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

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Science and Practice: Addressing Forest Climate Change in Maine Webinar Series
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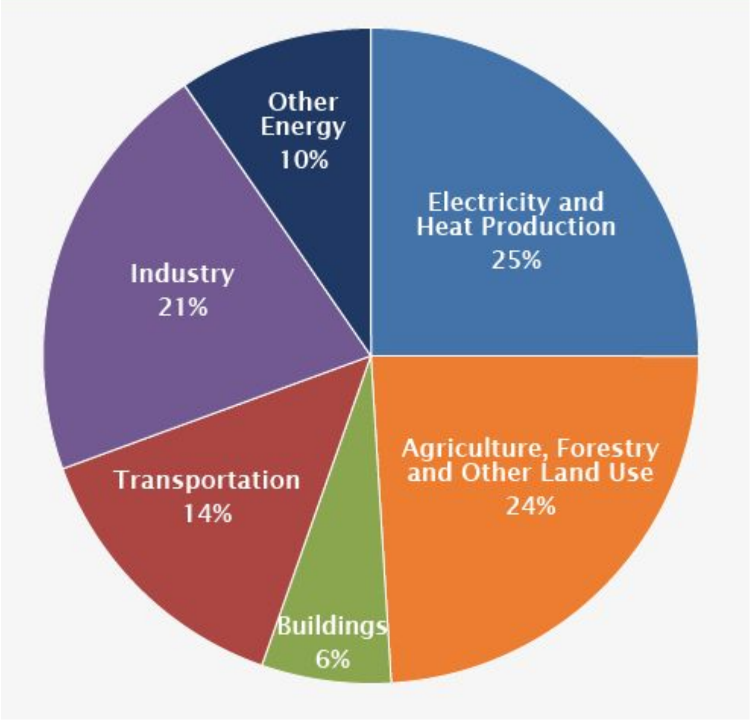
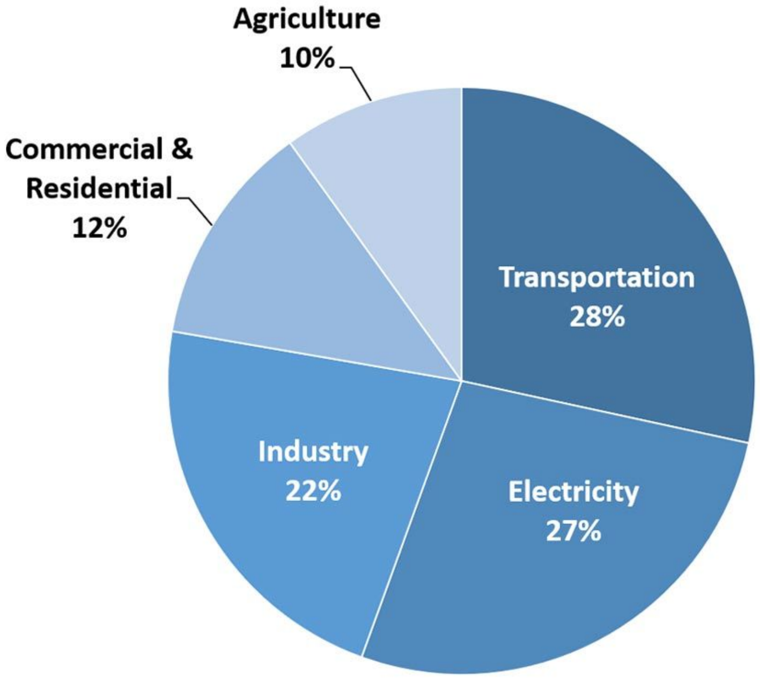
US Net Greenhouse Gas Emissions: How Does Maine Stack Up?

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

Total Global GHG Emissions by Economic Sector in 2014



Total USA GHG Emissions by Economic Sector in 2018



Total Maine GHG Emissions by Source Category in 2017

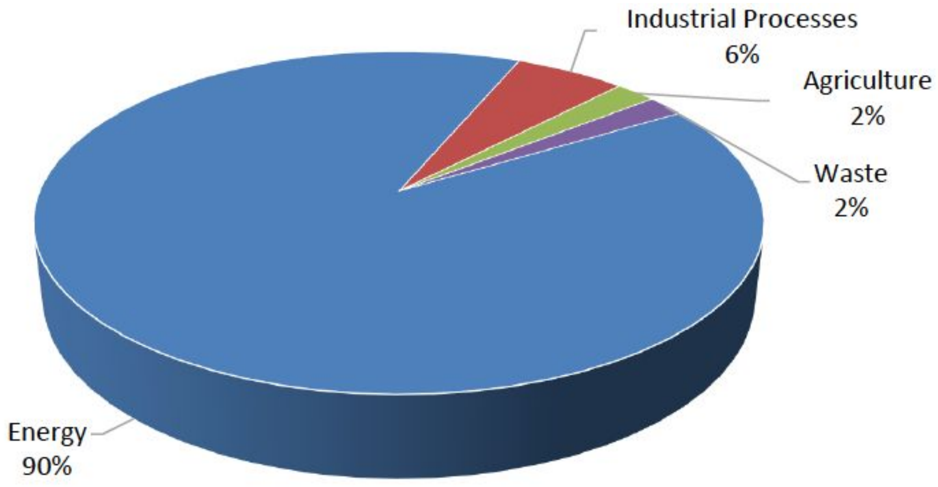
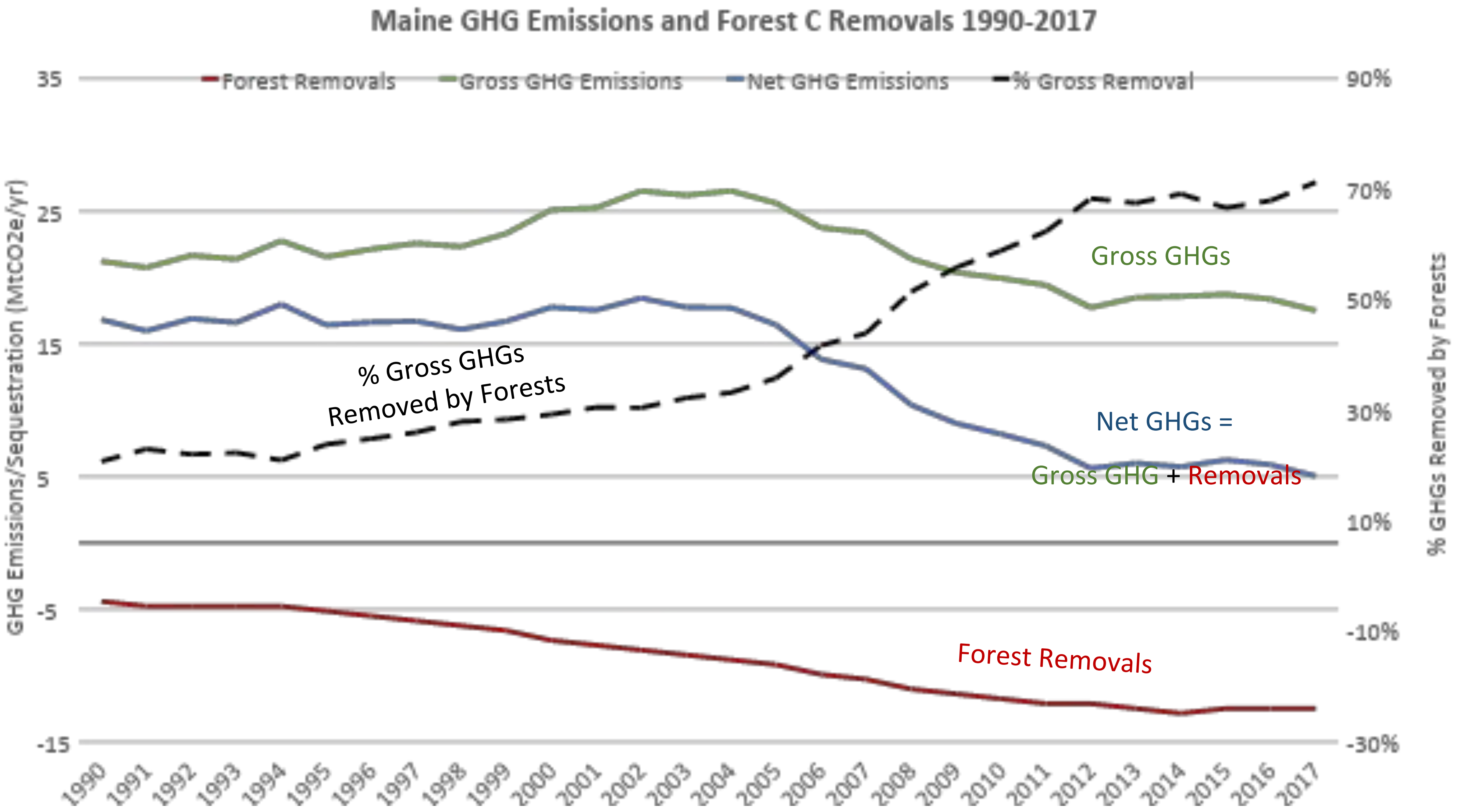


Figure 2. Emissions by source category for 2017 (data in Appendix A)

Global Ag & Forest: +24% total GHGs

USA Forests: -11%

ME Forests: -70%



ME DEP (2020); USFS (2020)

How Does Maine Compare to Other States?

