CFA Newsletter

No.103 December 2023 ISSN 1750-6417

Contents:

Lead
- Fire consuming more of world's forests

Forest Scenes
- Critics slam BC's logging transparency
- Addressing barriers to women's participation
- UK forests face ecosystem collapse
- The trees in our cities are dying
- The effects of climate change on Trinidad
- Sound recordings tell us if forests are recovering
- Study shows replanting forests with seedlings accelerates restoration
- Five reasons why trees are a solution to the climate crisis
- Boreal forest are shrinking
- Pakistan is planting mangrove forests
- Record year of wildfires
- Diverse forests better than monocultures as carbon sinks
- Ukrainian Journal of Forest and Wood Science
- When birds gorge on cicadas
- Antarctica was once home to forests

Publications
- Forest Pathways 2023

Around the World

CFA Newsletter
is the newsletter of the Commonwealth Forestry Association

Editor: Alan Pottinger

Contact: The Crib, Dinchope, Craven Arms, Shropshire SY7 9JJ, UK

Tel: + 44 (0) 1588 672868

Email: cfa@cfa-international.org

Web: www.cfa-international.org

The views expressed are not necessarily those of the CFA.

Publication of the CFA Newsletter is supported by a bequest from Jim Ball

Fire consuming more of world's forests, threatening wood, paper supplies

Climate change is a major driver of fire weather and fire behavior. The increased risk of high-severity wildfire is an entirely expected outcome of warmer temperatures and, in some places, reduced rainfall. (Photo courtesy of U.S. Forest Service – Pacific Northwest Region/UPI | License Photo)

A third of the world's forests are cut for timber. This generates $1.5 trillion annually. But wildfire threatens industries such as timber milling and paper manufacturing, and the threat is far greater than most people realize.

Research published in the journal *Nature Geoscience* shows that between 2001 and 2021, severe wildfires worldwide destroyed timber-producing forests equivalent to an area the size of Great Britain. Severe fires reach the tree tops and consume the forest canopy.

The amount of timber-producing forest burning each year in severe wildfires has increased significantly in the past decade. The western United States, Canada, Siberia, Brazil and Australia have been most affected.

Timber demand is expected to almost triple by 2050. Supplying demand is clearly going to be challenging. Our research highlights the need to urgently adopt new management strategies and emerging technologies to combat the increasing threat of wildfires.

What was found

Global maps of logging activity and severe wildfires were combined to determine how much timber-producing forest was lost to wildfire this century. Between 2001 and 2021, up to 25 million hectares of timber-producing forest was severely burned. The extent of fire has jumped

markedly in the past decade, from an average of less than 1 million hectares a year up to 2015 to triple that since then.

At a national scale, the three countries with the largest absolute wildfire-induced losses of timber-producing forest were Russia, the United States and Canada. When it comes to proportion of their forestry land lost, the nations with the highest percentages burnt were Portugal, followed by Australia.

Why are forests burning?

Climate change is a major driver of fire weather and fire behavior. The increased risk of high-severity wildfire is an entirely expected outcome of warmer temperatures and, in some places, reduced rainfall. However, it remains unclear why so much wood-production forest is being lost, and why the increase in burnt area has been so marked in the past decade.

One possible reason is logging makes forests more flammable. This has been documented in parts of southeastern Australia, where intact forest always burnt at lower severity than harvested forest across the entire footprint of the Black Summer fires. Forests that have been subject to thinning also are at risk of high-severity wildfire.

What does this mean?

Whatever the reason, it is clear these fires in wood-production forests will have profound impacts on global timber supplies and all the industries associated with them. This is a huge problem for society and the environment, because timber demand is expected to triple by 2050, in part to facilitate the transition away from carbon-intensive cement in construction.

In many parts of the world, it typically takes 80 to 100 years or even longer to grow a tree to a size at which it can be a saw log for products like furniture and floorboards. So the increased frequency of high-severity wildfire means fewer areas of forest will escape fire for long enough to reach timber harvesting age. This is especially problematic where logging makes forests more prone to burning in a high-severity wildfire.

Furthermore, given the long-term nature of timber production, typically on cutting cycles ranging from 40 years to more than a century, future timber crops will face a very different climate as they mature.

Responding to challenge

If wood production from forests becomes increasing costly and timber is increasingly hard to source, there may be more pressure from industry and government to log other places, such as tropical forests, with high biodiversity and conservation value.

One way to tackle the problem is to grow more timber in plantations. Plantations already produce a third of the main forms of wood-producing timber – called industrial roundwood. They do this from just 3% of the area of natural forests. Well-managed plantations can grow a successful timber crop within a couple of decades. This is a lot shorter than the many decades and sometimes even centuries required to grow sawlogs in native forests. Having a shorter growing time in plantations increases the chances of harvesting trees before they are destroyed in a wildfire.

But plantations, like some logged and regenerated native forests, can be highly flammable. Fire risks need to be carefully managed. That includes planning, to avoid putting neighboring areas and human communities at greater risk of being burnt.

Another key strategy to better protect timber resources will be to adopt new technologies to more quickly detect and then rapidly suppress ignitions such as those originating from lightning strikes. Big fires start as small fires. The best time to suppress fires is when they are small, and as soon as ignition occurs. We have been involved in the development of drone fleets and unmanned aerial water and fire suppressant dispensing craft to more quickly detect and extinguish wildfires.

New technologies, as well as more, better planned and managed plantations will be crucial in not only protecting forests, but also safeguarding the flow of marketable timber and the industries dependent upon them.

By David Lindenmayer & Chris Bousfield & David Edwards

David Lindenmayer is a professor in the Fenner School of Environment and Society at Australian National University; Chris Bousfield is a postdoctoral research associate and David Edwards is a professor at the University of Cambridge.

upi.com

Forest Scenes

Canada: 'A public relations strategy': Critics slam B.C's recent effort to boost transparency on logging

The B.C. government has announced changes to improve transparency around logging operations, but critics have more questions than answers.

Due to recent changes to the Forest and Range Practices Act, forestry companies will be required to create a map of proposed logging operations available for public review as of April 1, 2024, according to B.C.'s Ministry of Forests. And the public will be able to offer input on what environmental values should be considered for future logging plans.

In addition, the province is developing an online mapping system that companies can choose to use to display their map and get public feedback. The system will be fully launched sometime in 2024.

"Opening the planning process to the public through the use of new digital tools will engender greater public trust and ensure forest resiliency," said Minister of Forests Bruce Ralston in a press release.

But it's not clear whether logging companies are required to put their operation maps online if they don't opt to use the

government site, environmental groups said. How or if public environmental concerns will shape logging plans is also unclear, as is the question of whether the new mapping rules apply to logging plans that have already been recently developed.

"Since use of the [B.C.] online mapping tool is voluntary, some [licence] holders might choose to only make their forestry operations maps available for viewing and comment at their place of business," a detailed reading of a document on the ministry website revealed.

The only publishing requirement is that forestry companies must announce the map is available for public view and input once in a newspaper and on a public website. They must outline the hours people can view the document and the address of the location where it is kept.

It's pretty bold of the province to laud increasing public engagement in forestry but not require logging companies to post the maps online in this day and age so people can access them easily, said Jens Wieting, senior forest and climate campaigner with Sierra Club BC.

"The title of the press release talks about transparency, but the more time you spend reading and researching, the more disappointing [the announcement] becomes," Wieting said.

The step is incremental, doing little to meet the government's commitment to transform its approach to old-growth logging and meet much greater public transparency concerns or the recommendations of the 2020 independent old-growth strategic review.

Recommendations focused on involving First Nations and communities in forestry decisions, temporarily deferring logging in at-risk areas, protecting more massive trees, and improving public information and reporting in the sector.

"We're already three years out from the promised paradigm shift," Wieting said, adding the province promised to meet all the strategic review's recommendations.

"We are still in the dark about which of the most at-risk old-growth forests have logging deferrals in place, and there's still no conservation financing to make it easier for First Nations to implement conservation solutions."

Torrance Coste, national campaign director for the Wilderness Committee, agreed.

Little progress has been made on forestry's public transparency, a core tenet of many of the recommendations from the strategic review.

The new map requirements put the onus on individuals and communities to wrestle with logging companies to protect patches of the forest rather than the government creating an overarching, cohesive policy that safeguards at-risk ecosystems, he said.

"This isn't a paradigm shift, it's a public relations strategy," Coste said.

"Saying that you're making moves to improve transparency and public information is different than actually doing it."

As part of the modernization of the forestry sector, the province promised to provide updates on its process, create forest reports and establish a "one-stop" shop on the government's website for meaningful old-growth information for public consumption and debate.

Yet, a full picture about how much at-risk old-growth is left and where and how much has been logged since the B.C. government promised change almost three years ago still doesn't exist, Coste stressed.

This creates confusion and polarized narratives from the viewpoints of the logging industry and conservationists, which doesn't make for informed and insightful public conversations about forestry policy, he said.

"Public accountability is not possible without all that information," he said.

"We need a real understanding of what's happening on the land right now, in the woods."

The Ministry of Forests did not reply to *Canada's National Observer*'s questions regarding the new mapping regulations before publication deadline.

nationalobserver.com

Addressing barriers to women's participation in community-protected areas and community forestry through gender-based violence intervention

RECOFTC partners with Gender and Development for Cambodia (GADC) to implement the Rise Up! project, addressing gender-based violence and increasing women's participation and leadership in community-protected areas and community forestry in Pursat and Kampong Chhang Province in Cambodia

In rural areas, women aspire to contribute more, especially in protecting the forests they've depended on for generations. These forests provide vital natural resources and non-timber products for their livelihoods. However, several barriers hinder their active involvement in community activities. While forest protection should be a collective responsibility, traditional gender roles and an unsupportive environment often limit women's participation.

Participating in community activities is not only about safeguarding the forest but also about exercising their rights, ensuring their safety and securing food and income for their families. Gender-based violence, in various forms, poses a significant challenge in Cambodia's environmental and forestry context. Verbal abuse, harassment and physical threat can deter women from engaging fully in these activities. This issue needs urgent attention because all women deserve to be treated with respect and they are able to participate in processes that affect them.

Women face additional burdens and barriers when working to protect forests and natural resources. Reports of harassment and inappropriate behavior from men during their participation further exacerbate these challenges. To address this issue at the community level, it is essential to raise awareness and work towards eliminating gender-based violence. This intervention aims to promote women's participation and leadership in

Women and men in community forestry area

Mrs. Pen Sithol shared her experiences on gender-based violence during the provincial launching event.

Participant in the launching scan QR code to the project web page

community-protected areas and community forestry by addressing gender-based violence barriers.

The project was officially launched at the national level on 11 April 2023, with the participation of stakeholders, including partners, nongovernment organizations, government officials and community leaders. A provincial-level launch followed on 21 June 2023, with officials from provincial departments and committees in Kompong Chhnang province. The project garnered commitments from relevant stakeholders to support future activities.

