Update on greenhouse gas emissions and removals on forest land in the US

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Mission...

...to advance the science, monitoring and reporting of greenhouse gas emissions and removals on forest land in the US
Context within the land sector

Forest land

- Other land
- Cropland
- Grassland
- Wetlands
- Settlements

Atmosphere

NEP

- Fire

Harvested wood products

- Other land
- Cropland
- Grassland
- Wetlands
- Settlements
- Forest land

Gains

Losses

2018 NIR: (-637) MMT CO$_2$ eq. (11%)
Current efforts and contributions

- Ongoing R&D on carbon pool science, land use conversion dynamics, and integration of emerging data and technologies
- National GHG Inventory – Forest land and urban trees
- 4th National Climate Assessment – LULC and Forests
- National Soil Assessment – Soil Carbon and IMA
- 2016 RPA Update – C and biomass
- State reporting in the Northern Region (24 states)
- Intergovernmental Panel on Climate Change (IPCC) – Refinement of the 2006 GPG
Annual reporting responsibilities

- Forest Land Remaining Forest Land
  - Forest ecosystem carbon
  - Forest fire emissions
  - Emissions from drained organic soils*
  - Emissions from N additions to soils*

- Land Converted to Forest Land*
  - Forest ecosystem carbon
  - Emissions from drained organic soils

- Forest Land Converted to Land*
  - Cropland, Grasslands, Settlement, Wetland, Other Land

- Harvested Wood Products

- Urban trees in Settlements*
Forest ecosystem C pools

- Aboveground live biomass
- Belowground live biomass
- Dead wood
- Litter
- Soil organic matter
  - Mineral
  - Organic

Forest C stocks by pool in the US

- **Aboveground Biomass**: 28%
- **Belowground Biomass**: 6%
- **Dead Wood**: 5%
- **Litter**: 5%
- **Mineral soil - 100 cm**: 5%
- **Organic soil - 100 cm**: 1%

2018 NIR: 51,131 MMT C stocks

Forest land emissions and removals

Planned improvements

- New C pool methods (e.g., understory, foliage, belowground)
- Incorporation of woodland C stocks (Grasslands)
- Refinements to C stock changes associated with land use conversion
- Continued development of new approaches to provide more resolved estimates for the NIR and other efforts


Introduction
The Forest Service has responsibilities for delivering policy-relevant reports, tools, and data on GHG emissions and removals from forest land as well as trees outside of forest (TOF, e.g., urban forests, agroecosystems) in the US. Principally, the FIA program is responsible for compiling estimates of GHG emissions and removals from forest land in the US each year as a component of the National Inventory Report (NIR) that is submitted to the United Nations Framework Convention on Climate Change (UNFCCC). The FIA program contributes to several other state, regional, national and international reporting instruments such as the US Biennial Report, the US Resource Planning Act Assessments, the Montreal Process Criteria and Indicators, and US Global Change Research Program reports.

The 2014 Farm Bill (SSA301) directly addresses forest C stocks with language (subparagraph 3) on reporting on renewale biomass supplies and C stocks across scales and by ownership as well as through inclusion of interior Alaska (subparagraph 1), improving land cover and change detection (subparagraph 5) and refining spatial (subparagraph 11) resolution of estimates.

Forest Carbon Cycle
Carbon is continuously cycled among the previously defined C storage pools and the atmosphere as a result of biogeochemical processes in forests (e.g., photosynthesis, respiration, decomposition, and disturbances such as fires or pest outbreaks) and anthropogenic activities (e.g., harvesting, thinning, and replanting). As trees photosynthesize and grow, C is removed from the atmosphere and stored in living tree biomass. As trees die and otherwise deposit litter and debris on the forest floor, C is released to the atmosphere and is also transferred to the litter, dead wood and soil pools by organisms that facilitate decomposition.

The net change in forest C is not equivalent to the net flux between forests and the atmosphere because timber harvests do not cause an immediate flux of all harvested biomass C to the atmosphere. Instead, harvesting transfers a portion of the C stored in wood to a “product pool.” Once in a product pool, the C is emitted over time as CO2 in the case of decomposition and as CO2, CH4, N2O, CO, and NOx when the wood product combusts. The rate of emission varies considerably among different product pools.

Box 1: Carbon Pools
For estimating carbon (C) stocks or stock change (ΔC), C in forest ecosystems can be divided into the following five storage pools (IPCC 2006):

- Aboveground biomass, which includes all living biomass above the soil including stems, stumps, branches, bark, seeds, and foliage. This category includes live understory.
- Belowground biomass, which includes all living biomass of coarse living roots greater than 2 millimeters (mm) diameter.
- Dead wood, which includes all non-living woody biomass either standing, lying on the ground (but not including litter), or in the soil.
- Litter, which includes the litter, humus, and humus layers, and all non-living biomass with a diameter less than 2.5 centimeters (cm) at transect intersection, lying on the ground.
- Soil organic C (SOC), including all organic material in soil to a depth of 1 meter but excluding the coarse roots of the belowground pools.

In addition, there are two harvested wood pools included when estimating C flux:
- Harvested wood products (HWP) in use.
- HWP in solid waste disposal sites (SWDS).
Final thoughts

- The forest land C sink remains strong
- FIA data continues to be the foundation
- Growing need for more spatially and temporally resolved information
- Work is on-going to improve and expand capabilities - collaboration and partnerships are essential
- Inform policy and management decisions
Thanks!

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