Oregon Forest Ecosystem Carbon Report

Prepared by USFS Forest Inventory and Analysis
For the 2016 Inventory Period

Oregon Board of Forestry
September 4, 2019 Meeting

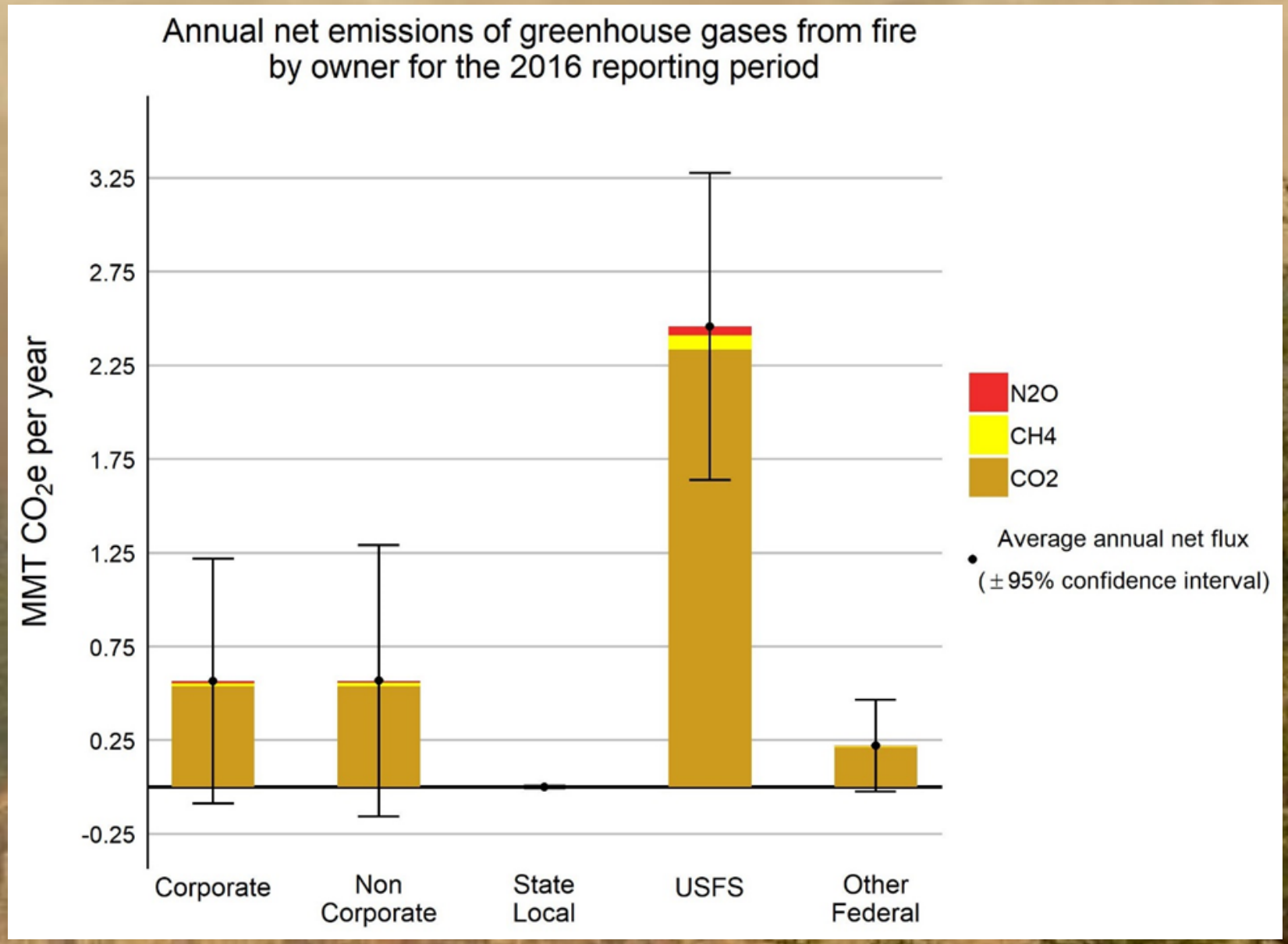
Forest Carbon Stocks

Oregon Forest Carbon Stocks by Forest Pools, 2007-2016		
Forest Carbon Pools	Total Carbon	SE
	million metric tons	
Live Trees	1,039.0	9.6
Standing Dead	79.0	1.6
Understory Veg	34.0	2.1
Down Woody Debris	156.8	1.9
Forest Floor	117.19	0.55
Roots	238.0	2.2
Soil Organic C	1,575.27	7.55
All Pools	3,239.7	16.7

Forest Carbon Flux

Annual Net CO2e Flux From Forest Pools in Forest Land Remaining Forest Land, 2001-2006 to 2011-2016

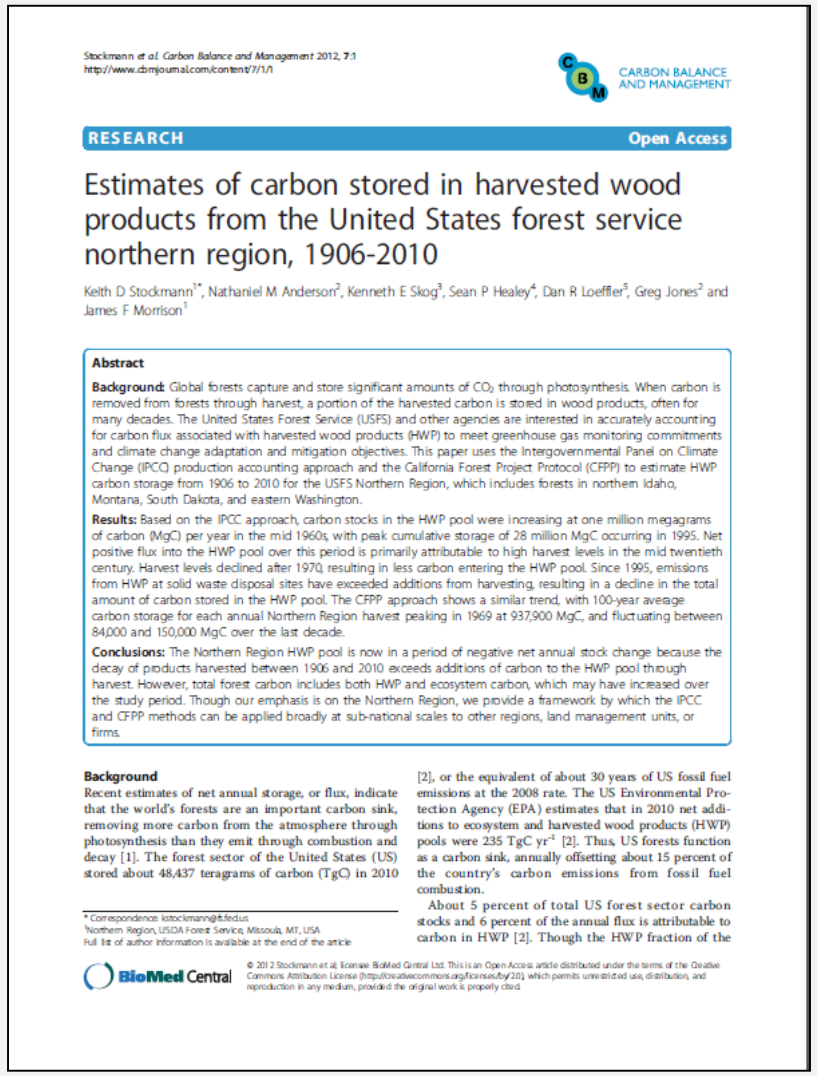
Forest Carbon Pools	Net flux	
	Total	SE
	Million Metric Tons CO2 equivalent/yr	
Live Trees	31.73	2.90
Standing Dead	-0.018	0.68
Understory Veg	-0.21	0.04
Down Woody Debris	-6.82	0.82
Forest Floor	0.56	0.13
Roots	5.98	0.69
Soil Organic C	-0.17	0.29
Net flux All Pools	30.91	3.77