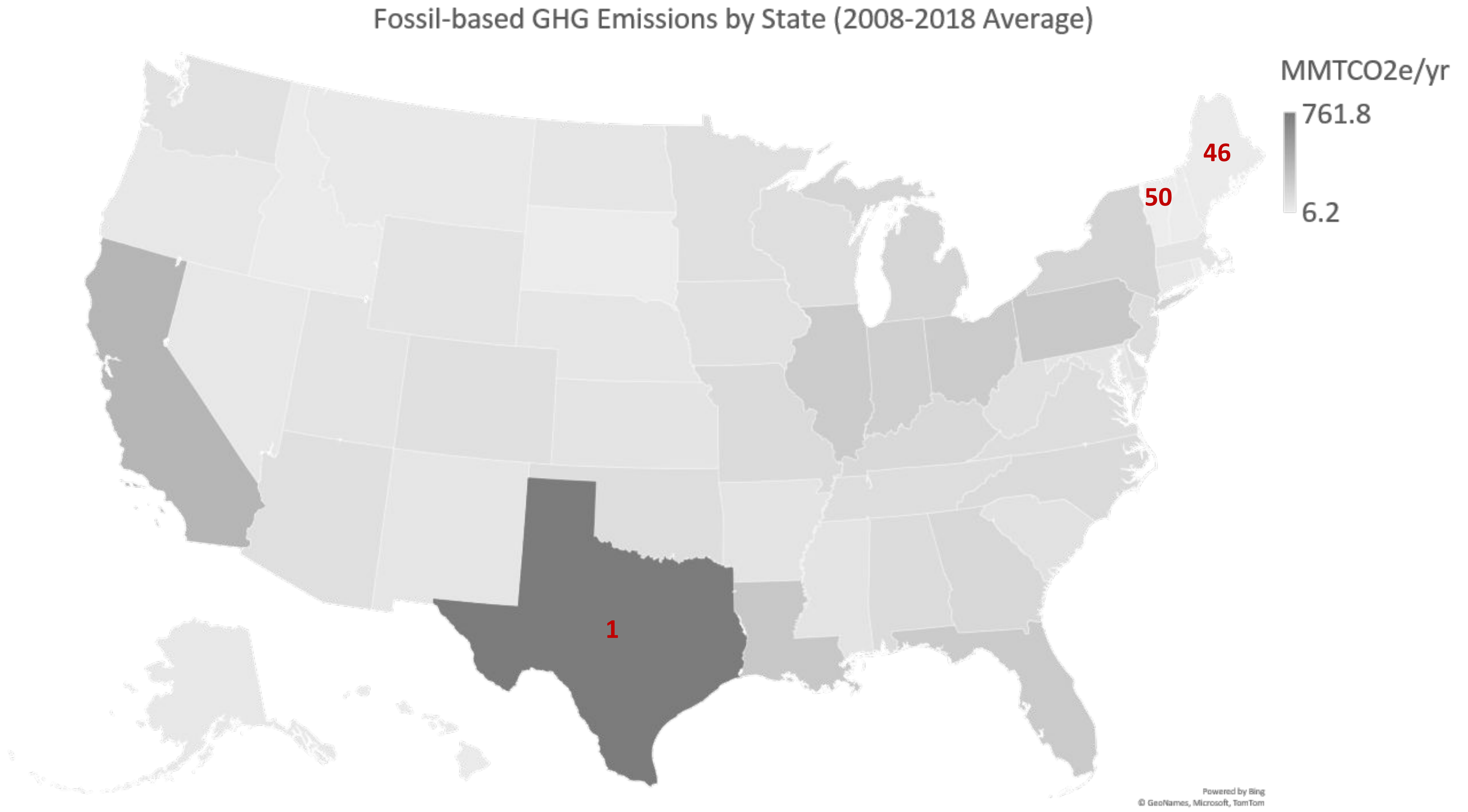
- GHG Emissions: Fossil-based emissions (EPA, 2020)

Forest C Sequestration: Growing stock sequestration (USFS, 2020)

Fossil GHGs + Forest C Sequestration = Net GHGs

$$\textbf{\% Forest Removal} = \frac{\textit{Forest Carbon Sequestration}}{\textit{Fossil GHG Emissions}}$$

Annual estimates averaged over 2008-2018 to minimize outlier bias


Fossil-based GHG Emissions by State (2008-2018 Average)
MMTCO2e/yr
761.8
6.2
46
50
1
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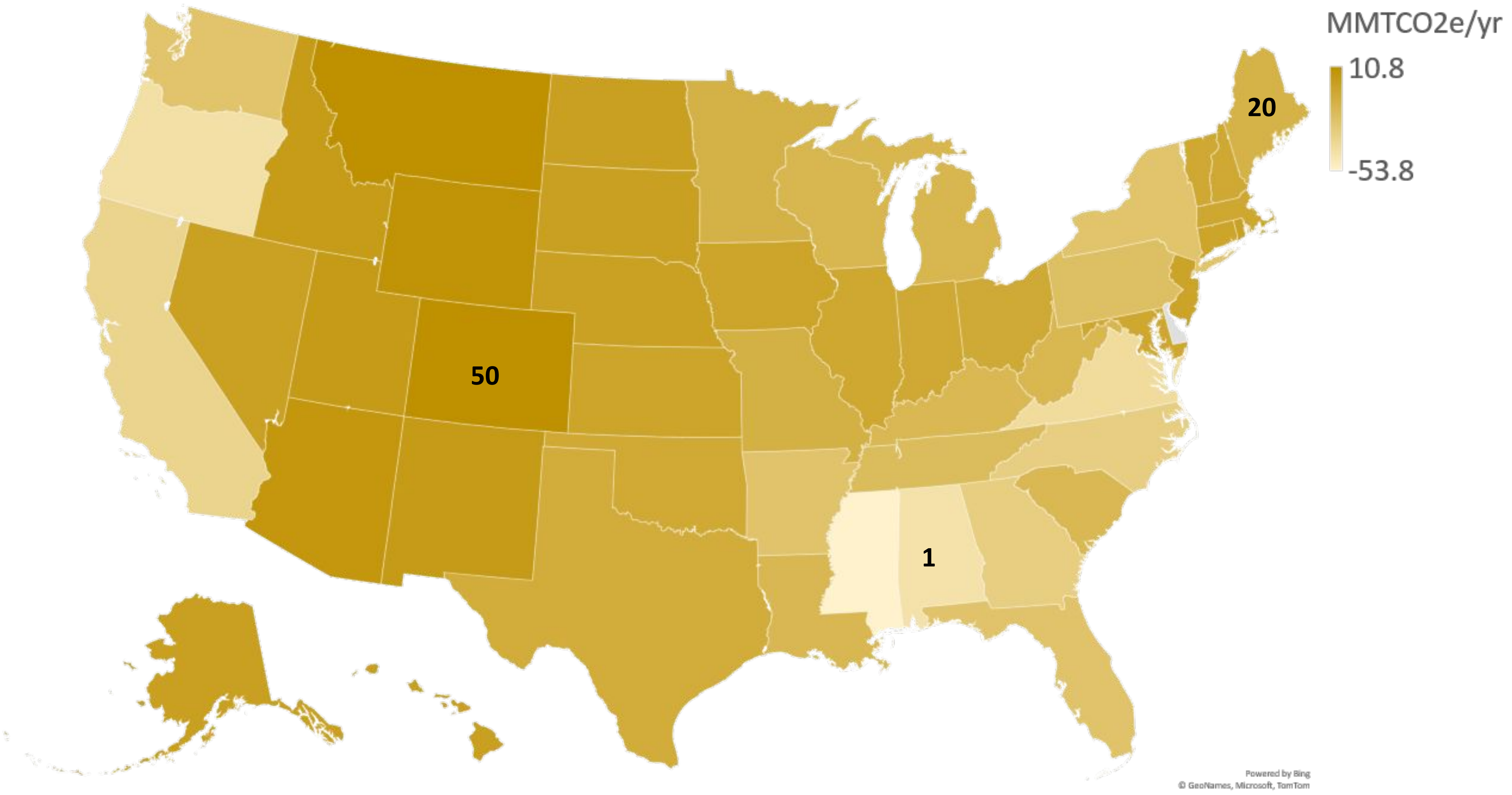
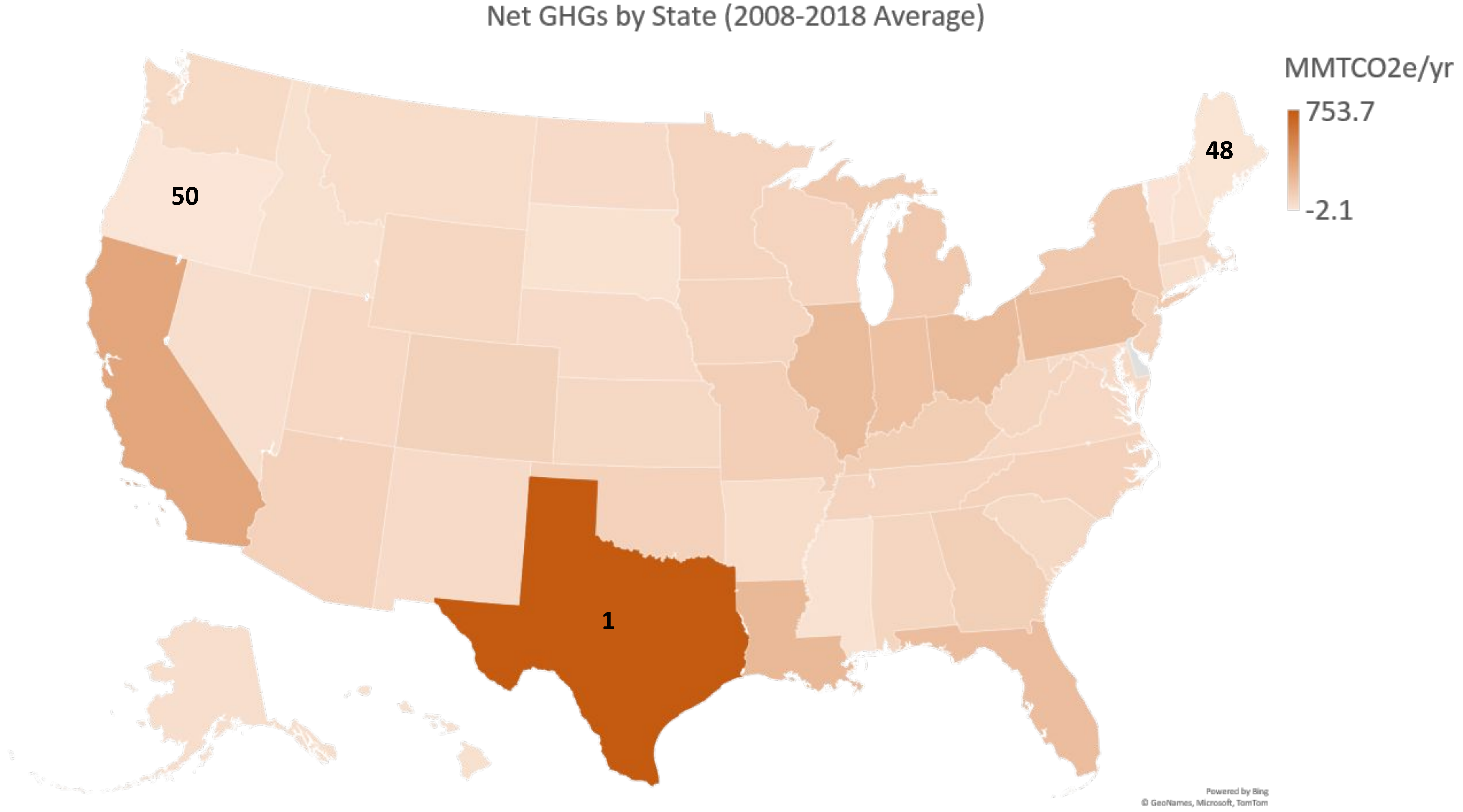
Forest Carbon Sequestration by State (2008-2018 Average)





