



The Fires: Air Quality, Public Health & What to Do Next

Personal Protection

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Fire and Smoldering Debris



- 25% of fire related deaths in the United States are caused by smoldering related to residential home fires.
- Smoldering debris may remain for weeks and could reignite if combined with combustible materials or if oxygen becomes available (i.e. disturbing debris during searching or cleanup operations).
- Exposure to wildfire smoke made up of particulate matter can cause eye, nose, throat, and lung irritation as well as other health impacts.
- Be aware of the state of the debris you are handling.
- Watch where you step. Hot debris may be under the surface.

Adapted from:
NIEHS Worker Training Program (December 2021). NIEHS Wildfire Response Training Tool. Protecting Yourself While Responding to Wildfires: Safety and Health Awareness for Responders to Fires
<https://tools.niehs.nih.gov/wetp/index.cfm?id=2455>

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Hazardous Materials Associated with Commercial and Residential Wildfire Debris

- Asbestos
- Ash
- Compressed gas cylinders and propane cylinders
- Gasoline cans (and other fuel containers)
- Bulk chemicals & chemical containers
- Lead acid batteries
- Lithium-ion batteries
- Moldy materials
- Paints and thinners
- Bulk pesticides
- Bulk fertilizers
- Munitions
- Laboratory equipment
- Lead, Heavy Metals
- Electrical Transformers
- Air conditioners
- Large metal appliances and equipment
- Fire retardants, may contain PFAS
- Residual of burned or damaged mattresses or cushions, may contain PFAS
- Transformers, may contain PCBs
- Petroleum products found in many modern materials

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Fire Retardants

In general, fire retardants reduce the flammability of materials by either blocking the fire physically or by initiating a chemical reaction that stops the fire.

- Human health effects from fire retardants not well known
- Some ingredients may cause cancer
- May contain metals
- Persist in the environment for weeks to months
- Reduce exposure to fire retardants as best as possible, i.e., during cleanup



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Personal Protective Equipment (PPE)

Depending on the site, any of the following PPE may be recommended:

- Protective clothing ranging from standard coveralls to Tyveks
- Respirator ranging from an N-95 to a powered air purifying respirator for high exposure and strenuous work.
- **N95 (or KN95) filters have limitations**
- Protective footwear with steel toe and insole. A chemical resistant boot or outer boot may be required for some work
- Disposable cut/abrasive resistant work glove. A chemical resistant glove may be required for some work
- Fully enclosed goggles (better for ash) or safety glasses
- Ear protection in noisy areas
- Hard hat/ Safety helmets
- **Baby Wipes**
- **Do not take contaminants back to your family, car or home**

Sources:

NIEHS Worker Training Program (December 2021). NIEHS Wildfire Response Training Tool. Protecting Yourself While Responding to Wildfires: Safety and Health Awareness for Responders to Fires.
<https://tools.niehs.nih.gov/wetp/index.cfm?id=2455>

CDPH (2024). N95 respirators FAQ. <https://www.cdph.ca.gov/Programs/EPO/Pages/Wildfire%20Pages/N95-Respirators-FAQs.aspx>

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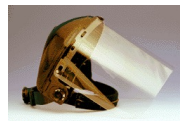
PPE Examples



Safety glasses



Safety goggles



Face Shield



Ear plugs



Tyvek suit



Example of Leather gloves
Courtesy Kirkwood



Example of Nitrile gloves
Courtesy Kirkwood



Steel toed/
reinforced boots



Wildfire helmet



N95 Respirator



1/2 face APR



Full face APR



PAPR

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Smoke Exposure in the Workplace

How does wildfire smoke affect air quality?

Wildfire smoke is a mix of gas and tiny particles, that includes ash from everything that is burning in a fire. Those particles pollute the air, which is why the sky becomes dark and smoky.

Why is wildfire smoke dangerous?

The main harmful pollutants are the tiny particles called particulate matter (PM) that measure 2.5 microns or less. The particles are much smaller than a grain of sand and can enter the bloodstream through the lungs when they are breathed in.

Grain of Sand
90 µm (microns)

Particulate Matter
2.5 µm (microns)

Wildfire Smoke Exposure Symptoms

<p>Short-term Symptoms</p> <ul style="list-style-type: none"> Chest pain Runny nose Burning eyes 	<p>Long-term Symptoms</p> <ul style="list-style-type: none"> Fatigue Coughing Difficulty breathing Rapid heartbeat
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People at Higher Risk for Symptoms

- Reduced lung function
- Chronic bronchitis
- Worsening of asthma
- Heart failure
- Adults over 65
- Children
- Pregnant people
- People with existing heart and lung conditions
- People with weakened immune systems

Protection from Wildfire Smoke

The Cal/OSHA Protection from Wildfire Smoke Standard (Section 5141) requires employers to reduce worker exposure to wildfire smoke when the current AQI for PM2.5 reaches 50 or higher for one continuous hour or longer per work shift.