Annual net emissions of greenhouse gases from fire by owner for the 2016 reporting period
MMT CO_2e per year
3.25
2.75
2.25
1.75
1.25
0.75
0.25
-0.25
Corporate
Non Corporate
State Local
USFS
Other Federal
N2O
CH4
CO2
Average annual net flux
(±95% confidence interval)

Harvested Wood Product Carbon Storage for Oregon 1962 - 2017

BUREAU OF BUSINESS AND ECONOMIC RESEARCH
UNIVERSITY OF MONTANA

Harvested Wood Product Modeling Framework



Stockmann et al. Carbon Balance and Management 2012, 7:1
http://www.cbmjournal.com/content/7/1/1

CARBON BALANCE AND MANAGEMENT

RESEARCH Open Access

Estimates of carbon stored in harvested wood products from the United States forest service northern region, 1906-2010

Keith D Stockmann[1*], Nathaniel M Anderson[2], Kenneth E Skog[3], Sean P Healey[4], Dan R Loeffler[5], Greg Jones[3] and James F Morrison[1]

Abstract

Background: Global forests capture and store significant amounts of CO_2 through photosynthesis. When carbon is removed from forests through harvest, a portion of the harvested carbon is stored in wood products, often for many decades. The United States Forest Service (USFS) and other agencies are interested in accurately accounting for carbon flux associated with harvested wood products (HWP) to meet greenhouse gas monitoring commitments and climate change adaptation and mitigation objectives. This paper uses the Intergovernmental Panel on Climate Change (IPCC) production accounting approach and the California Forest Project Protocol (CFPP) to estimate HWP carbon storage from 1906 to 2010 for the USFS Northern Region, which includes forests in northern Idaho, Montana, South Dakota, and eastern Washington.

Results: Based on the IPCC approach, carbon stocks in the HWP pool were increasing at one million megagrams of carbon (MgC) per year in the mid 1960s, with peak cumulative storage of 28 million MgC occurring in 1995. Net positive flux into the HWP pool over this period is primarily attributable to high harvest levels in the mid twentieth century. Harvest levels declined after 1970, resulting in less carbon entering the HWP pool. Since 1995, emissions from HWP at solid waste disposal sites have exceeded additions from harvesting, resulting in a decline in the total amount of carbon stored in the HWP pool. The CFPP approach shows a similar trend, with 100-year average carbon storage for each annual Northern Region harvest peaking in 1969 at 937,900 MgC, and fluctuating between 84,000 and 150,000 MgC over the last decade.

Conclusions: The Northern Region HWP pool is now in a period of negative net annual stock change because the decay of products harvested between 1906 and 2010 exceeds additions of carbon to the HWP pool through harvest. However, total forest carbon includes both HWP and ecosystem carbon, which may have increased over the study period. Though our emphasis is on the Northern Region, we provide a framework by which the IPCC and CFPP methods can be applied broadly at sub-national scales to other regions, land management units, or firms.

Background

Recent estimates of net annual storage, or flux, indicate that the world's forests are an important carbon sink, removing more carbon from the atmosphere through photosynthesis than they emit through combustion and decay [1]. The forest sector of the United States (US) stored about 48,437 teragrams of carbon (TgC) in 2010 [2], or the equivalent of about 30 years of US fossil fuel emissions at the 2008 rate. The US Environmental Protection Agency (EPA) estimates that in 2010 net additions to ecosystem and harvested wood products (HWP) pools were 235 TgC yr^{-1} [2]. Thus, US forests function as a carbon sink, annually offsetting about 15 percent of the country's carbon emissions from fossil fuel combustion.

About 5 percent of total US forest sector carbon stocks and 6 percent of the annual flux is attributable to carbon in HWP [2]. Though the HWP fraction of the

* Correspondence: kstockmann@fs.fed.us
[1]Northern Region, USDA Forest Service, Missoula, MT, USA
Full list of author information is available at the end of the article

BioMed Central

Keith Stockmann, PhD

Nathaniel Anderson, PhD

Kenneth Skog, PhD (retired)

Sean Healey, PhD

Dan Loeffler

Greg Jones, PhD (retired)

