

Retention and Recruitment of Coarse Woody Debris as Measurable Management Targets

A.J. Kroll
Weyerhaeuser





COARSE WOODY DEBRIS IN THE PACIFIC NORTHWEST

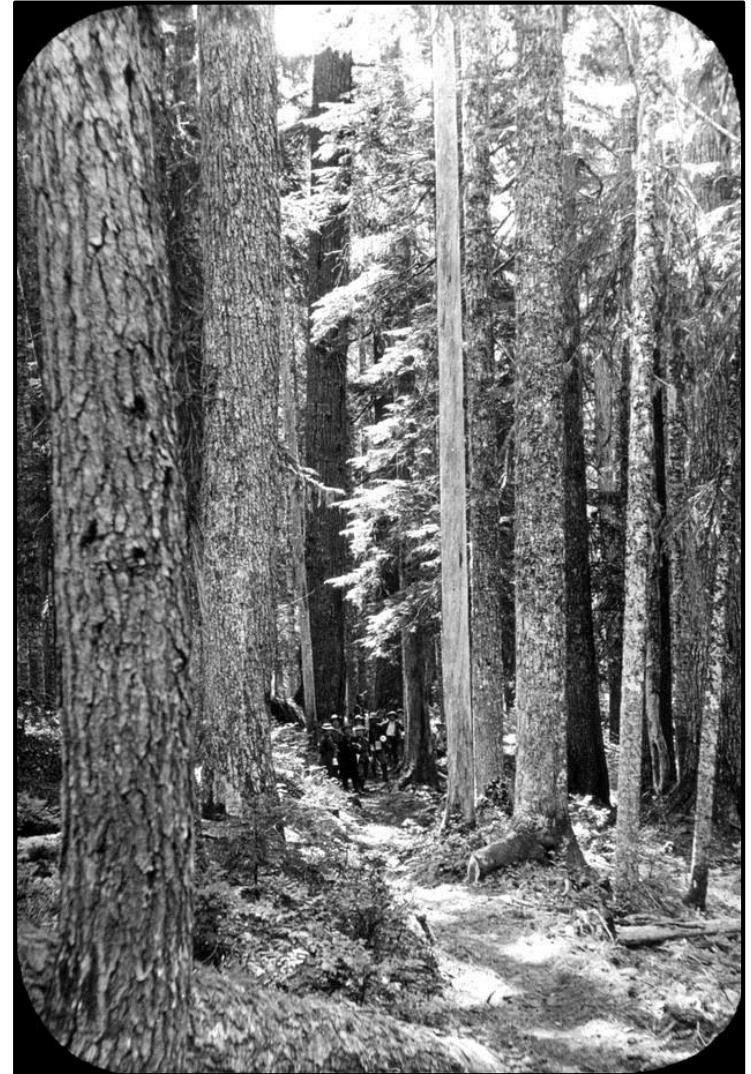
Substantial amounts of biomass

Inefficient wood utilization in past

May have created a mid-term “boom”

Older 2nd growth forests may contain large amounts of CWD

Many taxa *rely* on large structures











A GLANCE BACKWARDS

In a topographically diverse landscape with erodible soils and substantial precipitation, CWD played a critical role in “knitting” the landscape together

Ecology of Coarse Woody Debris in Temperate Ecosystems

M.E. HARMON, J.F. FRANKLIN, F.J. SWANSON, P. SOLLINS,
S.V. GREGORY, J.D. LATTIN, N.H. ANDERSON, S.P. CLINE,
N.G. AUMEN, J.R. SEDELL, G.W. LIENKAEMPER,
K. CROMACK, JR. AND K.W. CUMMINS

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MOVING BEYOND MOVING PARTS

Retention and decay of CWD on site contributes to the significant productivity of PNW forests: not only the biological diversity but the ability to grow massive, long-lived individuals of numerous species



