EPA Tools for Wildfire Smoke Events

2020 CARB Fire Preparedness Meeting

July 14, 2020

EPA REGION 9 AIR DIVISION SMOKE TEAM

Updated July 2020

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The EPA Region 9 Smoke Team is housed in the Air Division. The team meets monthly to coordinate smoke-related issues from wildfires, prescribed burns, and residential wood smoke. We focus on regulatory oversight, public health, science, outreach, and, to a limited extent, wildfire response as Air Resource Advisors through the USFS' Wildland Fire Air Quality Response Program. Team coordination responsibility rotates biannually. The team coordinates with other programs, including emergency response, NEPA, and sustainable communities.

EPA's Role in Wildfire Preparedness, Response & Recovery

Preparedness

- Coordination with Partners
- Trainings, Conferences and Workshops
- Outreach Tools and Communications
- Research
- Funding

Response

- AirNow
- Participation in the Air Resource Advisor program
- Protection of superfund sites, hazardous waste sites, drinking water systems

Recovery

- Household Hazardous Waste and asbestos Cleanup

EPA Wildfire Smoke Resources

SMOKE-READY TOOLBOX FOR WILDFIRES

EPA United States Environmental Protection Agency

Environmental Topics | Laws & Regulations | About EPA | Search EPA.gov

Related Topics: Air Research | CONTACT US | SHARE

Smoke Ready Toolbox for Wildfires

Wildland fires produce air pollution that impacts people's health and other aspects of daily life. The increased frequency and intensity of wildfires in the United States are adversely affecting air quality and putting more people at a health risk from exposure to smoke. Public health officials can use the resources in the Smoke Ready Toolbox to help educate the public about the risks of smoke exposure and actions people can take to protect their health.

Smoke and Your Health

- Wildfire Smoke Frequently Asked Questions
- How Smoke from Fires Can Affect Your Health
- Particle Pollution and Your Patients' Health Course
- More Information

Guides, Fact Sheets, and Other Resources

- Air Quality Guide for Particle Pollution
- More Information

AirNow

Air Quality Conditions and Forecasts

- AirNow
- AirNow current fire conditions
- More Information

Wildfire Smoke Guide

- Wildfire Smoke: A Guide for Public Health Officials

Wildfire Smoke and COVID-19 Resources

- Wildfire Smoke and COVID-19: Frequently Asked Questions and Resources for Air Resource Advisors and Other Environmental Health Professionals
- COVID-19 Considerations for Cleaner Air Shelters and Cleaner Air Spaces to Protect the Public from Wildfire Smoke
- Natural Disasters and Severe Weather
- Interim Guidance for General Population Disaster Shelters During the COVID-19 Pandemic
- FAQs for Wildland Firefighters
- Environmental Health Assessment Form for Disaster Shelters

Indoor Air Quality and COVID-19

EPA Wildfire Smoke Resources

Wildfire Smoke and Your Patient's Health Course (CEs)

Wildfire Smoke and Your Patients' Health

CONTACT US SHARE

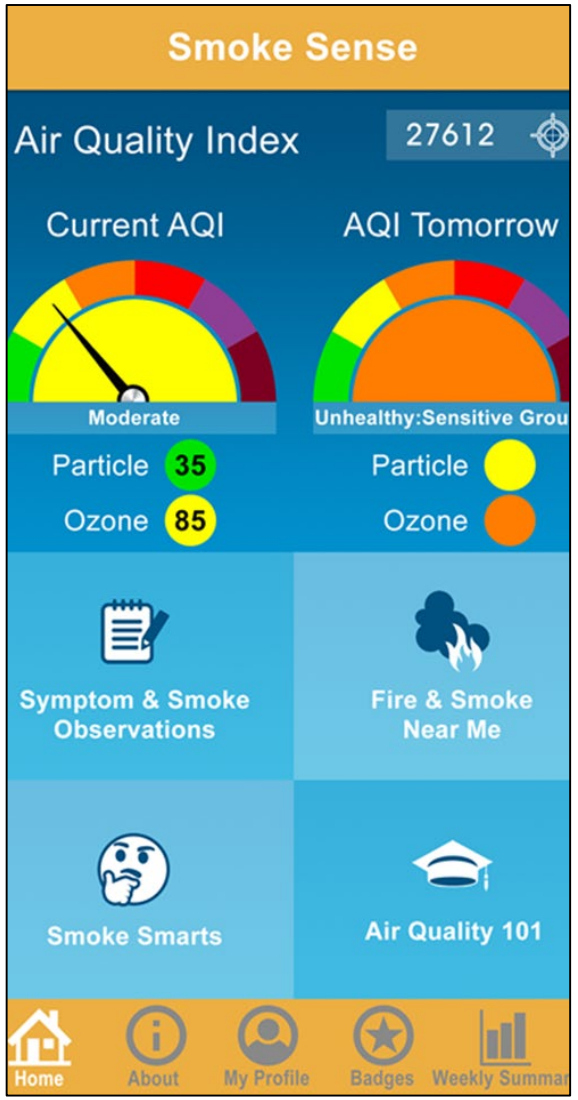
This course is intended for physicians, registered nurses, asthma educators and others involved in clinical or health education.

