Southern California wildfires show split personalities

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Southern California wildfires have two distinct personalities. Fires driven by Santa Ana winds cost 10 times the economic damages as non-Santa Ana fires
Credit: NASA

Wildfires have ravaged regions of Southern California at an increasing rate over the past few decades, and scientists from three University of California campuses and partner institutions are predicting that by mid-

century, a lot more will go up in flames.

In research published today in the journal *Environmental Research Letters*, the scientists discuss the split-personality nature of Southern California wildfires. They describe two distinct wildfire regimes, those driven by offshore Santa Ana winds that kick up in the fall and non-Santa Ana fires that result primarily from hot, dry conditions in the summer.

Santa Ana fires more damaging

The two fire regimes consume roughly the same amount of acreage and cost similar amounts to suppress. However, the Santa Ana fires, which tend to hit more developed areas such as the coastal areas of Los Angeles and San Diego, are roughly 10 times more economically damaging.

"The traditional one-size-fits-all fuel management strategy will not be effective in reducing fire risks and preventing large fires because factors such as fuel and weather vary for different fire regimes," said lead author Yufang Jin, assistant professor in the Department of Land, Air and Water Resources at UC Davis and a researcher at UC Irvine at the time of the study. "California and the western U.S. are expected to face increased fire risk from the current multi-year drought. Local meteorology, extreme climate events, and ecosystem processes must be explicitly considered to develop effective mitigation and adaptation strategies."

Compared to non-Santa Ana fires, Santa Ana fires:

- Spread three times faster
- Burned into urban areas with greater housing values
- Were responsible for 80 percent of the $3.1 billion in economic losses occurring over the study period of 1990 to 2009.

The researchers relied on NASA's satellite data and decades' worth of fire records from the California Department of Forestry and Fire Protection (CAL FIRE) and the U.S. Forest Service.

Contrasting personalities

Stoked by dry desert air channeled through mountain passes and canyons, Santa Ana fires burn with more intensity, and they do their worst in a shorter period of time than summer fires. In a typical Santa Ana fire, half of the territory burned is consumed in the first day of the blaze. Examples of Santa Ana fires include the costly Cedar Fire in San Diego and dozens of others that burned in late October 2003.

Non-Santa Ana fires, by contrast, burn more slowly over more remote mountain areas. Non-Santa Ana fires, such as the Station Fire that scorched large portions of the San Gabriel Mountains in 2009, rely on hot temperatures and dried vegetation and woody debris that serves as a fuel source.

A question of resources

Both types of fires are costly and damaging, but the researchers see change on the horizon.

"Warming in the summertime will be a big factor in increasing the number and size of non-Santa Ana fires," said co-author Alex Hall, UCLA professor of atmospheric and oceanic studies. "Lower relative humidity during Santa Ana events resulting from climate change toward the middle of the century will lead to larger Santa Ana fires."

Fire-prone regions also face increased competition during the summer for firefighting resources, such as air tankers, vehicles, and personnel.

"The large economic and human impacts of Santa Ana fires raises the question of whether more resources during the fall could be marshaled for suppressing these fires," said James Randerson, Chancellor's Professor of Earth system science at UCI and senior author on the paper.

More information: *Environmental Research Letters*, iopscience.iop.org/1748-9326/10/9/094005

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