CHANGING WILDFIRE AND CLIMATIC REGIMES IN THE 21ST CENTURY WESTERN US

1936

2012

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The Interior West:

A region of great biotic, cultural, and environmental diversity

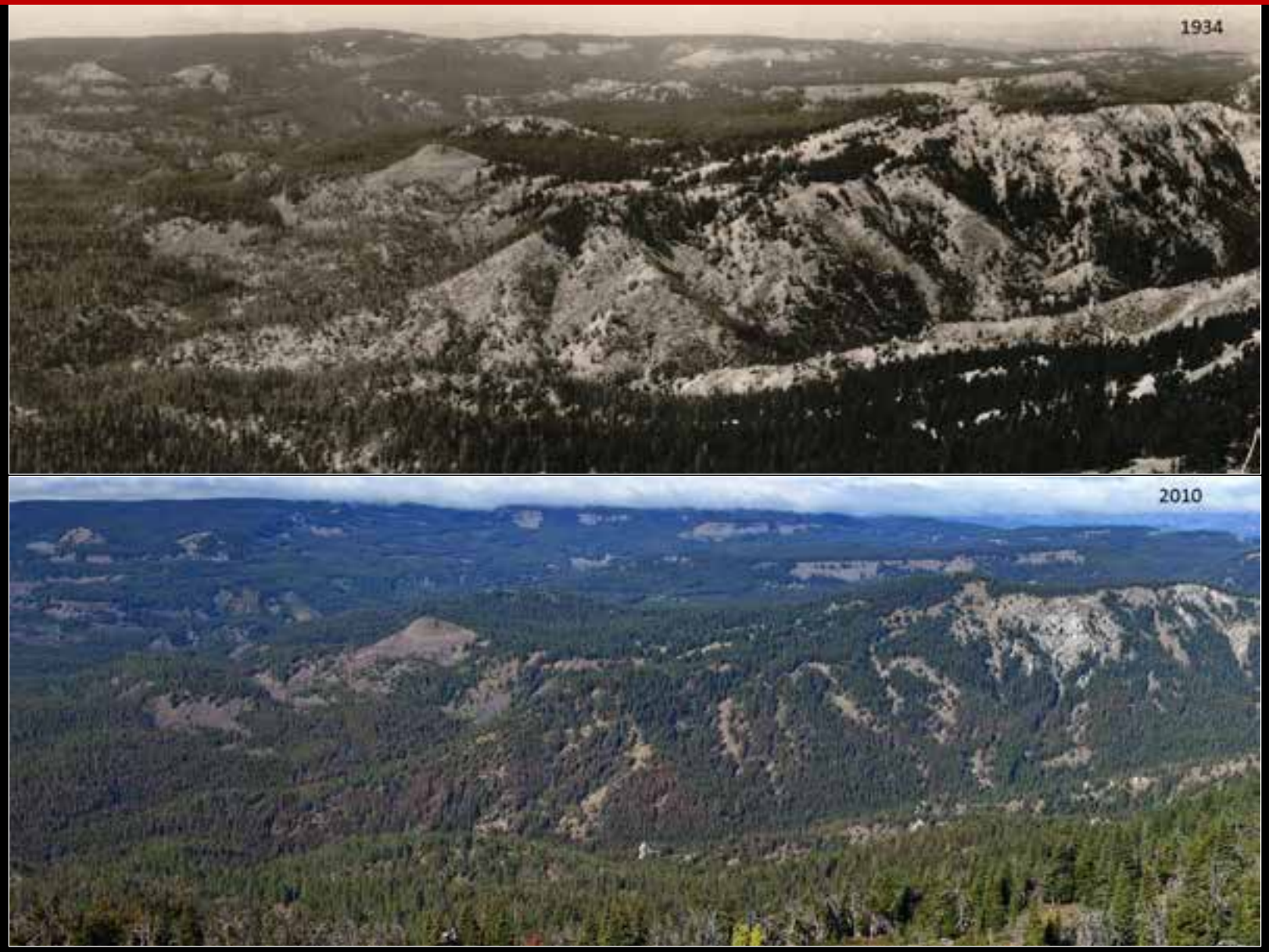
…but it is greatly changed over the last 2 centuries