Net GHGs by State (2008-2018 Average)
MMTCO2e/yr
753.7
-2.1
50
48
1
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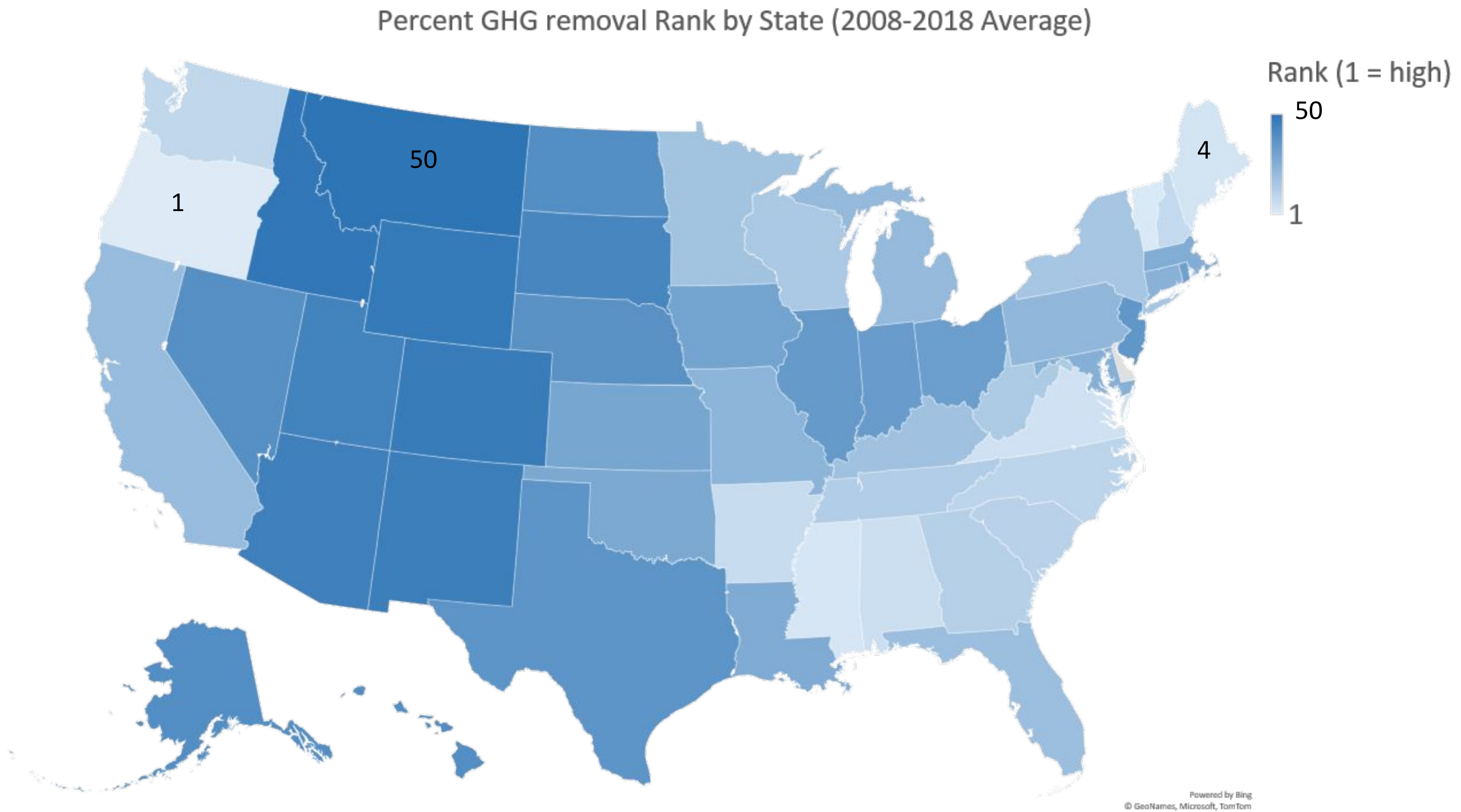
Percent GHG removal Rank by State (2008-2018 Average)
Rank (1 = high)
50
1
50
1
4
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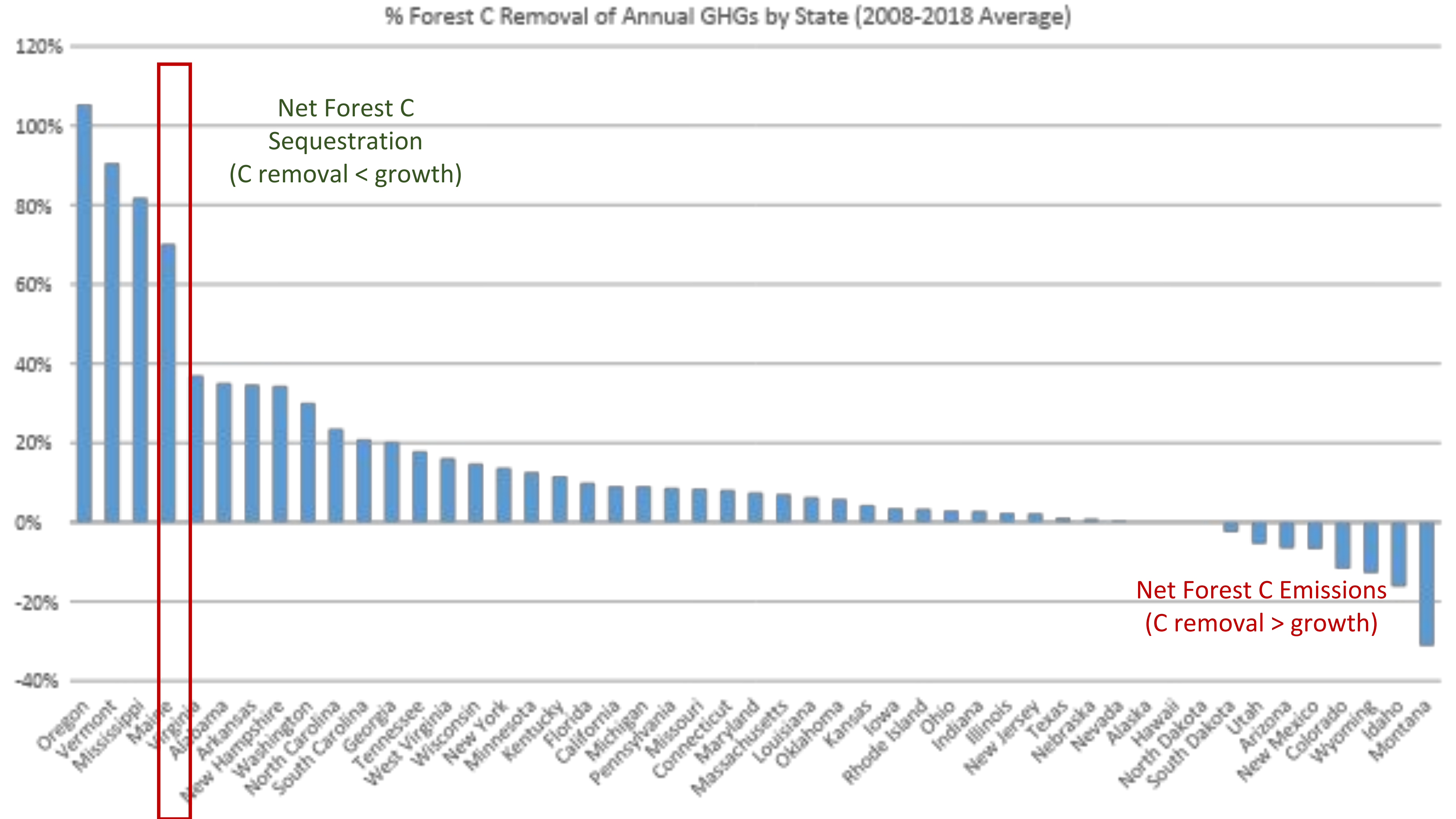


