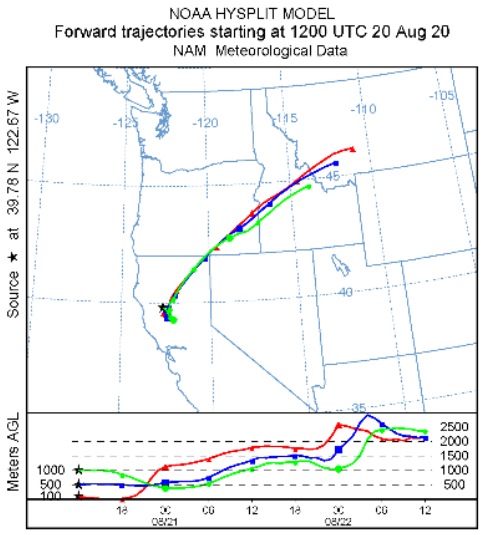
3. HYSPLIT Forward Trajectory (from Fires)

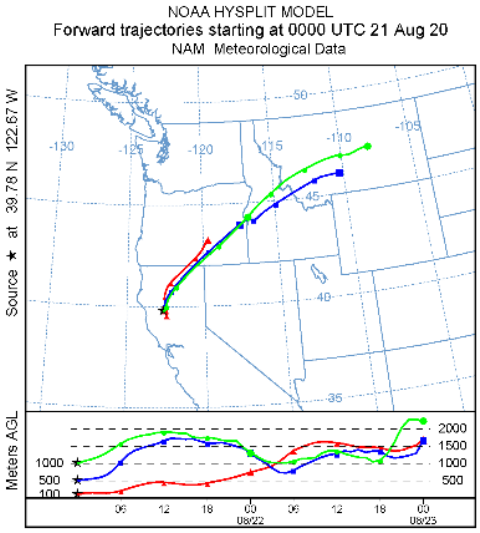
The forward trajectory tool of the HYSPLIT model was used to indicate how emissions from the wildfires were transported toward the monitors. The model was run from each major fire for 36 hours during the days of potential impact of the exceeding monitors using two starting times: 00UTC (16PST previous day) and 12UTC (04PST same day). These model runs offer insight into the path a hypothetical parcel of smoke would take from each fire. This provides for a generalized understanding of smoke transport from a single fire across a region, connecting a specific wildfire with smoke in satellite imagery, and finding potential correlations at a site through analysis of the intersection of forward and backward trajectories.

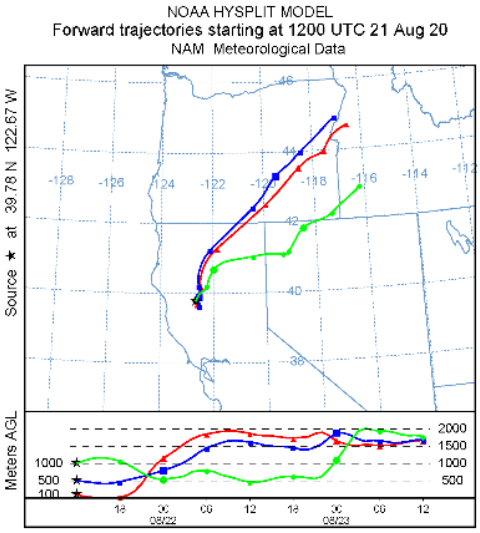
a) August Complex

Fire	Start	Containment	Latitude	Longitude	Total Acres
August Complex	8/16/20	11/11/20	39.776	-122.673	1,032,648






NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 39.78 N 122.67 W
Meters AGL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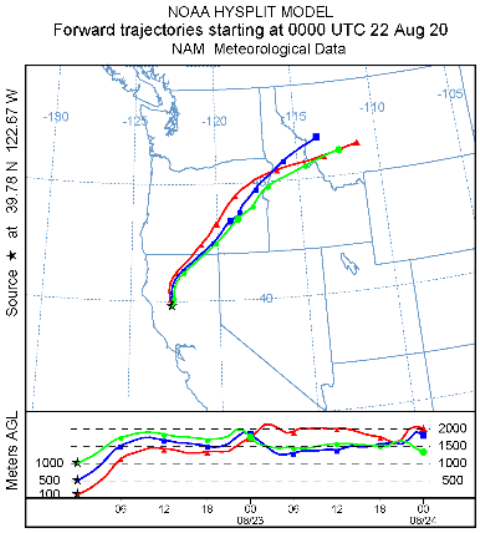
NAM Meteorological Data
Source ★ at 39.78 N 122.67 W
Meters AGL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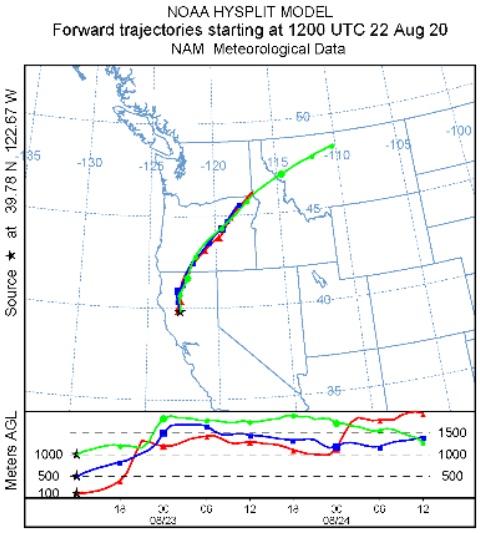
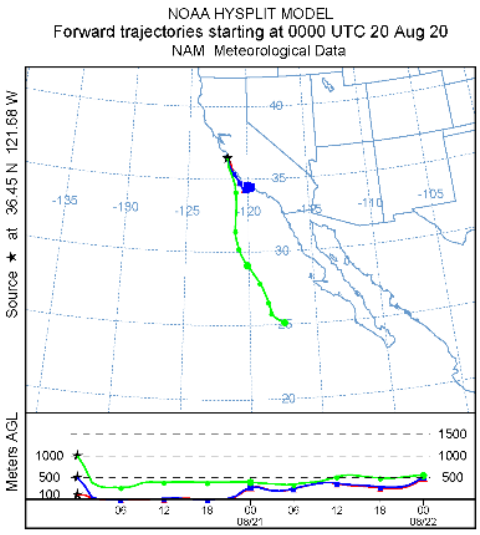
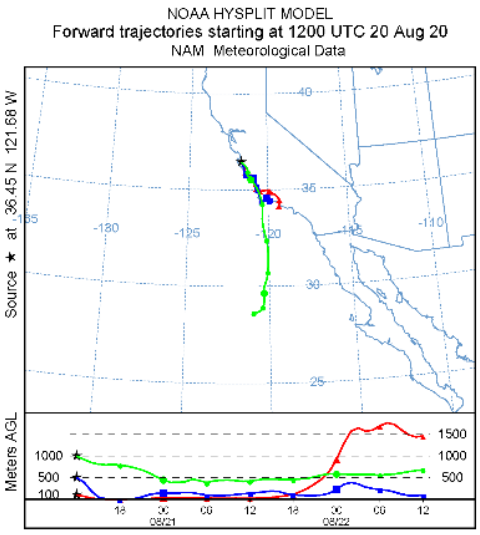
Meters AGL

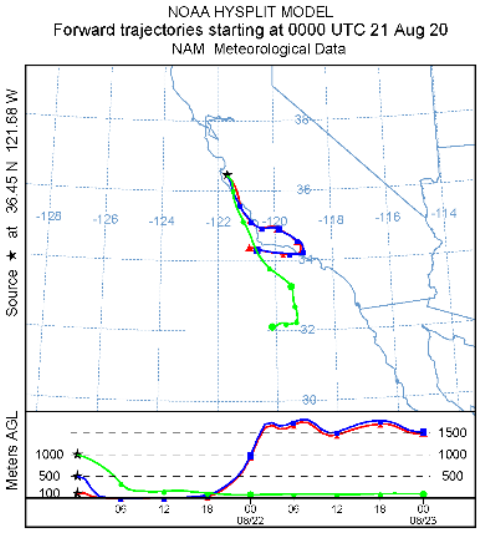

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 39.78 N 122.67 W
Meters AGL

b) Carmel Fire

Fire	Start	Containment	Latitude	Longitude	Total Acres
Carmel	8/18/20	9/4/20	36.4463	-121.6818	6,905






NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 36.45 N 121.68 W
Meters AGL
1500
1000
500
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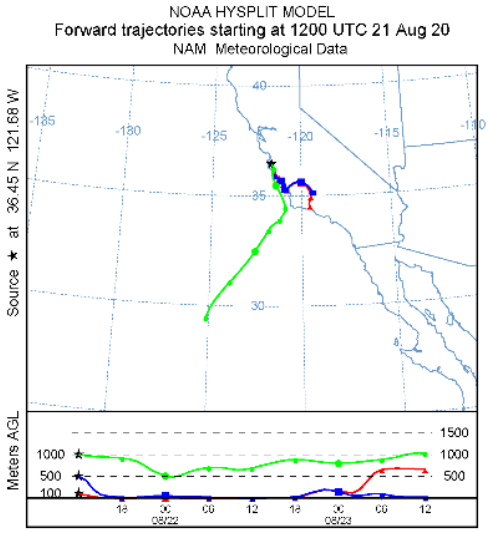
08/22
08/23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Forward trajectories starting at 1200 UTC 21 Aug 20
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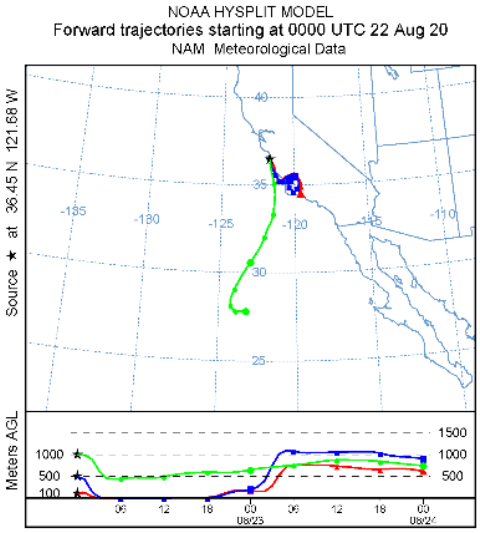
08/22
08/23


NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 36.45 N 121.68 W
Meters AGL
1500
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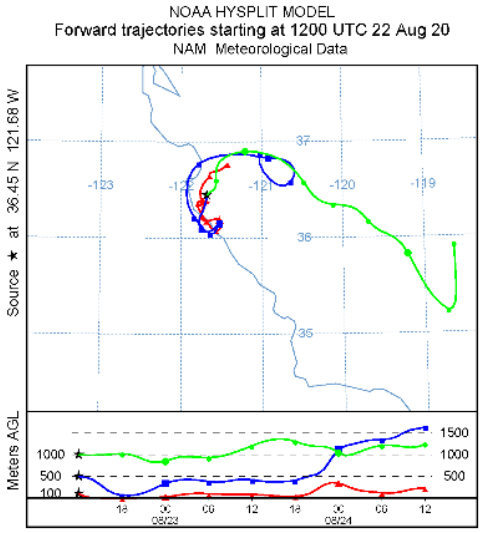
08/23


NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 36.45 N 121.68 W
Meters AGL
1500
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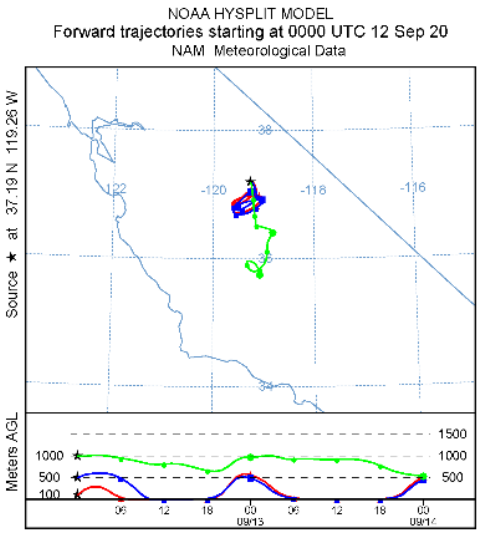
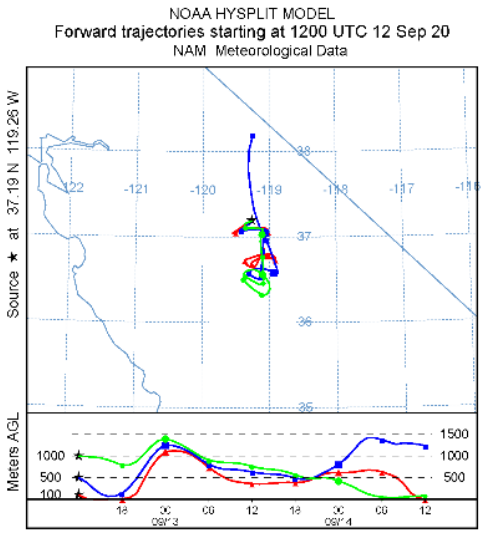
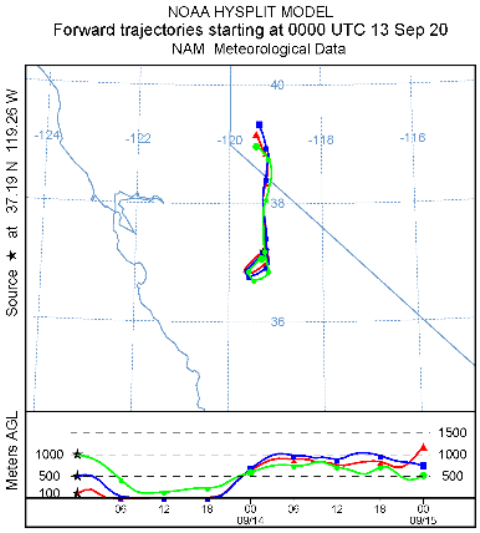
08/23
08/24

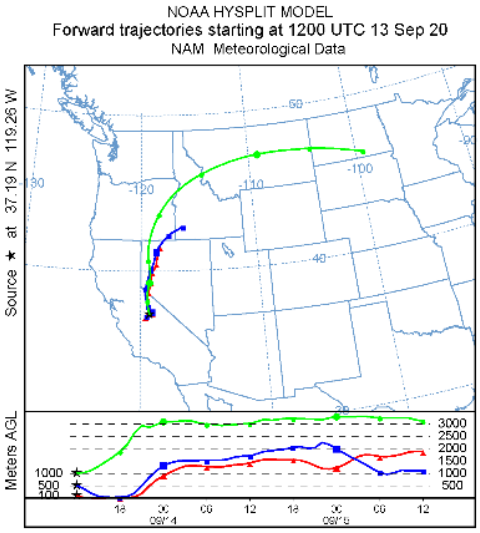
c) Creek Fire

Fire	Start	Containment	Latitude	Longitude	Total Acres
Creek	9/4/20	12/24/20	37.1915	-119.2612	379,895






NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 13 Sep 20
NAM Meteorological Data
Source ★ at 37.19 N 119.26 W
Meters AGL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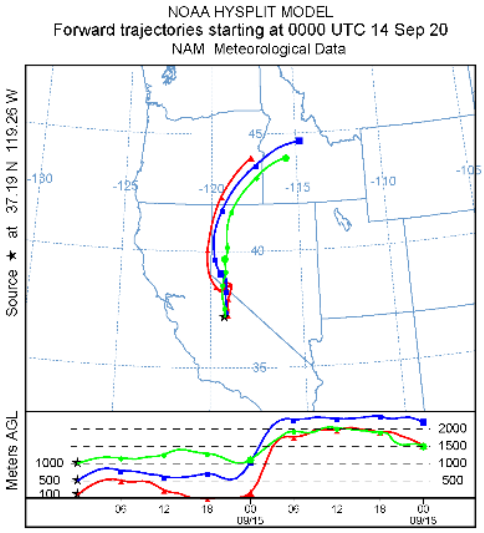
Meters AGL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Forward trajectories starting at 0000 UTC 14 Sep 20
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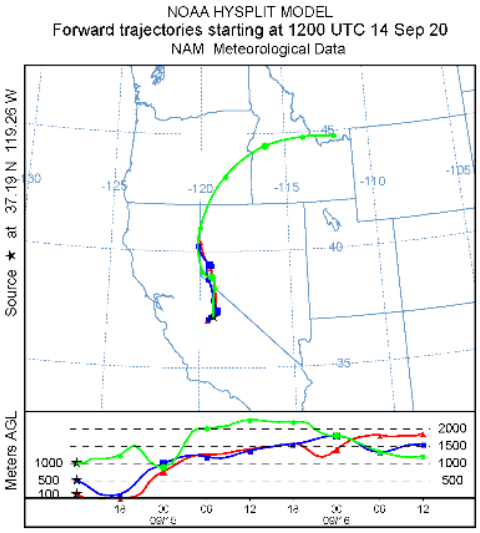
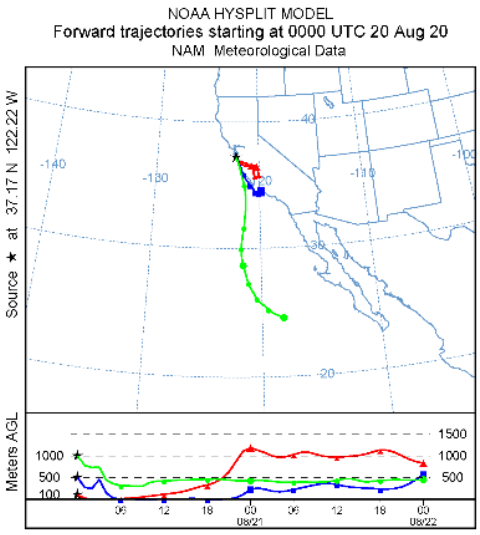
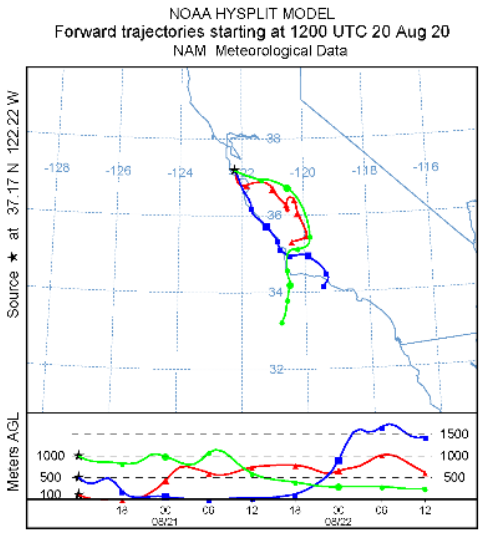
Meters AGL

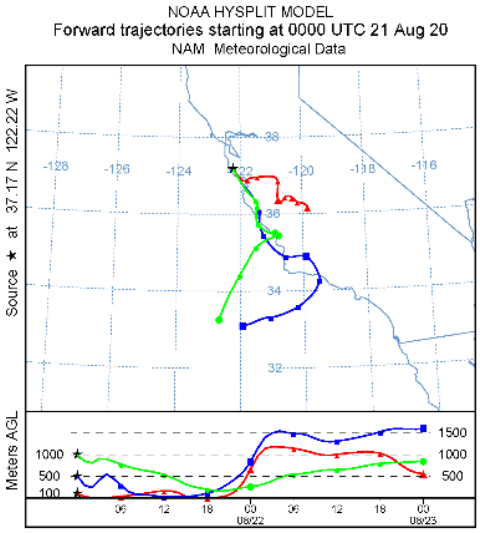

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 14 Sep 20
NAM Meteorological Data
Source ★ at 37.19 N 119.26 W
Meters AGL

d) CZU Lightning Complex

Fire	Start	Containment	Latitude	Longitude	Total Acres
CZU Lightning	8/16/20	9/22/20	37.1716	-122.2228	86,509






NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
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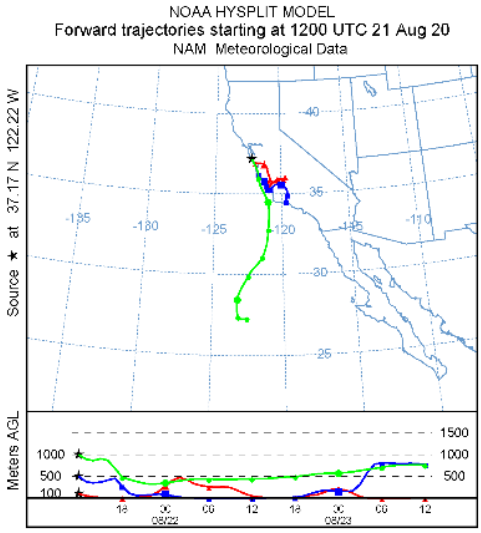
Source ★ at 37.17 N 122.22 W
Meters AGL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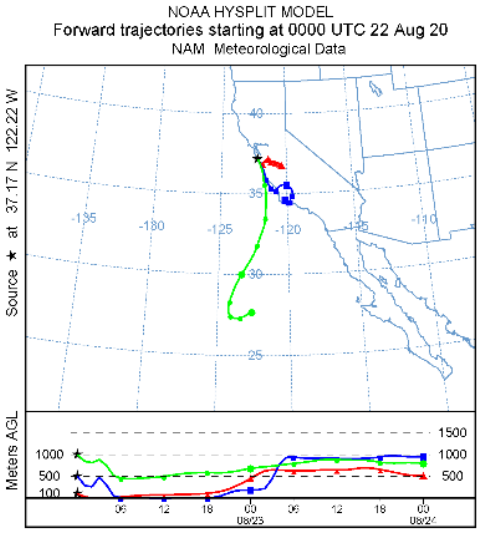
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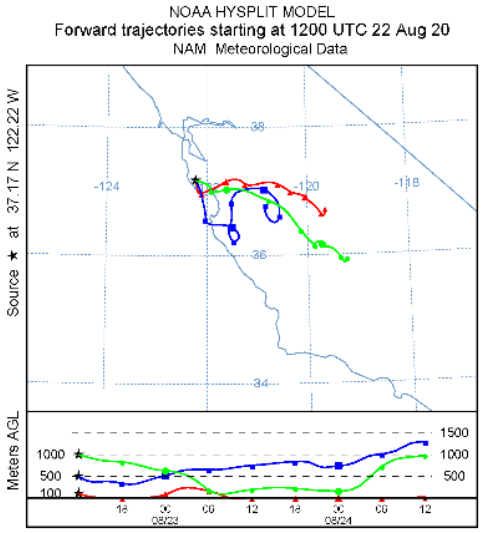
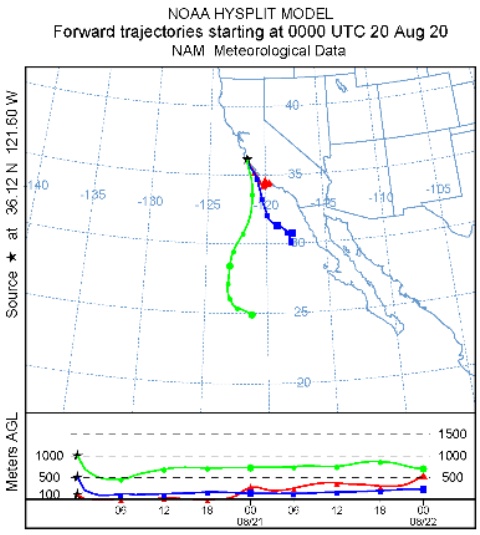
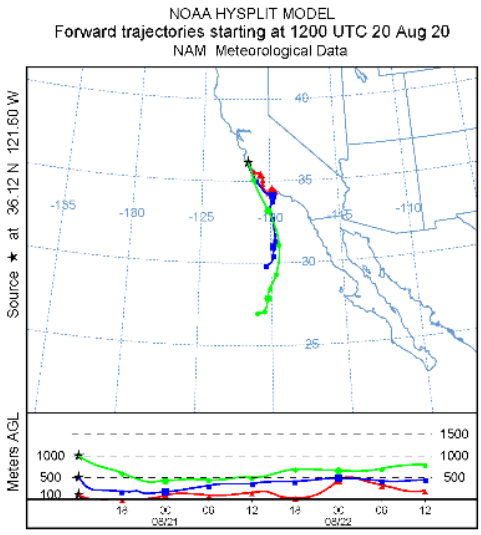
Meters AGL

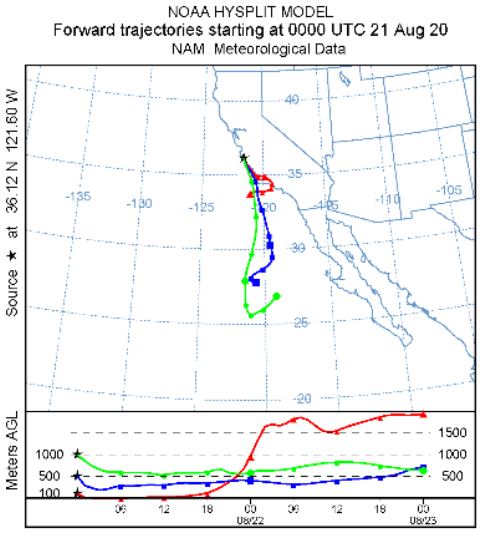

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 37.17 N 122.22 W
Meters AGL

e) Dolan Fire

Fire	Start	Containment	Latitude	Longitude	Total Acres
Dolan	8/19/20	12/31/20	36.123	-121.602	124,924



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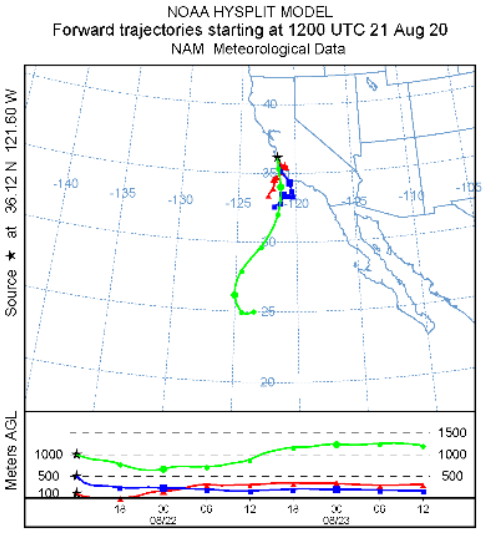
Meters AGL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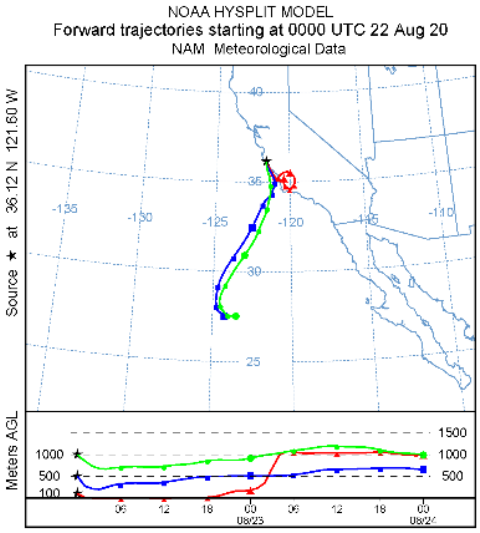
Meters AGL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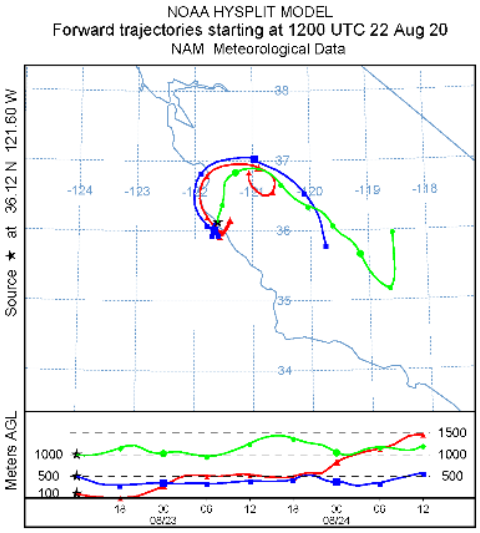
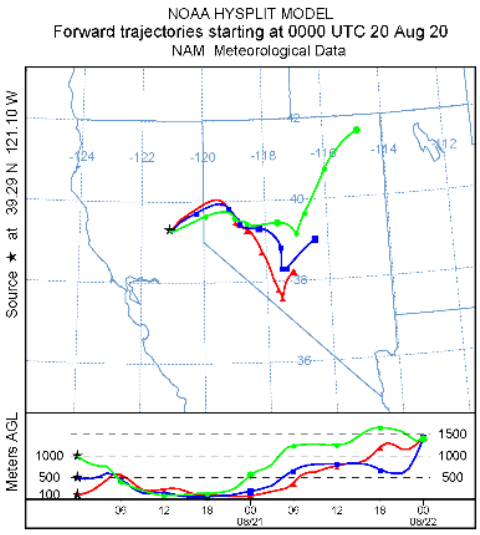
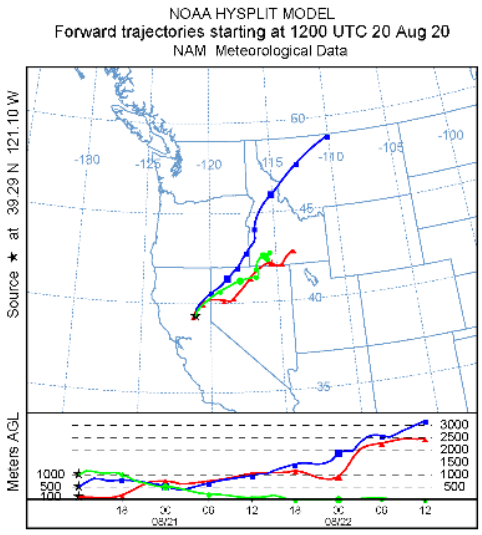
Meters AGL

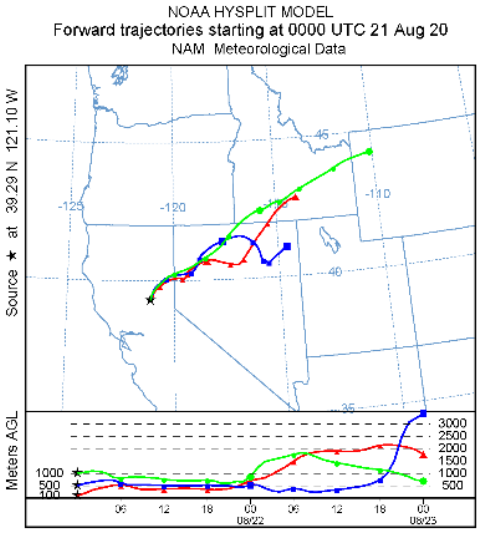

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 36.12 N 121.60 W
Meters AGL

f) Jones Fire

Fire	Start	Containment	Latitude	Longitude	Total Acres
Jones	8/17/20	8/28/20	39.2924	-121.1004	705



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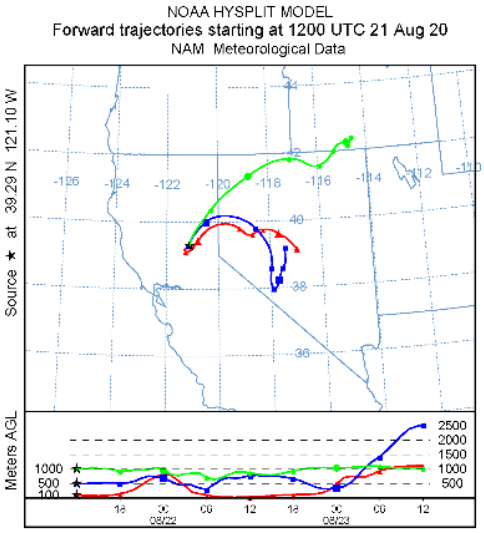
NAM Meteorological Data
Source ★ at 39.29 N 121.10 W
Meters AGL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Forward trajectories starting at 1200 UTC 21 Aug 20
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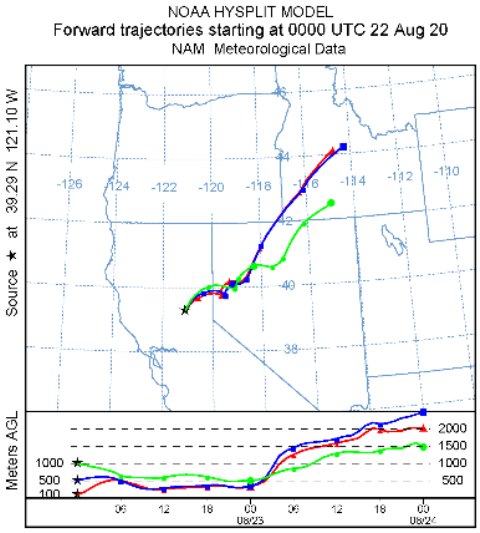
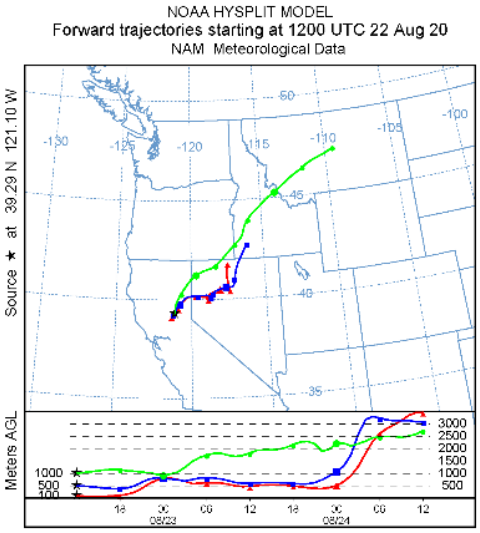
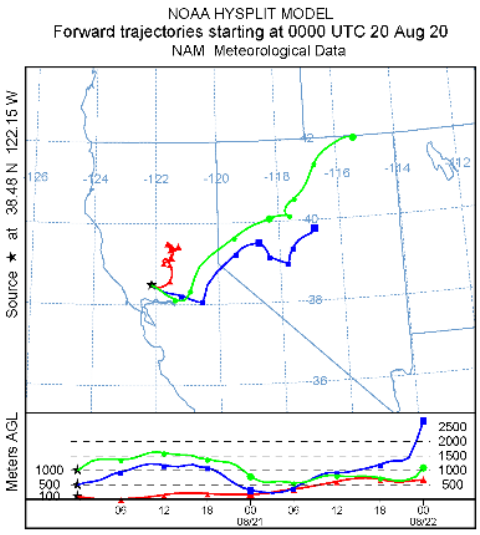
Meters AGL

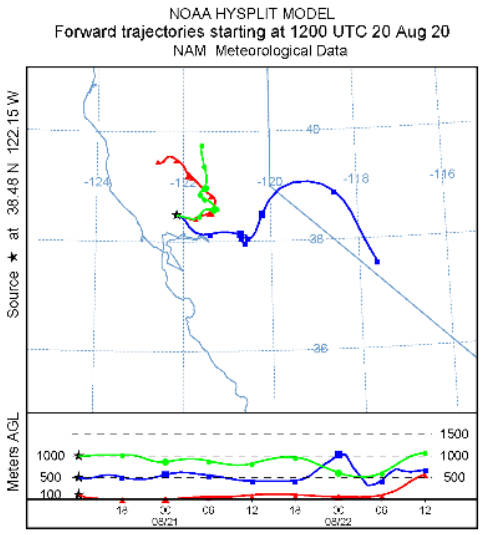

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 39.29 N 121.10 W
Meters AGL

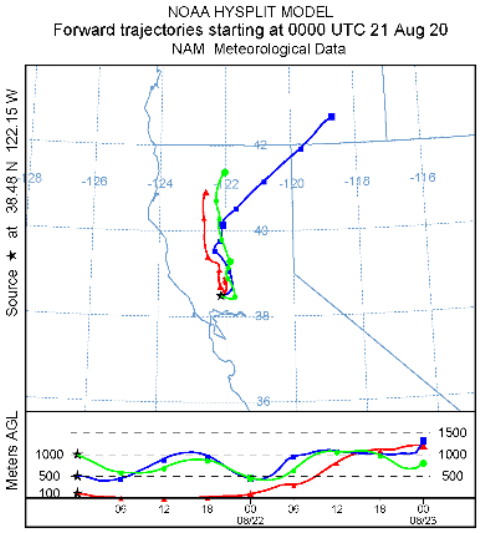

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 39.29 N 121.10 W
Meters AGL

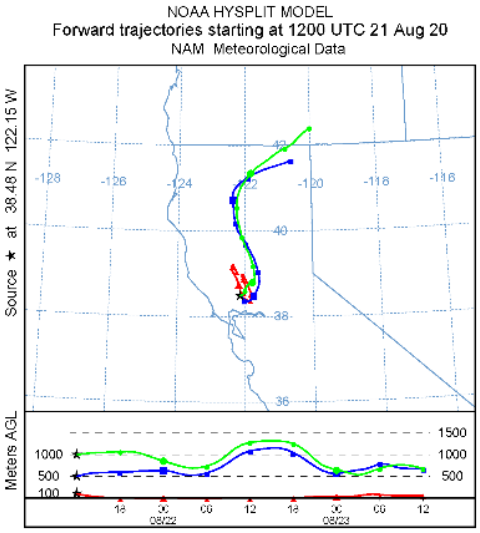
g) LNU Lightning Complex

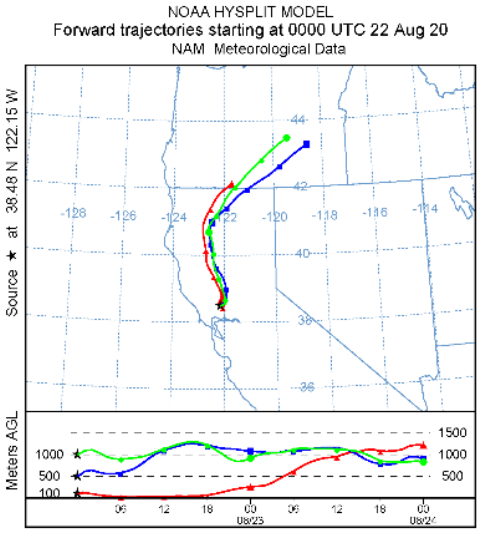
Fire	Start	Containment	Latitude	Longitude	Total Acres
LNU Lightning	8/17/20	10/2/20	38.4819	-122.1486	363,220

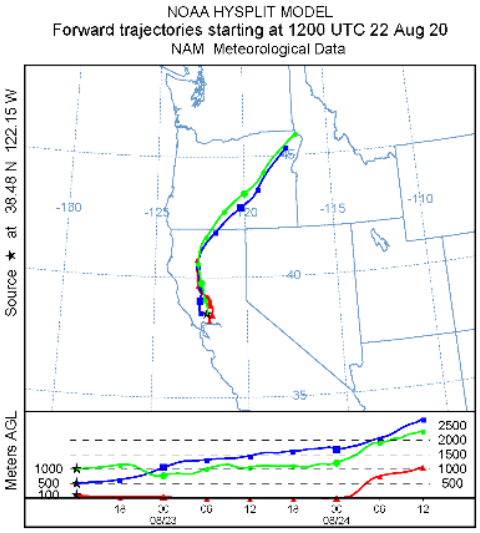





NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 38.48 N 122.15 W
Meters AGL

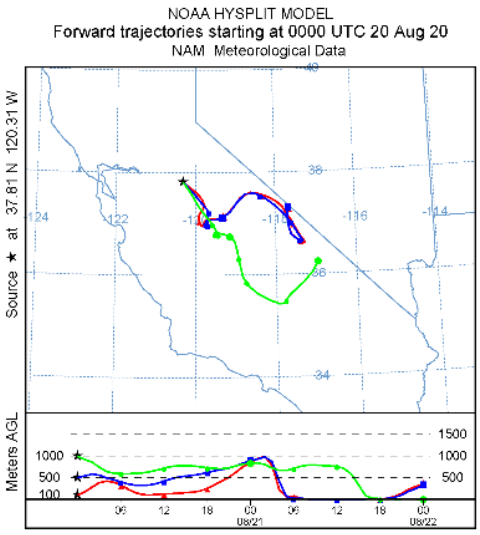

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 38.48 N 122.15 W
Meters AGL

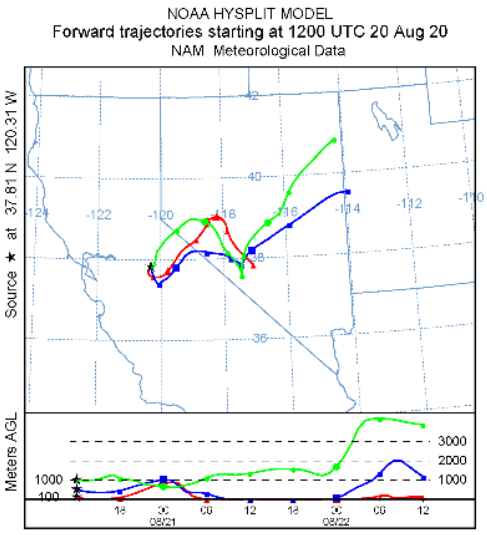

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 38.48 N 122.15 W
Meters AGL

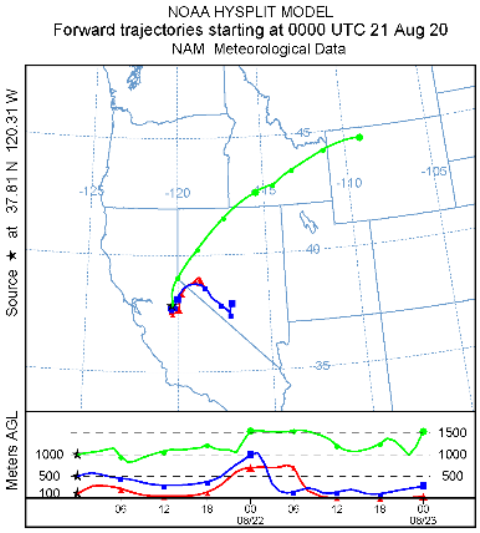

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 38.48 N 122.15 W
Meters AGL

