

PNW-Forest Inventory and Analysis (FIA)

# Program Overview



# Overview

- FIA 101: National program and FIA at the PNW Research Station
- FIA in Washington
- Forest carbon reporting at PNW FIA

# What is FIA?

- Congress authorized the program with the McSweeney-McNary Forest Research Act of 1928
- Initially started as a marketable timber inventory
  - Periodic data collection
  - State-by-State Basis
    - Intervals varied by state



# What is FIA Today?

- The Nation's Forest Inventory
- 1998 Farm Bill - Annualized inventory for all forest resources
  - Annual inventory to provide data on status and trends
  - Inventory all forest lands, on all ownerships
  - Consistent sampling protocol, compilation, database, reporting requirements
  - Confidentiality protects land owners and data integrity
- Connection to older FIA inventories?



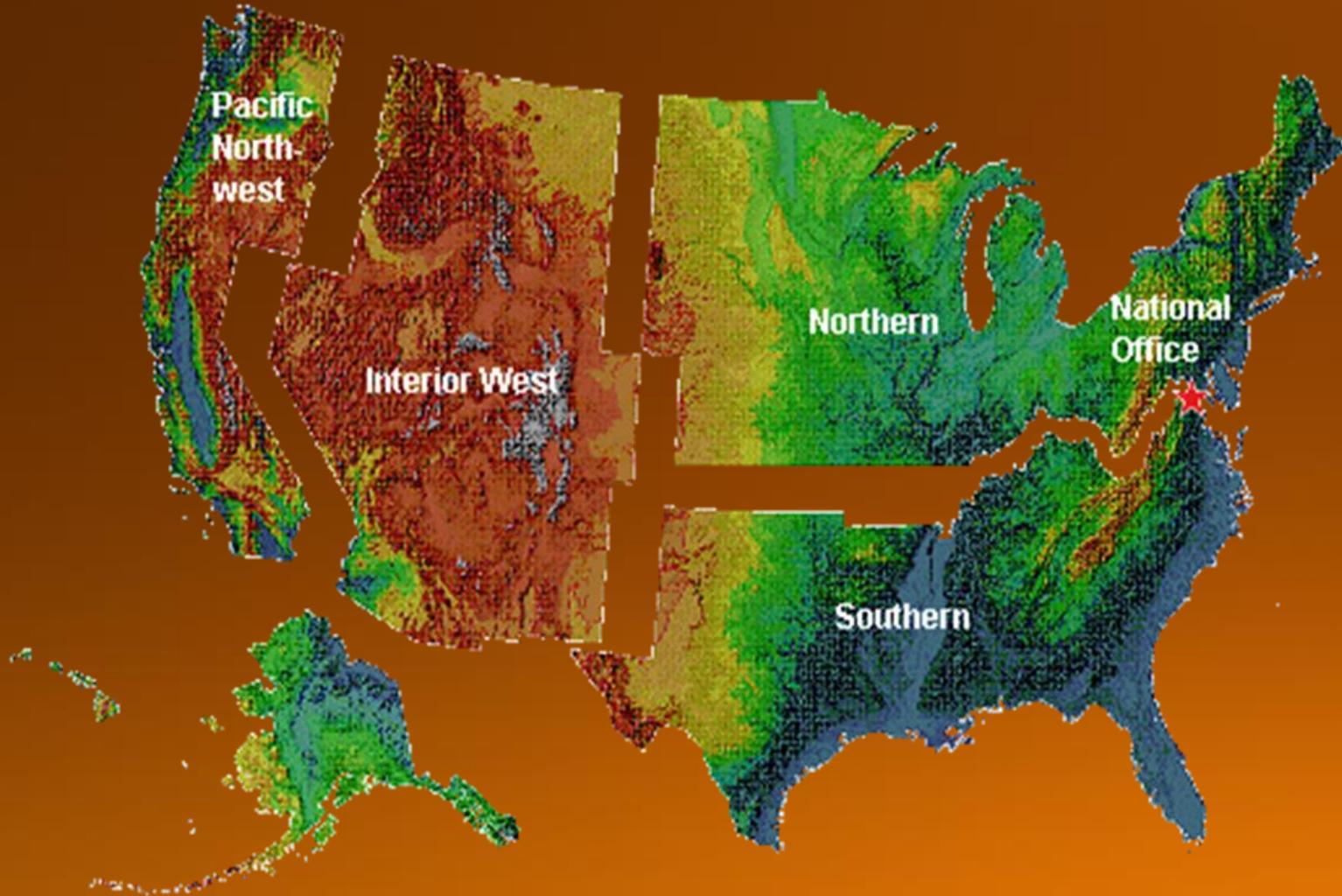
# What is FIA – Data Confidentiality

- Private ownership information is confidential
  - All plot estimates are provided as summary information in tables
  - Database only provides plot ownership group, ex. Private.
- Actual plot location is confidential
  - Exact plot location information is not made public
  - Database provides “fuzzed” plot locations
- Why – To protect landowners and integrity of sample data

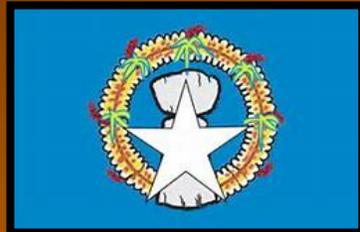
# What is FIA – Funding and Direction

- How is FIA funded?
  - Annual Congressional appropriations
  - Agreements with state cooperators, universities, government agencies
  - Partnerships with other branches of the Forest Service: National Forest Systems, State and Private, other R&D programs
- Who provides FIA direction and oversight?
  - 2014 Farm Bill set current national direction
  - Strategic plans implement direction – guided by national office, FIA regions, national stakeholders, and regional representatives

