



# **Fire on the Landscape: Past, Present and Future Fire Regimes in Western Oregon**

Jane Kertis  
Forest Service  
NW Oregon Ecology Group

# Outline

- Relationships: climate, vegetation and fire
- Role of Fire in space and time: focus on westside of Oregon
  - Historical role
  - Changing Current role
  - Potential Future role (climate change)

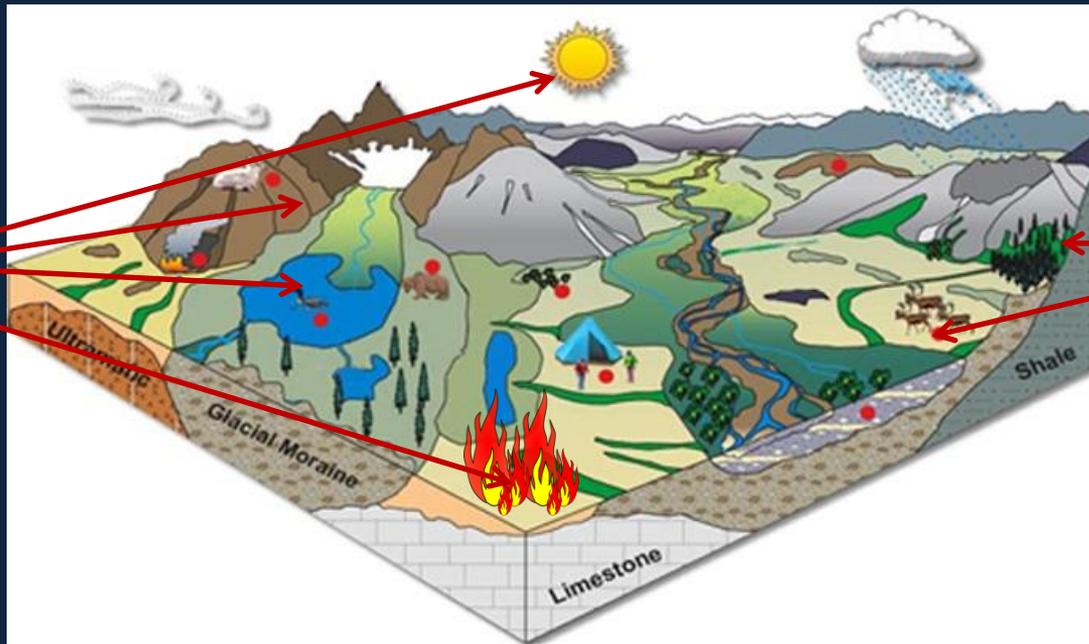


# Ecosystems: It's all about the relationships

*A system formed by the interaction of a community of living organisms with its non-living environment*

Non-Living Environment (Abiotic)

- Climate
- Geology
- Physical Processes



Living Organisms (Biotic)

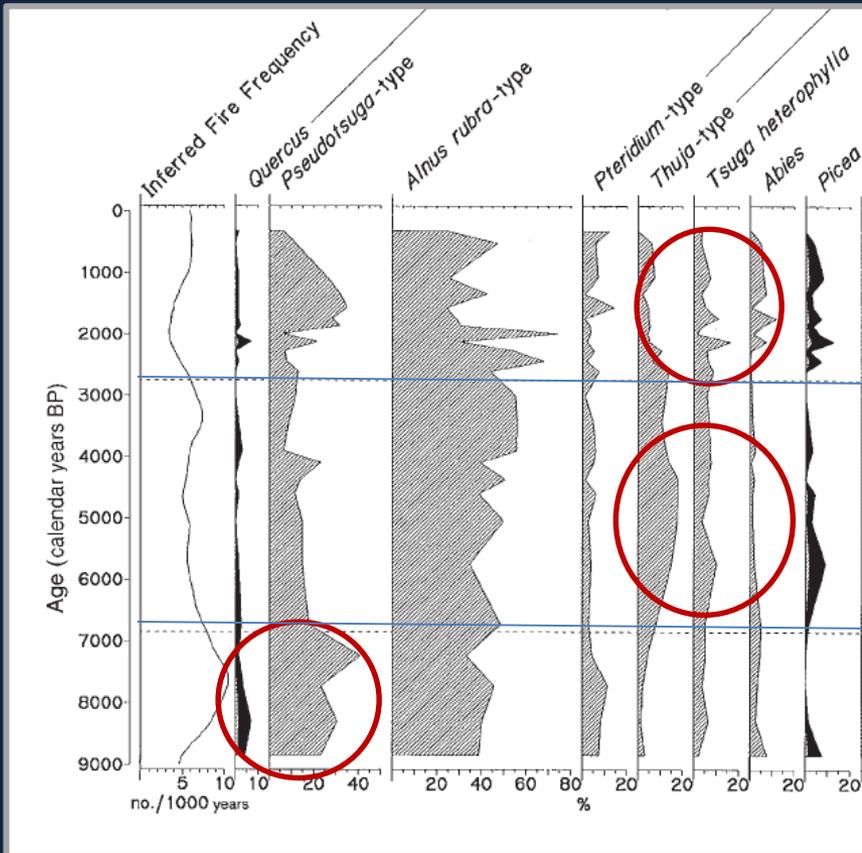
- Plants
- Animals

# Abiotic Drivers on Vegetation Composition, Structure and Distribution

- Growth
  - Climate and physical environment
  - species composition and productivity



