



Role of Fire in Oregon's Landscapes : Past Present and Future

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1. Key factors that influence kind and types of fire

2. Historical role of fire

- ❖ fire history and regimes
- ❖ landscape pattern

3. Modern role of fire:

- ❖ fire regimes
- ❖ fire management

4. Future role of fire:

- ❖ Climate change
- ❖ Fire effects

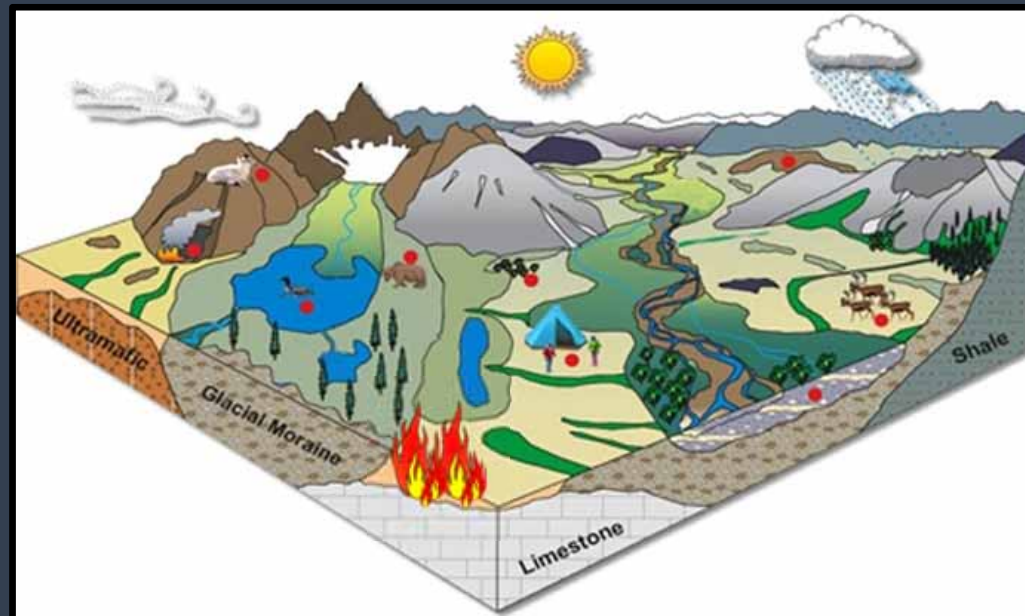


Landscapes as Ecosystems

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
- ❖ People

Ecosystem Drivers of Fire

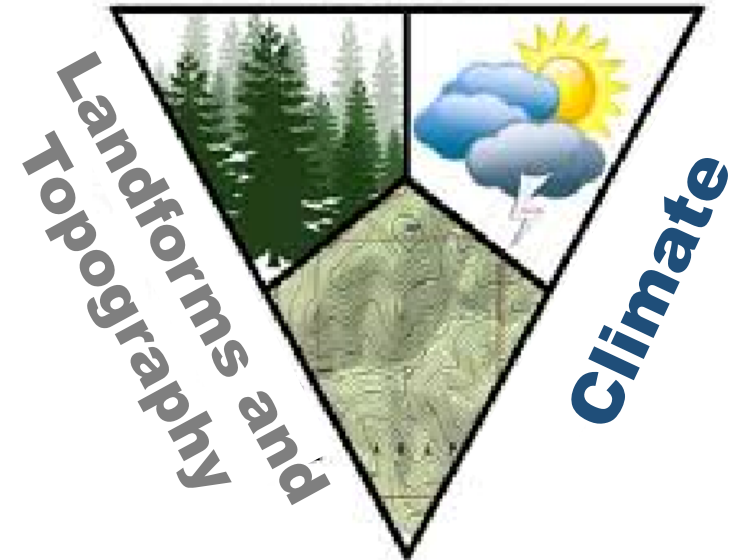
