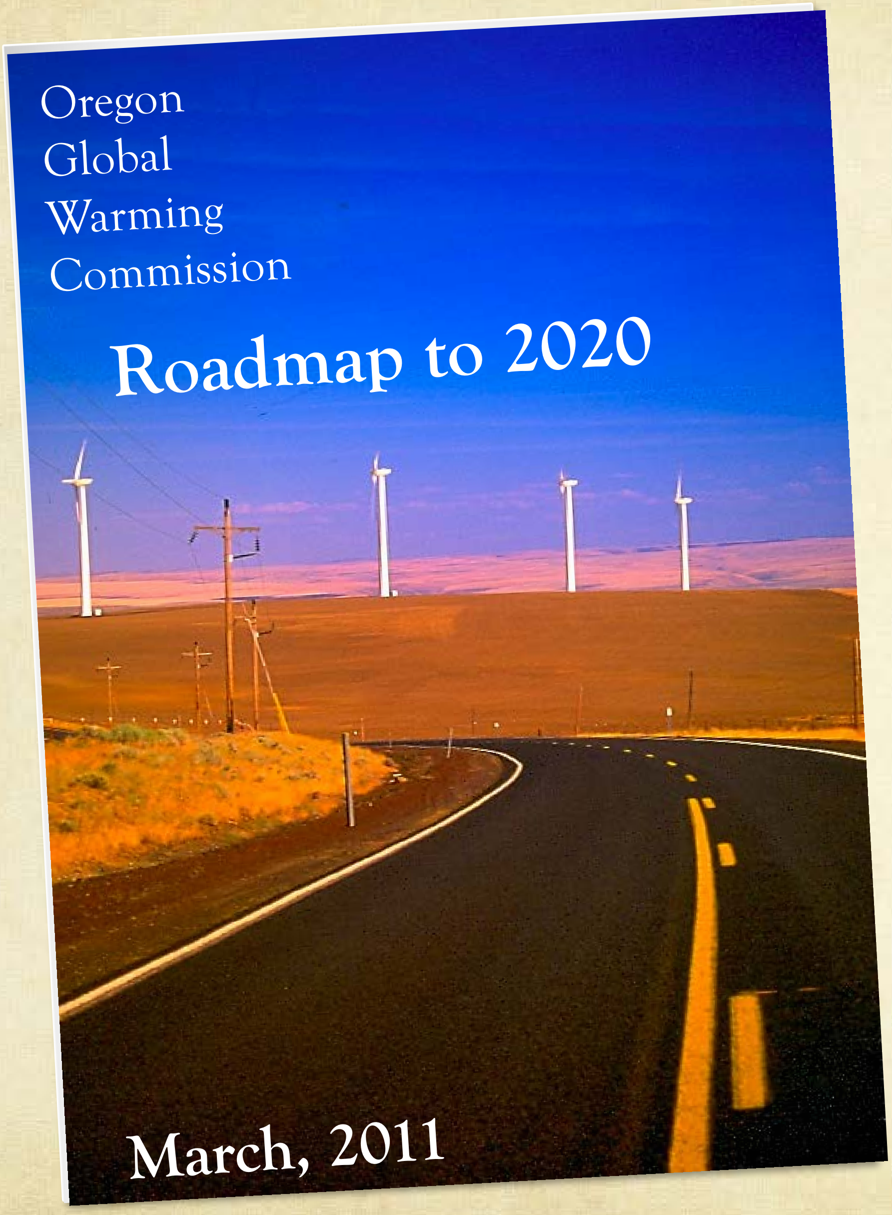


OGWC 2011 Report to Legislature: Roadmap to 2020

Forest Carbon Recommendations:

- Leave westside public forests alone to accumulate carbon
- Support eastside public forest health restoration
- Rely on private forestland for product
- Critical need: better forest carbon data

