



WILDFIRE SMOKE

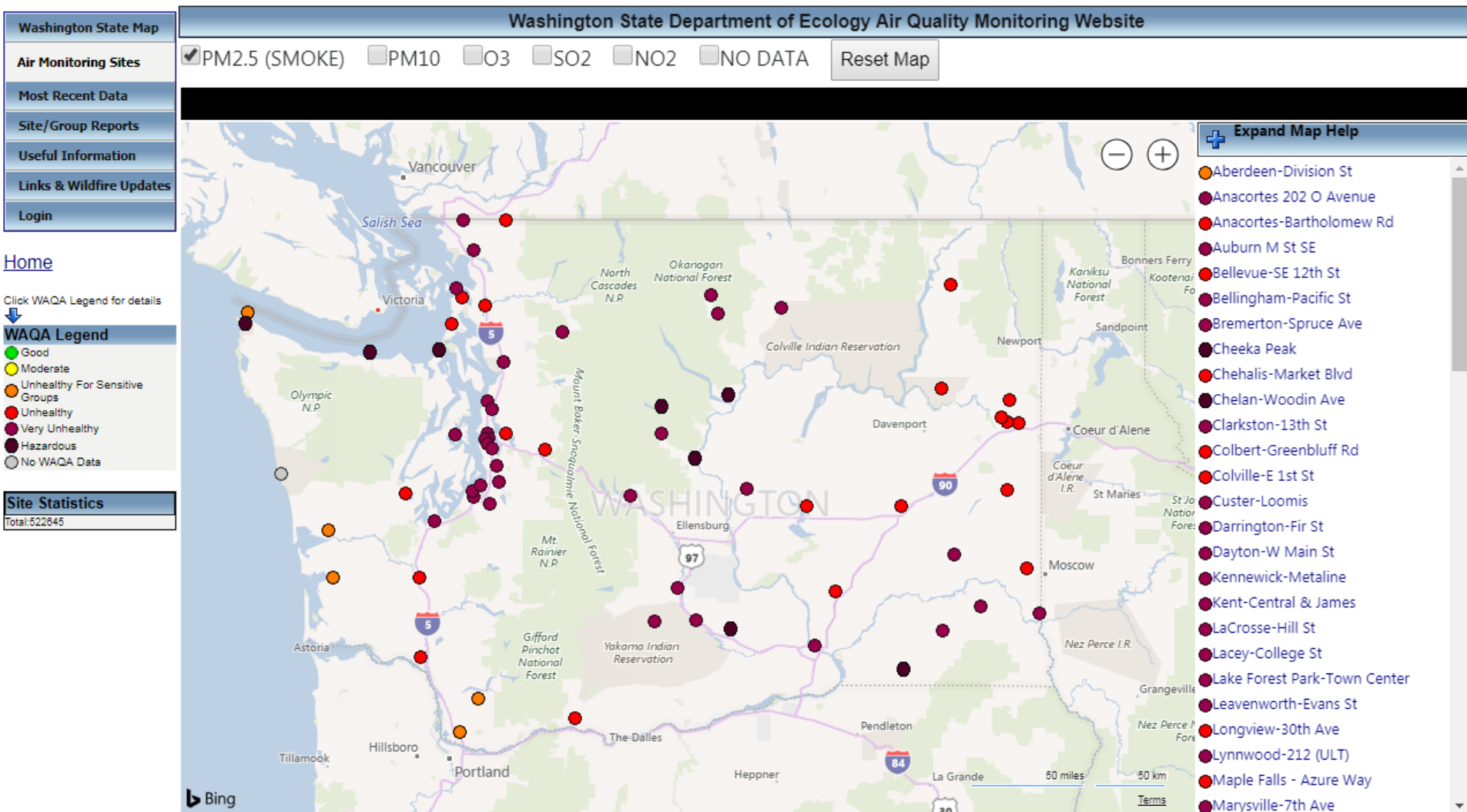
Nancy Bernard, MPH, REHS

- Wildfire smoke is an increasing threat to public health in Washington.
- Climate change and forest management practices have led to longer wildfire seasons with increased fuels, resulting in more smoke and increased air pollution
- Increasing need for wildfire smoke preparedness to protect public health and provide consistent messages across the state.

