



Wildland Fire and Smoke:
EPA Supported Tools and Research
Finding Solutions to Protect Public Health

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Wildland Fires & Their Emissions

Rural & Urban Community Public Health Issue



Brianna Paciorka
Knoxville News Sentinel



Wildfire spreads to Gatlinburg and Pigeon Forge

Photo: Bruce McCamish

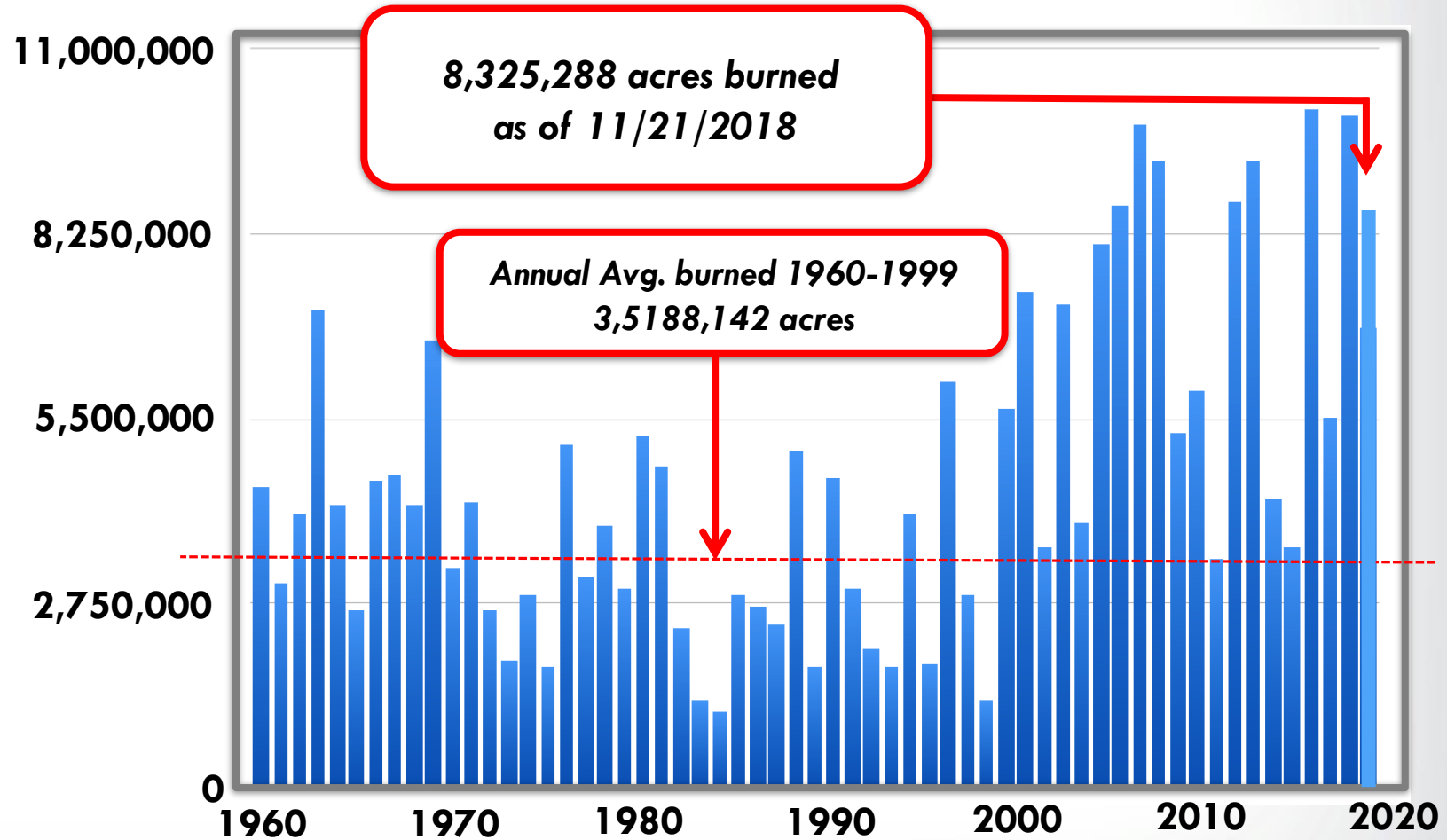


Wildfire in the United States

Acreage Burned Annually

Present Concerns

- Increasing acreage burned
- Increasing WUI 1990-2010 and vulnerability of the population
 - 30.8 to 43.4 million homes (41% increase)
 - 581,000 to 770,000 km² (33% increase)
- Increased sensitivity of the population

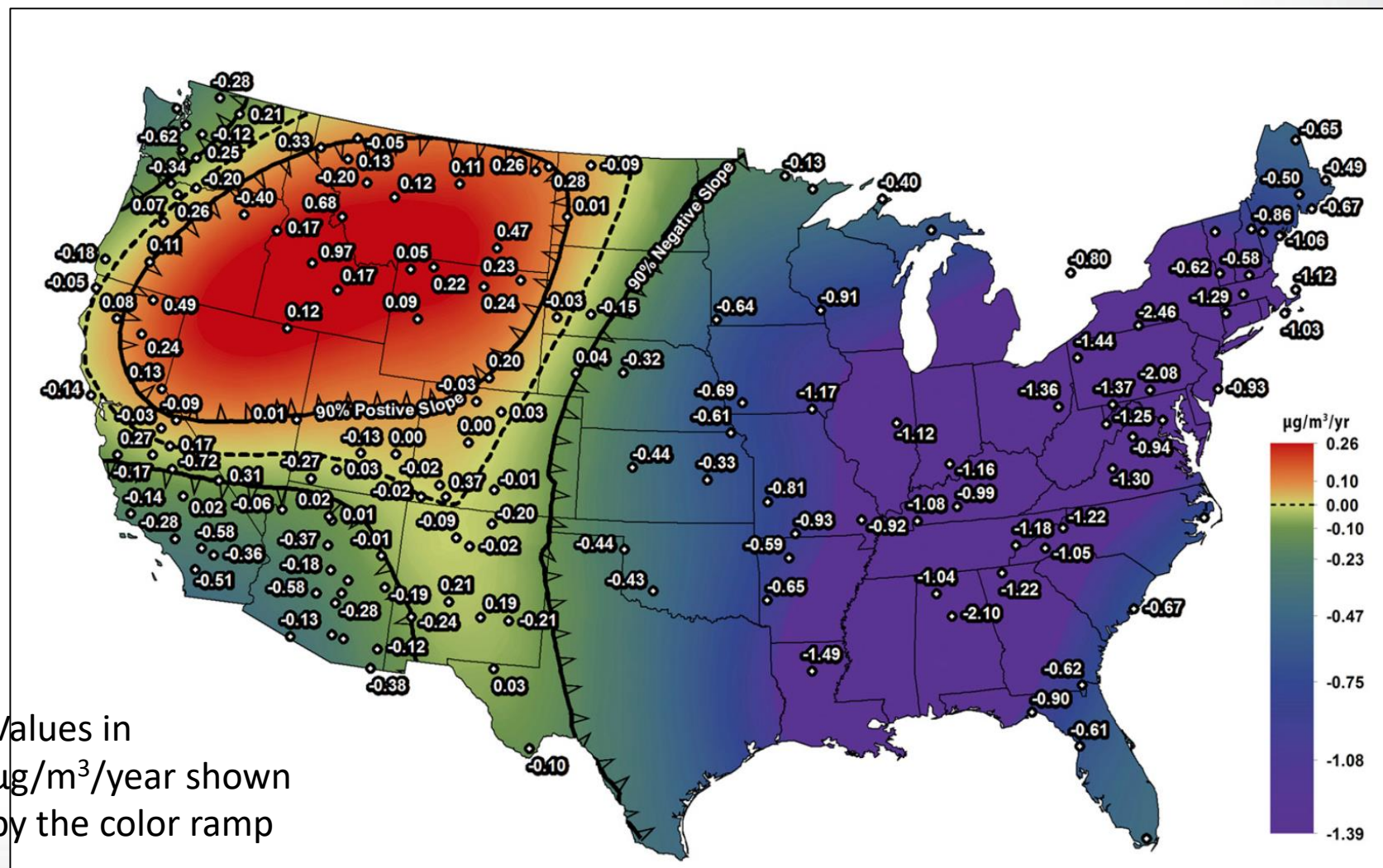




U.S. $PM_{2.5}$ Air Quality Improves Except in Wildfire-Prone Areas

Observed $PM_{2.5}$ trends for 1988–2016 in the U.S.

- Increased annual $PM_{2.5}$ concentration in the Northwest attributed to an increase in wildfire emissions



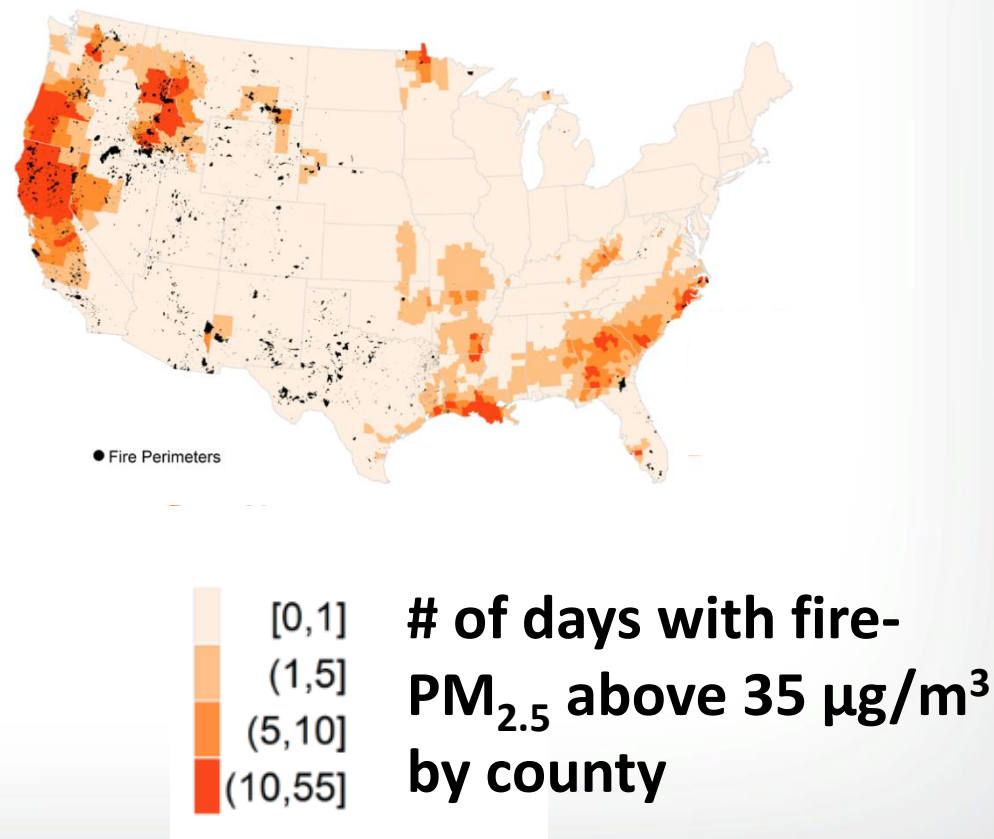
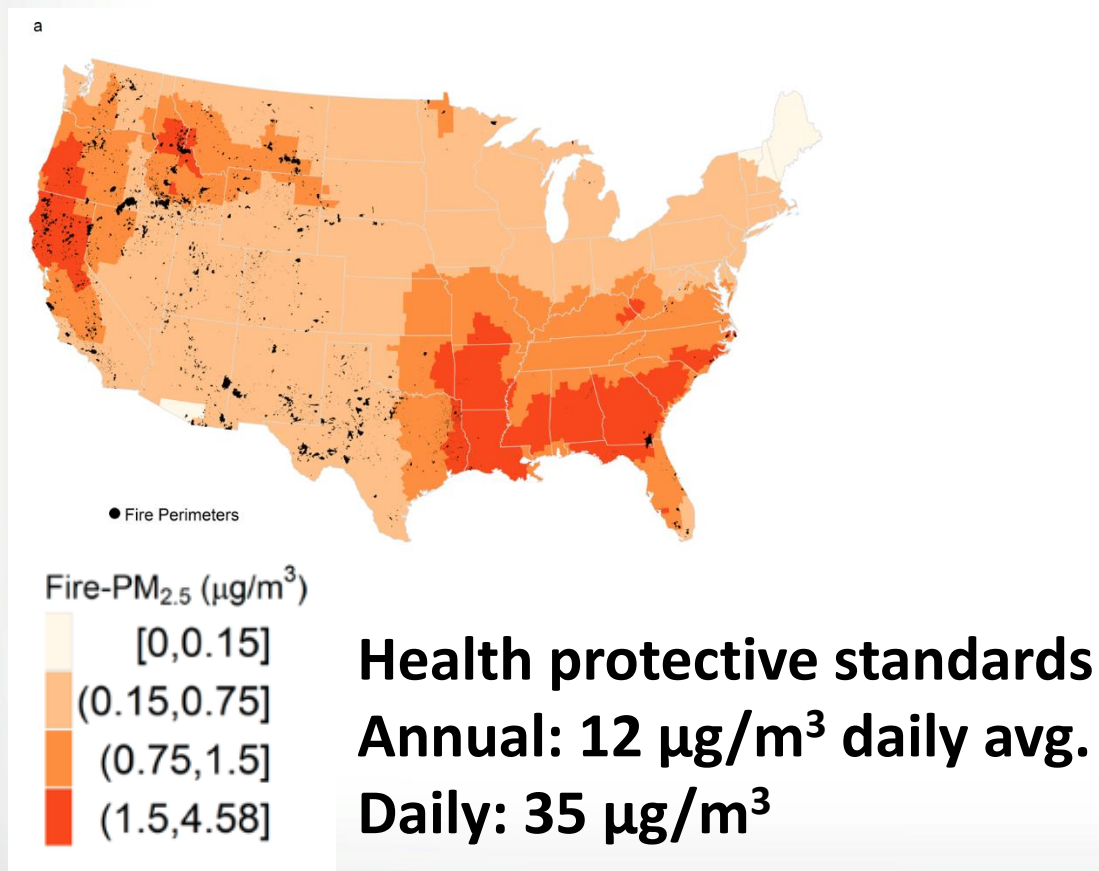


