

Forests and drought recovery: Forecasts of climate models are long way off

Most of the studies related to climate models have predicted a speedy recovery of forests and other vegetation from the impact of drought. However, a recent analysis of drought impact at forest sites across the world indicates a drift in this assumption. It has been found that trees need an average of two to four years to recover and resume their normal growth rate. As forest trees are vital for buffering CO₂ in atmosphere, researchers fear that drought is compromising their role in a changing climate.

Forest trees function as a major carbon sink by removing massive amounts of CO₂ emissions from the atmosphere and incorporating the carbon into woody tissues. In case of extreme drought, it was assumed that forest trees bounce back quickly after the period of drought. But finding from a recent global study has revealed that drought stress affects tree growth for years. This in turn reduces the capability of forests by storing less carbon than climate models have calculated. Prof. Anderegg of Biology Department at the University of Utah who headed the research team says “This really matters because in the future, droughts are expected to increase in frequency and severity due to climate change”. Anderegg performed much of the work on this study while at Princeton University. He has co-authored the study with colleagues at Princeton University and also with researchers from several other Universities and Research Institutions. Their study has been published in the journal *Science* recently.

The researchers used records from the International Tree Ring Data Bank to look at the recovery of tree growth after severe droughts at 1,300 forest sites that have played out since 1948. The rings tell the history of wood growth and also track carbon uptake of the ecosystem in which the tree is found. The data implies that though few forests showed a pronounced growth after the period of drought, trees in a majority of the world's forests struggled for years after a drought had ended. On average, trunk growth took 2 to 4 years to return to normal. Growth was about 9 percent slower than expected during the first year of recovery, and remained 5 percent slower in the second year. Long-lasting effects of drought were most prevalent in dry ecosystems, and among pines and tree species with low hydraulic safety margins.



Forests in south-western United States under drought stress

The underlying mechanisms of how drought causes long-lasting effects are not clear. However, the researchers predict three possible grounds due to which trees find difficult to recover. They are: (i) leaf loss and depletion of carbohydrate reserves during drought may impair growth in

subsequent years, (ii) pests and diseases may accumulate in drought-stressed trees and (iii) lasting damage to vascular tissues could impair water transport.

The correlation between tree growth and challenges caused by drought is further complicated by research that indicates certain regions are experiencing higher temperatures. "The fact that temperatures are going up suggests quite strongly that for instance, the western regions of the U.S. are going to have more frequent and more severe droughts, substantially reducing forests' ability to pull carbon from the atmosphere", Anderegg says. The impact of delayed recovery from drought on carbon storage is not trivial. Over a century, carbon storage capacity in semi-arid ecosystems alone would drop by about 1.6 metric gigatons -- an amount equal to about one-fourth of the entire U.S. emissions in a year.

Anderegg concluded that "In most of our current models of ecosystems and climate, drought effects on forests switch on and off like a light. When drought conditions go away, the models assume a forest's recovery is complete and close to immediate. But that is not how the real world works." Hence undoubtedly there is a concern that the fate of forests around the world and in particular in the West is quite uncertain.

Source:

<http://www.sciencedaily.com/releases/2015/07/150730162007.htm>

<http://www.deseretnews.com/article/865633513/Study-Drought-impacts-forests-more-than-previously-thought.html?pg=all>