



1t.org U.S. Chapter Carbon Estimator Methodology

The Carbon Estimator creates the capacity to estimate the potential carbon impact of 1t.org U.S. Chapter pledge activities, such as tree planting, that are taking place *within the United States*. The Carbon Estimator has been developed by American Forests in consultation with the U.S. Forest Service. Estimates are based on U.S. Forest Inventory and Analysis (FIA) data obtained from the U.S. Forest Service EVALIDator online toolⁱ, using the most recent inventory year for each U.S. state, ranging from 2016-2019. These estimates are not intended as guarantees or modeled results of each pledge. Rather, these figures provide a credible estimate of the carbon impacts of pledges entered with the U.S. Chapter. Actual carbon outcomes from pledge activities will be tracked with more rigor and detail as activities are completed.

For **Tree Planting** pledges in rural landscapes, estimated sequestration gains are derived from an annualized calculation of total cumulative carbon stocks in a 100-year old forest. These values are aggregated by region as shown in the Carbon Estimator Map, or are provided on the national average level. Carbon estimates indicate carbon sequestered in live and dead tree biomass, both above and belowground, along with understory and litter carbon pools, above a baseline of soil organic carbon stocks. All carbon pools follow IPCC definitions. We estimate carbon sequestration in annualized values of metric tons of carbon dioxide per acre per year, further converted to metric tons of carbon dioxide per tree per year based on a factor of 300 trees planted per acre.ⁱⁱ These annualized values form the basis for the estimated carbon benefits generated by our tool from a given tree planting activity over the specified timeframes of 30, 50, and 100 years. These estimates cover all land ownerships across the continental U.S.

For **Tree Planting** pledges in urban and community areas, estimated sequestration gains are derived from two published studies of urban forest carbon storageⁱⁱⁱ and area^{iv}. Following a methodology established by The Nature Conservancy, total urban tree cover and tree count data from 2010 is downscaled to an estimate of approximate canopy area per urban tree. This area per tree metric is multiplied by an annual carbon sequestration per area metric to arrive at an estimate of carbon sequestration in metric tons of carbon dioxide per urban tree per year. This estimate is applied as a national average value and is not accompanied by regionally-specific estimates.

For **Forest Conservation** pledges, estimated sequestration gains are derived from three factors: current carbon stocks, future sequestration rates, and expected forest loss. We first estimate average carbon stocks per acre on private lands at regional and national levels. We further calculate annual carbon sequestration rates using the Tree Planting carbon estimate methodology described above for rural landscapes, filtering results for privately owned lands only. Finally, we calculate the average percent decrease in tree cover from forest conversion^v to isolate those acres and trees that could reasonably be expected to be lost through forest conversion, and therefore would be protected by a forest conservation pledge. This average percent loss is applied as a discount factor to both average carbon stocks and foregone carbon sequestration rates. We estimate the carbon impacts of forest conservation pledges as [existing stocks + (annual sequestration rate x years of protection)], to account for both existing carbon stocks protected and additional sequestration enabled by the pledge activity.



References:

ⁱ USDA Forest Service, Forest Inventory and Analysis Program, Thu Apr 30 18:43:23 GMT 2020. Forest Inventory EVALIDator web-application Version 1.8.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: <http://apps.fs.usda.gov/Evalidator/evalidator.jsp>]

ⁱⁱ This trees per acre metric was provided by the U.S. Forest Service, based on an analysis of USFS reforestation data from 2009-2019.

ⁱⁱⁱ Nowak, D.J., Greenfield, E.J., Hoehn, R.E., Lapoint, E. (2013). Carbon storage and sequestration by trees in urban and community areas of the United States. *Environmental Pollution* 178: 229-236.

^{iv} Nowak, D.J. and Greenfield, E.J. (2018). US Urban Forest Statistics, Values, and Projections. *Journal of Forestry* 116(2): 164-177.

^v U.S. Geological Survey (USGS) National Land Cover Database, 2011 and 2016; Coulston, J.W., Moisen, G.G., Wilson, B.T., Finco, M V., Cohen, W.B., Brewer, C.K. (2012). Modeling percent tree canopy cover: A pilot study. *Photogrammetric Engineering and Remote Sensing* 78(7): 715–727.