Air Quality Impacts of Wildland Fires

Annual versus Daily Effects

Annual average daily fire-PM_{2.5} footprint for US counties

How much does smoke contribute to air quality and how often does it lead to exceeding daily standard?



BIGGER FIRES =
MORE SMOKE =
MORE PEOPLE
AFFECTED

- *Examples from physical sciences*
 - Fire science
 - Smoke science
 - Smoke modeling
- *Examples from social sciences*
 - Public health/environmental epidemiology
 - Social acceptance of smoke and adaptive fire management
 - Smoke Sense smart phone application:
 - citizen science outreach & research initiative



Health Effects Associated with Smoke from Wildland Fires

Health effects known to be caused by wildland fire smoke

(Source: Studies reviewed in Liu et al 2015, and Reid et al. 2016)

- Eye irritation, sore throat, wheeze and cough
- Asthma & chronic obstructive pulmonary disease (COPD) exacerbations
- Bronchitis & pneumonia
- Childhood respiratory disease



Health effects suspected to be caused by wildland fire smoke

- All-cause mortality
- Cardiovascular outcomes
- Adverse birth outcomes

At-risk populations include –

- Aged adults
- Pregnant women and fetuses
- Children
- People with respiratory disease
- People with cardiovascular disease

A large blue oval with a black border, containing white text. The text reads: "~30% of the U.S. population is at-risk".

**~30% of the
U.S.
population
is at-risk**

Populations suspected to be at greater risk –

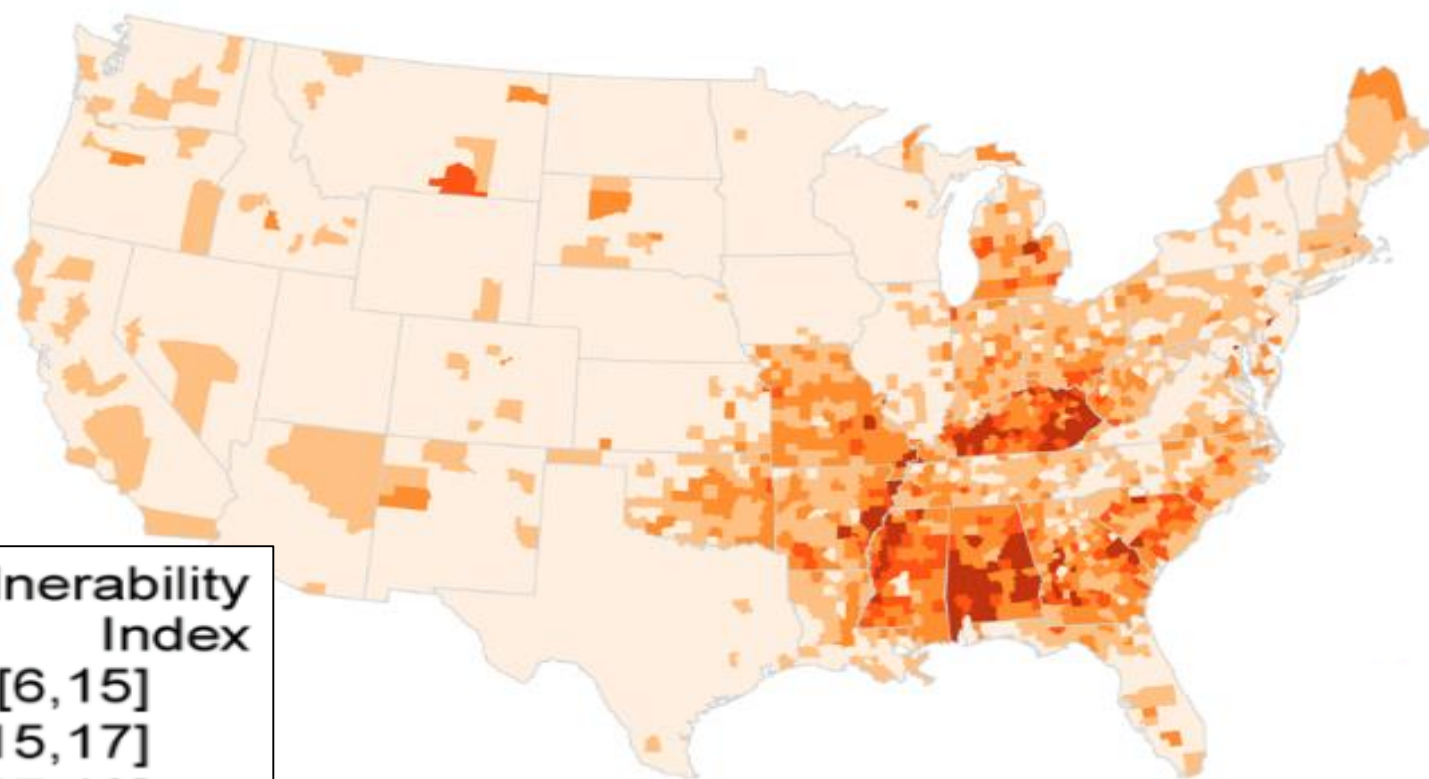
- Populations with chronic inflammatory diseases (e.g., diabetes, obesity)
- Women, African-Americans and populations with lower socio-economic status*

* Cocco Liu J et al. Am J Epidemiol 2017

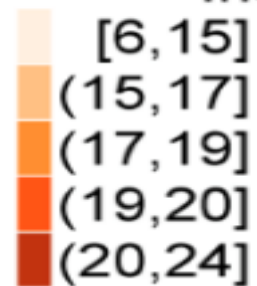


Community Health-Vulnerability Index

National map of community-health vulnerability index and air pollution awareness to adverse health effects



Vulnerability
Index



Vulnerability Factors

- Peds & Adult Asthma
- COPD
- Obesity
- Diabetes
- Hypertension
- % population age 65+
- Income, education, poverty, unemployment

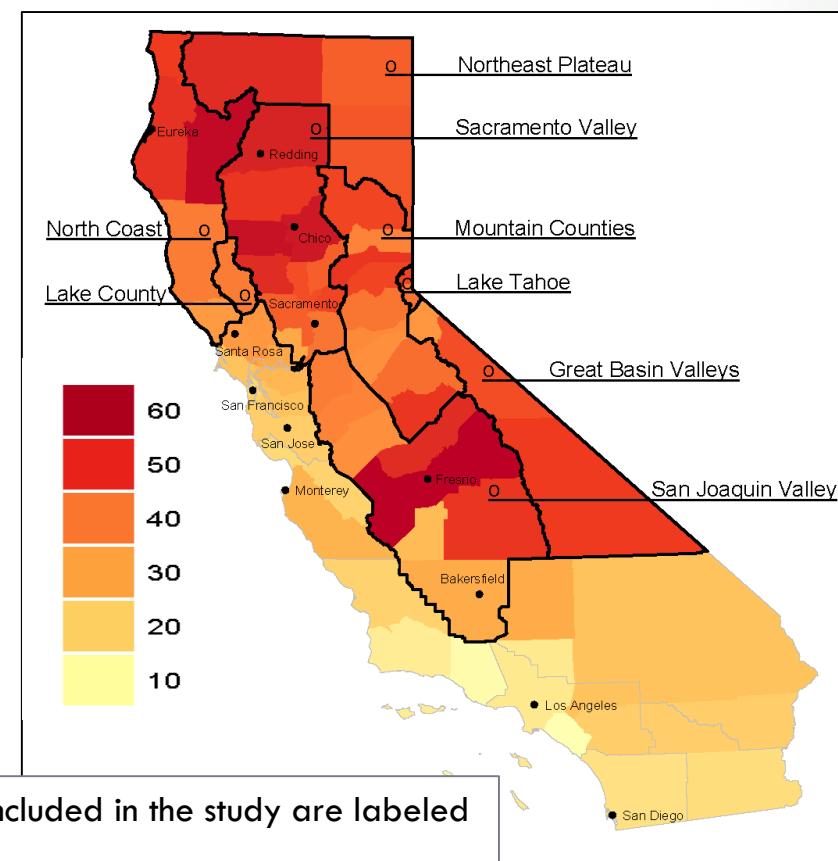
*Smoky days/county during the study: May through
September 2015*

Study Design

- Associated wildfire-PM_{2.5} exposure with emergency department visits for cardiovascular and respiratory diagnoses

Major Findings:

- Wildfire-PM_{2.5} associated with heart attacks and strokes for all adults, particularly for those over 65 years old