EPA Wildfire Smoke Resources

Smoke Sense App

- Smoke Sense is a citizen science initiative that makes smoke and health resources easily available on android and iOS devices
- Available since summer 2017 -- over 24,000 users from across the U.S.
- Access to current and forecast AQI, fire and smoke conditions, and education
- Record health symptoms and smoke observations (optional)
- Now available in Spanish and Commission for Environmental Cooperation looking to expand Smoke Sense to Canada and Mexico

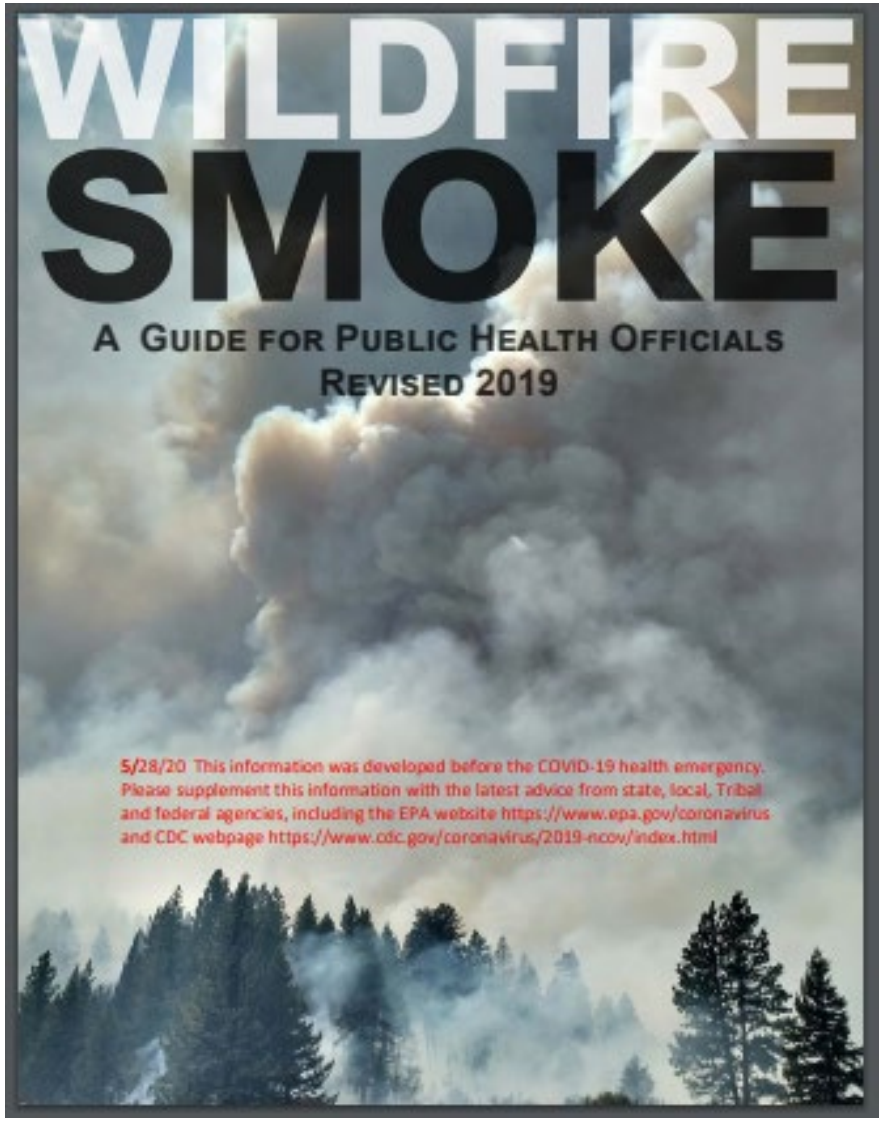
Smoke Sense



EPA Wildfire Smoke Resources

Wildfire Smoke: A Guide for Public Health Officials

A guide designed to help local public health officials prepare for smoke events, take measures to protect the public when smoke is present and communicate with the public about wildfire smoke and health.