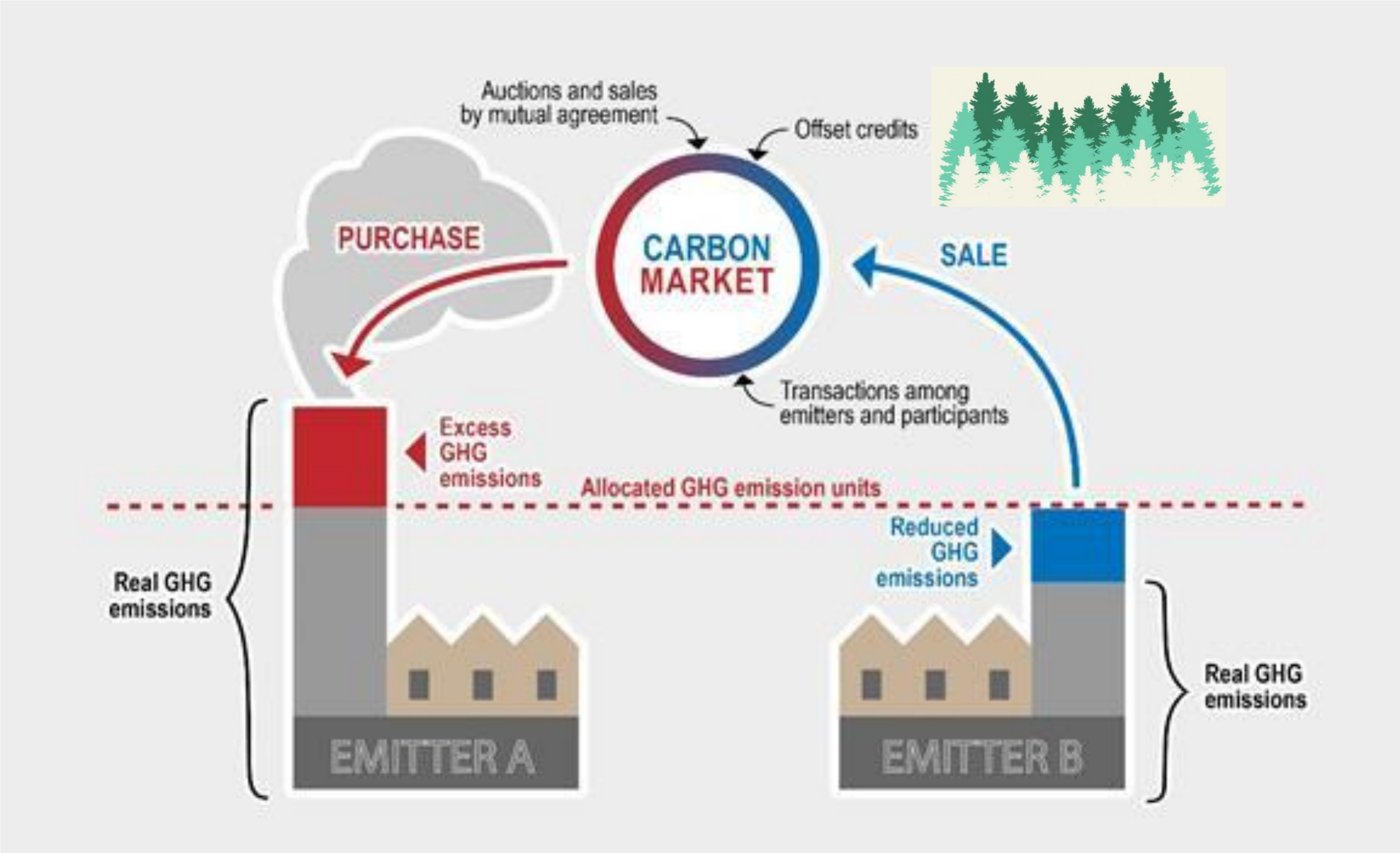
% Forest C Removal of Annual GHGs by State (2008-2018 Average)
120%
100%
80%
60%
40%
20%
0%
-20%
-40%
Net Forest C Sequestration (C removal < growth)
Net Forest C Emissions (C removal > growth)
Oregon
Vermont
Mississippi
Maine
Virginia
Alabama
Arkansas
New Hampshire
Washington
North Carolina
South Carolina
Georgia
Tennessee
West Virginia
Wisconsin
New York
Minnesota
Kentucky
Florida
California
Michigan
Pennsylvania
Missouri
Connecticut
Maryland
Massachusetts
Louisiana
Oklahoma
Kansas
Iowa
Rhode Island
Ohio
Indiana
Illinois
New Jersey
Texas
Nebraska
Nevada
Alaska
Hawaii
North Dakota
South Dakota
Utah
Arizona
New Mexico
Colorado
Wyoming
Idaho
Montana

A Very Quick Overview of Carbon Credits

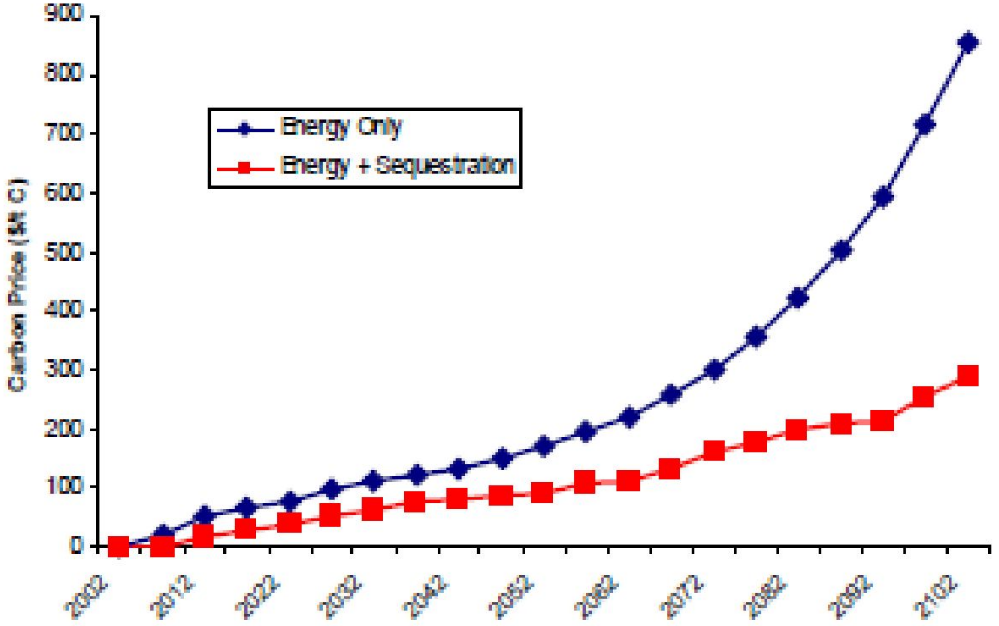
Role of forests in GHG policy and carbon markets

- 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)