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

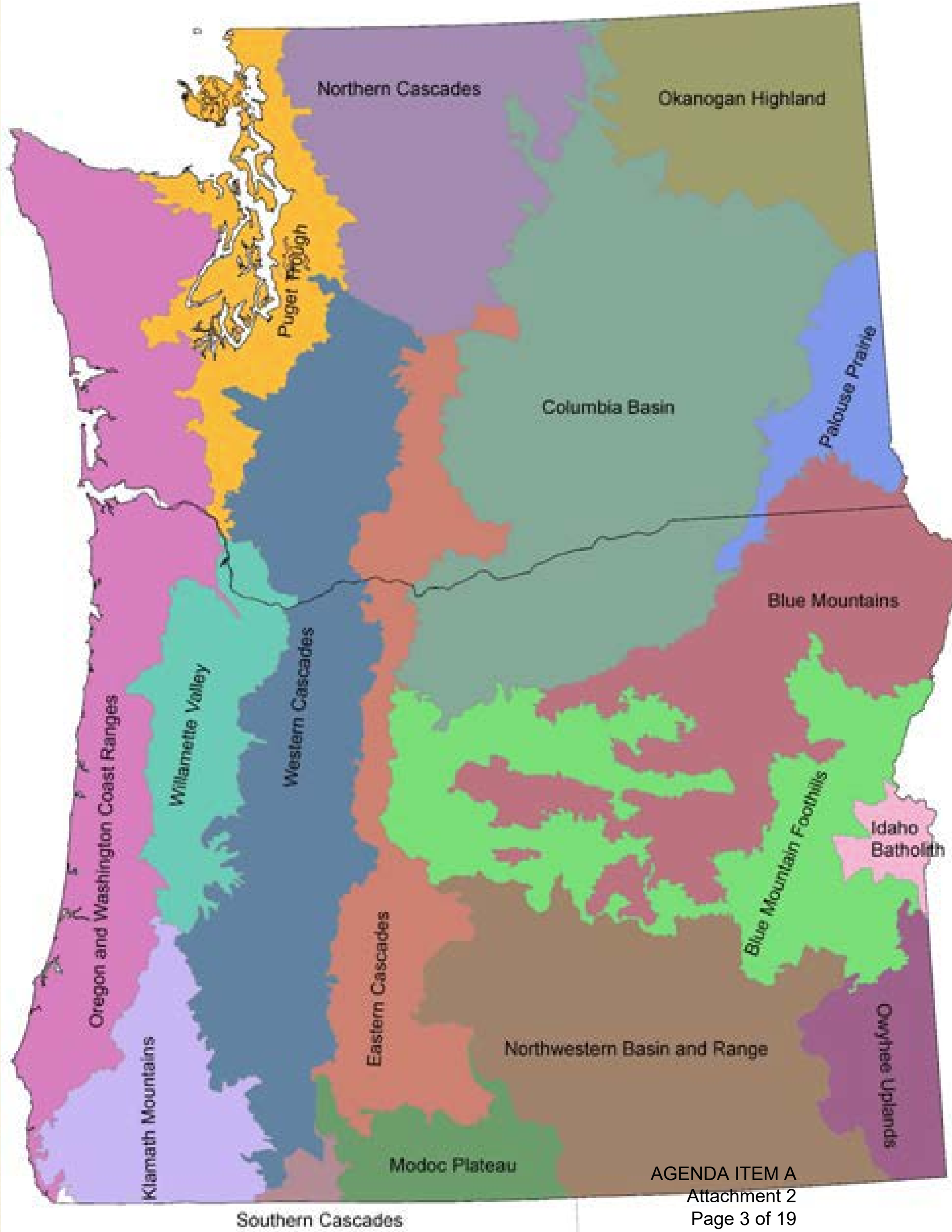
- Coast Range
- Klamath'
- West Cascades
- East Cascades
- Blue Mountains
- NW Basin

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

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); 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 CO_2." (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: forest products "pool" of harvested material in wood-based materials (e.g., lumber, paper); calculations include losses at harvest and processing; also landfilled materials
- Carbon stores are in constant flux, moving from pool to pool and from pool to and from atmosphere; calculations have to capture these movements

