



# ***Update on the Wildfire Smoke Guide and EPA's New Wildfire Smoke Communication Research***

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*Joint Meeting of the Environmental Research Institute  
of the States Board and US EPA ORD Meeting*

*July 11, 2017*

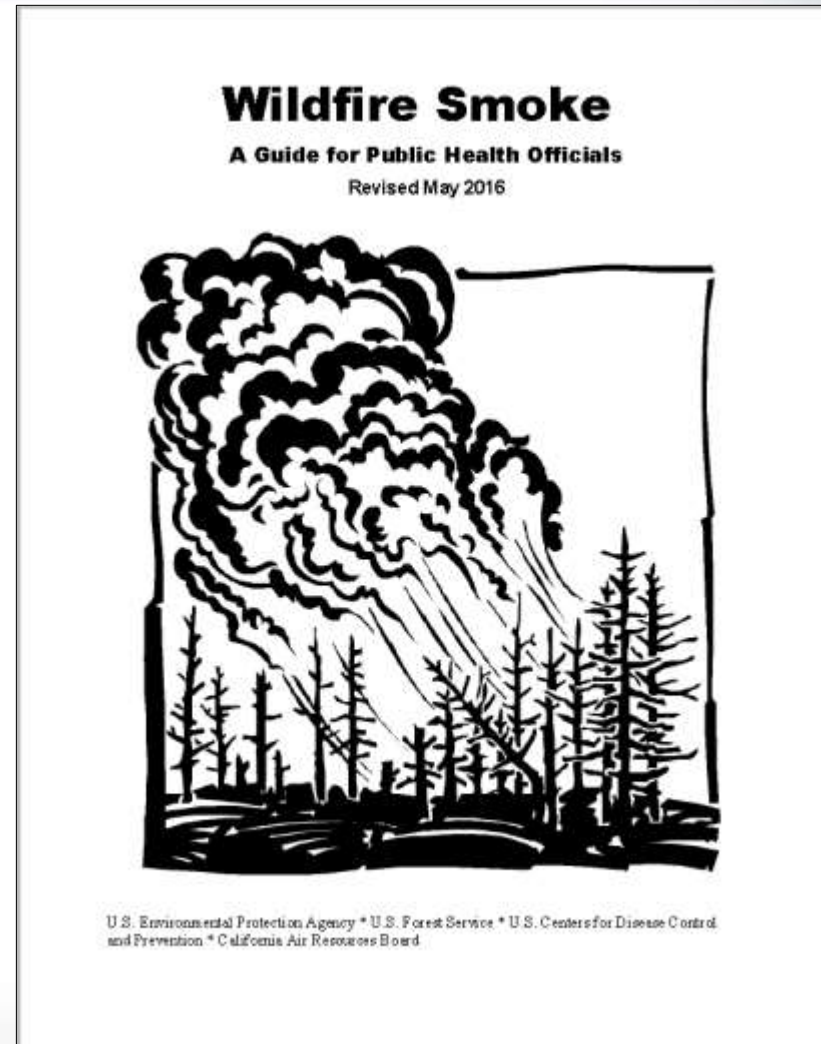
## *Provide an update of:*

- ***2017 Wildfire Smoke: Guide for Public Health Officials***
- **New EPA Wildland Fire Research website**
  - SmokeSense app
  - Wildland Fire Sensor Challenge
  - Wildfire Community Health-Vulnerability Index



# *Wildfire Smoke: Guide for Public Health Officials*

- Air quality and health information updated 2016
- Evidenced-based exposure reduction measures
- Entirely new section on communicating air quality
  - Uses “Current PM” levels from AirNow
  - Uses satellite information on Fires: Current Conditions page
  - Visual range information updated
  - New interagency Wildland Fire Air Quality Response Program
- Used by the states which provided recommendations for improvements





# New Wildfire Smoke Guide 2017

## Coming in Late Summer/Fall



- Updated look
- Addition of ozone
- Smoke vs urban particles
- Add sections
  - PM web course
  - Sensors
  - Ash cleanup
- Stand-alone fact sheets
  - Children
  - Older adults
  - Pets/livestock
  - Preseason preparedness
  - Exposure reduction
  - Respirator use
  - Ash cleanup
  - Know when to evacuate



# Wildfire Smoke Guide 2017

## Example Draft Fact Sheets



### 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.



### WILDFIRE SMOKE FACTSHEET: Indoor Air Filtration

#### Exposure to Particle Pollutants

Indoor sources of particulate matter (PM) come from combustion events such as smoking, candle burning, cooking and wood-burning. During a wildfire event, outdoor PM can increase indoor PM levels well above the levels normally found. As outlined in the Guide, reducing indoor sources of pollution is a major step to lower the concentrations of PM indoors. Further reductions in indoor PM can be achieved using one of the filtration options discussed below.

