



# Anniversary of the 2017 Northern California Wildfires and Update on Wildfire Program Development

BAY AREA  
AIR QUALITY  
MANAGEMENT  
DISTRICT

**November 7, 2018**

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- Sunday, October 8, 2017, numerous wildfires started in Sonoma and Napa counties.
- Bay Area Air Quality Management District (Air District) provided support via air quality and smoke information, monitoring and N95 masks.
- Recurring and unprecedented wildfires throughout California has prompted a discussion on Air District role in wildfires.
- Staff is exploring and developing an Air District program for wildfire preparation, prevention, and response.



## **California North Bay wildfires:**

*Curbed SF Image credit: Photo by Justin Sullivan/Getty Images*



# Presentation Outline

- Discussion on wildfire events and air quality impacts.
- Health information on smoke impacts.
- Air District actions in response to wildfires.
- Next Steps.



The first house built in the Coffey Park neighborhood after a wildfire is seen at 1613 Kerry Lane on Sunday, March 18, 2018, in Santa Rosa, Calif. The neighborhood was devastated by the Tubbs Fire.  
Photo: Santiago Mejia / The Chronicle



# 2017 North Bay Wildfires

- On the evening of Sunday, October 8, 2018, numerous wildfires started in parts of Sonoma and Napa counties
- Air quality became unhealthy, continued for several days due to ongoing fires and persistent northerly winds
- Relatively narrow but dense smoke plumes resulted in highly-variable air quality conditions
- Air District updated air quality forecasts early on Monday, October 9, 2018 to reflect wildfire smoke effects
- Air District provided regular air quality updates to partner agencies and organizations that requested them



MODIS satellite image from Thursday 10/12/2017

# Summary of Daily Average PM<sub>2.5</sub> Concentrations (µg/m<sup>3</sup>)

Color Coded by AQI Category (numbers are in *concentration* units, not AQI)

	Sun 10/08	Mon 10/09	Tue 10/10	Wed 10/11	Thu 10/12	Fri 10/13	Sat 10/14	Sun 10/15	Mon 10/16
Napa	25	86	N/A <sup>1</sup>	160	102	215	39	57	35
Napa Valley College	42	134	243	132	113	186	28	27	33
Napa (temporary)				102	108	171	20	19	24
Sonoma (temporary)				53	79	120	87	18	35
Cordelia (temporary)						143	31	11	16
Petaluma (temporary)				29	30	39	31	16	29
Rohnert Park (temporary)					23	51	33	21	40
Sebastopol	4	57	82	26	20	34	18	20	50
San Rafael	10	75	66	29	56	40	26	10	15
Vallejo	11	34	73	66	80	102	18	11	17
San Francisco	15	35	46	25	50	35	21	10	23
San Pablo	12	43	69	33	59	71	26	11	33
Berkeley	9	24	42	30	47	49	21	12	24
Oakland West	12	29	35	34	55	56	23	13	31
Oakland East	11	19	21	45	58	70	28	11	19
Laney College	14	28	33	38	63	71	26	16	28
Concord	12	22	26	89	63	60	31	14	19
Livermore	9	19	18	38	34	23	9	10	14
Redwood City	N/A <sup>2</sup>	N/A <sup>2</sup>	30	46	61	58	25	10	20
San Jose Jackson	N/A <sup>2</sup>	N/A <sup>2</sup>	21	39	34	48	26	10	19
San Jose Knox	N/A <sup>2</sup>	N/A <sup>2</sup>	24	37	40	50	24	13	20
Gilroy	10	11	15	41	35	48	28	8	12