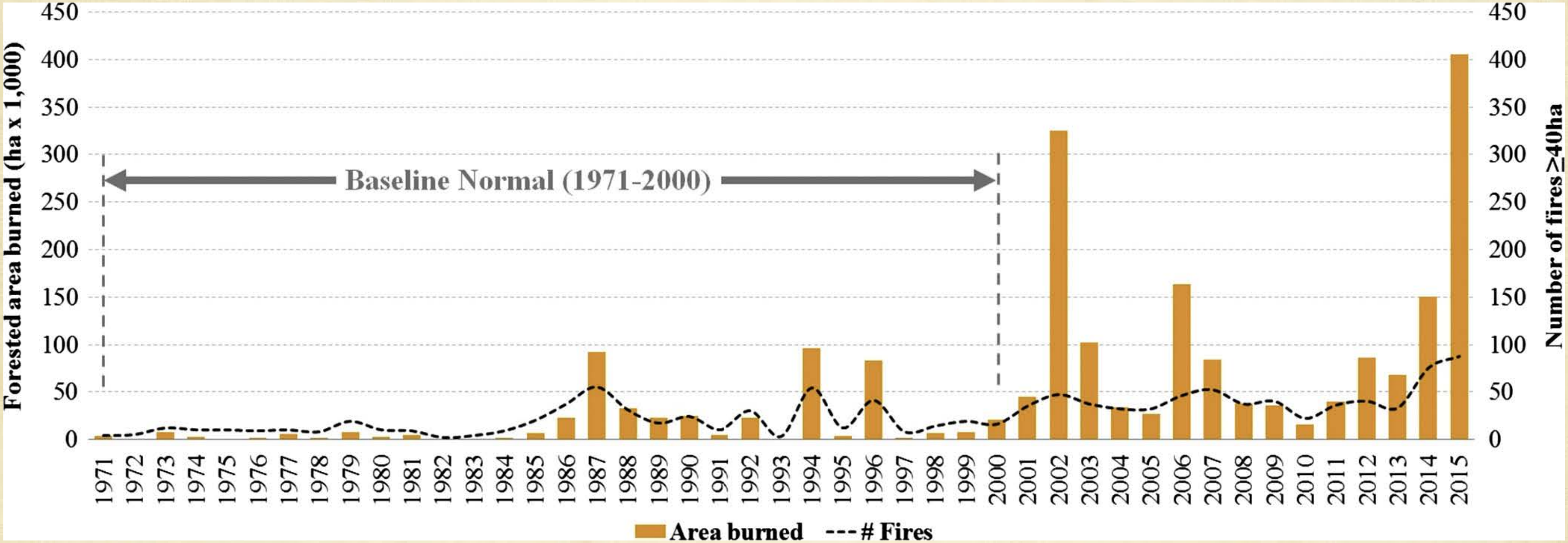
Findings (1)

1. Valuation of carbon stores and flows is still imprecise; **<u>better measurement and analysis methodologies</u>** will better support informed policymaking.

2. Oregon has **<u>opportunities to substantially increase forest carbon stores</u>**, which vary by ecoregion and ownership, and must be integrated into forest management for ecosystem values and commercial values.

3. **<u>Forest wildfire</u>** is now understood to be essential to forest health, but is thought to be a major source of carbon loss. This does not appear to be the case.

