

A photograph of a forest fire. Tall, thin trees stand in the background, their trunks silhouetted against a bright, orange and yellow sky. In the foreground, a firefighter in a yellow jacket is visible, working near a fire on the ground. The overall scene is dramatic and captures the intensity of the fire.

# Westside Fire Regimes—Past, Present and Future

Jane Kertis, Tom Spies

March 8, 2018

## 1. Past:

- ❖ fire history and regimes
- ❖ landscape pattern
- ❖ Forest developmental trajectories

## 2. Present:

- ❖ Fire activity
- ❖ Fire management

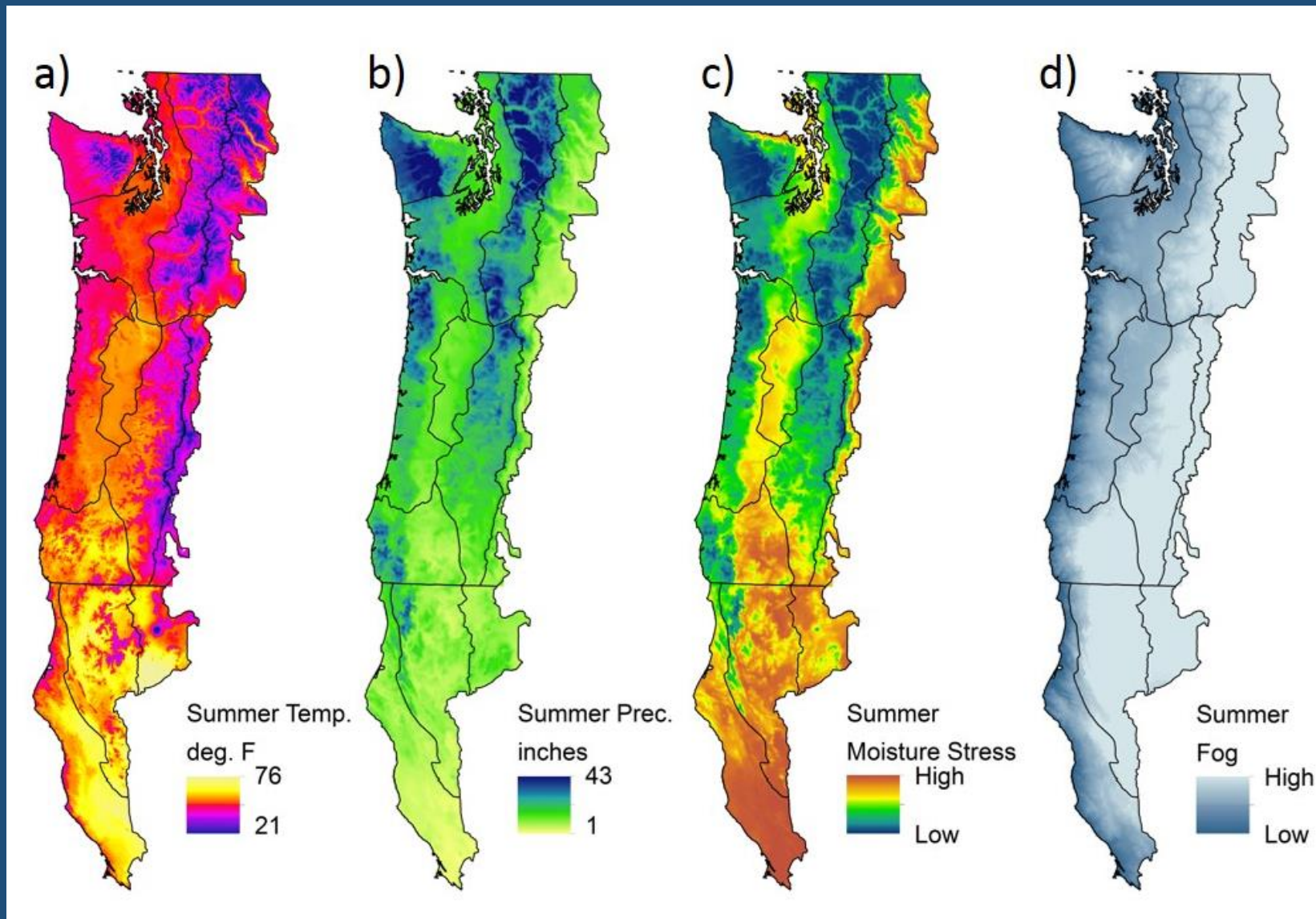


## 3. Future:

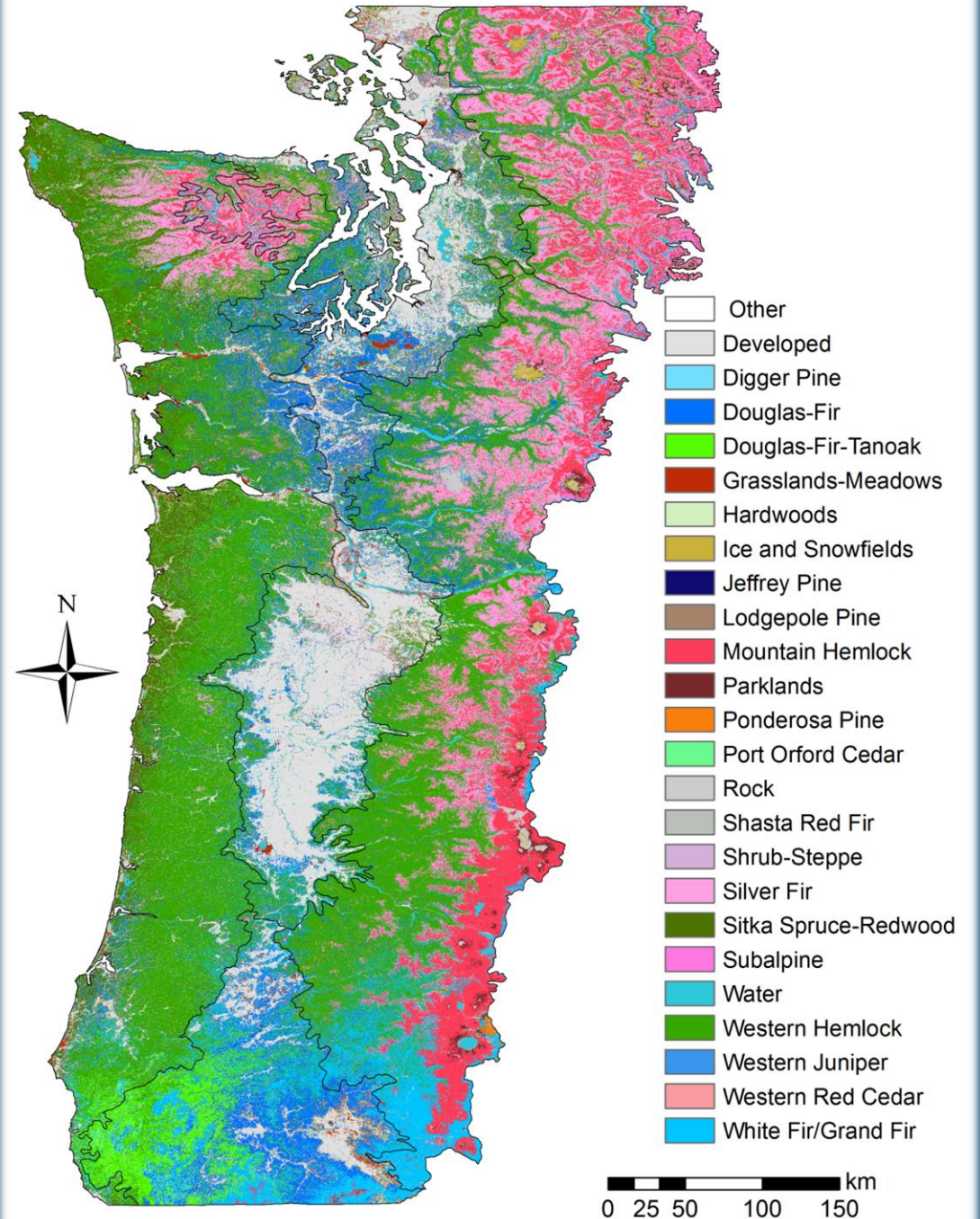
