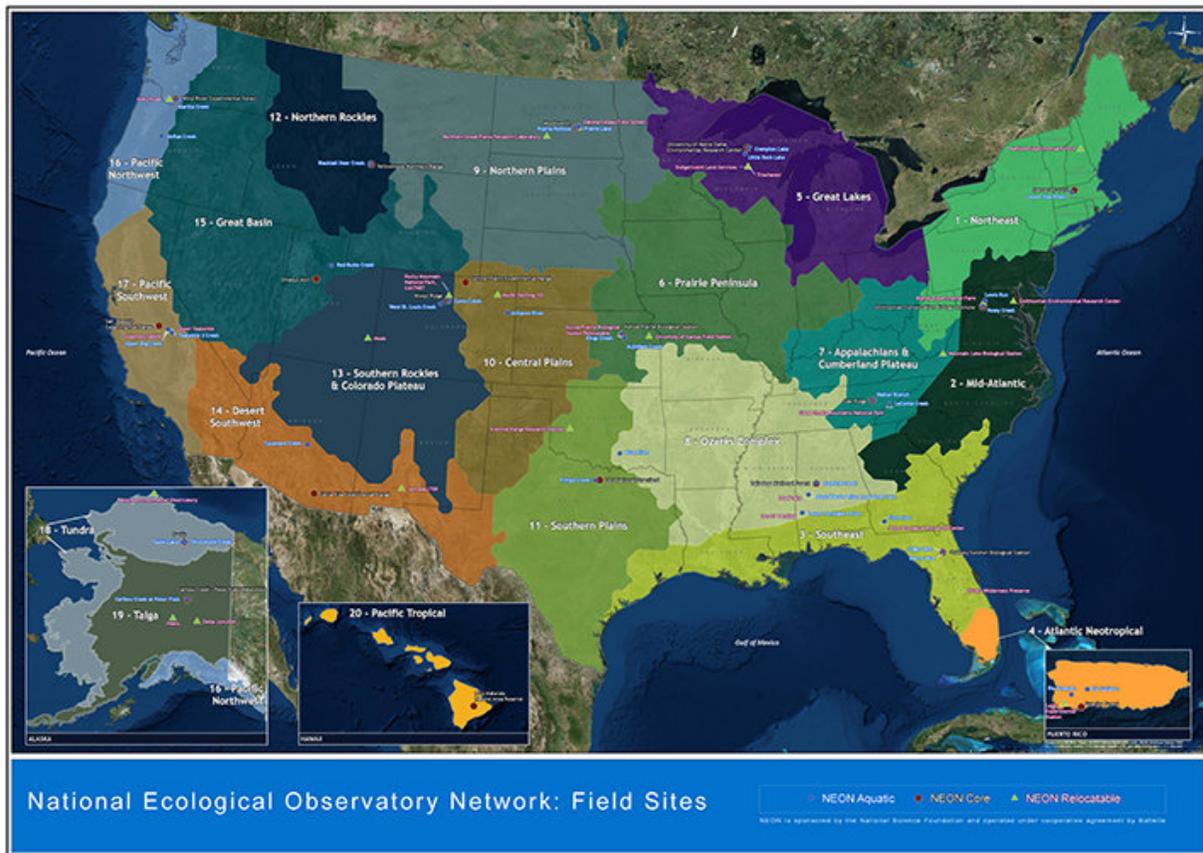


Forest loss in one part of US can harm trees on the opposite coast

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The study divided the mainland US into the 18 ecological regions shown in this map. The strongest response seen in models was for tree loss in the Pacific Southwest (PS) region, shown in light brown, which covers most of California. Credit: National Ecological Observatory Network