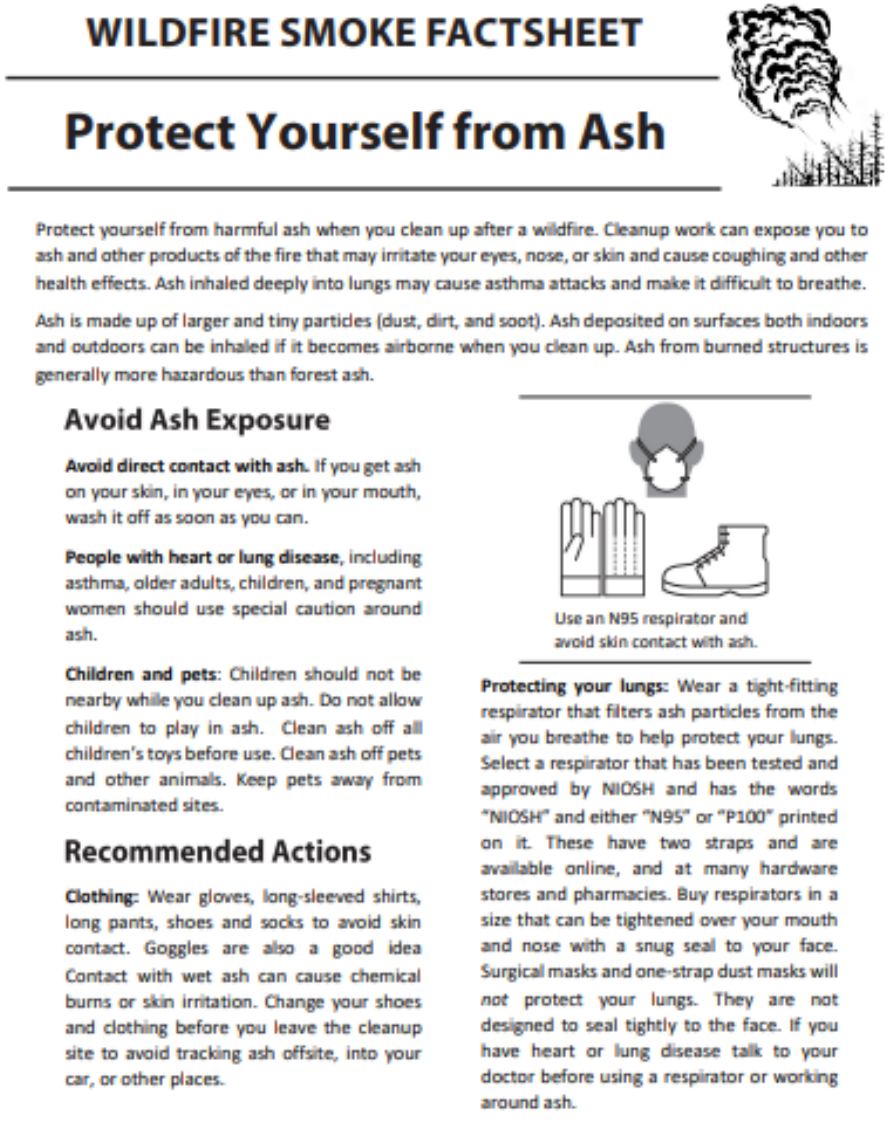


EPA Wildfire Smoke Resources

Wildfire Smoke Guide: Fact Sheets

Health Fact Sheets

- Reduce Your Smoke Exposure
- Protecting Children from Wildfire Smoke and Ash
- Protect Your Pets from Wildfire Smoke
- Protect Your Large Animals and Livestock from Wildfire Smoke
- Respiratory Protection
- Protect Yourself From Ash
- Indoor Air Filtration
- Prepare for Fire Season
- Asthma and Outdoor Air Pollution
- What Health Care Providers Should Know About Air Pollution and Cardiovascular Risk
- Heart Disease, Stroke and Air Pollution



WILDFIRE SMOKE FACTSHEET

Protect Yourself from Ash

Protect yourself from harmful ash when you clean up after a wildfire. Cleanup work can expose you to ash and other products of the fire that may irritate your eyes, nose, or skin and cause coughing and other health effects. Ash inhaled deeply into lungs may cause asthma attacks and make it difficult to breathe.

Ash is made up of larger and tiny particles (dust, dirt, and soot). Ash deposited on surfaces both indoors and outdoors can be inhaled if it becomes airborne when you clean up. Ash from burned structures is generally more hazardous than forest ash.

Avoid Ash Exposure

Avoid direct contact with ash. If you get ash on your skin, in your eyes, or in your mouth, wash it off as soon as you can.

People with heart or lung disease, including asthma, older adults, children, and pregnant women should use special caution around ash.

Children and pets: Children should not be nearby while you clean up ash. Do not allow children to play in ash. Clean ash off all children's toys before use. Clean ash off pets and other animals. Keep pets away from contaminated sites.

Recommended Actions

Clothing: Wear gloves, long-sleeved shirts, long pants, shoes and socks to avoid skin contact. Goggles are also a good idea Contact with wet ash can cause chemical burns or skin irritation. Change your shoes and clothing before you leave the cleanup site to avoid tracking ash offsite, into your car, or other places.

Use an N95 respirator and avoid skin contact with ash.

Protecting your lungs: Wear a tight-fitting respirator that filters ash particles from the air you breathe to help protect your lungs. Select a respirator that has been tested and approved by NIOSH and has the words "NIOSH" and either "N95" or "P100" printed on it. These have two straps and are available online, and at many hardware stores and pharmacies. Buy respirators in a size that can be tightened over your mouth and nose with a snug seal to your face. Surgical masks and one-strap dust masks will *not* protect your lungs. They are not designed to seal tightly to the face. If you have heart or lung disease talk to your doctor before using a respirator or working around ash.

COVID-19 and Smoke

https://www.airnow.gov/wildfire-guide-post-publication-updates/

Wildfire Guide Post-Publication Updates

This web page is for Wildfire Smoke Guide authors and contributors will post fact sheets, web links, and other new information developed since 2019. The goal is to provide public health officials with the latest information between revisions of the Guide.

