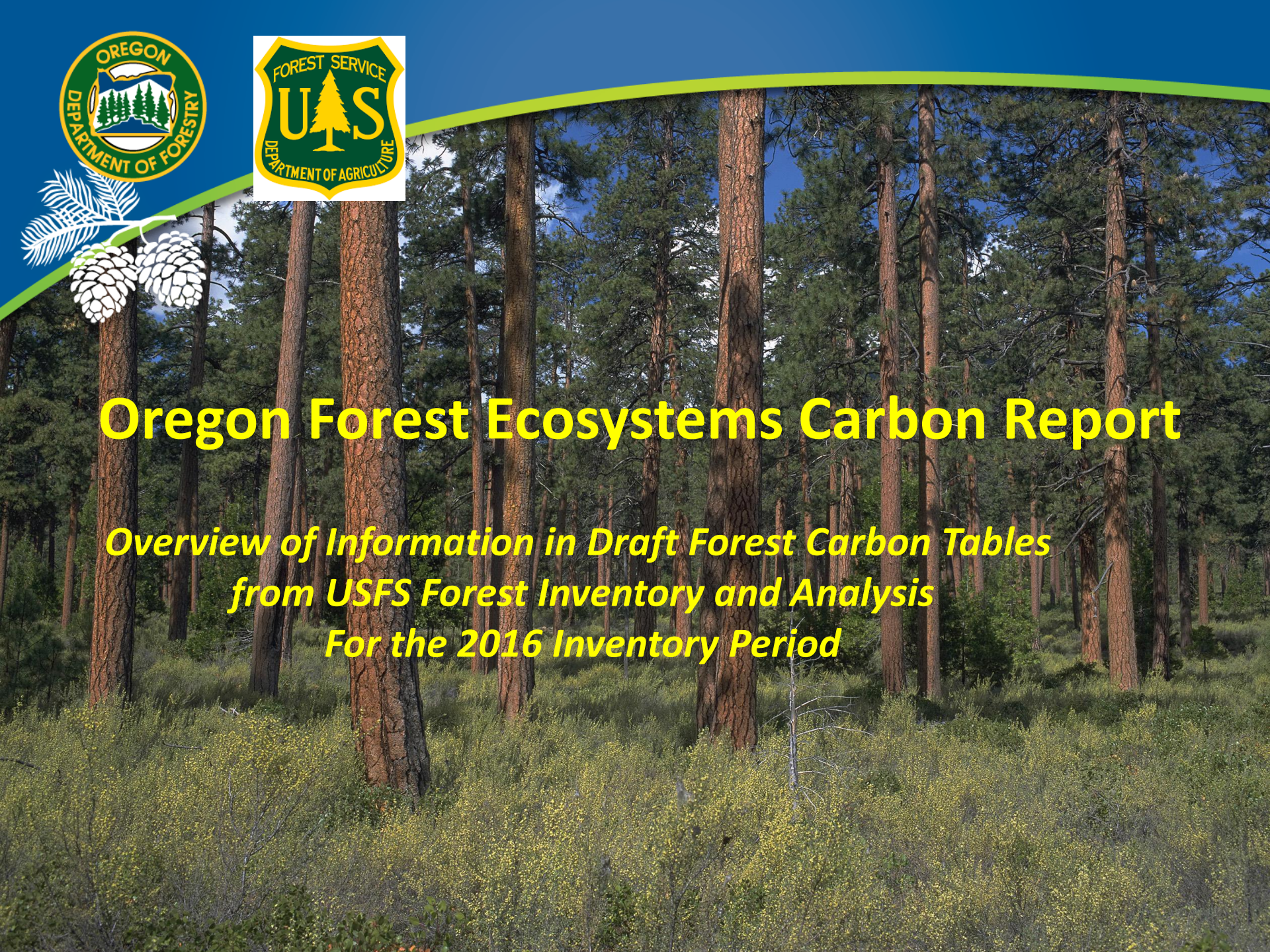
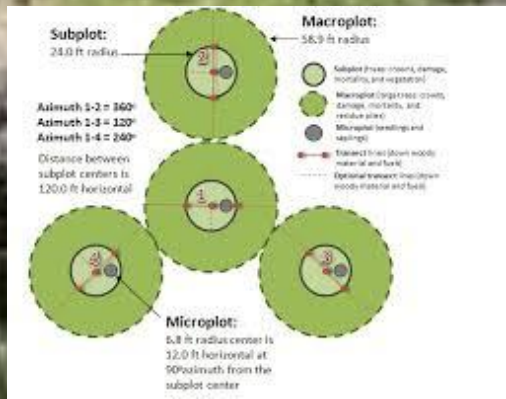


Oregon Forest Ecosystems Carbon Report

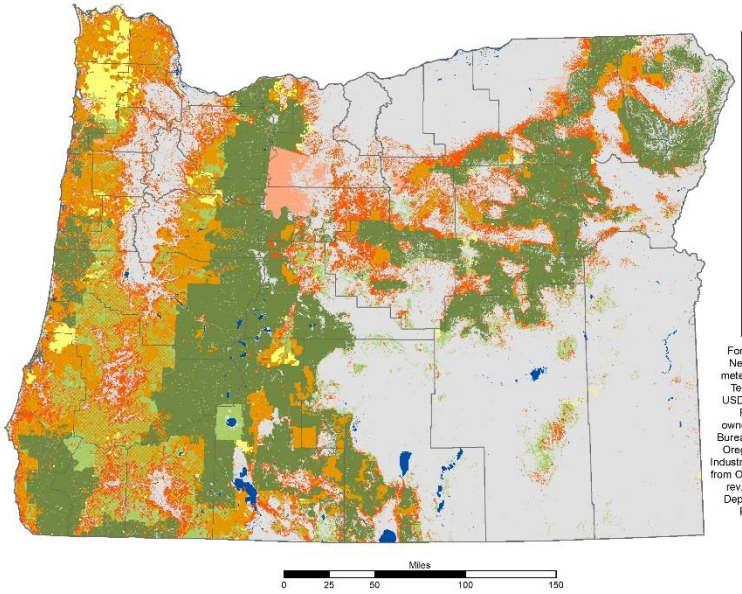
Overview of Information in Draft Forest Carbon Tables from USFS Forest Inventory and Analysis For the 2016 Inventory Period

Oregon Forest Ecosystems Carbon Report

- The report will provide summaries of total forest carbon stocks and flux by ecoregion, ownership, forest type, and forest pool.
- Report is based on measurements collected by the ***USFS Forest Inventory and Analysis Program*** on forest inventory plots in Oregon From 2001 to 2016
- 10% of all plots are measured each year and again at 10 year intervals.