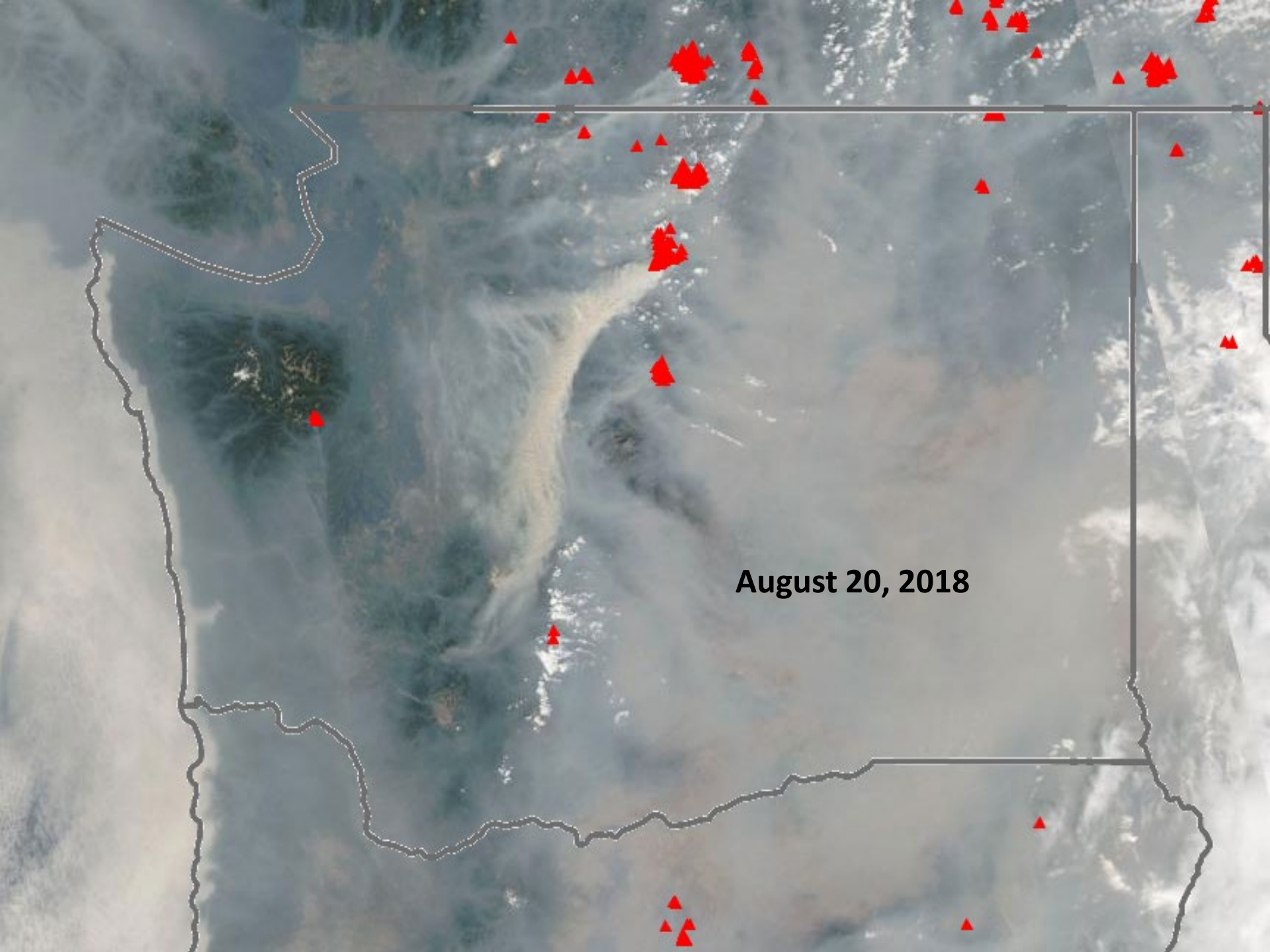




Seattle 2018

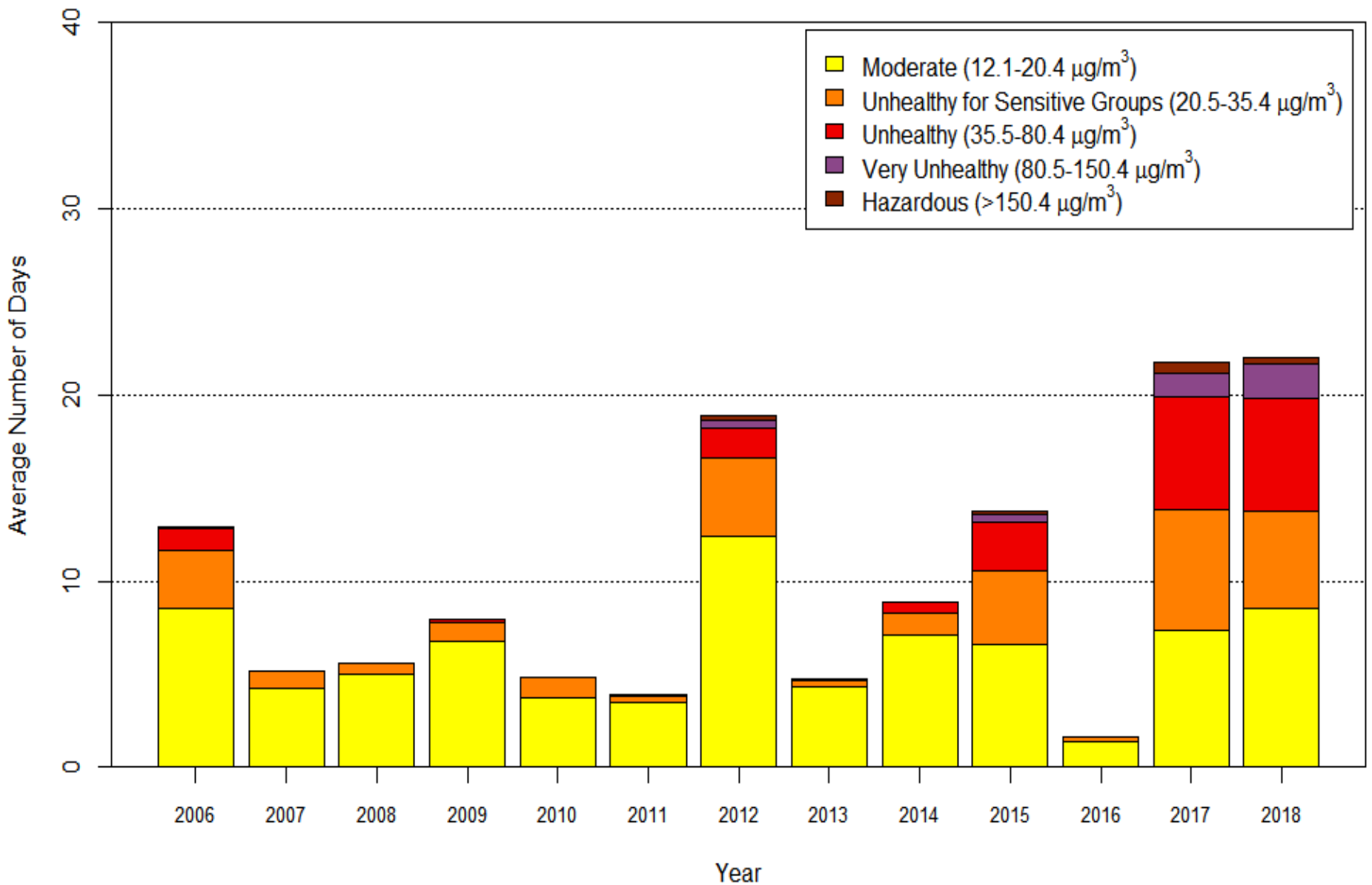


August 20, 2018



August 20, 2018

PM_{2.5} Days per Summer by WAQA Category



Wildfire Smoke vs. Other Major WA Air Pollutants

Pollutant	Typical Duration	Trend
WILDFIRE SMOKE	Weeks during summer	Typically highest daily peaks observed
RESIDENTIAL WOOD SMOKE	Months during heating season	Changes with temperature
TRAFFIC-RELATED AIR POLLUTION	Year-round	Relatively constant
INDUSTRIAL POLLUTION	Year-round	Relatively constant

What's in Wildfire Smoke?

Thousands of compounds!

Including:

- Carbon dioxide
- Water vapor
- Carbon monoxide
- Nitrogen dioxide
- Sulfur dioxide
- Hydrocarbons
 - PAHs, formaldehyde, acrolein
- Particles
 - Small: ultrafine, **PM2.5**, PM10
 - Organic carbon, elemental carbon

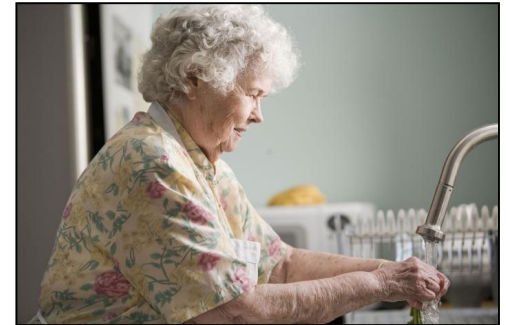


Health Effects of Wildfire Smoke Inhalation

- Cough, wheeze
- Eye irritation
- Respiratory morbidities
 - Trigger asthma attacks
 - Worsen Chronic Obstructive Pulmonary Disease (COPD)
- Cardiovascular disease Stroke
 - Hypertension
- Overall increased hospitalizations & mortality
 - ...Increasing evidence for other effects

Groups Sensitive to Smoke from Fires

- People with Pre-Existing Diseases
 - Especially cardiopulmonary conditions
 - **ASTHMA**
- People with respiratory infections
 - Worsens pneumonia
- **Children & Infants**
- People 65 years and older
- **Pregnant women**
- Growing evidence for other sensitive groups