Changing wildfire and climatic regimes in the 21st-century West

Grass and shrublands decreased…

…forests increased

Changing wildfire and climatic regimes in the 21st-century West



Dry slopes and ridgetops…

…filled in with trees

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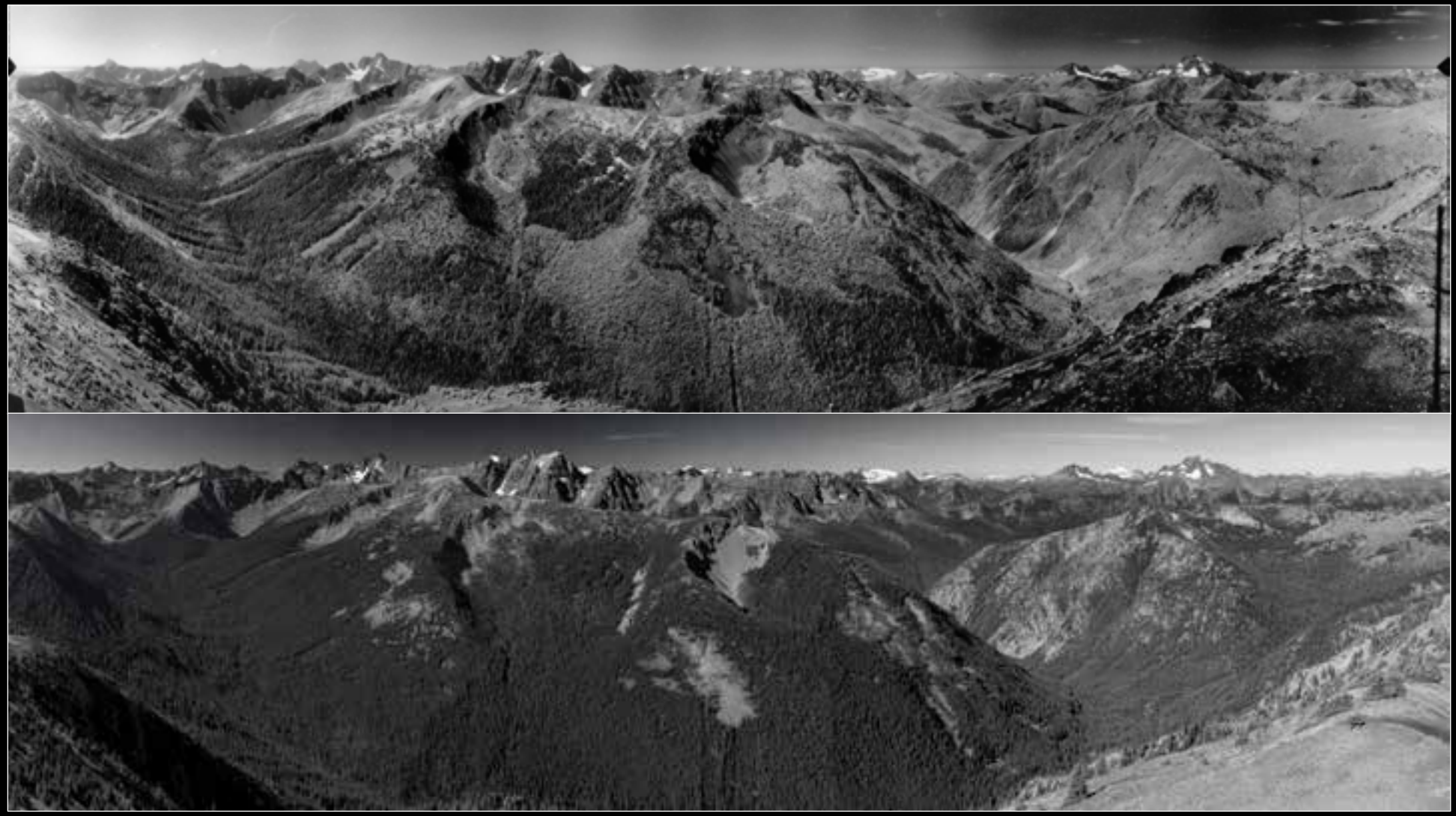
Complex forest age/density patchworks…

…became uniform

Changing wildfire and climatic regimes in the 21st-century West



Patchworks of burned and recovering forest…

…gave way to continuous forest

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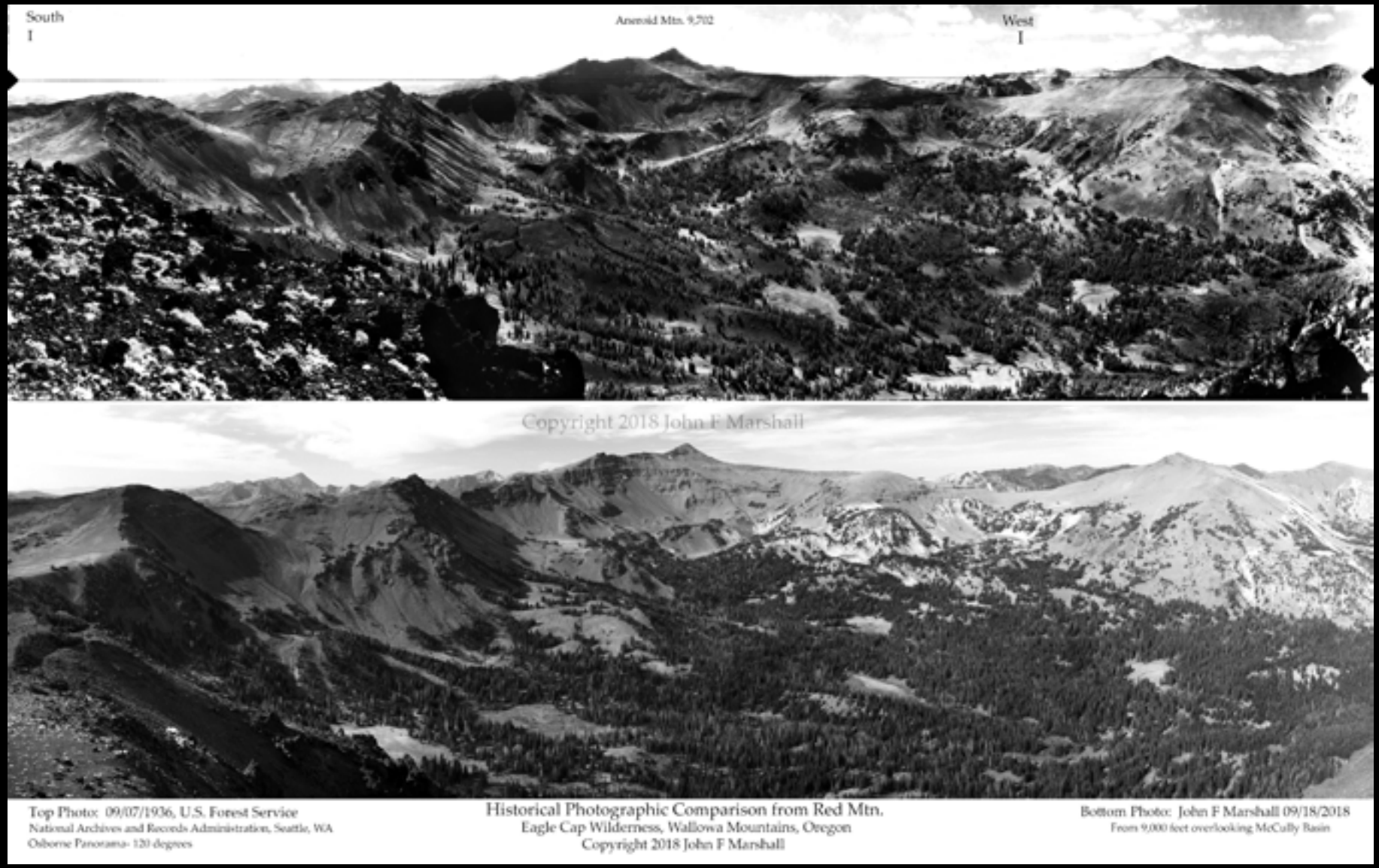

