

Future grim for 'biggest and most magnificent' trees

December 7 2012

Across the world, big old trees face a dire future globally from agriculture, logging, habitat fragmentation, exotic invaders, and the effects of climate change, warn leading scientists in an article published this week in *Science* magazine.

Professor William Laurance, an ecologist at James Cook University in Cairns, Australia, reveals a dramatic decline among the world's "biggest and most magnificent" [trees](#) and details the range of threats they face.

"Their demise will have substantial impacts on biodiversity and [forest ecology](#), while worsening climate change," he said.

"To persist, big trees need a safe place to live and long periods of stability but time and stability are becoming very rare commodities in our modern world."

Giant trees offer critical shelter and food for innumerable species of mammals, birds and insects, while emitting massive amounts of water through their leaves, contributing to local rainfall.

Old trees also lock up large amounts of carbon and thereby help to slow global warming.

But their ability to store carbon and provide other vital services is threatened by human activities, according to Professor Laurance and his coauthors Professor David Lindenmayer at ANU in Canberra, Australia

and Professor Jerry Franklin at the University of Washington in Seattle, USA.

Some of the world's largest trees are particularly targeted by loggers. The oldest trees are among the most valuable and therefore the first to be cut in "virgin" forest areas.

Big trees are also sensitive to [habitat fragmentation](#), which exposes them to stronger winds and drier conditions.

Professor Laurance's research in the [Amazon rainforest](#) has shown substantial die-off of canopy giants in small forest fragments. Their susceptibility seems counter-intuitive given big trees' life histories, which invariably include periods of drought and other stress.

"All around the tropics, big trees are succumbing to strong droughts," Professor Laurance said. "That's been a surprise to me and many other ecologists, because big, ancient trees would have had to survive many droughts in the past."

He said that forest giants may suffer disproportionately from climate change.

"According to one popular theory, trees get a double-whammy when the thermometer rises.

"During the day, their photosynthesis shuts down when it gets too warm, and at night they use more energy because their metabolic rate increases, much as a reptile's would do when it gets warmer."

With less energy being produced in warmer years and more being consumed just to survive, there is less energy available for growth.

"This hypothesis, if correct, means tropical forests could shrink over time," Professor Laurance said.

"The largest, oldest trees would progressively die off and tend not to be replaced. Alarmingly, this might trigger a positive feedback that could destabilize the climate: as older trees die, forests would release some of their stored carbon into the atmosphere, prompting a vicious circle of further warming, forest shrinkage and carbon emissions."

Professor Laurance noted that [climate change](#) was having less direct impacts on forests, including creating conditions for exotic pathogens to thrive. For example, pathogens such as Dutch Elm Disease, introduced by trade or happenstance, have devastated trees in many parts of the world.

All told, the outlook for big trees is not good, Professor Laurance and his coauthors said.

"The decline of [big trees](#) foretells a different world where ancient behemoths are replaced by short-lived pioneers and generalists that can grow anywhere, where forests store less carbon and sustain fewer dependent animals," Professor Laurance said.

"It's a place where giant cathedral-like crowns could become a thing of the past."

More information: Lindenmayer, David B., William F. Laurance, and Jerry F. Franklin. 2012. Global decline in large old trees. *Science* 338:1305-1306.

Provided by James Cook University

Citation: Future grim for 'biggest and most magnificent' trees (2012, December 7) retrieved 19 April 2024 from <https://phys.org/news/2012-12-future-grim-biggest-magnificent-trees.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.