THE CONVERSATION

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The end of big trees?

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When I was a small lad there was a stately old tree in our backyard. My little sister and I practically lived in it — it was our lair, our fortress, our stairway to the sky.

Trees need stability and protection to get big, and both of those are in short supply. William Laurance

Decades later, I sometimes recalled that regal giant as I studied rainforest trees in the Amazon. There, towering trees were dying en masse. Often the causes were obvious – growling bulldozers and chainsaws — but sometimes the reasons were mystifying.

In isolated fragments of rainforest, for instance, many trees simply dropped their leaves and died standing. Countless other trees died during droughts. Most puzzling, we discovered, was that the biggest rainforest trees were most vulnerable of all.

Why would big trees be so susceptible? In the Amazon, as elsewhere, large trees are often centuries or even millennia old. One would imagine such behemoths had survived many climatic vicissitudes over their vast lifetimes. But in an increasingly varying world, their great stature is evidently a curse. They struggle to get water up to their foliage without suffering dangerous embolisms in their vascular systems. For this reason droughts or the drier conditions prevailing in rainforest fragments can be fatal.

Big trees seem to be declining almost everywhere. Loggers have targeted big trees for centuries and vast forests have been razed worldwide for farmlands and urban sprawl, but a range of new and insidious threats are appearing too.

In India, exotic weeds like lantana are becoming so dense in the understory of many forests that trees simply can't regenerate.

Equally alarming is gamba grass, which is plaguing the savanna-woodlands of northern Australia. This giant African grass burns so fiercely that nearly every tree is killed. It's become so bad that Australian ecologist David Bowman recently suggested — only half in jest — that we should import African elephants to help control it.

Exotic diseases and pests are also a growing threat. Dutch elm disease is killing off millions of stately trees that once graced forests and cities. In North America, increasingly mild winters

Giant redwood tree from northern California. Rhett Butler

are favouring outbreaks of bark beetles, which can kill entire stands of trees. In rainforests, lianas — woody vines that parasitise trees and reduce their growth and survival — are increasing, possibly because their growth is being boosted by rising levels of carbon dioxide in the atmosphere.

A year ago, the realisation that big trees were declining virtually everywhere prompted me to pen an article in New Scientist that initially highlighted the growing scale of the problem. The story was covered by scores of newspapers and websites internationally, including The Guardian and Le Monde.

But the scary news about big trees has gone positively viral following an article last week in Science. In that article, I teamed up with two of the world's top ecologists to critically evaluate the vulnerability of big old trees globally.

Giraffes sheltering beneath a big umbrella tree in Tanzania. William Laurance

One of my coauthors, David Lindenmayer of Australian National University, is renowned for his studies of mountain ash trees — the world's tallest flowering plants — which have been decimated in southern Australia by logging and wildfires. Natural hollows in mountain ash trees provide crucial shelter for over 40 species of wildlife, but such hollows only begin forming when the trees are at least 120 years old. Few of the trees get to live that long.

My other coauthor, Jerry Franklin of the University of Washington in Seattle, USA, is famed for his research in western North America, where logging has wiped out most old-growth conifer forests. These ancient forests harbour numerous rare species, including the endangered spotted owl.

Our analyses highlight the special challenges faced by big old trees. In the broadest terms, they need a safe place to live and reproduce and long periods of relative stability. But time and stability are becoming very rare commodities in our modern world, where massive land-use changes, invaders, pathogens and climate alterations are rife. If big trees are to persist, we need special strategies to conserve them — for instance, by protecting the key refugia where big trees still persist, safe from logging and other threats.

In many ways, big trees are a barometer of the health of our planet. Their decline foretells a world where ancient behemoths are replaced by weedy, short-lived trees that can grow anywhere, where forests store less carbon and sustain fewer dependent animals.

I fear it might also be a world where kids don't have stately old trees to climb and play in — or just to stare in awe at a giant cathedral-like crown.