Trees in Eastern U.S. Head West as Climate Changes

Breaking from the general poleward movement of many species, flowering trees take an unexpected turn

By Emma Marris, Nature on May 18, 2017

The westward movement of some tree types in the eastern United States puts plant responses to climate change in a new perspective. *Credit: Joshua Mayer Flickr (CC BY-SA 2.0)*

Ecologists have long predicted that climate change will send plants and animals uphill and towards the poles in search of familiar temperatures. Such movements have increasingly been

documented around the world. But a study now shows that changing rainfall patterns may be driving some tree species in the eastern United States west, not north.

Songlin Fei, a forest ecologist at Purdue University in West Lafayette, Indiana, and his colleagues tracked the shifting distributions of 86 types of trees using data collected by the US Forest Service's Forest Inventory and Analysis Program during two periods: from 1980 to 1995 and between 2013 and 2015 for all states. They found more species heading west than north, probably partly because of changing precipitation patterns, the team reported on May 17 in *Science Advances*[1]. "That was a huge surprise for us," says Fei.

This study suggests that, in the near-term, trees are responding to changes in water availability more than to temperature changes, he says.

The team measured shifts in the centres of abundance for the 86 types of tree and found that over the past 30 years or so, 34% showed statistically significant poleward shifts at an average rate of 11 kilometers per decade. Forty-seven per cent made statistically significant westward shifts at an even faster rate — 15.4 kilometers per decade. Hardly any types of tree moved south or east.

A NEW DIRECTION

Most of the trees that shifted west were angiosperms, or flowering trees. Northbound trees were usually gymnosperms, which are mostly conifers in North America.

Increased precipitation in the central United States could be

one explanation for the angiosperms' westward movement, says Fei. The increase in moisture is still subtle enough that only the more drought-tolerant and faster-growing flowering trees, which have more-efficient and robust vascular systems, can take advantage for now.

Teasing out the explanations for these shifts is complicated by the fact that forests in the eastern United States are complex and inhabited by people. Many researchers say that this forest is still in the process of growing back after large-scale clearing before the 1920s[2]. The changing distribution of tree types could also be in part owing to the natural succession of species through an area, combined with human management such as the suppression of fires, experts say.

UNCERTAIN FUTURE

Tree physiologist Leander Love-Anderegg at the University of Washington in Seattle says that the study did well to acknowledge these potentially confounding variables. "They point out that in the eastern US it is a really tricky question to pull out climate-related changes in forests, from forests getting older and the effects of fire suppression," he says.

Whether the mechanisms are perfectly understood or not, knowing movement trends helps forest managers, Love-Anderegg says. "We live in an era of very rapid ecological change. In order to avoid some of the more drastic and negative consequences of that change — like massive forest fires and massive beetle outbreaks — we all have an interest in trying to predict change before it occurs."

What is certain is that the forests of today will look different 10, 20 or 30 years from now. “If you think of these species as members of a family, the question is, will some families break apart, or will they travel together?” says Fei. “We might be talking about these families breaking apart.”