Next steps

RECOFTC, in partnership with GADC, will provide training to community members, especially women, in the target communities. The training will include the following modules:

Module 1	Community mobilization for behavior change
Module 2	Gender-based violence and gender equality and gender-based violence and environmental linkages
Module 3	Feminist advocacy in addressing gender-based violence barriers to women's participation in community-protected area management.

Additionally, awareness campaigns and men's dialogues will be conducted as part of the next action plan.

About Rise Up!

Rise Up! is an initiative led by RECOFTC in partnership with Gender and Development for Cambodia (GADC). The initiative is funded by the United States Agency for International Development (USAID) and managed by the International Union for Conservation of Nature (IUCN) under the Resilient, Inclusive and Sustainable Environments (RISE) grant challenge. The project will run from January 2023 to December 2024, working towards empowering women and fostering gender equality by addressing gender-based violence barriers/challenges in community-based conservation efforts.

recoftc.org

UK forests face catastrophic ecosystem collapse within 50 years, study says

'Alarming' new research warns of risk to British woodlands from disease, extreme weather and wildfires, unless 'call to action' is heeded now

UK forests are heading for "catastrophic ecosystem collapse" within the next 50 years due to multiple threats including disease, extreme weather and wildfires, researchers have warned, with trees dying on a large scale.

The study, published in the journal Forestry, was put together by a panel of 42 researchers, with 1,200 experts consulted. Lead author, Dr Eleanor Tew, head of forest planning at Forestry England and visiting researcher at the University of Cambridge, described the finding as "sobering and alarming".

Many of the threats warned of by researchers are already affecting forests and woodlands. The fungal disease ash dieback will kill up to eight out of 10 of the UK's ash trees. In 2021, winter storms destroyed about 12,000 hectares (30,000 acres) of forest in Britain. Climate projections show storms, heatwaves, droughts and floods are likely to become more common and more severe.

"The problem comes when you get all of those things happening at the same time as multiple, interrelated threats," said Tew. "That just overwhelms the forest, and you basically get trees dying and the forest ecosystem collapsing … that has massive landscape impacts, and significant impacts for society."

Catastrophic ecosystem collapse is not inevitable, and is not yet occurring in the UK's forests. "We do have time to make a

Paths are closed at Hughenden Manor, Buckinghamshire, to fell trees with ash dieback, which has affected 6,000 trees on the estate, October 2023. (Photograph: Geoffrey Swaine/Shutterstock)

A wildfire on the Clwydian Range moorland in Llangollen, Wales, June 2021. (Photograph: Getty Images)

Ash trees with ash dieback are felled in Gloucestershire, England. The disease has killed up to eight out of 10 of the UK's ash trees. (Photograph: Nick Upton/Alamy)

difference, and there is a lot we can do to make our forests more resilient," said Tew, who described the paper as a "call for action".

Solutions include increasing the diversity of tree species within a wood, planting trees of different ages, promoting natural regeneration and managing deer populations. People can help by using the online Tree Alert tool to report possible tree pests and diseases. Tew also said people should make sure their boots are clean before walking in a new woodland to avoid spreading disease.

The long-term impacts of forest ecosystem collapse would include loss of timber, carbon sequestration, poorer air quality, water retention and human enjoyment. In some parts of Europe, there has already been ecosystem collapse within forests: storms, drought and bark beetle outbreaks in Germany have destroyed the equivalent of 250,000 football fields of forest.

All this is often made worse by management strategies that create forests full of the same species and age of tree, making them more vulnerable.

The forestry industry has to plan in advance, Tew said: an average conifer in a plantation can take up to 60 years to reach maturity, and a broadleaf up to 150 years. "Forestry has always been about planning for the long-term, and we're at a time of huge change," said Tew.

The government plans to plant 30,000 hectares of forest every year by 2025, which is double current planting rates. The UK is one of the least forested European countries, with a total coverage of 13%. A 2021 report from the Woodland Trust found that just 7% of the UK's native woodland was in good condition.

Other challenges facing forests outlined in the paper include the use of water for trees coming into increased conflict with human needs for water for homes and farmland, particularly as droughts and floods become more frequent. Forest management is projected to become harder due to wetter winters and hot summers.

The research said that protecting soil was also a priority, as well as preparing for the impacts of tree viruses.

Dr Elena Cantarello from Bournemouth University, who was not involved in the study, said her own recent research in south-west England "comes to similar conclusions". She added: "Catastrophic forest ecosystem collapse, identified in Tew's [paper] as the most highly ranked issue, is something which was also identified in the majority of the ecosystem services and biodiversity variables we studied."

theguardian.com

The trees in our cities are dying – a sick microbiome may be to blame

Efforts to expand urban green spaces are undermined by street trees dying prematurely. Restoring their root microbiomes could help them live longer

The trees in Boston are among the most studied in the world (Credit: Ian Dagnall/Alamy)

If you have ever walked down a tree-lined street on a hot day, you know the value of urban trees. They provide shade and respite from the concrete jungle. Some, like the great trees of London, a few of which are centuries old, are simply magnificent to behold. City trees have a range of less obvious benefits, too, from flood control to improving our mental health. It is no wonder, then, that around the world efforts to expand urban forests are growing. But there is a problem.

Take Boston, Massachusetts, where researchers have scrutinised the local trees for decades. There, around 40 per cent of saplings die within seven years of planting, far too early to realise their benefits. It is the same elsewhere. In New York, more than a quarter of trees planted in 2009 were dead within nine years. Despite planting drives, urban tree cover across the US fell by about 36 million trees per year between 2009 and 2014. What is going on?

We know these trees face unique challenges, from excess warmth due to the urban heat island effect to a surfeit of nutrients from dog urine. Poor, under-resourced management is also a factor. But now, emerging research suggests that all these may be the roots of another problem for urban trees: unhealthy microbiomes. Without the right kind of microbial communities, they may be more susceptible to the stresses they face in cities, and things look even worse for the most isolated or "lonely" trees.

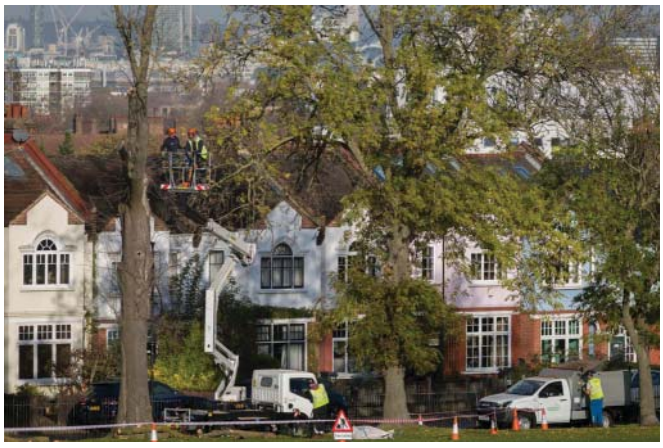
The good news is that improving trees' microbiomes could help them live longer – to the benefit of all city dwellers.

Urban green spaces

The majority of the human population are now urbanites, and the urban environment is forecast to be three times the size it was at the turn of this century by 2030. The importance of urban forests is growing accordingly. For instance, city trees help reduce the urban heat island effect by limiting the amount of the sun's radiation absorbed by the built environment, as well as cooling the surrounding air. Trees reduce runoff and associated flooding by intercepting rain. They also clean pollution from the air and water, serve as habitat for a host of urban wildlife and store carbon.

While city authorities have long recognised these benefits, most haven't invested enough to maintain their urban forests, or done so equitably. In the US, decades of discriminatory planning practices have left many neighbourhoods that are inhabited primarily by people of colour with fewer trees than whiter neighbourhoods. Low-income neighbourhoods in the US have 15 per cent less tree cover on average than wealthier ones, and the UK has similar disparities. Hotter than average temperatures in these neighbourhoods are largely a reflection of their lack of trees.

Growing recognition of those inequities, along with rapid urbanisation and billions of dollars in climate change-related funding, has spurred urban authorities to redouble efforts to maintain and expand urban forests. Many local residents have also got involved (see "Help your street trees", below). However, if a lot of these trees die within a few years of planting, much of this effort is wasted. "Trees need to get really big to benefit people," says Jennifer Bhatnagar at Boston University. It takes some 10 years after a specimen is planted for it to become established and grow a cooling canopy, she adds. Depending on the city and the species, a tree must survive two or three decades just to offset the carbon emissions produced by planting and maintaining it. A city of saplings is no replacement for a long-lived urban forest. This is why early mortality among city trees is so concerning.



Bigger city trees are more likely to die than less mature specimens (Credit: Richard Baker/In Pictures via Getty Images)

To tackle the problem, we must first understand why trees are dying. But making sense of the fate of millions of them in complex urban ecosystems isn't straightforward. "It's very hard to figure out what's happening," says Bhatnagar. Not only are there classic ecological factors like heat and drought; there are unpredictable human elements, too. Soil can be compacted or contaminated. City air is polluted with particulates, ozone and

other gases. Humans may introduce invasive pests and pathogens. Management is also a big factor, with trees planted in poor soils, then underwatered, over-pruned, vandalised or felled to make way for developments. "In other areas of ecology, you don't even think about people," says Bhatnagar.

One clue to why city trees die is when they tend to die. There is a general pattern that can be seen clearly in the closely studied trees of Boston. When Lucy Hutyra at Boston University and her colleagues compared thousands of the city's trees with their rural counterparts, they found that both died at high rates when young. Urban trees were also more likely to die when they are bigger, whereas mortality rates fell in rural trees the longer they survived.

This suggests different drivers of tree death in urban and rural settings, says Bhatnagar. She thinks that older city trees regularly succumb to over-zealous pruning or removal because they are deemed to be in the way or to pose a hazard. For younger urban trees, she suspects their deaths are often due to a failure to establish roots and access water. (Conversely, in rural environments tree seeds germinate profusely, but the population of saplings is naturally culled as they compete for light and nutrients.) City trees' failure to establish roots may be caused by stressors unique to cities, such as densely packed soils, excess nutrients and hotter temperatures.

New evidence, meanwhile, points to a problem with the microbes that live on and inside the roots of urban trees. Bhatnagar, a microbial ecologist, is a pioneer of this research. Until she learned about the plight of Boston's trees, she hadn't thought much about urban ecology. But in 2018, she started working with Hutyra's group to explore whether problems with the microbiomes of city trees might be playing a role in driving high mortality rates. "It's the most interesting science I've ever done," she says.

Unhealthy root microbiomes

One finding that intrigued her was from a small study conducted in Ontario, Canada, in 2009. The researchers found that the roots of urban trees were colonised by substantially fewer symbiotic fungi than comparable rural trees, and that there were fewer species present. Such mycorrhizal fungi are known to form mutualistic relationships with many species of plant. The fungi encase or penetrate tree roots with thin filaments to exchange nutrients such as nitrogen and phosphorus in return for sugars from the plant. They can also form underground mycorrhizal networks, which may help trees to share nutrients with each other through a "wood-wide web" of molecular exchange. Some researchers have argued – though not without controversy – that this is evidence of trees helping or communicating with one another.