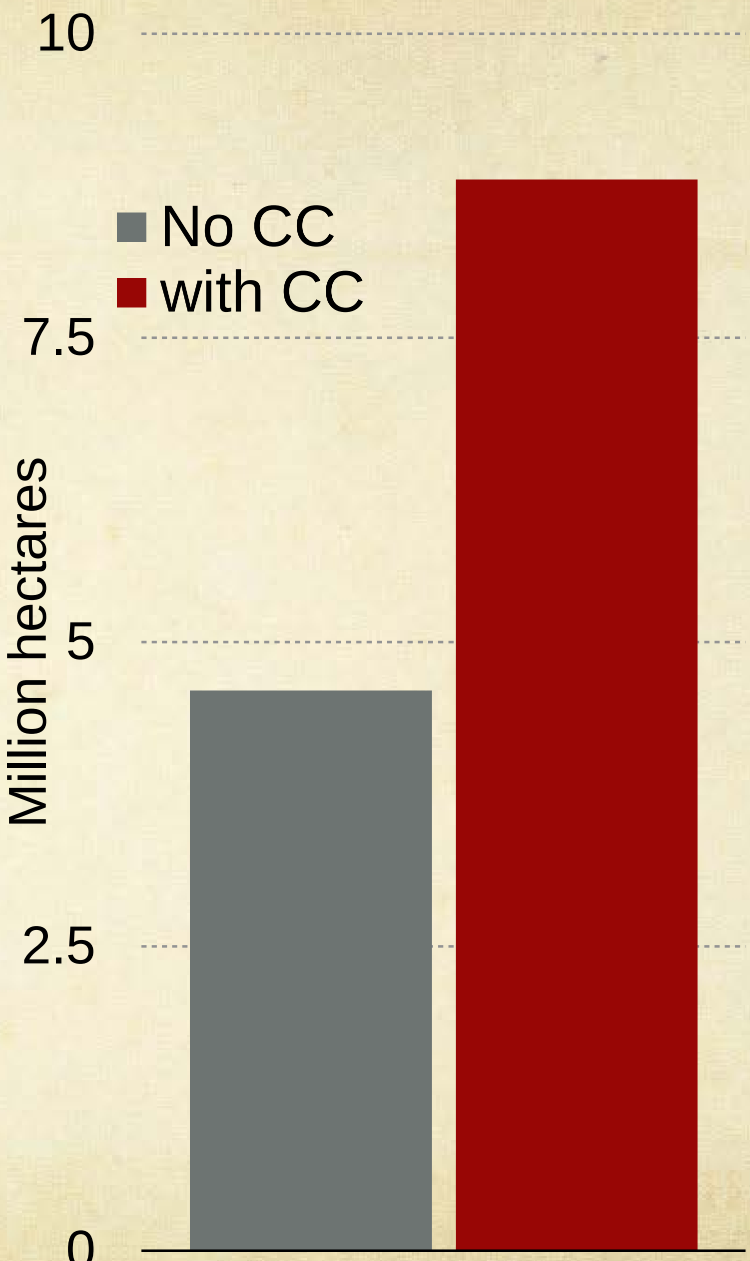
Oregon Wildfire: 1971-2000 and 2001-2015

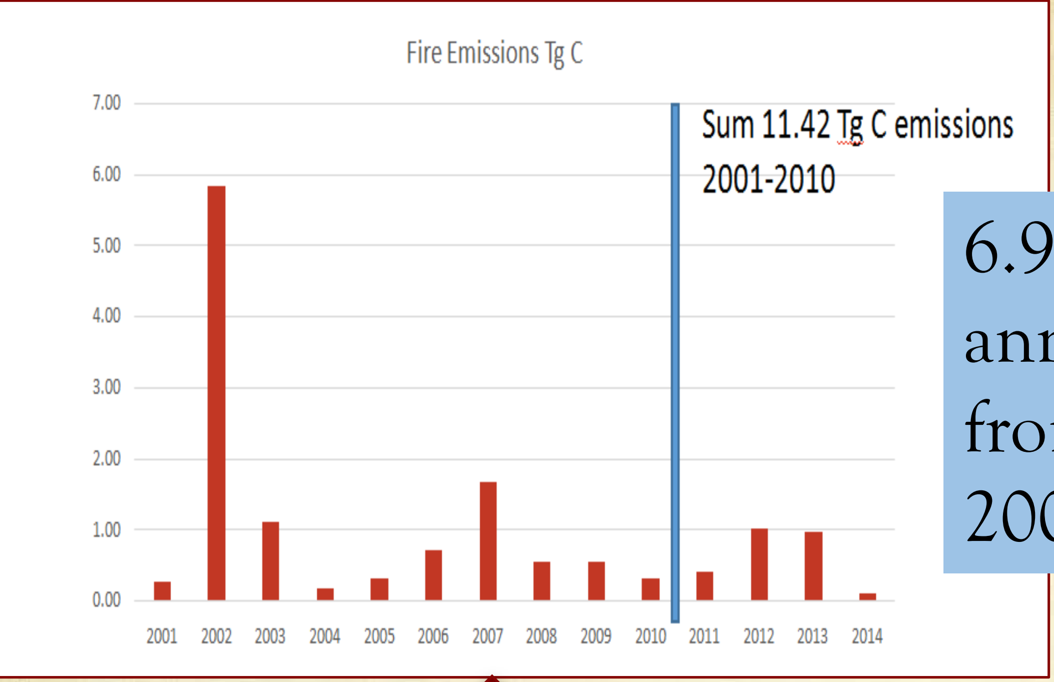


"The Normal Fire Environment," Davis, Yang, Yost et al, Forest Ecology and Management 390 (2017) pp. 173-186
Fig. 2. Large (P40 ha) forest wildfire history for the study area. The black dashed line for number of fires was smoothed..

