# Western Cascades landscapes in Oregon historically burned more often than previously thought

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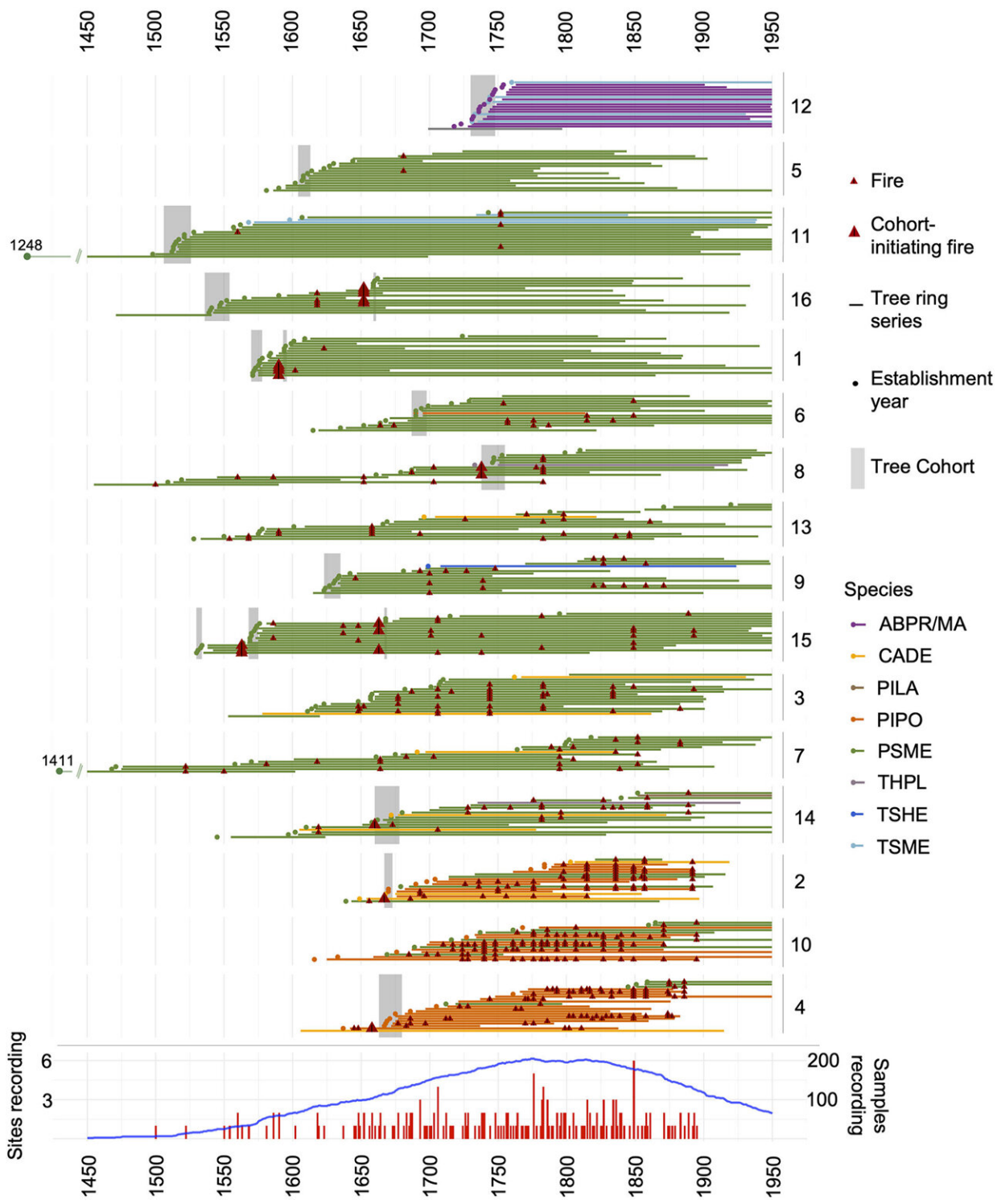


Fire history from 1450 to 1950 ce at 16 data collection sites across the upper Middle Fork study area. Upper panels show individual tree ring series (horizontal lines), tree establishment dates (small points), crossdated fire years (small

triangles), crossdated fire years that initiated cohorts (large triangles), and establishment dates that constitute distinct tree cohorts (shaded polygons) for each site. Sites are ordered from the fewest to the most fires reconstructed. Tree ring series and establishment dates are color coded by species (ABPR/MA, Abies procera/magnifica; CADE, Calocedrus decurrens; PILA, Pinus lambertiana; PIPO, Pinus ponderosa; PSME, Pseudotsuga menziesii; THPL, Thuja plicata; TSHE, Tsuga heterophylla; and TSME, Tsuga mertensiana). Two establishment dates that preceded 1450 ce are shown on the far left of the upper panels. Bottom panel shows the number of sites recording fire in each year as red bars (minimum of zero and maximum of six sites recording fire between 1450 and 1950) and the total samples capable of recording fire in a given year as a blue line (minimum of 2 and maximum of 216 samples capable of recording fire between 1450 and 1950). Credit: *Ecosphere* (2023). DOI: 10.1002/ecs2.4735

Forests on the west slope of Oregon's Cascade Range experienced fire much more often between 1500 and 1895 than had been previously thought, according to new research by scientists at Oregon State University.