- ❖ Climate change
- ❖ Fire effects



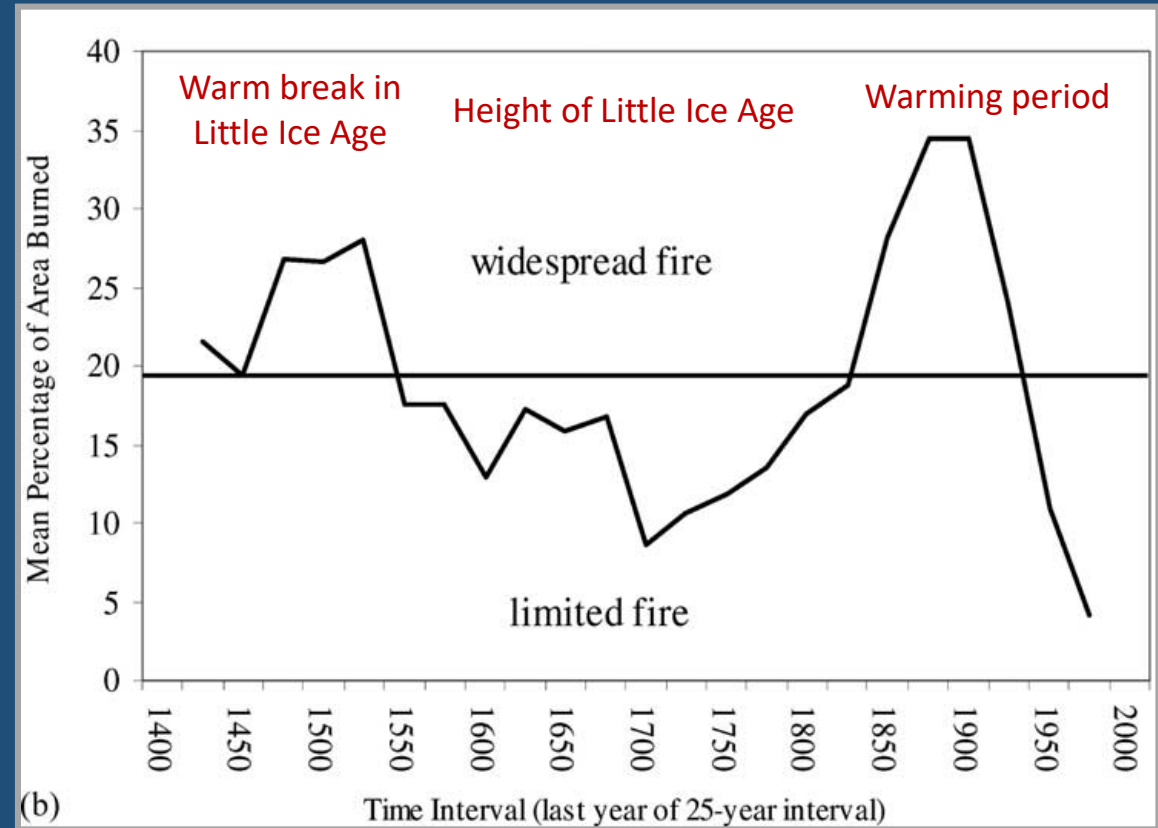
# Climatic Variation on the Westside



# Westside Biophysical Environments



# Fire History Record: Variability in Time



Weisberg & Swanson, 2003, *For. Ecol. Manag.*

- Mean fire return intervals varied (~50-500 years)
- Variable fire expression in space—stand replacement, mixed severity

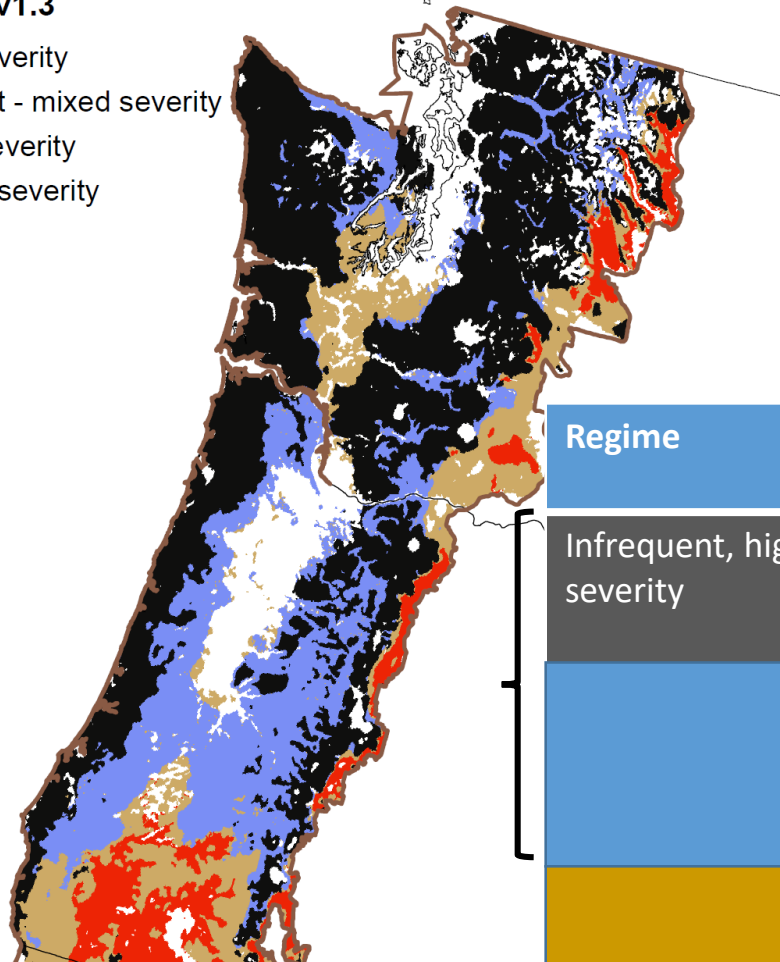
# Updated Classification of Historical Fire Regimes

## Hypothesized Distribution

### NWFP Fire Regimes - v1.3

- Infrequent - high severity
- Moderately frequent - mixed severity
- Frequent - mixed severity
- Very frequent - low severity
- NWFP Boundary