Fuels



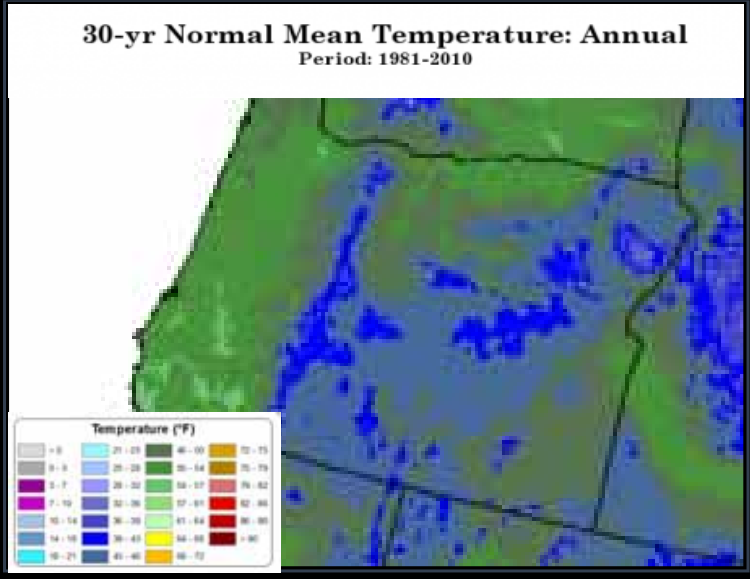
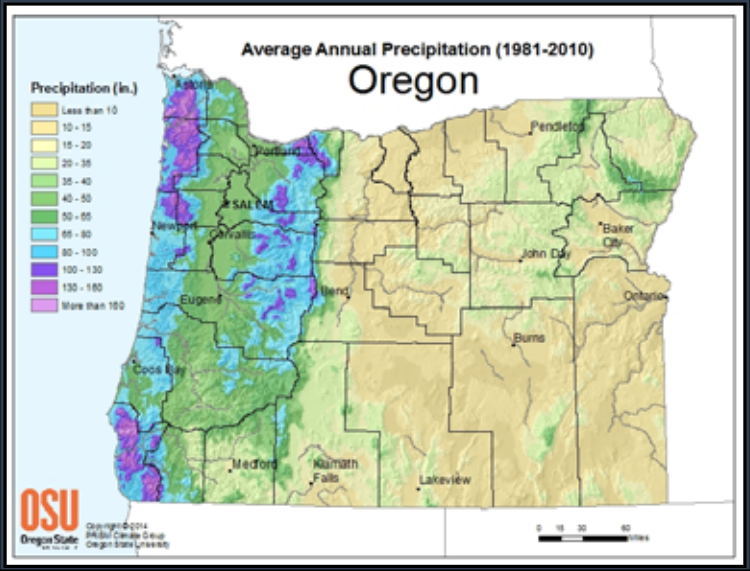
Fire behavior triangle



Vegetation Composition Structure and Pattern



Fire ecosystem triangle



Climate

Precipitation Temperature Seasonality



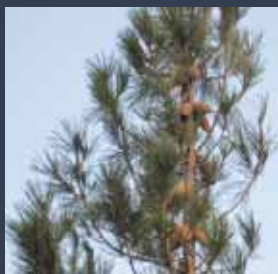
Ignition

Vegetation
(Fuels)

Other Processes



Vegetation Composition: Fire Adaptation



Adaptation	Traits
Avoider	Thin bark, shade tolerant, shallow rooted
Evader	Long lived seed in seedbed or crown, serotinous cones
Resister	Thick bark, shade intolerant, short crowns
Endurer	Sprout from root or air

