**Reference Articles on Forests & Forestry**

(Draft 1 November 2022)

**Benefits of Forests**

"Globally, forests absorb about twice as much carbon as they emit. Of the carbon emitted to the atmosphere by human activities, 25 percent is absorbed into terrestrial ecosystems including forests. Forests capture nearly 15 percent of US carbon emissions. Primary forests (forests that haven't been disturbed and have grown naturally over time) store 30-50 percent more carbon than logged forests."

Environment America, "The Climate Solution We Don't Have to Invent," June 2, 2021. [https://environmentamerica.org/blogs/environment-america-blog/ame/climate-solution-we-don’t-have-invent](https://environmentamerica.org/blogs/environment-america-blog/ame/climate-solution-we-don't-have-invent)

"Forests are the prime regulators of the water, energy and carbon cycles. The hydrologic and climate-cooling effects of trees and forests should be our first order of priority."

David Ellison, *et al.,* "Trees, Forests and Water: Cool Insights for a Hot World", Global Environmental Change, Volume 43, March 2017. <https://www.sciencedirect.com/science/article/pii/S0959378017300134?via%3Dihub>

"Forests reduce the risk of flooding. Clearcut logging increases downstream flooding by approximately 50 percent compared to intact forest canopies partly because about 21 percent less rain hits the ground under intact forest canopies."

Leslie M. Reid, "Do Forests Reduce Flood Risk", [Pacific Southwest Research Station](https://www.fs.usda.gov/psw/) U.S. Forest Service, Ecosystem Function and Health Program, 2011. <https://www.fs.usda.gov/research/news/highlights/do-forests-reduce-flood-risk>

"The psychological and emotional benefits of spending time in nature, of which forests are a major component, include:

• Mental restoration

• Stress reduction and its impacts

• Attention restoration

• Improved mood states

• Reduction of depression

• Reduction of anger and anxiety

• Enhanced feelings of pleasure

• Increased mental acuity

• Reduced mental fatigue

• Improved problem-solving ability

• Improved concentration

• Improved body image for women

• Increased feelings of empowerment

• Encouragement of nurturing characteristics

• Decreased risk of Seasonal Affective Disorder (SAD)

• Mitigation of the impact of dementia"

Denise Mitten, The Coalition for Education in the Outdoors, "Taproot", 2009, *Arbor Day Foundation*, Tree City USA Bulletin No. 71, 2014, entitled "The Healing Power of Trees". <https://www.arborday.org/trees/bulletins/coordinators/resources/pdfs/071.pdf>

**Protecting Forests**

"Darwin did not say, 'the survival of the fittest' - he said that 'nature operates by natural selection'. The story of the history of life is the story of a natural progression and a richness of biodiversity, ecological specialization, and geological sensitivity. It's not just rainforests and coral reefs: it's a rotting log or a forest floor."

Richard Fortey, "Age of Wonder,' Keynote lecture at Natlab, Eindhoven, Netherlands (March 29, 2014).

"The best chance of mitigating climate change involves the protection of existing forests (proforestation), and the passive recovery of forests by allowing them to regrow naturally."

William R. Moomaw, Susan A. Mesino, and Edward K. Faison," Intact Forests of the United States: Proforestation Mitigates Climate Change and Provides the Greatest Good, "*Frontiers in Forests and Global Change* 2 (June 2019): article 27; Erb et al., "Unexpectedly large Impace of Forest Management and Grazing."

**Forestry Practices - Logging**

"In US forests, logging causes ten times more CO2 emissions than the combined emissions from wildland fires and tree mortality from drought and native bark beetles."

N.L. Harris *et al.,* "Attribution of Net Carbon Change by Disturbance Type across Forest Lands of the Conterminous United States," *Carbon Balance Management* 11 (2016): article 24.

"Logging in US forests causes 617 million tons of CO2 emissions each year, with an additional 106 million tons of indirect CO2 emissions due to transportation associated with logging."