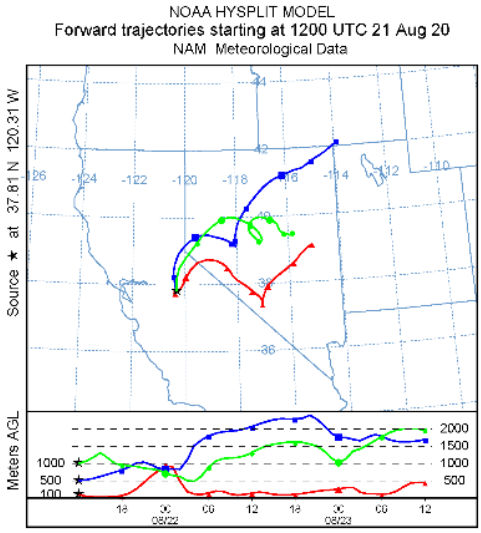
h) Moc Fire

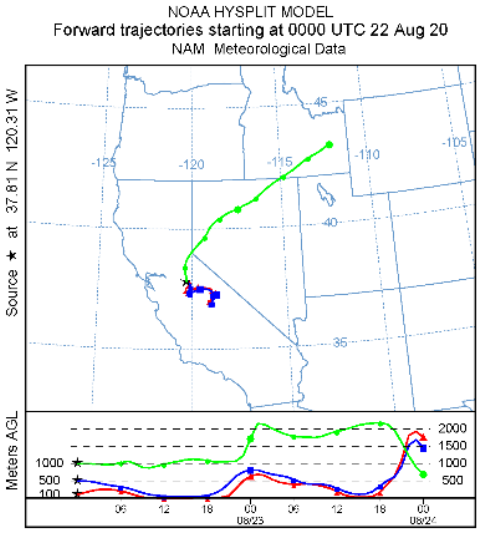
Fire	Start	Containment	Latitude	Longitude	Total Acres
Moc	8/20/20	8/30/20	37.8138	-120.3126	2,857

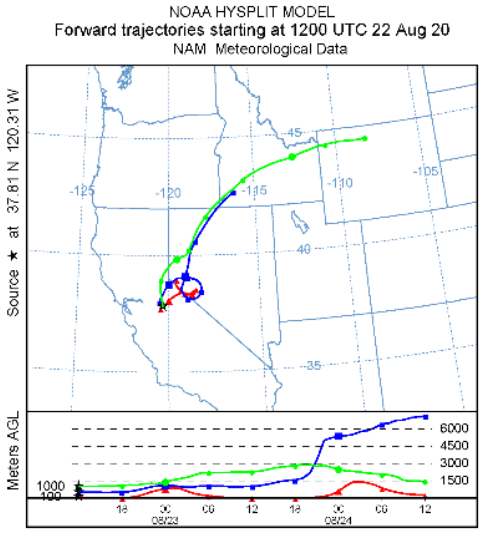





NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 37.81 N 120.31 W
Meters AGL

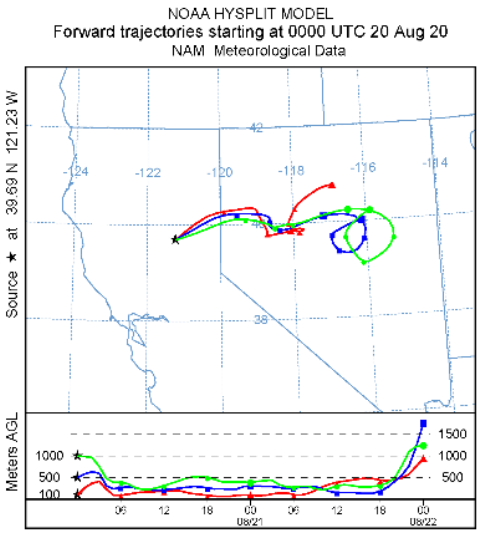

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 37.81 N 120.31 W
Meters AGL

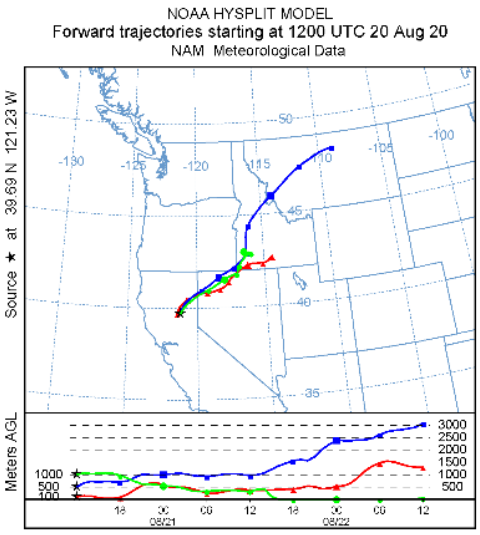

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 37.81 N 120.31 W
Meters AGL

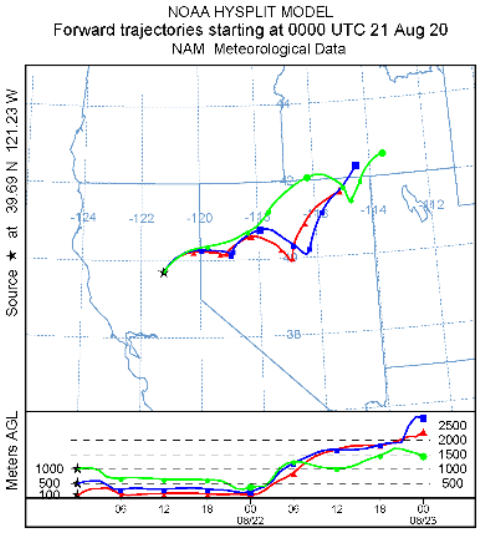

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 37.81 N 120.31 W
Meters AGL

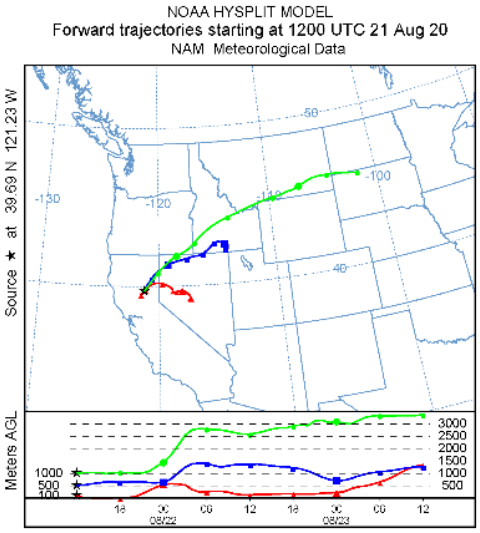
i) North Complex

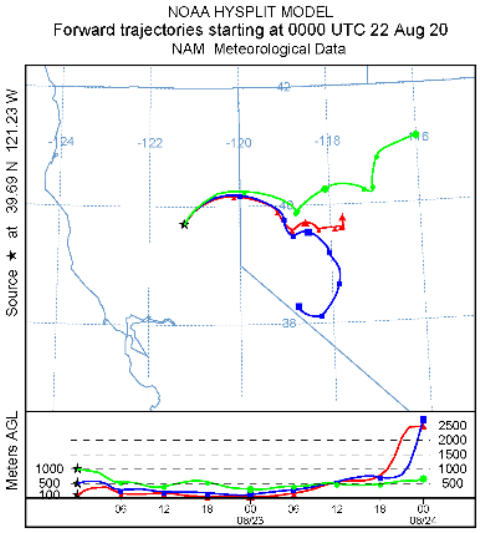
Fire	Start	Containment	Latitude	Longitude	Total Acres
North Complex	8/18/20	12/3/20	39.6907	-121.2272	318,935

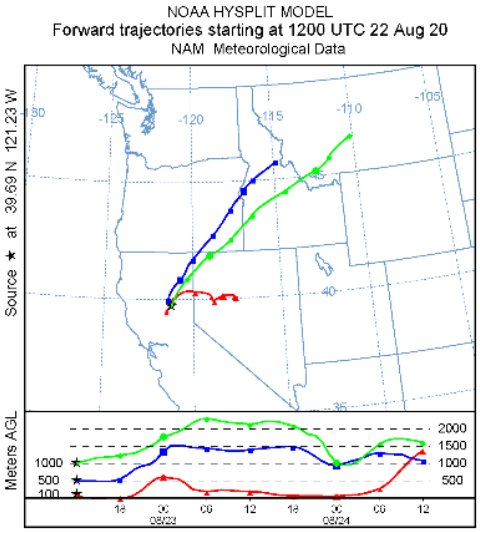


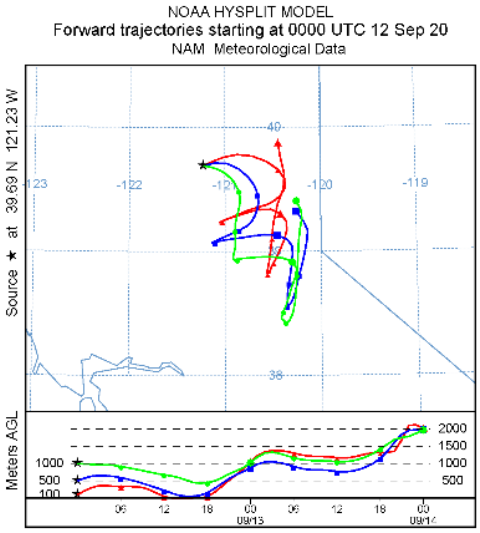


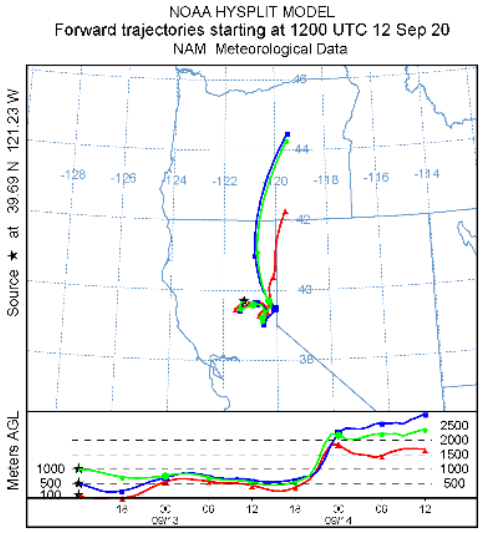

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 39.69 N 121.23 W
Meters AGL
2500
2000
1500
1000
500
100
08/22
08/23

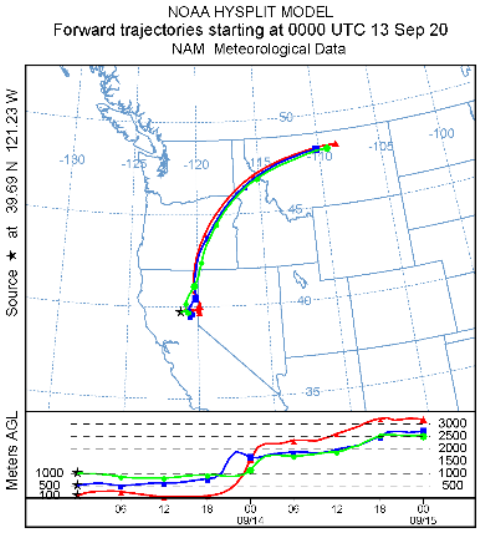

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 39.69 N 121.23 W
Meters AGL
3000
2500
2000
1500
1000
500
100
08/22
08/23

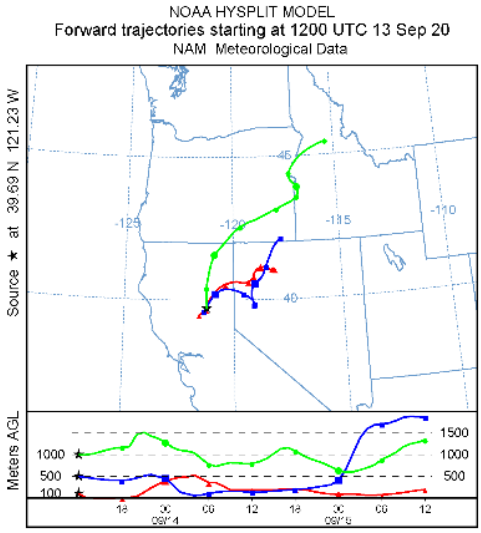

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 39.69 N 121.23 W
Meters AGL
2500
2000
1500
1000
500
100
08/23

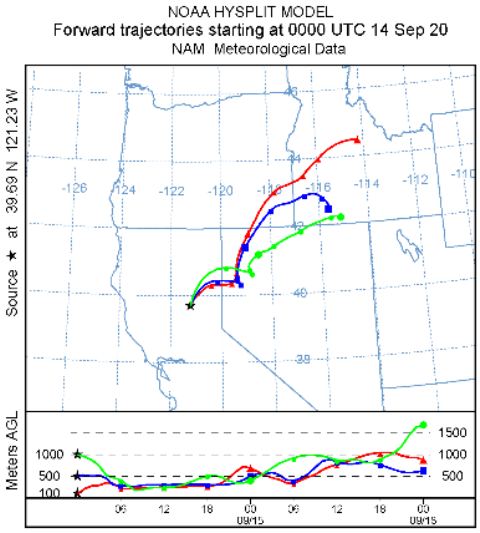

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 39.69 N 121.23 W
Meters AGL
2000
1500
1000
500
100
08/23
08/24

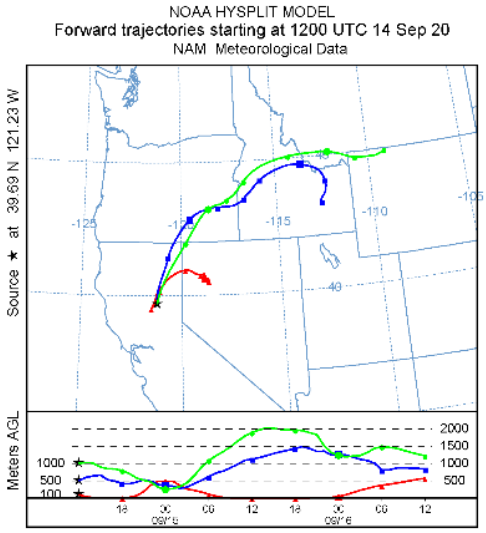

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 12 Sep 20
NAM Meteorological Data
Source ★ at 39.69 N 121.23 W
Meters AGL


NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 12 Sep 20
NAM Meteorological Data
Source ★ at 39.69 N 121.23 W
Meters AGL


NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 13 Sep 20
NAM Meteorological Data
Source ★ at 39.69 N 121.23 W
Meters AGL

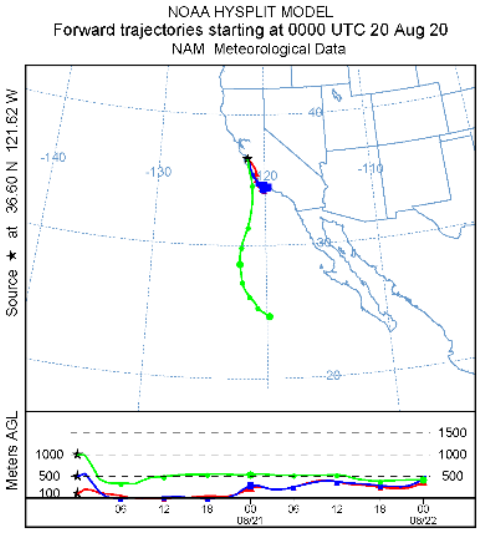

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 13 Sep 20
NAM Meteorological Data
Source ★ at 39.69 N 121.23 W
Meters AGL

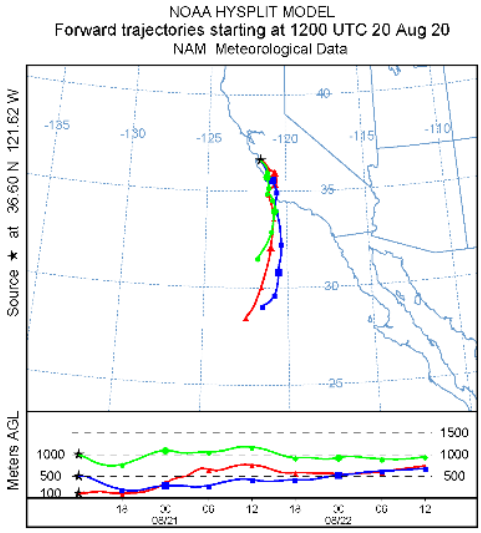


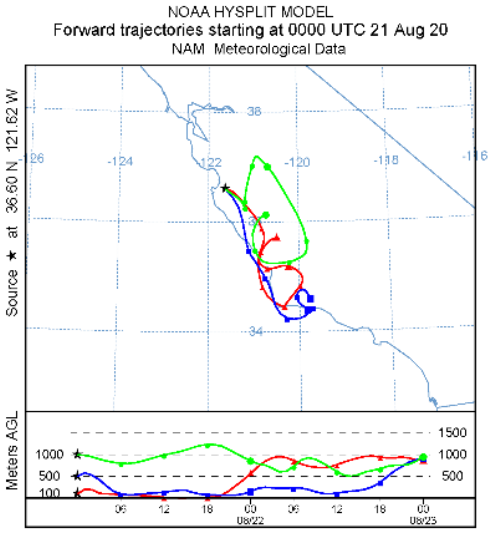


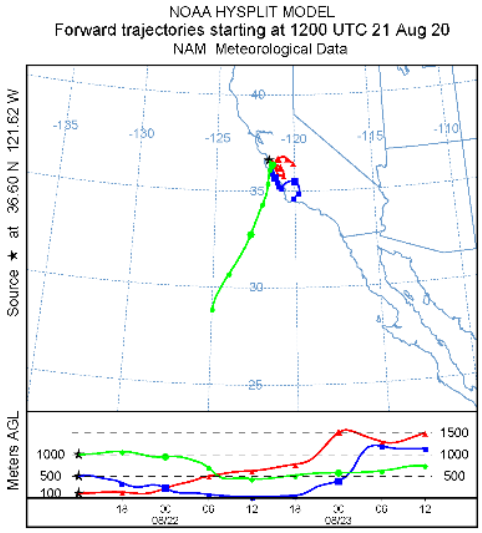
j) River Fire

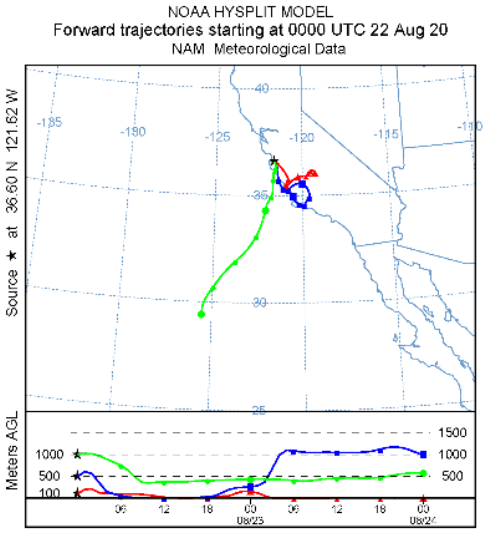
Fire	Start	Containment	Latitude	Longitude	Total Acres
River	8/16/20	9/4/20	36.6024	-121.6216	48,088

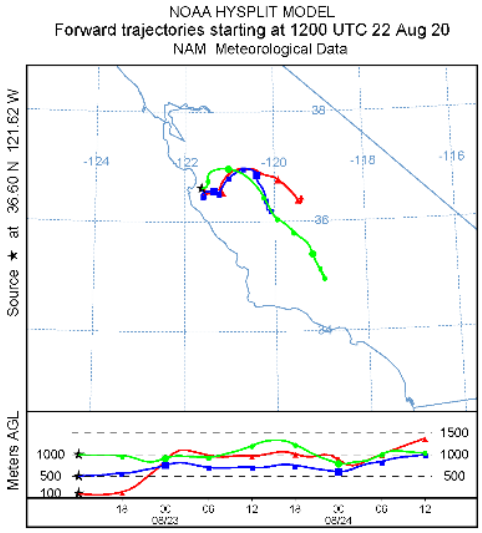

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 20 Aug 20
NAM Meteorological Data
Source ★ at 36.60 N 121.62 W
Meters AGL
1500
1000
500
100
08/21
08/22


NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 20 Aug 20
NAM Meteorological Data
Source ★ at 36.60 N 121.62 W
Meters AGL
1500
1000
500
100
08/21
08/22


NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 36.60 N 121.62 W
Meters AGL

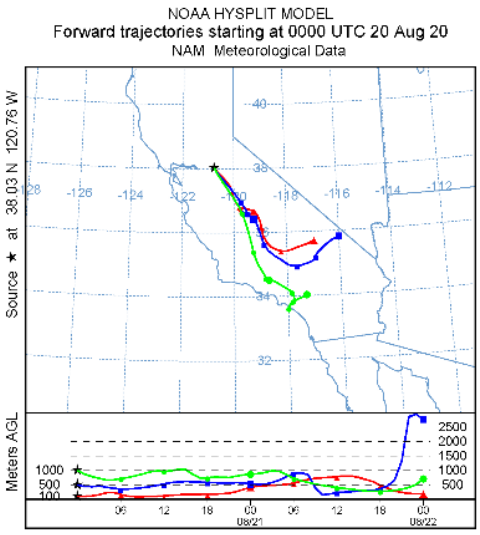

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 36.60 N 121.62 W
Meters AGL