Vegetation Structure: Kind of Fire

Ground Fire: Low Severity



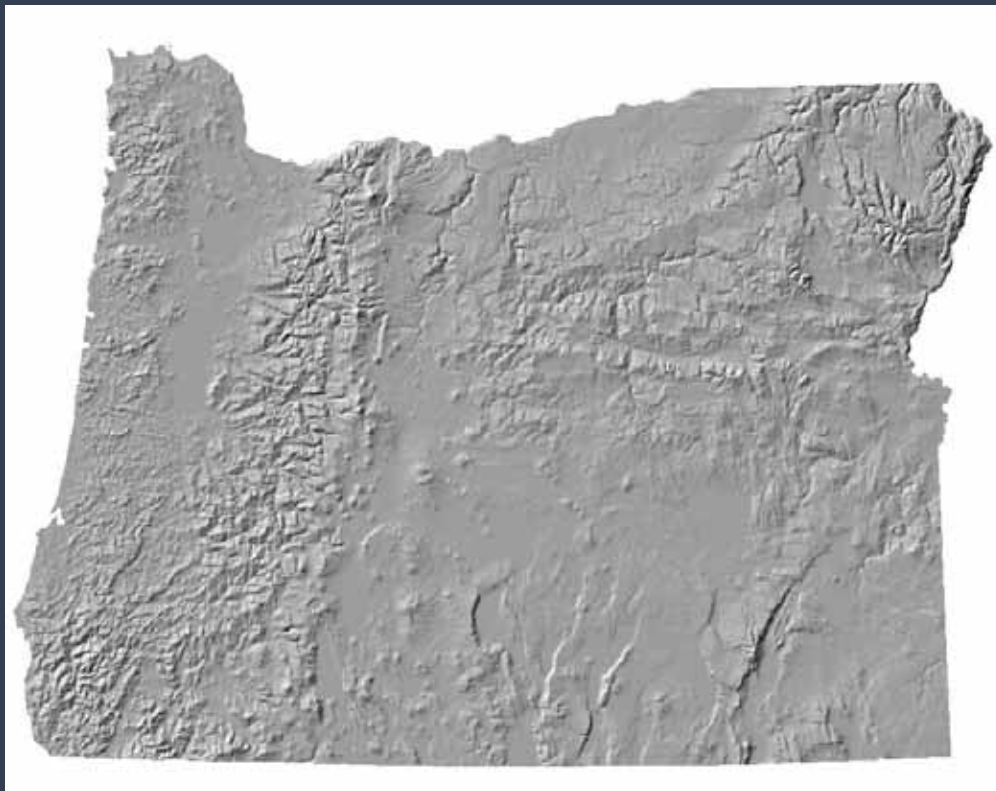
Surface Fire: Low to Moderate Severity



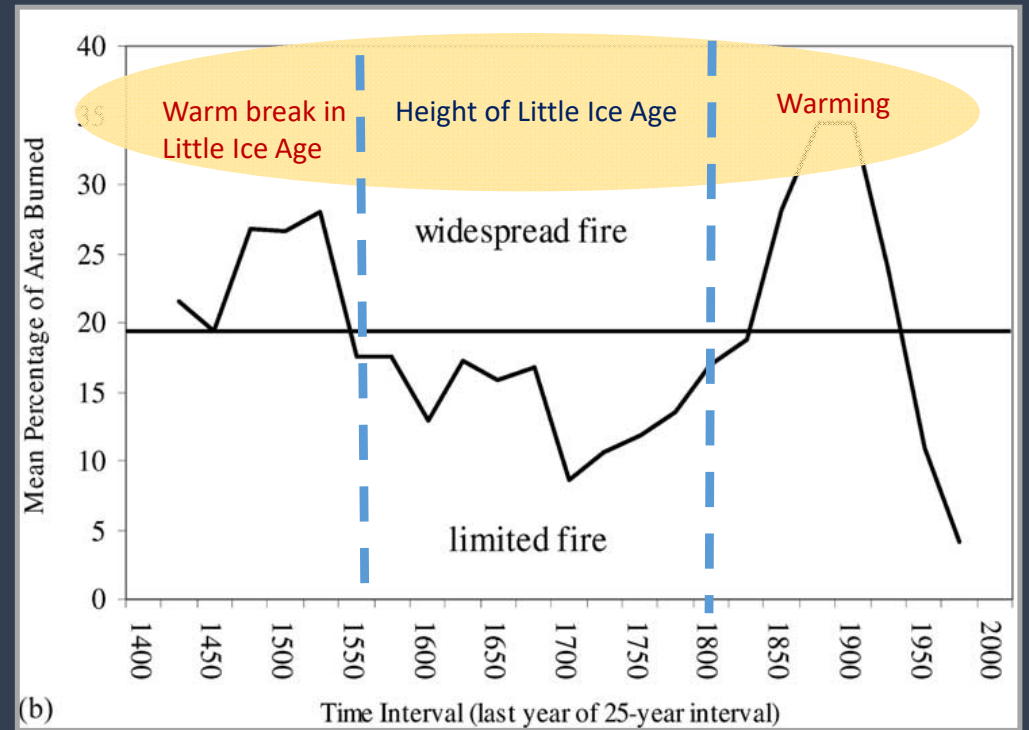
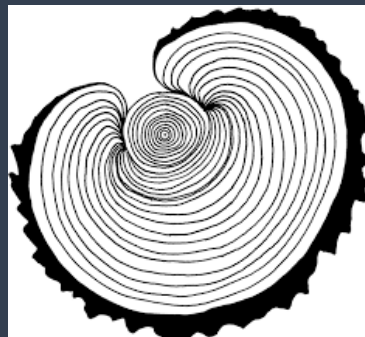
Crown Fire: Moderate to High Severity



Landforms and Topography Affect Pattern



Fire Through Time



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

Historical Fire Regimes

Frequency: How often

Severity: How much mortality (kinds of fire)