The findings provide important insight, the authors say, into how landscapes might adapt to climate change and future fire regimes.

James Johnston of the OSU College of Forestry led the study, which was published in *Ecosphere*.

"Wildland fire is a fundamental forest ecosystem process," he said. "With temperatures rising and more and more area burning, we need to know as much as we can about the long-term variability in fire."

Johnson and collaborators at Oregon State, the University of Oregon and the U.S. Forest Service gathered tree ring data at 16 sites in the southern part of the Willamette National Forest, in the general vicinity of

Oakridge.

Trees form scars after cambial cells are killed by wildfire heat, he said. These scars are partially or completely covered by new tissue as a tree grows, and tree rings tell the story of when the fire exposure occurred.

Using chain saws, the scientists collected samples from 311 dead trees—logs, short snags and stumps. Seventy-three percent of the samples were coastal Douglas-fir, and 13% were ponderosa pine. The remainder were sugar pine, noble fir, red fir, incense cedar, western red cedar, mountain hemlock and western hemlock.

"We cross-dated a total of 147,588 tree rings and identified 672 cambial injuries, 479 of which were fire scars," Johnston said. "The scars allowed us to reconstruct 130 different fire years that occurred at one or more of the 16 sites before a federal policy of fire suppression went into effect early in the 20th century."

The main takeaways:

- Fire was historically far more frequent in western Oregon Cascades landscapes than previously believed.
- Indigenous peoples likely used fire to manage large areas for resources and probably altered landscapes and fire regimes in significant ways.
- There are important present-day restoration opportunities for fire-adapted systems in western Oregon.

"Also, our study produced little evidence of the kind of large, wind-driven fires that in 2020 burned 50,000 to 75,000 hectares in the watersheds immediately to the north and south of our study area," Johnston said. "Only 39% of fire years were recorded at more than one site, only 11% were recorded at more than two sites, and only 3% at

more than three sites—in a study area of 37,000 acres, that strongly suggests that most historical fires were relatively small."

Across all 16 sites, the average fire return interval—the length of time between fires—was as short as six years and as long as 165. In general the differences in those averages were strongly associated with vapor pressure deficit or VPD, basically the drying power of the atmosphere. The higher the VPD, the shorter the time between fires.

However, historical fire in stands seral to Douglas-fir—stands that, if left alone, would end up with Douglas-fir as the dominant tree species—was much less strongly linked with dry air.

"We interpret the extraordinary tempo of fire in those stands, and the climate pattern associated with fire there, to indicate Indigenous fire stewardship," Johnston said. "We saw some of the most frequent fire return intervals ever documented in the Pacific Northwest, but the enormous volume of biomass that these moist forests accumulate over time is often partly attributed to long intervals between wildfire."

The authors note that humans have occupied the southern part of what is now the Willamette National Forest for at least 10,000 years. A variety of Indigenous cultures, including the Molalla, Kalapuya, Tenino, Wasco, Klamath, Northern Paiute and Cayuse, probably used the area for trading, hunting and the collection of plants.

"Removals happened very quickly, with most Native people taken to the Grand Ronde, Warm Springs and Klamath reservations," said co-author David Lewis, a member of the Grand Ronde Tribe and an assistant professor of anthropology and Indigenous studies in OSU's College of Liberal Arts. "Removal of the tribes took their cultural stewardship practices, their use of annual cultural fires, from the land, radically altering how the forests were managed."

By 1856, most remaining members of Willamette Valley and western Oregon Cascades tribes had been forcibly removed to reservations. Extensive clearcut logging on the Willamette National Forest started in the late 1940s and continued for four decades.

"Now, Forest Service managers want fine-grained information about forest vegetation and historical disturbance dynamics to manage lands in ways that promote resilience to climate change," Johnston said.

**More information:** James D. Johnston et al, Exceptional variability in historical fire regimes across a western Cascades landscape, Oregon, USA, *Ecosphere* (2023). DOI: 10.1002/ecs2.4735

Provided by Oregon State University