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# Managing for Dynamic Landscapes in an Era of Rapid Climate Change



Paul Hessburg, Senior Research Ecologist, [paul.hessburg@usda.gov](mailto:paul.hessburg@usda.gov)



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## **Context.** Before the era of fire suppression

- ▶ Lightning + Indigenous burning maintained large areas of wNA in hardwood & open conifer forest, meadows, woodlands
- ▶ This went on for 10,000 yrs. (Lake and Christiansen 2020)
- ▶ Closed canopy forests minimized food & resource production.
- ▶ Understories were the focus of burning (Roos et al. 2022, Swetnam et al. 2016, Eisenberg et al. 2024)
- ▶ Absent these fires, forests have grown dense & many nonforest areas are now forested (Hagmann et al. 2021)
- ▶ Indigenous & lightning fires also burned extensively in moist and cold forests (Hessburg et al. 2019)
- ▶ Often, 35-50% of a large landscape was in open forest or nonforest on forest capable sites (Hessburg et al. 2016, 2019)
- ▶ With fire exclusion, now a large fire deficit
- ▶ Because of these fires, many forests were woody fuel limited, many large, low-mod intensity, short duration, low smoke fires



Credit: Frederick Remington (public domain)



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Dry mixed conifer forests  
Frequent fires  
(2-15 yrs)





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**Produced an important local stabilizing effect**

High frequency, low-mod severity fires increased the likelihood of the same in future fires

(Povak et al. 2023, Prichard et al. 2017)



Bob Van Pelt drawing



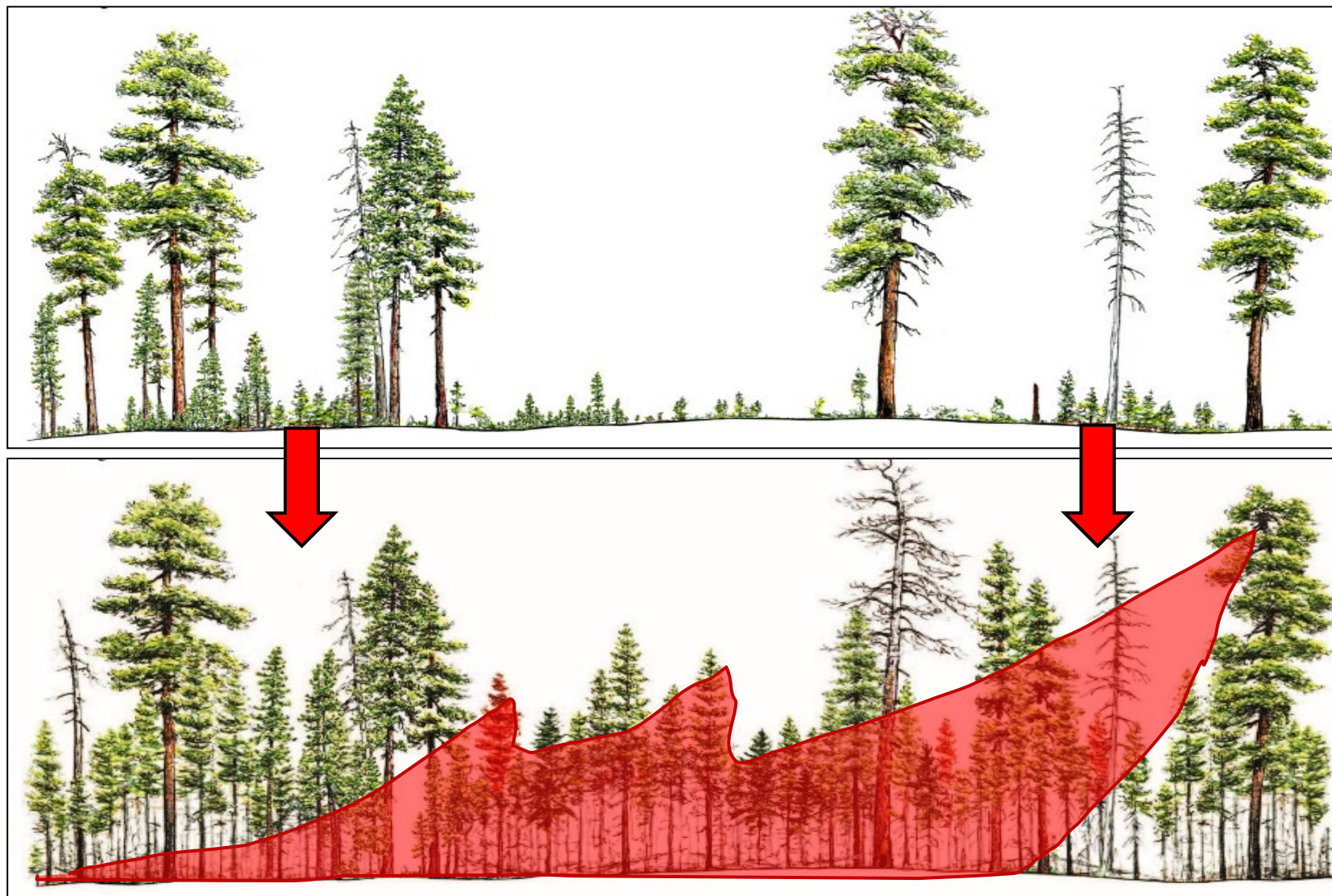
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## Lacking frequent fires

