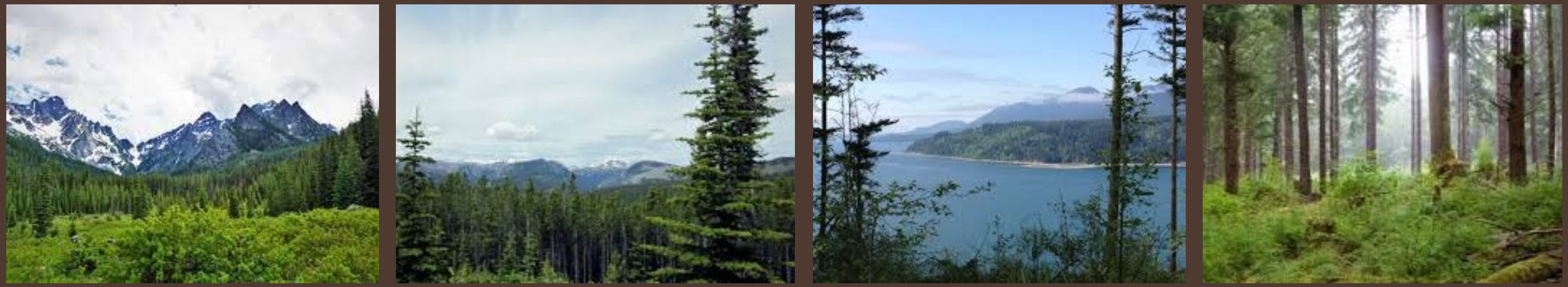

WASHINGTON
DEPARTMENT OF NATURAL RESOURCES



Older Forests and Carbon

A Presentation to the Board of Natural Resources

Andrew Hayes

Peter Gould

July 6, 2021

Agenda

Older Forest Discussion Review

Overview of the Forest Carbon Inventory Report

- Carbon Terminology
- Results of the Carbon Inventory
  - Carbon on the Landscape
  - Carbon in the Forest
  - How Carbon has Changed
  - Carbon emissions from Wildfire

Summary and Discussion

Old Growth and Older Forest Policy

REVIEW

Policies that shaped our current management

- 1997 Habitat Conservation Plan
- 2004 Sustainable Harvest Calculation
- 2004 Legislation on Old–Growth
- 2006 Policy for Sustainable Forests
- 2019 Marbled Murrelet Long-term Conservation Strategy – Habitat Conservation Plan Amendment

Policy Summary

REVIEW

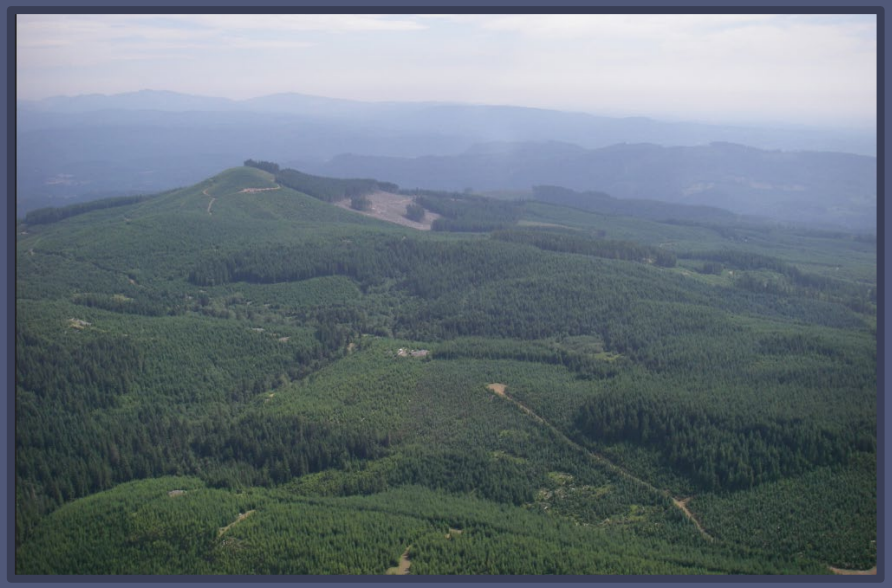
Trust Lands are managed for long-term revenue

Old Growth is identified and protected from harvest

HCP landscape conservation protects species, habitat, and biodiversity

Policy framework creates landscapes with substantial structurally complex forests

HCP Amendment reinforced landscape conservation and released older forests not essential to conservation goals



Assessments, Monitoring, and Projections Summary

REVIEW

- Conducting ongoing old-growth field assessments
- HCP strategies have resulted in increased older forest conditions
- Projections show:
  - Continuing increase in older forest conditions
  - Increasing stored forest carbon

Washington Forest Ecosystem Carbon Inventory

Peter Gould

Forest Biometrician

Comprehensive Carbon Assessment

Partnership with USDA Forest Service

Focus on
DNR-Managed Lands

Forest Inventory and Analysis Program

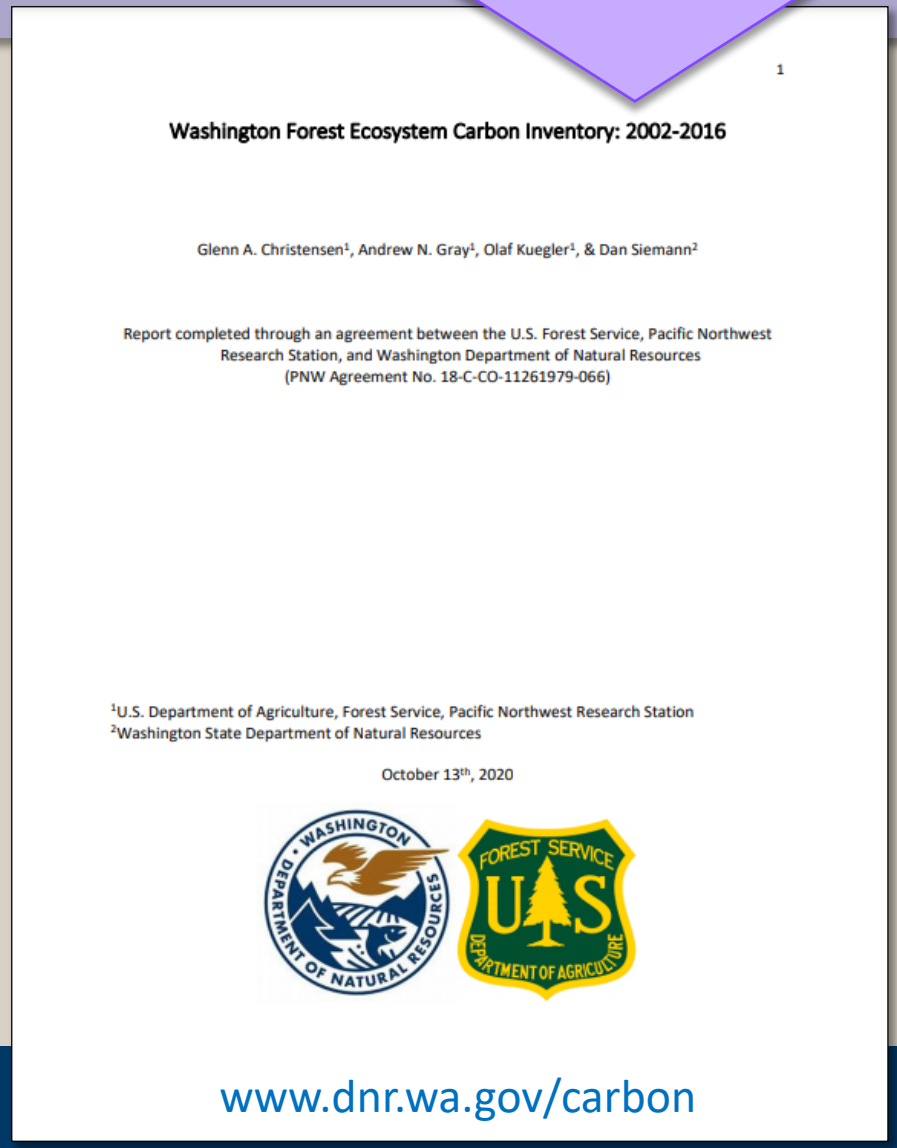
- Since 1930
- Comprehensive survey of forest plots
  (10%+ forest cover)
- 10% annually – 100% over 10 years

