

# Here's What We Know about Wildfires and Climate Change

Scientists think that global warming may already be influencing fire seasons

By Chelsea Harvey, ClimateWire on October 13, 2017



*Credit: David McNew Getty Images*

As deadly wildfires rage across California's wine country,

leaving at least 29 dead and a trail of destruction in their wake, the influence of climate change is again being questioned.

Just Monday, Hillary Clinton delivered a speech at the University of California, Davis, in which she noted that "it's been a tough couple of weeks with hurricanes and earthquakes and now these terrible fires" (*Climatewire*, Oct. 12).

"So in addition to expressing our sympathy, we need to really come together to try to work to prevent and mitigate, and that starts with acknowledging climate change and the role that it plays in exacerbating such events," she added.

While there's growing interest in investigating the fingerprints of climate change on extreme weather events, it's often challenging for scientists to parse out its influence versus other natural and human factors—and, as experts have warned time and again, no single weather event can be attributed solely to the effects of climate change. This may be particularly true for wildfires, which are heavily influenced by human land-use and management practices in addition to the weather.

Still, scientists are increasingly suggesting that climate change has already had a hand in shaping fire seasons, not just in California but elsewhere around the world, and will likely continue to play a major role. These are a few of the major climate-related factors that may be at play.

## **RISING TEMPERATURES MAKE VEGETATION DRIER**

Plants take in carbon dioxide, which they need to survive,

through tiny pores in their leaves called stomates. But they also lose water through these same pores every time they open—and the higher the ambient temperature, the more water they lose. Warmer weather can also cause more water to evaporate from dead plants littering the ground.

"A warmer world will have drier fuels," said Mike Flannigan, director of the Western Partnership for Wildland Fire Science at the University of Alberta in Canada. "Drier fuels will mean it's easier for fires to start and spread."

A study published last year in *Proceedings of the National Academy of Sciences* suggests that climate change has already played a significant role in making forests in the western U.S. drier and more likely to burn, nearly doubling the area affected by forest fires over the last three decades.

At the same time, there's a great deal of scientific debate about the influence of climate change on droughts around the world. In some places, California included, some scientists have suggested that future climate change may lead to an increase in the frequency or intensity of droughts—but there's still considerable uncertainty about how these changes will unfold. In some places, climate projections predict an increase in both drought and extreme precipitation events, suggesting more intense rainfall punctuated by longer or drier periods in between.

What this would mean for fire seasons may still be unclear. But Flannigan suggests that an increase in heavy rainfall events may not be enough to offset the effects of steadily rising temperatures, especially if they're accompanied by an increase

in dry periods.

"You only need a week of hot, dry, windy weather before you can have a raging inferno," he said. "You don't need very much time."

## **MORE LIGHTNING PROVIDES THE SPARK**

Fires get started in one of two ways—by humans or lightning. Both are growing in number. Lightning strikes may become more frequent in some places due to climate change.

Generally, lightning occurs more frequently in hot weather than cold weather. A 2014 study in the journal *Science* anticipates that the number of lightning strikes in the United States could increase by about 12 percent for every degree Celsius of warming.

Other research has suggested that lightning-driven fires are already becoming more frequent in some places.

A study published earlier this year in *Nature Climate Change* found that lightning ignitions in North America's northern boreal forests have increased since 1975. And the researchers say that future warming may cause more storms, more lightning and potentially more fires in the northern regions.

## **EARLIER SPRINGS EXTEND THE FIRE SEASON**

Rising temperatures don't just increase the chance that a fire

will start at any given time—they also lengthen the total time throughout the year that conditions are right for wildfires.

Recent research shows that spring is arriving earlier and earlier in many places, based on the timing of snowmelt and the re-emergence of vegetation.

Last year, an analysis released by the USA-National Phenology Network pointed out that spring had arrived up to three weeks early throughout the southeastern United States. Another study in *Ecosphere* from last year concluded that three-quarters of the nation's national parks have seen an advance in the timing of spring over the last century. Other recent research from *Proceedings of the National Academy of Sciences* has suggested that spring is coming about eight days earlier in the northern forests of North America and Eurasia than it did three decades ago.

Earlier springs mean more than just a longer warm season. In colder regions, this also means that snow is melting sooner. That's an important freshwater resource in many high-latitude or mountainous regions. But if snow melts too early, the water may dry up before it gets cold again and increase the potential for drought—and, thus, drier fuel for fires. Last year's devastating wildfire in Alberta coincided with the lowest area of snow cover in the Northern Hemisphere in any April over the last 50 years.

## **CLIMATE CHANGE CAN AFFECT THE WINDS THAT DRIVE FIRES**

Multiple experts pointed out that the fires in California are

fanned by seasonal strong, dry winds known as Diablo winds in Northern California and Santa Ana winds in the south.

Researchers say these winds may cause more burning in the future.

As Grist's Eric Holthaus recently noted, a 2015 paper in *Environmental Research Letters* found that climate models predict more intense Santa Ana wind events are on the way. The researchers say the total area at risk of being burned by Santa Ana fires by midcentury could increase more than 60 percent.

This research is specific to California, and the same changes in wind conditions may not necessarily occur in other fire-prone regions. But the study does emphasize the idea that other weather conditions, outside of temperature and moisture, are still important factors in the outbreak of wildfires and may be influenced by climate change.

## **MORE FIRES COULD CONTRIBUTE TO A DANGEROUS CLIMATE FEEDBACK LOOP**

Some scientists are also concerned that if wildfires become more frequent or intense, the carbon emissions they release could exacerbate the progression of climate change, leading to a kind of feedback loop—more warming leads to more fires, which release more carbon, which causes more warming, and so on.

This is of particular concern for boreal forests in North American and Eurasia, which contain heavy deposits of carbon-

rich peat, according to Flannigan. "One good fire that burns a meter or two [deep] could release many thousands of years of carbon accumulation in one blast," he said.

## **MANY UNCERTAINTIES REMAIN**

It's important to note that these are all ways that climate change *could* affect future fire seasons all over the world—but there are considerable uncertainties about the ways these changes would actually unfold.

First, while the above factors—temperature, moisture, wind, lightning—are generally significant in fire seasons all over the world, the effects of climate change will certainly not be identical everywhere.

Additionally, wildfires, perhaps more than any other type of natural disaster, are heavily subject to the influence of human land use—the types of vegetation we plant or clear away, how often we allow it to burn, and how we choose to manage fires once they start. These types of decisions could both mitigate or exacerbate the intensity of future fire seasons, the effects of climate change notwithstanding.

And while the fires continue to blaze in California, it's also important to remember that no single event can be attributed solely to the effects of global warming. Rather, as Clinton noted in her speech, climate change may simply exacerbate these events—in what ways and to what extent, scientists are still discovering.

