

Wildfires and fire related particulate

Tony Ward, PhD is a professor and Chair of the School of public and Community Health Sciences at the University of Montana. Research in his laboratory focuses on investigating indoor and ambient exposures (including emissions from wood stoves and smoke from forest fires) common to residents of rural and underserved areas of the northern Rockies and Alaska.

Nuggets mined from today's episode:

From Houston Tony moved to Missoula for graduate school. In the winter of 1999 he was doing air sampling for particulate matter to determine the effect of woodstoves on outdoor air quality. In 2000 a large wildfire impacted both outdoor and indoor air quality and he began studying the impact outdoors and indoors.

Wildfire activity has increased in the northern Rockies over the past 20 years, Wildfires now start earlier, are larger, burn longer, more intensely and form "mega fires". "The U.S. Interagency Fire Center defines a megafire by its size: It is a wildfire that burns more than 40,500 hectares (100,000 acres) of land. Other wildfire experts expand the definition of a megafire beyond "acres burned" to mean wildfires that have an unusually large impact on people and the environment." National Geographic Society

These large wildfires are increasing in California, Washington, Oregon, Montana and Idaho. Smoke from these fires travels 1,000 of kilometers. Anecdotal evidence suggests increased ER visits and doctor visits, more research is needed to quantify.

Ten years ago, Tony carefully designed a forest fire study. Monitors were mounted on wildland firefighters and they were going to create a controlled burn and measure human exposures. When a thunderstorm threatened the study needed to be cancelled. Wildfires are hard to predict, so its hard to design studies.

Tony stumbled into measuring the effects of woodstoves on outdoor air. Woodstoves are the #1 cause of PM 2.5 outdoors in some areas of the Northern Rocky Mountains. Indoor exposures to PM 2.5 from woodstoves can equal or

exceed outdoor exposures **35 $\mu\text{g}/\text{m}^3$** . He is looking at how to reduce emissions and improve occupant health.

20 years ago wildfires (in Montana) would only burn 1-3 weeks and not continuously. Now they may burn continuously for 6 weeks.

Exposure to PM 2.5 from stoves and wildfires varies according to proximity to the source. The particles from distant forest fires are aged and have notably different chemistry from particles created locally. Universities are studying the addition of fuel sources when wildfires enter more densely populated areas and burn homes and buildings.

During wildfires, bandanas and cloth masks may stop large particles, they don't provide adequate protection against PM 2.5. He recommends N95 masks.

Public messaging about the health hazards of PM 2.5 indoors has improved. Hunkering down indoors isn't good enough. Sensitive populations: the elderly, asthmatics, COPD, infants, need extra protection. Tony recommends the use of air cleaners to create a cleaner air space with an up to 60% reduction of PM 2.5. Suggests closing outdoor exhaust vents (not flue vents from water heaters, stoves or furnaces). He suggests improved air sealing. Many people in the Rockies don't have air conditioners and during the summer must decide whether to swelter indoors or open windows and allow more smoke indoors. Low cost air cleaners can be made by attaching 20"x20" Filtrete® filters to a similarly sized box fan. Fans and portable air cleaners do create white noise which can be irritating.

National Ambient Air Quality Standards (NAAQS) for PM

Currently, the EPA has primary and secondary standards for PM_{2.5} (annual average standards with levels of 12.0 $\mu\text{g}/\text{m}^3$ and 15.0 $\mu\text{g}/\text{m}^3$, respectively; 24-hour standards with 98th percentile forms and levels of **35 $\mu\text{g}/\text{m}^3$**) and PM₁₀ (24-hour standards with one-expected exceedance forms and levels of 150 $\mu\text{g}/\text{m}^3$)

Tony commonly finds that indoor levels will exceed the national standard all winter and reach **70-90 $\mu\text{g}/\text{m}^3$** the highest spikes in levels occur during loading, lighting and stoking. Tony recommends checking stove flues for indoor leakage.

100-400 $\mu\text{g}/\text{m}^3$ occur during wildfires.

2nd hand smoke from neighbor's woodstoves and coal furnaces can travel from home to home.

Large wildfires can influence weather and create their own climate when they reach enormous size. Tony has seen lightning within wildfire smoke.

There are no good small particles. Longtime exposure to small particles can create big adverse health effects. California wildfires have exposed millions of people downwind to high levels of PM2.5. Particulate from wildfires exacerbates: asthma, cardiovascular disease, and is a stressor to mental health. PM2.5 is associated with neurological issues.

Wood stove tips: Don't burn wet wood. Burn at correct temperature. Smoldering wood produces more particles. Keep ash levels low. Use fire starters. Invest in BOTH a moisture meter to ensure wood is under 20% MC and a temperature gauge to ensure you are burning at the correct temperatures.

Whether wildfire or wood stove, if you smell smoke you are being exposed.

Suggestions for improved forest management practices: Let some fires control burn in remote areas to consume excess fuel. Reduce our use of fossil fuels. Remove excess fuel from forests. Monetize excess removal of excess fuel from forests. Create more jobs in forestry. Communicate the strategies to the public.

Tony was hired to do environmental sampling in 65 homes following wildfire in New Mexico and found that 70% of homes sampled up to 50 kilometers away from the fire had particulate char.



The Las Conchas Fire was a wildfire in New Mexico, USA, in 2011. The fire started in Santa Fe National Forest and burned more than 150,000 acres, threatening Los Alamos National Laboratory and the town of Los Alamos.

Z-Man's Wildfire cleanup recommendations:

Prevent wildfire residue from entering your home by installing an HVAC or ventilation system which positively pressurizes your home.

Don't panic and try to wet clean! Wildfire residues are generally dry, loose particles that respond well to vacuuming. Use a vacuum cleaner with HEPA or HEPA type filtration with soft brush attachment. The greatest accumulation of particles will be found on horizontal surfaces, floors, tabletops, mantles, etc. Lambs wool dusters (real lambs wool not synthetic) work well for quickly cleaning both large and small surfaces.

Confirm whether or not you have wildfire residue? Use a white triangular cosmetic sponge on known residue deposit on the exterior of the home to establish the baseline color of the residue. Match with residues in the home to differentiate from dust.

If you are doing your own cleaning, photo document the pre-cleaning and post-cleaning conditions.

Z-Man signing off

Trivia-

Name the term used to describe fires spread by wind moving quickly across the tops of trees.

Answer:

Crown Fires. Running crown fires are even more dangerous because they burn extremely hot, travel rapidly, and can change direction quickly.

Answered by- Doug Kohnen- EraTech Environmental Dayton, Ohio