Accounting for Forest Carbon Loss

A Primer for Discussion—Green Press Initiative, June 2008

Introduction

The carbon accounting methodology in the recent report, *Environmental Trends and Climate Impacts,was based on rigorous data gathered from many expert objective sources. However, as with many complex and evolving calculations, the* model in the report has been criticized for not accounting for tree re-growth after harvest and as such labeled recently as a "radical" model that overstates the forest carbon loss figures. The goal of this narrative is to present additional data that underscores a multitude of factors not accounted for in the report, and it will show that the report's calculated carbon footprint for the U.S. book industry is actually conservative. Key data presented will include:

- Comparisons between carbon storage ability of mature vs. young trees/forests
- How re-planted forests can actually be net emitters of carbon for up to 20 years after planting due to soil disturbance and other factors
- How additional factors such as particulate emissions were not accounted for in the model
- How increases in forest growing stock over time doesn't represent whether forests are high or low carbon

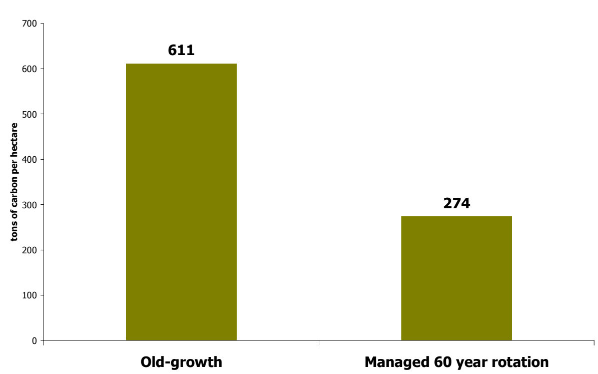
It was previously thought by many even in the conservation community that the lifecycle of a tree is "carbon neutral" and that any forest carbon lost from harvesting that tree was offset by carbon stored during a tree's life and from trees replanted after its harvest. But the science and new policies related to forest carbon accounting are evolving and beginning to explore new ground-level factors such as net emissions from soil disturbance and the variance in carbon storage ability between young and old forests. The ultimate goal is policies and practices in forest management that optimize the ability for forests to store the greatest amount of carbon—an indisputable need. Listed below are a variety of factors that underscore the validity of the model used in the report and the need for more research.

I Accounting for Differences between Carbon Storage of Newly Planted vs. Old Forests

The report researchers and BISG/GPI felt that measuring forest carbon loss was a tangible process due to the fact that biomass (wood) removal figures from U.S. book industry paper consumption can be extrapolated into a $C0_2$ equivalent through a standard calculation (See report pg. 26: total wood × 0.5 × 3.667). Developing a calculation for forest carbon storage from re-planting that also balanced out lost carbon storage ability of a mature forest (had it been left standing) in addition to soil and other emissions due to harvest was beyond the scope of this project and is currently something that Environmental Defense and others are embarking upon. Some key figures and statistics below illustrate why accounting for re-growth is not as simple as it sounds.

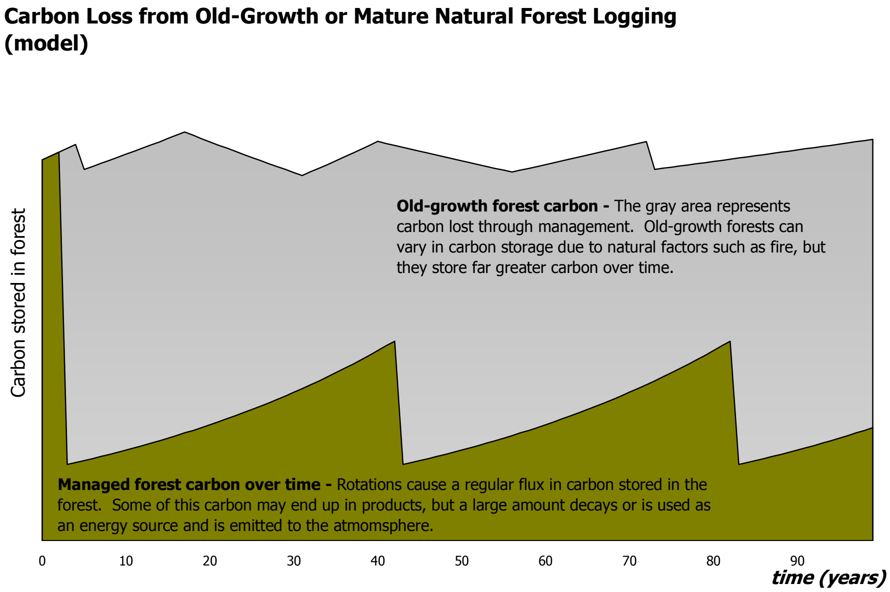
Figure 1

Harmon, Ferrell and Franklin (1990)



Source: Harmon, Mark E., William K. Ferrell, and Jerry F. Franklin. "Effects on Carbon Storage of Conversion of Old-Growth Forests to Young Forests." *Science,* 9 February 1990: Vol. 247, pp 699–702

Figure 2



Case Study: Registered Carbon Banking Project in California

The *Van Eck Forest Project* is a 2,100 acre forest carbon in California. The project is the first emissions reductions effort registered and independently certified under the rigorous accounting standards adopted by the California Air Resources Board to help the state meet its ambitious greenhouse gas reduction goals. According to the Pacific Forest Trust, even though only 2,100 acres, **The Van Eck Forest Project will permanently reduce approximately 500,000 tons of CO_2 emissions over a 100-year period** by focusing on forestry practices that keep trees standing and sequester more carbon than could be attained through conventional harvest and management.[i] California Governor Schwarzenegger and House Speaker Nancy Pelosi have both purchased offsets through this project for their travel emissions.

