Not all forests are equal

While tree planting can be good medicine for our sick planet, sheer numbers will not provide the cure. We need a carefully managed restoration effort that helps complex ecosystems to recover

By **Robin L. Chazdon**, Professor Emerita, Ecology and Evolutionary Biology Department, University of Connecticut and Senior Fellow, World Resources Institute Global Restoration Initiative

It is hard not to love trees. They provide myriad benefits for people and wildlife. They protect soil, water quality and the atmosphere. Trees are beautiful and inspiring. Human civilisation was literally built and fed using trees for fuel, fibre and food. Our species is adept at cutting trees down, but gets poor marks for replacing them in kind. Of the estimated six trillion trees that could potentially grow on Earth, only three trillion remain.

These numbers mask the dramatic alteration of the geographic distribution and species composition of tree cover on the planet. Net gains in tree cover over the past 30 years are heavily concentrated in the temperate zones, while net losses prevail in the tropics. The potential for removing carbon from the atmosphere through reforestation is greatest in deforested tropical regions with year-round conditions that favour tree growth.

The cumulative loss of trees through land clearance, fires or drought over the past few centuries contributed heavily to the twin global crises of climate change and biodiversity loss that challenge us today. It seems reasonable to conclude that repopulating the planet with a trillion (or more) newly planted tree seedlings would be an appropriate solution to compensate for these cumulative losses. But this simple-minded equation holds hidden fallacies.

Natural climate solutions including reforestation, avoided deforestation, and improved forest management can contribute significantly to mitigating climate change and biodiversity loss. But a solitary focus on repopulating trees all over the world is not going to return what has been lost or come close to compensating for ever-growing greenhouse gas (GHG) emissions. Conversion of forest to farmland emits about a quarter of global GHG pollution every year. Successful tree planting in all potential areas of the planet would still leave more than 70 per cent of the climate problem unresolved.

Natural climate solutions must avoid adding fuel to the fire, literally. An enormous wildfire in Alberta, Canada in 2016 was a direct outcome of draining and converting peat bogs to plantations of black spruce trees whose rapid growth reduced groundwater supplies, dehydrated the ecosystem, and turned the plantations into a tinder box.

Truly effective solutions to reverse environmental degradation require addressing the reasons why we so spectacularly failed to take care of the world's forests, shrublands, grasslands, rivers, wetlands and oceans, and the estimated 8.7 million species that depend on them (including us). We failed to safeguard the life-support systems of our planet by viewing natural ecosystems as expendable and converting the land that they previously occupied to simplified production systems. Our civilisation has become overly reliant on combustion of fossil fuels and on lucrative global trade based on products sourced from former tropical forests, driving continued deforestation and species loss.

I expose five fallacies of massive tree-planting schemes that claim to ameliorate the global climate crisis. These misconceptions stem from viewing trees as autonomous carbon-sucking machines that can be deployed to function predictably in space or time. Trees interact with other organisms to create forest ecosystems. Indigenous cultures long recognised the unique properties and products of different tree species and used this knowledge to sustainably manage tree cover over many millennia. Aiding the recovery of trees and forests requires similar attention to how different species and assemblages function, and applying this information to manage recovering systems for desired social and ecological outcomes.

Fallacy 1: The number of trees or hectares planted is an effective goal or target. Loss of trees and forests are symptoms of a larger systemic pathology. It requires long-term, targeted and effective treatment to bring about the restoration of ecosystems and landscapes along with reduced emissions of carbon dioxide and other GHGs. Treatment is not the goal. It is the means towards achieving recovery and better functioning. The socio-ecological outcomes of tree planting should be targeted and recognised. Tree-planting contests are publicity stunts.

Fallacy 2: Tree planting compensates for lost forests. Planted trees do not replace the species or ecosystems that were originally present. A species-rich tropical forest, for example, cannot be restored with a plantation composed of one or a few species. Protecting and enhancing remaining forests is the best way to maintain carbon stocks and protect forest-dependent species.

Forests naturally regrow under suitable conditions, particularly in areas adjacent to existing forests where land was lightly used. This means that new forests can regenerate in many areas, reducing the need for tree planting. But recovery of forests takes many decades and is not a quick fix.

▲ Wildfires near Fort McMurray, Alberta, Canada in 2016. The fires were a direct consequence of draining peat bogs and replacing them with black spruce plantations

Fallacy 3: Trees should be planted in all places where they once grew. Where forests once prospered, land cover now consists of agricultural fields, pastures, cities, roads, dams and barren lands. Many of these areas provide unfavourable conditions for newly planted trees or offer far greater socio-economic returns to be viable opportunities for reforestation. Assessments of priority areas for tree planting need to consider multiple benefits and feasibility factors.

Fallacy 4: The more trees, the merrier. What matters is how trees function to support the recovery of ecosystems and landscapes. It is important that trees selected for planting grow and survive well beyond their first year, support native wildlife, replenish soil fertility and organic matter, and support the livelihoods and wellbeing of local people who are the stewards of the land. Local communities should be actively involved in selecting the tree species and locations for planting, as they will live with these trees for many decades.

Planted trees should be an asset to the landscape, not a threat to native species and ecosystems, as some exotic species turn out to be. Not all trees are equal in terms of their ecological performance and functions. Fast-growing trees, which are often selected for quick tree-planting outcomes, can reduce local water supplies. Moreover, fast-growing trees are not built to last. Their low-density wood stores less carbon and for less long.

Fallacy 5: Reforestation equals restoration. Planting trees is not always a restorative measure, particularly if the location was not formerly a forest ecosystem. Tree planting when implemented in the context of aiding recovery of an ecosystem or improving landscape functions is a vital restorative action that requires participation and support of local people to provide long-term social and ecological benefits.

We are soon to embark on the United Nations Decade of Ecosystem Restoration, but our ship is not yet seaworthy. Actions need to be strategic, informed by science, and based on values and principles in opposition to those that intensify the climate and biodiversity crises. Effective actions are strengthened by alignment with hard-won international conventions and agreements, such as the United Nations Framework Convention on Climate Change, the United Nations Convention on Biological Diversity, and the United Nations Convention to Combat Desertification.

We must think and act differently. Tree planting should be viewed as a means to reach many goals, including promoting the global drawdown of atmospheric carbon. Tree-planting activities need to be part of an intelligently planned restoration effort with strong engagement and support of local stakeholders. All of these actions will help achieve the UN's Sustainable Development Goals. Intelligent tree planting can achieve a wide set of objectives that ensure that trees and forests are working for people as well as the environment. ●