Restoring Fire-Prone Inland Pacific Landscapes

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Restoring fire-prone Inland Pacific landscapes: seven core principles

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Road Map

- Historical fire regimes, forest succession, key linkages btw them
- Management alters fire regimes, structure, composition, patterns of forests
- This changes functioning at patch to regional landscape scales
- Warming climate, megafires: dense, layered forests—hot, dry, windy summers
- Key principles emerging from study of changes and their mgt implications
Low severity fire (LSF): <20% of the dominant tree cover killed by fire
- LSFs were common in the driest PP and MC forests, dry topo-edaphic sites
- Frequent fires occurred every 5-25 yrs, continuously reducing fuels
- Frequency reinforced LSFs, extreme climatic conditions drove more extreme fires

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High severity fire (HSF): > 70% of the tree cover killed by fire

HSFs common in wet & cold forests where fires were infrequent (every 150-300 yr)

Most fires were HSF, but mild climatic conditions favored milder fires

Created variation in fire severity and fire event patch sizes; i.e., a PSD
Mixed severity fire (MSF): 20-70% of the tree cover killed by fire
MSFs were common in dry & moist MC forests w/ PP, DF, GF, WL
Fires occurred w/ intermediate frequency, every 30-50+ yrs
Occasionally both milder & more severe fires occurred, climate driven
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Change in fire sizes

- Presuppression
- Suppression

Frequency

Hectares

$L_{10^1}$ $L_{10^2}$ $L_{10^3}$ $L_{10^4}$ $L_{10^5}$ $L_{10^6}$
Wildfire patterns provided a positive **landscape-level feedback** and a natural resilience mechanism...

Ongoing wildfires maintained patchworks of burned & recovering vegetation in a variety of fuel conditions, seral stages and patch sizes:

- Patchworks spatially interrupted conditions supporting large fires
- Influenced the frequency, size, & severity of future events
- Insect, disease, & weather disturbances added to this complexity
- Extreme weather events occasionally overrode these spatial controls
Important positive patch-scale feedbacks too:

Frequent LSFs & MSFs reinforced resilience by:

- Reducing surface and ladder fuels
- Increasing the height to live crowns
- Decreasing crown density
- Favoring early seral species
- Favoring medium and large sized, older trees
- Favoring patchy tree and surface fuel cover

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Time zero

How these patch-level feedbacks worked...

Bob Van Pelt drawings...

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Without fire suppression

+ 20 years
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+ 40 years
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+ 80 years
1) Locally—fires continually thinned forest patches, reducing density and fuels

2) Regionally—fires created variable patchworks of grass, shrub, early, mid, late seral conditions, these patterns spatially controlled future fire size & severity
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Slate Peak

George B. Clisby USFS September 2, 1934
From National Archives and Records Administration, Seattle, WA

16 miles NW of Mazama, WA
Slate Creek drainage

John F Marshall for USFS August 31, 2013

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Bethel Ridge 1936

Bethel Ridge 2012
Framing Landscape Restoration: Core Principle 1

Regional landscapes function as multi-level, cross-connected, patchwork hierarchies

Restore connectivity and processes across multi-level landscapes

Wu J., & Loucks, O. L. 1995. Quarterly Review of Biology, 439-466
Framing Landscape Restoration: **Core Principle 2**

Topography provides a natural template for vegetation & habitat patterns
Use topography and soils as a successional & environmental template for fitting more characteristic successional patterns to the landscape

Perry et al. (2011) For Ecol & Mgt 262:703
Fire and forest succession are the **engine** that drives the system. Restore the fire regime and supportive successional patterns, and the other disturbance regimes will follow.
Predictable patch size distributions historically emerged from linked climate-disturbance-topography-vegetation interactions. Restore size distributions of successional patches & allow changing climate & disturbance regimes to adapt them.

Framing Landscape Restoration: **Core Principle 4**

Framing Landscape Restoration: Core Principle 5

Widely distributed medium and large-sized, old trees provide a critical backbone to dry pine and dry + moist mixed conifer landscapes. Retain and expand on existing relict trees, old forests, and post-disturbance large snags and down logs in these types.

Lutz et al. (2009) For Ecol Manage 257: 2296-2307
Successional patches are “landscapes within landscapes”
In PP & MC patches, restore characteristic tree clump & gap variation

Lydersen et al. (2013) For Ecol Manage 304: 370-38
Land ownership, allocation, management and access patterns disrupt landscape and ecosystem patterns

Work collaboratively across ownerships to develop restoration projects

Rieman et al. (2015) Fisheries, 40:124-135
Summary

• We live in landscapes that were continuously shaped by fire.
• Our nearby forests and rangelands need to and will burn. We can influence how often, how severe, how large.
• Historical fire suppression & exclusion have created high fuel loads, a fire deficit in forests, and high contagion of crownfire behavior.
• Consequently, today’s wildfires burn hotter and larger than most historical fires.
• Our climate and weather are changing, becoming more extreme.
• Extreme weather is increasing fire size & severity in most interior forest types.
• Restoration of forest successional & fuel patterns is needed if your mgt goal is to recalibrate fire, insect, and pathogen disturbance regimes.
• The resulting patterns of successional and fuel conditions are vitally important to processes and species.
• These principles can guide your work.

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