Fire History and Wildfire Risk Within Rogue Source Areas

28 February 2019

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The Nature Conservancy

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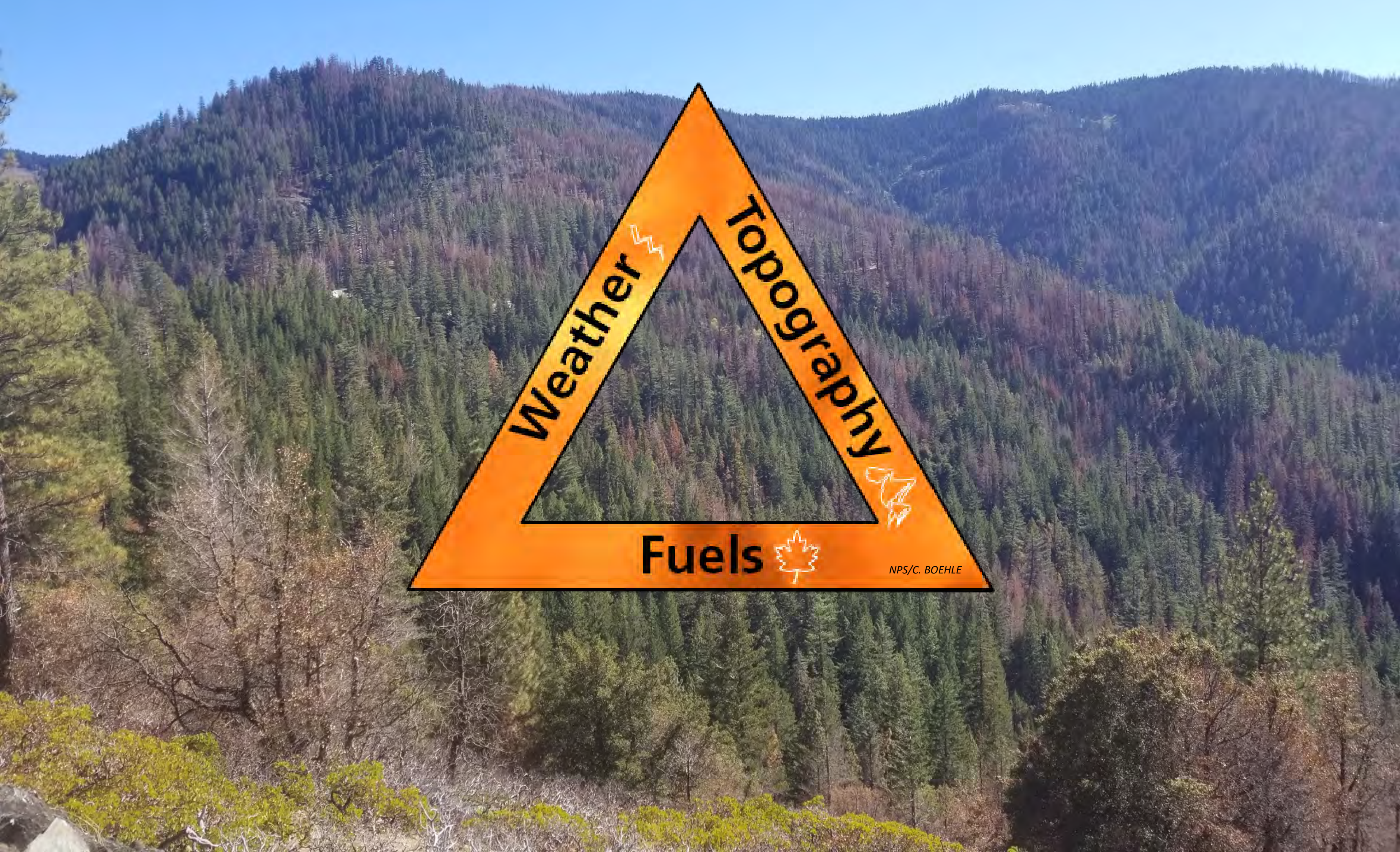
Working Together for Common Good

People and Nature are threatened by uncharacteristic fire

- Integrate across objectives
- Explicitly account for fire
- Collaborate
- Be broad-based and transparent

Fire Environment



What Controls Fires?

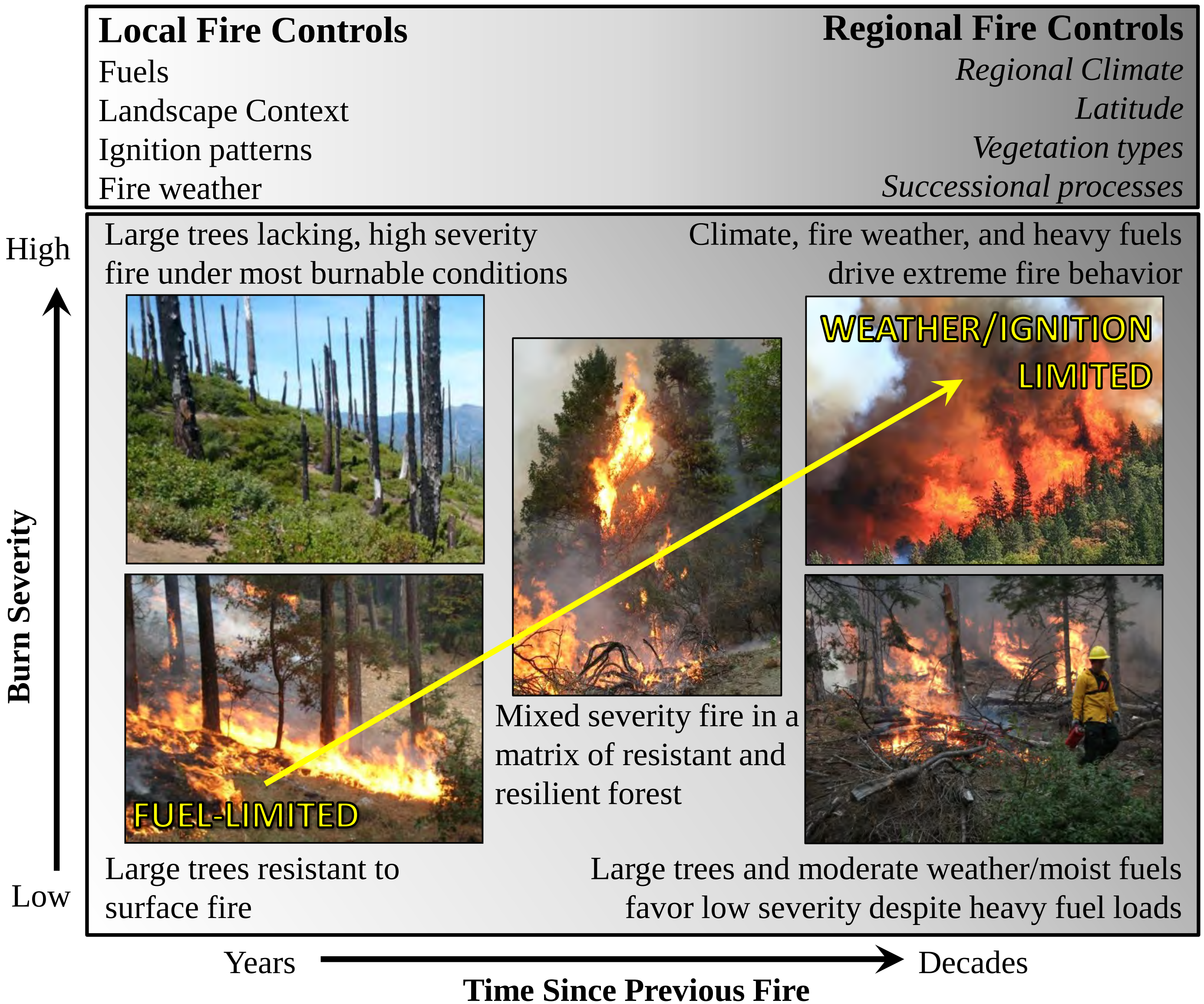
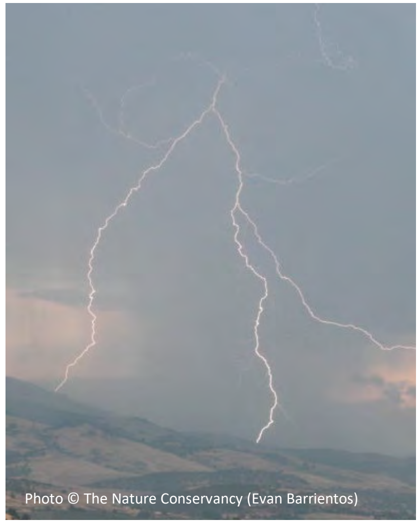
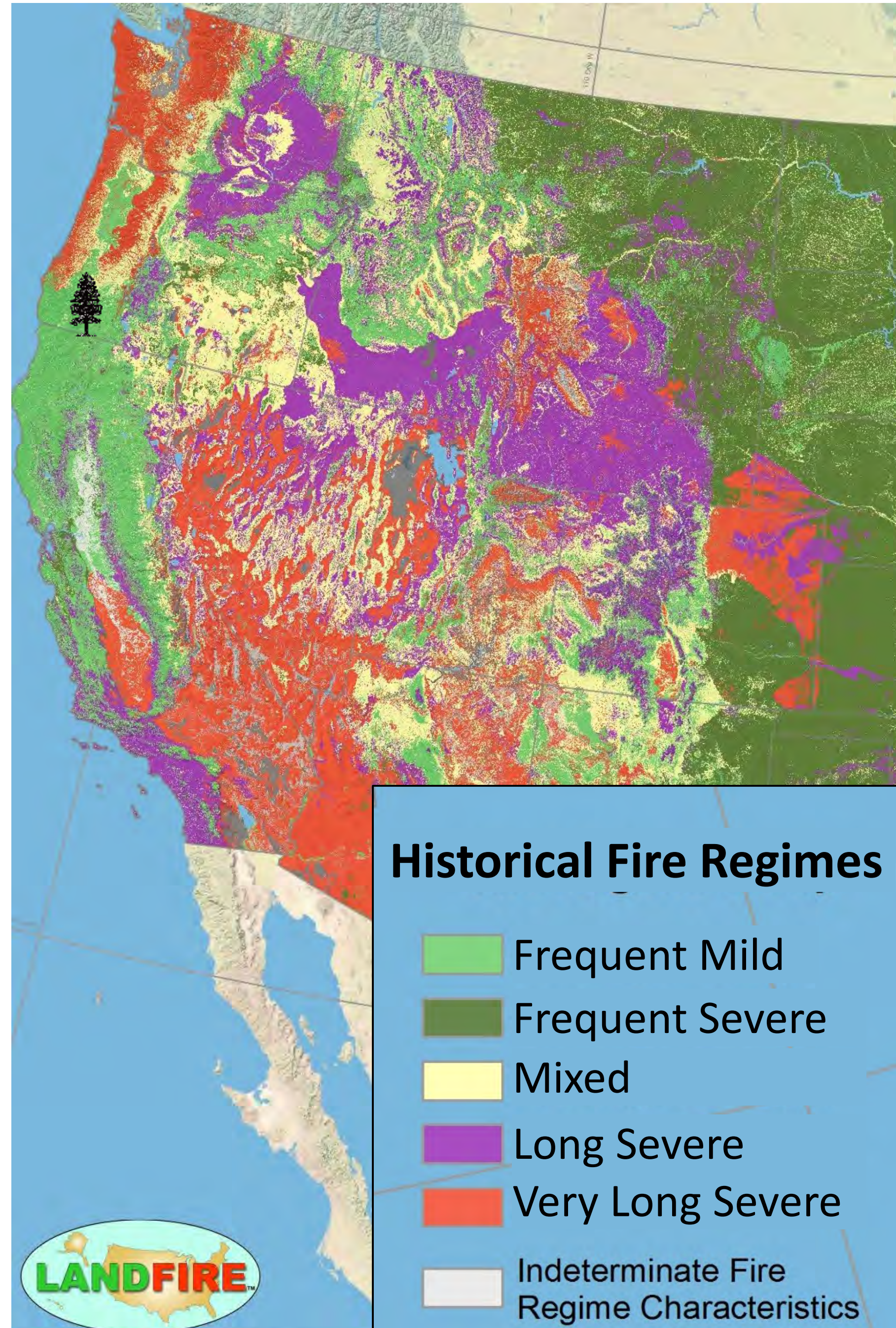