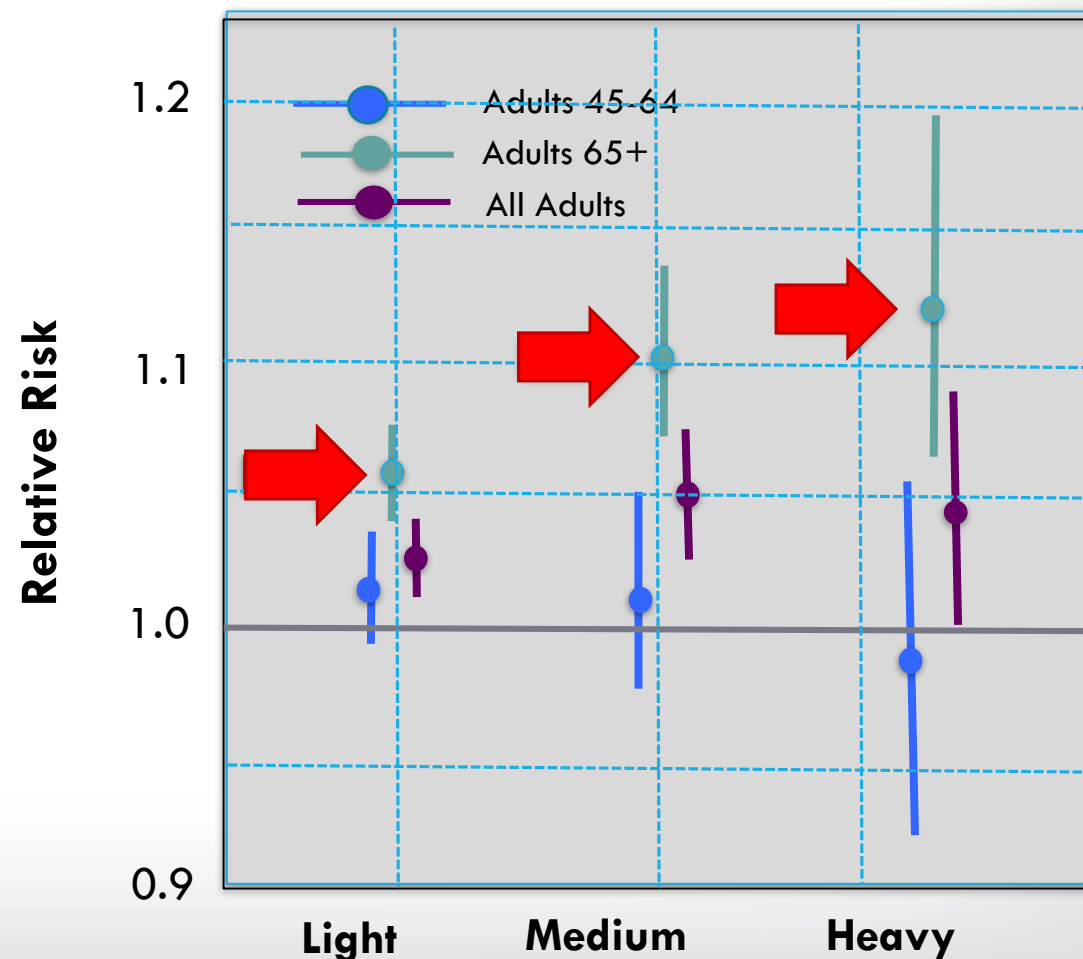


Wildfire-PM_{2.5} Increases Heart Attack & Stroke

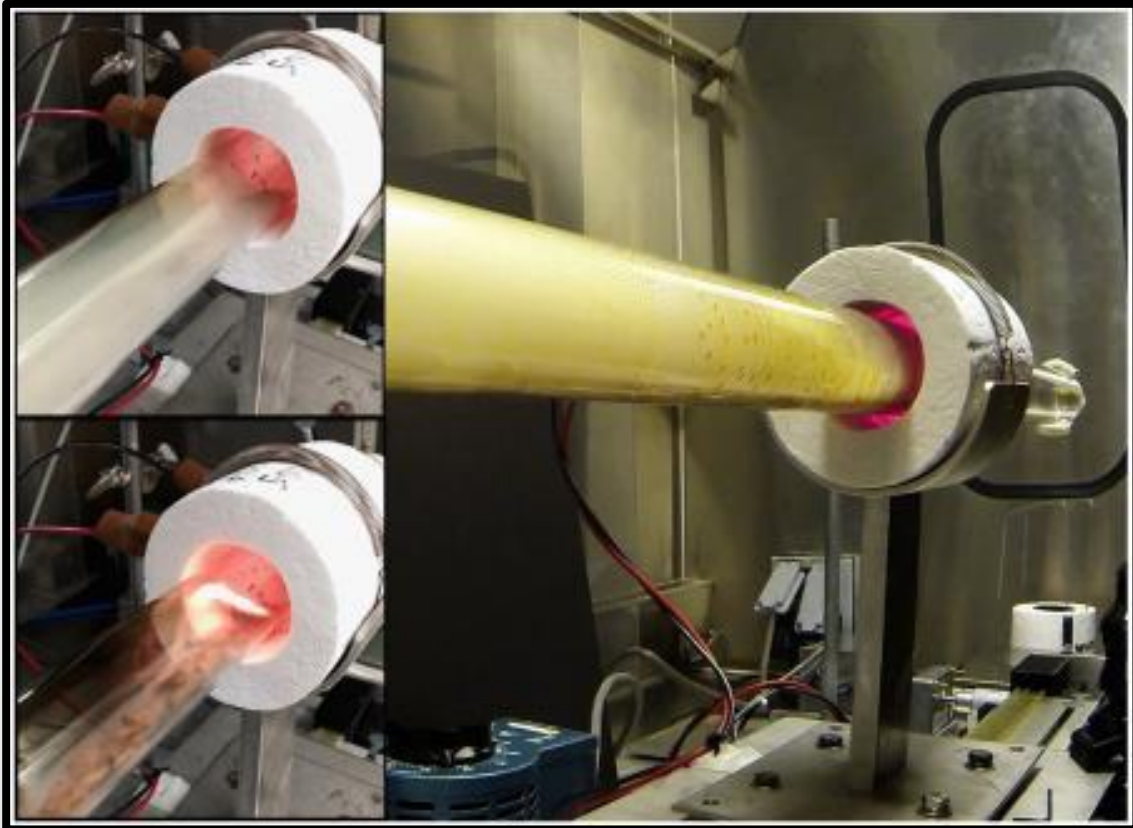
Increase in risk the day after exposure:

- All cardiovascular, 12%
- Heart attack, 42%
- Heart failure, 16%
- Stroke, 22%
- All respiratory causes, 18%
- Abnormal heart rhythm, 24%
(on the same day as exposure)

*All Cardiovascular Causes
Lag Day 1*



Tube Furnace in ORD Labs in Research Triangle Park, NC



- *Observed PM from different wood burned and combustion phases had appreciable differences in lung toxicity and mutagenic potency*
 - On an equal mass basis, flaming samples had higher lung toxicity and mutagenic potency than smoldering samples.
 - When emissions factors were taken into account, smoldering samples had a greater effect

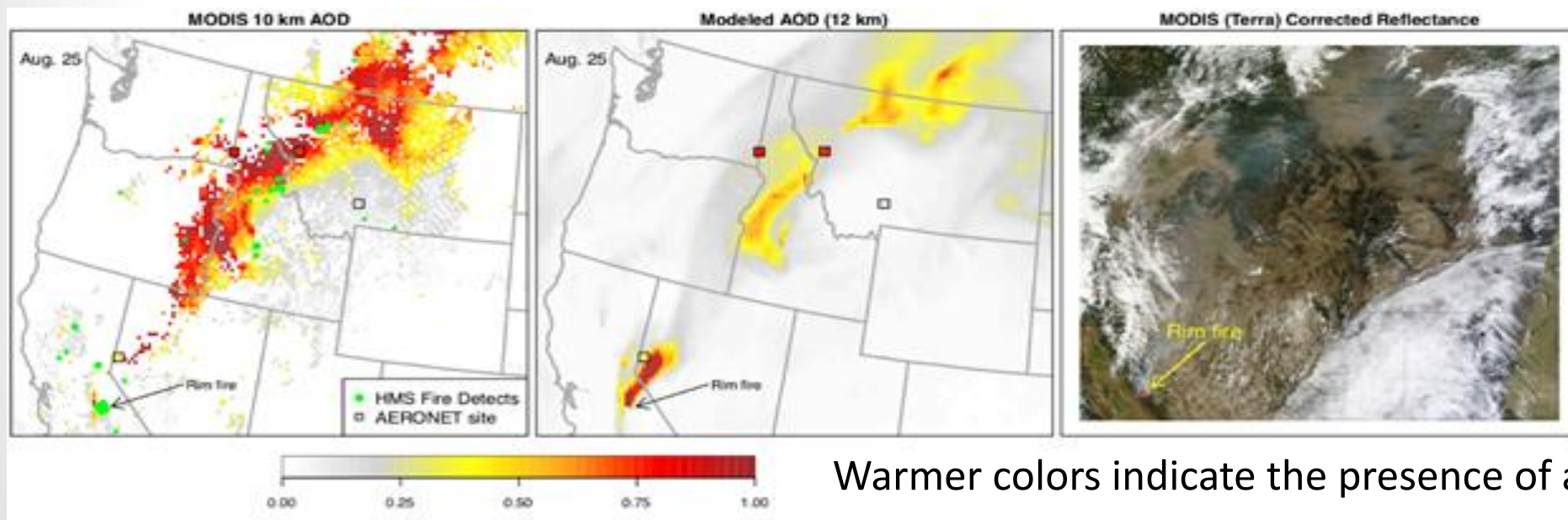


Air Quality Modeling Development

Using NASA Satellite Imaging to Evaluate Wildfires

NASA's Moderate Resolution Imaging Spectroradiometer (MODIS)

- Two satellites: Terra and Aqua
- Provide near-real-time observations with good spatial resolution and coverage
- Informs development of validated, global, interactive Earth system models, including air quality models used to evaluate wildland fires



CMAQ 12-km resolution modeled AOD and visible smoke (mostly from the Rim Fire, Sierra Nevada, CA)

Warmer colors indicate the presence of aerosols



Air Resource Advisors “Boots on the Ground” at an Incident



- Program of the USDA Forest Service
- Proactive direct response to the public health and safety threat of smoke
- Partners: US EPA, NPS, NOAA, other Federal, State, Tribal, and Local agencies
- Components: Air quality monitoring and modeling; coordination and communication; technical specialists (ARAs)

Air Resource Advisors – technical specialists who are “boots on the ground” at an incident



Smoke Ready Toolbox for Wildfires

[epa.gov/air-research/smoke-ready-toolbox-wildfires](https://www.epa.gov/air-research/smoke-ready-toolbox-wildfires)



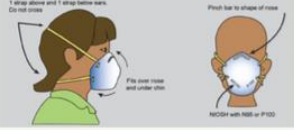
Airnow.gov: Current Fire Conditions
Get current air quality conditions and learn what to do to protect your health from air pollution, including smoke from wildland fires. Airnow.gov provides local air quality forecasts using EPA's science-based air quality index. https://airnow.gov/index.cfm?action=topics.smoke_wildfires



How Smoke From Fires Can Affect Your Health
Learn who is more at risk from smoke, how to tell if it is affecting you, and steps you can take to protect your health. Learn what to do before, during and after a wildfire. <https://airnow.gov/index.cfm?action=smoke.index>



Wildfire Smoke: A Guide for Public Health Officials
The guide is an easy-to-use resource that outlines whose health is most affected by wildfire smoke, how to reduce exposure to smoke, what public health actions are recommended, and how to communicate air quality to the public. The recommendations are based on science conducted by EPA and others. https://www3.epa.gov/airnow/wildfire_may2016.pdf



Wildfire Smoke Exposure Infographics
Two infographics provide information on actions to take to reduce health risks from smoke exposure in areas with wildfire smoke and what respirator (mask) to wear if you have to go outside and how to wear it properly. https://www3.epa.gov/airnow/smoke_fires/reduce-health-risks-with-wildfire-smoke.pdf and <https://airnow.gov/static/topics/images/epa-infographic-respirator.jpg>



Smoke Sense App
The Smoke Sense mobile app, developed by EPA researchers, enables you to get information on air quality and learn how to protect your health from wildland fire smoke. The app is being used in a citizen science study to determine how smoke from fires impacts public health. The app is available for anyone to use and can be downloaded on Android or iOS. www.epa.gov/air-research/smoke-sense



Particle Pollution and Your Patients' Health Course
Particle pollution, also known as particulate matter or PM, is the main component of haze, smoke, and dust. This course provides health professionals with knowledge they can share with patients to help reduce overall risk of PM-related health effects, particularly in individuals with heart and lung disease. www.epa.gov/pmcourse



Online Healthy Heart Toolkit
Breathing in fine particulate matter (PM_{2.5}) can trigger heart attacks, ischemic stroke, abnormal heart rhythms and worsen heart failure in people with cardiovascular disease or older adults with medical conditions that put them at risk. Particle pollution is a main component of smoke. Use the toolkit to protect your heart. <https://www.epa.gov/air-research/healthy-heart-toolkit-and-research>

Smoke Ready Toolbox for Wildfires

- Resources health officials can use to educate the public about the risks of smoke exposure and actions people can take to protect their health

<https://www.epa.gov/air-research/smoke-ready-toolbox-wildfires>



Local Air Quality Conditions

Zip Code:

Go

State :

Alabama



Go

[National Summary](#)

[Forecast](#)

[Current AQI](#)

[AQI Loop](#)

[More Maps](#)

Fires: Current Conditions

[Click to see map](#)



[U.S. Embassies and Consulates](#)

Data from air quality monitors at select U.S. embassies and consulates around the world

Announcements

3/9/16: NEW: [Spanish-language website](#) for Air Quality Flag Program - NEUVO: [En español—El sitio web](#) de la programa de banderines sobre la calidad del aire

03/03/16: Now available! Heart Disease, Stroke, and Outdoor Air Pollution (en Español) - [Enfermedades del corazón, ataques cerebrales y contaminación del aire](#)