# FIA is a National Program of 4 Regions a.k.a. “work units”



# Pacific Northwest (PNW-FIA)



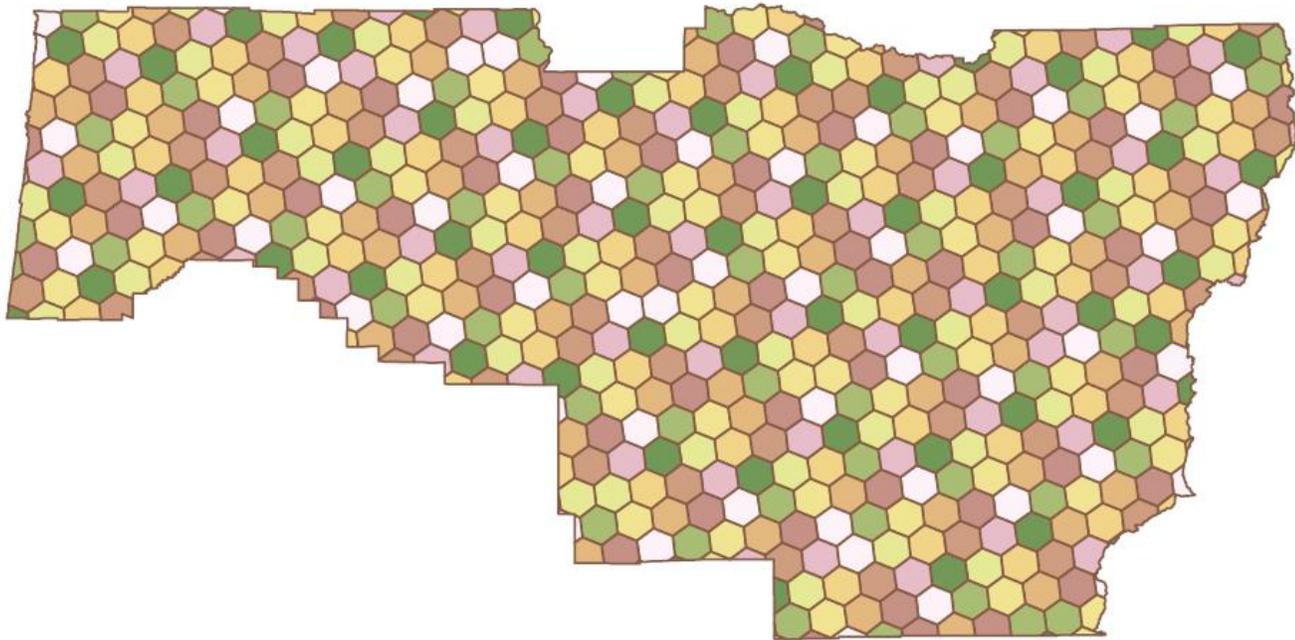
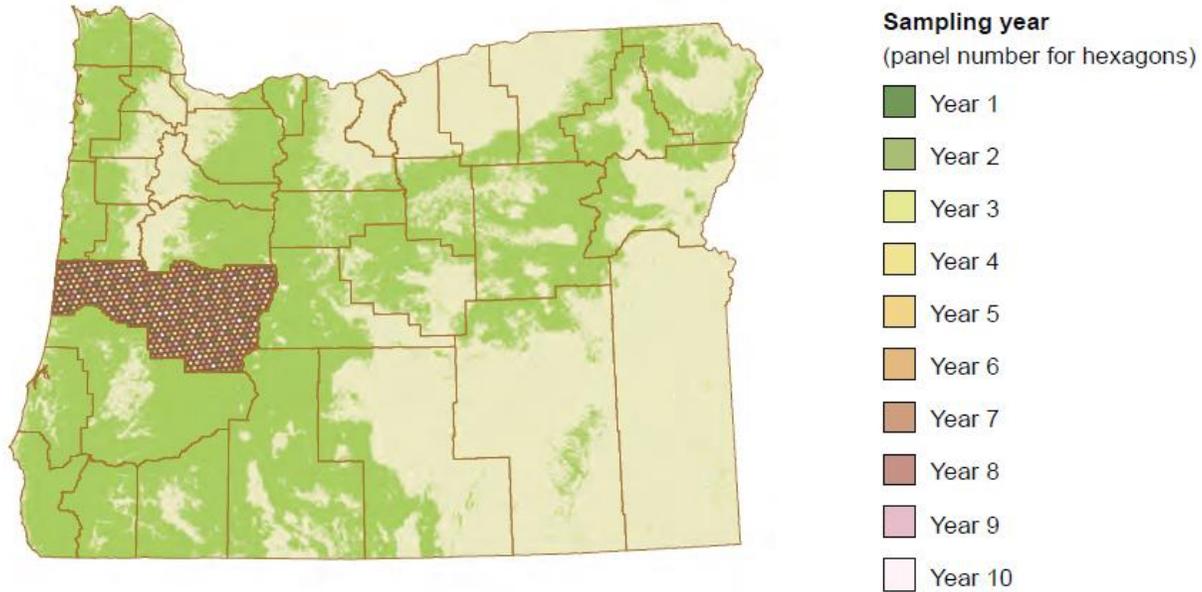
- Alaska
- Washington
- Oregon
- California
- Hawaii
- Guam
- American Samoa
- Palau
- Marshall Islands
- Federated States of Micronesia
- Northern Mariana Islands

# FIA Today – Sampling & Plot Design

- All forested lands
  - All states, territories, and U.S. affiliated islands
  - All ownerships – public, private, National Forests, National Parks, wilderness areas, military installations, etc.
- Sampling intensity
  - 10% of all plots measured every year in the western states, 10 year remeasurement cycle
  - Field measured plots permanently located on a base grid of 1 plot per 6,000 acres
  - Some states “buy down” the cycle length and sampling grid intensity through matched contributions