Bhatnagar thought the finding in Ontario was striking. "It's a very clear impact of a city on an organism," she says. But no one had followed up to see if the effect was more widespread, or what the consequences might be for tree health. So, to get a more complete view, she and her colleagues looked at data on the soil microbiome of eight urban and rural forest plots in Massachusetts. They focused on ectomycorrhizal fungi or "ectos", ones that sheathe the exterior of roots in some tree species.

Unexpectedly, the study, published in August, found that urban forests in Boston had more of these fungi in the soil than rural forests did. However, as in Ontario, there were fewer fungi colonising the tree roots. The researchers interpret this as

After planting, young urban trees often fail to establish healthy roots (Credit: Mikhail Olykaynen/Alamy)

evidence of a "breakdown" in the relationship between the fungi and their tree hosts. "In cities, the rules are broken for how microbes interact with trees," says Bhatnagar. She thinks this could be due to excess nitrogen in urban soils, both from pollution and from hotter temperatures favouring bacteria that fix nitrogen in soil. "If there's tons of free nitrogen in the soil, the plants will kick off the ectos," she says.

As-yet-unpublished research by Anne Pringle at the University of Wisconsin-Madison and her colleagues seems to back up this idea. In the very different setting of Bogotá, Colombia, Pringle says they are finding that trees growing in parks have fewer symbiotic fungi – both ectomycorrhizal and endomycorrhizal ones, which penetrate tree roots – compared with trees growing in tropical forests outside the city. However, the microbiomes of street trees growing in pits surrounded by concrete are comparable with those of rural trees. Unlike soil in parks, which may more often be subjected to nitrogen-rich dog urine, "the hard surfaces don't get peed on", says Pringle.

The consequences of lower fungal colonisation rates on tree health, if any, aren't yet clear. Miranda Hart at the University of British Columbia in Canada says it would be premature to draw a link between changes in microbiomes and higher mortality of trees in urban forests. "We don't know what these conditions are doing to [large organisms], let alone what they're doing to micros," she says. But, she adds, these findings hint at yet another way in which urban environments can undermine complex ecological interactions.

Pringle is more concerned. "It is a sign of trouble," she says. The loss of the fungal sheaths around roots could expose trees to more microbial pathogens, for instance. Indeed, Bhatnagar's group has found that hotter, drier soils at the edges of fragmented forests have a higher abundance of pathogenic microbes and a lower abundance of symbiotic fungi. An unhealthy microbiome could also affect the immune systems of city trees and make them less resilient to heat and drought. But if missing fungi and other microbes are part of the problem with urban trees, they could also be part of the solution.

Rebooting the wood wide web

One researcher exploring this possibility is Bhatnagar's colleague Vanessa Harden at Harvard University. After reading about ecologist Suzanne Simard's groundbreaking work on mycorrhizal networks of old-growth forests, she wondered if she could

facilitate such connections among isolated city trees. In a greenhouse at the Harvard Forest research station in western Massachusetts, she and her team have set up simulated sidewalks in the form of long wooden boxes, with soil conditions mimicking those in Boston. First, Harden plants white oak saplings at either end of each box, then, wearing latex gloves to avoid contamination, she adds a handful of extra soil collected from a stand of oaks at the Harvard Forest to one of the trees. This inoculates its roots with an intact community of fungi. Between the trees, she makes a "soil conduit" – a strip of loosened soil that should make it easier for the roots of both trees to spread.

Harden hopes to demonstrate that the mycorrhizae will colonise the first tree and spread through the conduit to the second, with health benefits for both. If the treatment works, city trees separated from others might benefit from soil conduits cut through roads or sidewalks. By her estimate, New York City alone has around 300,000 such "lonely" trees. "We have people plopping down trees without understanding what they need," she says.

Alongside Harden's team, Bhatnagar and a handful of other researchers have planted saplings in pots for a parallel experiment. The idea is to test how inoculating the plants with different types of urban and rural soils, each with distinct microbiomes, affects the growth and health of the tree. The results could inform Boston's tree-planting efforts and help correct what Bhatnagar sees as the "Home Depot-isation" of tree planting: spraying fertiliser and fungicide on any old soil and plonking in a tree.

Neither experiment will have clear results until 2025. However, research suggests that inoculating trees with native fungi and other microbes can improve growth and health, at least in non-urban settings. One Texas-based company called Funga is now using the microbes that produce the best results to make trees on a pine plantation grow bigger and faster. In Bogotá, Pringle is also experimenting with inoculation and says her group has found that trees treated with native soils and fertiliser grow best. However, she adds that one major challenge with this method is access to native soil, which can't yet be cultivated and instead must be collected from intact forest.

Hart thinks inoculation could help urban trees, but is sceptical that it would ever be enough to address the larger-scale issues that disrupt urban soil microbiomes. "We have to fix these problems if we want the microbes to survive," she says. "We need more plants and less concrete, and fewer cars."

Nevertheless, Bhatnagar believes these approaches are worth a try, given the desire to expand urban forests. "Folks are desperate," she says. "They don't want to go through the process of greening a space just to then see it fail."

newscientist.com

The effects of climate change on Trinidad's forests, rivers and seas

This story is a combination of two posts by members of Cari-Bois' first cohort of youth journalists, who examined the ways in which climate change affects each of their communities. The articles were first published on the Cari-Bois Environmental News Network. An edited version appears below as part of a content-sharing agreement.

In 2017, the United Nations Environment Programme (UNEP) interviewed former Norwegian Climate Minister Erik Solheim, who called for more efforts to be placed on protecting rainforests, especially since an estimated 20 percent of global carbon emissions are being generated through the destruction of rainforests.

When it comes to climate change, rainforests not only help to reduce emissions, but they can also help limit the damage done by extreme, climate-induced weather events. Protecting existing forest cover from deforestation is therefore becoming more important – especially for rural communities like Moruga, in south Trinidad.

In recent weeks, Moruga residents have not been spared from the extreme heat being experienced across Trinidad and Tobago. With global temperature averages having already increased in the past several years because of climate change, climate models only predict further heating.

Maintaining trees in Moruga will be important to helping residents cope with increasing temperatures as the presence of trees, especially around homes and communities, has a cooling effect.

According to the US Environmental Protection Agency (EPA), "trees and vegetation lower surface and air temperatures by providing shade and cooling through evaporation and transpiration, also called evapotranspiration."

Maintaining trees can also help reduce landslides and floods by stabilising hillside slopes. In the past decade, Moruga has experienced several flooding events, which have affected lives and disrupted livelihoods.

In the north of the island, the Santa Cruz River, and its tributaries, have served as a place where people living along its course gather for social activities. Over time, however, such activities have declined because of the river's decreasing volume and water quality.

Wesley Karimbocas, a resident of the area, remembers the river being "way better than it appears to be right now":

When I was a young child, my friends and I would go to the river after school to swim. The water was higher and cleaner, there were more fishes, [and] the rivers and natural pools were deeper.

While climate change isn't the sole cause of the river's decline, as there are quarries in the area and points along the river are polluted, its impact cannot be overlooked.

A study entitled "Global river water quality under climate change and hydroclimatic extremes," which was published in the Nature Reviews journal in 2023, highlighted the fact that frequent droughts and shifting precipitation patterns due to climate change can decrease water levels in rivers, lakes and streams. It also stated that climate-induced warmer temperatures also cause more frequent algal blooms and reduce dissolved oxygen levels – effects that can do significant harm to ecosystems and aquatic species.

In addition to its community impact and the disruption of ecosystems, these negative outcomes also affect the farmers who depend on the river to irrigate crops. With climate change already projected to affect Trinidad with more frequent and intense droughts during the dry season, farmers will need to have reliable sources of water to irrigate crops.

A degraded Santa Cruz river is therefore also directly related to farmers' ability to plant and successfully grow their produce, potentially reducing the availability of safe and nutritious food.

Not too far away, the north coast village of Blanchisseuse, like many rural areas, is dependent on farming, fishing, and ecotourism – but residents have become concerned about their well-being given the global climate crisis.

With increasingly frequent and extreme rainfall, there have been a number of landslides over the past several years which have affected the integrity of roads and infrastructure in the village, and often disrupted the activities of the community. Similar to agriculturalists in Santa Cruz, farmers in Blanchisseuse are concerned about the effects climate change will have on their yield. Fishermen, too, are anxious about impacts on the quality and quantity of fish they catch.

There is no doubt that climate change, with its noticeably hotter temperatures and unpredictable ripple effects on weather patterns, is already being felt in Small Island Developing States (SIDS) like the Caribbean. The degree to which rural communities will be supported in attempting to mitigate these effects, however, remains to be seen.

By Colleen Mudie, Hadassa Karimbocas and Jesus Bailey
globalvoices.org

Sound recordings and AI tell us if forests are recovering, new study from Ecuador shows

Male cock-of-the-rock birds in Peru's Kosñipata valley, a bird also found in the Choco. (Image credit: Rhett A. Butler)

- *Acoustic monitoring and AI tools were used to track biodiversity recovery in plots of tropical Chocó forest in northwestern Ecuador.*
- *The study found that species returned to regenerating forests in as little as 25 years, indicating positive progress in forest recovery.*
- *Acoustic monitoring and AI-based methods proved to be powerful and cost-effective techniques for assessing biodiversity levels in restored forests, including insects and animals that don't vocalize.*
- *The authors hope these methods make biodiversity monitoring more transparent, accountable, and accessible to support land managers and market-based conservation mechanisms that rely on forest restoration, such as payments for ecosystem services.*

Does planting trees bring back the animals? Around the world, people are working to restore forests, either by planting trees or allowing the flora to return naturally. But as the trees grow, it can be difficult to determine if communities of birds, bugs, frogs, and other life forms are also rebounding.

In the Chocó of northwestern Ecuador, one of the most biodiverse rainforests in the world, a group of German and Ecuadorian scientists measured biodiversity recovery across different land types, including active pastures and farms, abandoned farms regrowing into young secondary forests, and mature old-growth forests.

Using a combination of acoustic monitoring and DNA-based surveys, the team found that species were returning to the regenerating forests after just a couple of decades.

"We can see how the Chocó rainforest reestablishes itself over time. Within 25 years, you get a lot of species back," Martin Schaefer, one of the study's co-authors and the director of the Ecuadorian NGO Jocotoco Foundation, told Mongabay. "It's a positive message that we need to bring to the public… Over just three decades, forests are regrowing."

The researchers also found that analyzing animal and insect sounds yields information about the overall biodiversity of the forest, including the silent creatures that don't sing, call, chirp, or squawk.