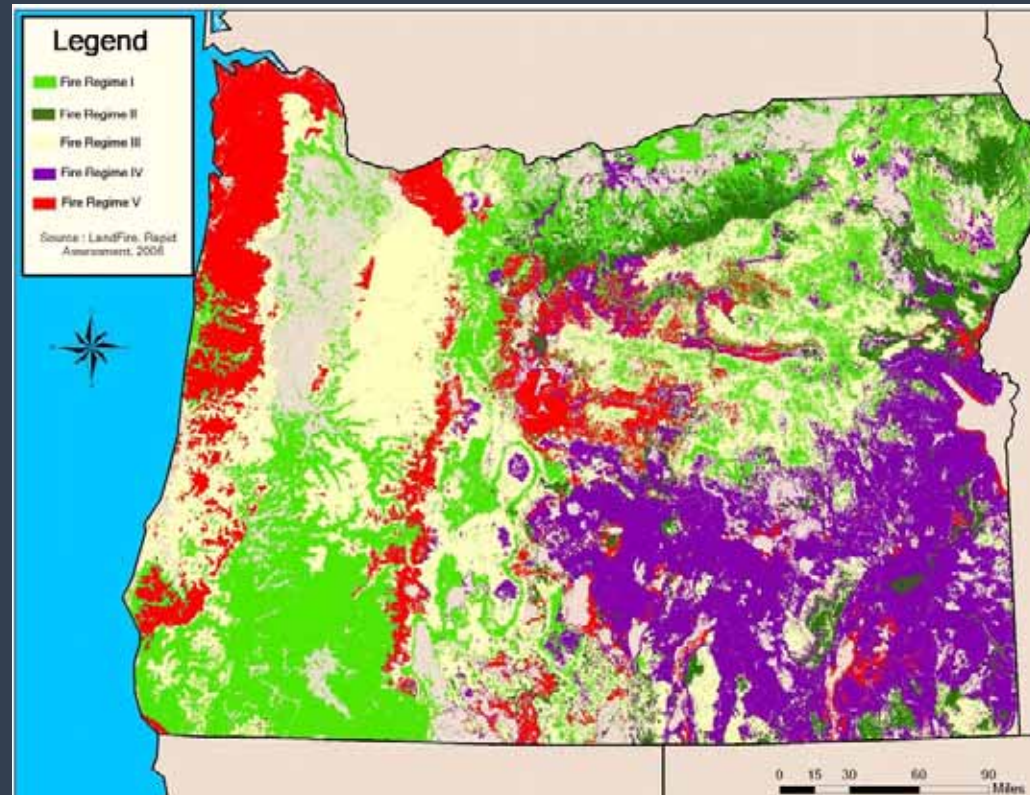
Extent: How large

Affects the composition, structural development and landscape pattern

Infrequent High
Severity
Large Extent

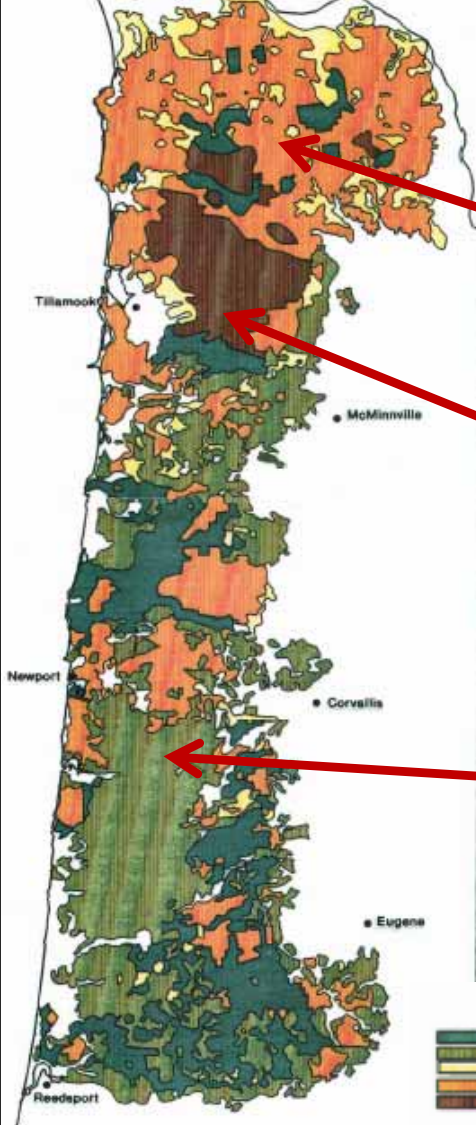
Variable
frequency
Mixed severity
Variable Extent

Frequent
Low severity
Moderate
Extent



Macdonald et al. , 2006.
Landfire Fire Regimes

Oregon Coast Range 1940

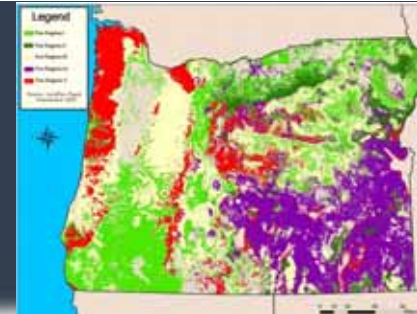


Infrequent , High Severity Fire Regime

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

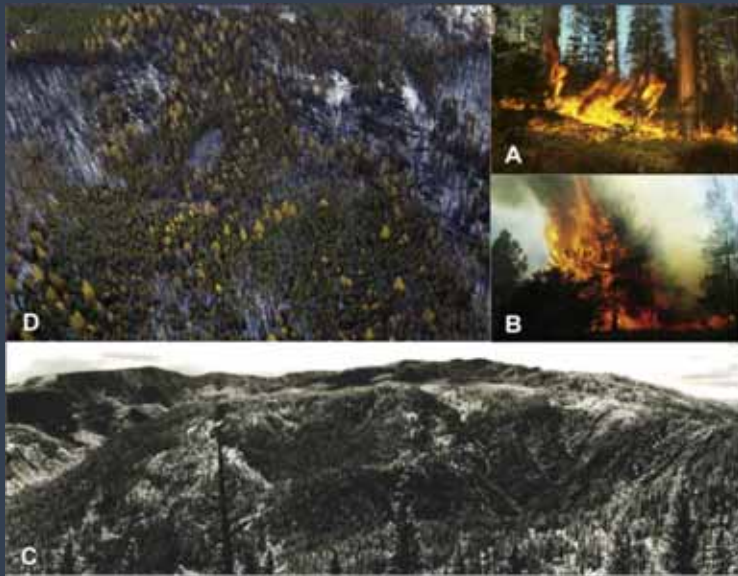
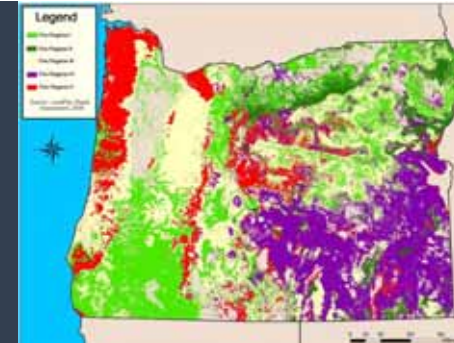
Nestucca: 1845/6/7
Repeated reburn by settlers;
300-375,000 total acres