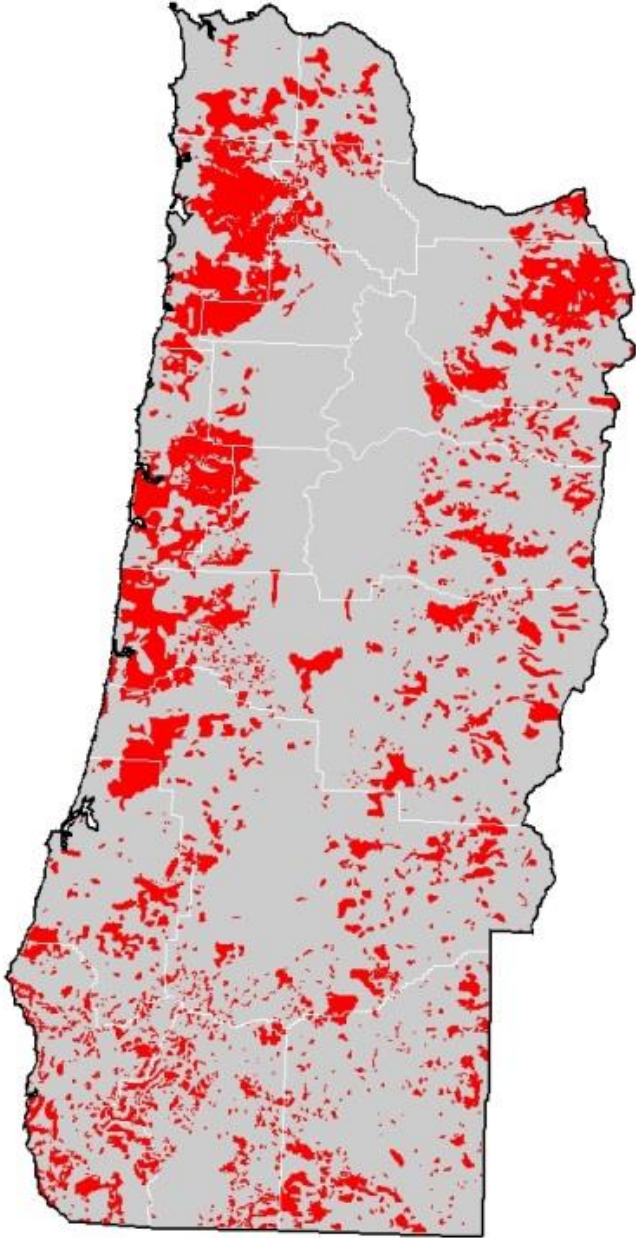
0 200  
Kilometers



Regime	Return interval	Severity Characteristics	Landfire group
Infrequent, high severity	> 200 years	Very large patches of high severity, with moderate and low severity	V

Spies et al., in press. Northwest Forest Plan Synthesis

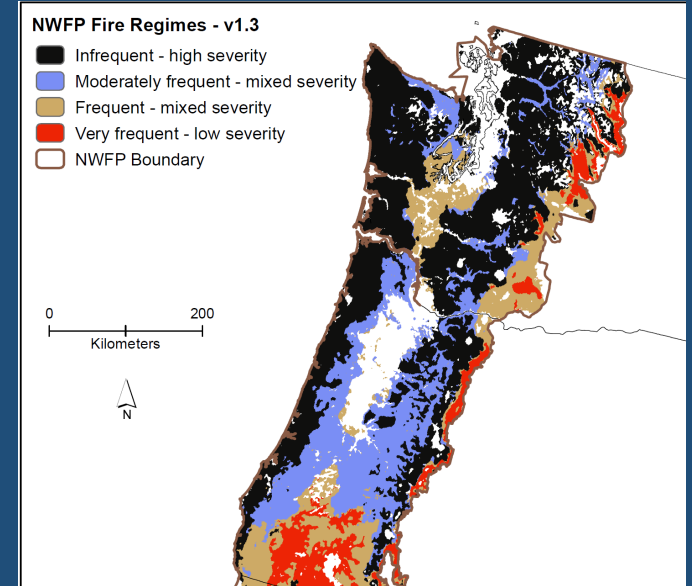
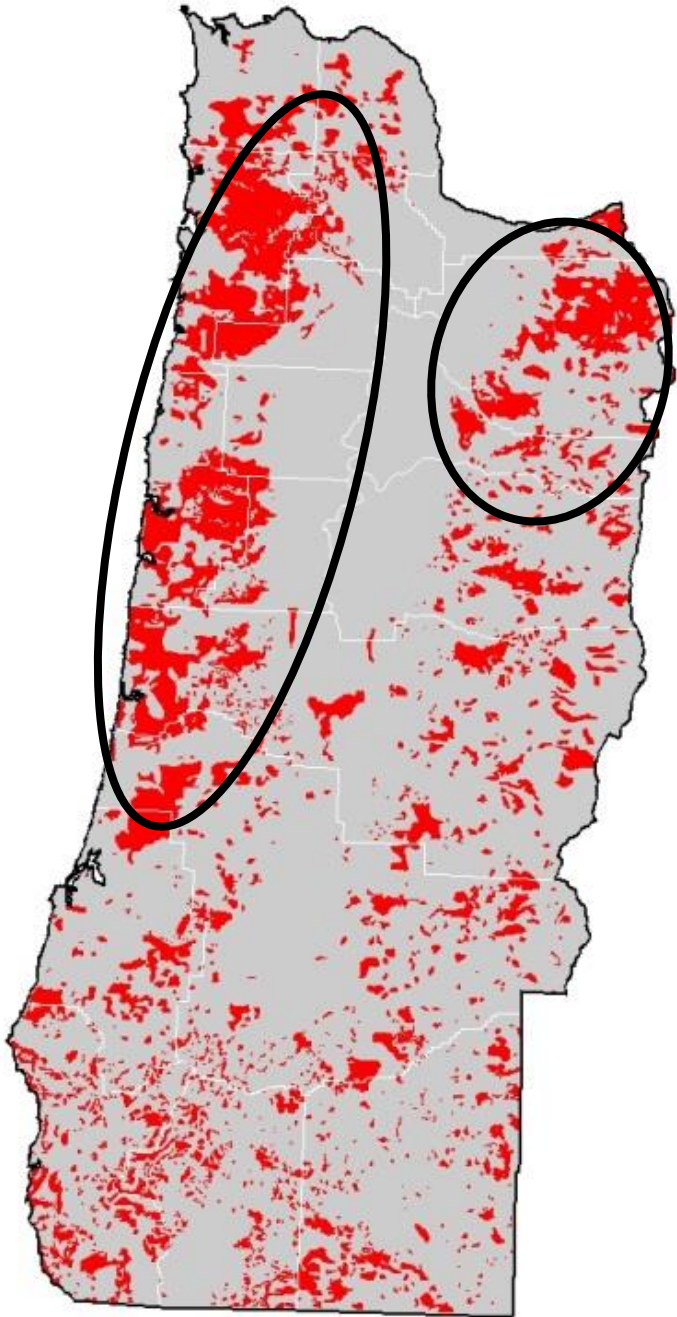
Early 20<sup>th</sup> century high severity patches



# Fire Effects: Variability in Space

- Variability in severity patch sizes/shapes
- High severity patches large and small