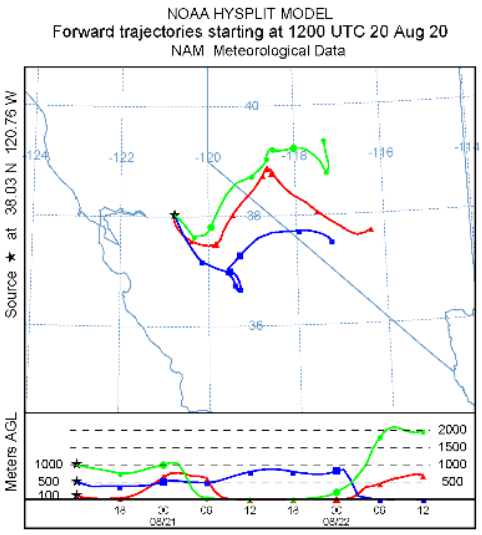

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 36.60 N 121.62 W
Meters AGL

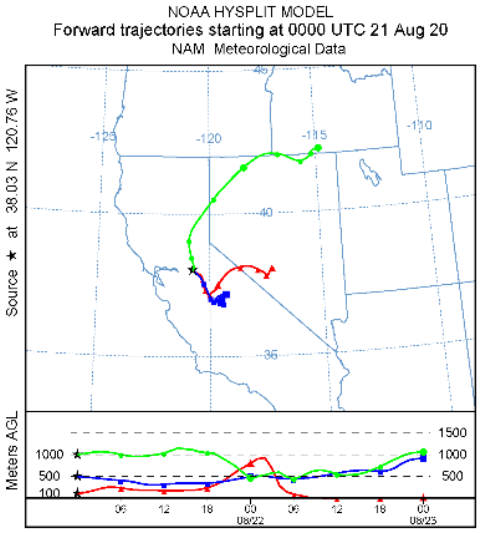

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 36.60 N 121.62 W
Meters AGL

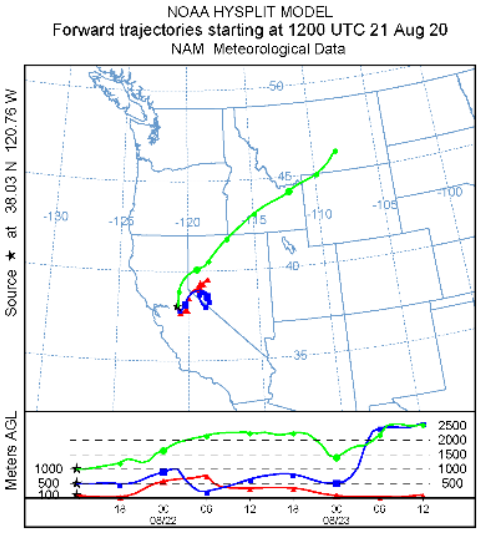
k) Salt Fire

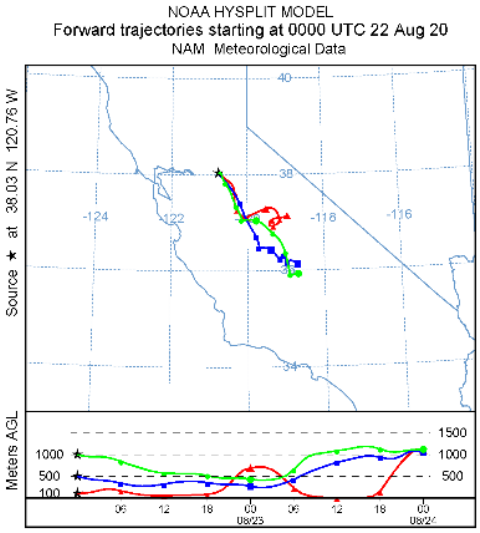
Fire	Start	Containment	Latitude	Longitude	Total Acres
Salt	8/18/20	8/24/20	38.0279	-120.7633	1,789

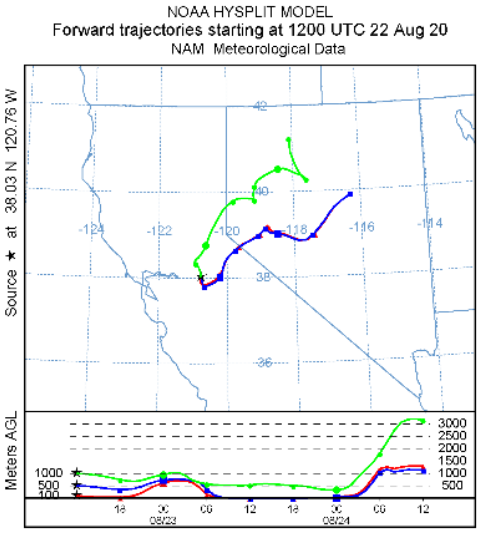





NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 38.03 N 120.76 W
Meters AGL

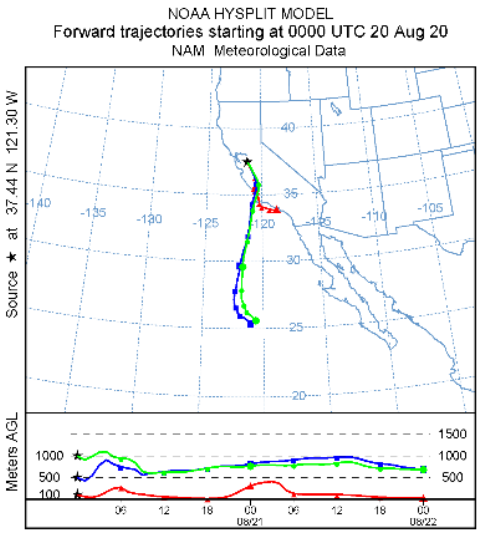

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 38.03 N 120.76 W
Meters AGL

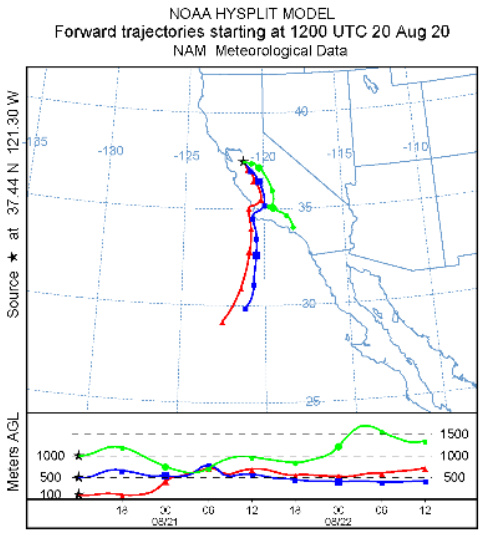

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 38.03 N 120.76 W
Meters AGL

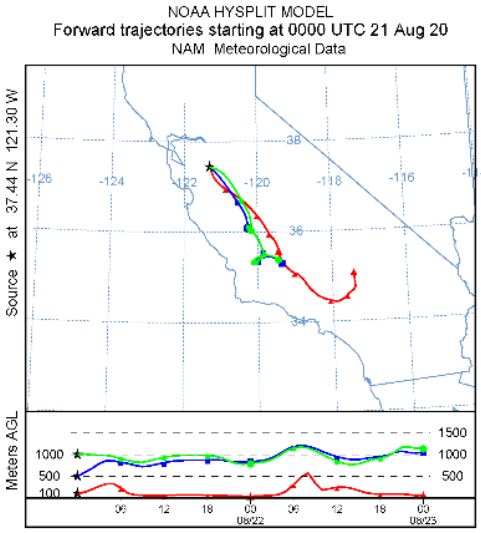

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 38.03 N 120.76 W
Meters AGL

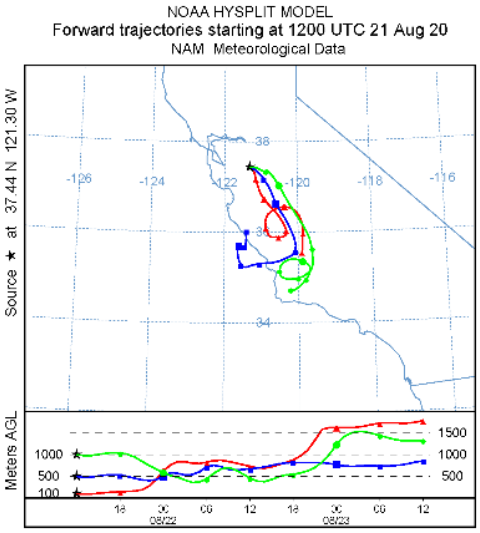
l) SCU Lightning Complex

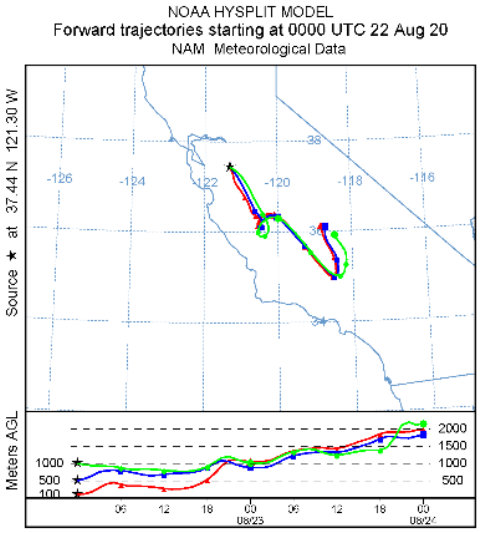
Fire	Start	Containment	Latitude	Longitude	Total Acres
SCU Lightning	8/18/20	10/1/20	37.4394	-121.3044	396,624

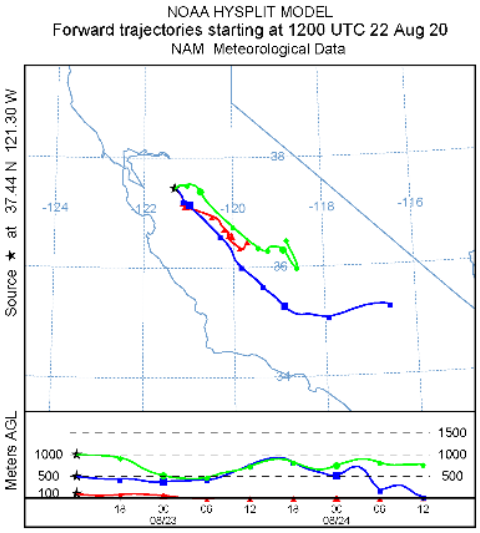





NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 37.44 N 121.30 W
Meters AGL
1500
1000
500
100
08/22
08/23

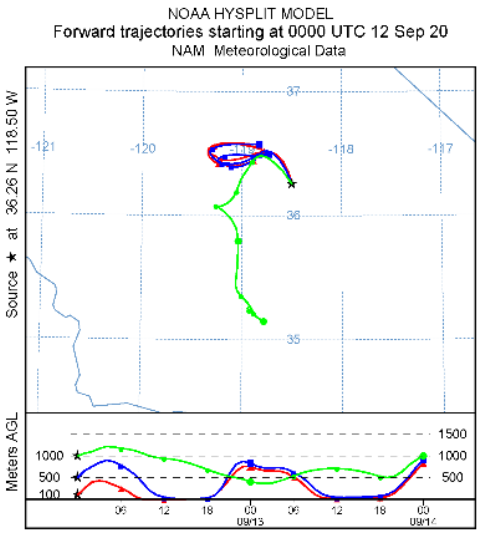

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 37.44 N 121.30 W
Meters AGL
1500
1000
500
100
08/22
08/23

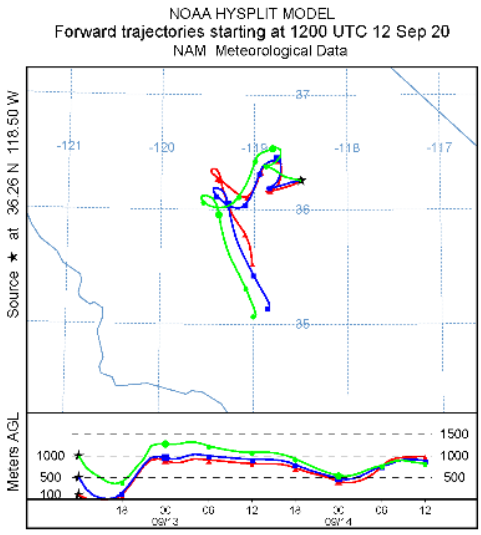

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 37.44 N 121.30 W
Meters AGL
2000
1500
1000
500
100
08/23
08/24

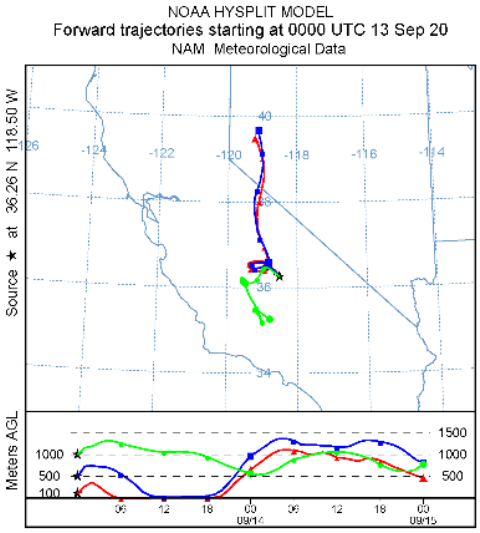

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 37.44 N 121.30 W
Meters AGL
1500
1000
500
100
08/23
08/24

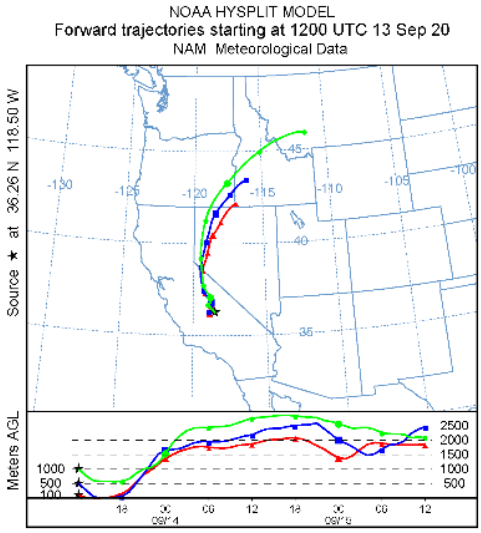
m) SQF Lightning Complex

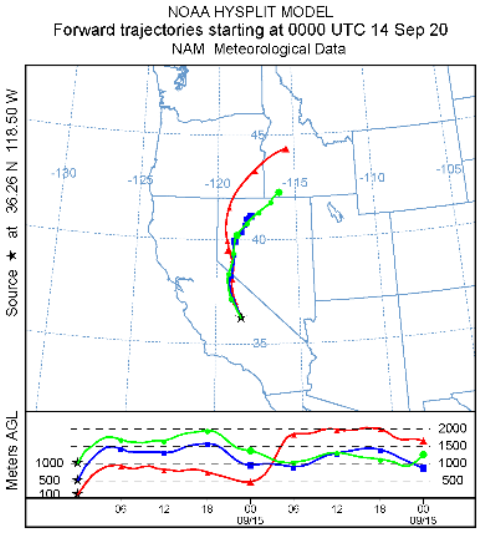
Fire	Start	Containment	Latitude	Longitude	Total Acres
SQF Lightning	8/21/20	1/6/21	36.255	-118.497	174,178

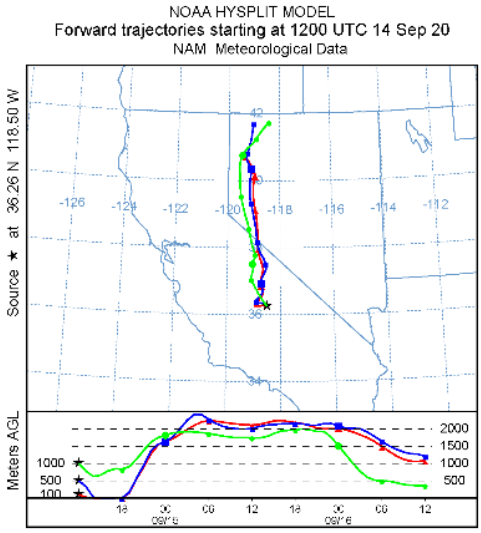





NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 13 Sep 20
NAM Meteorological Data
Source ★ at 36.26 N 118.50 W
Meters AGL

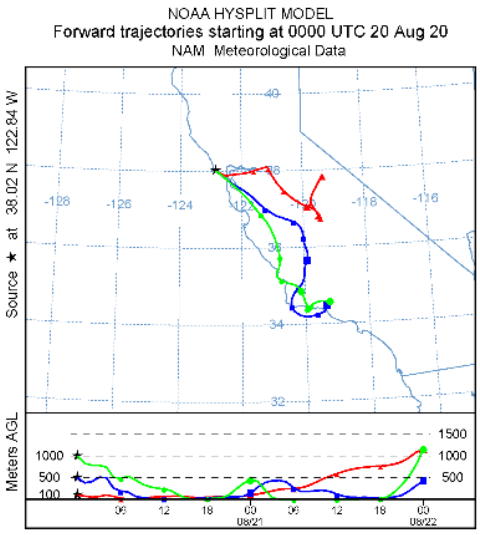

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 13 Sep 20
NAM Meteorological Data
Source ★ at 36.26 N 118.50 W
Meters AGL

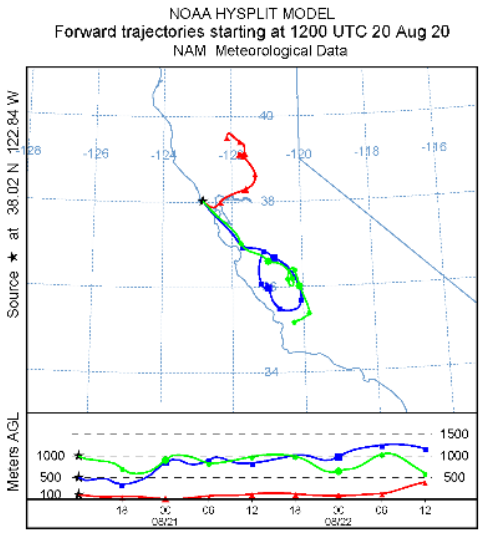

NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 14 Sep 20
NAM Meteorological Data
Source ★ at 36.26 N 118.50 W
Meters AGL

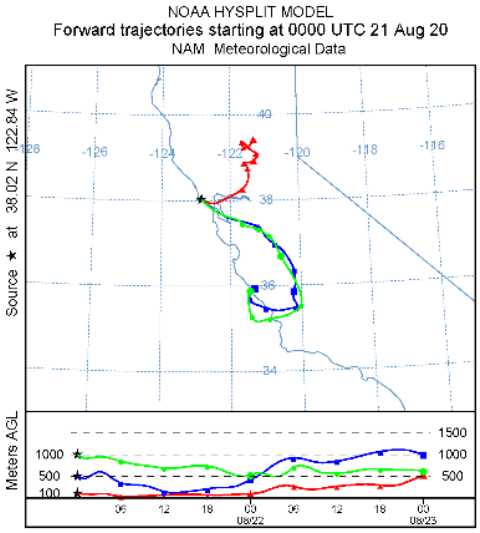

NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 14 Sep 20
NAM Meteorological Data
Source ★ at 36.26 N 118.50 W
Meters AGL

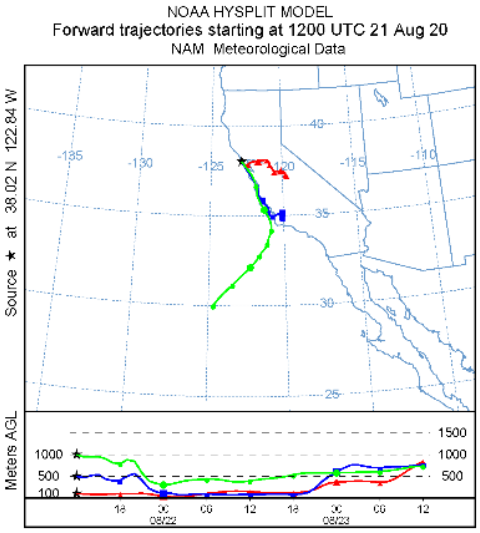
n) Woodward Fire

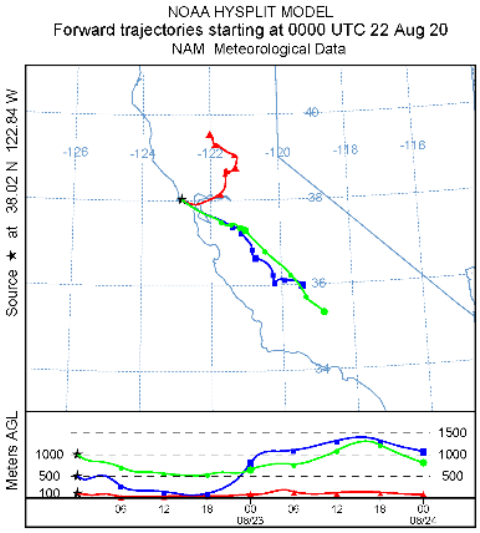
Fire	Start	Containment	Latitude	Longitude	Total Acres
Woodward	8/18/20	10/2/20	38.0181	-122.8367	4,929

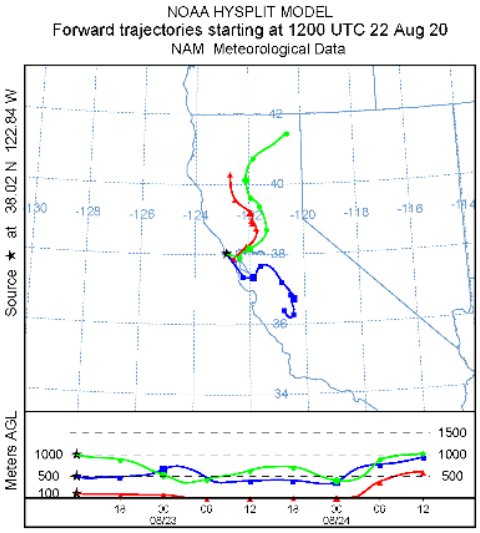





NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 38.02 N 122.84 W
Meters AGL


NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 21 Aug 20
NAM Meteorological Data
Source ★ at 38.02 N 122.84 W
Meters AGL


NOAA HYSPLIT MODEL
Forward trajectories starting at 0000 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 38.02 N 122.84 W
Meters AGL


NOAA HYSPLIT MODEL
Forward trajectories starting at 1200 UTC 22 Aug 20
NAM Meteorological Data
Source ★ at 38.02 N 122.84 W
Meters AGL

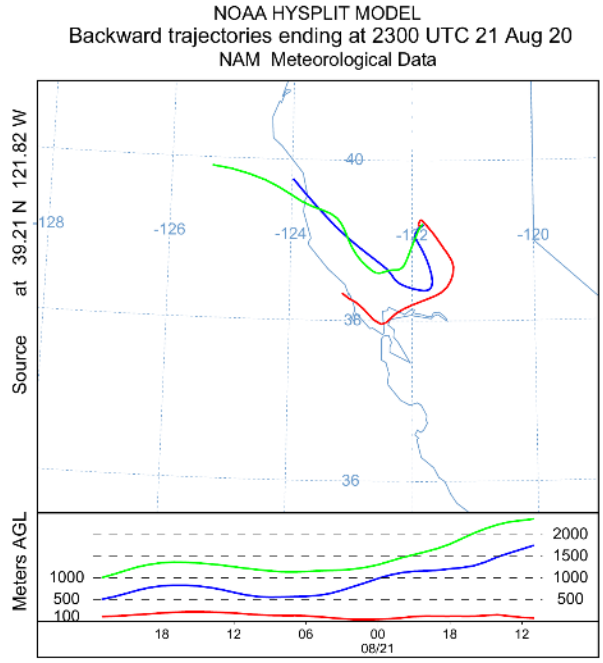
4. HYSPLIT Backward Trajectory (from Monitor)

NOAA's HYSPLIT[100] model was used to determine simple back-trajectories showing the path that an air parcel took for a specified period of time (here, 36 hours) before reaching each of the exceeding monitors at the hour of maximum concentration in the exceeding 8-hour time period. Three height levels (red: 100 meters (m), blue: 500m; green: 1000m) were used to indicate transport near the surface and in the mid to upper levels of the atmosphere. Tables indicate the first hour of the exceeding 8-hour time period and the hour of the maximum concentrations within that 8-hour time period. Both PST (Pacific Standard Time) and UTC (Universal Coordinated Time) are noted.