Yaquina 1849;
450,000 total acres



Teensma et. al 1991

Variable Frequency, Mixed Severity Fire Regime

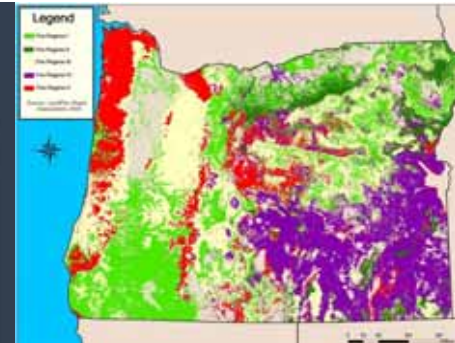


Hessburg et al. 2016. *USDA Forest Service / UNL Faculty Publications*. 296.
<http://digitalcommons.unl.edu/usdafsfacpub/296>

Low severity

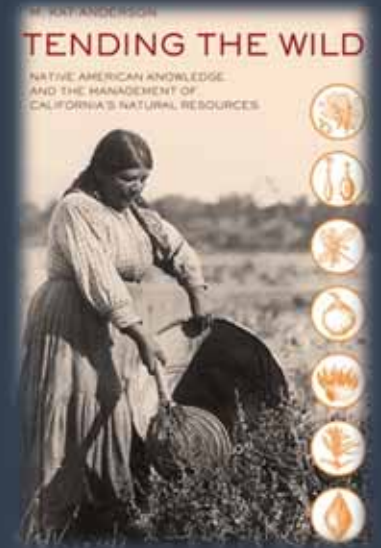
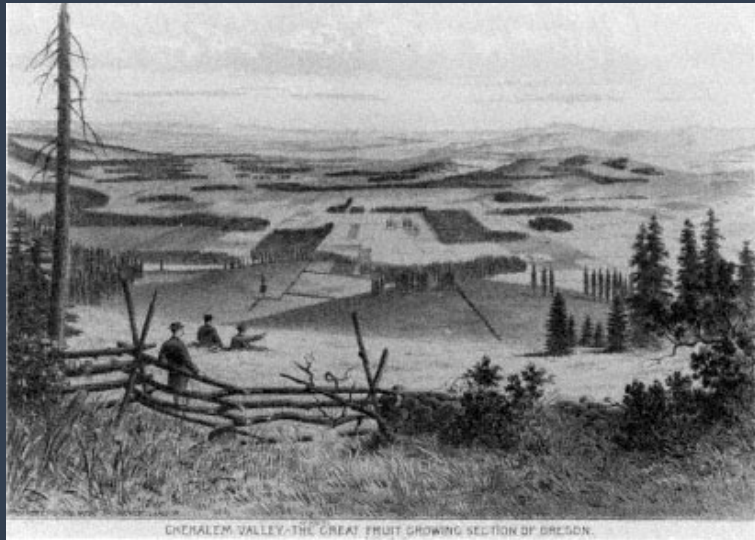
Moderate severity

Frequent , Low Severity Fire Regime



Role of People and Fire

- ❖ Native People
- ❖ European settlement
- ❖ Modern fire management



Native Americans and Fire

As Douglas observed while traveling south of present-day Salem on September 30, 1826, "Most parts of the country burned; ...*Some of the natives tell me it is done for the purpose of urging the deer to frequent certain parts, to feed, which they leave unburned and of course they are easily killed. Others say that it is done in order that they might better find wild honey and grasshoppers, which both serve as articles of winter food.*"

From Oregon Encyclopedia



T. Agate's sketch: "Costume of a Callapaya Indian"



European Settlement



Era of Fire Suppression

National Forest
Reservation designation

BIG BURN 3 million acres
Idaho, Montana, Washington

Total fire suppression policies
implemented



"In 1935, the Forest Service had a "10 a.m." policy which stipulated that a fire was to be contained and controlled by 10 a.m. following the report of a fire, for, failing that goal, control by 10 a.m. the next day and so on."