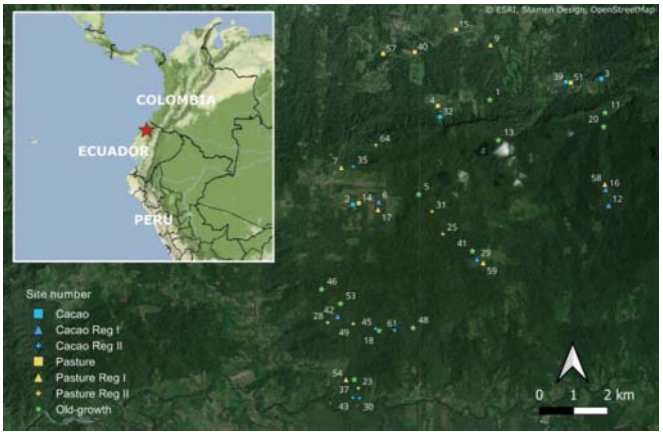
Sound-based monitoring using artificial intelligence tools is a powerful and cost-effective technique for monitoring biodiversity recovery in tropical forests and, the authors say,

Old-growth Chocó forest on Jocotoco's Canandé reserve. (Photo by Javier Aznar)

these tools are needed "to support market-based conservation mechanisms that may rely on forest restoration, such as payments for ecosystem services, biodiversity offsets and credit markets."

"What they've done is make a convincing argument that, yes, acoustic monitoring can be used to assess the effectiveness of a forest restoration project," Wesley Hochachka, an ecologist at Cornell University's Lab of Ornithology who was not involved in the study, told Mongabay. "I'm not aware of any more thorough examination or demonstration that the potential [of acoustic monitoring] is real and can be realized."

The research team established 43 plots across a "forest recovery gradient" in the Chocó rainforest. On each plot, they used three acoustic monitoring methods and one DNA-based method.



A figure from Mueller et al 2023 shows the location of study plots.

One of the pasture study plots, where the forest was cleared decades ago. (Image courtesy of Jocotoco Foundation)

On each plot, the team put out sound recording boxes that captured all ambient sounds (like rain and wind) as well as insects and vocalizing vertebrates such as frogs, monkeys, and birds.

The first acoustic method employed experts to listen to 28-minute recorded segments and identify mammals, birds, and amphibians by their calls. This is a long-standing method, but it is limited by the amount of data humans can process by ear and can be costly.

The second method used recordings to create an acoustic index analysis, which describes qualities like the complexity and diversity of sounds. For instance, the soundscape of a mature forest is more diverse and therefore denser than that of a pasture.

Finally, a deep-learning computer model called a convolutional neural network (CNN) was trained on recordings of 75 known bird species. Once trained, the CNN essentially did the work of bird experts to identify calls from weeks of recordings rather than short segments.

"Rather than having to do it by hand with an expert, this [CNN] allowed us to really scale up our model," Schaefer said.

For the final surveys, using DNA, the team set up light traps to catch insects at night. They then used a technique called metabarcoding to analyze the DNA from the insects to get a sense of the diversity of insects present.

Sound recording boxes (left) and automatic light traps (right) were set up on each plot to capture sounds and nocturnal insects to assess biodiversity. (Image courtesy of University of Wurzburg)

AI acoustic data correlated well with overall biodiversity levels, they found, even for species not directly detected in audio. Schaefer said this was expected, but they were pleased with how well the AI models performed.

"I think the most important finding is that AI models allow us to measure biodiversity levels relatively well, even in their simple versions," Schaefer said. "These AI models are also a good indicator for the recovery of species that you do not hear in the soundscapes of the forest."

"Of course (there is) no information on plants or silent animals. However, birds and amphibians are very sensitive to ecological integrity, they are a very good surrogate," Jörg Müller, a professor and ornithologist at University of Wurzburg Biocenter told AFP.

The endangered banded ground cuckoo (Neomorphus radiolosus) in the Chocó rainforest. (Image courtesy of Jocotoco Foundation)

The neural network model also effectively tracked bird community changes across the gradient. The results showed that the community of vocalizing animals shifted along the recovery gradient, with the most mature forests having a distinct and more diverse soundscape.

"The best thing about the paper is the integration of sound analysis, neural network models and biodiversity levels that are unconnected to sound … specifically the insect data," Shaefer said.

There are a few caveats to these methods. For instance, acoustic monitoring can't determine if species (especially birds) are just passing through or if they live in and use these plots. Nor can it tell about the abundance of species in a plot.

Bringing this method to more forests will require AI models to be trained on a greater number and diversity of animal sounds. Sound libraries such as Xeno-Canto and Cornell's Macauley Library of Natural Sounds, are working towards these goals, but more research and funding are needed, said Hochachka, especially in the global south.

However, the study demonstrates that sound recordings and AI have the potential to make biodiversity monitoring more transparent, accountable, and accessible. The authors hope this will help managers determine if their hard-fought efforts are bringing back the whole forest, not just the trees.

mongabay.com

Study shows replanting logged forests with diverse mixtures of seedlings accelerates restoration

- Twenty-year experiment finds that active replanting beats natural recovery for restoring logged tropical forests.
- The higher the diversity of replanted tree species, the more quickly canopy area and biomass recovered.
- Results emphasize the importance of preserving biodiversity in pristine forests and restoring it in recovering logged forest.

Satellite observations of one of the world's biggest ecological experiments on the island of Borneo have revealed that replanting logged forests with diverse mixtures of seedlings can significantly accelerate their recovery. The results have been published today in the journal Science Advances.

The experiment was set up by the University of Oxford's Professor Andy Hector and colleagues over twenty years ago as part of the SE Asia Rainforest Research Partnership (SEARRP). This assessed the recovery of 125 different plots in an area of logged tropical forest that were sown with different combinations of tree species. The results revealed that plots replanted with a mixture of 16 native tree species showed faster recovery of canopy area and total tree biomass, compared to plots replanted with 4 or just 1 species. However, even plots that had been replanted with 1 tree species were recovering more quickly than those left to restore naturally.

Lead Scientist of the study, Professor Andy Hector (Department of Biology, University of Oxford) said: 'Our new study demonstrates that replanting logged tropical forests with diverse mixtures of native tree species achieves multiple wins, accelerating the restoration of tree cover, biodiversity, and important ecosystem services such as carbon sequestration.'

Greater diversity gives greater resilience

According to the researchers, a likely reason behind the result is that different tree species occupy different positions, or 'niches', within an ecosystem. This includes both the physical and environmental conditions that the species is adapted to, and how it interacts with other organisms. As a result, diverse mixtures complement each other to increase overall functioning and stability of the ecosystem. For instance, some tropical tree species are more tolerant of drought because they produce a greater amount of protective chemicals, giving the forest resilience to periodic times of low rainfall.

Professor Hector added: 'Having diversity in a tropical forest can be likened to an insurance effect, similar to having a financial strategy of diverse investment portfolios.'

In turn, a diverse mix of trees can support a much wider range of animal life. For instance, hornbills specifically require large mature trees with holes where the females can nest. One of the world's biggest ecological experiments

Tropical forests cover just 6% of the planet's land surface but are home to around 80% of the world's documented species (WWF), and act as major carbon sinks. However, these critical habitats are disappearing at an alarming rate, chiefly due to logging for timber and conversion to palm oil plantations. Between 2004 and 2017, 43 million hectares of tropical forest were lost – an area roughly the size of Morocco (WWF).

Restoring logged tropical forests is a crucial component of efforts to tackle both the nature and climate crises. Up to now, however, it has been unclear whether this is best achieved through allowing forests to restore themselves naturally (using dormant seeds in the soil) or through active replanting.

To investigate this, the researchers collaborated with local partners to set up the Sabah Biodiversity Experiment on 500 hectares of logged forest in the Malaysian state of Sabah on the island of Borneo. This was divided into 125 experimental plots that were either left to recover naturally or planted with mixtures of either 1, 4, or 16 tree species that are frequently targeted for logging. The 16 species included several endangered species and the worlds' tallest species of tropical tree (Shorea faguetiana) which can reach over 100 m in height. The first trees were planted in 2002, with nearly 100,000 planted in total over the following years.

The recovery of the plots was assessed by applying statistical models to aerial images captured by satellites. Within a few years, it became apparent that those with 1 species did worse than those planted with a mixture of 4 species, and those enriched with 16 species did best of all.

Lead author Ryan Veryard (who analysed the data as part of his PhD at the University of Oxford), said: 'Importantly, our results show that logged forest can recover so long as it is not converted to agricultural uses like oil palm plantation. They also

emphasise the need to conserve biodiversity within undisturbed forests, so that we can restore it in areas that have already been logged.'

The Sabah Biodiversity Experiment team are now starting a new three-year project funded by the UK Natural Environmental Research Council to take a census of all the surviving trees in the experiment. This will be combined with a wider range of remote sensing methods (including lidar sensors carried by a helicopter and smaller sensors carried by drones) to give a more comprehensive analysis of forest health.

ox.ac.uk

Five reasons why trees are a solution to the climate crisis

From carbon sequestration to storm surge protection, trees matter every step of the way

A villager in the Peruvian Amazon with their pet parrot. (Photo by Marlon del Aguila Guerrero/CIFOR-ICRAF)

As the 28th UN climate conference (COP28) approaches, and countries prepare to take stock of progress in emission reduction since the adoption of the Paris Agreement through the first Global Stocktake (GST), measures to mitigate the advance and impacts of climate change are in the spotlight.

These measures are wide-ranging and touch on many elements of our daily lives, such as renewable energy, sustainable transport, and more climate-friendly diets and food systems.

But one of the most important solutions is often hiding in plain sight. That tree outside your window? On average, it's putting away about 21 kilograms (48 pounds) of carbon dioxide, and releasing oxygen in exchange.

Here are five reasons why trees must be valued as a critical part of the solution to the climate crisis.

1. We need to go beyond net zero – and trees can help

Reaching 'net zero' emissions (where greenhouse gas emissions are cut to as close to zero as possible, and any remaining emissions are reabsorbed from the atmosphere) is a big focus in the current climate talks.

"But net zero is not enough," said Anja Gassner, the director for Europe of the Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF), in a media seminar in October this year. "We don't just have to slow down the amount of emission that we are actually putting into the atmosphere. We actively have to draw the carbon dioxide down."

Trees are great at doing that. To survive and grow, they bind carbon from the atmosphere in their trunks and roots. They also improve the functionality of the soil they sit it, meaning it can stash more carbon for longer periods, too.

2. Trees can improve food and nutrition security for climate-vulnerable communities

Acute food insecurity has risen dramatically in recent years, and unusual and unpredictable weather is a key driver – especially for the world's smallholder and subsistence farmers. In the absence of sustainable solutions, falling crop yields will push more people into poverty – in Africa alone, an estimated 43 million people could fall below the poverty line by 2030 as a result.

Trees can help here, too. CIFOR-ICRAF's research shows that forests, trees, and agroforestry play key – and often undervalued – roles in supporting food security and nutrition.

These roles include contributing to incomes and employment; boosting dietary diversity; providing bioenergy (in the form of fuelwood and/or charcoal) for cooking and boiling water; and performing ecosystem services that are critical for agriculture and food production, such as keeping watersheds functional and boosting soil health and fertility.

3. There are so many places we can put more trees

Many of us are aware of the importance of preserving intact primary forests, which is often home to unique biodiversity and extensive stores of carbon.