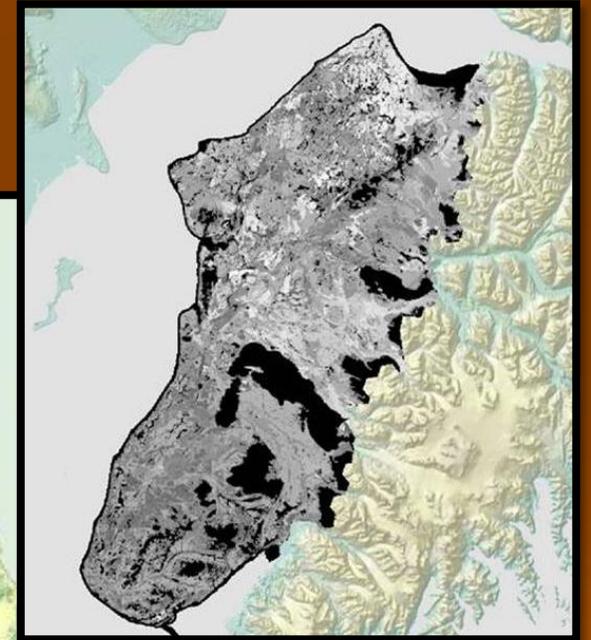
# FIA Sampling Strategy Today

**10-Year Cycle: 1/10<sup>th</sup>**  
of FIA field plots are  
sampled per year in  
western U.S.

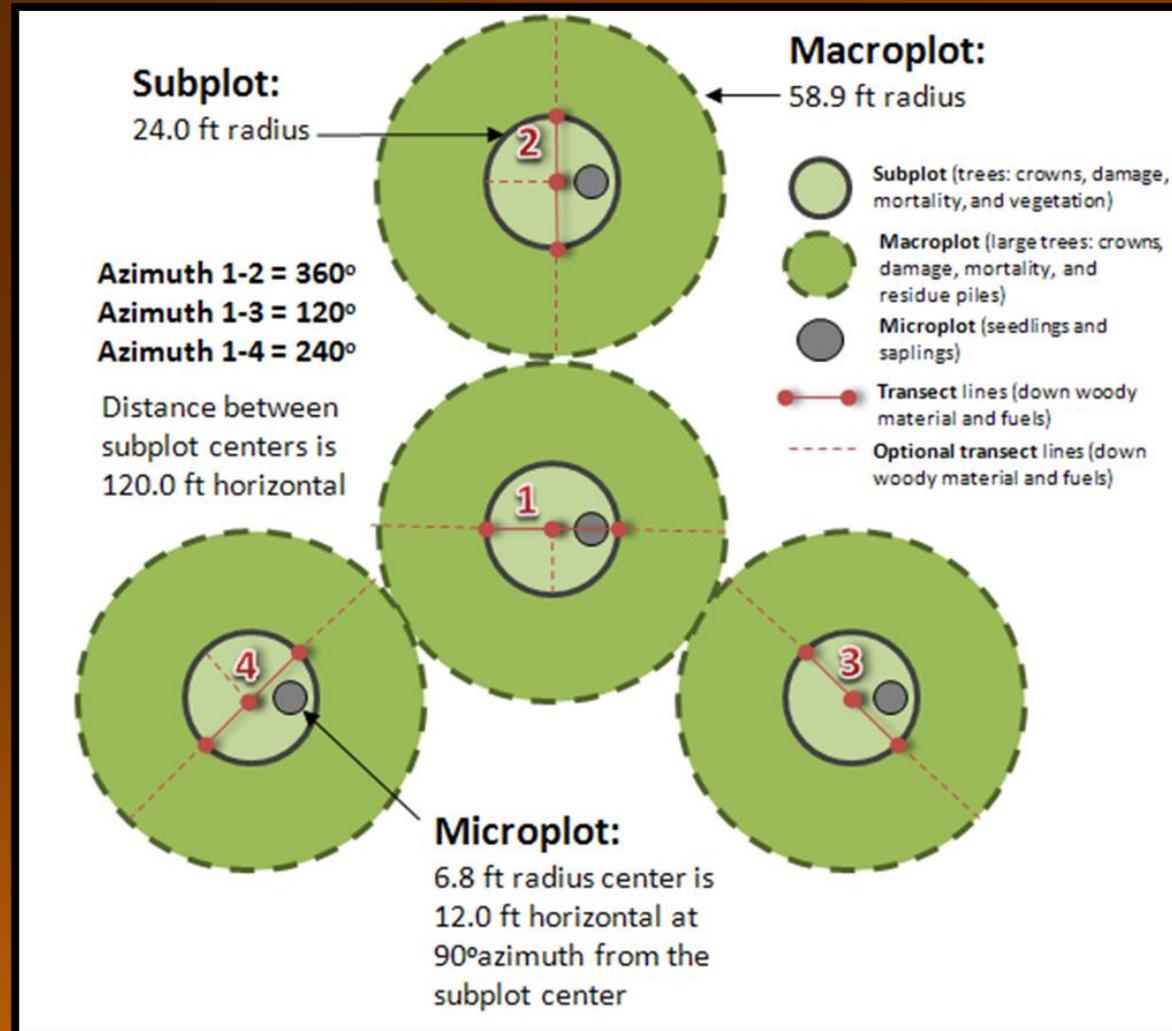


# Phase 1: Remote Sensing

- Forest/ Non-Forest
- Stratification to reduce SE
- Navigation



# Phase 2: Field Plot Design



# Field Plots and Condition Classes



## Field Plot Measurements

Plot level data: Location, elevation, topography, cover

Condition data: *Owner, forest type, size class, stand age, land use, disturbance, silvicultural treatments, physiographic class*

Tree data: Location, species, diameter, height, ~age, crown, damage



# What is all this data used for?

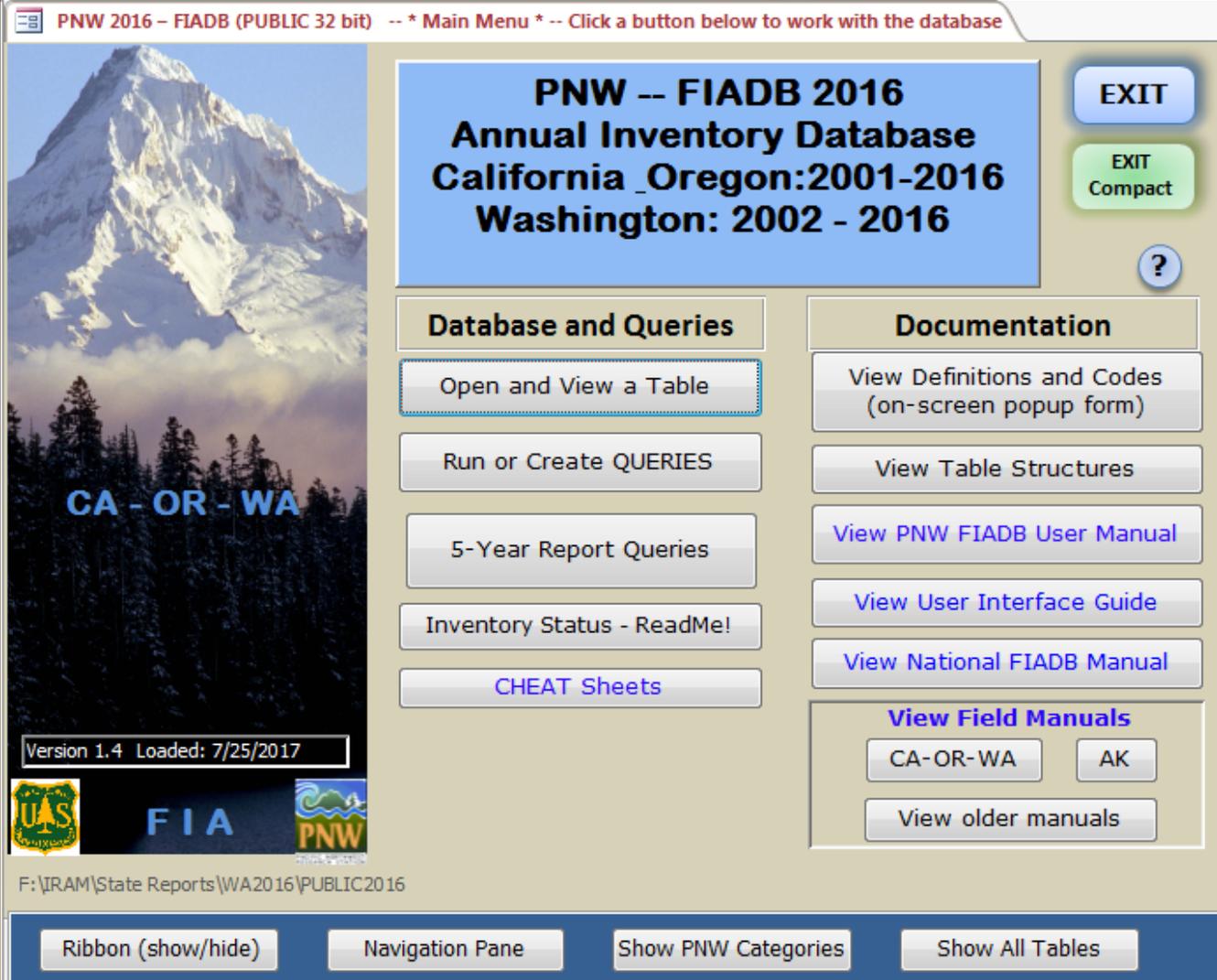
It's summarized, analyzed, published and shared...

By resource managers, scientists, state agencies, private land owners, investors and legislators



# How else is the data used?

PNW 2016 -- FIADB (PUBLIC 32 bit) -- \* Main Menu \* -- Click a button below to work with the database



**PNW -- FIADB 2016**  
**Annual Inventory Database**  
**California\_Oregon:2001-2016**  
**Washington: 2002 - 2016**

EXIT  
EXIT Compact  
?

**Database and Queries**

- Open and View a Table
- Run or Create QUERIES
- 5-Year Report Queries
- Inventory Status - ReadMe!
- CHEAT Sheets

**Documentation**

- View Definitions and Codes (on-screen popup form)
- View Table Structures
- View PNW FIADB User Manual
- View User Interface Guide
- View National FIADB Manual
- View Field Manuals**
  - CA-OR-WA
  - AK
  - View older manuals

CA - OR - WA

Version 1.4 Loaded: 7/25/2017

UAS FIA PNW

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Ribbon (show/hide) Navigation Pane Show PNW Categories Show All Tables

# FIA in Washington

Annual plot design installed:

- 2002-2011

Remeasurement:

- 2012-2021

Recent report:

- PNW-GTR-976, 2019: Reporting years 2007-2016
- Includes 5 year remeasurement results: 2012-2016

## Citation

Palmer, Marin; Kuegler, Olaf; Christensen, Glenn, tech. eds. 2019. Washington's forest resources, 2007–2016: 10-year Forest Inventory and Analysis report. Gen. Tech. Rep. PNW-GTR-976. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 79 p.