Steps to Protect Your Health from Smoke

❖ Stay informed about air quality

- Check the air quality hazard level

❖ Limit exposure

- Look at the hazard guidelines for recommendations
- Progression of steps as it gets smokier



Avoid strenuous outdoor activity

Limit time outdoors

Stay indoors

Steps to Protect Your Health from Smoke

❖ Keep indoor air clean

- Keep windows and doors closed
 - Be mindful of the heat—go where there is an AC if too hot
- Set air conditioner on recirculate
- Don't contribute to poor air quality
 - Don't smoke, avoid using candles and don't vacuum
- Use a portable air cleaner with a HEPA filter
 - Create a “clean room” where you spend time indoors

❖ Pay attention to symptoms

- Contact health provider if symptoms get worse
- Call 911 if symptoms are serious

Before Wildfire Season Steps Individuals can Take

❖ **Learn where to get air quality information**

- Be prepared to modify activity

❖ **Take extra steps if you have a pre-existing heart or lung condition**

- Check with your doctor about how to prepare
- Stock up on medications

❖ **Consider getting a portable air cleaner with a HEPA filter**

- Ensure no ozone generated by air cleaner
- California Certified Air Cleaning Devices:
<https://www.arb.ca.gov/research/indoor/aircleaners/certified.htm>
- Select an air cleaner that has capacity for the size of your space

WILDFIRE SMOKE FACTSHEET

Prepare for Fire Season



If you live in an area where the wildfire risk is high, take steps now to prepare for fire season. Being prepared for fire season is especially important for the health of children, older adults, and people with heart or lung disease.

Before a Wildfire

- **If any family member has heart or lung disease, including asthma,** check with your doctor about what you should do during smoke events. Have a plan to manage your condition.
- **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 air pollution.
- **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.
- **Buy a portable air cleaner** before there is a smoke event. Make sure it has high efficiency HEPA filters and it is the right size for the room.
- **Know how you will get alerts** and health warnings, including air quality reports, public service announcements (PSAs), and social media warning you about high fire risk or an active fire.
- **Ask** an air conditioning professional what kind of high efficiency filters to use in your home's system and how to close the fresh-air intake if your central air system or room air conditioner has one.
- **Have a supply of N95 respirators** and learn how to use them. They are sold at many home improvement stores and online.
- **Organize your important items** ahead of time, including financial and personal documents. Know your evacuation routes and where to go if you have to evacuate. Make sure to prepare your children, and consider your pets when making an evacuation plan.



EPA Factsheets

Distribute in May

Washington State

Comprehensive Emergency Management Plan



- Basic Plan -

June 2018

**Washington Military Department
Emergency Management Division**



ESF 8: Public Health, Medical and Mortuary Services

Appendix 5: Air Quality Response

http://mil.wa.gov/uploads/pdf/PLANS/esf8_final-appendix-5-air-quality-response.pdf

Attach 1: Wildfire Response—Severe Smoke Episodes

<http://mil.wa.gov/uploads/pdf/PLANS/esf-8-appendix-5-attachment-1-severe-smoke-episodes-2017.pdf>

Main Wildfire Response Roles of Selected Groups

US Forest Service	<ul style="list-style-type: none"> • Wildfire suppression and containment
Environmental Protection Agency Region 10	<ul style="list-style-type: none"> • Coordinate with tribes about air quality
WA Department of Health	<ul style="list-style-type: none"> • Public health guidance and technical support for coordinating agencies • Assists local health with health messaging
WA Department of Ecology	<ul style="list-style-type: none"> • Maintains real-time air monitoring
Local Health Jurisdictions	<ul style="list-style-type: none"> • Notify public and media of health risks • Coordinates with local school administration about school activities or closures • Coordinates with other community organizations about canceling or limiting public events
Local Air Agencies	<ul style="list-style-type: none"> • Maintains real-time air quality monitoring data for region with Ecology
School Districts	<ul style="list-style-type: none"> • Make decisions about school activities and closures

Source: WA Comprehensive Emergency Management Plan, Appendix 5 Attach 1: Wildfire Response—Severe Smoke Episodes; <http://mil.wa.gov/uploads/pdf/PLANS/esf-8-appendix-5-attachment-1-severe-smoke-episodes-2017.pdf>

DOH Health Message Distribution & Coordination

WA Smoke Information Blog	Interagency updates about fire and smoke, response to public
Smoke from Fires Website	DOH's most detailed source of information
Flyers	Detailed information on specific topics
Press Releases/Media Interviews	General health information
Social Media	DOH messages and sharing of other local and state messages
Interagency Smoke Call, Local Health Conference Calls & Emails,	Identify needs, share resources & information

[Air Quality](#)[Indoor Air](#)[Outdoor Air](#)[Smoke From Fires](#)[Smoke from Fires Toolkits](#)

Smoke from Fires

[Español](#)

Q&A

1. [What health problems can smoke cause?](#)
2. [Who is especially sensitive to smoke?](#)
3. [How can I tell if smoke is affecting the air quality in my community?](#)
4. [How can I tell if smoke is affecting my family?](#)
5. [What can I do to protect myself and my family from outdoor smoke?](#)
6. [What if I don't have air conditioning and it's hot indoors?](#)
7. [Should I use a face mask when there is outdoor smoke?](#)
8. [Can I use an air filter in my home to improve indoor air quality?](#)
9. [Should I exercise when it's smoky?](#)
10. [What should I do if I have to drive when it's smoky?](#)
11. [What can schools do to protect students during smoky conditions?](#)
12. [Smoke From Fires Information in Other Languages](#)

**Available in
9 Languages**

WAQQA

WASHINGTON AIR QUALITY ADVISORY

Check air quality conditions at ecology.wa.gov/WAQA

	GOOD Air pollution is so low so there is little health risk. It's a great day for everyone to enjoy the outdoors!
	MODERATE People with health conditions should limit spending any time outdoors & avoid strenuous outdoor activities. They may begin to have worsened symptoms.
	UNHEALTHY FOR SENSITIVE GROUPS <i>All of the above &:</i> All sensitive groups should limit spending any time outdoors. People with health conditions may have worsened symptoms. Healthy people may start to have symptoms.
	UNHEALTHY FOR EVERYONE Everyone, especially sensitive groups, should limit time spent outdoors, avoid strenuous activities outdoors, & choose light indoor activities.
	VERY UNHEALTHY FOR EVERYONE Everyone should stay indoors, avoid all strenuous activity, close windows & doors if it's not too hot, set your AC to recirculate, & use a HEPA air filter if possible.
	HAZARDOUS FOR EVERYONE <i>All of the above &:</i> People with heart or lung disease, or those who have had a stroke, should consult their healthcare provider about leaving the area & wearing a properly-fitted respiratory mask* if they must go outdoors. Follow burn bans and evacuation orders.

SENSITIVE GROUPS INCLUDE:

- People with health conditions such as:
 - Asthma, COPD, diabetes, & other heart/lung diseases
 - Respiratory illnesses & colds
 - Stroke survivors
- Children under 18 & adults over 65
- Pregnant women
- People who smoke

KNOW THE SYMPTOMS:

- Watery or dry eyes
- Coughing/wheezing
- Throat & sinus irritation
- Phlegm
- Shortness of breath
- Headaches
- Irregular heartbeat
- Chest pain

If you are experiencing serious symptoms, seek immediate medical attention.