But planting and preserving trees in agricultural landscapes is also extremely worthwhile for biodiversity conservation, as the Trees on Farms (TonF) project emphasizes and promotes – and maintaining the ecosystem services that keep carbon in the ground.

Agroforestry offers a compelling approach to meeting food security, livelihood, and climate mitigation needs, by storing an average of 8.4 tonnes of carbon per hectare per year. Meanwhile, "even small incremental increases in global tree cover on agricultural land could provide short-term respite to carbon accumulation in the atmosphere, benefiting the livelihoods of smallholder farmers, biodiversity, ecosystems, and ecosystem services," according to an international, multidisciplinary 2022 study.

4. Planting and protecting trees makes financial sense

Cleaning up the messes caused by climate change is extremely expensive and set to become more so, as governments around the world are already well aware. In this context, investing in trees, forests, and agroforestry makes sound financial sense. For instance, the USD 800 million investment made in the ten-year CGIAR Research Program on Forests, Trees and Agroforestry (FTA) between 2011 and 2021 was conservatively estimated to bring USD 240 billion in economic returns and avoided losses,

by enhancing protection for forests, restoring degraded land, improving management, and helping boost food security, nutrition, and livelihoods. That's a lot of value for money.

5. Trees can help build communities' resilience to climate change impacts

Extreme weather events have already shown us that trees can offer up much-needed protection as climate threats increase. Mangroves, for instance, play a key role in mitigating the impact of storm surges on vulnerable coastal communities, while trees in water-scarce areas help to regulate the climate and boost soil water storage capacity.

What's more, by providing habitats for biodiversity, the presence of trees also boosts the chances that some of the species they harbour will be able to adapt to a changing environment – thus helping to nourish the ecosystems of the future and ensure they can serve life and livelihoods for generations to come.

forestsnews.cifor.org

The world's boreal forests may be shrinking as climate change pushes them northward

A brown bear in a Siberian boreal forest. (Credit: Logan Berner, CC BY-ND)

Earth's boreal forests circle our planet's far northern reaches, just south of the Arctic's treeless tundra. If the planet wears an Arctic ice cap, then the boreal forests are a loose-knit headband wrapped around its ears, covering large portions of Alaska, Canada, Scandinavia and Siberia.

The boreal region's soils have long buffered the planet against warming by storing huge quantities of carbon and keeping it out of the atmosphere. Its remoteness has historically protected its forests and wetlands from extensive human impact.

These two traits rank boreal forests among the most important ecosystems on Earth. In addition, numerous species of mammals, fish, plants, insects and birds make these forests home.

For over two centuries, scientists have recognized that climate plays a key role in determining the geographic zones of plant communities. Because boreal forests and soils face subzero winters and short summers, these forests and the animals that live in them are shifting northward as temperatures rise.

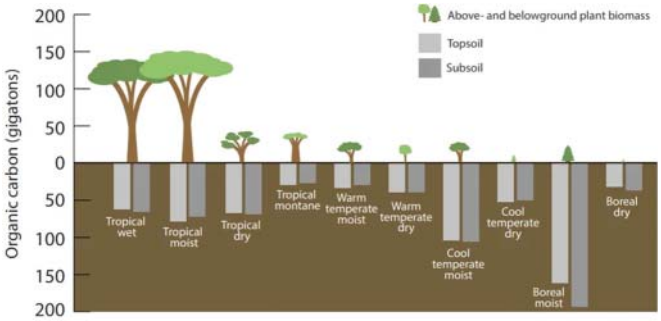
However, boreal forests' northward advance has been spotty and slower than expected. Meanwhile, their southern retreat has been faster than scientists predicted. As scholars who study northern ecosystems, forests and wetlands, we see concerning evidence that as the world warms, its largest forest wilderness appears to be shrinking.

The largest wilderness on Earth

Boreal forests contain billions of trees. Most are needleleaf, cone-bearing conifers, but there also are patches of broadleaf species, including birch, aspen and poplar. They support millions of migratory birds and iconic mammals like brown bears, moose and lynx.

These trees and the soils around their roots help regulate Earth's climate, in part by pulling carbon dioxide out of the atmosphere, where it would otherwise act as a greenhouse gas. The trees use this carbon to grow roots, trunks and leaves, which eventually turn into carbon-rich soil once the tree dies. Significant changes to the forests will translate to changes in global climate.

These forests are warming at rates well above the global average. Rising temperatures directly affect the growth and survival of trees and, in turn, their ability to store carbon.



Different forest types around the world store varying amounts of carbon. Warm tropical regions tend to store much more carbon in plants, while cool boreal forests have enormous carbon stores in soil. (Credit: U.S. Forest Service)

Forests on the move

As atmospheric warming frees trees from the icy grip of cold temperatures, adult trees can respond by growing faster. Milder temperatures also allow young seedling trees in the most northern boreal forests to gain a foothold where previous conditions were too harsh for them to become established.

In the warmer, southern boreal forests, the situation is quite different. Here, conditions have become too warm for cold-adapted boreal trees, slowing their growth and even leading to their death. With warming comes dryness, and water stress leaves trees more susceptible to insect infestation and fires, as Canada has experienced in 2023 and Siberia in 2019 and 2020.

If this happens at a larger scale, southern boreal forest boundaries will thin and degrade, thereby retreating farther north, where temperatures are still suitable.

If boreal forests expand northward and retreat in the south at the same rates, they could slowly follow warming temperatures. However, our combined research using satellite and field data shows that the story is more complex.

Flames from the Donnie Creek wildfire burn along a ridgetop north of Fort St. John, British Columbia, Canada, on July 2, 2023. Fire is part of the ecology of boreal forests, but climate change is drying out trees and making them more fire-prone. (Credit: AP Photo/Noah Berger)

Tracking forests from space

Satellites are invaluable for tracking how boreal forests have changed in recent decades and whether these changes are consistent with an overall northward shift. Researchers can use satellites to monitor year-to-year changes in forest characteristics, such as annual tree growth and tree cover.

Our recent studies using satellite data showed that tree growth and tree cover increased from 2000 to 2019 throughout much of the boreal forest. These changes occurred mainly in the coldest northern areas. However, there was limited evidence to indicate that forests were expanding past current tree lines.

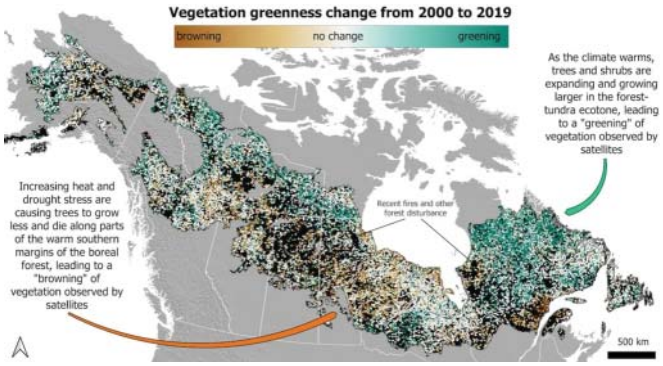
Our studies also revealed that tree growth and tree cover often decreased from 2000 to 2019 in warmer southern areas of the boreal forests. In these regions, hotter and drier conditions frequently reduced tree growth or killed individual trees, while wildfires and logging contributed to tree cover loss.

Satellite data makes it clear that climate change is affecting both the northern and southern margins of the boreal forest. However, if tree cover loss in the south occurs more rapidly than gains in the north, then the boreal forest will likely contract, rather than simply shifting northward.

Zooming in to understand forest change

Forests advance when individual tree seeds germinate and grow, but boreal trees grow slowly and require decades to reach a size that's visible from space. Finding young trees whose presence would signal tree-line movement requires data from the ground.

In the late 1970s, one of us (David Cooper) documented that young spruce trees were growing at altitudes hundreds of yards higher and locations miles north of the highest-elevation cone-bearing trees in Alaska's Brooks Range. Returning in 2021, we found those little trees had grown to be several yards tall and were producing cones. More importantly, 10 times the number of young spruces now grow above and beyond the tree line than during our first field forays.



Satellite measurements show that plant growth widely increased along the cold northern margins of the boreal forest in recent decades, but it often decreased along the warm southern margins – potential early indicators that the boreal forest is beginning to migrate northward. Logan Berner, based on results from Berner and Goetz 2022. (Credit: CC BY-ND)

Crisscrossing the boundary between Alaska's boreal forest and its Arctic tundra on foot, we have found thousands of young boreal trees growing up to 25 miles north of established tree lines. Most grow where deeper snows fall, due to an Arctic Ocean version of the "lake effect": Cold air moves across open water, picking up warmth and moisture, which then falls as snow downwind.

Retreating sea ice leaves more open water. This generates stronger winds that propel tree seeds farther and more snowfall that insulates seedlings from harsh winter conditions. The result is that trees in Alaska's Brooks Range are rapidly moving into the treeless tundra. However, these rapid expansions are localized and do not yet happen everywhere along the northern tree line.

A young white spruce colonist on the Alaskan tundra, with the Brooks Range mountains in the background. (Credit: Roman Dial, CC BY-ND)

The future face of boreal forests

Our combined research shows that boreal forests are, in fact, responding to rising temperatures. But rapid rates of climatic change mean that trees likely can't move northward at a pace that keeps up with their loss in the south.

Will trees in the far north ever catch up with climate and prevent forest contraction? At this point, scientists simply don't know. Perhaps the newly established trees in the Brooks Range herald such an expansion. It's also unclear whether the northern parts of boreal forests can accumulate enough carbon through increased growth to compensate for carbon losses in the south.

If boreal forests are indeed on the verge of contracting, they will eventually disappear from their current southern edge. This would harm many native and migratory animals, especially birds, by reducing their boreal habitat. The forests also are culturally important to several million people who call them home, such as Canada's aboriginal communities.

Monitoring boreal forests around the world more closely, using both satellite data and on-the-ground measurements, will help fill out this picture. Only then can researchers hope to glimpse the future of one of the Earth's last wildernesses.

theconversation.com

Pakistan is planting lots of mangrove forests. So why are some upset?

A worker harvests mangrove "propagules" from a forest planted five years ago in the Indus River Delta in southern Pakistan. A propagule is basically a spear-shaped baby tree that drops off the mama tree. They're harvested and planted elsewhere as workers undertake one of the largest mangrove forestation efforts in the world – a project that will take years and cost millions. Diaa Hadid/NPR

A member of the wildlife department of the southern Pakistani province of Sindh flies a drone over mangrove forests planted five years ago to check on how they are growing. This is part of one of the largest mangrove forestation efforts in the world. Diaa Hadid/NPR

Wildlife ranger Mohammad Jamali boats through mangrove forests of the Indus River Delta, the terminus of a curly waterway that begins thousands of miles upstream in the Himalayas. Birds flutter in and out. Insects dart around mangrove roots that poke like fingers out of the mud. It looks ancient, but this part of the forest is only 5 years old.