# Paleoclimate and Vegetation Composition Little Lake, Oregon Coast Range



Cooler/more humid

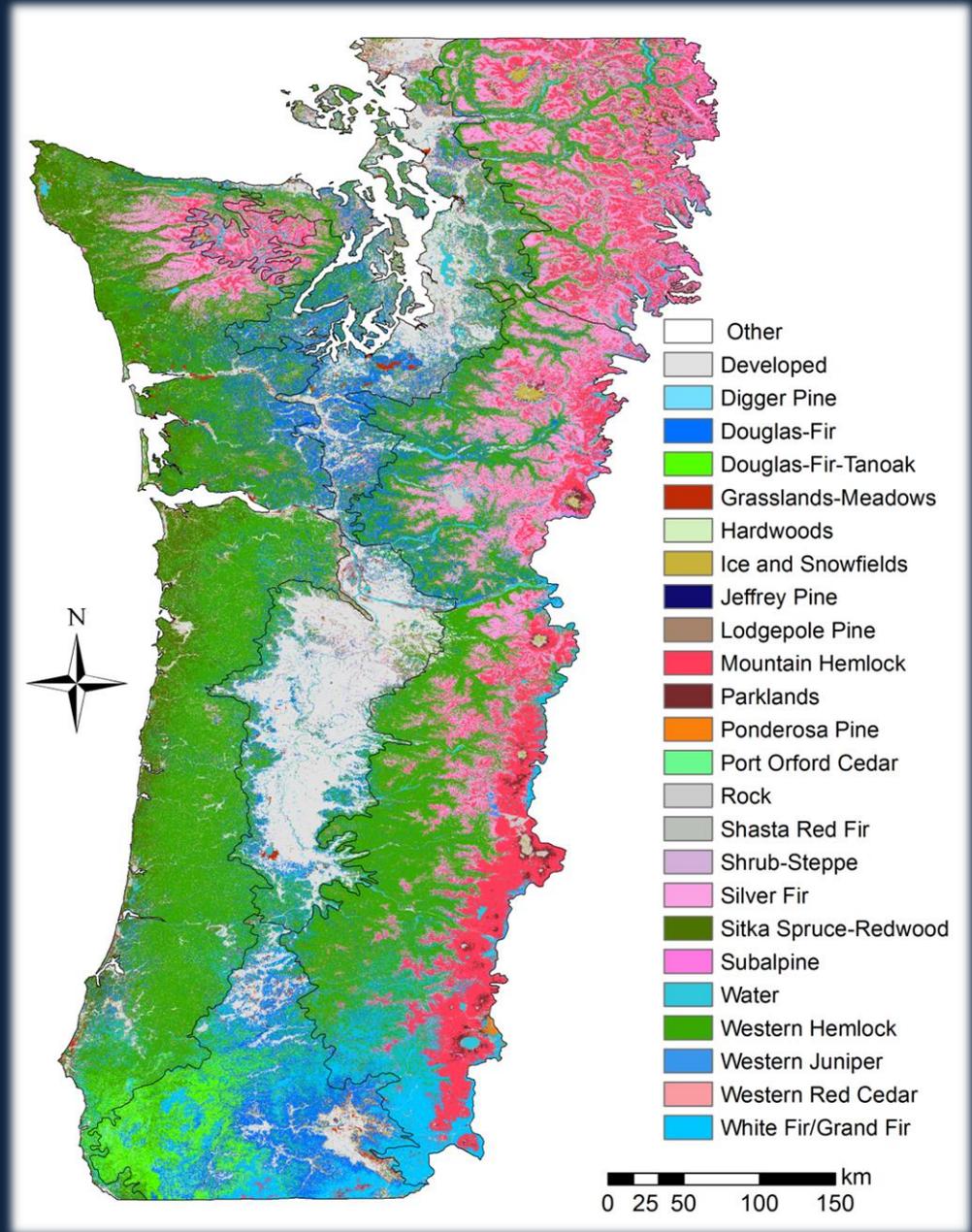


Cool/Humid



Warm/Dry

# Potential Vegetation Zones



# Abiotic Drivers on Vegetation Composition, Structure and Distribution

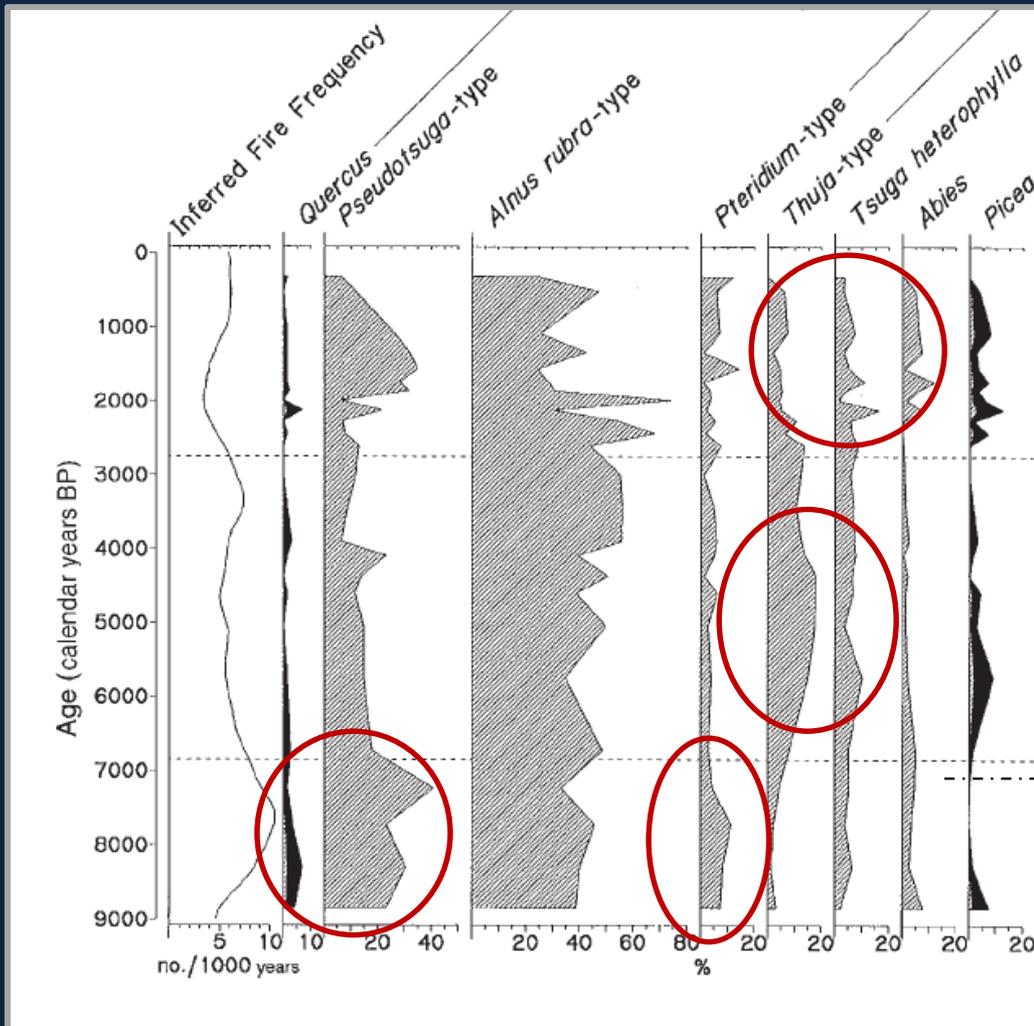
- Mortality:

- Fire
- Wind
- Competition
- Pathogens
- Insects



Ronald F Billings, Texas Forest Service and USDA Forest Service, Region 2, Rocky Mountain Region Archive,

