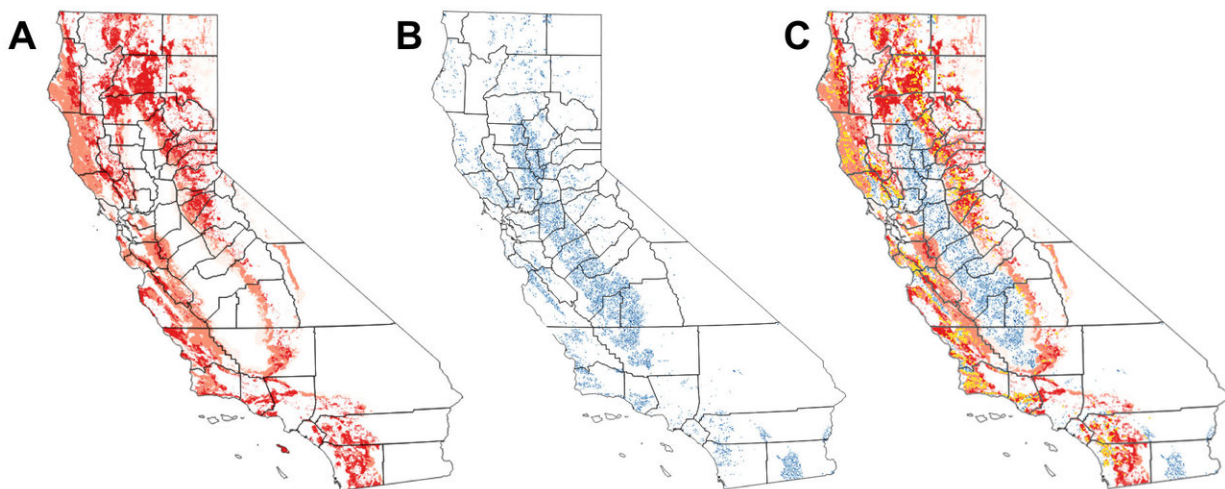


Too little is known about wildfire smoke

October 4 2017



These maps show regions in California (A) at risk for wildfires, (B) where pesticides are applied and (C) where they overlap (shown in yellow). Click the image for a larger view. Credit: *Current Topics in Toxicology*

How do fire-suppression chemicals and pesticides affect wildfire smoke and the health of those who breathe it? UC Davis graduate students discovered that this question cannot be answered based on current scientific evidence and, in a review published in *Current Topics in Toxicology*, they recommend studies on the compounds in wildfire smoke.

Closing this knowledge gap is particularly important in California, where lines are shrinking between high-population cities and neighborhoods

and the farmlands and forests where [pesticides](#) and fire-suppression chemicals are used, according to the [review](#) authors. California also is where pesticide use and the length and frequency of wildfires—together with the amount of retardants used to stop them—are increasing.

"When forests and farmlands catch fire, the chemicals applied to them burn, too, and potentially travel much longer distances than where they were first used," said review author Sarah Carratt, a pharmacology and toxicology graduate student at UC Davis.

"As areas at-risk for wildfires and where pesticides are applied overlap with areas where people live and breathe, it becomes increasingly important to characterize the content of wildfire smoke," Carratt added.

From class discussion to published research:

The review began as a discussion in a summer class where graduate students evaluate the state-of-the-science in environmental health topics. When Carratt participated, the focus was the respiratory effects of wildfire smoke.

"It was a timely topic, since Davis at the time was downwind of several fires, including a very large burn near Lake Berryessa," Carratt said.

She and the class found there are not many studies on the short- and long-term health effects of wildfire smoke. Most wildfire studies also do not account for the complexity of smoke composition, focusing instead on just a handful of chemicals or particles.

The course instructors included Jerold Last, professor of pulmonary, critical care and sleep medicine at UC Davis Health and researcher on the environmental causes of disease. His studies in animal models have shown that wildfire smoke reduces lung macrophages, the cells

responsible for protecting the lungs from infectious or toxic particles.

"We know wildfire smoke is made up of small particles, gases and vapor and that it is more toxic than other smoke, but we don't know what makes it so toxic," said Last, senior author of the review. "It's possible that what distinguishes it are the chemicals humans add to the environment, but researchers haven't paid enough attention to this yet."

Wildfires, fire retardants and pesticides on the rise:

The class also uncovered several important trends:

- Wildfires have increased nationwide and most of them occur in California, which had 82 percent of the total number of U.S. wildfires in 2016
- The frequency of wildfires has increased globally over the past few decades, with the greatest increase (18 percent) in Northern California
- The amount of aerial fire retardant used in California from 2012 to 2015 increased from about 3 million gallons to about 7 million gallons, and there is no data on the use of firefighting foams
- The total weight of pesticides used on California land in that same timeframe increased from about 186 million pounds to 194 million pounds
- There are regions throughout California at higher risk for wildfires and where pesticides are applied

While [chemical](#) agents are necessary in agriculture and to suppress fires, their use may need additional oversight and restrictions, according to the review authors.

"Ultimately, the benefits of applying these chemicals must be weighed against their drawbacks in order to protect the public from the

immediate threat of fire while minimizing exposure to compounds with unknown human health effects," they wrote.

The review, titled "Pesticides, [wildfire](#) suppression chemicals, and California wildfires: A human health perspective," is available online at http://www.researchtrends.net/tia/title_issue.asp?id=50&in=0&vn=13&type=3

Provided by UC Davis

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