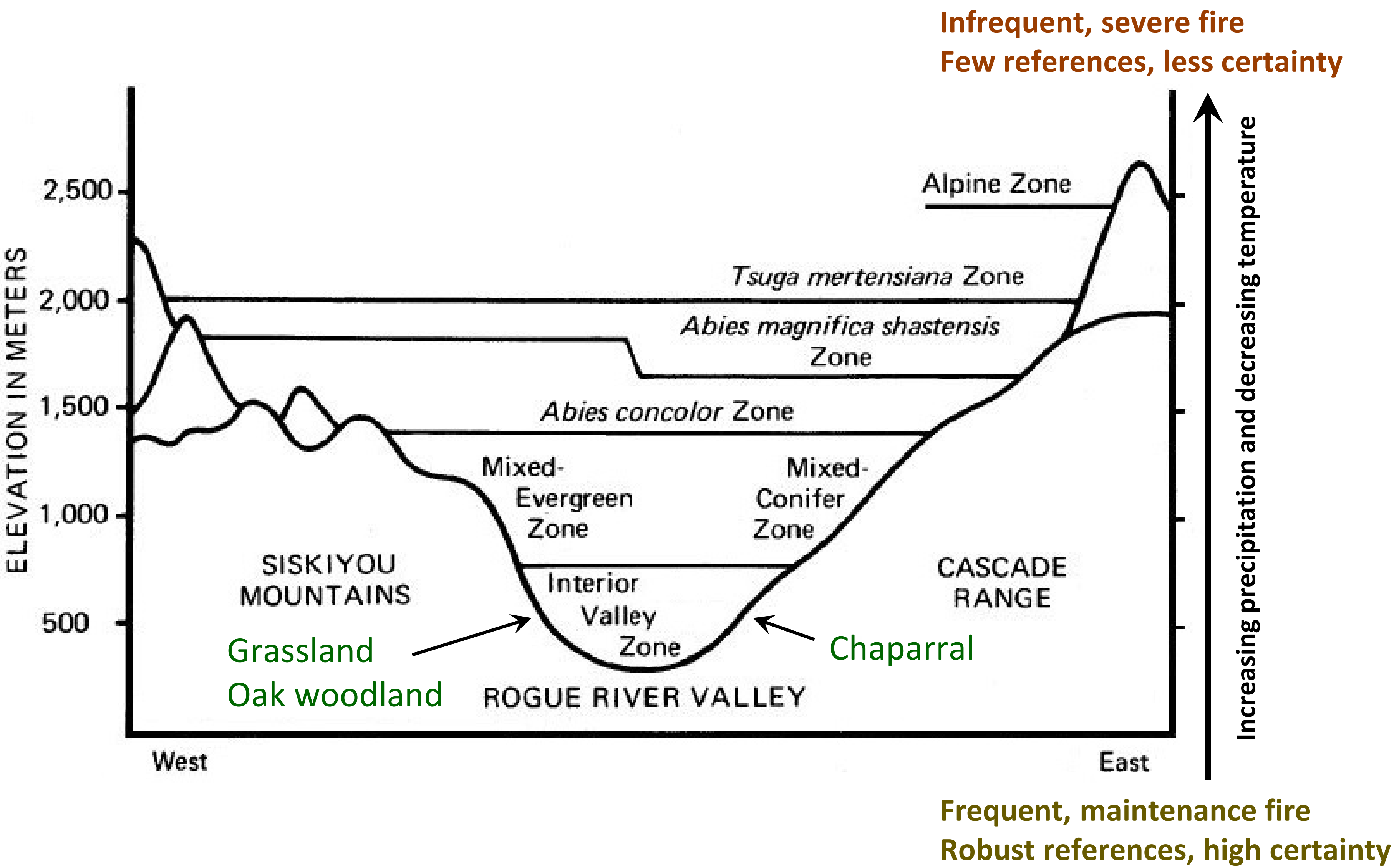
Photo credits clockwise from upper left: Web, Keith Perchemlides, Scott Harding, Marko Bey, and Keith Perchemlides.



Landscape Stewarded by *Frequent* Mild Fire



Vegetation and Fire Regimes of the Rogue Basin

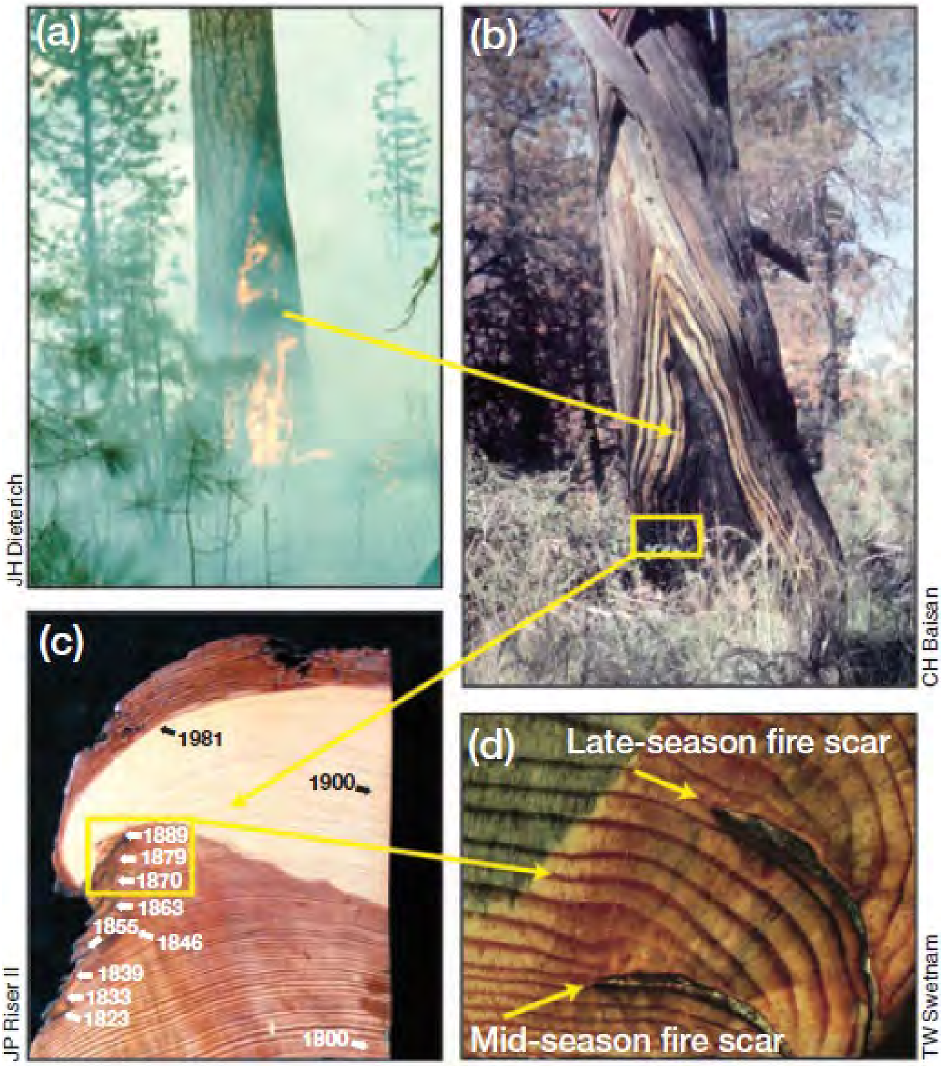


Redrawn from Franklin & Dyrness 1988 and Briles et al. 2005

Local Fire Regime Lines of Evidence

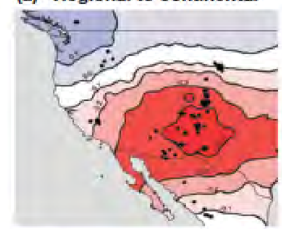
- Historical narratives
- Paleoecology
- Historical stand structures and species
  - inferred fire regime
    - Historical aerial photos
    - Historical stand structure – Data or GLO
- Fire scars recorded in trees
  - direct measure of fire periodicity and seasonality

Dendrochronology at Multiple Scales



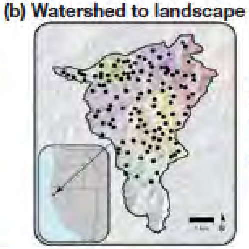
Spatial scale	Analyses and interpretation examples

(a) Regional to continental



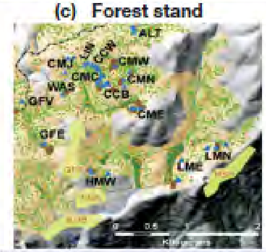
Regional+
- Climate
- Land use changes

(b) Watershed to landscape



Watershed to Landscape
- Aspect
- Topography
- Elevation

(c) Forest stand



Forest Stand
- Forest demography
- Fuels
- Succession

(d) Tree leve

Tree
- Physiological responses
- Mortality
- Regeneration

Falk, D. A., E. K. Heyerdahl, P. M. Brown, C. Farris, P. Z. Fulé, D. McKenzie, T. W. Swetnam, A. H. Taylor, and M. L. Van Horne. 2011. Multi-scale controls of historical forest-fire regimes: new insights from fire-scar networks. Frontiers in Ecology and the Environment **9:446-454.**

Topography + Diverse Geology + Fire = Diverse Interspersed Habitats

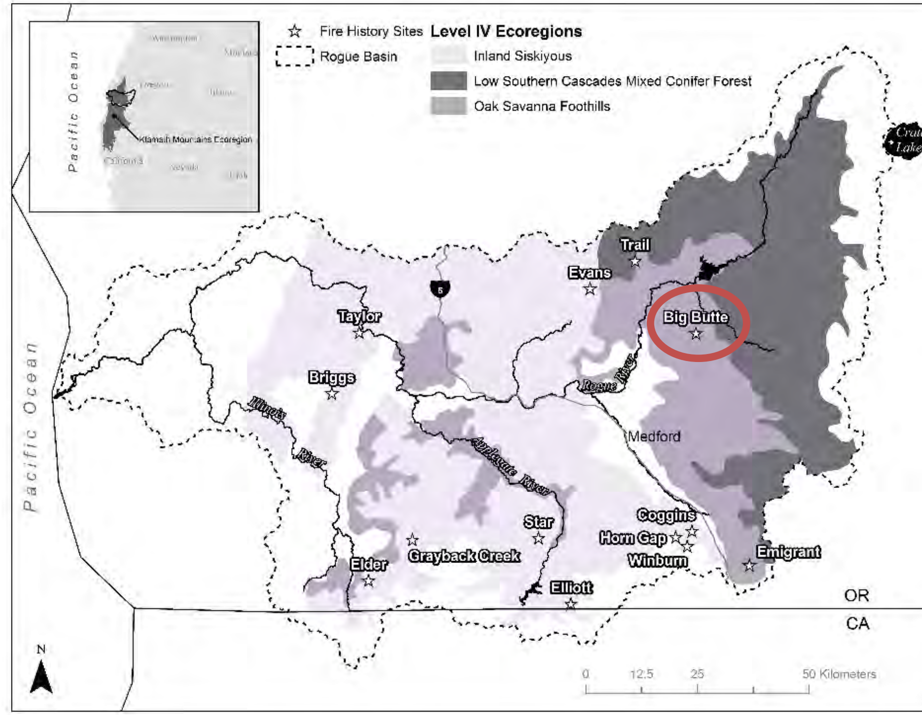
Local Fire History

Composite site fire return interval

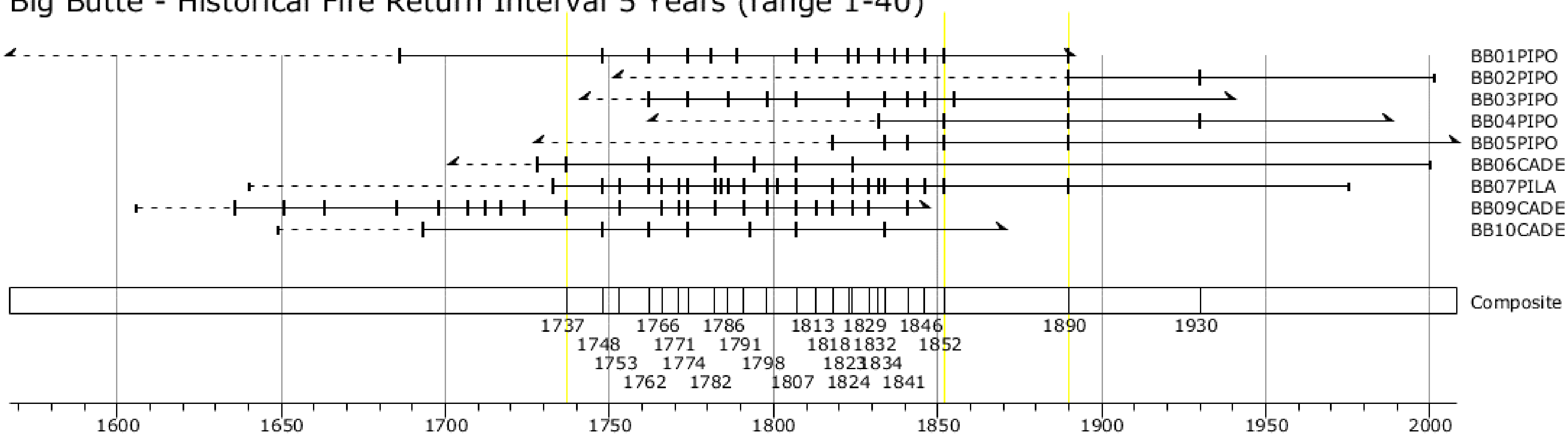
- **8 years on a 16 acre area**

Point fire return interval

- 13 years (at a given scarred tree)



