

CREATING A CULTURE OF PREPAREDNESS

PROTECTING INDOOR AIR FROM WILDFIRE SMOKE



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Smoke from a wildfire blankets a neighborhood. Take steps to protect your indoor air when outside air is unhealthy to breathe.

Glenda Hyde

Wildfire smoke can damage your lungs, heart, eyes, nose, throat and immune system. Smoke can enter homes and contaminate indoor air. Protect yourself by staying indoors and taking steps to reduce indoor air pollution. Here are tips on how to protect the air in your home.

Why is smoke harmful?

Smoke from sources such as burning homes, commercial buildings, automobiles and gas stations contains harmful gases, chemicals and fine particles known as “particulate matter.” The risk increases when these substances merge with forest fire smoke.

Air-quality alerts, such as the Air Quality Index, focus on six main components: nitrogen dioxide, sulfur dioxide, ozone, carbon monoxide, lead and particulate matter.

In a wildfire, the major contributor to smoke is fine particulate matter. Of particular concern are the

smallest particles, known as $PM_{2.5}$. These particles are invisible to the eye. Because they are so small, they can travel deep into the lungs and be absorbed into the body.

Larger particles, called PM_{10} , are usually visible in the form of ash. When inhaled, small bits are trapped high in the lungs and typically can be coughed out. However, they can still cause irritation.

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Who is at risk?

People sensitive to wildfire smoke include:

- Children younger than 18
- Adults 65 or older
- Pregnant women
- People with chronic health conditions such as heart or lung disease, asthma or diabetes
- Anyone who is seriously ill
- Outdoor workers
- People of low socioeconomic status, including those who are homeless and those who have limited access to medical care
- People who live in or near forested areas where wildfires occur.

However, as the Air Quality Index rating rises to unhealthy levels, anyone can experience serious complications. Seek advice from a medical professional if conditions persist.

Respiratory symptoms such as dry cough, sore throat and difficulty breathing are common to people with COVID-19 or other respiratory conditions and those exposed to wildfire smoke. People with compromised immune systems and those currently or previously infected with COVID-19 are at increased risk from wildfire smoke.

How does smoke enter homes?

Outdoor air can enter your home in several ways:

- Open windows and doors
- Bathroom or kitchen fans that vent to the outdoors
- Heating, ventilation and air conditioning (HVAC) systems with a fresh air intake
- Small openings, joints and cracks, including those around closed windows and doors

The impact of smoke on indoor air quality depends on smoke density and how close your home is to the fire.

Monitor fires and air quality

If there is an active fire in your area, follow recommendations from your local emergency manager. Emergency managers may make information available via local news outlets, social media, web pages or automatic notification systems. Conditions can change quickly, so be prepared to evacuate if necessary.

Outdoor air quality updates are available from AirNow.gov and from the Oregon Air Quality Map. Air-quality websites or weather apps may also report the level of harmful PM_{2.5} contaminants in smoke.

Assume that homes in Level 3 Evacuation Zones

are heavily contaminated. Follow local emergency management instructions before re-entering. Personal protective equipment or commercial cleaning may be required.

Wear a mask

Cloth masks can provide some protection from COVID-19, but they won't protect you from wildfire smoke.

For protection from smoke, look for respirators (masks) marked NIOSH with N95 or P100 ratings. Find these online or in drugstores, hardware or home repair stores. Masks that have vents work well during smoke events. Those working outdoors will find them much cooler. However, people with respiratory illness should tape the vent shut or place a surgical or cloth mask over the vent.

Improve indoor air quality

When the Air Quality Index indicates that smoke levels are unhealthy, take steps to protect the air quality in your home and stay inside.

Keep smoke out of your home

Close windows and doors, but don't block or tamper with exits. Minimize use of exhaust fans or range hoods that don't vent outside. If your window air conditioner or HVAC system has a fresh air option, turn it off or close the intake.

When you return home after prolonged exposure to wildfire smoke, consider wiping your shoes or boots on a wet towel before entering. Set up a plan so you can carefully remove and bag all clothing and take a shower before dressing. Launder clothing immediately or as soon as practical.

