

Understanding Indoor Air Quality during Wildfires

by Ann Cornelius Brown

Ann Cornelius Brown is a Communications Lead for the U.S. Environmental Protection Agency's (EPA) Air and Energy National Research Program.

When communities are blanketed by wildfire smoke for days and weeks, residents want to know what steps they can take to reduce their exposure outdoors and indoors. Building owners are interested in effective actions to protect their occupants. That was the situation in Missoula, Montana, during the summer of 2017 when the community and surrounding areas experienced significant smoke impacts from nearby forest fires.

The Missoula City–County Health Department (MCCHD) was inundated with inquiries about the risks of smoke, actions to take, and how to create clean air spaces indoors. Following the smoke episodes, the health department is interested in learning more about effective risk reduction strategies they can share with building owners and the public. As a result, the health department and other partners have teamed up with U.S. Environmental Protection Agency (EPA) researchers to conduct an indoor and outdoor air measurement study.

EPA researchers and partners placed over 30 low-cost air sensors that measure fine particulate matter (PM_{2.5})—the main component of smoke that is of great health concern—inside 18 buildings and outdoors at 16 locations throughout Missoula. The buildings are public or commercial buildings that range in air management methods from window-only ventilation to central air filtration and represent locations the public may visit during a summer smoke episode. Buildings include fitness centers, museums, churches, office buildings, a senior citizen center, and university facilities. The health department collected and sent the recorded data from the sensors to researchers for analysis.

The goal of the field study is to learn more about how air cleaning and ventilation practices impact indoor air quality during wildfire events. A complementary laboratory study in Research Triangle Park, North Carolina, will evaluate the effectiveness of portable air cleaners and air filtration systems in removing PM_{2.5} under simulated pollution levels found during wildfires.

When the lab study begins, researchers will test five portable air cleaners, ranging from a do-it-yourself cleaner composed of a box fan with attached heating, ventilation, and air conditioning (HVAC) filter to commercial high-efficiency particulate air (HEPA) air purifiers. The cleaners will be evaluated for their effectiveness at removing PM_{2.5} and other toxic pollutants, as well as their ease of use and cost to operate. Wood, tree litter, and duff collected from the forests surrounding Missoula will be burned to create the smoky conditions needed to evaluate the air cleaners. These real-world fuels will enable researchers to create emissions in the laboratory, similar to wildfires in the area. They plan to test the air cleaners at levels slightly above the air quality standard and at higher levels that can occur during wildfires.

The research has involved local partners from the beginning to identify what information they need to effectively communicate actions that building owners and the public can take to reduce public health risk during smoke episodes. In addition to the health department, the University of Montana in Missoula is participating.

At right: EPA scientist Amara Holder sets up an air cleaning device in a laboratory chamber at EPA Research Triangle Park, NC.

Below: EPA tests air sensors in Missoula, MT, at the U.S. Forest Service's Fire Sciences Laboratory before deployment in the area.



Sarah Coefield, air quality specialist with MCCHD says, "We're excited to be partnering with the EPA on this study. The data from this field study will show the variability of indoor air quality in buildings across our community and will help us understand how much outdoor air comes inside under real-world conditions. We expect the results will help us provide our community with practical advice about creating cleaner air spaces during wildfire smoke events."

The field work in Missoula has ended for the wildfire season, and EPA is now conducting a similar study of indoor and outdoor air quality associated with wildfire smoke and other high air pollutants with the Hoopa Valley Tribe in northern California.

This project is part of EPA's solutions-driven research initiative, which emphasizes working directly with stakeholders to develop solutions to public health and environmental concerns. The research findings are expected to be applied to help communities prepare for wildfire smoke and provide answers about indoor air quality and air cleaning devices.

Amara Holder, one of the EPA research engineers leading the project explains, "This research approach has been gratifying, as we are designing and quickly implementing studies to address time-sensitive questions about smoke episodes and how to protect the public when community members may have limited choices other than to stay indoors. This research will be impactful because of the input and support of our local partners." **em**

Disclaimer: The views and opinions expressed in this article are those of the author and do not represent the official views of the U.S. Environmental Protection Agency (EPA).



More Information

Learn more about EPA's Wildland Fire Science online at www.epa.gov/air-research/wildland-fire-research-protect-health-and-environment. For more information about the *EPA Research Highlights* column, contact Ann Cornelius Brown, U.S. Environmental Protection Agency (EPA), Office of Research and Development, Research Triangle Park, NC; phone: 1-919-541-7818; e-mail: brown.ann@epa.gov.

This article appears in the December 2019 issue of EM Magazine, a copyrighted publication of the Air & Waste Management Association (AWMA; www.awma.org). Permission has been granted for use

Wildfires

Are Front and Center in A&WMA's 2020 Programming Efforts

EM Editorial Calendar

Looking ahead, the June issue of *EM*, will focus on **Wildfire**. This issue will present various federal, state, and nongovernmental perspectives on wildfire issues, including impacts of wildfire on air quality and waste management, along with mitigation of adverse wildfire impacts on health and environment.

A&WMA's 50th Annual Critical Review

The 2020 Critical Review, **Wildfire and Prescribed Burning Impacts on Air Quality in the United States** by Daniel A. Jaffe, Susan M. O'Neill, Amara L. Holder, David L. Peterson, Ana Rappold, and Jessica E. Halofsky, will focus on wildfires, prescribed burning, and agricultural burning, with particular attention paid to the environmental effects of (and human exposure to) smoke and pollutant emissions; plume transportation and the formation of secondary pollutants; land and fire management practices; geographic differences; and trends and projections of future patterns in fire emissions and management.

Several factors have recently combined to make this one of the hottest and most important topics in environmental science. These include our changing climate, the increasing presence of humans in forests and wildlands, the increase in population at the wildland-urban interface, and the role of historical fire management. As a result of these factors wildfires, and the resulting air pollution impacts, are on the rise across the United States. This Critical Review team of authors includes the leading experts on these topics, and will cover a full range of issues across the fire/air quality/health perspectives and provide a Critical Review of key uncertainties and unknowns.

The full-length review paper will be published in the June 2020 issue of the *Journal of the Air & Waste Management Association (JA&WMA)*. In addition, plan to attend a live presentation of the 50th Annual Critical Review during A&WMA's Annual Conference & Exhibition in San Francisco, CA, June 29–July 2, 2020.

Following the live presentation by the review's authors, a panel of invited experts will critique the presentation and offer their own views on the topic. Comments also will be solicited from the floor and from written submissions to the Critical Review Committee Chair. The Chair will then synthesize these points into a Discussion Paper that will be published in the October 2020 issue of *JA&WMA*.

Wildfire Specialty Conference

In April 2020, A&WMA will host the specialty conference, **Our Devastated Communities: The Public Costs of Wildfires**, in Sacramento, CA. See page 9 for information.

And for the most up-to-date information on all A&WMA events and goings-on, be sure to go to www.awma.org.

