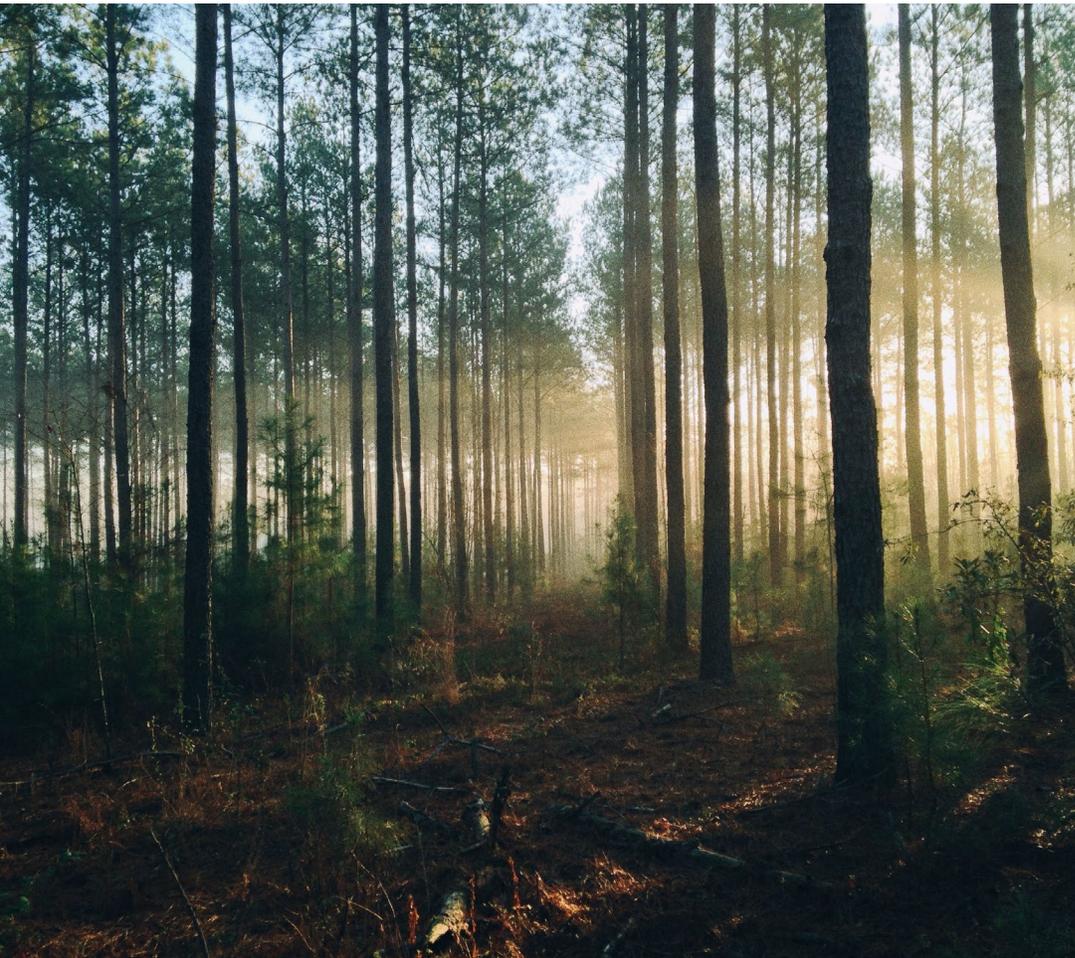


Forest Carbon Removal

Forests are important natural resources and nature's own carbon removal machines – trees can remove and store vast amounts of carbon dioxide for decades to hundreds of years. We can increase the carbon removal potential of forests via afforestation, reforestation, restoration, and forest management practices that focus on maximizing tree growth.¹

Forests grow in rural and urban settings on public and private lands, bringing a suite of ecological benefits that include improved air and water quality as well as carbon storage. Roughly one-third of the US is forested, capturing nearly 16% of the country's carbon dioxide emissions.^{2,3} Trees also provide economic co-benefits and local job opportunities, making them a win-win for communities and for climate.



