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Don't Rest ▄ on the Risk

Strategies to Increase Forest Carbon Storage and Reduce Fossil Fuel Consumption

By Ryan and Harmon et al. (2010)

From the outline below, we can see that benefits from forest thinning, urban forestry, biomass energy, carbon storage in forest products, and substitution of concrete and steel with wooden alternatives are not very enticing. The benefits from forest thinning are marginal at best; urban forestry is a tiny, circumstantial landscape; biomass energy market is limited and transportation of firewood is generally prohibited; forest products eventually end up in methane producing landfills; and, in the long term, wooden structures would be rebuilt several times compared to their steel and concrete counterparts, and wooden substitutes for the demands of concrete applications are rare.

Hope seems to lie in avoiding deforestation, afforestation, increased harvest rotations, and anthropogenically increasing forest growth rates. The major risk for the first three strategies lies in the assumption that these strategies will reduce available timber for harvest and/or reduce lands needed for agriculture, thereby offsetting benefits by accelerating deforestation in another part of the world.

However, I have yet to find an inventory of unused or under utilized land ripe for afforestation or agroforestry. In the long term, the harvest of reforested lands avoids deforestation of virgin stands and reduces the demand for imported forest products.

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Furthermore, the afforestation and subsequent harvest of unused lands can prevent carbon losses addressed in the third strategy by altogether removing the need to harvest lands currently forested. Thus, forest management aimed at reducing carbon loss can be applied to afforested lands.

1. Avoid deforestation - Deforestation releases 1,400 – 2,000 teragrams of carbon a year

Risks

- May increase demand for crops & livestock from other countries, simply reallocating deforestation
- Economic consequences from loss of agricultural or pastoral development

Benefits

- Directly prevents loss of carbon sequestration

2. Afforestation

Risks

- May increase demand for crops & livestock from other countries, simply reallocating deforestation
- Planting forests in non-native locations can lower species diversity, change water table, reduce streamflow and absorb more energy

Benefits

- Carbon storage
- Biodiversity
- Wildlife habitat
- Protection of watersheds from erosion
- Nutrient Retention
- Improved water quality
- Reduction of peak stream flow & increase in base streamflow
- Recreational opportunities
- Aesthetic and spiritual fulfillment
- Lowest risk for unintended consequences

3. Forest management: decreasing carbon loss by lengthening harvest interval or reducing amount removed stores more carbon

Risk

- Increase demand for timber harvest from elsewhere to compensate

Benefits

- Mimics natural disturbance regime
- Application of this practice over time and larger landscapes leads to greater carbon benefits
- Increases structural and species diversity

4. Forest management: increasing forest growth rate by regenerating harvest & damaged forests, controlling competing vegetation, fertilizing, genetically improved trees, species selection

Risks

- Emissions of nitrous oxide from fertilization
- Reduced water yield
- Loss of biodiversity if monocultured

Benefits

- ♪ Can substantially increase wood growth
- ♪ 500 million acres are available for increased growth rate
- ♪ Plantation of specimens resilient to future climate change

5. Forest management: thinning to reduce fire threat

Benefits Grim:

- **?** Landscape-level models suggest fuel treatments decrease carbon, even if thinned trees are used for biomass energy

6. Urban forestry

Benefits very limited:

- **?** Urban areas are small fraction of US landscape
- **?** Urban forests require intensive management and resources
- **?** Results are highly variable by region and species

7. Biomass energy

Drawbacks:

- Limited to forest products industry and residential heating
- If cost were not a constraint, forests could offset only 190 teragrams of fossil fuel carbon emissions per year (12% of 2003 emissions)

Benefits:

- ♪ Prevents fossil fuel use

8. Carbon storage in forest products

Drawbacks:

- Landfills produce methane, which as 25 times the warming potential of carbon

Benefits:

- ♪ Carbon otherwise released by decomposition is stored by in-use wood products and wood products disposed in landfills

9. Substitution of steel and concrete with wood products

Drawbacks:

- Must find use outside of residential homes, as most are already built out of wood

Benefits:

- ♪ Fewer emissions

Ryan, Michael G.; Harmon, Mark E.; et al.; *A Synthesis of the Science on Forest and Carbon for U.S. Forests*; The Ecological Society of America; Issues in Ecology; Report 13; Spring 2010