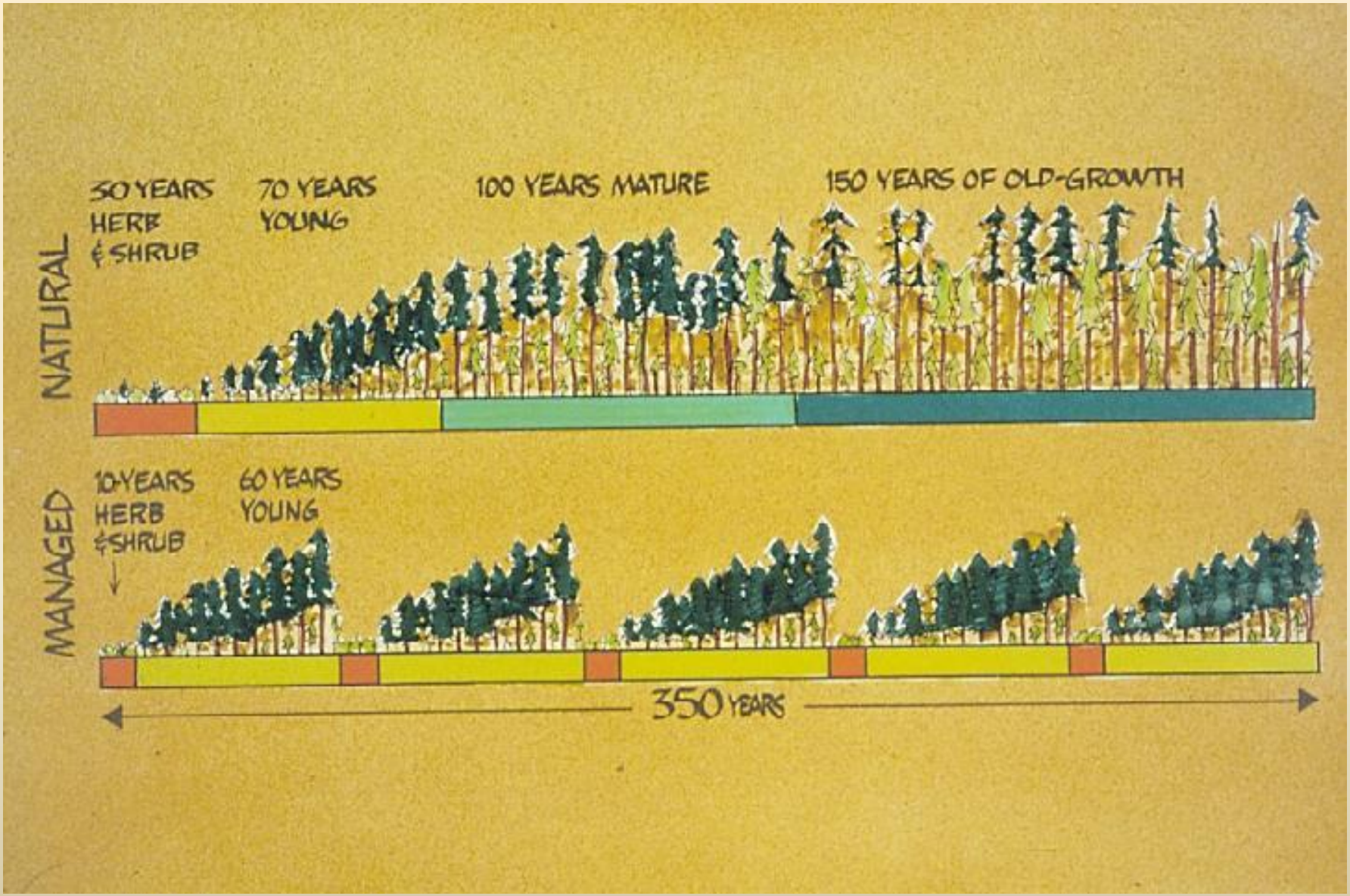
# Early Seral Through Time

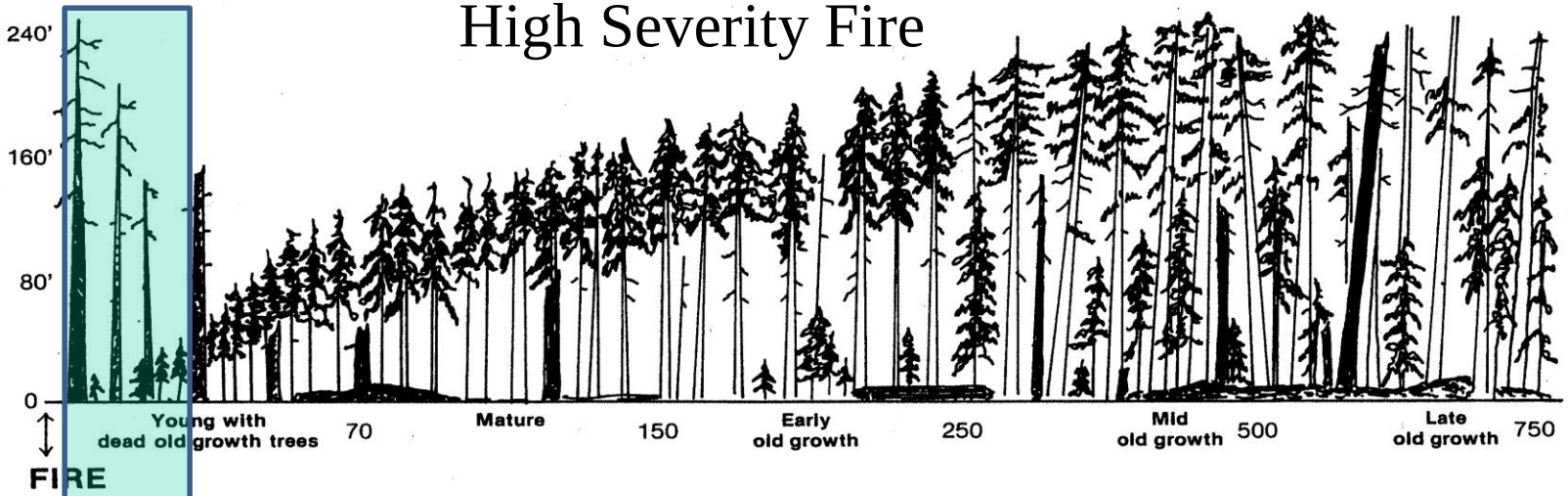
**Thomas Spies**
**PNW Research Station**

Song Bird Symposium November 18, 2014

# Early seral vegetation is a short part of successional sequence

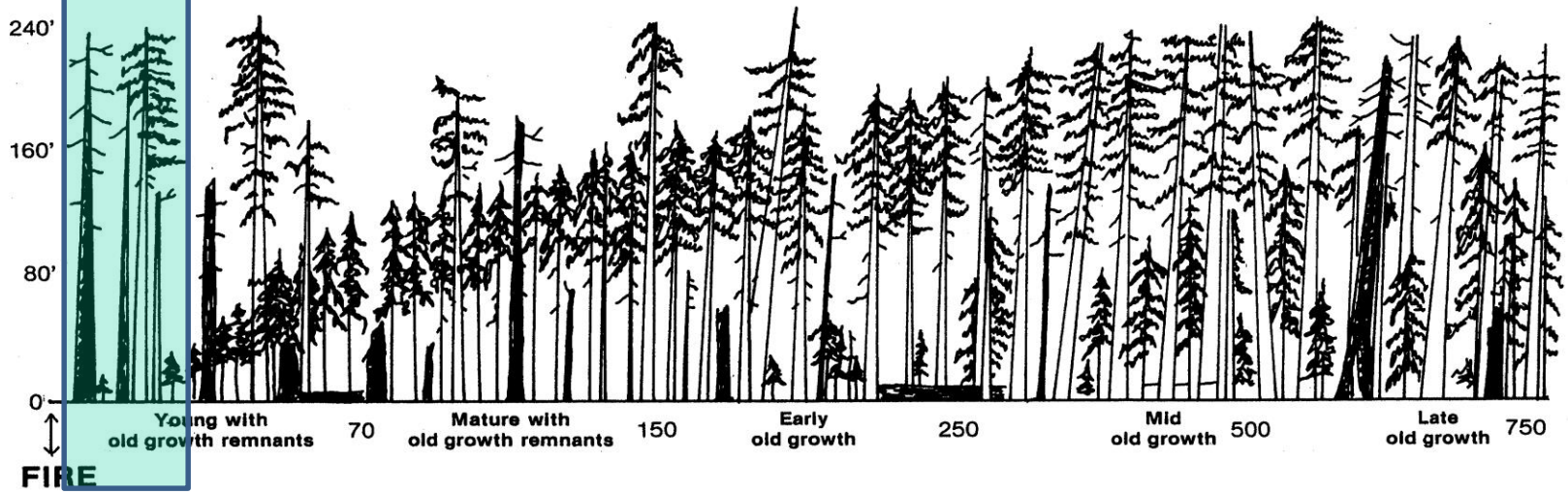


# High Severity Fire




**ES**

# Mixed-Severity Fire



# Topics

- What is early seral?
- Disturbance effects
- Successional pathways
- Regional patterns and trends

