Too hot, too cold, or just right:

Can wildfire restore mixed-conifer forests?

Skye Greenler

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Oregon State University
College of Forestry

Catastrophic, disastrous, restorative, natural, necessary

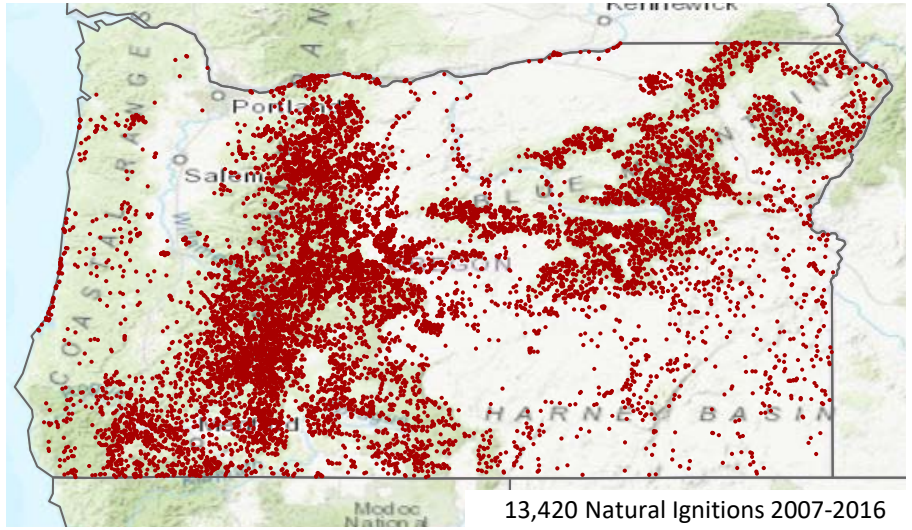







Fire prone landscapes need fire to function properly

Lightning and dry fuels = Fire and fire adaptive traits



13,420 Natural Ignitions 2007-2016

Fire influenced landscape at all scales

Scale	Surface	Understory	Stand	Landscape
				
Process	- Fuel bed depth - Nutrient cycling - Seedbed conditions	- Shrub continuity - Ladder fuels - Height to base crown	- Tree density - Species composition - Large trees	- Varied landscape - Natural ‘fire breaks’ - Connectivity
Suppression Effects	- ↑ Surface fuels - Altered germination conditions	- ↑ Understory fuel amount - ↑ Fuel connectivity	- ↑ Stand density - Promoted less fire tolerant species	- ↑ Connectivity - ↓ Heterogeneity

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Cannot just love forests back to historical conditions

- Forests developed with thousands of years of natural and indigenous fire
- Cannot easily undo 100+ years of fire suppression
- Management options
  - Mechanical
    - Precise
    - Expensive, sometimes unpopular
  - Fire
    - Natural, sometimes more popular
    - Inexpensive
    - Less control over results

