Conservation news

Do tree-planting projects on grasslands increase fire risk?

Alix Soliman 2 hours ago

- *Global tree-planting initiatives, aimed at storing carbon from the atmosphere, could include plantations in fire-prone African savannas.*
- *58% of tree plantations grown in South African grasslands between 1980 and 2019 burned, polluting water and releasing carbon dioxide back into the air.*
- *As efforts to plant trees for carbon storage in Africa expand, researchers suggest cutting fossil-fuel emissions would be a better approach — but scientists are hotly debating the issue.*

Planting trees is widely recognized as a climate-change solution. But what if those trees go up in flames?

Converting the grasslands of African savannas into new forests poses a fire risk that could call into question its proclaimed benefit, according to a recent study published in *Trends in Ecology & Evolution*.

"If you're doing it for carbon credits, the probability that these trees are going to stay there in the long term is fairly low because you've planted them in a flammable system," said lead author Nicola Stevens, Trapnell Research Fellow in African environments at the University of Oxford in the U.K. Colleagues elsewhere are disputing the team's analysis, part of a vigorous ongoing debate.

The Bonn Challenge, a globally funded IUCN initiative, set a goal more than a decade ago to plant trees across 350 million hectares (860 million acres) of land by 2030. Of the 74 pledges to join the challenge, 42% are in Africa. The African Forest Landscape Restoration Initiative (AFR100) is leading the tree-planting effort there.

A pine plantation in Cape Town, South Africa. Photo by Rhett A. Butler.

Stevens and her coauthor William Bond, an ecologist at the University of Cape Town, South Africa, dug through forestry reports and analyzed erosion and water-quality data from a South African pine plantation that burned in 1981. They also compared funding for tree plantations through the Bonn Challenge with the costs of protecting new forests from fire.

Land managers planted about 1.2 million hectares (3 million acres) of pine trees and eucalyptus trees in South Africa between 1980 and 2019, primarily in grasslands. But more than 58% of those new forests burned, the researchers reported. The country's forestry industry logs these plantation trees for lumber, so the trees are grown close together—sparking fires that burn hot and fast, the authors said.

In contrast, savannas—the dominant ecosystems in Africa—are naturally grassy because they burn too often for forests to establish on their own. Regular, low-level fires cycle nutrients back into the soil and encourage new grasses to grow in the spring.

Tree plantation fires rage more fiercely than grass fires and are igniting more often as the globe heats up, research has shown. The infernos leave bare, damaged soil that struggles to absorb

subsequent rains. Runoff then erodes hillsides and washes nutrient-rich sediment into waterways, causing water pollution.

Grassland fire. Photo credit: Rhett A. Butler

The team considered these impacts in its analysis. “When these megafires have happened, it’s happening in these plantations,” Stevens told Mongabay. “They’re so big and so huge that even the best-resourced countries can’t fight them. They just have to let them burn.”

However, AFR100 “never” promotes pine and eucalyptus plantations and does not aim to transform grasslands into forests, stated Ousseynou Ndoye, the initiative’s regional coordinator for west and central Africa. Instead, Ndoye told Mongabay, AFR100 primarily funds native tree plantings through agroforestry, where communities can eat or sell the fruits.

Moreover, the impact on savannas may be less extensive than the authors claim, said forest scientist and policy analyst Lars Laestadius of the Eco-Innovation Foundation in Stockholm, Sweden, who was not involved with the research. “I don’t see intensively managed tree plantations possibly taking out more than a small fraction of the grasslands,” Laestadius said.

But Bond is skeptical of these perspectives. The likelihood that carbon storage funding will go toward new pine and eucalyptus plantations is high, he said, because these fast-growing species store carbon more quickly than native fruit trees. The sheer amount of land pledged to growing trees far exceeds forestland in Africa, Stevens added. That means countries will have to plant trees in grasslands to meet their commitments.