MEET YOUR NEIGHBORS

Douglas-fir

Can live for ~200-1000 years

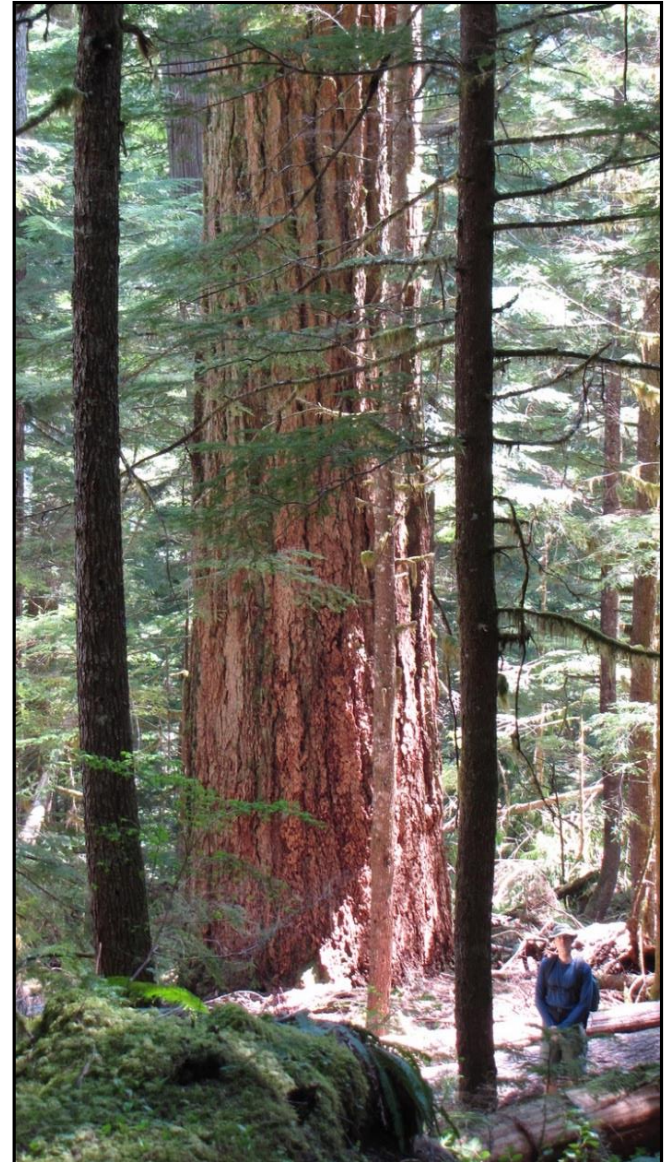
10-12 feet in diameter and 300+ feet tall