# Paleoclimate, Vegetation and Fire Little Lake, Oregon Coast Range



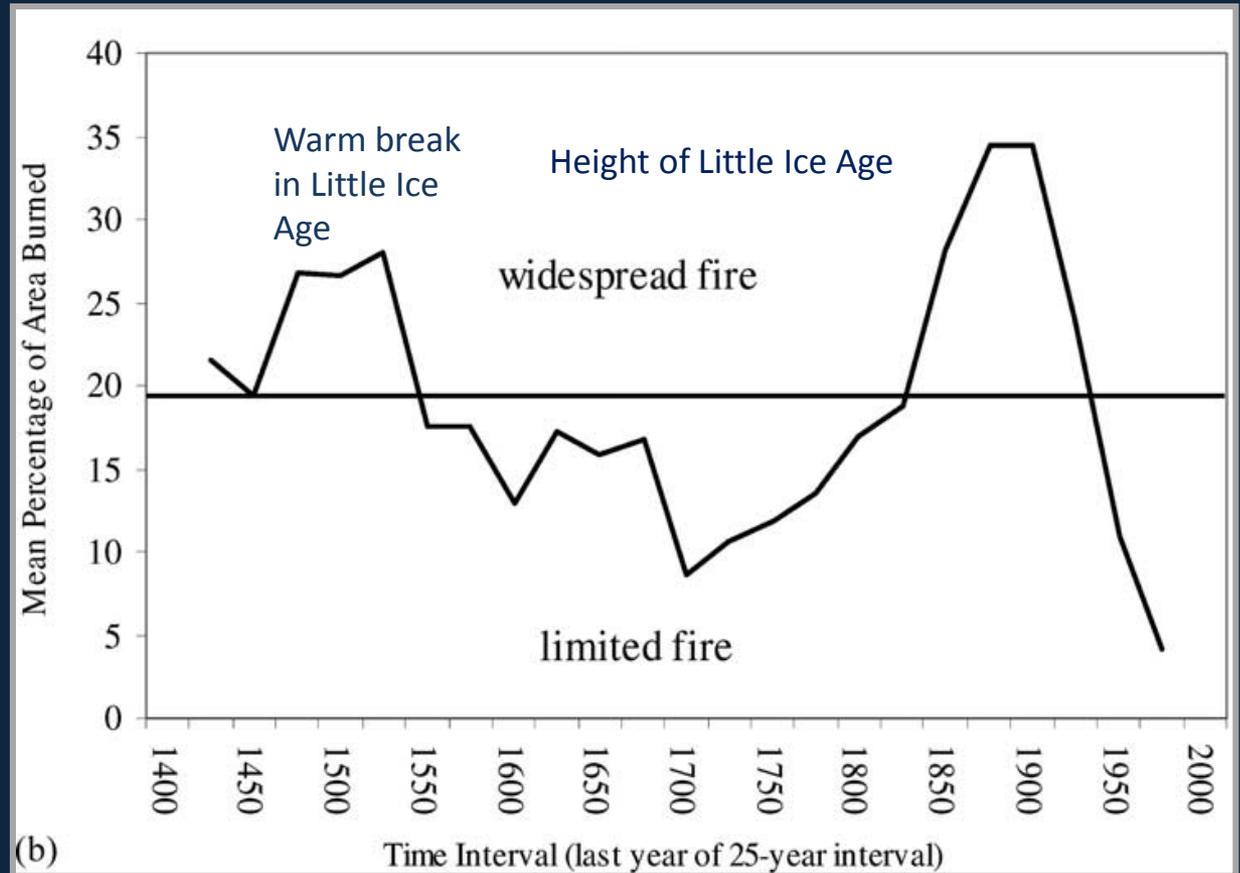
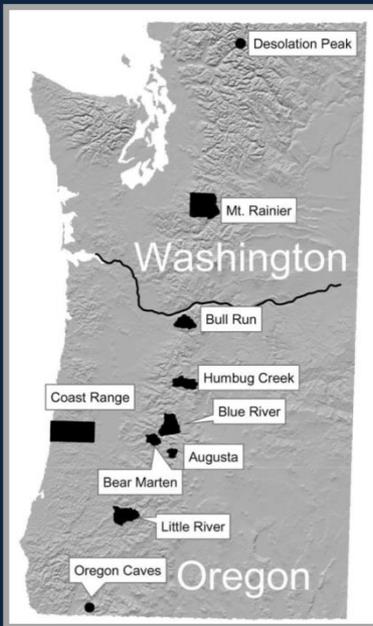
## Fire Frequency

Cooler/more humid  
230 yrs

Cool/Humid  
160 yrs

Warm/Dry  
110 yrs

# Fire History Studies: Westside Regional Signal



# Fire Regimes

Frequency: How often

Severity: How much mortality

Extent: How large

Affects the composition, structural development and landscape pattern

Infrequent High  
Severity  
Large Extent

Variable  
frequency  
Mixed severity  
Variable Extent

Frequent low  
severity



# Infrequent Stand Replacing Fire Regime

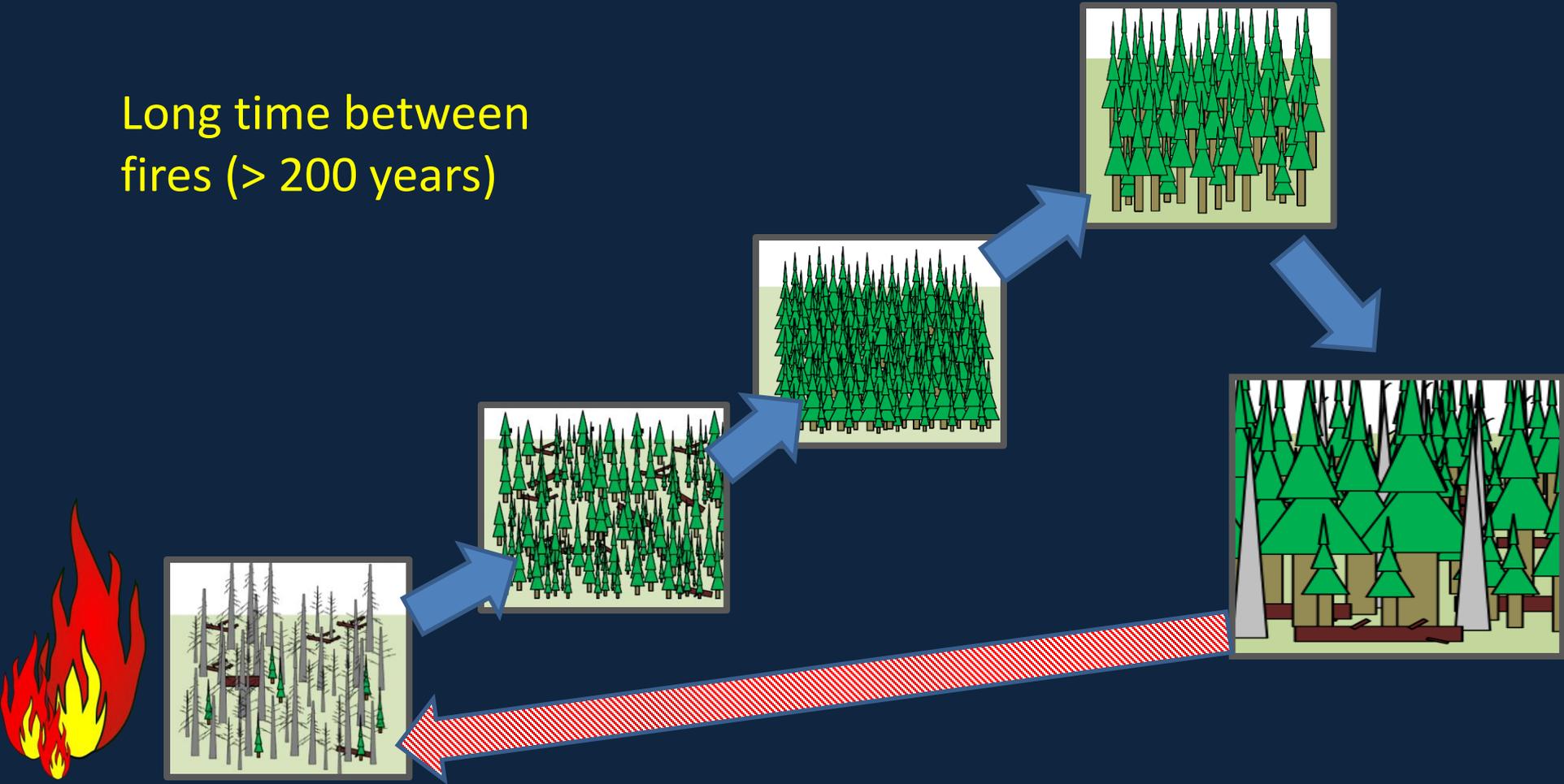
- Dominated Coast Range ecoregion
- Dominated northern West Cascade ecoregion
- More localized further south

