Latest CO₂ reading: 410.98 ppm
Fossil Fuel Emissions [Total]

Atmospheric Growth [Net]
Total estimated sources do not match total estimated sinks. This imbalance reflects the gap in our understanding.
A Large and Persistent Carbon Sink in the World’s Forests

Yude Pan,1* Richard A. Birdsey,2 Jingyun Fang,2,3 Richard Houghton,4 Pekka E. Kauppi,5
Warner A. Kurz6 Oliver J. Phillips7 Anatoly Shvidenko8 Simon I. Lewis7 Josep G. Cerdà9

Regions of the World
Other
  □ No Data/Other Countries
Tropical
  □ Asia
  □ Africa
  □ Americas
Temperate
  □ Continental US & S. Alaska
  □ Europe
  □ China
  □ Japan/Korea
  □ Australia/NZ
Boreal
  □ Canada
  □ N. Europe
  □ Asian Russia
  □ European Russia

Forest Carbon Flux 1990-1999
Forest Carbon Flux 2000-2007
Tropical Regrowth Carbon Flux 1990-1999
Tropical Regrowth Carbon Flux 2000-2007
Tropical Gross Deforestation C Emissions 1990-1999
Tropical Gross Deforestation C Emissions 2000-2007
The State of Maine's Carbon Budget
(v1.0)

Xue Bai¹, Adam Daigneault¹, Ivan Fernandez², Jereme Frank³, Daniel Hayes¹, Beverly Johnson⁴, Xinyuan Wei¹, Aaron Weiskittel⁵
The State of Maine's Carbon Budget

Atmosphere

Forests

Wetlands

Agriculture

Inland Waters

Fossil Emissions

Coastal Ecosystems

Urban
Trees take up C from the atmosphere through photosynthesis and adds it as biomass. As the C cycles through the ecosystem it is either returned to the atmosphere through decomposition or incorporated into the soil. In managed forests, live biomass is also removed in harvest and that C can be made into short- (e.g., pulp) or long- (e.g., sawlogs) term products. About 89% of Maine consists of forests (the most of any state), which account for the vast majority of C uptake and storage in this budget.
Carbon in crop residues can be incorporated into the soil, depending on management practices across the diversity of Maine's 7,600 farms. Livestock are a major source of the emissions from this sector.
In built environments, the C stored in trees, gardens, lawns, and wooden structures from residential areas and parks are increasingly important in keeping C out of the atmosphere.
There are more than 277,000 acres of wetlands in Maine, including bogs and fens where C is stored in saturated organic (e.g., peat) and mineral soils.
Table 1. Absolute and relative estimates of land area (millions of acres) and carbon (Megagrams) as well as carbon density (Mg C per acre) in 2016 by primary land type in Maine.

<table>
<thead>
<tr>
<th>Land Type</th>
<th>Area</th>
<th>Carbon</th>
<th>Density (Mg C/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M acres</td>
<td>% Total</td>
<td>Stock (Mg C)</td>
</tr>
<tr>
<td>Forest</td>
<td>17.30</td>
<td>87.6%</td>
<td>2,071,219,199</td>
</tr>
<tr>
<td>Ag (soil only)</td>
<td>1.25</td>
<td>6.3%</td>
<td>96,303,017</td>
</tr>
<tr>
<td>Wetland</td>
<td>0.28</td>
<td>1.4%</td>
<td>71,229,883</td>
</tr>
<tr>
<td>Salt Marshes (upper 1 m)</td>
<td>0.02</td>
<td>0.1%</td>
<td>2,518,500</td>
</tr>
<tr>
<td>Seagrasses (upper 1 m)</td>
<td>0.03</td>
<td>0.2%</td>
<td>1,625,600</td>
</tr>
<tr>
<td>Urban</td>
<td>0.87</td>
<td>4.4%</td>
<td>91,015,658</td>
</tr>
<tr>
<td>Total</td>
<td>19.75</td>
<td>100.0%</td>
<td>2,333,911,856</td>
</tr>
</tbody>
</table>

Compiled by the Forest Climate Change Initiative, Center for Research on Sustainable Forests at the University of Maine.
The plot below shows C emissions over time (since 1990) from the major sources of fossil fuel combustion in Maine. Carbon emissions from fossil fuel combustion in Maine peaked in 2002-04, and have been declining by ~3% per year since. Despite the decline, transportation emissions have maintained a steady pace and currently account for more than half of total emissions.
The U.S. Energy Information Administration reports annual estimates of fossil fuel emissions by energy-consuming sector in each state. Agricultural emissions and other sources are compiled in the U.S. Environmental Protection Agency’s National Greenhouse Gas Inventory and Reporting.
1,000s metric tons of C per year

**Atmosphere**

- **Emissions**

- **Net Uptake**

**Forests**

- Live Biomass +2,675
- Dead Biomass +132
- Soils +133

**Wood Products**

- Sawlogs +383
- Landfill +206
- Pulp +165

**Inland Waters**

- Sedimentation 431

**Soils**

- Wood Harvest 3,780

- Forest stocks and wood products are estimated by the U.S. Forest Service, which updates its Forest Inventory Analysis plot measurements across the country on a 5- to 10-year cycle. Fluxes in other land covers are estimated locally and extrapolated by satellite imagery, such as with the National Land Cover Dataset.
The State of Maine’s Carbon Budget: Key Findings

Key Findings
- GHG emissions in Maine are dominated by burning fossil fuels, primarily from the transportation sector, but with a sharp decline in electric power emissions over the last decade.
- Carbon 'offsets' are estimated as 55% for forest growth and 75% for the total annual C cycle.
- Critical uncertainties in the budget arise from undersampled or unknown components. Improved assessments require advances in stock quantification and flux monitoring.
The goal is to develop a reliable and accurate operational carbon monitoring system based on new measurements, maps, and models.

- NASA Remote Sensing of Forest Health
- NSF Informatics and Smart Data for Forests
- NASA Forest Carbon Estimation
- CFRU Enhanced Forest Inventory
- Maine Forest Ecosystem Status and Trends

In Maine, atmospheric GHGs are measured at a NOAA “tall tower” in Argyle, and the Howland Research Forest is one of the longest-running ecosystem C flux monitoring sites in the world.
Thank You!
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