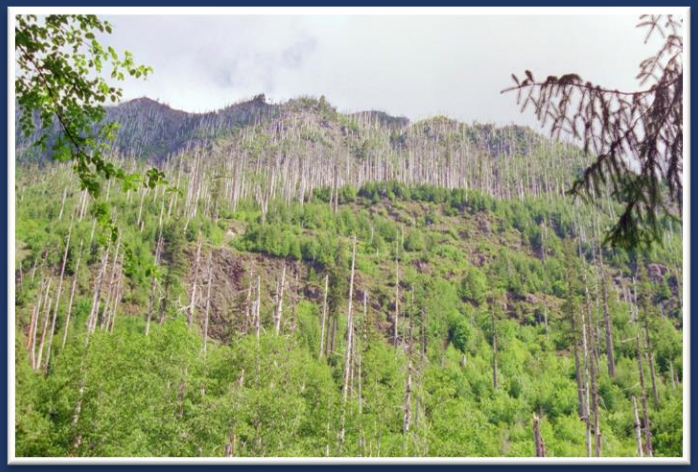
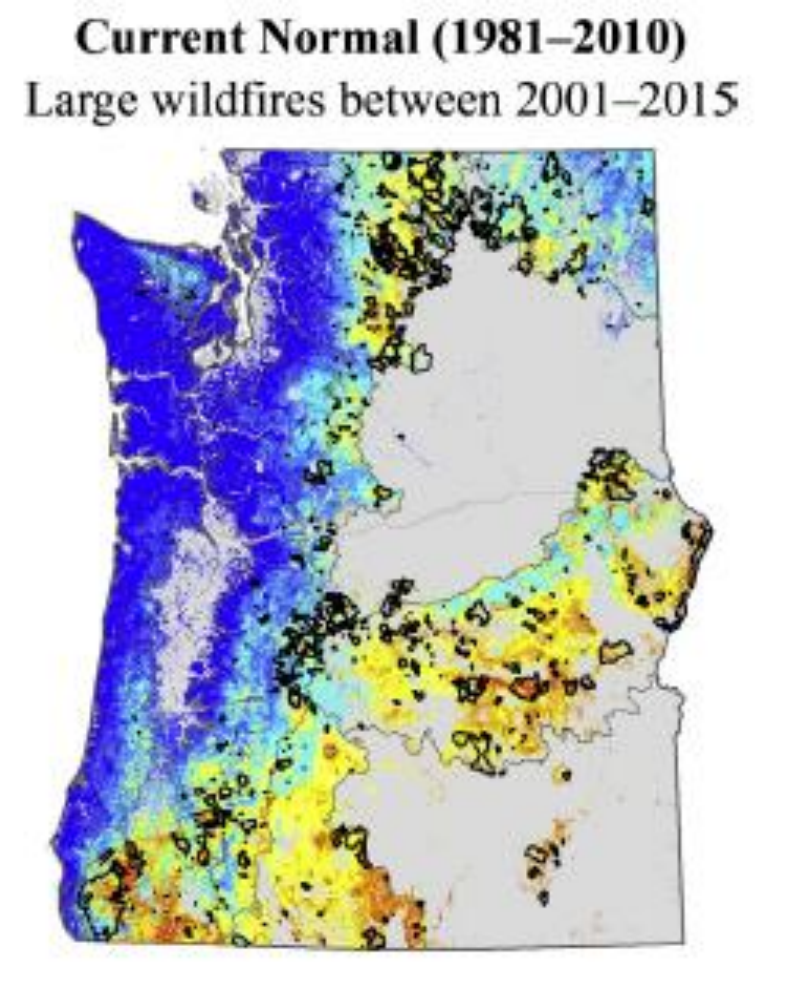
Fire Risk in Westside Forests of the Pacific Northwest



Matt Reilly

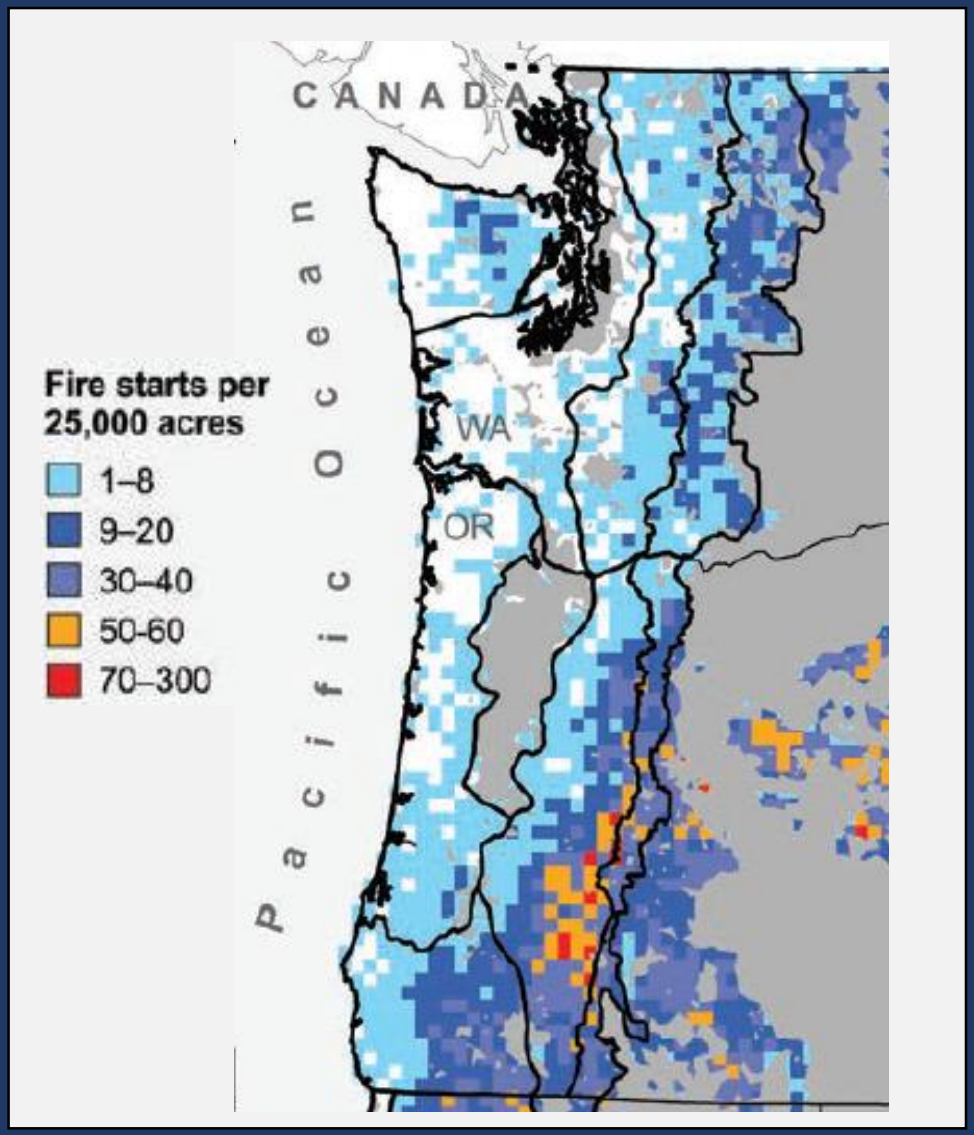
USFS PNW Research Station Corvallis, Oregon