Wildfire Preparedness and Response during COVID-19

- CDC - Wildfire Smoke and COVID-19: Frequently Asked Questions and Resources for Air Resource Advisors and Other Environmental Health Professionals
- CDC - COVID-19 Considerations for Cleaner Air Shelters and Cleaner Air Spaces to Protect the Public from Wildfire Smoke
- CDC - Natural Disasters and Severe Weather
- CDC - Interim Guidance for General Population Disaster Shelters During the COVID-19 Pandemic
- CDC - FAQs for Wildland Firefighters
- CDC - Environmental Health Assessment Form for Disaster Shelters

Indoor Air Quality and COVID-19

- EPA - Frequent Questions about Indoor Air and Coronavirus (COVID-19)

Other Smoke and COVID-19 Related Materials

- CDC - Open Burning during the COVID-19 Pandemic

Due to the intersection of wildfire smoke and COVID-19 during the pandemic, below are general resources from CDC about COVID-19:

- How to protect yourself and what to do if you are sick
- COVID-19 Communication Materials (posters, handouts, flyers, videos)

COVID-19 and Smoke

www.epa.gov/coronavirus/frequent-questions-about-indoor-air-and-coronavirus-covid-19

Frequent Questions about Indoor Air and Coronavirus (COVID-19)

View all frequent questions related to indoor air and Coronavirus (COVID-19) below.

Return to Frequent Questions about Coronavirus (COVID-19).

Indoor Air

Will an Ozone Generator protect me and my family from COVID-19?

Is there HVAC guidance that building and maintenance professionals can follow to help protect from COVID-19?

Where can professionals who manage school, office, and commercial buildings get information on ventilation and filtration to respond to COVID-19?

Will an air cleaner or air purifier help protect me and my family from COVID-19 in my home?

How can I increase ventilation at home to help protect my family from COVID-19?

Can running the HVAC system in my home help protect me from COVID-19?

Wildfire Smoke Resources – **UNDERWAY**

- CDC COVID-19 Supplement to Wildfire Smoke Guide

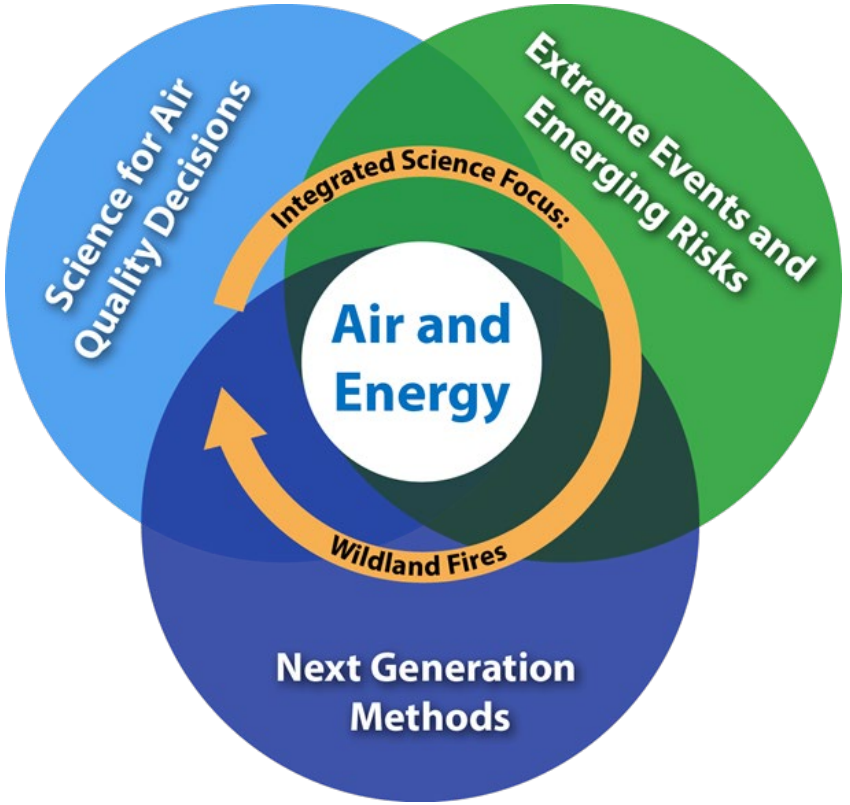
  Use in Conjunction With Existing Wildfire Smoke Guide and supplemental COVID-19 guidance

- Respirator and Face Covering Infographic
- White Paper on Children's Health and Wildfires (PEHSU)
- Outputs from 3 Workgroups on Children's Health and Wildfire Smoke

Current EPA Wildfire Research Efforts

Cross-cutting ORD Wildfire Research Framework

- Smoke Sense Study and Mobile Application
- Solutions-Driven Research Pilot: Evaluating Clean Air Spaces: Hoopa and Missoula Sensor Studies
- Evaluating commercial, DIY, and solar-powered air cleaners
- Wildfire Sensors Challenge and Sensors Field Testing
- Wildfire Smoke Challenge: Creating Clean Air Spaces
- Mobile Ambient Smoke Investigation Capability (MASIC) Monitoring Study
- And more!