Data for 2002-2006 & 2012-2016

- Repeat estimates for 5 years/50% of plots

Measures:

- Amount of carbon
- Form of carbon
- Change in carbon



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Washington Forest Ecosystem Carbon Inventory: 2002-2016

Glenn A. Christensen[1], Andrew N. Gray[1], Olaf Kuegler[1], & Dan Siemann[2]

Report completed through an agreement between the U.S. Forest Service, Pacific Northwest Research Station, and Washington Department of Natural Resources
(PNW Agreement No. 18-C-CO-11261979-066)

[1]U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station
[2]Washington State Department of Natural Resources

October 13th, 2020

www.dnr.wa.gov/carbon

Carbon Terminology

MT C = metric tons of carbon

MMT C = million metric tons of carbon

1 MT C = 3.667 MT CO_2e

CO_2e = Carbon dioxide equivalent

- A measure of greenhouse gases based on global warming potential
- CO_2 is most prevalent gas, so other greenhouse gases are equated to CO_2 when discussing overall emissions

Carbon Pool = reservoirs of carbon that can take in and release carbon. (E.g. Live trees, soil, dead wood)

Interesting Facts

Metric Ton
= 2,240 lbs.

Average car emits 4.7 metric tons of CO_2 / year*

*EPA Office of Transportation and Air Quality EPA-420-F-14-040a May 2014

Carbon Stock = The amount of Carbon in a Pool

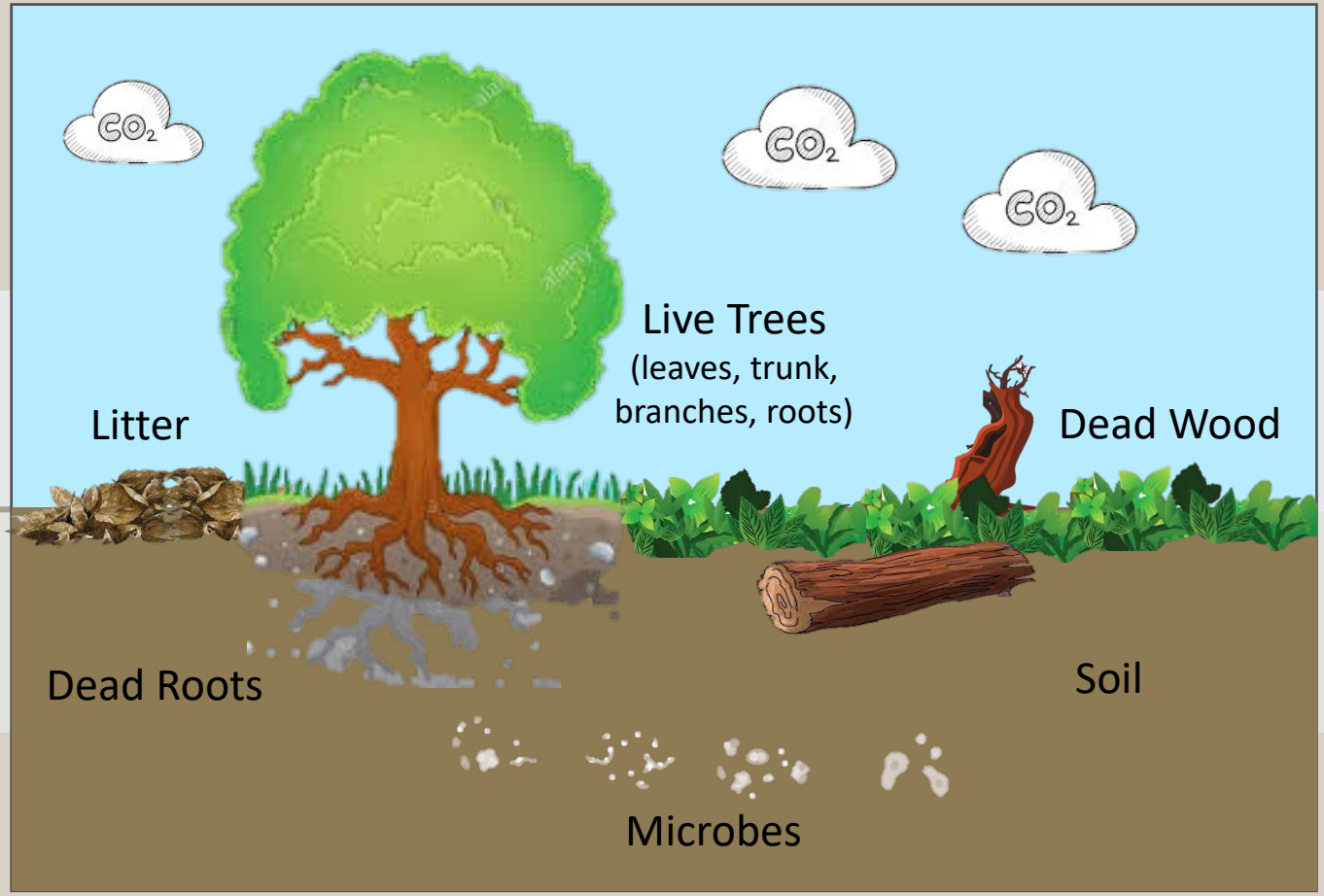
(e.g. live trees, standing dead trees, down wood, forest floor, soil)