Westside Fire



Davis et al. 2017

Ignition



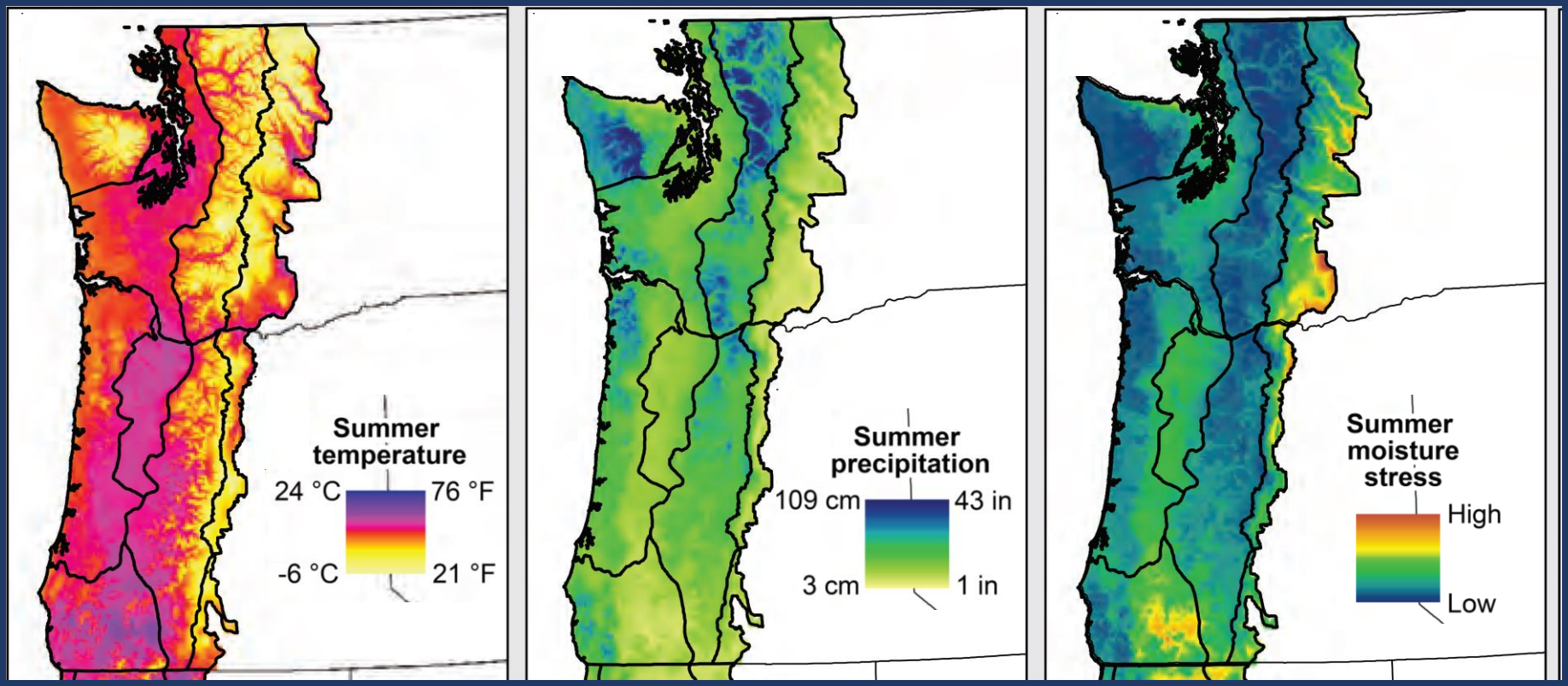
Spies et al. 2018

Regional Bioclimatic Setting

Summer Temperature

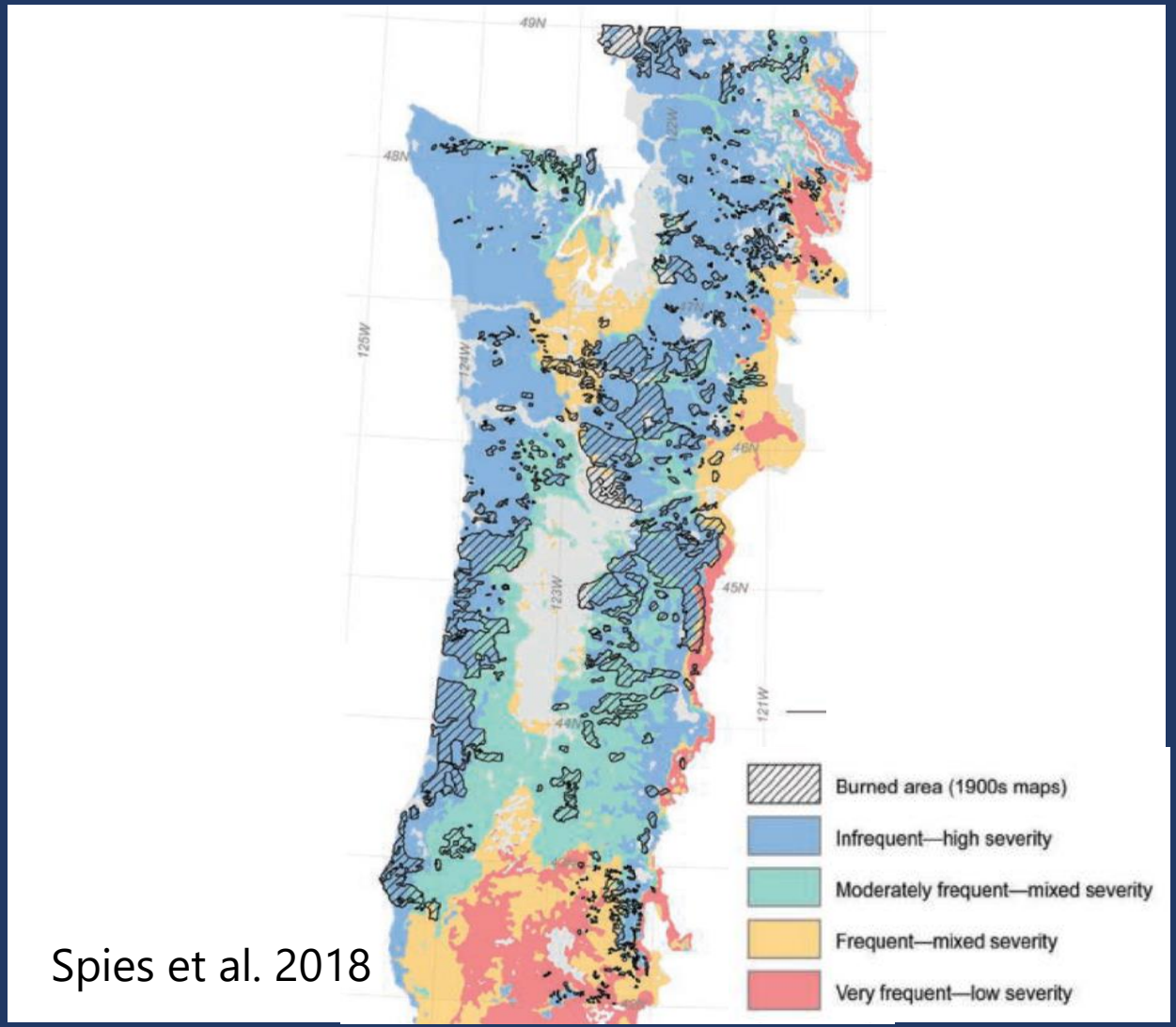
Summer Precipitation

Summer Drought



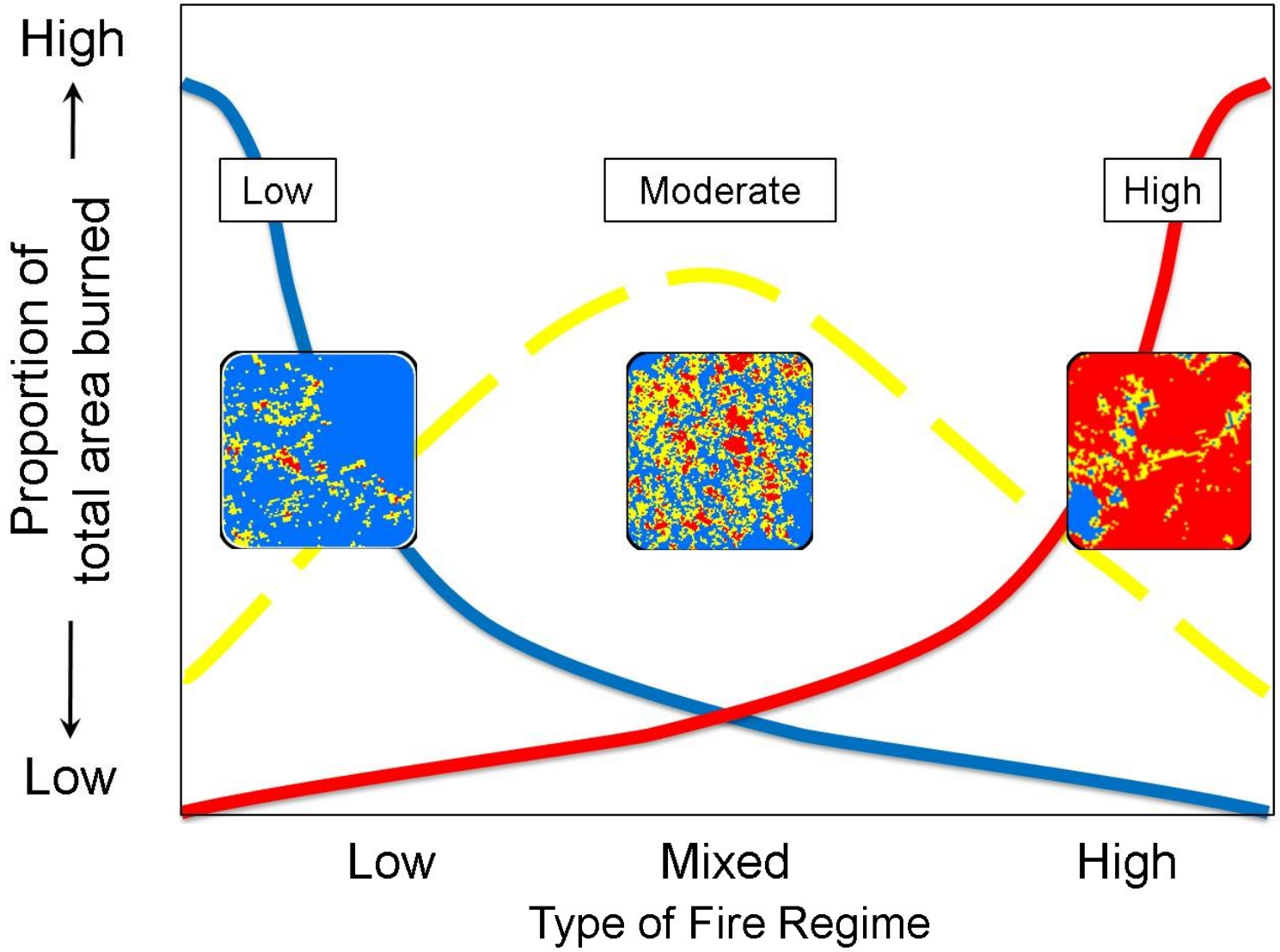
Reilly et al. 2018

Historical Fire Regimes



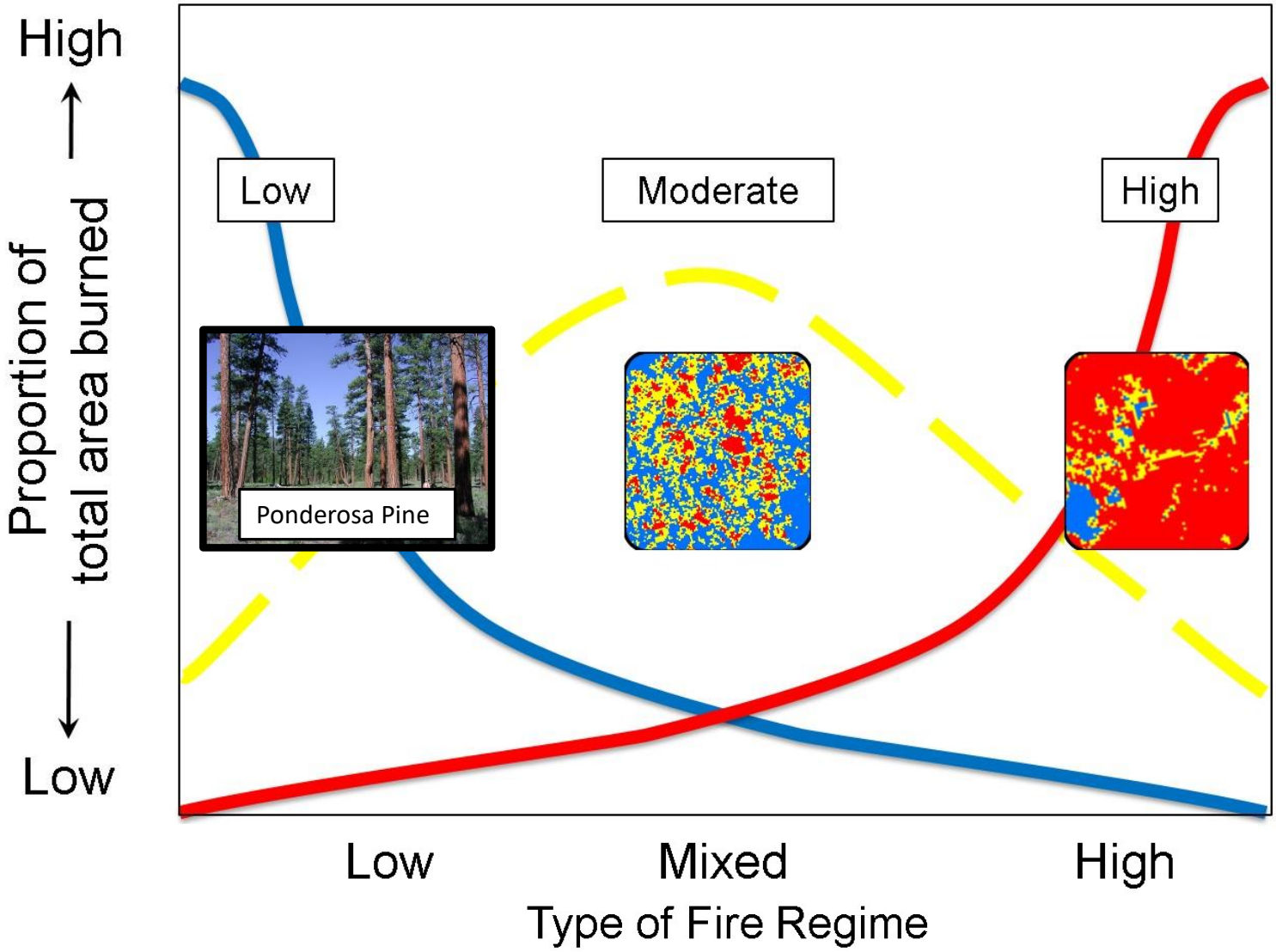
Spies et al. 2018

Historical Fire Regimes



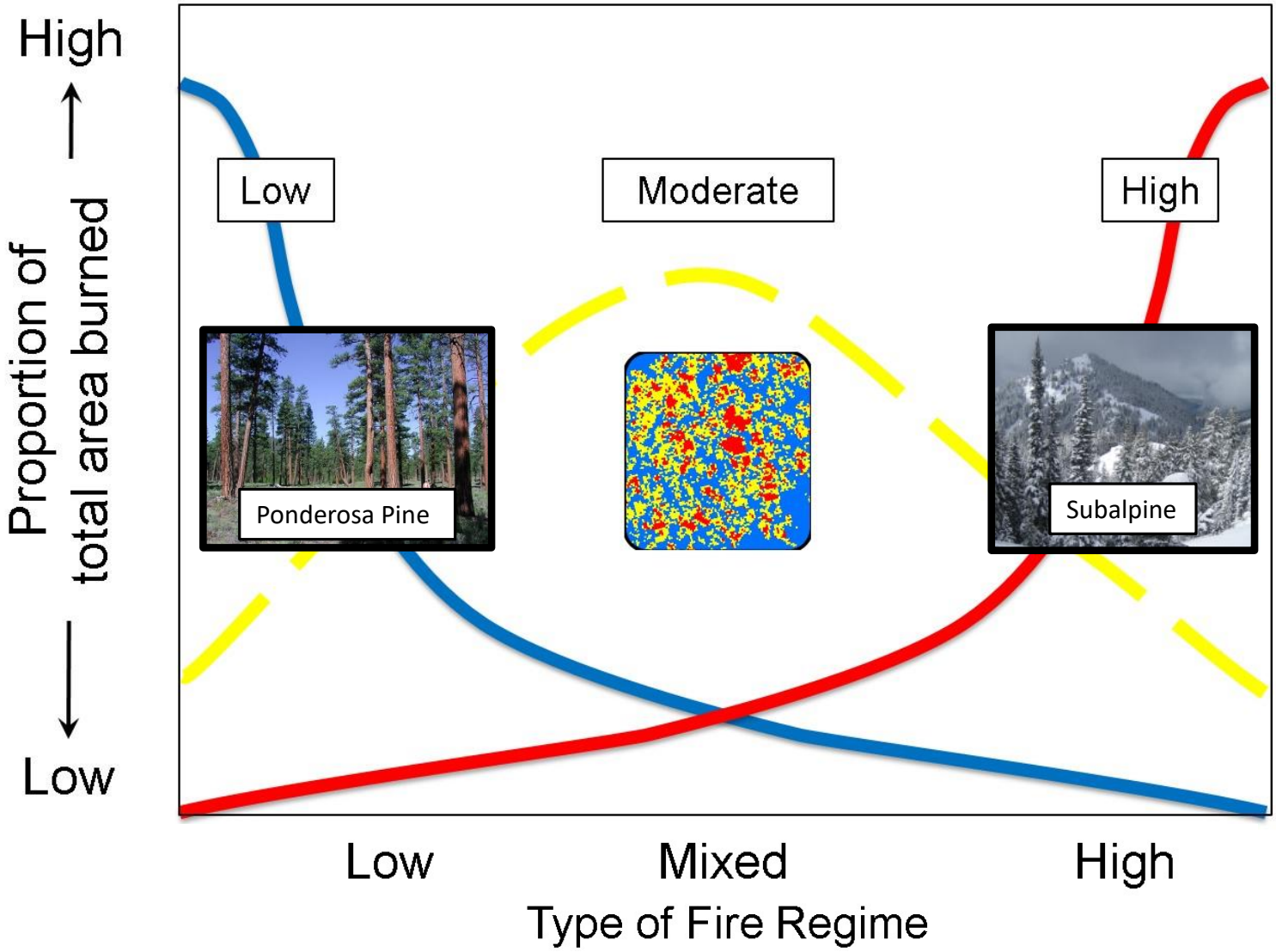
Adapted from Agee 1998

Historical Fire Regimes



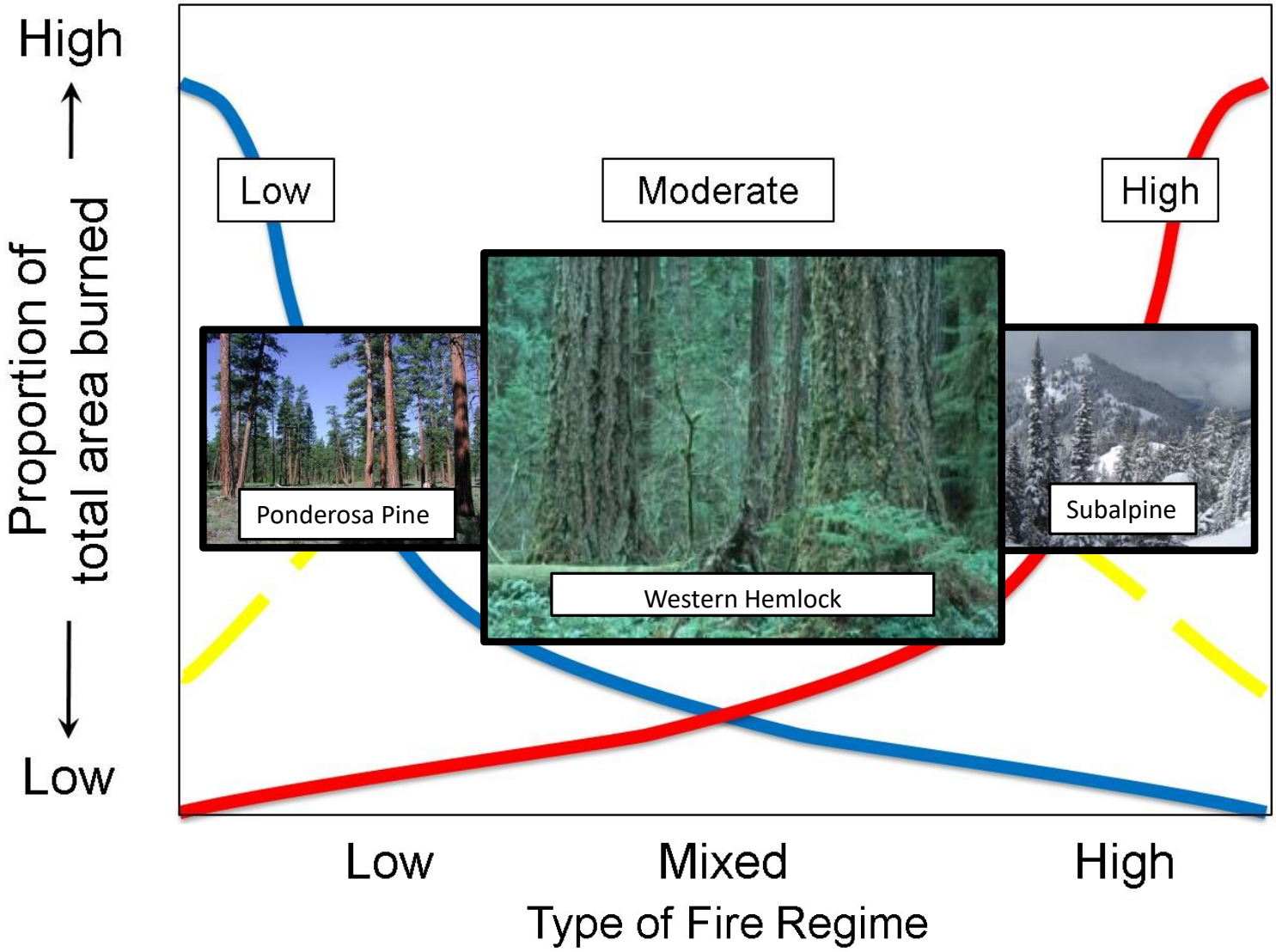
Adapted from Agee 1998

Historical Fire Regimes



Adapted from Agee 1998

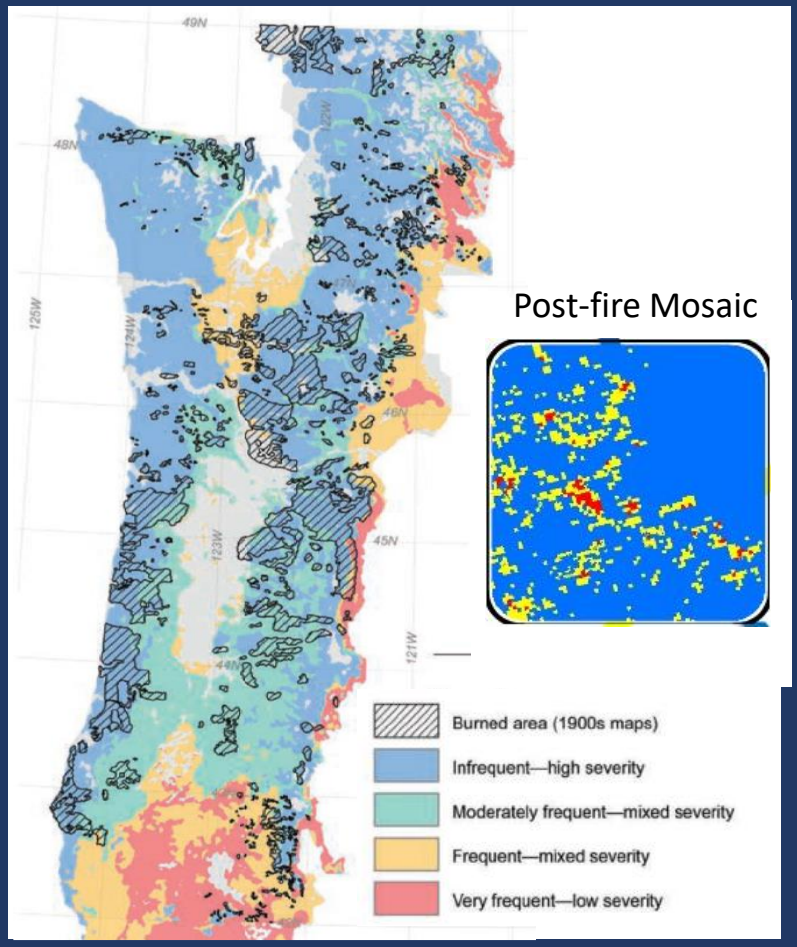
Historical Fire Regimes



Adapted from Agee 1998

Frequent, Low Severity

- More typical of the dry forest east of the Cascades but characteristic of low elevation oak woodlands