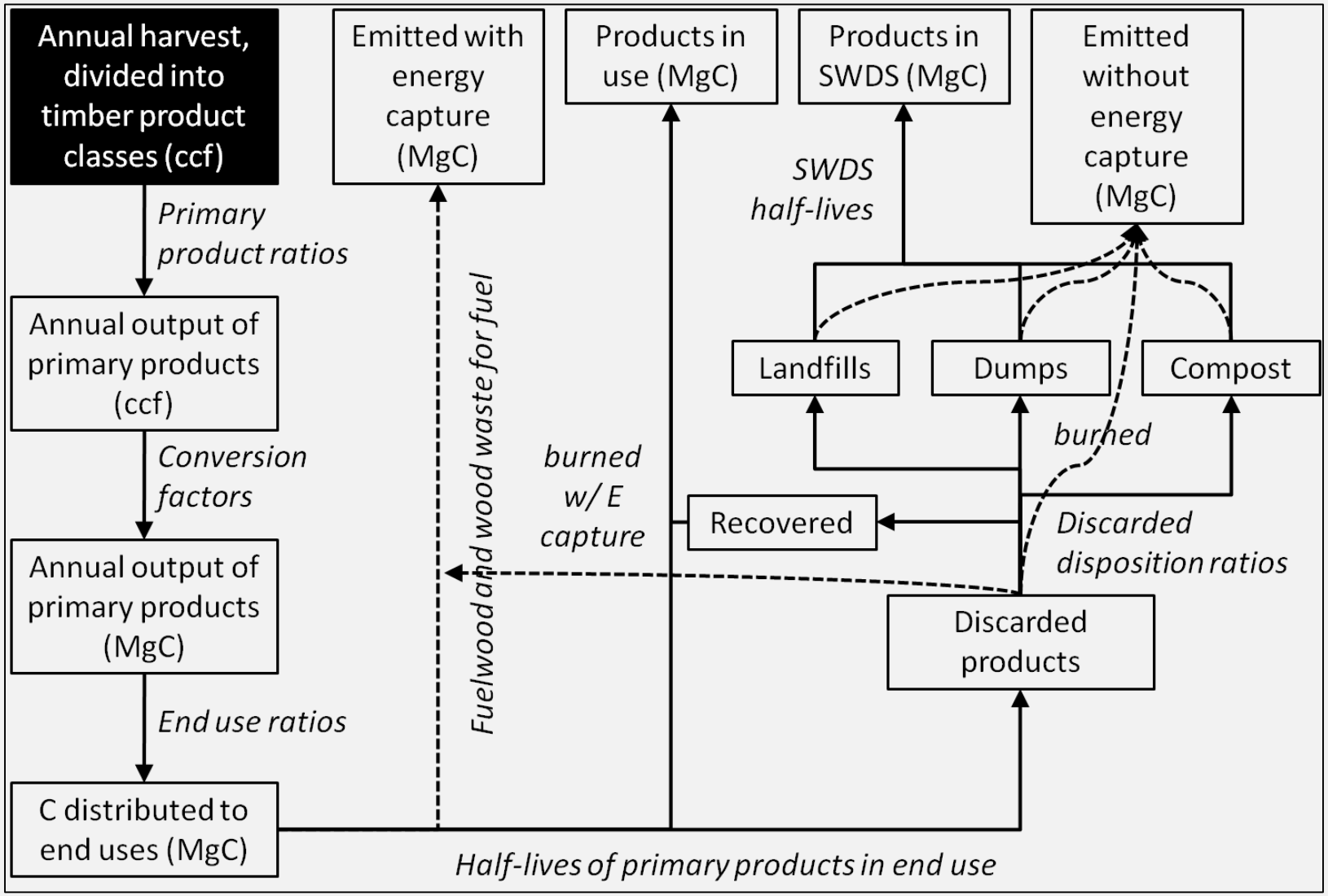
James Morrison (retired)

Other notable contributors:
Jesse Young
Edward Butler

The HWP framework

- Harvested timber
  - Board feet to cubic foot volume
- Timber products
  - sawtimber, poles, small roundwood, etc.
- Primary products
  - lumber, plywood, mill residue pulp, fuel, and non-structural panel, etc.
- End uses
  - New residential construction (single, multi family, mobile homes), new non-residential construction, manufacturing (household furniture, other furniture, other products), shipping, other uses

