TRILLION TREES

Why a Trillion? The scientific context of our partnership's vision

Briefing note prepared by the Wildlife Conservation Society, WWF-UK and BirdLife International, October 2017

The Trillion Trees programme is a long-term partnership between the Wildlife Conservation Society, WWF-UK and BirdLife International with the collective aim of ensuring there are more trees on our planet in the future.[1] Our partnership is founded on this ambitious vision:

> ***By mid-century, through concerted collective action by all sectors of society, one trillion trees have been re-grown, saved from loss and better protected around the world.***
>
> *Deforestation has ended, significant numbers of trees have returned to areas where they were lost and large areas of existing trees are better protected. These trees, in forests, woodlots and farms, bring multiple social, economic and environmental benefits.*

The scientific underpinning for the concept of 'one trillion trees' – outlined in this briefing note – gives us confidence that this is an ambitious yet essential and achievable vision.

We also recognize that our partnership is just one part of the very significant global effort that is needed to make 'one trillion trees' a reality. This vision is a challenge to the global community and a call to arms.

New evidence

A recent study estimated that the world contains around three trillion trees today (Crowther *et al.* 2015), and that at the dawn of civilisation there would have been twice that many on our planet. In fact, we continue to lose around 10 billion trees per year to human activities, with severe impacts on the climate, biodiversity and ecosystem services on which communities around the world depend.

What is a trillion?

We take it to be 1,000,000,000,000

The Trillion Trees vision is based on our work with the authors of the 2015 study to estimate what may be achievable through promoting the growth of new trees and halting tree loss, while we add a component for protection of established forests. The authors produced a detailed assessment covering a range of scenarios and assumptions, which can be found online.[2]

From those results, a range of combinations of scenarios can be made. For simplicity, we have chosen here one plausible set of estimates to illustrate how the Trillion Trees vision could be made possible.

Trees re-grown…

Under a medium ambition restoration scenario, we estimate that **recovery of tree numbers could deliver up to 360 billion mature new trees** through promoting tree planting and assisted natural regeneration across around 890 million hectares of land. Much of this restoration would occur in mosaics with farmland and settlements.

Trees saved from loss…

We chose an ambitious scenario for **halting tree loss which could save up to 170 billion trees at imminent risk of destruction** (i.e. avoided deforestation). This is justified on the basis that the projected forest loss out to 2050 (published by WWF in 2011) we used in the analysis was conservative compared to the rate of loss evident today, just six years later.

[1] www.trillliontrees.org

[2] This assessment can be found here: https://www.biorxiv.org/content/early/2017/11/07/210062

Trees better protected…

Those two components combined account for a total of 530 billion trees, or over half a trillion. Alongside these two components we argue for improved *protection* over much larger areas, because zones of restoration and avoided deforestation will be nested within broader forest landscapes that need better overall management to be sustained. A conservative estimate is that **the area requiring increased protection would be at least equal to the other two categories.**

Together, the three approaches could achieve just over a trillion trees restored, saved from loss and better protected. Arguably even larger numbers may need to be brought under improved protection to address current threats, and ultimately all three trillion trees, plus those new trees added through restoration, need to be guarded against future threats.

On this basis, the Wildlife Conservation Society, WWF-UK and BirdLife International have adopted the vision of 'one trillion trees re-grown, saved from loss and better protected around the world' as a way to communicate to a wide range of audiences the scale of the challenge, and the level of ambition that is required to address it.

We believe that this bold vision provides a new perspective to enable the forest conservation and restoration community to engage the interest of new audiences. Framing the issue around tree numbers is consistent with and complementary to other framings already in the global conversation, which focus mainly on area targets (e.g. hectares of forest), while also bringing in more flexibility to think about the important role of trees on farmland and pasture.

Climate benefits

Forest loss has a double impact on the climate. It releases stored carbon into the atmosphere as well as reducing the planet's ability to sequester carbon emissions from other sources. In December 2015, the world's governments signed up to the Paris Agreement[3] which set the goal of keeping global warming to well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees. It also set the goal of net zero emissions globally by the second half of this century. To deliver on this, it is not enough to simply aim for a world with zero deforestation. Humanity must find a way to return tree cover in many of the places where it has been removed, eventually leading to a net increase above present day levels.