Current EPA Wildfire Research Efforts

US EPA-led research efforts

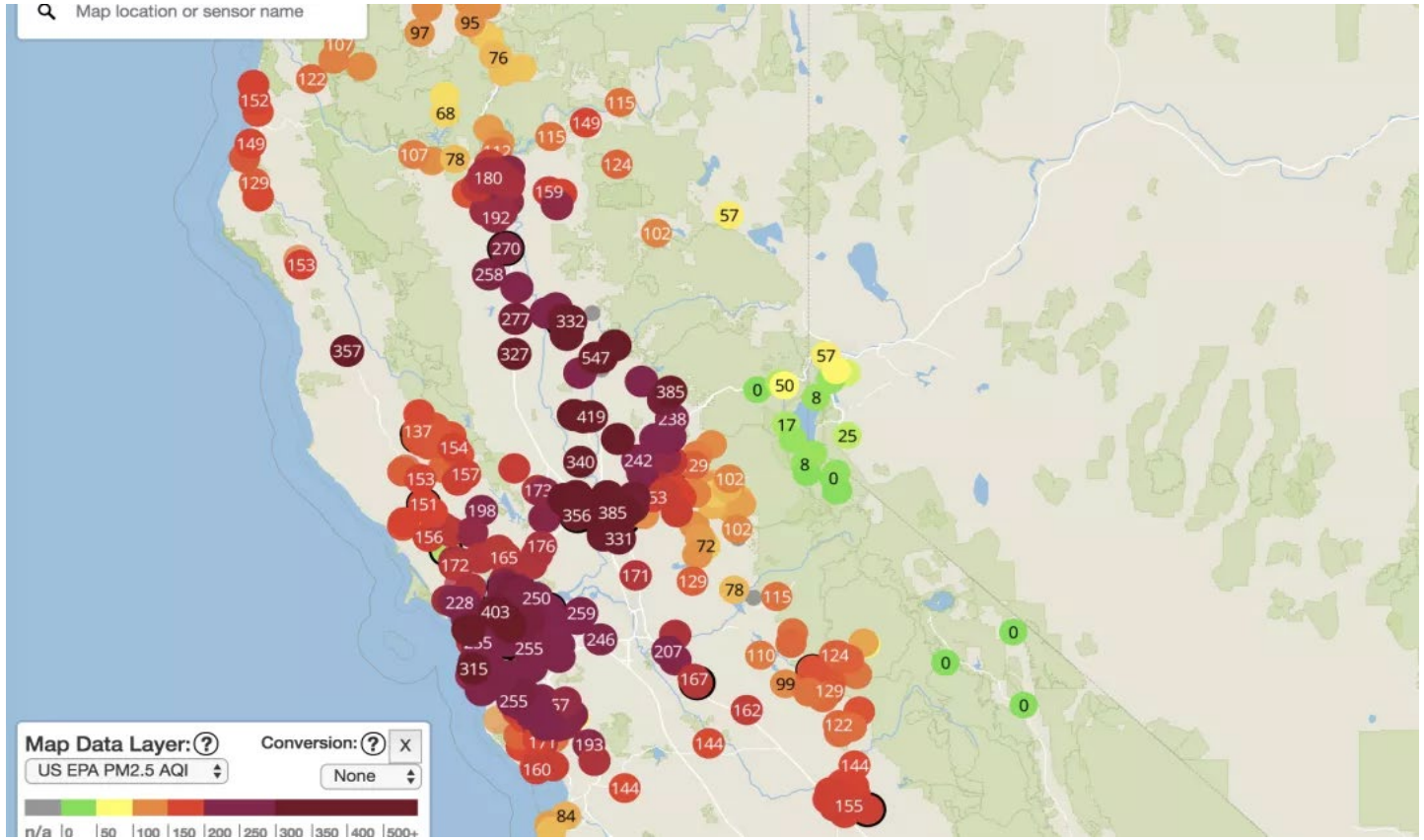
- Region 7 project measuring emissions from grassland prescribed fires in central Kansas (2017)
- **Regions 9/10 project deploying $PM_{2.5}$ sensors at large fires in the western U.S. (2018-2020)**
- Region 4 project measuring emissions and plume extent from prescribed fire in the southeast (2019-2020)

EPA studies are in coordination with and inform studies led by the Joint Fire Science Program, NSF, NOAA, and NASA

WE-CAN | **FIREX-AQ** | **FASMEE**

Regions 9/10 project deploying $PM_{2.5}$ sensors at large fires in western U.S. (2018-2020)

Project Objective: Evaluate low-cost PM sensors during wildfire/prescribed fire smoke impacted times



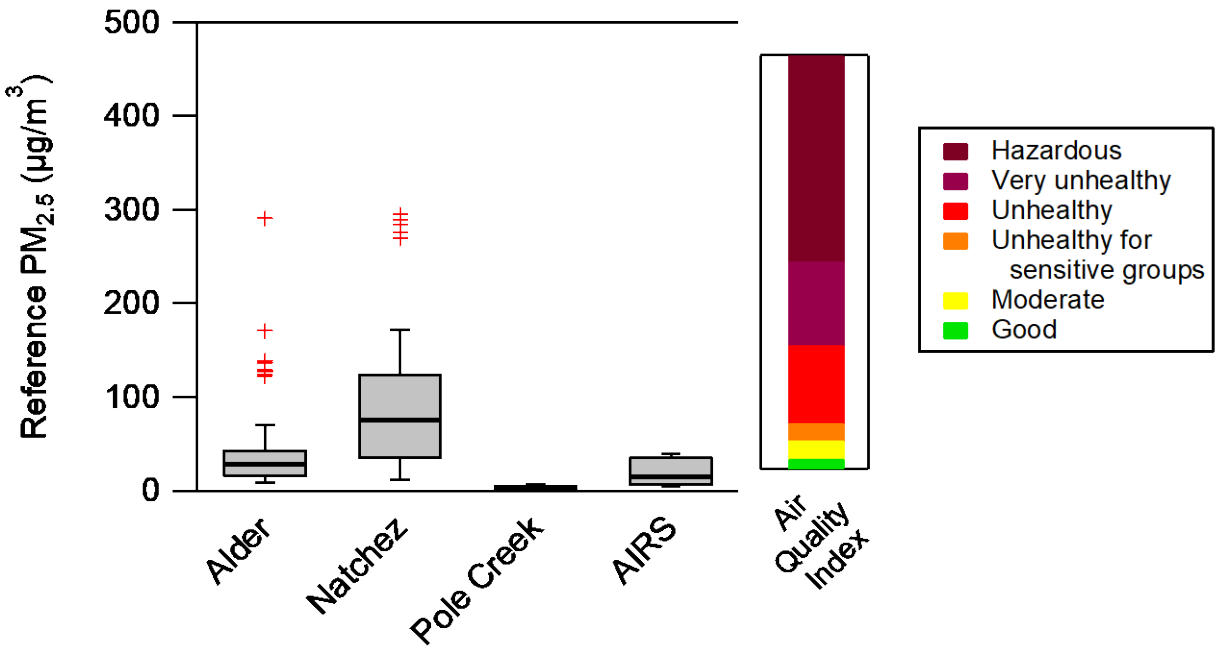
PurpleAir Map November 15 2018 (Camp Fire)