Washington Air Quality Advisory: [English](#) / [Spanish](#) / [Arabic](#) / [Chinese](#) / [Korean](#) / [Punjabi](#) / [Russian](#) / [Somali](#) / [Tagalog](#) / [Ukrainian](#) / [Vietnamese](#)

https://www.doh.wa.gov/Portals/1/Documents/4300/waqa%20infographic_English.pdf?ver=2018-07-26-131607-693

Air pollution from dust, vehicles, woodstoves, wildfires, & industries can seriously impact your health.

*For more health information & how to choose the proper respiratory mask, visit doh.wa.gov/smokefromfires.





EPA's Smoke Ready Toolbox

 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

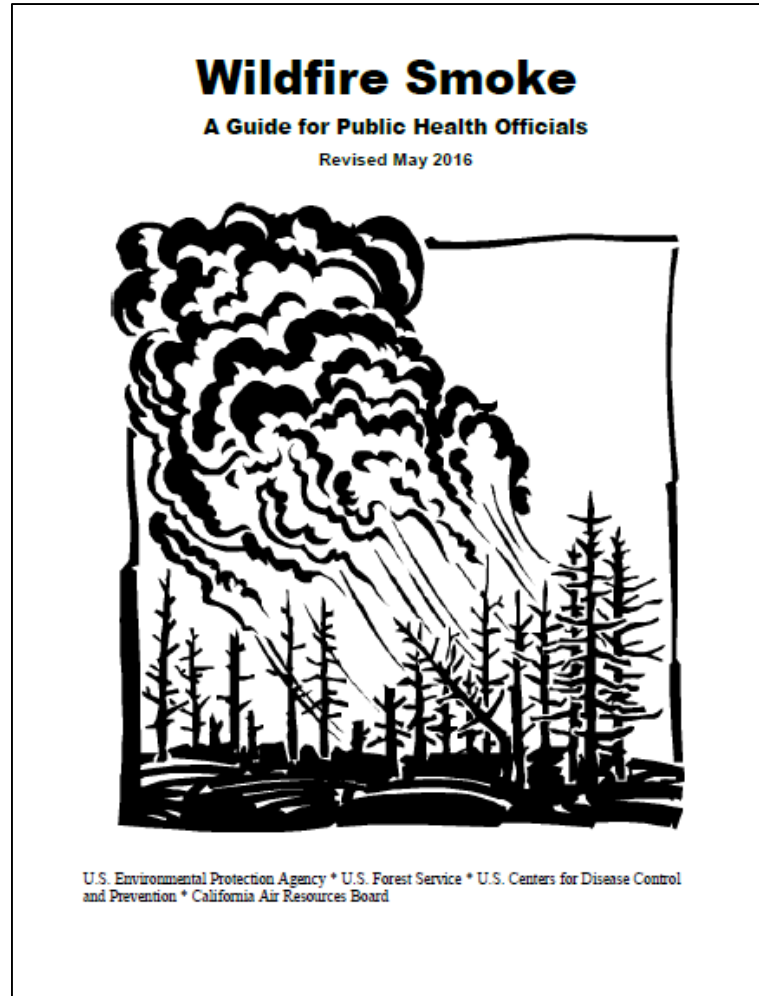
Air Quality Conditions and Forecasts

- [AirNow](#)
- [AirNow current fire conditions](#)
- [More Information](#)



Wildfire Smoke Guide

Wildfire Smoke Response Guidance



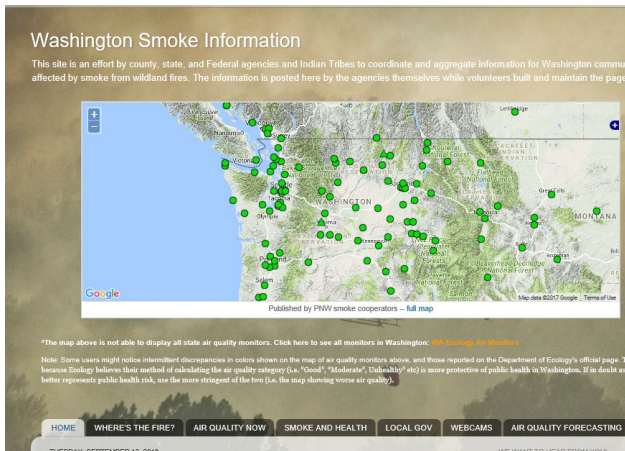
Source: US EPA;

https://www3.epa.gov/airnow/wildfire_may2016.pdf

Public Air Quality Updates

- ❑ Wildfire smoke location and concentrations shift
- ❑ Check Smoke Hazard Levels FREQUENTLY
- ❑ Updated information on websites, local news, radio

1. WA Smoke Info Blog

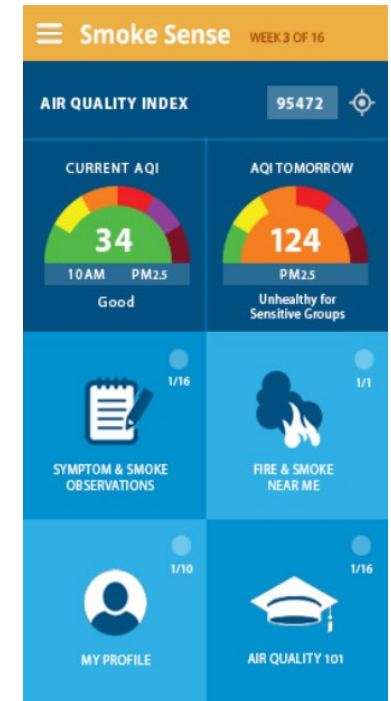


wasmoke.blogspot.com

2. Regional Clean Air Agency



3. EPA Smoke Sense Phone App



Wildfire Smoke Blog

Washington Smoke Information

Welcome to the Washington Smoke blog, a partnership between state, county, and federal agencies, and Indian Tribes. We coordinate to collectively share info for Washington communities affected by wildfire smoke. If the air monitoring map doesn't display here, links to additional monitoring maps can be found at the Air Quality Now tab.

<http://wasmoke.blogspot.com/>

[HOME](#)[Español](#)[WHERE'S THE FIRE?](#)[AIR QUALITY NOW](#)[SMOKE AND HEALTH](#)[LOCAL GOV](#)[AQ FORECASTING](#)[WEBCAMS](#)

TUESDAY, AUGUST 21, 2018

WEDNESDAY, AUGUST 15, 2018

Ash Falls in Seattle ... Some Clearing in Southeast Washington

There were several reports of ash in the greater Seattle area yesterday, probably from the Cougar Creek and/or Crescent Mountain fire. This can be disconcerting, but keep in mind that the amount of ash we are seeing in the Seattle area isn't a major health concern. The very fine particles that you can't see (PM2.5) are what can cause respiratory and other health problems in these conditions because they get deep into the lungs. Western Washington will continue to experience Unhealthy to Very Unhealthy air quality today. Strong westerly winds are predicted for Wednesday afternoon into Thursday. Those winds should push most of this lingering smoke out of Western Washington on Thursday. The coastal region could see some relief on Wednesday evening. Keep in mind, though, that there is a large area of smoke off the coast that will likely blow back over us on Wednesday.



