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Natural regeneration: when to let forests restore themselves

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Allowing forests to reestablish themselves is increasingly being recognised as a more cost-effective strategy for meeting ambitious forest restoration targets.

In May, the UK Forestry Commission announced a grant program designed to encourage the creation of new English woodlands as a means of mitigating climate change, boosting biodiversity, and reducing flooding.

The program will make 15.9 million pounds ($21.7 million) available in its first year to "provide greater financial incentives for landowners and farmers to plant and manage trees," according to a statement a Forestry Commission spokesperson provided to Mongabay. But tree planting isn't the only woodland-creating activity the grant supports: For the first time ever, the British government will also pay landowners for allowing forests to naturally reestablish themselves.

UK environmentalists have welcomed the new policy supporting natural regeneration. "We're really pleased that the UK Government [is] finally giving financial support for the natural regeneration of trees, rather than just for planting trees," Guy Shrubsole, policy and campaigns coordinator for the NGO Rewilding Britain, told Mongabay.

Rewilding Britain has called for a doubling of woodland cover by 2030 and argues that natural regeneration should be considered "the default approach" to achieving that goal. It has a number of advantages over planting trees. For one thing, natural regeneration is cheaper, since you don't have to collect seeds, grow seedlings, plant them, and maintain them to ensure their survival. And, as Shrubsole pointed out, natural regeneration "produces a far more biodiverse, species-rich habitat than tree planting alone."

He added: "Planting saplings invariably leads to trees all with the same age structure, arranged in serried ranks, and with a limited mix of tree and plant species. Tree-planting schemes also overlook the vital importance of scrub — a 'successional habitat' that is created when saplings, brambles and other plants are allowed to naturally regenerate — which is hugely important for biodiversity."

Natural regeneration can occur on its own. Think of the hardwood forests of the eastern United States, which were almost entirely cleared by the mid-1800s for timber and farmland, and have now regenerated to the point that you'd be forgiven for thinking many of them are primary forest.

But when you're talking about restoring a forest that has been cleared for intensive use, such as farming or pasture, it's usually more effective to employ what's known as assisted natural regeneration. This involves a little more work than just stepping back and letting trees grow, like putting up fences to keep cattle, deer and other animals from grazing on new growth, selectively removing vegetation that can threaten the survival of resprouting saplings, and addressing the pressures that lead to logging and other disturbances. All of these activities entail some upfront costs, so "cost-effective" certainly doesn't mean "free."

Tree-planting schemes are abundant these days, and they're touted as one of the best tools we have to combat climate change, species extinction, and a whole host of other environmental crises. But natural regeneration is increasingly being recognised as a more cost-effective strategy for meeting ambitious forest restoration targets like the pledges made under the Bonn Challenge, a global initiative to restore 350 million hectares (865 million acres) of degraded and deforested land by 2030.

So, when is it best to let forests restore themselves?

Karen Holl, an expert in restoration ecology at the University of California, Santa Cruz, said she agreed that forest restorers should consider natural regeneration first, before tree planting. "When I'm talking to people about tree planting campaigns, what I always say is, first of all, we should call it tree growing, not planting," Holl told Mongabay. "People immediately think, 'Let's plant trees.' But the default should be, 'Will they regenerate on their own?'"

If the answer is "no," for a given site, then it makes sense to move on to planting trees, Holl said. She cited three conditions conducive to natural regeneration: proximity of flora and fauna that can act as seed sources and dispersers; high levels of resprouting in the current system; and low-intensity past land use.

The presence of nearby seed sources is the most fundamental requirement for natural regeneration, and perhaps its most important limitation. Natural regeneration will not work everywhere; in areas with no nearby standing forests or woodlands, tree planting is necessary. Exactly what "nearby" means is subject to some debate, however.

Shrubsole's chief criticism of the UK's new fund for forest creation is that it restricts funding for natural regeneration to sites within 75 meters (246 feet) of a standing forest or other seed source. By contrast, the latest science by the UK Centre for Ecology and Hydrology shows that some tree species in England can regenerate as far as 122 m (400 ft) from the nearest seed source, and another study suggests the distance may be even farther.

There can be a lot of variation in the rates of recovery when ecosystems are left to naturally regenerate, which is perhaps one reason why the relative certainty of planting trees often takes precedence. Holl and her collaborator, Rakan Zahawi, director of the Charles Darwin Foundation in Ecuador, conducted a decade-long study of natural regeneration on former agricultural land in Costa Rica.