#### Filtration Options

There are two effective options for improving air filtration in the home: upgrading the central system filter, or using high efficiency portable air cleaning appliances. 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 known as the Minimum Efficiency Reporting Value, or MERV rating. The MERV scale for residential filters ranges from 1-20. The higher the MERV rating the greater the percentage of particles captured as the air passes through the filter media. Higher MERV (higher efficiency) filters are especially effective at capturing very small particles that can most affect health.

#### Central Air System Filter

The filter used in the central heating/cooling system of the home can effectively reduce indoor PM. A home typically will have a low MERV (1-4)

fiberglass filter that is 1" thick. Simply replace filter with a medium efficiency filter (MERV 5-11) significantly improve the air quality in your home. Higher efficiency filters (MERV 9-12) will even better, and a true high efficiency filter (MERV 15) in the central system can reduce PM by as a 95%. However, these filters can also more resistance to air flow, which may increase energy used by the blower motor for the system. You may wish to consult with a local technician or the manufacturer of your system to confirm that the system can handle efficiency filter. If you are not able to upgrade more efficient filter, simply running the continuously by switching the thermostat "Auto" to "On" has been shown to reduce concentrations by as much as 24%.

#### Portable Air Cleaners

Portable air cleaners are self-contained air appliances that can be used alone or in combination with central filtration to effectively reduce indoor PM concentrations. Their effectiveness in reducing indoor PM concentrations depends on several factors such as the size of the cleaner, the filter efficiency, how frequently the unit is turned on and at what fan speed. Portable air cleaners fitted with high efficiency filters can reduce indoor PM concentrations by as much as 90%.

#### Portable Air Cleaners: How to Choose

There is a wide variety of air cleaners on the market ranging in price from about \$50 to \$3,000. Most air cleaners under about \$200 typically do not filter the air well and would not be helpful in a smoke situation.

#### Types of Air Cleaners

Most air cleaners fall under two basic categories: mechanical and electronic. Mechanical air



### WILDFIRE SMOKE FACTSHEET

## Children

#### Background

- **Wildfires** expose children to fire, smoke, the byproducts of burning, and other chemicals released from burning structures and furnishings in addition to the psychological stress associated with these events.
- **During the acute phase** of wildfire activity, the major problems are fire and smoke. Smoke can travel many miles downwind from a burning fire.
- **Children**, individuals with pre-existing lung or cardiovascular diseases (e.g. asthma) are especially vulnerable during wildfires.
- **Children are in a critical period** of development when toxic exposures can have profound negative effects, and their exploratory behavior often places them in direct contact with materials that adults would avoid.

#### Health Effects from Smoke

- Wildfire smoke has very small particles, liquid droplets, and gases such as carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>) and other volatile organic compounds (VOCs).
- Symptoms from smoke inhalation can include chest tightness, shortness of breath, wheezing, coughing, respiratory tract and eye irritation and burning, chest pain, dizziness, or lightheadedness and other symptoms.
- Children with allergies and asthma may have more symptoms than usual.
- The risk of developing cancer from short-term exposures to smoke is vanishingly small.

#### Recommendations

##### Planning Ahead

- **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. 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.
- **Organize** and plan ahead of time and know where to go in case you have to evacuate.