Regenerates quickly after disturbance;
shade intolerant in some areas

Can dominate all successional stages

Snags and downed logs can last decades

Excellent structural properties: a premier
building material



RECRUITMENT

**Fires, windstorms,
volcanoes, and insects**

Various scales and intensities

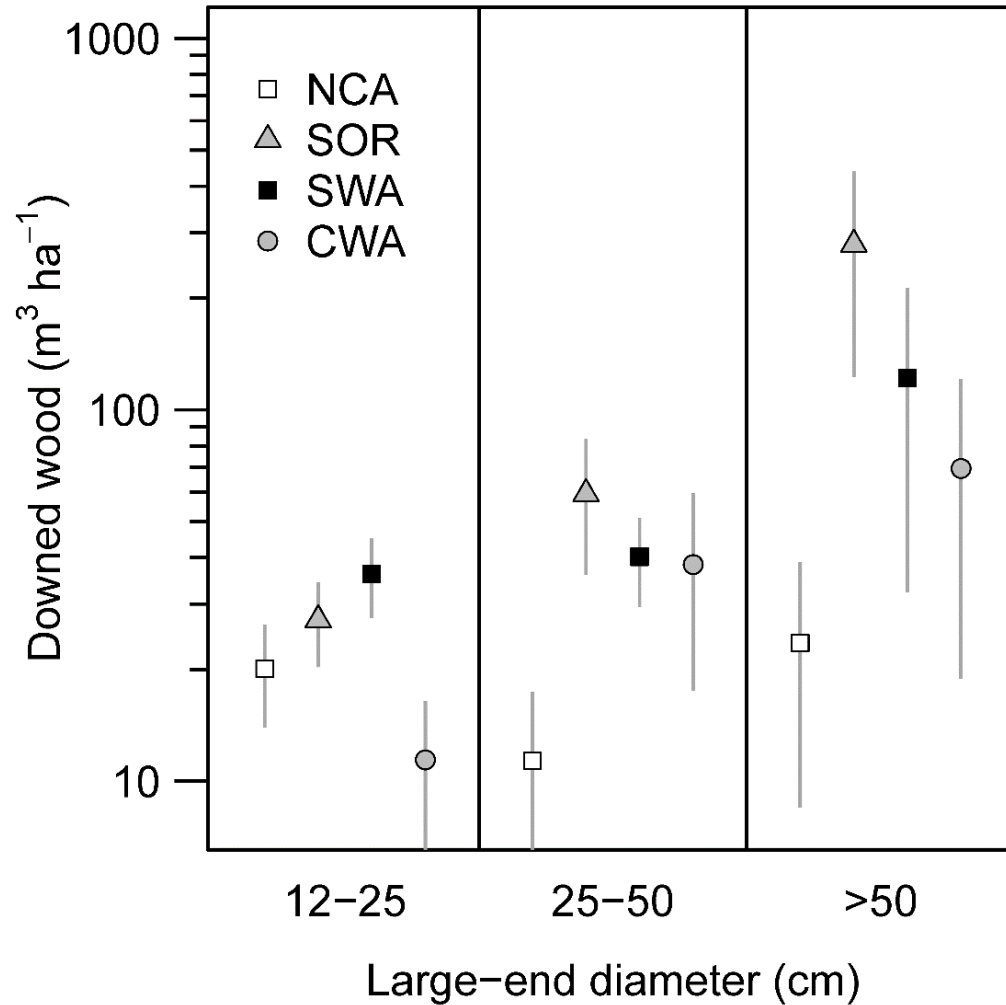
**Disturbance determines
CWD quantity and quality**

**Management alters
these scenarios**





INHERITANCE



Linden, D.W. and G.J. Roloff. 2013. *Forest Ecology and Management* 310:1045-1056.





DO RETENTION GUIDELINES MEET SPECIES NEEDS?

Feature	OREGON			WASHINGTON		
	Number per acre	Minimum height	Minimum diameter	Number per acre	Minimum height	Minimum diameter
Wildlife Reserve Tree	2*	30 feet	11 inch dbh	3**	10 feet	12 inch dbh
Down Log	2	6 feet	>10 feet ³ ; logs >20 feet ³ count as 2 logs	2	20 feet	12 inch dbh at small end
Green Recruitment	2*	30 feet	11 inch dbh	2	30 feet with 1/3 live crown	10" dbh

*OR forest practice rules stipulate leaving wildlife trees or green recruitment trees.