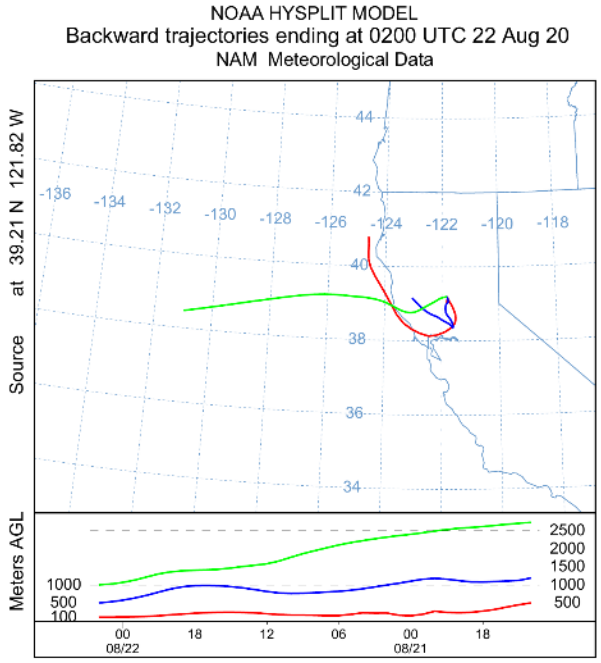
a) Sutter Buttes / Sutter County / Feather River AQMD

Date (PST)	First Hour (PST)	Date (PST)	Max Hour (PST)	DATE (UTC)	First Hour (UTC)	Date (UTC)	Max Hour (UTC)
8/21/2020	15	8/21/2020	18	8/21/2020	23	8/22/2020	2
8/22/2020	12	8/22/2020	18	8/22/2020	20	8/23/2020	2

First Hour: August 21, 2020 15PST (8/21/20 23UTC)

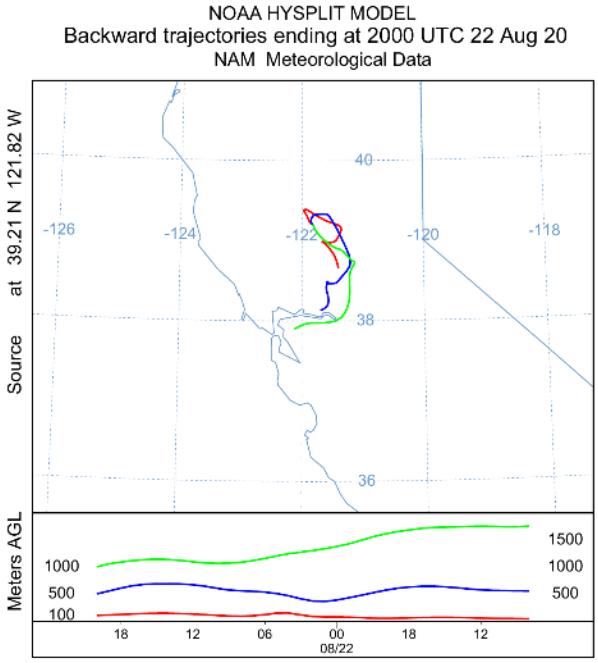


Maximum Hour: August 21, 2020 18PST (8/22/20 02UTC)

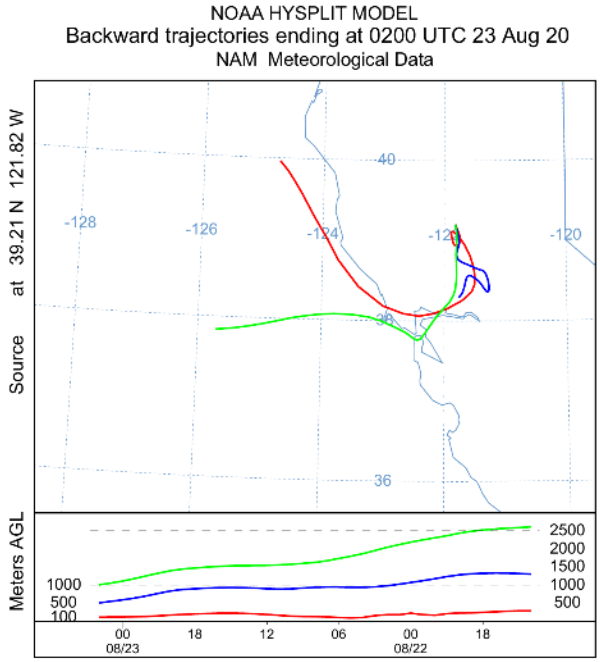


[100] HYbrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT)

First Hour: August 22, 2020 12PST (8/22/20 20UTC)



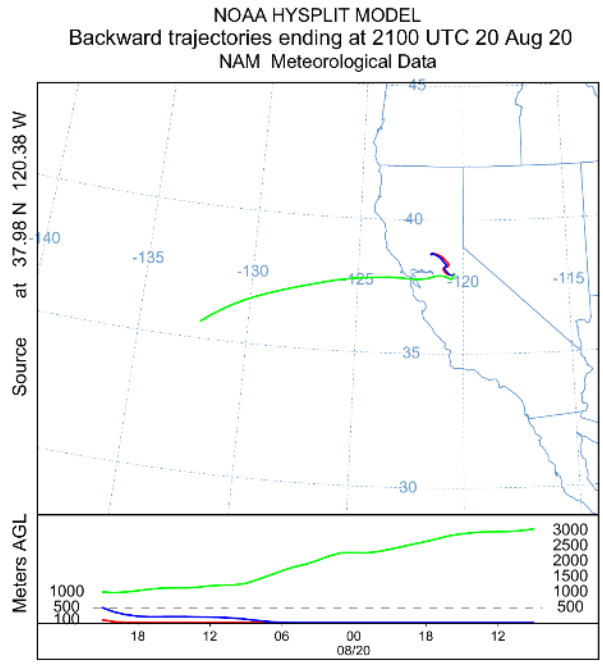
Maximum Hour: August 22, 2020 18PST (8/23/20 02UTC)



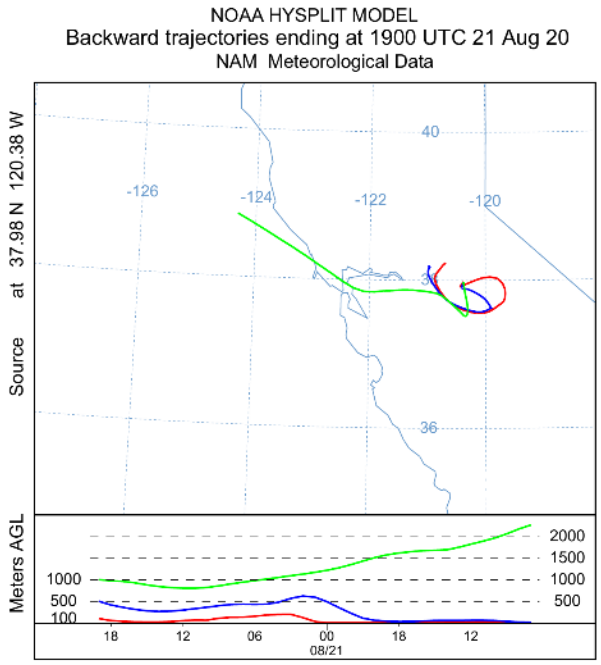
b) Tuolumne County (Sonora)

Date (PST)	First Hour (PST)	Date (PST)	Max Hour (PST)	DATE (UTC)	First Hour (UTC)	Date (UTC)	Max Hour (UTC)
8/20/2020	13	8/20/2020	15	8/20/2020	21	8/20/2020	23
8/21/2020	11	8/21/2020	18	8/21/2020	19	8/22/2020	2
8/22/2020	10	8/22/2020	14	8/22/2020	18	8/22/2020	22

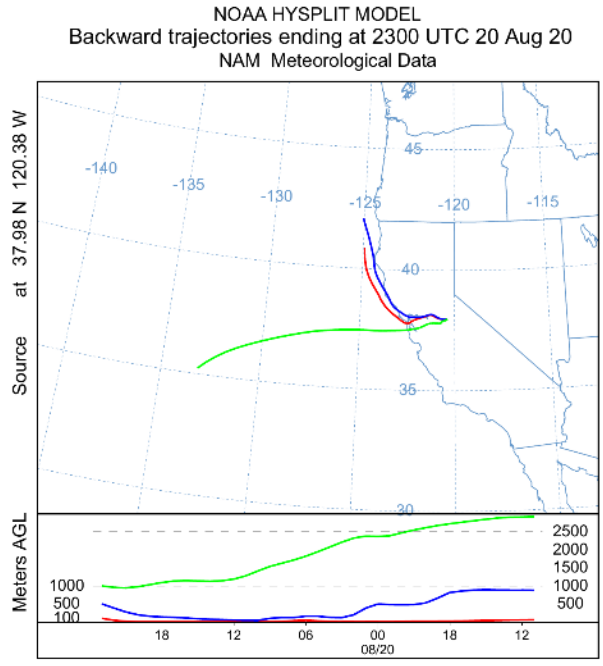
First Hour: August 20, 2020 13PST
(8/20/20 21UTC)



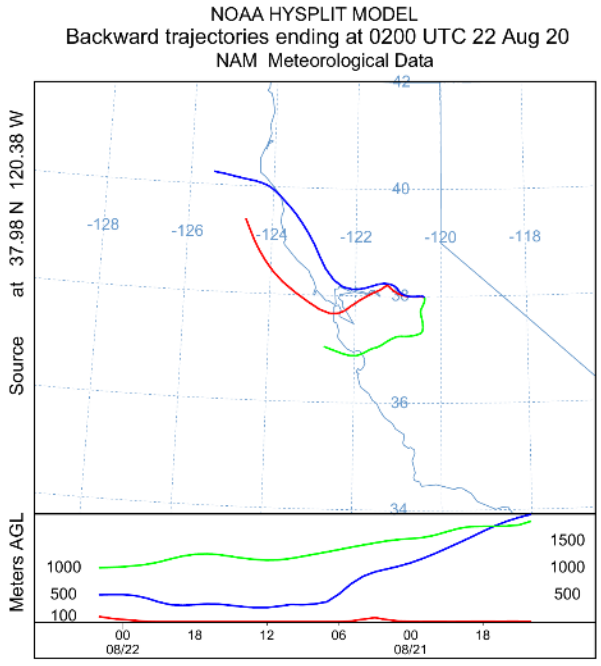
First Hour: August 21, 2020 11PST
(8/21/20 19UTC)



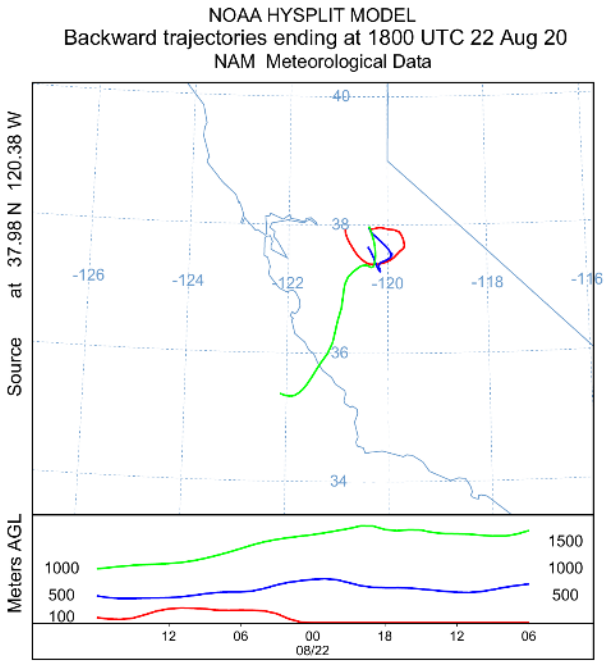
Maximum Hour: August 20, 2020 15PST
(8/20/20 23UTC)



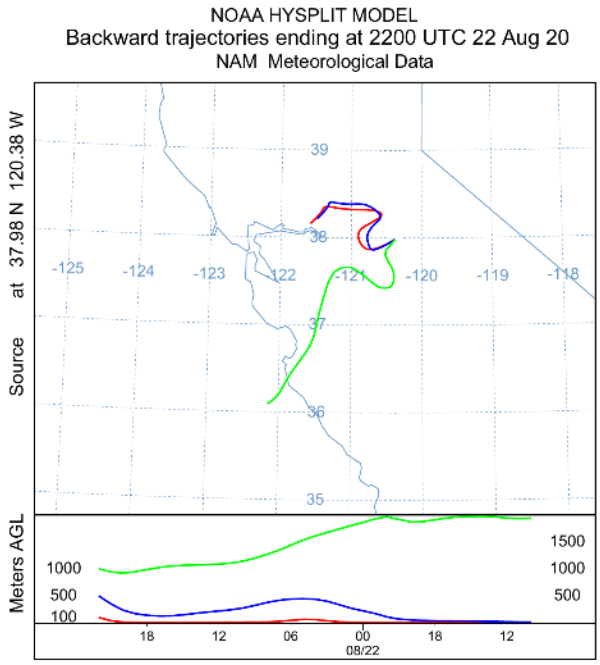
Maximum Hour: August 21, 2020 18PST
(8/22/20 02UTC)



First Hour: August 22, 2020 10PST (8/22/20 18UTC)



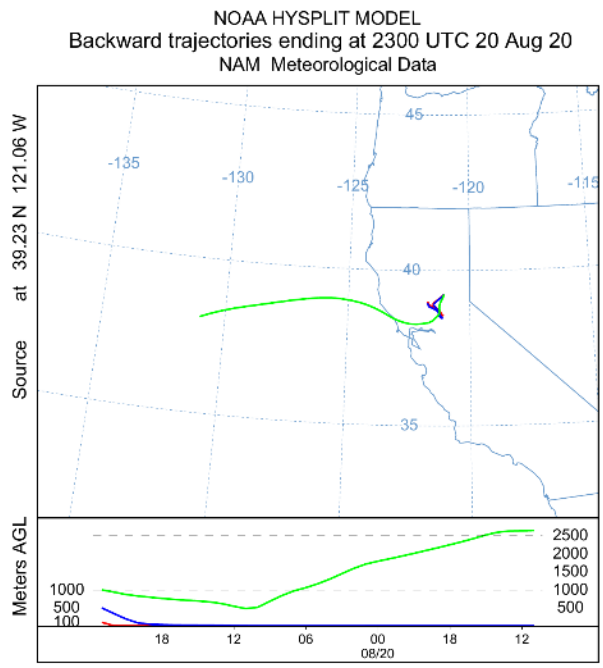
Maximum Hour: August 22, 2020 14PST (8/22/20 22UTC)



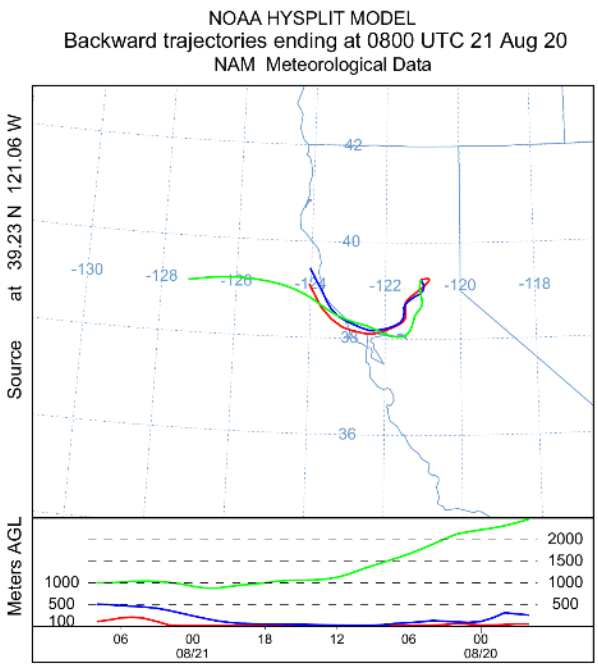
c) Western Part of Nevada County (Grass Valley) / Northern Sierra AQMD

Date (PST)	First Hour (PST)	Date (PST)	Max Hour (PST)	DATE (UTC)	First Hour (UTC)	Date (UTC)	Max Hour (UTC)
8/20/2020	15	8/20/2020	18	8/20/2020	23	8/21/2020	2
8/21/2020	0	8/21/2020	0	8/21/2020	8	8/21/2020	8
9/12/2020	18	9/12/2020	21	9/13/2020	2	9/13/2020	5
9/13/2020	0	9/13/2020	0	9/13/2020	8	9/13/2020	8
9/14/2020	14	9/14/2020	15	9/14/2020	22	9/14/2020	23

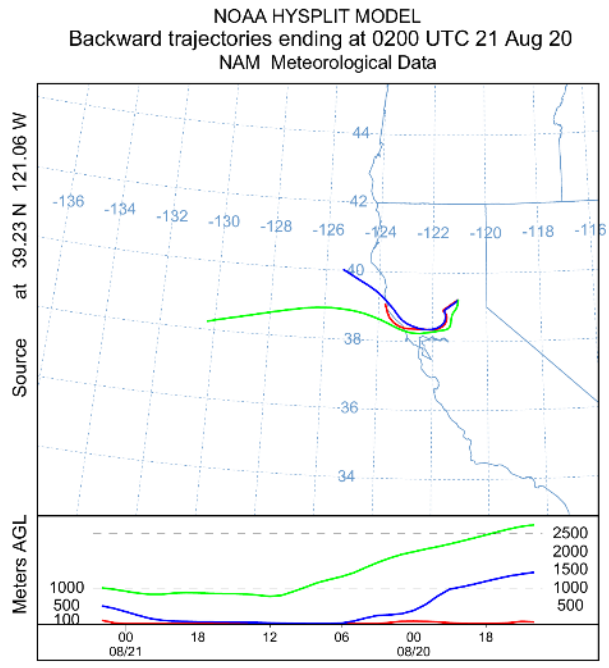
First Hour: August 20, 2020 15PST
(8/20/20 23UTC)