Infrequent High  
Severity  
Large Extent

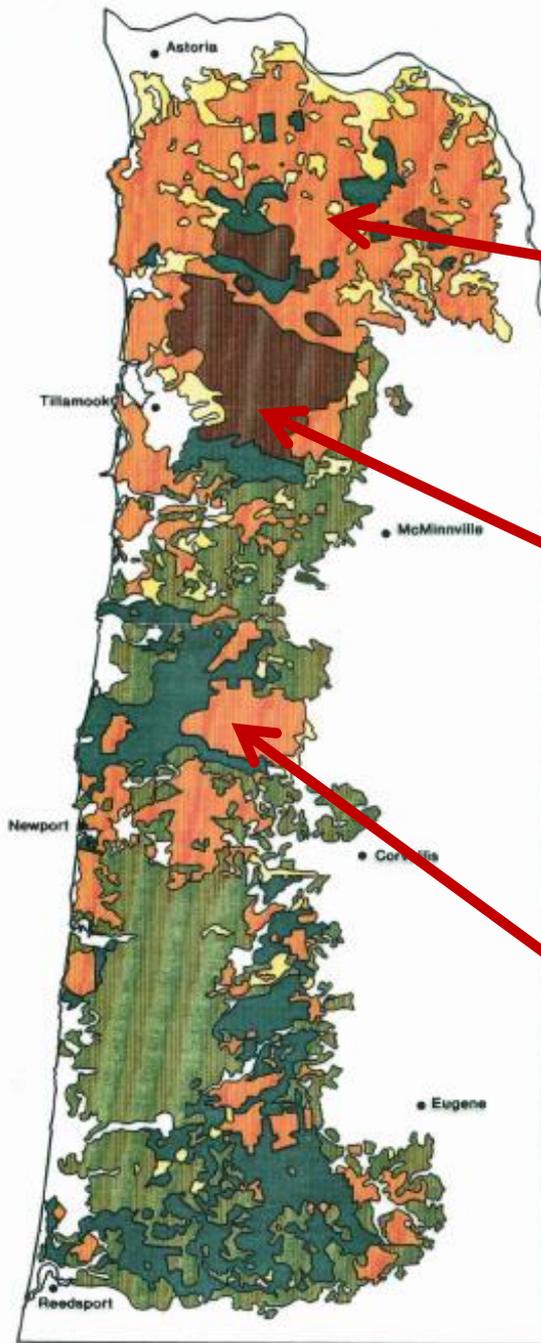


# Stand Development Pathways Stand Replacement Fire Regime

Long time between fires (> 200 years)



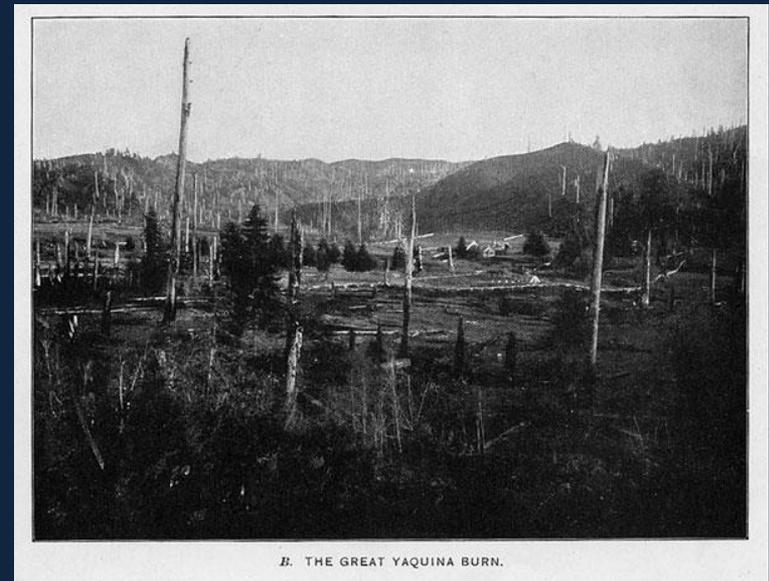
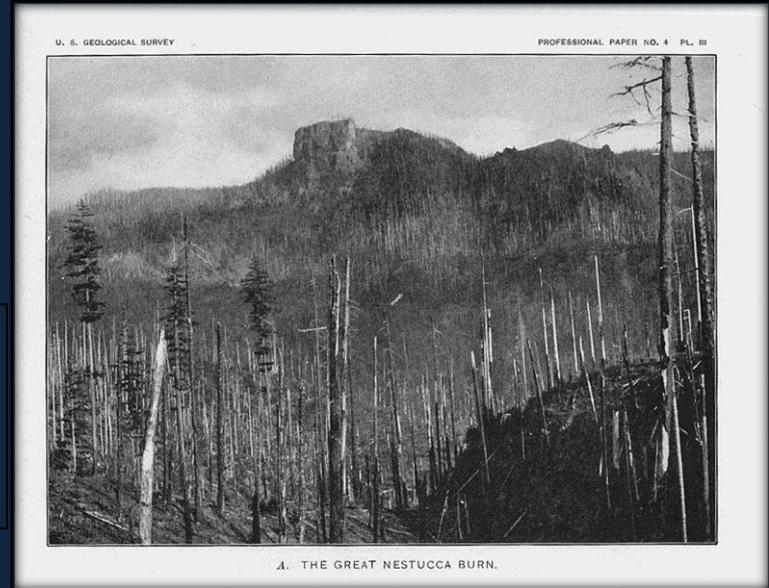
# Oregon Coast Range 1940