**If wildlife reserve trees are not present, only 2 green trees per acre.

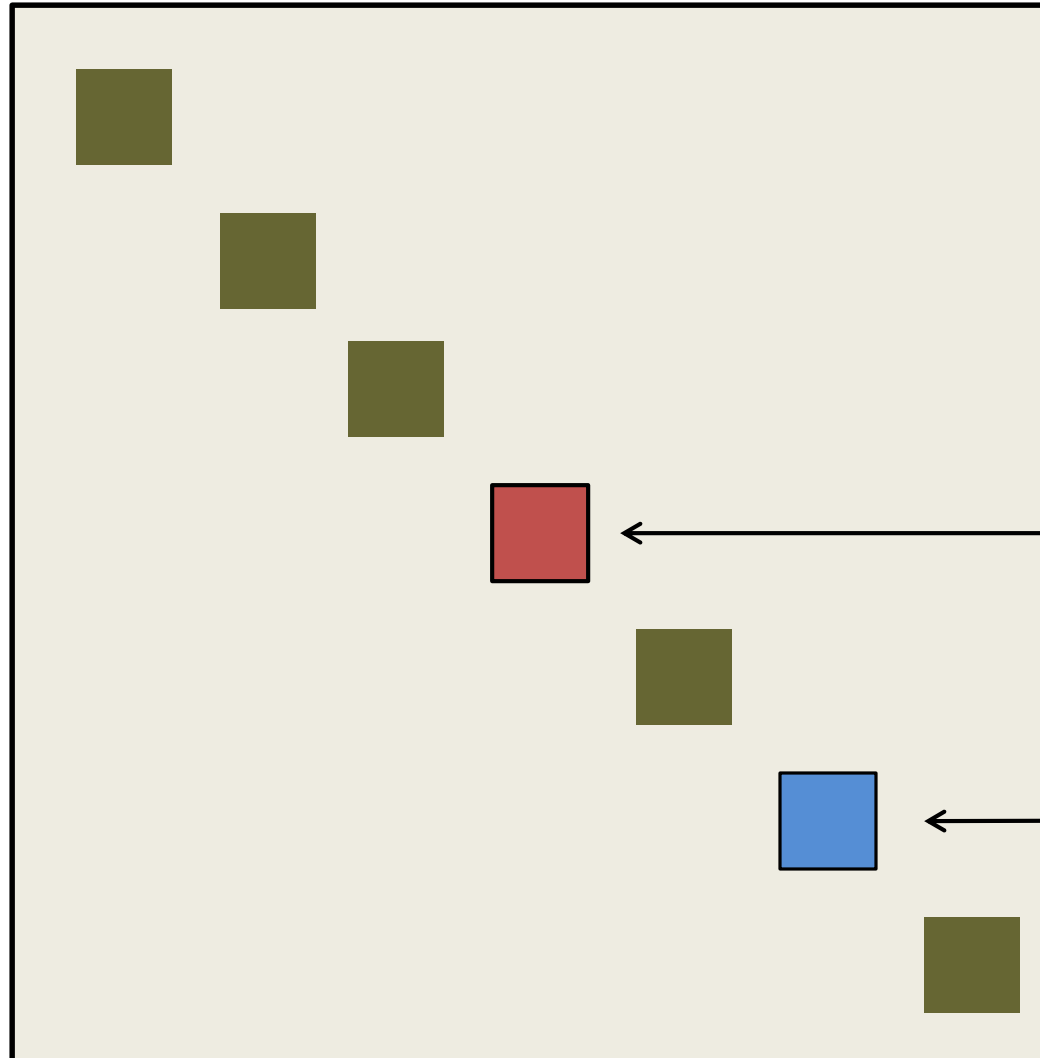


Oregon Slender Salamander (*Batrachoseps wrighti*)

Ensatina (*Ensatina eschscholtzii*)



UTILIZATION-Will 2 logs/acre support persistence of Oregon slender salamanders?



