California Wildfires

Here's how climate change fueled the Los Angeles fires

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High winds and dry vegetation set the stage for the explosive wildfires in Los Angeles. Scientists are finding that climate change fueled some of the extreme conditions.

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In early January, the stage was set for a wildfire disaster in Los Angeles. A long, hot summer had dried out the plants and vegetation, making it more flammable. Drought conditions dragged on, as winter rains had yet to arrive. Then came powerful Santa Ana winds, gusting above 80 miles per hour.

The result was more than 16,000 homes and buildings were destroyed after the fast-moving Eaton and Palisades fires exploded. In those extreme conditions, firefighters had little hope of getting control of the blazes.

New studies are finding the fingerprints of climate change in these wildfires, which made some of the extreme conditions worse. In particular, the hotter temperatures and a drier atmosphere can be linked to heat-trapping gases that largely come from burning fossil fuels, according to two different analyses from the University of California, Los Angeles, and World Weather Attribution, a collaboration of international scientists.

Still, for other extreme conditions that led to Los Angeles' fires, like the strong Santa Ana winds and lack of rain, discerning the role of climate change is scientifically trickier.

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Some Los Angeles homes made it through the firestorm. Here's how

While there may be a connection to climate change, it's harder to recognize given the state's highly variable weather, which normally swings from wet to dry years. The powerful computer models scientists use to analyze climate impacts also struggle with very small geographic areas or complex processes, like wildfire behavior.

Climate scientists are developing ways to pinpoint the role climate change is playing in wildfires. Still, the most significant human influence may be how the wildfires started since there were no lightning storms at the time that would have sparked the fires.

"The ignitions were undoubtedly due to human activity," says Alex Hall, director of the Institute of the Environment and Sustainability at UCLA. "So fundamentally, I think these fires are anthropogenic. They are human-created. We have to take the prevention of ignitions a lot more seriously, especially when we know that there's going to be a very dangerous Santa Ana wind event."

Thirsty atmosphere

Los Angeles' summer heat persisted late into the fall last year, including a record-breaking September heat wave. The period from June through December ranked as the third hottest since 1895.

A hotter atmosphere is a thirstier atmosphere. The dry air draws moisture out of plants, making them more susceptible to burning. For small vegetation like grasses, drying only takes hours. For larger things like trees, or even the wood in fences and decks, it can take days or months.


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What LA did right before the fires — and why it wasn't enough

The dryness of Los Angeles' vegetation before the fires was due to both hotter temperatures and a lack of rain. An analysis by UCLA found that about a quarter of that moisture deficit was due to the extreme heat, which was influenced by climate change.

"The fact that we have a warmer or drier atmosphere today because of global warming very likely causes large fuels like dead logs and fence posts and other materials that you find in urban environments to be drier than they would be otherwise," says Park Williams, a hydroclimatologist at UCLA. "These fires are very likely more intense and dangerous in urban environments because of global warming."

Another analysis by World Weather Attribution found that the hot, dry conditions were about 35% more likely because of climate change, as measured by the Fire Weather Index, which looks at temperature, humidity and other weather factors.

Wind and rain

Winds were the biggest factor for the explosive growth of the Los Angeles fires, sending showers of embers into neighborhoods that ignited homes.

"The wind speeds were incredibly, incredibly strong, and we had an incredibly dry fuel," says John Abatzoglou, professor of climatology at the University of California, Merced. "So realistically, this was a perfect storm when it comes to conditions for fire disasters."

The Santa Ana winds blow when there's an area of high pressure over the Southwestern U.S., which pushes air towards Southern California and funnels it through the mountains near Los Angeles. Often, that warms the air and accelerates the wind speeds, leading to dangerous fire conditions. Scientists are working on understanding how the conditions that create these winds could shift as the climate warms, but there still isn't a clear answer. The conditions could decline or shift in timing.

"Whether or not climate change affected the winds is highly uncertain, very, very complicated," Williams says.

The impact of climate change on Southern California's rainfall is another challenging question. California saw a wet winter prior to this one, which caused dense vegetation to build up. That heavy vegetation stayed dry this winter in drought conditions.

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This scientist studies climate change. Then the Los Angeles fire destroyed his home

"Normally we get our first rains, maybe around November, and that's what kills off the fire season, but we didn't have that rain," Hall says.

Hall says the rainfall deficit this winter in Los Angeles was a 1-in-50-year event, meaning it has a 2% chance of happening in any given year. Still, whether climate change played a role in that is still unknown. Climate scientists use complex computer models to forecast the effects of climate change, but California's location on the globe makes it difficult to discern what will happen.

"Most of Mexico is projected to dry and Seattle is projected to generally get wetter, and we are right between those two areas," Williams says. "If our models are off by just a little bit, California could either get drier or wetter. And at the same time, the models do project that precipitation will become more extreme in the future, which would cause the wet years to get wetter and the dry years get drier."

California's rainfall is also naturally highly variable, with huge swings between wet and dry conditions from year to year. That makes it harder to pick out a pattern and the oldest rainfall records only go back to the late 1800s.

"That means that we need a much longer record to look at for things like trends in precipitation in order to detect the influence of climate change, just because the natural swings are so large," Hall says.

Climate scientists are working on refining climate change models to better simulate wildfire conditions at a smaller scale. That could help areas like Los Angeles get a better view into their future.

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