Trees accumulate

Flames then “climb” the layered subcanopy

Results in crown fires



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Moderate frequency fire  
(20-50 yrs)  
Moist forests





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Fuel provides the energy for burn severity

Infrequent fire  
(30-150 yrs)  
Cold forests



High connectivity of dense forest provides the means for large & severe fires



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## Take home: Forest reburning created large landscape stabilizing effects

- Fires overlapped over space and time, the 1<sup>st</sup> fire killed trees, the 2<sup>nd</sup> reduced dead wood from the 1<sup>st</sup> fire.
  - Reburns decoupled surface from canopy fuels over large areas, enabled the landscape to stock more forest.
  - Made them more difficult to burn, crownfires require the energy from burning surface fuels to involve the canopy.
- Forest reburning created dynamically shifting mosaics of non-forest & forest conditions, which stabilized landscapes.
- This shifting patchwork governed likelihood of burning and burn severity patterns, dynamics vs statics.
- Resilient landscapes are much less forested than we think, current forest cover & C references inflated by 20-40%.







## Nonforest conditions & resilient landscapes


- ✓ **Much nonforest historically, 25-75% of area**
  - Nonforests: sparsely treed woodlands, meadows, shrublands, wetlands, burned bare ground, early seral conditions, prairies
  - Amount of area depends on the forest type, geography
  - Derives from reburning, fire on fire interactions
  - Hardwood patches also abundant, slowing fire spread
- ✓ **These features limited future fire size & severity**
  - Tug-o-war btw factors growing/burning forests
  - Nonforests & hardwood forest were the emergent property & they governed fire spread & severity
- ✓ **With CC, more nonforest, hardwoods, open forest**
- ✓ **We can aid these transitions w/ management**



Andrew Larson photo



## Solutions for managing dynamics

- ✓ **Current wNA forest biomass is unsustainable**
  - Re-establish successional mosaics, topography as template
- ✓ **Stabilize tug-of war btw factors growing / removing forests**
  - More meadows, woodlands, hardwoods, wetlands
  - CWD mapping can show us where to place them
- ✓ **Restore the positive ecological role of fire**
  - Incorporate Indigenous knowledge & practices
  - Tools are cultural & Rx burning, managed wildfires, thinning + Rx burning
  - Biomass removal can fuel a growing bioeconomy
- ✓ **Largest opportunity for gain is after wildfires.**
  - $\frac{1}{4}$  to  $\frac{1}{2}$  of the burned forest is a pretty good or better 1<sup>st</sup> entry fire, keep fire going with Rx & cultural burning
- ✓ **2<sup>nd</sup> largest opportunity, managed wildfires away from WUI**
  - Proactive PODs, PCL, burn planning, work natural ignitions
- ✓ **With CC, nonforests & open canopy forests increasingly relevant to stabilizing landscapes** 
  - Create these conditions, better than wildfire transitions



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OR Bootleg Fire of 2021, 414,000 ac, 3<sup>rd</sup> largest since 1900.

Fire rapidly transitions from crownfire in untreated forest...

... to surface fire in thinned & burned forest



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The thinned only treatment does not protect the forest



**Thank you!**

*paul.hessburg@usda.gov*  
*pfhess@uw.edu*