<sup>1</sup> Power/communications down at station

<sup>2</sup> Monitor undergoing maintenance

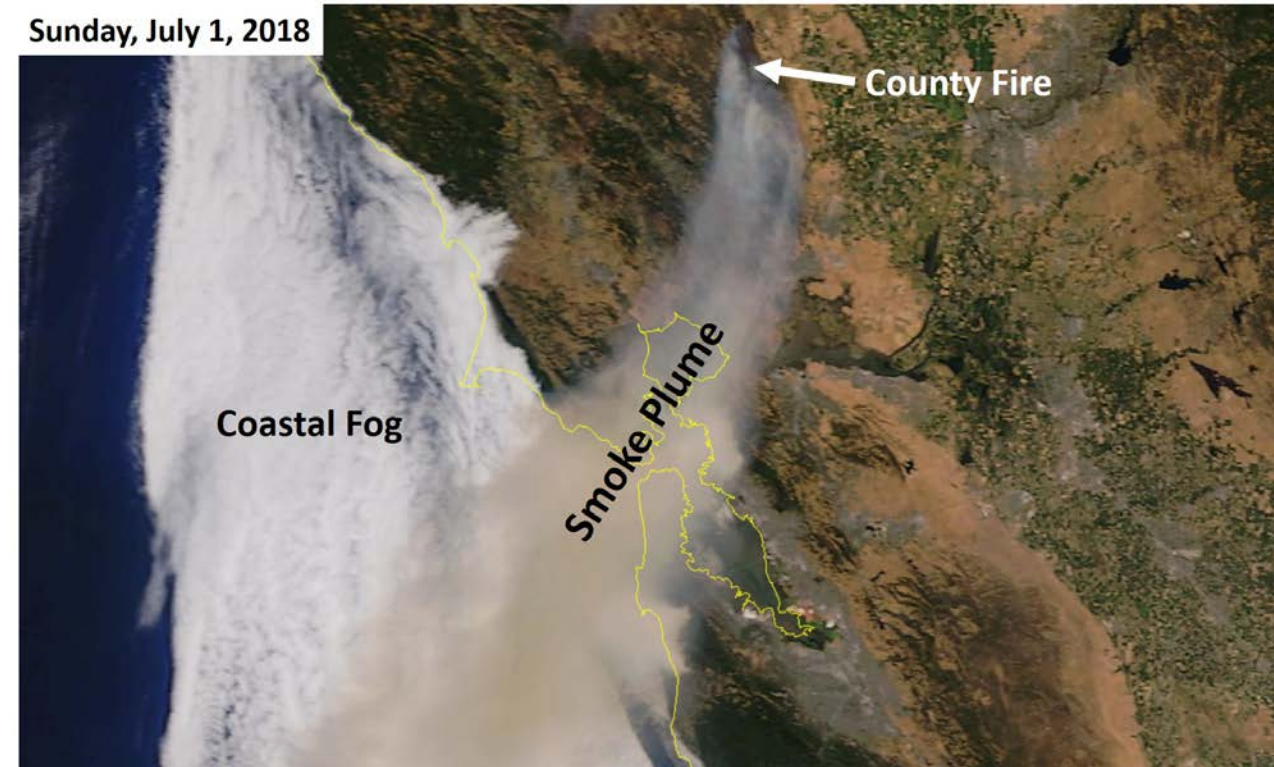
## October 2017

Air Quality Index	
	Good
	Moderate
	Unhealthy for Sensitive Groups
	Unhealthy
	Very Unhealthy
	Temporary Monitor – Not yet deployed



# County Fire, June 2018

- The County Fire started in the community of Guinda during the afternoon of June 30, 2018 in Yolo County
- Despite smoke moving over the Bay Area, air quality remained Good to low-Moderate
- A temperature inversion kept the smoke in the upper levels of the atmosphere



MODIS satellite image from Sunday 07/01/2018

# Summary of Daily Average PM<sub>2.5</sub> Concentrations (µg/m<sup>3</sup>)

Color Coded by AQI Category (numbers are in *concentration* units, not AQI)

	Sat 06/30	Sun 07/01	Mon 07/02	Tue 07/03	Wed 07/04	Thu 07/05	Fri 07/06
Napa	12	6	3	14	11	8	6
Sebastopol	9	2	1	12	10	4	3
San Rafael	11	6	4	16	9	6	6
Vallejo	12	6	4	16	11	7	5
San Francisco	12	5	4	15	11	9	6
San Pablo	15	6	5	18	12	8	8
Berkeley	13	4	6	14	12	8	10
Oakland West	17	9	5	11	9	7	8
Oakland East	11	4	5	12	21	9	7
Laney College	16	7	8	15	11	11	13
Concord	15	13	13	17	14	14	10
Livermore	9	7	6	7	12	10	6
Redwood City	13	6	7	8	10	14	8
San Jose Jackson	13	7	6	9	10	15	5
San Jose Knox	11	6	6	5	9	13	6
Gilroy	9	3	2	6	16	12	4