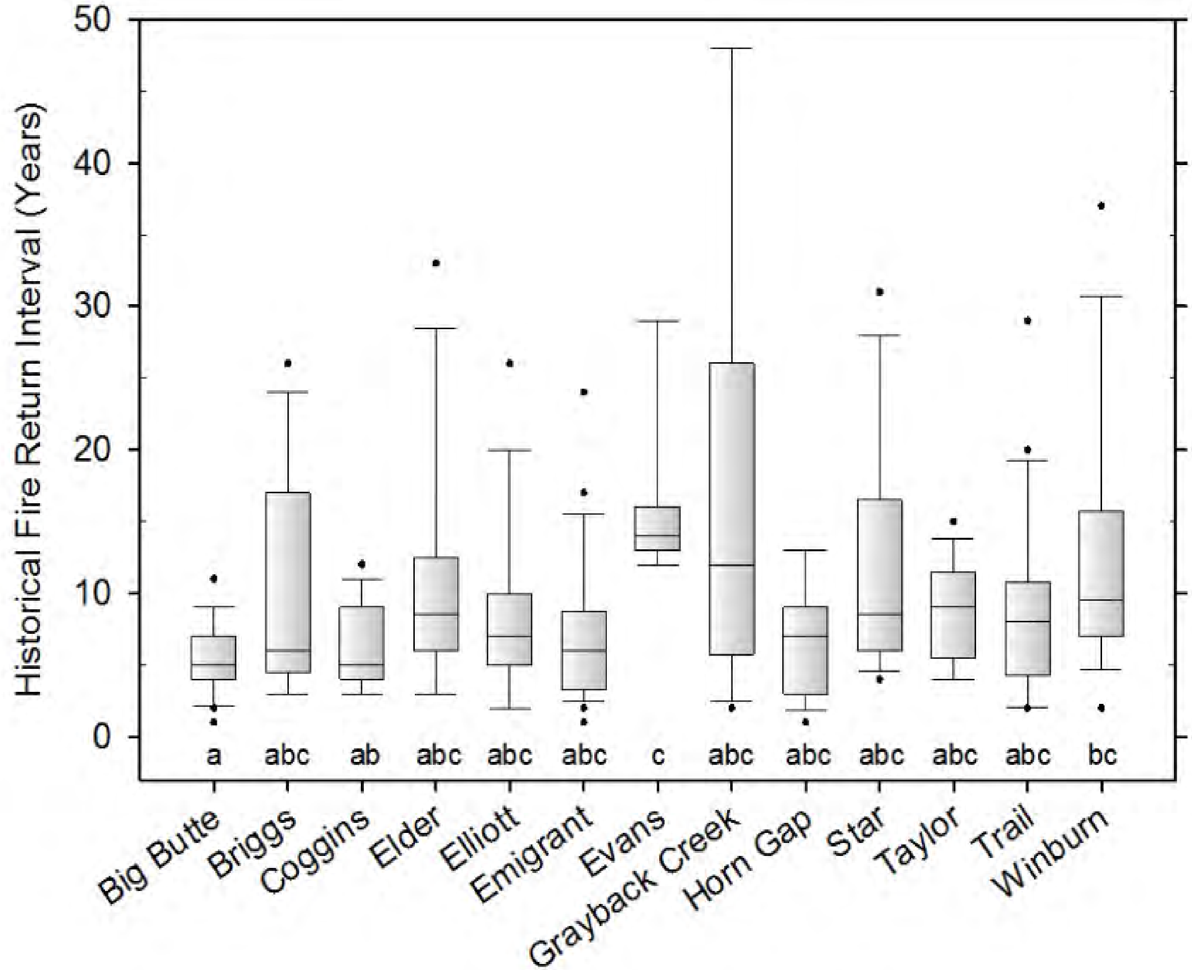
Big Butte - Historical Fire Return Interval 5 Years (range 1-40)

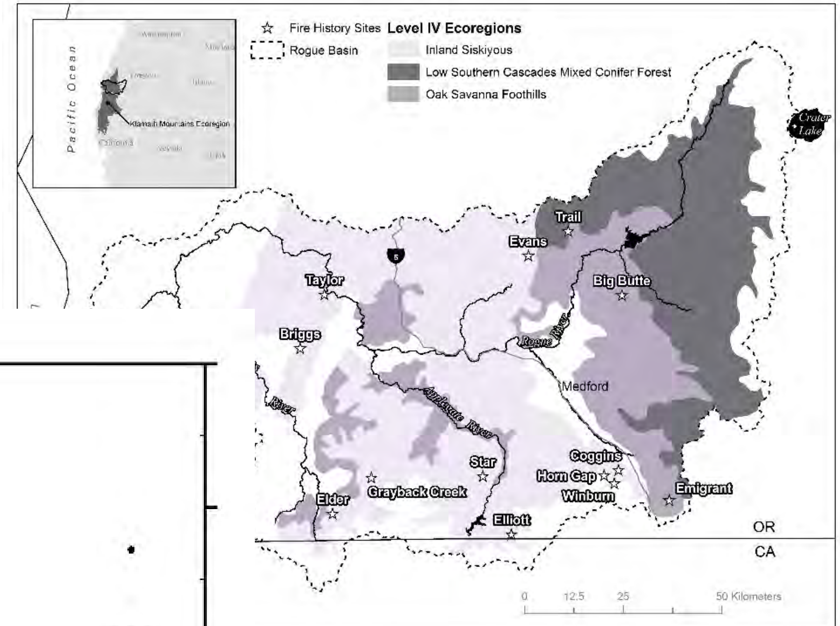


Metlen, K. L., C. N. Skinner, D. R. Olson, C. Nichols, and D. Borgias. 2018. Regional and local controls on historical fire regimes of dry forests and woodlands in the Rogue River Basin, Oregon, USA. Forest Ecology and Management **430:43-58. .**

Local-scale, among sites

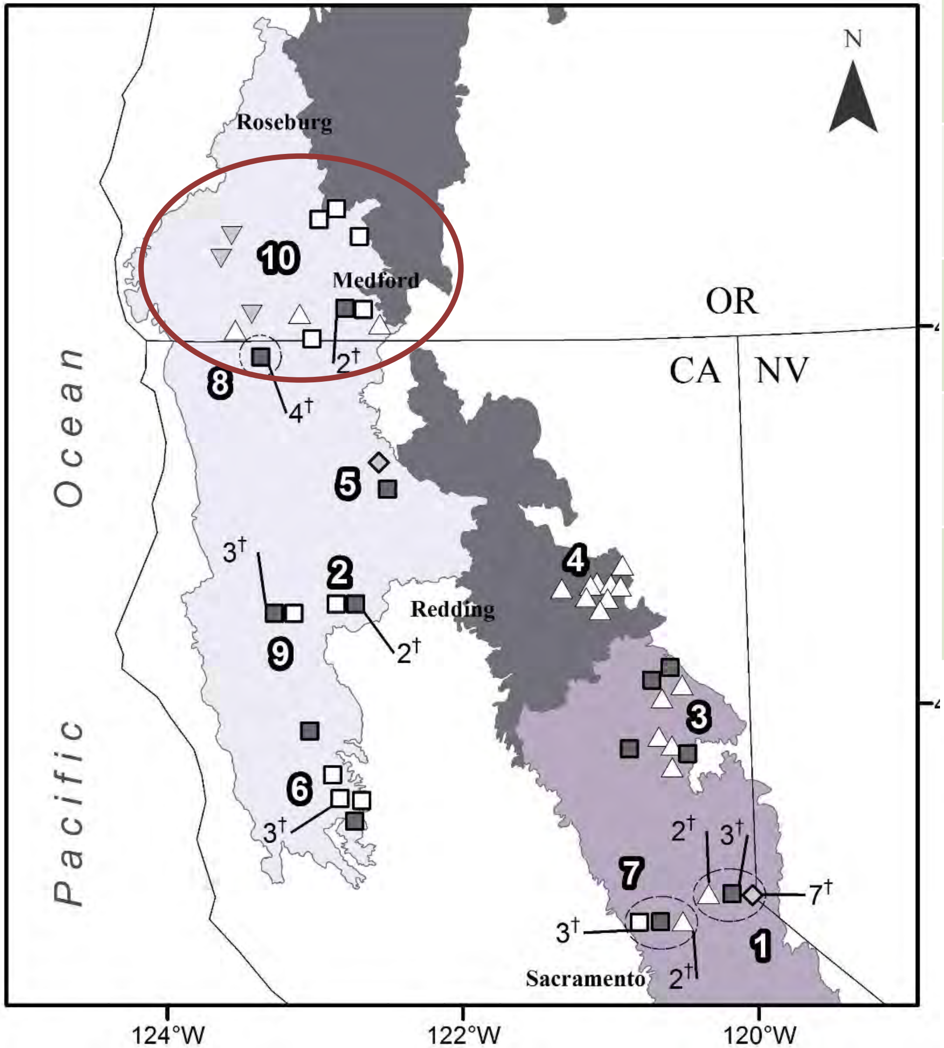
8-Year Historical Fire Return



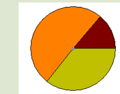
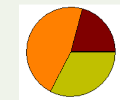
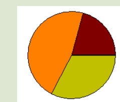
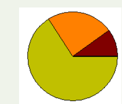
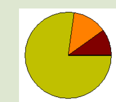


Metlen et al. 2018. Forest Ecology and Management **430:43-58. .**

Stand-scale frequent fire, ending in the 1800s



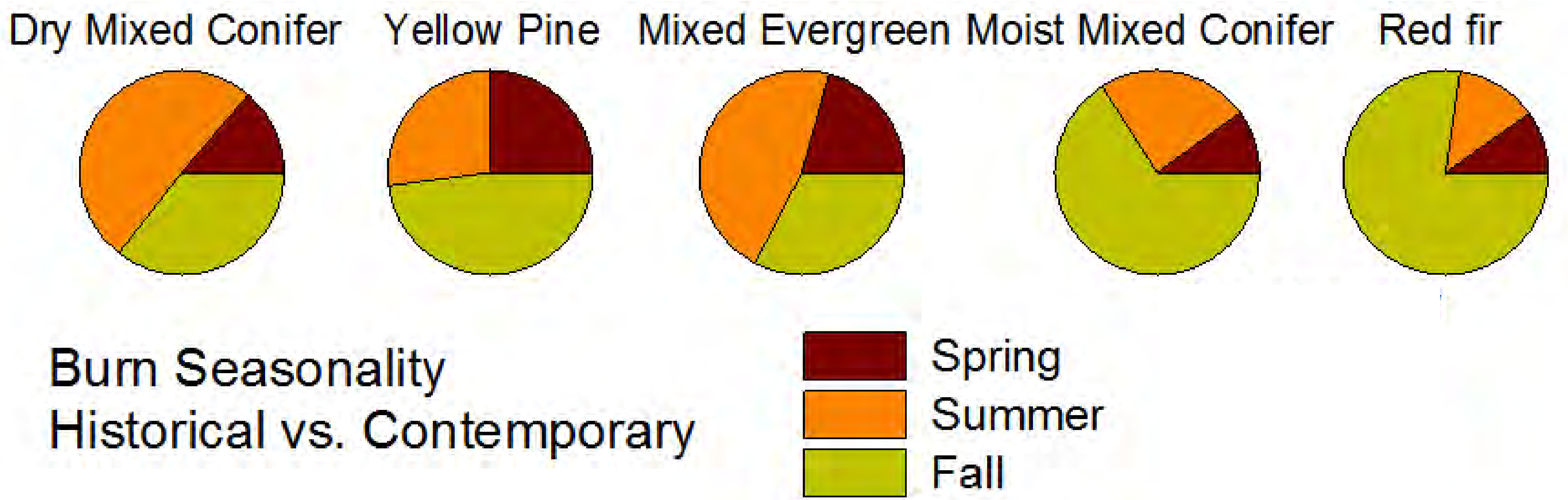
Metlen, K. L., C. N. Skinner, D. R. Olson, C. Nichols, and D. Borgias. 2018. Regional and local controls on historical fire regimes of dry forests and woodlands in the Rogue River Basin, Oregon, USA. Forest Ecology and Management **430:43-58. .**

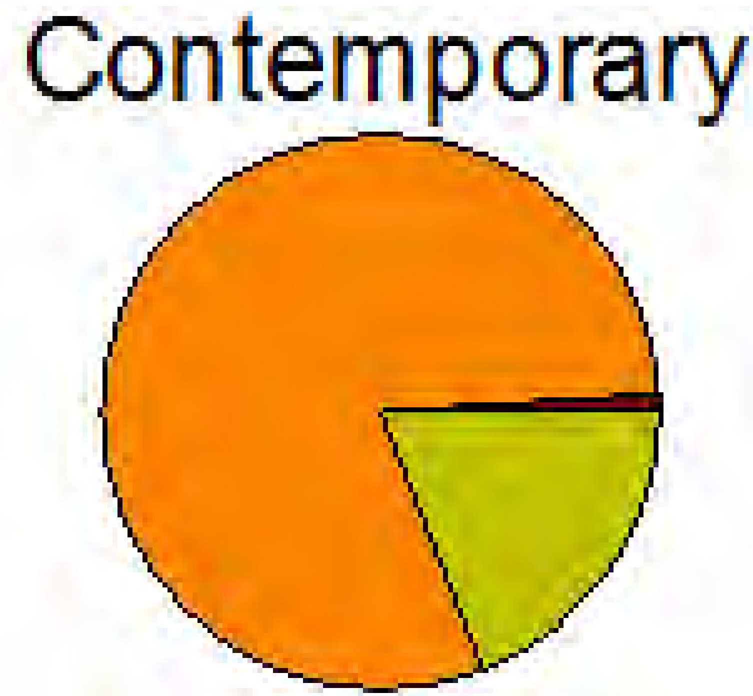
Forest Type	Fire Return Interval	Seasonality (%) Spring / Summer / Fall
Dry mixed conifer	8 (1-76)	
Yellow pine	9 (1-33)	
Mixed evergreen	9 (2-52)	
Moist mixed conifer	13 (1-116)	
Red fir	14 (7-148)	

Sites and Multiples (†) by Presettlement Fire Regime

- □ Dry mixed conifer
- ▽ Mixed evergreen
- ■ Moist mixed conifer
- ◇ Red fir
- △ Yellow pine

Studies are:
1 - Beaty & Taylor (2007);
2 – Fry & Stephens (2006);
3 – Moody et al. (2006);
4 – Norman & Taylor (2005);
5 – Skinner (2003);
6 – Skinner et al. (2009);
7 – Stephens & Collins (2004);
8 – Taylor & Skinner (1998);
9 – Taylor & Skinner (2003);
10 – Metlen et al (2018)