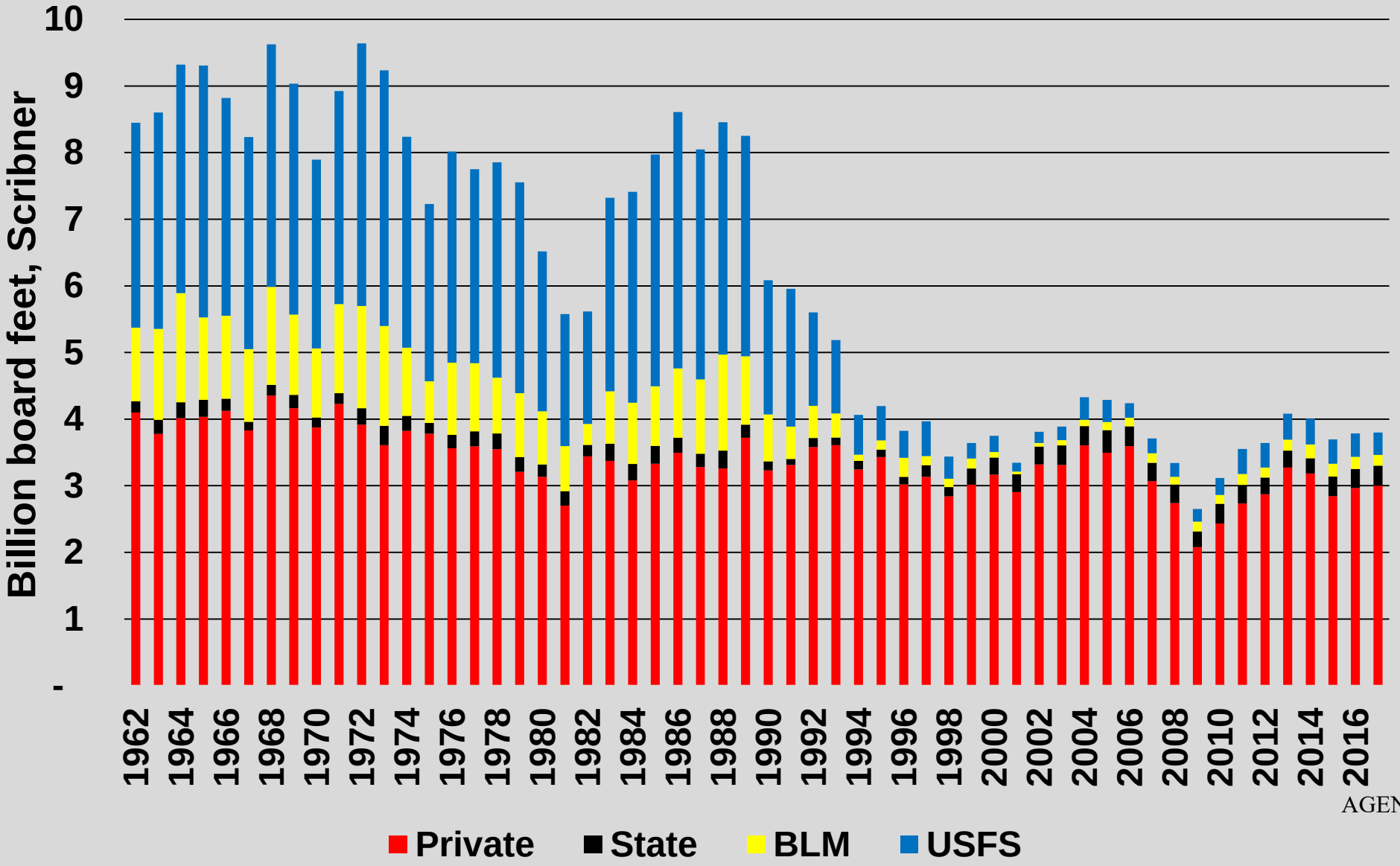
The HWP framework

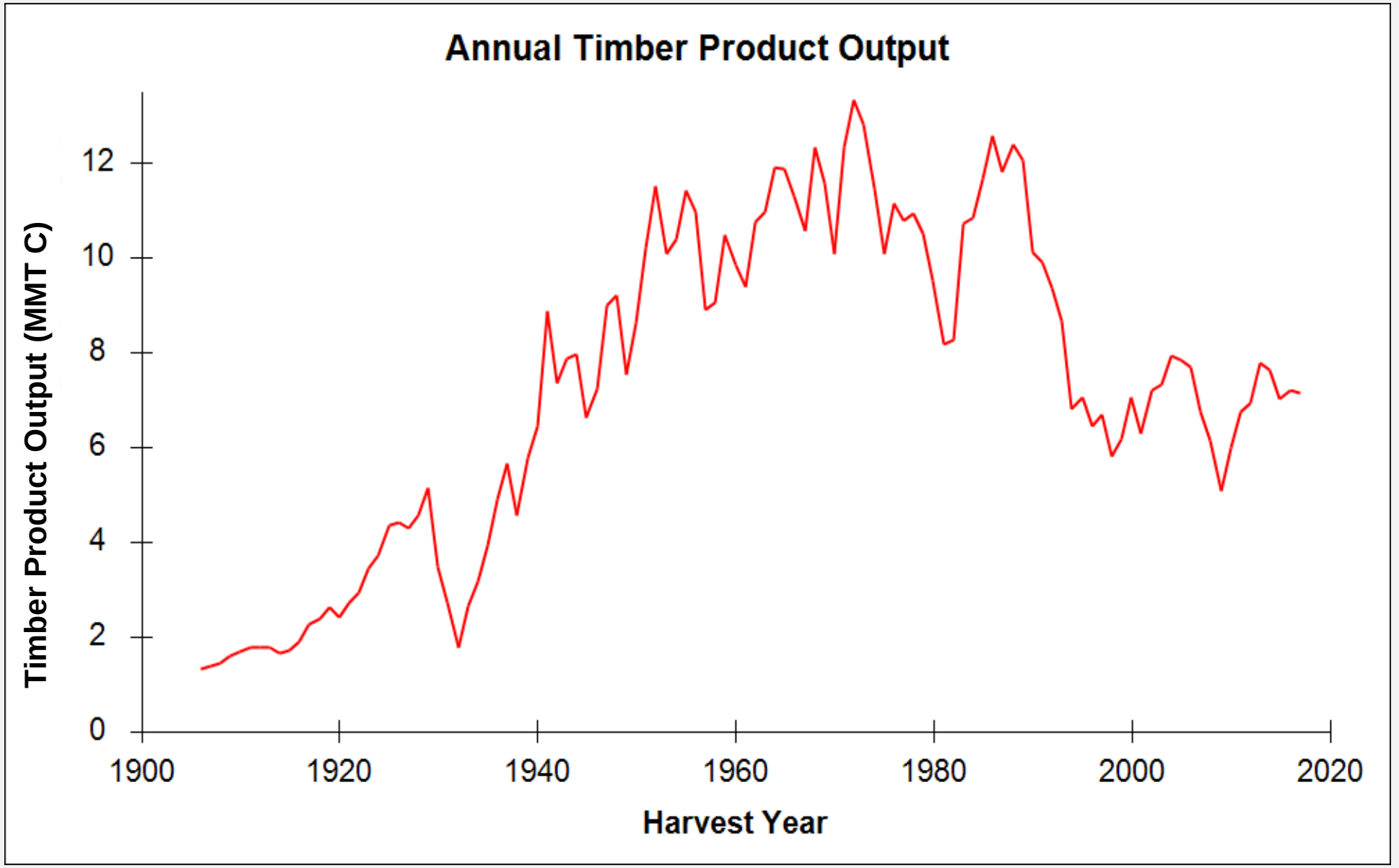


SWDS = Solid Waste Disposal Sites
ccf = 100 cubic feet
MgC = Megagram of Carbon = metric ton