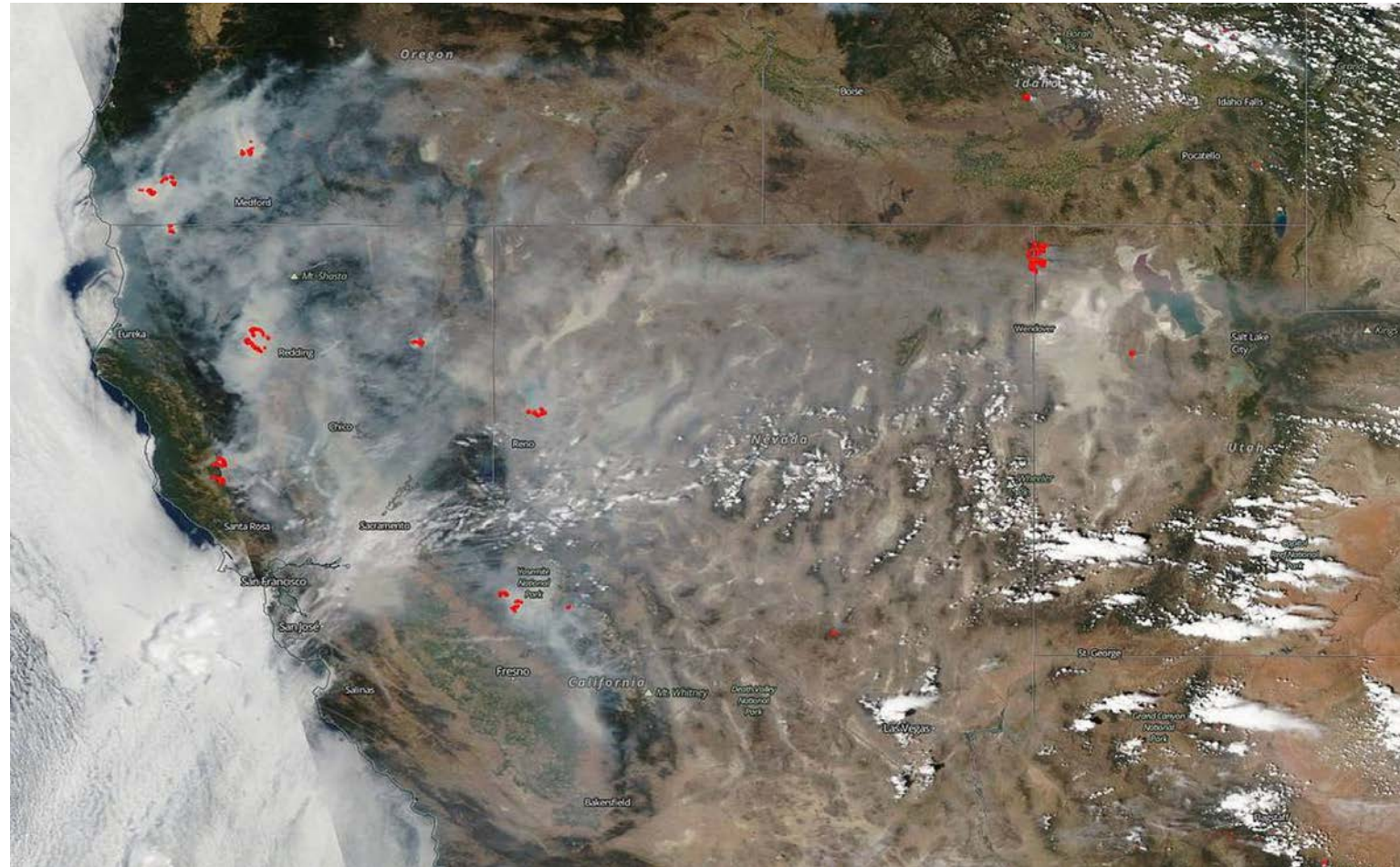
## June/July 2018

Air Quality Index	
	Good
	Moderate
	Unhealthy for Sensitive Groups
	Unhealthy
	Very Unhealthy



# Sunday, July 29, 2018

- A multi-fire event that included the Carr, Ferguson, and Mendocino Complex fires occurred from the latter part of July well into August across the Western U.S.
- Smoke impacts were felt at ground level as the smoke moved over the ocean, moved to lower levels of the atmosphere and moved in with coastal fog.