Oregon Forest Ownership

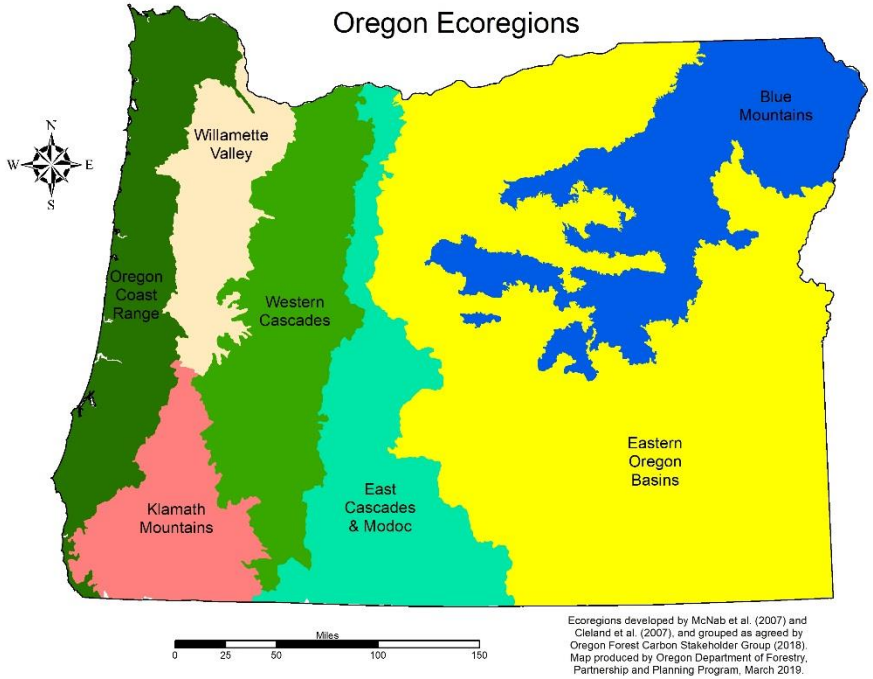


Forest Ownership

- USDA Forest Service
- Bureau of Land Management or Other Federal
- State or Local Government
- Tribal
- Corporate Private
- Non-Corporate Private
- Water
- Nonforested Land
- County Boundaries

Forested area from Gradient Nearest Neighbor (GNN) structure maps (30 meter resolution), produced by LEMMA Team, Oregon State University and USDA Forest Service Pacific Northwest Research Station (2012). Land ownership/management polygons from Bureau of Land Management, revised by Oregon Department of Forestry (2015). Industrial (corporate) management polygons from Oregon Department of Forestry (2006, rev. 2013). Map produced by Oregon Department of Forestry, Partnership & Planning Program, March 2019.

Oregon Ecoregions



Ecoregions developed by McNab et al. (2007) and Cleland et al. (2007), and grouped as agreed by Oregon Forest Carbon Stakeholder Group (2018). Map produced by Oregon Department of Forestry, Partnership and Planning Program, March 2019.