GLOSSARY

Afforestation

Planting trees where there was never a forest

Reforestation

Planting trees where there was once a forest

Private corporate

Entities that are legally incorporated such as forestry companies and timber investment management organizations

Private non-corporate

Individuals, families, trusts, estates, Native American tribes, and conservation organizations

Family owned

Individuals, families, trusts, estates, and family partnerships

Forest carbon stock

Amount of carbon that has been sequestered from the atmosphere and now stored within the forest ecosystem

Albedo

Measure of reflectivity of a surface; for Earth, this measures how much of the sun's energy is reflected back into the atmosphere

Urban heat island

A city or metropolitan area that is significantly warmer than its surrounding rural areas due to human activities

Considerations

LAND USE AND OWNERSHIP

Some forestry practices (e.g. afforestation) require a lot of land and may compete with other community or economic priorities, like using land to grow food.⁴ Public forests in the US are managed for multiple uses including timber, water, recreation, wildlife habitat, and more. However, nearly two-thirds of American forests are privately owned and classified as private corporate, private non-corporate, or family owned. Family forest owners (FFOs) control 36% of the nation's forestland and have enormous potential to support carbon removal – but when FFOs are not intimately involved in managing their land, they are more likely to sell it, leading to land conversion and forest loss.⁵

ECOSYSTEM IMPACTS

Forests provide many ecosystem services – they help control soil erosion, support biodiversity, and mitigate floods and droughts.⁶ Forests also help filter water and may improve access to safe and clean drinking water for local communities.⁷ In many cases, managing forests for ecological and climate outcomes can increase biodiversity and make forests more resilient.⁸

The site, scale, and tree species mix of any forestry project must be carefully assessed to protect the important ecosystem services that forests provide and their carbon stocks. Planting monocultures (or the same tree species) can threaten biodiversity, reduce soil productivity, disrupt water cycles, and leave forests more vulnerable to threats like disease and storms, which damage or kill trees and subsequently release stored carbon back into the atmosphere.⁹ Forestation efforts are best focused on geographies that were previously forested to restore ecological systems and because historically unforested land areas that are replaced with forest absorb more heat and exacerbate climate change via albedo feedback.¹⁰

HEALTH IMPACTS

Forests can improve human health conditions. Trees can reduce air pollution by absorbing carbon dioxide and other pollutants.¹¹ Trees also provide shade, reduce the urban heat island effect, decrease heat-related illnesses, and reduce utility costs.¹² There is also a growing recognition that forests and green spaces promote both physical and mental health by reducing stress and providing a stronger sense of community and connection to nature.^{13,14} Despite enormous ecological, economic, and health benefits, forests are not equitably distributed across America – low-income neighborhoods and communities of color have significantly less tree coverage and experience higher levels of pollution than wealthier and white neighborhoods.^{15,16}

JOB CREATION AND ECONOMIC IMPACTS

Forests can bring economic opportunities to both urban and rural settings. Every \$1 million invested in forest restoration creates approximately 40 jobs.¹⁷ Over the next 10 years, over 100,000 new jobs are projected to be created in urban forestry for planting trees, forest maintenance, and landscaping.¹⁸ As reforestation efforts expand, demand for seeds, sapling production, tree planting and maintenance, and broader technical assistance will all increase. However, planting and managing trees are not the only way forestry can mitigate climate change – carbon can also be stored in harvested wood products for a long time. Opportunities for engineered wood products like cross-laminated timber are expanding; these products can both store carbon and substitute carbon-intensive construction materials, like steel and concrete.¹⁹

COSTS

The cost of carbon removal in forests can vary regionally and should be considered on a project- and ecosystem-specific basis.²⁰ Some natural restoration and reforestation may occur on its own, requiring no direct cost.²¹ However, some studies estimate costs ranging from \$5 to \$50 per ton of carbon dioxide sequestered.^{22,23,24} Opportunity cost is also critical to consider, such as if a landowner has to forego an immediate economic opportunity (like harvesting timber) in order to maintain or increase the current carbon stocks within a forest.²⁵ This opportunity cost becomes increasingly expensive as competing priorities and alternative uses for land arise.²⁶