# Fires Visible from Space

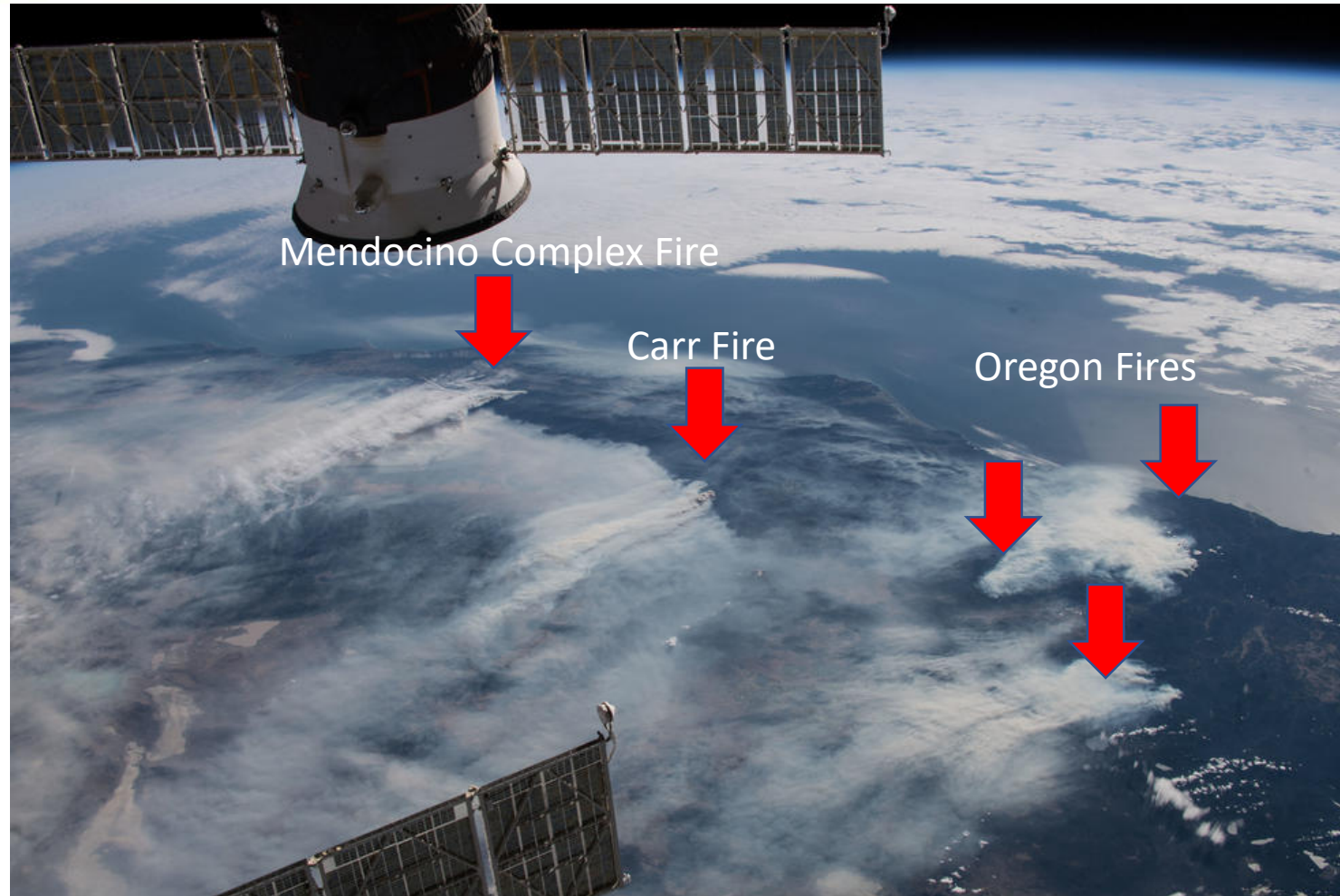


Image from the International Space Station taken on August 3, 2018 of Northern California.

# Summary of Daily Average PM<sub>2.5</sub> Concentrations (µg/m<sup>3</sup>)

Color Coded by AQI Category (numbers are in *concentration* units, not AQI)

	Tue 08/21	Wed 08/22	Thu 08/23	Fri 08/24	Sat 08/25	Sun 08/26
Napa	13	20	25	17	14	12
Sebastopol	11	19	15	14	9	9
San Rafael	12	25	34	18	14	13
Vallejo	13	22	32	20	15	13
San Francisco	14	27	46	20	17	14
San Pablo	16	27	42	20	14	15
Berkeley	13	27	42	17	12	11
Oakland West	10	25	45	20	21	17
Oakland East	12	26	42	19	15	13
Laney College	18	32	48	23	19	17
Concord	12	26	39	20	11	10
Livermore	14	23	41	24	17	13
Redwood City	9	19	44	18	16	14
San Jose Jackson	19	20	45	36	19	14
San Jose Knox	17	17	38	31	15	11
Gilroy	13	16	32	41	12	8

## August 2018

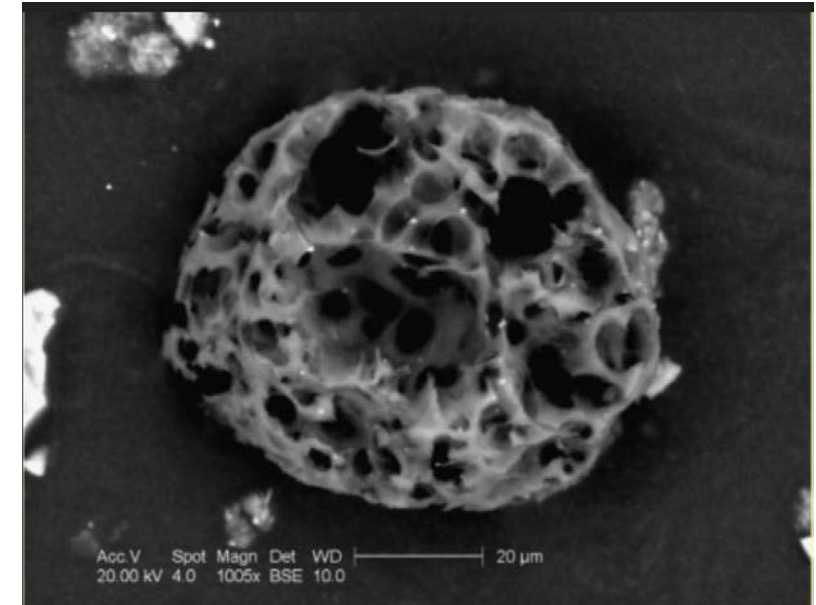
Air Quality Index	
	Good
	Moderate
	Unhealthy for Sensitive Groups
	Unhealthy
	Very Unhealthy



# Wildfire Smoke Compared to Ambient PM 2.5

## Wildfire particulate composition

- Fine particles and a mixture of various organic and inorganic gases
- Combustion products of trees
  - pine oils, eucalyptus
- Poison Oak and Ivy



Courtesy of CDPH Environmental Lab

## Urban wildfires - potentially higher concentrations of

- Metals – lead, chromium, arsenic, copper, mercury
  - from burned batteries, paint, electronics, solder, pipes
- PAHs - decomposition of plastics
- Asbestos, Fiberglass