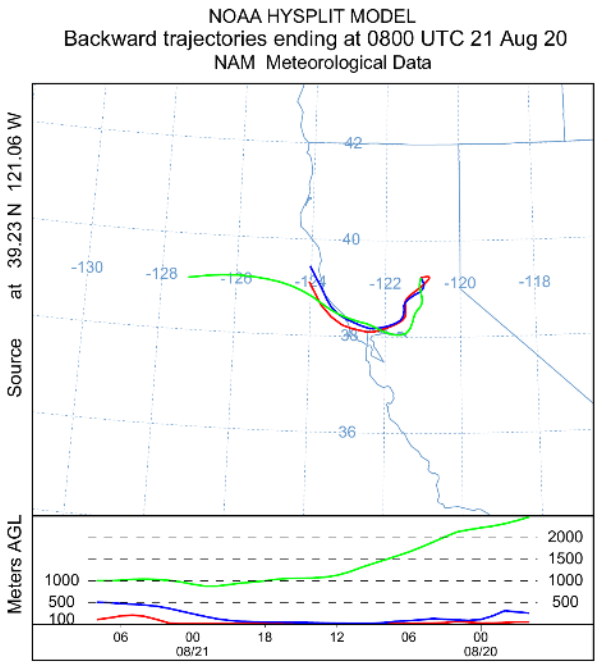
First Hour: August 21, 2020 00PST
(8/21/20 08UTC)



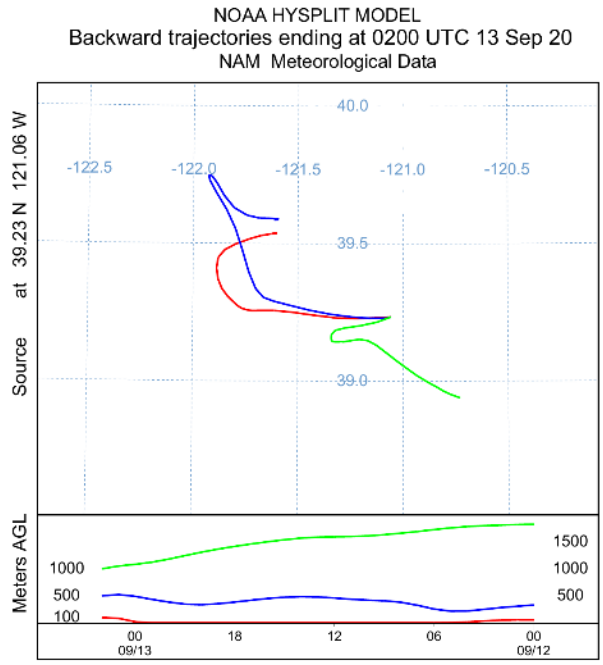
Maximum Hour: August 20, 2020 18PST
(8/21/20 02UTC)



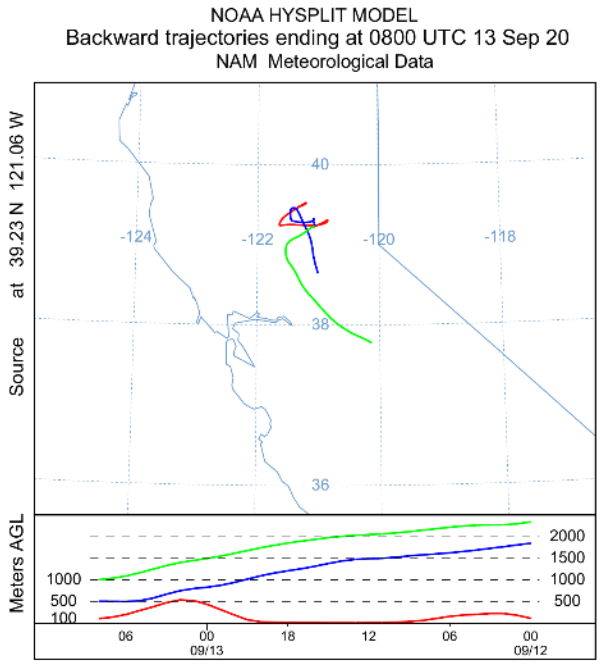
Maximum Hour: August 21, 2020 00PST
(8/21/20 08UTC)



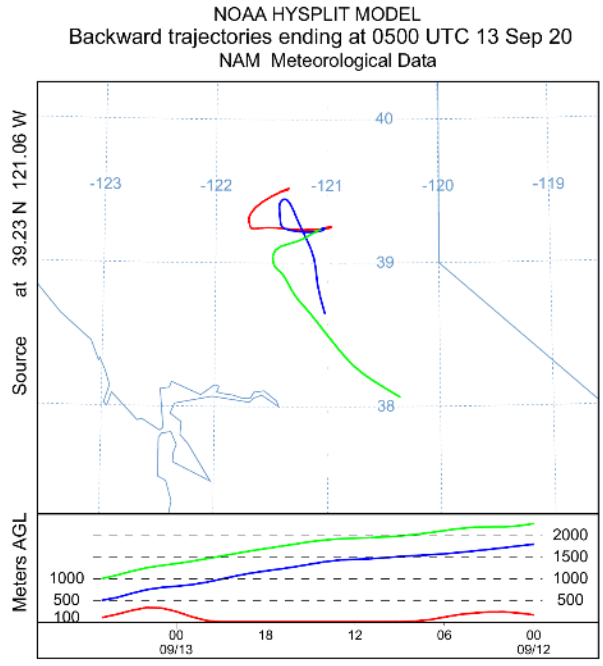
First Hour: September 12, 2020 18PST (9/13/20 02UTC)



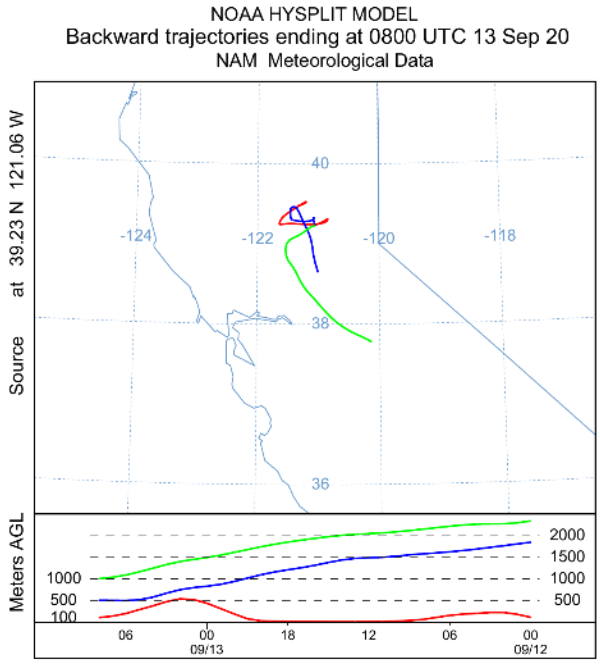
First Hour: September 13, 2020 00PST (9/13/20 08UTC)



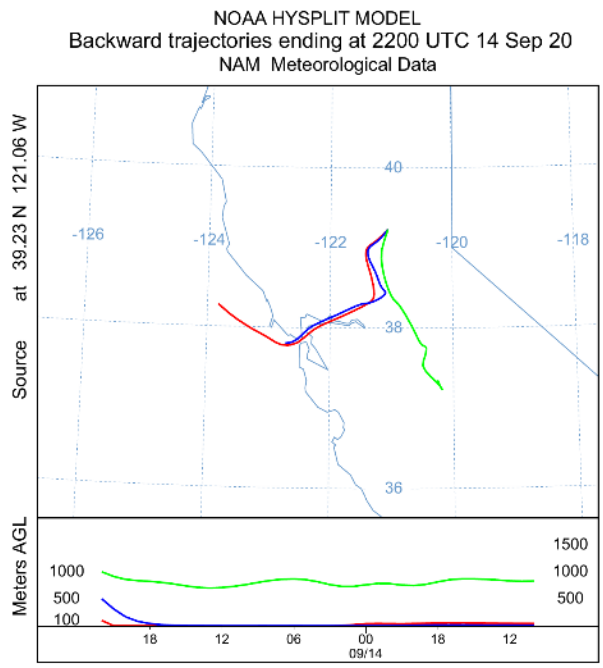
Maximum Hour: September 12, 2020 21PST (9/13/20 05UTC)



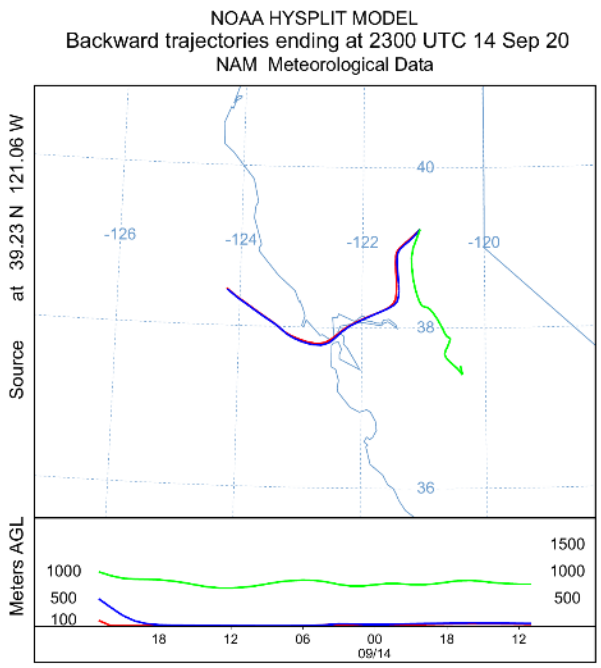
Maximum Hour: September 13, 2020 00PST (9/13/20 08UTC)



First Hour: September 14, 2020 14PST (9/14/20 22UTC)



Maximum Hour: September 14, 2020 15PST (9/14/20 23UTC)



D. NOAA Smoke Text Products[101]

The NOAA Smoke Text Product is a text-based analysis of data from multiple satellites. These products are used to give an overall view of smoke origins, current locations, and potential transport, and can supplement information from other media. Observations are generally recorded twice each day, although not all are shown here since they do not always provide new information. The majority of these reports highlight the large amounts of smoke issued on an almost daily basis and their impacts on California and the rest of the U.S. Individual areas at the county level are not specifically noted.

1. August 2020

Smoke Text Product was uavailable for August 2020.

[101] NOAA Hazard and Mapping System (HMS), *Fire and Smoke Text Product*, last accessed 8/31/21

2. September 2020

a) Saturday, September 12, 2020

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 1746Z September 12, 2020

SMOKE:

Very Large Area from the Eastern Pacific, Western United States extending through the southwest and into the Southern Plains, northwest Gulf of Mexico and northeast towards the Upper Midwest….

The ongoing very large wildfires burning primarily in Washington, Oregon, and California were producing a very large area of moderate to high density smoke that was extending from as far east as portions of the Midwest US and then extending southwest through the Southern Plains and Southwest United States and then through the West Coast States from California north to Washington. The smoke then extended offshore into portions of the eastern and northeastern Pacific Ocean.

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 0200Z September 13, 2020

SMOKE:

Eastern Pacific/Much of the Lower 48/Northwestern Mexico/Western Gulf of Mexico/Southern Canada…

The massive area of smoke from the major wildfires burning primarily in Washington, Oregon, and California continued to be visible over a huge area stretching from the eastern Pacific well off the West coast of the U.S. and off the Baja coast eastward and inland over the Western U.S. and across a good portion of the lower 48 and southern Canada to off the Northeast U.S. coast. Smoke also affected the western Gulf of Mexico and northwestern Mexico. The only areas which were relatively smoke free were parts of the Southeast, Middle Atlantic, and the Northeast, along with a swath of the Dakotas, western Nebraska, Colorado, and Wyoming. Very thick smoke was present over portions of the eastern Pacific, much of the Western U.S. along with the Southwestern and South Central U.S. with a narrow band of moderate density smoke extending as far to the northeast as the Great Lakes region. Additional somewhat smaller moderate to thick density smoke plumes were seen with wildfires scattered around southern British Columbia, Idaho, western Montana, and northeastern Utah.

b) Sunday, September 13, 2020

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 1730Z September 13, 2020

SMOKE:

Central and Western U.S./Pacific Ocean...

Ongoing large wildfire complexes in California, Oregon, and Washington continue to produce a very large plume that covers much of the central and western U.S. and the eastern Pacific Ocean. A light to moderate density plume extends from the Dakotas to the Great Lakes. Another light to moderate density plume covers Oklahoma northeastward to the Ohio Valley. The densest plumes over the western U.S. extend from the

Northern Rockies to the Pacific Northwest, then southeastward through Oregon and California, then eastward over Arizona, New Mexico, and the Texas Panhandle. A plume ranging from light to heavy density is entrained into an upper level low pressure system over the northeastern Pacific Ocean. A light to moderate density plume extends southwest off the southern coast of California southwestward into the tropical Pacific east of Hawaii.

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 0200Z September 14, 2020

SMOKE:

Eastern Pacific/Much of the Lower 48/Northwestern Mexico/Southern

Canada…

Wildfires in Oregon and California continued to emit huge quantities of very thick density smoke during the day. Somewhat smaller but still significant smoke plumes were also visible from wildfires in Washington, Idaho, western Montana, northeastern Utah, and northern Colorado. The result of this major wildfire activity occurring now for many days is an enormous area of smoke which covers a good portion of the eastern Pacific extending more than 1,500 miles off the West coast as well as much of the lower 48, southern Canada, and northwestern Mexico. Relatively smoke free parts of the lower 48 include a sliver encompassing southern Utah, northern Arizona, northern New Mexico, southern Colorado, northern Kansas, northern Missouri, and central Illinois. Also, the area from southern Texas eastward over much of the Southeast and northward from there to the Mid-Atlantic appeared to be relatively free of smoke as well as northern New England. Very dense smoke is blanketing much of the eastern Pacific, as well as virtually all of California, Oregon, and Washington. The northern portion of this area of dense smoke extends up over Western Canada as far east as Manitoba and across the the northern third of the U.S. reaching as far east as the Great Lakes region. The southern branch of the dense smoke stretches northeastward from the Southwestern U.S. and Northwestern Mexico over the Central and South Central U.S. to as far east as the Ohio Valley.

c) Monday, September 14, 2020

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 1730z September 14, 2020

SMOKE:

U.S./Southern Canada/Pacific...

Large wildfire complexes in Oregon and California continue to spread a very large area of smoke across the much of the U.S. and parts of southern Canada. A thin density plume is found extending from Newfoundland southwestward to New England, the Ohio/Tennessee Valley, and Kansas/Oklahoma. A moderate density plume is located over the Great Lakes, the Upper Mississippi Valley, the Northern Plains, the Northern Rockies, and a large part of British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario. Over the southern Rockies, Desert Southwest, northwestern Mexico, and into the subtropical Pacific extending several hundred miles offshore, a light to moderate density plume is detected. Over the northeastern Pacific, a light to moderate density plume is entrained into a low pressure system. The thickest plume is found extending from southwestern Manitoba westward to southeastern British Columbia, and continuing over eastern Washington, western Idaho, most of Oregon, a large part of California, and northwestern Nevada.

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY
THROUGH 0206z September 15, 2020

SMOKE:

U.S./Southern Canada/Pacific...

The large wildfires that continue to burn over California and Oregon have produced a tremendous area of smoke covers most of the United States and southern Canada. Within this tremendous area of smoke, a large area of high density smoke extended from portions of the Upper Midwest extending west through the Northern Plains, northern Rockies, Pacific Northwest, southern Canada and offshore into the northeast Pacific Ocean. The high density smoke then also extended through all the West Coast states from California to Washington and offshore into the eastern Pacific Ocean west of southern California.

E. Media Reports

Examples of traditional news and social media accounts of wildfires and smoke impacts, arranged by type of media and date. Due to the amount of information available, not all available articles are provided.

1. News media and other Information Sources

Los Angeles Times, Bay Area firestorms send thousand fleeing and cause dangerous air quality, *https://www.latimes.com/california/story/2020-08-20/fire-heat-wave-bay-area-california*, August 20, 2020, last accessed 10/31/2021

CALIFORNIA

Bay Area firestorms send thousands fleeing and cause dangerous air quality

https://www.latimes.com/california/story/2020-08-20/fire-heat-wave-bay-area-california

Matt Nichols sprays water on his home as fire bears down on Vacaville, Calif., on Wednesday. (Noah Berger / Associated Press)

BY SUSANNE RUST, ANITA CHABRIA, RONG-GONG LIN II, JOSEPH SERNA

AUG. 20, 2020 **UPDATED** 6:40 AM PT

VACAVILLE, Calif. — Already reeling from a pandemic and a record heat wave that has millions sweltering indoors, the San Francisco Bay Area is now besieged by fire, forcing tens of thousands to evacuate and leaving others inhaling air so smoky that experts warned of serious health risks.

Many residents say they've never seen such wildfire conditions, a product of high temperatures, strong winds and thousands of lightning strikes from unusual thunderstorms that started Sunday. As of Wednesday afternoon, the Bay Area was home to several of the 23 major fires statewide, a subset of the 367 blazes across California, according to Gov. Gavin Newsom.

"Those storms were not ordinary," said Steve Cobb, a Dearborn Park resident and one of the thousands forced to flee their homes. "They were tropical … [with] constant flashes of light, crashing thunder and rain."

As of late Wednesday, the most threatened area was Solano County, along the Interstate 80 corridor. After a fire roared close to Vacaville, a city of 100,000 northeast of San Francisco, it was beaten back but then blew up and jumped the freeway in the afternoon. Traffic was temporarily blocked in both directions as authorities worked to evacuate an area south of the interstate.

By Wednesday night, the fire and others in the area — collectively known as the LNU Lightning Complex — had burned more than 124,000 acres with zero containment. Vacaville Fire Chief Kris Concepcion warned residents online of a "long night ahead" with unstable and unpredictable weather conditions.

Another branch of that complex menaced Napa, Sonoma and Lake counties, forcing the evacuation of a hospital in the wine country town of St. Helena and remaining largely out of control as night fell.

Farther south, a grouping of 20 fires threatened the Silicon Valley area, while the rural areas north of Santa Cruz also saw a blaze that drove people down hilly mountain slopes toward the ocean, with fire close behind.

Such conflagrations would challenge emergency responders even in normal times, but these come as the coronavirus complicates the job of running evacuation centers and camps for firefighters.

Early Wednesday, Shawnee Whaley escaped her north Vacaville trailer park with her mother, Sharon Whitaker, 79. A phone call from a friend woke her minutes before they realized they had to go. When Whaley saw that the power was out, she said she flung open her front door "and saw the glow of the fire."

They made it to an evacuation center, only to be turned away because it was full. They finally found shelter at the local cultural center, where they set up two cots away from others. Asked if they were concerned about the virus, they said: not so much.

"Getting burnt in a fire is way worse than getting COVID-19 at this point," said Whaley, wrapped in a Red Cross blanket.

With so many blazes burning at the same time, state officials acknowledged Wednesday that they needed help and had asked for equipment and assistance from other states.

"We are experiencing fires the likes of which we haven't seen in many, many years," Newsom said at a news conference.

Jeremy Rahn, a public information officer with the California Department of

CALIFORNIA

Forestry and Fire Protection, said the state had already requested 375 additional fire engines as well as hand crews from out-of-state agencies, and hired "nearly all available private firefighting 'call-when-needed' aircraft in the Western United States."

From 'firenadoes' to record heat, California extreme weather a glimpse of future
Aug. 18, 2020

"Firefighting resources are depleted as new fires continue to ignite," he said during a media briefing Wednesday. Officials say nearly 7,000 personnel from state, local and federal agencies are assigned to the California fires.

Sunday's lightning bolts were the Bay Area's most widespread and violent in recent memory, and they struck on one of the hottest nights in years, said Daniel Swain, a climate scientist with UCLA and the National Center for Atmospheric Research.

They were the result of three separate weather phenomena: A high-pressure system that swirled hot desert air from Arizona and Nevada across the state; moisture floating in from Tropical Storm Elida off the coast of Mexico; and a thunderstorm in Sonora, Mexico, that sent a wave of uplifting pressure through the atmosphere, combining with the heat and moisture to create lightning strikes.

CALIFORNIA
Destructive Bay Area fires fueled by rare mix of intense dry lightning and extreme heat
Aug. 19, 2020

The most threatened city Wednesday was Vacaville, in the path of part of the LNU Lightning Complex fire. That complex comprises at least three major incidents in Napa, Sonoma, Solano, Yolo and Lake counties. It jumped from 46,000 to more than 124,000 acres over the course of the day.

As of Wednesday night, 105 structures had been destroyed, 70 more had been damaged and 25,000 were threatened, fire officials said.

In the Santa Cruz Mountains, nearly two dozen fires — known as the CZU August Lightning Complex — have prompted the evacuation of at least 25,000 people, with at least 20 structures destroyed.

On Wednesday, a small but steady trickle of San Mateo County coast residents streamed into the evacuation center at the high school in Pescadero, a town south of Half Moon Bay.

Rita Mancera, the executive director of Puente, a local community organization, helped evacuees find hotel rooms and arrange accommodations for pets and livestock. She said roughly 70 families had visited the center since Tuesday evening, when evacuations were ordered.

Lance Storm, 39, said the lightning storms and fires were unlike anything he'd ever witnessed.

Storm lives on a communal farm in the Pescadero hills, and when the fire approached, he and six others decided to get out early — fearing a repeat of the people trapped in Paradise in 2018.

"I put everything I could into the bus," he said, standing by his vehicle and holding a kitten named Energy. He said he set his two pigs, Delilah and Daisy, free — unable to get them into the bus.

By late Wednesday, authorities had closed the Pescadero shelter as fires threatened the community and others to the south in Santa Cruz County.