MODIS - Terra Satellite Image for Tuesday (~11am)

Don't Tough it Out!

Daycares, camps and school sports practices should be held indoors when the air quality is poor.

When the smoke levels are unhealthy, it is recommended that outdoor activities be restricted for everyone, especially those in sensitive groups who could have a wide range of health effects. Sensitive groups include those with health conditions, infants, children, pregnant women and people over 65.

Station	Yesterday hourly 6a noon 6p	Sat 8/25	Forecast Comment for Today -- Sun, Aug 26	Sun 8/26	Mon 8/27
Tonasket	No hourly data		Lingering smoke in the morning, clearing in the afternoon		
Winthrop			Some lingering smoke in the morning, clearing in the afternoon		
Twisp			Air quality much improved over recent days, some smoke remains due to proximity to Crescent fire.		
Omak			Lingering smoke in the morning, clearing in the afternoon today		
Nespelem			Lingering smoke in the morning, winds should increase and clear the air in the afternoon.		
Chelan			Smoke at times, clearing at times, best in the afternoon.		
Entiat			Smoke at times in the morning, clearing in the afternoon.		
Leavenworth			Light smoke at times today mostly clearing by later in the day.		
Wenatchee			Some smoke lingering today, clearing in the afternoon.		
Ellensburg			Light smoke accumulations lingering, improving in the afternoon.		
Yakima			Smoke from Miriam fire at times. Clearing in the afternoon.		
Moses Lake			Light smoke at times in the morning clearing from winds in the afternoon		
Cle Elum			Light smoke in the morning, clearing in the afternoon		

Issued 2018-08-26 09:35 PDT by Janice Peterson 206-484-4353, jlpeterson@fs.fed.us

11- What can schools do to protect students during smoky conditions?

- The [Air Pollution and School Activities Guide \(PDF\)](#), provides recommendations for recess, P.E., and athletic events and practices during smoky conditions. This guide is based on air quality categories used in the [Washington Air Quality Advisory Map](#).
- Follow the guidance for schools on keeping indoor air free of smoke:
 - [Improving Ventilation and Indoor Air Quality during Wildfire Smoke Events \(PDF\)](#)

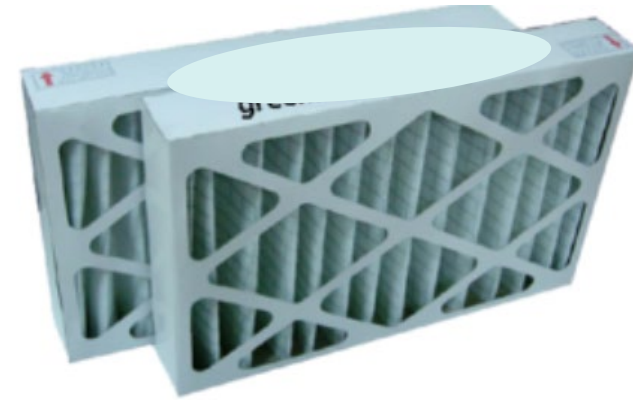
Improving Ventilation and Indoor Air Quality during Wildfire Smoke Events

Recommendations for Schools and Buildings with Mechanical Ventilation



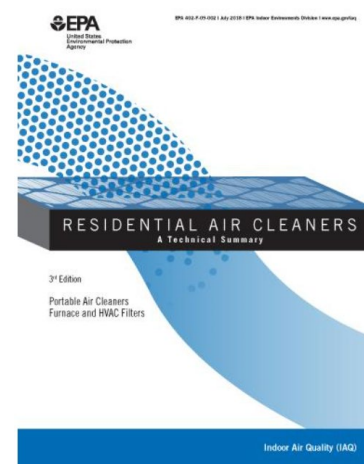
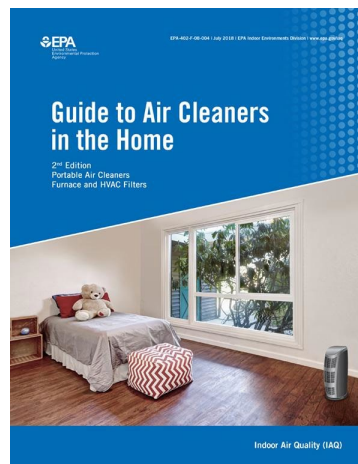
Keeping Smoke Out

- **Close up building, restrict entry**
 - “air lock” entries with plastic sheeting
 - Large air scrubbers near entries
- **Increase filtration efficiency – MERV 13**
 - **Secondary charcoal filter**
- **Change filters more frequently**
- **Keep buildings under positive air pressure**
- **Monitor CO₂**
- **Problems**
 - **Univentilators**
 - **Buildings with only windows for ventilation**
- **New/remodel:** Separate ventilation from heating/cooling/energy recovery. Bring in outside air through a minimum MERV 13. DOAS - Dedicated OA Systems.
- **DOH: Improving Ventilation & IAQ during WFS Events**
 - <https://www.doh.wa.gov/Portals/1/Documents/Pubs/333-208.pdf>



Portable Air Cleaners

- **Portable HEPA Filter / Charcoal Air Cleaners**
 - **California Air Resources Board Certified**
 - **No ozone**
 - <https://ww2.arb.ca.gov/our-work/programs/air-cleaners-ozone-products/air-cleaner-information-consumers>
 - **Size – Clean Air Delivery Rate (CADR)**
 - **Quiet**
- **EPA Wildfire Smoke Factsheet – Indoor Air Filtration**
 - https://www.epa.gov/sites/production/files/2018-11/documents/indoor_air_filtration_factsheet-508.pdf
- **EPA Air Cleaners and Air Filters in the Home**
 - <https://www.epa.gov/indoor-air-quality-iaq/air-cleaners-and-air-filters-home>



Air Pollution and School Activities

Air Quality Conditions*					
First, check local air conditions at https://fortress.wa.gov/ecy/enviwa/ and then use this chart.					
	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy/ Hazardous
Recess (15 minutes)	No restrictions.	Allow students with asthma, respiratory infection, lung or heart disease to stay indoors.	Keep students with asthma, respiratory infection, and lung or heart disease indoors.	Keep all students indoors and keep activity levels light.	Keep all students indoors and keep activity levels light.
P.E. (1 hour)	No restrictions.	Monitor students with asthma, respiratory infection, lung or heart disease. Increase rest periods or substitutions for these students as needed.	Keep students with asthma, respiratory infection, lung or heart disease, and diabetes indoors. Limit these students to moderate activities. For others, limit to light outdoor activities. Allow any student to stay indoors if they don't want to go outside.	Conduct P.E. indoors. Limit students to light indoor activities.	Keep all students indoors and keep activity levels light.
Athletic Events and Practices (Vigorous activity 2-3 hours)	No restrictions.	Monitor students with asthma, respiratory infection, lung or heart disease. Increase rest periods and substitutions for these students as needed.	Students with asthma, respiratory infection, lung and heart disease, or conditions like diabetes shouldn't play outdoors. Consider moving events indoors. If events are not cancelled, increase rest periods and substitutions to allow for lower breathing rates.	Cancel events. Or move events to an area with "Good" air quality — if this can be done without too much time spent in transit through areas with poor air quality.	Cancel events. Or move events to an area with "Good" air quality — if this can be done without too much time spent in transit through areas with poor air quality.