Plots are 81 m²

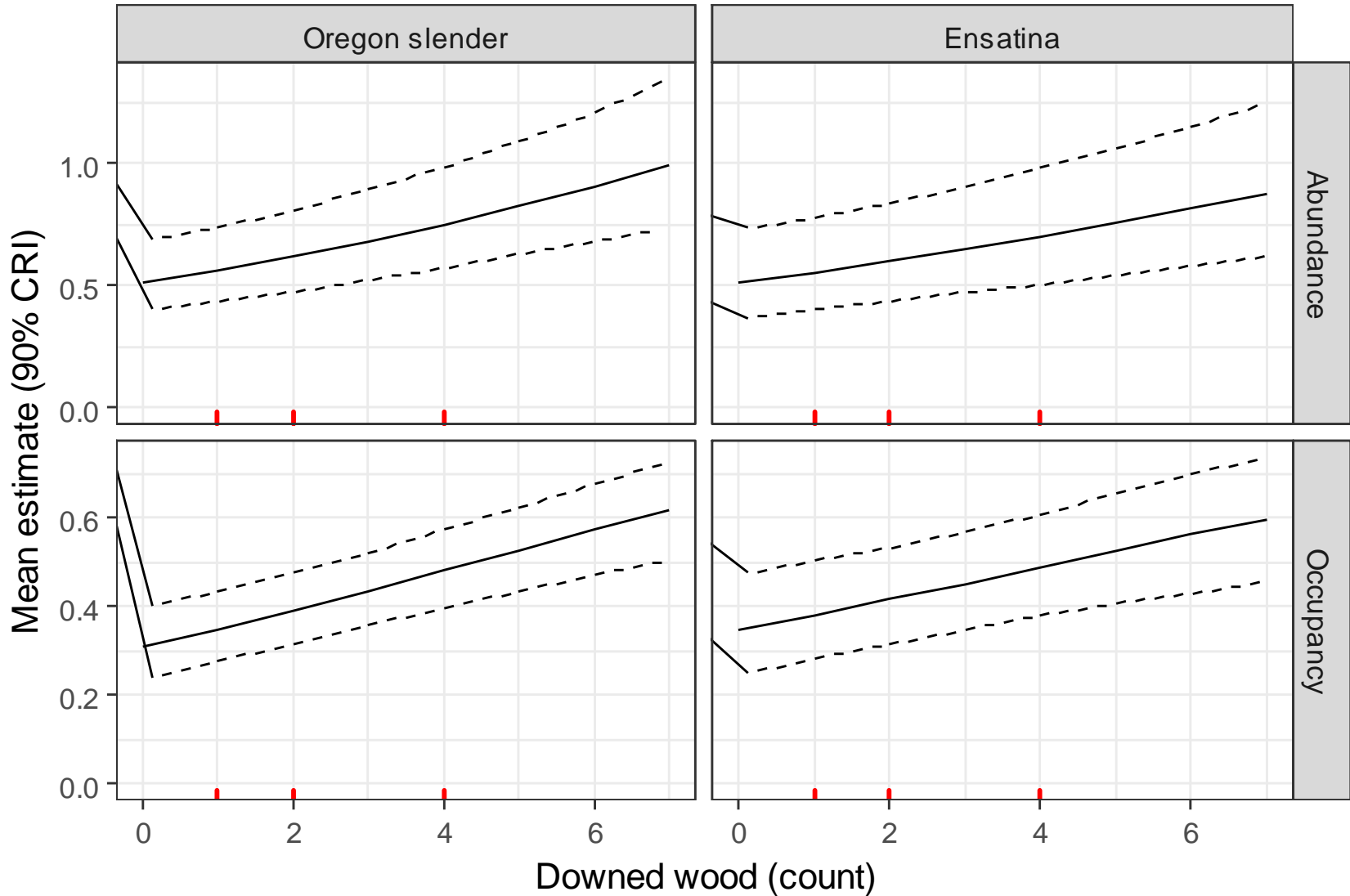
Plot occupancy (θ)

Plot abundance (λ)





RESULTS-88 harvest units, 2013-2017



DISTRIBUTION



METHODS


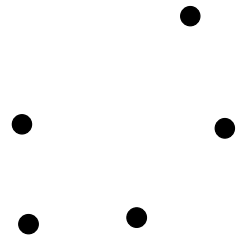
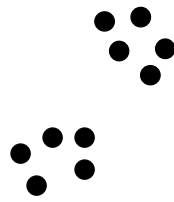
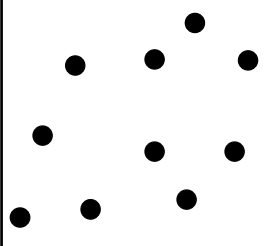
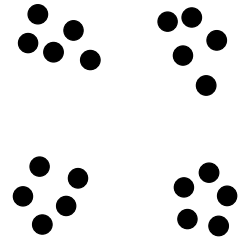
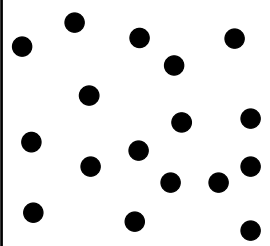
Experimental Design and Analysis