Tillamook: 1933-1951;  
4 fires  
355,000 total acres

Nestucca: 1845/6/7  
Repeated reburn by  
settlers;  
300-375,000 total acres

Yaquina 1849;  
450,000 total acres



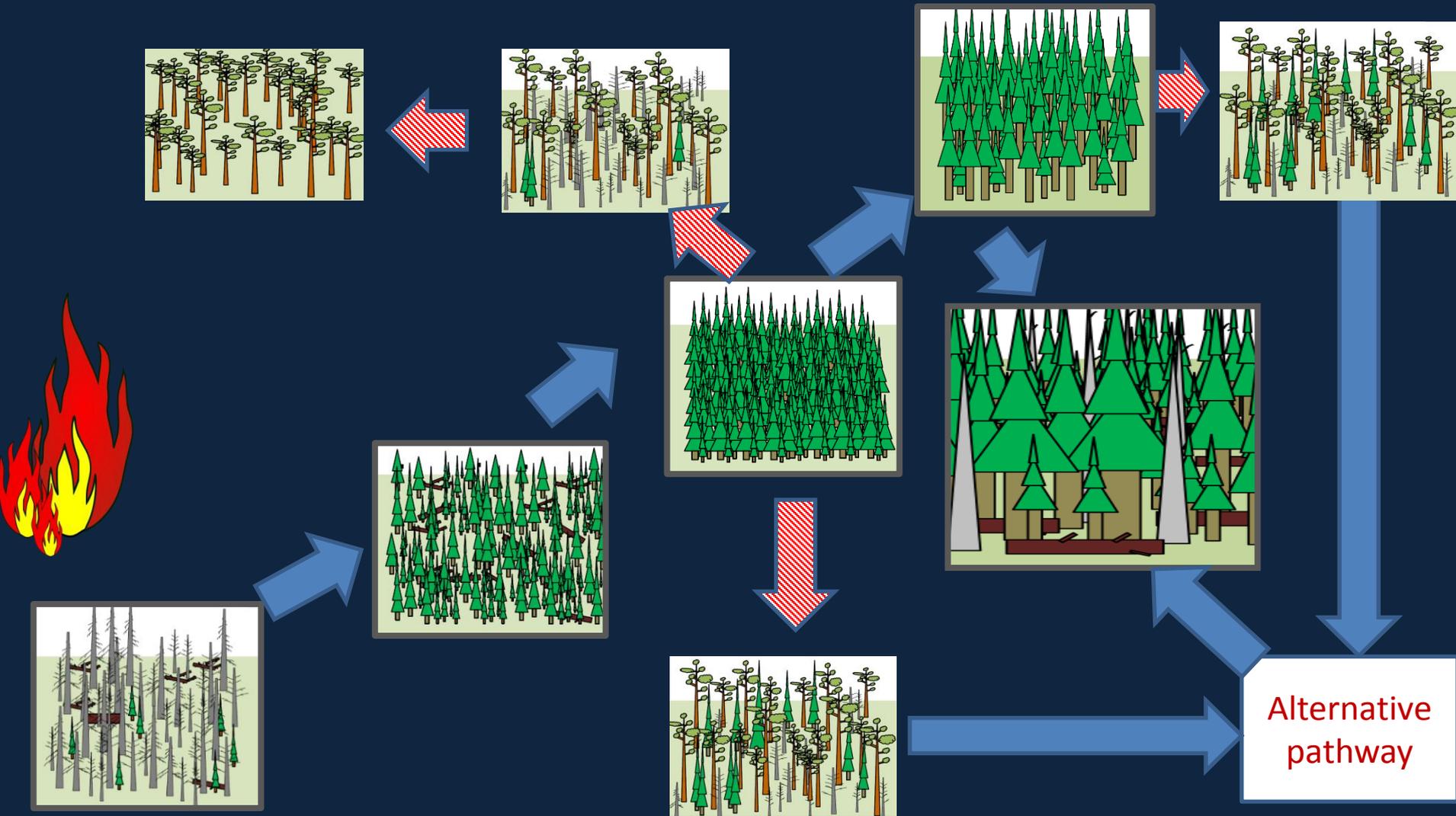
# Mixed Severity Fire Regimes

- Dominated Valley margin
- Dominated central/south West Cascades ecoregion
- Found in mesic vegetation types in Klamath Mountain ecoregion

Variable  
frequency  
Mixed severity  
Variable Extent

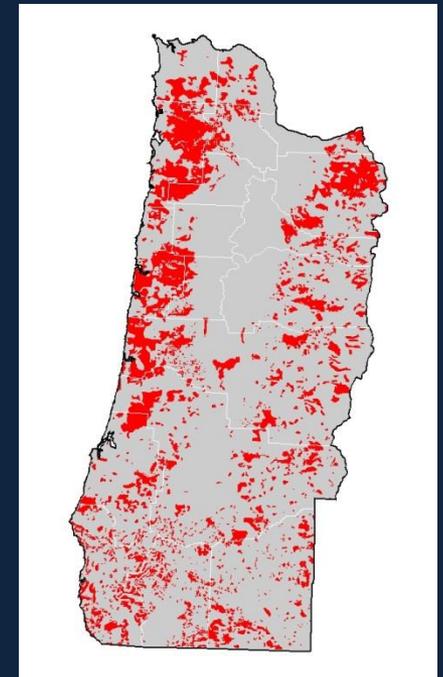
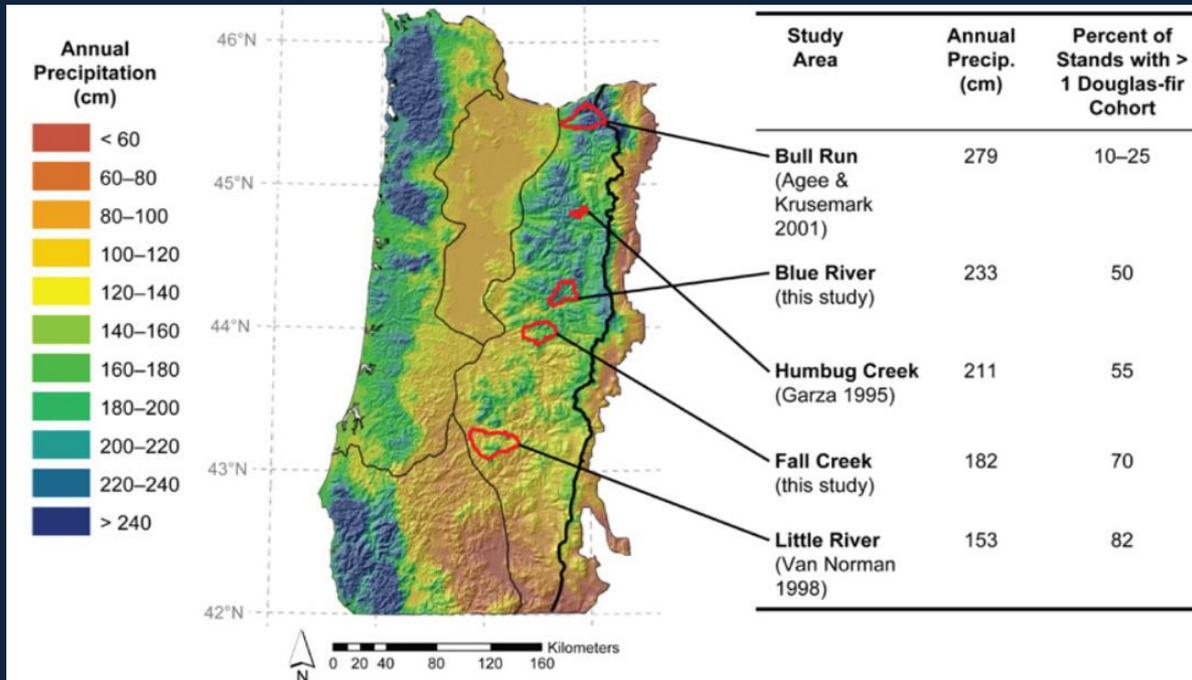


# Stand Development Pathways Mixed Severity Fire Regime: It is Complicated!



# Precipitation, Topography and Mixed Severity Fires

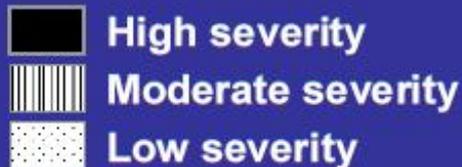
- Precipitation influences fire severity patterns
- Effects of topography stronger with more limiting moisture.