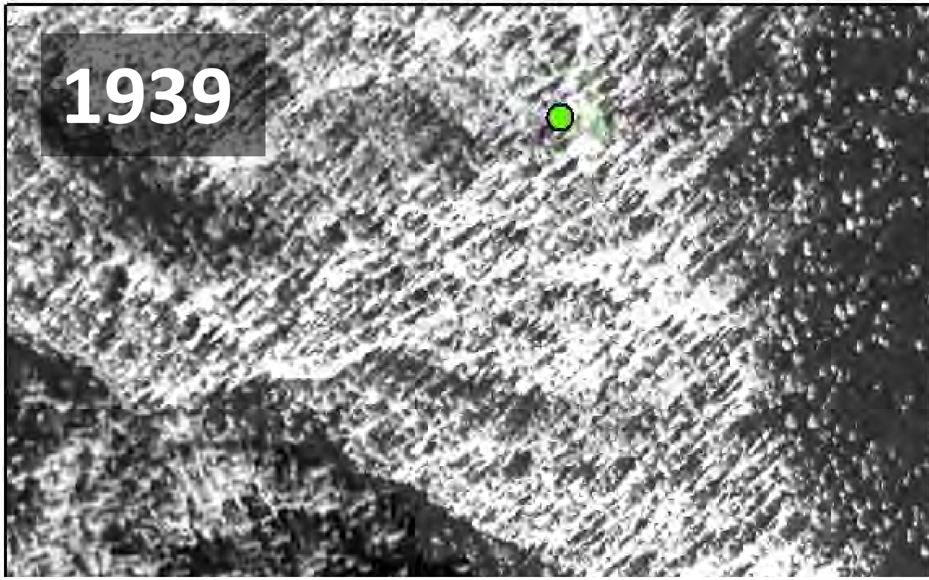


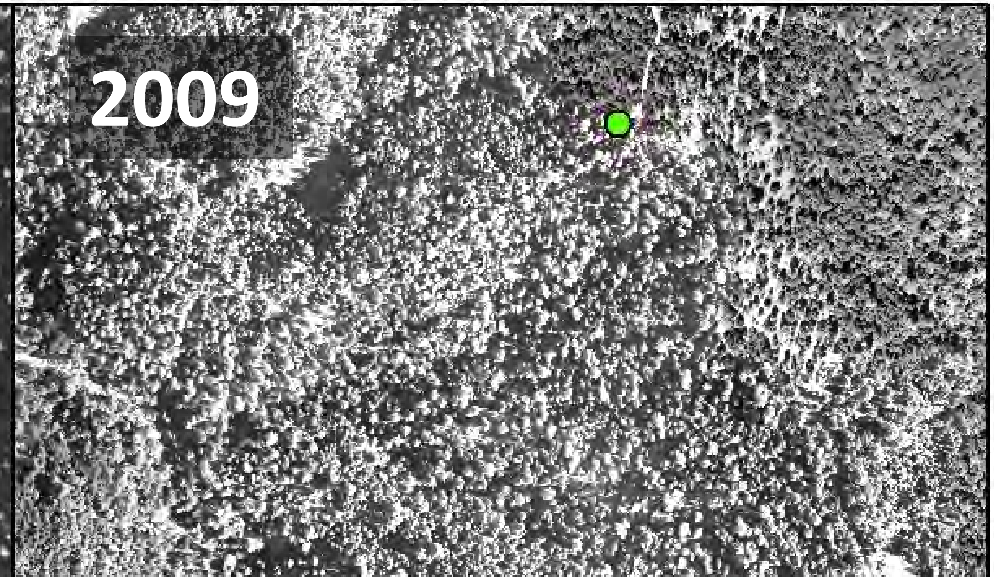


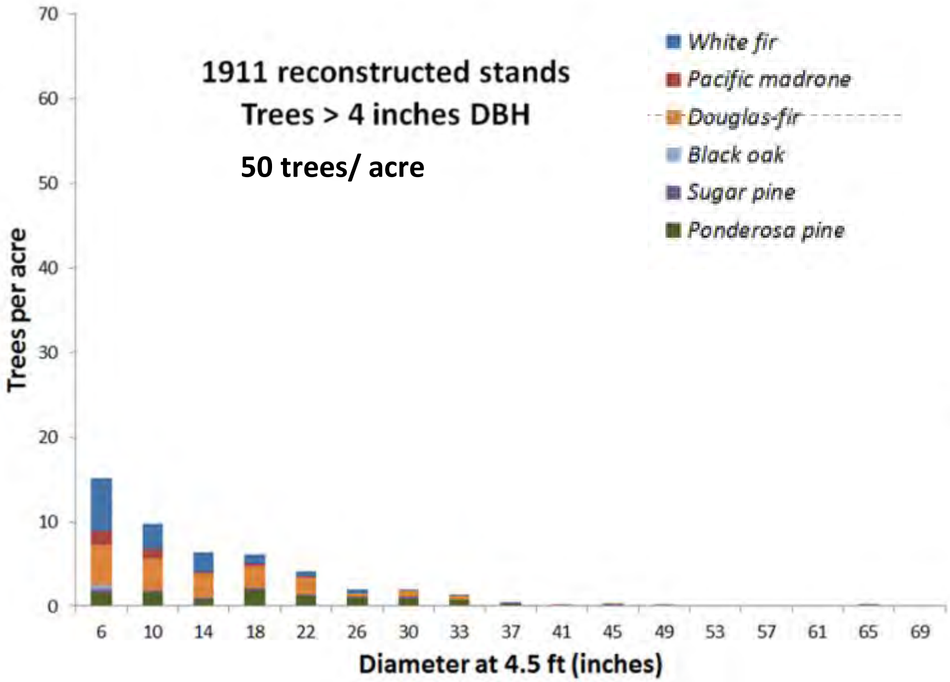
Much More Cool Season Burning Historically

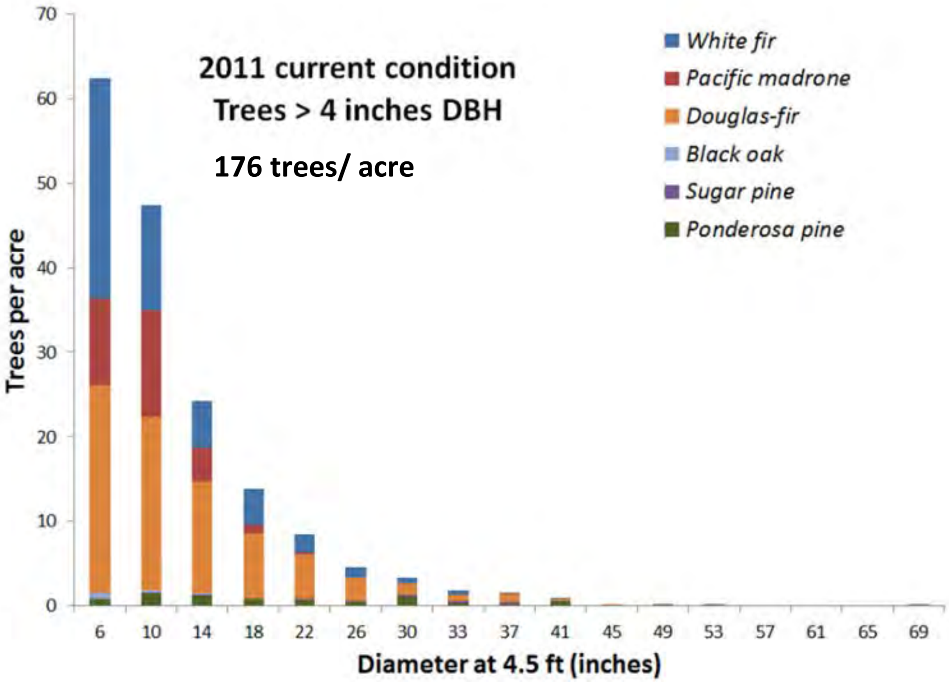
Metlen, K. L., C. N. Skinner, D. R. Olson, C. Nichols, and D. Borgias. 2018. Regional and local controls on historical fire regimes of dry forests and woodlands in the Rogue River Basin, Oregon, USA. Forest Ecology and Management **430:43-58. .**

Forests of Today are Dramatically More Dense and Fire Sensitive







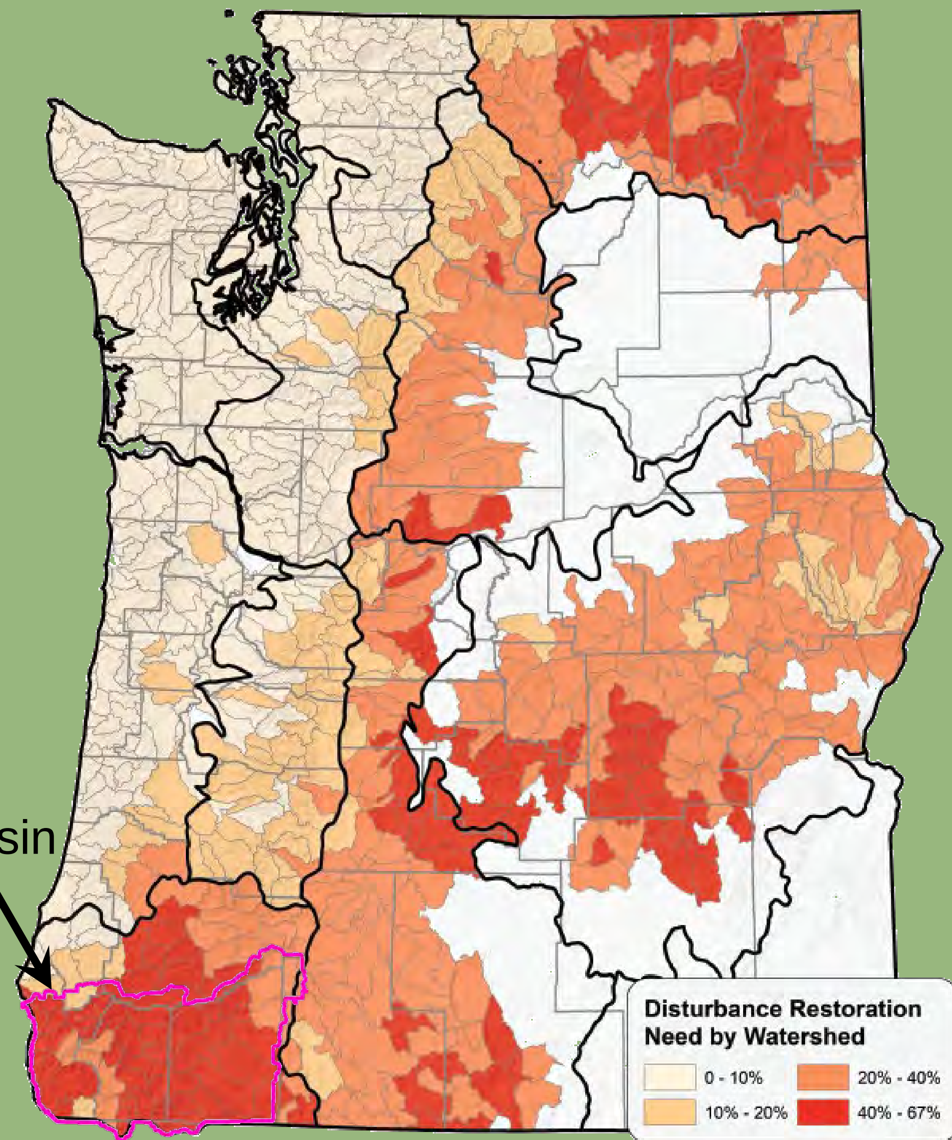


Restoration Needs in Frequent Fire Forest
A collaboration of USFS R6 and TNC

The Nature Conservancy
Protecting nature. Preserving life.™

Rogue Basin Forests and Woodlands

- 4.2 million acres
- Late seral forest severely deficit
- 2.1 million ac overly dense

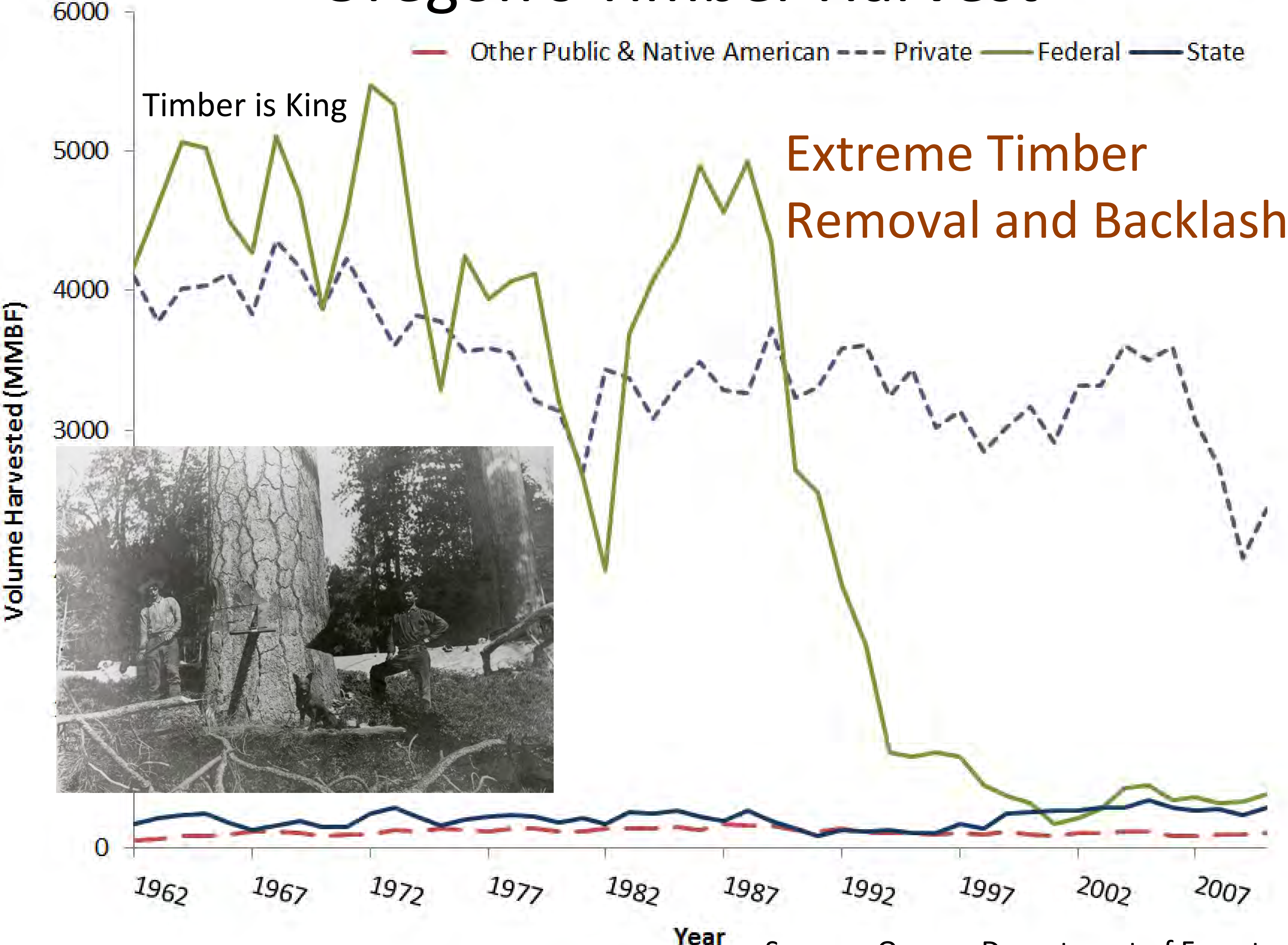


Haugo et al. 2015. A new approach to evaluate forest structure restoration needs across Oregon and Washington, USA. **Forest Ecology and Management 335:37-50**.