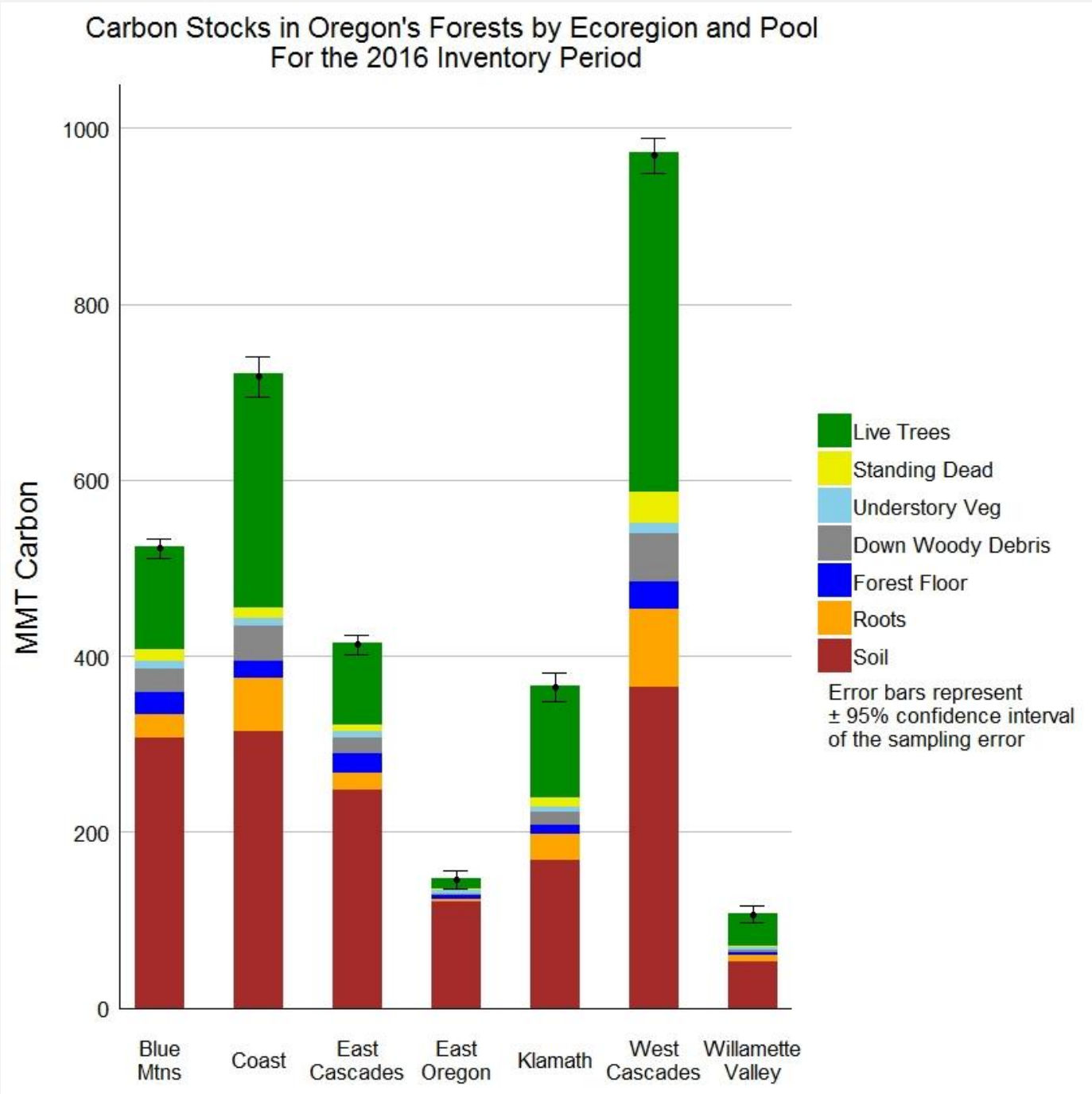
Forest Carbon Stocks

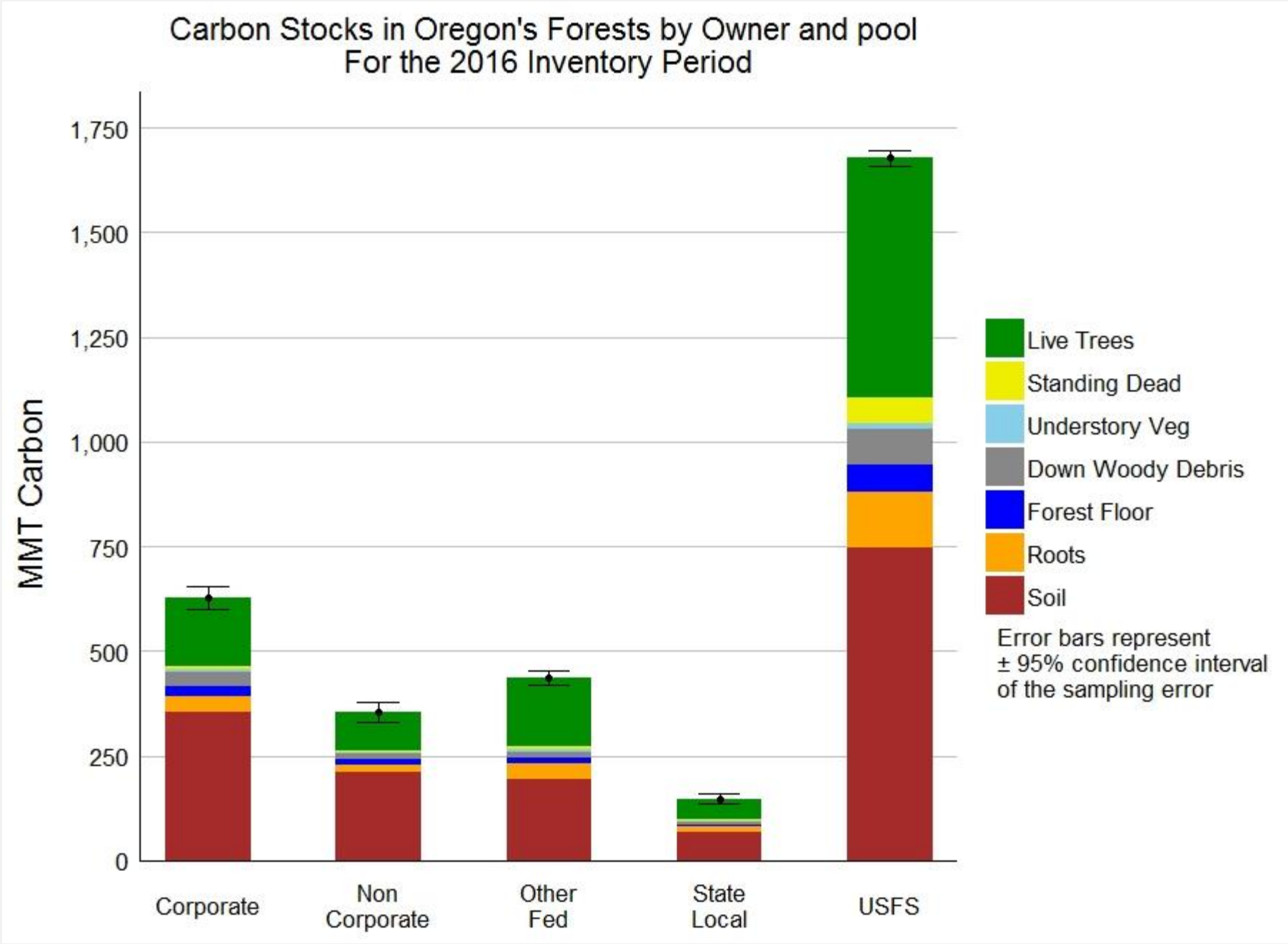
- **Live trees**: Based on FIA regional biomass equations, adds foliage
- **Standing dead trees**: Same as live trees, including reductions for decay
- **Understory vegetation**: As modeled and populated in FIA DataBase
- **Down wood debris**: Use collected measurements and National FIA estimation protocol, piles not included
- **Forest floor**: Use collected measurements and national estimation protocol
- **Roots** on live and standing dead trees: Uses National FIA protocol
- **Organic soils**: As modeled and populated in FIA DataBase using Domke et al. (2017)