Abundant high meadows…

…gave way to dense forest

CLOSE UP OF THE CHANGES

Top: U.S.Forest Service 1936
National Archives

McCully Creek, Wallowa Mtns.
Eagle Cap Wilderness, Oregon

Bottom: John F Marshall 2018

Primary Change Agents

1850 → **2020**

Timber harvest – Clearcut & selective logging
Fire exclusion – grazing, development, suppression
Climate change – warmer, drier, windier

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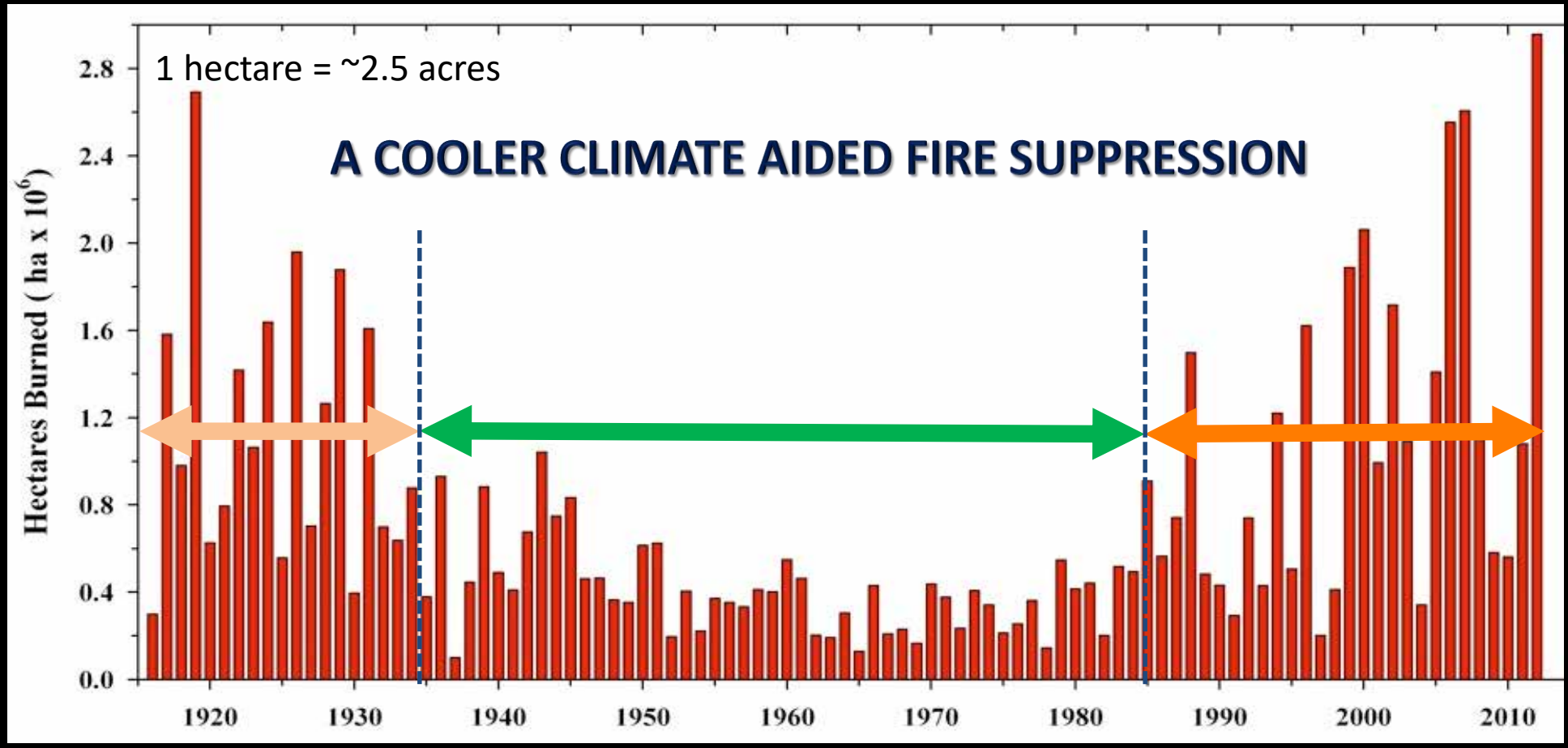

