

Climate change causing massive movement of tree species across the West

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A huge "migration" of trees has begun across much of the West due to global warming, insect attack, diseases and fire, and many tree species are projected to decline or die out in regions where they have been present for centuries, while others move in and replace them.

In an enormous display of survival of the fittest, the forests of the future are taking a new shape.

In a new report, scientists outline the impact that a [changing climate](#) will have on which tree species can survive, and where. The study suggests that many species that were once able to survive and thrive are losing their competitive footholds, and opportunistic newcomers will eventually push them out.

In some cases, once-common species such as lodgepole pine will be replaced by other trees, perhaps a range expansion of ponderosa pine or Douglas-fir. Other areas may shift completely out of forest into grass savannah or sagebrush desert. In [central California](#), researchers concluded that more than half of the species now present would not be expected to persist in the [climate conditions](#) of the future.

"Some of these changes are already happening, pretty fast and in some huge areas," said Richard Waring, professor emeritus at Oregon State University and lead author of the study. "In some cases the mechanism of change is fire or [insect attack](#), in others it's simply drought.

"We can't predict exactly which tree (species) will die or which one will take its place, but we can see the long-term trends and [probabilities](#)," Waring said. "The forests of our future are going to look quite different."

Waring said tree species that are native to a local area or region are there because they can most effectively compete with other species given the specific conditions of temperature, precipitation, drought, cold-tolerance and many other factors that favor one species over another in that location.

As those [climatic conditions](#) change, species that have been established for centuries or [millennia](#) will lose their competitive edge, Waring said, and slowly but surely decline or disappear.

This survey, done with remote sensing of large areas over a four-year period, compared 15 coniferous tree species that are found widely across much of the West in Canada and the United States. The research explored impacts on 34 different "eco-regions" ranging from the Columbia Plateau to the Sierra Nevada, Snake River Plain and Yukon Highlands.

It projected which tree species would be at highest risk of disturbance in a future that's generally expected to be 5-9 degrees Fahrenheit warmer by 2080, with perhaps somewhat more precipitation in the winter and spring, and less during the summer.

Among the findings:

- Some of the greatest shifts in tree species are expected to occur in both the northern and southern extremes of this area, such as British Columbia, Alberta, and California.

- Large declines are expected in lodgepole pine and Engelmann spruce, and more temperate species such as Douglas-fir and western hemlock may expand their ranges.
- Many wilderness areas are among those at risk of the greatest changes, and will probably be the first to experience major shifts in tree species.
- Some of the mild, wetter areas of western Oregon and Washington will face less overall species change than areas of the West with a harsher climate.
- More than half of the evergreen species are experiencing a significant decrease in their competitiveness in six eco-regions.
- Conditions have become more favorable for outbreaks of diseases and insects.
- Warming will encourage growth at higher elevations and latitudes, and increased drought at the other extremes. Fire frequency will continue to increase across the West, and any [tree species](#) lacking drought resistance will face special challenges.

"Ecosystems are always changing at the landscape level, but normally the rate of change is too slow for humans to notice," said Steven Running, the University of Montana Regents Professor and a co-author of the study. "Now the rate of change is fast enough we can see it."

Even though the rate of change has increased, these processes will take time, the scientists said. A greater stability of forest composition will not be attained anytime soon, perhaps for centuries.

"There's not a lot we can do to really control these changes," Waring said. "For instance, to keep old trees alive during drought or insect attacks that they are no longer able to deal with, you might have to thin the forest and remove up to half the trees. These are very powerful forces at work."

One of the best approaches to plan for an uncertain future, the researchers said, is to maintain "connective corridors" as much as possible so that trees can naturally migrate to new areas in a changing future and not be stopped by artificial boundaries.

Provided by Oregon State University

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