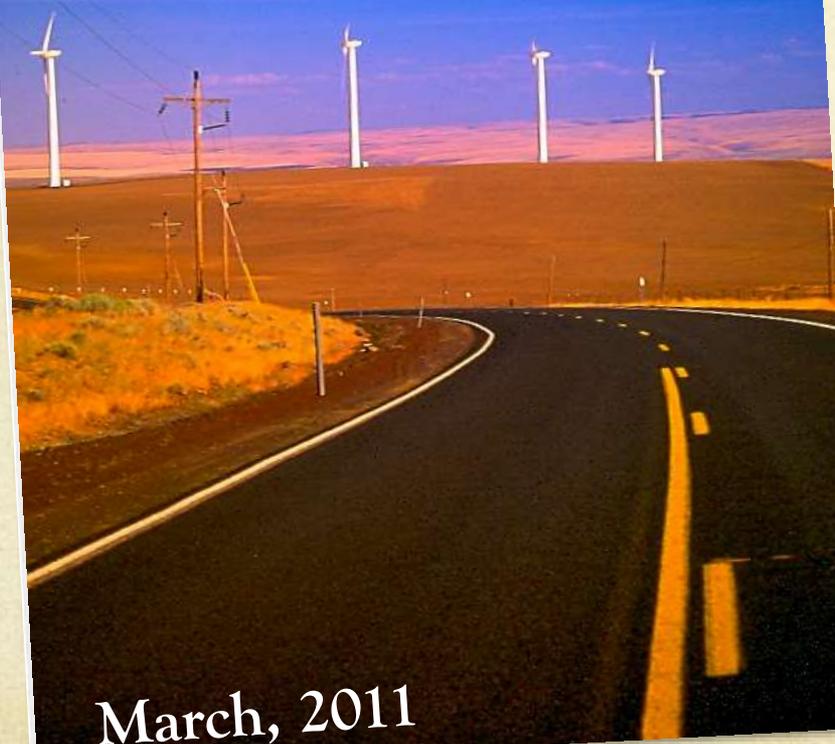


Oregon
Global
Warming
Commission

Roadmap to 2020



March, 2011

OGWC 2011 Report to Legislature: Roadmap to 2020

Forest Carbon Recommendations:

- Leave west-side public forests alone to accumulate carbon
- Support east-side public forest health restoration
- Rely on private forestland for product
- Critical need: better forest carbon data
- Forest carbon activity NOT included in OR carbon goals

OGWC Forest Carbon Accounting Project 2016-2018

- Forest Carbon Advisory Task Force
- Forest Inventory and Analysis (FIA) data from USFS
- Data and analysis from OSU School of Forestry scientists

