Fire Changing Forests Forever
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GRANTS PASS, Ore. -- High in the rugged Klamath Mountains, an old-growth stand of Brewer spruce, left over from the last mini-Ice Age, was killed when the Biscuit fire burned across 500,000 acres of southwestern Oregon forest two summers ago. Dominick DellaSala does not expect this stand of Brewer spruce to grow back. The reason: The climate is now warmer and drier than it was 275 years ago when the trees got their start. And fire, the great catalyst for change in the West's forests, has opened the way for something else to move in that better fits the new climate. "Brewer spruce is an indicator species of the climate change in this region," said DellaSala, a forest ecologist and director of the World Wildlife Fund's Klamath Siskiyou Program. "It's adapted to cool places and infrequent fires. You get away from fog and cool temperatures and it disappears."

Across the West, forests are showing signs of a changing climate: bigger and hotter wildfires, hardwoods and brush moving into conifer forests after they burn, more insect infestations, and trees moving into high-altitude meadows once too cold to support them. Just how much of that might be due to human-caused global warming is difficult for scientists to sort out, said Nate Mantua, an atmospheric scientist with the Climate Impacts Group at the University of Washington in Seattle. "If this were a court trial, a good lawyer could get you off," Mantua said. "But there are all kinds of circumstantial evidence that point in the direction that, as we accumulate greenhouse gases in the atmosphere, these kinds of things become more frequent and more widespread." Greenhouse effects aside, the West's climate goes through ups and downs of temperature and precipitation linked to El Nino, atmospheric changes in the South Pacific that change every two to seven years, and the Pacific Decadal Oscillation, atmospheric changes over the North Pacific that change every 20 or so years, according to a Climate Impacts Group report.

Ronald P. Neilson, a bioclimatologist at the U.S. Forest Service's Pacific Northwest Research Station in Corvallis, heads a team using climate models combined with vegetation maps to predict future wildfires. The team's examination of fire seasons over the past century shows that the size and number of fires goes up and down much more closely with climate variability -- temperatures and precipitation -- than with how intensely people fight forest fires. "This is really saying that climate's in the driver's seat," Neilson said. The vegetation components of the models foresee forests moving north in latitude and treelines moving higher on mountains.

Junipers expand into sagebrush in eastern Oregon and the Great Basin. Deserts in New Mexico, Arizona and southeastern California turn into grasslands. Conifer forests of the Northwest, particularly the southern fringes, see more oaks and other broadleaf trees. Already, foresters are seeing brush and hardwoods growing back where vast fires in southwestern Oregon in 1987 killed Douglas fir and pine, and subalpine fir moving into high-altitude meadows of grass and wildflowers on mountains on Washington's Olympic

Peninsula.

Looking backward, the model picked out the Idaho fires of 1910, the Tillamook burns in Oregon in the 1930s, the Yellowstone fires of 1988, and the Biscuit fire in 2002. redictions of the near-term future are getting more accurate. The team hopes to be able to suggest key places to thin forests to reduce fire intensity. Neilson and others have a hypothesis of how forests react to a warming world that they call early green-up and later brown-down. With a little bit of warming, much of the United States gets wetter, allowing forests to expand into steppe and grassland now too dry for trees. Increased carbon dioxide in the atmosphere acts like fertilizer, allowing trees to use water more efficiently and grow faster. "The hotter it gets, the more plants demand water. That increased demand from trees overtakes the benefits that produced the greening. Then you can get a situation where trees that were initially growing more rapidly could quite suddenly flip around and start declining from drought stress induced by elevated temperatures."

The catalyst for changing forests is fire, said Don McKenzie, a research ecologist with the U.S. Forest Service in Seattle and the Climate Impacts Group. "The lag time ... when there is no fire can be as much as 500 to 600 years," he said. "The big old trees we have now, if it gets a little warmer, they will not drop dead. Much more sensitive are the seedlings, trying to germinate. "Insects could be just as important as fire as an agent of change related to climate," he added. Beetles killing white spruce on Alaska's Kenai Peninsula appear to be due to milder winters that don't kill as many beetles and longer summers that allow them to breed twice instead of once, he said. The result is the same as a fire, forcing seedlings to start anew in climates that may no longer be hospitable. "It's much harder to establish and grow than it is to maintain," he said.

For clues to the forests of the future, University of Oregon geography professor Cathy Whitlock looks back thousands of years by examining sediment cores drilled from lake bottoms. Grains of pollen tell her what trees were growing and pieces of charcoal indicate fire intensity. "One thing we know is that around 9,000 to 6,000 years ago it was warmer and drier than it is today in the Northwest," said Whitlock from her office in Eugene. "That gave rise to more fires in drier vegetation. If you are going to look for a modern counterpart, that would be the time to go back to." Whitlock thinks the surge in wildfires since the late 1980s -- peaking at 8.4 million acres in 2000 -- is more related to global warming than fuel buildups from fighting forest fires the past 100 years. "On a longtime scale we are really moving into a cooler wetter period with more wet forests and fewer fires," she said. "It's only with global warming that we are moving out of that natural trend," into hotter summers and drought across the West. "There are a lot of reasons to explain that besides global warming. But it's definitely curious we have only just started having large stand-replacement fires. "The future projections are so extreme that it's going to definitely cause a lot of impact on people in the way they make their livelihoods," Whitlock added.