- Numerous fire scar studies
- Conditions for burning are common, but fuels usually limit fire behavior and effects



Frequent, Low Severity

- More typical of the dry forest east of the Cascades but characteristic of low elevation oak woodlands
- Numerous fire scar studies from ponderosa pine
- Conditions for burning are common, but fuels usually limit fire behavior and effects

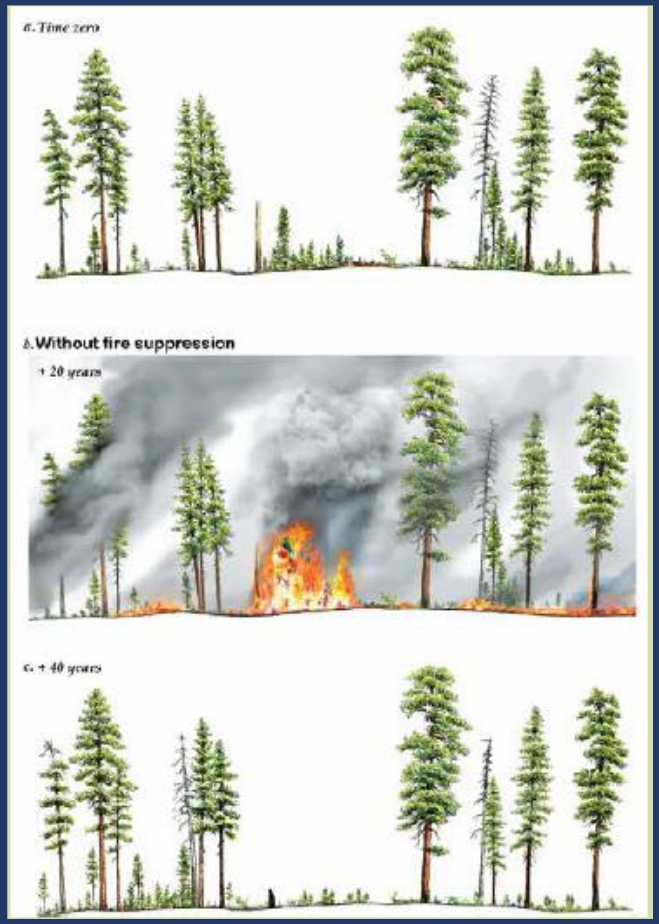


Illustration by Bob Van Pelt

Frequent, Low Severity

- Long period of fire exclusion
- Increased density and changes in composition
- Increased potential for uncharacteristic fire behavior and effects
- Loss of old legacy trees

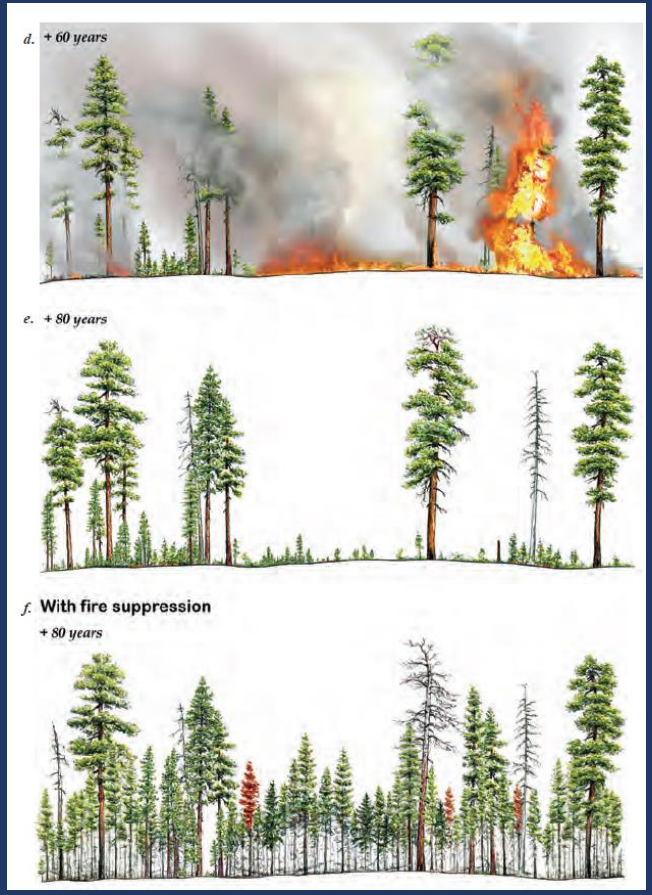
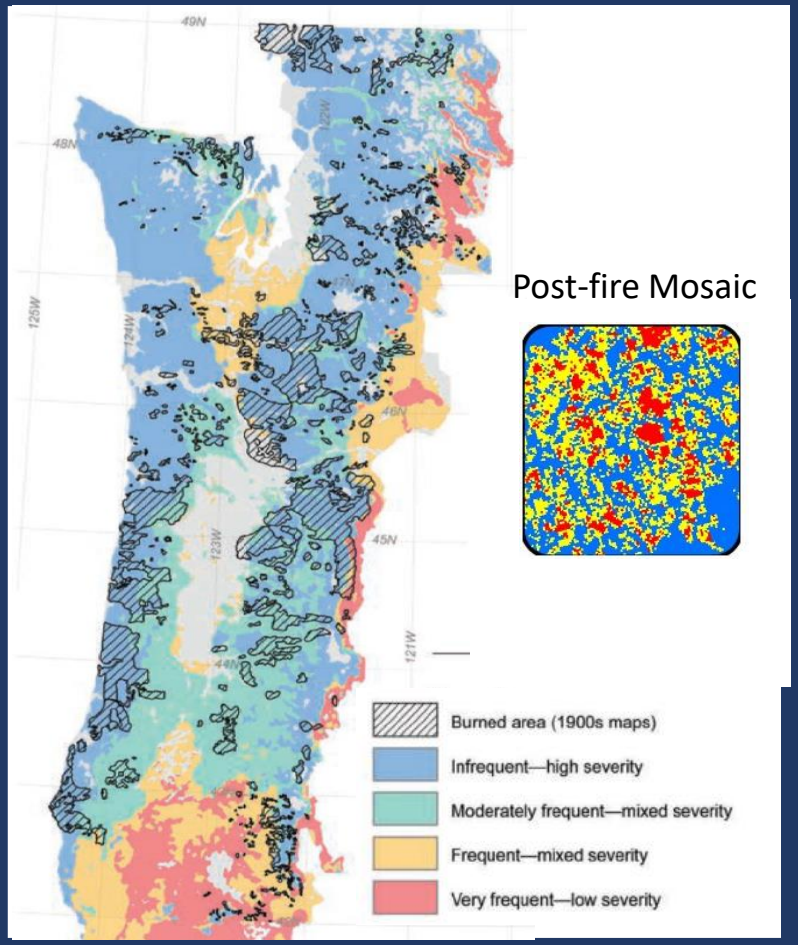


