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New Utah Museum of Natural History Curator Offers Insight Among Climate Change, Human Activity and Wildfires

Study of last 2,000 years of charcoal evidence suggests human impacts have curtailed fires in most areas

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Salt Lake City, Utah -- (Sept. 21, 2008) -- Climate has been implicated by a new study as a major driver of wildfires in the last 2,000 years, but human activities, such as land clearance and fire suppression during the industrial era (since 1750) created large swings in burning, first increasing fires until the late 1800s, and then dramatically reducing burning in the 20th century.

The study by a nine-member team from seven-institutions -- co-led by Mitchell Power, the new curator of the Garrett Herbarium at the Utah Museum of Natural History and new associate professor in the Department of Geography at the University of Utah and Jenn Marlon, a doctoral student in geography at the University of Oregon -- appears online ahead of regular publication in the journal Nature Geoscience. The team analyzed 406 sedimentary charcoal records from lake beds on six continents.

A 100-year decline in wildfires worldwide -- from 1870 to 1970 -- was recorded despite increasing temperatures and population growth, researchers found. "From studying this global network of charcoal records, we were surprised to see a decrease in global biomass burned during those years," said Power. "We are attributing this recent decrease to habitat fragmentation, expansion of agriculture, intensification of livestock grazing, and effective fire management."

Members of the media are invited to the Museum's Garrett Herbarium **Monday, September 22, from 9:00 to 11:00 am to talk with Mitchell Power** and see examples of

charcoal core samples and other specimens from current research projects. The Museum is located at 1390 East Presidents Circle (approx. 200 South)

Observations of increased burning (as expressed by charcoal accumulating in lake beds) associated with global warming and fuel build-up during the past 30 years, however, are not the focus of this paper, but are a topic of current research by Power and colleagues.

The analysis of burnt plant material, or charcoal, has drawn increasing attention from researchers during the past 25 years because these data can track wildfire activity -- both incidence and severity -- over very long time periods, providing information for periods when similar data from satellites or fire-scarred trees do not exist. This study and one other study, published in the journal Climate Dynamics by Power and colleagues in June, are the first efforts to analyze a global network of charcoal records for reconstructing large-scale patterns and trends spanning thousands of years.

The importance of the data presented by Power and his colleagues is put into perspective of overall information about the history of fire in a "News & Views" article, also appearing online, written by Andrew C. Scott, an earth sciences researcher at Royal Holloway, University of London.

This new study suggests that during the last 2,000 years, global fire activity was highest between 1750 and 1870. "This was a period when several factors combined to generate conditions favorable to wildfires," said Jennifer Marlon. "Population growth and European colonization caused massive changes in land cover, and human-induced increases in atmospheric carbon dioxide concentrations may have started to increase biomass levels and fuels."

From A.D. 1 to about 1750, wildfires worldwide declined from earlier levels, probably resulting from a long-term global cooling trend that offset any possible influence of population growth and related land-use changes. Researchers pointed especially to charcoal evidence in western North America as an example of this trend. Similar records also were found in Central America and tropical areas of South America. In the western U.S. and in Asia, researchers noted, "initial colonization may have been marked by an increased use of fire for land clearance."

Subsequently, the expansion of intensive agriculture and grazing, as well as forest management activities, likely reduced wildfire activity, Marlon said. "Our results strongly suggest that climate change has been the main driver of global biomass burning for the past two millennia," the researchers concluded. "The decline in biomass burning after A.D. 1870 is opposite to the expected effect of rising carbon dioxide and rapid warming, but contemporaneous with an unprecedentedly high rate of population increase."

As the new curator of the Garrett Herbarium at the Utah Museum of Natural History, Power intends to put the entire plant collection into a database and explore the causes of changing plant distribution through time. The collection contains over 126,000 plant specimens that have been collected over the last 150 years. It is the second largest collection in Utah and ranks in the top 15 percent worldwide.

“There are multiple agents of change, and our study on fire history suggests that climate and humans have had important roles in the past. Once the entire herbarium collection has been entered into a database, we will explore historical linkages among plant distributions, climate, disturbance and humans,” said Power.

Power’s experience with the charcoal database resulted in many surprising and notable outcomes, and he anticipates many new discoveries from the Garrett Herbarium collection. “This collection is remarkable for many reasons. Its ability to examine the responses of individual plants to historical changes in climate and human-related activities is a powerful tool for understanding how much climate and land-use change will be too much for some species,” said Power.

The other six co-authors with Power and Marlon were: Patrick J. Bartlein and Daniel G. Gavin, professors in the geography department and members of the Environmental Change Research Group; C. Carcaillet of the Centre for Bio-Archaeology and Ecology in Montpellier, France; S.P. Harrison and I.C. Prentice, both of the University of Bristol in the United Kingdom; P.E. Higuera of Montana State University in Bozeman, and Mont.; Fortunat Joos of the Physics Institute and Oeschger Centre for Climate Change Research in Bern, Switzerland.

The U.S. National Science Foundation and U.K. Natural Environment Research Council were the primary funders of the research. To learn more about the Global Palaeofire Working Group, visit: http://www.bridge.bris.ac.uk/projects/QUEST_IGBP_Global_Palaeofire_WG

Sources:

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