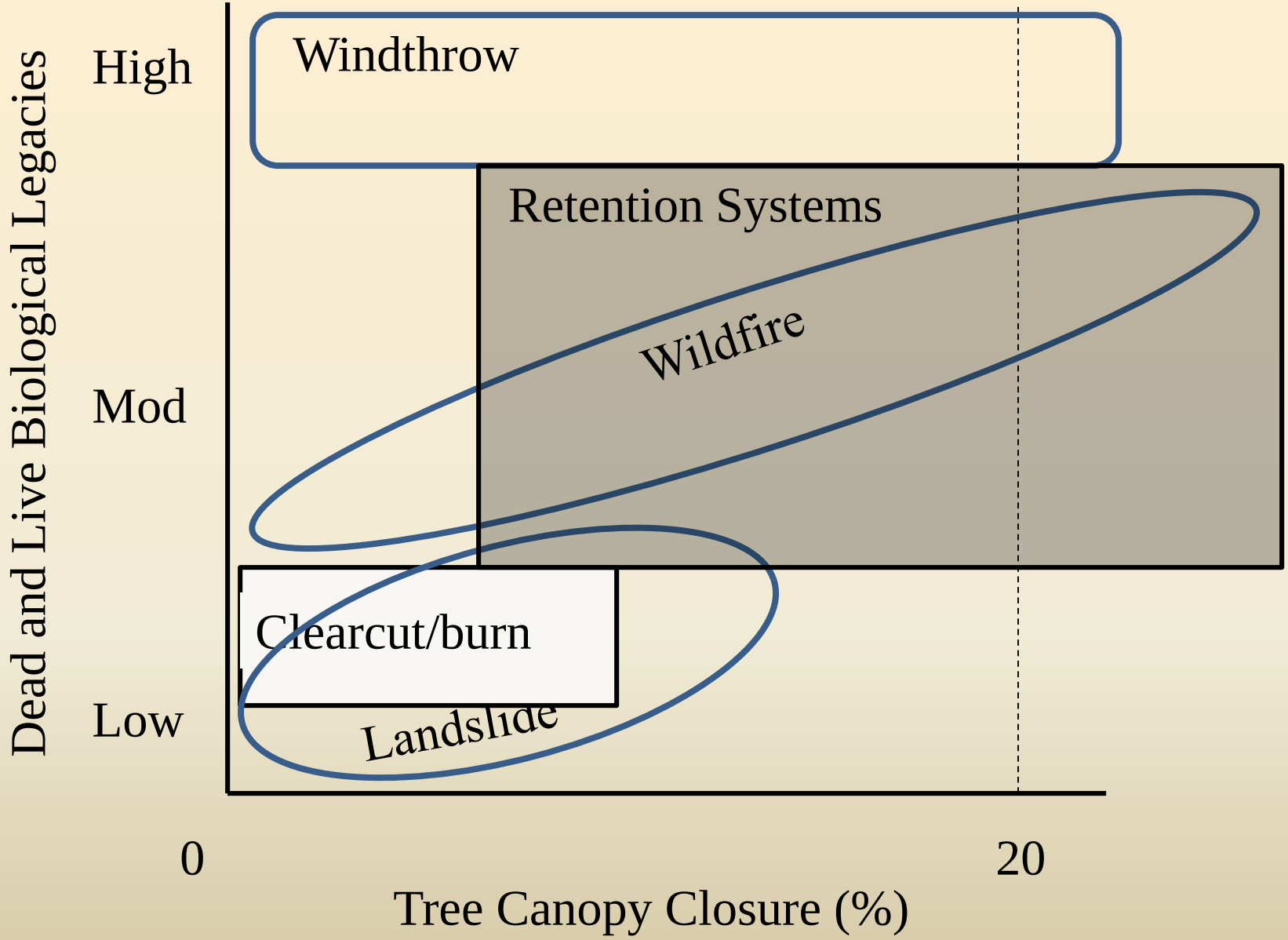
# A Definition and Characteristics

- An stage in forest succession that is the immediate product of a disturbance that removes most of the canopy cover
- Characteristics
  - Less than 20% canopy cover remaining
  - Large enough patch for light-demanding species
  - Has biological legacies from previous forest
  - Short lived, depending site productivity

# Components of Early Seral

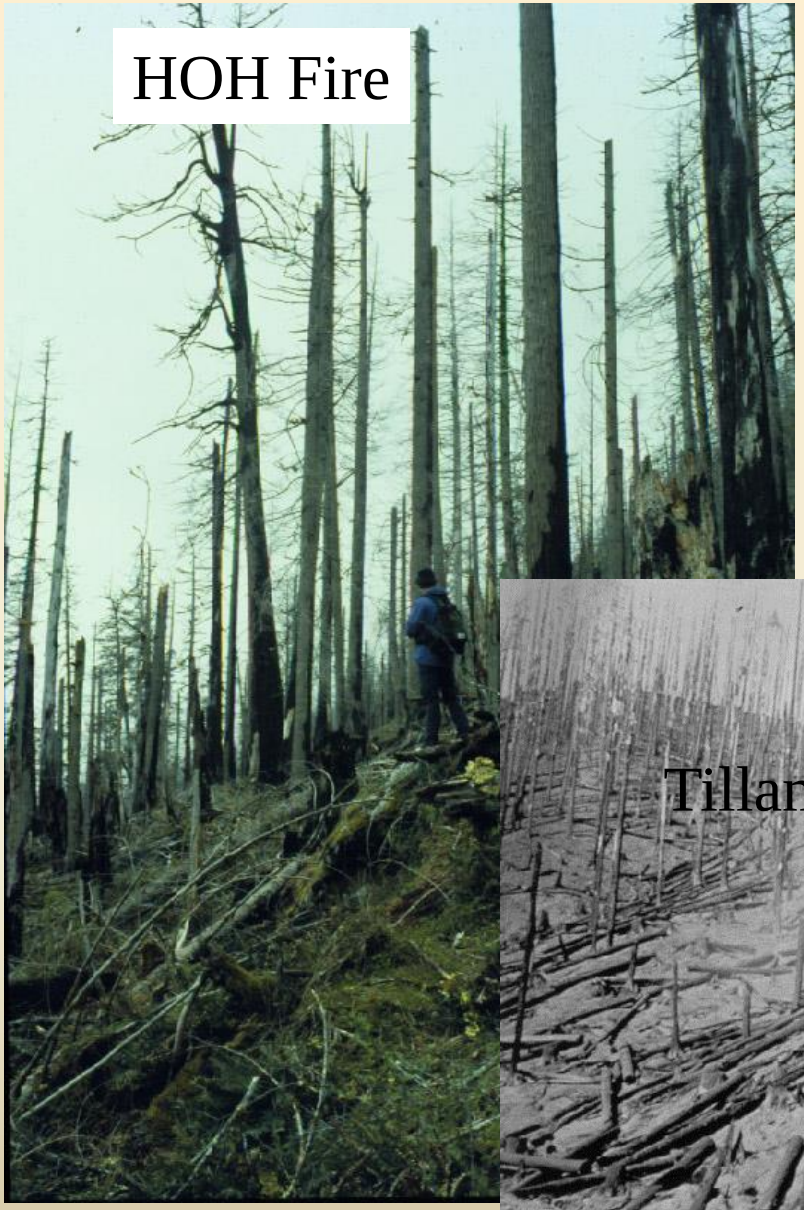
- Loss of tree canopy
- And  reduction or loss one or more of  following:
  - Standing trees
  - Understory vegetation
  - Forest floor litter
  - Large woody debris
  - Soil organic matter
  - Tree roots