Illustration by Bob Van Pelt

Mixed Severity

- Increases in importance towards the south where ignitions and summer drought become more prominent
- Limited number of fire scar studies
- More complex and less well understood



Mixed Severity

- Increases in importance towards the south where ignitions and summer drought become more prominent and productivity is relatively high
- Limited number of fire scar studies
- More complex and less well understood

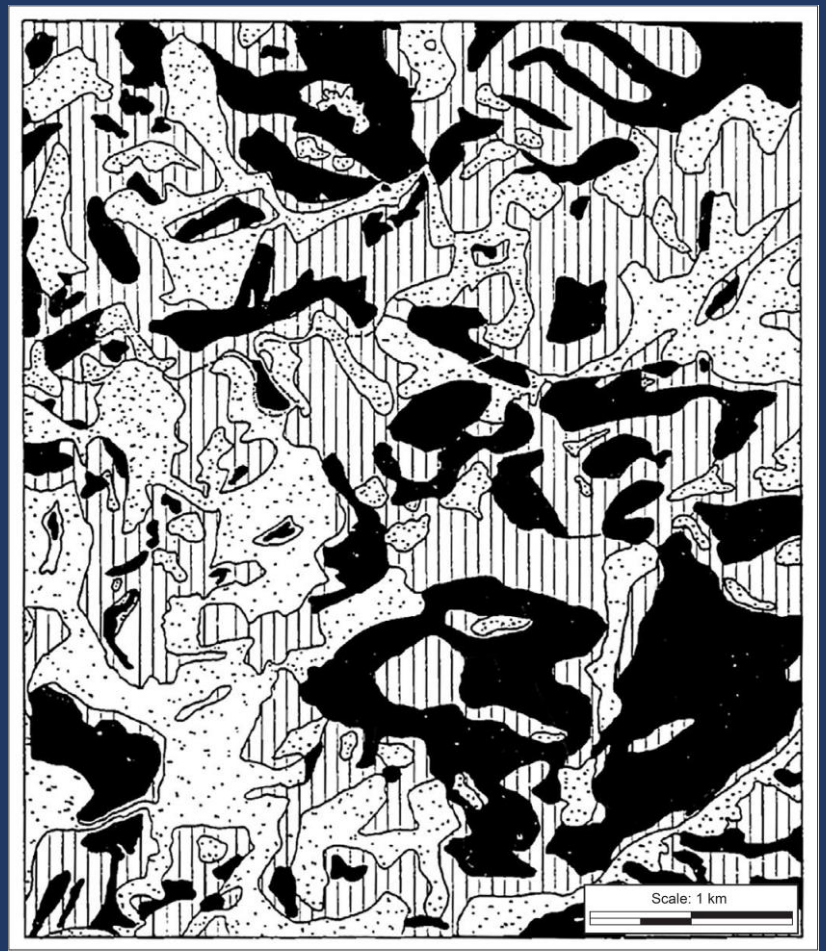
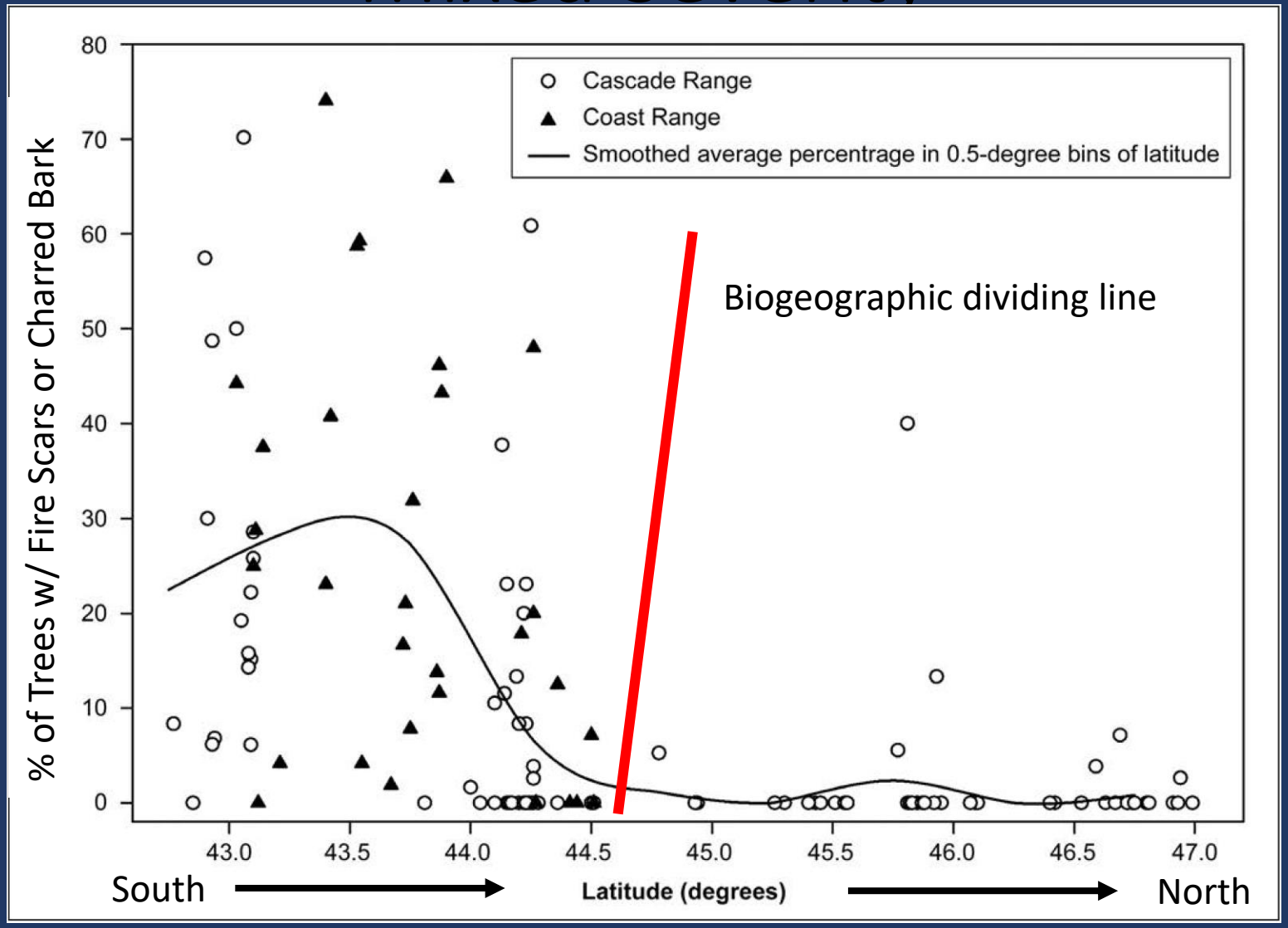


Figure 3-16—Mosaic of fire severity patches in a Douglas-fir and western hemlock landscape in the western Cascade Range of Oregon. Black = a high mortality area (>70 percent), vertical lines = moderate mortality (30 to 70 percent), and stippled = low mortality areas

Morrison and Swanson 1991

Mixed Severity

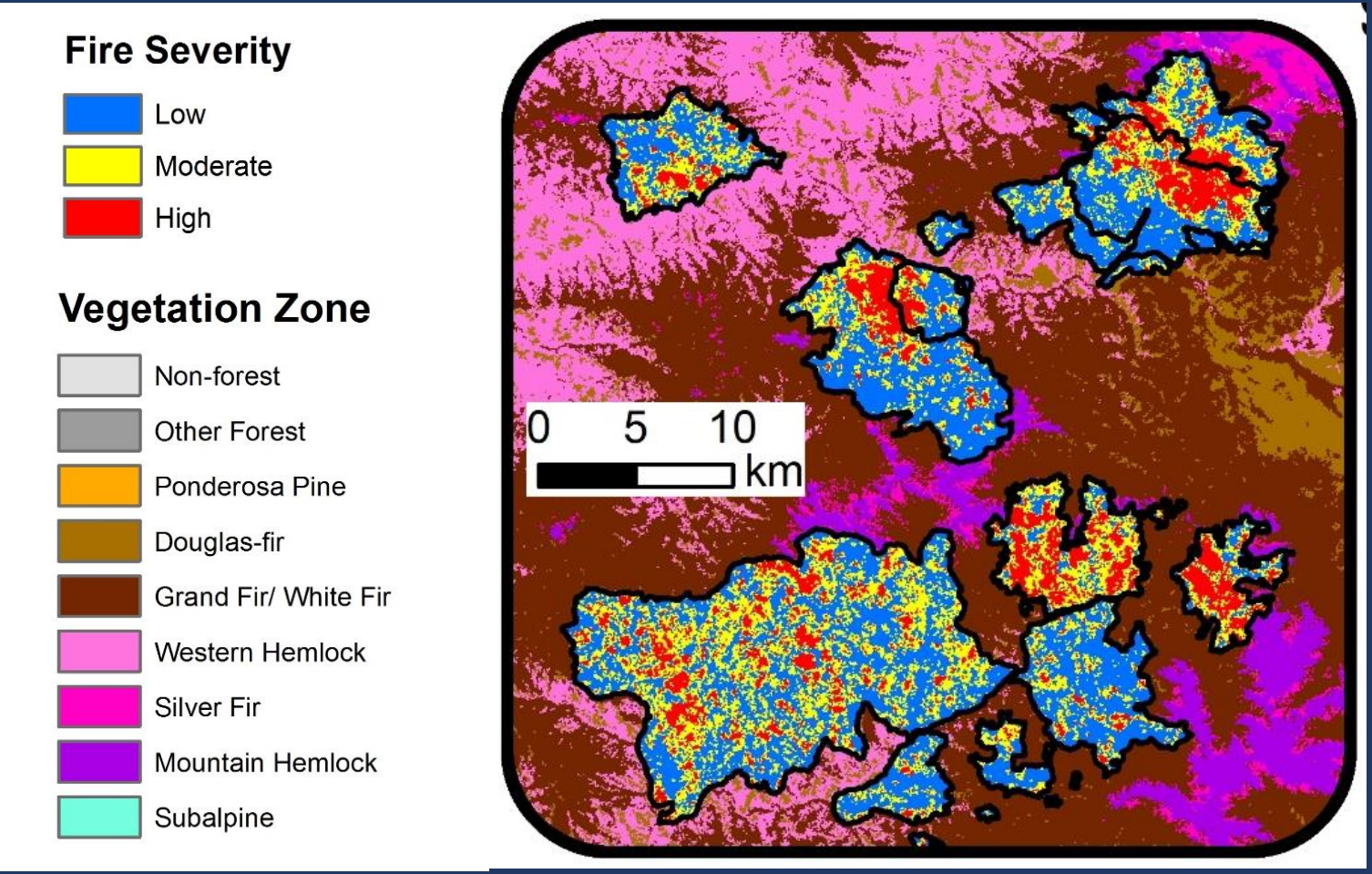


Spies et al. 2018

Fine and Coarse Scale Mosaic

- Strong “bottom-up” controls on fire behavior and severity
- Forest structure and topography are important
- Occasional large patches of high severity-fire in weather driven fires

Fine and Coarse Scale Mosaic

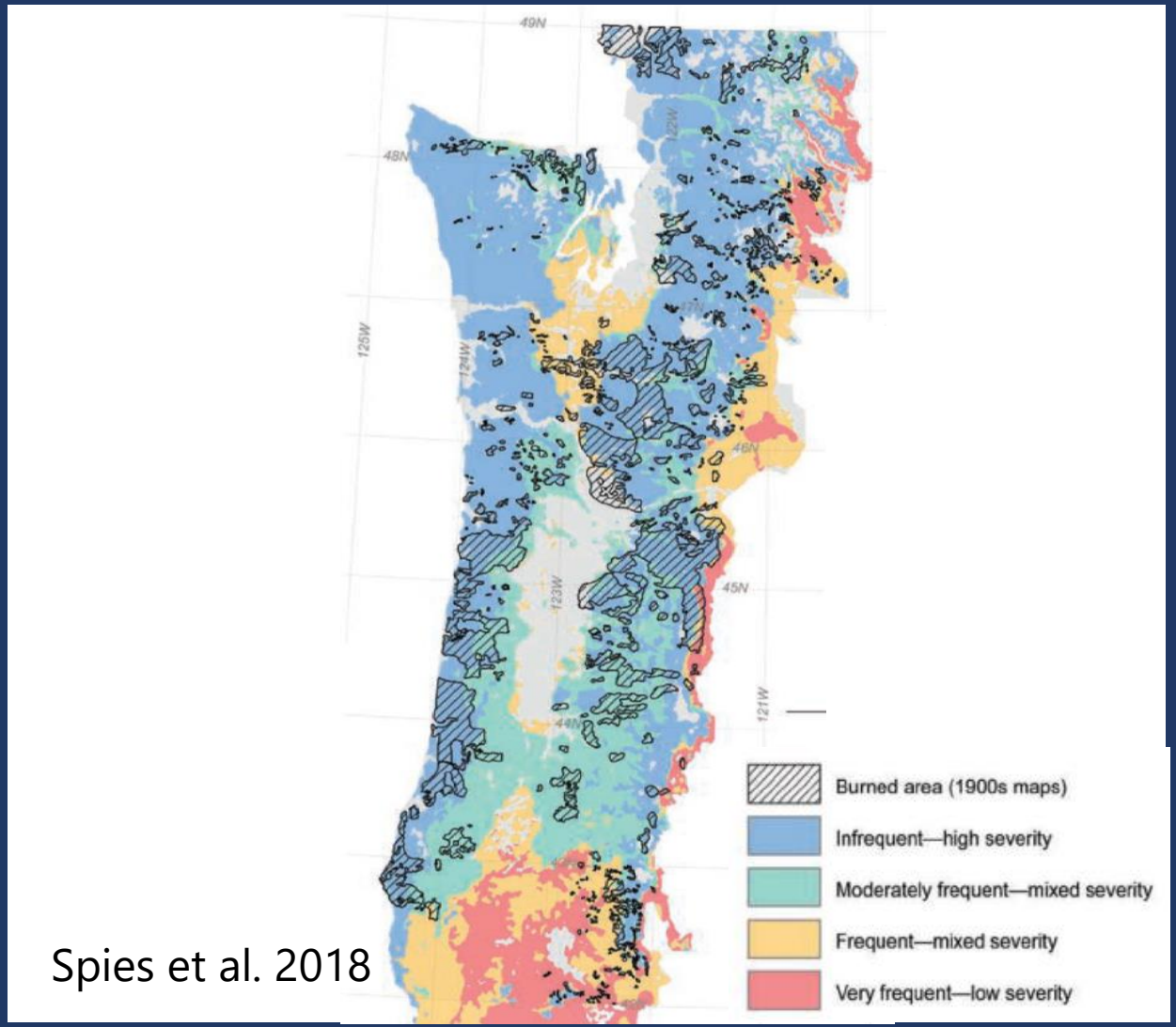


Infrequent, High Severity

- Long time periods between stand-replacing fires
- Evidence for pre-settlement ecological role
- Primarily in wet or cool forest types