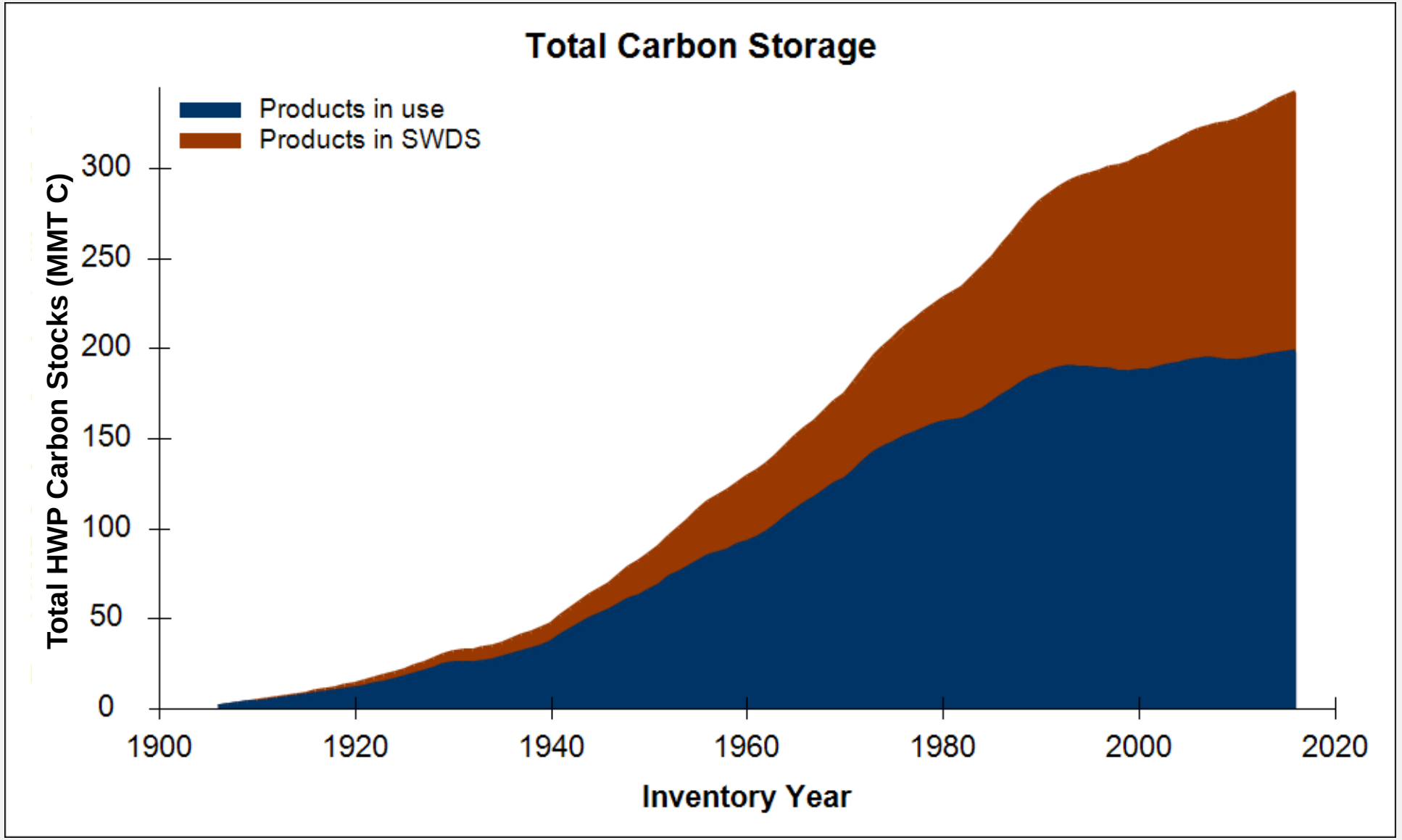
From Stockmann et al. 2012, Carbon Balance and Management 7:1.