Early 20<sup>th</sup> century  
high severity fires

# Historical Distribution of Mixed Severity patches: central west Oregon Cascades

Cook-Quentin Study Area  
(Morrison & Swanson 1990)



Low



Moderate



High

- 9000 acre area
- 1800-1900 fires
- Almost equal area occupied by each severity group
- Most of high severity patches < 25 acres with 2 large patches (250 acres)

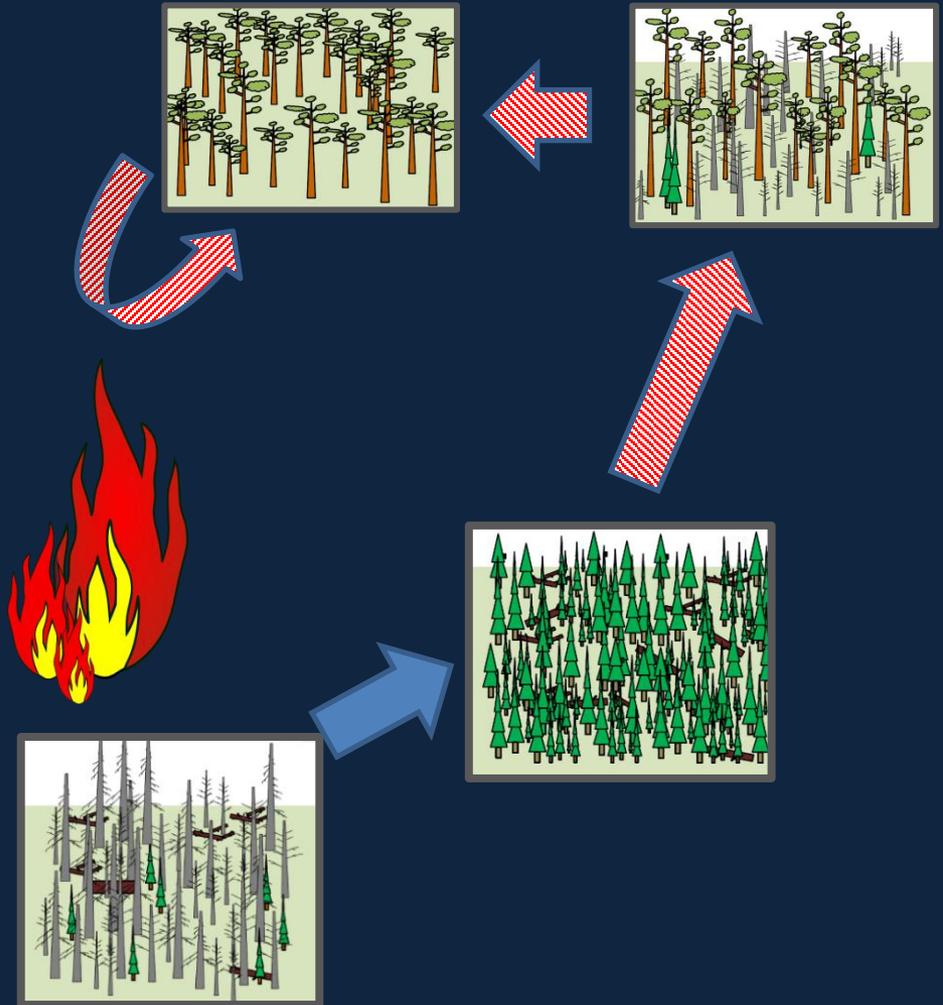
# Frequent Low Severity Fire Regimes

- Willamette Valley
- Dry sites in south West Cascades and Klamath Mountains

Frequent low severity



# Stand Development Pathways Low Severity Fire Regime



5-25 year Fire return interval



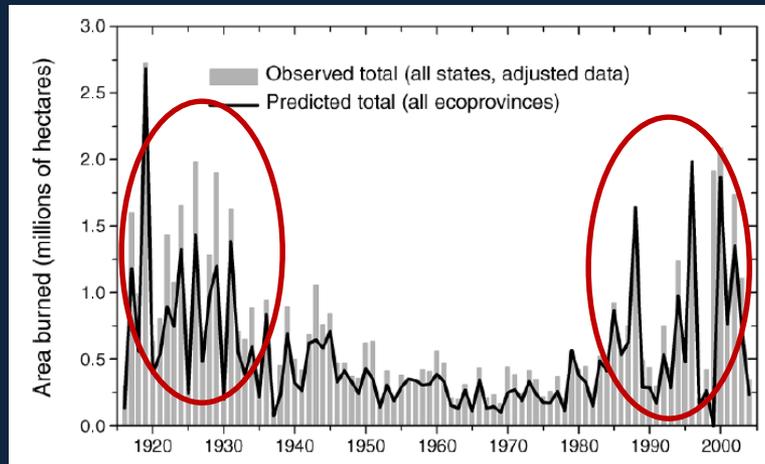
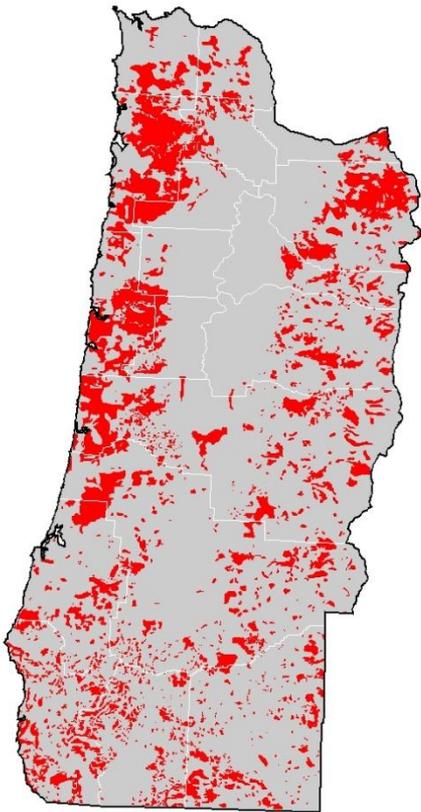
Oak forests  
and savannas