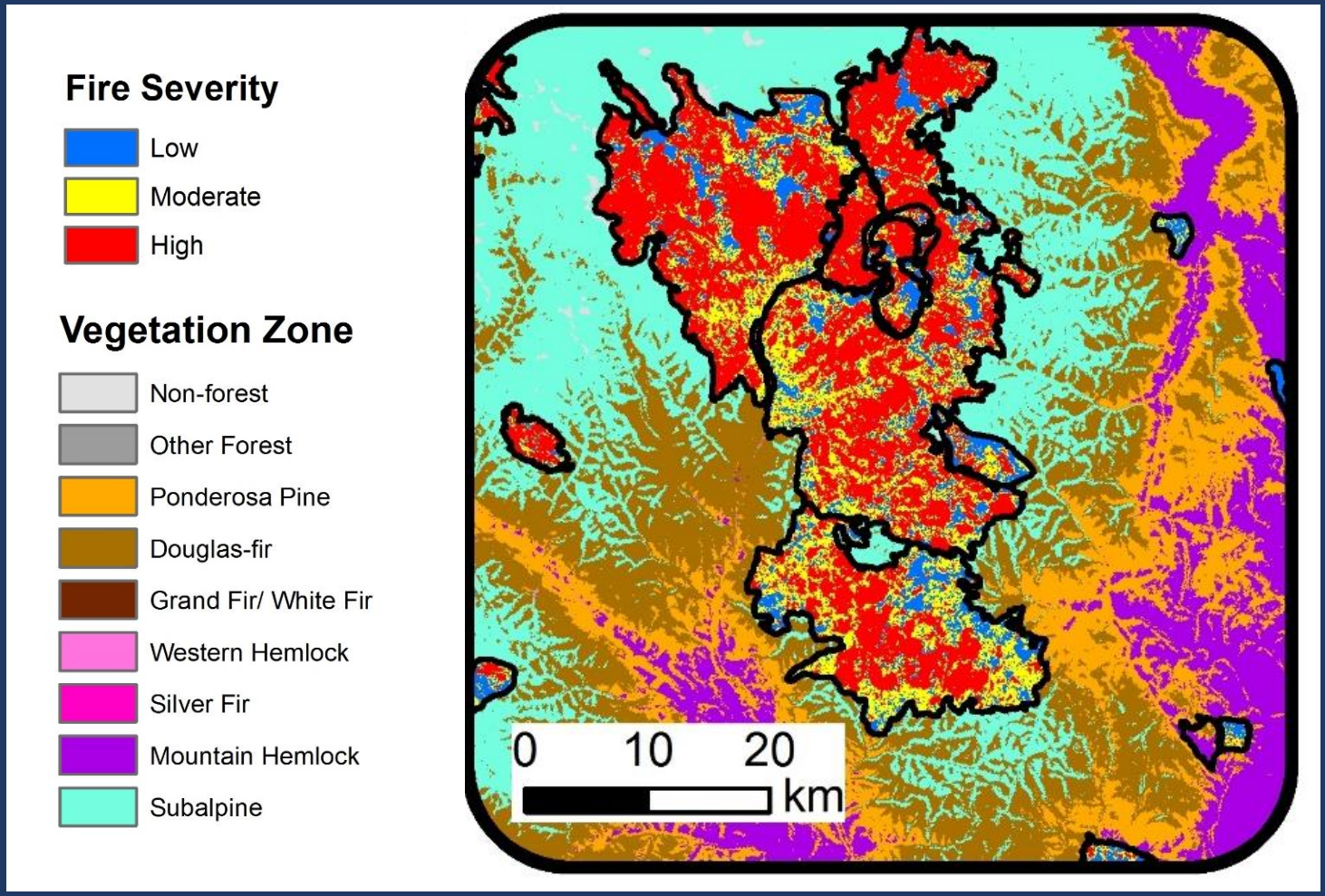
Illustration by Bob Van Pelt

Historical Fire Regimes

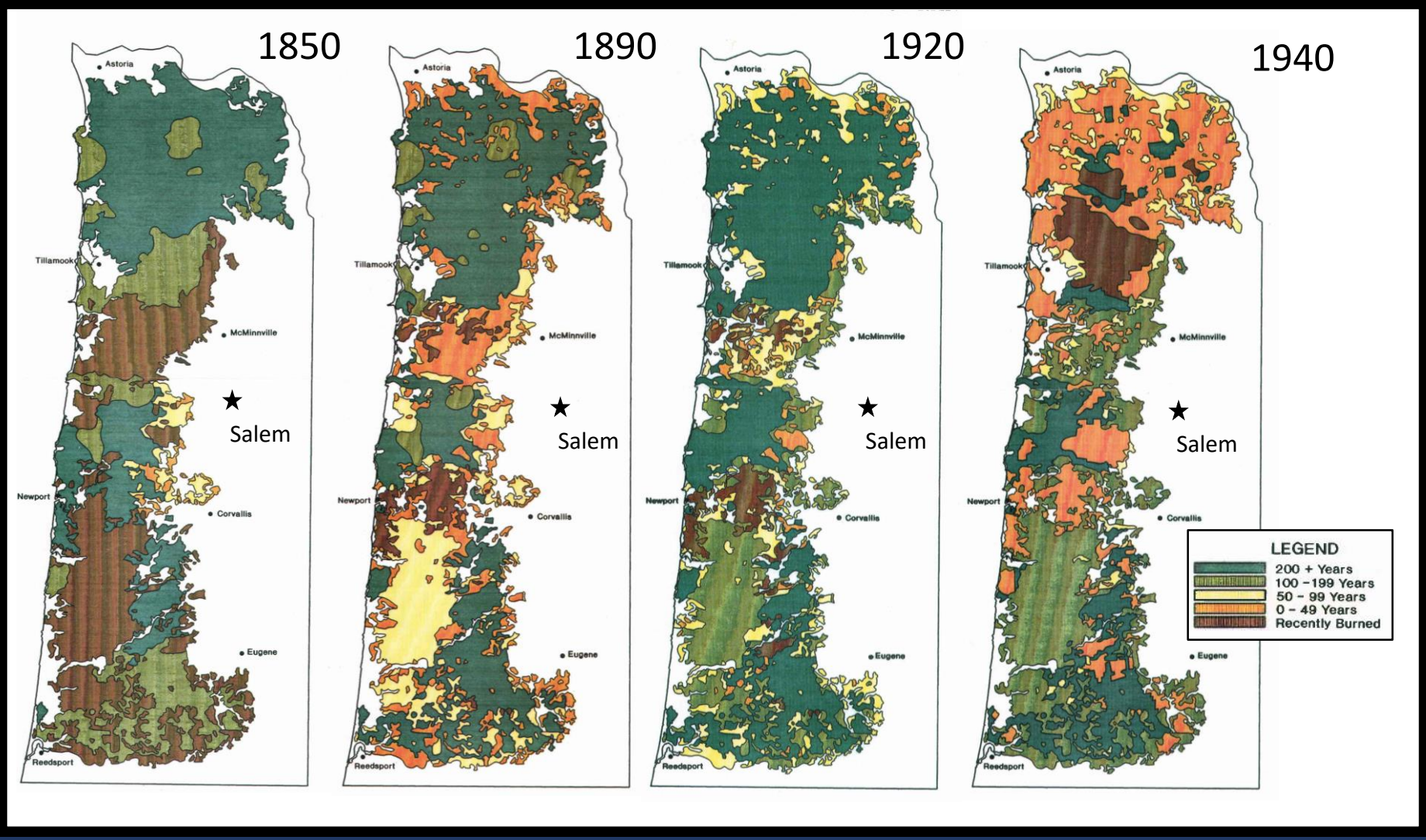


Spies et al. 2018

Coarse Scale Mosaic



Oregon Coast Range Fire History (1850 to 1940)



Teensma et al. 1991

Large, High Severity Fires are the Norm

Figure 11 Tillimook Fire, August 25, 1933 *Courtesy of National Archives*

Large, High Severity Fires are the Norm

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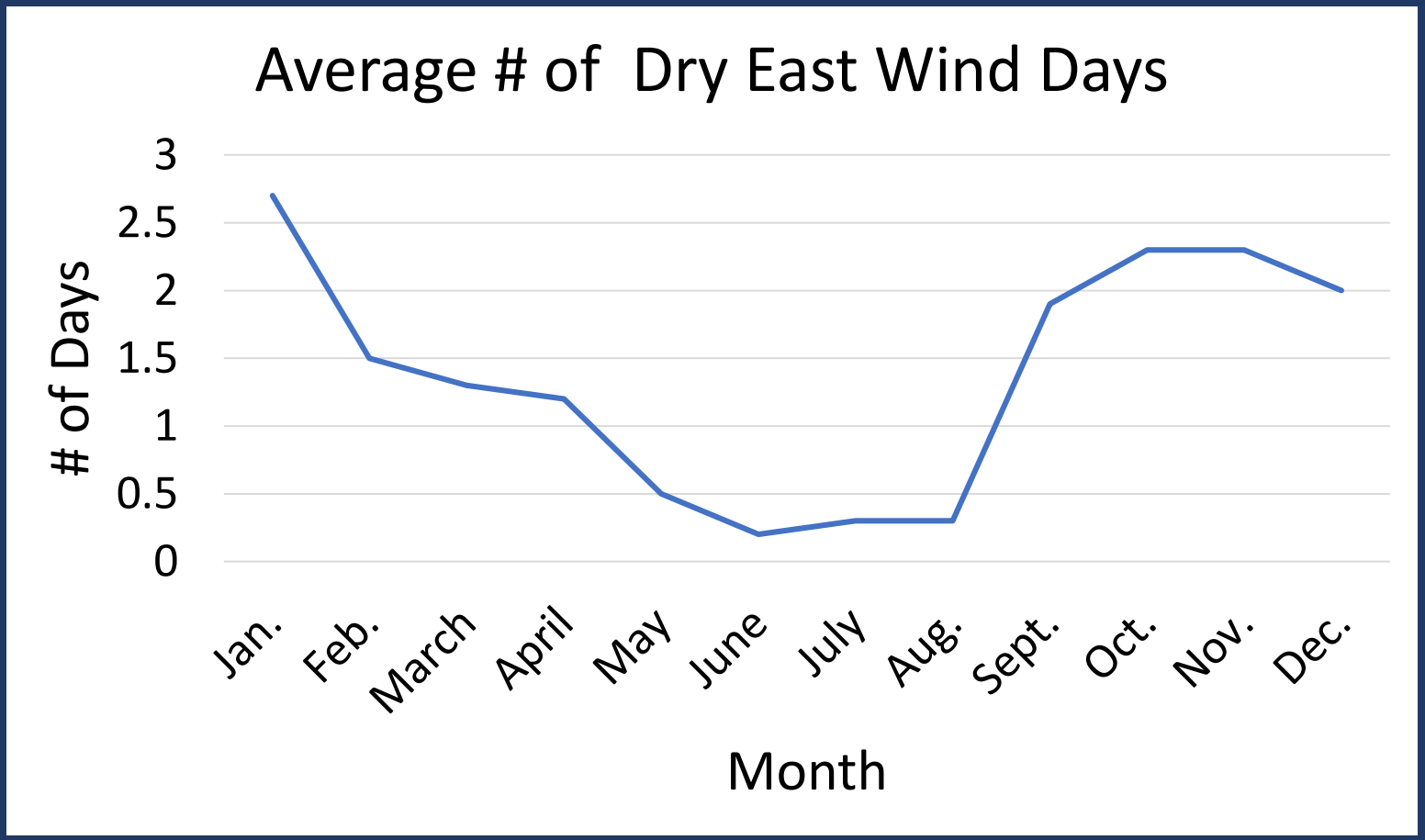
Large, High Severity Fires are the Norm