##### During Wildfires – Around Your Home & Car

- **Stay indoors** with the doors and windows closed. If you have an air conditioner, run it with the fresh-air intake closed (recirculate mode) to keep outdoor smoke from getting indoors.
- **Do not add to indoor air pollution.**



## Wildfire Factsheets Under Development

Original PEHSU Wildfire Factsheet available at: <http://www.pehsu.net/cgi/page.cgi/resources.html>





# AirNow ([www.AirNow.gov](http://www.AirNow.gov))





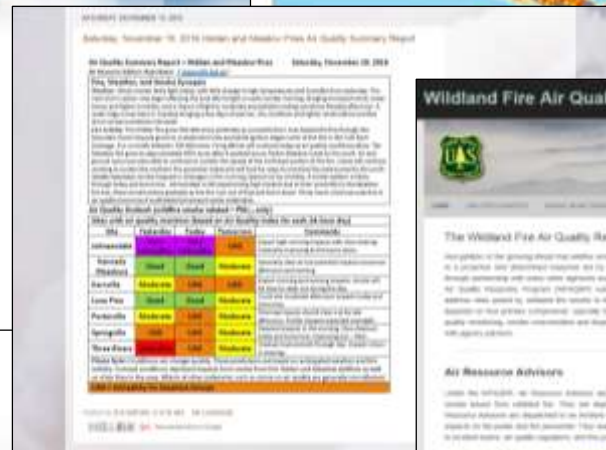
# Fires: Current Conditions Page

- Current Smoke Map generated by NOAA HMS
- Current Advisories – State/Local/Tribal agency blogs and Wildland Fire Air Quality Response Program

Current Conditions Map - May 9, 2016



Current Advisories



CA Smoke Blog



# Wildland Fire Smoke Risk Communication





# EPA Wildland Fire Research

## New Web Page

**Wildland Fire Research to Protect Health and the Environment**

Fires are increasing in frequency, size and intensity partly due to climate change and land management practices, yet there is limited knowledge of the impacts of smoke emissions —both short term and long term. EPA is using its expertise in air quality research to fill the gaps in scientific information and to develop tools to prevent and reduce the impact of wildfires and controlled or prescribed burns. The wildland fire research has three main goals:

- Provide new science to understand the impacts of smoke on health, and how this knowledge can instruct smoke management practices and intervention strategies to reduce health impacts.
- Provide essential novel data on smoke emissions to construct the national emission inventory used to understand air quality across the country.
- Improve understanding of how smoke from fires affects air quality and climate change.

**Research Areas**

- Health Effects
- Tools and Technology Development
- Water Supply and Ecosystem Protection

**Research Publications and Other Resources**

- Health Risk Communication Workshop Report and Presentations
- EPA Wildland Fire Research Publications 2010-2017
- Other Resources
- Key Links

**Public Health Information**

- Local air quality conditions
- Current fire conditions and advisories
- Fires and health
- Burn Wise program
- Other Resources

**Wildland Fire Sensors Challenge**

- [Learn more](#)
- [Webinar Presentation](#)

**Smoke Sense Study and App**

- [Learn more](#)

## Featuring:

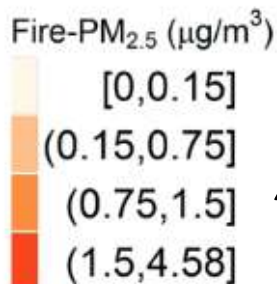
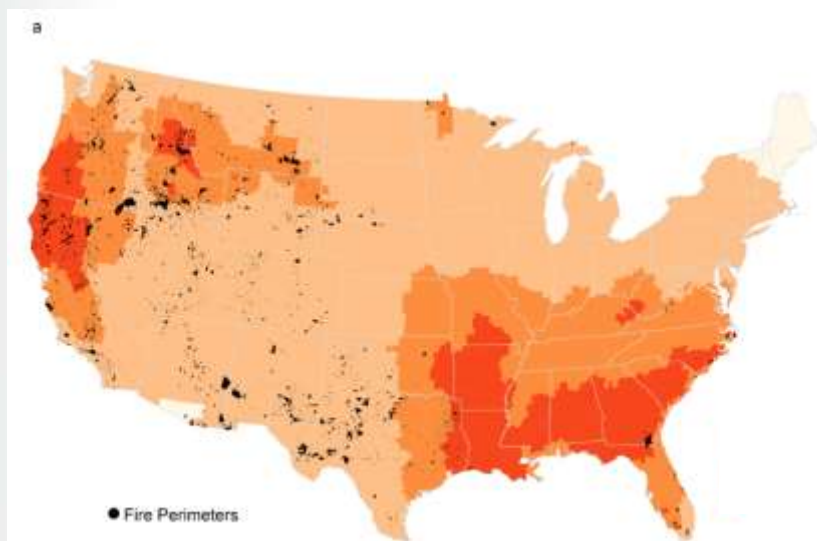
- Links to Public Health Information
- Research Areas
- Research Publications and Other Resources
- Smoke Sense Study and app
- Wildland Fire Sensor Challenge