## Washington's Forest Resources, 2007–2016: 10-Year Forest Inventory and Analysis Report



Forest  
Service

Pacific Northwest  
Research Station

General Technical Report  
PNW-GTR-976

May  
2019

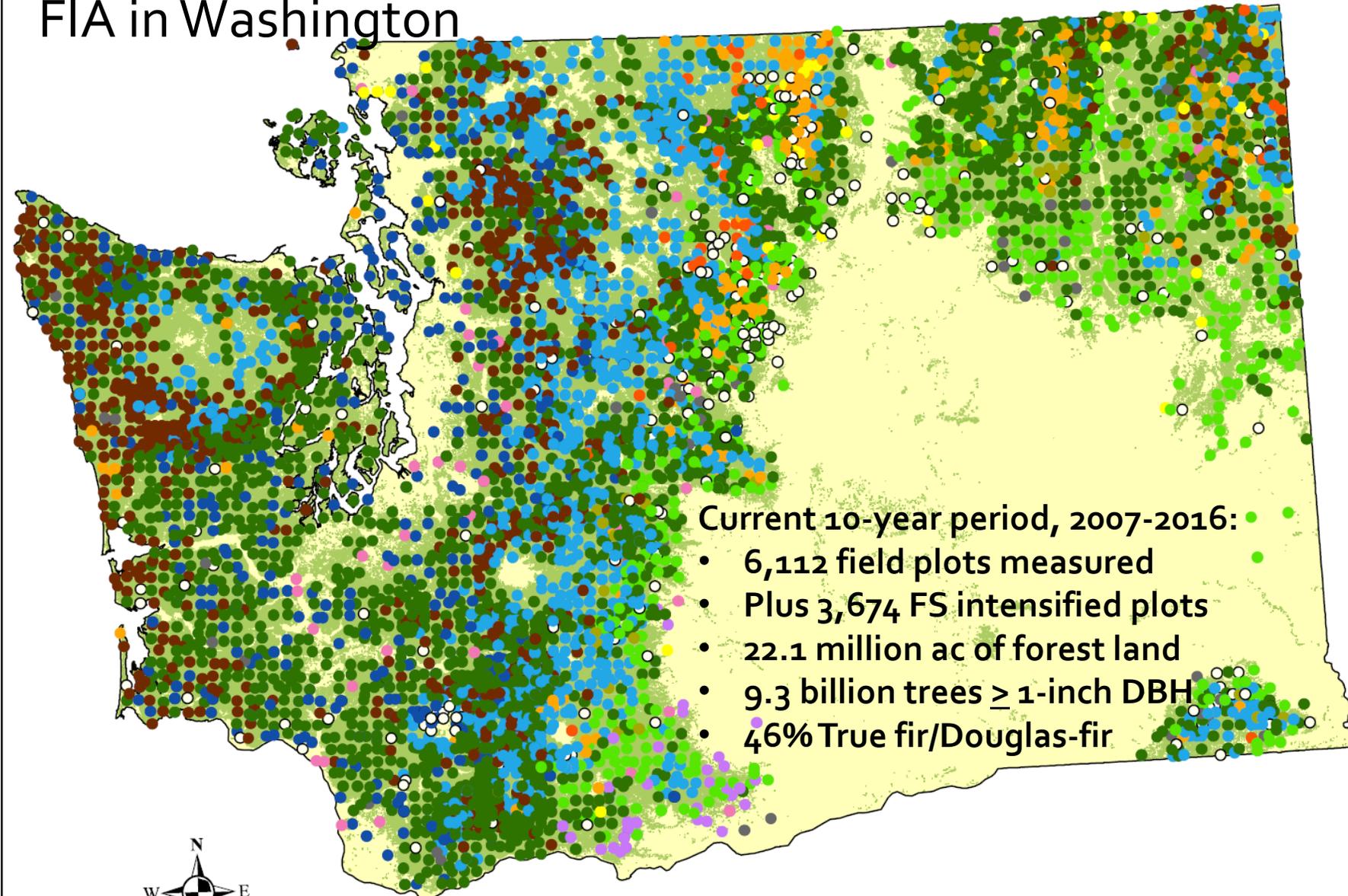
# FIA Terms Defined

- Forest land vs. Timberland
  - Forest land = Land within the population of interest with at least 10% canopy cover of live tally trees of any size (or has had at least 10% canopy cover of live tally species in the past), based on the presence of stumps, snags, or other evidence. To qualify, the area must be at least 1.0 acre in size and 120.0 feet wide.
  - Timberland = Subset of forest land. Unreserved forest land capable of producing 20 cubic feet per acre or more per year of wood at culmination of mean annual increment (MAI).
- Reserved vs. Unreserved Forests
  - Reserved = Forest permanently prohibited from being managed for the production of wood products through statute or agency mandate; the prohibition cannot be changed through decision of the land manager.
    - Productive forest land = Reserved forest land that otherwise would be classified as timberland.
  - Other forest = Forest land not capable of producing  $\geq 20$  cu. ft./ac/yr of wood at culmination of mean annual increment (MAI), low site forest.

# FIA Terms Defined

- Forest type vs. tree species
  - Forest type = A classification of forest land based on and named for the tree species that forms the plurality of live tree stocking (cover).
    - Can be a stand of trees occupied by a single tree species, or a stand of trees where other tree species form the minor component.
- Private corporate vs. non-corporate ownerships
  - Corporate = Private forest lands owned by a company, corporation, legal partnership, investment firm, bank, timberland investment management organization (TIMO), or real estate investment trust (REIT).
  - Private forest land = Private forest lands owned by nongovernmental conservation or natural resource organizations; unincorporated partnerships, associations, or clubs; individuals or families; or Native Americans.

# FIA in Washington



0 12.5 25 50 75 100 Miles

## Forest Type Group

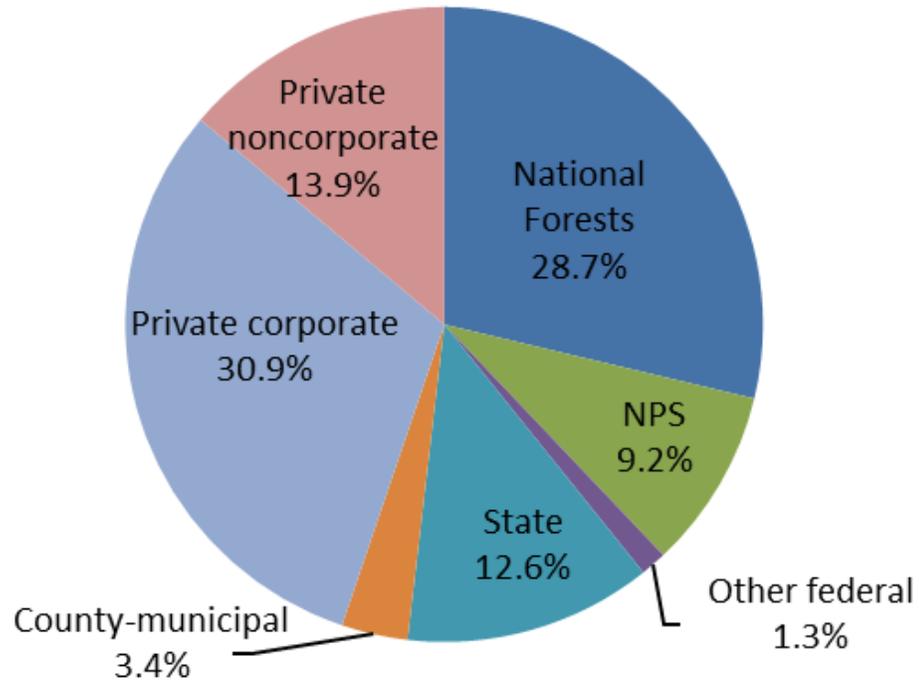
- |                           |                           |                      |                   |
|---------------------------|---------------------------|----------------------|-------------------|
| ● Douglas-fir             | ● Lodgepole pine          | ● Alder/maple        | ● Other hardwoods |
| ● Fir/spruce/mtn. hemlock | ● Western larch           | ● Elm/ash/cottonwood | ○ Nonstocked      |
| ● Hemlock/Sitka spruce    | ● Other western softwoods | ● Aspen/birch        | ■ Forest          |
|                           |                           | ● Western oak        | ■ Nonforest       |