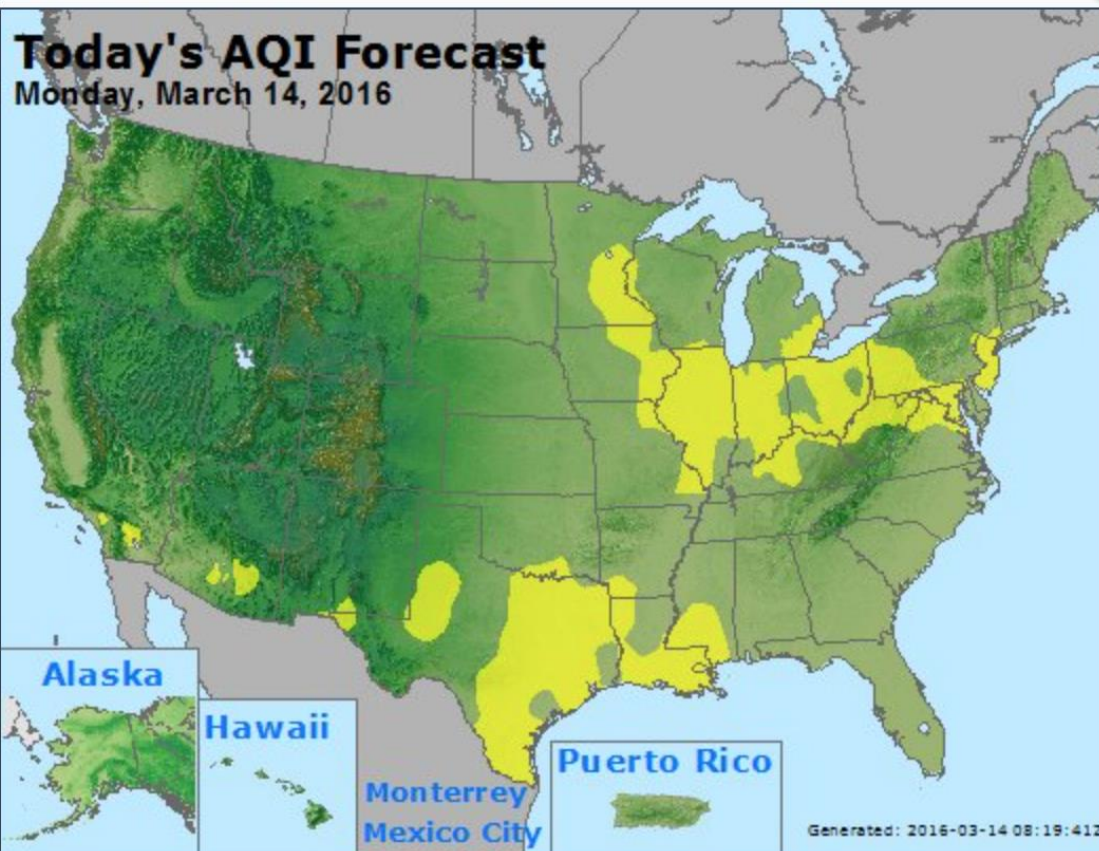
[more announcements](#)

Air Quality Basics

[Air Quality Index](#) | [Ozone](#) | [Particle Pollution](#) | [Smoke from fires](#) | [What You Can Do](#)

[Health](#)

[Learning Center](#)



Good

Moderate

USG

Unhealthy

Very Unhealthy

Hazardous

! Action Day



Apps



EnviroFlash Email



Local Air Quality Conditions

Zip Code: Go

State : Alabama

National Summary

Forecast

Current AQI

AQI Loop

More Maps

Today's AQI Forecast

Monday

Fires: Current Conditions

[Click to see map](#)

Alaska

Hawaii

Monterrey

Mexico City

Puerto Rico

Generated: 2016-03-14 08:19:41Z

Fires: Current Conditions

[Click to see map](#)

[U.S. Embassies and Consulates](#)

[corazón, ataques cerebrales y contaminación del aire](#)

[more announcements](#)

Air Quality Basics

[Air Quality Index](#) | [Ozone](#) | [Particle Pollution](#) | [Smoke from fires](#) | [What You Can Do](#)

Health

Learning Center

Good

Moderate

USG

Unhealthy

Very Unhealthy

Hazardous

! Action Day

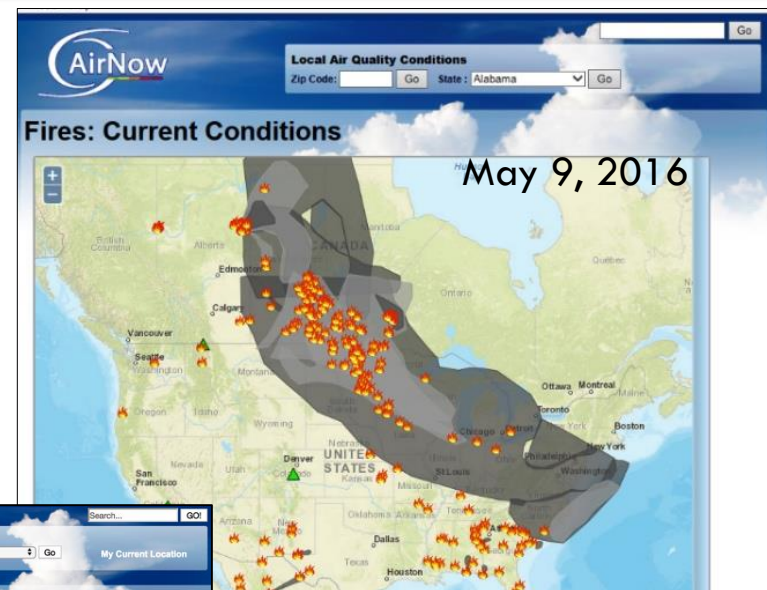
Apps

EnviroFlash Email



Fires: Current Conditions Page

- **Current Smoke Map generated by NOAA Hazard Mapping System**
- **Current Advisories – State/Local/Tribal agency blogs**
- **Wildland Fire Air Quality Response Program**



Current Advisories

Fires and Health

Before, During, and After a Wildfire

More Fire Tools

- [Prepare for Fire Season](#) (2 pp., 260KB, [about PDF](#)) - Learn how to protect your health from wildfire smoke.
- [Wildfire Smoke: A Guide for Public Health Officials, 2016](#) (76 pp., 2.3MB, [about PDF](#)) - This document is designed to help local public health officials prepare for smoke even the public when smoke is present, and communicate with the public about wildfire smoke and health. It was updated assistance and expertise from a number of federal and state agencies.
- The right respirator and proper fit can reduce your exposure to wildfire smoke.

See Infographic enlarged JPG 127.36 KB
See Infographic enlarged PNG 26.17 KB

See Infographic enlarged PDF (1 p., 2.2 KB)

AirNow

Local Air Quality Conditions

Zip Code: Go State: Go

My Current Location

Fires and Your Health

Smoke is made up of a complex mixture of gases and fine particles produced when wood and other organic materials burn. The biggest health threat from smoke is from fine particles. These microscopic particles can get into your eyes and respiratory system, where they can cause health problems such as burning eyes, runny nose, and illnesses such as bronchitis. Fine particles also can aggravate chronic heart and lung diseases - and even be linked to premature deaths in people with these conditions.

If you are healthy, you're usually not at a major risk from short-term exposures to smoke. Still, it's a good idea to avoid breathing smoke if you can help it. Everyone should take the steps below when wildfires are present.

Questions? Visit our [Frequently Asked Questions](#) page for answers to some common questions about health and smoke from wildland fires.

Fires and smoke across Alaska and Northern Canada
[Archive Image courtesy of NASA Media](#)

Use common sense. If it looks smoky outside, it's probably not a good time to mow the lawn or go for a run. And it's probably not a good time for your children to play outdoors.

Pay attention to local air quality reports. Stay alert to smoke-related news coverage or health warnings.

Visit AirNow to find out the Air Quality Index in your area. As smoke gets worse, the amount of particles in the air changes - and so do the steps you should take to protect yourself. AirNow recommends precautions you can take to protect your health when air pollution gets bad.

If you are advised to stay indoors, take steps to keep indoor air as clean as possible. When smoke levels are high, try to avoid using anything that burns, such as wood, candles, gas logs, gas stoves - and even incense! Don't vacuum. That stirs up particles already inside your home. And don't smoke. That puts even more pollution in your lungs, and in the lungs of people around you.

If you have asthma or other lung disease, make sure you follow your doctor's directions about taking your medicines and following your asthma management plan. Call your doctor if your symptoms worsen.

Health Resources

- [Wildfire Smoke: A Guide for Public Health Officials, 2016](#) (76 pp., 2.3MB, [about PDF](#))
- [How Smoke from Fires Can Affect Your Health](#) - Learn steps you can take to protect your health.
- [Particle Pollution and Your Health](#) - Find out if you are at risk from exposure to particle pollution, and what health effects can be caused by particles.

Educational Resources

- [CDC Wildfire Fact Sheet](#) - Information on emergency preparedness and response
- [California Air Resources Board SMP Public Outreach Protocol - Tools and Materials](#)
- [FOR KIDS- Follow Smoke Bear's advice](#) when wildfires are in your area!

CDC Centers for Disease Control and Prevention

CDC 24/7 Saving Lives. Protecting People™

SEARCH

CDC A-Z INDEX

Natural Disasters and Severe Weather

Natural Disasters and Severe Weather

- Earthquakes
- Extreme Heat
- Floods
- Hurricanes
- Landslides & Mudslides
- Lightning
- Tornadoes
- Tsunamis
- Volcanoes
- Wildfires

Wildfires

More and more people make their homes in areas that are prone to wildfires. You can take steps to be ready for a wildfire and prepare your home and landscaping to reduce your risk. Learn how to protect yourself and your family from a wildfire, evacuate safely during a wildfire, and how to stay healthy when you return home.

Before a Wildfire

- [Wildfire: Are You Prepared?](#)
- [Is your home firewise?](#)
- [Make a Plan](#)

During a Wildfire

- [Wildfire Smoke](#)
- [Wound Care](#)
- [Readygov Wildfires](#)
- [Protecting Pets](#)
- [Animals in Evacuation Centers](#)

After a Wildfire

- [What to Do After a Home Fire](#)
- [Preventing Injury](#)
- [Returning Home After a Disaster](#)

View a full-sized image of the Be Ready! Wildfires infographic. Share it on social media or print it out to post in your office, school, or home.

Info for Specific Groups

- [Evacuees & Other Affected Persons](#)
- [Evacuation Centers](#)
- [Pregnant Women](#)
- [Responders](#)

Fires and Your Health

CDC: Before, During and After a Wildfire



2019 Wildfire Smoke Guide for Public Health Officials

- *Multi-agency document*
- *Updated look*
- *Health effects section*
 - Ozone
 - Prolonged exposures
 - Heat and smoke
 - Smoke vs urban particles
- *New additions*
 - Outdoor workers
 - PM web course for health professionals
 - Sensor use
 - After the fire and ash clean-up





Wildfire Guide Factsheets

- Prepare for Fire Season
- Reduce Your Smoke Exposure
- Protect Your Lungs from Wildfire Smoke or Ash
- Protecting Children from Wildfire Smoke and Ash
- Indoor Air Filtration
- Protect Yourself from Ash

In development:

- Protect Your Pets
- Protect Your Large Animals and Livestock
- After the Fire
- Spanish translations

WILDFIRE SMOKE FACTSHEET

Protect Your Lungs from Wildfire Smoke or Ash

Wildfire smoke and ash can irritate your eyes, nose, throat, and lungs. They can make you cough or wheeze, and can make it hard to breathe. A respirator is a device (mask) that covers your nose and mouth, fits tightly to your face, and can filter out smoke or ash particles before you breathe them. Respirators are not sized for children.

Protecting Your Health
The most effective way to protect yourself during wildfire emergencies is to stay indoors or limit your time outdoors when there is smoke in the air. This is especially important if you have heart or lung disease and are at higher risk for adverse health effects. Reducing physical activity and using a MERV 13-16 HEPA filtered air cleaner indoors are other options.

How Do I Know if I Need to Wear a Respirator?

- People who stay indoors or limit their time outdoors during wildfire emergencies are doing the most effective thing to avoid exposure and may not need to wear a respirator.

WILDFIRE SMOKE FACTSHEET

Indoor Air Filtration

When wildfire smoke gets inside your home it can make your indoor air unhealthy, but there are steps you can take to protect your health and improve the air quality in your home. Reducing indoor sources of pollution is a major step toward lowering the concentrations of particles indoors. For example, avoid burning candles, smoking tobacco products, using aerosol products, and avoid using a gas or wood-burning stove or fireplace. Another step is air filtration. This fact sheet discusses effective options for filtering your home's indoor air to reduce indoor air pollution.