FIA Data sorted by six eco-regions

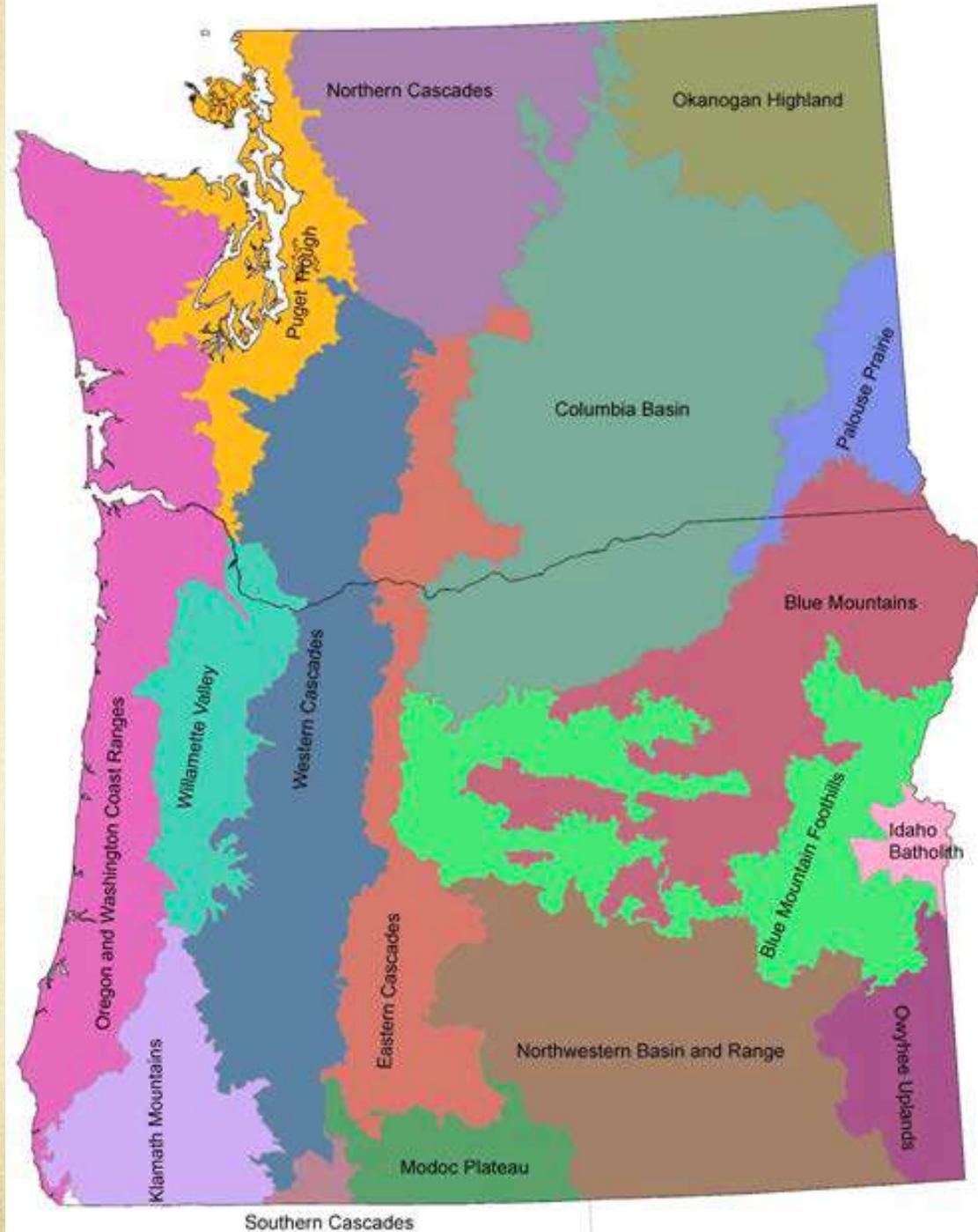
- Coast Range
- Klamath'
- West Cascades
- East Cascades
- Blue Mountains
- NW Basin

Analyzed by forestland owner

- US Forests
- BLM Forests
- National Parks
- State
- Private Industrial
- “Family Forests”
- Other

... and by carbon pool:

- Live trees
- Dead Trees
- Downwood
- Forest floor
- Soil/roots



Acres / % of Oregon forestland by ownership (Federal 60%; Private 36%)

Public	Private	Other
64%	36%	--
By Owner		
	Acres (000)	%
US Forest Service (USFS)	14,180	47
US Bureau of Land Management (BLM)	3,621	12
US Park Service	166	1
State of Oregon + Local Government	1,205	4
Private Industrial Forests	5,984	20
Private Non-Industrial Forests (woodlots)	4,799	16
Other	29	--
Totals		
	29,984	100

USDA:
Oregon's
Forest
Resources,
2001-2010:
TenYear
Forest
Inventory
and
Analysis
Report;
November,
2017.

Key Takeaways (1)

- Oregon's forests sequester some 3 *Billion* tons of carbon (= about 11 Billion tons CO₂e)
- 73% of forest carbon is in federal forests (= 60% of acres; *net sink* since 1990's); 28% of forest carbon is in private forests (= 36% of acres)
- Oregon's forests are withdrawing from the atmosphere 23 mm to 63 mm tons CO₂e annually.
- All ownership categories are acquiring net carbon:
 - 79% of new carbon acquired is in federal forests;
 - 16% in all private woodlands
 - 4% in private *industrial* woodlands

[data from USFS FIA tables]

Key Takeaways (2)

