



# Oregon Small Woodlands Association 2019 Annual Meeting

## Oregon Forest Carbon

Peter Daugherty, Oregon State Forester

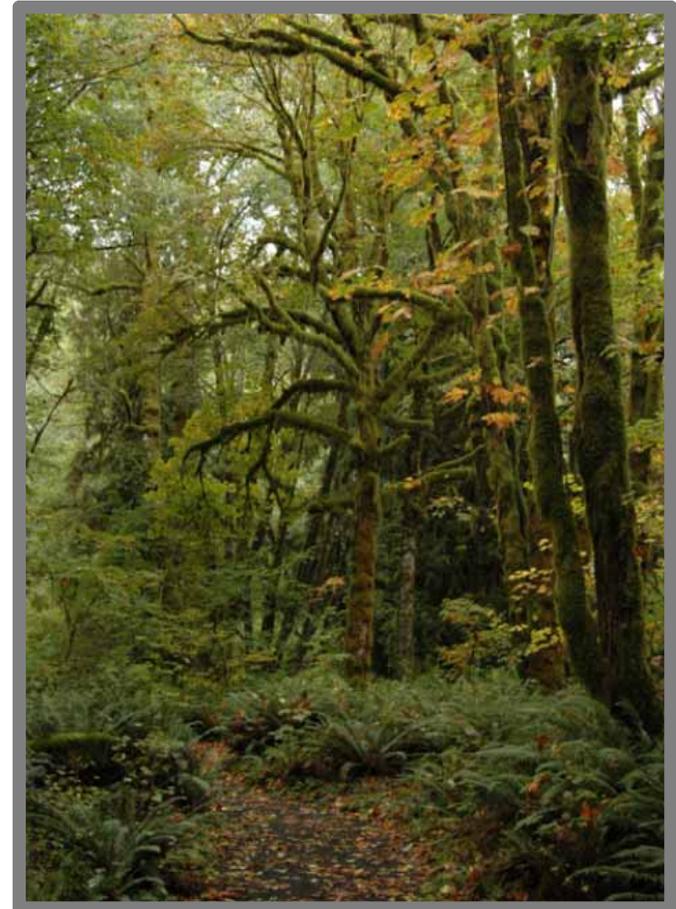
Glenn Christensen, Forester and Forest Inventory Analyst, USFS

Andrew Yost, Forest Ecologist, Oregon Department of Forestry

# Presentation Overview



- Overview of Forests Carbon
- Forest Carbon Studies
  - Storage and flux of carbon in Oregon's forest ecosystems
  - Flow of carbon through harvested wood products pool
- Next Steps
  - Climate change mitigation potential of Oregon's forest sector



# Climate Change and Forest Carbon Policy



- Oregon Department of Forestry has been involved in Oregon's planning process related to climate change since 1990.
- 2003 the Board of Forestry releases new Forestry Program for Oregon with Strategy G: Enhance carbon storage in Oregon's forests and forest products
- 2010 Climate Change Adaptation Framework

# Climate Change Research Accomplishments



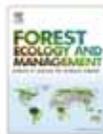
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## The normal fire environment—Modeling environmental suitability for large forest wildfires using past, present, and future climate normals

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### ABSTRACT

We modeled the normal fire environment for occurrence of large forest wildfires (>40 ha) for the Pacific Northwest Region of the United States. Large forest wildfire occurrence data from the recent climate normal period (1971–2000) was used as the response variable and fire season precipitation, maximum temperature, slope, and elevation were used as predictor variables. A projection of our model onto the 2001–2030 climate normal period showed strong agreement between model predictions and the area of forest burned by large wildfires from 2001 to 2015 (independent fire data). We then used downscaled climate projections for two greenhouse gas concentration scenarios and over 30 climate models to project changes in environmental suitability for large forest fires over the 21st century. Results indicated an increasing proportion of forested area with fire environments more suitable for the occurrence of large wildfires over the next century for all ecoregions but less pronounced for the Coast Range and Puget Lowlands. The largest increases occurred on federal lands, while private and state lands showed less. We calculated fire rotation periods for the recent historical and current climate and examined the relative differences between them and our modeled large wildfire suitability classes. By the end of the century, the models predicted shorter fire rotation periods, with cooler/moister forests experiencing larger magnitudes of change than warmer/drier forests. Modeling products, including a set of time-series maps, can provide forest resource managers, fire protection agencies, and policy-makers empirical estimates of how much and where climate change might affect the geographic distribution of large wildfires and effect fire rotations.