Masks

Wildfire Smoke and Face Masks



Wildfire smoke can irritate your eyes, nose, throat, and lungs. It can make you cough and wheeze, and can make it hard to breathe. If you have asthma or another lung disease, or heart disease, inhaling wildfire smoke can be especially harmful. If you cannot leave the smoky area, good ways to protect your lungs from wildfire smoke include staying indoors and reducing physical activity. Wearing a special mask called a "particulate respirator" can also help protect your lungs from wildfire smoke. These masks should be used mostly by people who have to go outdoors.

Will a face mask protect me from wildfire smoke?

Respirator masks labeled N95 or N100 provide some protection – they filter-out fine particles but not hazardous gases (such as carbon monoxide, formaldehyde, and acrolein). This type of mask can be found at many hardware and home repair stores and pharmacies. Your local health agency may also have these masks.

- Choose an N95 or N100 mask that has two straps that go around your head. Don't choose a one-strap paper dust mask or a surgical mask that hooks around your ears – these don't protect against the fine particles in smoke.
- Choose a size that fits over your nose and under your chin. It should seal tightly to your face. These masks don't come in sizes that fit young children.
- Don't use bandanas or towels (wet or dry) or tissue held over the mouth and nose. These may relieve dryness but they won't protect your lungs from wildfire smoke.

Anyone with lung or heart disease or who is chronically ill should check with their health care provider before using any mask. Using respirator masks can make it harder to breathe, which may make existing medical conditions worse. The extra effort it takes to breathe through a respirator mask can make it uncomfortable to use them for very long. These masks should be used mostly by people who have to go outdoors.

Respirator masks shouldn't be used on young children – they don't seal well enough to provide protection. They also don't seal well on people with beards.

How do I use my respirator mask?

- Place the mask over your nose and under your chin, with one strap pl below the ears and one strap above. Adjust the mask so that air can through at the edges.
- Pinch the metal part of the mask tightly over the top of your nose.
- The mask fits best on clean shaven skin.
- Throw away your mask when breathing through it gets difficult, if it's damaged, or if the inside gets dirty. Use a new mask each day if you c
- It's harder to breathe through a mask, so take breaks often if you wor
- If you feel dizzy or nauseated, go to a less smoky area, take off your n get medical help if you don't feel better.

For more information, search for "wildfire smoke" on www.doh.wa.gov.

DOI: 334-353 July 2014

Adapted from California Department of Public Health.

For people with disabilities
To submit a request, i



N95 respirators can help protect your lungs from wildfire smoke. Straps must go above and below the ears.



Watch this video on how to use a face mask.



Wildfire Smoke and Dust Masks at Work



When smoke from wildfires enters your work environment you may have concerns about your comfort or health.

Should workers wear a dust mask?

When the amount of smoke exposure at work isn't likely to exceed occupational exposure limits, you can still ask your employer to allow you to voluntarily wear a dust mask.

Dust masks labeled as N95 or N100, also known as respirators, can provide some reliable protection by filtering out smoke particles in the air but they will not provide protection against the gases or vapors found in smoke.

You can find N95 or N100 dust masks online or at many hardware and home repair stores. Your local health department may also have some available.

Do employers have to provide dust masks for voluntary use?

No, but they may choose to provide them anyway.

Employers allowing voluntary use aren't required to provide a medical evaluation or fit-testing for voluntary users of dust masks, but they are required to provide a free copy of the advisory information sheet found in VAC.296-842-11005 after determining voluntary use is a safe action for their workers.



N95 or N100 dust masks can provide some protection from wildfire smoke particles in the air. Straps must go above and below the ears.

Attention!

Using dust masks can make it harder to breathe and possibly make certain medical conditions worse. If you have lung or heart disease or are chronically ill, you should check with a doctor before using a dust mask.



Particle Filter Face Masks

- **NIOSH-Approved Respirator Masks**
 - **N95**, N100 or P100 commonly sold
 - N, P, R with 95% efficiency or greater are all appropriate
 - **2 straps**
 - Filter fine particulates, **not CO or other gases**
 - Surgical masks **not** effective
 - **Relief valve** – easier breathing
- Tight seal / self fit test
 - Correct size (and sometimes brand)
 - Requires clean shave
- Not appropriate for children
- Consult physician before use if have chronic condition



The right face mask can provide some protection for some people for a limited time when not possible to stay indoors.

Flyer with more information link on www.doh.wa.gov/smokefromfires and here:

<https://www.doh.wa.gov/Portals/1/Documents/Pubs/334-353.pdf>

NIOSH Guidance on particulate respirators: https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/default.html

Wildfire Smoke Impacts Advisory Group

27 Members

Including Washington State Department of Health, local health jurisdictions, tribal communities, Department of Ecology, Labor & Industries, regional clean air authorities, University of Washington