Some Stocks are measured more precisely than others

Higher Precision:
above ground biomass

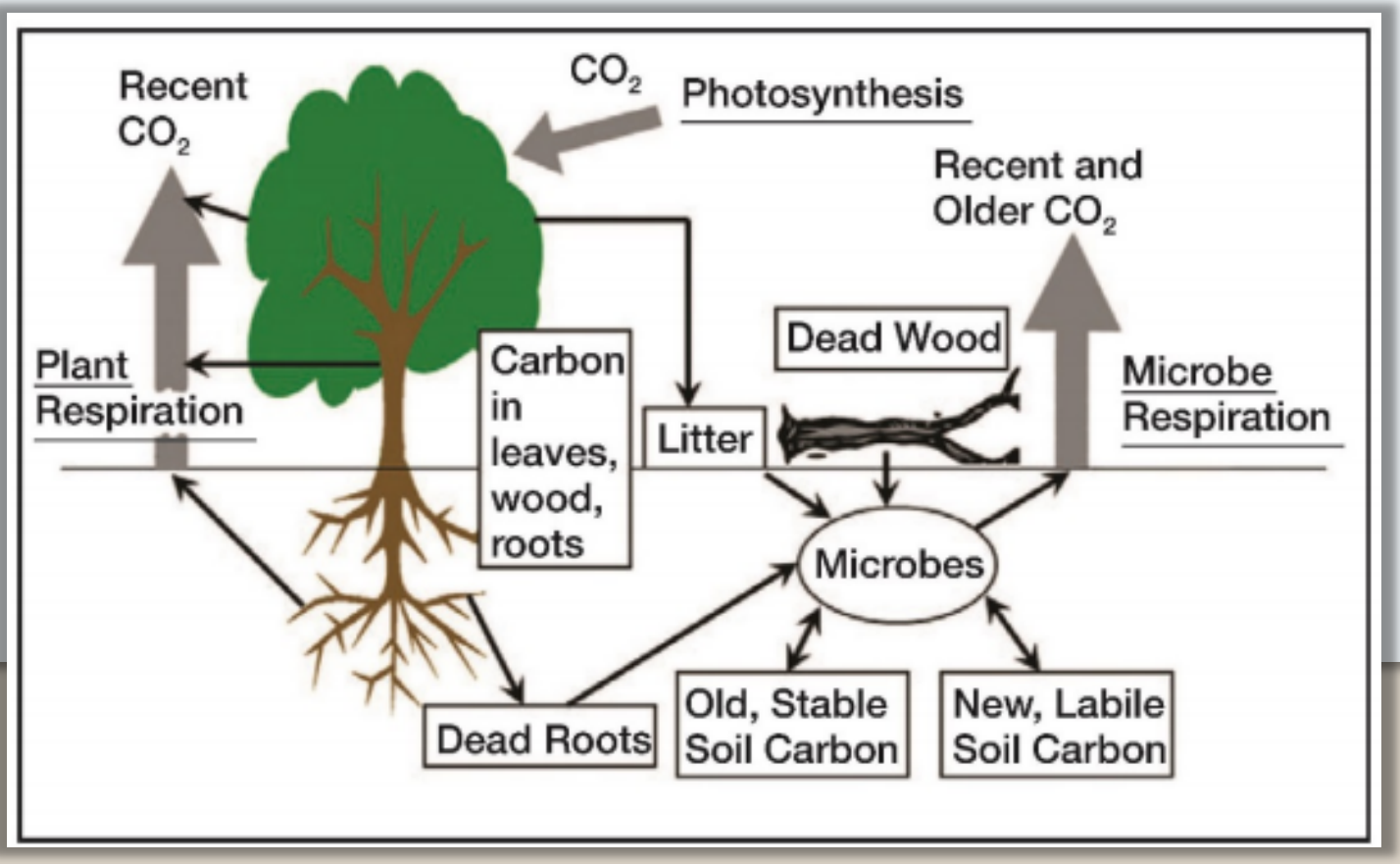
Lower Precision:
soil carbon

Reported in MT C



Carbon Flux =

The change in net carbon in one or more pools over a period of time



This report tracked the difference between:

2002-2006

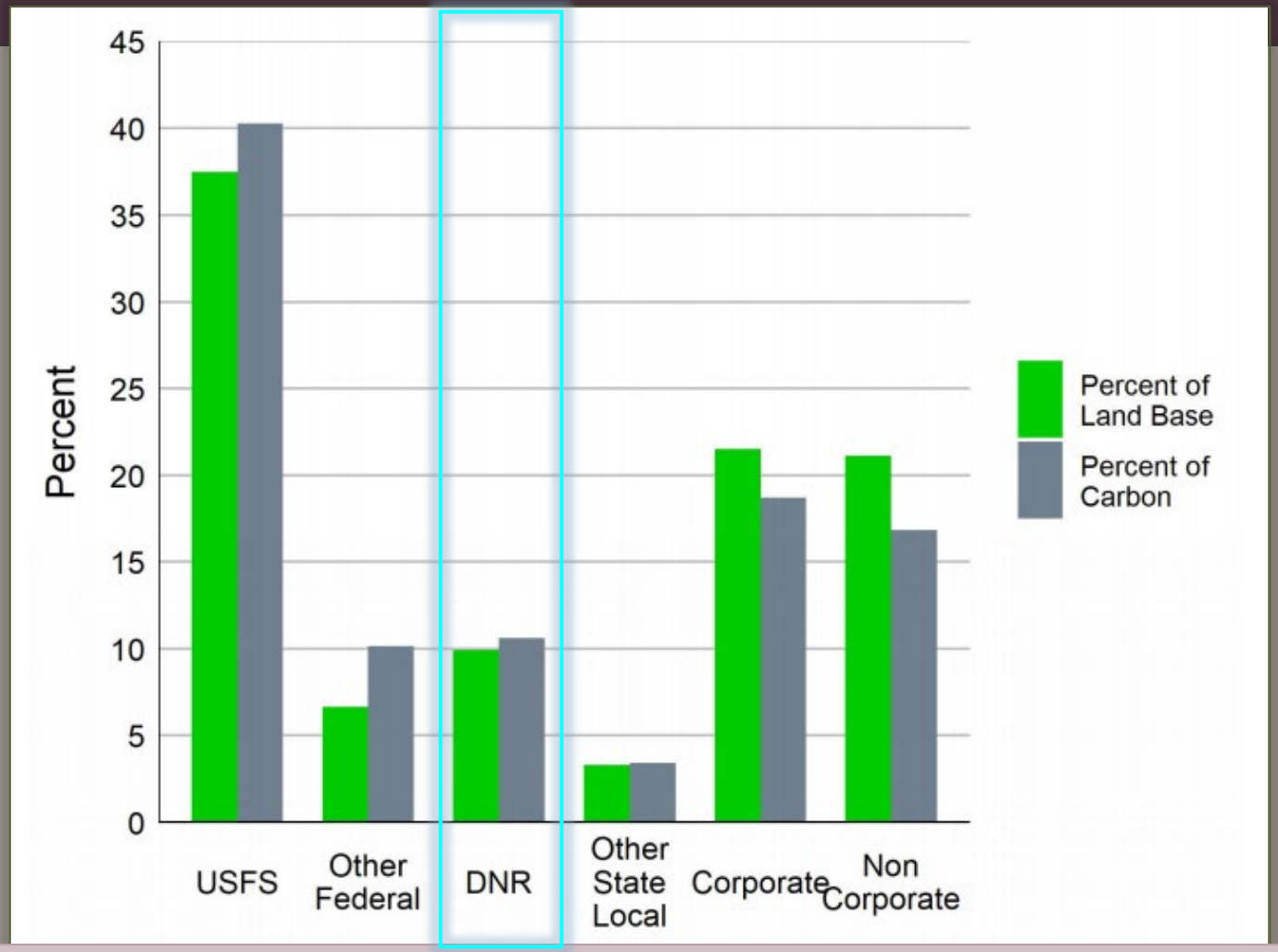
and

2012-2016

Reported in MT CO_2e

Did not track the carbon once it was removed from the forest
(e.g. harvested wood products)

Where is Carbon on the Landscape?



