

Western tree deaths rise with temperatures

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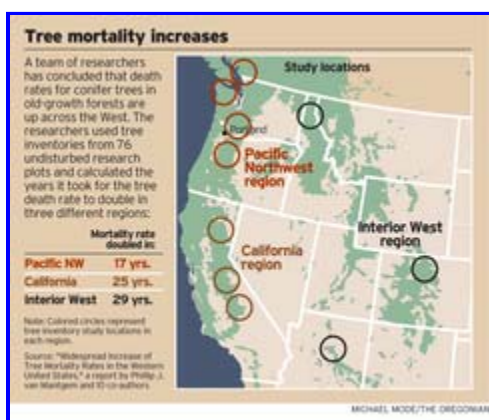
University of WashingtonTree

death rates are rising in established old-growth forests across the West, scientists say. This shot is from the Gifford Pinchot National Forest.

A small increase in temperatures during the past three decades probably contributed to a doubling of tree death rates in undisturbed old-growth forests across the West, a team of researchers reported in the journal *Science* today, with the increase in mortality highest in the Pacific Northwest.

The researchers ruled out insect attack, fire suppression, forest overcrowding, air pollution and other potential local causes in the study areas, which include some of the West's most stable and resilient stands.

Instead, they pinned the increase in tree deaths on a small -- about 1 degree Fahrenheit -- rise in regional temperatures in the past 30 years.



Higher temperatures added more stress to trees by reducing snowpack and prolonging summer dry periods, researchers said.

The change in tree death rates is tiny compared with devastating bark beetle infestations and fires in other forests. It amounts to a thinning of about one extra dead tree an acre each year, said Mark Harmon, one of 11 co-authors of the study and a forest ecology professor at Oregon State University.

But it's unexpectedly widespread, the university and government scientists said, hitting conifers from firs to hemlocks to pines of various sizes at all elevations in forest plots averaging 450 years old.

If the globe warms as projected, the results indicate tree size and age would significantly diminish over time, the researchers said, and forests could become more susceptible to abrupt die-offs.

Increased tree deaths would also diminish the forests' capacity to act as "carbon sinks" that offset global warming by absorbing and storing carbon dioxide, a greenhouse gas, which could further increase temperatures. Pacific Northwest forests, with dense stands of huge trees, are among the biggest carbon sinks on the globe.

Harmon and another co-author, University of Washington forest resources professor Jerry Franklin, said the study's conclusions aren't 100 percent certain.

Tree mortality is highly variable, and researchers would like to have had long-term data from more than the 76 research plots included in the study. The net effect on global warming depends on how fast the dead trees decompose and release carbon, which is largely unknown. And though there's a strong correlation between higher temperatures and increased tree deaths, that's still just an inference.

"But the level of confidence that there's a shift in tree mortality that's occurred in the last 30 to 40 years is pretty strong," Franklin said. "There's something going on."

Scientists have documented increased tree death rates in tropical forests, and previous studies have concluded that warming contributes to increased beetle infestations and fires in the American West. But the study is the first large-scale analysis of mortality rates in North America's temperate forests, the researchers said.

In the Pacific Northwest and southern British Columbia, the rate of tree death in the older coniferous forests doubled in 17 years, the fastest rate among the areas studied. Mortality rates doubled in 25 years in California and 29 years in interior Western states, the researchers said. Meantime, the rate of new tree establishment remained the same.

The researchers, led by scientists from the U.S. Geological Survey, based their findings on long-term tree inventories at 76 undisturbed sites across the West, most with 30 to 50 years of data.

The plots, included several in national parks, contained 58,736 living trees over the study period, of which 11,095 died. Had mortality rates stayed constant, about 5,500 fewer trees would have died, Harmon said.

The increased death rate could be a sign of forests naturally regulating themselves, he said. "The question is whether they can keep up with the rate we're pushing the system."

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