Is Tree Mortality Increasing in Oregon's Forests?



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Outline

- What is background mortality?
- What are the patterns of tree mortality over the last decade?
- What is driving mortality in Oregon's forests?
- How does this compare with the previous decade?

Mortality and tree density



Mortality and stand development

Total volume



Annual components of change

The strategic inventory of Oregon's forests



The power of the FIA plot grid:

- Representative sample
- Consistent protocols
- Multiple data attributes
- Permanent plots
- Plot confidentiality



The big picture for Oregon

Acres of forestland: 29,195,481

	N trees		Volume		
	(million)	Percent	(million ft3)	Percent	
Live	9,674		98,882		
Mortality / yr	171	1.8%	699	0.7%	
Cut / yr	40	0.4%	1,052	1.1%	
Overstory / yr	53	3 1.2%	57	1 0.7%	
Understory / yr	118	3 2.4%	b 12	8 1.4%	

Net growth / yr 1,015 1.0%

Mortality and ownership





How prevalent is disturbance?

Disturbance	Area (1000 ac) SE	F	Percent	Percent/yr	
Cut	3,477.6	152.4	11.9%	5 1.2%	
Fire	1,026.1	81.4	3.5%	6 0.4%	
Cut + Fire	161.1	33.9	0.6%	6 0.1%	2 00/ /
Insect or Disease	4,100.5	148.3	14.0%	1.4%	2.0%/yr
Weather	524.0	62.9	1.8%	6 0.2%	
Incidental Cut	373.7	56.3	1.3%	6 0.1%	
None	19,532.4	254.0	66.9%	, D	
Total	29,195.5	182.9			

Area by fire severity class, OR/WA NFS

 \sim 45% of area burned in fire was moderate or severe (>60% overstory mortality)



Timing and cause of mortality



Mortality volume (%) by watershed



Net change volume (%)



Net change volume (%) no fire or cutting



Mortality in the 90s + 00s on NFS

		95	% CI	95% CI		
Component	Means 90s	90s		Mean 00s00s		
Growth	1.73	%	0.04%	2.01%	0.06%	
Mortality	-1.11	%	0.07%	-0.87%	0.07%	
Cut	-0.12	%	0.03%	-0.16%	0.03%	
Net change	0.50	%	0.08%	0.98%	0.10%	

Clearly mortality events happen...



Whitebark pine in Wind Rivers

Species change in the 90s on NFS



Lintz 2016, Ecol. Ind. 66: 1

Big losers: madrone, whitebark pine, white pine, subalpine fir, yew, Engelmann spruce, lodgepole

Species change in the OOs on NFS

Unburned stands



Losers: paper birch, whitebark pine; dogwood + sugar pine losing numbers but gaining volume.

95% CI overall mean, -0.144 to -0.096°C

Pinus lambertiana Pinus jeffreyi Calocedrus decurrens Abies concolor Pinus monticola Cornus nuttallii Pinus contorta Picea engelmannii Larix occidentalis Chamaecyparis lawsoniana Juniperus occidentalis Abies magnifica Aesculus californica Quercus douglasii Abies procera Acer macrophyllum Sequoia sempervirens Arbutus menziesii Abies lasiocarpa Pinus ponderosa Pseudotsuga menziesii Cercocarpus ledifolius Pinus sabiniana Pinus albicaulis Pinus monophylla Acer glabrum Tsuga mertensiana Abies grandis Callitropsis nootkatensis Picea sitchensis Quercus chrysolepis Alnus rubra Umbellularia californica Lithocarpus densiflorus Quercus agrifolia Tsuga heterophylla Fraxinus latifolia Abies amabilis Quercus kelloggii Populus tremuloides Quercus wislizeni Thuja plicata Populus balsamifera Quercus garryana Taxus brevifolia Chrysolepis chrysophylla -1.5-1 -0.5 0.5 0

Species migration on the west coast

Opportunity to follow-up with ingrowth and mortality

Monleon & Lintz, 2015. Plos One

Mean temperature difference (seedlings minus trees, °C)

Conclusions

- Background mortality is a concept with limited utility
- Most tree mortality in Oregon is from insects, disease, suppression, and other, with relatively little due to fire. Quite different from California
- Mortality has decreased on National Forests from the 90s to 00s, though declines in whitebark pine continue. Lodgepole, white pine, and subalpine fir appear to be recovering.

Thank you!