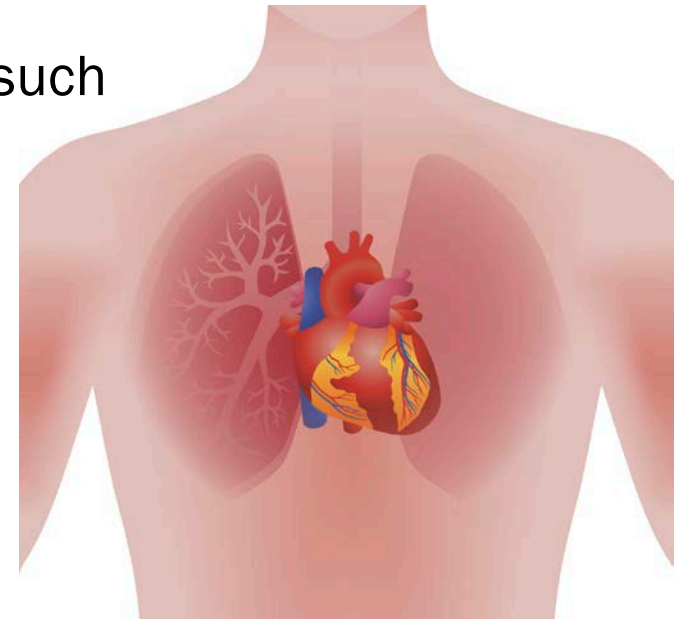
# Smoke Health Impacts

Exposure to high concentrations of smoke may cause:

- Irritation of eyes, nose, throat, airway and lungs
- Chest tightness, cough, wheezing and difficulty breathing

More serious effects may include:

- Exacerbation of pre-existing respiratory and cardiovascular disease, such as asthma, COPD, and heart failure
- Bronchitis – chronic inflammation of the airway
- Increased risk of heart attack and stroke





# Studies on Health Effects

- One 2016 study of the statewide 2015 wildfires found
  - Smoke exposure was associated with cardiovascular and cerebrovascular ED visits for all adults, especially those over age 65 yrs.
- Few studies available on long term health effects of wildfire smoke
  - High concentration, shorter duration exposures
- Multiple studies of health effects are currently underway:
  - UC Davis, UC Berkeley, Univ. of Montana, OEHHA



**A firefighter covers his eyes as he walks past a burning hillside in Santa Rosa, California, on Monday, October 9, 2017.**

Jeff Chiu/AP

# Improving Understanding and Communication

California Department of Public Health (CDPH) and EPA

- Publishing new updated guidance documents to aid county health officials
- CDPH conducted wildfire smoke webinars for health officials, public
- U.S. EPA has updated AirNOW website



The Air District is working with county health officers to improve coordination and communication:

- Consistent health messaging
- Improved notification of smoke advisories
- Exploring pilot projects to place air filters in cooling/clean air centers

