

# Wildland Fire Smoke & Air Quality

---

Greater Yellowstone Fire Action Network

Region 4 Wildland Smoke Coordination

Bridger Teton National Forest

April 11, 2023





## Pollutants in Smoke



## Your Health & Safety



## Prescribed Fire





# What is in Smoke from Wildland Fires?

Smoke is a complex mixture. The major pollutants are:

- Particulate matter, aka PM.
- Gaseous pollutants such as carbon monoxide (CO)
- Hazardous air pollutants (HAPs) (e.g., polycyclic aromatic hydrocarbons [PAHs]), benzene, acrolein, formaldehyde, and others

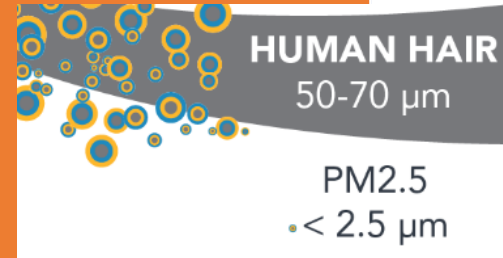


# Why Wildfire Smoke is a Health Concern

<https://www.epa.gov/wildfire-smoke-course/why-wildfire-smoke-health-concern>



The particles are tiny  
(mostly < 2.5 microns)



Tiny particles are bad for you  
(they go deep into your  
lungs)