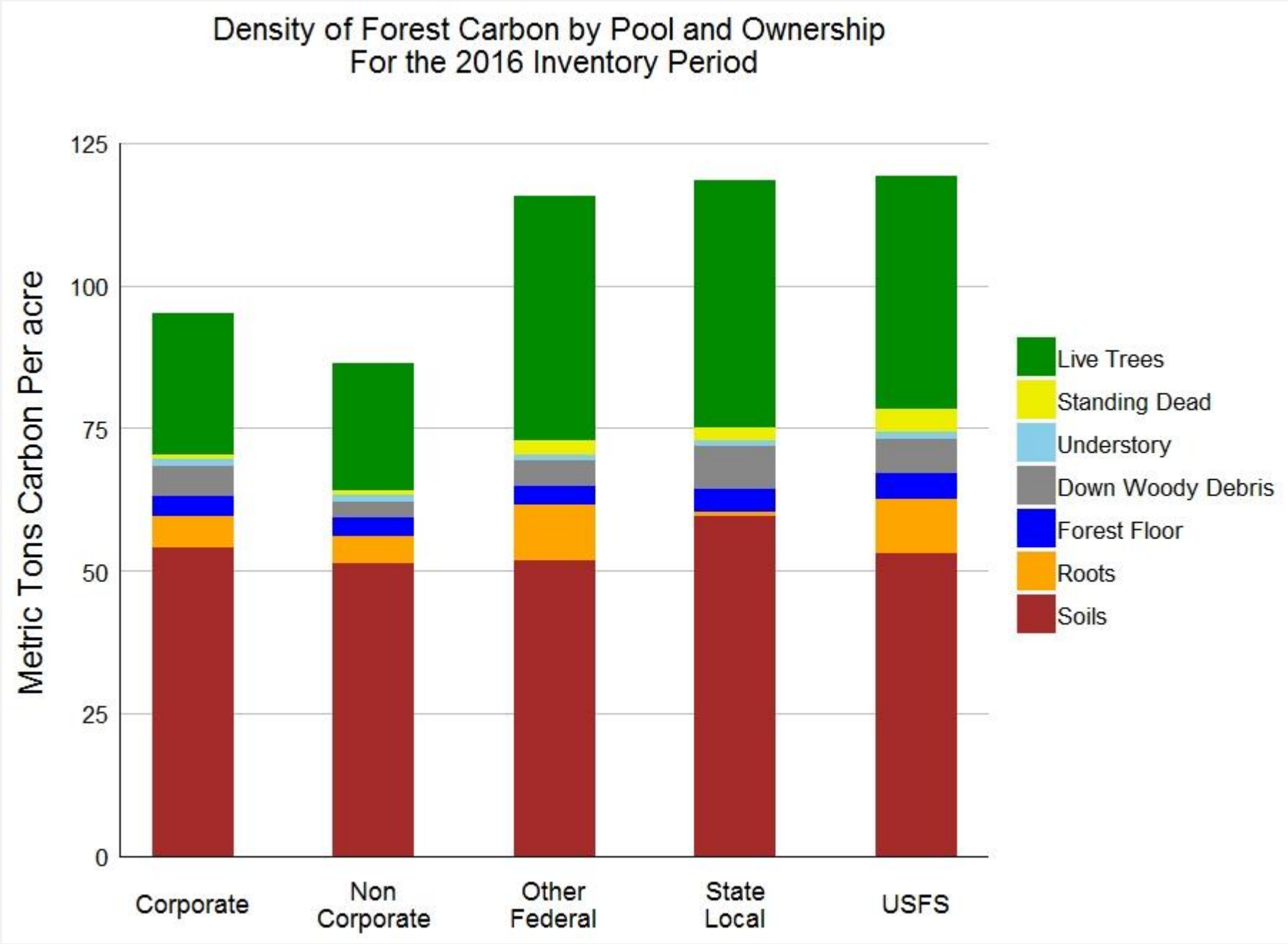
Domke, G.M.; Perry, C.H.; Walters, B.F.; Nave, L.E.; Woodall, C.W.; Swanston, C.W. 2017. Towards inventory-based estimates of soil organic carbon in forests of the United States. Ecological Restoration 27(4): 1223-1235. DOI: 10.1002/eap.1516. (accessed: November 2, 2017).