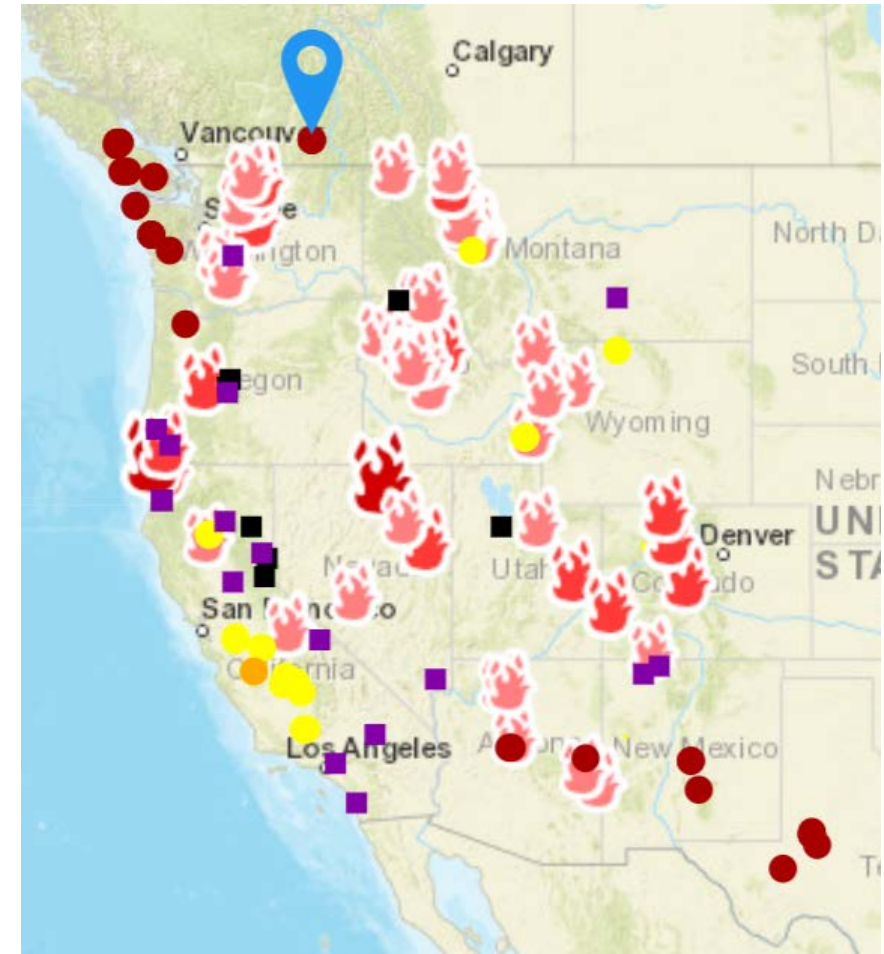




# 2018 Wildfire Season

## Communications Office - Better messaging focused following 2017 North Bay Wildfires

- Developed better approach to messaging about smoke - Air Quality Alerts
- Air Quality Alert vs Spare the Air Alert - Worked with Meteorology to determine when to call, under what conditions
- Met with ABAHO Public Health PIO's - How do we partner on messaging
- Work in progress - Improving message delivery to other city/county PIO's