This is all the more pertinent given a recent UN report highlighted the large gap between current emission reduction targets and what is needed to deliver on the Paris Agreement goals (UN Environment, 2017). The annual emissions gap in 2030 will be 16-19 Gigatonnes of CO_2e – or approximately 4.4-5.2 Gigatonnes of carbon. The report highlighted reforestation, afforestation and avoided deforestation as among the most cost-effective and large-scale solutions that should be further exploited.

The analysis conducted for Trillion Trees has shown that the scale of restoration we identify in the 360 billion tree scenario above would lock up an estimated **36-50 Gigatonnes of carbon** by the time these forest areas reach maturity. To put this into context, human caused anthropogenic carbon emissions are currently in the order of ~9-12 Gigatonnes per year. This is a major opportunity that could significantly close the net annual emissions gap through extracting carbon from the atmosphere. And on top of this the Trillion Trees vision would deliver huge emissions savings from avoided deforestation and the continued carbon sequestration of healthy, better protected forests.

[3] See http://bigpicture.unfccc.int/#content-the-paris-agreemen for more information about the Paris Agreement, and http://unfccc.int/focus/ndc_registry/items/9433.php for the individual Nationally Determined Contributions set out by the Parties (i.e. the specific commitments and targets of each participating nation).

Explanatory Notes

Natural tree densities for each biome were based on the database compiled for the study reported by Crowther *et al.* (2015).

'360 billion trees re-grown'

This estimate is based on an Atlas of Forest Landscape Restoration Opportunities generated by the International Union for the Conservation of Nature (IUCN) and World Resources Institute (WRI) with the University of Maryland (Potapov *et al.,* 2011). It uses a scenario where 100% of areas categorized with potential for 'widescale' and 'remote' restoration are returned to natural tree densities, along with 50% of areas highlighted as having potential for 'mosaic restoration'. This estimate is based on counts of reasonably mature trees, i.e. at least 10 cm in diameter at breast height, which is a standard foresters' measure. Note that to end up with 360 billion mature trees of that size, the global community would probably need to plant, or enable the natural regeneration of, around 4.7 trillion saplings (i.e. trees of at least 1 cm diameter).

'170 billion trees saved from loss'

This estimate is based on the levels of global deforestation through to 2050 projected by WWF in the Living Forests Report (WWF, 2011). It represents the difference between the scenario with the worst deforestation ('bioenergy') and the residual deforestation that would happen even in the scenario with the most effective conservation ('pro-nature').

'the area requiring increased protection would be at least equal to the other two categories'

Ending deforestation and ensuring that restored areas remain so requires action not just around individual patches of trees but across larger land management units such as protected areas, indigenous territories, community forests, farms and ranches. Large areas of the world's forests are already under some form of protection or conservation, but losses continue in many protected areas and community lands, and few can be considered wholly secure (Nolte *et al.* 2013, Spracklen *et al.* 2015). Action at higher scales is also often needed, for instance across watersheds, regions, districts or provinces—the term 'jurisdictions' is frequently used for these larger units. In truth, the extent may need to be even greater; this is a potential area for further research.

Limitations

The figures presented here should be recognized very much as estimates. There are a number of limitations in the underlying datasets. For example, they give global overview figures based on large-scale maps and so tend to include some areas unsuitable for restoration (such as natural grasslands) but omit others (e.g. areas outside the main forest zones). It is also inherently difficult to predict expected deforestation decades into the future, and some other published studies would imply significantly higher estimates than those given here (e.g. Busch *et al.* 2017). Tree densities are likely to be under-estimated in many biomes since available data are often drawn from sites that have already experienced some human disturbance.

Importantly, our estimates describe the biophysical range of possibilities but do not attempt take into account the political, social and economic feasibility of the changes that we model. In a sense, this is exactly the point of Trillion Trees and the broader challenge that society faces: bridging the gap between what is possible and what can be achieved on the ground, in hugely diverse real-world settings, and taking full account of the rights of people currently using particular areas of land. There is a limit to how far global modelling can go in answering this question—specific analyses are needed within individual countries and regions, informed by monitoring data from trials, pilots and implementation programs. In the end, only time will tell what is possible. Our models at this stage simply help to point out a direction of travel and mobilise ambition.

References

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