Fire produces varied and uncertain results

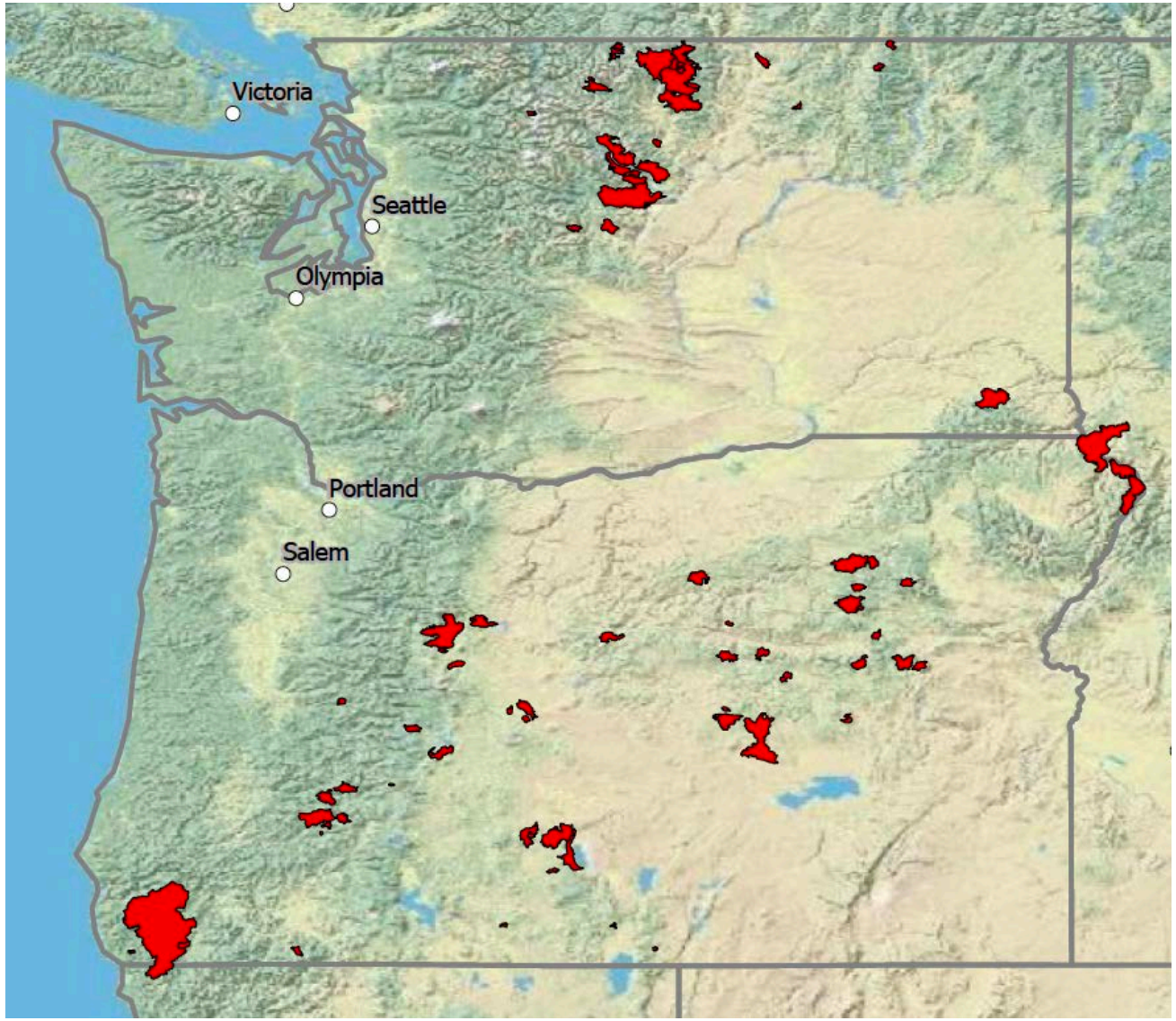
Too hot

- Beyond restorative to resetting
- Driven by
  - High surface fuel loads
  - Dense understory fuel
  - High tree density
  - Weather conditions

Too cold

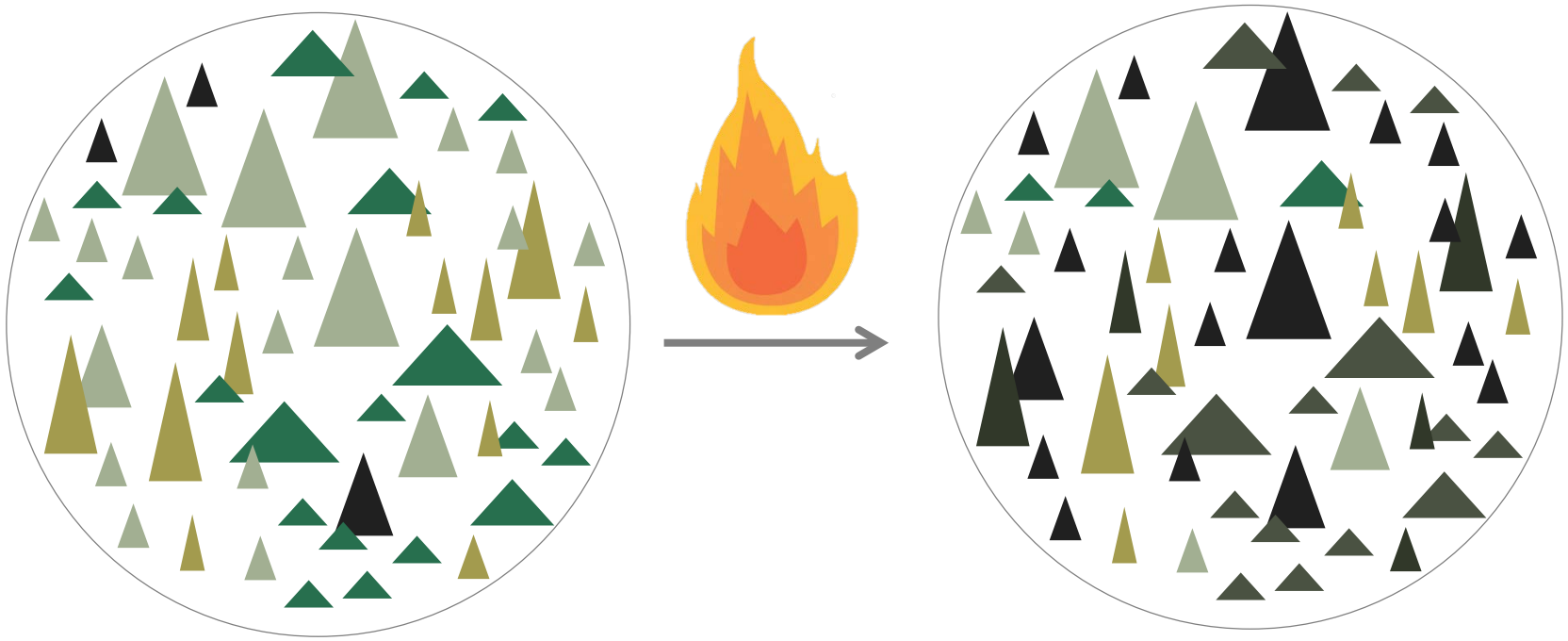
- Fire only consumes surface fuels
- Both wild and prescribed fires
- Driven by
  - Fuels, topography
  - Manager comfort with risk
  - Weather conditions