Random assignment to one of 6 treatments: dispersion \times density

Landscape was characterized in a 1000 m buffer around each stand

Used median NN distance to quantify dispersion

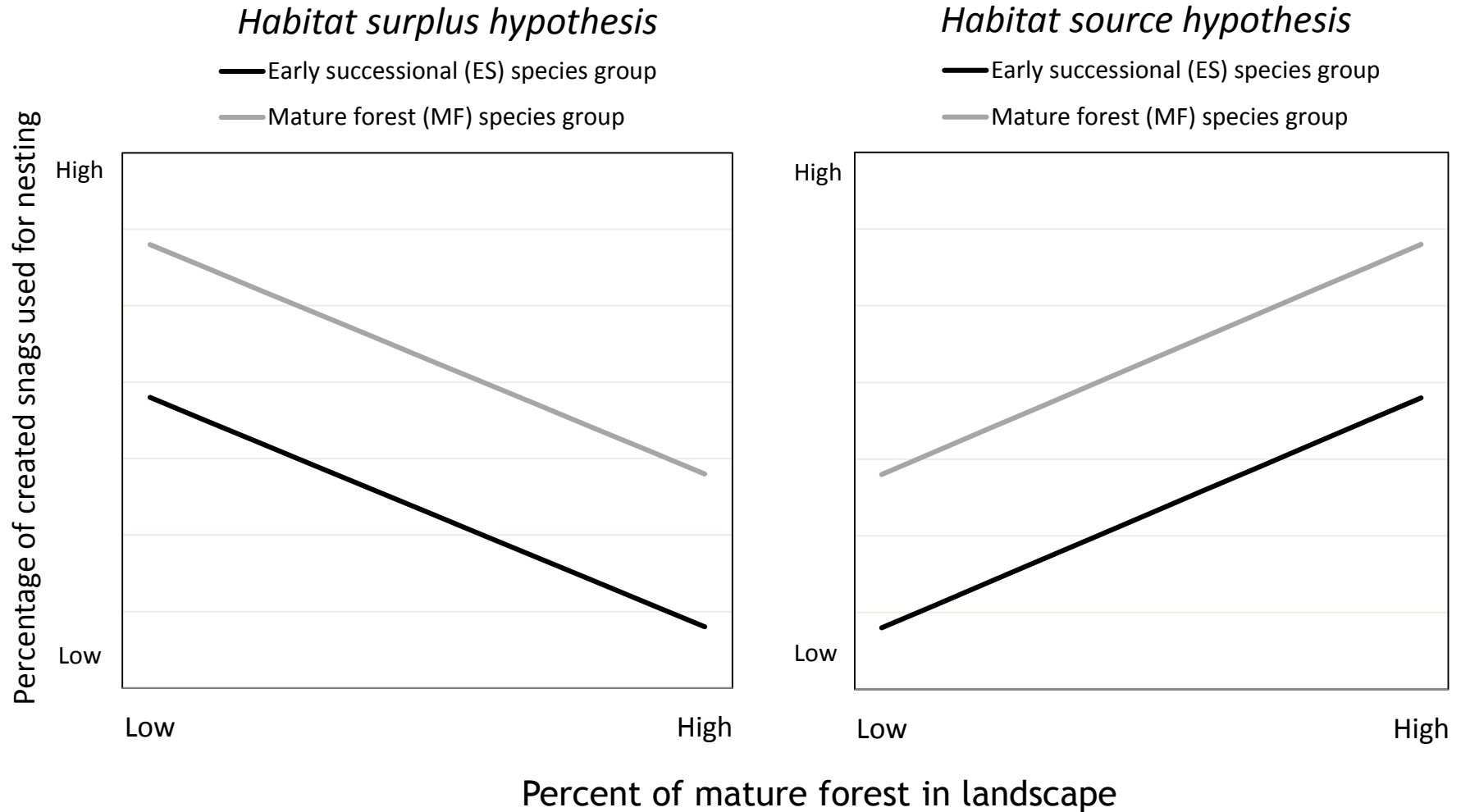
Changes to dispersion since 1999

Density	Clumped created snags	Dispersed created snags
<i>Low</i> (0.5 created snag/ha)		
<i>Medium</i> (1 created snag/ha)		
<i>High</i> (2 created snags/ha)		



Does landscape composition interact with local conditions?

Habitat surplus and habitat source hypotheses



Kroll, A.J. et al. 2012. *Biological Conservation* 152:145-151.



