

History shows more big wildfires likely as climate warms

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University of Wyoming doctoral candidate John Calder holds sediment cores taken from Seven Lakes in the Mount Zirkel Wilderness Area of northern Colorado. Calder and his colleagues examined charcoal deposits in 12 lakes in and near the wilderness area, finding that wildfires burned large portions of that area during a documented spike in temperatures in North America starting about 1,000 years ago. Credit: Bryan Shuman

The history of wildfires over the past 2,000 years in a northern Colorado mountain range indicates that large fires will continue to increase as a result of a warming climate, according to new study led by a University of Wyoming doctoral student.

"What our research shows is that even modest regional warming trends, like we are currently experiencing, can cause exceptionally large areas in the Rockies to be burned by wildfires," says John Calder, a Ph.D. candidate in UW's Program in Ecology and the Department of Geology and Geophysics.

The findings will be published this week in the *Proceedings of the National Academy of Sciences*, a major scientific journal. The paper, "Medieval warming initiated exceptionally large wildfire outbreaks in the Rocky Mountains," is co-written by UW researchers Calder, Dusty Parker, Cody Stopka and Bryan Shuman, along with Gonzalo Jimenez-Moreno of the University of Granada in Spain.

Calder and his colleagues examined charcoal deposits in 12 lakes in and near the Mount Zirkel Wilderness of northern Colorado, finding that wildfires burned large portions of that area during a documented spike in temperatures in North America starting about 1,000 years ago. That period, known as the Medieval Warm Period (MWP), lasted about 300 years, when temperatures rose just under 1 degree Fahrenheit.

Temperature increases over the past few decades have been comparable to those of the MWP, resulting in some of the largest wildfires in U.S. history. Since the mid-1980s, beginning with the large fires in Yellowstone National Park in 1988, there has been an increase in the frequency of large wildfires in the American West.



University of Wyoming doctoral candidate John Calder prepares to take core samples from Lake Eileen in the Mount Zirkel Wilderness Area of northern Colorado, part of a study of wildfire history. Credit: Bryan Shuman

If the warming trend continues as projected, the fires of recent years could be just the start of more extensive and devastating blazes, the researchers say.

The study examined how often large areas burned in the past 2,000 years. It found that the only time when fires burned substantially more area than in the 20th century was during the MWP.

"When we look back in time, we only see evidence of large areas burning one time in the last 2,000 years," Calder says. "This suggests that large wildfires of the magnitude we have recently seen used to be very infrequent."

The researchers estimate that 83 percent of the 385-square-mile study area burned at the beginning of the MWP, when the climate warmed 0.9 degrees. That represented an increase of more than 250 percent, compared to the 20th century.

By comparison, the average increase in temperature in the Rocky Mountain region since 2000 has been about 1.25 degrees higher than during the 20th century.

"Corresponding to those higher temperatures, 12 percent of our study area burned in the large Zirkel Complex [fire](#) in 2002," Calder says. "Our data indicate that, in the Medieval Warm Period, fires were either much larger, or large fires similar to the Zirkel Complex fire burned in that same wilderness area once every decade or two when the temperatures warmed by 0.9 degrees Fahrenheit."

The Medieval fires would be unusual almost anywhere in the Rockies.

"Using Yellowstone fire history as a baseline for comparison, our minimum estimate of 50 percent of (Mount Zirkel) sites burned within a century at the beginning of the MWP exceeds any century-scale estimate of Yellowstone burning for the past 750 years," the scientists wrote. Over the century that led up to and included the massive 1988 fires, only about 30 percent of Yellowstone burned.

"The large increase in the number of sites burned by fires (during the MWP) highlights the risk that large portions of individual landscapes may burn as climates continue to warm today," the researchers

concluded.

More information: Medieval warming initiated exceptionally large wildfire outbreaks in the Rocky Mountains,
www.pnas.org/cgi/doi/10.1073/pnas.1500796112

Provided by University of Wyoming

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