- Nationally forest carbon increased by 10% from 1990 to 2013; Oregon's forests were a large part of this gain
- The US National Climate Assessment identified the "well-watered forests of the Pacific Coast" as *singularly important globally* to acquiring and sequestering atmospheric carbon (NAC 2014)
- Globally, ". . . over the past 150 years, deforestation has contributed an estimated 30 percent of the atmospheric build-up of CO₂." (WRI 1998)

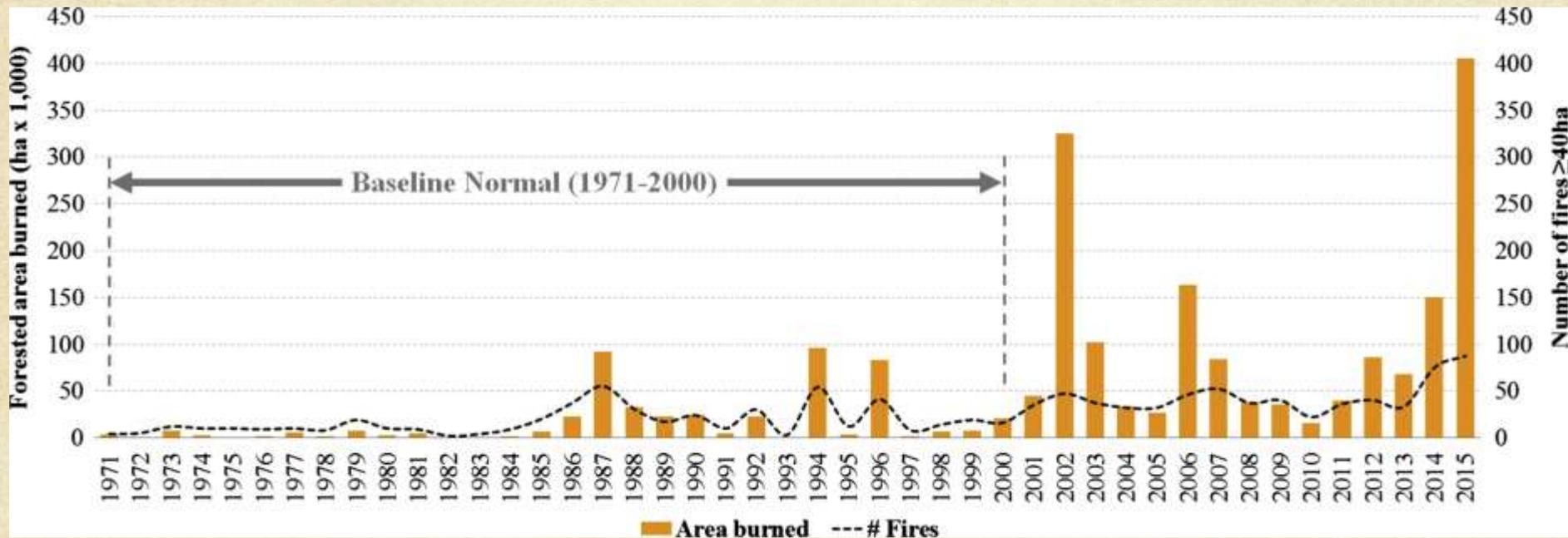
Forest Carbon Pools

- Five FIA pools: “live trees,” “standing dead trees,” “downed and woody material,” forest floor,” and “soil carbon.”
- Largest in-forest pools: live trees (35%) and soil carbon (47%)
- Add sixth “forest products” pool of harvested material in wood-based materials (e.g., lumber, paper); calculations include losses at harvest and processing; also landfilled materials and end-of-life carbon return to atmosphere
- Carbon stores are in constant flux, moving from pool to pool and from pool to and from atmosphere; to support effective policy, calculations have to capture these movements

Findings (1)

1. Valuation of carbon stores and flows is still imprecise; better measurement and analysis methodologies will better support informed policymaking.
2. Oregon has opportunities to substantially increase forest carbon stores. Nature and scale vary by ecoregion and ownership. Carbon choices must be integrated into forest management that currently reflects ecosystem values and commercial values.
3. Forest wildfire is now understood to be essential to forest health, but is also thought to be a major source of carbon loss. This does not appear to be the case.