Source: <http://www.fs.fed.us/fire/people/aboutus.html>

1891



1910



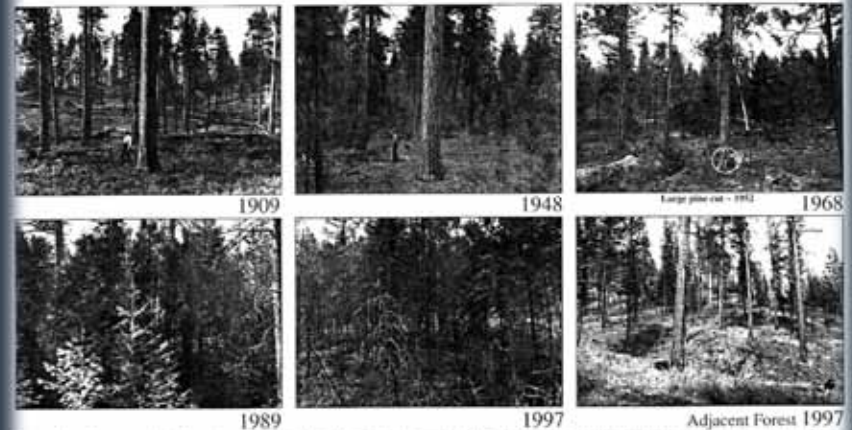
1920-1970s

Modern Fire Suppression

- ❖ Let It Burn policy
- ❖ Yellowstone Fires 1988
- ❖ Wildland Urban Interface
- ❖ Years of suppressed fires effects

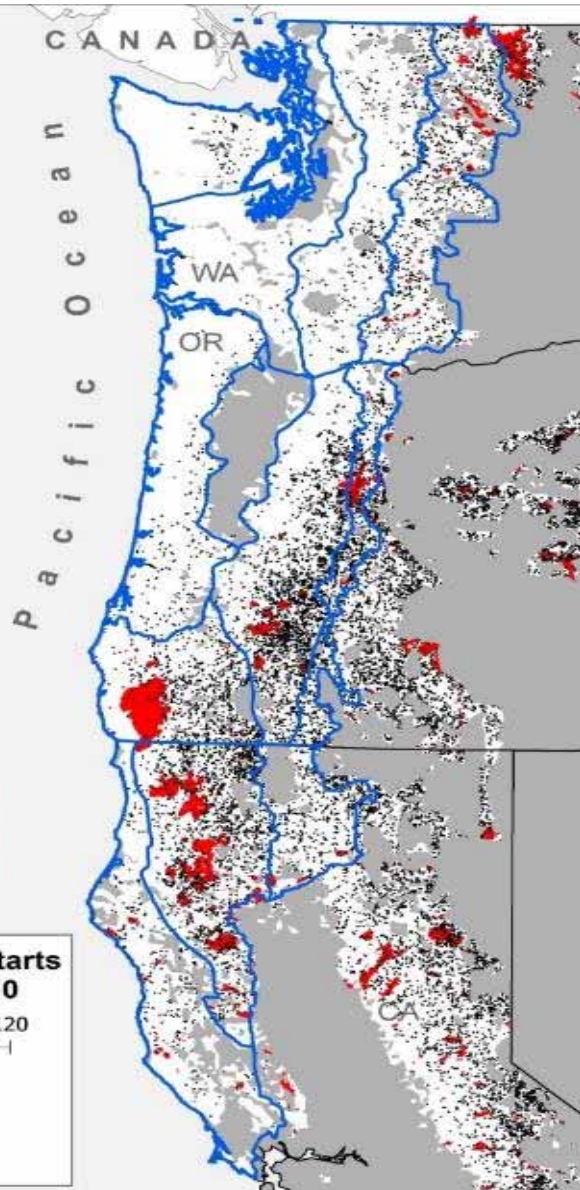


88 Years of Change in Ponderosa Pine Forest



Photos taken from one point show changes resulting from fire exclusion, removal of large pines and ecosystem management treatments in the 1990's.
Pine-pine location between National Forest - Produced by the Fire Effects Unit, Pacific Northwest Research Station, Vancouver, Washington - For General Technical Report GTR-353, U.S. March 1999.