Yearly harvest data

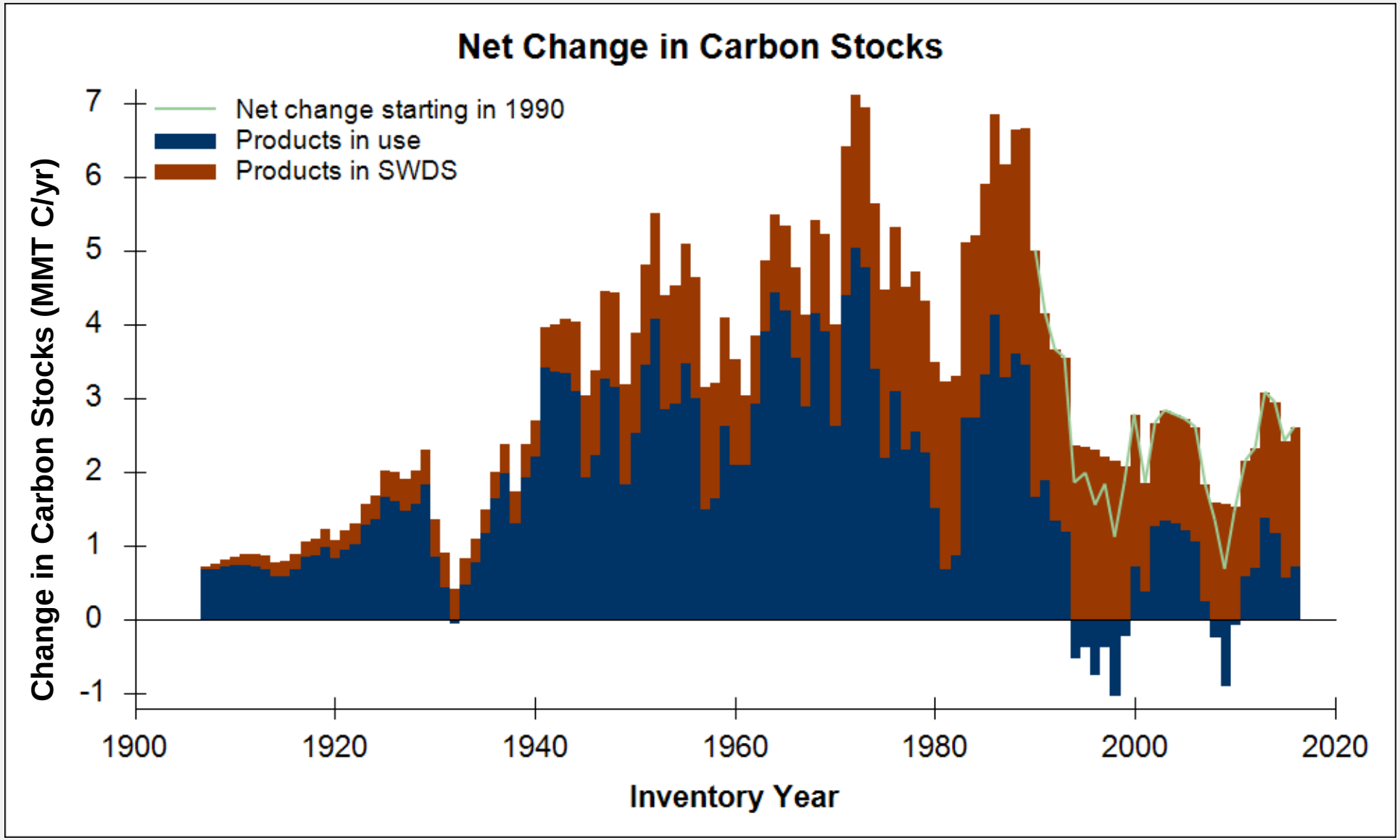




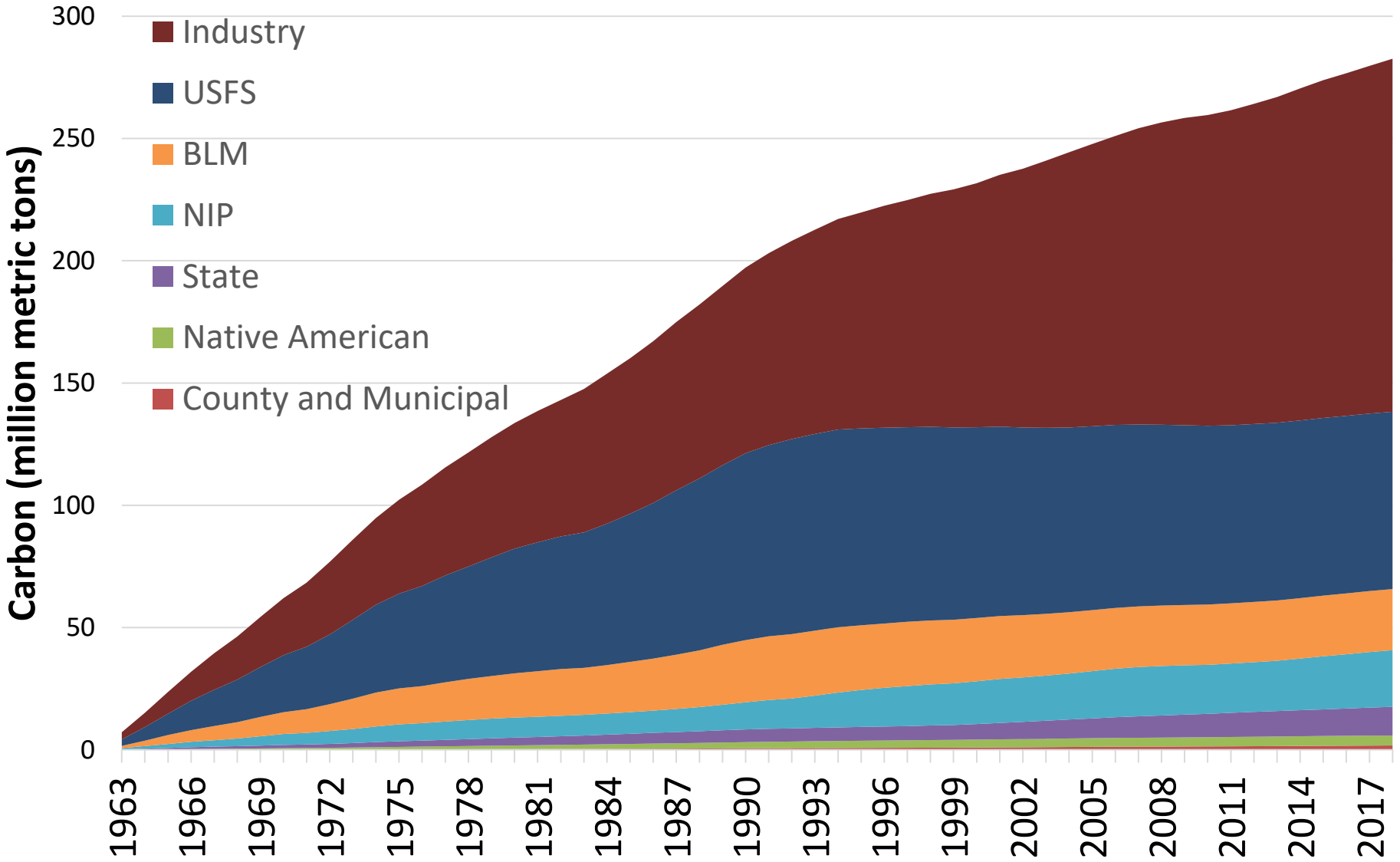
Annual timber product output in Oregon, converted to Million Metric Tons of Carbon, 1906 to 2017.



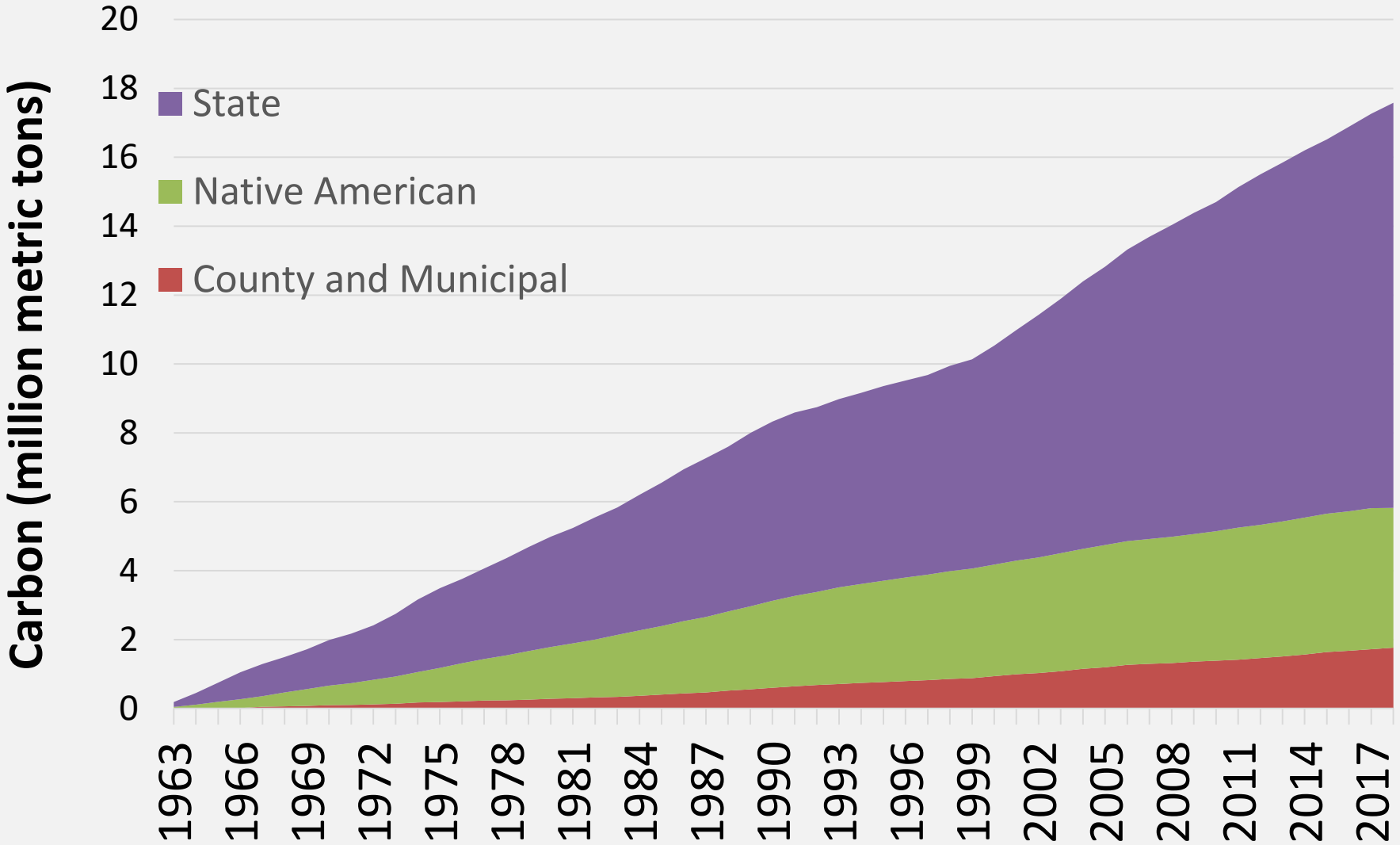
Cumulative total carbon stored in HWP manufactured from timber harvested from Oregon forests 1906 to 2017. Carbon in HWP includes both products that are still in use and carbon stored at solid waste disposal sites.