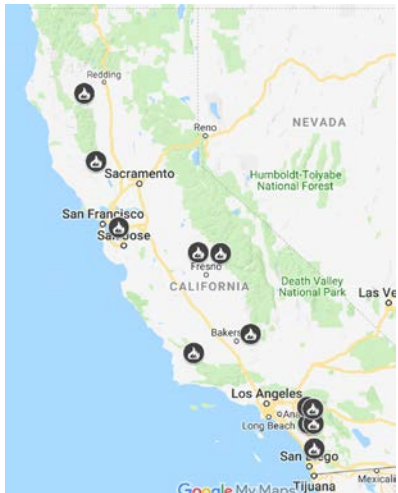
# Summer 2018 CalFire Incidents



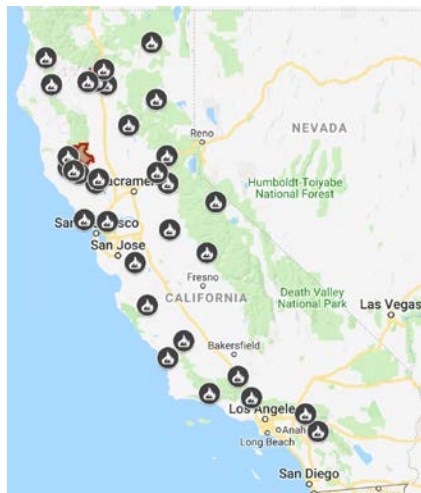
June 2018



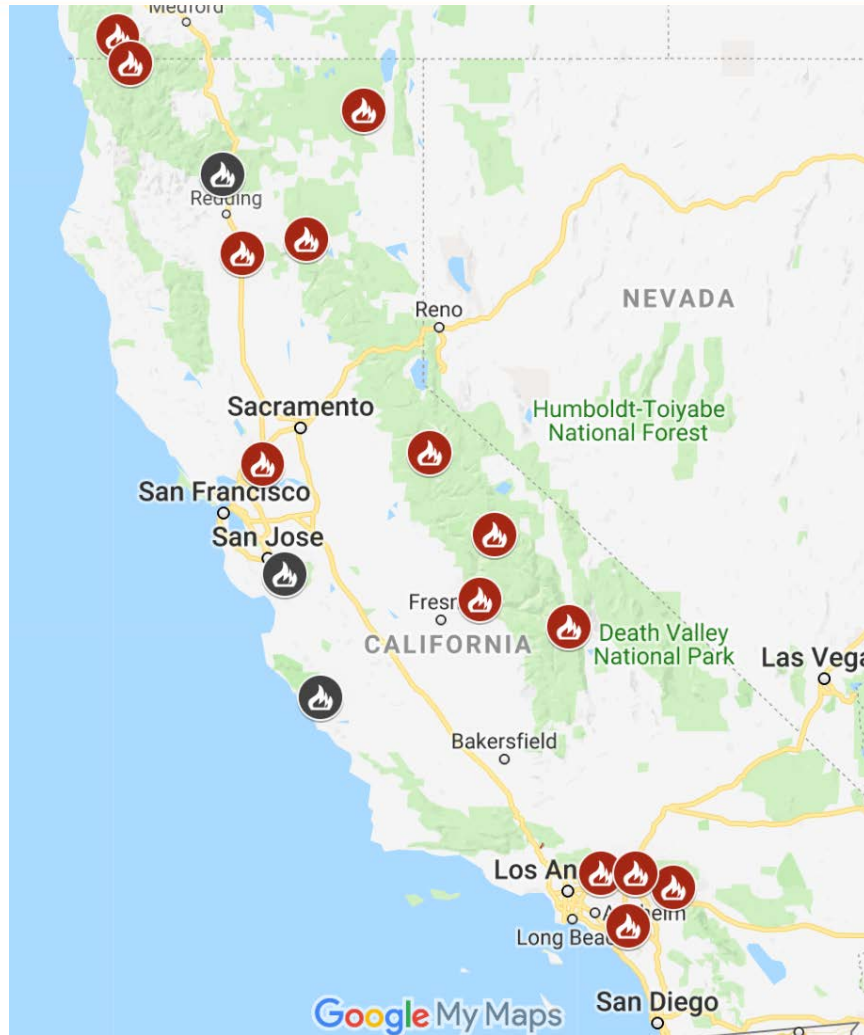
July 2018



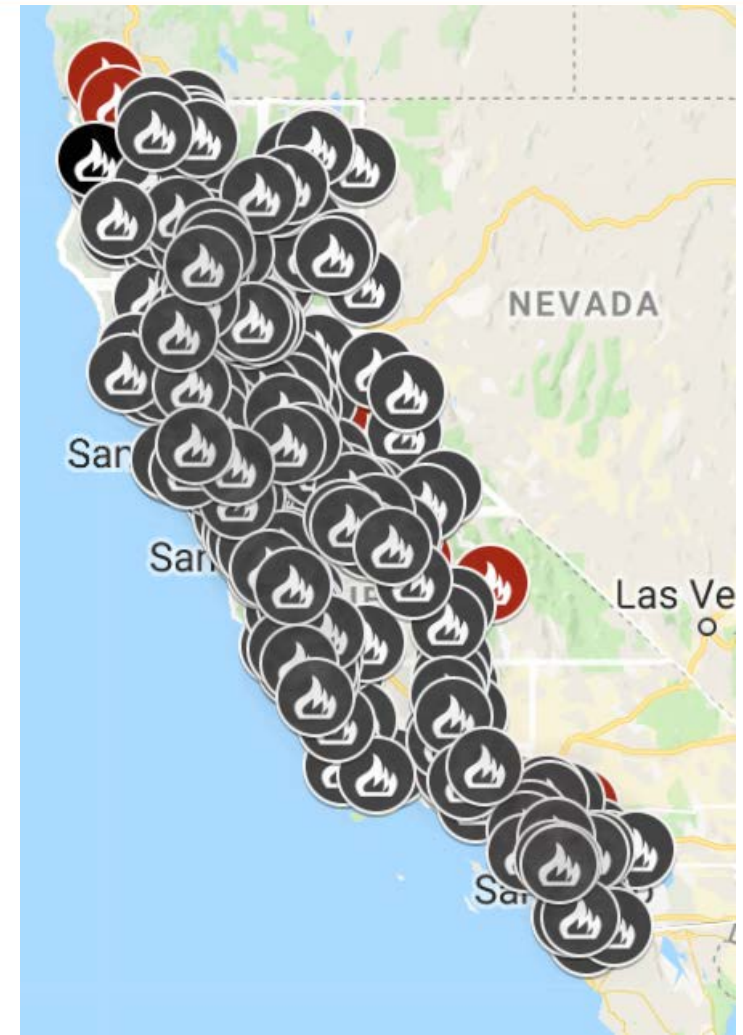
August 2018



September 2018



Active CalFire Incidents 2018



Statewide Incidents Summer 2018



# Lessons Learned

- Weather complexity makes forecasting impacts difficult.
- Deploy air monitoring and report data quickly.
- Must focus on fire prevention measures.
- Continue to develop, improve and maintain relationships with other agencies.
- Develop consistent and improved messaging.



# Actions to Date

Improving forecasting by tracking smoke from all fires with potential impact in the western US



Working with US EPA and CA to develop wildfire response plans and messaging programs



Improving coordination and messaging with county health and response agencies



Developing a wildfire program strategy to prepare, prevent and respond to wildfires



# Example: Health Guidance Document



## Public Health Guidance: School Outdoor Activities During Wildfire Events

Check the local Air Quality Index (AQI) online (<http://www.deq.state.or.us/air/>) and do a visual inspection outside.\* Compare the AQI and visibility test to determine the air conditions in your community. Then, use the guide below to determine activity level for your students.\*\*

