

Likelihood of extreme autumn fire weather has increased 40%

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The likelihood of hot, dry, windy autumn weather that can set the stage for severe fires in California and western Oregon has increased 40% due to human-caused climate change, new computer models show.

The study led by Oregon State University's Linnia Hawkins, which covered 2017 and 2018, looked at the role [climate](#) change may have played in extreme fire [weather](#) conditions that accompanied recent large September, October and November fires in those states.

The collaboration that included David Rupp of the Oregon Climate Change Research Institute examined the weather conditions during big fires driven by strong offshore winds such as California's Santa Ana and Diablo winds and western Oregon's East wind.

The modeling found that human influences on climate actually reduced the frequency of those winds in the two years studied. But higher temperatures and dryer fuels mean the four study areas were nevertheless much more likely to have extreme [autumn](#) fire weather than they would have had without human-caused increases in atmospheric aerosols and carbon dioxide.

"Over the last handful of years, California and western Oregon have experienced their largest and most destructive wildfires ever recorded," said Hawkins, a postdoctoral researcher in the OSU College of Forestry. "The rapid and extensive growth of many of the fires was driven by strong, dry, offshore, downslope autumn winds blowing across fuels that had become very parched over the summer and stayed that way into fall."

For this research, the scientists focused on conditions like those seen during recent catastrophic fires, including Northern California's Wine Country fires in October 2017, the Camp Fire in November 2018 and the North Complex Glass fires in September 2020; Southern California's Woolsey Fire in November 2018; and western Oregon's Lionshead Fire in September 2020.

"Anthropogenic climate change has increased the likelihood of

extremely hot, dry and windy weather in autumn, but it has not necessarily increased the likelihood of fire, nor did these fires occur because of climate change," Hawkins said. "But those fires provided archetypes of extreme offshore-wind-driven autumn fire weather for us to study."

To model a climate absent human activity, the scientists set the atmospheric CO₂ and aerosol concentrations to mid-19th century levels. They performed thousands of simulations with present-day CO₂ and aerosol concentrations and thousands more simulations with CO₂ and aerosol concentrations set to pre-industrial levels.

The researchers then compared the likelihood of extreme autumn fire weather conditions—defined as conditions that, absent human influence, would occur once every 20 years—between the two ensembles of simulations.

"We found that when CO₂ and aerosols from human activity were included, the chance of extreme conditions was 40% higher in those areas of California and Oregon where recent autumn fires have occurred," Hawkins said. "The jump was mainly because of an increase in temperature and fuel aridity and not an increase in wind speeds. In fact, we found [anthropogenic climate change](#) slightly decreased the frequency of strong, dry, offshore winds."

Hawkins emphasizes that the 40% increase in likelihood is the average across the western United States, and that the increase is smaller or larger in specific regions. She also stresses that this study examined extreme fire weather conditions as opposed to average conditions and only in one season of the year.

"What our research demonstrates is that anthropogenic [climate change](#) has already increased the likelihood of autumn [wind](#)-driven extreme fire

[weather conditions](#) in the West," she said. "Together with non-climatic factors like biomass accumulation and more and more people living in the wildland urban interface in fire-prone lands, that means overall fire risk is going up. Approaches such as we used here can guide fire risk assessments and [fire](#) adaptation efforts."

More information: Linnia R. Hawkins et al, Anthropogenic Influence on Recent Severe Autumn Fire Weather in the West Coast of the United States, *Geophysical Research Letters* (2022). [DOI: 10.1029/2021GL095496](#)

Provided by Oregon State University

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