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TREE IDEOLOGY

The truth about planting trees as a response to the climate crisis

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"As long as Death keeps himself out of sight in our hot dark future, we need not face facts." – **WILLIAM T. VOLLMANN, CARBON IDEOLOGIES VOL 2**

AS THE CLIMATE crisis bites, we find ourselves confronting dire scenes of devastation. In the face of them, many of us are rightly wondering, what's the best thing to do?

"Plant trees," is one increasingly popular answer.

Given that the climate crisis feels like an intractable and apocalyptic global challenge, "planting trees" is a very appealing answer. It is both easily understood and actionable. It represents hope in the face of far too much bad news.

A Guardian article[1] reporting on the work of Thomas Crowther, "a young British ecologist then at Yale," breathlessly announced, "Tree planting has the 'mind-blowing potential' to tackle the climate crisis," (quoting him).

The article continued, "New research estimates that a worldwide planting programme could remove two-thirds of all the emissions from human activities that remain in the atmosphere today, a figure the scientists describe as 'mind-blowing'." This story was based on a paper published by Crowther Labs[2].

The headline seems to have acted like a starting pistol in the race for competing headlines as to who is planting how many trees, how fast. Ethiopia claims to have planted 350 million trees in one day. Even Climate-Denier-In-Chief Donald Trump upped the ante by announcing the planting of a trillion trees during his recent trip to the World Economic Forum at Davos.

More and more, I'm in conversations about the climate crisis where "tree planting," usually by drones, is cited as a sensible response to the climate crisis. There are moments where I genuinely get a sense that people believe a solution to the crisis is at hand, one that's entirely pragmatic and feasible and that we are saved.

We are being led to believe, at least by the headline writers, that we can avert dangerous climate change by planting trees.

1. https://www.google.com/amp/s/amp.theguardian.com/environment/2019/jul/04/planting-billions-trees-best-tackle-climate-crisis-scientists-canopy-emissions

2. https://science.sciencemag.org/content/365/6448/76

Are we saved, then?

Does the strategy of planting trees to avert dangerous climate change work? Here's a quick and dirty assessment of planting trees as a response to the climate crisis.

WHAT DOES IT MEAN TO PLANT TREES?

A FOREST CAN be thought of as a "carbon sink," absorbing atmospheric CO_2 through photosynthesis to form wood; branches and roots. This carbon is then stored for the life-time of a tree.

When a tree dies, CO_2 is returned to the atmosphere (although it's not necessarily instant unless the tree is burned). The recent Australian fires, for example, pumped huge amounts of CO_2 into the atmosphere in a matter of days. It's important to remember that all trees die – either by natural or unnatural causes. That carbon will end up back in the atmosphere one day[3].

Beyond this utilitarian "carbon" view, a healthy forest of-course is also fulfilling multiple other functions including being a home for diverse species (at a time when biodiversity loss is a largely unspoken part of the wider ecological crisis).

One word for "planting trees," is "afforestation." And we can make a distinction between two different types of afforestation.

The first, most common form of afforestation is the creation of plantations. A plantation is typically a centrally managed monoculture. Imagine the same species of tree planted in multiple straight lines, in a grid, the trees growing to form a plantation. Often created for commercial reasons, a significant percentage of the world's commercial timber comes from plantations. Plantations are not forests.

Project Drawdown[4] tells us that "To date, plantations comprise the majority of afforestation projects," and that they "…remain controversial," because often commercial gain outweighs the "long term wellbeing of the land, environment, or surrounding communities."

3. One reader pointed out that old growth forests have the capacity to sequester carbon for tens of thousands of years and to regenerate. This is theoretically true. The challenge is two-fold. We don't really have a track record of being able to steward ecosystems for any length of time (compared to say indigenous civilisations) and secondly, we are looking at a deep temporal incommensurability when talking about tens thousands of years – in that we don't have tens of thousands of years to act. The timeframe for effective climate strategy is years and decades at best. An effective strategic response to the climate crisis must factor in temporal targets

4. https://www.drawdown.org/

Most plantations are "ecological deserts of monoculture," that can cause ecological damage in a variety of ways, from the introduction of invasive species, to soil nutrient loss, through to depletion of the water table. And then obviously, trees grown for commercial timber are eventually cut down[5].