It showed that the best predictor of how well any given site would recover was what it did in the first couple years of being disturbance-free. If tree seedlings were established within that time, Holl said, sites generally recovered well. If not, they didn't.

"If somebody asks me, 'Do you think natural regeneration would work?' I'll say 'Do you need to plant next year? Could you give it two years and see what happens?'" she said. "If things are going to regenerate naturally, it happens pretty quickly. It's very practical advice, too, it doesn't take a lot of resources."

Forest restorers also need to take social factors into account. A 2014 article published in the journal Restoration Ecology, for instance, identified direct and indirect costs related to natural regeneration. Projects that leave forests to restore themselves often require longer recovery times, which can give the impression that they have failed.

"In the worst case scenario, this can lead to the premature termination of a project by a landowner who would like to see more rapid or visible results," Zahawi and Holl wrote in the paper.

The researchers also wrote that, in some cases, local people perceive land undergoing passive restoration as abandoned, and this can lead to "unanticipated uses, such as ranchers who may unintentionally or intentionally allow livestock to graze the 'unused' forage grass, thus setting back recovery efforts." Then there are the more direct costs, like purchasing the materials to build and maintain fences, and the labor required to keep vigilant watch over the site.

These social factors could make it difficult, if not impossible, to set aside many types of land for two years in order to determine whether or not it is suitable for natural regeneration. And there are some places where natural regeneration might be ecologically feasible, but simply won't work socially because landowners want to plant trees with direct economic value.

Luckily, according to Renato Crouzeilles, senior manager at the International Institute for Sustainability, Brazil, and a professor at Universidade Veiga de Almeida, "You don't need to just wait two years to see if [natural regeneration] happens. You can predict where there is higher likelihood or not for it."

Crouzeilles led a 2020 study that looked at the potential for natural regeneration on the 75.5 million hectares (187 million acres) of land that have been deforested in Brazil's Atlantic Forest. He and his team used remote-sensing data to determine where natural regeneration occurred spontaneously in the Atlantic Forest over the past 25 years and analyzed those places to build a model for predicting what areas will be suitable for natural regeneration in the future.

They found that, of the 34.1 million hectares (84.3 million acres) of current forest cover in the Atlantic Forest, some 2.7 million hectares (6.7 million acres), or 8 per cent, regenerated naturally between 1996 and 2015. Based on their analysis, Crouzeilles and co-authors say 2.8 million more hectares (6.9 million acres) could be restored via natural regeneration, and another 18.8 million hectares (46.5 million acres) could be restored using assisted natural regeneration, by 2035. All of this, they estimate, would cost $90.6 billion less than actively planting those areas with trees.

The model the researchers built for the Atlantic Forest showed that the most important variable was distance to forest remnants: They found that some 90 per cent of naturally regenerated sites occurred within 192 meters (630 feet) of other forested areas.

Crouzeilles said he's hopeful these findings can encourage more policymakers around the world to follow the lead of the UK Forestry Commission and invest in natural regeneration.

"Governments need to recognise natural regeneration. They don't recognise natural regeneration because there is higher uncertainty, and what we are trying to do is reduce the uncertainty," he told Mongabay. "The same for the private sector. They will not invest in something that has higher uncertainty and higher risk."

Crouzeilles is now using the same data to determine where landowners are keeping the naturally regenerated forests standing and where they are cutting them down again. "We are interviewing them to understand why they cut or not, what could change their mind, if it's awareness, if it's financial incentives, and how much we should pay for this," he said. In other words, having built a model to predict which areas meet the biophysical requirements for natural regeneration, Crouzeilles is now attempting to determine the most conducive socioeconomic conditions.

Which isn't to say that natural regeneration, or any one restoration strategy, is a panacea for all of the environmental problems we're facing today, Crouzeilles is quick to point out. It's also crucial that we optimise for the environmental and social benefits forest restoration can deliver, and not just the highest number of trees we can put in the ground.

"Restoration is a means to many ends. Restoration is not the end. The number of trees is not important," he said. "What you need to measure is amount of area, but also the benefit that it provides: social benefits, jobs, income, biodiversity, extinction, connectivity, carbon sequestration, water, air."

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