Mixed conifer/  
Ponderosa pine

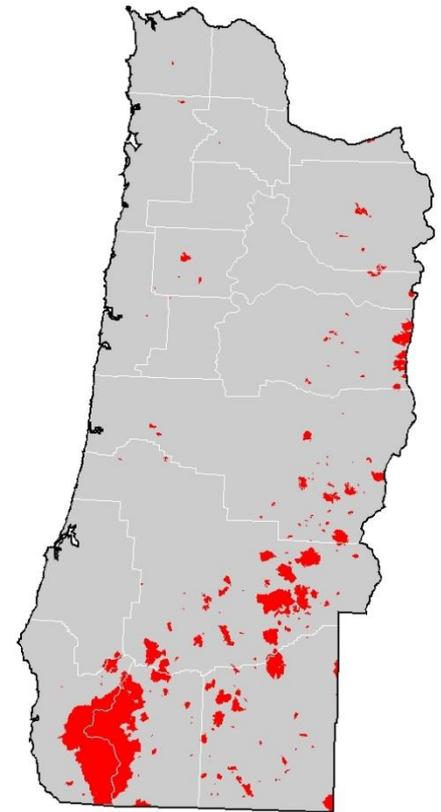


# 20<sup>th</sup> Century Fire Activity

1900-1946



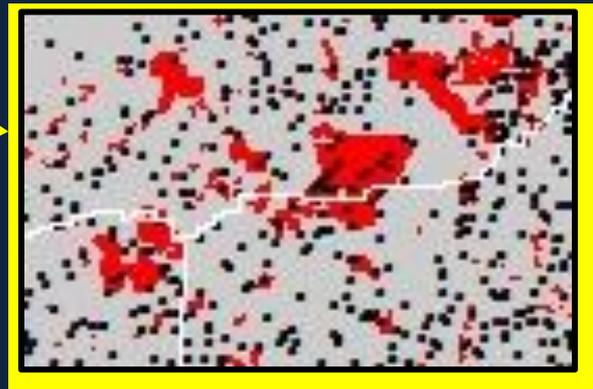
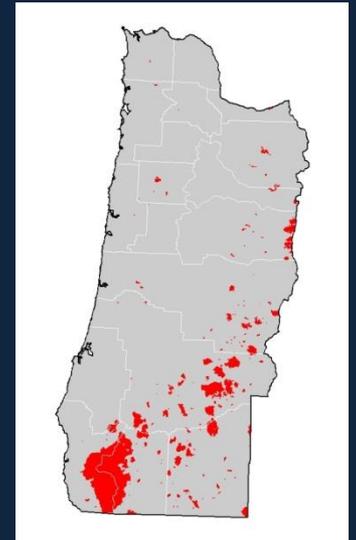
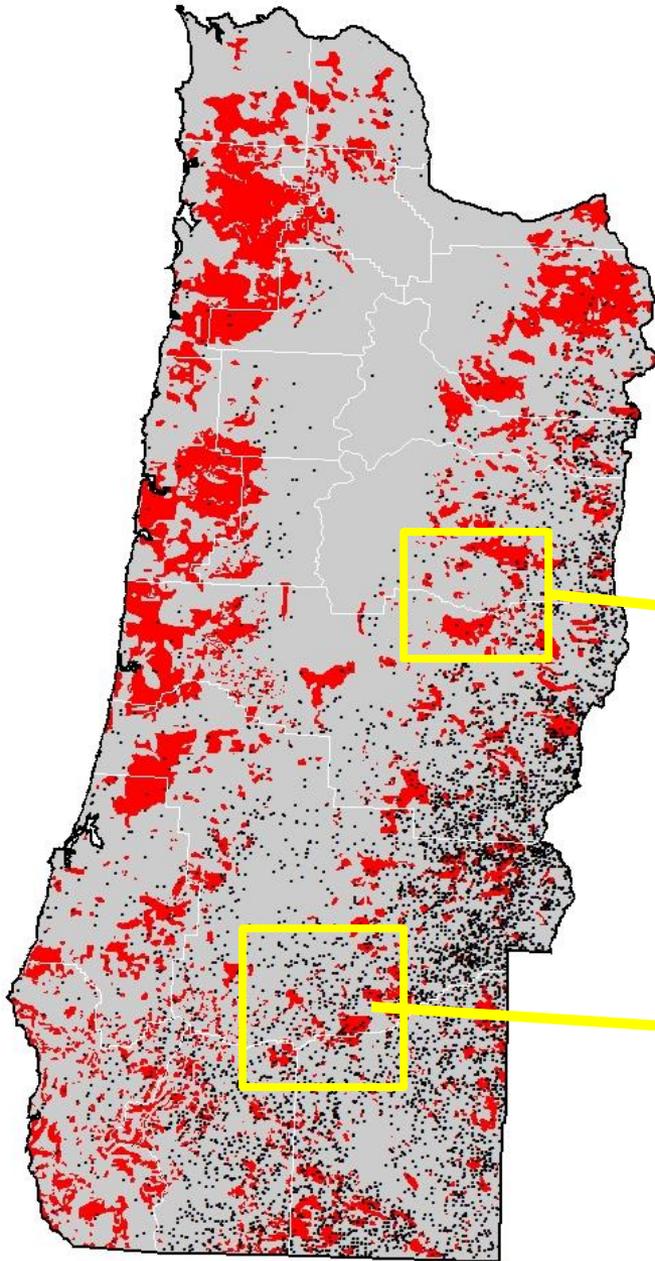
1970-2014