Warm/dry climate

Cool/wet climate, active fire suppression, burned area declines

Warm/dry climate Burned area increases

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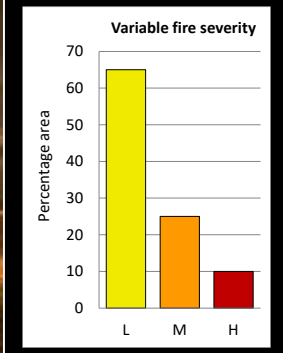
Historical



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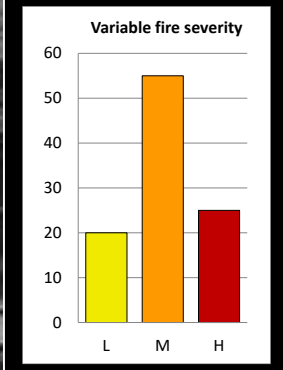
Current



- ✓ Low severity fire <20-25% of the tree cover killed
- ✓ Common in seasonally dry forests
- ✓ Fires every 5-25 yrs, reinforced low severity
- ✓ More extreme climate/weather drove more extreme fires

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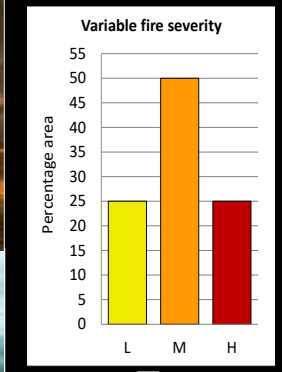
Historical



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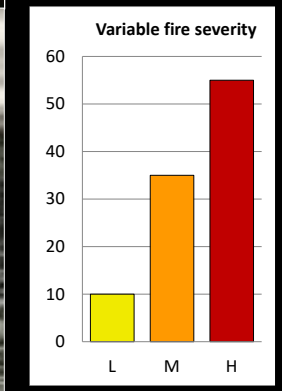

- ✓ Moderate severity, 25-75% of the tree cover killed
- ✓ Common in seasonally dry mixed conifer forests, more snowpack
- ✓ Intermediate frequency, every 20-50 yrs
- ✓ Milder & more severe fires occur, climate driven

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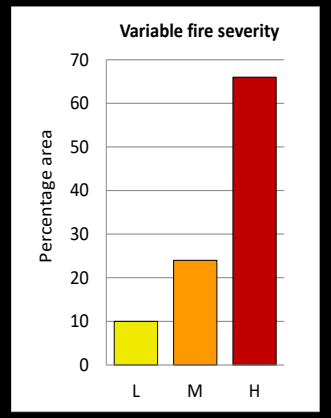
Historical



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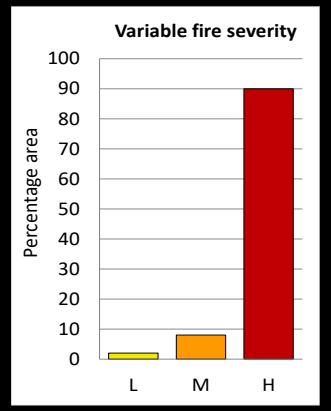

- ✓ High severity > 75% of the tree cover killed
- ✓ Common in wet & cold forests, infrequent (every 75-200+ yr)
- ✓ Mild climate/weather conditions favored milder fires
- ✓ Created variation in fire severity and event patch sizes