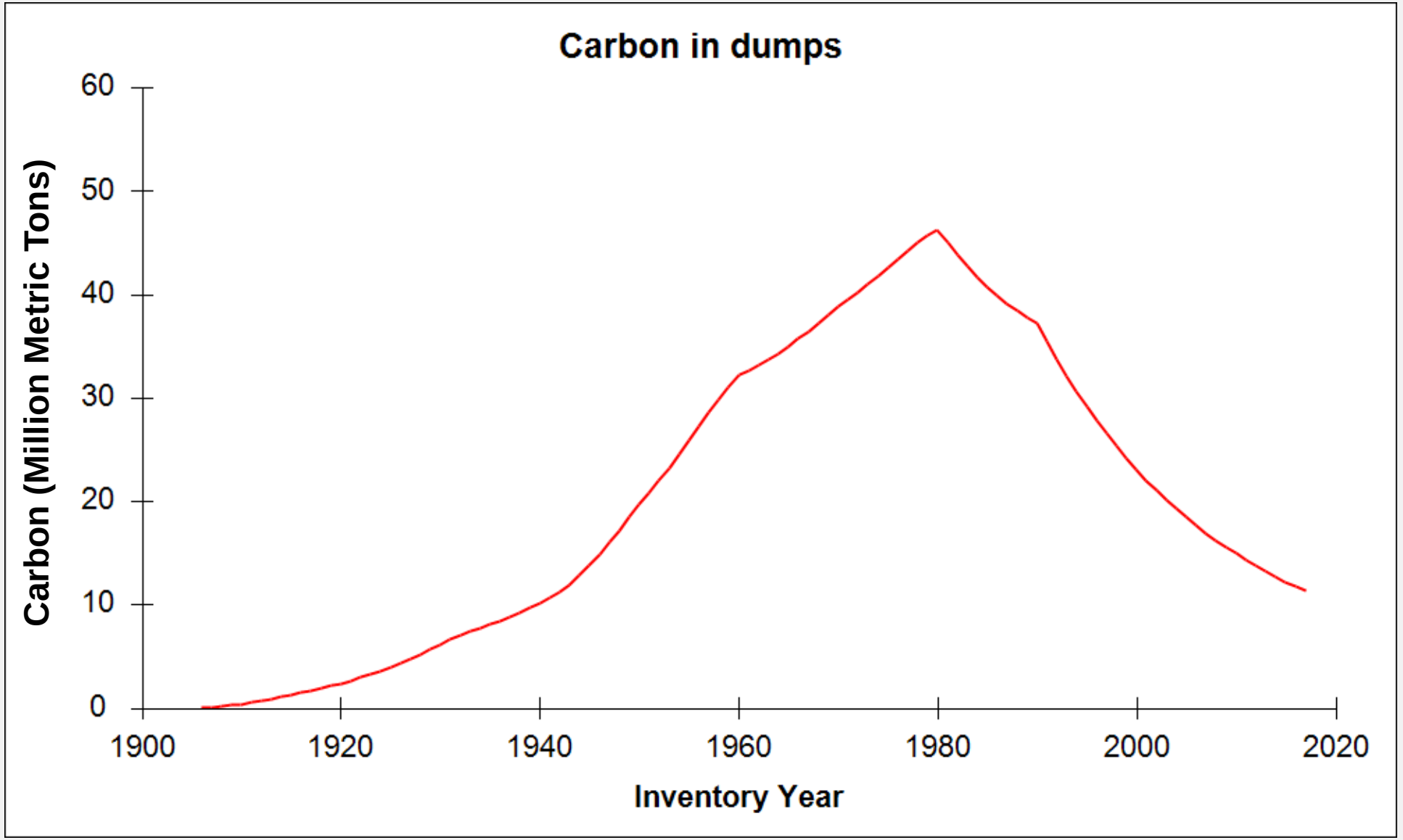
The net change in Oregon timber carbon stocks in HWP from the previous year. The net stock change is the sum of net change for SWDS (red bar) and products in use (blue bar).