Influence of burn severity and tree size on mortality



304 CVS (FIA) plots
74 fires
22,419 trees

Influence of burn severity and tree size on mortality



Survey 1: 1992-1997

Survey 2: 1997-2007

Know:

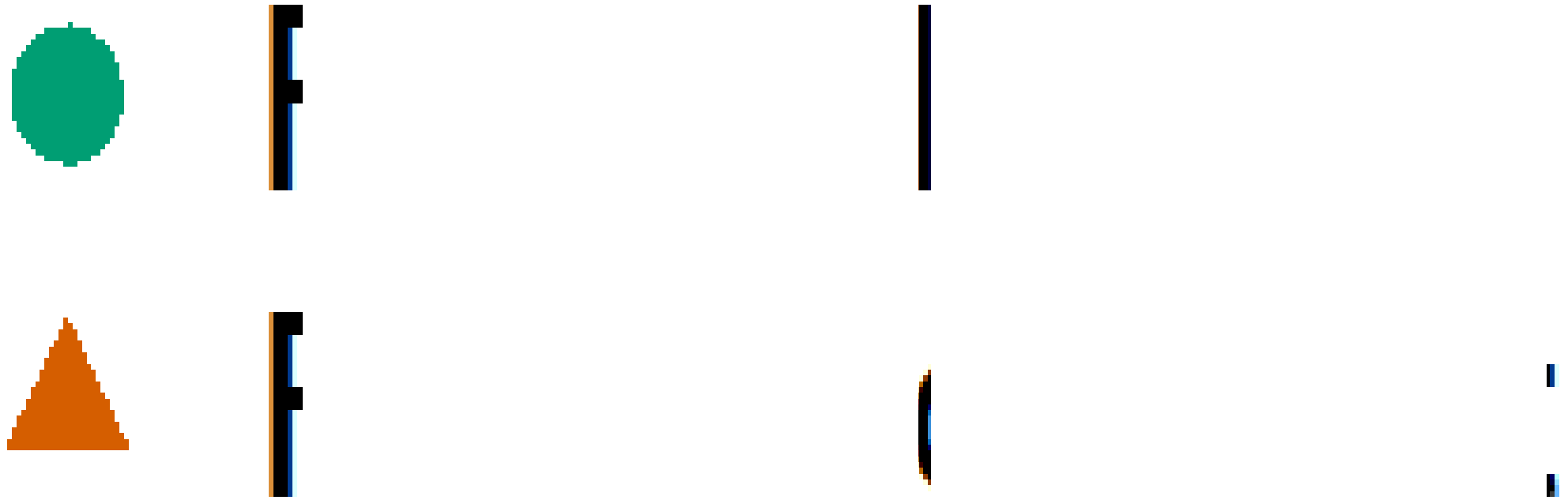
Species
Size
Alive or dead
Alive or dead after fire
Years measured post-fire
Fire severity