Locally, fires continually thinned forest patches, reducing density & fuels

IMPORTANT FEEDBACKS

Seasonally dry forests

How these patch-level feedbacks worked…

Bob Van Pelt drawings…

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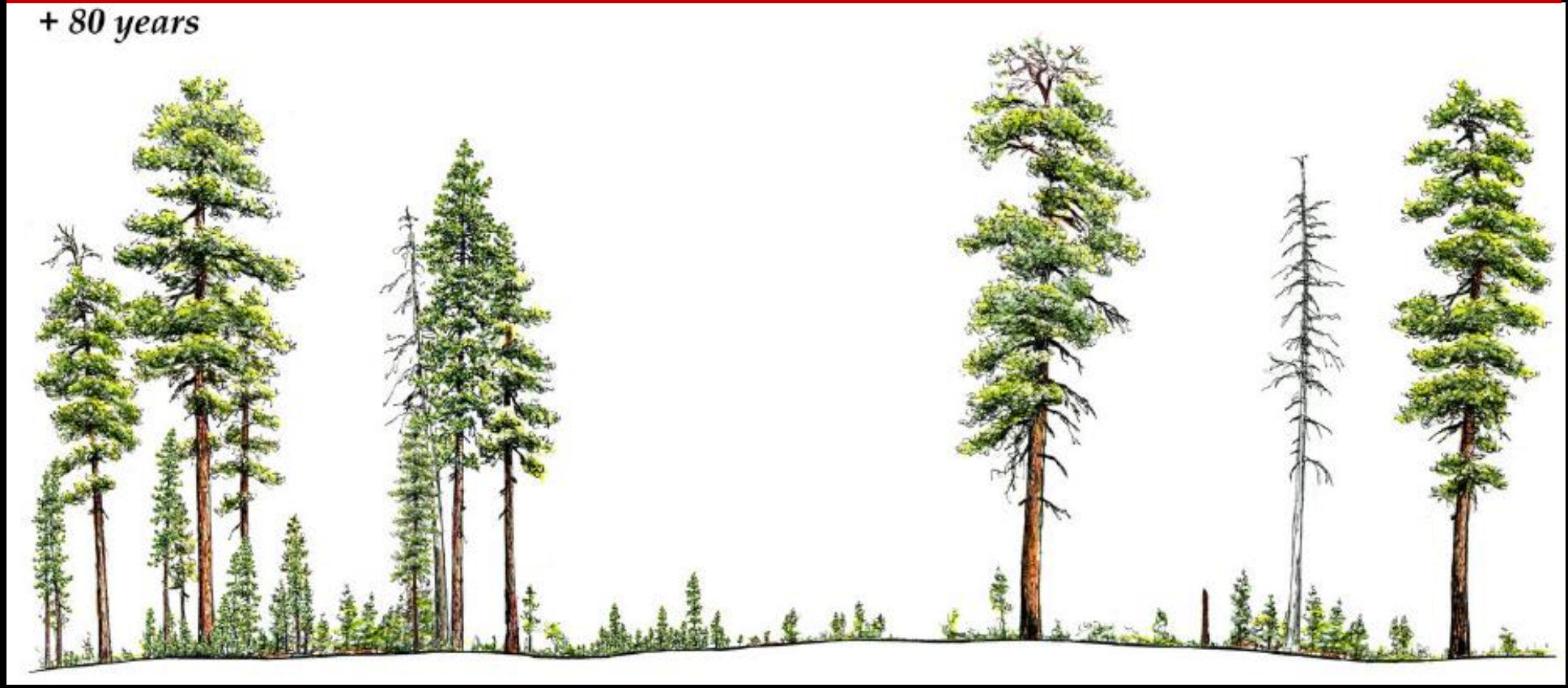

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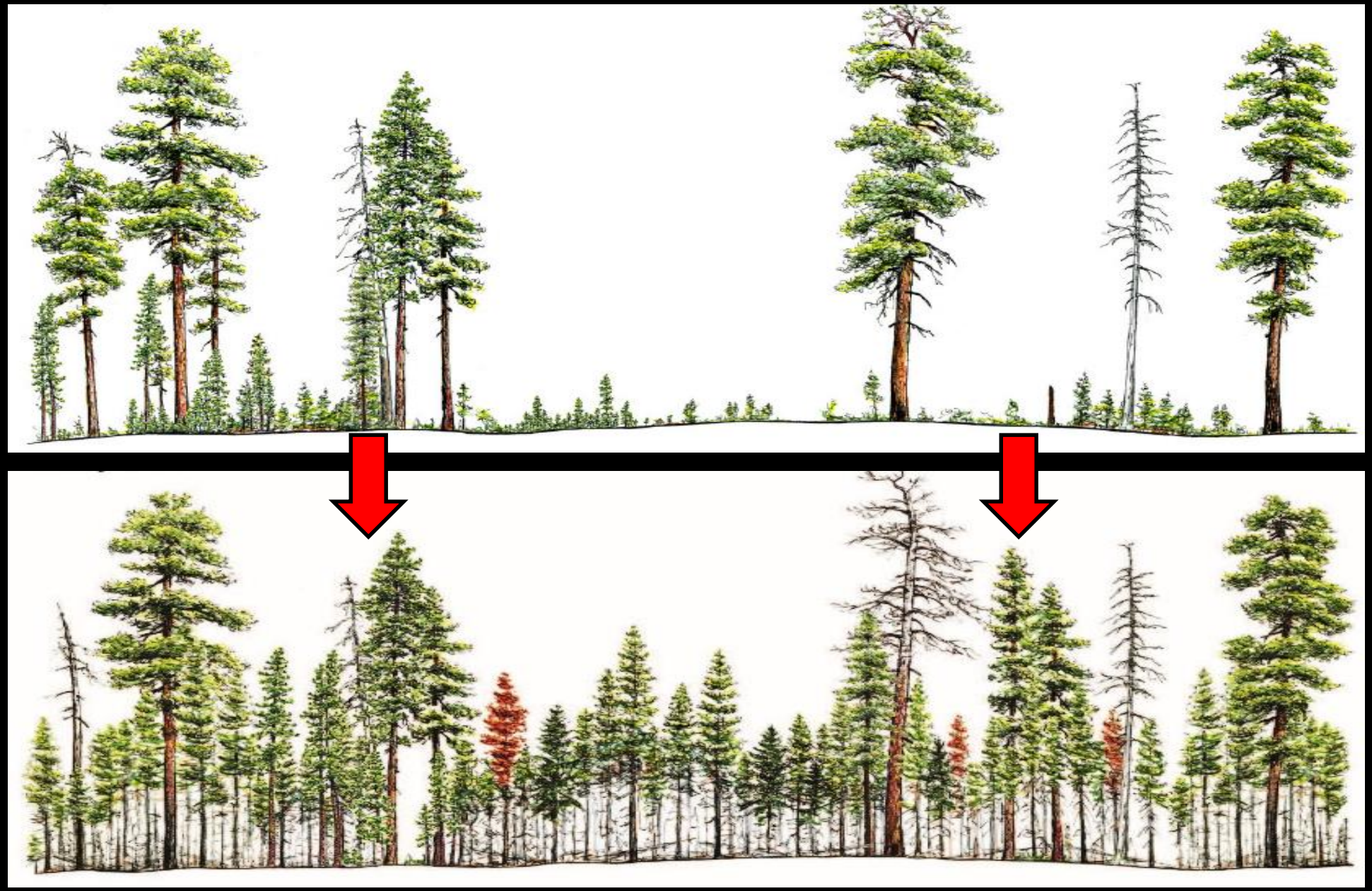