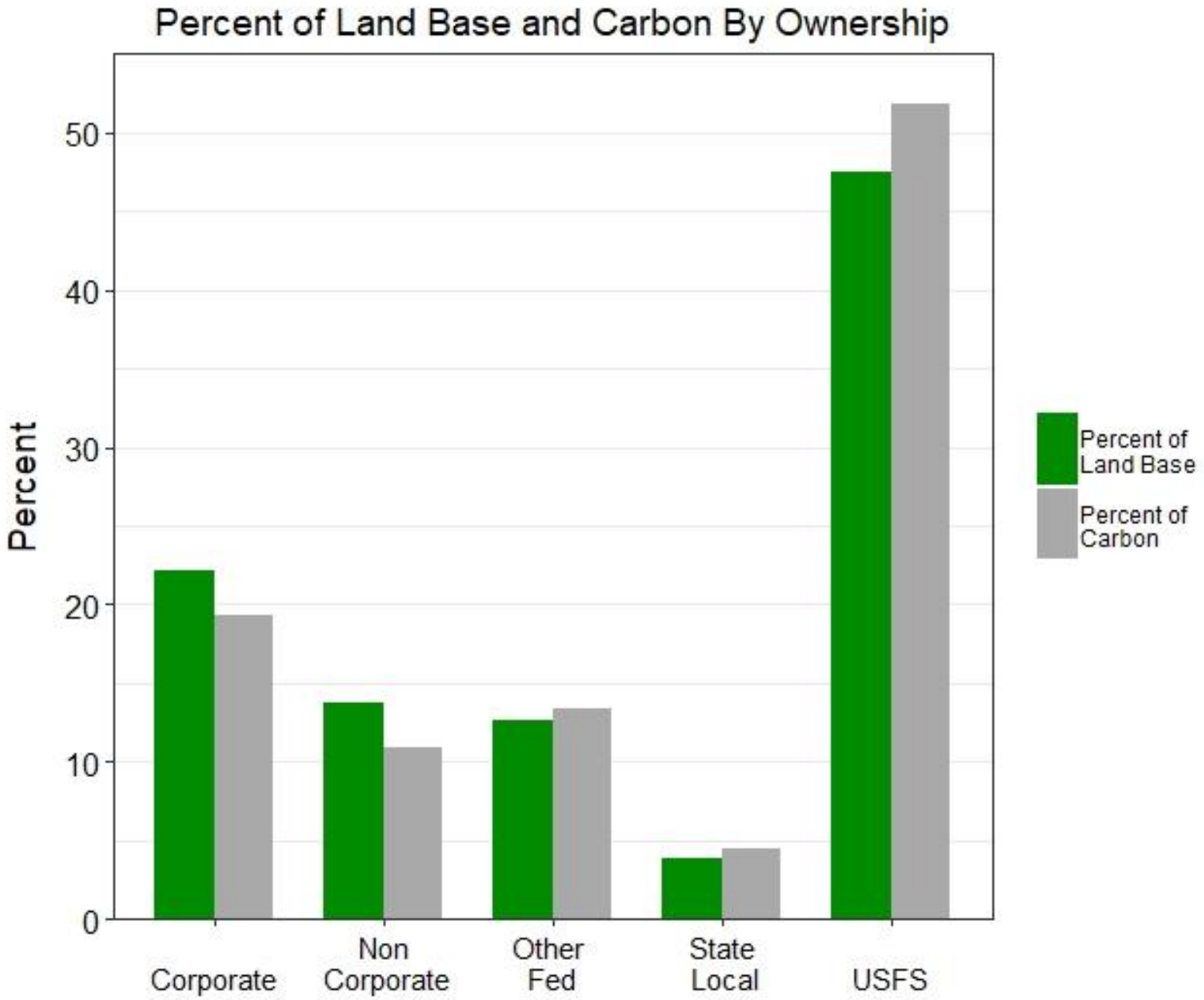
Forest Carbon Stocks

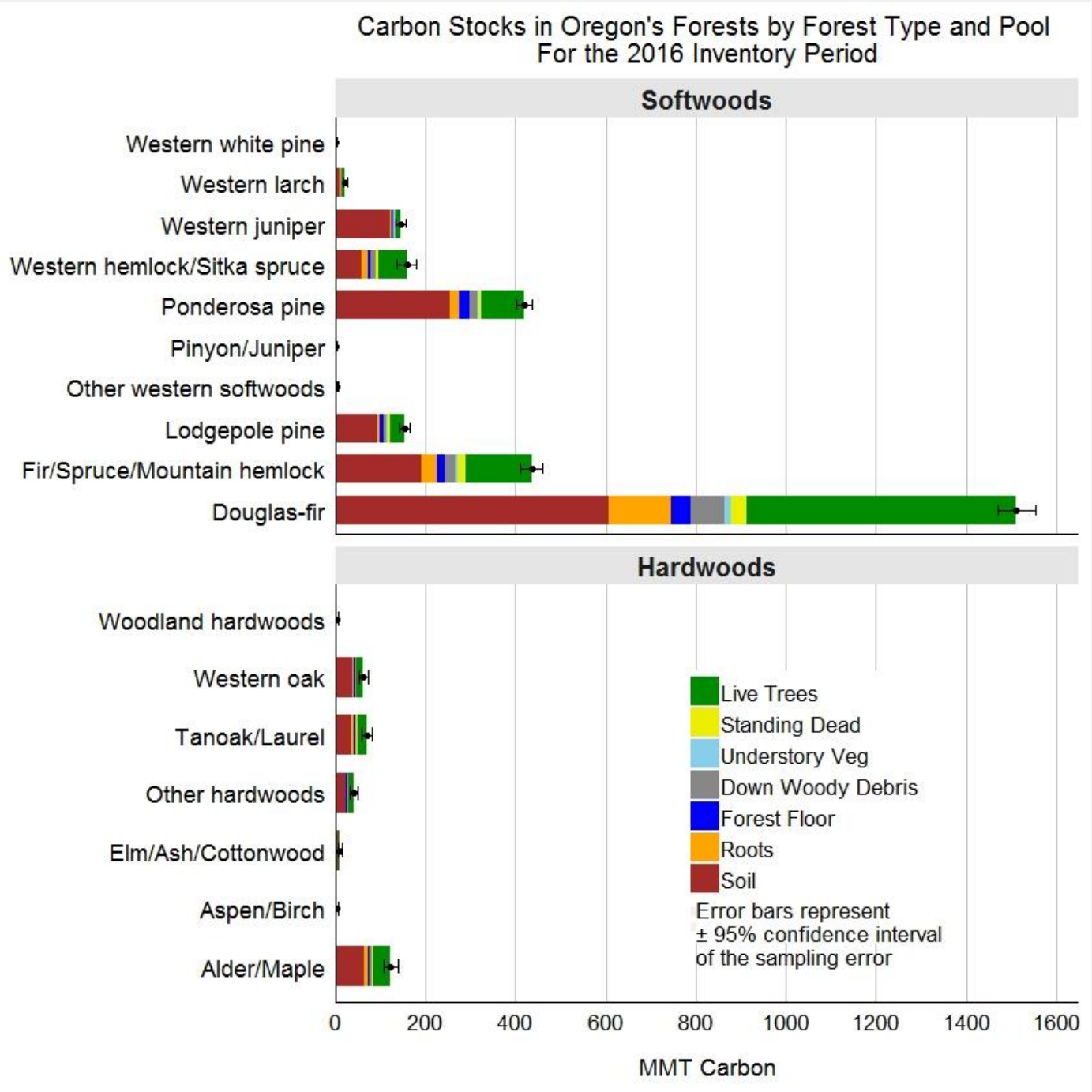
Oregon Statewide Forest Carbon Stocks by Forest Pools, 2007-2016		
Forest Carbon Pools	Total Carbon	SE
	million metric tons	
Live Trees	1,039.0	9.6
Standing Dead	79.0	1.6
Understory Veg	34.0	2.1
Down Woody Debris	156.8	1.9
Forest Floor	117.19	0.55
Roots	238.0	2.2
Soil Organic C	1,575.27	7.55
All Pools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


Carbon Stocks in Oregon's Forests by Ecoregion and Pool
For the 2016 Inventory Period
MMT Carbon
1000
800
600
400
200
0
Blue Mtns
Coast
East Cascades
East Oregon
Klamath
West Cascades
Willamette Valley
Live Trees
Standing Dead
Understory Veg
Down Woody Debris
Forest Floor
Roots
Soil
Error bars represent
± 95% confidence interval
of the sampling error


Carbon Stocks in Oregon's Forests by Owner and pool
For the 2016 Inventory Period
MMT Carbon
1,750
1,500
1,250
1,000
750
500
250
0
Corporate
Non Corporate
Other Fed
State Local
USFS
Live Trees
Standing Dead
Understory Veg
Down Woody Debris
Forest Floor
Roots
Soil
Error bars represent
± 95% confidence interval
of the sampling error


Density of Forest Carbon by Pool and Ownership
For the 2016 Inventory Period
Metric Tons Carbon Per acre
125
100
75
50
25
0
Corporate
Non Corporate
Other Federal
State Local
USFS
Live Trees
Standing Dead
Understory
Down Woody Debris
Forest Floor
Roots
Soils


Percent of Land Base and Carbon By Ownership
Percent
0
10
20
30
40
50
Corporate
Non Corporate
Other Fed
State Local
USFS
Percent of Land Base
Percent of Carbon