Table 1--Area of forest land, by ownership and land status, Washington 2007-2016

	Land Status															
	Unreserved forests						Reserved forests						All forest land			
	Timberland		Other forest		Total		Productive		Other forest		Total					
Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE	Total	SE			
<b>All Washington Ownership</b>							<i>Thousand acres</i>									
<b>USDA Forest Service</b>	5,701.2	40.9	290.1	21.8	5,991.3	35.7	1,776.2	61.4	525.4	55.4	2,301.6	51.0	8,292.8	51.2		
<b>Other federal government:</b>																
Bureau of Land Management	46.6	15.2	8.7	7.5	55.3	16.7	--	--	--	--	--	--	55.3	16.7		
Departments of Defense or Energy	62.3	19.4	--	--	62.3	19.4	--	--	--	--	--	--	62.3	19.4		
National Park Service	--	--	--	--	--	--	1,068.6	41.3	117.4	25.4	1,186.0	39.3	1,186.0	39.3		
U.S. Fish and Wildlife Service	--	--	--	--	--	--	93.5	19.8	4.4	5.4	97.8	20.3	97.8	20.3		
Other federal	36.8	14.4	--	--	36.8	14.4	20.5	11.8	11.4	8.7	32.0	14.4	68.7	20.4		
<b>Total</b>	<b>145.7</b>	<b>28.5</b>	<b>8.7</b>	<b>7.5</b>	<b>154.4</b>	<b>29.4</b>	<b>1,182.5</b>	<b>41.2</b>	<b>133.2</b>	<b>27.0</b>	<b>1,315.7</b>	<b>38.0</b>	<b>1,470.1</b>	<b>43.9</b>		
<b>State and local government:</b>																
Local	376.4	46.3	13.3	7.9	389.6	46.9	67.7	20.1	--	--	67.7	20.1	457.4	50.8		
State	2,317.5	57.3	16.8	9.4	2,334.3	57.3	106.6	24.5	10.8	8.0	117.4	25.8	2,451.7	53.3		
Other public	12.5	8.8	--	--	12.5	8.8	--	--	--	--	--	--	12.5	8.8		
<b>Total</b>	<b>2,706.3</b>	<b>71.1</b>	<b>30.0</b>	<b>12.3</b>	<b>2,736.4</b>	<b>71.5</b>	<b>174.4</b>	<b>31.4</b>	<b>10.8</b>	<b>8.0</b>	<b>185.1</b>	<b>32.5</b>	<b>2,921.5</b>	<b>69.1</b>		
<b>Corporate private</b>	<b>4,693.3</b>	<b>121.8</b>	<b>66.9</b>	<b>19.2</b>	<b>4,760.2</b>	<b>122.6</b>	--	--	--	--	--	--	<b>4,760.2</b>	<b>122.6</b>		
<b>Noncorporate private:</b>																
Nongovernmental conservation or natural resource organizations	190.8	33.5	2.2	2.1	193.0	33.6	--	--	--	--	--	--	193.0	33.6		
Unincorporated partnerships, associations, or clubs	24.7	11.0	--	--	24.7	11.0	--	--	--	--	--	--	24.7	11.0		
Native American	1,848.7	95.6	40.7	14.8	1,889.4	96.6	--	--	--	--	--	--	1,889.4	96.6		
Individual	2,480.5	102.9	88.1	21.4	2,568.6	104.5	--	--	--	--	--	--	2,568.6	104.5		
<b>Total</b>	<b>4,544.7</b>	<b>124.2</b>	<b>131.0</b>	<b>26.0</b>	<b>4,675.7</b>	<b>125.3</b>	--	--	--	--	--	--	<b>4,675.7</b>	<b>125.3</b>		
<b>All private</b>	<b>9,238.0</b>	<b>112.8</b>	<b>197.9</b>	<b>32.2</b>	<b>9,435.9</b>	<b>111.7</b>	--	--	--	--	--	--	<b>9,435.9</b>	<b>111.7</b>		
<b>All owners</b>	<b>17,791.2</b>	<b>117.2</b>	<b>526.8</b>	<b>41.5</b>	<b>18,317.9</b>	<b>114.0</b>	<b>3,133.0</b>	<b>80.3</b>	<b>669.4</b>	<b>62.1</b>	<b>3,802.4</b>	<b>71.4</b>	<b>22,120.3</b>	<b>119.5</b>		

Note: Totals may be off because of rounding; data subject to sampling error; SE = standard error; -- = less than 50 acres was estimated.

## Western Washington



## Eastern Washington

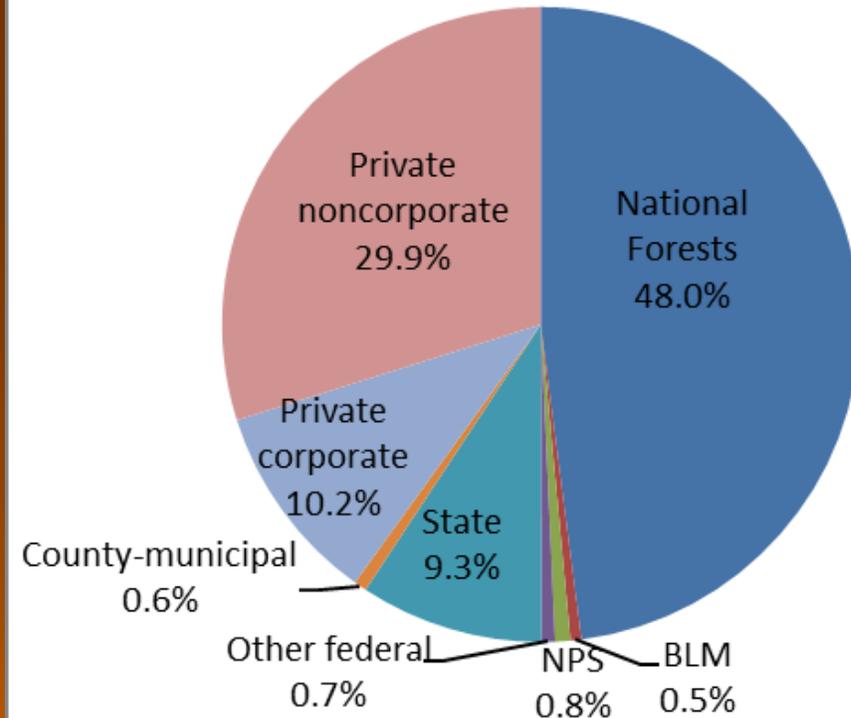


Figure 12: Percentage of forest land by owner group in western and eastern Washington, 2007-2016.