Lightning Fire Starts in Northwest Forest Plan Area and Large Recent fires



Suppression Effects on Westside Fire Regimes

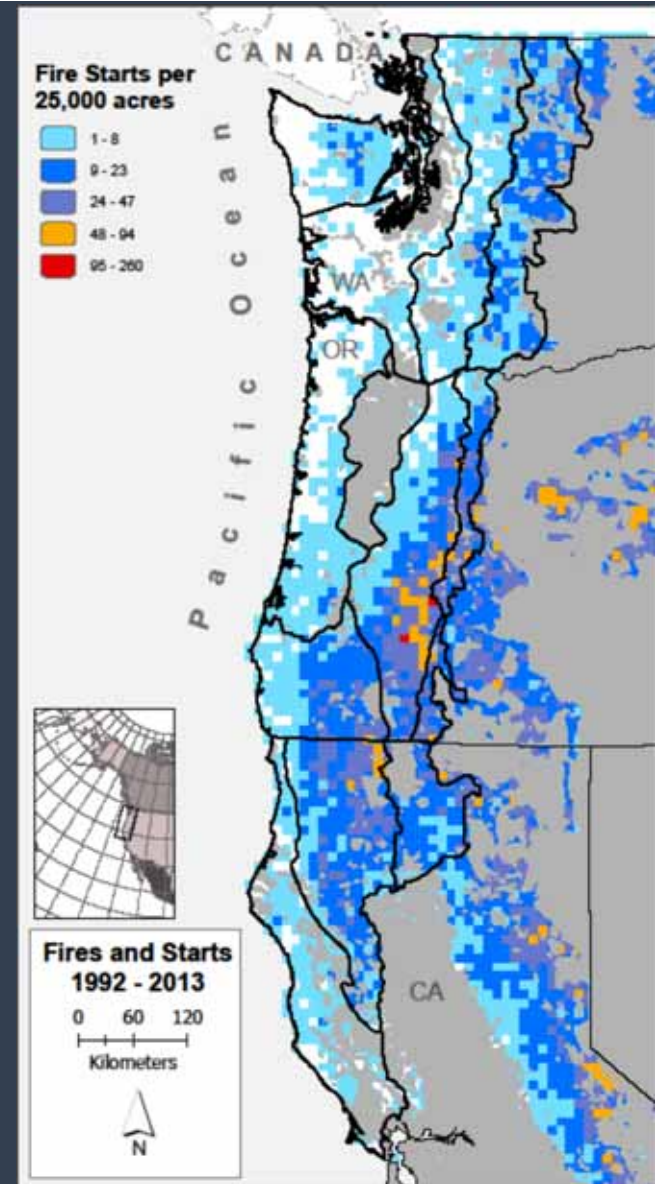
Suppressed Lightning Fire Starts 1992-2013



Tony Patten, Columbia Helicopters



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
TOTAL	13,372	



Effects of Fire Suppression on Fire Regimes

- ❖ Decreases in fire frequency
- ❖ Increases in higher fire severity proportions
- ❖ Larger patches of high severity fire

Reilly et al. 2017



Charlton 1996



Tumblebug 2009



Rattle 2008

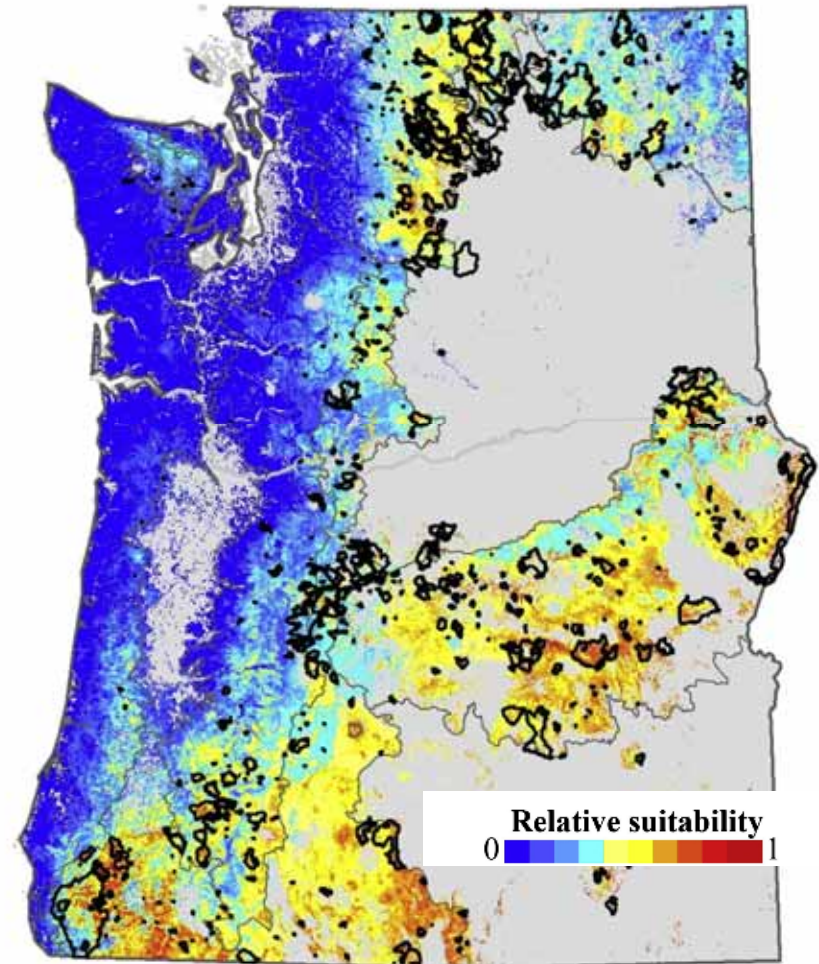
Potential Future Fire Suitability

- ❖ Large Fire suitability model—probability NOT severity
- ❖ Trained on past fires
- ❖ Used climate models to predict future