In many areas, a layer of ash covered the ground, kicked up by winds and adding to the pollution that clouded much of the Bay Area.

The American Lung Assn. warned that excessive heat, wildfire smoke and COVID-19 pose risks to those most vulnerable to respiratory problems.

"The combination of uncontained wildfires and extreme heat has created conditions that put even healthy individuals at risk," said Dr. Afif El-Hasan, an association spokesman. "The ongoing COVID-19 pandemic only makes these potential effects more serious."

Intense smoke and heat trigger coughing and wheezing, worsen lung function and can lead to bronchitis or even death, he said.

"The best thing you can do is to avoid outdoor air," San Francisco Mayor London Breed said.

Several cities set up cooling centers to help people without air conditioning. In Redwood City, staff had equipped the Red Morton Community Center with air conditioning, bottles of water, free public Wi-Fi and plenty of space to maintain physical distance.

But Wednesday afternoon, the only two occupants were employees from the city's facilities department.

"We think the site is just so new that nobody really knows about it," said Rachael Grant, a city employee.

The fires have sent American Red Cross staff and county workers from across Northern California scrambling to prepare for a potential wave of evacuees, said Denise Everhart, the Red Cross' Pacific Division disaster executive.

The Red Cross has set up 10 to 15 temporary evacuation points where residents' needs are assessed before they're sent to a hotel or motel, Everhart said. She said that the organization has put precautions in place against the coronavirus and that people should not hesitate to go to shelters.

"If you're told to go, go. We're all working together to keep people safe…. The fire is the risk."

In Vacaville, 78-year-old Lloyd Broughton evacuated with his family after a firetruck came up his road at 3 a.m. He, his wife, Anne, 73, and daughter Kristine, 35, gathered their seven rescue cats and packed two cars.

All three suffer from breathing problems, and with a heavy layer of ash falling, they were already coughing and having trouble breathing, Kristine said.

"No one is ready for it," Lloyd Broughton said of having to leave in the middle of a pandemic.

Times staff writers Luke Money, Colleen Shalby, Leila Miller and Maura Dolan contributed to this report.

CALIFORNIA CLIMATE & ENVIRONMENT FIRES

Susanne Rust

https://www.latimes.com/california/story/2020-08-20/fire-heat-wave-bay-area-california

Calaveras Enterprise, Salt Fire at 1,789 acres..., *http://www.calaverasenterprise.com/news/article_8829965a-e315-11ea-8672-4b1e93c58645.html,* August 20, 2020, last accessed 10/26/2021

HOT

Salt Fire at 1,789 acres with 35% containment; experts warn residents to stay indoors to avoid wildfire smoke exposure

By Davis Harper Aug 20, 2020 Updated Aug 20, 2020

Pictured from Rock Creek Road at the southernmost tip of Salt Valley Spring Reservoir, a helicopter heads into a shroud of smoke to battle the Salt Fire.
Enterprise photo by Davis Harper

A layer of smoke is hanging over the county due to the Salt Fire near Salt Spring Valley Reservoir and a number of lightning-caused wildfires throughout Northern California. Public health experts are warning residents to avoid the outdoors.

The Salt Fire, which broke out east of Milton near the reservoir Tuesday afternoon, has grown to 1,789 acres in size. Reports from the California Department of Forestry and Fire Protection (Cal Fire) Tuolumne-Calaveras Unit Thursday morning indicated that crews had reached 35% containment with no structures threatened.

The fire, first reported at 2:49 p.m. Tuesday at 20 acres, grew to 1,500 acres in three hours.

Engines were accessing the blaze through a turnout off Rock Creek Road at the southernmost tip of the reservoir Tuesday at 6:30 p.m., rolling through a stretch of dry grass to reach the fire.

Several property owners were parked off the side of the road watching dense clouds of smoke drift over golden hills southwest of the reservoir.

A helicopter made several trips between the reservoir to carry water back to the fire, and multiple planes weaved in and out of sight through the smoke, where they presumably dropped retardant to slow the spread.

"Firefighters are faced with extremely hot temperatures and difficult access to the fire, and that's what's hampering containment efforts," Cal Fire TCU Incident Commander Loren Monsen told the Enterprise at the scene. "We've had a pretty strong wind, with light, flashy fuels burning in grass, oak woodland and brush, and that's made it spread very fast."

Shortly after speaking with Monsen, a dozer was hauled in.

An unnamed spokesperson for Cal Fire warned that residents should avoid the area if able to in a phone interview with the Enterprise Wednesday around noon.

Regarding the amount of personnel and resources assigned to the fire, he said there were "too many to list."

The Salt Fire is the second large wildfire that's taken off near Salt Spring Valley Reservoir this year. The Walker Fire was contained in late June at 1,455 acres northeast of the reservoir.

The day the Salt Fire broke out, Gov. Gavin Newsom declared a statewide emergency "to help ensure the availability of vital resources to combat fires burning across the state, which have been exacerbated by the effects of the historic West Coast heat wave and sustained high winds," a press release from the Governor's Office states.

"We are deploying every resource available to keep communities safe as California battles fires across the state during these extreme conditions," Newsom said in the press release. "California and its federal and local partners are working in lockstep to meet the challenge and remain vigilant in the face of continued dangerous weather conditions."

Following nearly a week of sweltering heat, an excessive heat warning for the foothills was rescinded Wednesday night.

Temperatures originally projected to be in the triple digits in Calaveras County through the weekend are now being forecasted to be in the mid to upper 90s, due to a confluence of smoke in the region.

"It looks like temperatures have trended down because of the smoke blocking some of that sunlight from the surface," said National Weather Service meteorologist Sierra Littlefield. "Smoke is going to impact those temperatures … where you are can influence how much sunshine you get."

The NWS is also keeping its eye on potential remnants of a tropical storm that could be moving northward starting south of Highway 50 in higher elevations late Saturday through Monday.

Average wind speeds are expected to reach a mild five to eight miles per hour in the afternoons over the weekend.

Residents should take action to avoid air quality impacts due to smoke caused by the Salt Fire and various lightning-caused fires burning across California, states a joint press release from the Calaveras County Health Officer and Calaveras County Air Pollution Control District released Wednesday.

Particulate Matter (PM 2.5) levels are currently at an unhealthy 158 based on the California Air Resources Board air quality monitor in San Andreas.

Areas of concern include the lower foothills up into the High Country area, depending on wind direction, until the fires are extinguished.

Residents in the lower foothills and near lower river drainage basins, in particular, are at increased risk to smoke exposure in the evenings when smoke tends to move downhill and become more concentrated in those areas. Conditions may improve in the afternoon and early evening hours as smoke rises.

The danger in smoke exposure are the tiny particles that can be inhaled deep in the lungs, the release states.

Sensitive individuals – very young, elderly and those with respiratory conditions – are at the greatest risk of developing "aggravated symptoms," such as coughing, watery and itchy eyes, headache, scratchy throat, and difficulty in breathing.

"Poor air quality caused by the nearby fires can lead to health problems for those at increased risk. Those considered sensitive to the unhealthy effects of smoke caused by breathing the small particles in the air include those with asthma, lung problems such as COPD, those with heart conditions, and those over 65 years old," said Dean Kelaita, MD, Calaveras County Health Officer.

"Those considered at higher risk should take precautions to minimize their exposure to the smoky air."

Especially in cases where smoke is visible or is smelled, some precautions include staying indoors with windows and doors closed and not running fans that bring outdoor air inside.

Additional precautions, per Public Health:

• Reduce unnecessary driving. If traveling through smoke-impacted areas, be sure that your vehicle's ventilation system is on recirculate

• Do not smoke, vacuum, fry food or do other things that will create indoor air pollution

• If you have asthma, take your medications and follow your asthma management plan

• Non-HEPA paper face mask filters and bandana-type face coverings may be helpful in reducing the spread of germs and viruses, but they are not capable of filtering out extra fine particulates which are much smaller in size. Therefore, they will not be helpful in protecting individuals from smoke-related impacts.

For more information on local air quality and smoke, visit the EPA's Airnow Fire and Smoke webpage at fire.airnow.gov.

Residents can reach the Calaveras County Air Pollution Control District at (209) 754-6588 or Calaveras County Public Health Department (209) 754-6460.

The Press Democrat, Smoke from LNU Complex fires raises North Bay air pollution to unhealthy levels, *https://www.pressdemocrat.com/article/news/wildfire-smoke-raises-north-bay-air-pollution-to-unhealthy-levels/,* August 20, 2020, last accessed 10/26/2021.

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SciTechDaily

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HOT TOPICS SEPTEMBER 27, 2021 | GLOBAL CANCER RISK FROM BURNING ORGANIC MATTER COMES FROM UNREGULATED CHEMICALS

HOME EARTH NEWS

Thick Smoke Obscures California Skies After Wildfires Exploded Across the North

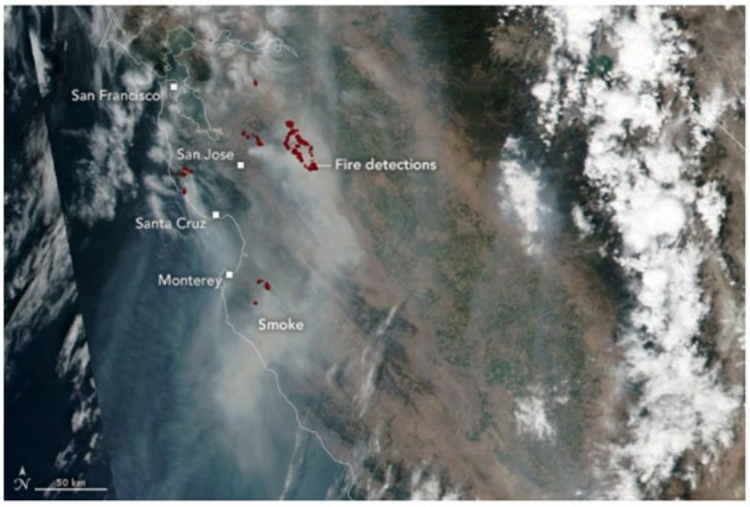
TOPICS: Earth Observatory NASA Wildfires

By KASHA PATEL, NASA EARTH OBSERVATORY AUGUST 20, 2020

August 14, 2020. (Click image for detailed view.)

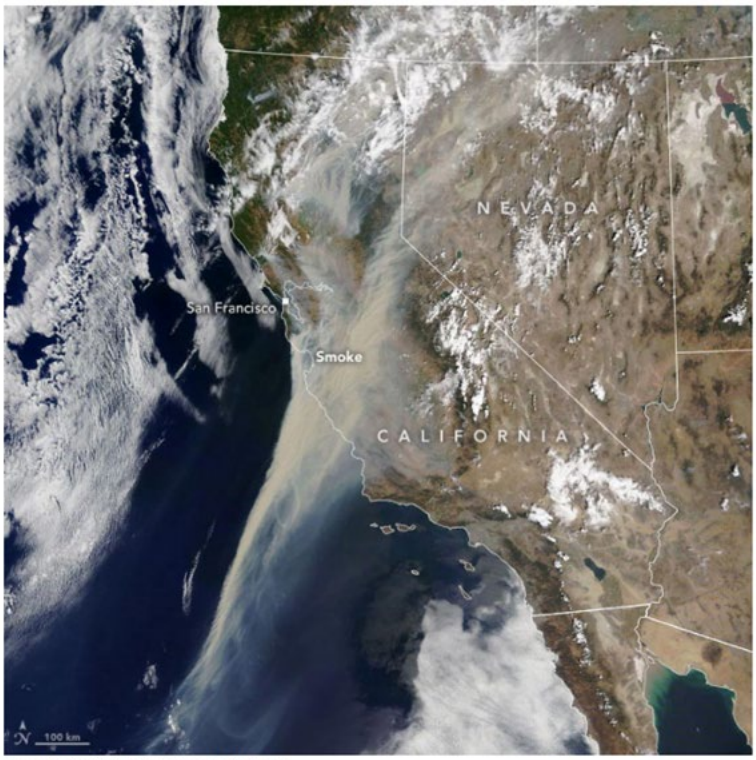
On August 18, 2020, several fires exploded across northern California and scorched thousands of acres.

The Visible Infrared Imaging Radiometer Suite (VIIRS) on the NOAA-NASA Suomi NPP satellite captured a natural-color image (right) showing wildfire smoke blanketing the region. The red dots depict a "fire detection," a pixel in which the sensor and a computer algorithm indicated there was active fire. (The seam running diagonally through the August 18 image shows where two adjacent VIIRS swaths were stitched together to make one image.) The image on the left shows clear skies on August 14, before the fires had started.



August 18, 2020. (Click image for detailed view.)

Many of the fires were sparked by intense lightning storms and moved rapidly due to an intense heatwave and sustained high winds. On August 18, the governor declared a statewide emergency. Thousands of people have evacuated some towns surrounding the San Francisco Bay Area as well as areas in and surrounding Santa Clara county.



August 19, 2020. (Click image for detailed view.)

As wildfires rage across northern California, enormous smoke plumes are smothering cities and towns in the San Joaquin Valley and San Francisco Bay area. On August 19, 2020, the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite captured this natural-color image just before noon.

The smoke has caused unhealthy breathing conditions and ash-covered cars. More than 20,000 people were ordered to evacuate some neighborhoods near the Santa Cruz Mountains.

NASA Earth Observatory images by Lauren Dauphin, using MODIS and VIIRS data from NASA EOSDIS/LANCE and GIBS/Worldview, and the Suomi National Polar-orbiting Partnership.

CBS13 Sacramento, Wildfire Smoke Causes Dangerous Air Quality Levels in Sacramento Region, *https://sacramento.cbslocal.com/2020/08/20/wildfire-smoke-air-quality-sacramento-region/,* August 20, 2020, last accessed 10/26/21.

Wildfire Smoke Causes Dangerous Air Quality Levels In Sacramento Region

YUBA CITY (CBS13) — Smoke from multiple wildfires across Northern California is blanketing the sky in an apocalyptic glow.

"I've noticed the sun is no longer the color the sun should be. It's red with no visibility," said Yuba City resident, Rick Heryford.

READ MORE: Child Tax Credit: When Will Your October Payment Show Up?

Regardless of where you live, you have probably seen the hazy skies and ash in the air. The haze is making it hard to see a mile ahead in some areas, including Yuba City.

"It's been really bad. Yesterday, it was raining ash and when we woke up this morning it looked like someone set off mini campfires all over the place," said Alexandria Conklin.

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"It's been really bad. Yesterday, it was raining ash and when we woke up this morning it looked like someone set off mini campfires all over the place," said Alexandria Conklin.

READ: How To Create A 'Clean Room' At Home To Filter Out Smoke

The air quality in the city is one of the worst in the region, but it is not stopping people from dining outside.

"It's just the smell. Once you get past the smell it's not as bad," said Rita Elsalaymeh.

The city's air quality Thursday ranked as "Hazardous" with an air quality index (AQI) reading of more than 350. Anything over 100 is when Sutter Health Dr. Vanessa Walker said causes a concern.

"These particles wiggle themselves down and deposit themselves into the actual cells of the lungs and they just cause inflammation," she said.

The air quality ranges from unhealthy in Folsom where you can no longer see the Sacramento skyline, to "Very Unhealthy" and "Hazardous" for anyone in places like Roseville, Auburn and Lincoln.

"It's pretty nasty, not good for you. So we try to stay inside and not exercise," said Pete Fleming in Folsom.

Walker said in some areas we are seeing dangerous levels even for people who are normally healthy.

"It would be the equivalent of sticking your head over a campfire and just breathing in all that material for a long period of time," said Dr. Walker.

Those at greater risk include young children, pregnant women, the elderly and those with conditions like COPH, heart issues, and asthma. Dr. Walker cautions everyone should stay inside, avoid outdoor exercise and keep windows closed.

"Hunker down, stay indoors and if you're healthy you still don't want to go outside. It doesn't mean you are immune to the smoke. Anybody can have what is called a bronchial spasm where the airways tighten up because of these very small particles in their lungs," she explained.

The type of smoke you are breathing can also cause greater issues, according to Dr. Walker.

"It's plastic material, it's all kinds of stuff that is releasing formaldehyde into the area releasing carbon monoxide levels. It's not just simply smoke from burning wood. Its smoke from burning chemicals," she said.

Common cloth masks currently being used to prevent the spread of COVID-19 are not effective in helping to protect you from the air particles because they are too small to filter through a cloth mask, according to Dr. Walker.

Tahoe Daily Tribune, Loyalton Fire burns through 43,000 acres, sends smoke throughout Lake Tahoe region, *https://www.tahoedailytribune.com/news/loyalton-fire-burns-through-43000-acres-sends-smoke-throughout-tahoe-region/,* August 20, 2020, last accessed 10/26/21.

CNN, Satellite images show the wildfire smoke making California air quality the worst in the world,*https://www.cnn.com/2020/08/20/us/california-fire-satellite-image-smoke-trnd/index.html,* August 20, 2020, last accessed 10/26/21.

Earth Observatory, Wildfire Smoke Shrouds the U.S. West, *https://earthobservatory.nasa.gov/images/147151/wildfire-smoke-shrouds-the-us-west?src=ve,* August 20, 2020, last accessed 10/19/21.

Union Democrat, Moc Fire size increases to 2,800 acres, evacuations remain in effect, *https://www.uniondemocrat.com/news/article_445c3810-e3c4-11ea-894b-573cad9ca00a.html,* August 21, 2020, last accessed 10/26/21.

Evacuation Map

The Tuolumne County Geographic Information Systems (GIS) team shared the following map of areas under mandatory evacuation orders and evacuation warnings due to the Moc Fire:

https://www.arcgis.com/apps/webappviewer/index.html?id=62e6d4a2e7a043f1a53c78c0335f4729&extent=-13418288.8764%2C4534304.9452%2C-13344909.3292%2C4568586.9524%2C102100

Cal Fire reported the size of the Moc Fire grew slightly Friday morning to 2,800 acres as air tankers made drops of retardant in the battle to protect communities along the Highway 120 corridor in south Tuolumne County.

Hundreds of residents in Groveland, Pine Mountain Lake, Big Oak Flat and Moccasin were forced to flee their homes on Thursday due to the fast-moving blaze that reportedly ignited in some brush along the 16000 block of Highway 49, southeast of Moccasin Reservoir.

Eric Erhardt, assistant county administrator, said the area under mandatory evacuation essentially covers everything on Highway 120 from Moccasin to Smith Station Road, including all side roads and beyond.

The fire remained 0-percent contained as of about noon Friday, according to Lindy Shoff, spokeswoman for Cal Fire's Tuolumne-Calaveras Unit.

Cal Fire said it was still burning to the southeast Friday morning in steep, rugged terrain that presented a challenge for the roughly 300 to 400 personnel battling the blaze to gain containment.

The agency said there were no reports of any injuries to people or destruction of property overnight, but the fire was still threatening hundreds of homes in the area as of Friday morning.

Helicopters and air tankers from Cal Fire's Columbia Air Attack Base were assigned to the blaze, but the agency said whether they can fly over will depend on smoke conditions.

Several tankers were making drops of retardant on the blaze by noon.

Cal Fire said limited visibility on Thursday due to smoky skies from the fire and others burning in the region had prevented the tankers from making drops "more often than not" during the initial attack.

The fire burned 300 acres in less than three hours on Thursday.

Mandatory evacuations were initially called for the area along Highway 120 from Moccasin through Big Oak Flat to Merrell Road, but the communities of Groveland, Pine Mountain Lake and along Highway 120 to Big Creek Shaft Road were added to that about 9:25 p.m. Thursday.

The westbound lane of Highway 120 was opened about 9:45 p.m. for people to evacuate. People were also able to evacuate east on Smith Station Road to Highway 132 and through Yosemite National Park.

Evacuation shelters have been established at the Mother Lode Fairgrounds in Sonora and Mariposa Fairgrounds.

Debbie Calcote, disaster program manager for the American Red Cross, said 156 people came through the shelter at the Mother Lode Fairgrounds and about 115 remained as of about 8 a.m. Friday.

An additional 16 people were staying at a hotel in Jamestown, she said.

"They're a bit anxious," she said. "They don't know anything yet because we haven't had anybody come to do a briefing yet, so it's nerves and worry."

Calcote said the Red Cross was able to get some of the people who came through hotel rooms until there were no longer any available in the area, while others who left found other places to stay with family.

Erma Millheim, 83, of Groveland, was among the evacuees at the fairgrounds with her dogs, Maximilian and Pixie.

"A sheriff came to my house around 11:30 and told me someone would come get me if I wanted," she said. "Deputies came and picked me up and took me into Moccasin, and we were bussed from there to here with four people, three dogs and a kitty."

There were also about 60 horses and other animals that had been brought to the fairgrounds that Calcote said were being cared for in the livestock area by Tuolumne County Animal Control.

Contact Alex MacLean at amaclean@uniondemocrat.net or (209) 768-5175.

The Union, Firefighters make progress, but smoke still causing poor air quality at Lake Tahoe, *https://www.theunion.com/news/firefighters-make-progress-but-smoke-still-causing-poor-air-quality-at-lake-tahoe/,* August 21, 2020, last accessed 10/26/21.

SFGate, Moccasin Fire breaks out near Yosemite, quickly burns through 2,800 acres, *https://www.sfgate.com/california-wildfires/article/Moccasin-Moc-Fire-Yosemite-Groveland-15505686.php,* August 21, 2020, last accessed 10/26/21.