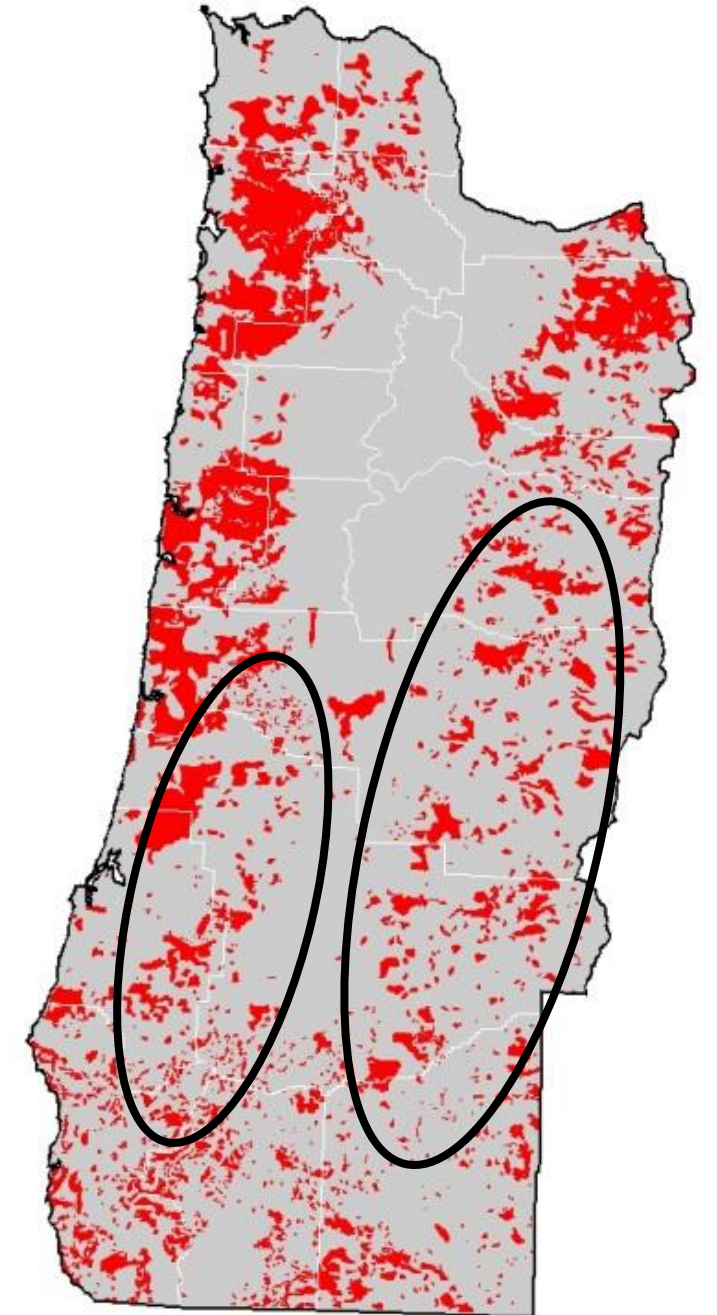
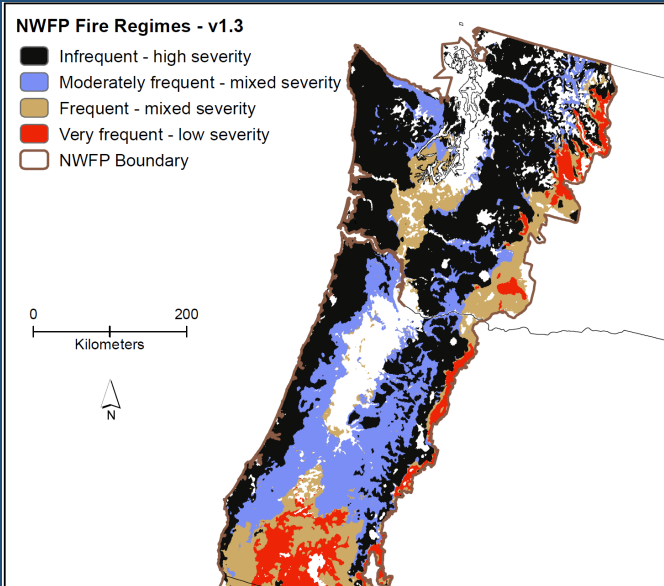
# Infrequent High Severity Pattern



Fire regime	Number of burned patches	Median patch size (ac)	Largest patch size (ac)	Percentage of area in patches
Infrequent - high severity	331	968	1,022,700	29
Moderate frequency - mixed severity	103	2,146	128,163	11
Frequent - mixed severity	132	556	51,302	5
Frequent - low severity	51	398	6,579	1

Data from Thompson and Johnson 1900 and Plummer 1902

# Mixed Severity Pattern

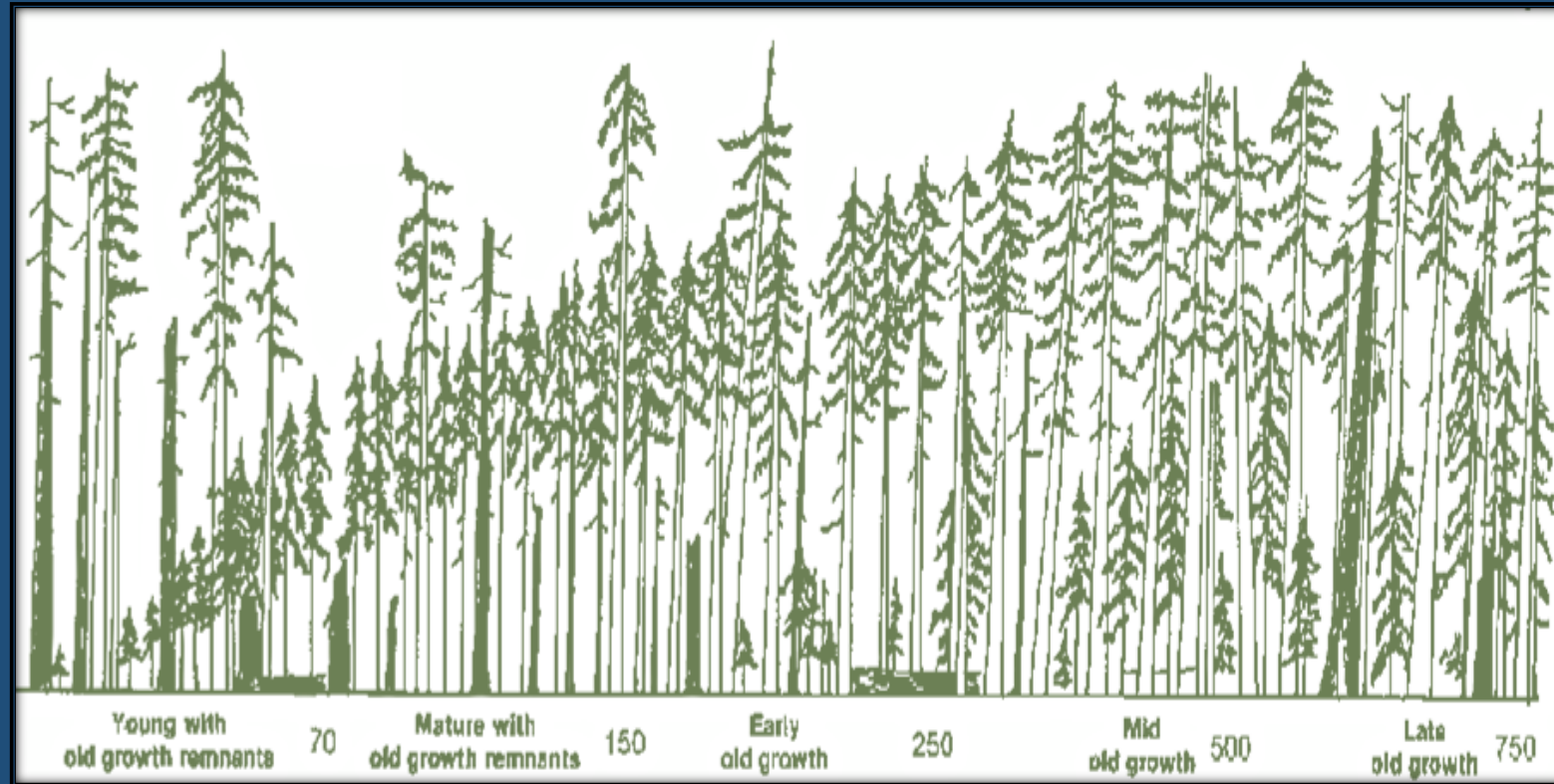


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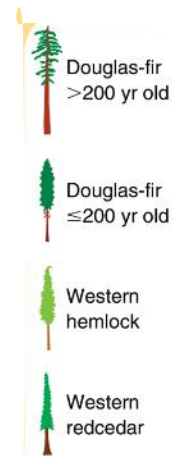
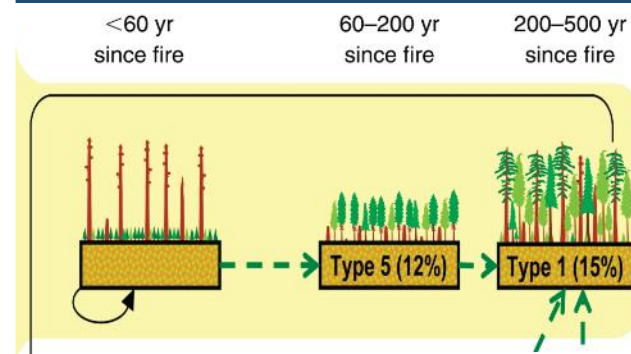
# Single Successional Pathway ???????