Deployment

Most forest management approaches are well known and ready to be deployed today.²⁷ Sustainable reforestation efforts must take into account: 1) competition for land between food and fiber production, 2) optimal geographies (i.e. areas that are suitable for certain tree species, have little to no albedo concerns, and do not result in significant land use changes), 3) the need for robust monitoring of carbon outcomes, and 4) economic, social, and environmental benefits for foresters and local communities.^{28,29}

There are many forestry projects and initiatives across the United States that are focused on carbon removal and storage. Many reforestation projects are launched in response to disturbances such as wildfires or disease outbreaks, and may include carbon removal as a goal.³⁰ Robust monitoring, reporting, and verification (MRV) will be critical to accurately measure how much carbon is stored in forests across geographies, species, and management approaches. Monitoring is incredibly important given the growing interest in monetizing forest carbon.

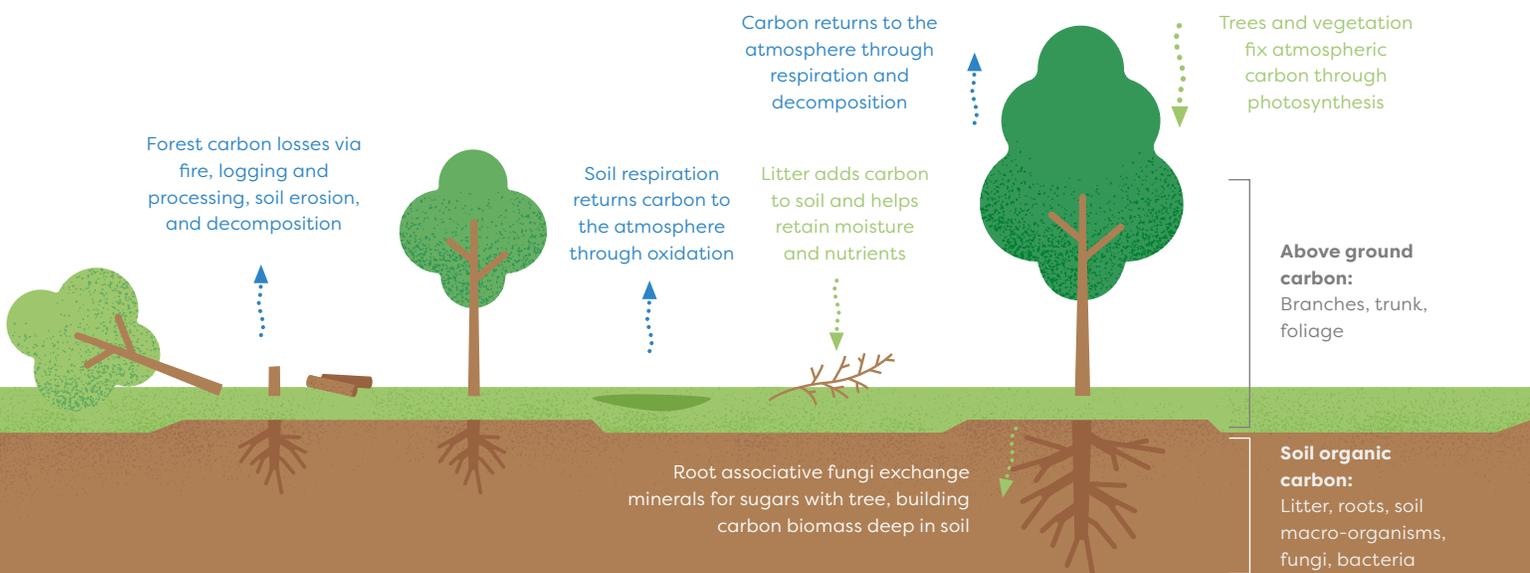
Government Engagement

The United States Department of Agriculture's (USDA) Forest Service (FS) and the Department of the Interior (DOI) are the primary agencies involved in forestry in their respective jurisdictions. The FS is a global leader in developing tools to measure and manage forest carbon. It produces regional carbon assessment reports to help foresters and communities understand how carbon is stored in forests and harvested wood products, as well as the potential co-benefits of forestry practices.³¹ The USDA also administers conservation programs (such as the Forest Legacy Program and Environmental Quality Incentives Program) and provides technical assistance to support the implementation of different forestry practices.

