

## Climate change causing demise of lodgepole pine in western North America

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A massive epidemic of bark beetle infestation on these stands of lodgepole pine in British Columbia reflect the impact that changing climate is having on the ability of this tree species to survive, a new study suggests. (Photo courtesy of Richard Waring, Oregon State University)

Lodgepole pine, a hardy tree species that can thrive in cold temperatures and plays a key role in many western ecosystems, is already shrinking in range as a result of climate change – and may almost disappear from most of the Pacific Northwest by 2080, a new study concludes.

Including Canada, where it is actually projected to increase in some places, lodgepole pine is expected to be able to survive in only 17 percent of its current range in the western parts of North America.

The research, just published in the journal Climatic Change, was done by



scientists from the College of Forestry at Oregon State University and the Department of Forest Resource Management at the University of British Columbia. It was based on an analysis of 12,600 sites across a broad geographic range.

Lodgepole pine <u>ecosystems</u> occupy large areas following major fires where extreme <u>cold temperatures</u>, poor soils and heavy, branch-breaking snows make it difficult for other <u>tree species</u> to compete. This includes large parts of higher elevation sites in Oregon, Washington, the Rocky Mountains and western Canada. Yellowstone National Park is dominated by this tree species.

However, warming temperatures, less winter precipitation, earlier loss of snowpack and more summer drought already appear to be affecting the range of lodgepole pine, at the same time increasing the infestations of bark beetles that attack this tree species.

The researchers concluded that some of these forces have been at work since at least 1980, and by around 2020 will have decreased the Pacific Northwest range of lodgepole pine by 8 percent. After that, continued climatic changes are expected to accelerate the species' demise. By 2080, it is projected to be almost absent from Oregon, Washington and Idaho, some of the areas facing the most dramatic changes.

"For skeptics of <u>climate change</u>, it's worth noting that the increase in vulnerability of lodgepole pine we've seen in recent decades is made from comparisons with real climatic data, and is backed up with satelliteobservations showing major changes on the ground," said Richard Waring, an OSU distinguished professor emeritus of forest science.

"This is already happening in some places," Waring said. "Bark beetles in lodgepole pine used to be more selective, leaving the younger and healthier trees alone.



"Now their populations and pheromone levels are getting so high they can more easily reach epidemic levels and kill almost all adult trees," he said. "Less frost, combined with less snow favors heavier levels of bark beetle infestation. We're already seeing more insect attack, and we project that it will get worse."

Some species are adapted to lower elevations, experts say, but lodgepole pine is predominately a sub-alpine tree species. Its new foliage can handle frost down to temperatures below freezing, it easily sheds snow that might break the branches of tree species more common at lower elevations, and it can survive in marginal soils.

But it makes these adaptations by growing more slowly, and as the subalpine environment becomes less harsh, lodgepole pine may increasingly be displaced by other species such as Douglas-fir, grand fir and ponderosa pine, which are also more drought-tolerant.

As lodgepole pine continues to decline, one of the few places on the map where it's still projected to survive by 2080 is Yellowstone National Park – a harsh, high-elevation location – and a few other sub-alpine locations.

The species historically has played important ecological and cultural roles. It provided long, straight and lightweight poles often sought for tepees by Native American tribes, was later harvested commercially for poles and fence materials, and offers cover and habitat for big game animals.

Provided by Oregon State University

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