The gradual and orderly process of change brought about by the progressive replacement of one structural stage by another until a stable climax stage is established



# Successional Pathways-- It's Complicated!

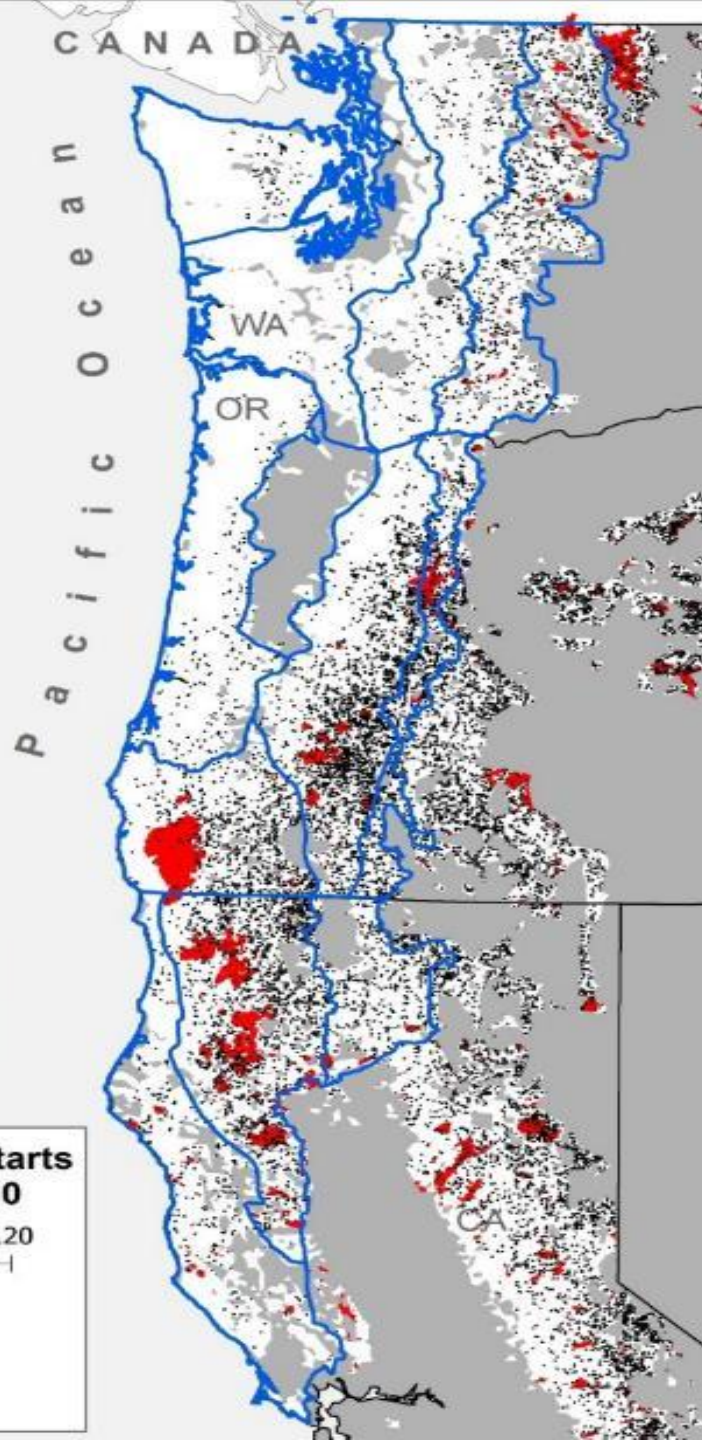
Stand replacement,  
long interval between fires