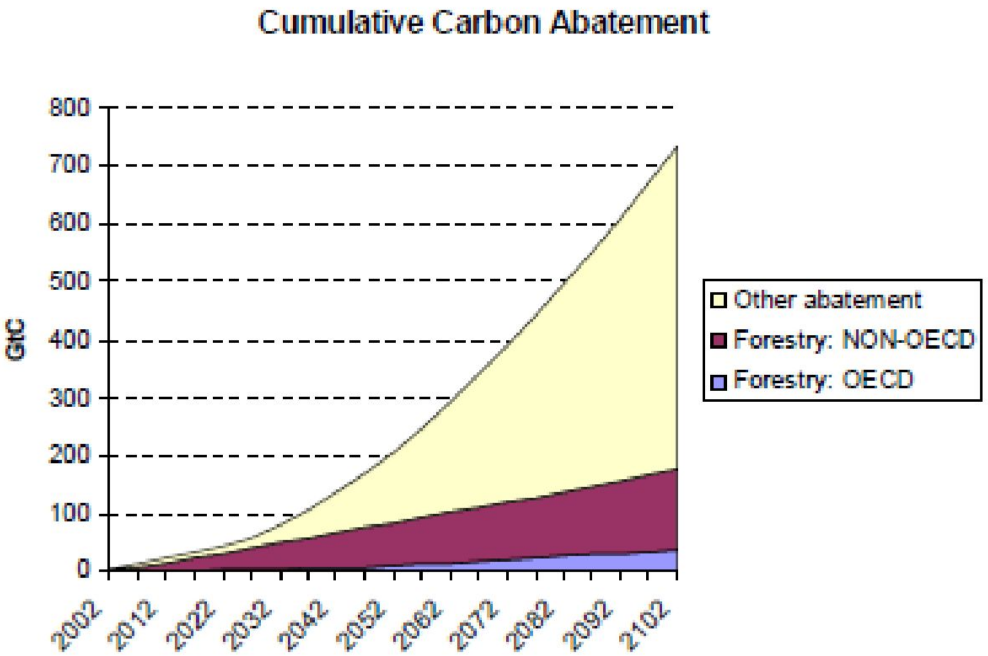
How the Carbon Credit Market Works



Including incentives for forest carbon sequestration can reduce costs by 40-50%



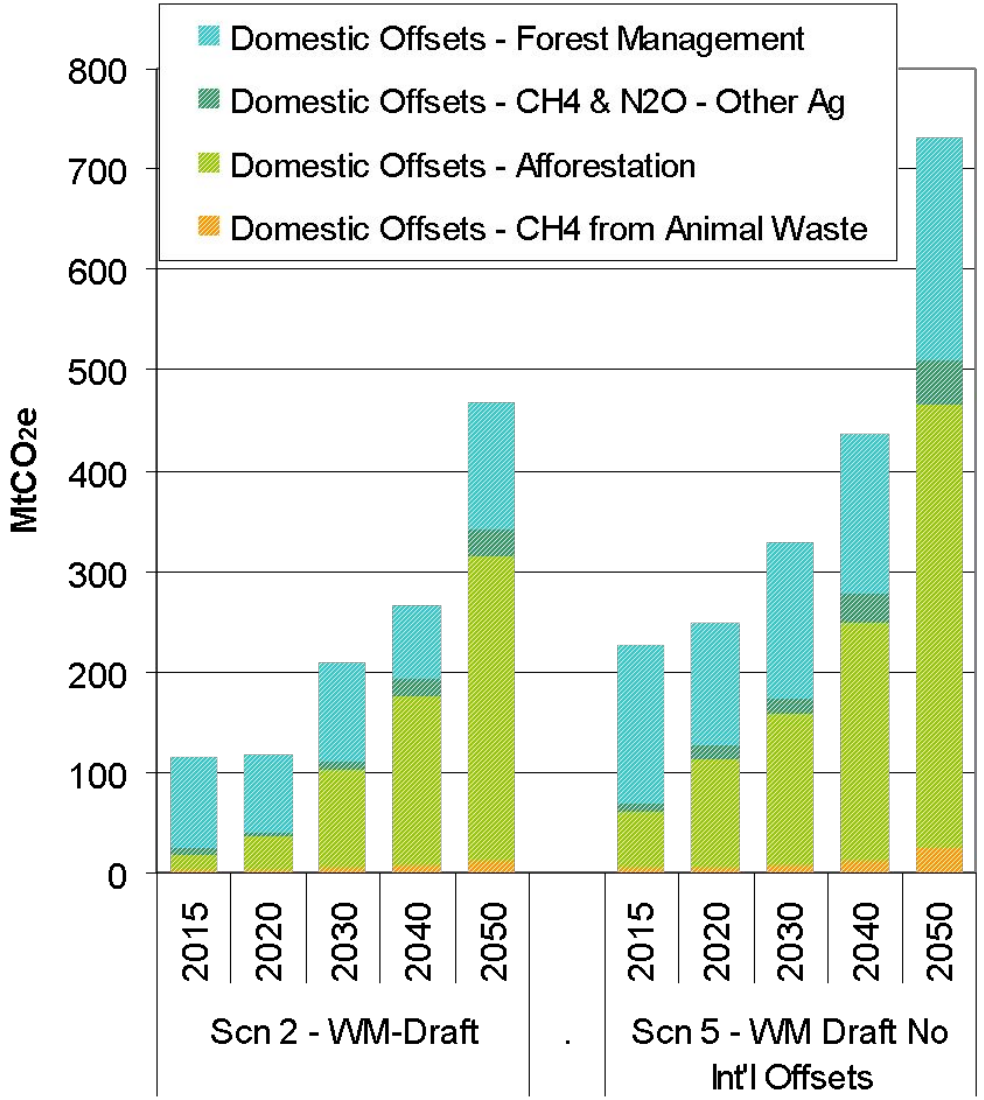
Analysis of costs to stabilize at 550 ppm CO_2



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

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

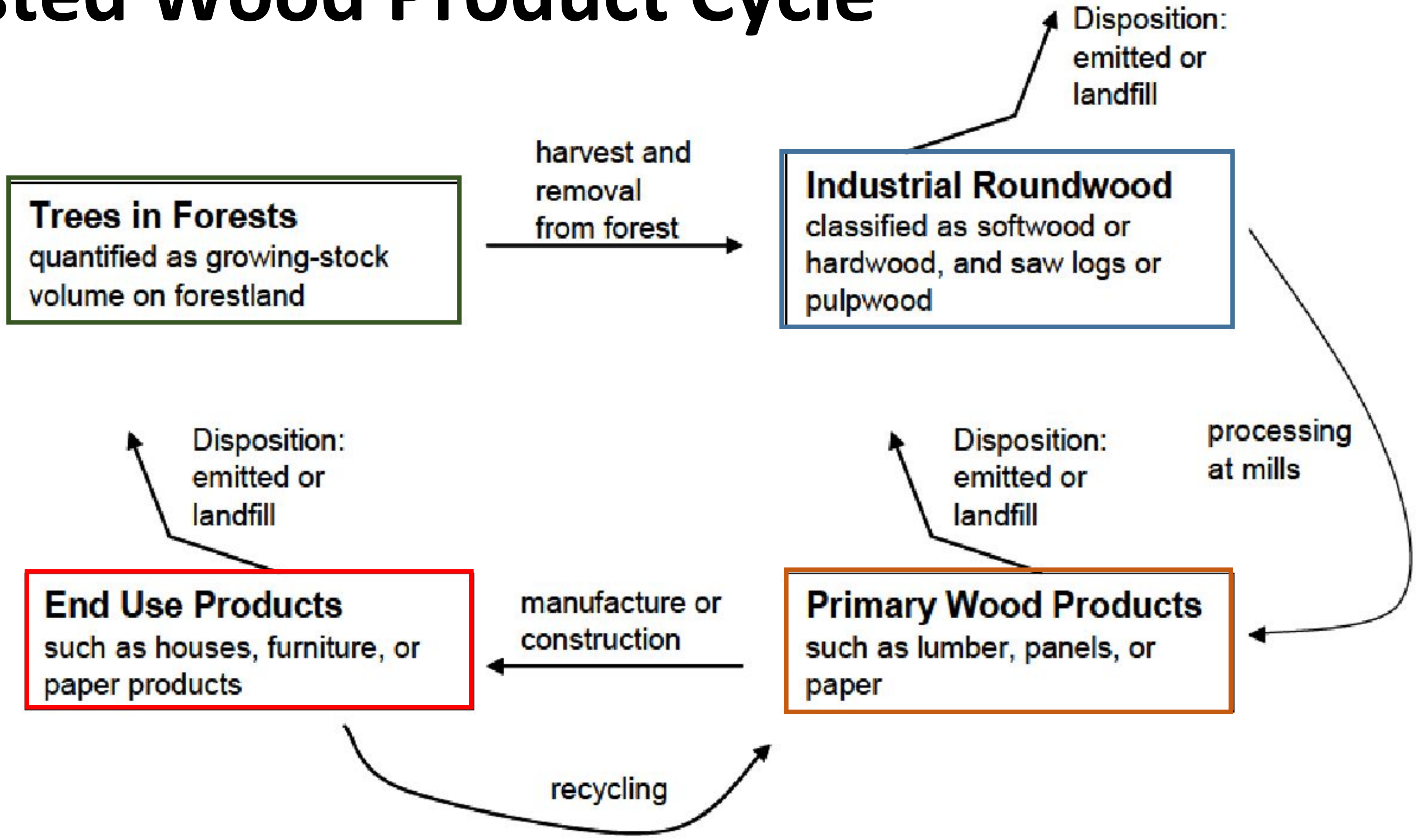
Source: EPA (2010) – Economic Analysis of Waxman-Markey Bill