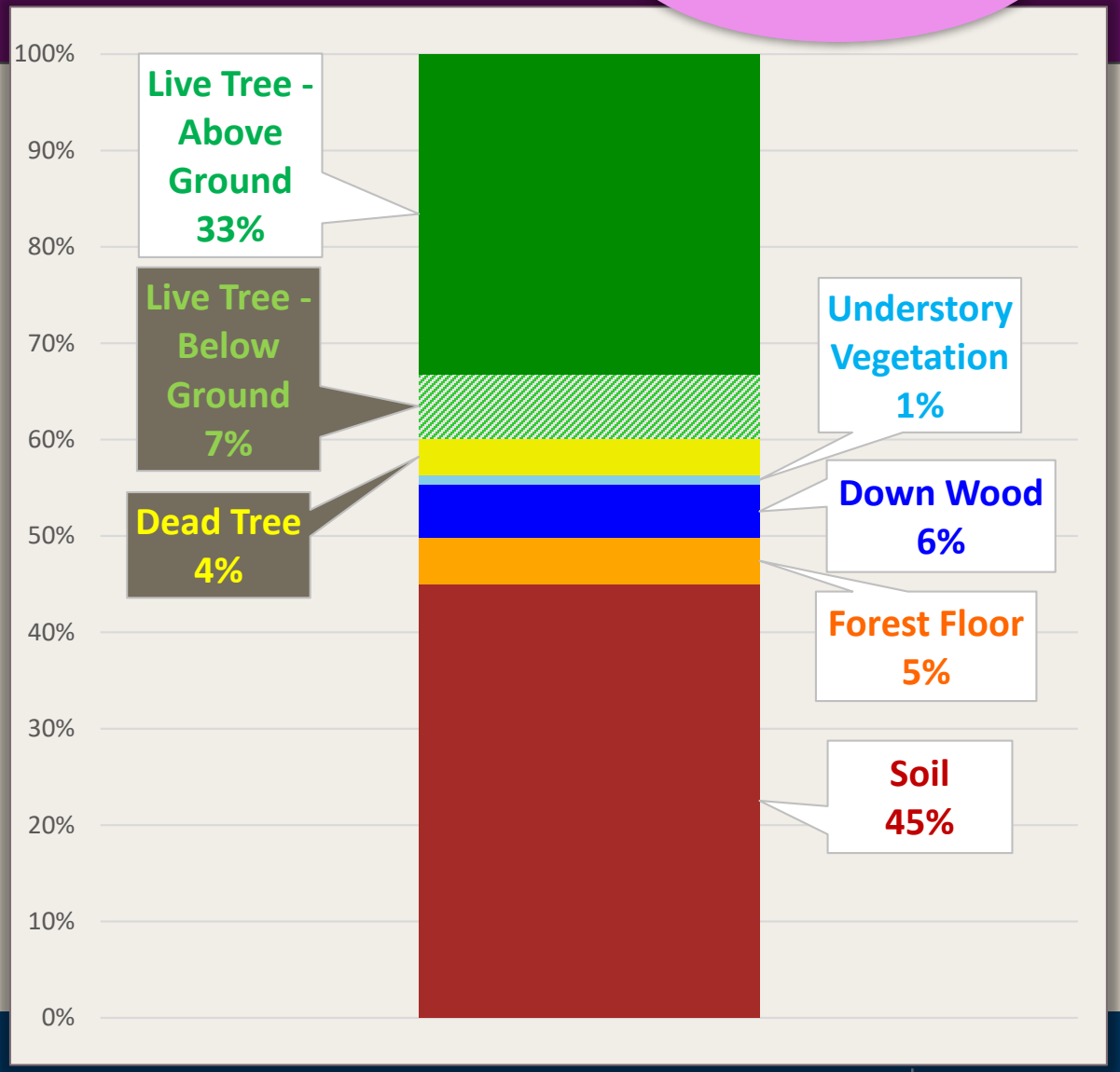
Washington Statewide – Percent of Forest Land Base and Percent of Carbon Stocks by Owner

Where is Carbon in the Forests?

- 22.1 million acres of forest
- 2.72 billion MT C in WA
  (gigatons)
- 122.9 tons/acre
- Nearly half in roots and soil