There is a second type of afforestation, "rewilding." Rewilding can be thought of as simply allowing the land to return to its natural state, but it can also be thought of as a deliberate attempt to build the biodiversity of an ecosystem and then allowing it to flourish on its own terms. It generally takes much longer than growing plantations and the land does not provide commercial crops ie timber, making the economics quite different to plantations.

The Miyawaki method, a type of afforestation, is more akin to rewilding. It involves "the introduction of multiple native species and indigenous flora planted close together." Miyawaki forests are self-sustaining after two years. They can have large footprints, or they can be tiny, micro-forests.

In comparative terms, rewilding is generally a healthier and more effective strategy than creating plantations. Unfortunately, "planting trees" does not de facto mean rewilding. Nor does it mean growing Miyawaki forests. It usually means creating plantations and monocultures.

Let's take the headline "350 million trees planted in a day." In looking beyond the headlines, here are some questions it would be good to know the answers to.

Where are trees being planted? What is being planted? Are native trees being planted as part of a natural ecosystem or are invasive species being planted? Are the trees part of a plantation? Are we creating an artificial monoculture? If so, when are trees cut down? Is there a replenishment rate?

What is the survival rate of saplings? How many saplings are likely to reach maturity?[6] (*It is obviously not going to be 100%*) Who, if anyone, is looking after the saplings through their lifetime? What is the political economy of the geography that saplings are planted

5. https://www.theguardian.com/environment/2020/mar/10/uk-commercial-tree-plantations-ineffective-climate-crisis-report?CMP=Share_iOSApp_Other

6. https://www.theguardian.com/world/2020/jan/30/most-of-11m-trees-planted-in-turkish-project-may-be-dead?CMP=Share_iOSApp_Other

in? In other words, what is to stop people waiting for the saplings to reach a certain age, and then simply chopping them down for economic reasons?

How long does it take for a sapling to reach maturity? Fast growth trees reach maturity in 10 to 15+ years, slow growth trees reach maturity in 20–30+ years. Old growth forests are the product of centuries. This means that while a growing sapling sequesters carbon, that is turns atmospheric carbon into wood, the amount of carbon a tree sequesters depends on the maturity of the tree and it's lifespan. Trees grown for commercial timber, for example, are harvested on a timetable.

TREE ARITHMETIC

What do the numbers look like when it comes to planting trees as a response to climate change?

The efficacy of a strategy also has to be measured against a baseline. A baseline is the state of a system at the moment you start measuring. Let's make some assumptions on a 2020 baseline.

A mature tree absorbs about 1 tonne of CO_2 over its lifetime. Let's assume a hectare of mature trees absorbs 1 tonne of CO_2 per year.[7] (Note this is a little low but I'm assuming this is in 10 years and not 30 years which is probably more accurate for tree maturity).

Global CO_2 emissions in 2020 are approximately 35 billion tonnes (adding other greenhouse gases increases it, so CO_2eq is higher.)

In 2018 emissions rose by 2.7%, in 2017 they rose by 1.6%. Let's very conservatively assume that global emissions are increasing by 1% a year. This means an extra 0.35 billion tonnes of CO_2 are added to the atmosphere every year.

Let's assume a deforestation rate, about 13 million hectares a year (according to google between 3–7.5 billion trees are cut down every year).

7. https://jancovici.com/en/climate-change/ghg-and-carbon-cycle/cant-we-just-grow-forests-to-compensate-for-our-co2-emissions/

This tells us what the "replenishment" requirement is, in other words, how many million hectares of mature trees are needed to simply stand still. Here's a table:

YEAR	CUMULATIVE NEW EMISSIONS (BILLIONS CO_2)	CUMULATIVE NEW DEFORESTATION (BILLIONS OF HECTARES)	NEW REQUIREMENT (BILLIONS OF TONNES CO_2)
2020	0.35	0.013	0.363
2021	0.70	0.026	0.726
2022	1.05	0.039	1.089
2023	1.4	0.052	1.452
2024	1.75	0.065	1.815
2025	2.1	0.078	2.178
2026	2.45	0.091	2.541
2027	2.8	0.104	2.904
2028	3.15	0.117	3.267
2029	3.5	0.13	3.63
2030	3.85	0.143	3.993

Assuming a straight replacement by 2029, we need an extra 0.13 billion = 130 million hectares of mature trees to ensure we stay at 2020 levels ignoring increases in emissions.