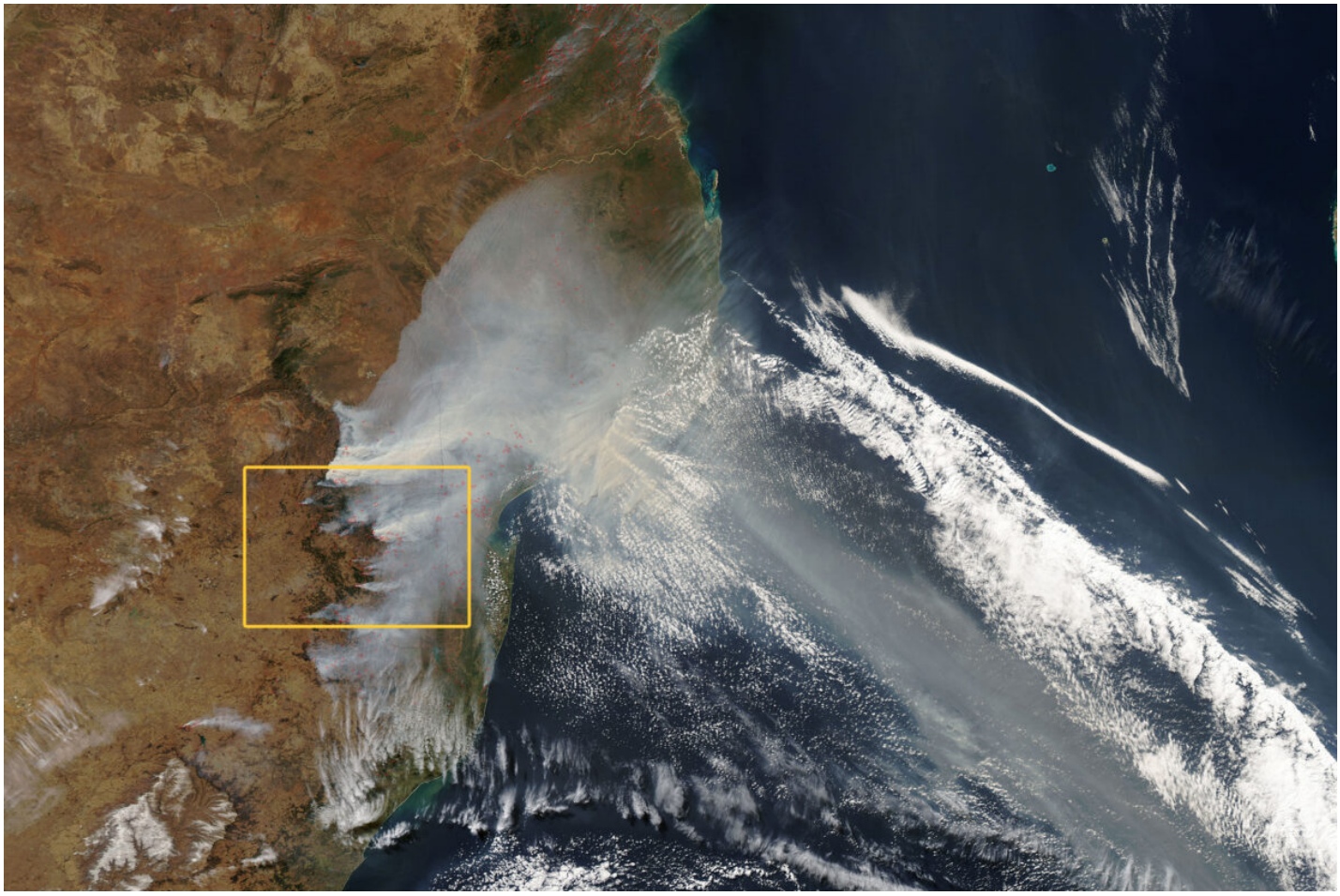
Firefighter fighting a battle against a veld-fire at Ashton Bay, Jeffreys Bay, Eastern Cape Province, Republic of South Africa in March 2017. Photo credit: Steven Terblanch

The issue lies in how scientists define "degraded forest," Stevens and Bond told Mongabay. The maps AFR100 relies on to find suitable land for tree planting have miscategorized savannas as degraded forest, the researchers found in a 2019 paper, opening up huge swaths of grassy ecosystems for forestry.

