

To Protect Climate We Must Protect More Forests as Carbon and Biodiversity Reserves

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- Climate Change is happening because WE have increased the predominant heat trapping gas, carbon dioxide (CO₂), to the atmosphere by 50% more than before the industrial revolution. Additional heat trapping greenhouse gases add about one-third of the global warming over the next 100, and more in the next 25 years. IPCC AR 5 2014 <https://www.ipcc.ch/report/ar5/syr/>
- Half of all the increase in atmospheric CO₂ has occurred since governments universally agreed to “ ... achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” UNFCCC Article 2 1992 <https://unfccc.int/resource/docs/convkp/conveng.pdf>
- Two-thirds of atmospheric CO₂ increase is from burning fossil fuels & industry and one-third is from land clearing, forest harvests and burning wood for energy
- Forest harvests from 48 contiguous US states release 5x more CO₂ emissions than fire, wind, insect damage, land use change, and drought conditions *Harris et al. 2016 USFS* <https://doi.org/10.1186/s13021-016-0066-5>
- US Forest harvests are comparable to emissions from all US coal combustion or all direct US building emissions
- Global forest harvest emissions equal 10% of all fossil fuel emissions and are not fully counted. Net accounting of growing forests to offset harvests transfers credit, but undercount full emissions from harvest and fire *Moomaw & Law; https://rdcu.be/dihci Peng et al https://doi.org/10.1038/s41586-023-06187-1*

IPCC calls for protecting ecosystems to respond effectively to accelerating climate change:

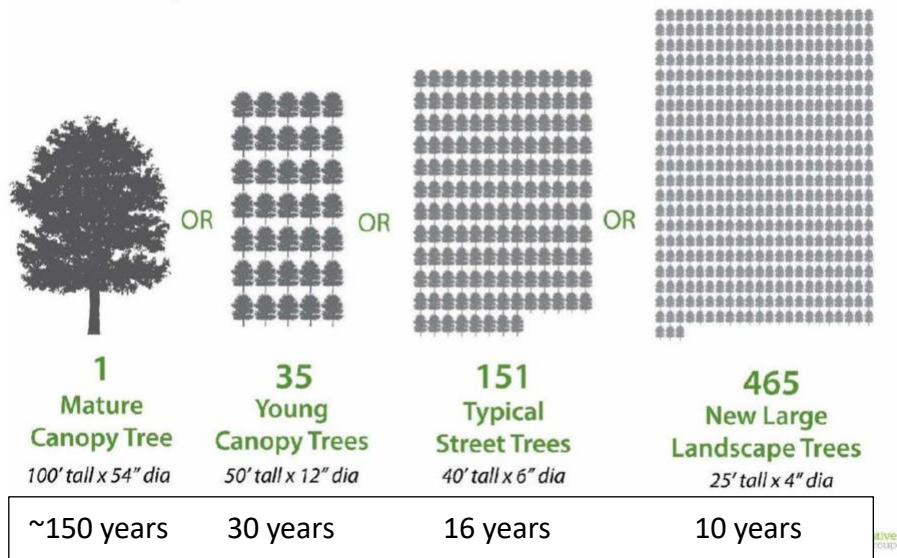
<https://www.ipcc.ch/report/ar6/wg2/>

- To limit increasing temperature to no more than 2.7°F (1.5°C) **the world must achieve Net Zero by 2050** when all emissions from combustion and land use no longer exceed removals by forests and other ecosystems. *IPCC 2018 https://www.ipcc.ch/sr15/*
- Global average temperature has already risen by 2.2°F (1.2°C)
- **“Safeguarding biodiversity and ecosystems is fundamental to climate resilient development**, in light of the threats climate change poses to them and their roles in adaptation and mitigation (very high confidence).” *IPCC AR6 WG 2 Summary for Policymakers D.4)*
- **“...maintaining the resilience of biodiversity and ecosystem services at a global scale depends on effective and equitable conservation of approximately 30% to 50% of Earth’s land, freshwater and ocean areas, including currently near-natural ecosystems** (high confidence).” (*IPCC AR6 WG 2 Summary for Policymakers D.4)*
- **“... protection of existing natural forest ecosystems is the highest priority for reducing GHG emissions** (*Moomaw et al. 2019*) **and restoration may not always be practical.**” (*IPCC AR6 WG 2 page 303*) <https://doi.org/10.3389/ffgc.2019.00027>
- Globally, forests could store 2x their current carbon stocks *Erb et al. 2018 https://doi.org/10.1038/nature25138*

To reduce atmospheric CO₂ we must accumulate more carbon by letting more forests become old growth with larger trees

CARBON ROCK STARS: LARGE, OLDER TREES AND FORESTS

How many oak trees does it take to store 8 tons of carbon?



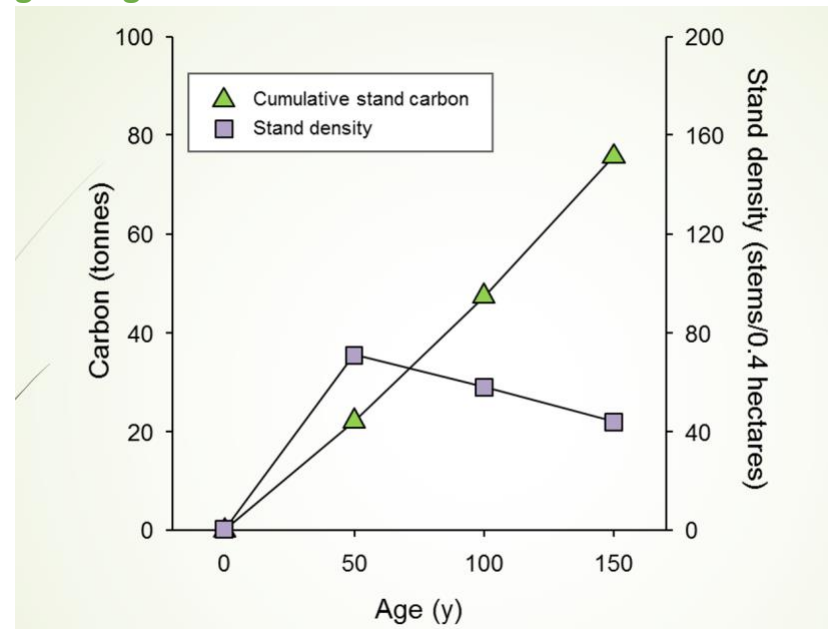
Leverett and Tusser 2021
<https://www.treeib.com/carbon-storage-in-trees-robert-leverett>

Additional references

- Law et al. 2023 <https://doi.org/10.3390/land11050721>
- Stephenson et al. 2014 <https://doi.org/10.1038/nature12914>
- Birdsey et al. 2023 <https://doi.org/10.3389/ffgc.2022.1074508>
- Birdsey et al. 2023 <https://doi.org/10.1016/j.foreco.2023.121373>

White Pine stand in Western Massachusetts demonstrates increased carbon accumulation for each 50-year period of growth for 150 years

Proforestation is management that achieves the potential of forest carbon accumulation and biodiversity by growing without harvest



Note that over time the number of trees (squares) decreases from competition, but the total carbon (triangles) on this land continues to increase as the remaining trees become larger.

Leverett et al. 2021
<https://doi.org/10.3389/ffgc.2021.620450>