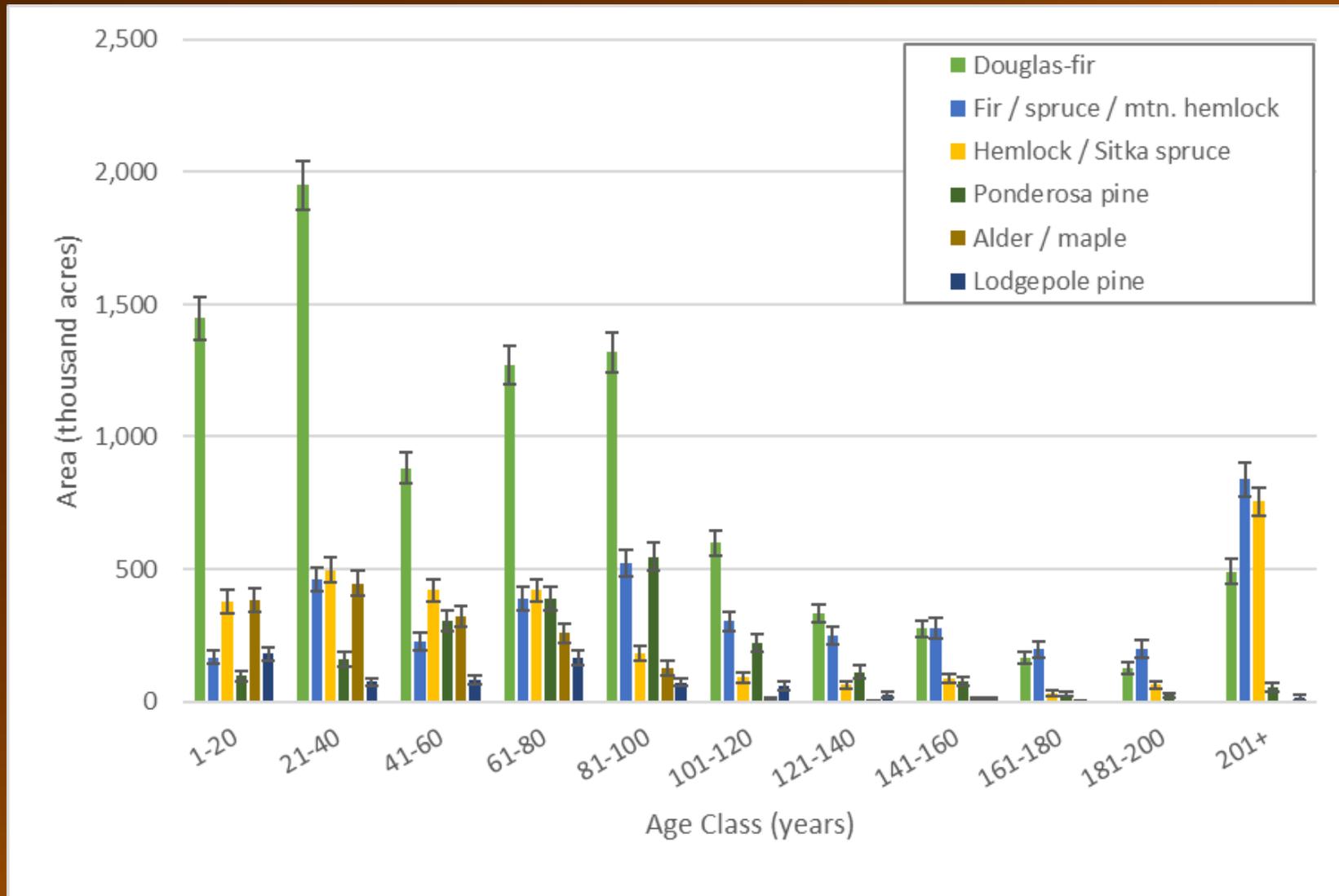


Figure 8: Stand age distributions of the six forest types with the greatest forest land area in Washington, 2007-2016.

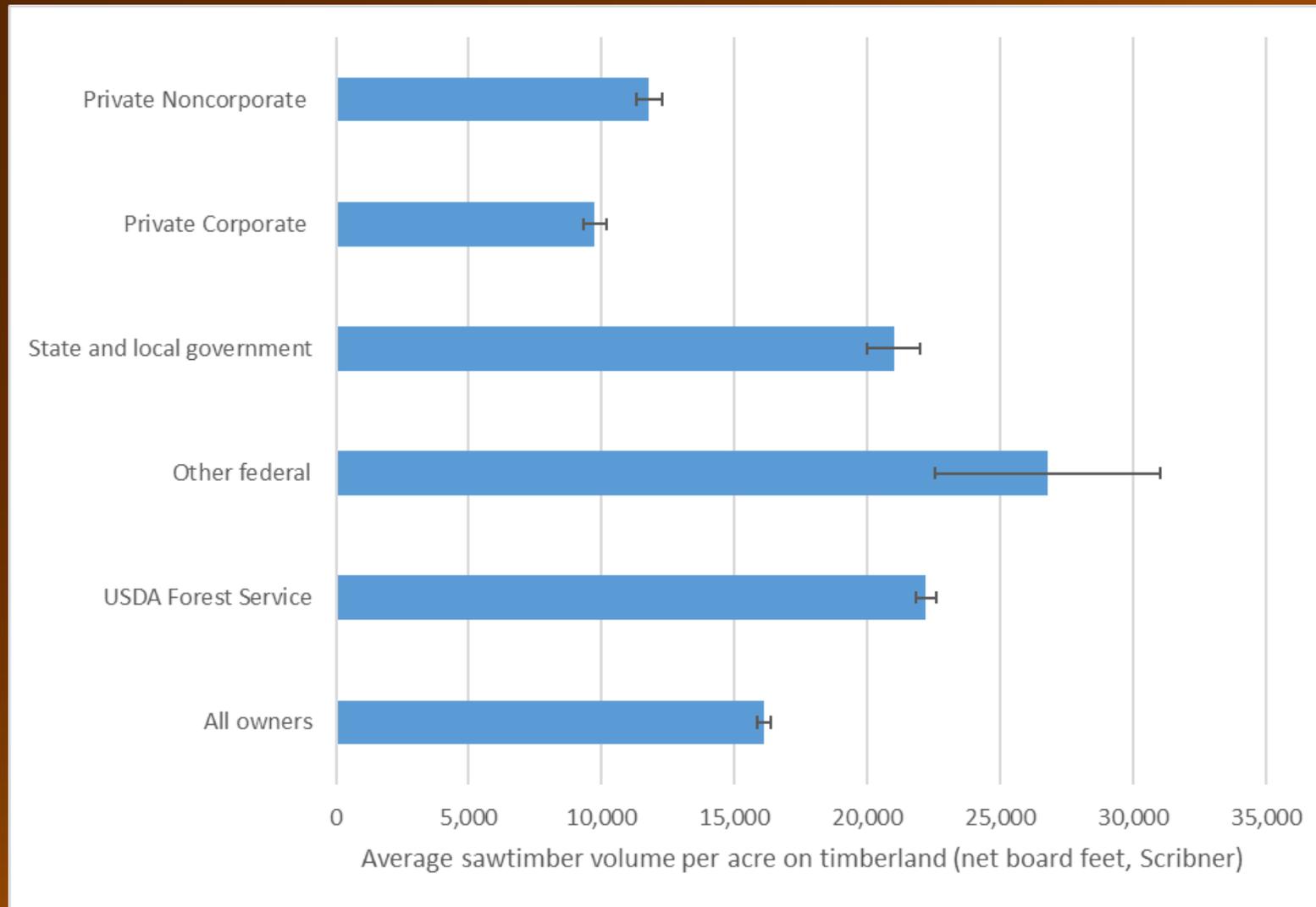


Figure 24: Average sawtimber tree volume per acre of timberland by ownership group (net board feet, Scribner), Washington 2007-2016.