3 Sub-Workgroups to address **3 Priorities** for the **2019 Wildfire Season**:

Communication Workgroup

Develop custom toolkit for local outreach and communication

Closures Workgroup

Develop guidance for school and outdoor event closures

Sensors Workgroup

Develop guidance for low-cost sensors to use for health decisions

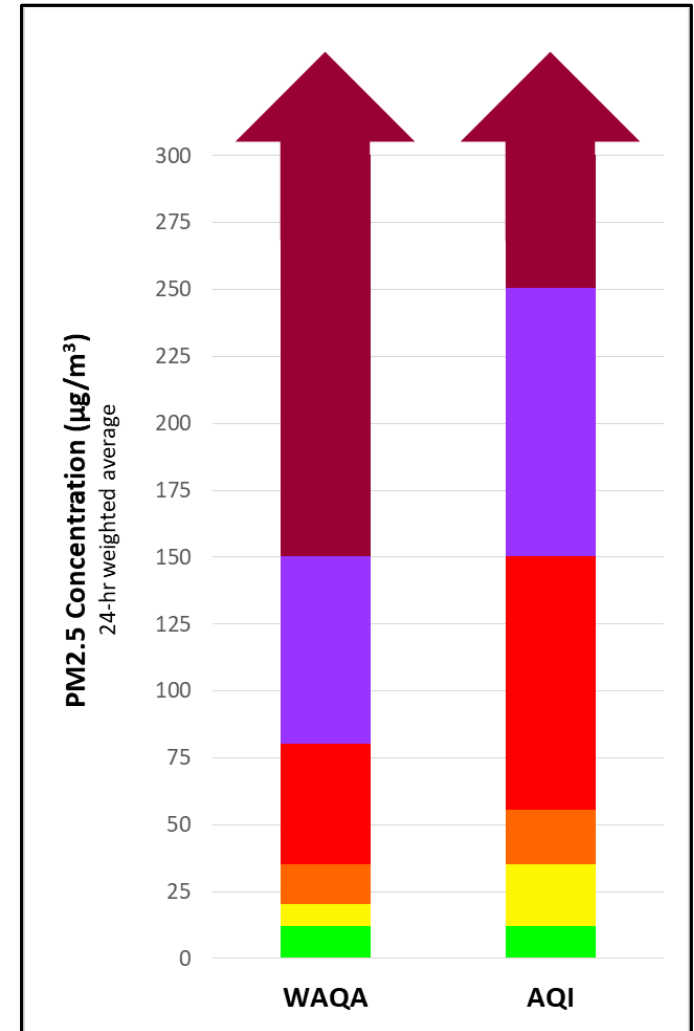
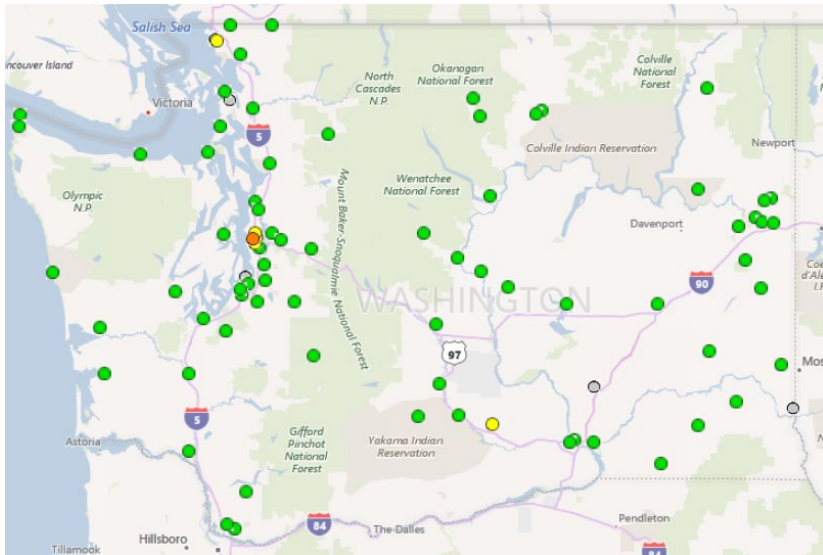


What is an acceptable
level of risk?

Washington Air Quality Advisory (**WAQA**) vs. EPA's Air Quality Index (**AQI**)

WAQA designed to be more health protective

Category	Index Value	WAQA Concentration ($\mu\text{g}/\text{m}^3$)	AQI Concentration ($\mu\text{g}/\text{m}^3$)
Good	0-50	0 to 12.0	0 to 12.0
Moderate	51-100	12.1 to 20.4	12.1 to 35.4
Unhealthy for Sensitive Groups	101-150	20.5 to 35.4	35.5 to 55.4
Unhealthy	151-200	35.5 to 80.4	55.5 to 150.4
Very Unhealthy	201-300	80.5 to 150.4	150.5 to 250.4
Hazardous	301-400	>150.4	250.5 to 350.4
	401-500		350.5 to 500



Goals of Closures Workgroup

Develop guidance about school closures and canceling outdoor events during wildfire smoke episodes.

- **Recommend an action level for school closures and outdoor event and activity cancelations.**
- **Provide guidance about alternatives to closures.**
- **Provide guidance about factors to take into consideration in decisions to close**



Draft Wildfire Smoke Closures Guidance

Draft 4.29.19

Guidance on Canceling Events or Activities and Closing Schools During Wildfire Smoke Episodes

During wildfires with elevated smoke levels, the Departments of Health and Ecology have been asked for guidance about the level of indoor smoke that should lead to consideration of closing schools and other facilities, and/or making plans for relocation of populations to cleaner indoor areas. The Departments of Health and Ecology do not have authority to make decisions about closures, relocations, or evacuations; these decisions are made at the local level. This document is intended to provide guidance about air concentrations of smoke that are considered a health concern.

Health Concern of Smoke Exposures

Exposure to wildfire smoke, like all smoke, can cause health problems. Symptoms of smoke exposure include minor irritation such as burning eyes, runny nose and coughing. There are also much more serious effects, such as aggravation of existing heart and lung diseases. Smoke can be life-threatening, including triggering asthma attacks and flare-ups of COPD, causing irregular heart rhythms, heart attacks and strokes.

When smoke levels are elevated, sensitive populations are especially at-risk for experiencing adverse health effects. Sensitive populations include people with heart and lung diseases, people with respiratory infections, people with diabetes, stroke survivors, infants, children, pregnant women, and people over 65.

Most epidemiologic research of wildfire smoke focuses on health effects that occur within a week or less of elevated 24-hour PM_{2.5} exposures. Several studies have evaluated lags of health impacts on the order of about one week following an elevated 24-hour exposure, with most acute effects occurring within about 4 days of exposure. There is no such data about the impacts of wildfire smoke beyond about a week. There is also limited data about long-term health impacts resulting from wildfire smoke exposures. However, there is indication that most people recover from exposures to wildfire smoke within a few weeks. Studies of wildland firefighters have found their forced expiratory capacity (in liters per second /1) declines over a firefighting season, and returns to baseline within months (Black 2000). In general, particle clearance from lungs of healthy people is nearly complete after several weeks. Clearance takes longer in people with progressive lung diseases (Uppmann 1980, Houtmeyers 1999). Particle clearance rates are relatively long in comparison to most Pacific Northwest wildfire smoke episodes. This suggests most people will likely recover a few weeks after inhalation of wildfire smoke. However, there may be some residual physical damage.

Recommended PM_{2.5} Action Level for Closures and Cancellations

For outdoor events, the Department of Health recommends that when outdoor PM_{2.5} concentrations exceed 35.5 µg/m³ (AQI value of 101), public health officers should consider cancelling outdoor public events. When outdoor PM_{2.5} concentrations exceed 80.5 µg/m³ (AQI value of 164), outdoor events should be cancelled.

If school is in session, the Department of Health recommends that local administrations consider school closures when air monitoring identifies that indoor PM_{2.5} concentrations exceed 80.5 µg/m³.

- Health concern & steps to reduce exposures
- Factors to consider in closures and cancellations
- Measurement of PM_{2.5}
- Estimated risk (TBD)
- Action level

Factors to consider for outdoor event & activity cancellations

- What is the forecast for how long the wildfire smoke levels will remain high?
- Is there an option to relocate to an area with cleaner air?
- If children or others who require care are involved, will adults be available as caretakers?
- Will there be economic or job security impacts of cancelling the activity or event?
- Are there other weather factors to consider, like excessive heat or humidity, that would further increase risk of outdoor exposure?
- Is the visibility safe for driving?

Factors to consider for school closures

Same as outdoor events, plus:

- Have all options for immediately improving indoor air quality been attempted?
- If the facility is closed, where will children be relocated? Is the air quality expected to be better there?
- Will there be economic or job security impacts of parents missing work to attend to children?
- In the process of moving people, will they be more exposed outdoors than if they had just stayed indoors?
- Is it safe to walk or bike to school?
- Are there other safety concerns about relocating people?
- Are sensitive students and staff allowed to stay home if it's safer?