# Recent Fire Regimes



# Lightning Fire Starts in NWFP Area and Large recent fires



**Fires and Starts  
2000-2010**

0 60 120  
Kilometers



# Suppression Effects on Westside Fire Regimes

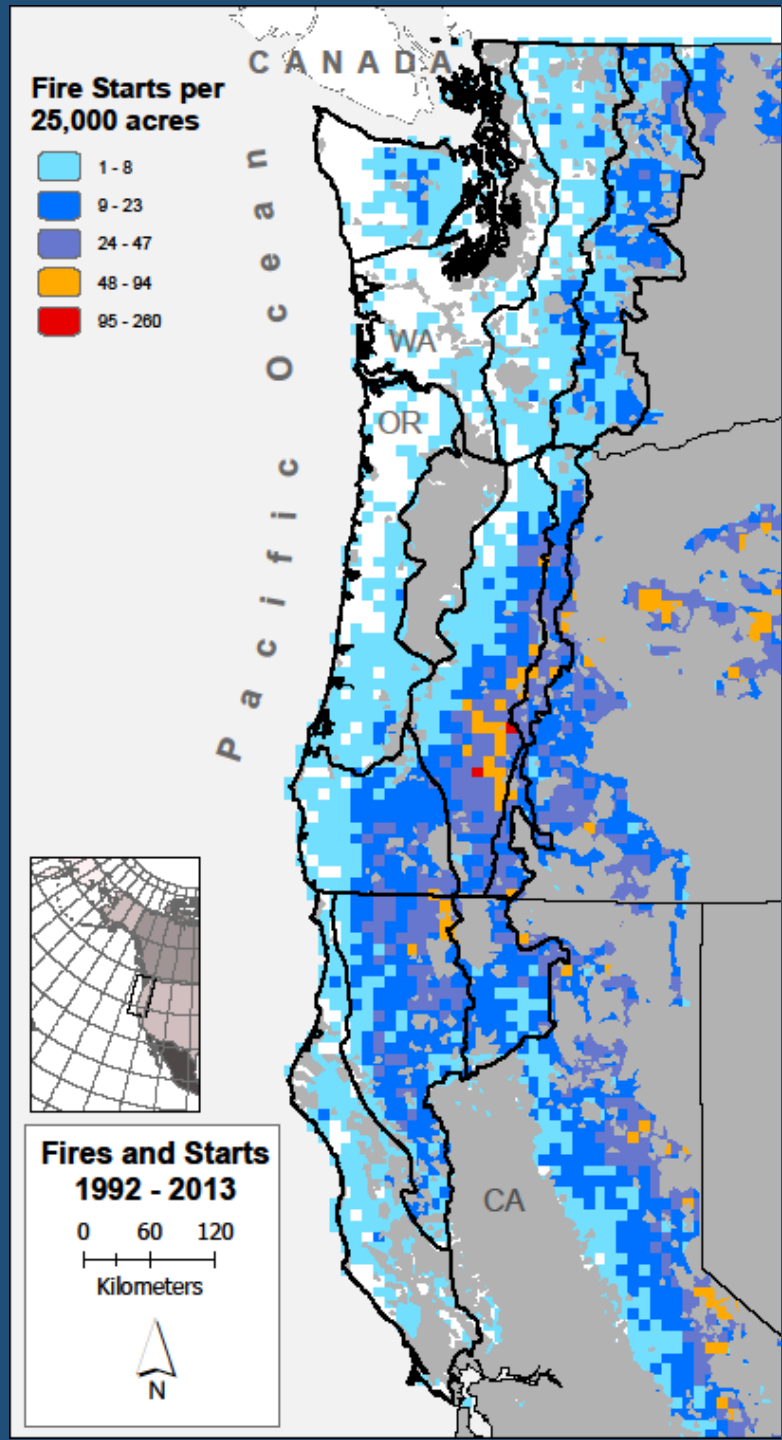


Tony Patten, Columbia Helicopters



## Suppressed Lightning Fire Starts 1992-2013

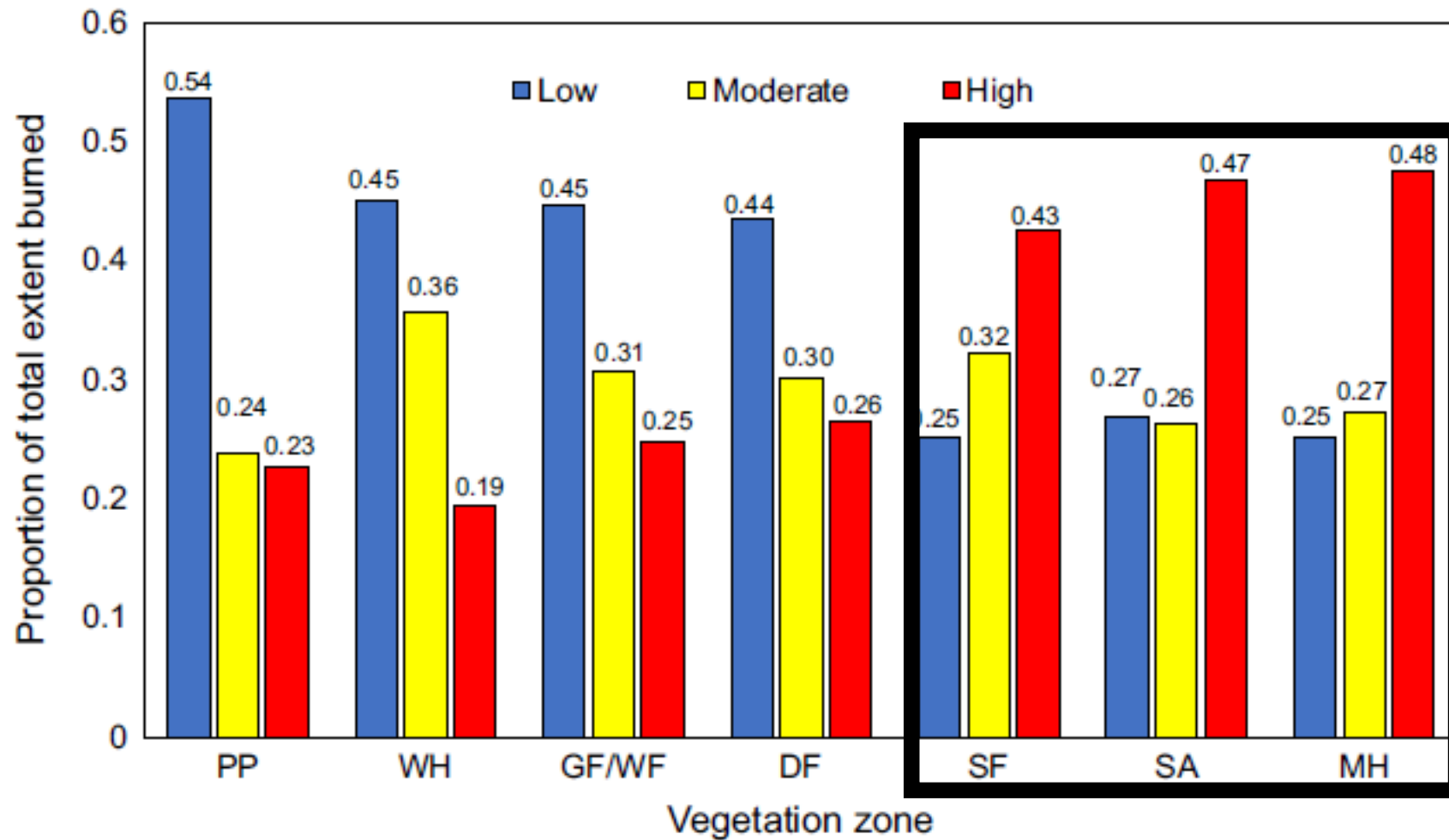
Fire Regime	Number of starts suppressed	Starts suppressed per 25,000 acres
Infrequent-high severity	4271	12.2
Moderately frequent-mixed severity	2350	13.4
Frequent-mixed severity	2511	15.2
Very frequent-low severity	4240	17.4



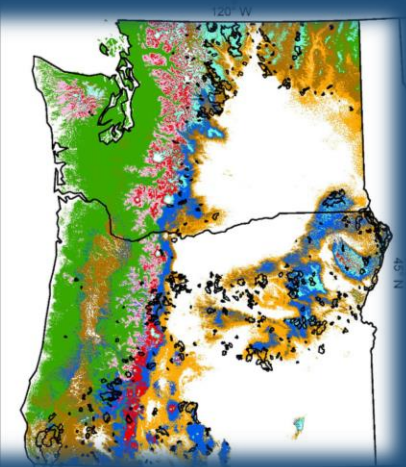
# Recent Fire Regimes 1985-2010

Zone	High Severity Extent (ha)	All Fires Extent (ha)	High Severity Rotation (yrs)	All fire Rotation (yrs)
Western Hemlock	10,242	50,083	18,594	3,802