Workers are protected in California regardless of immigration status. The standard does not apply to wildfire firefighters in vehicles in enclosed buildings, structures, or vehicles with filtered air.

What is the employer required to do?

- Check the current AQI for PM2.5 throughout the day and communicate with workers.
- Provide training on smoke exposure programs, how to receive medical treatment, and how they will protect workers.
- When the current AQI for PM2.5 is 51 or higher:
 - Provide clean NIOSH-approved respirators (such as N95) for voluntary use.
 - Reduce smoke exposure by rotating the work, changing work schedules, cooling work intensity, or providing shade.
- When the current AQI for PM2.5 is 50 or higher, respirator use is required if work has not been relocated or postponed.

How to wear a respirator properly

- 1 Pull bottom strap over head and place on lower part of head, below ears.
- 2 Pull top strap over head and place on top of head.
- 3 Press gently on nose piece.
- 4 Check for air leaks by placing both hands gently on mask and breathing in and out. If the respirator does not seal a little when you breathe in, adjust the straps and the nose piece to make it tighter.
- 5 Employers should provide a new respirator at the beginning of each shift or if it becomes dirty or damaged.

Those who suffer from any pre-existing conditions or are pregnant should check with a healthcare provider before wearing a respirator.

Regardless of immigration status, any worker can contact Cal/OSHA (www.dir.ca.gov/direct/directoffice.html) if they believe their workplace is not safe. Former employees and community members can also contact Cal/OSHA on a worker's behalf.

Labor Occupational Safety & Health Program
 University of California Agricultural Health and Safety
 To view Cal/OSHA standard: [Click Here](#)


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Source:
 UCLA LOSH (2025) LA Wildfires: LOSH Resources and Support. Disaster and Emergency Response for Workers- Wildfires. Smoke Exposure in the Workplace https://losh.ucla.edu/wp-content/uploads/sites/37/2022/07/LOSH_Wildfire_Infographic_English_07182022.pdf

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Use of Respirators

- **Wearing NIOSH-approved respirators:**
 - An N-95 or greater respirator may be acceptable for some activities
 - Use an elastomeric, half-mask respirator with N, R, or P-100 series filters if asbestos, ash or fire retardants may be present
 - If airborne contaminants are causing eye irritation, full-face respirators with P-100 organic vapor/acid gas (OV/AG) combination cartridges should be used
 - Surgical masks or face gaiters should **not** be used because they do not provide adequate protection
 - Replace filters when breathing becomes difficult or you detect an odor through organic vapor cartridges



½ face respirator with P-100/OV/AG cartridges

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Use of N95 Respirator

- Reduce exposure to PM but not all pollutants (e.g., VOCs, gases)
- May mitigate short-term physiological effects of PM (evidence limited to healthy adults)
- None approved for children (NIOSH certifies N95s for adults)
- Safety of prolonged use not evaluated in adults with severe heart or lung disease



Source: iStock/Daniil

Slide credit:
Solmon G. (2025). Presentation: Wildfires and Human Health.
Shi et al. *Environ Health Perspect.* 2017

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Dusts Containing Fire Retardant, Ash, Asbestos, Silica and Other Toxins

- Try to apply the following engineering controls in addition to wearing a respirator:
 - Do **not** aggressively dry sweep
 - Use wet sweeping methods
 - Use a vacuum that contains a HEPA filter and better if approved to vacuum ash



Wetted debris during clean up of 2007 Angora wildfire

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<https://tools.niehs.nih.gov/weto/index.cfm?id=2455>

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South Coast AQMD

WILDFIRE

AFTER A WILDFIRE - SAFE CLEAN-UP
WHEN CLEANING UP ASH:

-  Wear a tight-fitting disposable respirator (N-95 or P-100).
-  Wear goggles, gloves, long-sleeved shirts, long pants, shoes and socks to avoid skin contact.
-  Mist lightly with water and then sweep gently with a broom or wet mop.
-  Collect ash into a plastic bag and dispose in the regular trash.
-  Wash off ash from vehicles and outdoor toys.
-  Inside your home, use a vacuum with a HEPA filter or similar industrial ones with disposable collection filter bags.
-  Direct ash-filled water to ground areas and away from the storm drains. Don't use leaf blowers!
-  Clean ash off pets.

 Take precautions when cleaning up ash from wildfires. Ash particles are usually bigger than smoke particles, but can still cause health problems. People with heart or lung diseases, older adults, children, and pregnant women should use special caution around ash.

Source:
South Coast AQMD. Wildfire Smoke & Ash Wildfire Safety Tips. <https://www.aqmd.gov/home/air-quality/wildfire-health-info-smok>

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After the Fire....