# Early Seral Based on What Remains

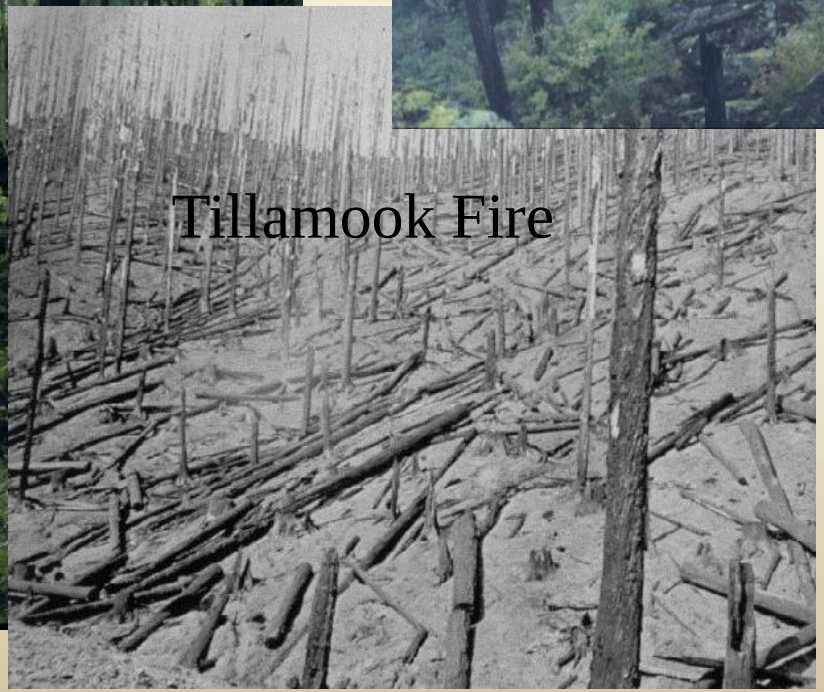


Blowdown, Bull Run Watershed

# High Severity Wildfire





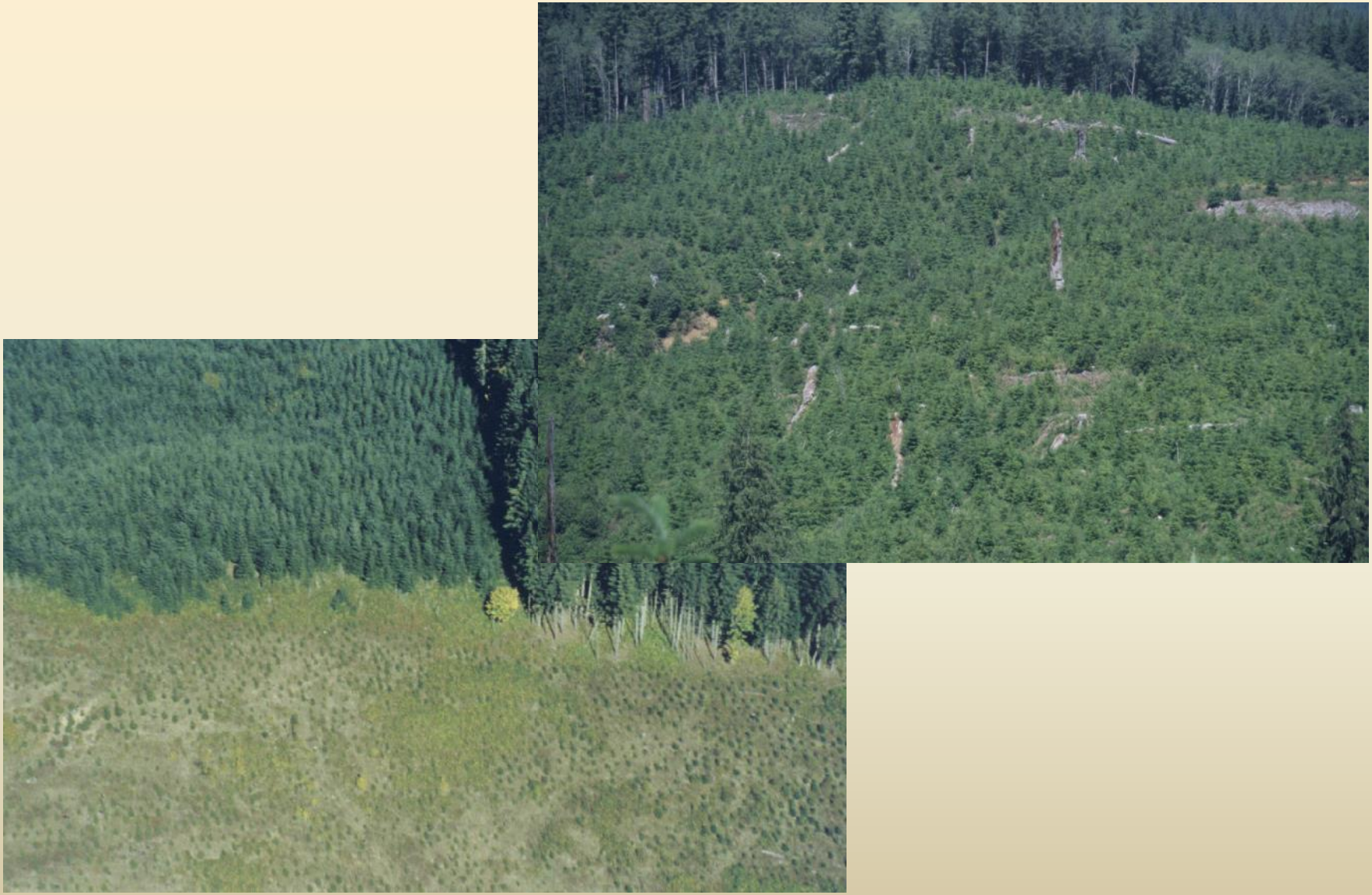


# Landslides in Coast Range

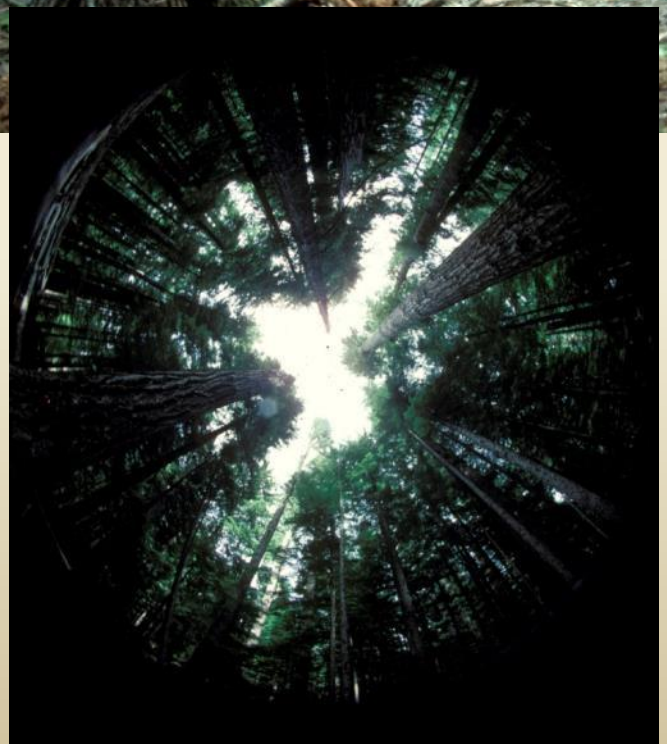
Photo by Rob Pabst

# Long-lived early seral related to land-use history and site conditions

# Early Seral on Intensively Managed Forest Land

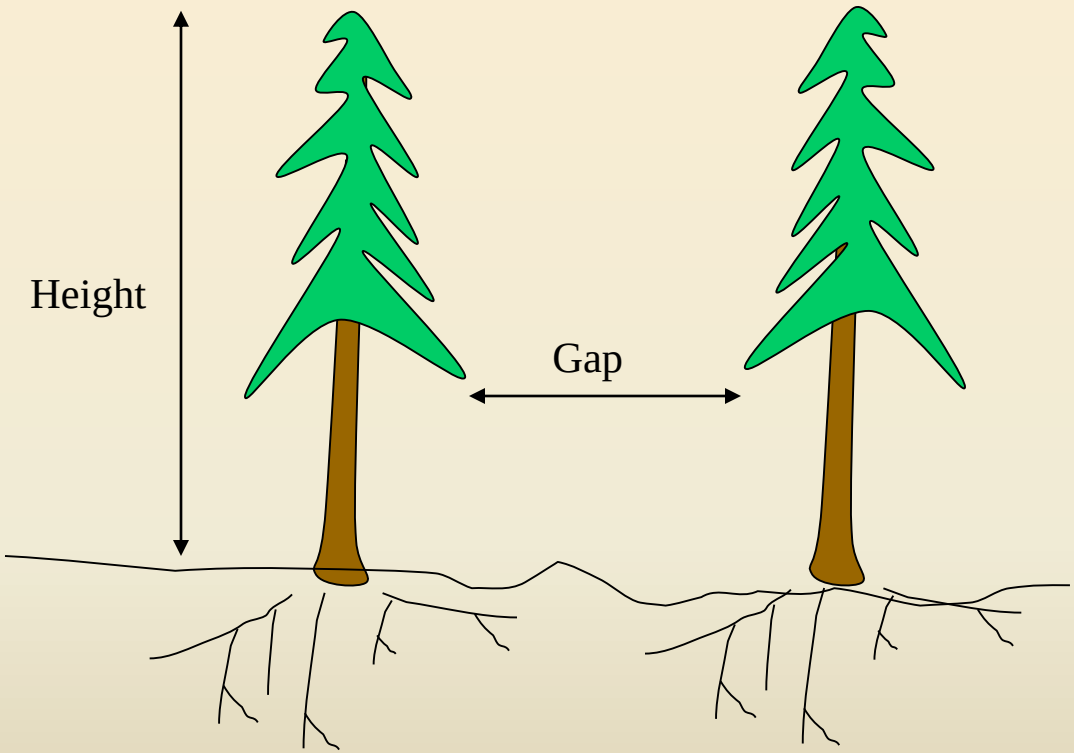


# Gap Disturbances



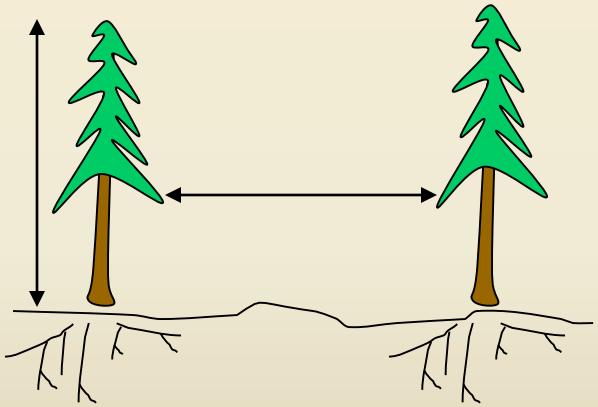
# Gap Size Effect Dense Conifer Forests

Diameter/Ht Ratio = **0.5**




**ES plant species infrequent**

Diameter/Ht Ratio = **1.0**



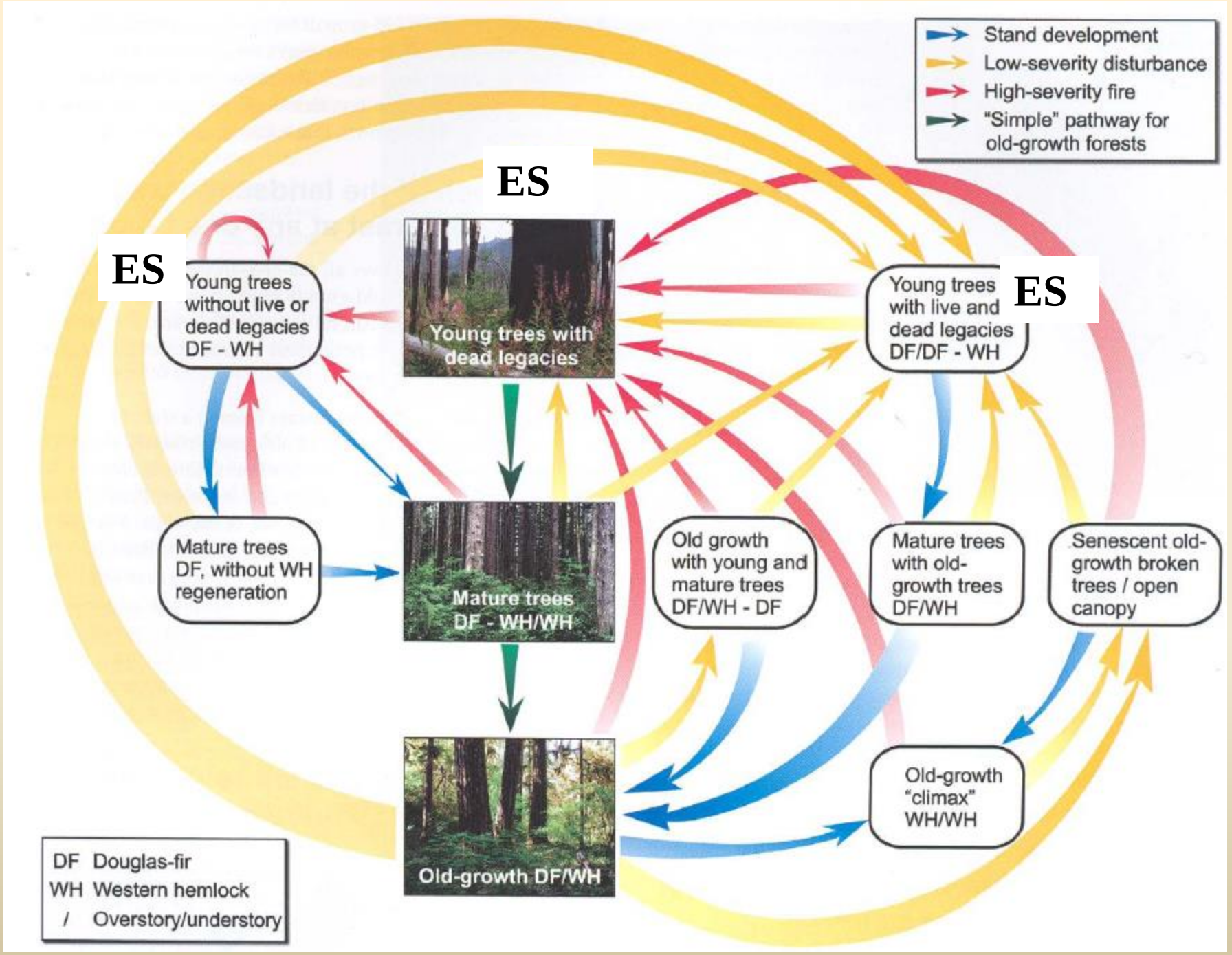