Happy Camp – Natchez Fire, August 2018

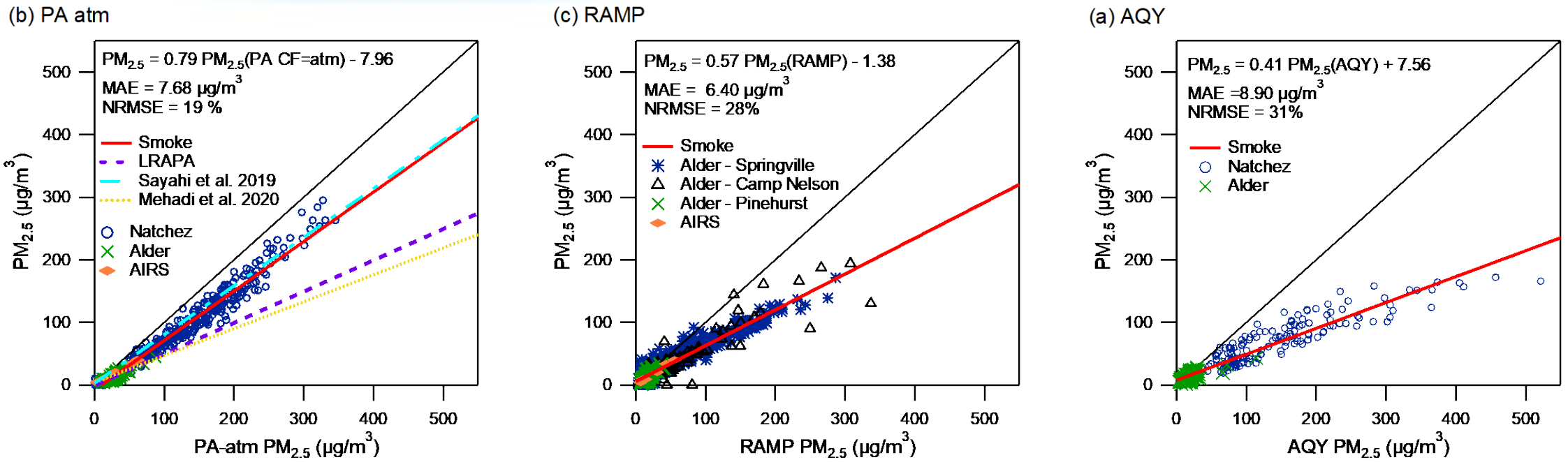
Regions 9/10 project deploying $PM_{2.5}$ sensors at large fires in western U.S. (2018-2020)

Collocated with various references at fires in different locations across the US

Event	Location	Dates	Reference Instrument	Sensors Deployed
AIRS (ambient, prescribed fire)	RTP, NC	8/8/2018-6/30/2019	T640 (Teledyne API) / Grimm	PA, AQY, RAMP
Natchez Wildfire	Happy Camp, CA	8/11-8/29/2018	E-BAM (Met One)	PA, AQY
Bald Mt. / Pole Creek Wildfire	Price, UT Dutch John, UT	9/24-10/1/2018	E-SAMPLER (Met One)	PA, AQY
Alder Wildfire / prescribed fire	Springville, Pinehurst, and Camp Nelson, CA	10/19-11/27/2018	BAM 1020 (Met One)	PA, AQY, RAMP



Results and Correction Factors



- All three sensors tracked $PM_{2.5}$ concentration trends, but were biased high relative to reference measurements
- Bias could be addressed by calculation of correction factors
- Correction factors were sensor-specific
- Ongoing efforts using sensors to evaluate smoke