II Newly Planted Forests As Carbon Emitters?

Soil organic carbon constitutes more than twice as much stored carbon as that of the earth's vegetation (plants, trees, crops, and grasses). This is a vital statistic and part of the reason why trees planted after harvest often emit carbon for years, despite the rapid growth rate of young trees. This is due to the fact that microbes in the forest soil, which release CO_2 as they break down dead branches and roots, work more quickly after a stand is logged. In Eastern Oregon, for example, Oregon State professor Dr. Beverly Law found that where trees grow slowly a replanted clear-cut gives off more CO_2 than it absorbs for as long as 20 years.[ii] In a recently published article in *On Earth Magazine*, Dr. Law observes, "That's a long time, during which microbes respiring in the soil, rather than trees photosynthesizing aboveground, dominate the carbon balance."[iii] Dr. Law has been using the Eddy Flux measurement, which is a pioneering high-tech field-based measurement system that measures carbon exchange in the tree, air, and soils and is redefining the way in which previous carbon models were developed and how optimum carbon benefit in forests is perceived.

III Other Variables Not Included in the Carbon Fooprint Analysis

There are additional factors related to forest harvest and paper production that would increase $C0_2$ emissions for the industry footprint, but were not included due to a lack of substantive data and the time and capacity constraint. These factors include:

- The embedded emissions from the use of chemicals in paper production. (The chemical industry is the second largest industrial emitter of greenhouse gases in the US. The paper industry is a major user of chemicals, but the share in currently unknown.)
- The burning of slash after harvest—releasing $C0_2$ and particulate pollution, both increasing the calculations associated with forest harvest.
- The use of chemicals and fertilizers in forest management.

IV Increases in Growing Stock: Not a True Indicator of Optimal Carbon Storage in Forests

According to the U.S. Forest Service, growing stock on timberlands increased by 36% between 1953 and 1997,and according to the Forest Inventory Analysis, growth is exceeding harvest. These facts are used to illustrate the notion that *forests aren't losing carbon.* While these are positive indicators and emblematic of a forest products industry that successfully replants, it does not accurately reflect whether forests are being managed for a high or low carbon potential. As was presented earlier, replanted clear-cuts can be net emitters of carbon for up to 20 years and, if trees are part of a short pulpwood harvest rotation for paper, they are likely to be harvested every 30 to 40 years.

Additionally, the forest growing stock data does not account for conversion from natural forests to plantations and the subsequent loss in carbon storage capability. For example, if a hardwood forest is harvested and converted to a pine plantation, there may not be a change in long-term growing stock, but there is a change in carbon storage ability. Ohio State professor Dr. Brent Sohngen has calculated that upland hardwood forests have from 45 to 80 tons of Carbon/hectare, whereas pine stands have 21 to 55 tons of Carbon/hectare[iv] Accordingly, as natural forests are converted to plantations, there can be a net carbon storage decrease of 68%. In the Southeast U.S., the world's largest paper producing region, there has been a rapid expansion of natural forests converted to pine plantations—with 15% of the total forest (32 million acres) in plantation management. Accordingly, a macro-level assessment such as increased growing stock ceases to account for important carbon storage related factors at the individual forest scale.

Discussion

According to the Intergovernmental Panel on Climate Change (IPCC), *"New protected areas should include those that contain large C* [carbon] *pools, such as forests growing on peat soils at high and low latitudes, and high biomass old-growth forests"* Using this same logic, if we can put less pressure on forests through reduced consumption and increased recycling and have improved forest management for less soil disturbance, more standing trees, and longer rotations, we will be actively investing in our future climate stability. While the counter-arguments to the book industry carbon footprint model are compelling, the fact is, our original calculations as well as the additional data included in this brief, the industry's footprint may be even larger than calculated. Leading NGOs including Environmental Defense, are re-evaluating their forest carbon assumptions and will likely be accounting for forest carbon loss in the near future. As the science continues to evolve, so should our baseline footprint model. But for now, we should make use of the significant amount of time and resources that were devoted to creating the model and focus energy on setting goals and developing strategies to reduce the industry's carbon footprint.

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[i] See http://www.pacificforest.org/stewardship/vaneck/index.html

[ii] Forest soil respiration across three climatically distinct chronosequences in Oregon
J.L. CAMPBELL* and B.E. LAW Biogeochemistry (2005) 73: 109–125
http://www.springerlink.com/content/p01p01602u63g237/fulltext.pdf

[iii] More on Dr. Law and the findings at: http://www.onearth.org/article/the-giving-trees?page=1 and
http://wwwdata.forestry.oregonstate.edu/terra/people/bevlaw.htm

[iv] The Influence of Conversion of Forest Types on Carbon Sequestration and other
Ecosystem Services in the South Central United States. *December 15, 2004*
http://aede.osu.edu/people/sohngen.1/forests/HW_SW_paper_v2.pdf