Air Quality Index	Visibility Scale	Recess (15 min)	P.E. (1 hr)	Athletic events and practices (2–3 hrs)
<b>Good</b>	Over 5 miles	Great day to be active outdoors!	Great day to be active outdoors!	Great day to be active outdoors!
<b>Moderate</b>	5–15 miles	It is a good day for students to be active outside. <ul style="list-style-type: none"> <li>• Watch students who are unusually sensitive to air pollution for symptoms of shortness of breath or coughing.</li> </ul>	<ul style="list-style-type: none"> <li>• Watch students who are unusually sensitive to air pollution.</li> <li>• Look for symptoms of shortness of breath or coughing.</li> <li>• Monitor symptoms and reduce or cease activity if symptoms arise.</li> </ul>	<ul style="list-style-type: none"> <li>• Watch students who are unusually sensitive to air pollution.</li> <li>• Look for symptoms of shortness of breath or coughing.</li> <li>• Increase rest periods and make substitutions for these students as needed.</li> <li>• Monitor symptoms and reduce or cease activity if symptoms arise.</li> </ul>
<b>Unhealthy for sensitive groups</b>	3–5 miles	It is an OK day for students to be active outside. <ul style="list-style-type: none"> <li>• Allow students who are unusually sensitive to air pollution to stay indoors if they'd like.</li> </ul>	<ul style="list-style-type: none"> <li>• Move activities indoors for students sensitive to air pollution.</li> <li>• Limit other students to light outdoor activities or move the activities indoors.</li> <li>• Increase rest periods and make substitutions.</li> <li>• Monitor symptoms and reduce or cease activities if symptoms arise.</li> </ul>	<ul style="list-style-type: none"> <li>• Move activities indoors for students sensitive to air pollution.</li> <li>• Limit other students to light outdoor activities or move the activities indoors.</li> <li>• Increase rest periods and make substitutions.</li> <li>• Monitor symptoms and reduce or cease activities if symptoms arise.</li> </ul>
<b>Unhealthy</b>	1–3 miles	<ul style="list-style-type: none"> <li>• Consider keeping all students indoors or allowing only light outdoor activity.</li> <li>• Move activities indoors for students sensitive to air pollution.</li> </ul>	<ul style="list-style-type: none"> <li>• Move activities indoors for students sensitive to air pollution.</li> <li>• Consider moving all activities indoors.</li> <li>• Limit all students to light activities.</li> <li>• Increase rest periods and make substitutions.</li> </ul>	Consider any of the following: <ul style="list-style-type: none"> <li>• Cancel the event.</li> <li>• Move the event indoors.</li> <li>• Postpone the event.</li> <li>• Move the event to an area with "good" air quality.</li> </ul>
<b>Very unhealthy/hazardous</b>	1 mile or less	Keep all students indoors.	<ul style="list-style-type: none"> <li>• Move all activities indoors.</li> <li>• Limit all students to light activities.</li> <li>• Increase rest periods and make substitutions.</li> </ul>	Do any of the following: <ul style="list-style-type: none"> <li>• Cancel the event.</li> <li>• Move the event indoors.</li> <li>• Postpone the event.</li> <li>• Move the event to an area with "good" air quality.</li> </ul>

\* If you get conflicting results when you compare the AQI to your visual inspection, err on the side of caution. Follow the recommendations for the worse of the two assessments.

\*\*Students with asthma action plans should follow them closely. They should monitor their breathing and exposure to wildfire smoke. Anyone experiencing symptoms should contact a health care provider for further advice. They should call 911 in an emergency.



# Air District Next Steps

- Continue to improve forecasting.
- Continue to work with CARB to locate temporary monitors.
- Enhance monitoring capabilities.
- Utilize sensor technology when applicable.
- Improve smoke health effects guidance and actions information.
- Enhance partnership by integrating Air District, federal and state programs.
- Continue to build coordination capability with local agencies.
- Develop guidance for masks and clean air locations.
- Define and address Air District role in wildfire response.
- Amend/develop regulations and guidance to aid in preparing, preventing, and responding to wildfires.



# Summary of Ozone Seasons

Year	National 8-Hour	State 1-Hour	State 8-Hour
2015*	5	4	11
2016	15	5	15
2017	6	6	6
2018	3	2	3

Spare the Air Alerts: 6/22/18, 6/23/18, 6/30/18, 7/26/18, 8/8/18, 8/9/18, 8/18/18, 8/19/18, 8/23/18, 8/24/18, 9/3/18, 9/25/18, 9/26/18

Days > 0.070 ppm 8-hour NAAQS: 8/3/18, 8/9/18, 8/18/18

\*Based on NAAQS of 0.075 ppm that was in place during that year

# Winter PM<sub>2.5</sub> Seasons

Year	Days > 35 µg/m <sup>3</sup>	Winter Spare the Air Alerts
2014/2015	6	23
2015/2016	0	1
2016/2017	0	7
2017/2018	8	19

- Spare the Air Alert Called for: 12/8/17 – 12/15/17, 12/22/17 – 12/26/17, 12/29/17 – 12/31/17, 1/1/18, 1/2/18, 1/15/18
- Days > 35 µg/m<sup>3</sup> 24-hr NAAQS: 12/15/17, 12/24/17, 12/30/17, 12/31/17, 1/1/18, 1/2/18, 1/3/18, 1/4/18



# Calendar Year Summary

Year	National Ozone Exceedances	Days > 35 $\mu\text{g}/\text{m}^3$ due to Wildfires ( $\text{PM}_{2.5}$ )	Total Days > 35 $\mu\text{g}/\text{m}^3$ ( $\text{PM}_{2.5}$ )
2014	5*	0	3
2015	5*	3	9
2016	15	0	0
2017	6	14	18
2018	3	2	6

For Ozone - Days > 0.070 ppm 8-hour NAAQS: 08/03/18, 8/9/18, 8/18/18

\* Based on NAAQS of 0.075 ppm that was in place during those years

For Wintertime - Days > 35  $\mu\text{g}/\text{m}^3$  24-hr NAAQS: 12/15/17, 12/24/17, 12/30/17, 12/31/17, 1/1/18, 1/2/18, 1/3/18, 1/4/18

(Other exceedances occurred due to wildfires outside of the November 1 – February 28 timeframe)