~50%

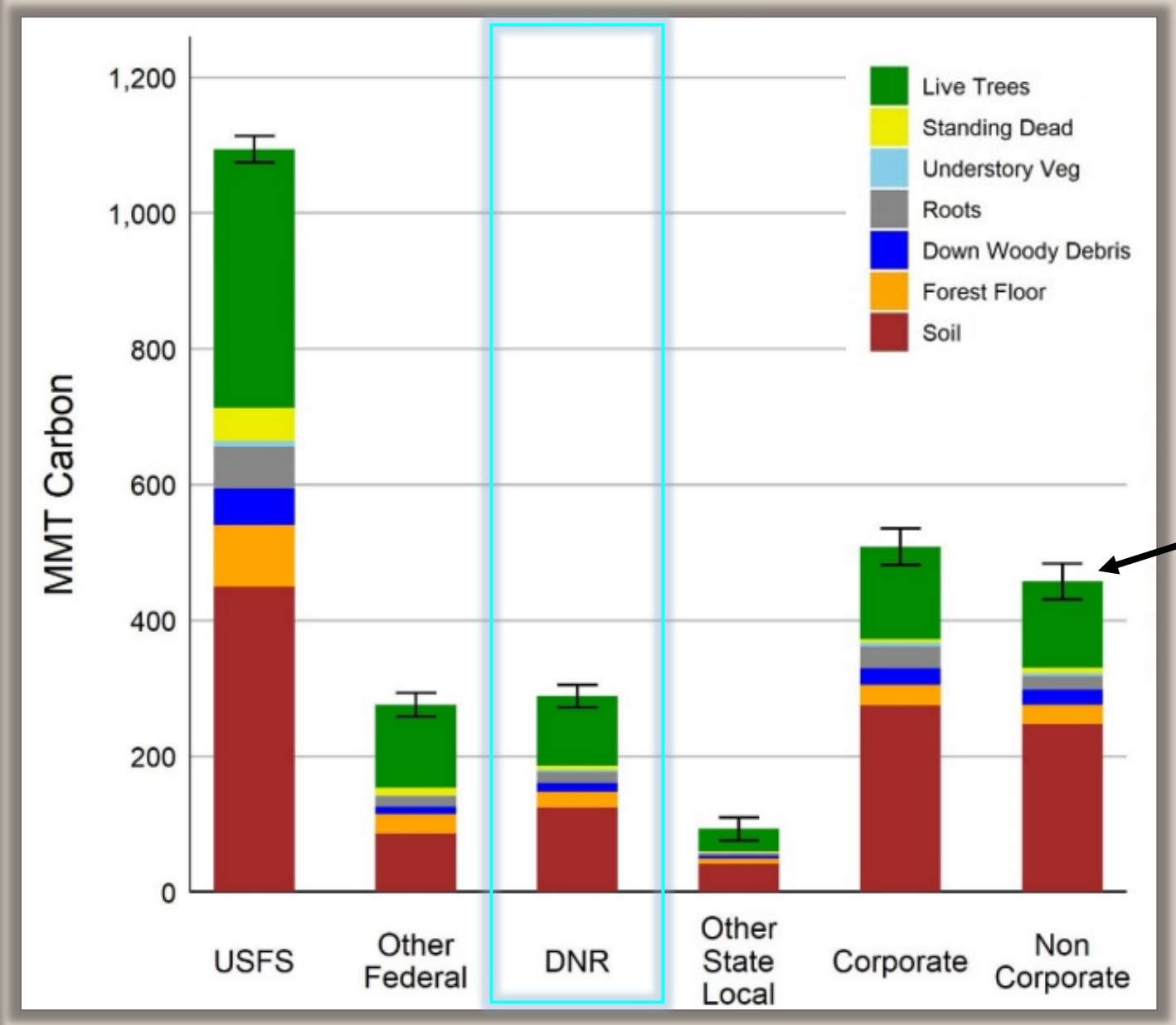
All Forests in Washington



Total Forest Carbon

by Ownership and Pool

2007-2016

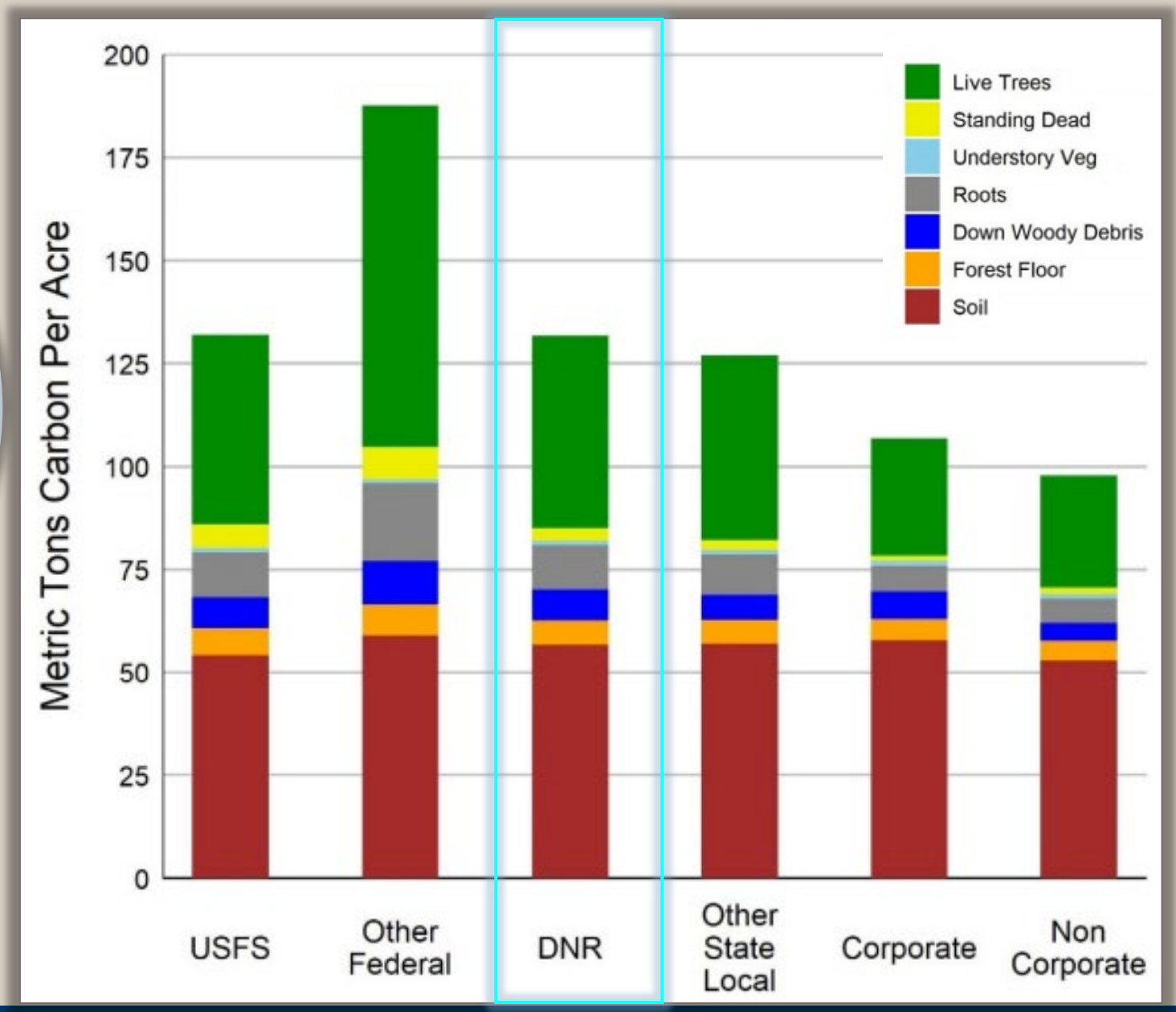


Tight confidence intervals for total forest carbon

Density of Forest Carbon

by Ownership and Carbon Pool

For the 2016 Inventory Period

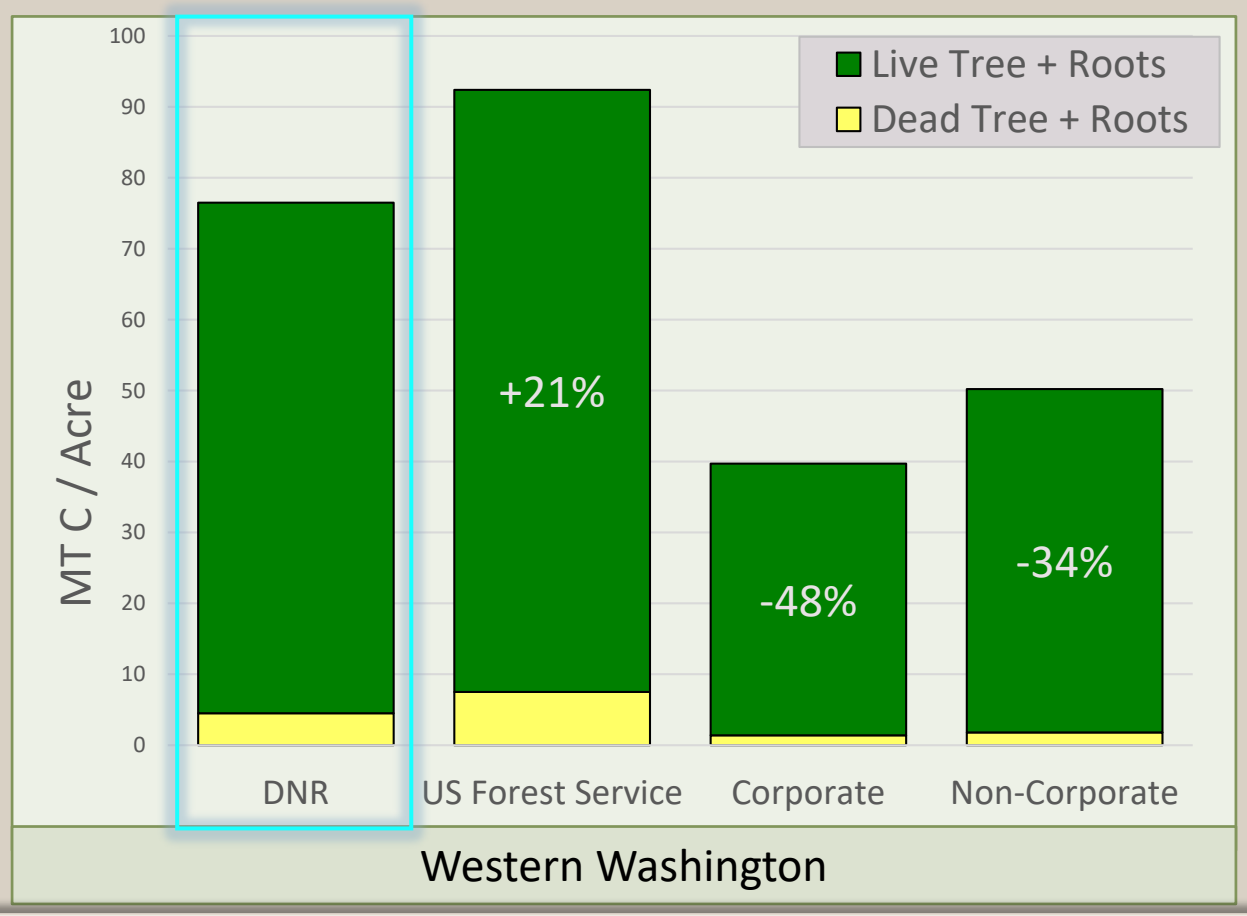


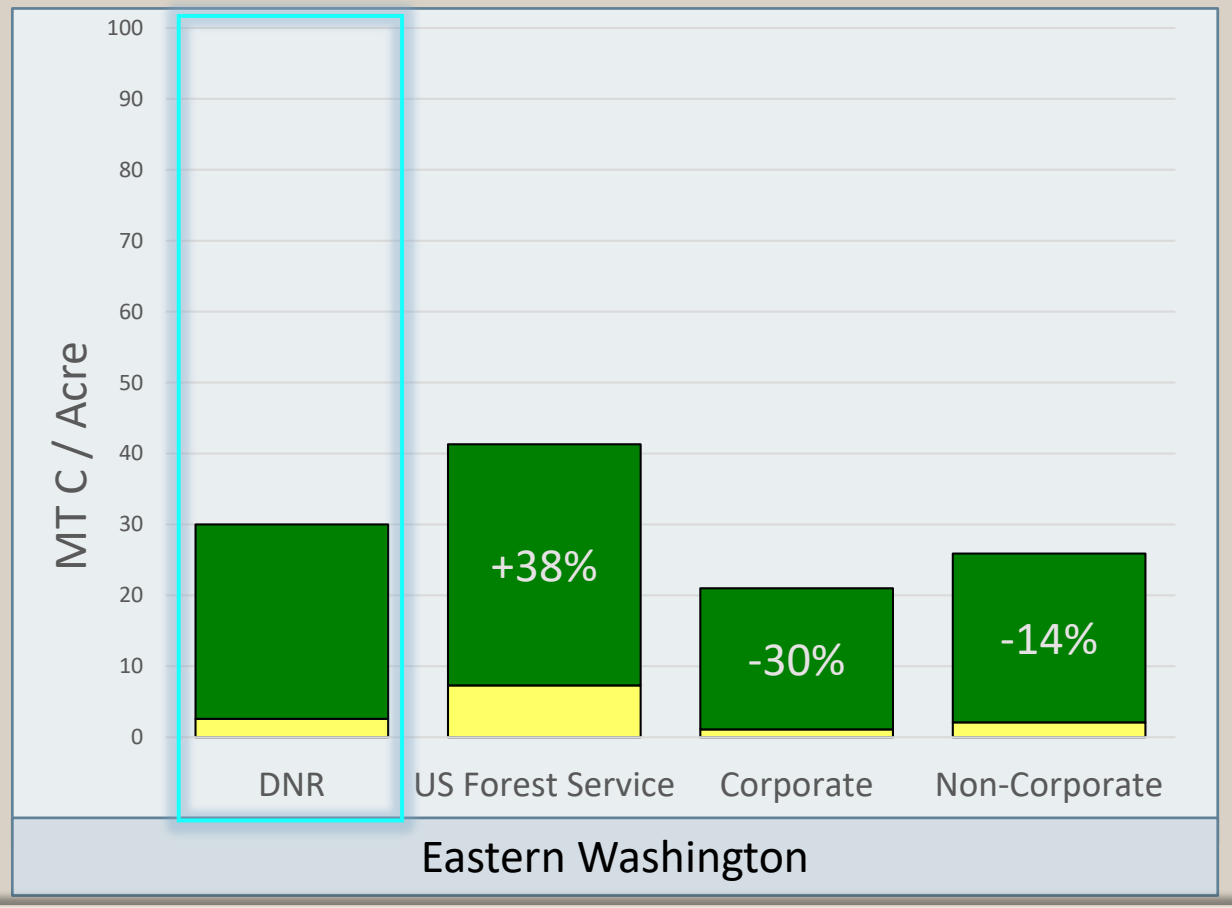
Big differences in Tree Carbon Stocks