GRAIN OF POLLEN  $15\mu\text{m}$  >

DUST PARTICLE ( $\text{PM}_{10}$ )  $<10\mu\text{m}$  >

RED BLOOD CELL  $7\text{-}8\mu\text{m}$  >

RESPIRATORY DROPLETS  $5\text{-}10\mu\text{m}$  >

DUST PARTICLE ( $\text{PM}_{2.5}$ )  $2.5\mu\text{m}$  >

BACTERIUM  $1\text{-}3\mu\text{m}$  >

WILDFIRE SMOKE  $0.4\text{-}0.7\mu\text{m}$  >

CORONAVIRUS  $0.1\text{-}0.5\mu\text{m}$  >

T4 BACTERIOPHAGE  $0.225\mu\text{m}$  >

ZIKA VIRUS  $0.045\mu\text{m}$  >



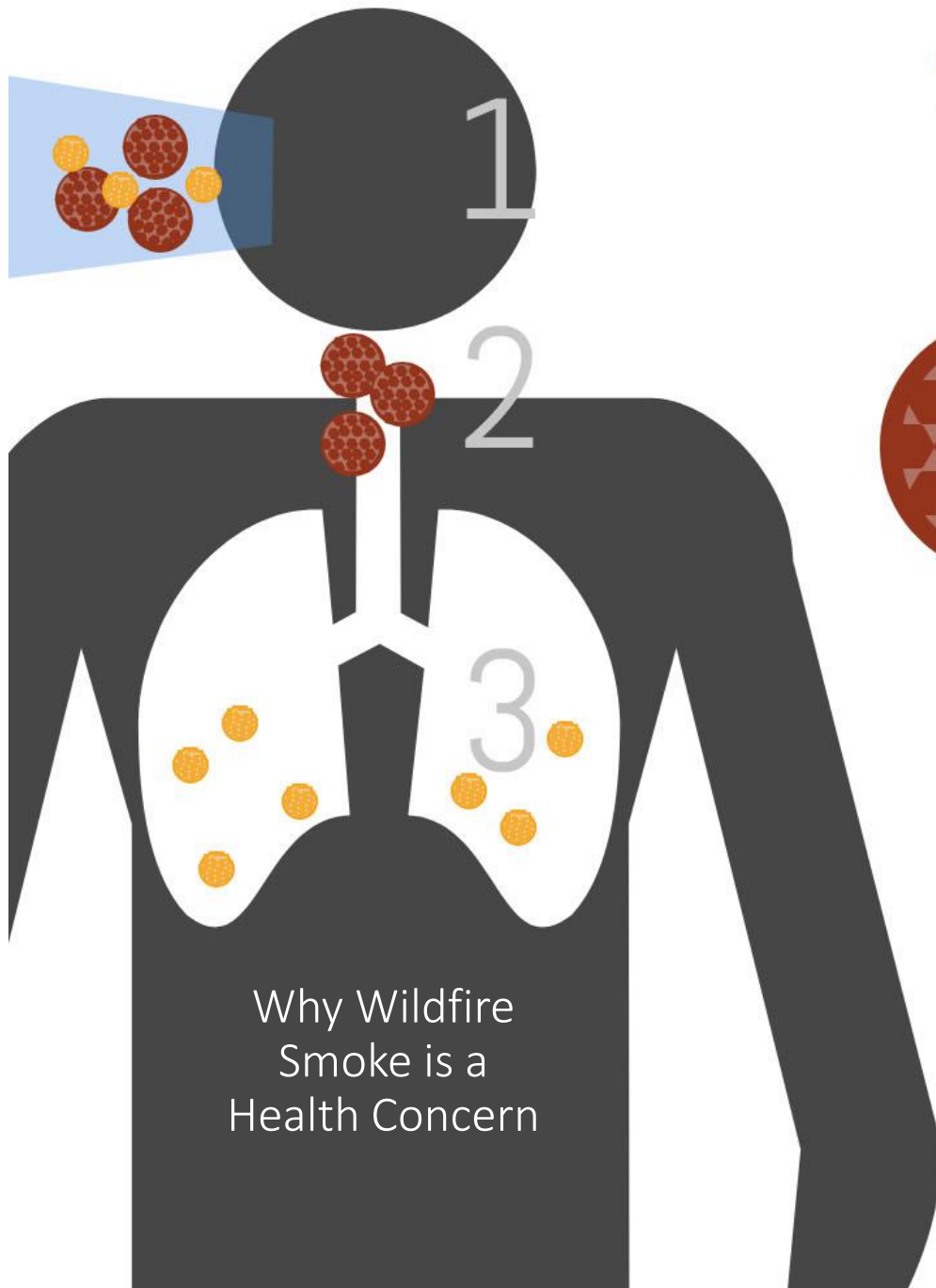
Respiratory droplets have the ability to carry smaller particles with them, such as dust or coronavirus.



Wildfire smoke can persist in the air for several days, and even months.

**SOURCES** Clearstream, Daniel Loverbey, EPA, Financial Times, News Medical, Science Direct, SCMP, Susan Sokolowski, Petroclear, U.S. Dept. of Energy

**COLLABORATORS** RESEARCH + WRITING Carmen Ang, Iman Ghosh | DESIGN + ART DIRECTION Harrison Schell






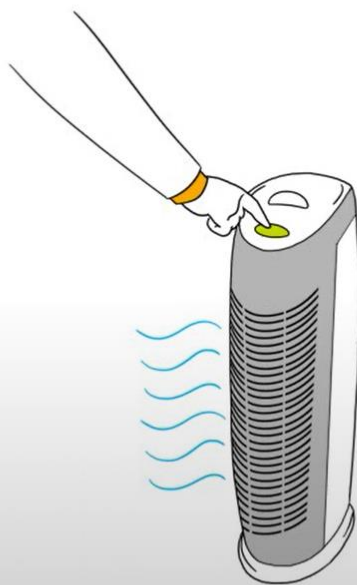
- 1 particulate matter enters body through:
- ▶ NOSE
  - ▶ MOUTH



- 2 larger particulate matter (PM<sub>10</sub>) is eliminated through
- ▶ COUGHING
  - ▶ SNEEZING
  - ▶ SWALLOWING