**ES plant species begin to appear**

# Fire as a gap process in dry, fire-prone forests

# Successional Pathways

ES


DF Douglas-fir
WH Western hemlock
/ Overstory/understory

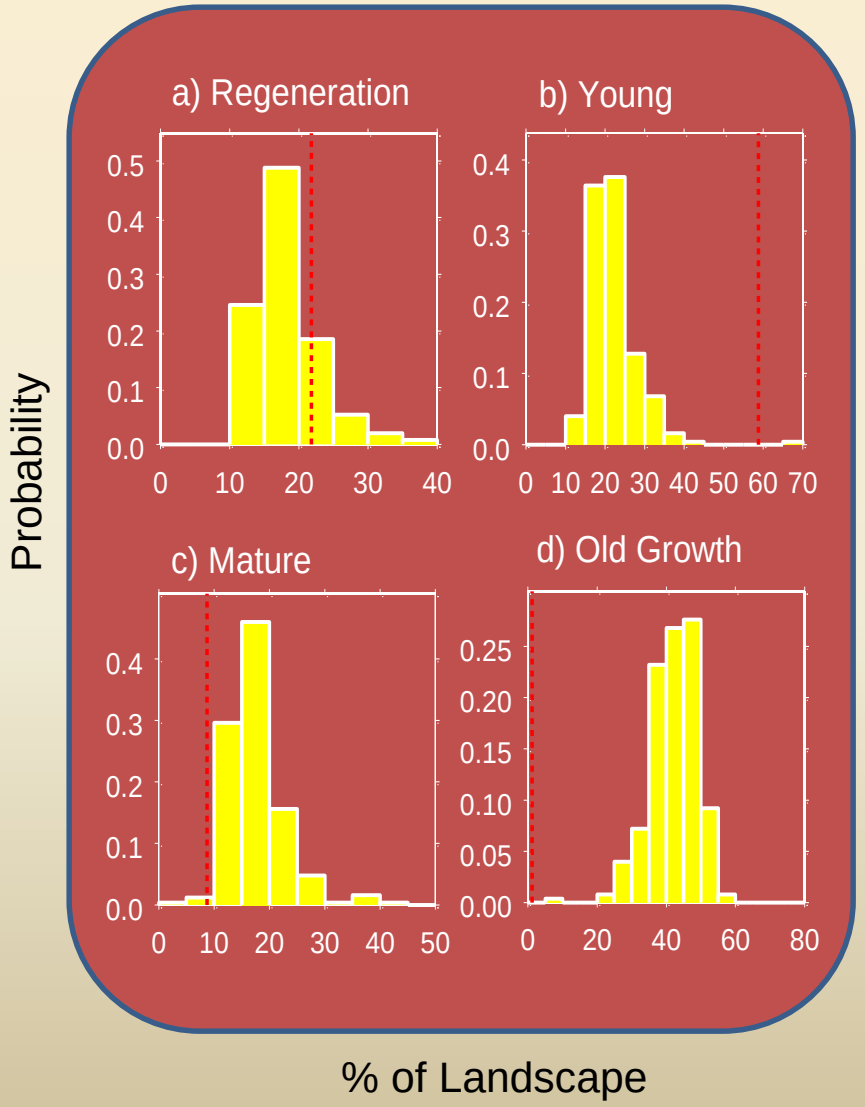

Stand development
Low-severity disturbance
High-severity fire
"Simple" pathway for old-growth forests
ES
ES
ES
Young trees without live or dead legacies DF - WH
Young trees with dead legacies
Young trees with live and dead legacies DF/DF - WH
Mature trees DF, without WH regeneration
Mature trees DF - WH/WH
Old growth with young and mature trees DF/WH - DF
Mature trees with old-growth trees DF/WH
Senescent old-growth broken trees / open canopy
Old-growth "climax" WH/WH
Old-growth DF/WH
DF Douglas-fir
WH Western hemlock
/ Overstory/understory