DeMeo et al. 2018. Expanding our understanding of forest structural restoration needs in the Pacific Northwest. **Northwest Science 92:18-35**.

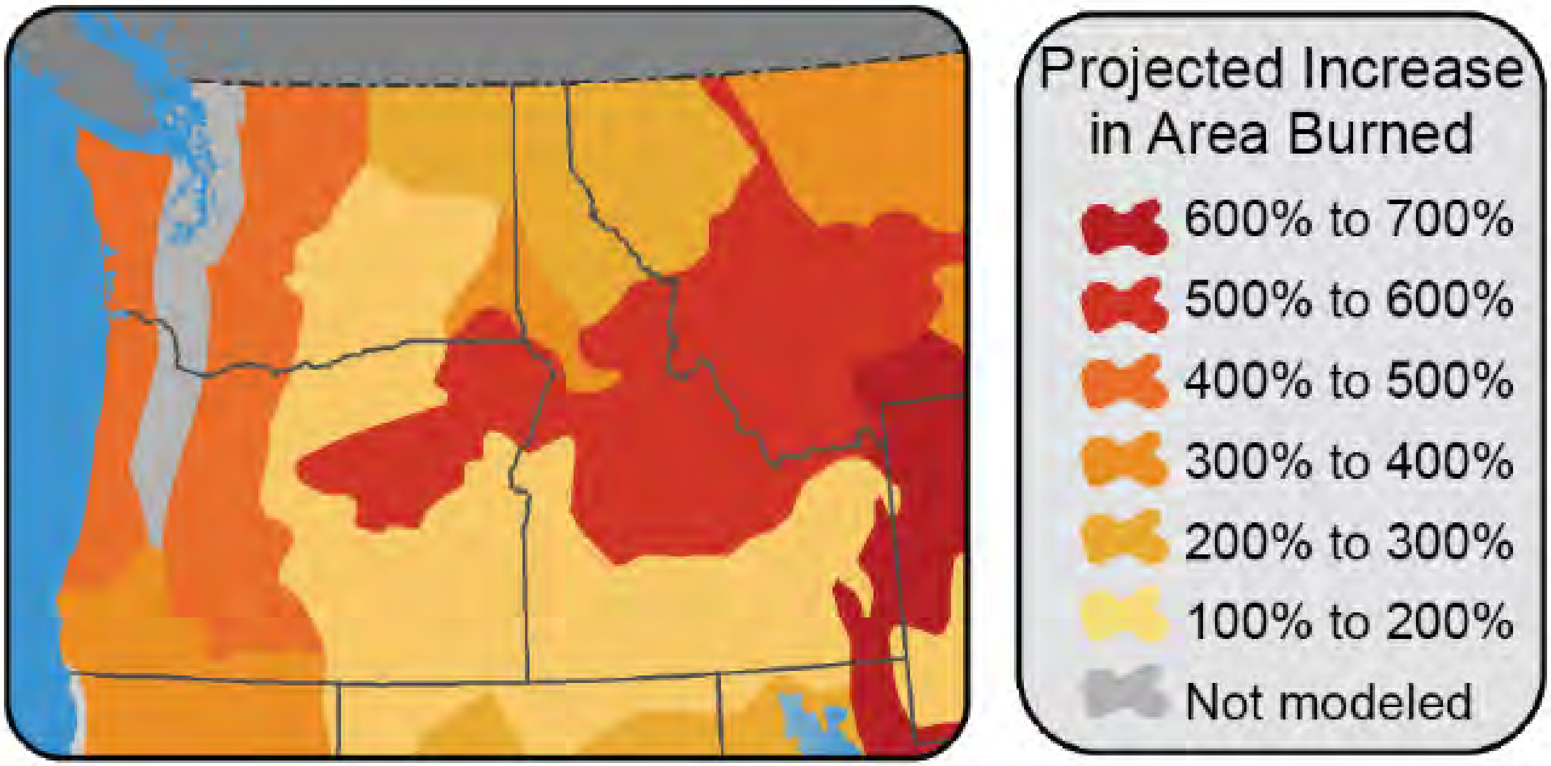
Suppressed *mild* fires aggravates future Wildfire!

Oregon's Timber Harvest



Source: Oregon Department of Forestry

Area burned will increase with climate change
Even With Full Suppression



Littell et al. 2013
Supports:
Cansler & McKenzie 2014, Whitlock et al. 2003, Westerling et al. 2006, Littell et al. 2009; Miller et al. 2009 & 2012

Best Science: Treatments work!

- Fuel treatments are highly effective at a landscape scale
- Large events can overwhelm individual treatments
- Thinning with controlled burning is most effective

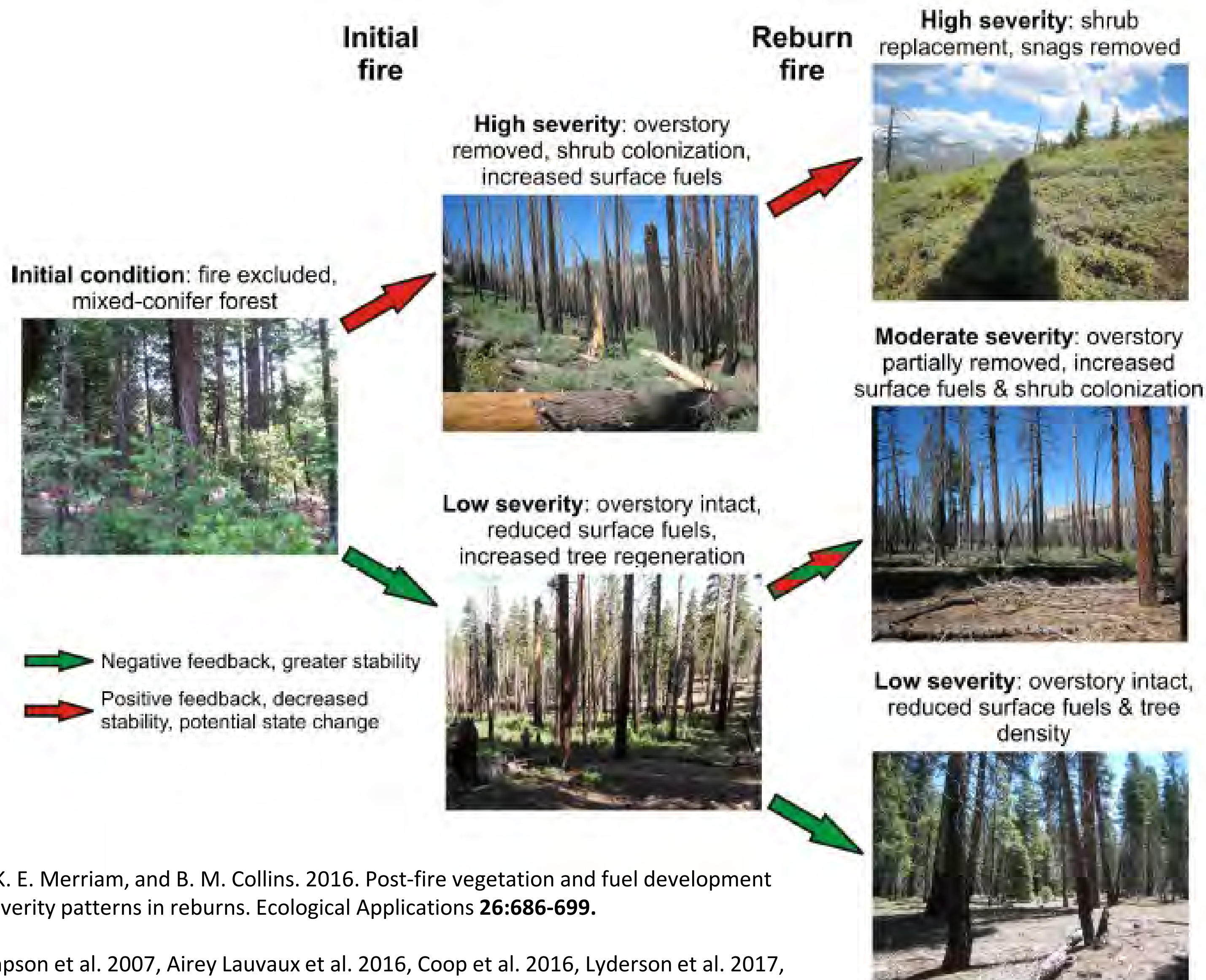
Thin + Rx burn then Wildfire

No treatment then Wildfire

Supported by: Ritchie et al. 2007, Prichard et al. 2010, Fulé et al. 2012, Safford et al. 2012, Martinson and Omi 2013, Shive et al. 2013, Lyderson et al. 2014, Prichard et al. 2014, Yocom et al. 2015; Lydersen et al 2017; Walker et al. 2018; Tubbesing et al. 2019

Prichard, S., D. Peterson, and K. Jacobson. 2010. Fuel treatments reduce the severity of wildfire effects in dry mixed conifer forest, Washington, USA. Canadian Journal of Forest Research **40:1615-1626.**

The Choice: Vicious or Virtuous Cycle



Coppoletta, M., K. E. Merriam, and B. M. Collins. 2016. Post-fire vegetation and fuel development influences fire severity patterns in reburns. Ecological Applications **26:686-699.**

- Supports Thompson et al. 2007, Airey Lauvaux et al. 2016, Coop et al. 2016, Lyderson et al. 2017, Liang et al. 2018, Walker et al. 2018; Tubbesing et al. 2019

The Problems

Climate Change

- Temperatures
- Drought
- Fire probability and effects

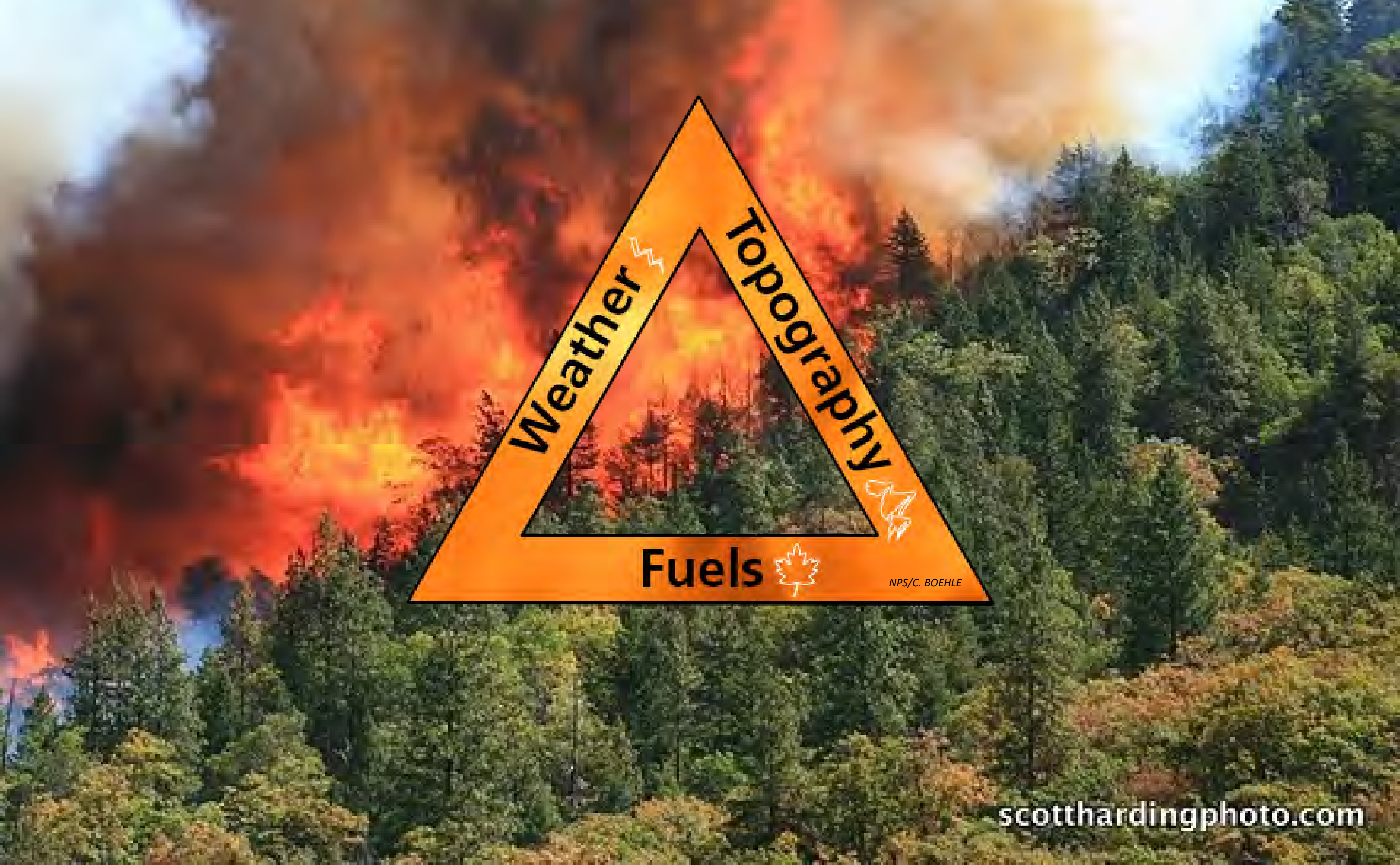
Altered Landscapes

- Elevated wildfire risk
- Diminished old growth
- Overly dense forests and altered species mix
- Endangered species