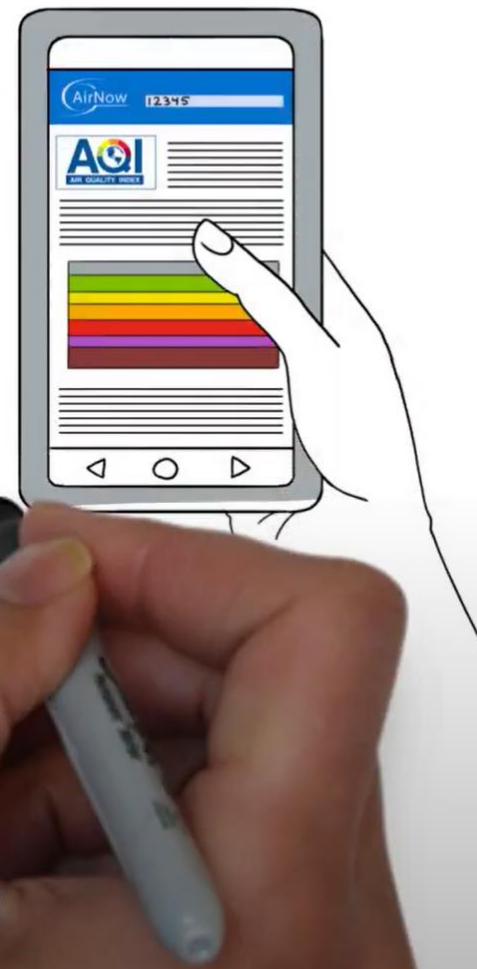


- 3 smaller particulate matter (PM<sub>2.5</sub>) can penetrate deep into lungs causing:
- ▶  problems
  - ▶  problems
  - ▶ harmful chemicals into 



HEPA

N95 Mask



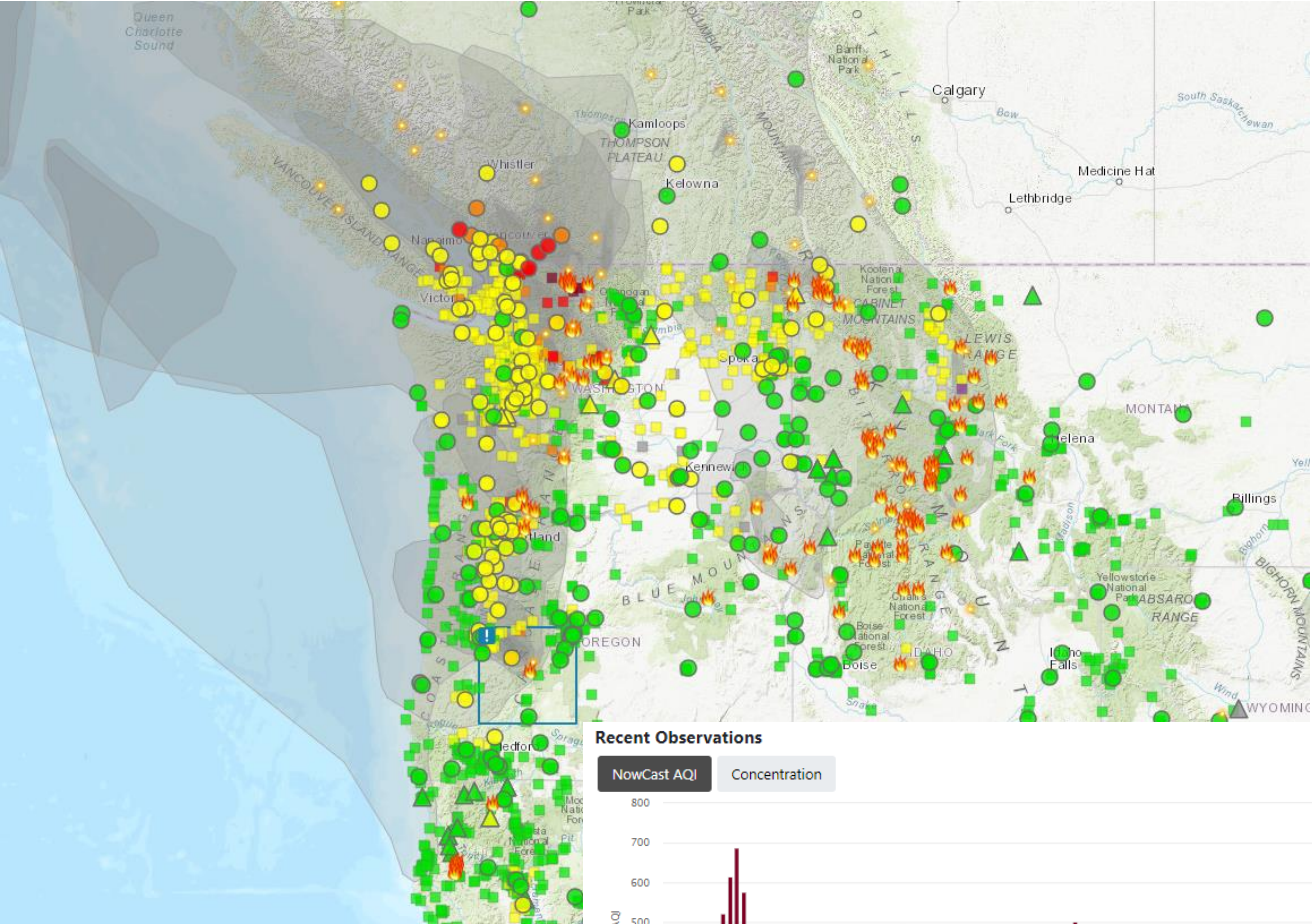
Always keep an eye on the Air Quality Index.