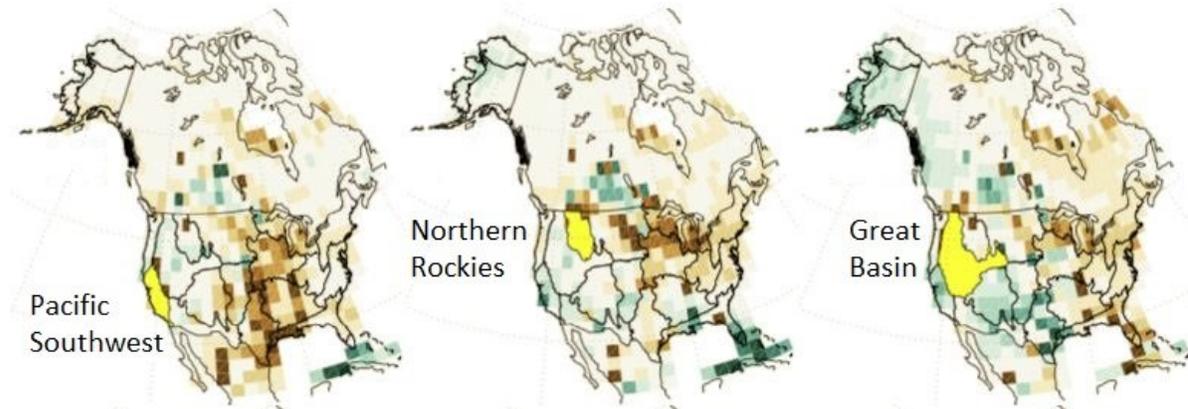
Large swaths of U.S. forests are vulnerable to drought, forest fires and disease. Many local impacts of forest loss are well known: drier soils, stronger winds, increased erosion, loss of shade and habitat. But if a whole forest disappears, new research shows, this has ricocheting effects in the atmosphere that can affect vegetation on the other side of the country.

A University of Washington-led study published May 16 in *Environmental Research Letters* shows that forest die-offs in specific regions of the United States can influence [plant growth](#) in other parts of the country. The largest impacts seen were from losing forest cover in California, a region that is currently experiencing dramatic tree mortality.

"These smaller areas of forest can have continental-scale impacts, and we really need to be considering this when we're thinking about ecological changes," said first author Abigail Swann, a UW assistant professor of atmospheric sciences and of biology. Such far-off effects are accepted in the atmospheric sciences community, Swann said, but the idea is only beginning to be accepted by ecologists.

A 2016 study from the same UW group looked at what removing trees from larger areas, like western North America or the entire Amazon rainforest, would mean for worldwide plant growth. This study took the same approach on a regional scale.

The project divided the mainland U.S. into the 18 regions used in the National Ecological Observatory Network. Researchers then ran a climate model to look at what removing the existing [forest cover](#) from the 13 most-heavily-treed regions would mean for growing conditions across the country.



Removing forests (marked yellow) in the Pacific Southwest, Northern Rockies and Great Basin regions significantly affected plant growth elsewhere in the country. Green shows areas with increased plant growth in computer models, while brown shows places with reduced plant growth. Credit: Abigail Swann/University of Washington

Of all the regions, the Pacific Southwest region, which covers most of California, has the smallest total area of tree cover. But removing those trees had the biggest influence on growing conditions nationally, by reducing vegetation in the Eastern U.S.

The precise mechanisms would require further study, Swann said, but in this case it seemed to make Eastern summers slightly warmer, which was harmful to plant growth.

"Forest loss is disrupting or changing the flow patterns in the atmosphere that is leading to a slightly different summertime climate in the eastern part of the country," Swann said. "It's very analogous to El Niño or 'the blob,' something that's occurring that causes the atmosphere to move around, which causes these warmer or cooler conditions, or wetter and drier conditions, somewhere else."

Compared to an El Niño cycle, Swann said, "the changes we made here were smaller and over land, but it's very analogous."

The results also showed other Western regions, such as the Northern Rockies and the Great Basin [region](#), as having negative effects on plant growth in the eastern half of the country. These regions are currently losing tree cover: California forests have lost more than 130 million trees since 2010, largely due to the combined effects of drought, warm temperatures, insects and disease.



This August 2016 aerial photo of the Sierra Nevada Mountains in central California shows widespread tree loss. The new study shows changes here can affect plant growth across the country. Credit: US Forest Service

"In some case [trees](#) may be killed by drought, but in many cases they're being weakened by the drought and then being finished off by the beetles or other stresses," Swann said.

The study suggests that current [forest](#) loss in Western regions is big enough to trigger changes in plant growth, though it might not be possible to detect these small changes over large areas of the country.

"There's some pretty extensive, widespread [forest loss](#) going on," Swann said. "The changes we made in the model are bigger, but they're starting to converge with things that we're actually seeing.

"These results show that we need to start thinking about how altering vegetation in one place can affect [plants](#) elsewhere, especially in the context of climate change."

More information: *Environmental Research Letters* (2018). [DOI: 10.1088/1748-9326/aaba0f](#)

Provided by University of Washington

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