<https://www.epa.gov/air-research/wildland-fire-research-protect-health-and-environment>



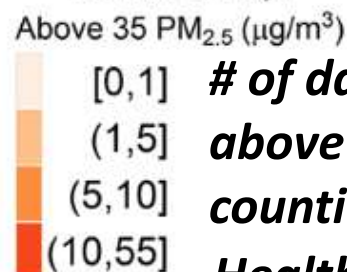
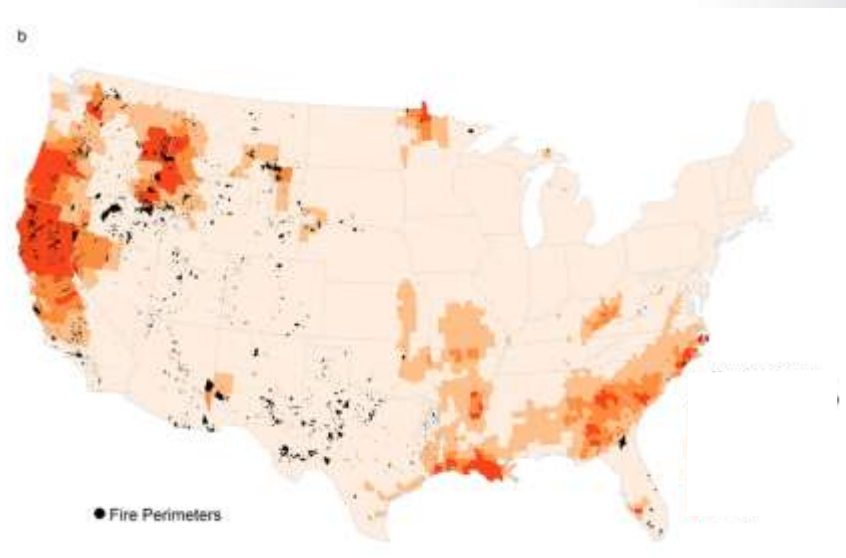
# Air Quality Impacts of Wildland Fires

*Annual average daily fire-PM<sub>2.5</sub> footprint for US counties*



**Health protective stds**  
**Annual: 12  $\mu\text{g}/\text{m}^3$  daily avg.**

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



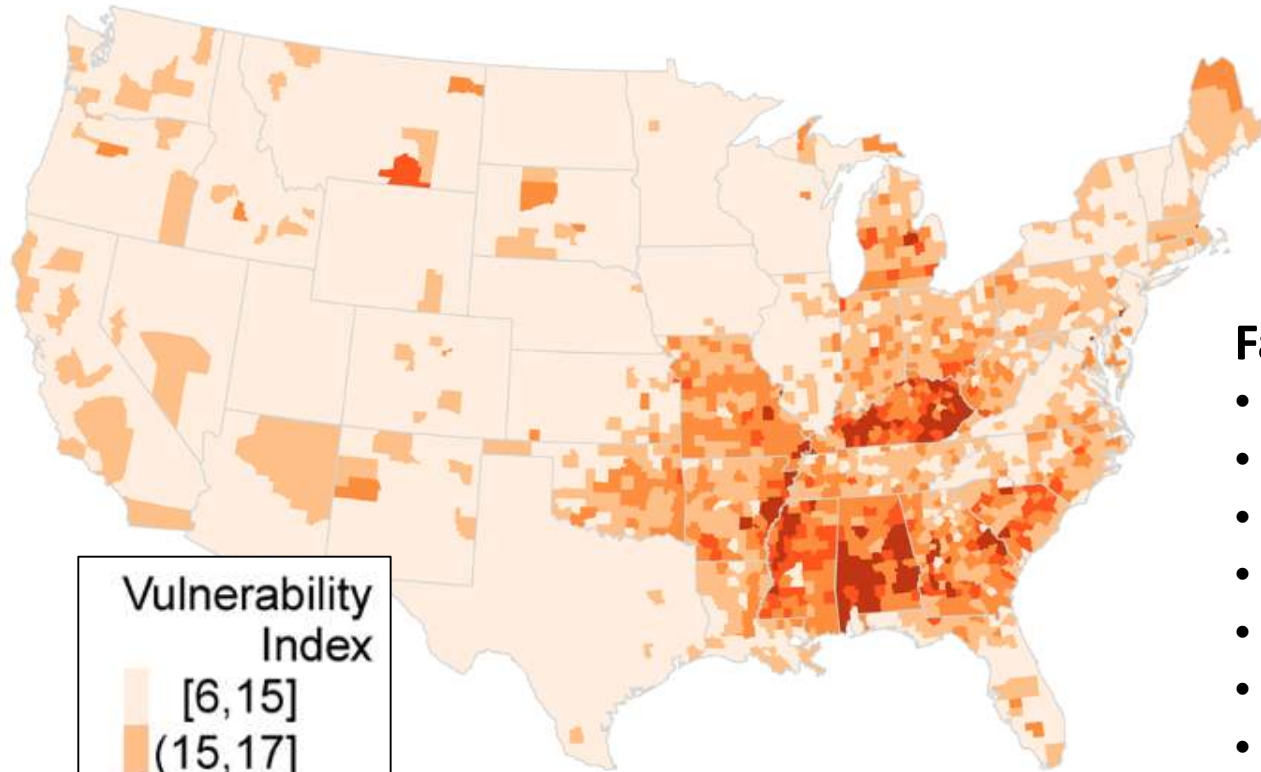
**# of days with fire-PM<sub>2.5</sub> above 35  $\mu\text{g}/\text{m}^3$  by counties of continental US**  
**Health protective standards**  
**Daily: 35  $\mu\text{g}/\text{m}^3$**