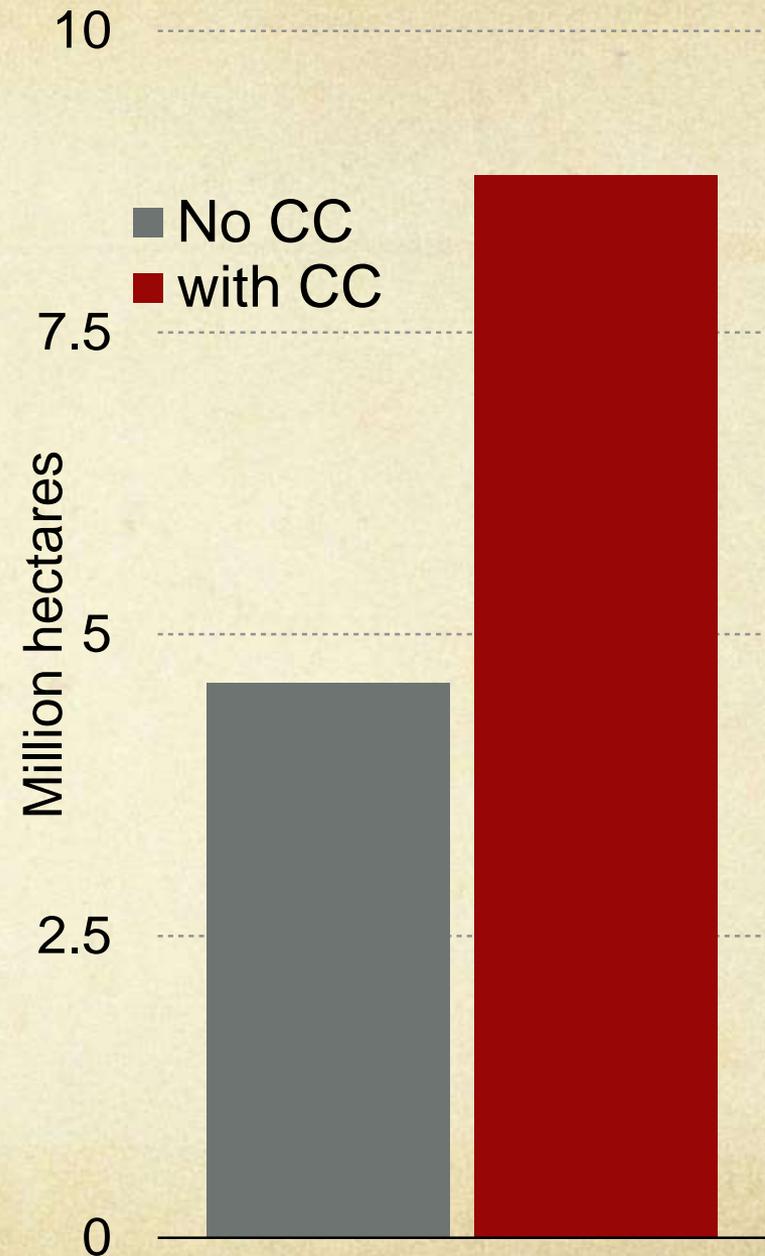
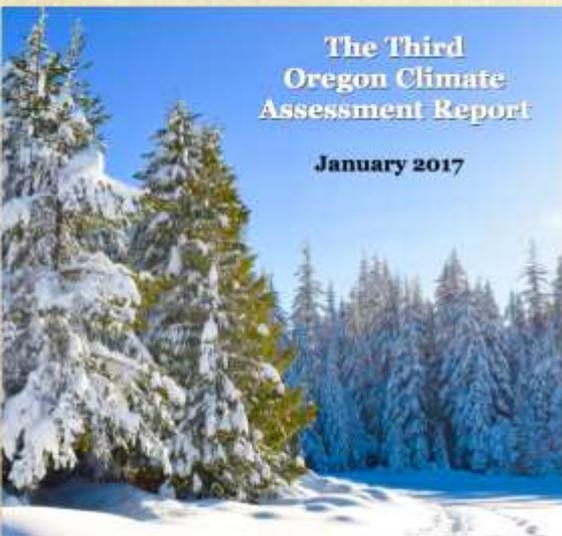
Oregon Wildfire: 1971-2000 and 2001-2015