If we add the increases of emissions, at say 1%, global emissions will have increased x10 = 3.5 billion tonnes of CO_2. So if we want to mop up what's lost from deforestation + the gains from emissions, we need 3.63 billion hectares by 2030. This is roughly 3 times the entire land mass of the US.

The Crowther paper is, of course, not assuming that **ALL** global emissions are mopped up by trees – which is what I'm doing here for the purposes of illustrating how impossible trees as a singular solution would be.

There is also lag time, between planting trees and maturing. The lag time means that 1 hectare planted in 2020 only yields an absorption capacity of 1 tonne of CO_2 by 2029. (If we were being precise we would model the annual sequestration rate, which increases as a tree grows, but the number per tree is tiny).

One way of looking at this is that if we planted 3.63 billion hectares in 2020, then by 2029 we would be at the same levels of CO_2 concentration in the atmosphere as in 2020.

Obviously this doesn't make sense. It also doesn't align with the Crowther numbers. The Crowther numbers only add up if you consider the lifetime of a tree, assuming say 30–40 years and even then they don't really. They emerge from a spatial analysis of how much land is theoretically available to be afforested. The claim being made is[8]:

- there are nearly a billion hectares available for forest restoration excluding existing "agricultural and urban areas";
- that land should be able to sustain a trillion trees, absorbing over their lifetimes about 205 gigatonnes of carbon;

So the Crowther numbers are 1 billion hectares = 1 trillion trees (1000 billion or 1000 trees per hectare), yielding 205 gigatonnes, or 205 billion tonnes of absorption over the lifetime of a tree, which I'm guessing is something like 30–40 years. A billion hectares is a little greater than the size of the United States.

The numbers don't really add up, mainly because they assume a per hectare sequestration rate that seems to be off by at least a factor of 5x. A technical analysis of the original paper makes the same point[9]. Drawdown for example cites a figure of 18.06 GT as the size of potential reductions from afforestation, a far cry from the 205 GT claimed by the Crowther numbers.

Setting aside technical points of order, all of this simply illustrates the fact that when considering increasing emissions in the billions of tonnes per decade, offsetting those emissions through simply planting trees at best sequestering millions of tonnes over many decades, is literally an impossible equation to square.

None of this makes any assumptions about failure rates for saplings[10] to reach maturity over a decade, it's doesn't assume that maybe it'll take 15, 20, 30 or 35 years for some trees to reach maturity; it doesn't assume wildcard events like tree disease (monocultures are very susceptible); nor does it factor in massive

8. https://members.tortoisemedia.com/2020/01/13/plant-a-trillion-trees/content.html

9. https://redd-monitor.org/2019/10/18/global-tree-restoration-most-effective-climate-change-solution-dangerously-misleading/

10. https://www.theguardian.com/world/2020/jan/30/most-of-11m-trees-planted-in-turkish-project-may-be-dead?CMP=Share_iOSApp_Other

fires such as the ones we have seen in Australia, Brazil, California, and in the Congo; or for that matter increasing emissions, for example instead of a conservative 1%, consider 2% or 3% or more (we could for example look at what we have added in the last decade alone as a benchmark).

It also is worth saying that not all global greenhouse gas emissions are CO_2, global emissions of CO_2 "equivalent" are closer to 55 GT in 2020, meaning that at least 20 billion tonnes of greenhouse gas emissions are non-CO_2 (for example methane).

Throwing in any one of the variables above dramatically changes the numbers for the worse. This means ignoring all these variables and even the issue of plantations vs rewilding, planting trees is not a game changer.

We have to figure out how to stop pumping greenhouse gases into the atmosphere. Without doing that planting trees is more akin to a conversation about how far the rubble flies when a bomb goes off.

Now this is the point where you say, "Hold up, hold up, no one is saying that planting trees is **THE** strategy that will tackle climate change. We're saying that planting trees is part of an overall basket of strategies that will help climate change."

Ah well, it's good that we got that settled then.

THE JOY OF TREES

TREES RISK BECOMING a deus ex machina, a woody hand-of-god coming out of the sky to ensure a magical happy ending to an increasingly desperate story.

In our current economic paradigm, growing and cutting down trees is good for the short-terms needs of the economy ie timber is a cash-crop, rewilding dramatically less so. The fact is that monoculture plantations are amenable to central state management, whereas genuine rewilding is not.