Carbon Stocks in Oregon's Forests by Forest Type and Pool
For the 2016 Inventory Period
Softwoods
Western white pine
Western larch
Western juniper
Western hemlock/Sitka spruce
Ponderosa pine
Pinyon/Juniper
Other western softwoods
Lodgepole pine
Fir/Spruce/Mountain hemlock
Douglas-fir
Hardwoods
Woodland hardwoods
Western oak
Tanoak/Laurel
Other hardwoods
Elm/Ash/Cottonwood
Aspen/Birch
Alder/Maple
Live Trees
Standing Dead
Understory Veg
Down Woody Debris
Forest Floor
Roots
Soil
Error bars represent
± 95% confidence interval
of the sampling error
0
200
400
600
800
1000
1200
1400
1600
MMT Carbon

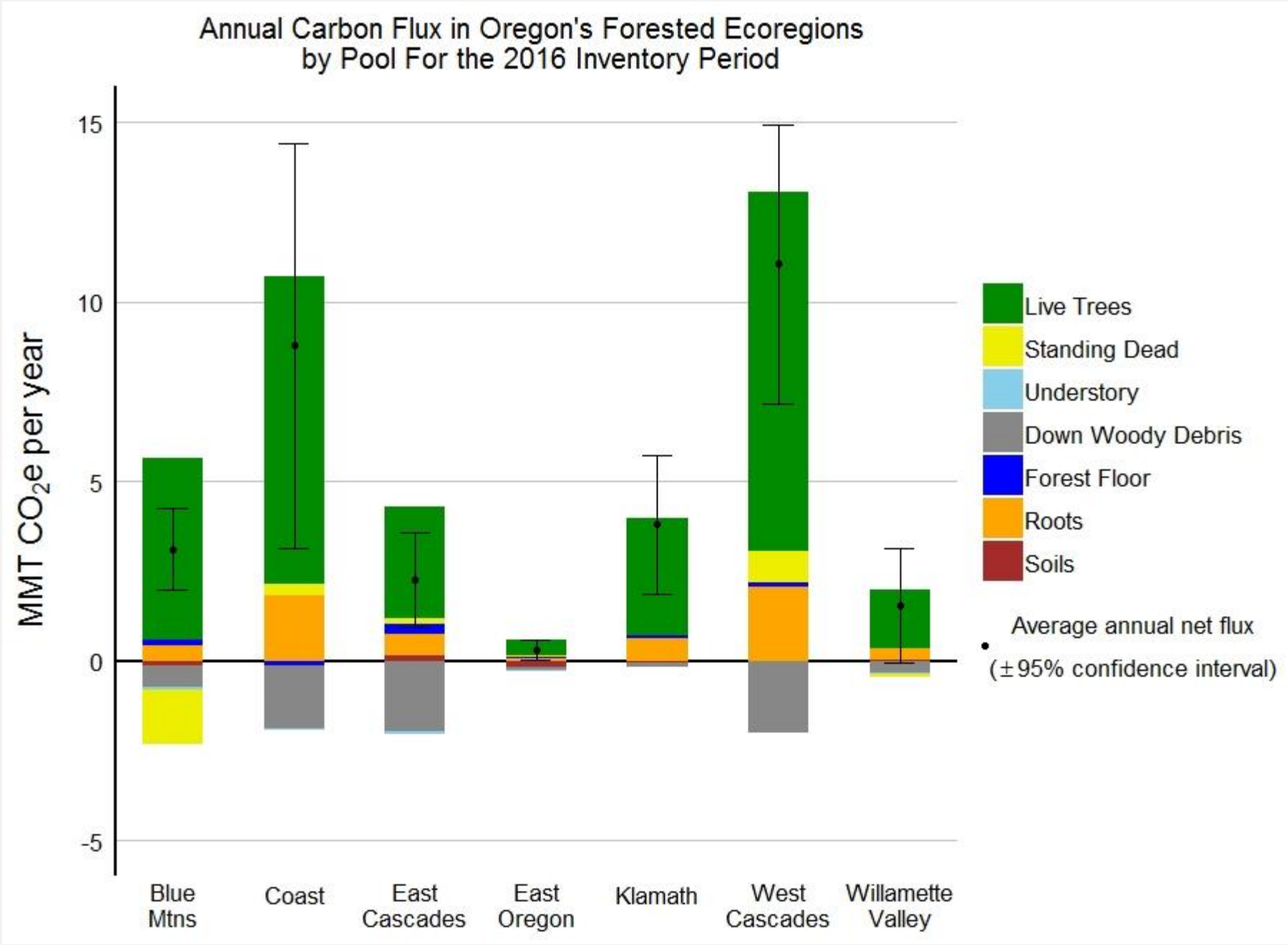
Forest Carbon Flux

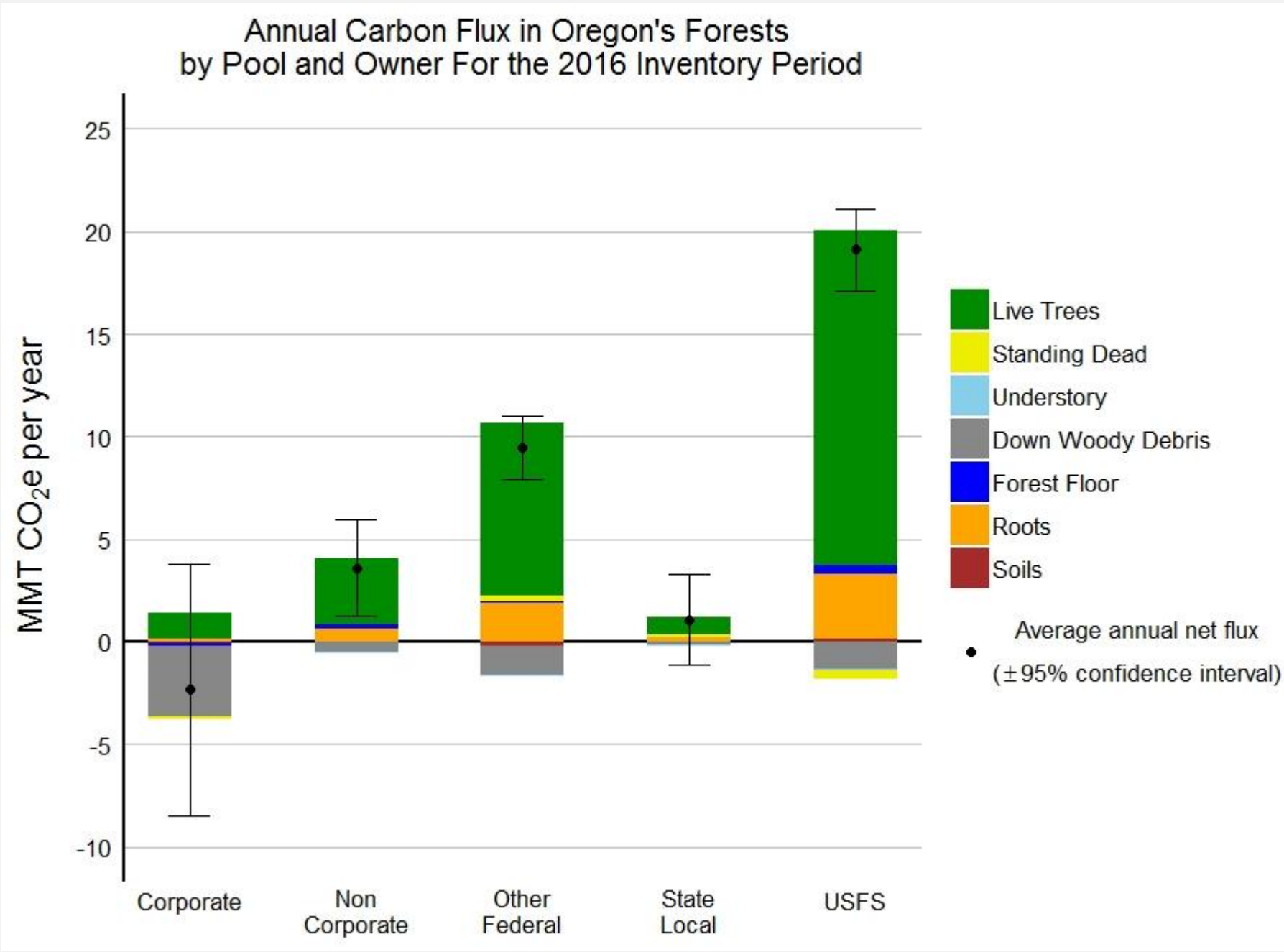
- Every pool of forest carbon has a rate of carbon input and rate of carbon output.
- Flux represents the amount of carbon going into a pool minus the amount going out
- Flux is reported in units of CO_2 equivalents
- Current estimates of forest carbon flux were based on one repeat measurement on 60% of all plots in Oregon.
- 100% of all forest inventory plots will be remeasured by 2020
- Annual forest carbon flux is estimated from actual measurements of growth, removals, and mortality