# Early seral creation in the Biscuit Fire

# Historical Range of Variability
## Oregon Coast Range
## % of Landscape

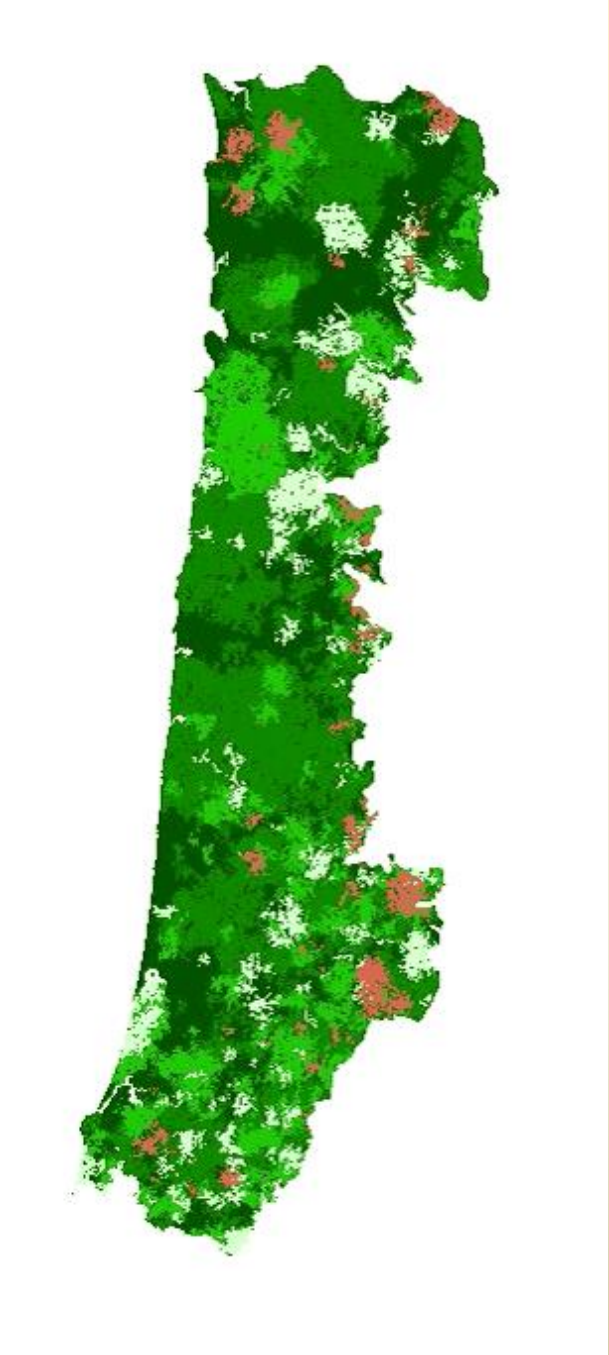
Early Seral: 10-25%

Old Growth: 35-60%



Stand Age

- <10 recent fire
- 11 - 40
- 41 - 80
- 81 - 200
- > 200

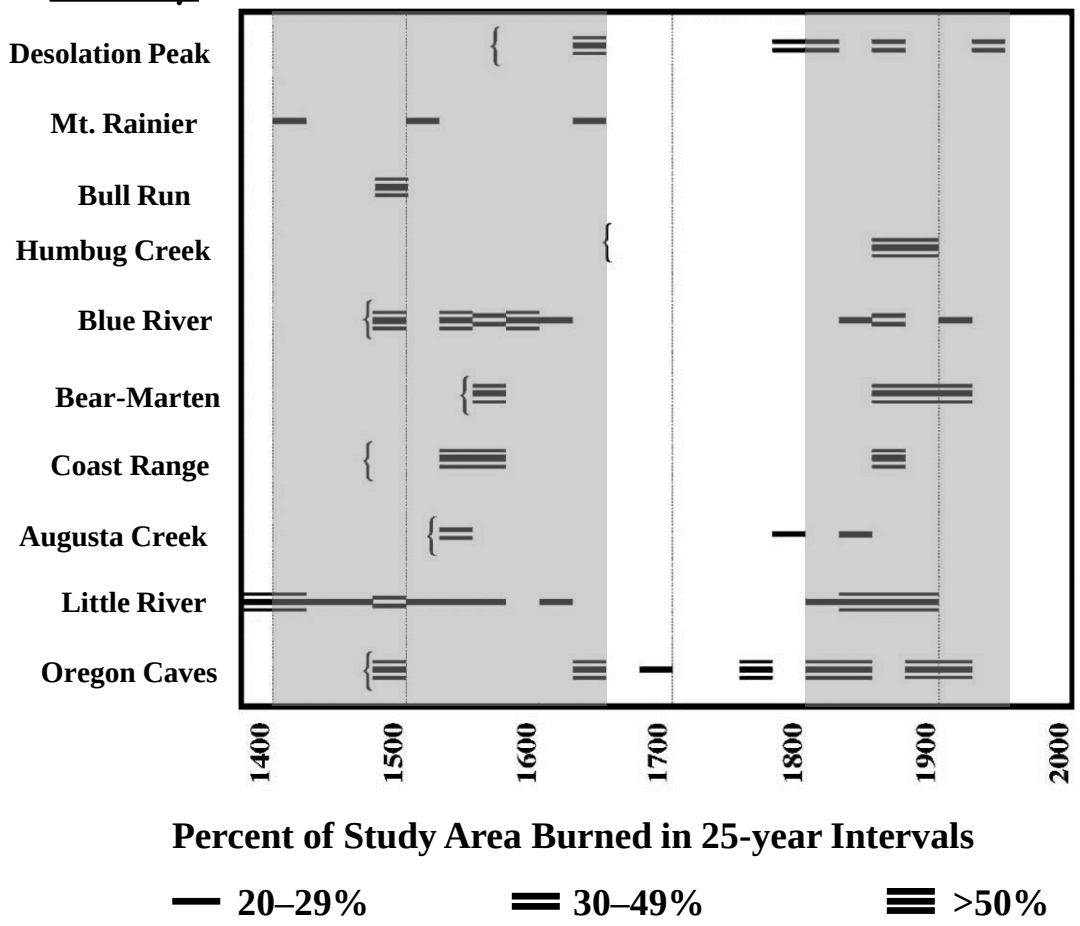


# Three Centuries Of Simulated Pre-Columbian Fire History in Oregon Coast Range

By Nonaka,
Wimberly and Spies