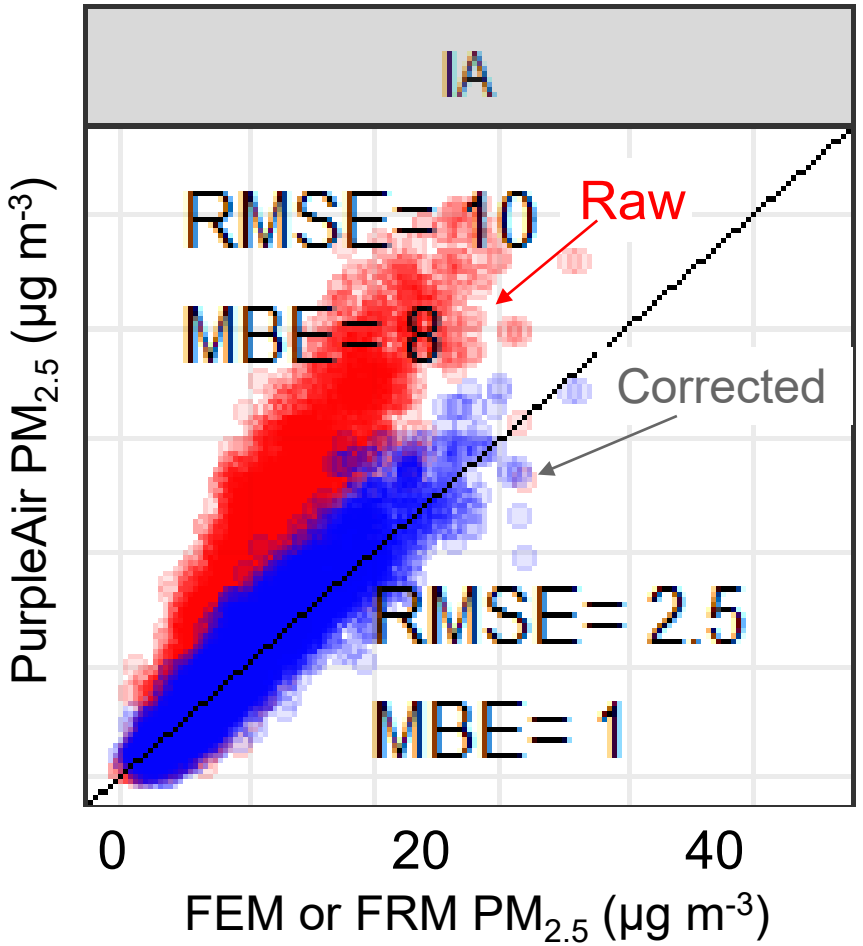
Holder et al., Environmental Science & Technology, submitted 2020

Related Efforts: EPA ORD U.S.-Wide PurpleAir Correction Factor

EPA ORD has developed a U.S.-wide correction factor for PurpleAir

- 50 sensors at 39 unique sites across 16 states
  - Represents urban and neighborhood sites; range of meteorological conditions; aerosols include a variety of particle types and sizes

- Compared sensors to FEM/FRM monitors
- Correction factor applies across the country in different aerosol types



Credit: Andrea Clements and Karoline Barkjohn, EPA ORD

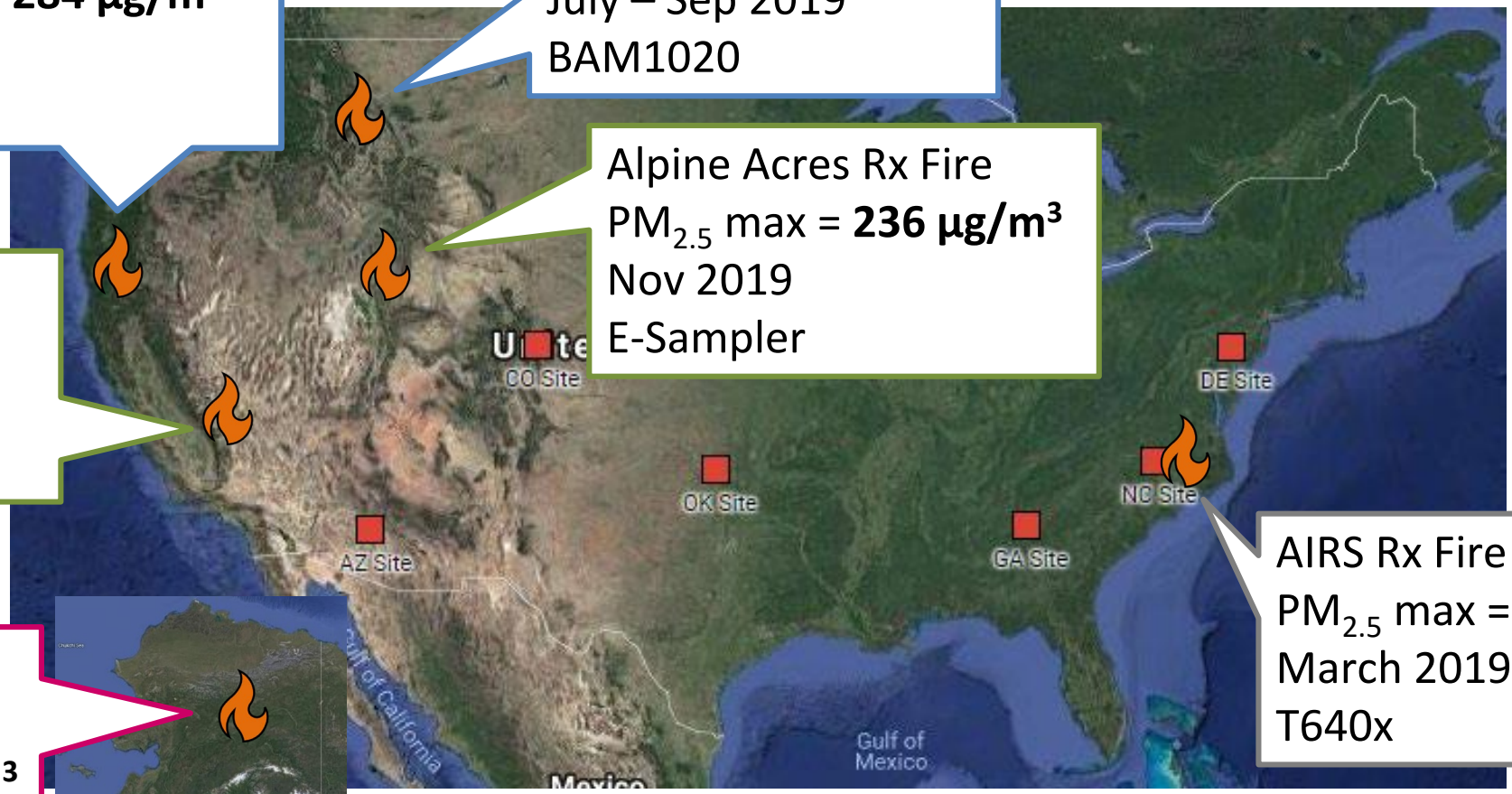
Validating with smoke-impacted data sets