Ecosystem Services

- Water
- Jobs
- Biodiversity
- Carbon

Modern Fire Environment



Modern Fire Environment

Photo: Keith Perchemlides;
The Nature Conservancy

Management Options

Managed Fire

- Protect communities
- Controlled burns
- Improved suppression options and safety

Protect and Promote Complex Forests

- Protected areas
- Thinning to accelerate old growth development
- Proximal proactive management

Proactive Ecological Thinning

- Integrate fire management
- Resilient landscapes of open and closed forest
- Revenue and support to local economies


Forest Thinning
(Structure and Tree Species)

Thinning + Controlled Burning

Forest composition and structure

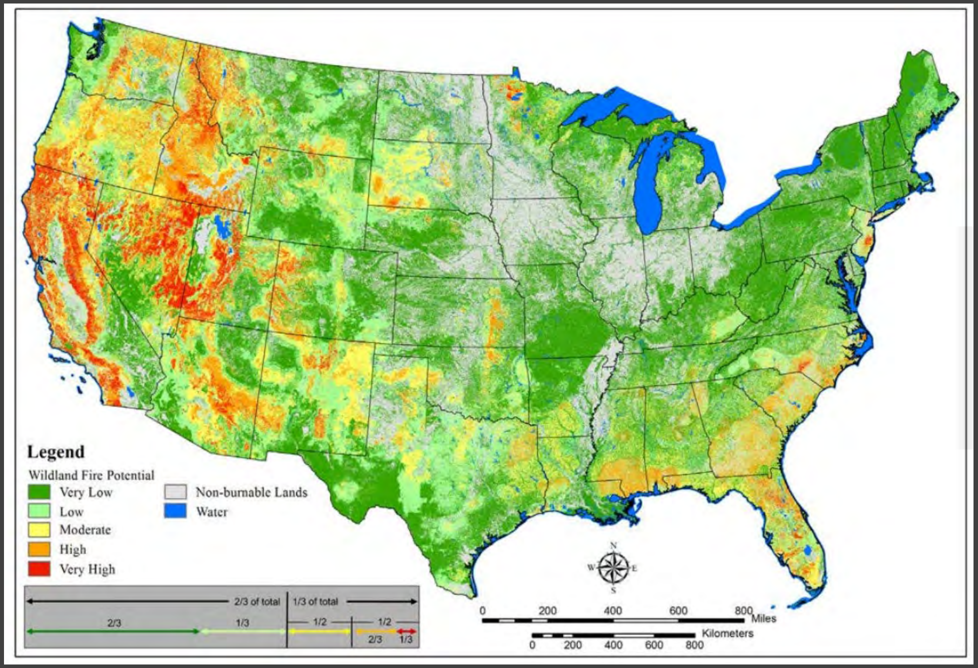
- Species selection
- Density
- Canopy layers
- Spatial patterning

Forest function

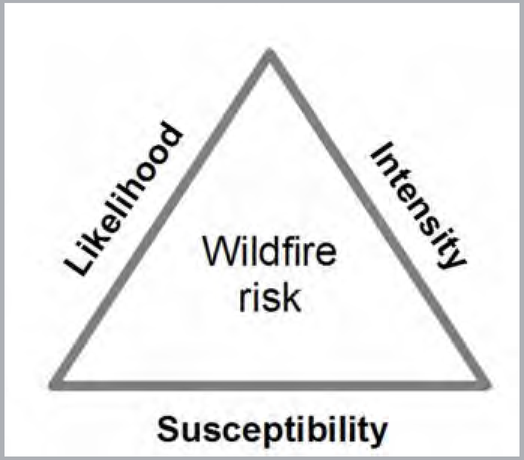
- Fuels and future fire behavior
- Light availability
- Nutrient cycling and soils
- Seedling establishment

Photo: Keith Perchemlides (TNC)

What are Wildfire Risk Assessments?



2015 - National Wildfire Hazard Potential = Likelihood & Intensity

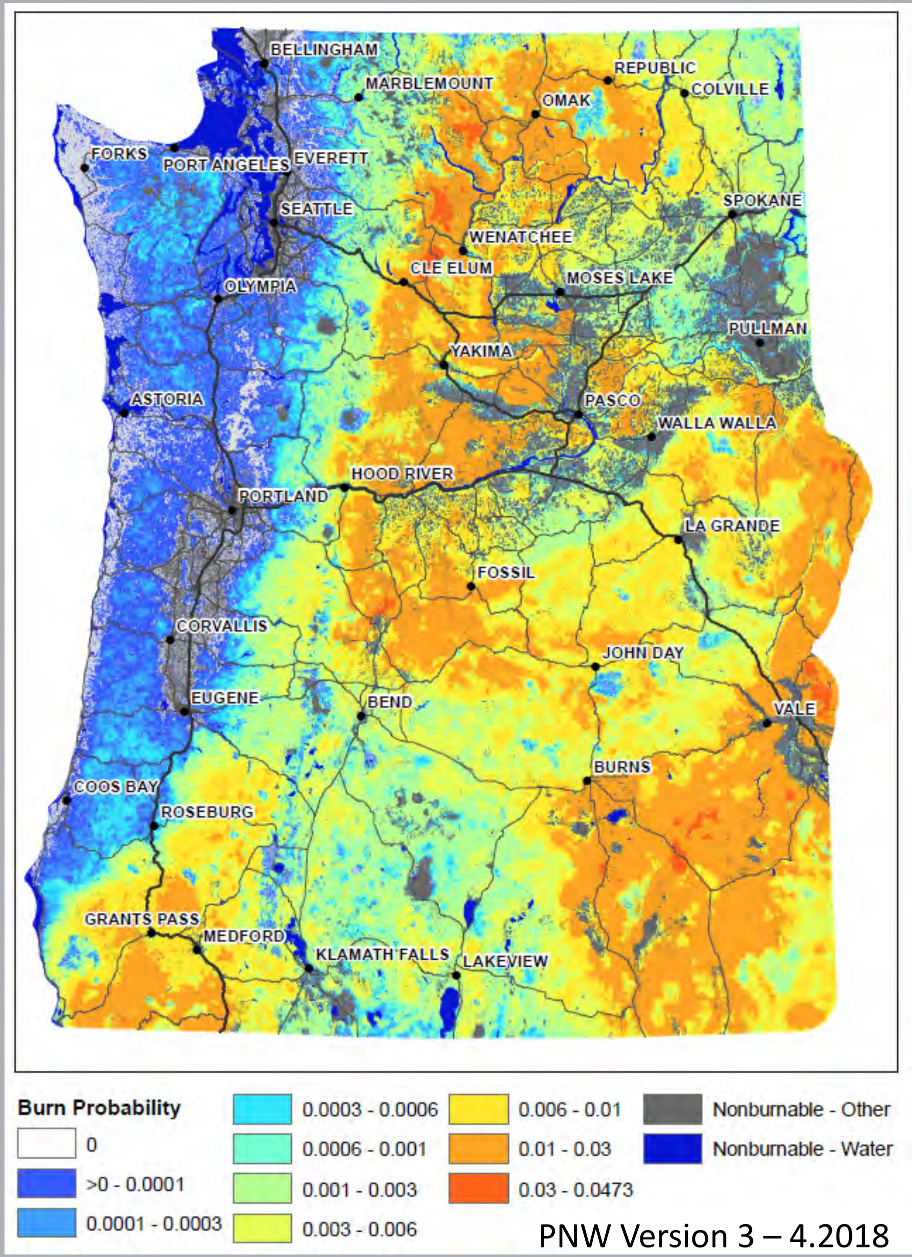


2016 – Rogue Basin Risk Assessment

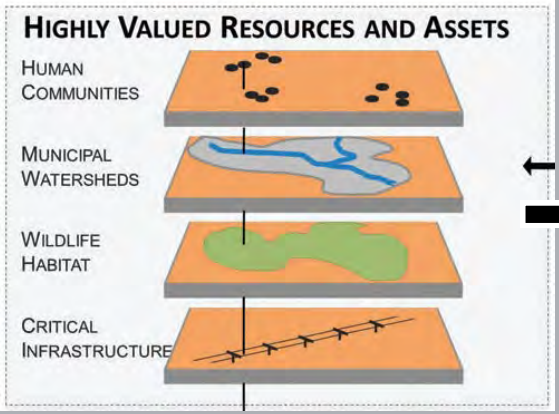
2018 – Pacific Northwest

Burn Probability

1. Can be used as a direct measure of hazard
2. Foundational for calculating risk

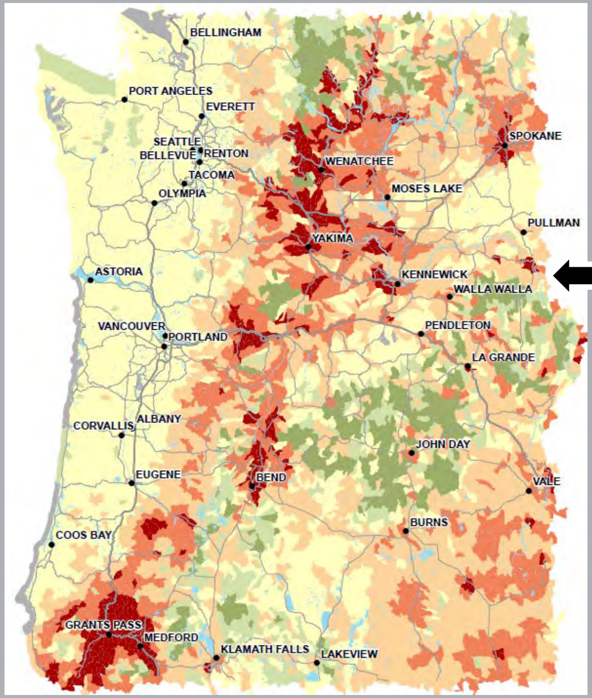


Values and Their Susceptibility to Fire

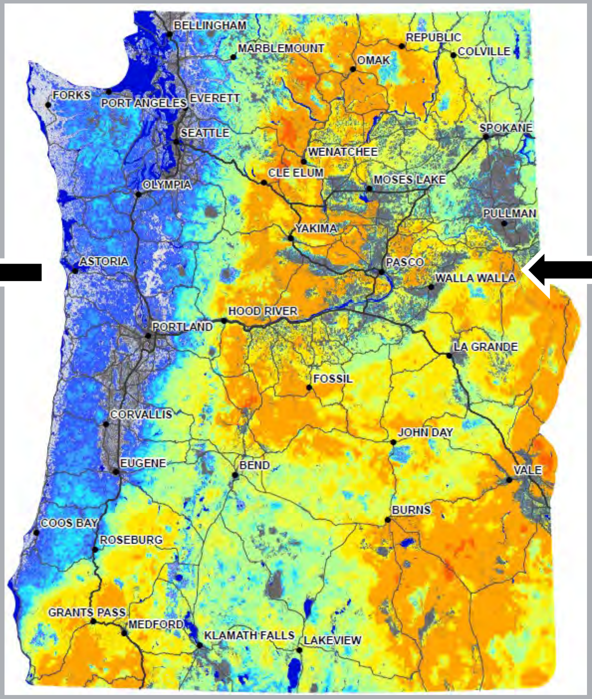


Response Functions (Susceptibility)

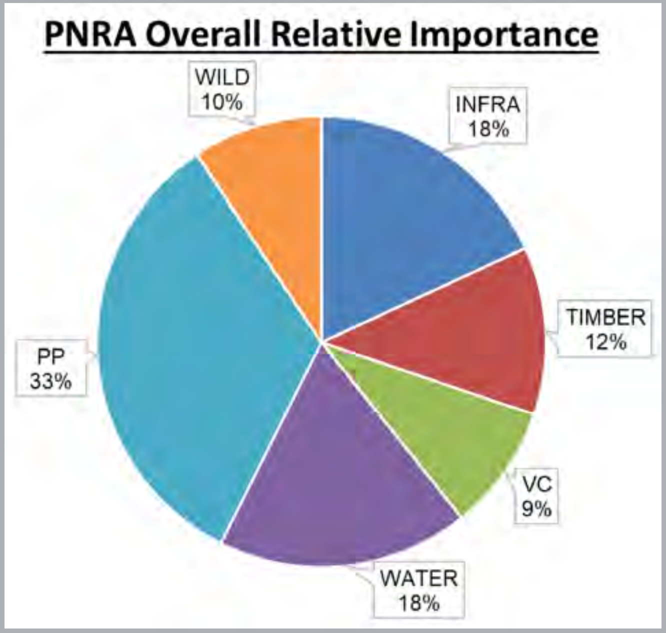
Sub-HVRA	FIL1	FIL2	FIL3	FIL4	FIL5	FIL6	spark
Cell towers	-10	-20	-40	-60	-80	-90	
Electric transmission lines	20	20	0	-20	-60	-80	
FS Repeaters	-10	-20	-40	-60	-80	-90	
Wooden bridges	-40	-50	-60	-70	-80	-90	
Other comm sites	-10	-20	-40	-60	-80	-90	



Risk Products



Burn Probability



Relative Importance

Assets (*no benefits from fire*)