# Fire Severity in PNW (1985-2010)



PNW study area



Reilly et al. 2017

# Current Effects and Pattern: Stand Replacing Regime



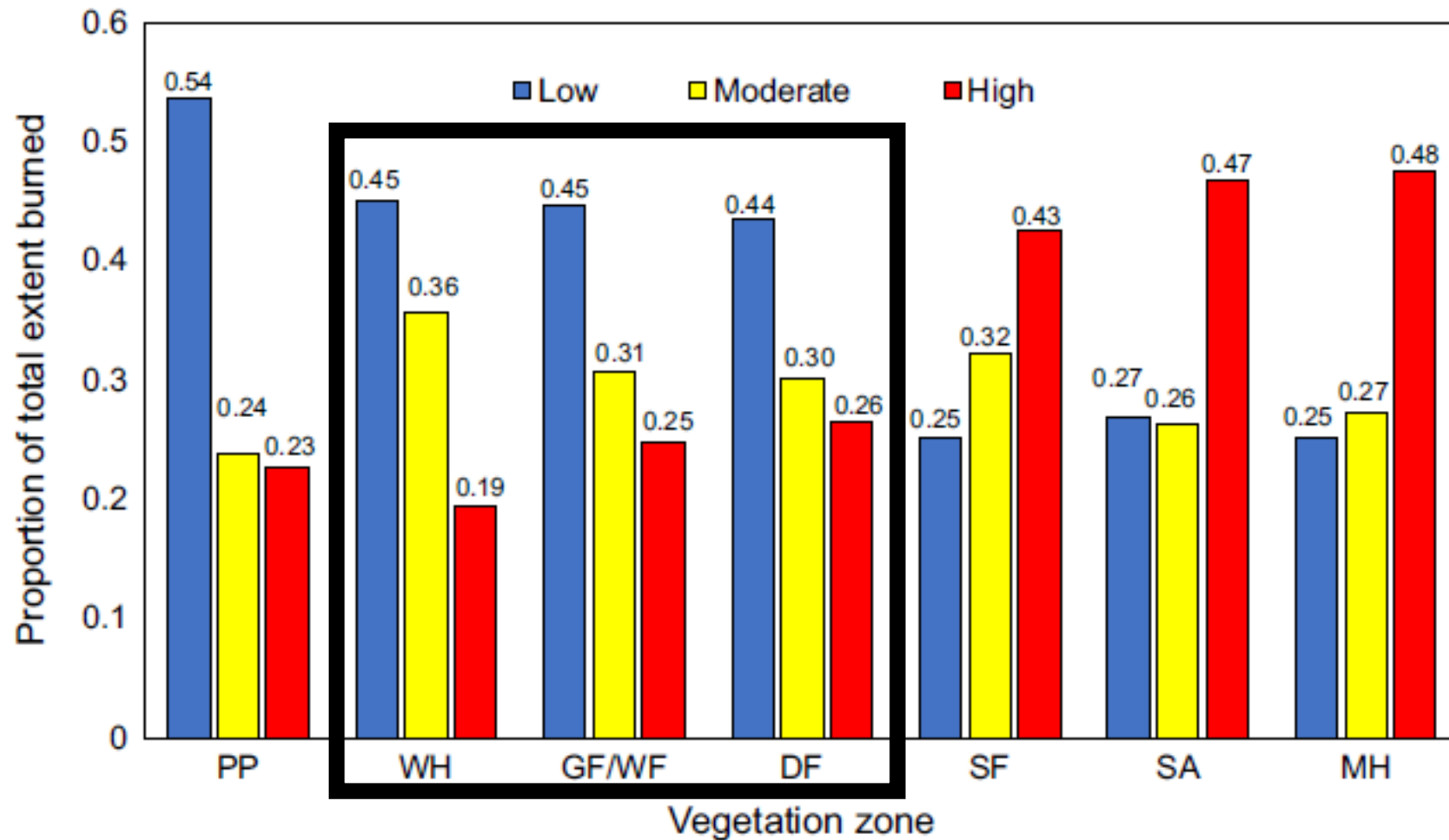
Charlton 1996



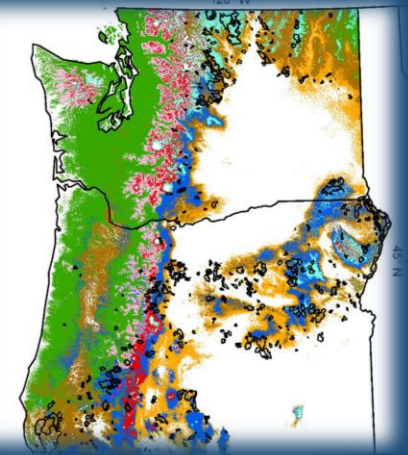
Shadow Lake 2011



# Fire Severity in PNW (1985-2010)



PNW study area



Potential vegetation

- Ponderosa pine
- Douglas-fir
- Grand fir/white fir
- Western hemlock
- Silver fir
- Mountain hemlock
- Subalpine



Reilly et al. 2017

# Current Fire Effects and Pattern: Mixed Severity Regime



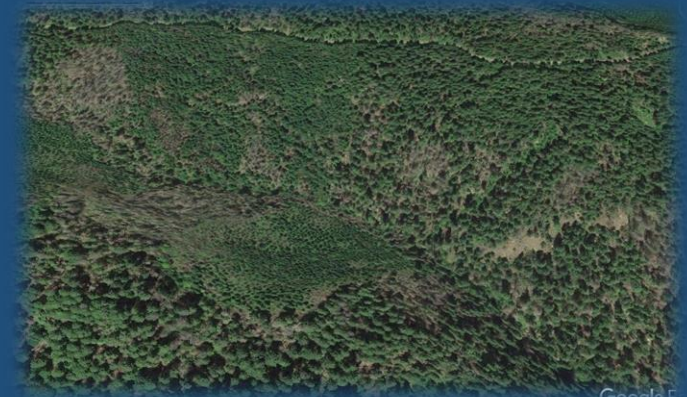
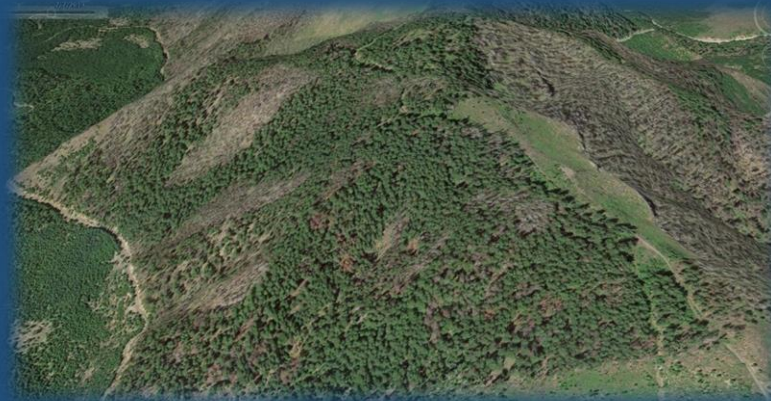
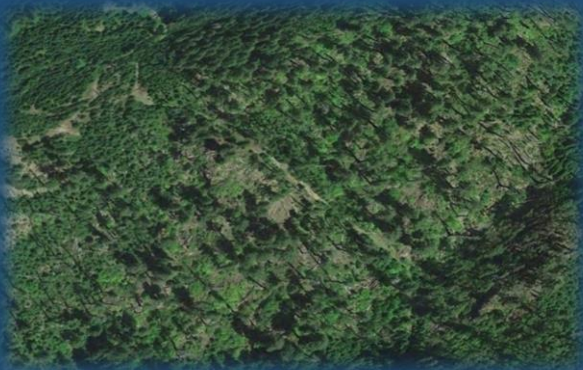
Warner 1991