"We planted this," says Jamali, 28-years-old. We – rangers of the wildlife department of the government of the southern Pakistani province of Sindh, and locals of nearby fishing communities.

This forest in southern Pakistan is part of one of the world's largest mangrove restoration projects, covering much of the vast delta, an area nearly the size of Rhode Island. These trees, which exist in slivers between sea and land, are powerhouses of sucking up the carbon dioxide that is dangerously heating up the planet.

"They do this very big job per hectare," says Catherine Lovelock, an expert on coastal ecology. Mangroves capture, or sequester, carbon dioxide «through their roots and into the soil, as well as above ground,» she says.

This mangrove reforestation effort alone in the Indus Delta is expected to absorb an estimated 142 million tons of carbon dioxide over the next sixty years. It›s a test case for restoration, and planting mangroves at this scale might help the fight to curb planetary warming.

Speaking over gusty winds, Jamali, the wildlife ranger, says reforestation began here two decades ago after a cyclone swept through and killed dozens of people. The area was hit hard, because the mangrove forests that once fringed this area had died away over the decades after successive Pakistani governments built dams upstream that deprived the delta of fresh water. The mangroves were a buffer between the sea and local communities, muting the impact of storm surges during cyclones and heavy storms.

According to Afia Salam, an environmental campaigner, it was a former Sindh wildlife ranger, Tahir Qureshi, who pioneered planting mangrove species that don't need so much fresh water, because there's so little of it now in the Indus River Delta.

Qureshi died in 2020 after a lifetime of advocacy for mangroves, and on behalf of the impoverished fishing communities that rely on them to attract aquatic life. Salam recalls fisherfolk called him "baba," or father, "because they respected what he was doing," she says, "how he was benefiting the communities."

Qureshi oversaw the forestation of some 30,000 hectares of mangrove forest over the decades. But planting efforts were supercharged after a Pakistani company, Delta Blue Carbon, partnered with the provincial government to restore more than a hundred thousand hectares of degraded forests, and to plant an area more than double that with new mangroves.

Building out a mangrove forest, sapling by sapling

Jamali, the wildlife ranger, jumps out of the boat to show how they are expanding mangrove forests. From a mangrove tree,

he snaps off a thing that looks like a spear. It's a propagule, basically, an already germinated seed that drops from the mother tree and lodges into the muddy, wet soil below.

Wildlife ranger Mohammad Jamali heads into the nearby shallow waters of a mangrove forest, planted just five years ago, to show how workers are harvesting baby mangrove trees to replant elsewhere. Tree by tree, they are expanding this forest to encompass the entire Indus River Delta, and when completed, will cover an area nearly the size of Rhode Island. Diaa Hadid/NPR

Workers harvest the propagules and raise them in nurseries on the forest outskirts. When they're hardy enough, the workers plant them elsewhere. That scale of reforestation takes years, and has so far cost millions – far more than the provincial government was willing, or even able, to spend on its own.

The company Delta Blue Carbon has chiefly funded these efforts, spending years preparing this project, making agreements with local communities and the government. The company undertook this project so it could sell the mangrove's carbon dioxide removal service as credits to polluting companies.

Delta Blue Carbon representatives declined to respond to a detailed list of questions.

The way carbon credits work is if a company *emits* a ton of planet-heating carbon dioxide, it can pay another company to do some activity that *absorbs* a ton of carbon dioxide. Carbon dioxide can be absorbed and stored many ways, including by planting forests, restoring wetlands and in this part of Pakistan, planting mangroves.

Delta Blue›s carbon credit program works by planting mangroves that suck up and store carbon dioxide and then it sells credits for that activity. This is big business in a world where companies are trying to show they are compensating for the carbon dioxide they are emitting, also called becoming «carbon neutral».

But is it "carbon colonialism"?

In Pakistan, some environmentalists say without carbon credits, this massive reforestation project wouldn't have happened. They say the government was incentivized to support it. Instead of having to find the budget to do this, the government is being paid proceeds from carbon credit sales.

So far, Delta Blue Carbon has sold two batches of credits, most recently in June. It›s made the provincial government around $40 million so far, according to local media outlet Arab News. It›s big money in a poor country.

«It is paying money. It is generating revenue,» says ecologist Rafiul Haq who consulted on the mangrove project. Haq says without that revenue stream, the government would be under pressure to let developers in, for shrimp farms or for seaside homes.

Haq says there›s another benefit: auditors must evaluate the company›s progress before they can sell more carbon credits, which means the mangrove forests are nurtured and protected, and the company has to show local communities are benefiting. «This is a blessing for us,» Haq says. «We have to present ourselves as the good boy,» he laughs.

A woman walks past lines of men waiting for donations of food from a charity in the fishing village of Keti Bandar, at the mouth of the Indus River Delta in southern Pakistan. Poverty here is still widespread although fishermen say their lives have been improving since mangrove reforestation efforts began here in earnest a few years ago. Diaa Hadid/NPR

To other environmentalists, the mangrove project is "carbon colonialism."

"I don't begrudge anyone, especially in areas like these, for taking money for large scale restoration projects like this," says Polly Hemming, director of the climate and energy program of the progressive think tank, the Australia Institute. But she says, «it›s just another form of carbon colonialism. Like, we›ll give you some money to restore your land,» and then, sell «your credits to a polluter so they can continue emitting.»

Fishermen gather their daily catch in a hut by the jetty in Keti Bandar, a fishing village at the mouth of the Indus River Delta in southern Pakistan. Fishermen here say their catches of fish, shrimp and crabs have been improving since mangrove reforestation efforts began here in earnest. Diaa Hadid/NPR

Underscoring that argument, Hemming pointed to one of the key purchasers of these carbon credits is one of the world›s largest fossil fuel trading companies, Trafigura. It is also one of the world›s largest traders of carbon credits. Through a spokesperson, the company declined to comment for this story.

In Keti Bandar, in a fishing hut near the jetty, 23-year-old Gul Zamir shakes freshly caught blue crabs into freezer boxes for market. He says crab, shrimp and fish have been returning in greater numbers as the mangroves have expanded. He calls them «nurseries» for sea life, and magnets that bring back catches.

He says a few years ago his family could only eat one meal a day – rice and lentils, or fish that he caught. Now he says, they're eating three meals a day – "beef, mutton, chicken," Zamir crows, and pats his belly. That's where he measures the difference.

npr.org

After a record year of wildfires, will Canada ever be the same again?

Unprecedented blazes tore through boreal forest unleashing vast carbon emissions in what may be a permanent change of state

A firefighter from an Alaska smoke jumper unit uses a drip torch to set a planned ignition on a wildfire burning near a highway outside Vanderhoof in northern British Columbia, Canada, on 11 July 2023. (Photograph: Jesse Winter)

Canada's extraordinary year of wildfire finally appears to be slowing down, leaving behind a weighty legacy of charred northerly forests, acrid smoke and a huge pulse of carbon emissions that will have reverberations for the climate around the world.

Fire ravaged Canada in 2023 like no other year, by a stupendous margin. A record 45.7m acres (18.5m hectares) went up in flames, an area about twice the size of Portugal, shattering the previous annual record nearly three times over. From the spring onwards, more than 6,500 fires sprang up, unusually, across the whole country, tearing through Nova Scotia in the east to British Columbia in the west.

The fires were largely centered on Canada's vast boreal forests, a trove of habitat for creatures such as moose, bears and songbirds and a crucial carbon bank that blankets an area larger than India, representing about a quarter of the world's remaining intact forest.

Most of the blazes were in remote areas – but there were two firefighter deaths in July and numerous evacuations, most memorably the 20,000 citizens of Yellowknife, the capital of the Northwest Territories, who had to flee their homes in August as multiple fires converged upon the city.

Fire has always been a feature of Canada's forests but experts say this year was not only a staggering departure from previous norms but also a grave omen of the sort of conditions that will be wreaked by the climate crisis, which is helping spur larger, fiercer wildfires through elevated temperatures and altered rainfall patterns.

"It has been an exceptional, epic year," said Stephen Pyne, a fire historian at Arizona State University. "We are watching mythology become ecology – it's a slow-motion Ragnarök. We've had ice ages in the past but we are now living through what I call the 'pyrocene'. Imagine an ice age but instead of ice as a forming feature, we have fire.

"This is clearly a case of climate change adding energy to the system, magnifying the boom and bust of the boreal forest. We may be witnessing a change of state, a change in the character of this environment."

At least 100 of Canada's fires this year have been so fierce as to create their own weather via pyrocumulonimbus clouds, or "fire storm clouds", which can stretch 200 miles (320km) wide and carry ash and other debris upward and unleash lightning that can trigger multiple other fires that immolate more trees.

The sheer intensity of some of these blazes means it is not clear whether the dominant fir and spruce trees in the boreal forest will come back as before – it may be a different, more flammable mixture of vegetation that regrows in their place.

"We are seeing an environment adapted to ice being driven off to be replaced by one that is adapted to fire," said Pyne. "If you have these sort of fires, these sort of monsters, you start to see quite big changes."

Smoke from Canadian wildfires turned the skies orange in US cities, including New York, seen here on 7 June. (Photograph: David Dee Delgado/Getty Images)

The impact of the fires was also felt far beyond Canada's borders, causing plumes of smoke that turned New York City's skies a dystopian orange in June and as recently as last month caused hazy skies as far away as Florida. People in cities in eastern Canada and the north-east US were forced to put on masks discarded since the Covid pandemic amid some of the worst air quality in the world, as hospitalizations for conditions such as asthma spiked.

The impact upon the world's climate will be even more significant than this. According to data from the European Union's satellite monitoring service, more than 1.7bn tons of planet-heating gases have been released this year by the enormous fires – about three times the total emissions that Canada, a major fossil fuel-producing nation, itself produces each year.

Such huge emissions, eclipsing in a single year any measure, however ambitious, to cut pollution from cars or factories by a country like Canada, are a major drag upon efforts to stem the climate crisis. The majestic boreal forests, much like the Amazon rainforest that now emits as much carbon as it sucks up and is tipping towards becoming a savannah, suddenly appear to be a danger to the world's climate rather than a key safeguard.

The planet's most important stories. Get all the week's environment news – the good, the bad and the essential

"People used to see places burn on the news but now they are feeling it with smoke where they live," said Pyne. "Who would've cared about fires in northern Quebec before? But now it's suddenly smoky in major metropolitan areas and people have to care. It's all very real for them.

"The forest isn't our friend any more," he added. "This was supposed to be a natural reservoir, our carbon bank, but now the bank isn't stable. There's a bank run. It is going to burn, as well as the peat below the ground that is also a huge store of carbon. It's potentially a carbon timebomb."

For Canada, the challenge of maintaining its huge forests in an age of rapid climate breakdown looms large. The country has about 10% of the world's forests and a third of this land has burned in the past 40 years. Even as temperatures plummet and snow starts to arrive over winter, many of the outbreaks will continue to smolder underground as "zombie" fires, possibly then rearing up again next year.