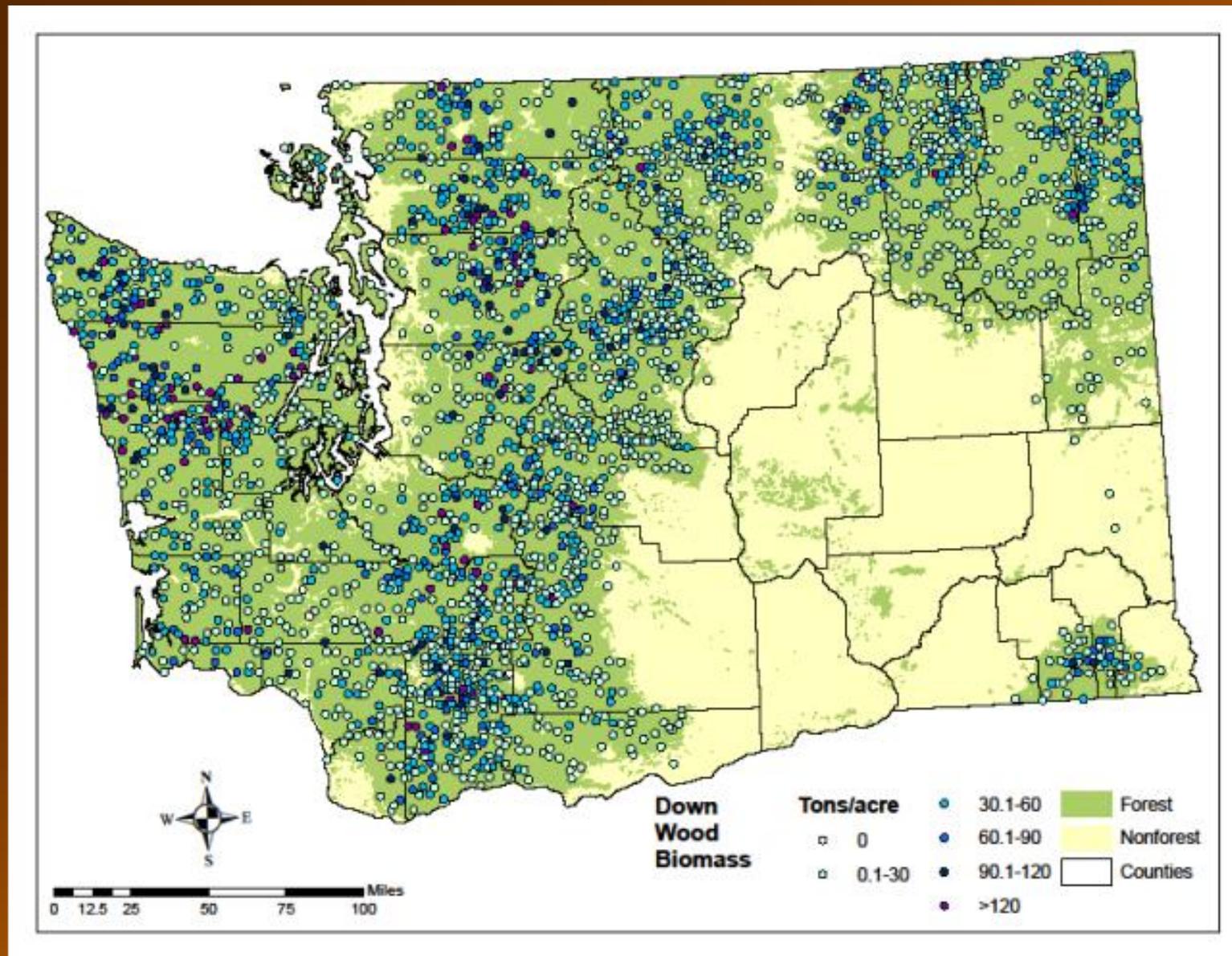


Figure 34: Plot distribution of total down wood biomass (tons per acre), Washington 2007-2016.

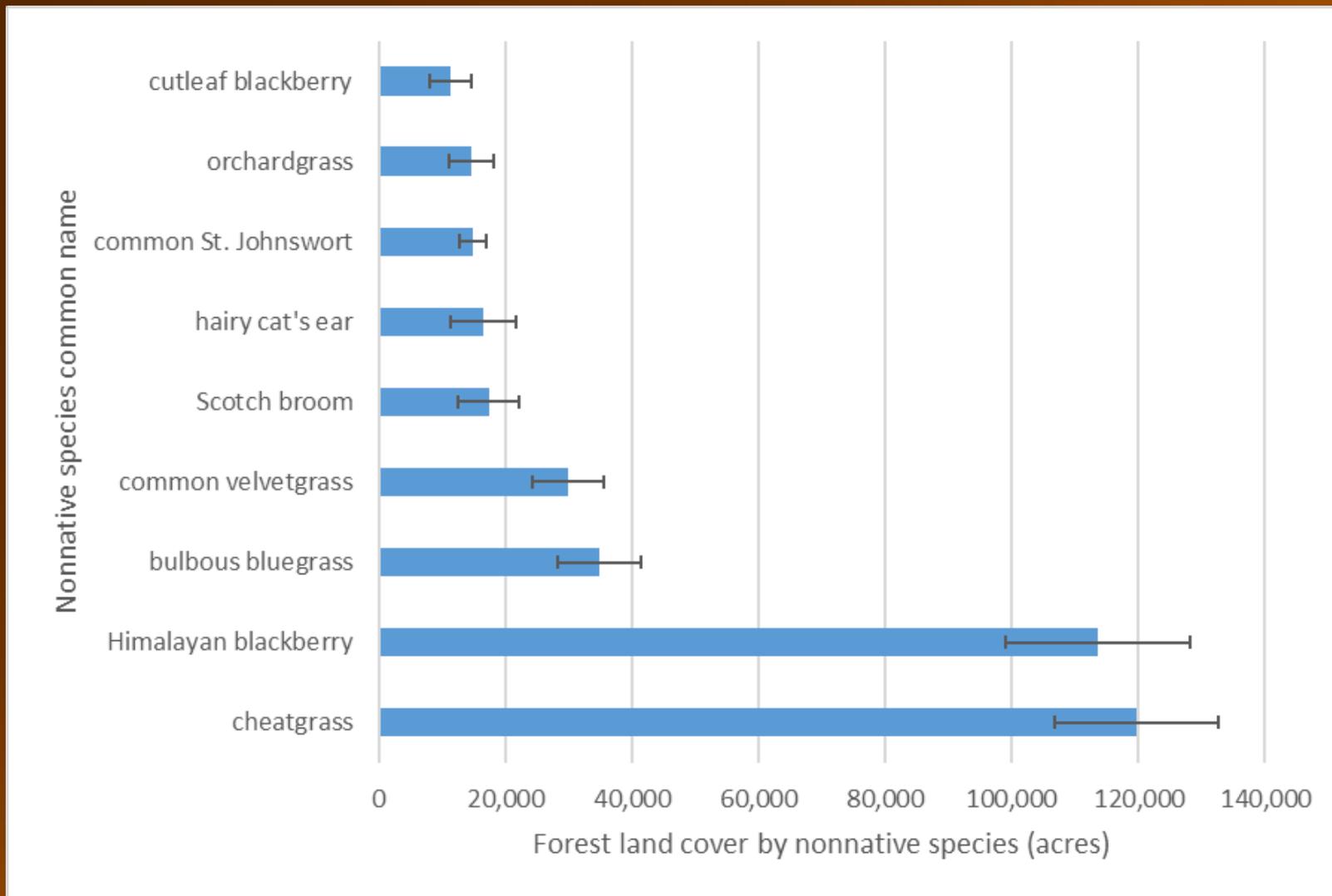


Figure 40: Nonnative invasive species with the highest acreage cover on forest land in Washington 2007-2016.