Filtration Options
There are two effective options for improving air filtration in the home: 1) upgrading the central air system filter, and 2) using high efficiency portable air cleaners. Before discussing filtration options, it is important to understand the basics of filter efficiency.

Filter Efficiency
The most common industry standard for filter efficiency is the Minimum Efficiency Reporting Value, or MERV rating. The MERV scale for residential filters ranges from 1 to 16. Filters with a MERV rating of 13-16 can reduce indoor particles by as much as 95 percent. Filters with a High Efficiency Particulate Air (HEPA) rating, or MERV 17-20 are the most efficient. You may need to consult with a local heating and air technician or the manufacturer of your central air system to confirm which (or if) high efficiency filters will work with your system. If you can't switch to a more efficient filter, running the system continuously by switching the thermostat fan from "Auto" to "On" has been shown to reduce exposure.

WILDFIRE SMOKE FACTSHEET

Protect Yourself from Ash

Protect yourself from harmful ash when you clean up after a wildfire. Cleanup ash and other products of the fire that may irritate your eyes, nose, or skin and health effects. Ash inhaled deeply into lungs may cause asthma attacks and other health effects. Ash is made up of larger and tiny particles (dust, dirt, and soot). Ash deposited on surfaces can be inhaled if it becomes airborne when you clean up. Ash 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.

Protecting your lungs: A respirator that filters the air you breathe to help you avoid ash exposure. Select a respirator that is approved by NIOSH (NIOSH) "NIOSH" and either "N" or "P" on it. These have to be available online, and stores and pharmacies sell them. They are designed to seal tightly to your face and protect your lungs from ash. Surgical masks and one-way valves are not designed to seal tightly to your face and do not protect your lungs from ash.

WILDFIRE SMOKE FACTSHEET

Reduce Your Smoke Exposure

When wildfires create smoky conditions, there are things you can do, indoors and out, to reduce your exposure to smoke. Reducing exposure is important for everyone's health — especially children, older adults, and people with heart or lung disease.

Reduce smoke exposure indoors

- **Stay inside** with the doors and windows closed. Whether you have a central air conditioning system or a room unit, use high efficiency filters to capture fine particles from smoke. Ask an air conditioning professional what type of high efficiency filter your air conditioner can accept.
- **Seek shelter elsewhere** if you do not have an air conditioner and it is too warm to stay inside with the windows closed.
- **Do not add to indoor air pollution.** Do not burn candles or use gas, propane, wood-burning stoves, fireplaces, or aerosol sprays. Do not fry or broil meat, smoke tobacco products, or vacuum. All of these can increase air pollution indoors.
- **Use a portable air cleaner** to reduce indoor air pollution. Make sure it is sized for the room and that it does not make ozone, which is a harmful air pollutant. Portable air cleaners can be used along with efficient central air systems with efficient filters to maximize the reduction of indoor particles.
- **Create a "clean room"** in your home. Choose a room with no fireplace and as few windows and doors as possible, such as a bedroom. Use a portable air cleaner in the room.
- **Have a supply of N95 respirators** and learn how to use them. They are sold at many home improvement stores and online.
- **Long-term smoke events** usually have periods when the air is better. When air quality improves, even temporarily, **air out your home** to reduce indoor air pollution.

Use a portable air cleaner to reduce indoor air pollution

WILDFIRE SMOKE FACTSHEET

Prepare for Fire Season

If you live in an area that is regularly affected by smoke or where the wildfire risk is high, take steps to prepare for fire season. Know how to get ready before a wildfire. Know how to protect yourself from smoke exposure during a wildfire. Being prepared for fire season is especially important for the health of children, older adults, and people with heart or lung disease.

Prepare Before a Wildfire

- **Stock up** so you don't have to go out when it's smoky. Have several days of medications on hand. Buy groceries that do not need to be refrigerated or cooked, because cooking can add to indoor particle levels.
- **Create a "clean room"** in your home. Choose a room with as few windows and doors as possible, such as a bedroom. Use a portable air cleaner and avoid indoor sources of pollution.
- **Buy a portable air cleaner** before there is a smoke event. High-efficiency particulate air (HEPA) filter air cleaners, and electrostatic precipitators that do not produce ozone, can help reduce indoor particle levels.
- **Understand** how you will receive alerts and health warnings, including air quality reports and public service announcements, from local officials.
- **If you have heart or lung disease**, check with your doctor about what you should do during smoke events.
- **If you have asthma or another lung disease**, update your respiratory management plan.
- **Have a supply of N95 masks** and learn how to use them. They are sold at many home improvement stores and online.
- **Organize** your important items ahead of time and know where to go in case you have to evacuate.

Particulate Matter Web Course

For Healthcare Professionals and Educators

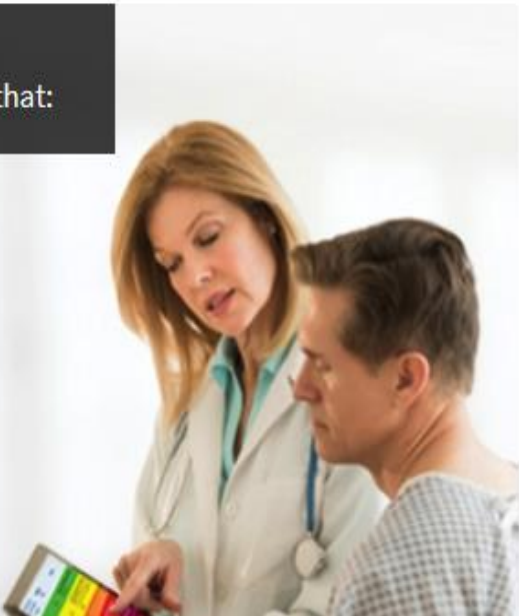
[Environmental Topics](#) [Laws & Regulations](#) [About EPA](#) [Q](#)

[Share](#) [Contact Us](#)

Particle Pollution and Your Patients' Health

An evidence-based training course for healthcare providers that:

- Describes the biological mechanisms responsible for the cardiovascular and respiratory health effects associated with particle pollution exposure.
- Provides education tools to help patients understand how particle pollution exposure can affect their health and how they can use the Air Quality Index to protect their health.



This course is designed for family medicine physicians, internists, pediatricians, occupational and rehabilitation physicians, nurse practitioners, nurses, asthma educators, pulmonary specialists, cardiologists, and other medical professionals.

[Start the Course](#)

CME credit from CDC to physicians, nurses and health educators



Wildfire Guide Recommendations to Reduce Exposure

- Go indoors and keep activity levels low
- Close doors and windows; open windows when air quality is better
- Don't add to indoor particle levels
- Use high efficiency filters in central air system
- Use high efficiency portable air cleaner - HEPA indoor air filtration or electrostatic precipitator that does not generate ozone – that is appropriate for space it is intended to clean (Clean Air Delivery Rate)
- Create a clean room
- Evacuate to a cleaner air shelter or out of the area

- *High temperatures/no air conditioning*
- *Cold temperatures/home heating that generates indoor particles*
- *Lack of outdoor air quality information – current and forecast air quality*
- *Central air system not designed for use with high efficiency filters*
- *No access to high efficiency portable air cleaners*
- *Inability or reluctance to go to shelter or evacuate*
- *Longer duration smoke events*
- *After the fire - smoke and ash exposure*

- *Amplify the daily messages: communicate the increased importance of reducing smoke exposures with longer events*
- *Create cleaner-air places where people can go during the day to reduce their smoke exposure*
 - Places that people would normally visit, especially at-risk populations
 - Provide cooling in warm weather and heating in cold weather
 - Identify before fire season
- *Be aware of the potential for a prolonged smoke event to increase stress and impact mental health*



Real-Time AQI The Dial

- *Mobile-friendly website*
- *Front page provides real-time and forecast AQI, map and box plot of hourly AQI values*