Recommended measurement of PM_{2.5}

- For outdoor events & activities: **outdoor** PM_{2.5} concentrations
- For schools: **indoor** PM_{2.5} concentrations

PM_{2.5} Concentrations:

20 $\mu\text{g}/\text{m}^3$

G. PM_{2.5} = 20 $\mu\text{g}/\text{m}^3$, RH = 40%, B_{ext} = 74 Mm⁻¹,
Visual Range = 33 miles, Deciview = 20



35 $\mu\text{g}/\text{m}^3$

F. PM_{2.5} = 35 $\mu\text{g}/\text{m}^3$, RH = 40%, B_{ext} = 122 Mm⁻¹,
Visual Range = 20 miles, Deciview = 25



150 $\mu\text{g}/\text{m}^3$

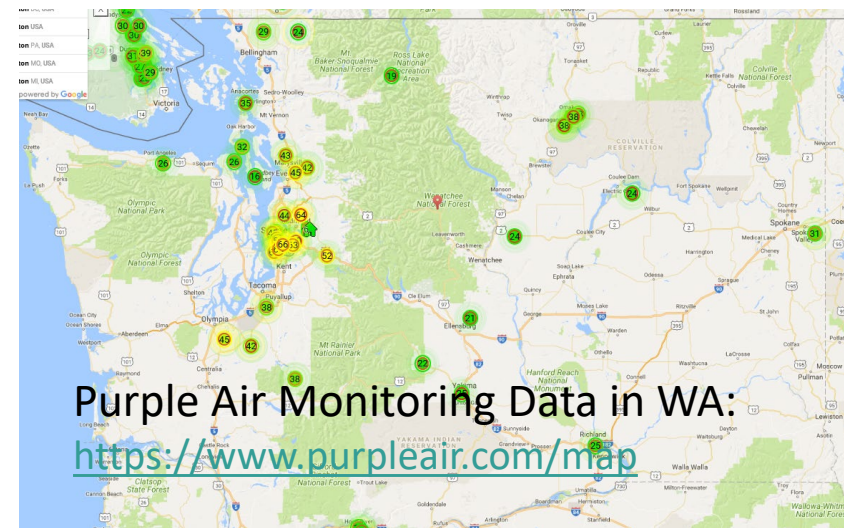
B. PM_{2.5} = 150 $\mu\text{g}/\text{m}^3$, RH = 40%, B_{ext} = 491 Mm⁻¹,
Visual Range = 5 miles, Deciview = 38.4



Low-Cost Portable Air Sensors

- Increasing public use
- Potentially helpful in areas without nearby monitors, but issues with reliability and accuracy
 - Testing indicates results differ from agency monitors by 2X
- Issues to consider in use:
 - EPA: <https://www.epa.gov/air-sensor-toolbox>
- Comparison of analytical capability
 - South Coast AQMD: <http://www.aqmd.gov/aq-spec>

Image Source: EPA, <https://www.epa.gov/air-sensor-toolbox>



Others Using Low Cost Sensors

- California Air Resources Board
 - 200 PurpleAir PM Sensors – real time
 - Using to determine where to deploy portable Met One E Sampler Federal Reference Monitors
 - Appear to be ~1.7x higher than the FRM
- Lane Regional Air Protection Agency, Oregon
 - Supplement 7 Air Monitoring Stations with PurpleAirs
- Confederated Tribes of the Colville Reservation
 - Aerocet (IA)
- Methow Valley Clean Air Project
 - PurpleAir (OA)



Goals of Sensors Workgroup

Develop guidance for use of low-cost air sensors to assist in decisions about indoor and outdoor activities. The low-cost air sensor guidance document will include:

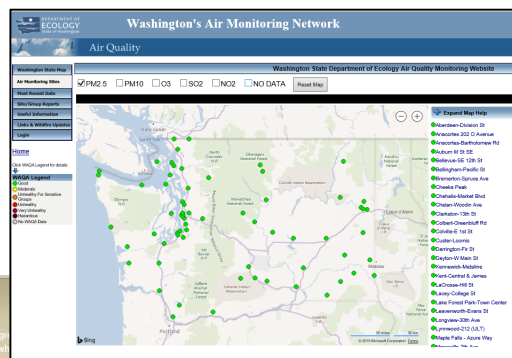
- A summary of measurement reliability and accuracy of low-cost sensors
- Options for addressing reliability issues
- Guidance about how, when and where to use monitors indoors and outdoors



Image Source: EPA, <https://www.epa.gov/air-sensor-toolbox>

Current Sensors Workgroup Discussions

- Reliability & need for correction factors
- User interface, accessibility
- Averaging time
 - WAQA and AQI hourly updates incorporate NowCast formula for PM_{2.5} concentration



NowCast PM_{2.5} Concentrations:

Less Variable

More Variable

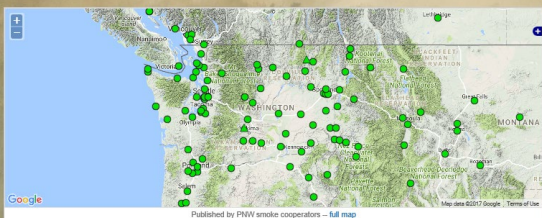


~12-hour Avg

~3-hour Avg

Washington Smoke Information

This site is an effort by county, state, and Federal agencies and Indian Tribes to coordinate and aggregate information about smoke from wildfires. The information is posted here by the agencies themselves.



*The map above is not able to display all state air quality monitors. Click here to see all monitors in Washington. [AQI Data by County](#)

Note: Some users might notice intermittent discrepancies in colors shown on the map of air quality monitors above, and those reported on the Department of Ecology's official page. This is due to the fact that the map is not updated in real-time.

Figure Adapted from: EPA (Mintz D, Stone S, Dickerson P, Davis A). Presentation Slides: "Transitioning to a New NowCast Method" July 2013.

Next Steps: Coming Soon

Closures Workgroup

- Establish and action level for closures and cancelations
- Finalize draft closures guidance
- Distribute closures guidance

Sensors Workgroup

- Continue to learn from others using sensors
- Draft and finalize sensors guidance
- Distribute sensors guidance



Thank You

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Resources available:
www.doh.wa.gov/schoolenvironment

Join my list serve for timely
information!



Stay healthy during **WILDFIRE SEASON**

If your area is affected by wildfire **SMOKE**

Stay informed on air quality



Check local air
quality reports.



Listen to the radio
for health warnings.

Follow your doctor's directions



If you have a heart or lung
condition, smoke might make
your symptoms worse.

Dial 911 for emergency
assistance if symptoms
are serious.

Avoid outdoor physical activities



Especially when
the air quality is
in the "Unhealthy,
Very Unhealthy,
or Hazardous"
categories.

Keep windows & doors closed



Run AC, set it to re-circulate
and close the fresh-air intake.

If it is too hot to keep
windows and doors closed,
and you don't have AC,
consider leaving the area.

Visit www.doh.wa.gov/smokefromfires for more information