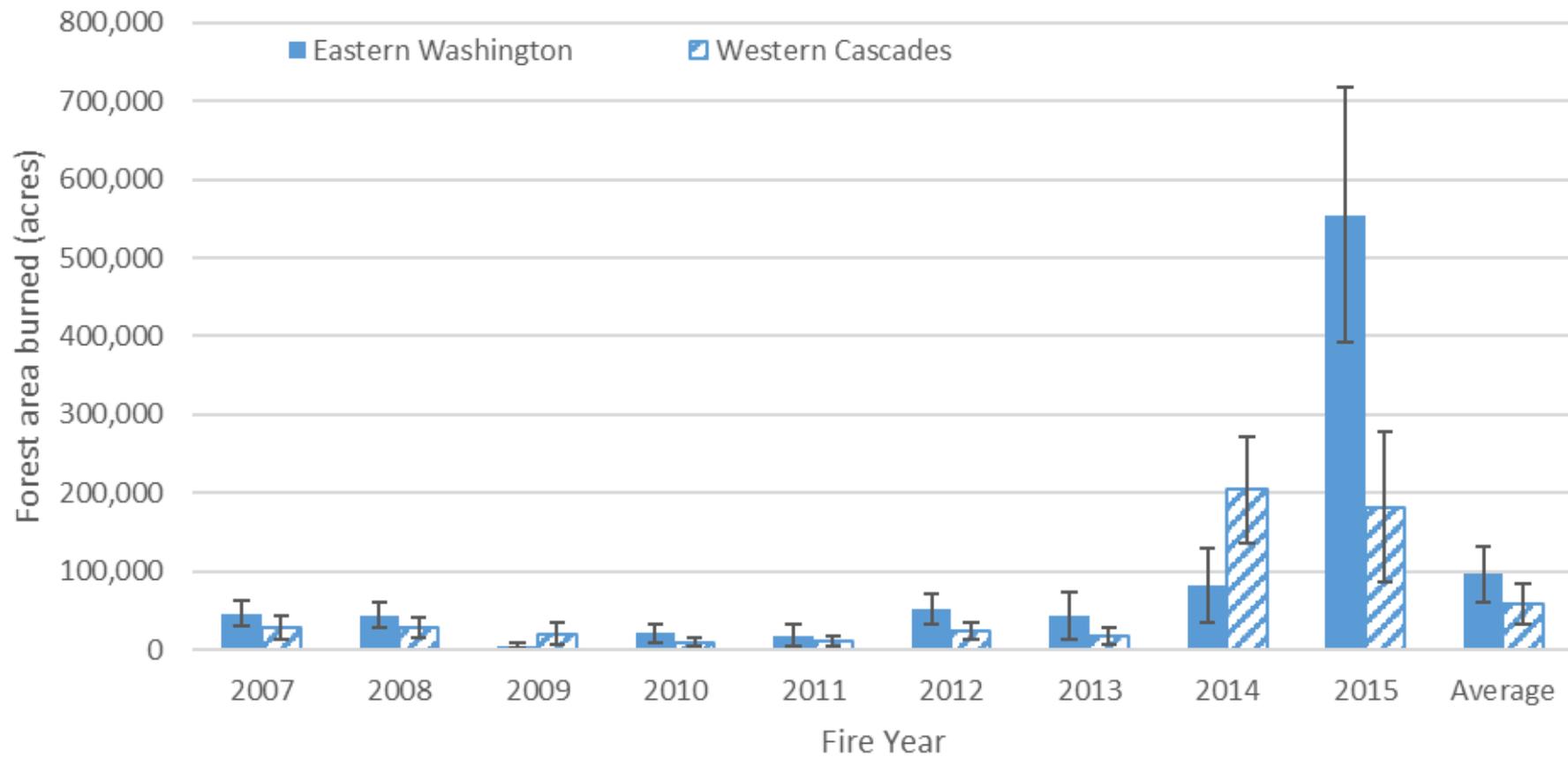


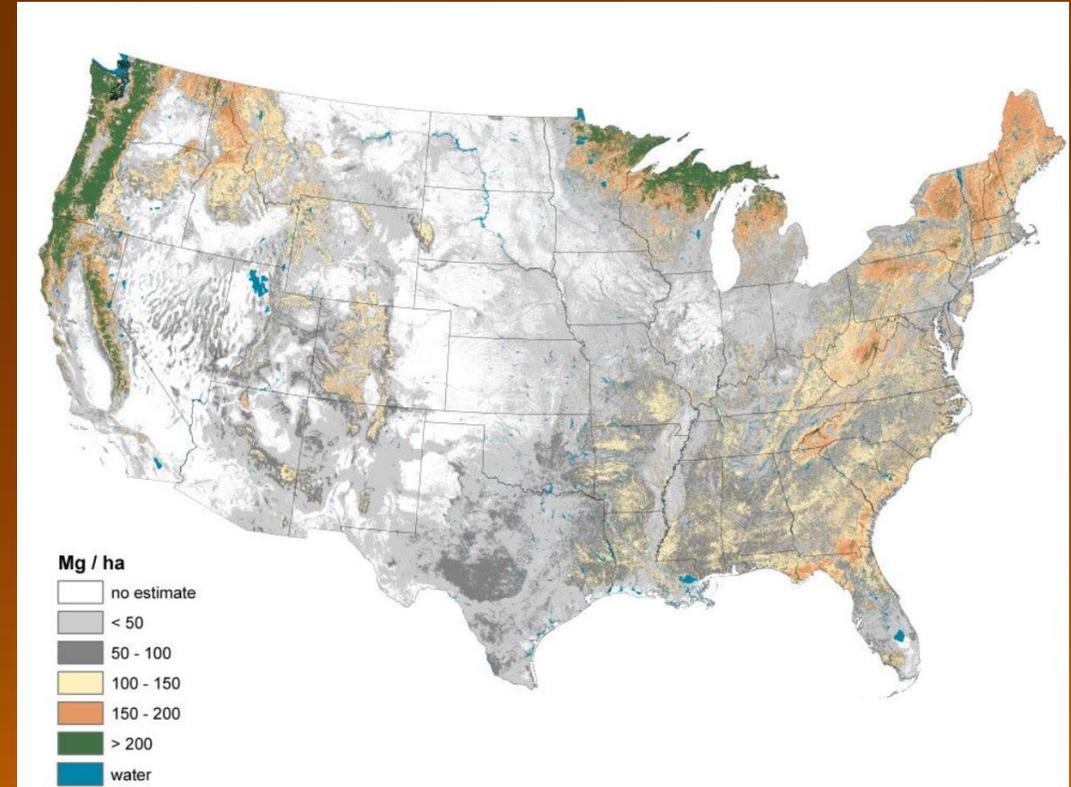
Figure 46: Area of forest land with evidence of fire, by region, Washington 2007-2015.

# Forest Carbon Reporting - Why FIA?

- In 2008 PNW-FIA completed initial forest baseline carbon estimates for California Air Resources Board in support of California Cap & Trade forest protocol
- Desire for nationally consistent field protocol, database, and compilation based on statistically valid sampling design
- Desire for carbon stock and flux estimates based on field collected data (FIA) and accounting for harvested wood products
- Ability to provide carbon estimates by ownership on all forest land at statewide scale

# FIA National Program: Forest Carbon Assessments

- US EPA Greenhouse Gas Inventory
- National Climate Assessment
- National Forests Carbon Assessments
- FAO Global Forest Resources Assessment
- UN Land use, Land change and Forestry Assessment



Total forest ecosystem carbon density imputed from forest inventory plots, conterminous U.S., 2000-2009

# Forest Carbon Reporting at PNW

- California –
  - 2014: Agreement with Cal Fire funding first carbon report
  - 2016: First report to meeting California Assembly Bill 1504 needs based on 2006-2015 inventory years
  - 2018: Second AB 1504 report based on 2008-2017 inventory years
    - Added carbon in harvested wood products (HWP)
- Oregon –
  - 2018: Oregon Department of Forestry funds agreement to complete forest carbon and harvested wood products report similar to California reports. Report completed 2019.
- Washington –
  - 2018: Washington Department of Natural Resources funds agreement for forest carbon report similar to Oregon and California reports. Draft report completed late 2019.

# Useful Websites

- National FIA Website: <https://www.fia.fs.fed.us/>
- PNW FIA Website: <https://cms.fs.usda.gov/pnw/tools/pnw-fiadb-forest-inventory-and-analysis-database>
- Treesearch: <https://www.fs.usda.gov/treesearch/>
  - PNW-GTR-976 (May 2019)