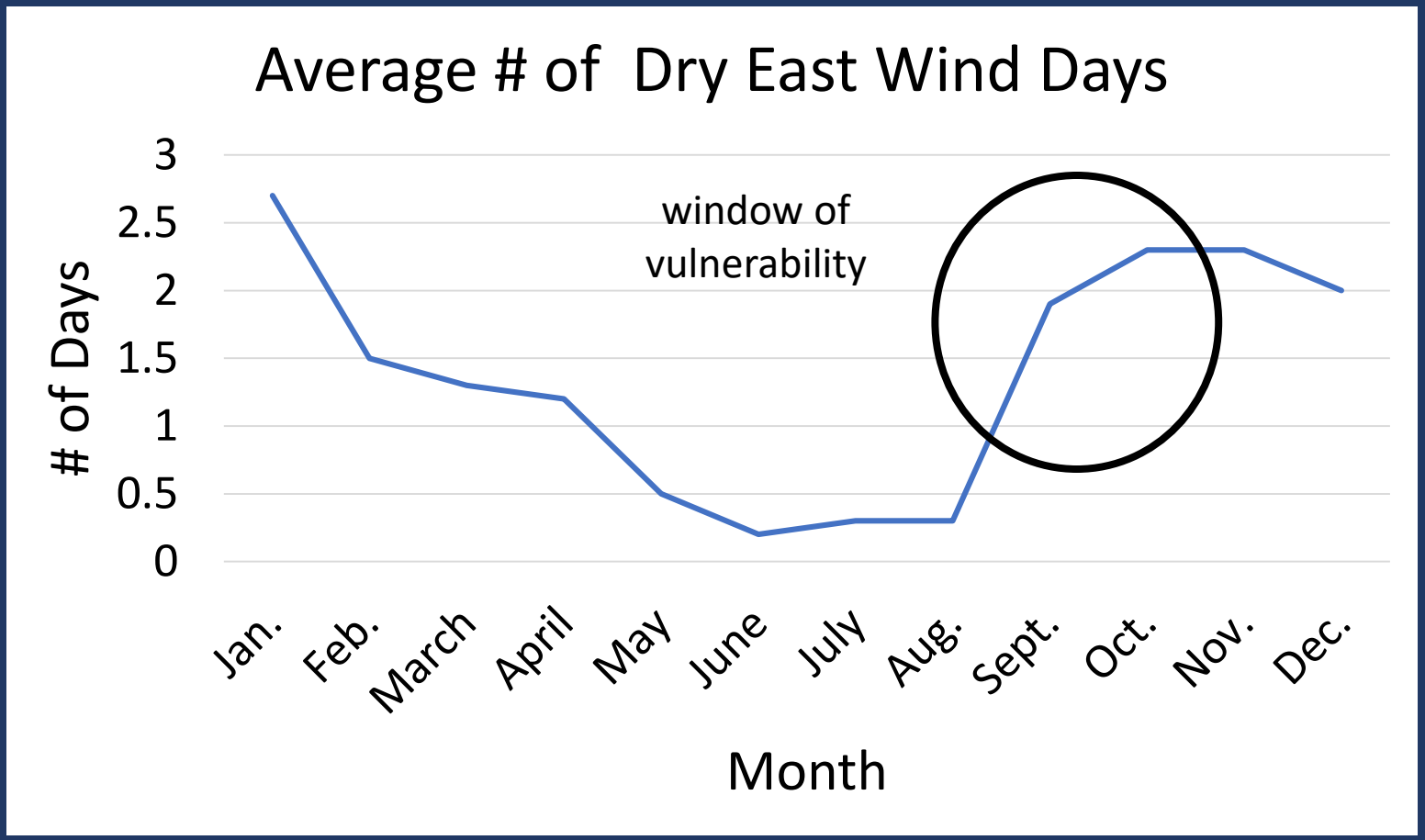
Figure 11 Tillimook Fire, August 25, 1933 *Courtesy of National Archives*