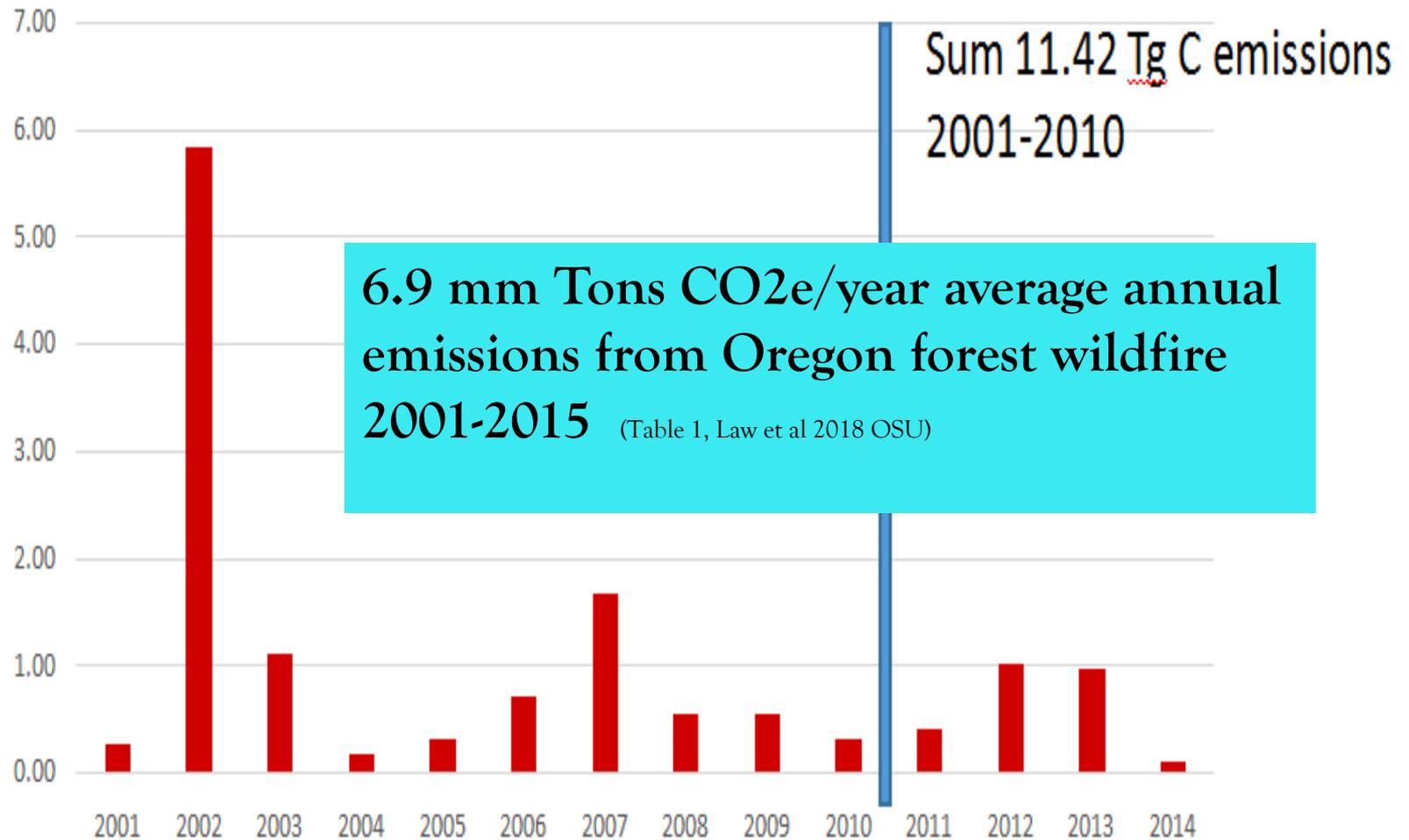
“The Normal Fire Environment,” Davis, Yang, Yost et al, Forest Ecology and Management 390 (2017) pp. 173-186
Fig. 2. Large (P40 ha) forest wildfire history for the study area. The black dashed line for number of fires was smoothed..

