A look back suggests a sobering future of wildfire dangers in US west

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The American West has seen a recent increase in large wildfires due to droughts, the build-up of combustible fuel, or biomass, in forests, a spread of fire-prone species and increased tree mortality from insects and heat.

In a paper appearing online Feb. 14 in the Proceedings of the National Academy of Sciences, a 12-member research team warns that these conditions may be "a perfect storm" for more fires.

While grazing and fire suppression have kept incidents of wildfires unusually low for most of the last century, the amounts of combustible biomass, temperatures and drought are all rising. "Consequently, a fire deficit now exists and has been growing throughout the 20th century, pushing fire regimes into disequilibrium with climate," the team concludes.

"The last two centuries have seen dramatic changes in wildfire across the American West, with a peak in wildfires in the 1800s giving way to much less burning over the past 100 years," said lead author Jennifer R. Marlon, now a National Science Foundation Earth Science Postdoctoral Fellow at the University of Wisconsin, Madison. "The decline was mostly caused by the influx of explorers and settlers and by their subsequent suppression of wildfires, both intentionally and accidentally."

Marlon earned her doctorate at the University of Oregon, where she studied with co-authors Patrick J. Bartlein and Daniel G. Gavin,

professors of geography, as well as with former UO professor Cathy Whitlock, professor of earth sciences at Montana State University. Five other co-authors also hold doctoral degrees from the UO but are now affiliated with other institutions.

Wildfires have been debated for years as either a destructive force of nature that should be eradicated or natural disturbance that keep ecosystems healthy. For nearly 100 years, national policy, as administered by the U.S. Forest Service, had been to respond rapidly to suppress all wildfires, but in recent years, local forest managers have been given more latitude to evaluate which fires to suppress, while ensuring public safety.

In their analysis, Marlon and colleagues used existing records on charcoal deposits in lakebed sediments to establish a baseline of fire activity for the past 3,000 years. They compared that with independent fire-history data drawn from historical records and fire scars on the landscape.

Their key findings:

- Comparing charcoal records and climate data, as expected, showed warm, dry intervals, such as the "Medieval Climate Anomaly" between 1,000 and 700 years ago, which had more burning, and cool, moist intervals, such as the "Little Ice Age" between 500 and 300 years ago, had fewer fires. Short-term peaks in fires were associated with abrupt climate changes -- warming or cooling.
- Wildfires during most of the 20th century were almost as infrequent as they were during the Little Ice Age, about 400 years ago. However, only a century ago, fires were as frequent as they were about 800 years ago, during the warm and dry

Medieval Climate Anomaly. "In other words, humans caused fires to shift from their 1,000-year maximum to their 1,000-year minimum in less than 100 years," Gavin said.

- Climate and humans acted synergistically -- by the end of the 18th century and early 19th century -- to increase fire events that were often sparked by agricultural practices, clearing of forests, logging activity and railroading.

"We can use the relationship between climate and fire," Marlon said, "to answer the question: What would the natural level of fire be like today if we didn't work so hard to suppress or eliminate fires? The answer is that because of climate change and the buildup of fuels across the western U.S., levels of burning would be higher than at any time over the past 3,000 years, including the peak in burning during the Medieval Climate Anomaly."

The long-term perspectives gained through these studies demonstrate how strongly climate and people affect the present-day landscapes and forests of the American West, and how they may change in the future, Bartlein said.

"Policymakers and others need to re-evaluate how we think of the past century to allow us to adjust and prepare for the future," he said. "Recent catastrophic wildfires in the West are indicators of a fire deficit between actual levels of burning and that which we should expect given current and coming climate conditions. Policies of fire suppression that do not account for this unusual environmental situation are unsustainable."

The five other co-authors previously at the UO are: Colin J. Long, now at the University of Wisconsin, Oshkosh; Christy E. Briles, now at Monash University in Australia; Daniele Colombaroli, now at the University of Bern in Switzerland; Mitchell J. Power, now at the

University of Utah; and Megan K. Walsh, now at Central Washington University in Ellensburg, Wash. The remaining four co-authors are R. Scott Anderson of Northern Arizona University, Kendrick J. Brown of the Canadian Forest Service, Douglas J. Hallett of the University of Calgary and Elizabeth A. Scharf of the University of North Dakota.

"This collaboration of researchers with UO roots provides potentially important information that may be useful in guiding policies to protect the environment," said Kimberly Andrews Espy, vice president for research and innovation. "It is gratifying to see that the impact of graduate study at the UO extends well beyond students' time on our campus. Working together is a hallmark of UO graduate study and reflects well on our nationally ranked geography department."

Charcoal records used in the research were obtained from the Global Charcoal Database of the Global Palaeofire Working Group. Marlon, Bartlein and Power serve on the organization's scientific steering group.

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