Daily Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.



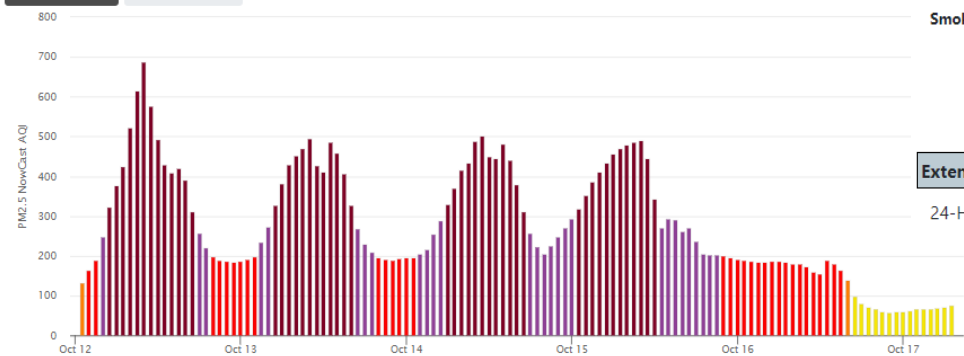
# Smoke messaging for wildland fire



<https://fire.airnow.gov/>

### Recent Observations

NowCast AQI Concentration



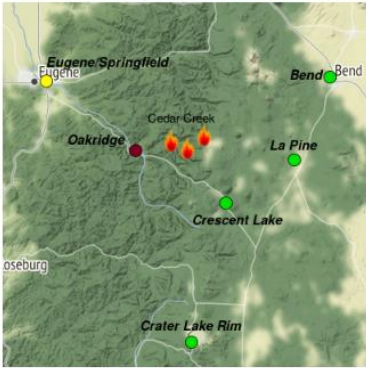
Issued: 2022-10-16 11:52 (EDT) U.S. Interagency Wildland Fire Air Quality Response Program  
By: Marlene DePietro, mdepietro.hpclic@gmail.com