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

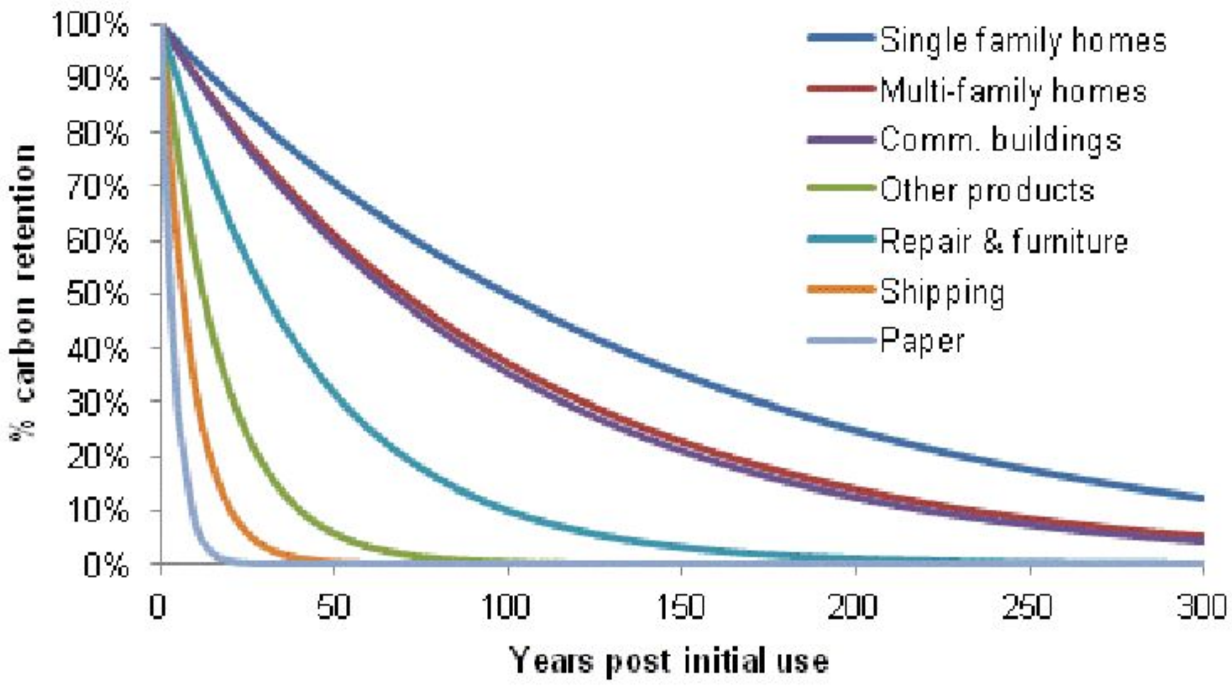


Smith et al (2006)

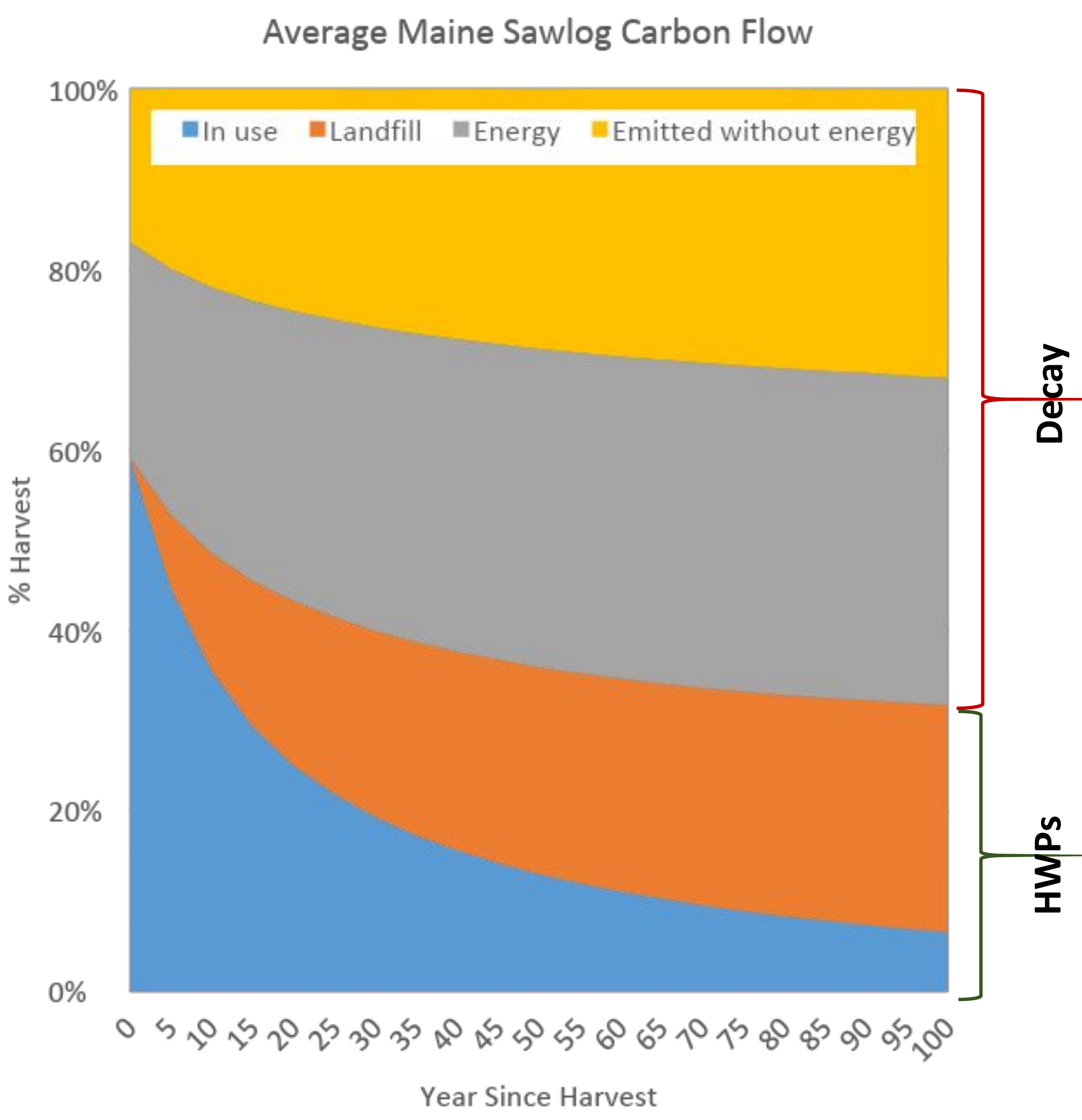
Forest Product Pool Decay Rates (based on Smith et al. 2006)

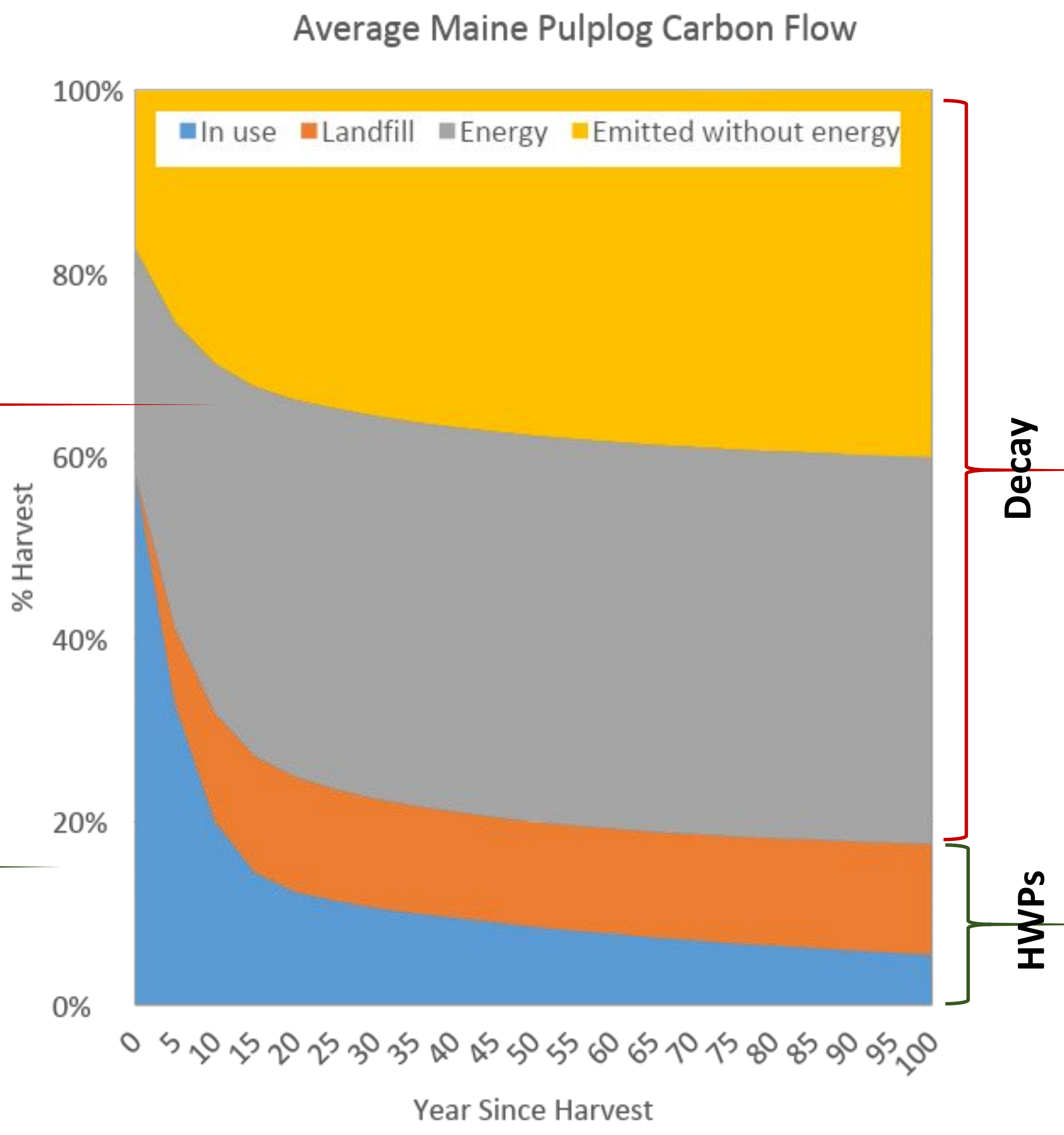
Aggregated end use products simulated by the Carbon Object Tracker and associated end use product categories defined by Smith et al. 2006.