# Community Health-Vulnerability

## Community-Health Vulnerability Index

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



Vulnerability  
Index

[6,15]  
(15,17]  
(17,19]  
(19,20]  
(20,24]

### Factors of Vulnerability

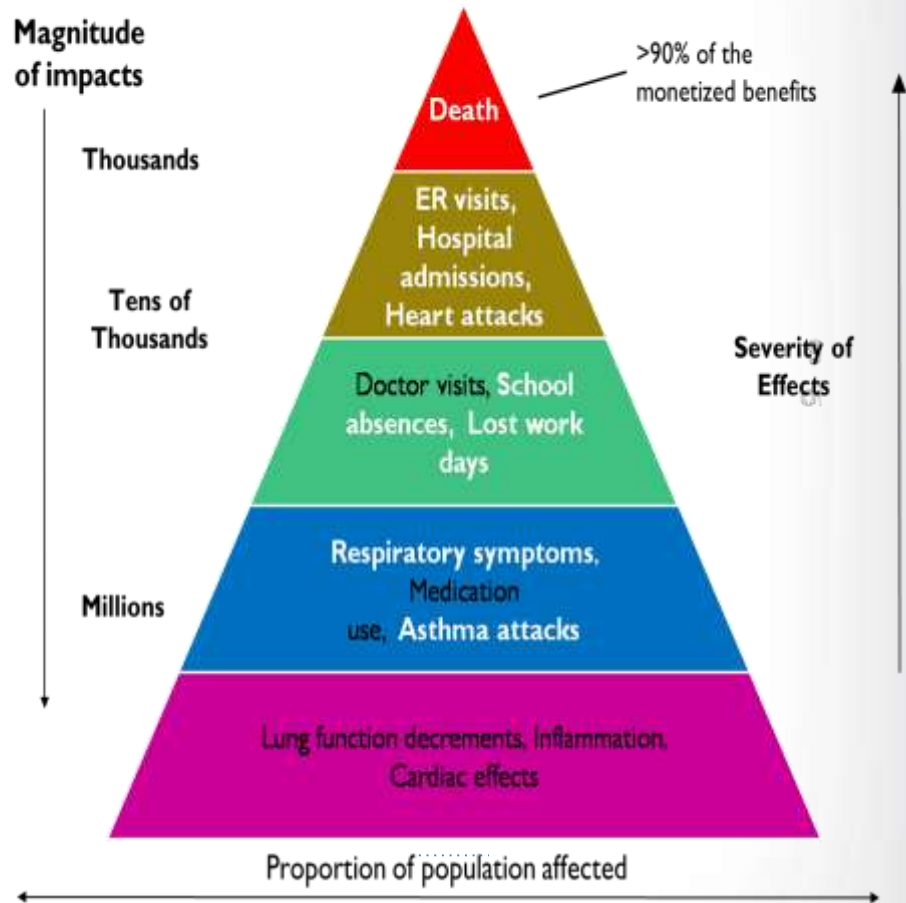
- Peds & Adult Asthma
- COPD
- Obesity
- Diabetes
- Hypertension
- % population age 65+
- Income, education, poverty, unemployment