Soil Carbon Stocks nearly the same on all ownerships

Live-Tree and Dead-Tree Carbon Stocks

(percent difference from DNR)





4.3 Billion Metric Tons of Tree CO_2e in Trees Statewide

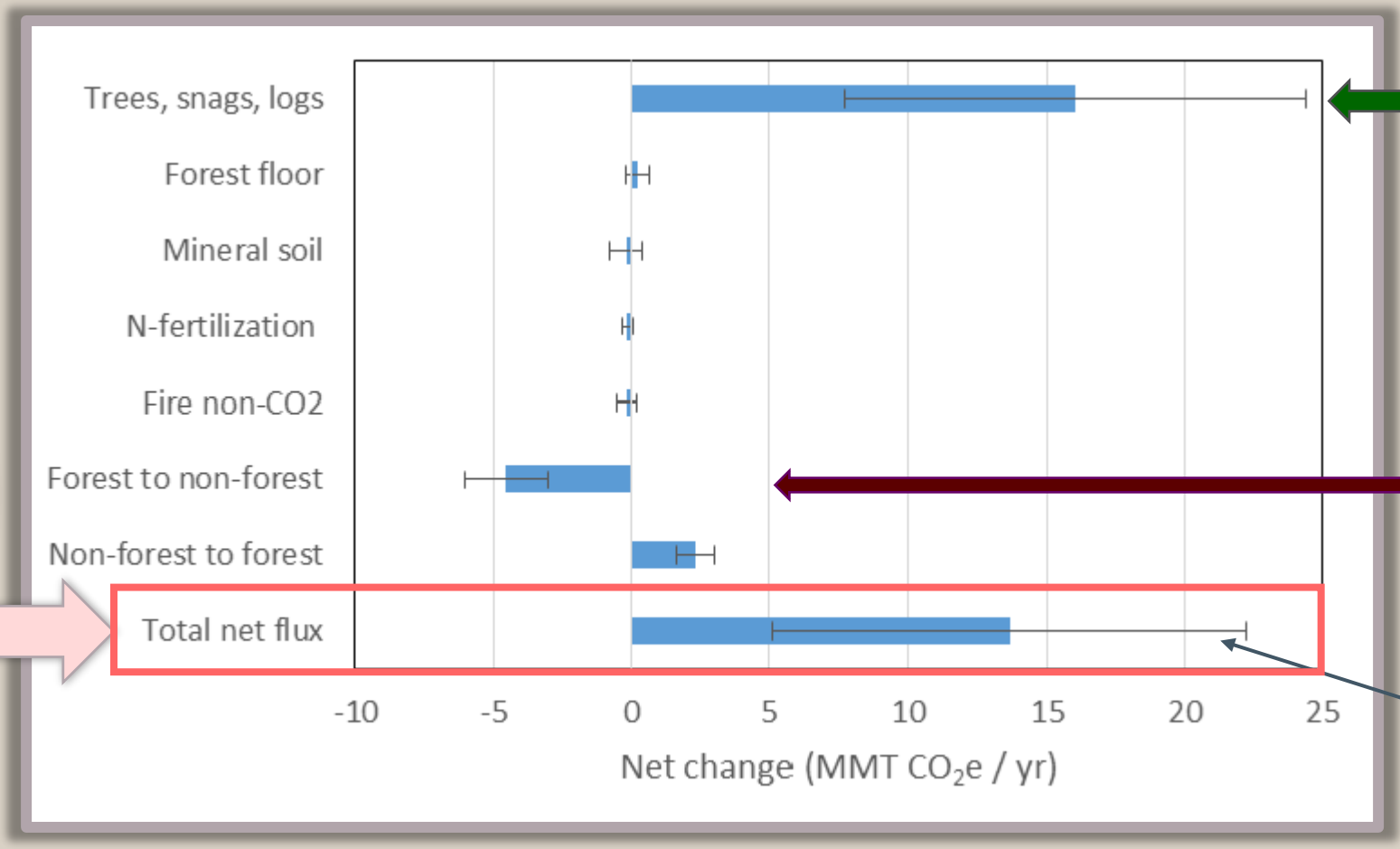
Equivalent to 925 million vehicle years | 2x all annual transportation emissions in US

https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

How Did Statewide Carbon Change?