Tumblebug 2009

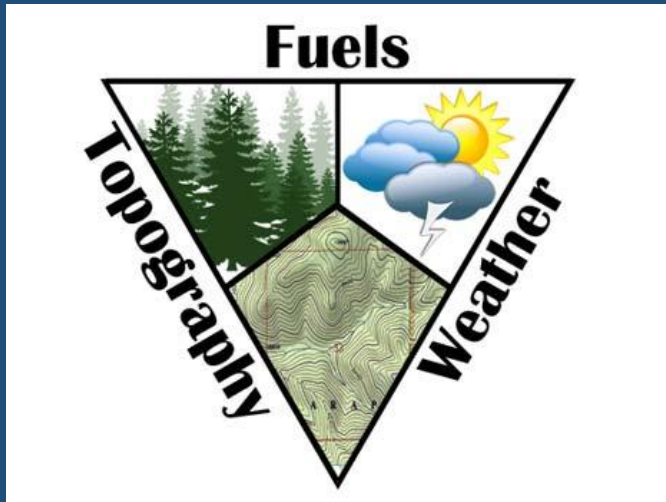


Deception Complex 2014



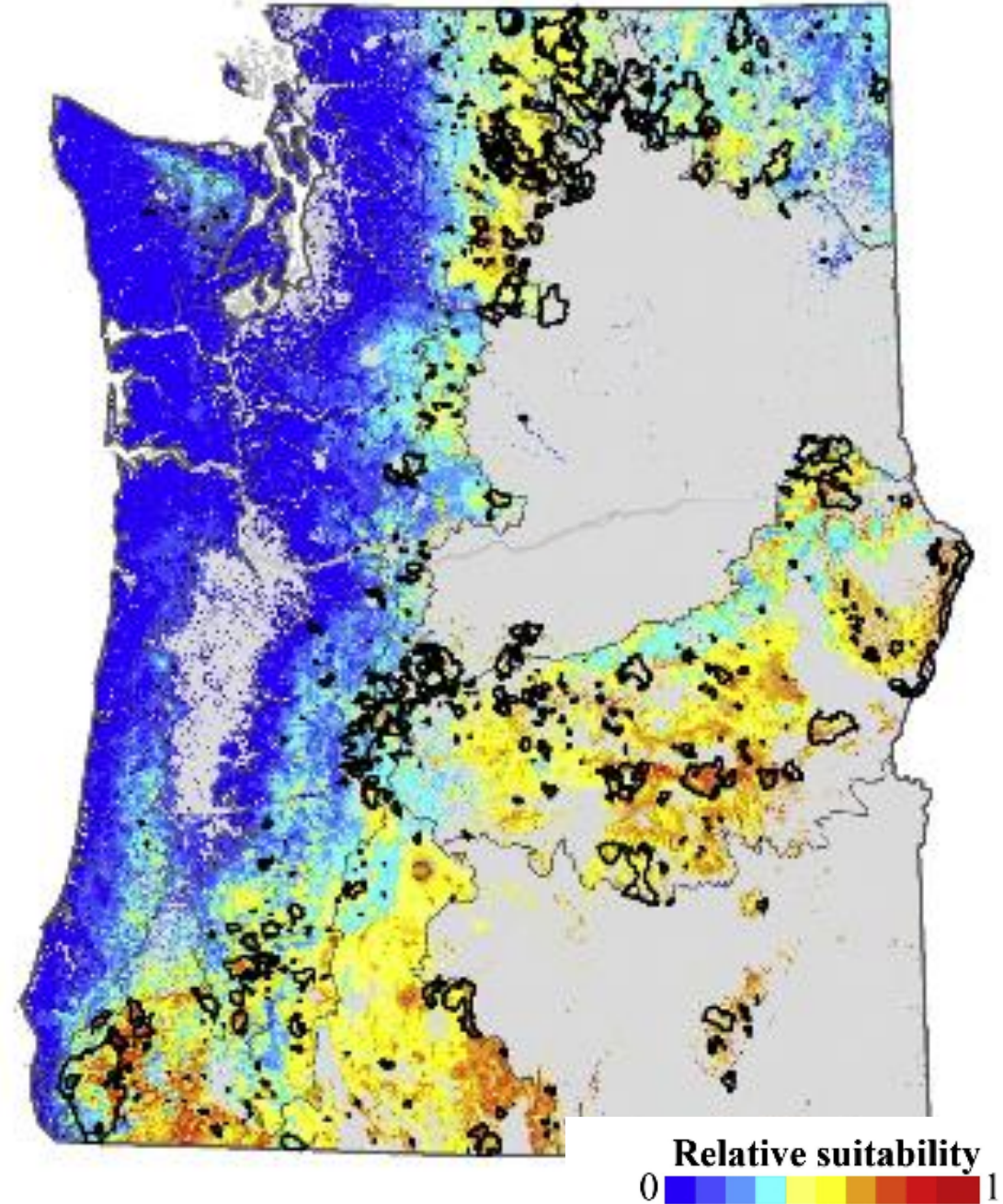
# Potential Future Fire Suitability

Large Fire suitability model  
Trained on past fires  
Used climate models to  
predict future



Davis et al. 2017

Current Normal (1981-2010) Large wildfires 2001-2015



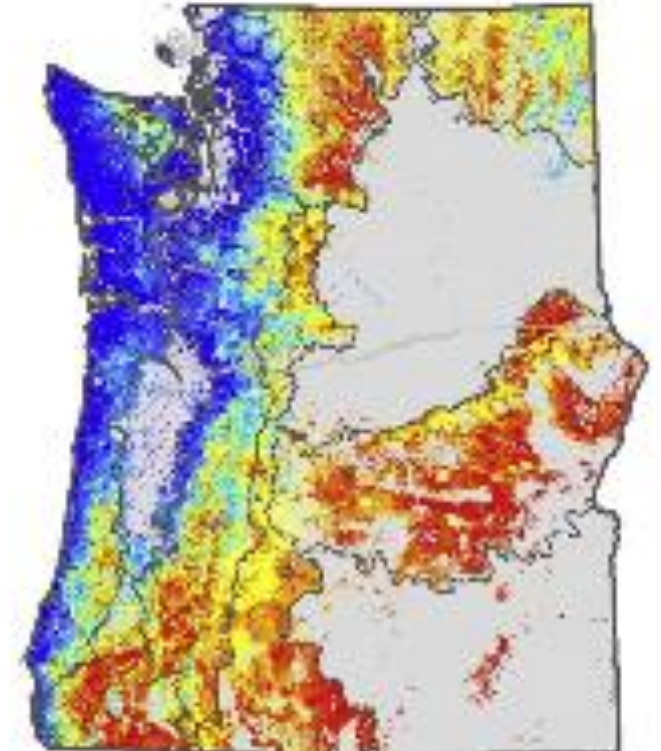
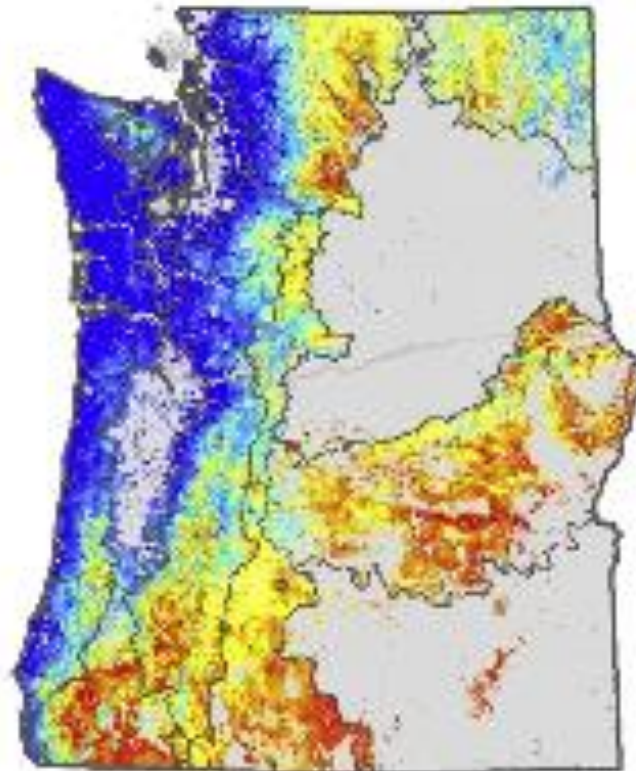
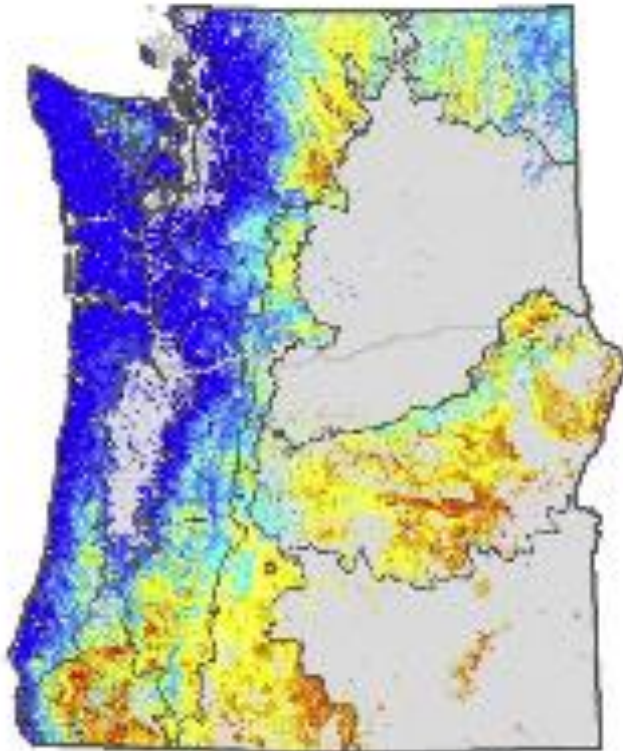
# Potential Future Fire Suitability

**1991–2020 Normal**

**2031–2060 Normal**

**2071–2100 Normal**

**median**



# Summary

- 1. Variation in historical fire regimes of westside forests**
  - **Infrequent, high severity fire, very large HS fire patches**
  - **Moderately frequent, mixed severity fire with variable patch sizes (some large HS fire patches)**
- 2. Climate variation affected fire occurrence**
- 3. Multiple successional pathways across region**
- 4. Variability in landscape pattern**

# Summary

1. Despite increase in fire in western U.S.
    - Fires have been relatively rare in westside forests
      - Except subalpine forests
    - Thousands of fires have been suppressed
    - Probably less landscape variability than historical for current climate
  2. Increases in fire under climate change but amount of increase is uncertain
  3. Challenge for fire-related biodiversity on westside
    1. Although fire suppression still needed in some areas, may have opportunities to manage wildfires in others
    2. How to provide for landscape diversity (including early seral)
- 
- An aerial photograph of a forest fire. A firefighting aircraft is flying over the fire, dropping a large amount of red fire retardant. The fire is a bright orange-red color, and the surrounding forest is dark green. The aircraft is a white twin-engine plane with a red tail and wings. The text is overlaid on the left side of the image.

A photograph of a forest fire at sunset. The scene is filled with tall, thin trees, some of which are silhouetted against a bright orange and yellow sky. The ground is covered in flames and smoke, with a person in a yellow jacket visible in the lower center. A semi-transparent white box with the text "Questions?" is centered over the image.

Questions?