Avoid activities that create smoke or other airborne particles:

- Smoking cigarettes, pipes and cigars
- Using gas, propane or wood-burning stoves and furnaces
- Spraying aerosol products
- Frying or broiling food
- Burning candles or incense
- Vacuuming, unless you use a vacuum with a High Efficiency Particulate Air, or HEPA, filter

You can use gas and propane cooktops if the range hood vents to the outside and is turned on or if using a portable HEPA air filter in a closed kitchen. Dust or mop surfaces with a damp cloth as needed to keep settled particles from getting back into the air. For more information about key pollutants and how to address them, see the Interactive Tour of the Indoor Air Quality Demo House, <https://www.epa.gov/indoor-air-quality-iaq/interactive-tour-indoor-air-quality-demo-house>.



Photo: Glenda Hyde, © Oregon State University

To maximize effectiveness, operate your air cleaner continuously or as often as possible. Use the highest fan speed and make sure the airflow to the air cleaner is not obstructed.

Set up a clean room

Without a central HVAC system or multiple portable air cleaners, it can be hard to improve air quality in the entire house. In this case, focus on setting up a clean room. The clean room should be big enough that everyone in your household is comfortable spending time there.

Start with the simple no-cost steps outlined above. The following options will provide additional benefits:

- Purchase a portable air cleaner with HEPA filter.
- Upgrade your HVAC system with best-quality high-efficiency filters.
- Make a low-cost portable air cleaner.

COMMERCIAL AIR FILTERS

During a wildfire smoke event, commercial portable air cleaners fitted with high-efficiency filters may reduce indoor particle concentrations by as much as 45%. Both people and pets will benefit from improved indoor air quality while you wait for wildfire smoke to clear.

Avoid using an air cleaner that works by generating ozone, which will increase the pollution in your home.



Photo: Glenda Hyde, © Oregon State University

During heavy smoke events, check and change smoke-grade filters more regularly. Keep extra smoke-grade air filters on hand.

Place the air cleaner where people spend the most time, such as the clean room or a bedroom. This may be particularly helpful to a person with asthma or chronic obstructive pulmonary disease.

Use a portable air cleaner that is the right size for the room. It should have a HEPA filter, if possible. Check the manufacturer's website for better quality smoke filters that may be available. Purchase HEPA air filters before fire season begins. Supplies can be disrupted during wildfire events.

To maximize air cleaner effectiveness:

- Operate it continuously, or as often as possible.
- Use the highest fan speed and ensure the flow of air to the cleaner is not obstructed.
- Keep outside doors and windows closed to prevent additional particles from entering the room.
- Purchase replacement filters in the wildfire off-season so you will have them when you need them.

HVAC SYSTEM UPGRADES

If you have central air conditioning, install or upgrade to a high-efficiency filter such as those rated MERV 13.

These filter the tiny PM_{2.5} particles. Run the system's fan as often as possible to get the most out of the filter.

See the *Indoor Air Filtration fact sheet*, <https://www.airnow.gov/publications/wildfire-guide-factsheets/wildfire-smoke-indoor-air-filtration-factsheet/> and EPA's *Guide to Air Cleaners in the Home*, <https://www.epa.gov/indoor-air-quality-iaq/air-cleaners-and-air-filters-home> for more information.

BOX FAN FILTER SYSTEMS

You can make a do-it-yourself air cleaner by attaching a high-efficiency filter (MERV 13) to a box fan with a bungee cord or tape. There is some limited evidence that this type of air cleaner is helpful.

Triangle-shaped versions may be more stable. However, they may be less effective, since the tiny PM_{2.5} particles can travel through the cardboard used to bridge the gap between filters.

See the video *How to Make Your Own Clean Air Fan*, <https://youtu.be/4qr1Aj6Di7w>, from the Washington Department of Ecology. Place the filter so the arrows point toward the box fan on the air intake side.

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Use the device with caution. It's possible that the box fan motor could overheat when a filter is attached. Do not operate the device unattended or when sleeping.

Protect yourself

- **Minimize exercise:** Reducing your activity level is the best way to reduce the pollution you breathe into your lungs.
- **Drink plenty of water:** Water helps minimize a scratchy throat and coughing.
- **Stay cool:** Run fans, window air conditioners or central air conditioning.
- **Keep calm:** Learn how to lower stress levels to improve your resilience in a disaster. See *Survival Basics: Stress Less*, EM 9287, <https://catalog.extension/oregonstate.edu/em9287>.
- **Eat well:** Good nutrition can help protect you from the effects of smoke and recover from smoke exposure.

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