# Fire Synchrony in Western Oregon and Washington

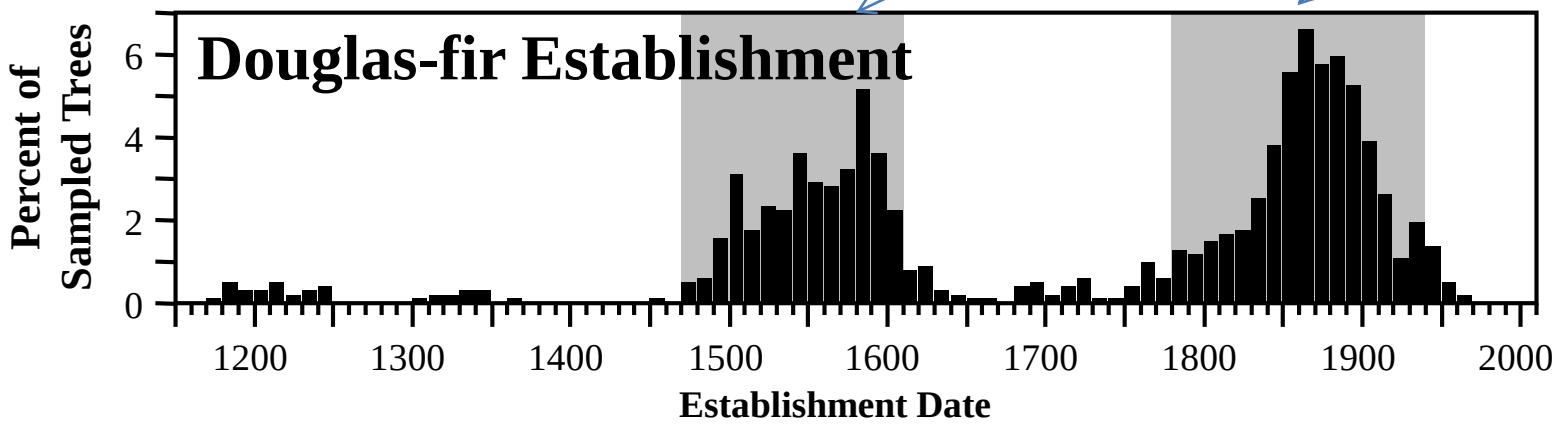

## Study




Weisberg and Swanson 2003

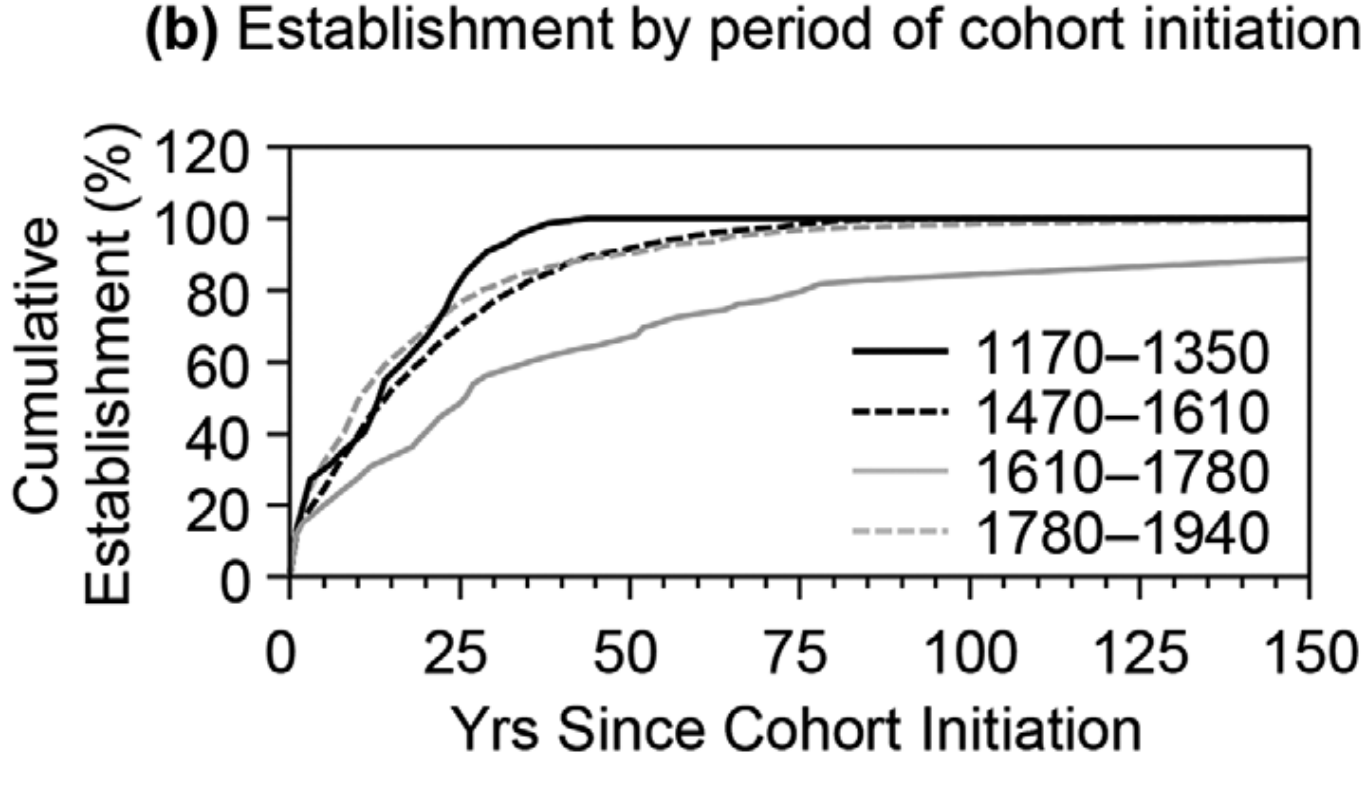
Douglas-fir establishment was regionally episodic during periods of widespread fire

Warm
Dry
Climate
Periods




Alan Tepley, HJ Andrews Forest

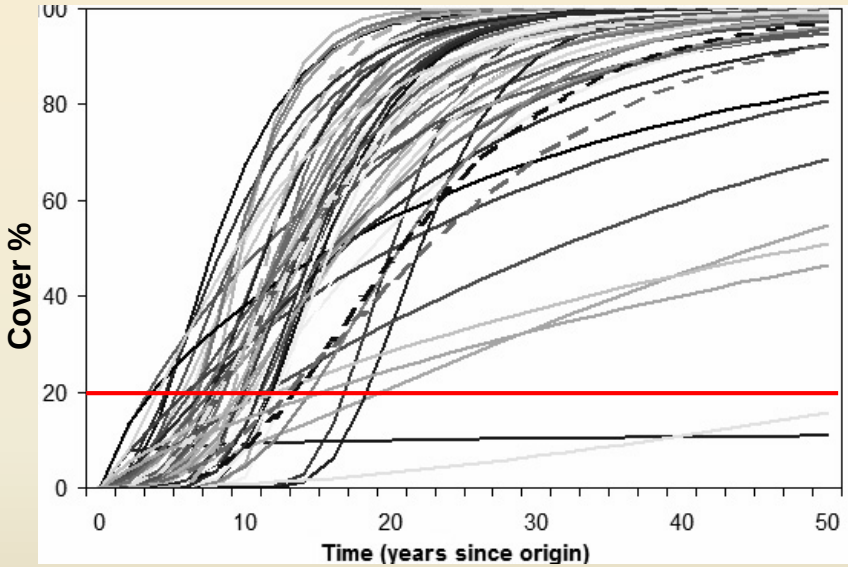
# Timing of post-wildfire establishment for different historical fire periods in western Cascades