### Fire

The Incident Meteorologist predicts the weather to continue with strong and gusty off-shore winds through Sunday morning, switching to on-shore, and then southerly by Monday. Although relative humidity's are expected to rise, dry fuel conditions will continue to support isolated areas of moderate fire behavior. The Fire Behavior Analyst expects overall fire activity to continue to be low to moderate. Fire is expected to be more active in isolated pockets of heavy fuels, particularly where wind and slope align. For size, containment, and detailed information about the fire, see <https://inciweb.nwcg.gov/incident/8307/>

### Smoke

Air quality will likely be similar to what was experienced Saturday across the Outlook Area through Sunday, improving briefly by noon in some areas as the inversion lifts. As on-shore winds develop smoke can be expected to again be concentrated below the inversion layer, especially in and around Oakridge, and impact air quality much as it has the past week. Communities east of the divide may see smoke as regional haze, with some potential for Moderate air quality, depending on fire activity and smoke production.



Oakridge Eugene/Springfield La Pine Crater Lake Crescent Lake Bend

### Oakridge

Expect air quality to vary between Unhealthy to Hazardous today.

#### Yesterday's Forecast

Sunday 10/16/22

24-HR AQI: ● Hazardous

Smoke continuing. Very Unhealthy to Hazardous air quality continuing.



Morning



Afternoon



Evening



Night

#### Today's Forecast

Monday 10/17/22

24-HR AQI: ● Hazardous

Smoke continuing. Very Unhealthy to Hazardous air quality continuing.



Morning



Afternoon



Evening



Night

#### Extended Forecast

24-HR AQI: ● Hazardous

Is it smoky outside? Protect your health.  
Use the **5-3-1** Visibility Method

During fires  
if you  
can see\*  
about:

\*when humidity is low

**5** miles

**3** miles

**1** mile

and you are:

An Adult  
A Teenager  
An Older Child

Check  
visibility  
often.

Reduce  
outdoor  
activity.

**Stay inside.**

or you are:

Age 65 and Over  
A Young Child  
Pregnant

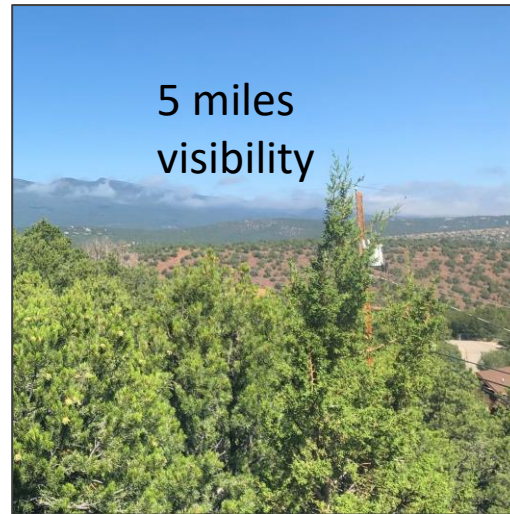
or you have:

Asthma  
Respiratory Illness  
Lung or Heart Disease

Minimize  
outdoor  
activity.

**Stay  
inside.**

## Estimating PM by Visual Assessment



More info:

Summary and analysis of  
approaches linking visual  
range, PM<sub>2.5</sub> concentrations,  
and air quality health impact  
indices for wildfires

<https://doi.org/10.1080/10962247.2013.806275>



<https://nmtracking.doh.nm.gov/environment/air/FireAndSmoke.html>



# How to Reduce Impact from Wildfire Smoke

## American Lung Association Video

- <https://youtu.be/-RkAAWRJcRY>

### KEY MESSAGES

#### Reducing Wildfire Smoke Exposure

Numerous strategies can be implemented to reduce public health impacts associated with wildfire smoke exposure, many of which also mitigate smoke exposure from prescribed burn activities. Briefly, these strategies include

- (1) air quality surveillance coupled with public outreach and public notification systems;
- (2) indoor air filtration and clean air spaces;
- (3) provision and use of respiratory protective equipment; and
- (4) additional emergency planning and response, including protections for vulnerable populations.