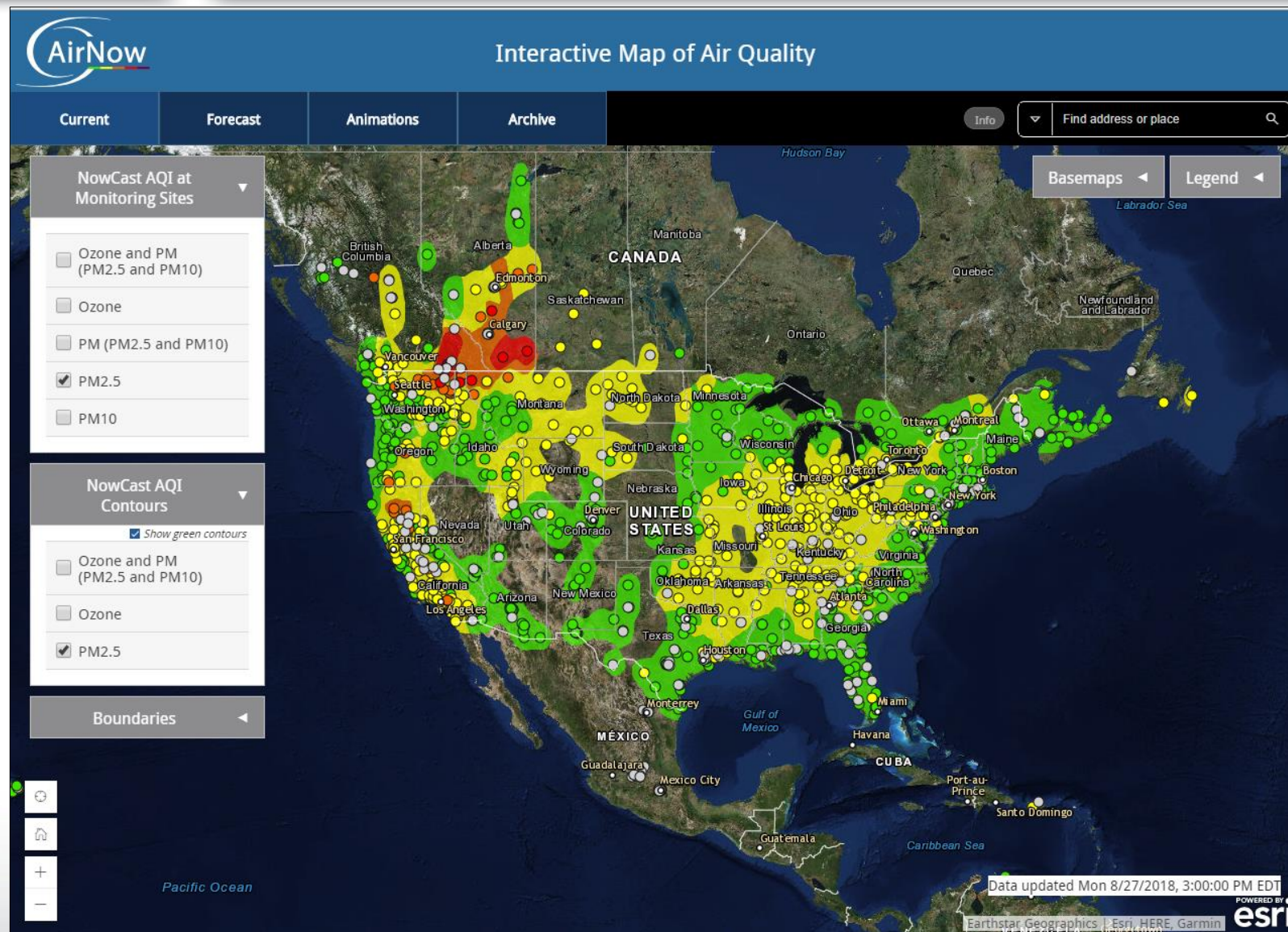
www.airnow.gov ,

8/27/18



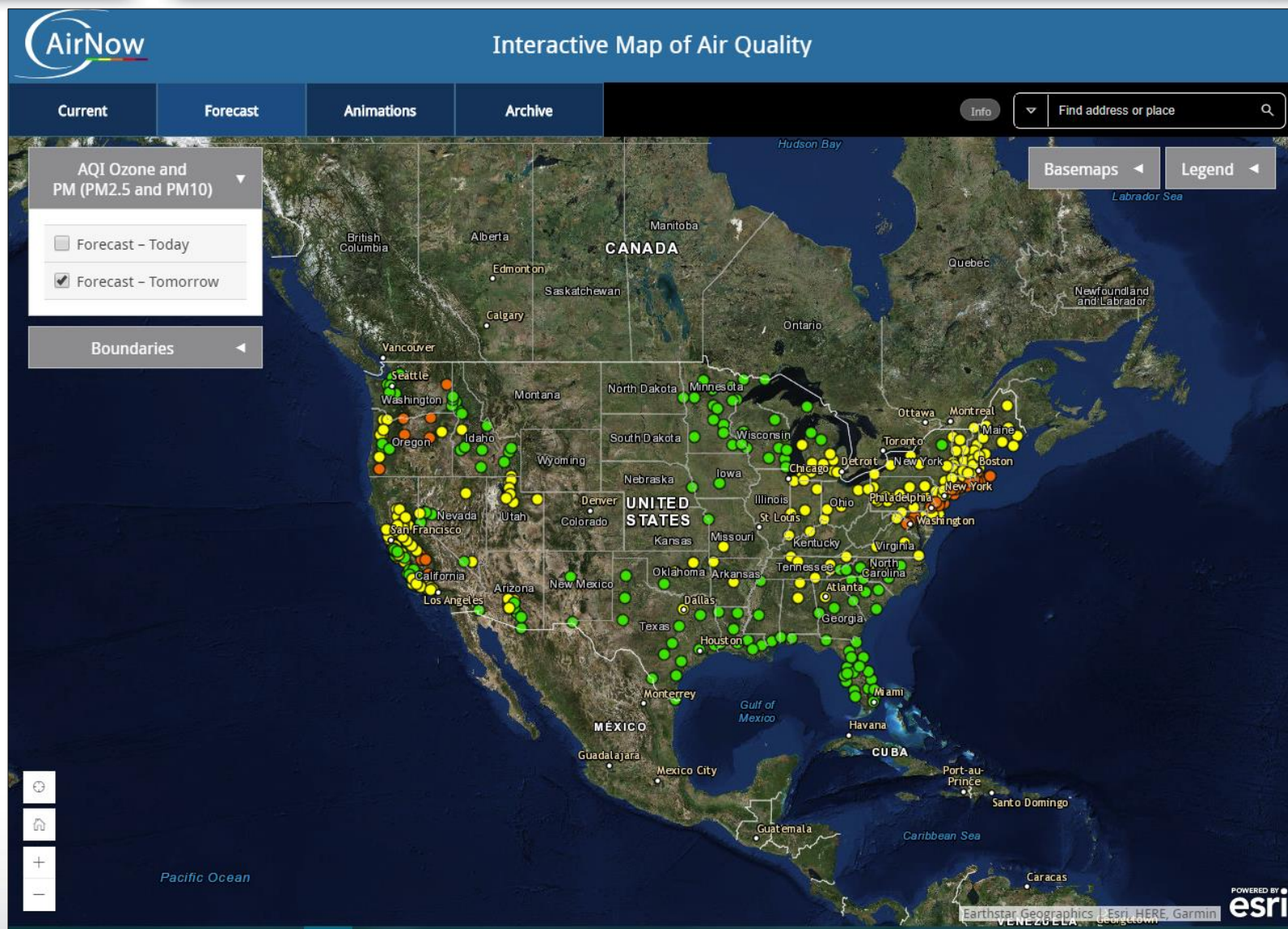


Real-Time AQI



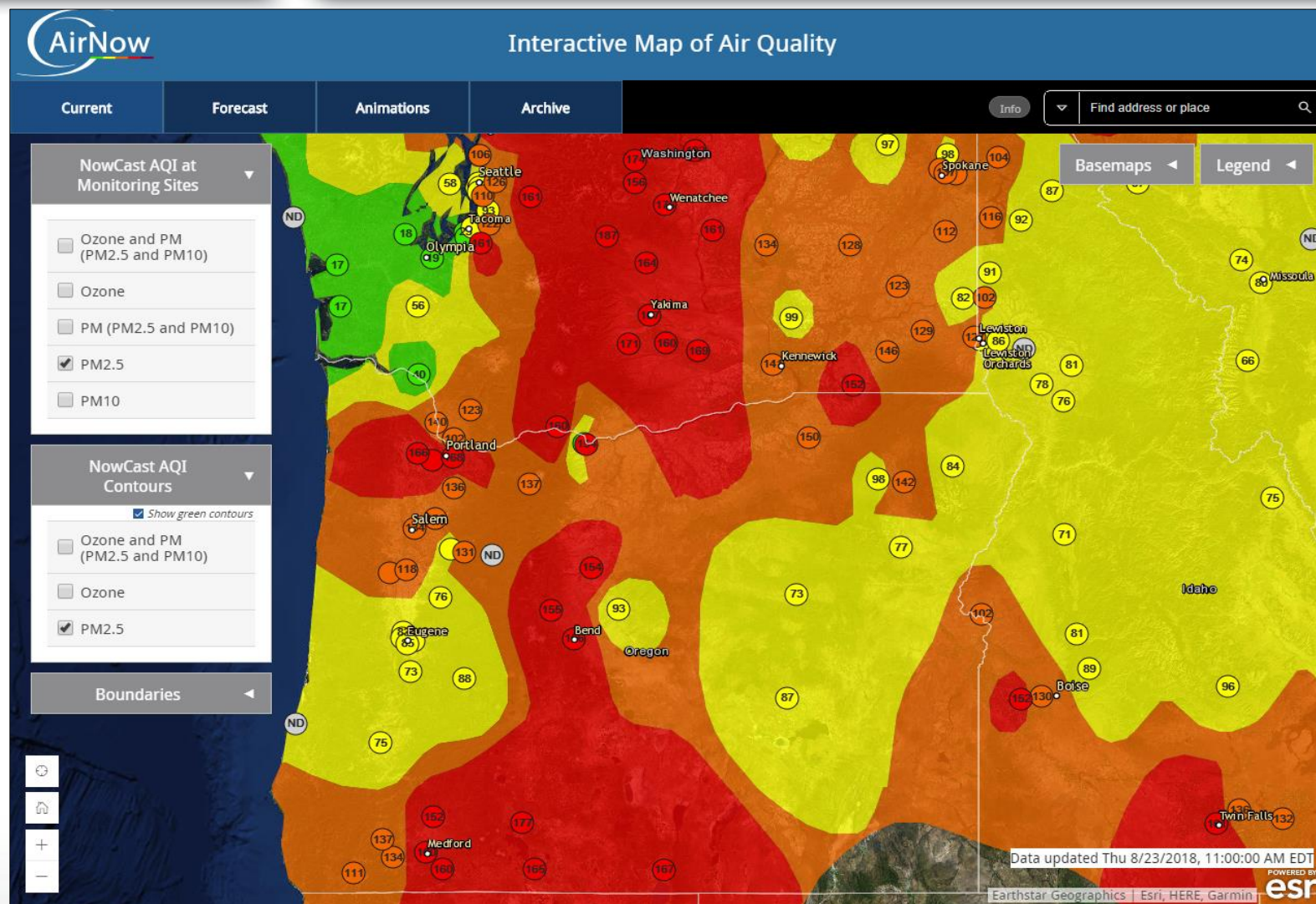


Forecast AQI



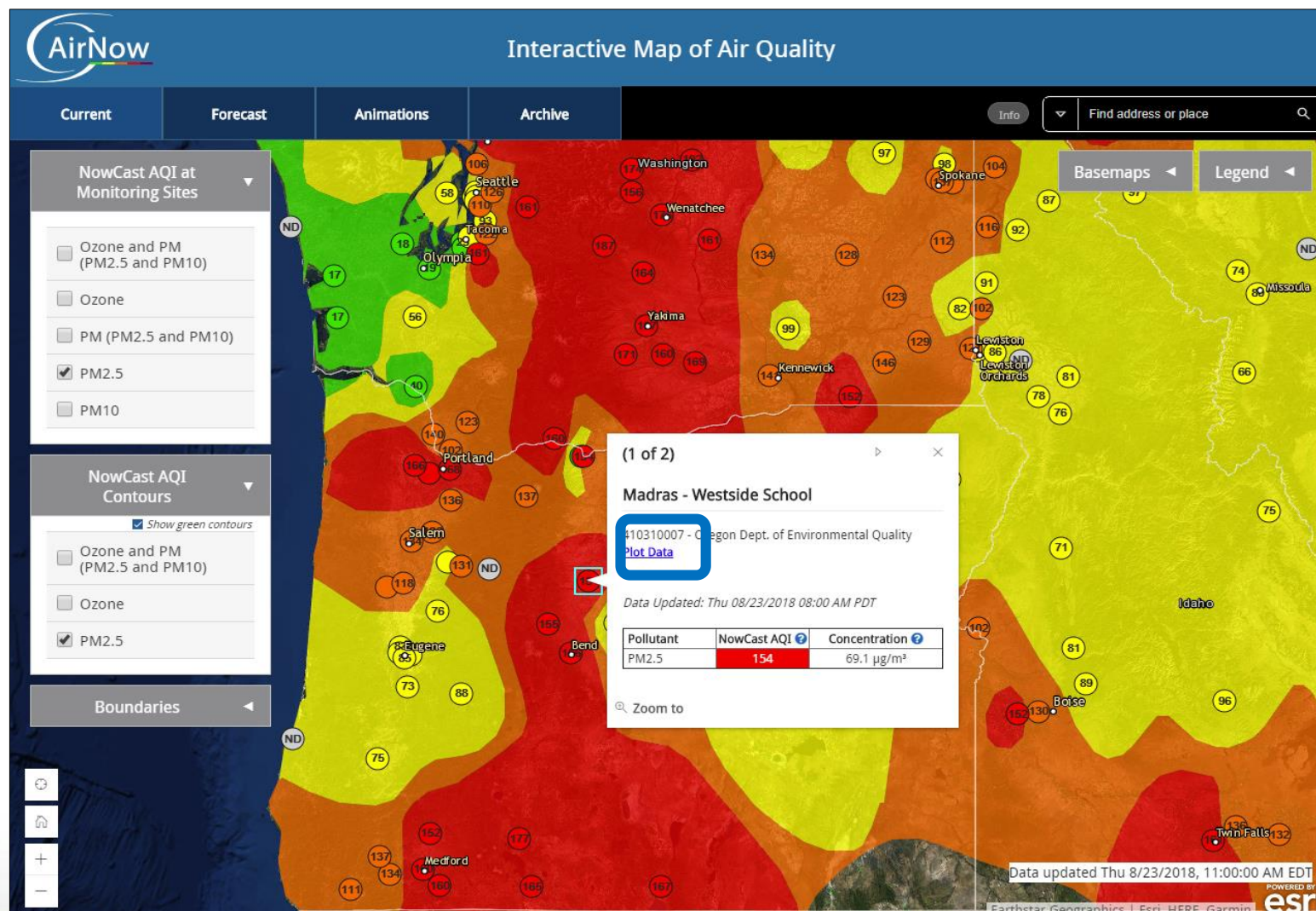


Interactive Map Spatial Resolution





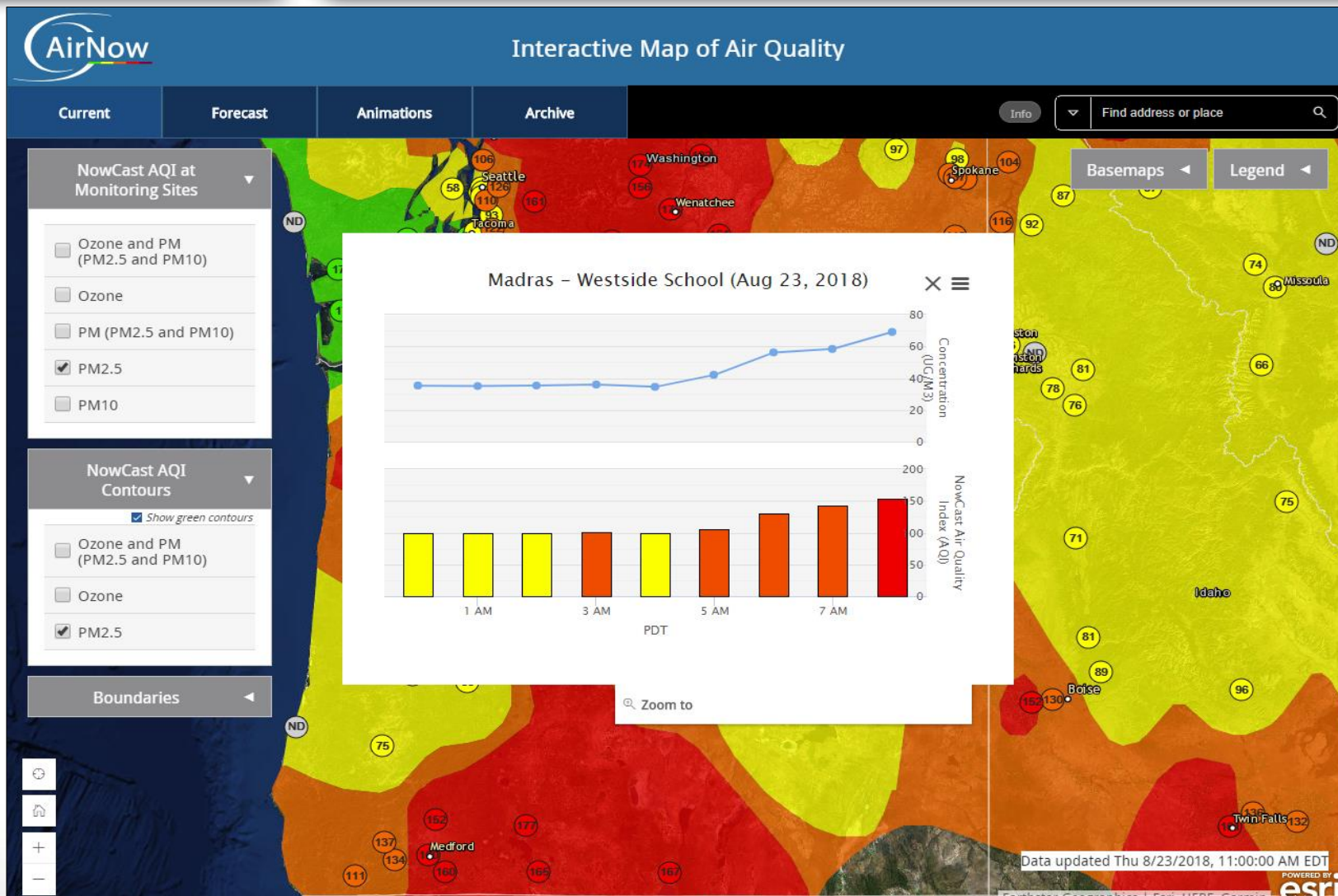
Interactive Map Spatial Resolution





Interactive Map

Spatial and Temporal Resolution

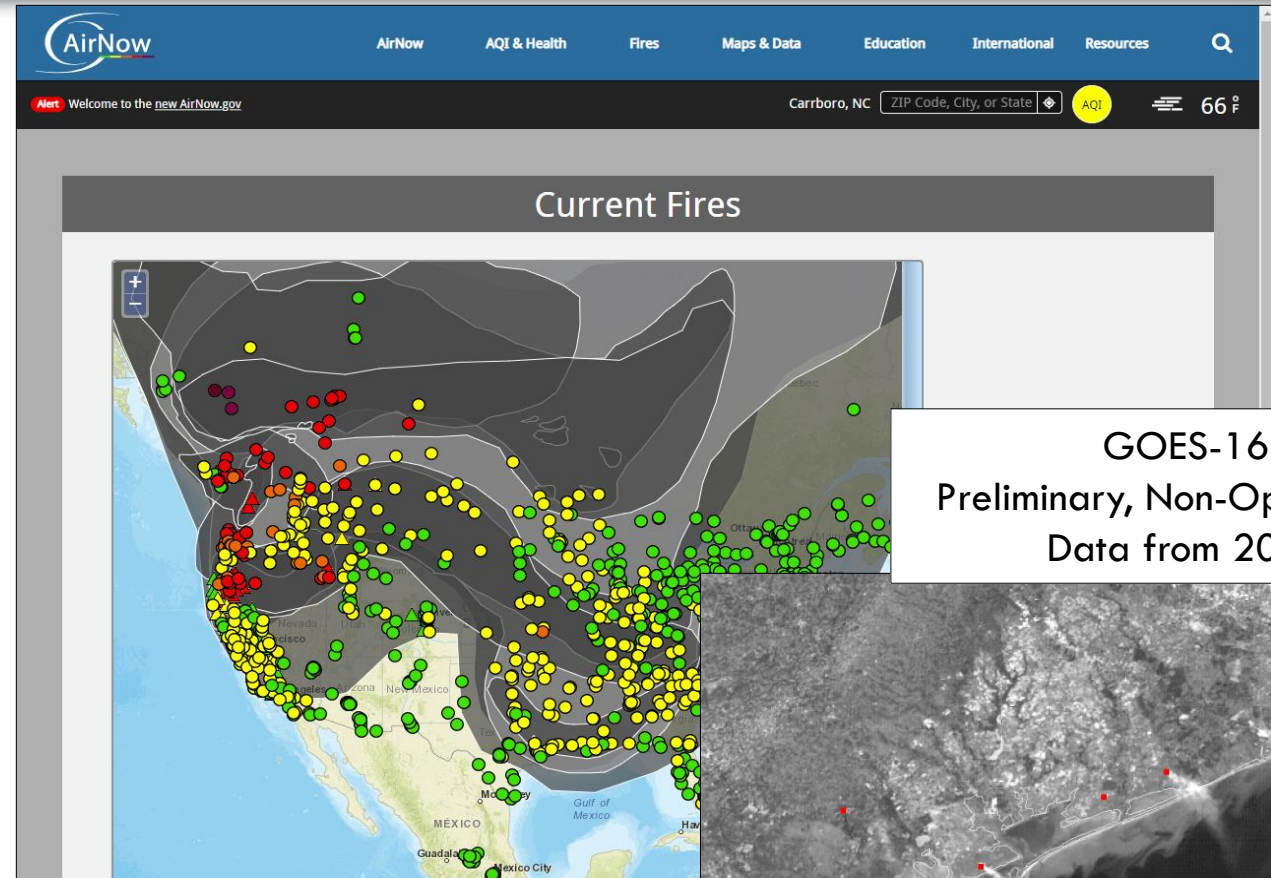




Current Fires Smoke Plumes

NOAA Hazard Mapping System

- 10 satellites send images every 15 minutes
- NOAA analysts work 24/7 to update maps
- Reflects smoke in entire column
- Different temporal and spatial scales than the ambient monitoring network, but the information can supplement the AQI and monitored data
- GOES-16 provides higher resolution images to detect smoke from most fires



GOES-16
Preliminary, Non-Operational
Data from 2017

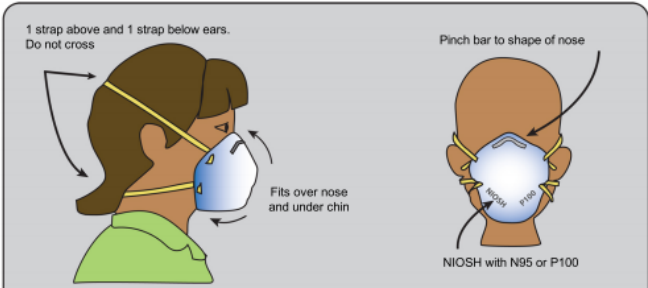


- Satellite imagery may also identify other potential air quality concerns

EPA The right respirator* and proper fit can reduce your exposure to wildfire smoke.

Cloth (wet or dry), paper masks, and tissues will **NOT** filter out wildfire smoke. Look for respirators (masks) marked NIOSH with N95 or P100. They can be found online, or in hardware, home repair, or drugstores.

* Respirators are not designed to fit children. Facial hair prevents proper fit and reduces effectiveness.



Respirator should collapse as you breathe in and not let air in from the sides.

Ask your doctor before using if you have heart or lung health issues.	Throw mask away if it's dirty or you find it difficult to breathe.	If you are dizzy or nauseous, go to where there is less smoke and seek medical attention.