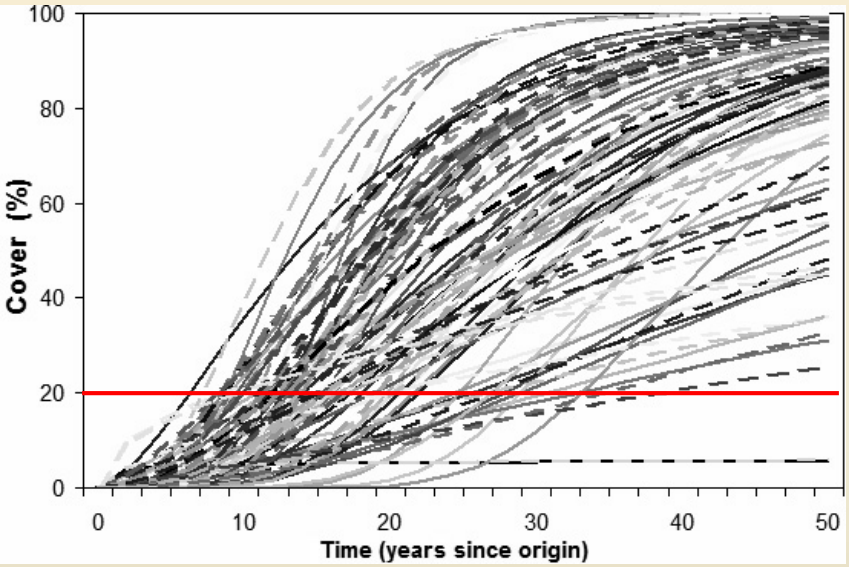

Tepley et al. 2013

# Trends in Canopy Cover Following Clear-cutting on National Forests

Coast Range

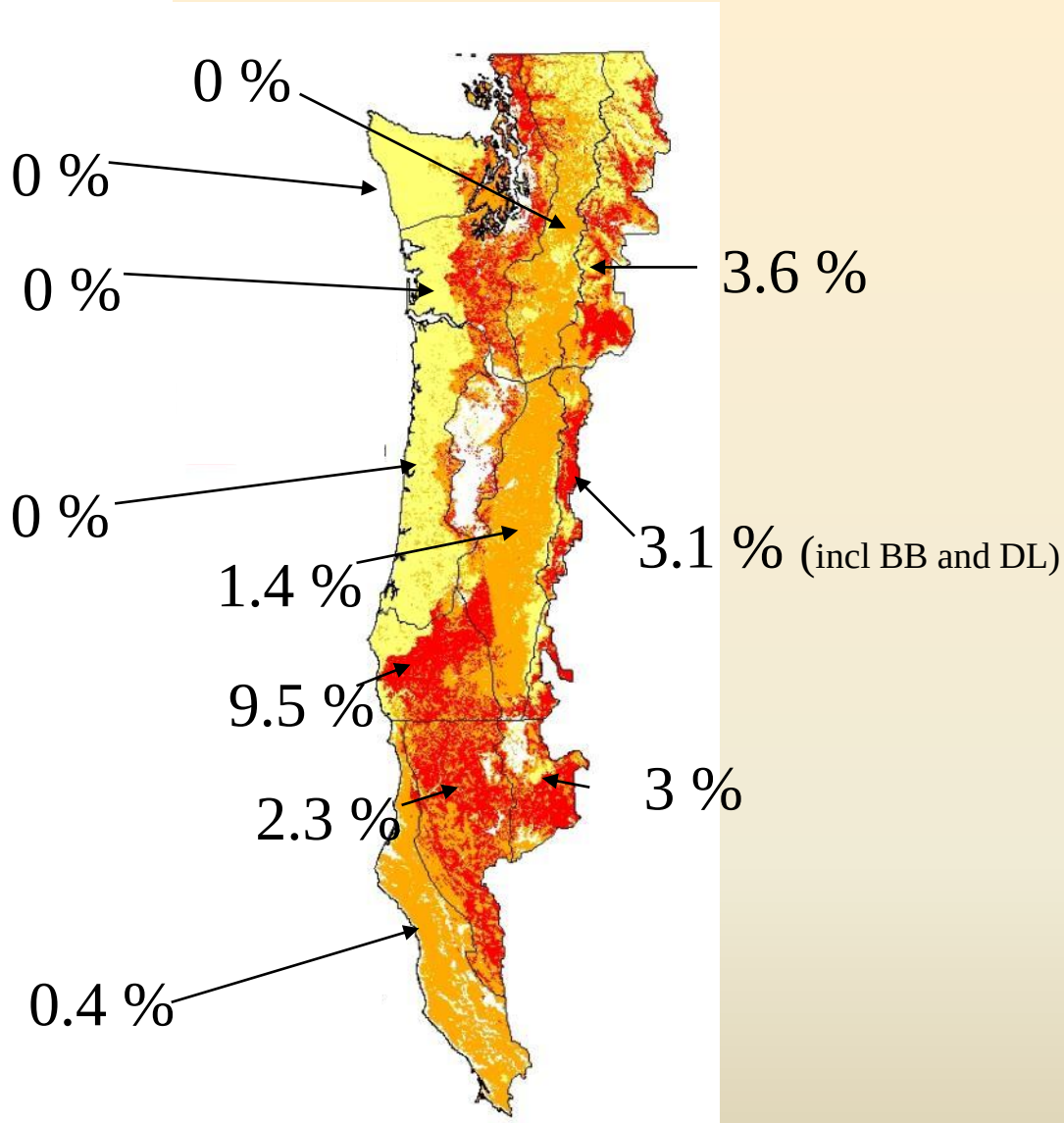



Western Cascades




Yang et al. 2005

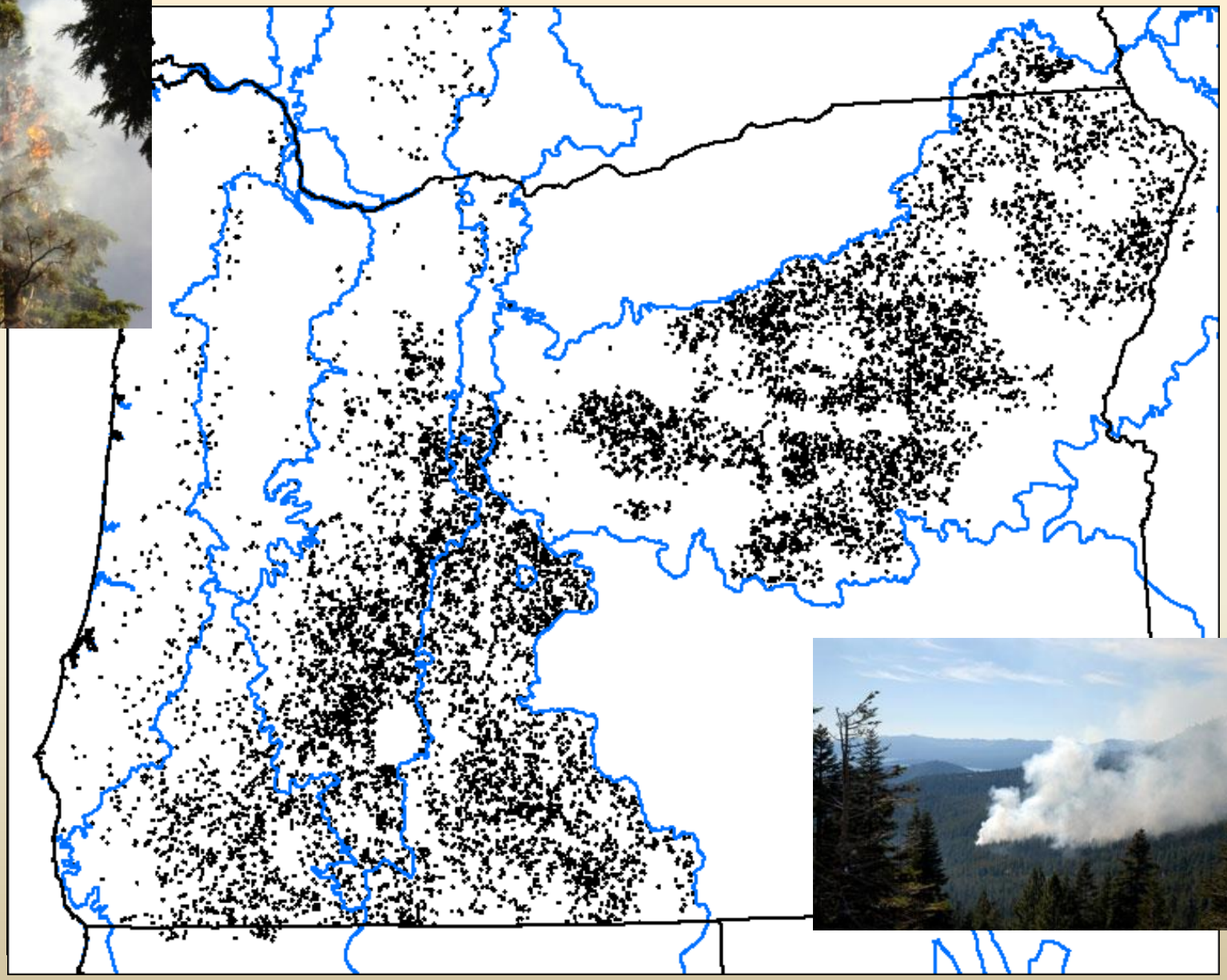
# Wildfire Conversion of Old Forest to Early Successional 1993-2003