~2.9 million cars per year

Increase 13.7 MMT C Annually



Forest trees biggest gains

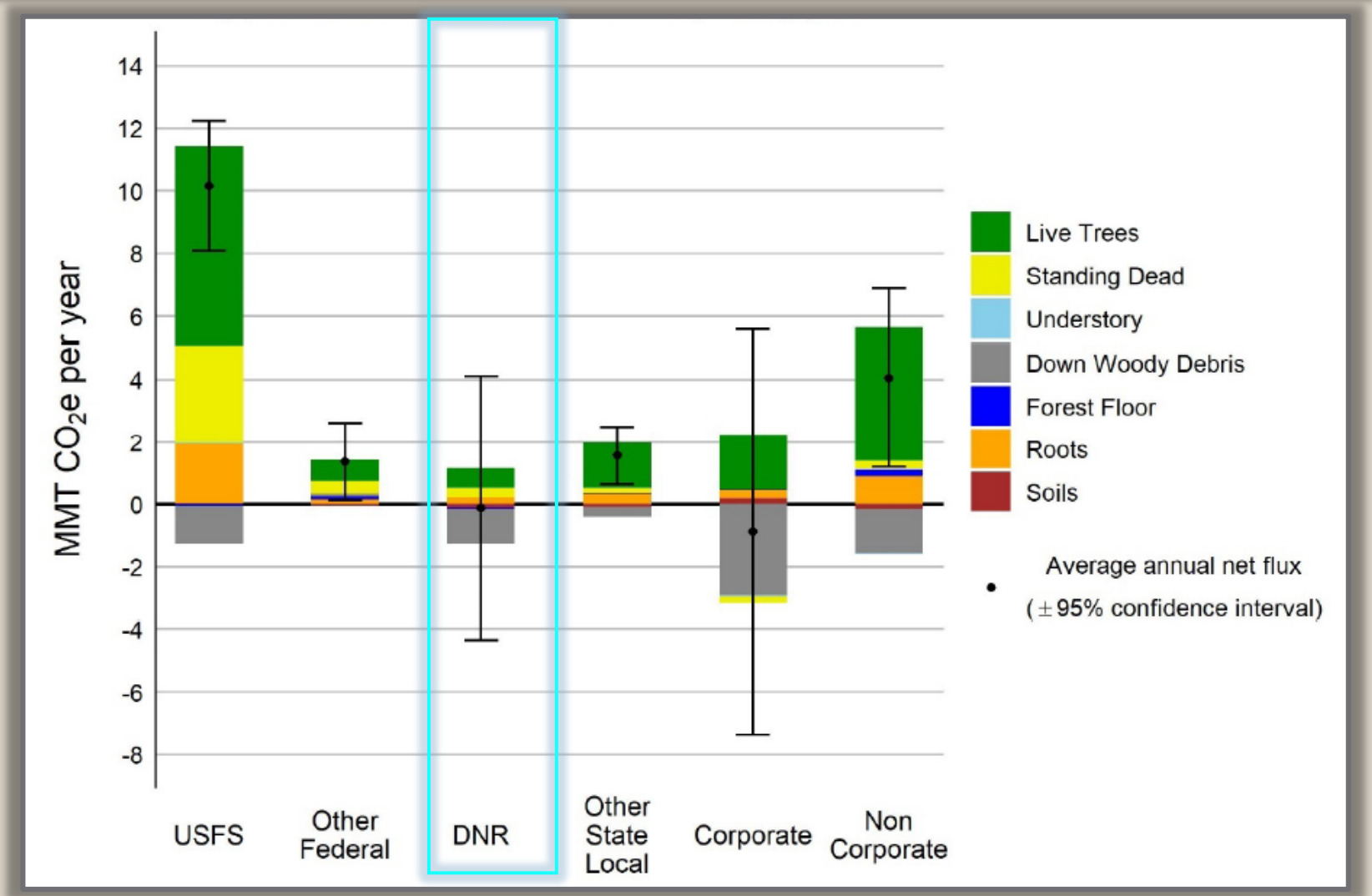
Land conversion biggest loss

Large confidence intervals (less precision)

Statewide Average Annual Net CO_2e Flux from Forest Pools, Land Use, and Land Use Change

How Did Carbon Change by Ownership?

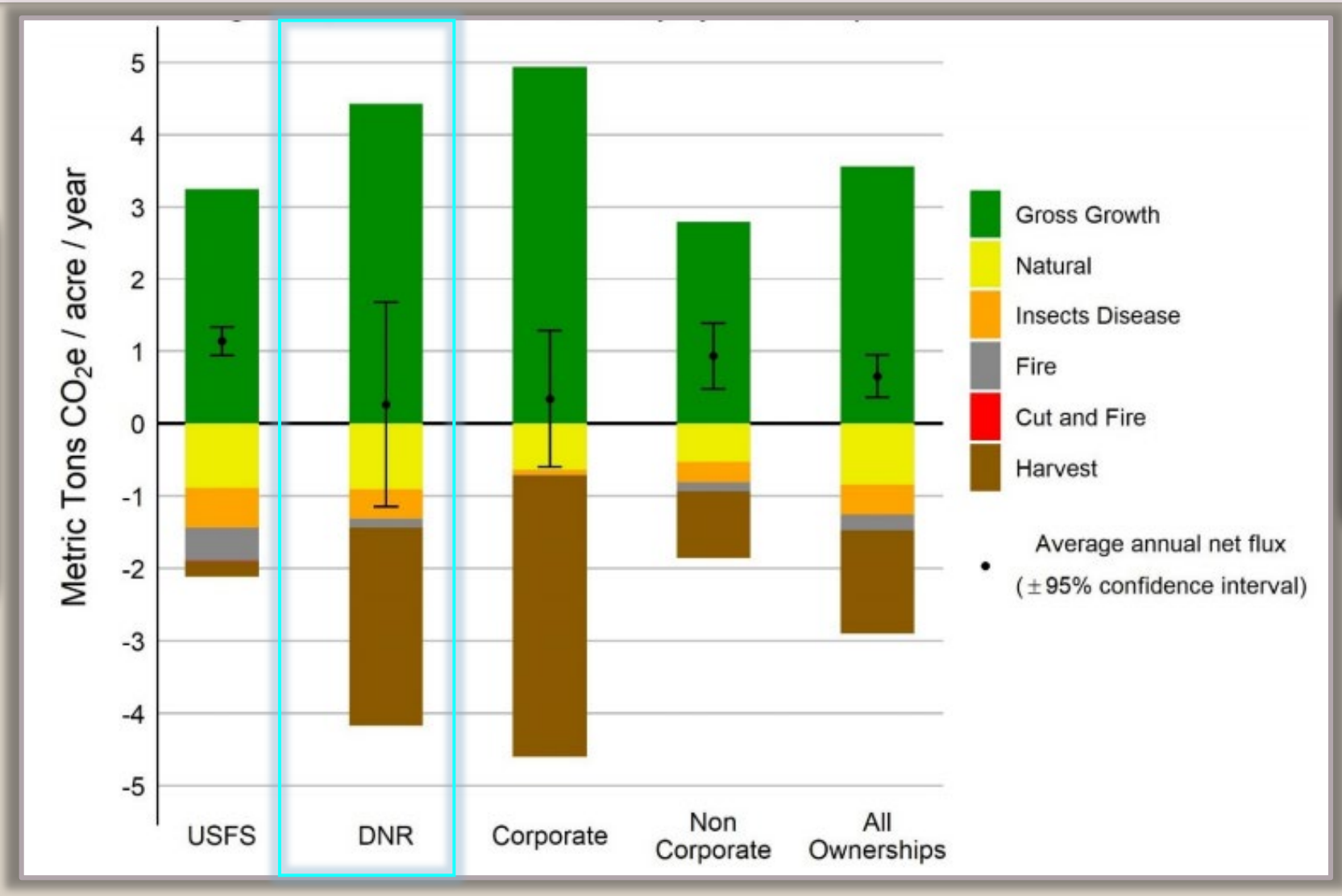
2016 Reporting Period



By Carbon Pool

How did Carbon in Live Trees Change?