- Walking/working surfaces may be wet, slippery and unstable. Spread sand and wear slip resistant footwear if possible, to reduce slips and falls.
- Wear personal protective equipment, including hard hats, safety shoes, safety glasses, work gloves, ear plugs.
- Do not stand or walk under loads being hoisted or swinging from by cranes and other heavy equipment.
- Make sure that you have an up-to-date tetanus immunization.
- Avoid contact with stagnant water:
 - If exposed to stagnant water, wash and decontaminate yourself and any contaminated equipment immediately

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Indoor Air Quality

1. HVAC systems equipped with filters

- Merv 13, 14, 15 or 16 filters to filter fine particulate matter
- Adding activated carbon to the filter would reduce VOC levels indoor
- Windows and doors to the outside must remain closed to ensure that all air that enters is filtered
- Change filters often

2. Indoor air purifiers may be helpful

- Must be large enough to provide enough air for the size of the room and # of occupants
- Must be certified by CARB* to avoid purifiers that produce harmful gases such as ozone
- Maintain purifier regularly
- Windows and doors to the outside must remain closed to ensure that most all air in the room gets a chance to be processed by the purifier

*California Air Resources Board. List of CARB-Certified Air Cleaning Devices.
<https://www2.arb.ca.gov/list-carb-certified-air-cleaning-devices>

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Indoor Air Quality

3. Low-Cost DIY Indoor Filters


HOW TO BUILD A LOW-COST AIR FILTER

Particulate matter in smoke from wildfires is unhealthy to breathe. A simple box fan filter will help keep your indoor air clean.


What you'll need:



Box fan




20" x 20" x 1" furnace filter (MERV 13 or FPM 10)




Optional: Duct tape or bungee cords

- 1 Place filter on back (air intake side) of fan.
- 2 Use the duct tape or bungee cords to attach the filter securely to the fan.




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

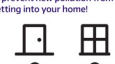


Use tape or cords only around the edges. Do not block air or flow through the fan.

- 3 Place in an area away from any obstacles and turn the fan on.
- 4 Keep all windows and doors closed to prevent new pollution from getting into your home!



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



The University of Washington EDGE Center
Exposures, Diseases, Genomics & Environment
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¿CÓMO CONSTRUIR UN FILTRO DE AIRE DE BAJO COSTO?

Las partículas en el humo de los incendios forestales no son saludables para respirar. Un filtro de ventilador de caja simple ayudará a mantener limpio el aire interior.

Lo que necesitas:



Ventilador de caja



Filtro de horno de 20" x 20" (MERV 13 o FPM 10)



Opcional: cinta adhesiva o cuerdas elásticas

- 1 Coloque el filtro en la parte trasera (lado de entrada de aire) del ventilador.
- 2 Utilice la cinta adhesiva o los cordones elásticos para sujetar el filtro de forma segura al ventilador.



Asegúrese de que la flecha al costado del filtro apunte hacia el ventilador.



Use cinta o cuerdas solo alrededor de los bordes; no bloquee el flujo de aire a través del ventilador.

- 3 Colóquelo en un área alejada de cualquier obstáculo y encienda el ventilador.
- 4 Mantenga todas las ventanas y puertas cerradas para evitar que nueva contaminación ingrese a su hogar!



¡Maga! Funcional el ventilador a máxima potencia durante unas horas si la calidad del aire interior ya es deficiente. Luego, gírelo a medio para mantenerlo limpio.



The University of Washington EDGE Center
Exposures, Diseases, Genomics & Environment
RIVER CENTER FOR CLIMATE SOLUTIONS
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Source:
 University of Washington, Environmental and Occupational Health Sciences. How to Build a Low-Cost Air Filter.
https://deohs.washington.edu/pnash/sites/deohs.washington.edu.pnash/files/2023-09/AirFilterInfographic_FINAL_EnSpn.pdf

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Resources

- California Air Resources Board. Air Cleaner Information for Consumers. <https://ww2.arb.ca.gov/air-cleaner-information-consumers>
- California Air Resources Board. List of CARB-Certified Air Cleaning Devices. <https://ww2.arb.ca.gov/list-carb-certified-air-cleaning-devices>
- California Department of Industrial Relations. Respiratory Protection During Fire Cleanup. https://www.dir.ca.gov/dosh/fire_resp_protection.html
- EPA. Guide to Air Cleaners in the Home. <https://www.epa.gov/indoor-air-quality-iaq/guide-air-cleaners-home>
- NIEHS WTP. Disaster Preparedness and Response: Wildfires. <https://tools.niehs.nih.gov/wetp/index.cfm?id=2455>
- South Coast AQMD. Wildfire Smoke & Ash Wildfire Safety Tips. <https://www.aqmd.gov/home/air-quality/wildfire-health-info-smoke-tips>
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- University of Washington, Environmental and Occupational Health Sciences. How to Build a Low-Cost Air Filter. https://deohs.washington.edu/pnash/sites/deohs.washington.edu.pnash/files/2023-09/AirFilterInfographic_FINAL_EnSpn.pdf

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