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

Abatzoglou and Williams (2016)
redrawn by P Mote

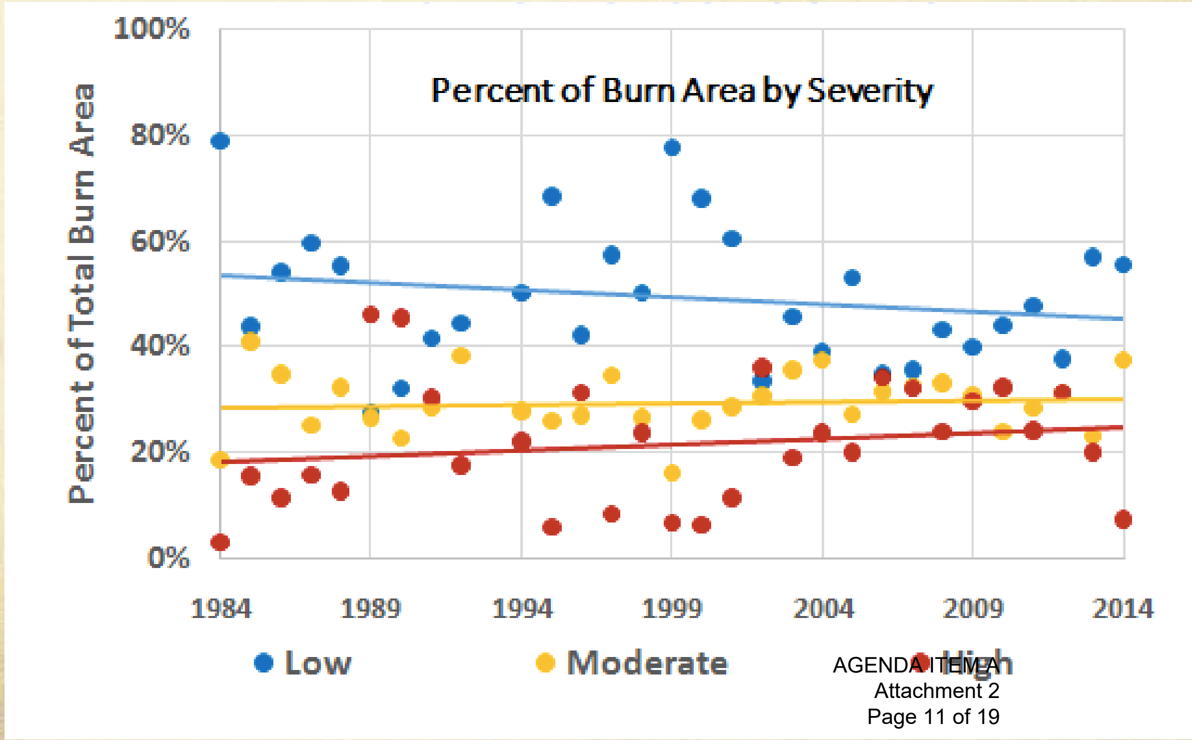




6.9 mm Tons/year average annual CO2e emissions from Oregon forest wildfire 2001-2015 (OSU)

2002: 600,000 acres

2007: 200,000 acres



Findings (2)

4. **<u>Forest practices that remove woody material</u>** from forests will, by definition, reduce stored carbon; and those reductions are often only restored over decades. 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]