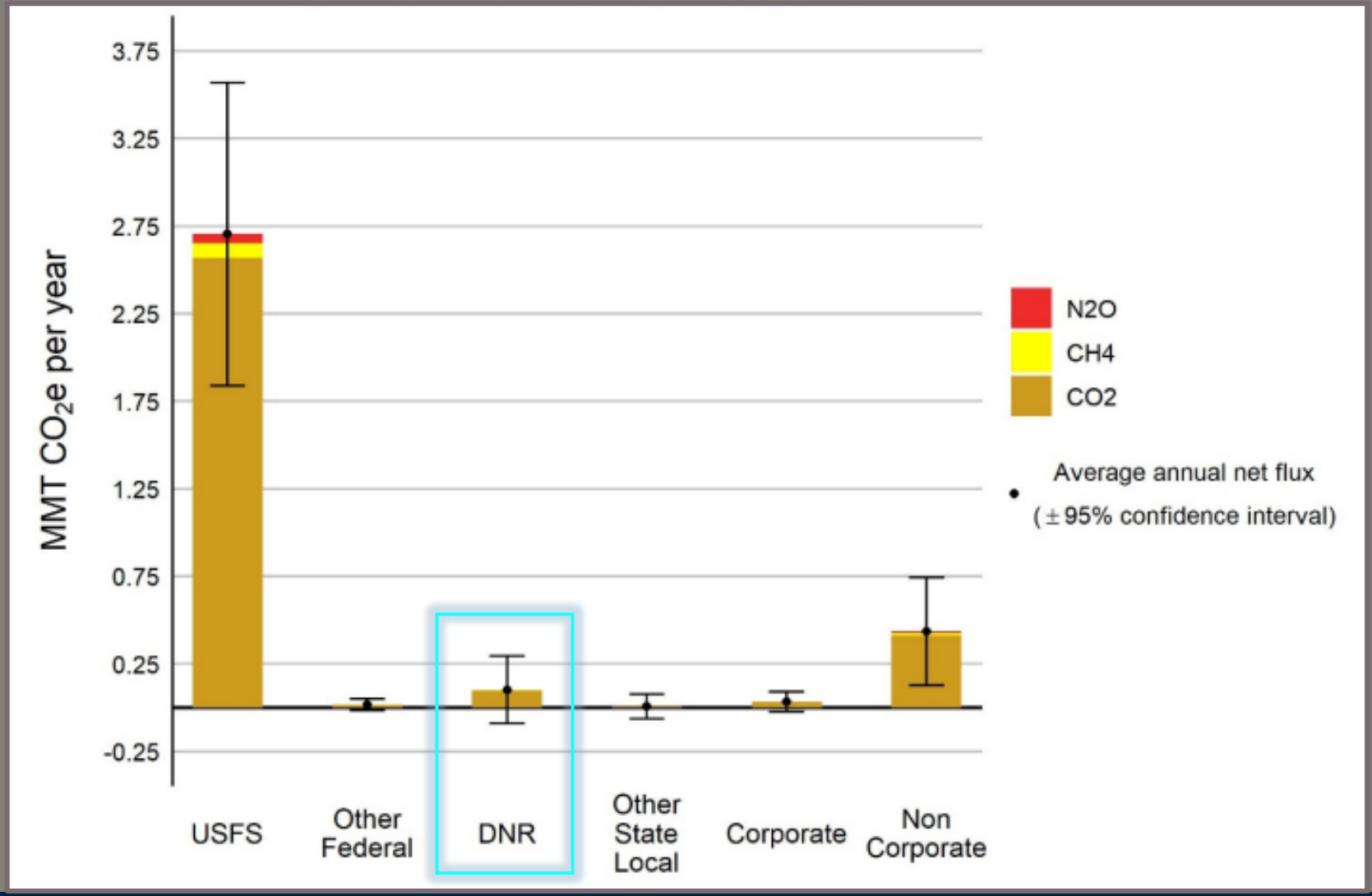
Annual change per acre in live tree Carbon from Growth, Removals, and Mortality



More Gain then Loss for all Ownerships

Annual Wildfire Greenhouse Gas Emissions

3.1 MMT C CO_2e/year =~667,000 cars



By Ownership

Between 2002-2006 & 2012-2016 Reporting Periods

Forest Carbon Inventory Take-Aways

Washington Forests Sequester ~13.7 MMT C Annually

U.S. Forest Service > DNR > Private

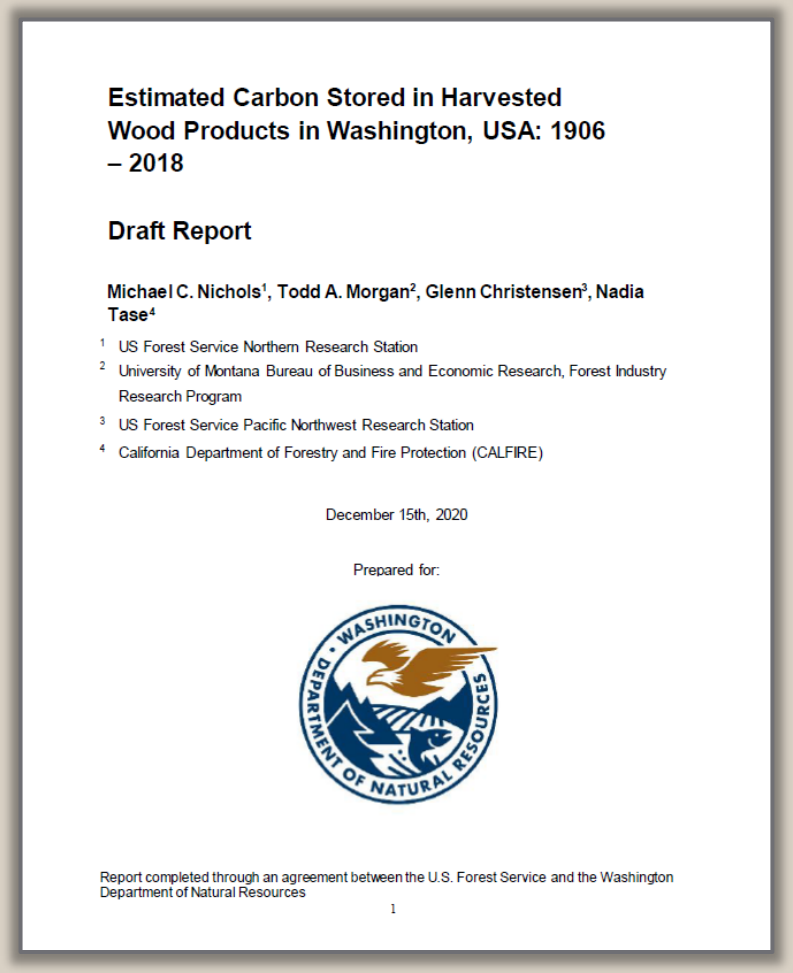
DNR Net Flux ≈ 0 ← *(Estimate is imprecise)*

Future reports will have more data – will it be enough?

Estimated Carbon Stored in Harvested Wood Products in Washington: 1906-2018

This report provides resulting estimates of harvested wood products carbon stocks and flux, or net annual change in stocks, over the interval from 1906 to 2018 for the state of Washington.

https://www.dnr.wa.gov/publications/em_wa_carbon_121420.pdf



Estimated Carbon Stored in Harvested Wood Products in Washington, USA: 1906 – 2018

Draft Report

Michael C. Nichols[1], Todd A. Morgan[2], Glenn Christensen[3], Nadia Tase[4]

[1] US Forest Service Northern Research Station
[2] University of Montana Bureau of Business and Economic Research, Forest Industry Research Program
[3] US Forest Service Pacific Northwest Research Station
[4] California Department of Forestry and Fire Protection (CALFIRE)

December 15th, 2020

Prepared for:

Report completed through an agreement between the U.S. Forest Service and the Washington Department of Natural Resources

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Carbon and Older Forests Summary

Current DNR policy framework protects old-growth and creates landscapes with structurally complex forests

Washington forests show an annual increase in stored carbon

More information is needed about the relationship between carbon stored in the forest and atmospheric carbon

Potential policy implications

Questions and Discussion


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