This handout satellite image from 16 August shows fires burning in Yellowknife, Northwest Territories, Canada. Photograph: European Space Agency/AFP/Getty Images

Fire is now a near-constant. This year's extremes have severely taxed firefighters, pushed to the brink of exhaustion battling flames in areas that had to be protected while other, more remote, fires were left to burn, spewing out carbon.

"This year has just been totally unprecedented," said Mélanie Morin, a spokeswoman for Sopfeu, a firefighting organization in Quebec, which smashed its record for the area burned in a year. The tone for Quebec's summer was set by a series of lightning strikes in June that set off dozens of fires that firefighters, some of them volunteers from as far as France and South Korea, struggled to contain.

"Everyone worked very hard this summer, everyone was tired with the consecutive shifts," Morin said. "We are starting to see the consequences of tiredness and the effect on people's mental states.

"This was something new for eastern Canada. There is a kind of new consciousness that fires exist in this part of the country. People are more aware of it. Those images of the smoke in New York City were shocking but this is the cause and effect of an unprecedented amount of fire."

by Oliver Milman
theguardian.com

Forests with multiple tree species are 70% more effective as carbon sinks than monoculture forests, study finds

To slow the effects of climate change, conserve biodiversity, and meet the sustainable development goals, replanting trees is vital. Restored forests store carbon within the forest's soil, shrubs, and trees. Mixed forests are especially effective at carbon storage, as different species with complementary traits can increase overall carbon storage.

Compared to single-species forests, mixed forests are also more resilient to pests, diseases, and climatic disturbances, which increases their long-term carbon storage potential. The delivery of other ecosystem services is also greater in mixed species forests, and they support higher levels of biodiversity.

Although the benefits of diverse forest systems are well known, many countries› restoration commitments are focused on establishing monoculture plantations. Given this practice, an international team of scientists has compared carbon stocks in mixed planted forests to carbon stocks in commercial and best-performing monocultures, as well as the average of monocultures.

Their work is published in *Frontiers in Forests and Global Change*.

"Diverse planted forests store more carbon than monocultures – upwards of 70%," said Dr. Emily Warner, a postdoctoral researcher in ecology and biodiversity science at the Department of Biology, University of Oxford, and first author of the study. "We also found the greatest increase in carbon storage relative to monocultures in four-species mixtures."

Credit: Unsplash/CC0 Public Domain

Species richness increases carbon storage potential

The researchers analyzed studies published since 1975 that directly compared carbon storage in mixed and single-species forests, and combined this with previously unpublished data from a global network of tree diversity experiments. "We wanted to pull together and assess the existing evidence to determine whether forest diversification provides carbon storage benefits," Warner explained.

The mixed planted forests assessed in the study ranged in species richness from two to six species. In the data set the scientists worked with, four-species mixtures were the most effective carbon sinks. One such mix was made up from different broadleaf trees, which can be found across Europe. Mixes with two species also had greater above-ground carbon stocks than monocultures and stored up to 35% more carbon. Forests made up of six species, however, showed no clear advantage to monocultures.

Accordingly, the researchers were able to show that diversification of forests enhances carbon storage. Altogether, above-ground carbon stocks in mixed forests were 70% higher than in the average monoculture. The researchers also found that mixed forests had 77% higher carbon stocks than commercial monocultures, made up of species bred to be particularly high yielding.

Forests for the future

"As momentum for tree planting grows, our study highlights that mixed species plantations would increase carbon storage alongside other benefits of diversifying planted forests," said Dr. Susan Cook-Patton, a senior forest restoration scientist at The Nature Conservancy and collaborator on the study. The results are particularly relevant to forest managers, showing that there is a productivity incentive for diversifying new planted forests, the researchers pointed out.

While showing the increased potential of mixed forests to store more carbon, the researchers cautioned that their study is not without limitations, including the overall limited availability of studies addressing mixed vs. monoculture forests, particularly studies from older forests and with higher levels of tree diversity.

«This study demonstrates the potential of diversification of planted forests, and also the need for long-term experimental data to explore the mechanisms behind our results," Warner said. "There is an urgent need to explore further how the carbon storage benefits of diversification change depending on factors such as location, species used and forest age."

More information: Young mixed planted forests store more carbon than monocultures – a meta-analysis, *Frontiers in Forests and Global Change* (2023). DOI: 10.3389/ffgc.2023.1226514

phys.org

The importance of forests and new challenges for science in the context of military operations. Scientific articles in the field of forestry and tree science.

Forests are essential for ensuring the ecological balance and viability of the planet. In today's environment, where we are constantly facing complex environmental challenges, wars, disasters and climate change, the study and conservation of the forest ecosystem is a priority.

The Ukrainian Journal of Forest and Wood Science (https://forestscience.com.ua/en) promotes the dissemination of knowledge in this field. It is a peer-reviewed open access journal that publishes original scientific and review articles.

Scientific research in the field of forestry and tree science helps to understand the causes of problems and find effective methods to solve them.

Join our unbreakable team and publish your research papers in the Ukrainian Journal of Forest and Wood Science (https://forestscience.com.ua/en/submission).

When birds gorge on cicadas, caterpillars go unchecked and chomp their way through oak forests

Scientists trace ecological effects of cicada brood to defoliation of forests

This brown headed cowbird was one of many birds that feasted on cicadas – rather than caterpillars – when Brood X emerged in 2021.CHIP SOMODEVILLA/GETTY IMAGES

Every 17 years, billions of cicadas emerge from the soil in the eastern United States to climb trees, mate, and lay eggs. For a few weeks, the plump insects provide an all-you-can-eat buffet for birds, mammals, and other predators. "It's a phenomenal explosion to an ecosystem," says Kathy Williams, an insect ecologist at San Diego State University.

The consequences of this gluttony ripple through the ecosystem, as satiated birds ignore their usual prey of caterpillars, which then grow fat eating the leaves of oaks, researchers report today in *Science*. "I thought this was an amazing study," says Jalene LaMontagne, a population ecologist at DePaul University who was not involved. "It really adds to the big picture of cicadas," says Gene Kritsky, an entomologist at Mount St. Joseph University.

Many species of cicada appear every year, chirping and buzzing through summer days. Other species, called periodical cicadas, live for 13 or 17 years underground before appearing in massive numbers. They live in populations, or broods, that create a geographical patchwork across the eastern United States, emerging in different places on different schedules. Each brood produces so many periodical cicadas that predators can't eat them all, and enough individuals survive to reproduce. Although the cicada feast can help predators increase their numbers the next year, their populations shrink back to normal before the periodical cicadas emerge again.

Ecologists John Lill of George Washington University (GW) and Martha Weiss of Georgetown University have studied insects in oak forests for many years. While Brood X, the largest of the cicada broods, was still preparing to emerge, Lill and Weiss wondered what the massive numbers of cicadas would mean for caterpillars. Too many caterpillars can wreak havoc on oak trees, but birds keep their populations in check. Lill and Weiss reasoned that if birds filled up on cicadas, they might not have much appetite left for their usual diet of caterpillars.

To find out, they counted caterpillars on oak trees in two locations near Washington, D.C., 1year before the Brood X emergence. They and colleagues also measured birds' appetites by gluing clay models of caterpillars onto branches. Each week, they found, about 25% of these decoys had been pecked.

When Brood X finally emerged in 2021, the feast was on. Weiss and Lill gathered 983 observations from birders in Mid-Atlantic states. All told, 82 bird species were reported feeding on the cicadas. "We were really surprised at how many bird species were eating cicadas," says entomologist Zoe Getman-Pickering, who at the time was a GW postdoctoral researcher. Trumpeter swans wolfed down the 1.2-gram cicadas. Even blue-gray gnatcatchers, which weigh less than 7 grams, managed to pick at bits of a cicada like eating pieces of BBQ chicken.

All this easy food meant birds didn't eat as many caterpillars. After the cicadas emerged in May 2021, fewer than 10% of the clay caterpillar models were pecked each week. By August 2021, after the cicadas had finished mating and died or been eaten, those levels returned to about 25%. A tally of real caterpillars in the oak forests revealed their population was twice that of the following 2 years, when the cicada brood had returned underground. The researchers also found that a common caterpillar, the eclipsed oak dagger (*Acronicta increta*), was much more likely to grow large – defined as developing to a stage called the third larval instar or beyond – when the birds were full of cicadas. In fact, in 2021, more than half of measured caterpillars grew to this large stage compared with 13% or 1% in the subsequent 2 years, respectively.

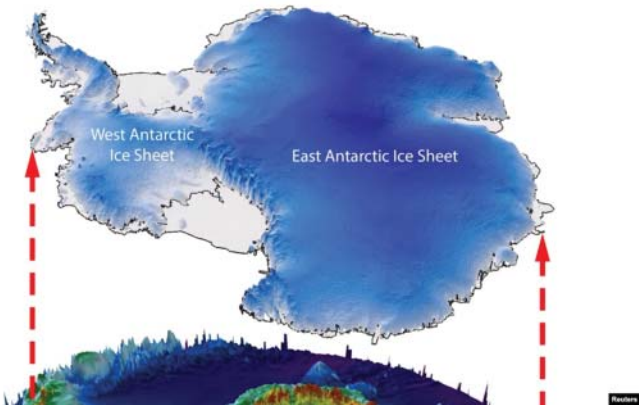
As the very hungry caterpillars grew plump, they feasted on oak trees. The researchers observed that leaf damage was twice as extensive during the cicada glut. "The leaves looked like lace, they had so many holes of different shapes and sizes," Getman-Pickering says. It's not clear whether such leaf damage harmed the ability of the tree to reproduce, because they were not old enough to produce acorns, but previous studies suggest this level of herbivory could set the forests back. Research on tree rings shows that oaks grow more slowly during years when cicada broods emerge.

The cicadas themselves do some damage when females lay their eggs inside twigs. But the dead bodies of cicadas also release nutrients back into the soil, which could benefit plants. The bugs' burrows and tunnels help air and water penetrate the soil, as well.

Getman-Pickering hopes the new research will serve as a reminder of how interconnected ecosystems are – and that shocks to them can have wide-ranging consequences. The disruption from Brood X "was short-lived, it was intense, and then it went away." In contrast, current changes such as declines of bird populations through loss of habitat, climate change, or invasive species are chronic and widespread.

science.org

Antarctica was once home to rivers, forests



An illustration shows how a landscape the size of Belgium located in Wilkes Land, East Antarctica would appear if the thick ice sheet covering it were lifted away. (Stewart Jamieson, Durham University/Handout via REUTERS)

Antarctica has not always been a land of ice and snow. Earth's southernmost continent once was home to rivers and forests full of life.

Scientists are using satellite observations and radar imagery to look deep under the ice. The researchers report finding a large ancient landscape buried under the continent's ice sheet. It is full of valleys and ridges, shaped by rivers before being covered by glaciers long ago.

The landscape is located in East Antarctica's Wilkes Land area bordering the Indian Ocean. It covers an area about the size of Belgium. The researchers said the landscape appears to date to at least 14 million years ago and perhaps beyond 34 million years ago, when Antarctica entered its deep freeze.