East Wind Events



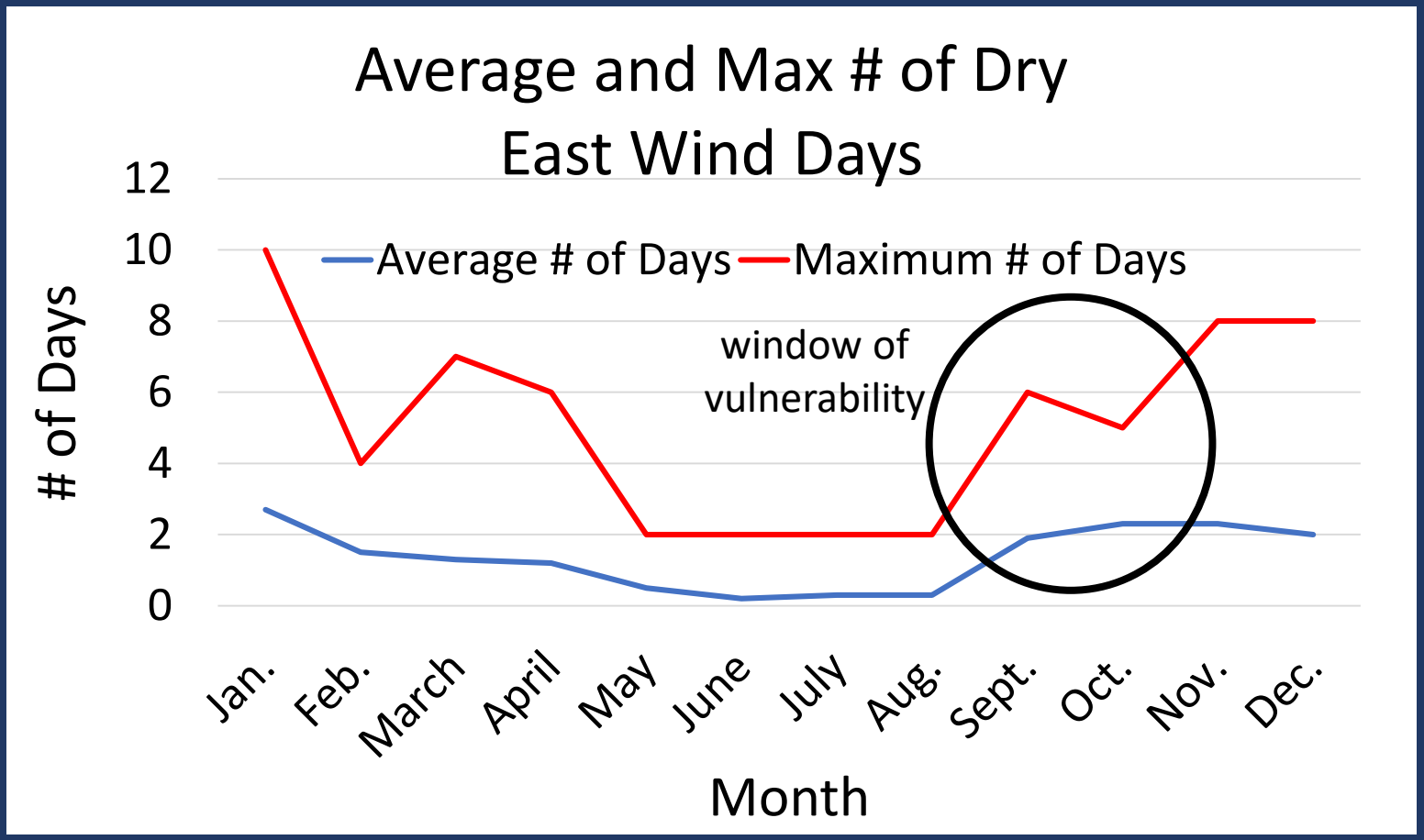
data from Cramer 1957

East Wind Events



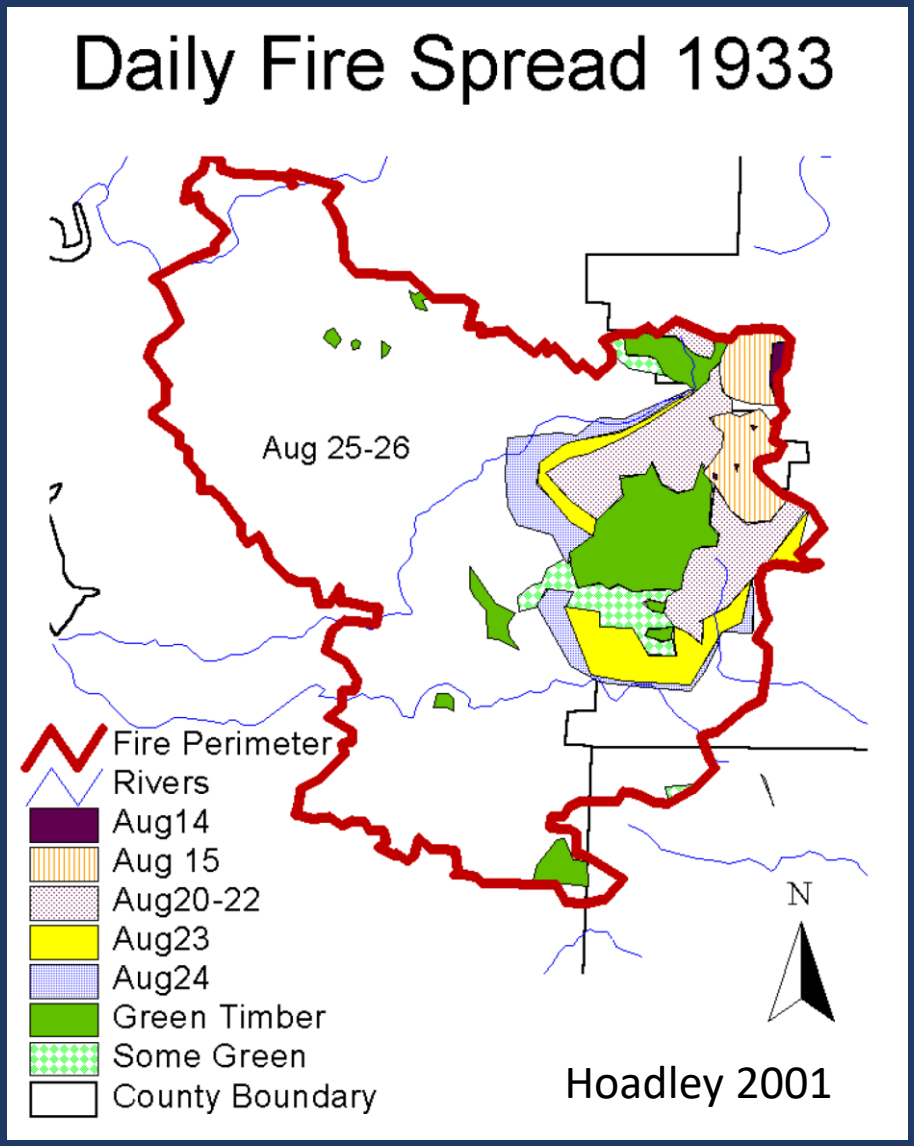
data from Cramer 1957

East Wind Events



data from Cramer 1957

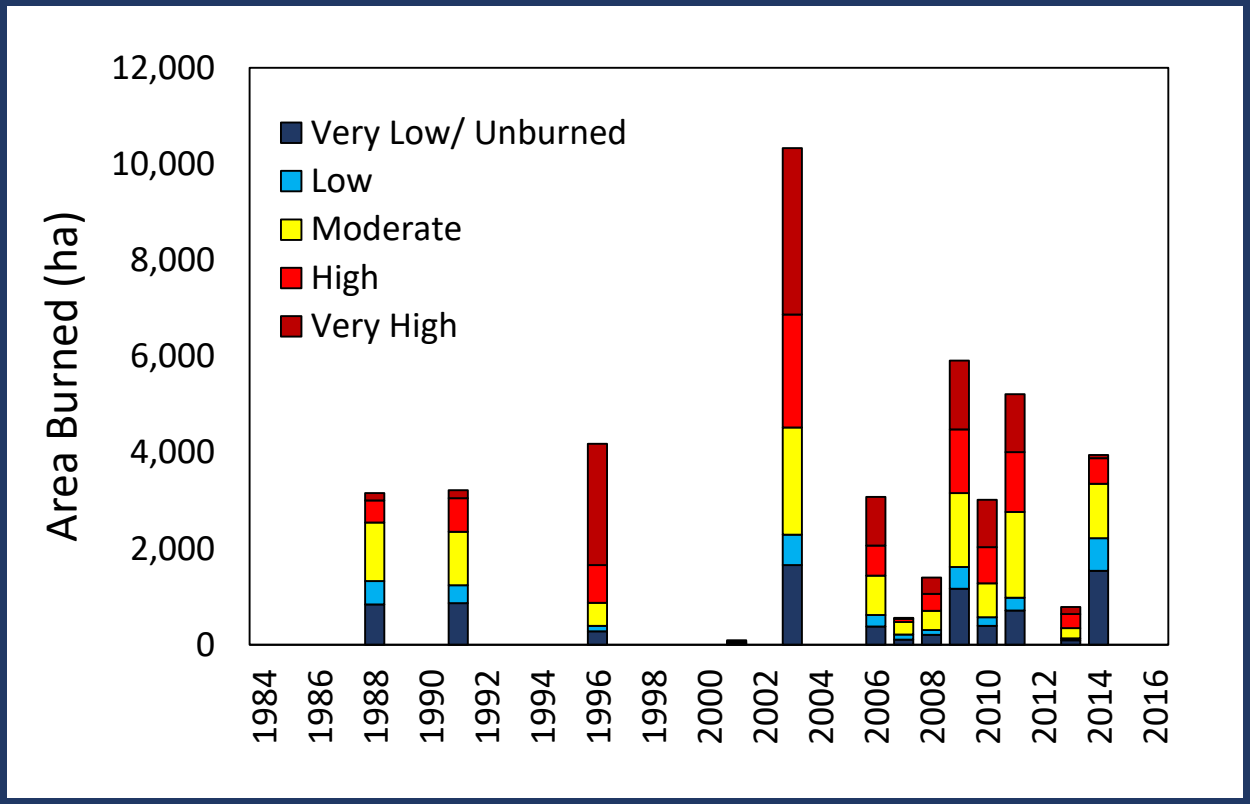
Tillamook Daily Spread



Weather

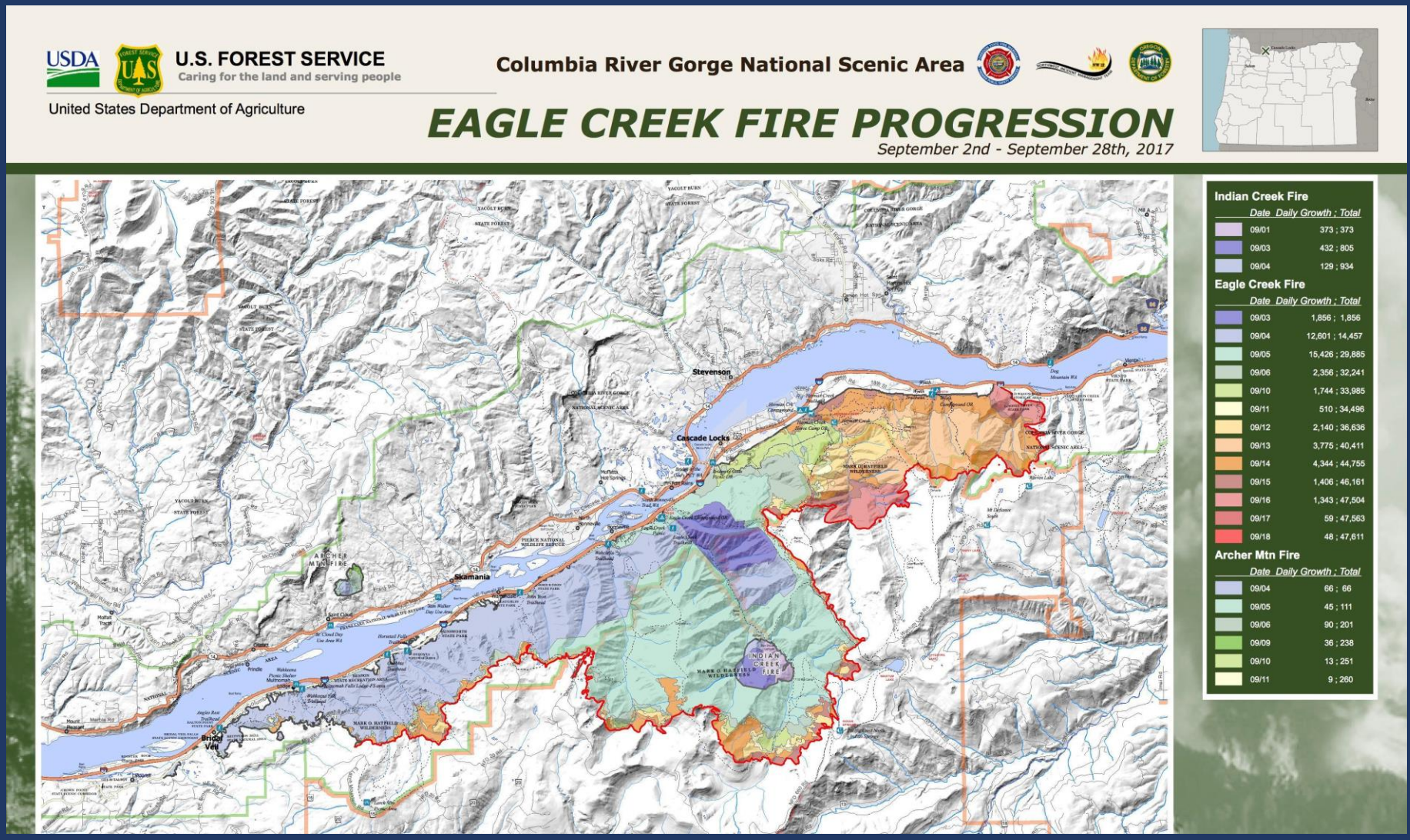
Date	Max Temp	Min R.H.	Wind Direction	Wind Speed
Aug 14	90-97	20-30%	NNE	18-23mph
Aug 15	100-105	15-25%	E shift to W	15-20mph
Aug 16	70-75	35-45%	E-SE	5-10mph
Aug 17	unknown	40-50%	West	5-10mph
Aug 18	unknown	45-55%	West	5-10mph
Aug 19	unknown	45-55%	West	5-10mph
Aug 20	unknown	40-50%	North	10-15mph
Aug 21	unknown	25-35%	East	15-25mph
Aug 22	unknown	20-30%	East	20-25mph
Aug 23	unknown	20-30%	East	10-15mph
Aug 24	unknown	25-35%	E-NE	10-15mph
Aug 25	unknown	20-25%	East	25-35mph
Aug 26	unknown	Rising to >60%	E shift to W	20-28mph decreasing

