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NEWS

Plants Could Override Climate Change Effects on Wildfires

Paleoecological data reveal strong influence of vegetation changes on wildfire frequency

The increase in warmer and drier climates predicted to occur under climate change scenarios has led many scientists to also predict a global increase in the number of wildfires. But a new study in the May issue of *Ecological Monographs* shows that in some cases, changes in the types of plants growing in an area could override the effects of climate change on wildfire frequency.

Philip Higuera of Montana State University and his colleagues show that although changing temperatures and moisture levels set the stage for changes in wildfire frequency, they can often be trumped by changes in the distribution and abundance of plants. Vegetation plays a major role in determining the flammability of an ecosystem, he says, potentially dampening or amplifying the impacts that climate change has on fire frequencies.

"Climate is only one control of fire regimes, and if you only considered climate when predicting fire under climate-change scenarios, you would have a good chance of being wrong," he says. "You wouldn't be wrong if vegetation didn't change, but the greater the probability that vegetation will change, the more important it becomes when predicting future fire regimes."

Higuera and his colleagues examined historical fire frequency in northern Alaska by analyzing sediments at the bottom of lakes. Using meter-long samples, called sediment cores, Higuera and his colleagues measured changes in the abundance of preserved plant parts, such as pollen, to determine the types of vegetation that dominated the landscape during different time periods in the past. Like rings in a tree, different layers of sediment represent different times in the past.

The researchers used radiocarbon dating to determine the sediment's age, which dates as far back as 15,000 years. They then measured charcoal deposits in the sediment to determine fire frequency during time periods dominated by different vegetation. Finally, they compared their findings to known historical climate changes.

In many cases, the authors discovered, changes in climate were less important than changes in vegetation in determining wildfire frequency. Despite a transition from a cool, dry climate to a warm, dry climate about 10,500 years ago, for example, the researchers found a sharp decline in the frequency of fires. Their sediment cores from that time period revealed a vegetation change from flammable shrubs to fire-resistant deciduous trees, a trend which Higuera thinks was enough to offset the direct effects of climate on fire frequencies.

"In this case, a warmer climate was likely more favorable for fire occurrence, but the development of deciduous trees on the landscape offset this direct climatic effect. Consequently, we see very little fire," Higuera says.

Similarly, during the development of the modern spruce-dominated forest about 5000 years ago, temperatures cooled and moisture levels increased, which – considered alone – would create unfavorable conditions for frequent fires. Despite this change, the authors observed an increase in fire frequency, a pattern they attribute to the high flammability of the dense coniferous forests.

Higuera thinks this research has implications for predictions of modern-day changes in fire regimes based on climate change. These findings, Higuera says, emphasize that predicting future wildfire frequency shouldn't hinge on the direct impacts of climate change alone.

"Climate affects vegetation, vegetation affects fire, and both fire and vegetation respond to climate change," he says. "Most importantly, our work emphasizes the need to consider the multiple drivers of fire regimes when anticipating their response to climate change."