

Changes in the climate suitability and growth rates of trees in eastern North America

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April 16, 2024

Abstract

According to the “fitness-suitability” hypothesis, ongoing changes in climate are expected to affect species’ fitness and habitat suitability. In trees, differences in fitness may manifest as changes in growth rates, which alters carbon uptake. Using tree-ring data, we calculated annual growth rates for 15,866 trees representing 37 species from 558 populations throughout eastern North America. We used species distribution models to estimate each population’s climatic suitability from 1900-2010. Growth rates and relative climatic suitabilities were analyzed using linear mixed-effects models. There were no significant relationships between growth rates and climate suitability across space or time. However, growth rates have decreased significantly through time independent of changes in climate suitability, especially in gymnosperms. These results suggest that unidentified factors may slow tree growth and outweigh potential benefits of climate change and increasing [CO₂]. Consequently, we should not count on growth of eastern North American trees to help offset anthropogenic carbon emissions.

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2021-12-09-growth-suitability-NE-Bernal.kjf.DZ.docx available at <https://authorea.com/users/738969/articles/712896-changes-in-the-climate-suitability-and-growth-rates-of-trees-in-eastern-north-america>