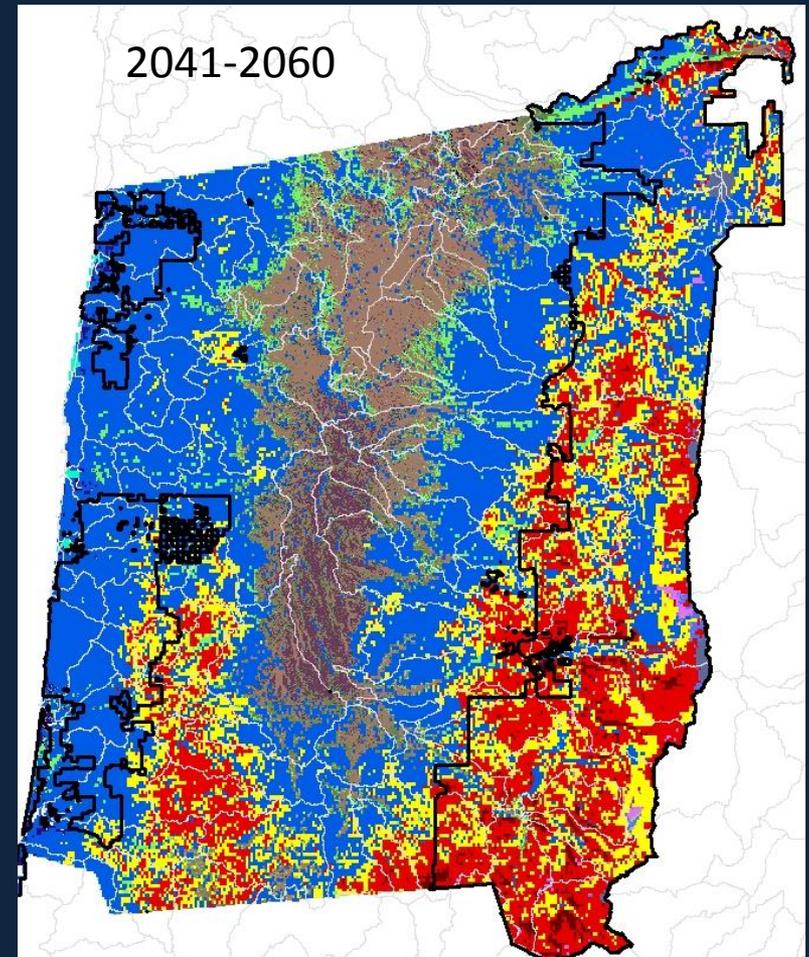
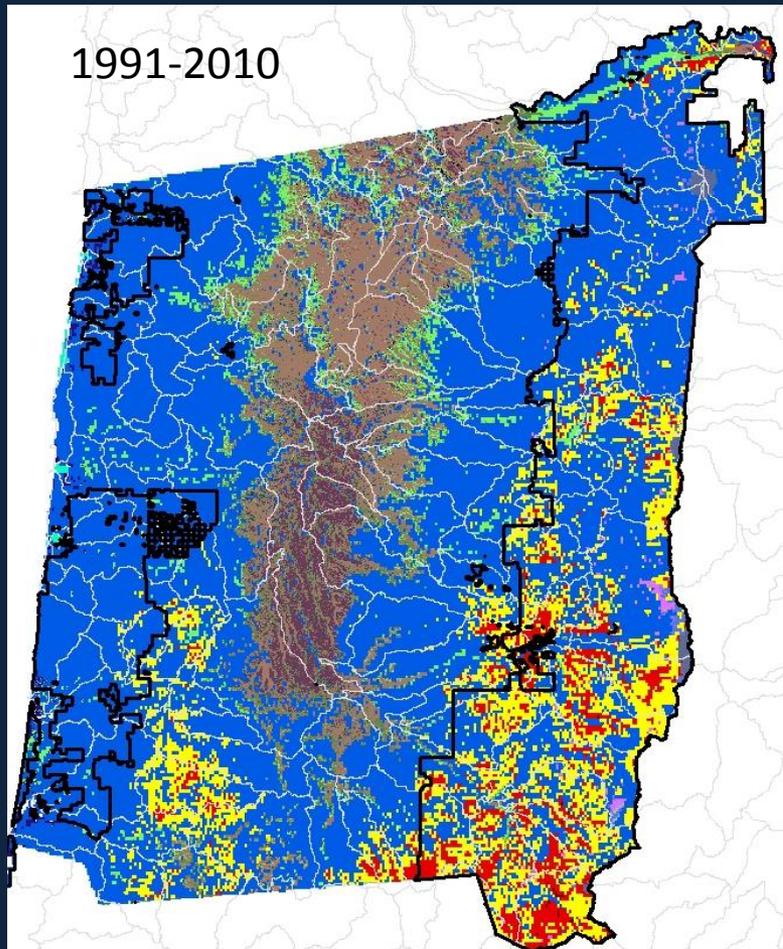
Littell et al. 2009, Ecological Applications

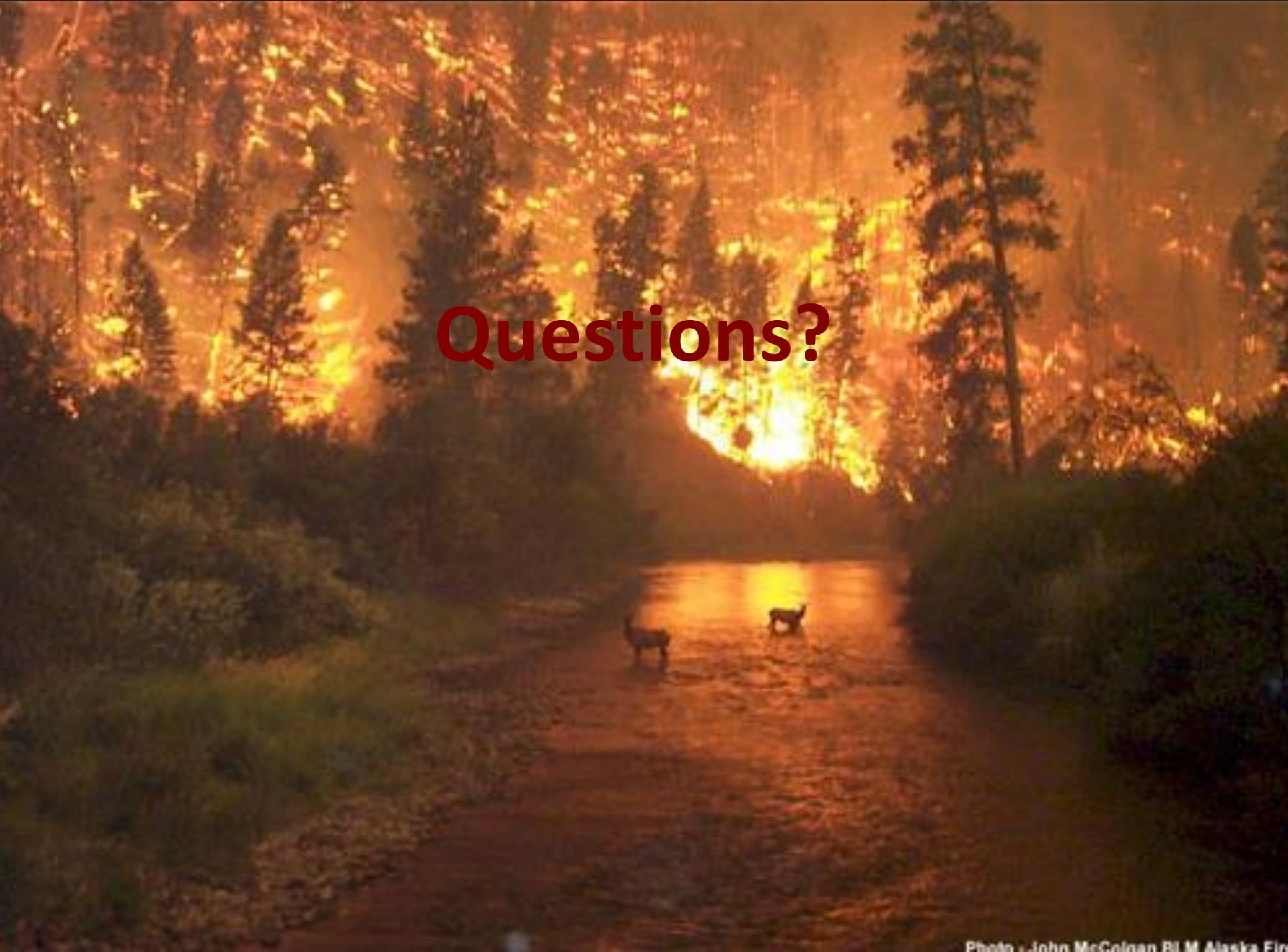
# Lightning Fires 1990-2012 and early 20<sup>th</sup> Century Fires

Opportunities for mixed severity fires?



# What about the future? Large Wildfire Suitability through time



A photograph of a forest fire at night. The fire is intense, with bright orange and yellow flames consuming the trees. The fire is reflected in a stream in the foreground. Two moose are standing in the stream, their silhouettes visible against the fire's glow. The overall scene is dramatic and dangerous.

**Questions?**