James C Scott, in his ground-breaking book, "Seeing Like A

State: How Certain Schemes to Improve the Human Condition Have Failed," uses the example of "State and Scientific Forestry" as exhibit A, Chapter One. Scott opens his book with this argument:

> *"Certain forms of knowledge and control require a narrowing of vision. The great advantage of such tunnel vision is that it brings into sharp focus certain limited aspects of an otherwise far more complex and unwieldy reality. This very simplification, in turn, makes the phenomenon at the centre of the field of vision more legible and hence more susceptible to careful measurement and calculation. Combined with similar observations, an overall, aggregate, synoptic view of a selective reality is achieved, making possible a high degree of schematic knowledge, control, and manipulation.*
>
> *The invention of scientific forestry in late-eighteenth century Prussia and Saxony serves as something of a model of this process. Although the history of scientific forestry is important in its own right, it is used here as a metaphor for the forms of knowledge and manipulation characteristic of powerful institutions with sharply defined interests, of which state bureaucracies and large commercial firms are perhaps the outstanding examples. Once we have seen how simplification, legibility, and manipulation, operate in forest management, we can then explore how the modern state applies a similar lens to urban planning, rural settlement, land administration, and agriculture."*

The current fashion for tree headlines harks to a deeper yearning for solutions to our planetary ecological crisis. We are suffering from climate crisis fatigue. Unfortunately, this also means we are vulnerable to solutionism, an ideology seeking to assuage our fears with easy technocratic solutions involving, as Scott states, "a high degree of schematic knowledge, control, and manipulation."

As the crisis deepens so too does the depth of our craving for solutions. As the dimensions of the crisis become more complex, increasingly hard to grasp, so too does our desire for simply grasped solutions.

But, of-course, these solutions are not really solutions. Behind the headlines of how many millions of trees have been planted is a particular view of society, the arc of which bends not to climate justice, but to manipulation and control.

In other words plantations are amenable to state-driven corporate control whereas rewilding is not. It's a little wag the dog, pick the approach amenable to state-driven corporate control and then provide a rationalisation. We have to remember that "Rationalisation presented as rationality is a principle strategy in the exercise of power."[11]

11. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2278409

These projects are unfortunately designed to score quick political and/or commercial points on the basis of the potency of these schemes to act as psychological balm to our terror. They should not be confused with effective strategy.

All is not lost. It's not as if we, as a society, as people, lack the means to create genuinely effective strategy. We can. It's hard and it takes work. Doing this work requires we not get distracted by both our psychological pain and our desire for a quick fix.

By all means let us plant trees, let us celebrate the rituals of planting trees, let us invite many more trees into our lives, let us celebrate trees.

Let us create many more forests, from the micro- to the mega-.

Let us not, however, mistake the joy of doing so with an effective strategy in the face of a planetary ecological crisis.

Big thanks to Marc Eisenstadt for feedback and edits!

FURTHER READING

The paper that kicked it all off:

The global tree restoration potential, Jean-Francois Bastin,Yelena Finegold, Claude Garcia, Danilo Mollicone, Marcelo Rezende, Devin Routh, Constantin M. Zohner1, Thomas W. Crowther
https://science.sciencemag.org/content/365/6448/76 (PAYWALL)

For a more detailed (than mine) overview of the tree-planting and climate crisis see:

Plant a trillion trees: Can the world's wide open spaces deliver a solution to climate armageddon? Giles Whittell https://members.tortoisemedia.com/2020/01/13/plant-a-trillion-trees/content.html (PAYWALL)

Reforesting an area the size of the US needed to help avert climate breakdown, say researchers — are they right? https://theconversation.com/reforesting-an-area-the-size-of-the-us-needed-to-help-avert-climate-breakdown-say-researchers-are-they-right-119842

How much can forests fight climate change? https://www.technologyreview.com/s/615102/tree-planting-is-a-great-idea-that-could-become-a-dangerous-climate-distraction/ (Note, posits another set of silver bullets to replace the silver bullet of trees – thanks Dawn for spotting this)

There aren't enough trees in the world to offset our emissions — and there never will be — April 2021 https://apple.news/Av_w5i9D7SBmWIdAGRij_pQ

BOOKS

Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming, Paul Hawken

Seeing Like A State: How Certain Schemes to Improve the Human Condition Have Failed, James C Scott

Wilding: The Return of Nature to a British Farm, Isabella Tree

For a non-utilitarian, non-carbon view of forests see,

How Forests Think: Towards an Anthropology beyond the Human, Eduardo Kohn