

Health dangers of forest fire smoke remain less understood

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MISSOULA — We can see it. We can feel it. But when we breathe the wildfire smoke filling the Missoula Valley lately, what do we taste?

“Ammonia is always present in wildfire smoke, but that’s something that wasn’t previously measured,” said Vanessa Selimovic, a University of Montana graduate student who helped crunch piles of data revealing what’s in those plumes rising around Missoula’s horizon. “There’s acetic acid. There’s formaldehyde and methanol. And it’s hard to say what happens as those compounds age. We don’t know if it gets worse or better if it sits in a valley overnight.”

We do know that Missoula’s airshed will fill and spill regularly this week as fumes blow in from the Sunrise fire (6,400 acres), Lolo Peak fire (4,792 acres), Liberty fire (1,843 acres), Rice Ridge fire (1,100 acres) and Sapphire Complex (11,911 acres). At least for the next few days, we should get some occasional respite as breezes and temperature changes churn the haze downwind.

“This time of year, our dispersal is pretty good,” Missoula County air quality specialist Sarah Coefield said on Monday. “The smoke builds up but moves on. We don’t tend to get days-long pollution in one area. Although there was that time in 2015, when a high-pressure ridge locked in and we had a solid week where nothing got out and more came in.”

Communities like Seeley Lake have been smothered in smoke as fires to the east and west pump particulate clouds into the Seeley-Swan drainage. On Monday the Sunrise fire put up so much smoke, the incident command grounded its helicopters for lack of visibility. Seeley Lake air quality was classified as “unhealthy” for most of Monday.

Selimovic and UM research professor Robert Yokelson participate in a nationwide wildfire smoke project that has revealed much about what goes into those plumes, what happens to the chemical fumes as they age and what that means for land managers. Yokelson said the good news is wildfires don’t typically produce enough of those toxic chemicals to exceed human



Heavy smoke prevented helicopters like this UH-60 Firehawk from flying missions over the Sunrise fire near Tarkio for most of the day on Monday. From Superior to Lolo, smoke from the five active fires burning in western Montana will continue to plague Missoula. Photo by TOMMY MARTINO, Missoulain.

health risk levels during a fire season. The bad news is wildfires produce far more fumes than prescribed burning during the spring or fall.

“We’ve done a lot of measurements since the 1990s flying through wildfire smoke plumes,” Yokelson said. “NASA and the Department of Energy had research aircraft, and we got them to include wildfires on their target list. We found that when we flew through wildfire, you make a lot more pollution from the same amount of fuel. If you think about an acre on way up to Snowbowl, if it burns during wildfire rather than a prescribed fire, we make 10 times more pollution.”

Yokelson said wildfires consume much more fuel per acre during the hot days of summer, including a lot more of the dead-down rotten logs that burn inefficiently and release lots of smoke. Prescribed burns during cooler, wetter times of year would reduce the fuel loads while clearing out forest litter that has no commercial value, Yokelson said.

“That has implications for land managers who want to improve air quality,” Yokelson said. “Every forest ecosystem has a tendency for flammable fuels to build up over time. It’s mostly small stuff that dries out quickly in summer that causes fire danger.”

The health dangers remain less understood. While air-quality monitors like Missoula County’s know wildfire smoke contains nasty stuff, they’re not well-equipped to measure chemical composition as precisely as they can particulate size.

“A lot of people’s initial reaction to wildfire smoke — what makes them feel kind of yucky, like the scratchy eyes, nausea, and headaches — comes from the organic chemicals released from combustion,” Coefield said. “But we don’t have the tools to measure that running on constant basis. What we measure is particulate pollution, especially particles 2.5 microns in diameter and smaller.”

Sucking those tiny particles into the lungs can cause respiratory and heart problems, regardless whether they contain poisonous compounds. The potential for wildfire smoke to produce a cocktail of toxins that do more damage in combination than individual substances might by themselves remains a topic of intensive research. One thing that Yokelson and Selimovic want to know more about is how specific fires might differ, depending on where and what they burn.

For example, a study of tree growth downwind of New York City found that forests farther from the source of smog grew slower than those closer to the urban area. Researchers determined that it took a while for the smog components to transform into ozone, which inhibits tree health.

Yokelson wonders if similar effects show up downwind of forest fires. In a 2013 experiment, he spent two days in an airplane following the smoke plume of California’s Rim fire in Yosemite National Park to Winnipeg, Manitoba. The flight included touch-and-go landings in Missoula, Great Falls and Bozeman where the plane would dive from the top of the plume to ground level and climb back again to sample all strata of the smoke.

“We’re trying to understand the physics of the smoke, and that’s really complex,” Yokelson said. “It has to do with the energy of the fire and the stability and structure of the atmosphere and the complexity of the topography. With an airplane, you have a lot of flexibility to follow the plumes.”

So far, most of Missoula's smoke comes from the fires everyone can see on the horizon. Missoula County's Coefield said that may start to change soon as August heat grinds in.

"This is the first time in seven years I've ever seen this many fires in the immediate area," Coefield said. "But we're starting to see more fires forming in Washington, Idaho, and Oregon. If those fires take off, I wouldn't be surprised if we get some out-of-town flavor to the smoke."