# In a Population Subclinical Effects Outnumber Clinical Effects

A "Pyramid of Effects" from Air Pollution

- **Sufficient information** about how many people go to the hospital during wildfire smoke episodes
- **Insufficient information on subclinical symptoms** (less severe symptoms) from exposure to wildfire smoke
- **More people experience these subclinical effects** than those who go to the hospital
- Effects include **decreased lung & heart function, worsened asthma, & lost days of school and work**



Community vulnerability to health impacts of wildland fire smoke exposure, *Rappold AG, et al Environ Sci Technol* 2017



### ***Aims of Smoke Sense:***

- ***Measure the effect of wildfire smoke exposure on health and productivity***
- ***Develop health risk communication strategies to improve public health outcomes***

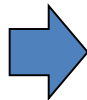
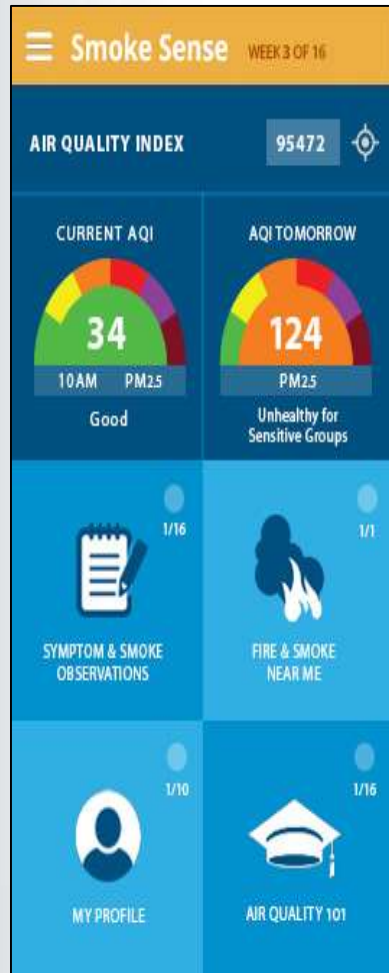
**As part of this, researchers have developed a Smoke Sense mobile phone application to:**

- 1) Collect user input on how smoke events impact their health and daily activities, and
- 2) Provide information about the smoke exposure and recommended health risk messages