HVRA	Sub-HVRA	Fire Intensity Level* 1	2	3	4	5	6
Infrastructure	Comm Sites/Cell Towers	0	0	-10	-20	-30	-30
	Electric Trans-Line/Sub	0	0	-20	-20	-20	-20
Non-residential	Fire Lookouts	0	-10	-30	-60	-100	-100
	National Park Structures	-10	-20	-40	-80	-100	-100
	Ski Area Buildings	-10	-20	-40	-80	-100	-100
	USFS Cabins/Structures	-10	-20	-40	-80	-100	-100
Recreation	Recreation Sites	-10	-20	-40	-80	-100	-100
	Ski Area (Mt. Ashland)	0	0	0	-10	-20	-40
	Pacific Crest Trail	0	0	-10	-10	-20	-20
Water Assets	Canals-Irrigation	0	0	0	-10	-10	-10
	Reservoirs - Drinking	0	0	0	-10	-20	-40
Where People Live	Residences <1 / 40 ac	-10	-20	-40	-80	-100	-100
	Residences 1/10 - 1/5	-10	-20	-40	-80	-100	-100
	Residences 1/2 to 3/ac	-10	-40	-80	-100	-100	-100
	Residences 1/20 - 1/10	-10	-20	-40	-80	-100	-100
	Residences 1/40 - 1/20	-10	-20	-40	-80	-100	-100
	Residences 1/5 - 1/2	-10	-40	-60	-100	-100	-100
	Residences 3+/ac	-20	-60	-80	-100	-100	-100

*Fire Intensity Level: 1 = 0-2 foot flame lengths, 2 = 2-4 foot flame lengths, 3 = 4-6 foot flame lengths, 4 = 6-8 foot flame lengths, 5 = 8-12 foot flame lengths, 6 = >12 foot flame lengths

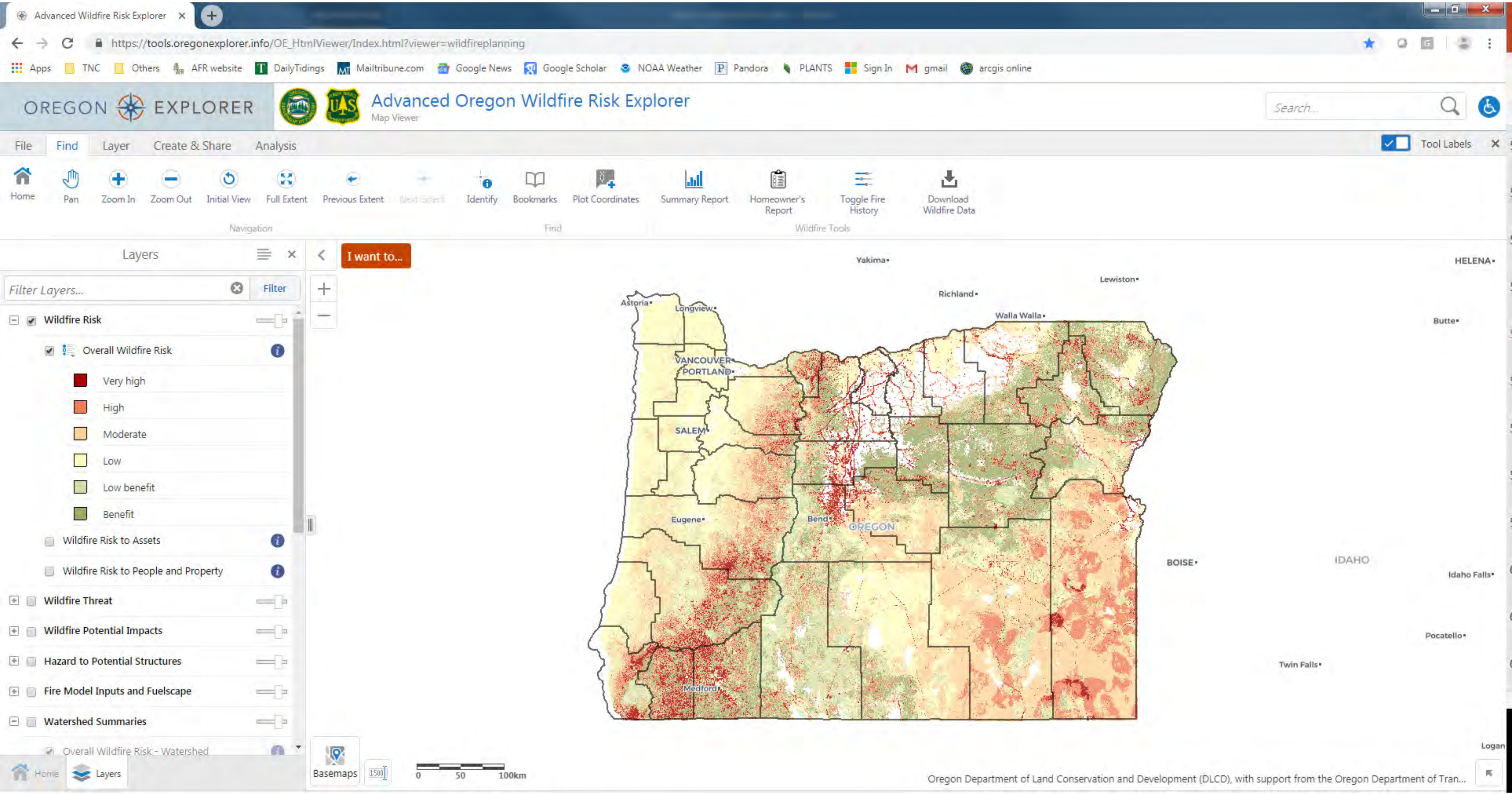
Resources *May benefit from fire*

			Fire Intensity Level*					
HVRA	**Sub-HVRA**	**Covariate**	**1**	**2**	**3**	**4**	**5**	**6**
Vegetation	Aspen		20	50	100	100	50	0
	Late Seral Forest	Dry, (D)	80	90	10	-10	-90	-100
	Late Seral Forest	Dry, (E)	70	30	-10	-50	-90	-100
	Late Seral Forest	Wet, (D)	80	90	10	-10	-90	-100
	Late Seral Forest	Wet, (E)	40	10	-30	-60	-100	-100
	Oak Woodlands		100	100	30	-40	-80	-100
	Tan Oak		100	100	100	80	10	-20
	Unique/Endemic	Fire dependent	30	50	100	100	60	30
	Unique/Endemic	Fire resilient	60	70	60	60	-10	-40
	Unique/Endemic	Fire sensitive	0	-20	-40	-60	-80	-100
Water Resources	Municipal Watersheds	Ground water	10	20	30	0	-10	-20
	Municipal Watersheds	Spring source	10	20	0	-10	-30	-50
	Municipal Watersheds	Surface	10	20	-10	-40	-60	-90
	Riparian Zones		20	10	-5	-40	-80	-100
Wildlife	Deer and Elk Winter Range		10	50	50	30	10	-40
	Dispersal NSO **		20	0	-30	-60	-80	-100
	NRF NSO ***		10	-10	-40	-80	-100	-100
	Marbled Murrelet		20	10	-10	-80	-100	-100
	Mardon Skipper		-50	-100	-100	-100	-100	-100
	Oregon Spotted Frog		10	-10	-30	-40	-60	-80
	Siskiyou Mountain Salamander		20	10	0	-40	-70	-90

*Fire Intensity Level: 1 = 0-2 foot flame lengths, 2 = 2-4 foot flame lengths, 3 = 4-6 foot flame lengths, 4 = 6-8 foot flame lengths, 5 = 8-12 foot flame lengths, 6 = >12 foot flame lengths
**NSO=Northern Spotted Owl
***NRF NSO=Nesting, Roosting, and Foraging Northern Spotted Owl Habitat

Oregon Explorer

https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=wildfireplanning



Oregon Explorer Teresa Alcock (Teresa.ALCOCK@oregon.gov) – Water Intake Brian Fulfrost (Brian.FULFROST@state.or.us)

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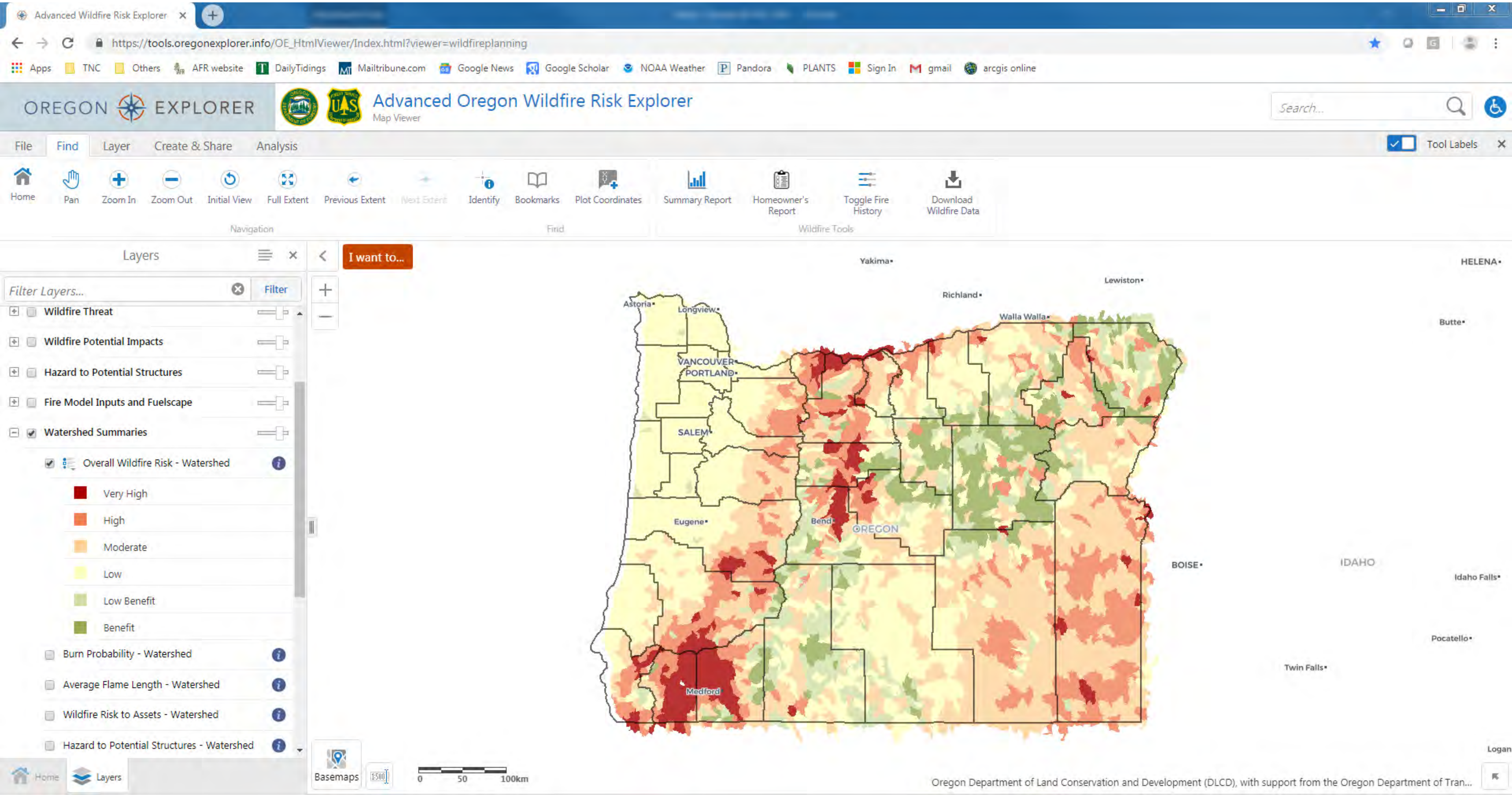

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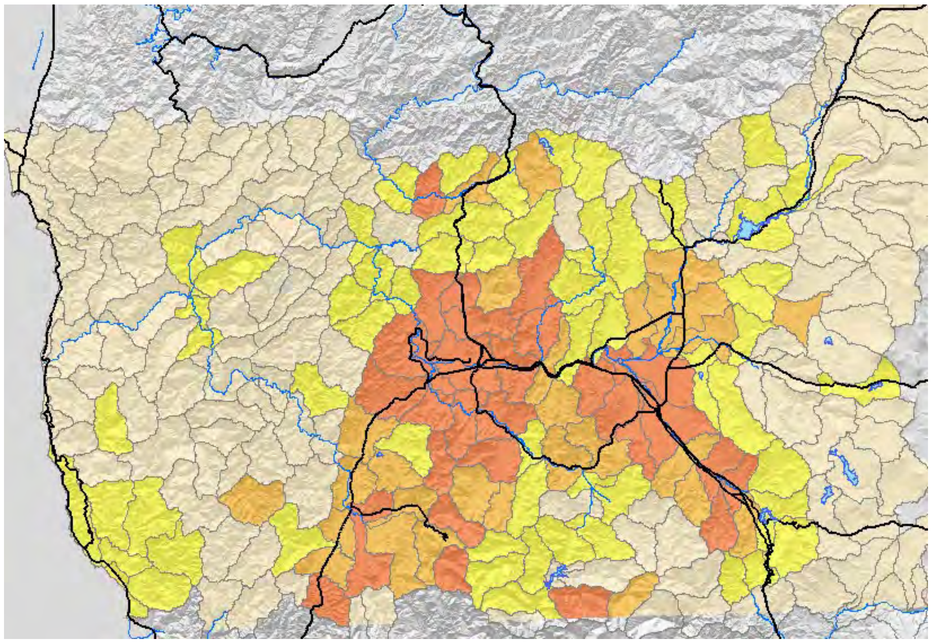
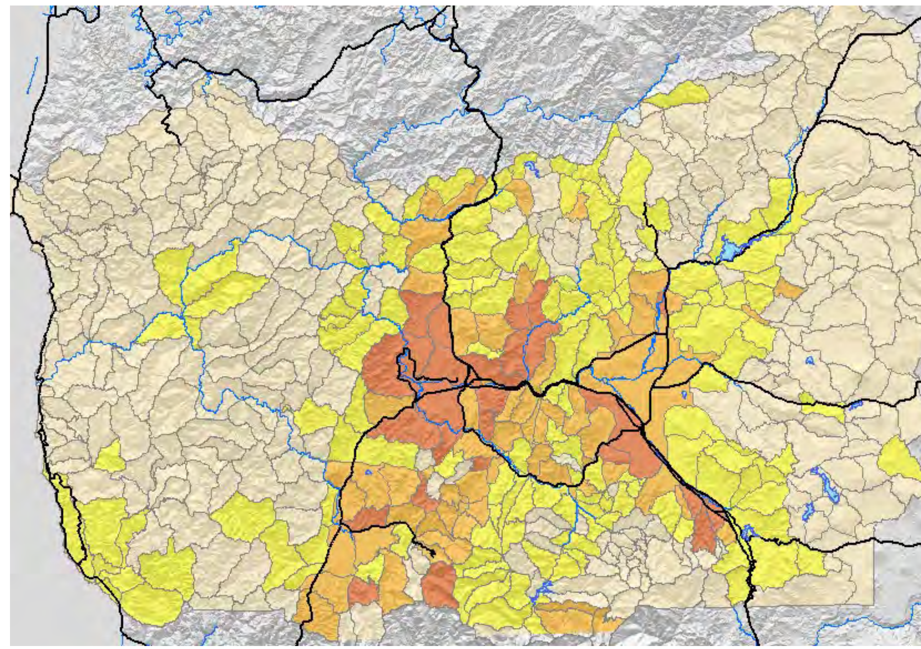
Spatial Summaries Matter