Natchez Wildfire
$PM_{2.5}$ max = **284 µg/m³**
Aug 2018
E-BAM

Missoula Rx Fires
$PM_{2.5}$ max = **75 µg/m³**
July – Sep 2019
BAM1020

Alpine Acres Rx Fire
$PM_{2.5}$ max = **236 µg/m³**
Nov 2019
E-Sampler

Alder Wildfire
$PM_{2.5}$ max = **32 µg/m³**
Oct 2018
BAM 1020



AIRS Rx Fire
$PM_{2.5}$ max = **40 µg/m³**
March 2019
T640x

Shovel Creek/Oregon Lakes Wildfires
$PM_{2.5}$ max = **200 µg/m³**
May – Aug 2019
BAM 1020

Credit: Andrea Clements and Karoline Barkjohn, EPA ORD

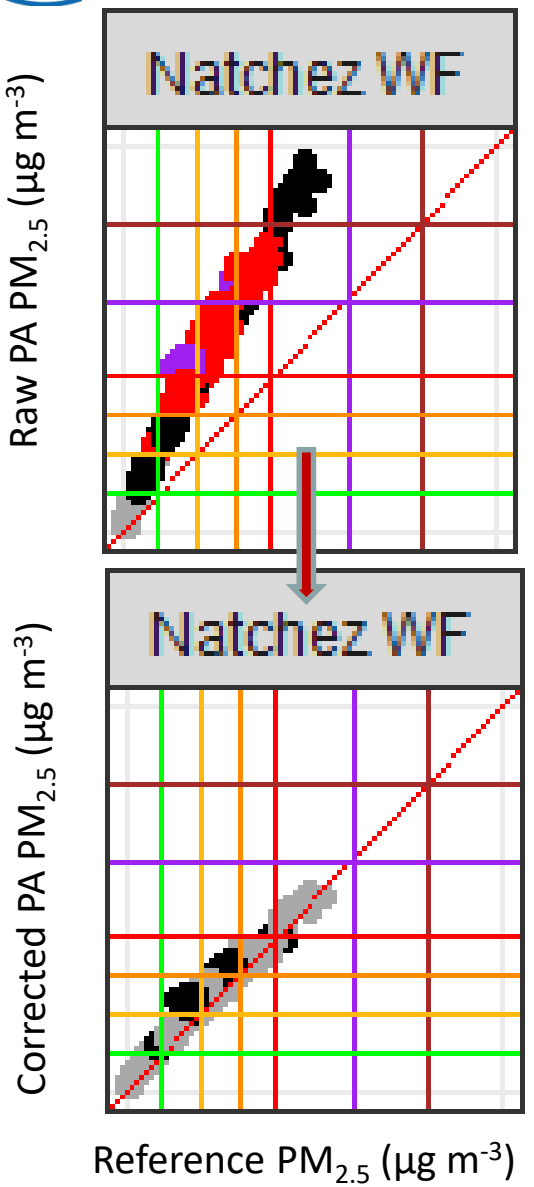
Results from smoke-impacted data evaluation

PurpleAir map data:

- Overreports $PM_{2.5}$ concentrations by 30 – 50%
- Overestimates AQI category 20% of the time
- Overestimate most often in the "**unhealthy for sensitive groups**" category

U.S.-wide correction improved $PM_{2.5}$ accuracy

- $PM_{2.5}$ concentrations reported < 20% error
- AQI category correctly reported 93% of the time
- AQI reported within 1 category 100% of the time
- Most disagreement is at the boundary between AQI levels



Credit: Andrea Clements and Karoline Barkjohn, EPA ORD

Related Efforts: EPA Sensor Data Pilot

- EPA and USFS have developed a pilot to add a sensor data layer to the AirNow Fires and Smoke Map
- PurpleAir Data will be displayed using the U.S.-wide correction factor developed by ORD

Credit: Andrea Clements and Karoline Barkjohn, EPA ORD

Questions?