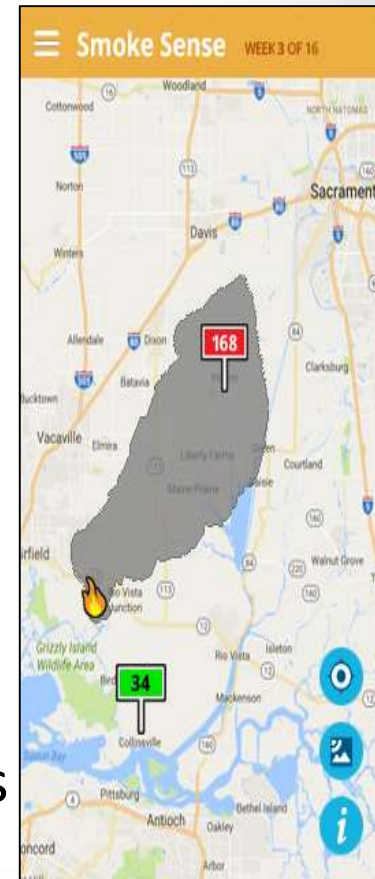
# Air Quality & Smoke Plume Info



Smoke Sense provides information about current and future air quality

Forecasted smoke plumes can be visualized

Less time outside during smoke episodes to decrease exposure & protect health





# Symptom & Smoke Reporting

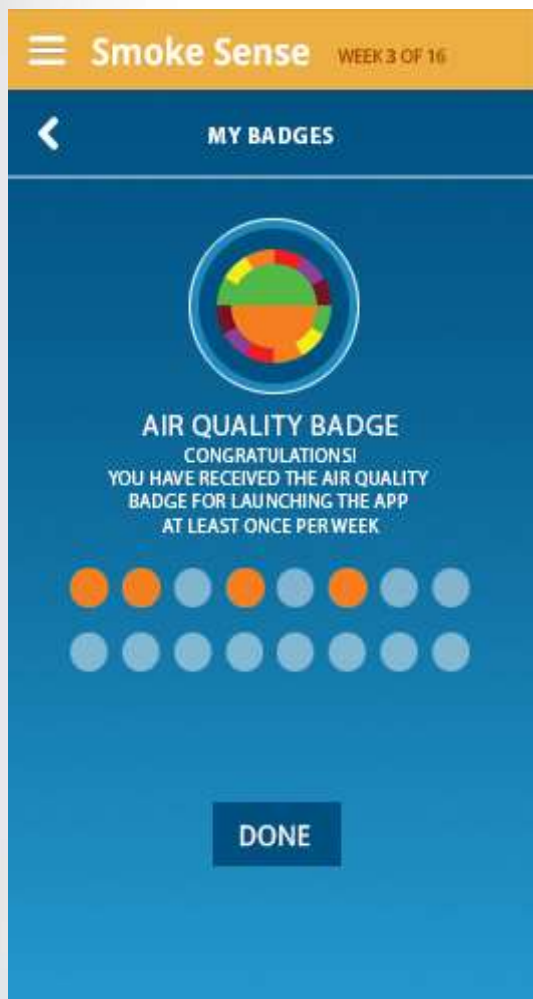
The main menu of the Smoke Sense app, titled "Smoke Sense WEEK 3 OF 16". It features a header with a hamburger menu icon and the text "Smoke Sense WEEK 3 OF 16". Below the header is a section titled "REPORT YOUR SYMPTOMS AND SMOKE OBSERVATIONS". This section contains five menu items, each with an icon and a right-pointing arrow: "Eyes and Ears" (person with glasses), "Respiratory" (person with a stethoscope), "Cardiovascular" (heart with a pulse line), "Other Symptoms" (person with a headache), and "Smoke Observations" (smoke plume). At the bottom of the menu is a blue button labeled "DONE".

The "Eyes and Ears Symptoms" report screen in the Smoke Sense app. The title bar at the top says "Smoke Sense WEEK 3 OF 16". Below the title bar is a back arrow and the text "EYES AND EARS SYMPTOMS". A person icon with glasses is shown. The main question is "DID YOU EXPERIENCE THE FOLLOWING SYMPTOMS IN THE PAST WEEK: WATERY EYES, STINGING EYES OR EAR INFECTION?". Below this is a calendar for the week of June 6th to 30th, with the 7th highlighted. The next question is "WERE YOU TREATED BY A PHYSICIAN FOR THESE SYMPTOMS?", with three options: "No", "Yes (Outpatient or Clinic)", and "Yes (Inpatient Hospitalization)". The next question is "DID YOU USE MEDICATION TO TREAT YOUR SYMPTOMS?", with three options: "No", "Yes (Prescription)", and "Yes (Over the Counter)". The final question is "WERE YOU TRAVELING MORE THAN 50 MILES FROM HOME WHEN YOU EXPERIENCED THESE SYMPTOMS?", with two options: "No" and "Yes". At the bottom is a blue button labeled "SAVE".

- Smoke Sense helps collect information about who, when, and how frequently people are impacted by smoke
- Information about smoke in the air and symptoms experienced in the past week will be logged



# Gamification to Promote Participation



- Participants receive badges as they learn about air quality and when they complete surveys
- Our expectation is that participants have fun as they learn to protect their health



## **Work closely with NC & WA to encourage residents to use the Smoke Sense App**

- Use existing communication channels (websites, social media, etc.) to encourage usage of the App
- EPA will help states develop packet of communication materials to promote App to residents
  - Tweets
  - Factsheets
  - Blogs
  - More, as desired
- Explore setting up a formal collaboration to exchange data gathered during this study





# Wildland Fire Sensor Challenge

## Multiple Federal Agency Sponsors

### Wildland Fire Sensors Challenge



"Turnkey real-time air pollutant measurement platform to support public health messaging during large wild and prescribed fire events"

Do you have ideas on new air pollution measurement strategies for wildfire events?