Human-caused climate change doubled the area burned in western US since 1985

Abatzoglou and Williams (2016)
redrawn by P Mote



Fire Emissions Tg C



Law et al. PNAS 2018 (SI Table S4 extends quantities through 2015)

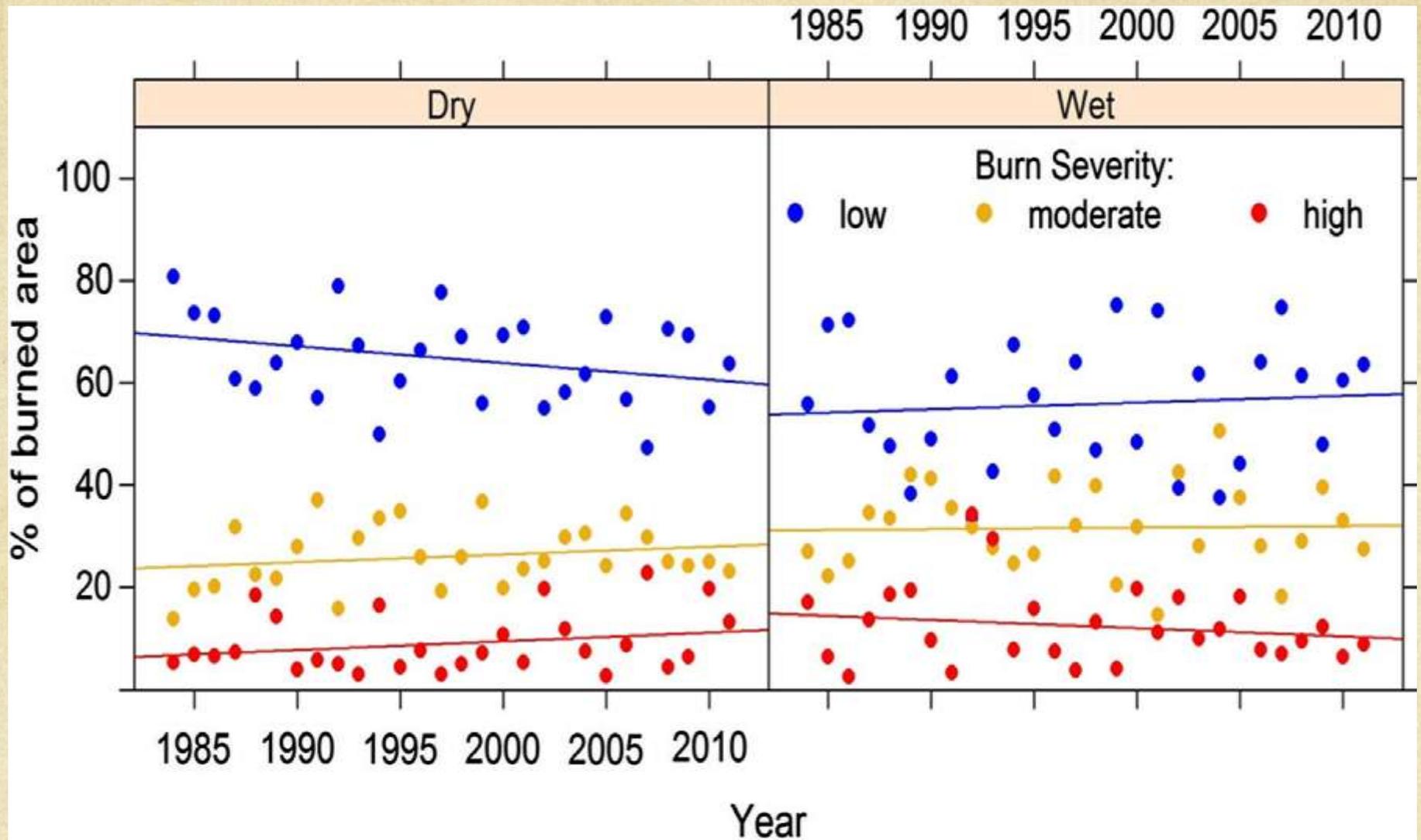


Fig. 2. The percentage of total area burnt within each burn severity class from 1984 to 2011 for dry (left panel, less than 600 mm year⁻¹) and wet (right panel, more than 600 mm year⁻¹) ecoregions in the Pacific Northwest. High severity fire accounted for an average of 9–12% of the total burn area and did not change significantly over time. Estimates are from the Monitoring Trends in Burn Severity database (Eidenshink et al., 2007). Summary statistics for each burn severity class are presented in Table 2, graphs by Logan Berner. (Law, Waring 2015)

Findings (2)

4. Forest practices that *remove* woody material from forests will, by definition, reduce stored carbon. These reductions may only be restored over decades, depending on intensity and extent of removals. So harvest and rotation, forest health treatments and fire management, all interact with carbon stores and flows. Those interactions must be measured, and associated carbon losses accounted for.

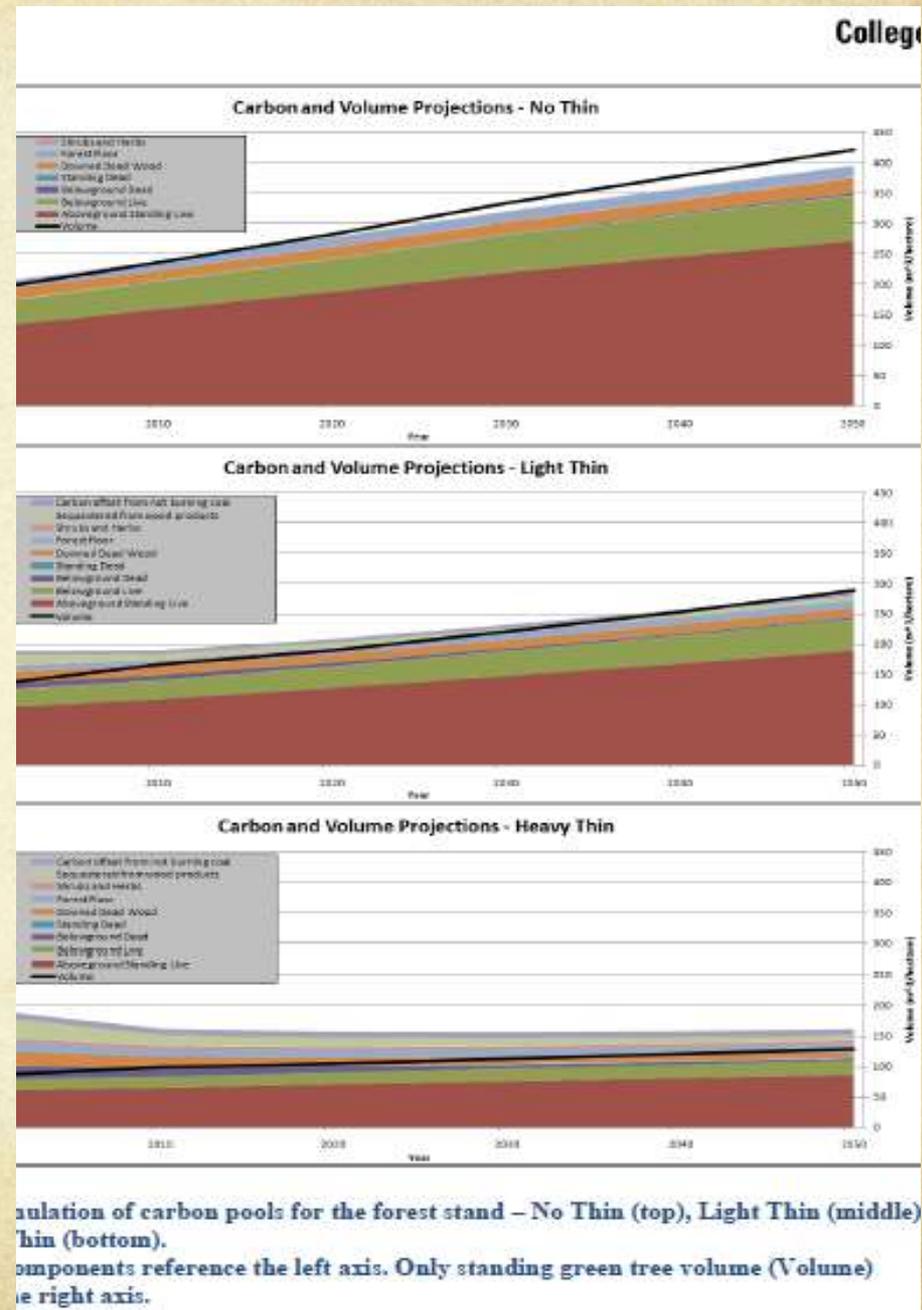
Simulation of Forest Carbon Pools Under Different Thin/Harvest Assumptions