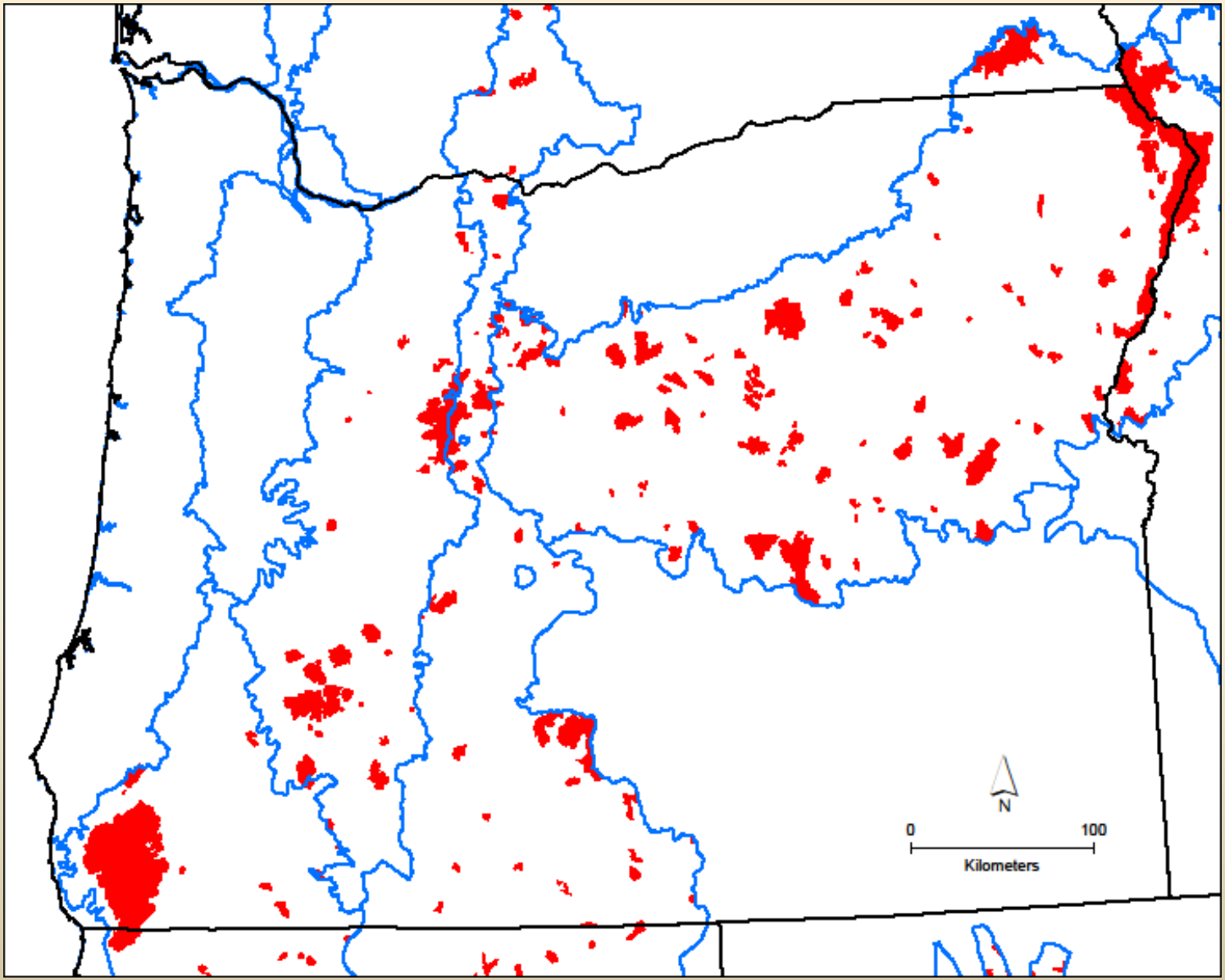

**Percent Loss of Older Forest on a Decadal Basis By Province**

Based on Moeur and Spies et al. 2005

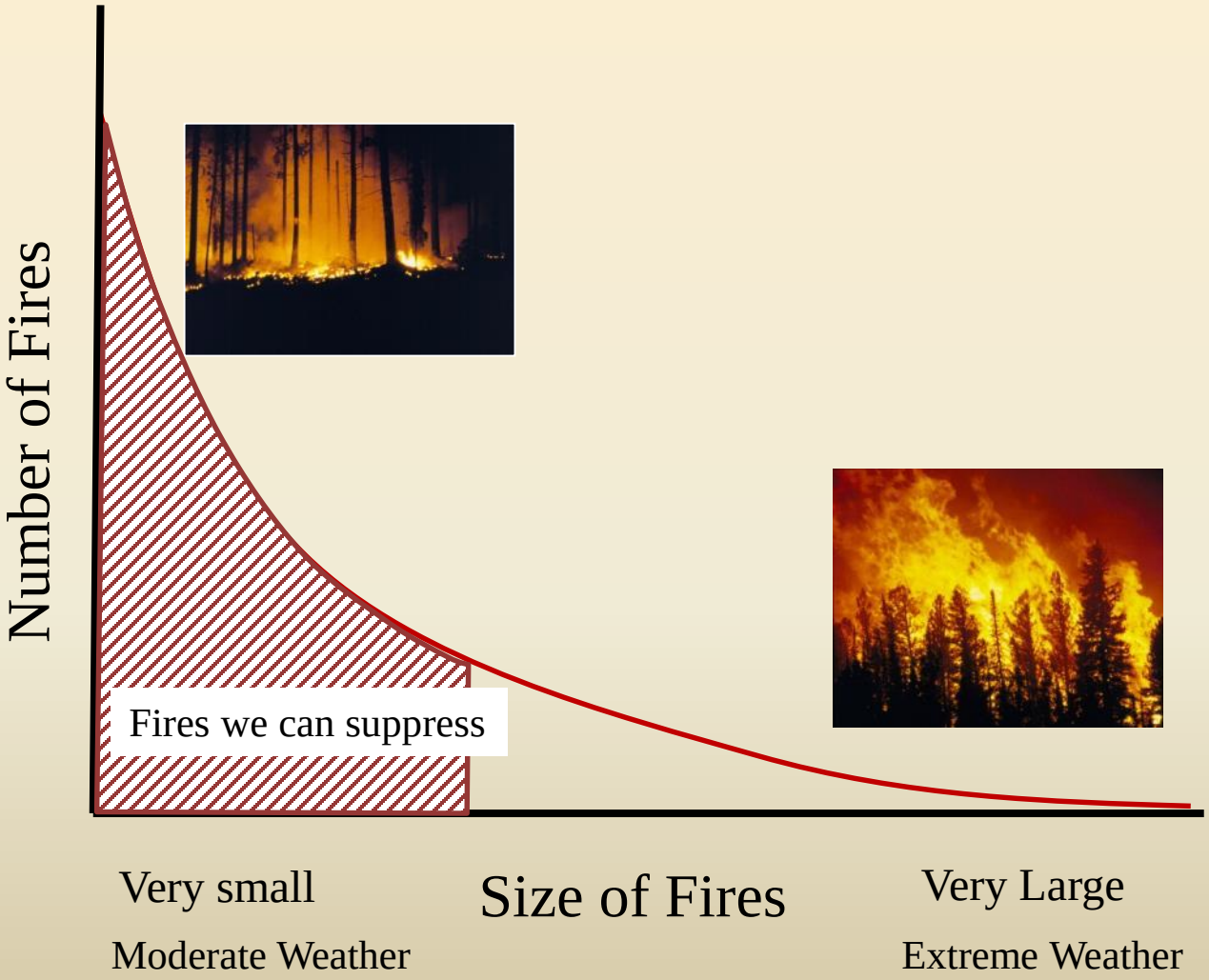
# Fire starts from lightning 2003-2012
# Suppressed by fire crews

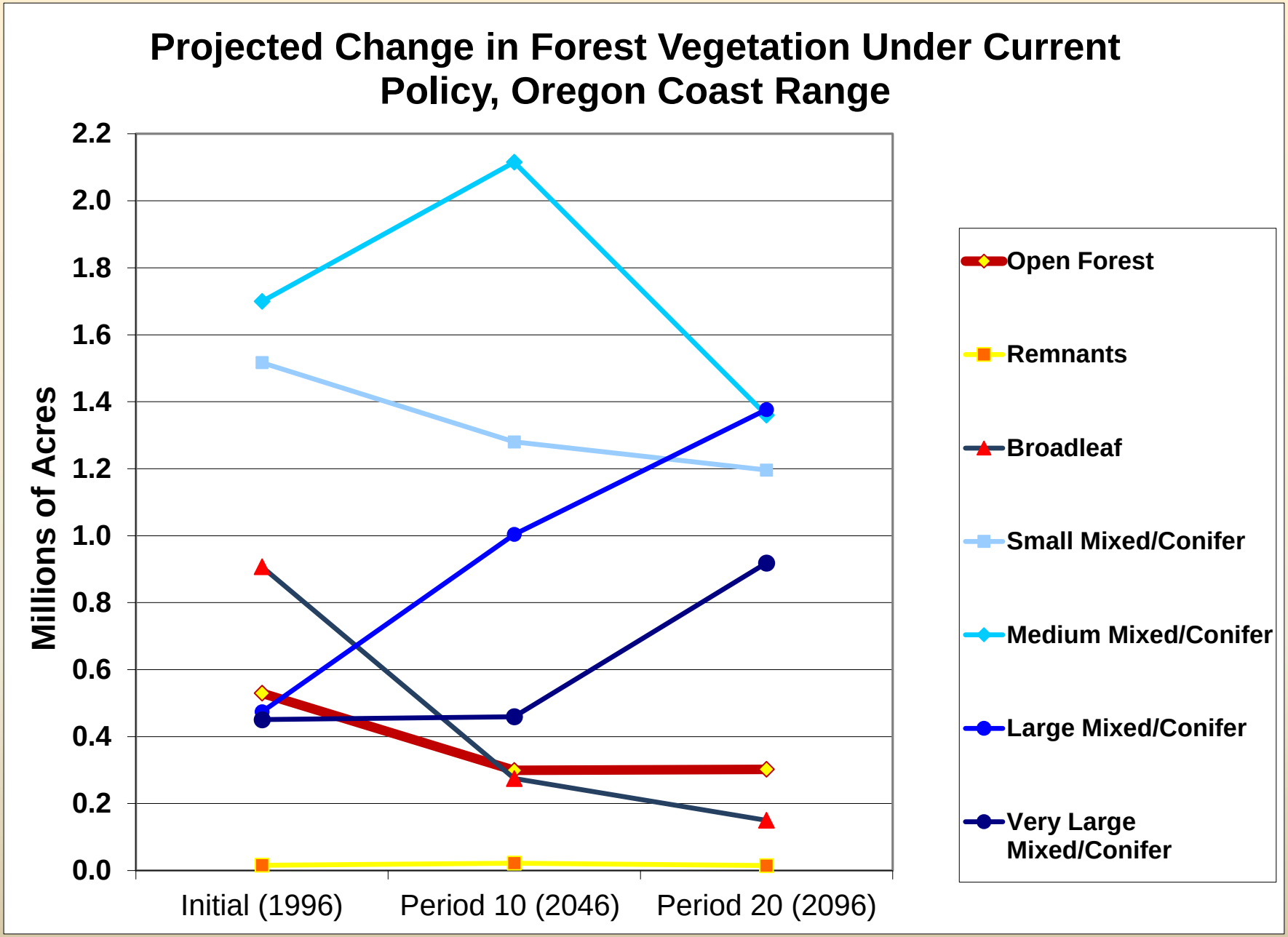


# Large Wildfires 2003-2012



# Fire Size, Frequency and Suppression




Projected Change in Forest Vegetation Under Current Policy, Oregon Coast Range
Millions of Acres
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Initial (1996)
Period 10 (2046)
Period 20 (2096)
Open Forest
Remnants
Broadleaf
Small Mixed/Conifer
Medium Mixed/Conifer
Large Mixed/Conifer
Very Large Mixed/Conifer

# Conclusions

- All ES Share the same element:  Loss of tree canopy cover to low levels (e.g. <20%)
- A transitory stage that lasts 15 ~ 30 years depending on site productivity and vegetation type
- Disturbances produce different kinds of ES vegetation structure

# Conclusions

- Rate of ES creation has varied over time under historical fire regime
- May now have less ES than historical on westside as a result of fire suppression
- ES created by intensive forest management is not the same as that created by natural disturbances


Thank You