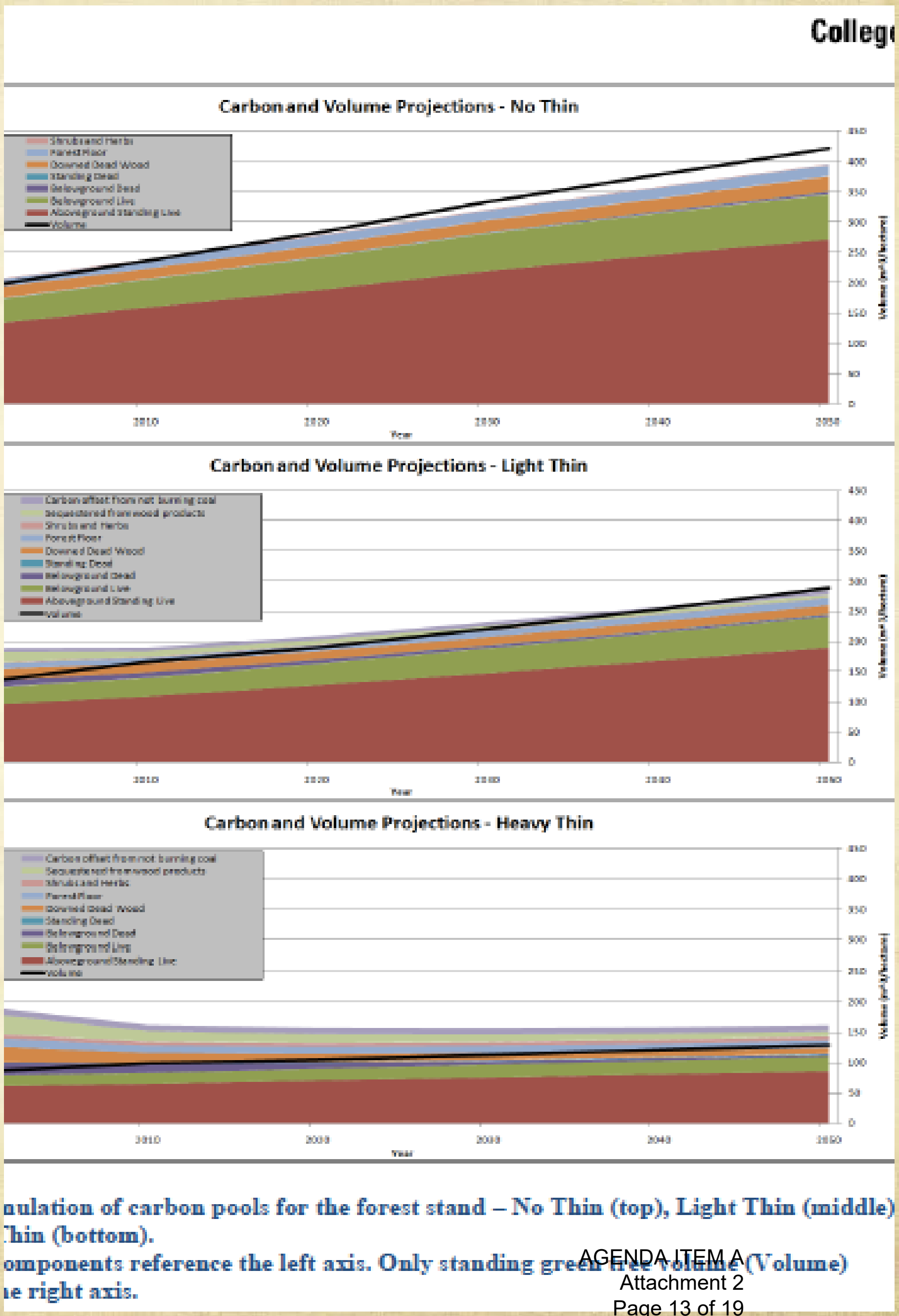
Forest Carbon Retained under:

- **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 our communities and useful in many products. While 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 carbon in forests.
    - By one analysis, harvest reduced net in-forest carbon stores by 34% between 2001 and 2015 (Law 2018). Other analysis (FIA) shows small net carbon increase on industrial woodlands (4% of total gains vs 79% from federal forests)
    - The greatest in-forest carbon losses are on privately-owned industrial forests that are harvested more intensely 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.
    - More analysis of materials substitution, leakage and other effects will be useful.

