NEWS BULLETIN

Plants and Pollution

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The Effects of Climate Change

CSIR-NATIONAL BOTANICAL RESEARCH INSTITUTE, LUCKNOW

In a warming world, New England's trees are storing more carbon

PHYS.ORG, 04 August 2020

Climate change has increased the productivity of forests, according to a new study that synthesizes hundreds of thousands of carbon observations collected over the last quarter century at the Harvard Forest Long-Term Ecological Research site, one of the most intensively studied forests in the world.

The study, published today in Ecological Monographs, reveals that the rate at which carbon is captured from the atmosphere at Harvard Forest nearly doubled between 1992 and 2015. The scientists attribute much of the increase in storage capacity to the growth of 100-year-old oak trees, still vigorously rebounding from colonial-era land clearing, intensive timber harvest, and the 1938 Hurricane—and bolstered more recently by increasing temperatures and a longer growing season due to climate change. Trees have also been growing faster due to regional increases in precipitation and atmospheric carbon dioxide, while decreases in atmospheric pollutants such as ozone, sulfur, and nitrogen have reduced forest stress.

"It is remarkable that changes in climate and atmospheric chemistry within our own lifetimes have accelerated the rate at which forest are capturing carbon dioxide from the atmosphere," says Adrien Finzi, Professor of Biology at Boston University and a co-lead author of the study.

The volume of data brought together for the analysis—by two dozen scientists from 11 institutions—is unprecedented, as is the consistency of the results. Carbon measurements taken in air, soil, water, and trees are notoriously difficult to reconcile, in part because of the different timescales on which the processes operate. But when viewed together, a nearly complete carbon budget—one of the holy grails of ecology—emerges, documenting the flow of carbon through the forest in a complex, multi-decadal circuit.

"Our data show that the growth of trees is the engine that drives carbon storage in this forest ecosystem," says Audrey Barker Plotkin, Senior Ecologist at Harvard Forest and a co-lead author of the study…….

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Forest growth in drier climates will be impacted by reduced snowpack

Science Daily, 10 August 2020

A new study suggests that future reductions in seasonal snowpack as a result of climate change may negatively influence forest growth in semi-arid climates, but less so in wetter climates.

Researchers from Portland State University, U.S. Geological Survey, U.S. Forest Service and the universities of Vermont and Maine found that forest density and snowpack can influence drought stress and forest growth in ways that are important to recognize for managing forests in a changing climate.

Research sites included pine-dominated experimental forests in northern Arizona, South Dakota, and northern Minnesota.

The study -- led by Kelly Gleason, assistant professor of ecohydrology at PSU -- found that forest growth in water-limited, dryland areas is likely to be most dramatically impacted by snowpack reductions. In these semi-arid climates, reduced snowpack may negatively influence forest growth and may increase tree mortality. This was only exacerbated in high-density forests.

"Forests are a lot more vulnerable because of increasing density," Gleason said. "More trees are sharing the same amount of water, and there's less water over time because of climate change impacts."

She said that in arid climates like much of the western U.S. where water availability is driven by snow, reducing forest density through thinning will improve the resilience of these forests amid a changing climate.

By contrast, the study found that in wetter climates like Minnesota, reduced snowpack as a result of future warmer winters may positively influence forest growth, potentially by extending the growing season. The study found that in these forests, thinning would have less of an impact on the snowpack-growth relationship…….

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Climate change could put tropical plant germination at risk: Study

Mongabay, 12 August 2020

Tropical plants are at greater risk as the climate warms because soil temperatures may become too high for them to germinate, according to an analysis of over 10,000 laboratory studies recorded in the Millennium Seed Bank Partnership Data Warehouse. Researchers found a higher risk of germination failure for species living closer to the equator.

The study, published in the journal Global Ecology and Biogeography, used data from seed germination experiments compiled by the Royal Botanic Gardens Kew to calculate germination tolerance characteristics such as maximum, minimum, and optimum temperature for over 1,300 plant species, spanning every continent except Antarctica. They found that many species — particularly those in the tropics — are already living outside their optima, and likely suffering reduced germination rates.

The researchers combined these results with climate modelling to predict the risk of germination failure by 2070. “Over 20% of plant species in the tropics may face temperatures higher than their maximum germination temperature … [and] over half of tropical species may have reduced rates of germination,” warned study author Alexander Sentinella, a PhD student at the University of New South Wales in Sydney, Australia. By comparison, just 8% of species outside the tropics would exceed their maximum germination temperature in the next 50 years under the model projections.

Species living in high latitudes tend to be nearer their lower temperature limit, meaning that climate change may actually move them closer to their optima. “For species at higher latitudes, increased temperatures may increase rates of germination,” Sentinella explained.

Lauren Buckley, an evolutionary ecologist at the University of Washington who was not involved in the study, described the results as exciting, saying that the study “fills a data gap to show that tropical plants may [like animals] be more at risk with warming.”…… **Read More...**

Global warming makes tropical soils leak carbon dioxide

PHYS.ORG, 12 August 2020

Tropical forest soil warmed in experiments to levels consistent with end-of-century temperature projections released 55 percent more CO2 than control plots, exposing a previously underestimated source of greenhouse gas emissions, researchers reported Wednesday.

Before humanity began loading the atmosphere with carbon pollution by burning fossil fuels, the input and outflow of CO2 into soil—one key element in Earth's complex carbon cycle—remained roughly in balance.

Gases emitted by deadwood and decaying leaves, in other words, were canceled out by microorganisms that feed on such matter.

But climate change has begun to upset that balance, according to a new study, published in Nature.

"Carbon held in tropical soils is more sensitive to warming than previously recognized," lead author Andrew Nottingham, a researcher at the University of Edinburgh's School of Geosciences, told AFP.

"Even a small increase in respiration from tropical forest soils could have a large effect on atmospheric CO2 concentrations, with consequences for global climate."

The quantity of carbon cycling each year through soils worldwide is up to 10 times greater than human-generated greenhouse gas emissions.

Just a one-percent imbalance—with more carbon going out than in—"would equal about ten percent of global anthropogenic (manmade) carbon emissions," noted Eric Davidson, a researcher at the University of Maryland Center for Environmental Science.

Earth's average surface temperature has risen just over one degree Celsius (1C) above preindustrial levels, enough to boost the severity of droughts, heatwaves and ……..… **Read More…**