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Air Quality Alert For Tuolumne And Mariposa Counties

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By **Mark Truppner** Published **Aug 21, 2020 07:52 am**

Sun and Smoke

View Photo

An Air Quality Alert is now in effect for both Tuolumne County and Mariposa County in addition to Calaveras, San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare Counties and the Central Valley portion of Kern County.

The Air Quality Alert will remain in effect until most of the major fires are extinguished.

Exposure to particle pollution can cause serious health problems, aggravate lung disease, cause asthma attacks and acute bronchitis, and increase risk of respiratory infections. Residents are advised to use caution as conditions warrant. People with heart or lung diseases should follow their doctor`s advice for dealing with episodes of unhealthy air quality.

Additionally, older adults and children should avoid prolonged exposure, strenuous activities or heavy exertion, as conditions dictate.

For additional information, call your local Air District office. In Tuolumne County, the phone number is 209-533-5693. In Mariposa, the phone number is 209-966-2220. In Modesto, the phone number is 209-557-6400. Fresno, 559-230-6000. Bakersfield, 661-381-1809.

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Tahoe DailyTribune, Dense Smoke Advisory extended, poor air quality expected through Sunday at Tahoe, *https://www.tahoedailytribune.com/news/dense-smoke-advisory-extended-smoke-expected-through-sunday-at-tahoe/*, September 12, 2020, last accessed 10/19/21.

Dense Smoke Advisory extended, poor air quality expected through Sunday at Tahoe

News FOLLOW NEWS | September 12, 2020

Staff Report FOLLOW
editor@tahoedailytribune.com

The view Saturday morning of the North Shore of Lake Tahoe from Diamond Peak Ski Resort.
Provided / Alertwildfire.org

The National Weather Service has extended its Dense Smoke Advisory through the weekend for the Lake Tahoe Basin.

NWS issued the extension Friday due to fire activity and a light westerly wind.

The wind will push smoke from multiple ongoing California wildfires into the region and is forecast to settle in area valleys overnight.

Poor air quality is expected to last through Sunday morning, although conditions could improve in the afternoon hours, especially in the basin and mountain ranges, but will likely deteriorate overnight as smoke settles, NWS officials said.

South Lake Tahoe has "good" air quality as of Saturday morning while it is "unhealthy" across the lake in Incline Village and Crystal Bay.

Officials say the smoke advisory will be lifted at 11 a.m. Sunday, fire conditions permitting.

Officials are advising people to stay indoors as much as possible when the smoke is present, especially those sensitive to poor air quality such as the elderly, kids and anyone with respiratory problems.

Check airnow.gov for the latest air quality information.

The fires nearest to the basin likely sending in all the smoke are the North Complex, Slink and Fork fires. The North Complex is burning about two-three hours northwest of Tahoe while the Fork and Slink fires are south to southwest of the basin. The Creek Fire in Fresno County well south of the basin has also chewed up nearly 200,000 acres and is just 6% contained.

The North Complex in the Plumas National Forest is now over 252,000 acres with 21% containment. There have been nine deaths. The complex has three fires, the Bear, Sheep and Claremont, being managed as one.

South Lake Tahoe Fire Rescue personnel were recently reassigned to support those on the front lines of the Bear Fire.

The Slink Fire near Coleville and Walker about 45 minutes south of Tahoe is at 25,131 acres but the spread has slowed and officials have it almost half way contained.

The Fork Fire several miles west of Tahoma and Tahoe's West Shore, and 15 miles northeast of Pollock Pines is at 1,647 acres and is 7% contained. Local evacuation orders are in effect.

As of Saturday morning, Cal Fire says there are over 16,000 firefighters on 28 major wildfires in the state. Thirteen new wildfires were sparked Friday, but just one grew beyond the control of the initial response, in Siskiyou County.

Officials said improved weather conditions helped increase containment numbers on all fires.

Since the beginning of the year, fires have burned over 3.2 million acres, which is larger than the state of Connecticut and over four times the size of Rhode Island.

Since Aug. 15 when the lightning siege began, there have been 19 deaths and over 4,000 structures destroyed.For information on how to prepare for wildfire, visit http://www.ReadyForWildfire.org.

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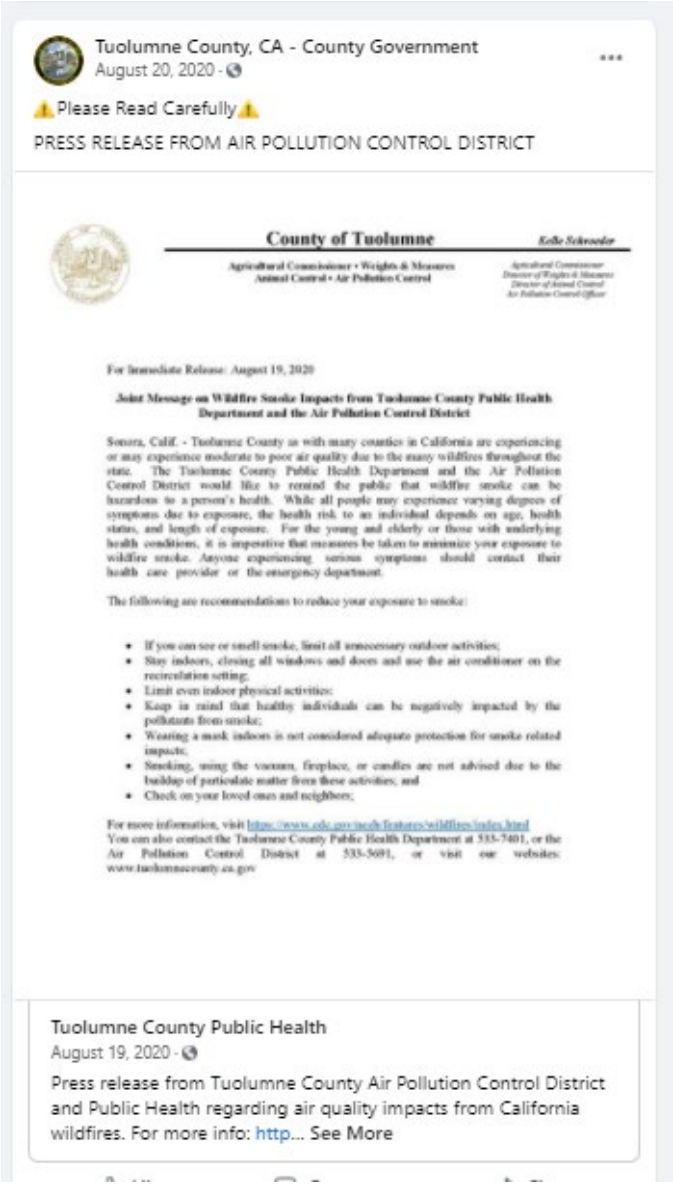
2. Social Media

a) District, County, State, and News Accounts

https://twitter.com/FeatherRiverAir/status/1296144565066326016

https://twitter.com/bcaqmd/status/1296488328959795201

https://www.facebook.com/552132464909545/photos/a.555617554561036/3173056586150440/



Tuolumne County, CA - County Government
August 20, 2020 ·

⚠️Please Read Carefully⚠️

PRESS RELEASE FROM AIR POLLUTION CONTROL DISTRICT

County of Tuolumne

Kelle Schroeder

Agricultural Commissioner • Weights & Measures
Animal Control • Air Pollution Control

Agricultural Commissioner
Director of Weights & Measures
Director of Animal Control
Air Pollution Control Officer

For Immediate Release: August 19, 2020

Joint Message on Wildfire Smoke Impacts from Tuolumne County Public Health Department and the Air Pollution Control District

Sonora, Calif. - Tuolumne County as with many counties in California are experiencing or may experience moderate to poor air quality due to the many wildfires throughout the state. The Tuolumne County Public Health Department and the Air Pollution Control District would like to remind the public that wildfire smoke can be hazardous to a person's health. While all people may experience varying degrees of symptoms due to exposure, the health risk to an individual depends on age, health status, and length of exposure. For the young and elderly or those with underlying health conditions, it is imperative that measures be taken to minimize your exposure to wildfire smoke. Anyone experiencing serious symptoms should contact their health care provider or the emergency department.

The following are recommendations to reduce your exposure to smoke:

- If you can see or smell smoke, limit all unnecessary outdoor activities;
- Stay indoors, closing all windows and doors and use the air conditioner on the recirculation setting;
- Limit even indoor physical activities;
- Keep in mind that healthy individuals can be negatively impacted by the pollutants from smoke;
- Wearing a mask indoors is not considered adequate protection for smoke related impacts;
- Smoking, using the vacuum, fireplace, or candles are not advised due to the buildup of particulate matter from these activities; and
- Check on your loved ones and neighbors;

For more information, visit https://www.cdc.gov/media/features/wildfires/index.html
You can also contact the Tuolumne County Public Health Department at 533-7401, or the Air Pollution Control District at 533-5691, or visit our websites: www.tuolumnecounty.ca.gov

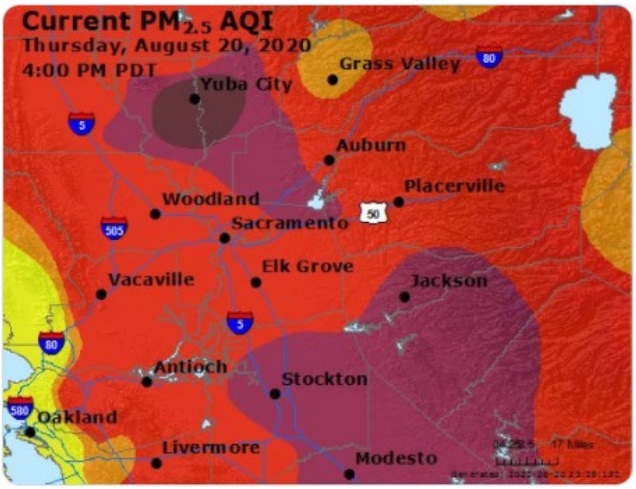
Tuolumne County Public Health
August 19, 2020 ·

Press release from Tuolumne County Air Pollution Control District and Public Health regarding air quality impacts from California wildfires. For more info: http... See More

https://twitter.com/FeatherRiverAir/status/1296592187837177856

Feather River AQMD
@FeatherRiverAir

The Air Quality Health Advisory has been extended through Sunday Aug 23. The Yuba/Sutter are is currently experiencing Unhealthy - Very Unhealthy AQI from wildfire smoke. Unhealthy AQI levels may continue through the weekend. For more information visit fraqmd.org



4:37 PM · Aug 20, 2020 · Twitter Web App

https://twitter.com/GoodDaySac/status/1296701573159149568

Good Day Sacramento
@GoodDaySac

Wildfire Smoke Causes Dangerous Air Quality Levels In Sacramento Region

gooddaysacramento.cbslocal.com
Wildfire Smoke Causes Dangerous Air Quality Levels In Sacramento Region
Regardless of where you live, you have probably seen the hazy skies and ash in the air.

https://www.facebook.com/552132464909545/photos/a.555617554561036/3175557802566985/

Tuolumne County, CA - County Government
August 20, 2020 ·

AIR QUALITY ALERT

Please read the Tuolumne County Public Health Post carefully and contact your Healthcare with any personal medical question you may have.

Stay Safe. Stay Healthy.

Tuolumne County Public Health
August 20, 2020 ·

Wildfire smoke continues to impact our area prompting Mariposa and Tuolumne County air pollution control districts to issue an Air Quality Alert:

This Air Quality Alert is in effect until the fires are extinguished.

Exposure to particle pollution can cause serious health problems, aggravate lung disease, cause asthma attacks and acute bronchitis,
and increase risk of respiratory infections.

Residents are advised to use caution as conditions warrant. People with heart or lung diseases should follow their doctor`s advice for dealing with episodes of unhealthy air quality.

Additionally, older adults and children should avoid prolonged exposure, strenuous activities or heavy exertion, as conditions dictate.

For additional information, call your local Air District office.
Mariposa 209-966-2220, Tuolumne 209-533-5693

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https://twitter.com/ABC7/status/1296826278721368066

https://twitter.com/NWSSacramento/status/1296790404550066179

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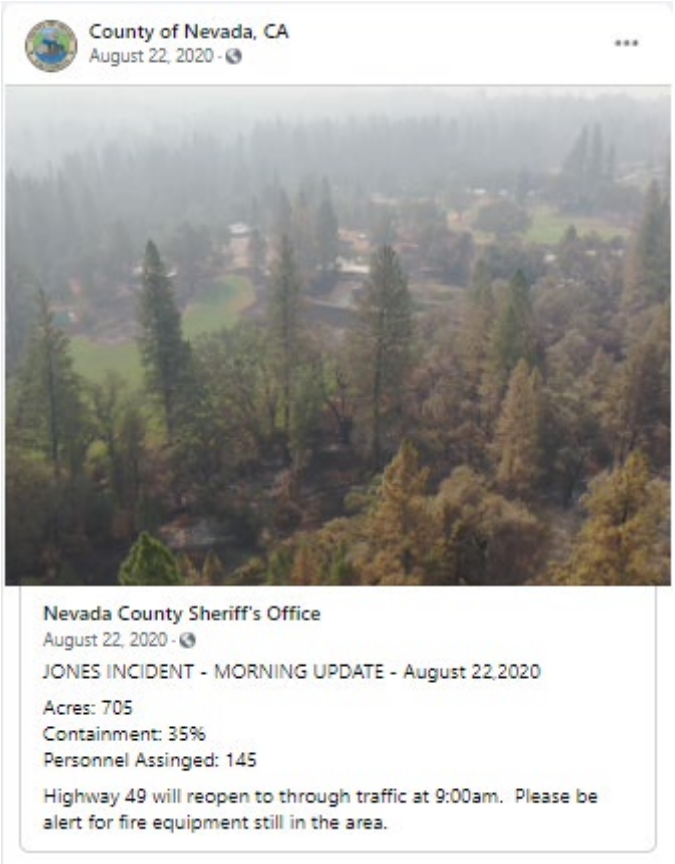

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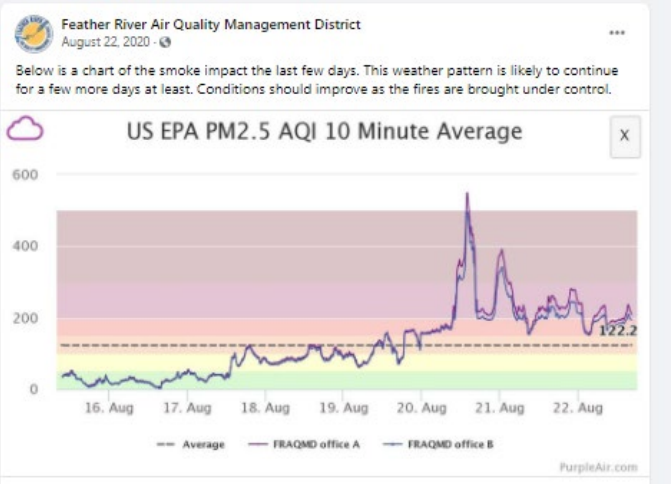

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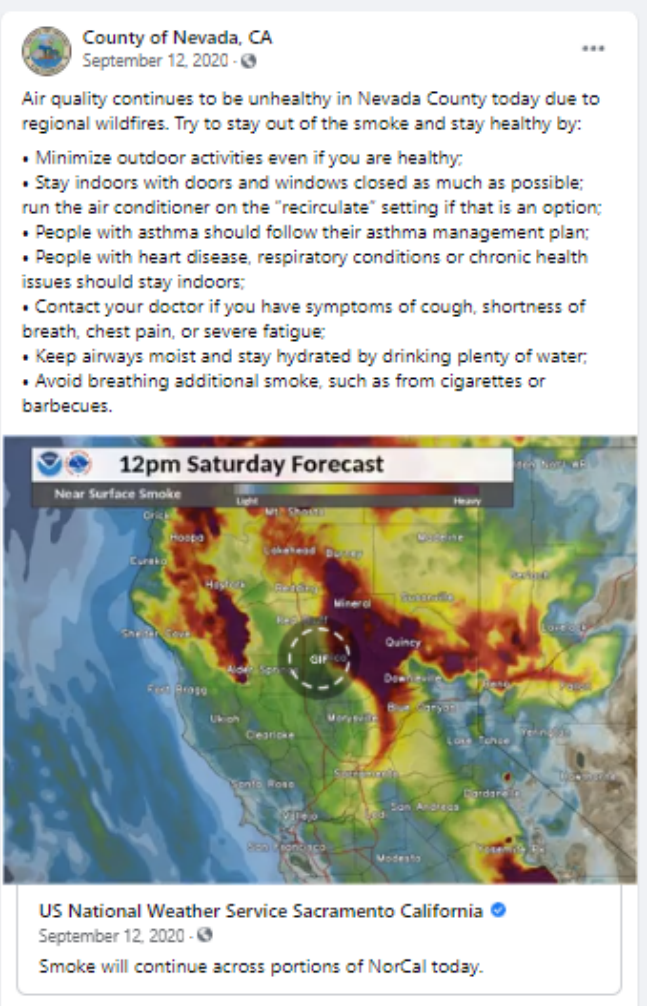
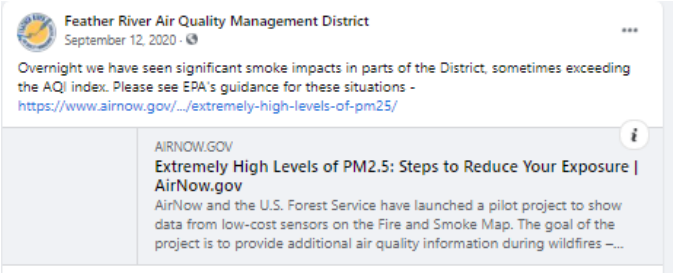


https://www.facebook.com/NWSSacramento

https://www.facebook.com/NWSSacramento

https://www.facebook.com/Feather-River-Air-Quality-Management-District



b) Citizen Accounts

https://twitter.com/Weather1224/status/1296491444404989955

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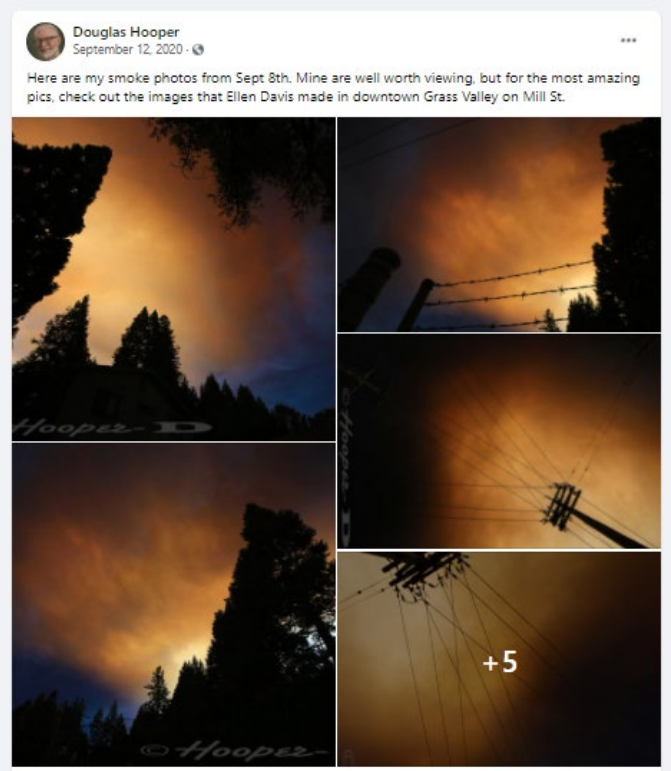

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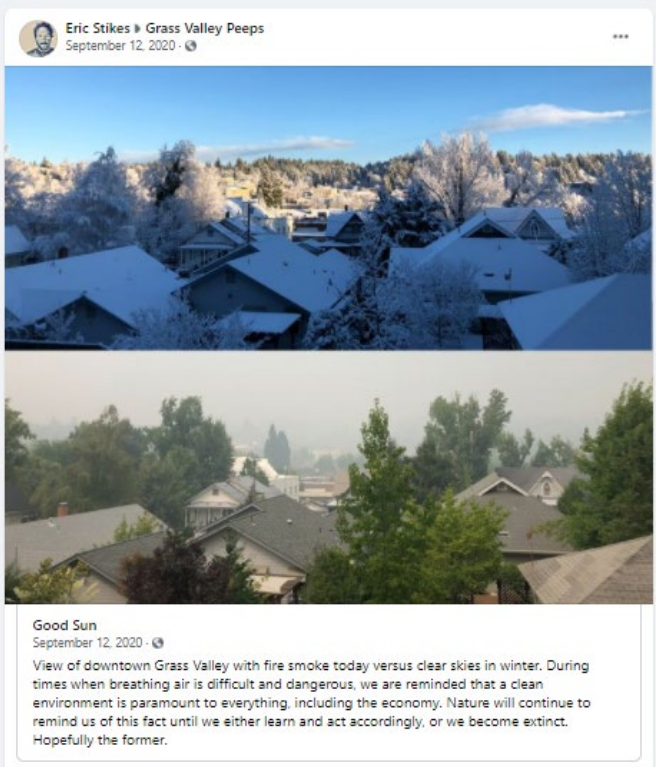

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