Congress has signaled growing interest in supporting forestry through legislative action – many federal bills, such as the REPLANT Act, have recognized the importance of forests as a tool to address climate change. In recent years there have been increases in federal funding for forestry, but most of these funds have been used for wildfire suppression, leaving other critical research and implementation programs severely underfunded.³²

Continued government support and partnerships are necessary to increase forest carbon practices across the US. Government engagement at the local, regional, national, and international level will be crucial for ensuring inclusive, equitable, and transparent scale-up.

Forest Carbon Sequestration



Endnotes

Forest Carbon Removal

- 1 [Natural climate solutions for the United States](#), American Association for the Advancement of Science
- 2 [Forest Inventory and Analysis: Fiscal Year 2016 Business Report](#), United States Department of Agriculture
- 3 [U.S. Forests and Carbon infographic](#), Forest Service and Department of Agriculture & Climate Change Resource Center
- 4 [Building a New Carbon Economy: An Innovation Plan](#), Carbon180
- 5 [Minority Family Forest Owners in the United States](#), Society of American Foresters
- 6 [Promoting human health through forests: overview and major challenges](#), Eeva Karjalainen, Tytti Sarjala, and Hannu Raitio
- 7 [Healthy Forests for Clean Water](#), Urban & Community Forestry Program of the North Carolina Forest Service, Department of Agriculture and Consumer Services, and the USDA Forest Service
- 8 [Carbon sequestration and biodiversity co-benefits of preserving forests in the western United States](#), Polly C Buotte, et al.
- 9 [Forestation Fact Sheet](#), American University
- 10 Ibid.
- 11 [Institutionalizing urban forestry as a “biotechnology” to improve environmental quality](#), David J. Nowak
- 12 [The relationship between neighbourhood tree canopy cover and heat-related ambulance calls during extreme heat events in Toronto, Canada](#), UC San Diego
- 13 [Promoting human health through forests: overview and major challenges](#), Eeva Karjalainen, Tytti Sarjala, and Hannu Raitio
- 14 [Sustaining America’s Urban Trees and Forests](#), United States Forest Service
- 15 [Trees Grow on Money: Urban Tree Canopy Cover and Environmental Justice](#), Kirsten Schwarz, et al.
- 16 [The Long-Term Dynamics Of Racial/Ethnic Inequality In Neighborhood Air Pollution Exposure, 1990–2009](#), Nicole Kravitz-Wirtz, Kyle Crowder, Anjum Hajat, and Victoria Sass
- 17 [Investing in nature: Restoring coastal habitat blue infrastructure and green job creation](#), P.E.T .Edwards, A.E.Sutton-Grier, and G.E.Coyle
- 18 [Trees as a Pathway for Social Equity](#), American Forests
- 19 [Global Mitigation Potential of Carbon Stored in Harvested Wood Products](#), Proceedings of the National Academy of Sciences
- 20 [Negative Emissions Technologies and Reliable Sequestration: A Research Agenda](#), The National Academies of Sciences
- 21 [Forestation Fact Sheet](#), American University
- 22 [Carbon Removal in Forests and Farms in the United States](#), World Resources Institute
- 23 [Forestation Fact Sheet](#), American University
- 24 [New Cost Estimates for Carbon Sequestration Through Afforestation in the United States](#), United States Forest Service
- 25 [Carbon Removal in Forests and Farms in the United States](#), World Resources Institute
- 26 Ibid.
- 27 [Building a New Carbon Economy: An Innovation Plan](#), Carbon180
- 28 [Governing Nature-Based Solutions to Carbon Dioxide Removal](#), Carnegie Climate Governance Initiative
- 29 [Carbon Removal in Forests and Farms in the United States](#), World Resources Institute
- 30 [Reforestation Partnerships](#), United States Forest Service
- 31 [Carbon](#), United States Forest Service
- 32 [Secretary Perdue Applauds Fire Funding Fix in Omnibus](#), United States Department of Agriculture

Learn more,
donate,
and subscribe at
carbon180.org

 Washington, DC

 hello@carbon180.org

 [@carbon_180](https://twitter.com/carbon_180)