12th Field Watershed



Potential Wildfire Operational Delineates (PODs)



Legend

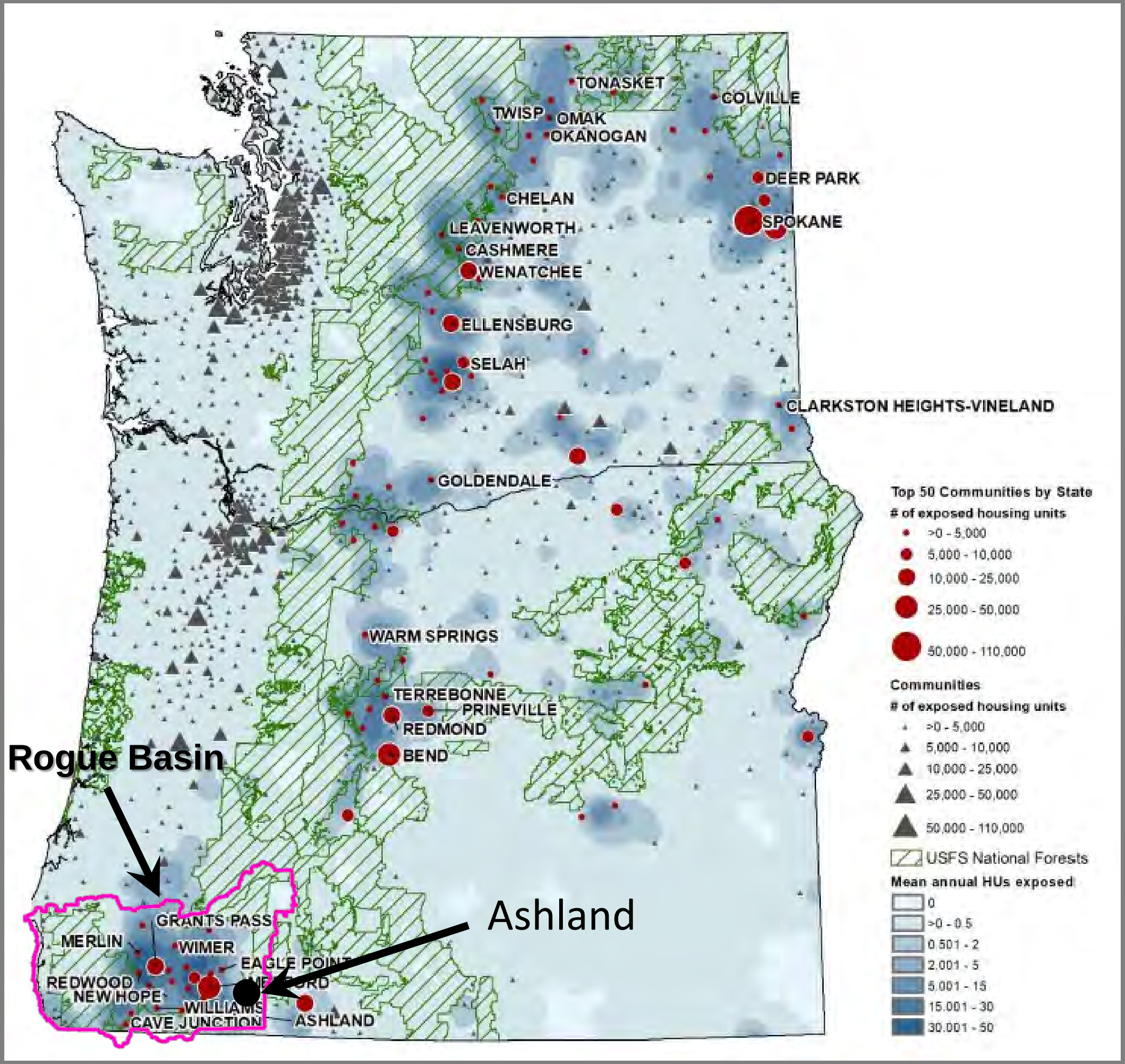
Mean Expected NVC — EXTREME | HIGH | MODERATE | LOW

We will be reviewing PODs for the Rogue Basin March 16 and 17, stay tuned

Point of Risk and Risk Source

Red Dot= Point of Risk

Blue Shade= Fire source



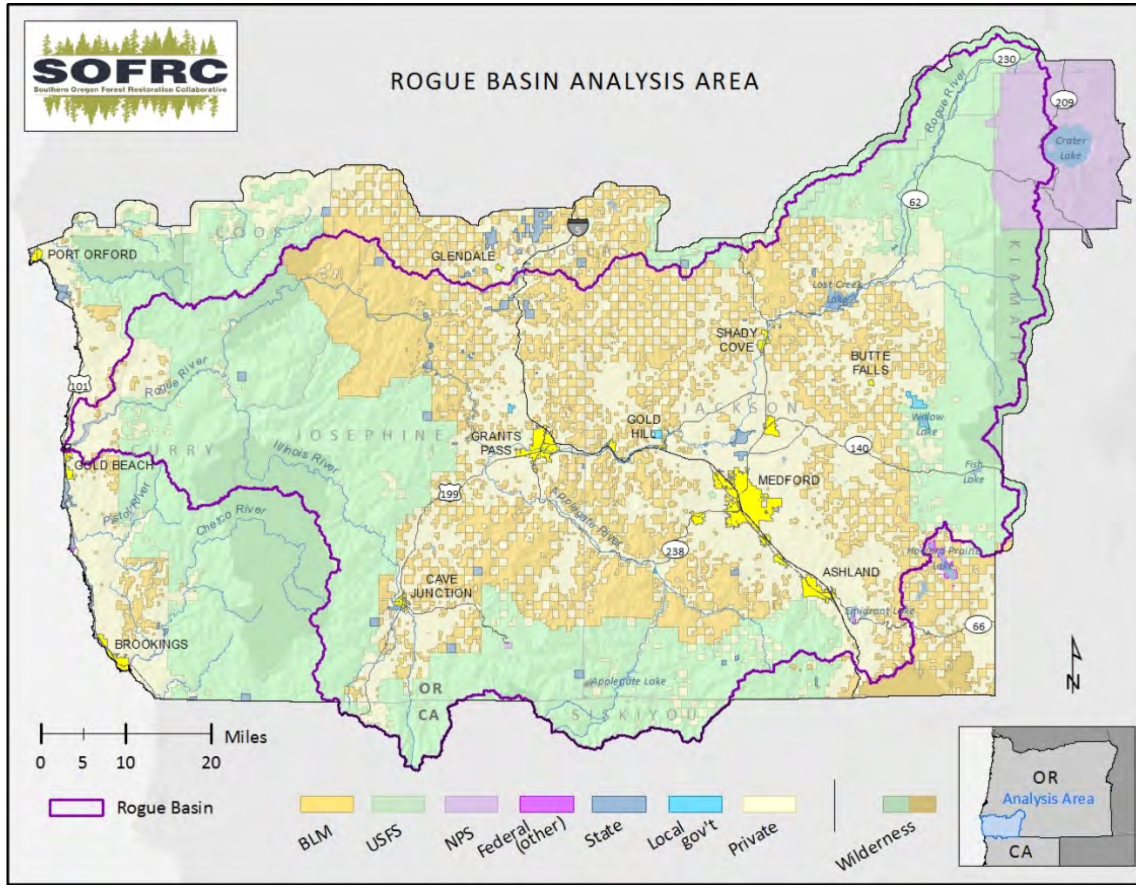
https://tools.oregonexplorer.info/OE_HtmlViewer/Index.html?viewer=wildfireplanning

Rogue Basin Cohesive Forest Restoration Strategy: A Collaborative Vision for Resilient Landscapes and Fire Adapted Communities

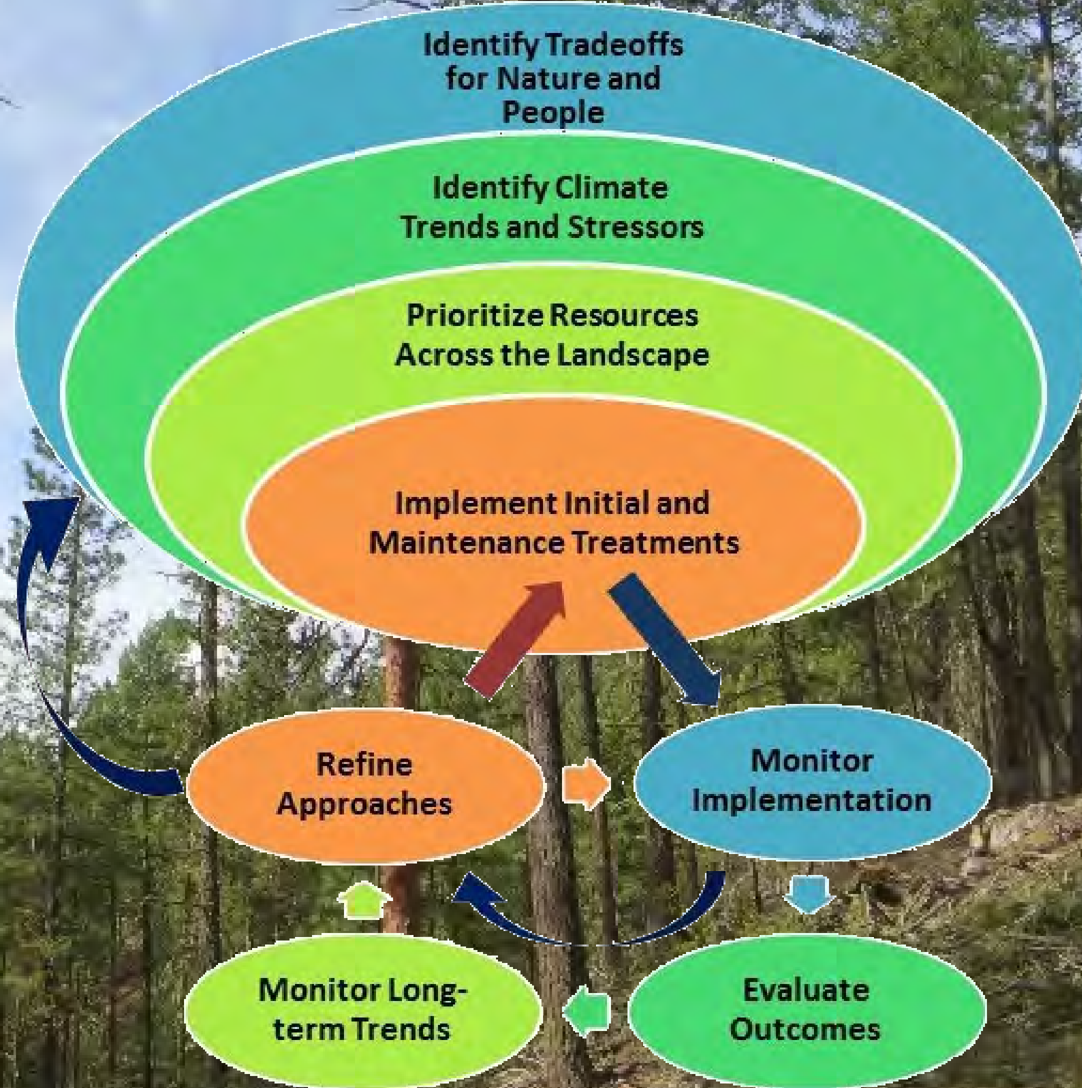
Wildfire Risk Mitigation

Ecological Restoration Need

Forest and Wildland Fire Management that Benefits People and Nature



Transformative Land Management NOT Business As Usual



Halofsky, J. E., D. L. Peterson, K. L. Metlen, M. G. Myer, and V. A. Sample. 2016. Developing and implementing climate change adaptation options in forest ecosystems: A case study in southwestern Oregon, USA. Forests 7:1-18. Available online at https://tnc.box.com/s/qy4cssywmvay6kn1vbxqad46ys2thjsb

Rogue Forest Restoration Initiative

0 5 10 20 30 40

1:850,000 Miles 1 in = 13 miles

N

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BLM

NPS

USFS

Fire History and Wildfire Risk Within Rogue Source Areas

28 February 2019

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The Nature Conservancy