IMPORTANT FEEDBACKS

Regionally—fires created patchworks of grassland, shrubland, young, middle-aged and older forest conditions, these patterns controlled future fire size & severity

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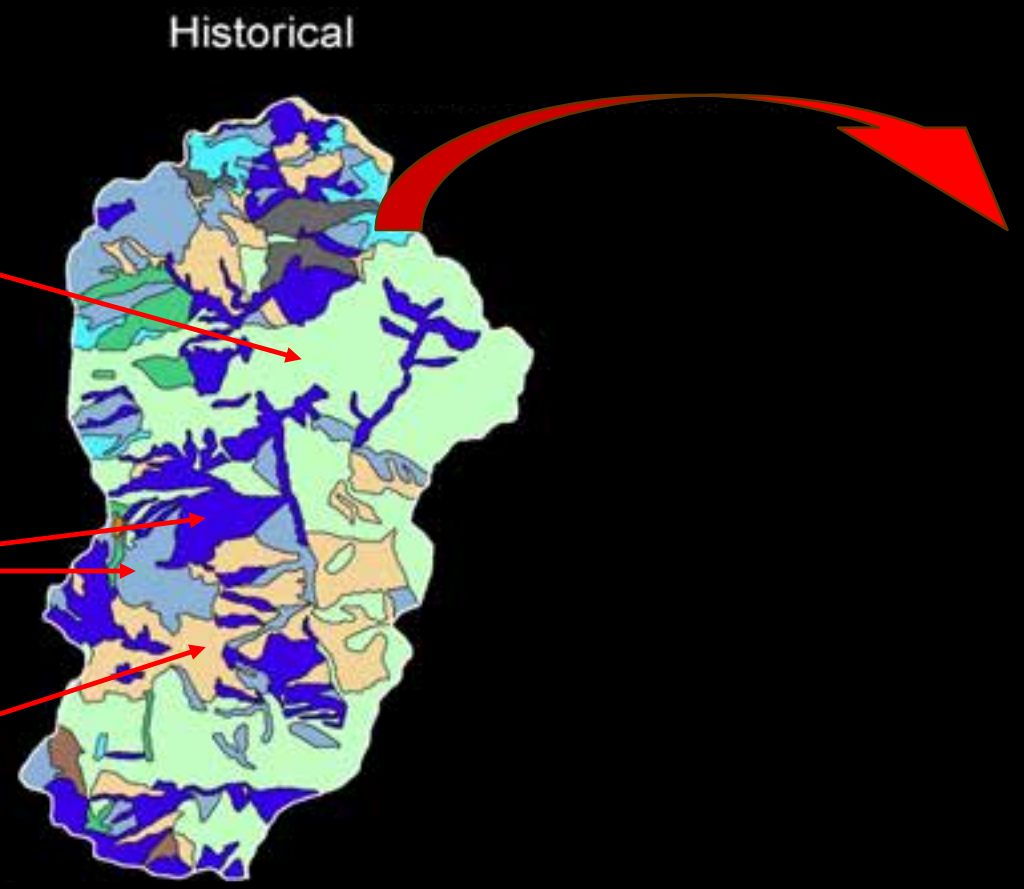

Fire-tolerant tree species abundance decreased; intolerant species increased.
Ponderosa pine cover gave way to Douglas-fir and grand fir.

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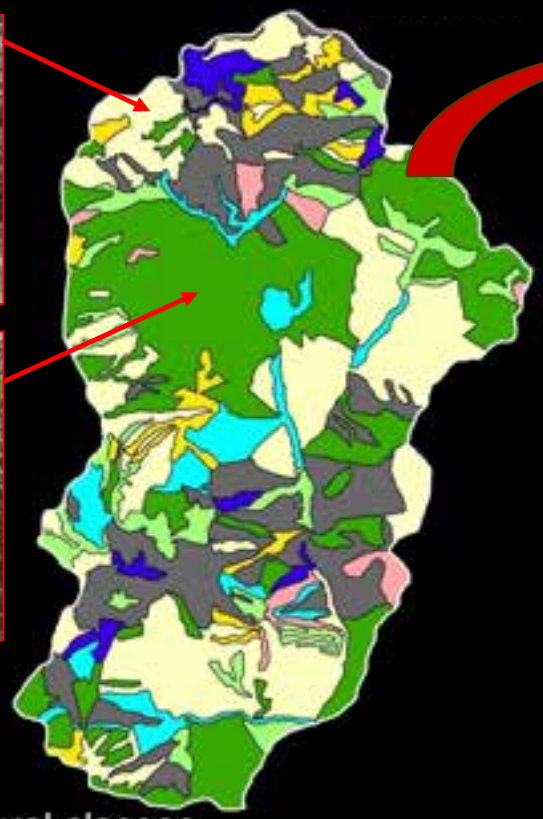