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PLOS ONE

### RESEARCH ARTICLE

## Evidence of Tree Species' Range Shifts in a Complex Landscape

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### Abstract

Climate change is expected to change the distribution of species. For long-lived, sessile species such as trees, tracking the warming climate depends on seedling colonization of newly favorable areas. We compare the distribution of seedlings and mature trees for all but the rarest tree species in California, Oregon and Washington, United States of America, a large, environmentally diverse region. Across 46 species, the mean annual temperature of the range of seedlings was 0.120°C colder than that of the range of trees (95% confidence interval from 0.096 to 0.144°C). The extremes of the seedling distributions also shifted towards colder temperature than those of mature trees, but the change was less pronounced. Although the mean elevation and mean latitude of the range of seedlings was higher than and north of those of the range of mature trees, elevational and latitudinal shifts run in opposite directions for the majority of the species, reflecting the lack of a direct biological relationship between species' distributions and those variables. The broad scale, environmental diversity and variety of disturbance regimes and land uses of the study area, the large number and exhaustive sampling of tree species, and the direct causal relationship between the temperature response and a warming climate, provide strong evidence to attribute the observed shifts to climate change.

### OPEN ACCESS

**Citation:** Monleon VJ, Lintz HE (2015) Evidence of Tree Species' Range Shifts in a Complex Landscape. PLoS ONE 10(1): e0118069. doi:10.1371/journal.pone.0118069

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# Board of Forestry Policy

## 2011 Forestry Program for Oregon



### **Goal G: Enhance carbon storage in Oregon's forests and forest products**

1. Encourage increasing Oregon's forestland and promote expansion of urban forests
2. Promote increased public and forest landowner understanding of the potential contributions of forests, and forest products in sequestering and storing carbon.
3. Ensure carbon-offset and ecosystem service markets provide sources of revenue that does not discriminate against landowner participation from excessive regulations.
4. Encourage greater consumer awareness of the environmental advantages of using Oregon forest products and their use as substitutes for more energy intensive building materials.

# Board of Forestry Policy

## 2011 Forestry Program for Oregon



### **Goal G: Enhance carbon storage in Oregon's forests and forest products (*continued*)**

5. Advocate for public and private forestland biomass to be considered on an equal basis with other renewable energy sources and as key component of Oregon's strategy for meeting state greenhouse gas reduction and renewable energy portfolio standard policy goals.
6. Continue to support research and develop policies and incentives that will drive the growth of the biomass/ bioenergy/ bio-based products industry in the state.
7. Promote research and innovation towards increasing energy efficiency and reducing the use of fossil fuels in the Oregon forest sector.

# Board of Forestry Policy

## 2011 Forestry Program for Oregon



**Goal C: Protect and improve the productive capacity of Oregon's forests**

- Promote consideration of alternate climate change adaptation and mitigation scenarios when planning reforestation and vegetation management, particularly when managing plant species of specific climate and fire regimes.

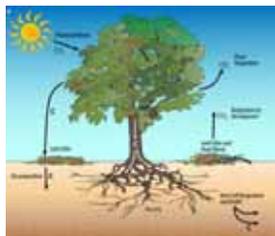
**Goal F: Protect and improve the health and resiliency of Oregon's dynamic forest ecosystems, watersheds, and airsheds.**

- Promote integration of climate change assessment, mitigation and adaptation strategies into planning, decision-making, management, restoration, and public information efforts.

# Forest Carbon Studies



- The Office of Carbon Policy was established with 2018 HB 5201 (Section 173)
- **Forest carbon accounting** will be done by ODF working closely with the Oregon Office of Carbon Policy and the USFS Forest Inventory and Analysis Program.
- The USFS Forest Inventory and Analysis Program conducts a census of all U.S. forests.





# Forest Carbon

- **Two Pools:**
  - Carbon in Forest Ecosystems
  - Carbon in Harvested Wood Products.
- **Two Types of Measurement:**
  - Carbon Stocks (amount)
  - Carbon Flux (change)





# Stakeholder Advisory Committee and Process for Studies

- Stakeholder advisory committee will provide feedback, guidance, and critical review.
- Includes conservation organizations, forest landowners, and forest products industry
- Supported in partnership between ODF and Office of Carbon Policy
- Open and transparent process through the production of these reports.

# Oregon Forest Ecosystem Carbon



- A forest ecosystems carbon analysis of the storage and flux of carbon in Oregon forests.
- Based on forest inventories from 2001 to 2016.
- Plan to repeat the analysis and report every two years.