RESULTS

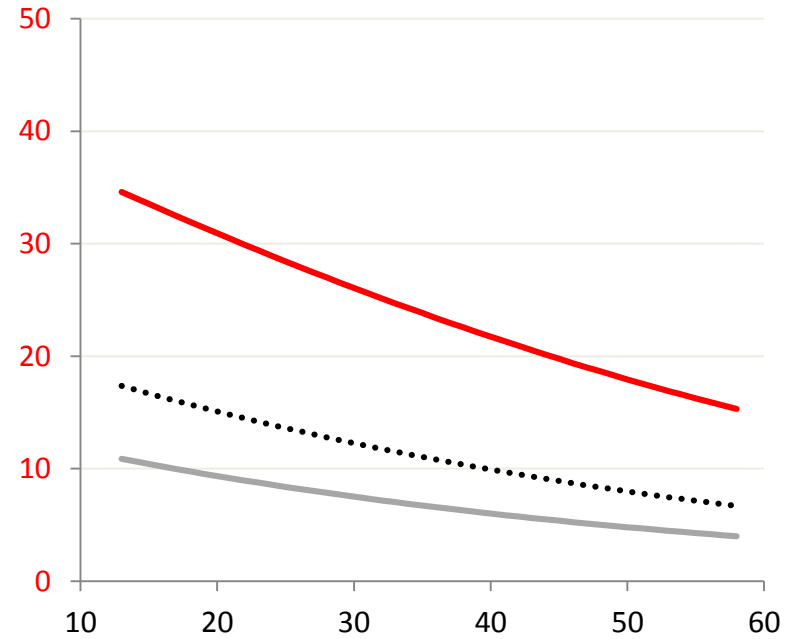
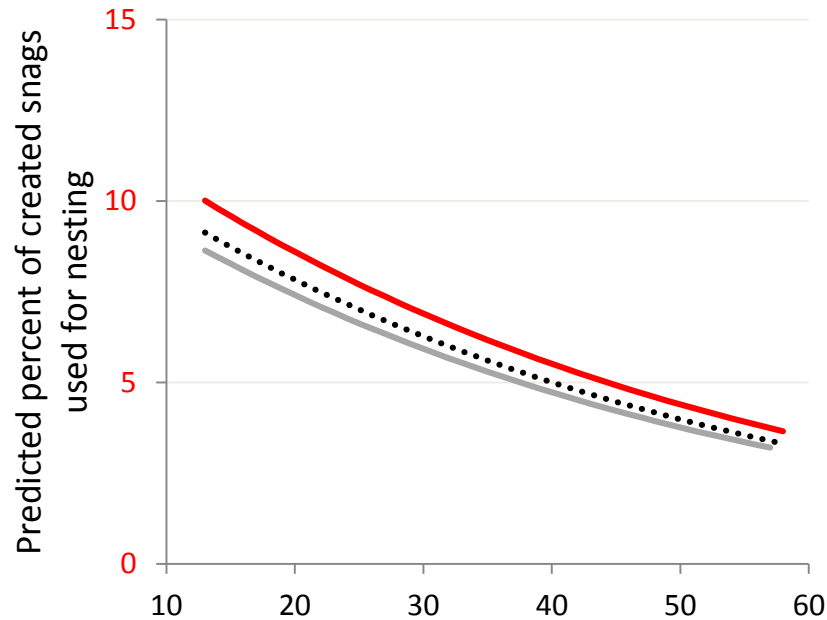
Support for the habitat surplus hypothesis

Early successional (ES)

Mature forest (MF)

- Median nearest neighbor distance = 5 m
- Median nearest neighbor distance = 45 m
- Median nearest neighbor distance = 113 m

- Median nearest neighbor distance = 5 m
- Median nearest neighbor distance = 45 m
- Median nearest neighbor distance = 113 m



Percent of surrounding landscape (1 km radius) in mature forest (> 40 years of age)











THE FUTURE IS ARRIVING MOMENTARILY

Douglas-fir is an invasive species with a recent evolutionary history in the PNW

Directional selection against large trees continues

Douglas-fir capitalized on a climatic window that is closing

**Conserving the ecological infrastructure
to grow, retain, and process
the largest terrestrial organisms
on the planet is the goal**

