# Wildfire problem will grow in coming decades

February 27 2018, by Susan Mcginley

The Thomas Fire devastated parts of California in 2017, burning 281,893 acres, destroying 1,063 structures and damaging 280 more. Credit: U.S. Forest Service

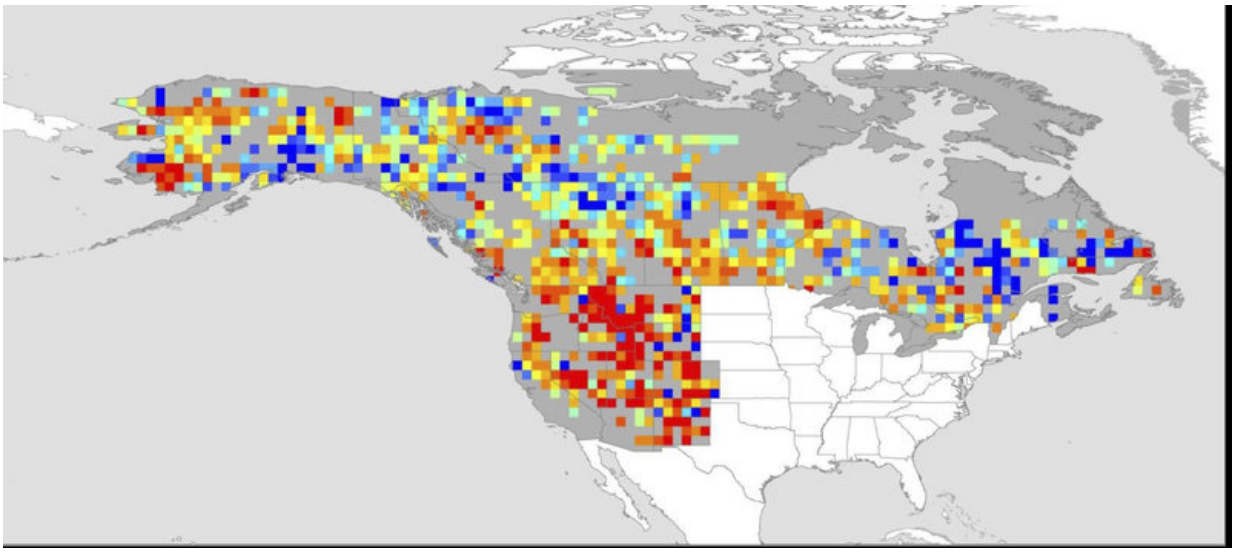
The massive wildfires that burned in California, Oregon, Montana, Idaho, British Columbia and other parts of North America in 2017 in many cases exhibited a disturbing trend: a marked increase in the amount of area burned.

The Thomas Fire, which consumed 281,893 acres in California's Santa Barbara and Ventura counties in December, was the largest in the state's history. The Nazko Complex Fire in British Columbia burned more than 1 million acres, the largest ever recorded for the province.

That trend will continue in coming decades across the Western U.S. and northwestern Canada, though not uniformly, according to a recent study. UA professor Don Falk and Thomas Kitzberger from the Universidad Nacional del Comahue in Argentina, who started working on the research as a visiting scholar at the UA, were co-investigators on the study that also included Thomas Swetnam from the UA and Leroy Westerling of the University of California, Merced.

While it may have been an exceptional year in some respects, Falk's and Kitzberger's predictions suggest that years like 2017 are likely to become more common over time. States in the interior Western U.S., in particular, may be faced with large increases in total wildfire area burned, potentially beyond anything that has been experienced in the past.

Their research paper, "Direct and indirect climate controls predict heterogeneous early-mid 21st century wildfire burned area across western and boreal North America," was published in the journal *PLOS ONE* in December as the 2017 fire season was ending. The results project where the greatest increases in area burned are likely to occur across the Western U.S. and Canada in coming decades, suggesting that large fires such as the recent ones in southern and northern California may become more common.



Projected change in annual area burned for the period 2010–2039, with red colors indicating areas with the greatest increase in area burned annually in wildfires, and dark blue the least. Credit: University of Arizona

## A Model to Measure and Project Fire Activity

"We used 34 years of climate data to calibrate area burned in 1,500 grid cells across western North America, so we could capture the different ways that seasonal climate regulates fire in different regions," said Falk, a professor in the School of Natural Resources and the Environment in the UA College of Agriculture and Life Sciences.

The key measurement, annual area burned, is a combination of fire size, frequency and variability from year to year. Area burned does not necessarily indicate fire severity, the ecological effects in a burned area.

Taking into account geographic variation, the study data focused on fire occurrence, seasonal temperatures and snowpack. The seasonal climate variables that turned out to be driving the amount of area burned were

summer temperatures during fire season, spring temperatures and rainfall, and winter temperatures. Winter and spring conditions regulate snowpack, which can delay the onset of the fire season.

The team built a statistical model for wildfire area burned in each of the grid cells studied, and then tested it with data for actual area burned since 2010 to validate their predictions. It did not project the extent of area burned beyond the mid-21st century, as climate and vegetation changes become more uncertain later in the century.

Findings for western and northern North America show that about half the states and provinces are projected to have a large increase—five or more times the current levels—in total wildfire area burned. Others may see smaller increases, indicating there is no "one-size-fits-all" model. Increases in area burned are unevenly distributed across the study area, with the strongest increases projected in the interior western region.

Thousands of homes and buildings were destroyed in the Thomas Fire, which is estimated to have a total cost of more than $180 billion. Credit: U.S. Forest Service

## Heads-Up for Land Management

"Ultimately, this means that the large fire seasons of recent years, such as the one just ending, are likely to occur more frequently, affecting ecosystems, communities and public safety," Falk said. "These will be billion-dollar fires. We're just not ready for fire impacts of this kind, including post-fire effects from flooding after fire."

The total cost of the 2017 fires in California alone is projected to exceed $180 billion. This includes not only the immediate costs of firefighting,

but also the much larger costs of landscape rehabilitation; medical and hospital costs; insurance losses and the costs of replacing thousands of homes and other buildings; lost economic productivity from the destruction of businesses; repair and replacement of key infrastructure such as roads, power lines and dams; and weeks of lost income by employees.

Across the U.S., public land managing agencies are being stretched to their limits by the current scale of wildfire. The U.S. Forest Service spends more than half of its entire budget on wildfire response, leaving little for other key elements of its mission such as recreation, ecosystem restoration, research and public education.

Knowing about future regional variation in the projected annual area burned can help land managers and policy makers prepare for the possibility of extremely large fire years. Falk pointed out that seasonal climate changes also are having the effect of making the fire season longer, so there is additional time for more acreage to burn. In years when seasonal climate drives lengthy fire seasons, fire management resources may be stretched to the limit.

"Wildfires act as a multiplier of other forces such as climate change, exposing more and more areas not only to the immediate effects of fire, but also to the resulting cascade of ecological, hydrological, economic and social consequences," Falk said. "We hope that this research will be a wake-up call to public agencies and legislatures at all levels of government that the fire problem is not going to get any smaller in coming decades.

"If anything, we need a serious, fact-based national dialogue about how to sustain our forests and woodlands through smart management and policy."

**More information:** Thomas Kitzberger et al. Direct and indirect climate controls predict heterogeneous early-mid 21st century wildfire burned area across western and boreal North America, *PLOS ONE* (2017). DOI: 10.1371/journal.pone.0188486

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