A Brief Overview of Maine’s Net GHGs, Carbon Credit Markets, and Harvested Wood Product Accounting

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Greenhouse gas (GHG) emissions vary depending on where and what you measure...

**Global Ag & Forest:** +24% total GHGs

**USA Forests:** -11%

**ME Forests:** -70%
Forest Removals

Gross GHGs =

% Gross GHGs Removed by Forests

Net GHGs =

Gross GHGs + Removals

Forest Removals

Maine GHG Emissions and Forest C Removals 1990-2017

ME DEP (2020); USFS (2020)
How Does Maine Compare to Other States?

- GHG Emissions: Fossil-based emissions (EPA, 2020)
- Forest C Sequestration: Growing stock sequestration (USFS, 2020)

\[
\text{Fossil GHGs} + \text{Forest C Sequestration} = \text{Net GHGs}
\]

\[
\% \text{ Forest Removal} = \frac{\text{Forest Carbon Sequestration}}{\text{Fossil GHG Emissions}}
\]

Annual estimates averaged over 2008-2018 to minimize outlier bias
Forest Carbon Sequestration by State (2008-2018 Average)

MMTCO2e/yr

-53.8  10.8

-53.8  20  1  50
Net GHGs by State (2008-2018 Average)

MMTCO2e/yr

-2.1

753.7

50

48

1

Net GHGs by State (2008-2018 Average)
Net Forest C Sequestration
(C removal < growth)

Net Forest C Emissions
(C removal > growth)
A Very Quick Overview of Carbon Credits
Role of forests in GHG policy and carbon markets

• Forests can be a large contributor to both GHG emissions and climate change mitigation

• Mitigation potential from global forests varies with geography, carbon price, option, etc.

• Many international climate policy proposals highly dependent on forest-based mitigation to minimize costs

• Currently, only New Zealand includes the forest sector as ‘mandatory’ coverage in their emissions trading scheme (ETS)
How the Carbon Credit Market Works

Auctions and sales by mutual agreement
Offset credits
Transactions among emitters and participants

PURCHASE

SOLD

Excess GHG emissions
Allocated GHG emission units

Real GHG emissions

EMITTER A

EMITTER B

Reduced GHG emissions
Real GHG emissions
Including incentives for forest carbon sequestration can reduce costs by 40-50%.

- Accounts for up to 30% of GHG abatement
- Most abatement from outside OECD

Analysis of costs to stabilize at 550 ppm CO2

Source: Tavoni, Sohngen, and Bosetti (2007)
...and most of the low-cost, land-based, GHG abatement is expected to come from improved forest management and planting more trees.

- Maine stands to gain a lot from an efficient climate policy that incentivizes gains in forest carbon sequestration, particularly through improved forest management.

- Maine could potentially gain from an increase in market demand for wood-based products, bioenergy, and biofuels, especially if wood is recognized globally as a low-carbon and sustainable source.

Notes on carbon credits/markets

• Additionality, permanence & leakage
  • Are credits being issued for real gains in C?

• Voluntary vs. Regulatory Markets
  • How flexible do you want to be?
  • Are you willing to enter a 100 year commitment?

• Transaction costs for carbon credit project development
  • Can cost $100,000+
  • Likely need 1,000s of acres to be viable
Estimating Carbon in Maine’s Harvested Wood Products
Harvested Wood Product Cycle

**Trees in Forests**
quantified as growing-stock volume on forestland

**End Use Products**
such as houses, furniture, or paper products

**Industrial Roundwood**
classified as softwood or hardwood, and saw logs or pulpwood

**Primary Wood Products**
such as lumber, panels, or paper

Disposition: emitted or landfill

Processing at mills

Harvest and removal from forest

Manufacture or construction

Recycling

## Forest Product Pool Decay Rates (based on Smith et al. 2006)

Aggregated end use products simulated by the Carbon Object Tracker and associated end use product categories defined by Smith et al. 2006.

<table>
<thead>
<tr>
<th>Carbon Object Tracker decay pools</th>
<th>Smith et al. 2006 Table D3</th>
<th>Half-life (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single family homes</td>
<td>New residential construction: single family</td>
<td>100</td>
</tr>
<tr>
<td>Multi-family homes</td>
<td>New residential construction: multifamily</td>
<td>70</td>
</tr>
<tr>
<td>Other products</td>
<td>New residential construction: mobile homes</td>
<td>12</td>
</tr>
<tr>
<td>Repair &amp; furniture</td>
<td>Residential upkeep and improvement</td>
<td>120</td>
</tr>
<tr>
<td>Commercial buildings</td>
<td>New non-residential construction: all except railroads</td>
<td>67</td>
</tr>
<tr>
<td>Other products</td>
<td>New non-residential construction: railroad ties</td>
<td>12</td>
</tr>
<tr>
<td>Other products</td>
<td>New non-residential construction: railcar repair</td>
<td>12</td>
</tr>
<tr>
<td>Repair &amp; furniture</td>
<td>Manufacturing: household furniture</td>
<td>30</td>
</tr>
<tr>
<td>Repair &amp; furniture</td>
<td>Manufacturing: commercial furniture</td>
<td>30</td>
</tr>
<tr>
<td>Other products</td>
<td>Manufacturing: other products</td>
<td>12</td>
</tr>
<tr>
<td>Shipping</td>
<td>Shipping: wooden containers</td>
<td>6</td>
</tr>
<tr>
<td>Shipping</td>
<td>Shipping: pallets</td>
<td>6</td>
</tr>
<tr>
<td>Shipping</td>
<td>Shipping: dunnage etc.</td>
<td>6</td>
</tr>
<tr>
<td>Other products</td>
<td>Other uses for lumber and panels</td>
<td>12</td>
</tr>
<tr>
<td>Other products</td>
<td>Solid wood exports</td>
<td>12</td>
</tr>
<tr>
<td>Paper</td>
<td>Paper</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**Note:** Single and multi-family homes and commercial buildings are listed as 'Construction' for brevity in the top figure conceptually depicting CO2 model dynamics.
Percent Harvest Stored in Products + Landfills Over Time

- Softwood Saw log
- Hardwood Saw log
- Softwood Pulpwood
- Hardwood Pulpwood

% Original Harvest C Stored

Years Since Harvest

Maine 100-yr Mean HWP Carbon Flow (MtC)

- Sawlogs: 1.066
- Pulplogs: 1.550
- Total Harvest: 2.616

Long-term Storage:
- Long lasting sawlog products: 0.250
- Long lasting pulp products: 0.195
- Landfill: 0.410

Energy use: 0.989

Decay (no use): 0.772
What if we shift all harvests to sawlogs?

- **2016 100 year-average** ~850,000 tC
- **All Sawlog 100 year-average** ~1,010,000 tC
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