Increased tree canopy cover, and canopy layers

All age forest mosaic was replaced by young multi-story forest

Open stands developed dense, layered understories

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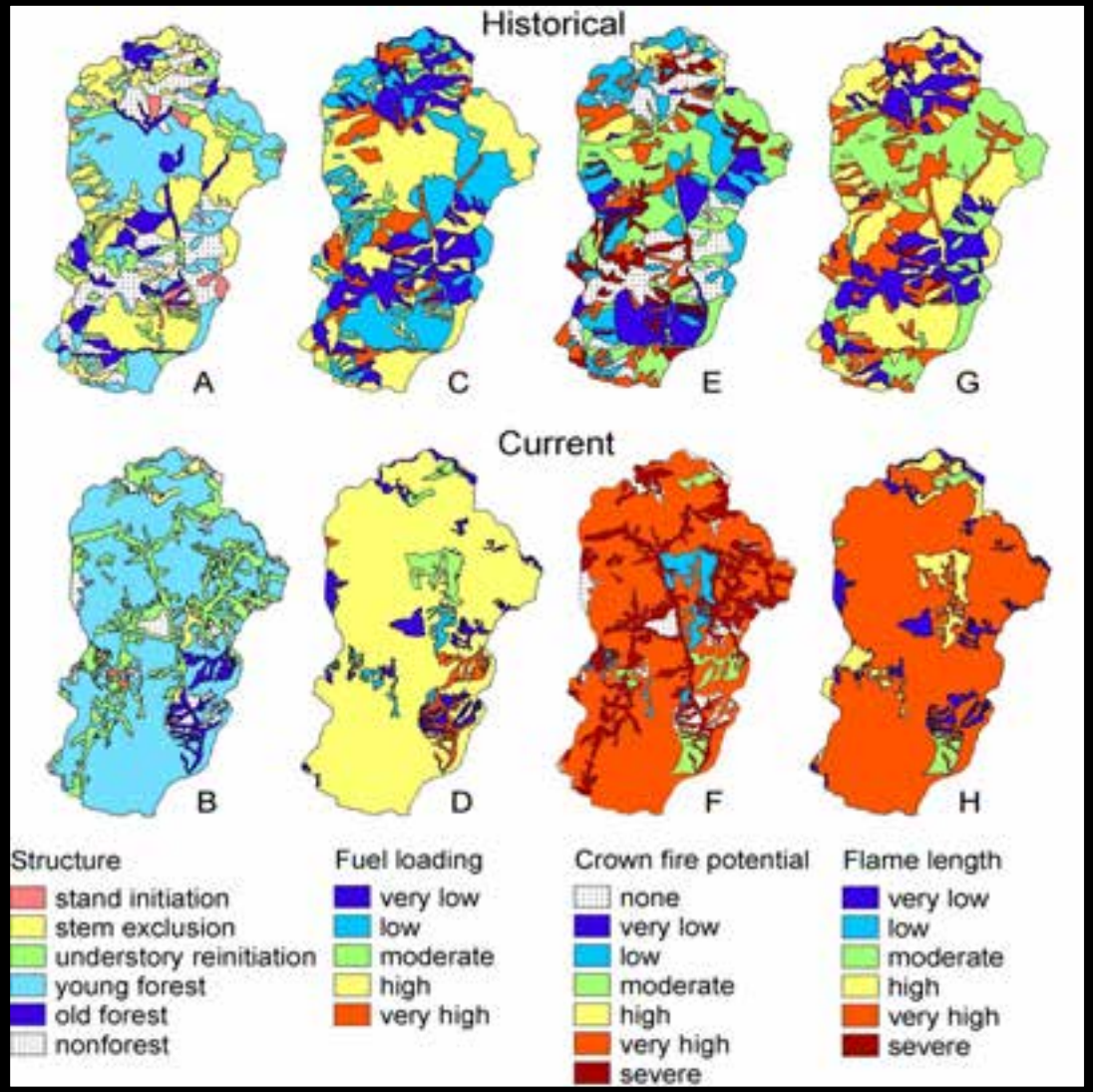

Variable fire severity replaced by severe fire w/ good connectivity

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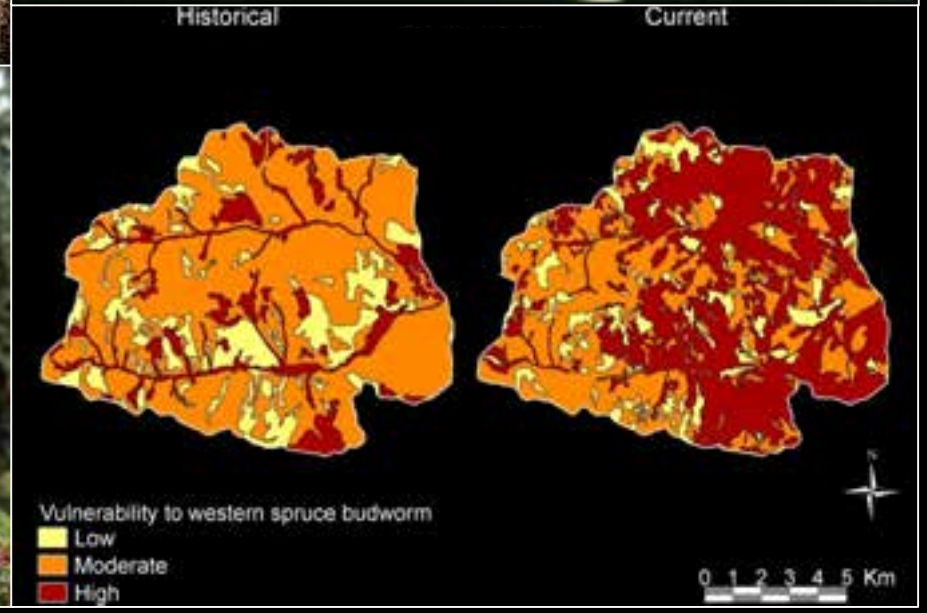
Western spruce budworm