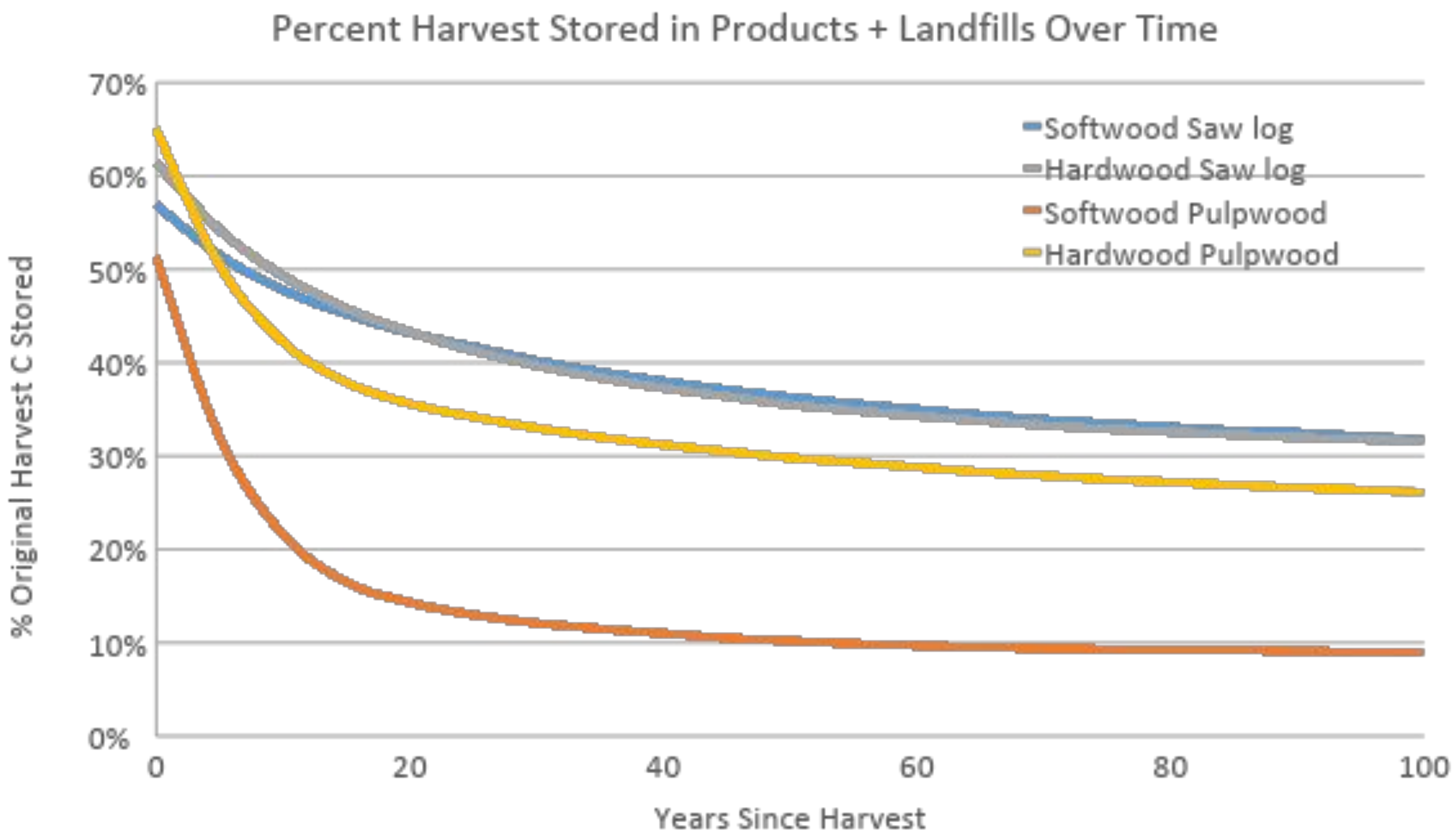
Carbon Object Tracker decay pools	Smith et al. 2006 Table D3	
	End use or product	Half-life (years)
Single family homes	New residential construction: single family	100
Multi-family homes	New residential construction: multifamily	70
Other products	New residential construction: mobile homes	12
Repair & furniture	Residential upkeep and improvement	30
Commercial buildings	New non-residential construction: all except railroads	67
Other products	New non-residential construction: railroad ties	12
Other products	New non-residential construction: railcar repair	12
Repair & furniture	Manufacturing: household furniture	30
Repair & furniture	Manufacturing: commercial furniture	30
Other products	Manufacturing: other products	12
Shipping	Shipping: wooden containers	6
Shipping	Shipping: pallets	6
Shipping	Shipping: dunnage etc.	6
Other products	Other uses for lumber and panels	12
Other products	Solid wood exports	12
Paper	Paper	2.6
	Smith et al. 2006 Table D5	
Landfill degradable	Landfill degradable	14



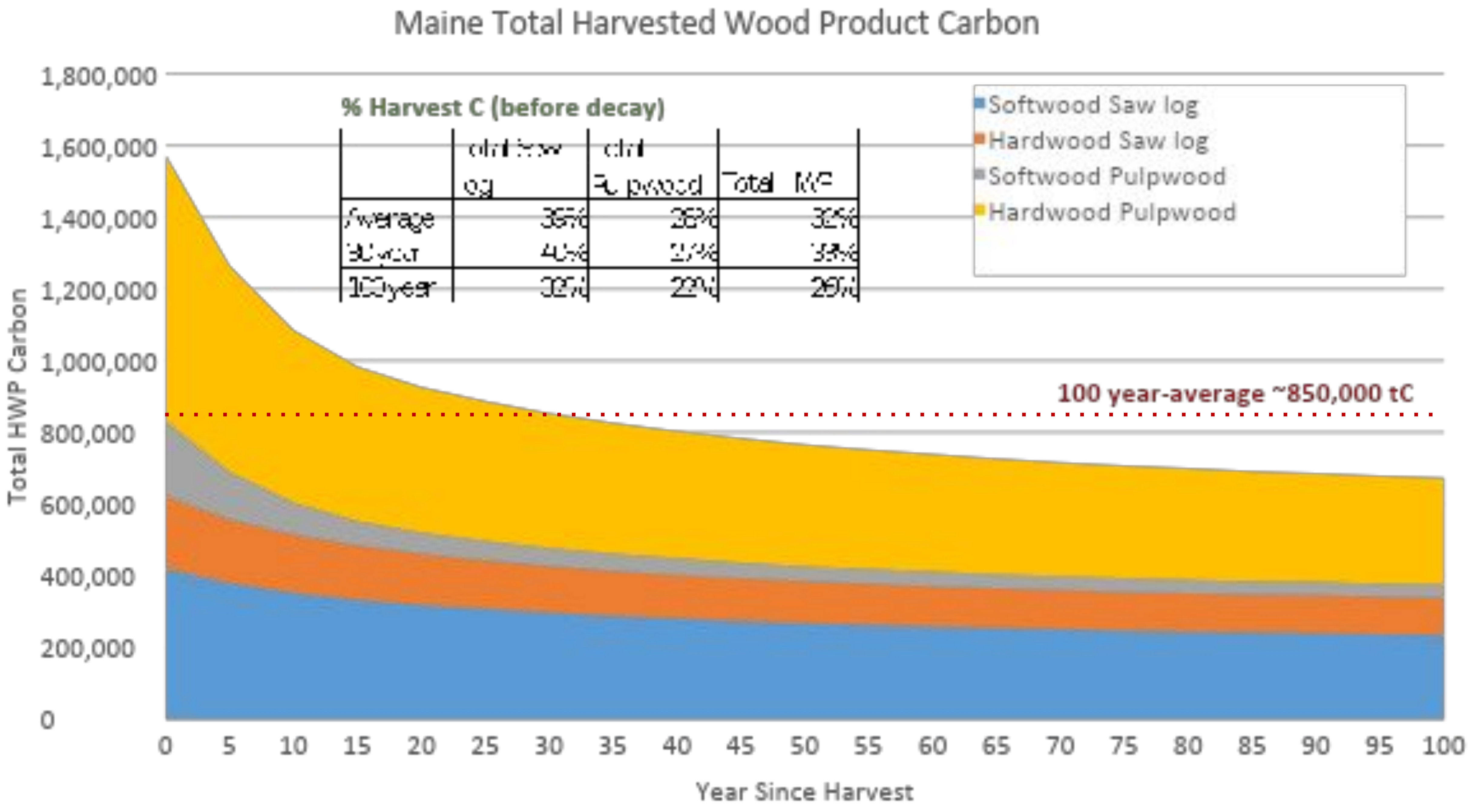
Note: Single and multi-family homes and commercial buildings are listed as 'Construction' for brevity in the top figure conceptually depicting CO_T model dynamics.


