Climate change creates complicated consequences for North America's forests

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Dartmouth Professor Matt Ayres studies the southern pine bark beetle, a forest pest that may be the largest source of disturbance in coniferous forests throughout North America. Credit: Eli Burakian

Climate change affects forests across North America – in some cases permitting insect outbreaks, plant diseases, wildfires and other problems—but Dartmouth researchers say warmer temperatures are also making many forests grow faster and some less susceptible to pests, which could boost forest health and acreage, timber harvests, carbon

storage, water recycling and other forest benefits in some areas.

The Dartmouth-led study, which appears in the journal *Ecological Monographs*, reviewed nearly 500 scientific papers dating to the 1950s, making it the most comprehensive review to date of climate change's diverse consequences for forests across the United States, Canada and the rest of North America.

Tree-killing insects and plant diseases are natural elements of healthy forest ecosystems, but climate change is rapidly altering the distribution and magnitude of forest pestilence and altering biodiversity and the ecosystem. For example, pine bark beetles have recently killed trees over more area of U.S. forests than wildfires, including in areas with little previous experience managing aggressive pests. "One of our prominent challenges is to adapt forest management tactics and generalize the underlying theory to cope with unprecedented changes in pest pressure," the authors say.

Results show that over the last 50 years, the average global air temperature has increased about 1° F, while the coldest winter night averages about 7° F warmer. That has permitted population explosions of tree-killing bark beetles in forests that were previously shielded by winter cold and made it easier for invasive species to become established. But tree growth rates in many regions are increasing due to atmospheric change, which may increase resilience to pests. Also, pest populations in some regions may decline, allowing those forests and their environmental and economic benefits to expand.

Provided by Dartmouth College

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