N.L. Harris *et al.,* "Attribution of Net Carbon Change by Disturbance Type."Ingerson, *US Forest Carbon and Climate Change.*

"While US forests sequester 1.66 billion tons of CO2 each year, logging is preventing that figure from being at least 30 percent higher because of logging-related soil damage and nutrient removal and the conversion of mature forests to young tree plantations."

Elliot *et al.,* "Effects of Forest Management on Erosion and Soil Productivity"; W.R. Moomaw et al., "Whole Tree Harvesting Can Reduce Second Rotation Forest Productivity": W.R. Moomaw et al., "Intact Forests in the United States" Proforestation Mitigates Climate Change and Serves the Greatest Good," *Frontiers in Forests and Global Change* 2 (2019): article 27.

"Logging-related soil compaction alone can reduce forest carbon sequestration and storage capacity by 30 percent, and reductions of 50 to 75 percent sometimes occur."

William J. Elliot *et al.,* "The Effects of Forest Management on Erosion and Soil Productivity," Symposium on Soil Quality and Rrosion Interaction, Keystone, CO, July 7, 1996.

"The overall impact of logging in US forests is more than 1 billion tons of CO2 each year, or about the same as the overall effect of coal production. The real carbon bomb is logging."

Chad T. Hanson, "Smokescreen: Debunking Wildfire Myths to Save our Forests and Our Climate," *University Press of Kentucky*, (2021).

"Removing trees from the forest and incinerating them for energy in biomass power facilities emits even more CO2 than burning coal, for equal energy produced. The emissions are about 65 percent worse than those from a modern coal plant."

John D. Sterman, Lori Siegel, and Juliette N Rooney-Varga, "Does Replacing Coal with Wood Lower CO2 Emissions? Dynamic Lifecycle Analysis of Wood Bioenergy," *Environmental Research Letters* 13 (2018): article 015007.

Jamie Fanous and William R. Moomaw, "A critical Look at Forest Bioenergy: Exposing a High Carbon 'Climate Solution'," Climate Policy Brief no. 8, Global Development and Environmental Institute, Tufts University, 2018.

"Forest degradation (of natural forests due to timber harvesting) causes widespread loss of bird breeding habitat and population declines."

Matthew G. Betts, *et al*., "Forest degradation drives widespread avian habitat and population declines," *Nature Ecology & Evolution,* 28 April 2022.

**Forest Wildfire**

Over 90% of a tree's carbon remains after a fire. The needles and branches burn, but the trunk and roots with most of the carbon don’t. If the tree is left and not salvage logged, the carbon remains and the tree provides habitat for more wildlife than when it was alive.

"Based on 154 wildfires that burned a combined area of more than 971,000 hectares (2.4 million acres) in California, the odds of a high-severity fire on private industrially managed forest lands were 1.8 times greater than on public lands. Moreover, high-severity fire incidence was also greater in areas adjacent to private industrial land, indicating this trend extends across ownership boundaries…underscoring the need for cross-boundary cooperation to protect ecological and social systems."

Jacob I. Levine *et al.,* "Higher incidence of high-severity fire in and near industrially managed forests," *The Ecological Society of America*, (2022), *Research Communications*, 397-404.

"The effects of [high-severity] fires on forest ecology are long-lasting and can facilitate conversion to non-forest ecosystem types, which has major negative implications for carbon storage and wildlife habitat."

Coop JD *et al.* (2020). Wildfire-driven forest conversion in western North American landscapes. *BioScience* **70**: 659-73

**Carbon Sequestration in Wood**

"Only about 1/5th of the wood in trees removed by logging makes its way into lumber products that temporarily store carbon in buildings. The branches and treetops are either incinerated in logging "slash piles" or burned in biomass power plants, and about half of the carbon in a tree trunk is lost a manufacturing or mill waste and is typically incinerated for energy."

Tara W. Hudiburg et al., "Meeting GHG Reduction Targets Requires Accounting for All Forest Sector Emissions," *Environmental Research Letters* 14 (2019): article 095005; Ann Ingerson, *U.S. Forest Carbon and Climate Change* (Washington, DC; Wilderness Society, 2007).