NAILING REFORESTATION TO THE GROUND AS A NATURAL CLIMATE SOLUTION

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THE NATURE CONSERVANCY
NATURAL CLIMATE SOLUTIONS

Actions that avoid or capture additional emissions through:

– improved management
– protection
– restoration of forests, agricultural lands, grasslands, and wetlands.
Deployable now and can provide multiple co-benefits (conservation of biodiversity, sustainable livelihoods, clean air and water, etc.)
World Economic Forum leaders pledge to plant 1 trillion trees

To help fight climate change and promote biodiversity, Davos leaders launch a campaign to plant one trillion trees.

by Jonah Hull
23 Jan 2020
Restoration of forest cover is a tool
- not “the” tool
- with the potential for wise use or mis-use
Restoration of forest cover
Transition from < 25% to > 25% forest cover in places that historically supported forests
(~afforestation, ~reforestation, ~ forest restoration)

Take homes

1) Restoration of forest cover = promising natural climate solution

2) Multiple options for restoring forest cover (where/how) and we need customizable menu to understand the costs, co-benefits, and climate mitigation trade-offs among approaches

3) But there are other natural climate solutions too, such as protection of intact forests.

4) Reduction in fossil fuels is the most critical action

5) To use restoration of forest cover to its highest potential as a climate solution, we need robust estimates of mitigation potential AND a dynamic system of global monitoring
How do we get robust estimates of reforestation potential?

RATES + AREA OF OPPORTUNITY
FIND THE RELEVANT LITERATURE

- ~1400
- 5464
- 11360
the recovery of forest cover on cleared lands through spontaneous regrowth after cessation of prior disturbance or land use
ABOVEGROUND FIELD DATA + 66 COVARIATES

climate • soil nutrient/chemical/physical • radiation • topography • nitrogen deposition
SPATIALLY-EXPLICIT CARBON ACCUMULATION POTENTIAL IN FORESTS < 30 YEARS

100-x variation

Aboveground carbon sequestration rate in forest and savanna biomes

6.0 Mg C ha⁻¹ yr⁻¹

0.058

Savanna biomes

Cook-Patton et al. 2020 Nature Mapping Carbon Accumulation Potential from Global Natural Forest Regrowth
1.7x variation in country
AREAS OF UNCERTAINTY CAN BE IMPROVED THROUGH TIME

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**FORC: A GLOBAL DATABASE OF FOREST CARBON STOCKS AND FLUXES**


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How do we get robust estimates of reforestation potential?

RATES + AREA OF OPPORTUNITY
OUR GOAL = MOVE FROM BIG NUMBERS TO STATE-LEVEL MENUS TO INFORM LOCAL CONVERSATIONS AND FACILITATE CUSTOM ANALYSES

NCS US STUDY
Ecologically-appropriate for > 25% tree cover? ✓
Not currently a forest? ✓
Not a city, road, or good agricultural land? ✓

= OPPORTUNITY
(307 Tg CO2/yr, 63 Mha)

Fargione et al. 2018 Science Advances
A MENU OF OPTIONS

Natural lands: (1) Non-stocked forests, (2) shrub cover, (3) protected areas

Post-fire restocking: (4) Areas that burned and may need assistance recovering

Agricultural lands: (5) Challenging croplands and (6) pasture lands (some with challenging soils)

Frequently flooded landscapes: (7) Areas that experience flood events an average of one in five years.

Riparian buffers: (8) Areas near streams to help shade and partially protect streams from the impact of adjacent land uses.

Urban open space: (9) Parks, roadsides with room for additional tree cover

Biodiversity corridors: (10) Easiest paths for species to follow while trying to keep pace with climate change.
Yes, >25% tree cover is appropriate
Biophysical Group Setting (BPS)

- Unstocked Forest 
  - NLCD 2011
- Shrub/scrub 
  - NLCD 2011
- Protected Areas 
  - by state, NLCD 2011 class, ownership type/name, BPS
- Burned Areas
- Years since last burn
- Floodplains (pluvial and fluvial, 1 in 5 years return interval)
  - by state, NLCD 2011 class, ownership type/name, BPS
- 30m streamside buffers
- Urban Open Space 
  - NLCD 2011
- Biodiversity corridors
  - McGuire et al., 2017
- Protected Areas
  - by state, NLCD 2011 class, ownership type/name, BPS
- Pasture 
  - NLCD 2011
- Challenging soil 
  - gSSURGO
- Challenging soil 
  - by state, ownership type/name, BPS
- Crop 
  - NLCD 2011
- Pasture 
  - NLCD 2011
- Challenging soil 
  - gSSURGO

Current Forests 
- NAFD 2010

Ice/Snow, Open Water, Developed Areas 
- NLCD 2011

Primary & Secondary Roads 
- TIGER

Wilderness Areas 
- PAD-US

Cropland without challenging soil (NLCD 2011, gSSURGO)

Biophysically suitable area for restoration of forest cover

NATURAL LAND USE

LOWER VALUE

CO-BENEFITS

Remove locations that are not appropriate for additional trees
Partition opportunity into each of the “menu” options
By state – who owns the land, how the land is used, and what the native forest type would be.
Lower cost and more feasible options to restore forest cover in the contiguous United States for climate mitigation

Graphical Abstract

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In Brief
To inform decisions about where to deploy restoration of forest cover as a climate solution, we produced maps of opportunities across the contiguous United States. We found up to 51.6 Mha of opportunity for new forest, which we divided into 10 different classes to compare their carbon capture, costs, co-benefits, and feasibility. We found that the opportunity class with the strongest potential differed by state but that many opportunities fall in lower-cost and more feasible locations.

Highlights
- Restoring forest cover in the US can be a cost-effective climate solution
There are up to 133 million acres of opportunity in the United States to restore forest cover for climate mitigation.

Reforestation these areas with approximately 68 billion trees could capture 333 million tonnes of CO₂ per year, equivalent to removing 72 million cars from the road.
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Reforesting these areas with approximately 68 billion trees could capture 333 million tonnes of CO₂ per year, equivalent to removing 72 million cars from the road.
All three pillars are necessary
Each pillar enhances the others
Questions?
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