Average Maine Sawlog Carbon Flow
In use
Landfill
Energy
Emitted without energy
100%
80%
60%
40%
20%
0%
% Harvest
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Year Since Harvest
Decay
HWPs


Average Maine Pulplog Carbon Flow
In use
Landfill
Energy
Emitted without energy
100%
80%
60%
40%
20%
0%
% Harvest
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Year Since Harvest
Decay
HWPs

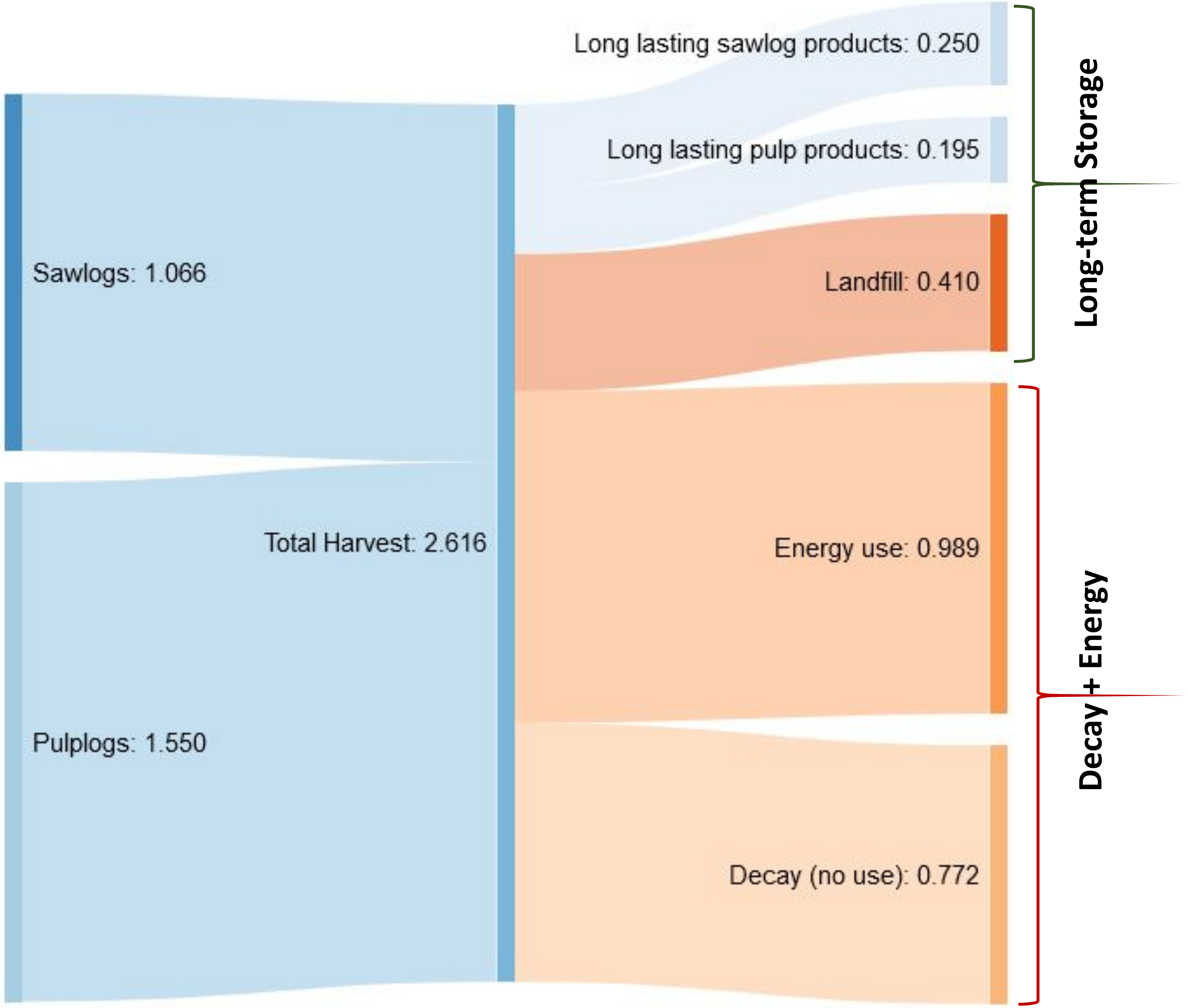


Smith et al (2006)

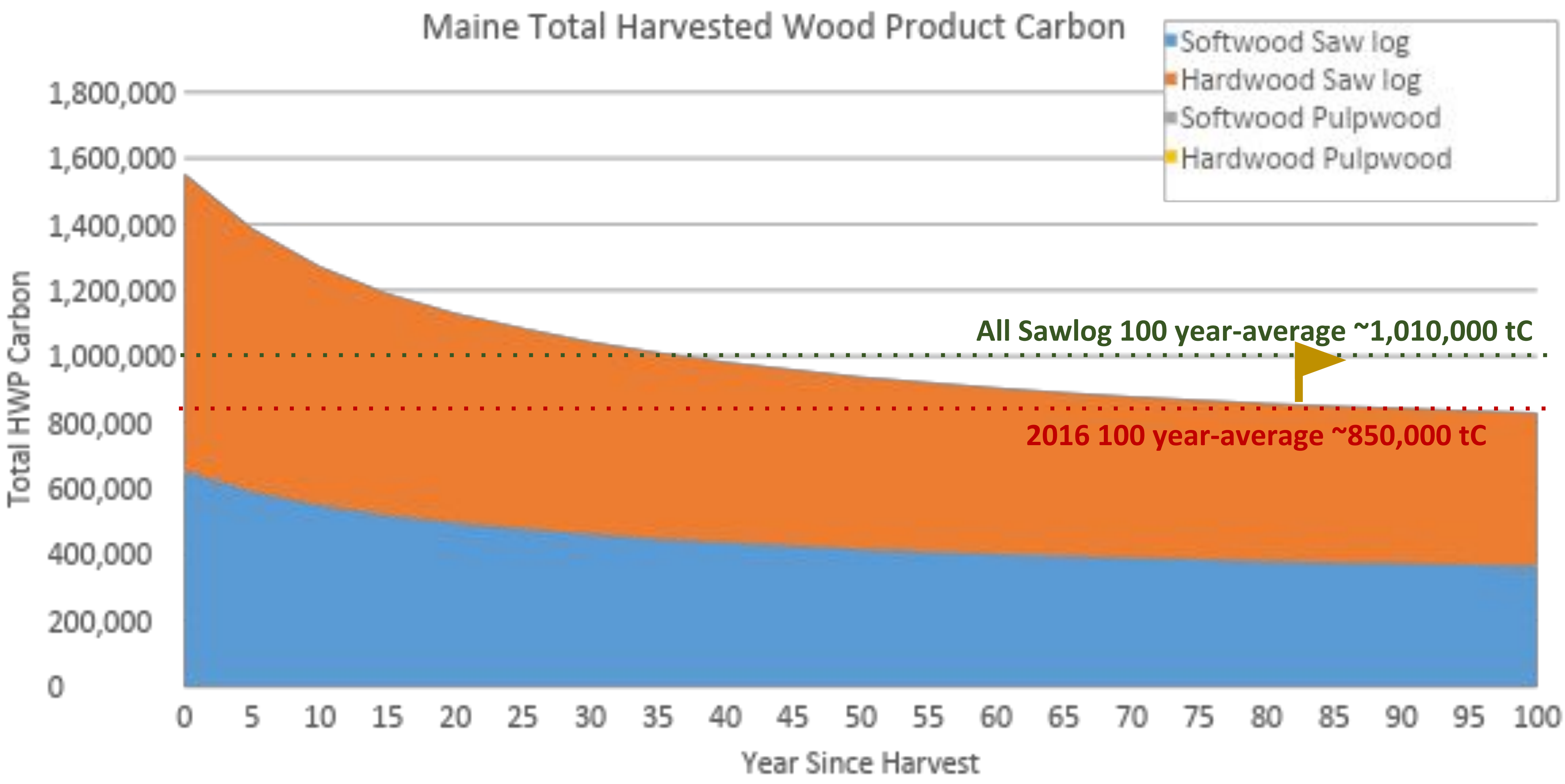


Maine Total Harvested Wood Product Carbon
% Harvest C (before decay)
Softwood Saw log
Hardwood Saw log
Softwood Pulpwood
Hardwood Pulpwood
100 year-average ~850,000 tC
Total HWP Carbon
Year Since Harvest
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

Maine 100-yr Mean HWP Carbon Flow (MtC)



What if we shift all harvests to sawlogs?



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