Current Fire in the West Cascades

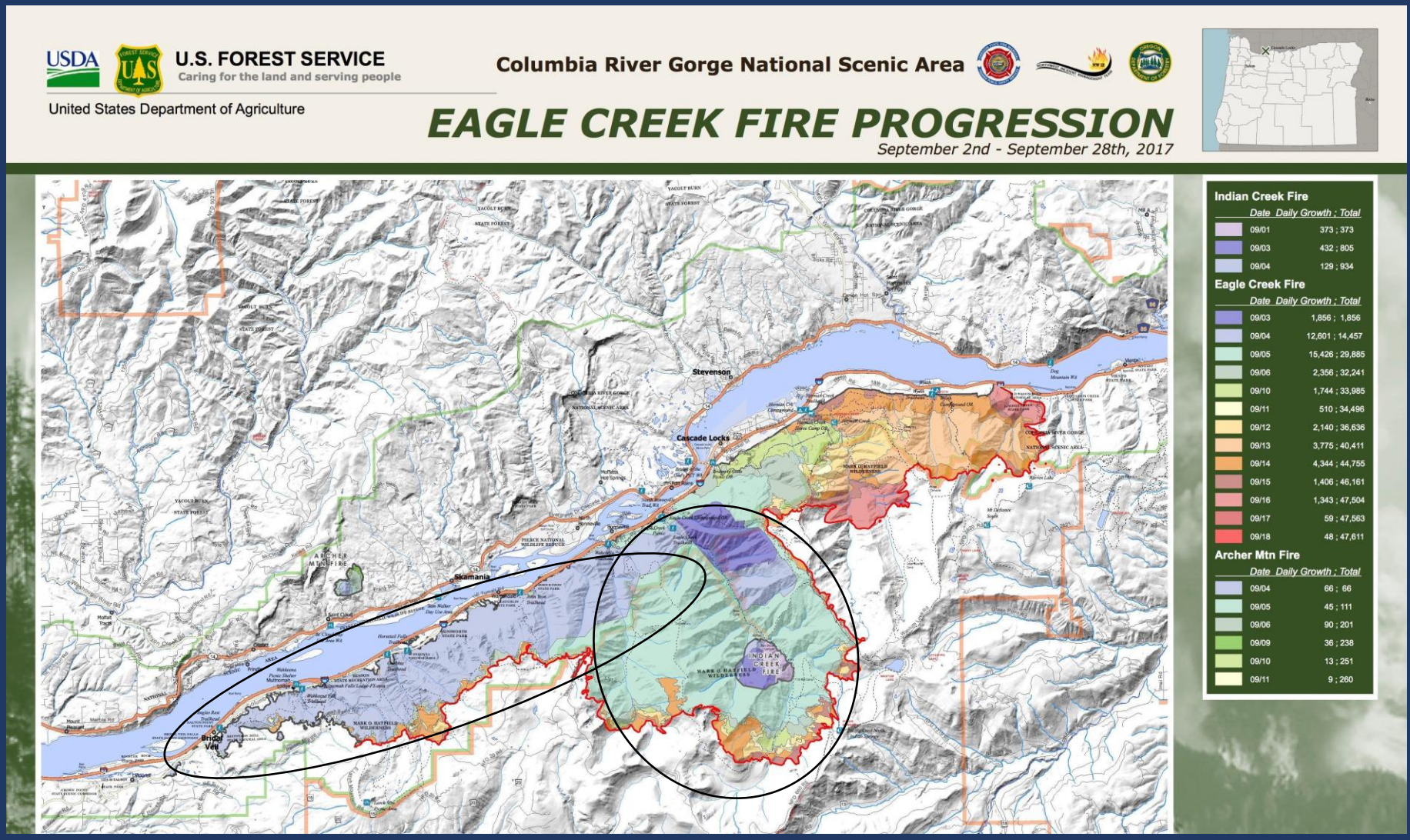


Oregon Western Cascades

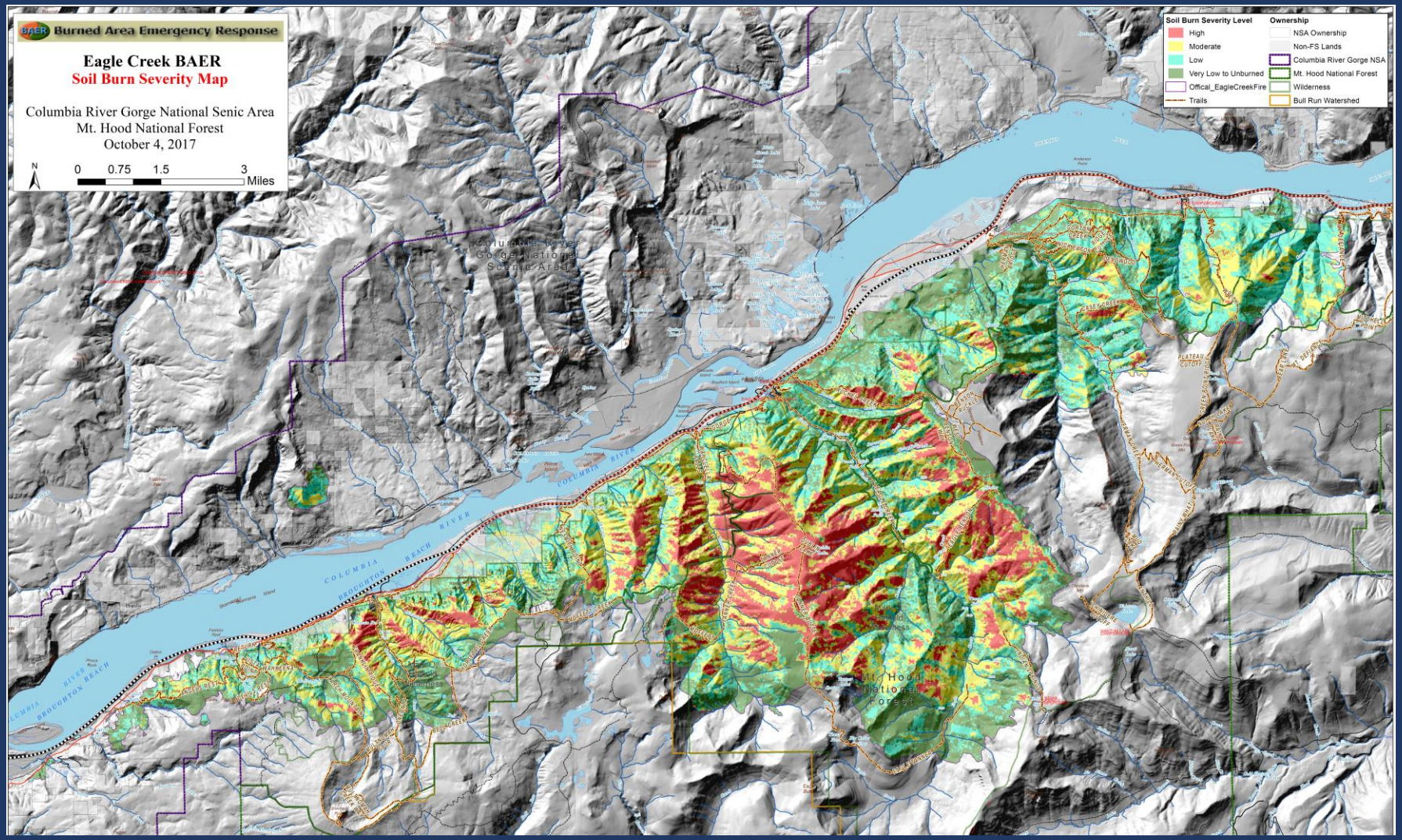
Eagle Creek Fire



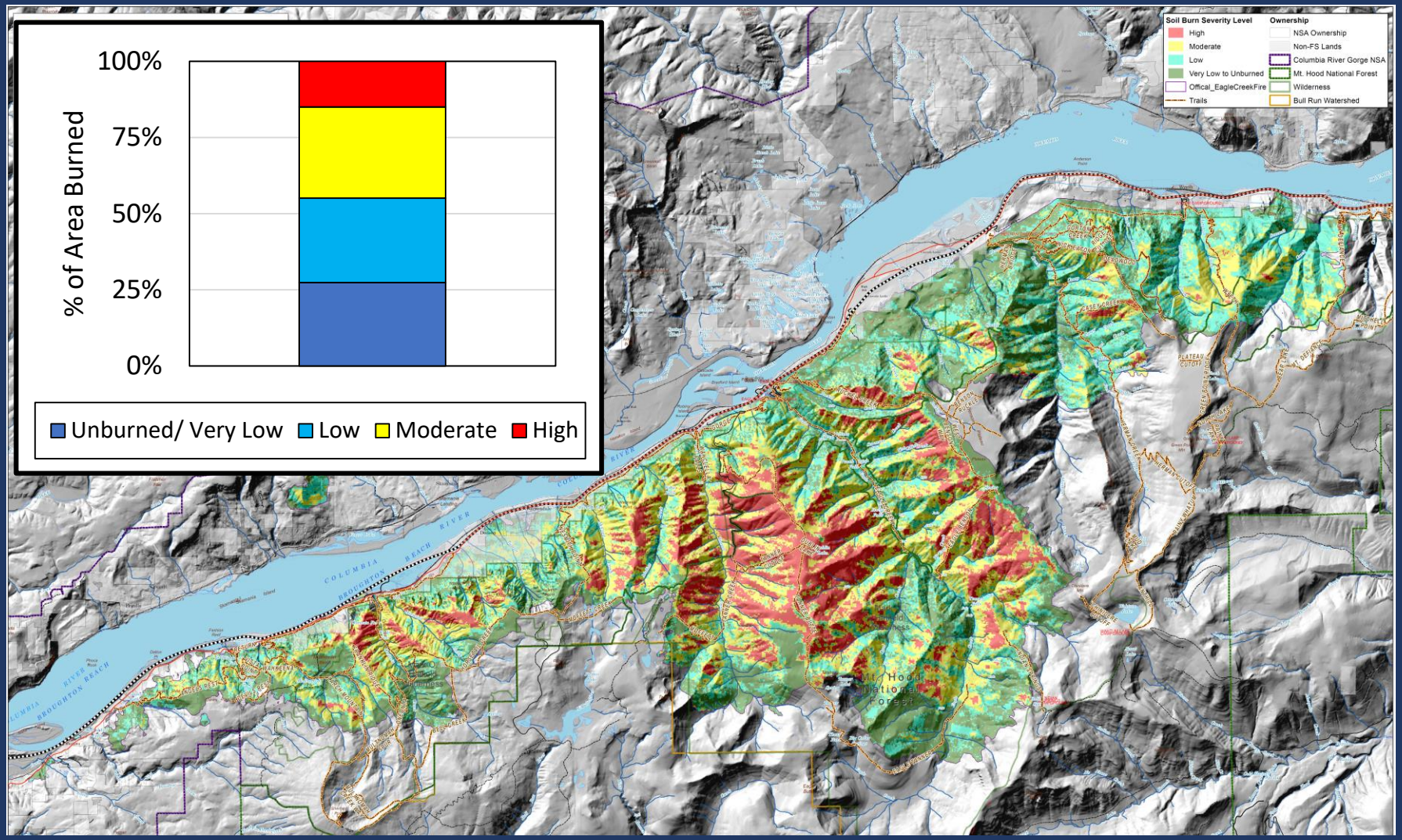
Eagle Creek Fire



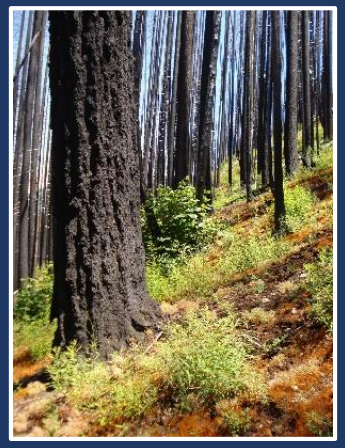
Eagle Creek Fire

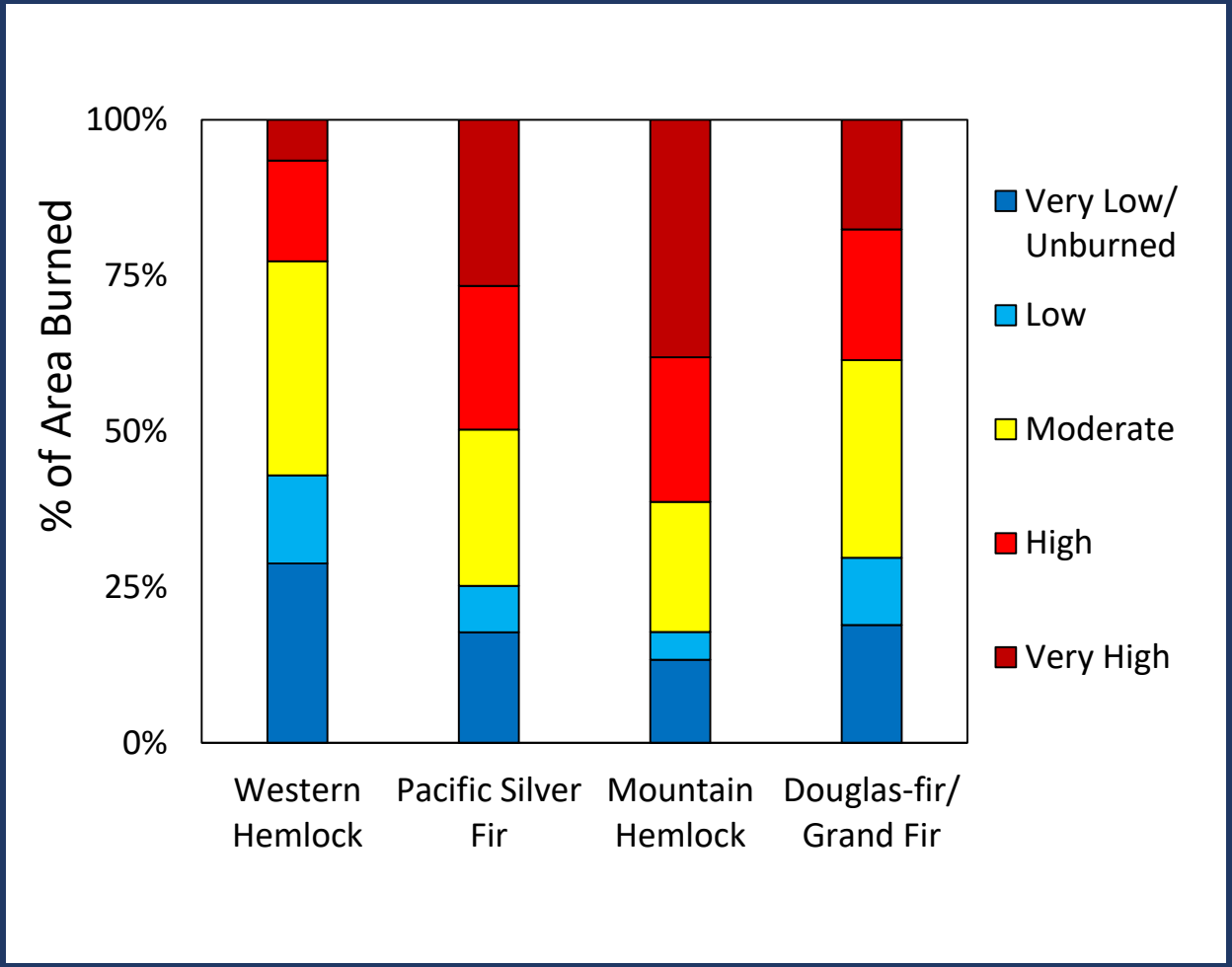


Eagle Creek Fire



Current Fire Severity

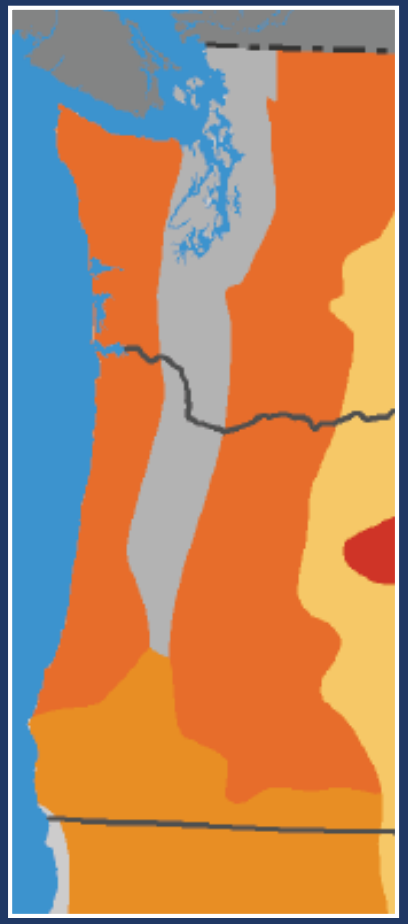


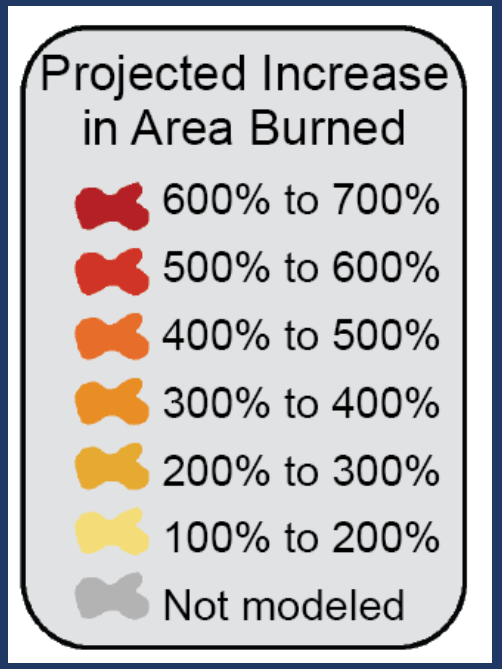


Oregon Western Cascades

Future Fire Activity

Study	Geographic Extent	Projected Change from Current	Variable
Stavros et al. 2014	OR,WA, N. CA	+	Large fire occurrence
McKenzie et al. 2004	OR,WA, N. CA	+	Area burned
Littell et al. 2010	WA	+ 200 to 300%	Area burned
Turner et al. 2015	Willamette Valley – OR	+300 to 900%	Area burned
Krawchuck et al. 2009	Global	+	Fire probability
Fried et al. 2004	N. CA	-8%	Area burned
Barr et al. 2010	Klamath Basin - OR and N. CA	+11 to 22%	Area burned
Liu et al. 2012	continental US	no	Fire potential[2]
Westerling et al. 2011	N. CA	+100%	Area burned
Rogers et al. 2011	OR, WA	+76 to 310%/ +29 to 40%	Area burned/ Severity
Sheehan et al. 2015	OR, WA	-82% to 14%	Mean Fire Interval





Mote et al. 2014

Things To Consider

- Patch Size
- Seasonality
- Productivity
- Post-fire climate
- Invasive species
- State changes

Pre-fire Management Options

Pre-fire management options	*Low Severity Regimes*	*Mixed Severity Regimes*	*High Severity Regimes*
Basic stand-level fuel reduction (thinning, surface fuels, ladder fuels)	✓	?	✘
Promote species and structural diversity within and across stands, include hardwoods	✓	✓	?
Reduce other ecosystem stressors (invasives, fragmentation)	✓	✓	✓
Limit human ignitions	✓	✓	✓
Aggressive wildfire detection	✓	✓	✓
Develop post-fire response strategies	✓	✓	✓

Post-fire Management Options

Pre-fire management options	*Low Severity Regimes*	*Mixed Severity Regimes*	*High Severity Regimes*
Assess fire impacts relative to management objectives (can be + or -)	✓	✓	✓
Leverage natural regeneration - inexpensive, diverse, can't replant everywhere	✓	✓	✓
Planting: promote species and structural diversity within and across stands, consider hardwoods	✓	✓	✓
Coordinate post-fire activities with adjacent landowners	✓	✓	✓
Use events as learning opportunities (research, monitoring, trials, adaptive mgt.)	✓	✓	✓

Questions?