Wild fires often produce significant air pollution, which poses health risks to first responders, residents in nearby communities and other populations that are impacted by smoke as it travels downwind. In contrast, prescribed fires are typically managed to minimize downwind impacts on populated areas; however those in close proximity may be exposed to smoke. Wildland fire refers to both wild and prescribed fires.

Quickly deploying air pollution measurement stations has, to date, been limited by the cost and complexity of implementation. However, emerging technologies including miniaturized direct-reading sensors, compact micro-processors, and wireless data communications provide new opportunities to detect air pollution. U.S. EPA and collaborating partners are preparing a challenge opportunity to develop a prototype multi-node measurement system capable of rapid deployment and continuous real-time monitoring of highly dynamic air pollution levels during a fire event, including  $PM_{2.5}$ , CO, and  $CO_2$ .

Visit [challenge.gov](http://challenge.gov) for more information.

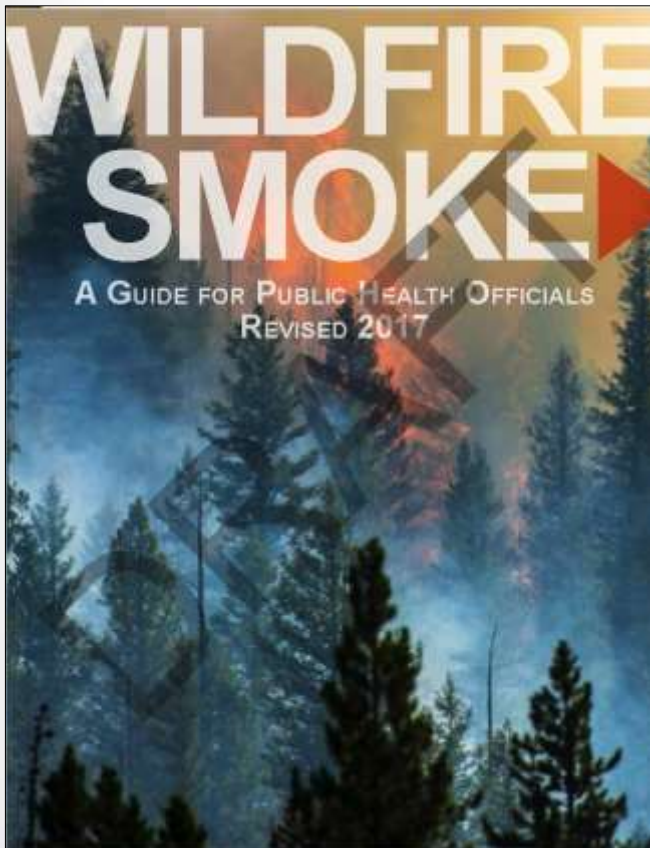


- Intended to stimulate development of low-cost, light-weight, accurate & easily deployable sensor technology that could be used by first responders and public health agencies during wildland fires
- Collaborative project between EPA (ORD, OAQPS and regional offices), federal partners (USFS, NASA, NOAA, CDC and NPS) and NGOs
- Announced in early 2017, 9 month development window, testing and judging in 2018
- Designing complimentary projects with EPA regional offices and other interested groups to field test sensors in a wildland fire scenario



## *For More Information Visit*

**2017 WILDFIRE GUIDE - A GUIDE FOR  
PUBLIC HEALTH OFFICIALS,  
Estimated release late Summer/Fall 2017**



Contact information: Wayne Cascio, MD  
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- [\*\*AirNow\*\*](#)
  - [\*\*Current Conditions\*\*](#)
  - [\*\*Health Providers Page\*\*](#)
  - [\*\*Wildfire Smoke and Health\*\*](#)
  - [\*\*Wildfire Smoke: Guide for Public Health Officials\*\*](#)
  - [\*\*Wildfire Trends\*\*](#)
- [\*\*EPA Wildfire Research Webpage\*\*](#)
- [\*\*California Air Resources Board Resources\*\*](#)
- [\*\*CDC Wildfire Factsheets\*\*](#)
- [\*\*Wildland Fire Air Quality Response Program\*\*](#)



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