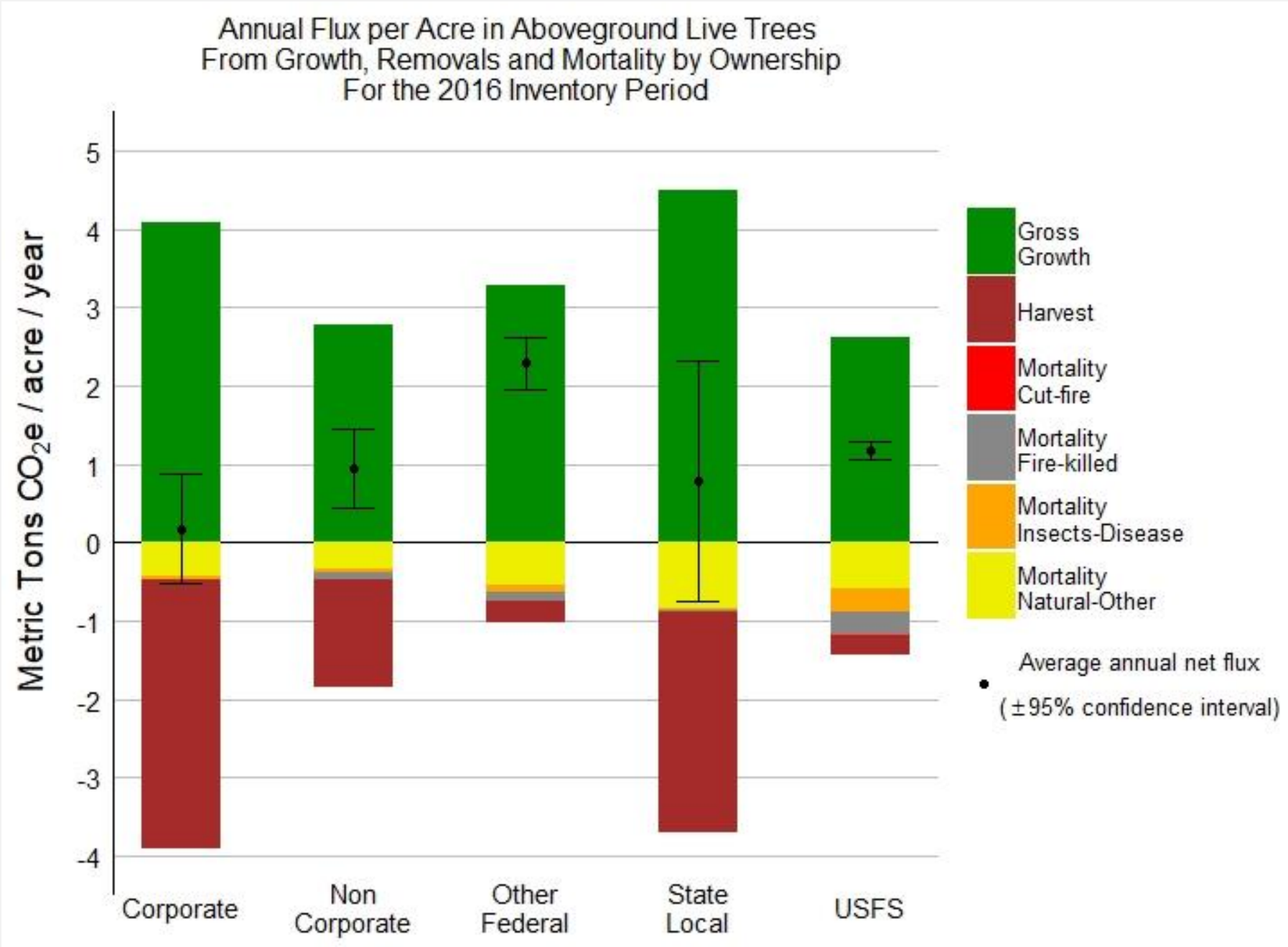
Forest Carbon Flux

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

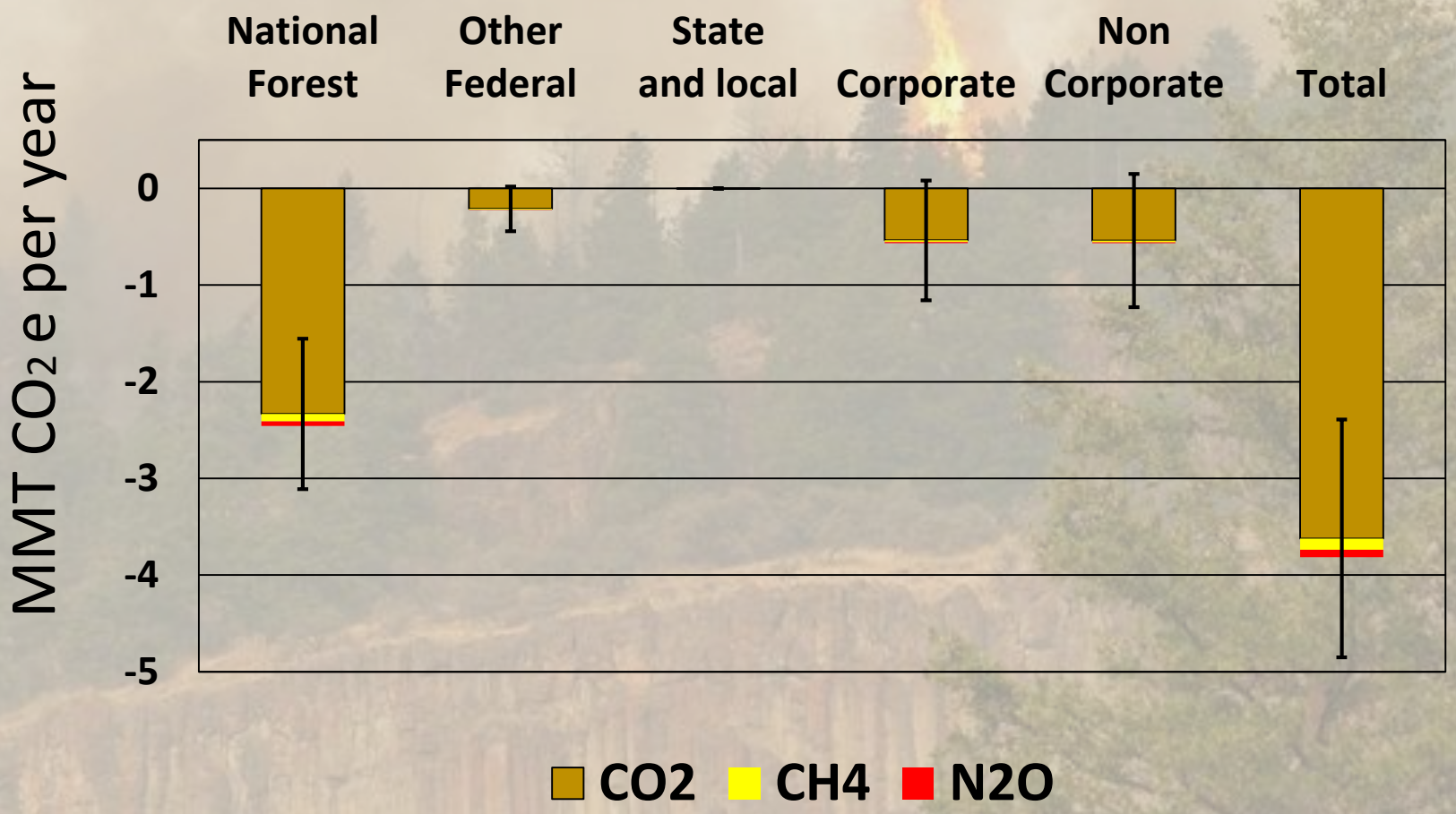
Forest Carbon Pools	Net flux	
	Total	SE
	Million Metric Tons CO2 equivalent/yr	
Live Trees	31.73	2.90
Standing Dead	-.018	0.68
Understory Veg	-0.21	0.04
Down Woody Debris	-6.82	0.82
Forest Floor	0.56	0.13
Roots	5.98	0.69
Soil	-0.17	0.29
Net flux All Pools	30.91	3.77


Annual Carbon Flux in Oregon's Forested Ecoregions
by Pool For the 2016 Inventory Period
MMT CO_2e per year
15
10
5
0
-5
Blue Mtns
Coast
East Cascades
East Oregon
Klamath
West Cascades
Willamette Valley
Live Trees
Standing Dead
Understory
Down Woody Debris
Forest Floor
Roots
Soils
Average annual net flux
(±95% confidence interval)


Annual Carbon Flux in Oregon's Forests
by Pool and Owner For the 2016 Inventory Period
MMT CO_2e per year
25
20
15
10
5
0
-5
-10
Corporate
Non Corporate
Other Federal
State Local
USFS
Live Trees
Standing Dead
Understory
Down Woody Debris
Forest Floor
Roots
Soils
Average annual net flux
(±95% confidence interval)


Annual Flux per Acre in Aboveground Live Trees
From Growth, Removals and Mortality by Ownership
For the 2016 Inventory Period
Metric Tons CO_2e / acre / year
5
4
3
2
1
0
-1
-2
-3
-4
Corporate
Non Corporate
Other Federal
State Local
USFS
Gross Growth
Harvest
Mortality Cut-fire
Mortality Fire-killed
Mortality Insects-Disease
Mortality Natural-Other
Average annual net flux
(±95% confidence interval)

Annual Net Emissions of GHG From Fire: All Oregon. 2001-2006 to 2011-2016



Next Steps

- Complete the Forest Ecosystems Carbon Report
- Harvested Wood Products Report later this year
- Research methods for simulating mitigation benefits of forest management alternatives.
- Continued cooperation with California and Washington on forest carbon accounting as well as monitoring the effects of climate change on forest ecosystems

Summary

- Carbon storage in Oregon's forests is about 3.2 billion metric tons
- Each year, Oregon's forests sequester about 30.9 million metric tons of CO_2 equivalents.
- Flux of carbon released from wildfire was smaller than the standard error of 3.8 on the total net flux of 30.9 million metric tons
- Carbon stored in harvested wood products will be analyzed in separate report.


Questions?