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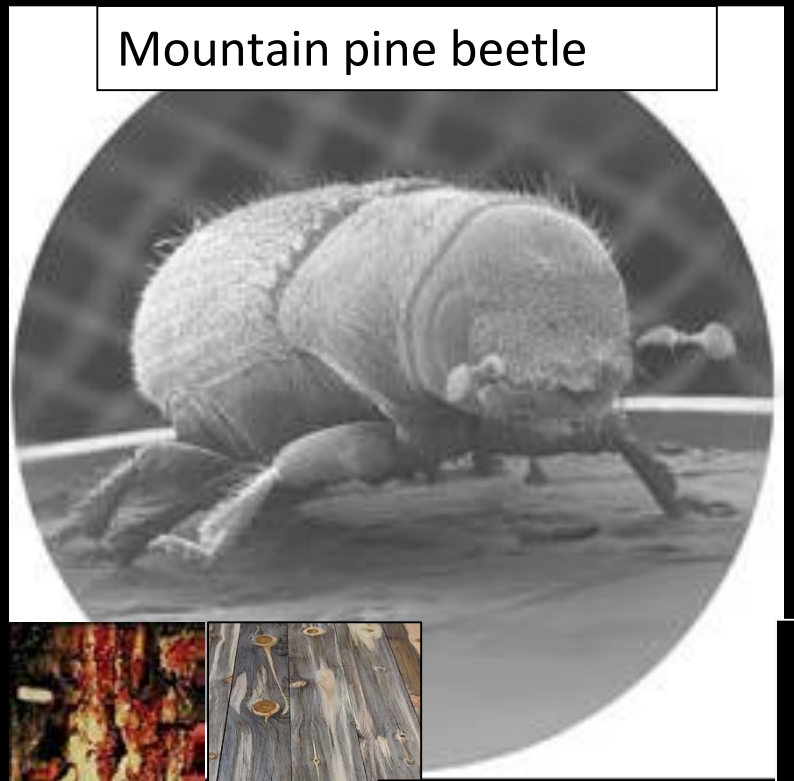

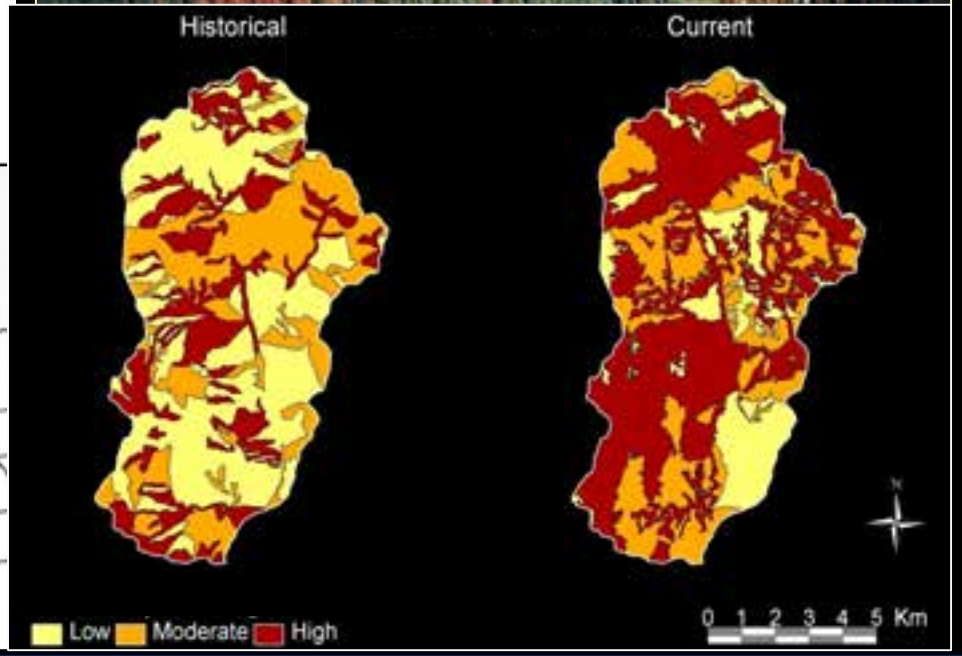

SUMMARY

- Our forests need to/will burn. We can influence how often, severe, less so how large. Climate mostly drives that
- Our climate & weather becoming more extreme; upward trend in 21st century
- Today's wildfires burn more severely & larger than most historical fires
- If the goal of management is to adapt landscapes to the coming climatic changes, adaptation of existing forest structure & composition is needed:
- More open canopy forest, less forested area-more meadows
- Vary forest age-density-layering structure—match it to the topography
- Managed wildfire & Rx burning in backcountry, thinning-biomass utilization-Rx burning in managed forests, restore good fire, increase pace & scale
- Social problem-ecological explanation; up to us to chart a new path