Climate and vegetation shape wildfire risk in Hawai'i

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Credit: The University of Hawai'i

A new research paper by Dr. Clay Trauernicht is the first study to link climate change to increasing wildfire probability in Hawai'i, and one of the few that looks at this question for tropical regions more broadly.

"Fire in tropical ecosystems is driven by cycles of wet and dry periods, which makes it harder to pin to climate change than in temperate areas where longer summertime 'fire seasons' provide a clearer signal," said Trauernicht, assistant specialist in the department of Natural Resources and Environmental Management in the College of Tropical Agriculture and Human Resources. Fires pose serious threats to island communities and watersheds, as well as nearshore reefs due to the erosion that often follows when an area is burned. This paper demonstrates that drying and warming trends on Hawai'i Island will cause areas of highest wildfire probability to shift upwards in elevation. This shift has critical implications for protecting upland natural resources and can help identify where fire risk mitigation should be prioritized in coming decades.

In a paper published in *Science of the Total Environment*, Trauernicht used the "footprints" of historical fires mapped on the Big Island by the non-profit Hawaii Wildfire Management Organization to quantify how vegetation, ignition frequency, and climate contribute to wildfire probability. This novel approach is the first to show not only where fire risk is highest, but also how changes in rainfall and temperature change patterns of fire risk across the landscape. The analysis indicates that climate change will increase the annual risk of wildfire by as much as 375% for parts of the Big Island. It also predicts that most of this change will happen within the next several decades.

"Conditions for fire are likely to worsen significantly by mid-century. But the analysis also shows that we're getting glimpses of what's to come during particularly bad years now and that can help us prepare," said Trauernicht. In addition to predicting the effects of climate change on fire, the study also demonstrates how tracking year-to-year rainfall patterns can help us better anticipate near-term wildfire risk. Whereas all prior research in Hawai'i has looked at how drought increases fire risk, this analysis shows that excess rainfall the year preceding fires can

dramatically increase wildfire risk, especially in Hawai'i's extensive grasslands. "We know that fire risk in grasslands is sensitive to drought, but excess rainfall appears to contribute to this risk even more than drought by increasing grassland fuel loads, something that firefighters have long paid attention to," he explained. By quantifying the effects of both excess rainfall and short-term drought on fire probability, the analysis can provide us with a longer lead for predicting periods of high fire danger in real time.

This timely study confirms patterns recently observed in Hawai'i. High rainfall in the 2017–2018 winter followed by late-summer drought contributed to nearly 30,000 acres burning across the state this past August. It also helps explain why El Niño years tend to be such bad fire years for the state. "Many are aware of dry winters that increase fire risk during El Niño. But these often follow wetter-than-average summers," Trauernicht pointed out. He added, "This is our reality right now. It's been very wet since August, but dry conditions are forecasted for January and February as another El Niño looks increasingly likely." Dr. Trauernicht is already using these results in his Cooperative Extension program to inform ongoing collaboration with fire-response agencies to ramp up statewide outreach and risk reduction efforts.

More information: Clay Trauernicht. Vegetation—Rainfall interactions reveal how climate variability and climate change alter spatial patterns of wildland fire probability on Big Island, Hawaii, *Science of The Total Environment* (2018). DOI: 10.1016/j.scitotenv.2018.08.347

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