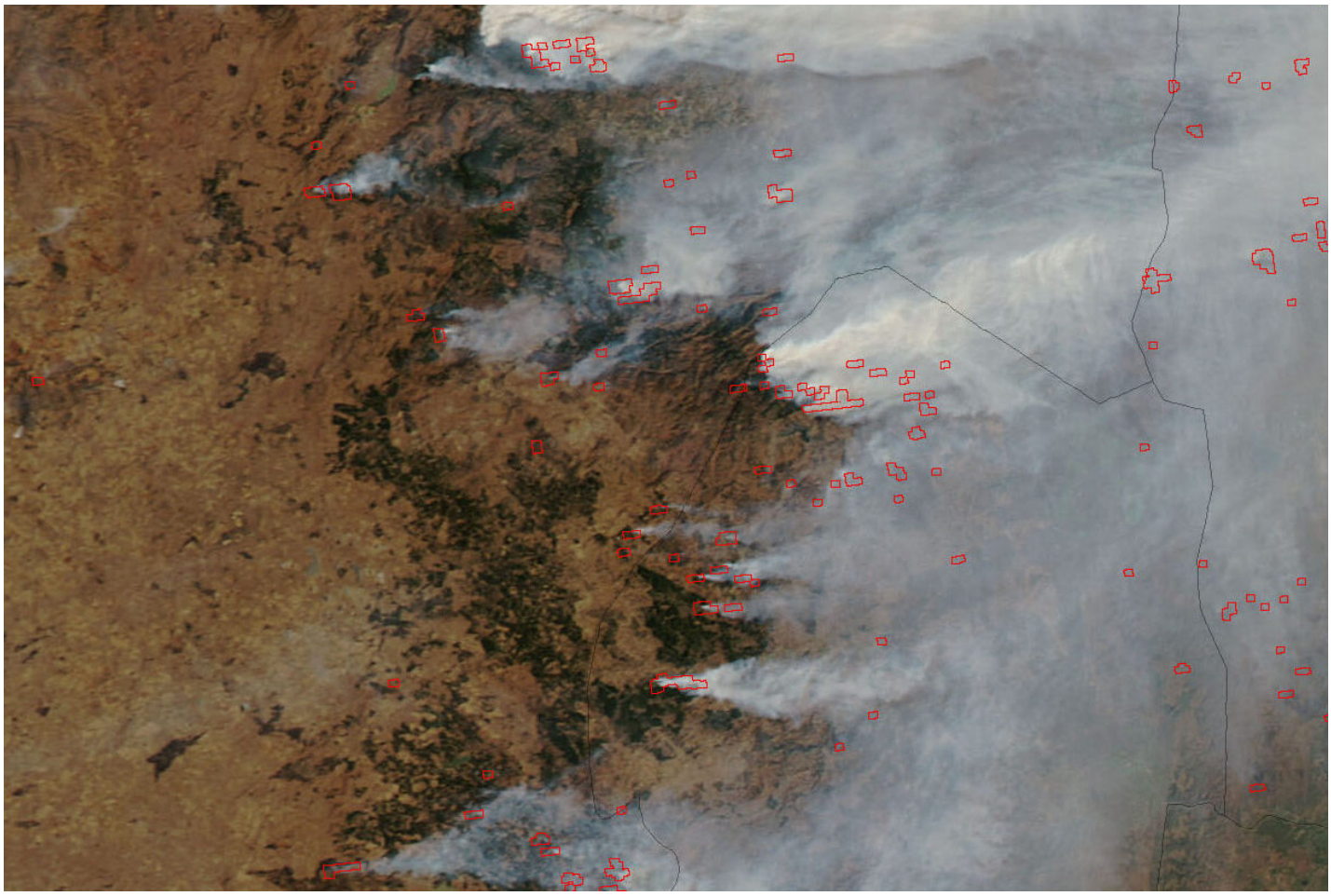
Reliable maps do not exist to show which tree species have been planted through carbon storage initiatives across Africa, they note, nor how many of these trees have taken root in historical grasslands.

The funding available through the Bonn Challenge, roughly $15 per hectare ($6 per acre), only covers the cost of planting the first round of trees. It does not include money for fire prevention, insurance, firefighting, or replanting when an area has been logged or burned, Stevens and Bond found.

“I think that’s a really valuable point,” said Meredith Martin, an unaffiliated forest researcher at North Carolina State University. “Monitoring and maintenance for these tree plantings seems to be really overlooked. Very few organizations [have] mentioned monitoring or survivorship at all.”



Intense fires raged in South Africa on July 28, 2007, when the Moderate Resolution Imaging Spectroradiometer (MODIS) flying on NASA’s Aqua satellite captured this image. Actively burning fire fronts are outlined in red, though it is likely that MODIS could not detect flames beneath the thick wall of smoke that rose from the fires, so only a portion of the fires are marked here. The smoke completely obscures the ground for hundreds of kilometers across northeastern South Africa, southern Mozambique, and the Indian Ocean. Image courtesy Jeff Schmaltz, MODIS Land Rapid Response Team at NASA GSFC.



Zoomed-in version of the image above. Image courtesy Jeff Schmaltz, MODIS Land Rapid Response Team at NASA GSFC.

Amidst the ongoing debate, a pragmatic view is emerging that both approaches—strategic tree planting and cutting carbons emissions—are essential. Still, Bond urges closer scrutiny of the rush toward major new swaths of forest.

"These trees are going to take 50 years before they make a difference, if they make a difference," he said. "Massive speed is needed to reduce fossil fuel emissions. That's where you can step in and really make a difference quickly."

Alix Soliman is a graduate student in the Science Communication M.S. Program at the University of California, Santa Cruz. Other Mongabay stories produced by UCSC students can be found here.

Citations:

- Stevens, N., & Bond, W. J. (2023). A trillion trees: carbon capture or fuelling fires? *Trends in Ecology & Evolution,* 14 October 2023. doi: 10.1016/j.tree.2023.09.015

- Bond, W. J., Stevens, N., Midgley, G. F., & Lehmann, C. E. (2019). The trouble with trees: afforestation plans for Africa. *Trends in Ecology & Evolution, 34*(11), 963-965. doi: 10.1016/j.tree.2019.08.003

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