OR Carbon Report: **DRAFT**

06/06/2019

1

## Oregon Forest Ecosystem Carbon Inventory: 2001-2016

--- **DRAFT REPORT** ---

Glenn A. Christensen<sup>1</sup>, Andrew N. Gray<sup>1</sup>, Olaf Kuegler<sup>1</sup>, &  
Andrew C. Yost<sup>2</sup>

Report completed through an agreement between the U.S. Forest  
Service, Pacific Northwest Research Station, and the Oregon  
Department of Forestry  
(PNW Agreement No. 18-C-CO-11261979-019)

<sup>1</sup>U.S. Department of Agriculture, Forest Service, Pacific Northwest Research  
Station

<sup>2</sup> Oregon Department of Forestry

June 6<sup>th</sup>, 2019





# Carbon in Oregon Forest Ecosystem

- Oregon's 30 million acres of forests store approximately 3.2 billion metric tons of carbon in live and dead trees, down wood, forest floor and soil.
- Over the past 10 years Oregon's forests have net increase of approximately 8 million metric tons of carbon each year (30.9 million metric tons CO<sub>2</sub>e).

0 25 50 100 Miles

Satellite Imagery  
of Oregon

2016

Data Source:  
National Agriculture  
Imagery Program



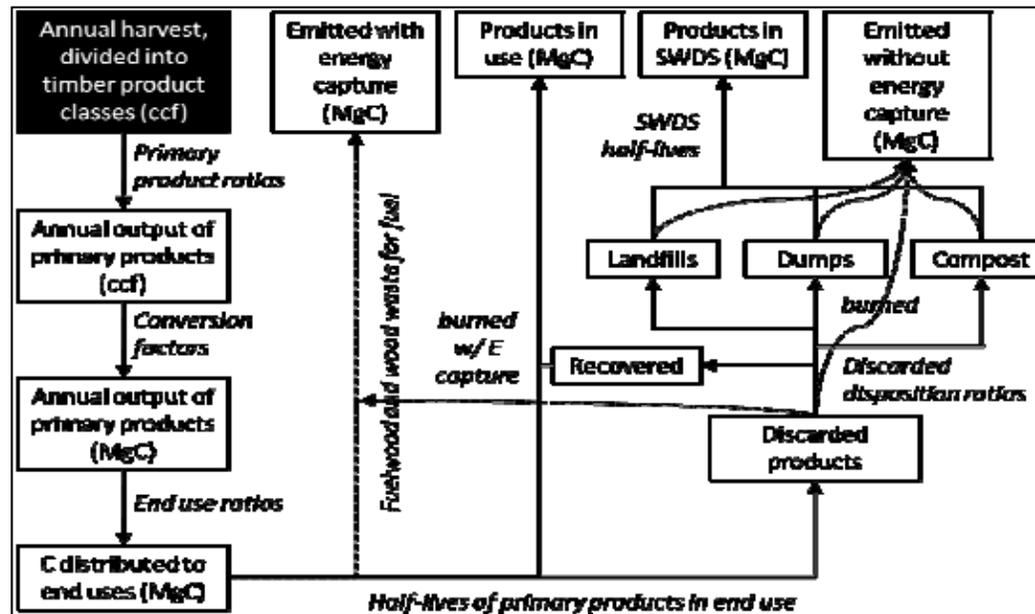
Prepared by:  
Oregon Department of Forestry  
02/22/2017

USDA

# Harvested Wood Products



- Analysis will be produced through partnership with USFS FIA and Bureau of Business and Economic Research.
- Based on historic and current timber harvest in Oregon.
- Integrate Oregon-specific product uses, disposal rates, decay functions.
- Final report on the storage and flux of carbon in harvested wood products.





# Carbon in Harvested Wood Products

- From 1962 to 2017, cumulative total carbon stored is approximately 286 million metric tons of carbon.
- Over the past 10 years, harvested wood products added approximately 2 million metric tons of carbon each year (8.1 million metric tons CO<sub>2</sub>e).



# Oregon Forest Ecosystem Carbon Report

## Harvested Wood Products Report



# Next Steps : Climate Change Mitigation Potential of Oregon's Forest Sector



- Need an analysis of short- and long-term climate benefits from alternative forest carbon mitigation strategies.
- Done as a simulation of different combination of strategies.
- Scenarios are done relative to a base case, e.g., current policy approach.
- No scientific consensus and will likely be the most contentious of the studies.



# QUESTIONS