["Clark, Sessions, Krankina, Maness: "Impacts of Thinning on Carbon Stores", p 15, May 25, 2011]

Forest Carbon Retained under:

- No Thin [C=±400tonnes/hectare]
[no recovery time required]
- Light Thin [C=±300tonnes/hectare]
[25 to 40 year carbon recovery time]
 - 208 trees/acre remaining;
 - Removing 100% of trees less than 10 in. Diameter(BH)
 - Resistance to crown fire is improved and resistance to individual tree torching is unchanged.
- Heavy Thin [C=±150tonnes/hectare]
[>50 year carbon recovery time]
 - 46 trees/acre remaining
 - Removing: 100% of trees less than 12 in. DBH; removing 30% of trees 12-16 in. DBH; removing 10% of trees 16-20 in. DBH
 - Leaves the stand in a relatively park-like condition, with little understory and only a few of the largest trees remaining. Resistance to torching and crowning have significantly increased.

Forest Carbon Retained



Findings (3)

5. Forest harvest is economically important to Oregon's economy and many communities, and useful in many products. Wood products may store carbon, in some cases for many years (as products or in landfills). They also result in net carbon losses to the atmosphere compared to leaving trees in forests.
- By one analysis, harvest reduced net *in-forest* carbon stores by 34% between 2001 and 2015 (compared to no harvest - Law 2018).
 - Other analysis (FIA) shows small net carbon increase on industrial woodlands (4% of total gains vs 79% gains in federal forests less intensively harvested)
 - Largest in-forest carbon losses from harvest are on privately-owned industrial forests that are harvested more intensively and at shorter rotations.
 - Longer rotations + more efficient harvest practices and utilization of harvested fiber can reduce this carbon penalty, as can end-of-life disposal practices.
 - OR Dept of Forestry analysis of materials substitution, leakage and other effects will be useful.

Accounting for Carbon in Wood Products Pool

1. Begin with total carbon in harvested trees; account for carbon loss of harvest residue left in-forest
2. Count carbon emitted by extraction, transportation and milling processes
3. Count residue carbon loss from stems during milling into durable products
4. Account for emissions associated with substitution (e.g., displacing steel, concrete)
5. Net carbon *additions* to wood products pool against carbon *losses* as older wood products age out, are disposed of and decompose, their carbon leaving the pool and returning to the atmosphere

Data/Analysis Needs Specific to Oregon Forests

- Reconcile FIA and OSU pool stores/flows data
- Measure (vs. model) non-live tree carbon pools (e.g., dead wood, forest floor, mineral soil carbon)
- For wood product stores, reconcile FIA-based and process model data
- Assess vulnerability of forest carbon stores and acquisition to effects of climate change

Looking Forward - Oregon Forest Carbon Policy Choices

- How should forest management practices be modified to incorporate carbon consequences into harvest, fire management and forest health recovery strategies?
- How should forest carbon offset incentives be integrated into an economy-wide Oregon carbon cap?
- Should Oregon set a forest carbon acquisition target (or eco-region specific targets for public and private forests)?



Keep Oregon Cool

Oregon Global Warming Commission

Questions?

Oregon Forest Carbon Budget (2011 – 2015)