Data/Analysis Needs Specific to Oregon Forests

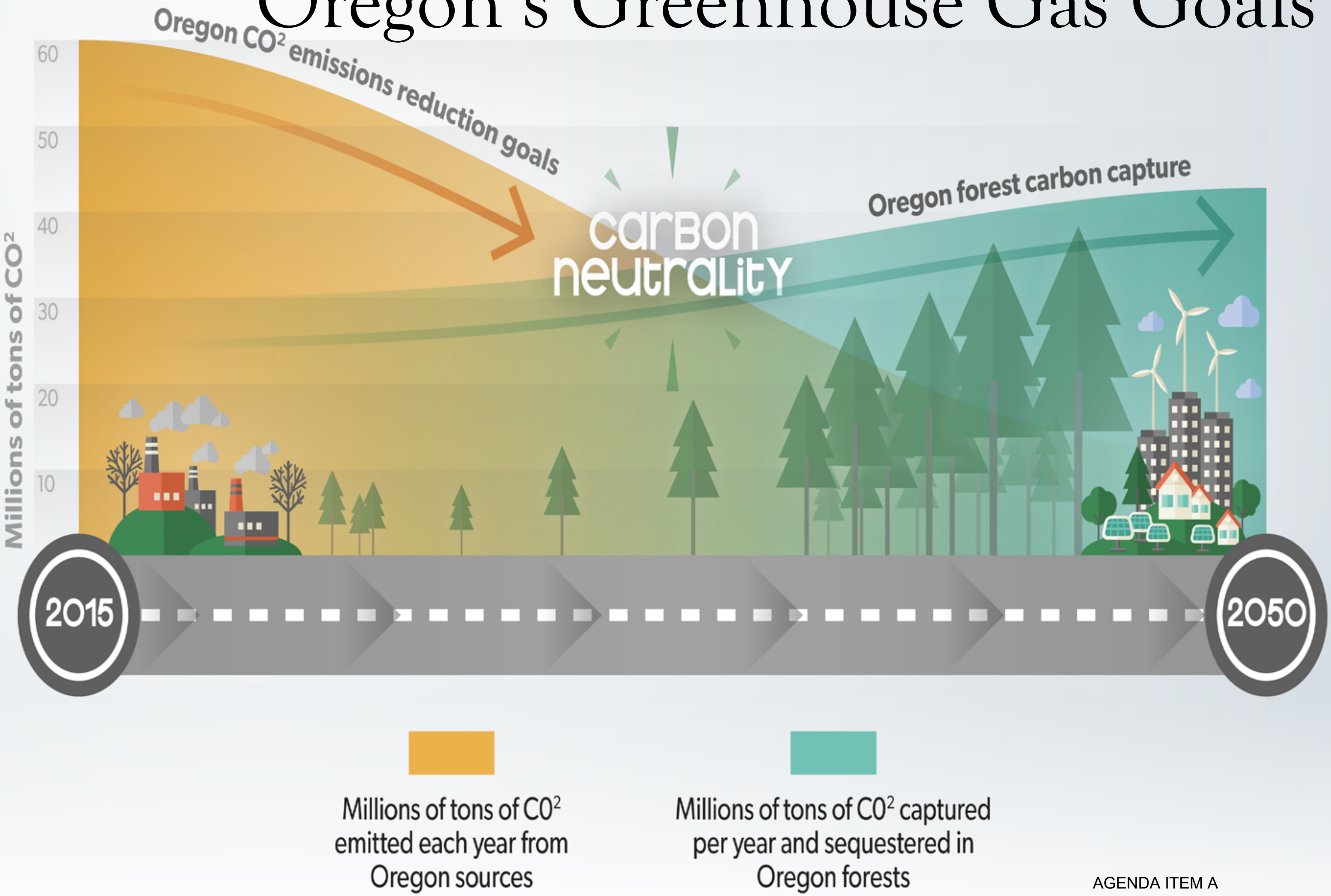
- Reconcile FIA and OSU pool stores/flows data
- Measure (vs. model) non-live tree carbon pools (e.g., dead wood, forest floor, mineral soil carbon)
- For wood product stores, reconcile FIA-based and process model data
- Assess vulnerability of forest carbon stores and acquisition to effects of climate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

Looking Forward - Oregon Forest Carbon Policy Choices

- Revisit forest management practices to reconcile harvest, fire management and forest health recovery strategies with carbon capture targets?
- How should forest carbon be integrated into an economy-wide Oregon carbon cap?
- By including potential for forest carbon gains, could Oregon set a combined higher statewide carbon acquisition target (or eco-region specific targets for public and private forests)?

KeepOregonCool
Oregon Global Warming Commission

Incorporating Forest Carbon into Oregon's Greenhouse Gas Goals



KeepOregonCool

Oregon Global Warming Commission

Questions?

Oregon Forest Carbon Budget (2011 – 2015)