## Summary of Research/Literature Review

- [Can Prescribed Fires Mitigate Health Harm? \(lung.org\)](https://www.lung.org/can-prescribed-fires-mitigate-health-harm/)



**A little smoke from  
a prescribed burn...**

**...can prevent a lot  
of smoke later.**





What is  
prescribed fire ?

What is smoke  
management?

- A smoke management plan is submitted to state environment department to show air quality standard would be in compliance during the event.
- Localized and aims to minimize the smoke impacts to community.
- VIDEO
- [Good Fire: Prescribed Burning - YouTube](#)



# HOW TO BUILD A LOW-COST AIR FILTER

What you'll need:



Box fan

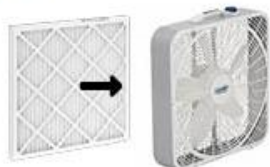


20"x20"x1" furnace filter  
(MERV 13 or FPR 10)



Optional: Duct tape or bungee  
cords

- 1 Place filter on back (air intake side) of fan.



! Make sure that the arrow on the side of the filter is pointing towards the fan.

- 2 Use the duct tape or bungee cords to attach the filter securely to the fan.



! Use tape or cords only around the edges; do **not** block the air flow through the fan.

- 3 Place in an area away from any obstacles and turn the fan on.



⌚ Run the fan on high for a few hours if your indoor air quality is already poor, then turn it to medium to keep it clean.

- 4 Keep all windows and doors closed to prevent new smoke from getting into your home!



# Do it Yourself Low Cost Air Filter

<https://youtu.be/EUHVo54tXz0>



Fan with clean filter



Fan with smoke filter



Fan with dust laden filter



# Where to Find Air Quality Information

- [AirNow.gov](https://www.airnow.gov/)
- [Fire and Smoke Map \(fire.airnow.gov\)](https://fire.airnow.gov/)
- [EnviroFlash – Home](https://www.enviroflash.com/)
- [National Maps | AirNow.gov](https://www.airnow.gov/national-maps/)
- [Be Smoke Ready | AirNow.gov](https://www.airnow.gov/be-smoke-ready/)
- [Prepare For Fire Season \(airnow.gov\)](https://www.airnow.gov/prepare-for-fire-season/)
- [NM-Tracking - Fires, Smoke and Health](https://www.nm-tracking.org/)
- <https://www.montanawildfiresmoke.org/>

# Information you can use

[Fire and Smoke Map \(airnow.gov\)](https://airnow.gov)

[PurpleAir | Real-time Air Quality Monitoring](#)

[Wyoming Air Quality Monitoring Network \(wyvisnet.com\)](https://wyvisnet.com)

## Apps for phones

- [EPA AIRNow on the App Store \(apple.com\)](https://apple.com)
- [AirNow Mobile App | AirNow.gov](https://airnow.gov)
- Purelogic labs AQI App
- IQAir/Airvisual
- Air Quality – AirCare
- Plume Labs
- BreezoMeter



# Presenting Team Contacts

**Paul Corrigan** -Utah Interagency Smoke Coordinator  
Forest Service Regional Office  
[paul.Corrigan@usda.gov](mailto:paul.Corrigan@usda.gov)

**Brinda Ramanathan**- Air Quality Specialist  
Bridger Teton National Forest- Supervisor Office  
[Brinda.Ramanathan@usda.gov](mailto:Brinda.Ramanathan@usda.gov)

**Lesley Williams Gomez**- Wildfire Prevention Specialist  
North Zone, Bridger Teton National Forest  
[Lesley.williams@usda.gov](mailto:Lesley.williams@usda.gov)

**Liz Davy**- Greater Yellowstone Fire Action Network -Director of  
Operations and Program Specialist  
[lizdavy88@gmail.com](mailto:lizdavy88@gmail.com)