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Use a respirator only after first trying other, more effective methods to avoid smoke. That includes staying indoors and reducing activity. When possible, people at risk should move away from the smoke area.

airnow.gov

EPA Reduce health risks in areas with wildfire smoke:

Follow these tips, especially if someone in your family (including you!) has heart or breathing problems, is an older adult or child, or is pregnant.

DO

- Stay inside
- Pay attention to local advisories and check air quality (airnow.gov)
- Set car A/C on recirculate (to keep smoke out)
- Keep a supply of medicine and non-perishable food
- Use a well-fitted N95 or P100 respirator if you go outside when it is smoky
- Prepare to evacuate if smoke levels get too high



KEEP AIR CLEAN

Close windows and doors. Close fresh intake on A/C units. If your home is too warm, try to stay with friends or relatives.	Use a portable air cleaner with HEPA filters properly sized for a specific room.
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DON'T

- ✗ Play or exercise outdoors
- ✗ Fry or broil foods, which can add particles to indoor air
- ✗ Use a fireplace, gas logs or gas stove
- ✗ Smoke indoors
- ✗ Vacuum, it can stir up dust



airnow.gov

https://www3.epa.gov/airnow/smoke_fires/the-right-respirator-and%20proper-fit-508.pdf

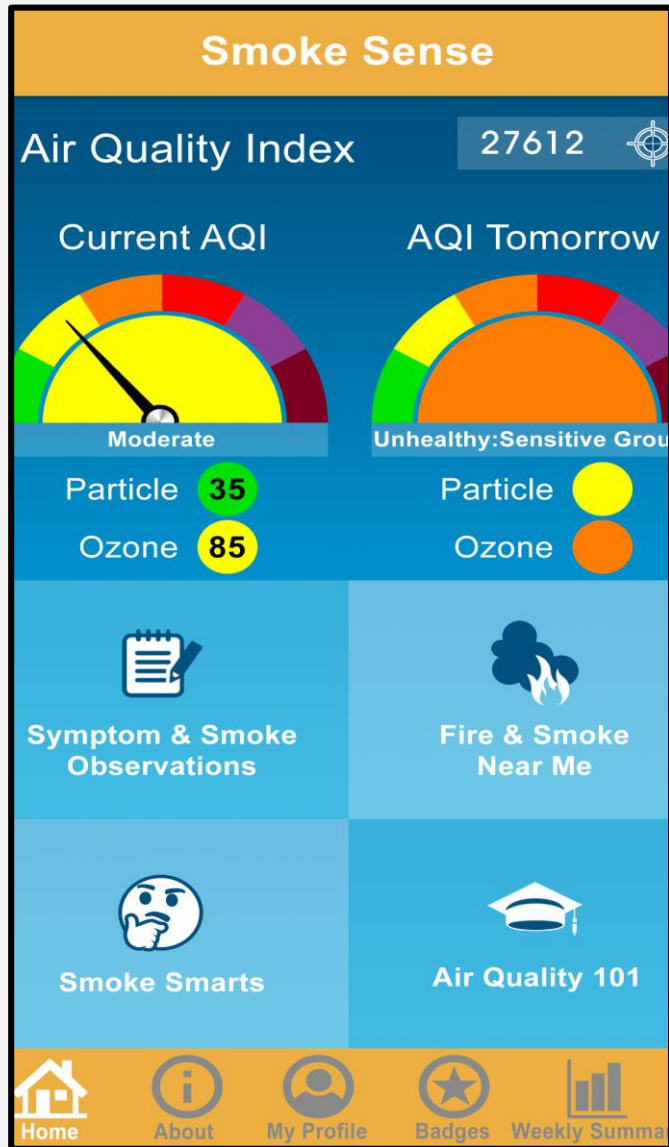
<https://airnowtest.epa.gov/sites/default/files/2018-06/reduce-health-risks-with-wildfire-smoke-508.pdf>