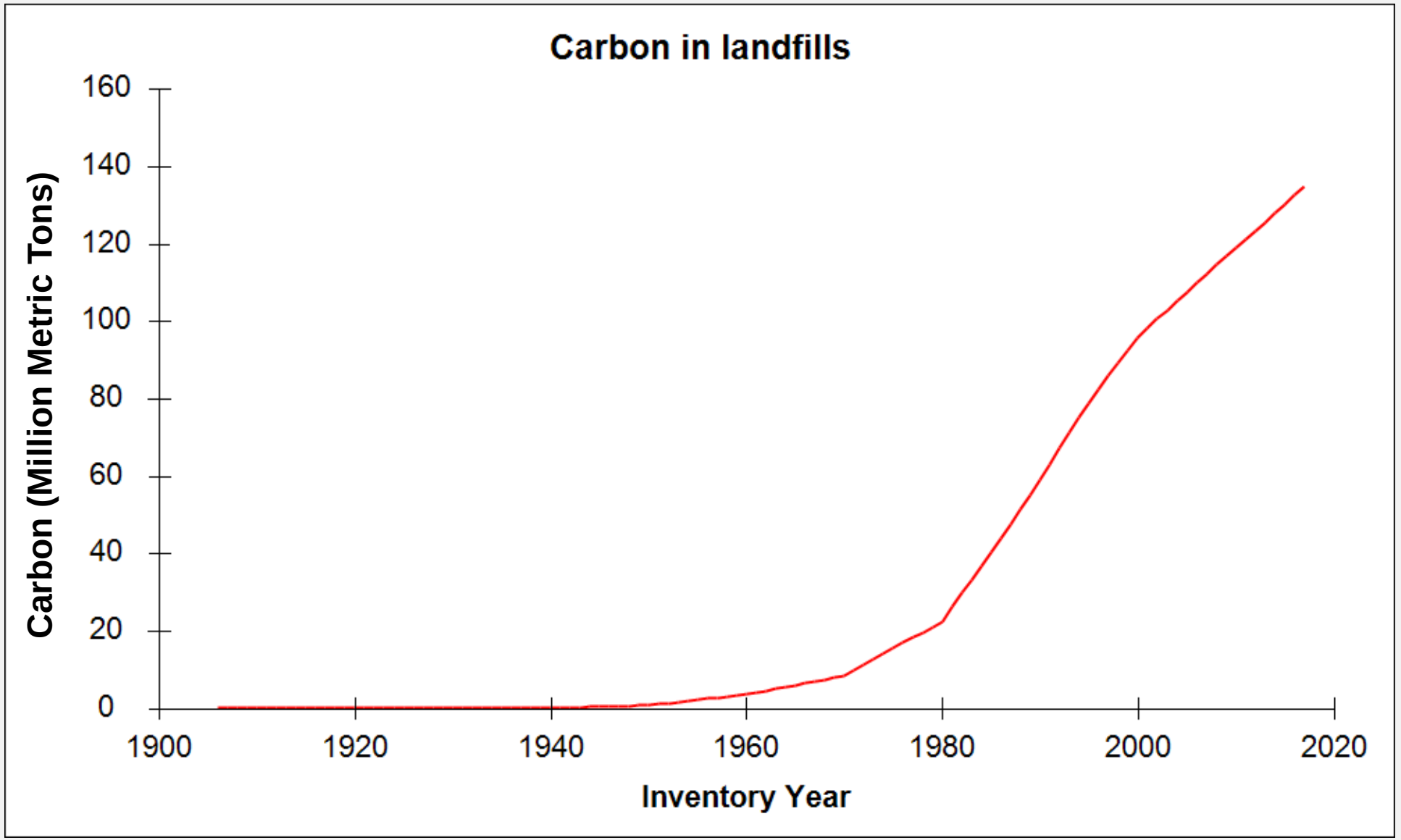


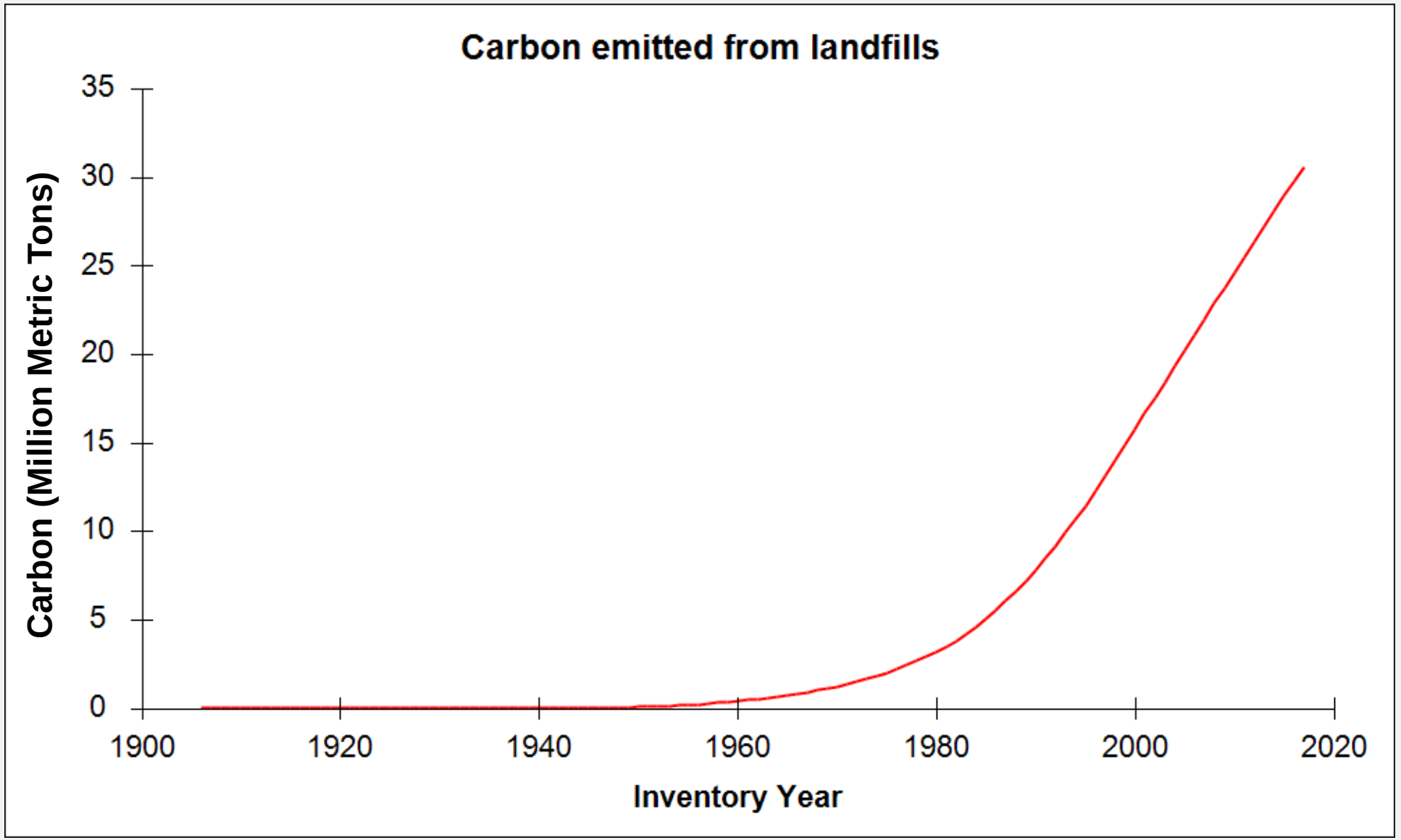
All ownership HWP C disposition of products in use and in SWDS



State, Tribal, County and Municipal ownership HWP C disposition of products in use and in SWDS


Carbon in dumps
Carbon (Million Metric Tons)
60
50
40
30
20
10
0
1900
1920
1940
1960
1980
2000
2020
Inventory Year


Carbon in landfills
Carbon (Million Metric Tons)
160
140
120
100
80
60
40
20
0
1900
1920
1940
1960
1980
2000
2020
Inventory Year


Carbon emitted from landfills
Carbon (Million Metric Tons)
35
30
25
20
15
10
5
0
1900
1920
1940
1960
1980
2000
2020
Inventory Year

Oregon Harvested Wood Product Carbon Report

- Currently working to integrate Oregon harvest data prior to 1962.
- Analysis on schedule and draft report expected to be completed by the end of October 2019 and final report by June 2020.