

THE CONVERSATION

2 April 2013, 7.32am AEST

Final frontiers: rainforests



Bill Laurance

Distinguished research professor and Australian Laureate

With the global population now well over seven billion there are few remaining parts of the world relatively untouched by human activity. We assess the current state and future prospects of five final frontiers: rainforests, Antarctica, the Arctic, the deep sea and space.

Tropical rainforests are the world's most biologically important real estate. They also offer a range of tangible benefits for humanity — buffering climate change, limiting destructive flooding and sustaining indigenous peoples, among others. For this reason it seems a bit odd that humans are hacking down rainforests with such fervour.



Road to nowhere: The human impact on rainforests is highly tangible. Flickr/Rainforest Action Network.

For three decades I've been studying how rainforests in the Amazon, Africa and the Asia-Pacific region are altered by human activities. Along the way I've been chased by angry forest elephants, attacked by venomous snakes and suffered a few tropical diseases — all part of my job description. Here's my quick perspective on the world's rainforests: what is happening to them and their remarkable biodiversity?

Changing drivers of destruction

Around ten million hectares of rainforest are destroyed annually — roughly 40 football fields a minute. Beyond this, many rainforests are being fragmented, logged, overhunted and otherwise degraded. The forces that drive these changes are continually evolving over time.

In recent years, one key change is that the industrial drivers of deforestation — large-scale agriculture, plantations and cattle ranching — have risen sharply in importance. This is a big shift from just a few decades ago, when small-scale farmers and colonists were the main drivers of forest loss. Today, it's not the little guys with machetes and axes, but the big guys with bulldozers and other heavy equipment, that are causing most forest destruction.

Industrialisation is also promoting a huge wave of road building. Logging, infrastructure

expansion and mineral, oil and gas projects are all pushing roads into the last tropical wildernesses. The impacts of such roads often extend far beyond the road itself. They open a Pandora's Box of environmental problems, including illegal land colonisation, land speculation, and influxes of illegal hunters and gold miners. In the Amazon, for instance, over 95% of all deforestation occurs within 10km of roads.



Forest clearing along roads in the southern Brazilian Amazon
– 95% of deforestation happens near roads. [Google Earth](#)

In discussing rainforest loss, one cannot ignore China. The last two decades have witnessed a stunning increase in the country's timber consumption, with more than half of all timber shipped anywhere in the world today destined for China. China has been remarkably aggressive in pursuing timber but is criticised for being little concerned with social or environmental issues. Because much of its imported timber is ultimately exported worldwide as wood products, China and its many wood-product corporations are vulnerable to international boycotts, unless they start to clean up their act.

Another growing threat to rainforests is biofuel production. As petroleum costs rise, biofuel is a likely near-term alternative. Most biofuel expansion will occur in the tropics because that is where plant biomass grows the fastest and where land is still relatively inexpensive. **One recent study** suggested at least 30 million hectares of additional land — an area nearly the size of Germany — could be devoted to biofuel production over the next decade, mostly in tropical nations.

And in tallying the threats to rainforests, one can't ignore climate change. For instance, the world's tropical mountains are hotspots of biodiversity, containing myriad unique species adapted for cool, wet conditions at higher elevations. As global temperatures rise, many of these species could be imperiled. The **white lemuroid possum** of north Queensland — driven to the very edge of the abyss by a severe heat wave in 2005 — is just one example. Changing rainfall patterns could also have a big impact; the Amazon, for instance, experienced unprecedented droughts in 2005 and 2010 that were linked to unusually warm Atlantic sea-surface temperatures.

Ultimately, many scientists see continued growth of human population as a crucial driver of forest destruction. The United Nations projects the global population will top **ten billion people this century**, with most people added in developing nations. This will place tremendous pressures on rainforests as developing countries scramble to meet the needs of their growing populace and to develop economically.

Per-capita consumption of food, energy and consumer goods is also rising as people in developing nations seek the kinds of prosperity enjoyed by those in industrial nations.

Throughout the world, people are also living longer and thereby consuming more. As natural resources become scarcer, the environmental cost of acquiring them rises. The principle applies to minerals, timber and just about any other diminishing natural resource.

The bottom line: for rainforests and their denizens, weathering assaults at every turn, things are going to get much worse before they begin to get better.



Biofuel production is an increasing threat: a bulldozer clearing forest in Kalimantan, Indonesia. William Laurance

Fate of biodiversity

What does all this mean for the great wealth of biodiversity that relies on rainforests? In truth, almost everywhere we look, we see uncertainties.

For starters, we don't know how many species live in rainforests or indeed on Earth. Plausible estimates for Earth's biodiversity vary from 2 to 50 million species, excluding things like bacteria and viruses. Regardless of the total, over half of all species are thought to live in rainforests.

We also don't know how bad things are going to get environmentally. Sure, we're going to lose a lot of forest, but how much, and where, exactly? Some places are more critical than others. For instance, razing the last scraps of forest in Madagascar or the Philippines, which contain myriad unique species, would be devastating for biodiversity.

And how hard will climate change hit rainforests? Imagine what would happen if the Congo Basin — already under assault from loggers and slash-and-burn farmers — began having severe droughts. The tinder-dry forests, opened up to fire-wielding farmers by logging roads, could be consumed by flames. The environmental consequences of such combinations of environmental insults are maddeningly difficult to predict.

Finally, we just don't know how much environmental change rainforest species can tolerate. How many species can survive in human-dominated landscapes, areas where expanses of ancient rainforest have been replaced by agriculture, urban development, second-growth and relict forest patches? Can many species persist in such wounded landscapes, or just a few?

Such serious uncertainties aside, there are some important things we do know. We know that many species are seeing a great decline in their population size and geographic range. The

tiger, for instance, is clinging to survival in just 8% of its original range, with perhaps 5% of its original numbers. We know that most ecosystems are being massively distorted by land-use change, over-hunting, invasive species and shifting climates. And we know that many species are losing vital genetic variation — the raw fuel needed to adapt to future changes — as their populations collapse.

While there's plenty to fret about, we should also remember that with uncertainty there's hope. The tale of tropical biodiversity is only now being written. If we act fast we can start changing the story; by attacking the drivers of rainforest destruction we can forge something more like a happy ending.

Next: Antarctica

Sign in to Favourite Donate and become a friend of The Conversation

Copyright © 2010–2013, The Conversation Media Group