Smoke Sense Smart Phone App

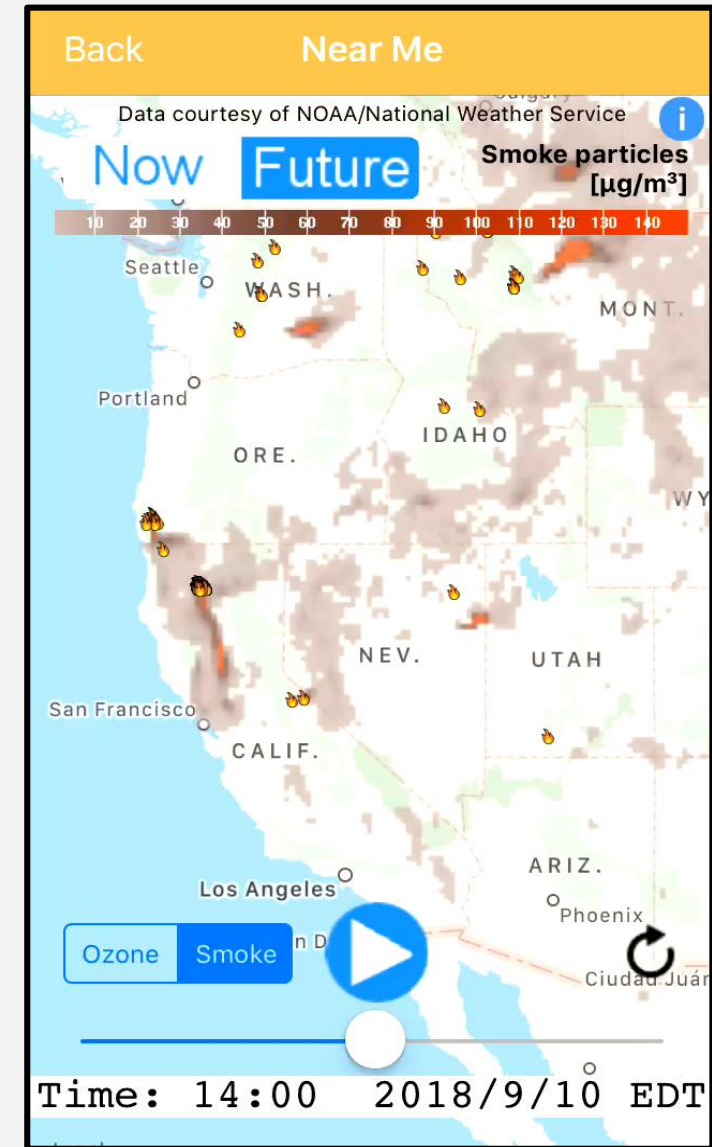
- *Smoke Sense promotes issue engagement and education that aims to:*
 - Foster personal connection between changes in the environment and our health
 - Raise personal awareness about the salience of changing behavior during smoke.
 - Increase knowledge-base about health effects of smoke & risk communication



Smoke Sense App

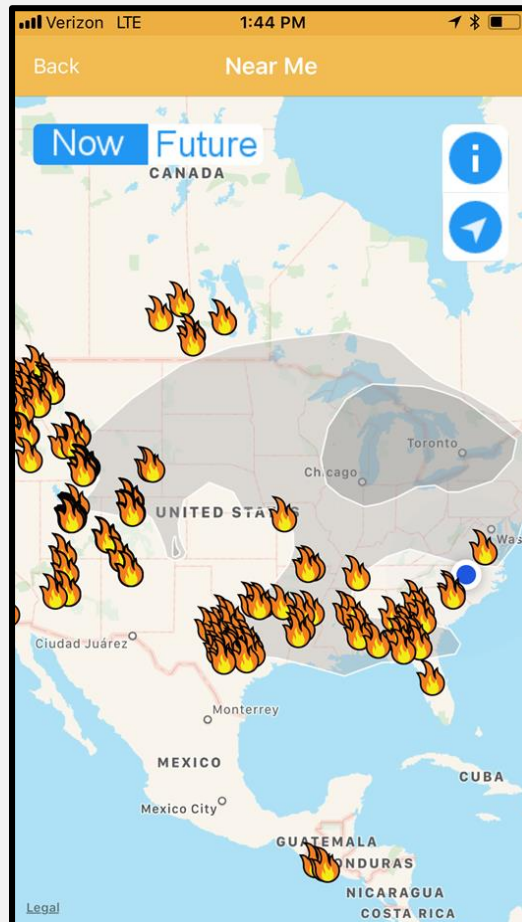


- **Mobile application**
 - Available on iOS & Android
- **Innovative methodology for collecting data that is otherwise not available**
- **Collects data about:**
 - Wildfire smoke exposure
 - Concurrent health symptoms
 - Perceptions on health risk communication
- **Provides:**
 - Air quality information
 - Smoke data
 - Details about current selected fires
 - Accurate health risk communication

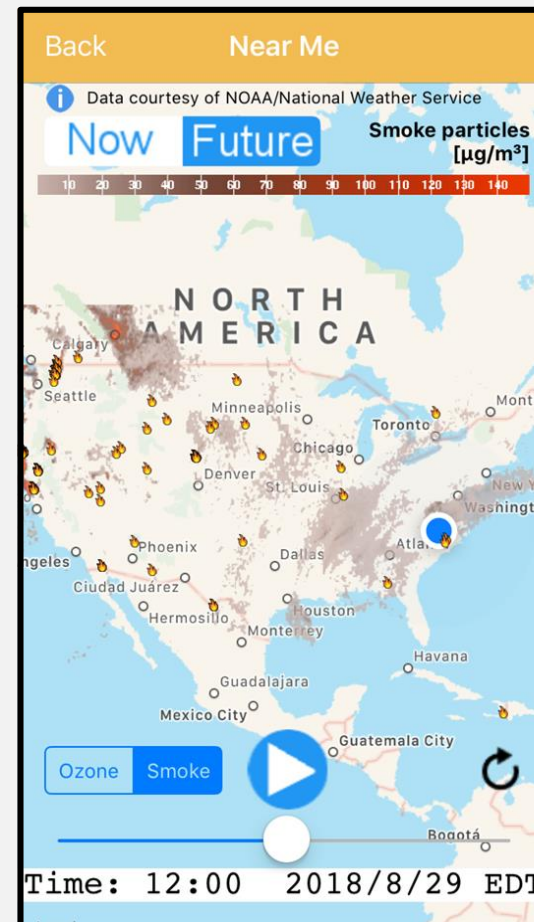


Integration of Smoke & Forecasting Data

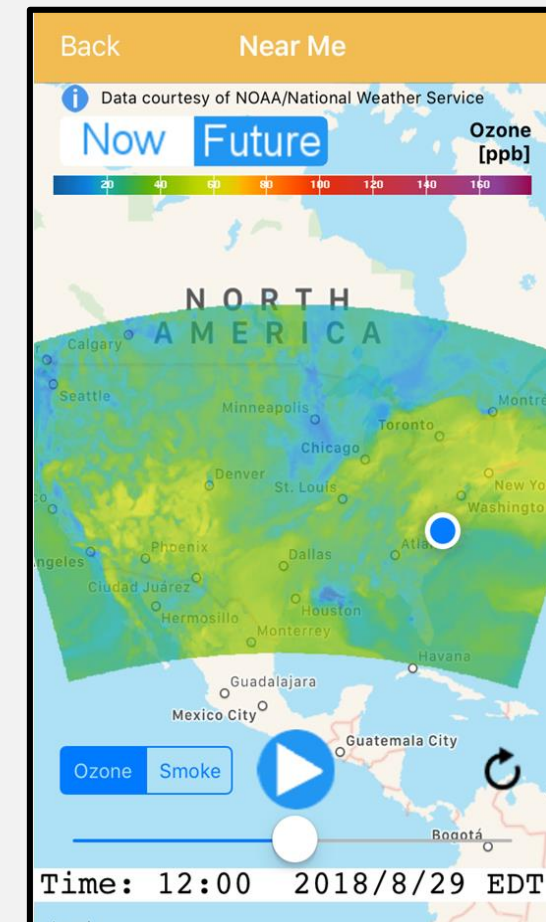
Current Smoke
Conditions Map Layer



Forecast Smoke
Conditions Map Layer

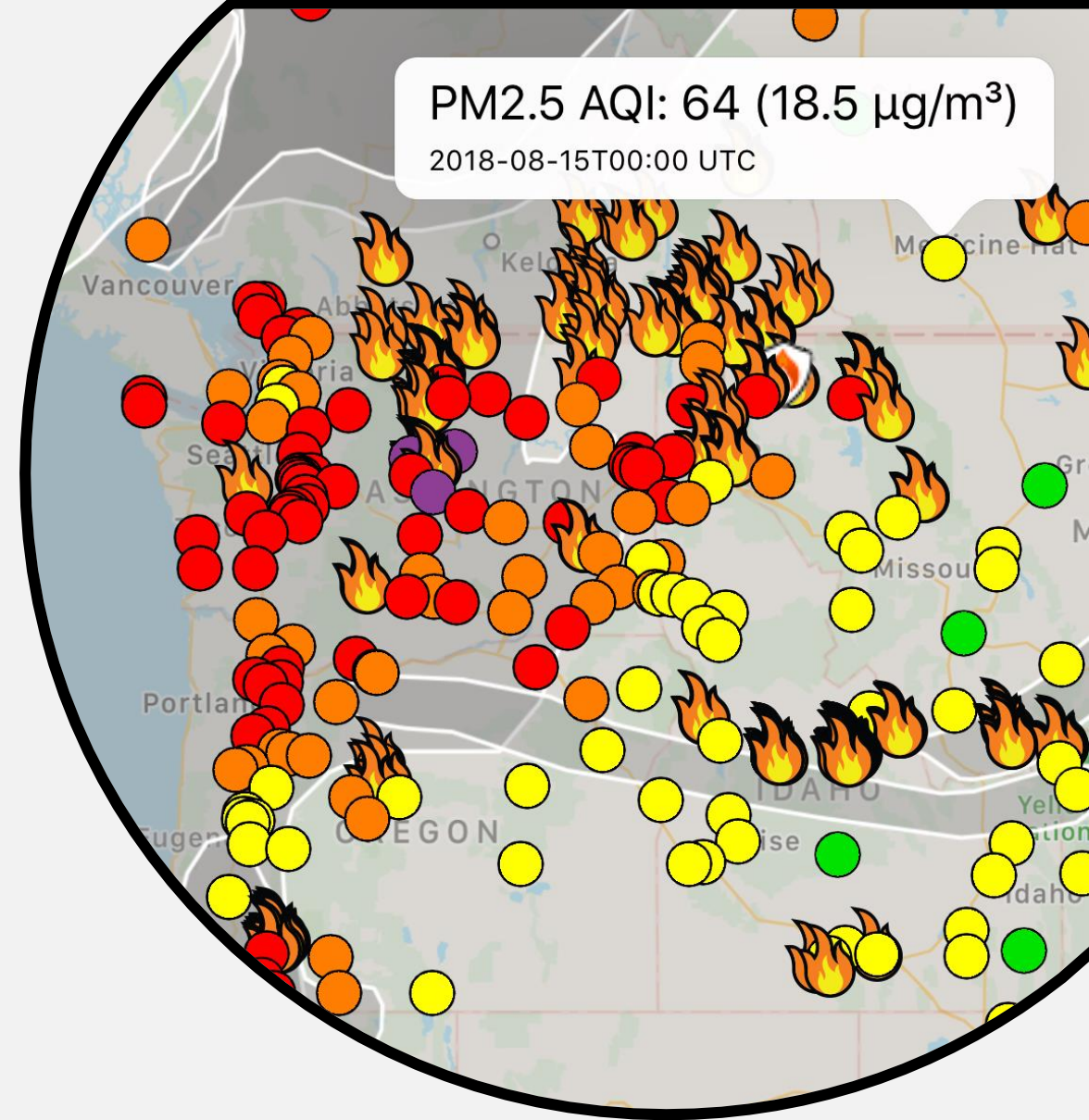


Forecast Ozone
Conditions Map Layer



2018 Smoke Sense Stats

- Over 20,000 users
- Nearly 200,000 sessions!



Additional Projects



- *Organizational Motivations for Engagement in Science Initiative*
 - Primary findings:
 - Motivations are largely intertwined with community experience with smoke
 - Respondents see citizen science as an opportunity to build awareness and engagement
- *K-12 Curriculum Project*
 - Objective: provide standards-based instructional resources related to the Smoke Sense app that can be incorporated into the classroom

Take Away Points

- Smoke Sense is a platform for cutting edge, solutions-driven research and has strong potential for sustained value to both science and improved public health and increased visibility of EPA in communities.
- We have a proven approach to engaging with users and stakeholders to build a strong and growing community of citizen scientists.



Wildland fire research focuses on:

- Exploring new ways to integrate social and natural science perspectives to reduce risks from wildland fires
- Advancing measurement and predictive tools and models to estimate AQ impacts
- Investigating opportunities to better understand, manage, and communicate public health risks



ORD researchers lift a balloon to evaluate air quality from a prescribed fire in Camp Lejeune, NC





Thank you!

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