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New Study by Scripps Researchers Shows Western Wildfires Are Linked to Variations in Climate

California Applications Program at Scripps forecasts mild wildfire season for 2003

Scientists from the California Applications Program at Scripps Institution of Oceanography at the University of California, San Diego, have found a link between variations in climate and the severity of wildfires that spans a range of regions and ecosystems across the Western U.S. over the last two decades.

In developing the first comprehensive database of Western wildfires, the researchers found that, for particular vegetation types across the West, the acres burned tend to result from a few characteristic patterns in moisture surplus or deficit that develop over a few to several seasons. The type of vegetation is key because it determines the growth of wildfire fuel and how it stores moisture.

"The database provides evidence for a direct link between climate, vegetation, and wildfire severity," said Anthony Westerling, a Scripps researcher and lead author of the study appearing in the May issue of the *Bulletin of the American Meteorological Society*. "By understanding the role of climate two years before the fire season through the preceding spring, we can estimate the severity of the wildfire season a season or more in advance."

For example, the number of acres burned in dry shrub and grasslands, as in the Great Basin, Mojave Desert, southern Arizona and New Mexico, eastern Oregon, and the Wyoming Basin, appears to depend strongly on the accumulation of fine fuels such as grasses.

Westerling and his colleagues derive the predictive accuracy, or "skill," of the forecast several months before the wildfire season through the analysis of the 21-year

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history provided by the wildfire data. The connections revealed in the data appear to run through the effects of varying moisture patterns in producing higher or lower than normal amounts of grass in the preceding two years and from the dryness of the vegetation.

The dataset Westerling assembled includes more than 21 years of monthly data—including fire starts and acres burned—from the U.S. Forest Service, the Bureau of Land Management, the National Park Service, and the Bureau of Indian Affairs.

"Essentially we've aggregated wildfires by ecosystem characteristics, including climate, vegetation, and elevation," said Westerling. "So you can say our forecasts apply to large ecosystem 'provinces' based on their climate environment."

In areas with coniferous forests, such as the Sierra Nevada, Colorado Rockies, and the mountains in Arizona and New Mexico, fire season severity is associated with drought during that season and is not tied as strongly to excess moisture during previous summers. In these areas there appears to be a trade-off between fuel accumulation and flammability, according to Westerling.

"This forecast is designed to assist in planning fire suppression personnel resources and to reduce the response time of fire suppression teams in areas that are at risk," said Westerling. "It's also useful for fuels management in terms of planning the complexities of prescribed fires in Western lands."

Westerling says the climate linkages used in the forecast also can help to understand the evolution of Western U.S. ecosystems.

"Over the last several thousand years, the Western U.S. landscape evolved in the presence of periodic wildfires. A lot of species here need fire to propagate themselves. An important problem that has developed is that our fire seasons are much more severe than they used to be because we've aggressively suppressed fires for most of the past century. Consequently, fuels have accumulated to unprecedented levels in ecosystems that used to get very frequent fires."

Although previous forecasts of Western U.S. wildfires have been released by the California Applications Program in March, Westerling and his colleagues have used advances in studies of climate "linkages," or how climate elements are connected, to accelerate the 2003 wildfire season forecasts to January or February releases.

Westerling says experimental forecasts for this year's fire season (see http://meteora.ucsd.edu/cap) indicate a continuation of fire patterns seen in 2002. Largely due to persistent drought, the 2003 forecast shows: a lower than average total area burned

in most western deserts and basins; a higher than average area burned in the southern Rocky Mountains and in higher-elevation zones of Arizona and New Mexico; and medium to high area burned in the Sierra Nevada.

However, the forecast cautions: "If parts of the Western U.S. experience significant additional precipitation before the start of the Western fire season, high (wildfire) forecasts for mountain provinces could change, but forecasts of low fire activity for basins and deserts are unlikely to be affected."

The research is supported by the National Oceanic and Atmospheric Administration Office of Global Programs through the California Applications Program and the Experimental Climate Prediction Center at Scripps; the Department of Energy Accelerated Climate Prediction Initiative; and the National Fire Plan grant to the United States Department of Agriculture Forest Service's Southern Research Station.

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Note to Editors and Assignment Desks: PDF or faxed copies of the paper, "Climate and Wildfire in the Western United States," are available to journalists from Stephanie Kenitzer, AMS press office, at 425/432-2192, or kenitzer@dc.ametsoc.org.

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