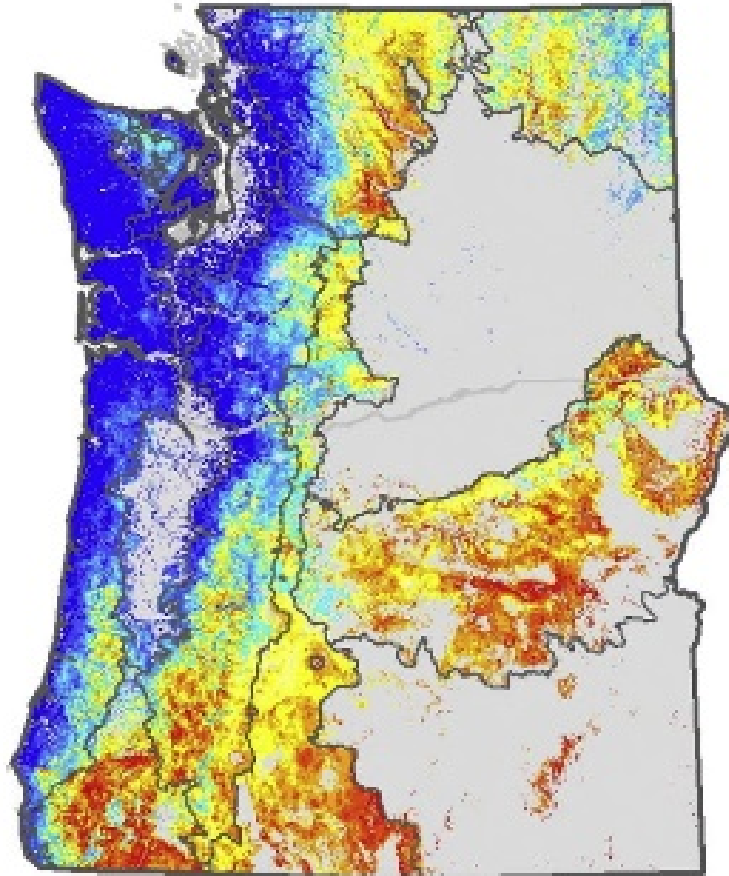
Davis et al. 2017

Current Normal (1981–2010)
Large wildfires between 2001–2015

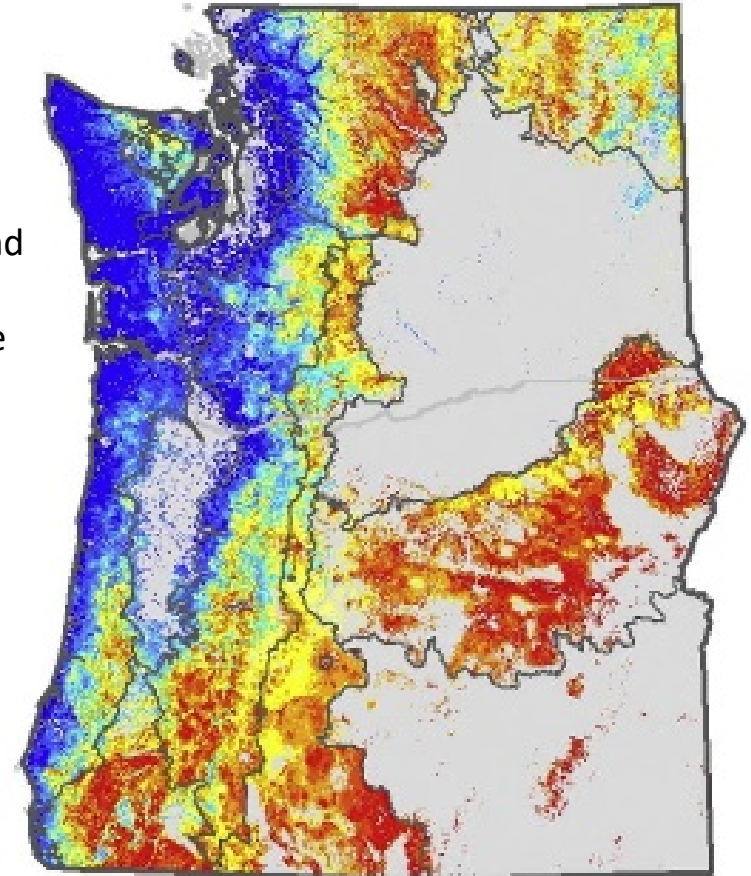


2031–2060 Normal


2071–2100 Normal



- ❖ Increase in suitability through time, with largest shifts in Eastern and SW Oregon
- ❖ With increased fire potential and high suppression costs, need to shift suppression strategies



Davis et al. 2017

Relative suitability
0  1



Summary

1. **Climate, vegetation composition, structure, pattern and landforms and topography are key drivers of fire**
2. **Variation in historical fire regimes in Oregon's forests**
3. **Temporal climate variability affected fire occurrence and severity in westside Oregon's forests**
4. **Fire regimes created variability in landscape pattern**

Summary

An aerial photograph of a forest fire. A firefighting aircraft is flying from right to left, dropping a large amount of red fire retardant onto the fire. The fire is a large, irregular shape in the center of the image, with a bright orange and red core. The surrounding forest is dark green and brown. The sky is a pale blue.

1. Current fire regimes have shifted
 - a) Tens to hundreds of thousands of fires have been suppressed
 - b) Higher proportion of high severity in all regimes distributed in large patches.
2. Increases in fire activity in future due to changing climate.
 - a) Need for addressing how fire fits into our current and future
 - b) Need for developing alternative fire management strategies

