Climate Change The long view of forests, for the trees

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Highlight: WSUV scientists Nikolay Strigul, left, and Jean Liénard are part of the team that created a mathematical model to better understand how different forest types will be affected by ***climate change***.

Body

Pacific Northwest gardeners might consider planting banana and avocado trees in the not-too-distant future, according to new research coming out of Washington State University Vancouver.

Created by WSUV scientists Jean Liénard, Nikolay Strigul and John Harrison, the Tolerance Distribution Model is a new mathematical model that examines the drought, shade and flood tolerances of different forest types to see how they will respond to future ***climate change***.

"I was surprised by how much of the forests of the (United States) forestland is going to be pushed beyond its current tolerance envelope for ***climate*** stress," Harrison said. "The other was the distribution of where that's going to happen. There are areas likely to be a ***climate*** that we just don't see currently."

The new method stands in contrast to existing models because it can be applied to a continental scale while still including such ecological stressors as drought and temperature ***changes***.

Like animals, plants evolved to tolerate a certain range of ***climate*** conditions in a given area. The model shows that if Earth's temperatures continue to rise as predicted, ***climate*** patterns in the United States will shift to be more like those seen in the more tropical and arid parts of the world.
The model predicted that after 2050, Washington's Cascade mountains may be warmer and wetter, reminiscent of places like southeastern China, southern Brazil or sub-Saharan Africa - shifting from a temperate rainforest to a subtropical.
"Because we don't have an analogue currently in the U.S. for this type of forest, we cannot fully know what we can expect that drought tolerance should be in the future," Liénard said.
Meanwhile, the mixed conifer and deciduous forests in the northeastern United States will be highly intolerant of the predicted drought conditions in the latter part of this century, the model predicted.
It also showed forests of the Great Plains and the highest elevations of the Rocky Mountains to be at risk from drought. The Gulf Coast, from southern Texas to Florida, could one day host the same type of forests currently found in Cuba.
The lower altitudes of Texas would likely host dry tropical forests like those found in eastern Mexico.
The researchers created the model by collecting data on American tree species' abilities to cope with drought and various levels of flooding and sunlight. They put tolerance rankings to each of the 400,000 forest plots in the U.S. Department of Agriculture's Forestry Inventory and Analysis Program based on the composition of the trees in each plot and their physical traits.

The data were then integrated on the projected ***changes*** in annual U.S. temperatures and perceptions from the Intergovernmental Panel on ***Climate Change*** to see how each plot is likely to fare in a ***changing climate***.

The three said they plan to develop versions of the model that can be applied to agricultural systems and other land and water ecosystems.
"We are working on modeling other continents and have already gained access to European and Asian forest data," Strigul said in a news release. "Our work is really just getting started."
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