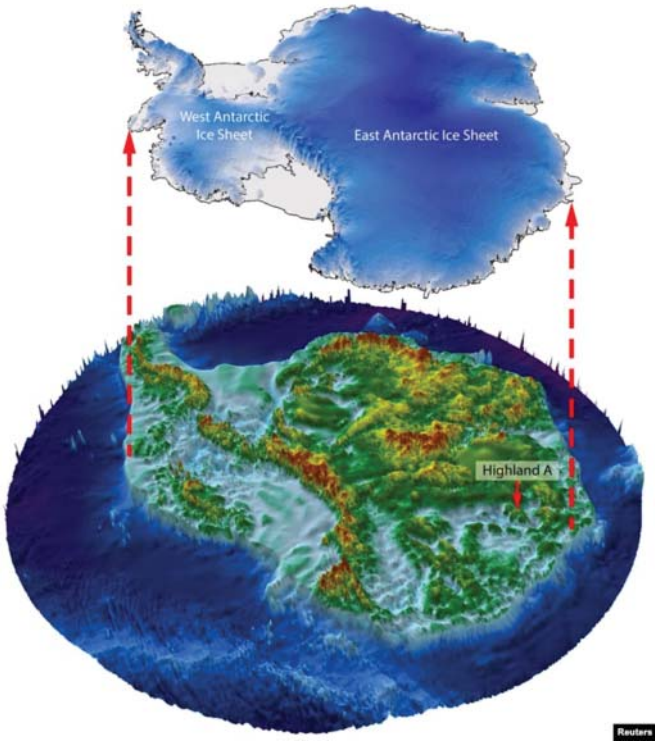
"The landscape is like a snapshot of the past," said Stewart Jamieson. He is a professor of glaciology at Durham University in England and co-leader of the study published in the journal *Nature Communications*.

"It is difficult to know what this lost world might have looked like before the ice came along, but it was certainly warmer back then," Jamieson added. "Depending how far back in time you go, you might have had climates that ranged anywhere from the climate of present-day Patagonia through to something more approaching tropical."

Such an environment likely would have been populated by wildlife, Jamieson said. But the area's fossil record is too incomplete to know which animals may have lived there.

The ice above the ancient landscape measures about 2.2 kilometers to 3 kilometers thick, said study co-leader Neil Ross. He is a professor of polar science and environmental geophysics at Newcastle University in England.

The researchers said the surface of the planet Mars is better known than the earth surface below the ice in Antarctica. They said one way to learn more would be to drill through the ice and take a piece of the earth below. This could uncover evidence



An illustration shows how a landscape the size of Belgium located in Wilkes Land, East Antarctica would appear if the thick ice sheet covering it were lifted away. (Stewart Jamieson, Durham University/Handout via REUTERS)

showing ancient life, as was done with samples taken in Greenland dating back two million years ago.

Some earlier studies have uncovered ancient landscapes beneath Antarctica's ice including mountains. But the landscape discovered in the new study was the first of its kind.

Right before 34 million years ago, Antarctica's landscape and wildlife was likely similar to today's cold temperate rainforests. That includes places like Tasmania, New Zealand and South America's Patagonia area, Ross added.

Antarctica was once part of the Gondwana supercontinent that also included what is now Africa, South America, Australia, the Indian subcontinent and the Arabian Peninsula. But it eventually split off in a process called plate tectonics.

Jamieson said the researchers think that when Antarctica's climate was warmer, rivers flowed toward a continental coastline that was created as the other land masses broke away. When the climate cooled, he said, some small glaciers formed on hills next to the rivers, with valleys deepening as glaciers eroded.

When the climate cooled even more, an ice sheet grew which covered the whole continent, Jamieson added. Eventually, "the landscape got preserved, likely for 34 million years."

voanews.com

Publications

We're off track to protect and restore forests by 2030. Here's how we can change course

A startling increase in the speed and intensity of global deforestation has derailed efforts to protect and restore forests by 2030, according to two new reports analyzing progress toward global forest conservation goals.

WWF's *Forest Pathways 2023* report and the *Forest Declaration Assessment* detail the immense scale of forest loss just two years after more than 130 countries representing 85% of the planet's forests pledged to halt and reverse deforestation by the end of the decade. The lack of progress on commitments leaves the world in clear danger of missing vital targets.

In 2022, global deforestation reached 16.3 million acres, with primary tropical forest loss at 10.1 million acres. An alarming 96% of this takes place in tropical regions. Tropical Asia is the only region close to achieving zero deforestation. Without urgent action, tropical forests will begin to act as a carbon source, not a sink, under the pressures of a warming, drying, and increasingly extreme climate. Widespread and increasing deforestation and degradation in the planet's three largest tropical forest basins – the Amazon, Congo, and the forests of Asia-Pacific – could deliver a global climate catastrophe.

Fortunately, there's still time to halt deforestation and sustainably manage and restore forests in ways that benefit people and nature.

«If we're serious about ensuring a future for forests – and halting the biodiversity and climate crises – time is of the essence,» said Kerry Cesareo, senior vice president for forests at WWF. «While the numbers are stark, we know what we need to do. And the *Forest Pathways* report provides tangible guidance for decision-makers, from governments to financial institutions to private sector actors."

Globally, at least 100 times more public funding goes to environmentally harmful subsidies than financing to help forests. Only $2.2 billion in public funds is channeled to forests each year – a mere fraction compared to other global investments. Indigenous peoples and local communities do not receive the necessary resources to secure their rights and effectively manage their lands, even though tropical forests under their stewardship are better protected and deforestation and degradation are lower.

Forest Pathways outlines specific steps countries can take to save forests.

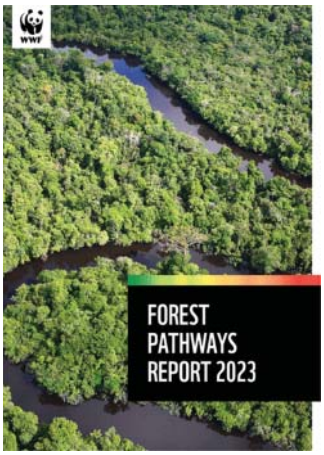
In addition to calling for governments to meet their financial promises, the report sets out a blueprint to save forests by 2030, with essential measures, including:

- Ending forest-harming investments and subsidies such as agricultural subsidies responsible for the loss of 5.4 million acres of forest per year;
- Reforming the rules of global trade that harm forests, cutting deforesting commodities out of global supply chains, and removing barriers to forest-friendly goods;
- Accelerating the recognition of land rights to Indigenous peoples;
- And making the shift toward nature-based economies.

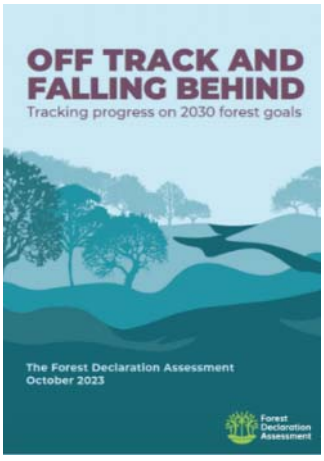
Forest Pathways also includes specific case studies detailing efforts underway across the globe to confront deforestation. These include the Amazon Region Protected Areas (ARPA) program in Brazil and WWF's signature corporate engagement program for forests, Forests Forward.

WWF urges governments and businesses to heed the warnings from the new data and take urgent action to protect and restore forests, including supporting the passage of the FOREST Act and enforcement of the Lacey Act in the United States.

Forests are at the heart of WWF's work. We've supported the creation of protected areas, helped move the forest sector toward sustainability and transparency, and galvanized momentum around forest landscape restoration. We're also working alongside local and global partners to halt deforestation, help restore forests, and put deforestation-free commitments into action around the world.



Download at Forest Pathways Report 2023 | Publications | WWF (worldwildlife.org)



Download at 2023 Forest Declaration Assessment: Off track and falling behind – Forest Declaration

worldwildlife.org

Around the World

Japan to tackle hay fever by felling cedar forests near major cities

Japan recently compiled a policy package to tackle hay fever caused by pollen from cedar and cypress trees, with plans to accelerate their reduction and replace them with varieties that produce less pollen.

The government is expected to initially focus on areas ringing major cities, such as Tokyo and Osaka, and cut down 70,000 hectares of forest annually over the next 10 years, higher than the current removal rate of 50,000 hectares annually.

The package also includes initiatives to introduce machines that can fell trees more efficiently, improve cedar timber distribution facilities and create a system for releasing data regarding the use of domestic timber among home builders within fiscal 2023.

Regarding the use of immunotherapy medicines for alleviating allergy symptoms, the government will work on securing raw materials and help increase production to ensure sufficient supply for 500,000 people from 2025 onward, up from the current 250,000.

Allergies to the pollen, with symptoms such as runny nose and itchy eyes, is estimated to affect more than 40 percent of the population in Japan, according to an Environment Ministry survey.

A large number of cedar trees were planted in reforestation efforts during Japan's period of rapid economic growth after the end of World War II.

The government in May unveiled measures against hay fever consisting of allergy prevention, pollen forecasts and treatment. It plans to reduce the total area covered with cedar trees by around 20 percent in the next 10 years.

mainichi.jp

Indonesia says 200,000 hectares of palm plantations to be made forests

Some 200,000 hectares (494,210 acres) of oil palm plantations found in areas designated as forests in Indonesia are expected to be returned to the state to be converted back into forests, a government official said late on Tuesday.

Indonesia, the world's biggest palm oil producer and exporter, issued rules in 2020 to sort out the legality of plantations operating in areas that are supposed to be forests, aimed at fixing governance in the sector.

Officials said the measures were necessary as some companies have already been tending the land for years, although green groups have attacked the government for forgiving past forest encroachment.

Companies have to submit paperwork and pay fines to obtain cultivating rights on their plantation by Nov. 2, 2023, according to the rules.

While 3.3 million hectares (8.1 million acres) of the country's nearly 17 million hectares of palm plantation have been found in forests, only owners of plantations with a combined size of 1.67 million hectares have been identified, forestry ministry secretary general Bambang Hendroyono told reporters.

The government is still cataloguing which of those are found in designated production forests, meaning owners will have to pay fines but they can continue to grow palm trees, and which are in protected areas and must be returned to the state, he said.

He gave an estimate that about 200,000 hectares will be returned, adding the figure may increase.

"The ones in protected forests and conservation forests, the government wants to restore after they pay the fine," Bambang said, adding this will be part of the government's efforts to mitigate climate change.

Indonesia's chief security minister Mahfud MD has threatened to pursue legal action against palm oil companies that use land illegally after the Thursday deadline passes.

Indonesia has launched several programmes to improve governance in its massive palm oil industry, amid criticism by environmentalists of the crop›s impact on deforestation.

Last year it started an industry-wide audit, followed by this year›s launch of a task force aimed at ensuring companies pay the right taxes.

reuters.com