As more of the Pacific Northwest burns, severe fires change forest ecology

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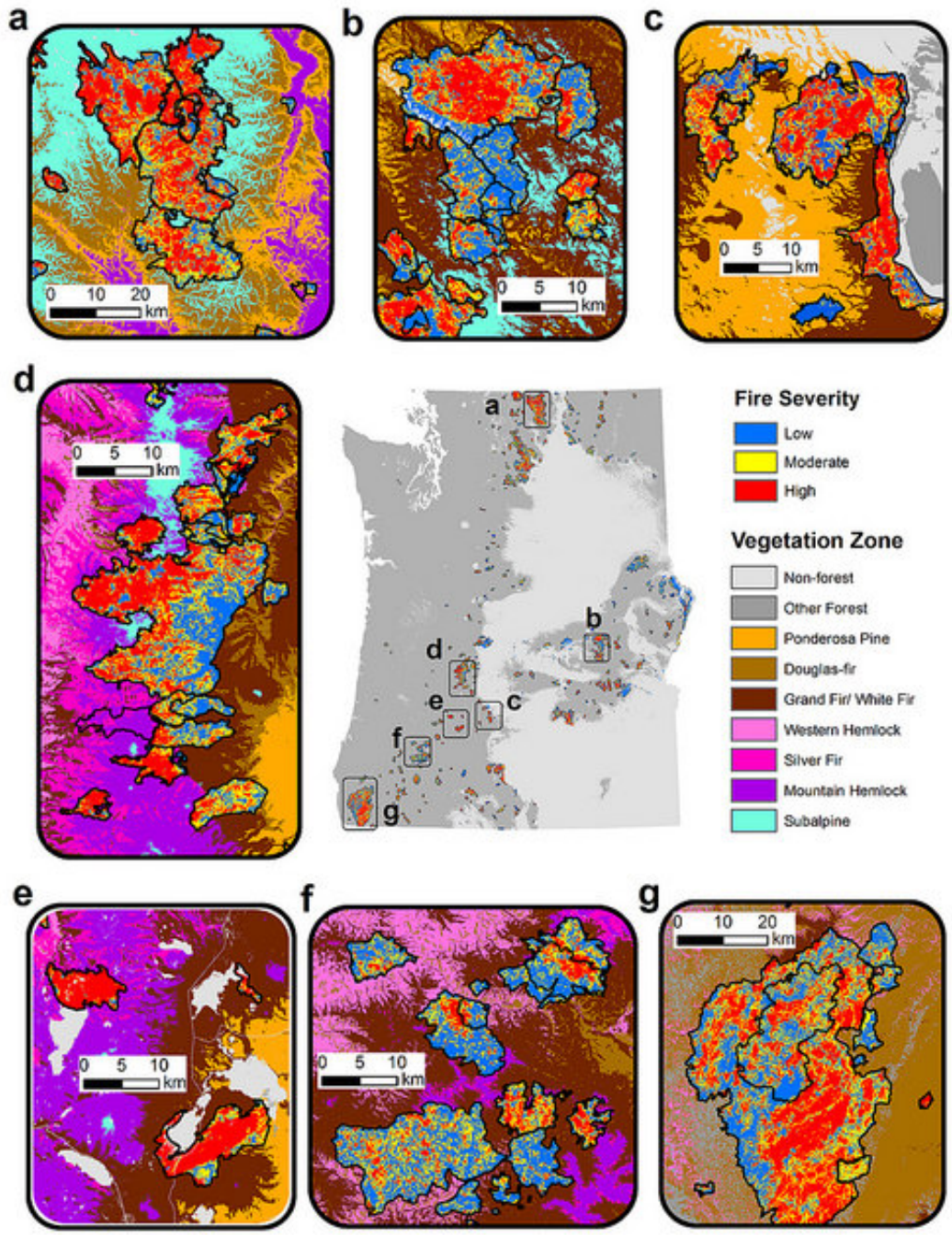

Geographic variability in spatial patterns of burn severity from 1985 to 2010 in the Pacific Northwest, United States. Burn severity is based on the percent of basal area mortality low (75%). Credit: Oregon State University

Over the last 30 years, the landscape annually affected by forest fires has slowly increased across the Pacific Northwest, and in some regions, severe blazes account for a higher proportion of the area burned than in the past.

As a result, the ecology of some of the region's forests is changing in unprecedented ways.

Scientists calculated that less than one-half of 1 percent of the region's forest is subject to fire in any given year. But in a project using satellite imagery and ground-based tree inventories, they also found that, in areas historically dominated by low- and mixed-severity fires, nearly a quarter of the burned landscape was subject to patches of high-severity fires that often exceeded 250 acres in size.

Studies of fires prior to 1900 suggest that severe fires occurred over smaller patches of forest and accounted for a much smaller proportion of the total burned area than they do today.

To reach their conclusions, researchers analyzed images taken by the LANDSAT satellite between 1985 and 2010. The study evaluated burned area and fire severity in seven different ecosystems, ranging from high-elevation subalpine forests to those dominated by western hemlock, ponderosa pine and Douglas fir. Since high-severity fire kills trees outright, the scientists were able to link fire-related tree mortality to changes in images from year to year.

They published their findings in the journal *Ecosphere*.

"Large fires can have significant social and economic costs, but they are also playing an important role in the ecology of our forests," said Matthew Reilly, lead author and a post-doctoral researcher in the College of Forestry at Oregon State University.

"From a regional biodiversity perspective, they are enhancing diversity by creating early seral habitats (the first stage of forest development dominated by grasses, forbs and shrubs). These provide important habitats for species that depend on open conditions and fire-killed trees (or snags). Such habitats are very rare and dispersed across the region but are concentrated in hotspots of high-severity fire like southwest Oregon, Santiam Pass in central Oregon, the North Cascades in Washington and more recently the Blue Mountains, following the Canyon Creek Complex fire near John Day."

About 98 percent of forest fires are put out before they have a chance to grow, said Reilly.

"Our study is really about the other 2 percent that tend to burn during the hottest, driest, windiest conditions," he said. "Suppression tends to be more effective when it's cool and wet."

More high-severity fires occur in hotter, drier years, the scientists said. But in dry areas east of the Cascades, fires burn a smaller portion of the landscape than they did before 1900. Consequently, forests are becoming denser as vegetation accumulates, creating what scientists call a "fire deficit."

"In the ponderosa pine forests in eastern Oregon, we estimated it would take about 380 years at the current rate for fire to cover the whole region," said Reilly. "But historically, we know that those forests were subject to fire every 12 to 28 years."

The scientists' results are consistent with other studies that document a fire deficit in the forests of the western United States, but this is the first study to document how recent fires vary in different ecosystems across the Pacific Northwest.

"There's no one out there who thinks that fire will play the historical role that it used to. We just can't really have that," Reilly said. "But we need to figure out how to let the low- to moderate-severity fires burn in forests where fire was frequent historically. There is growing consensus among scientists that use of managed wildfire may be one way to do this, especially in cool, wet years."

More information: Matthew J. Reilly et al. Contemporary patterns of fire extent and severity in forests of the Pacific Northwest, USA (1985-2010), *Ecosphere* (2017). DOI: 10.1002/ecs2.1695

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