Probability

or

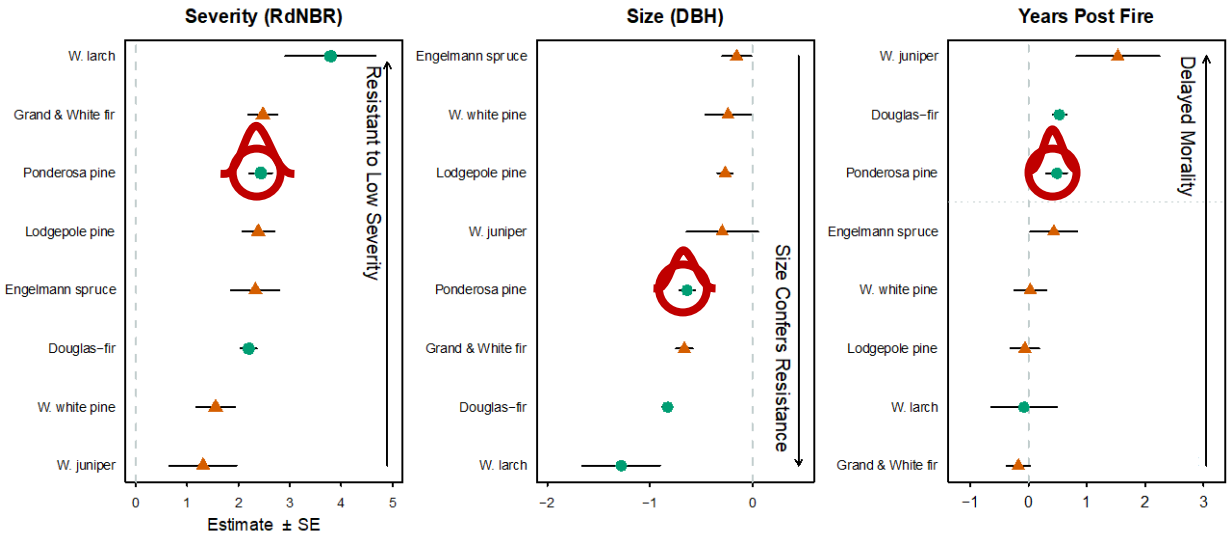
= *tree size + burn severity + years post-fire*

Influence of burn severity and tree size on mortality



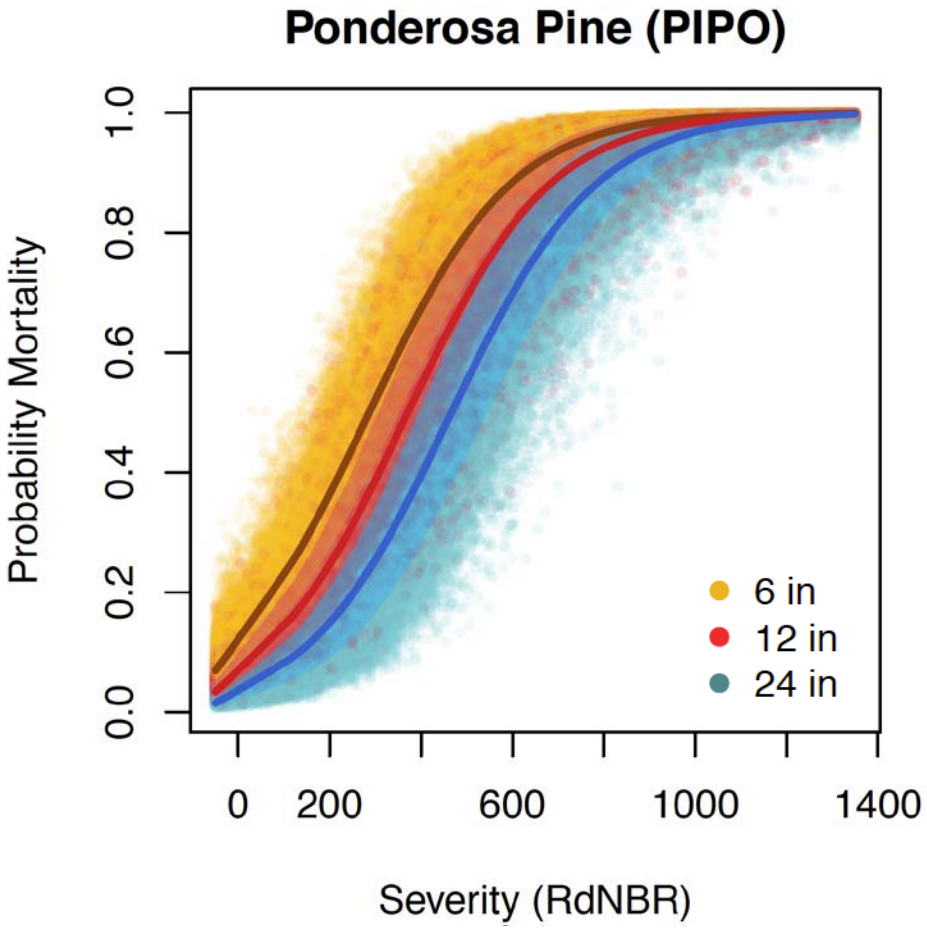
- Fire Tolerant
- Fire Intolerant

Influence of burn severity and tree size on mortality

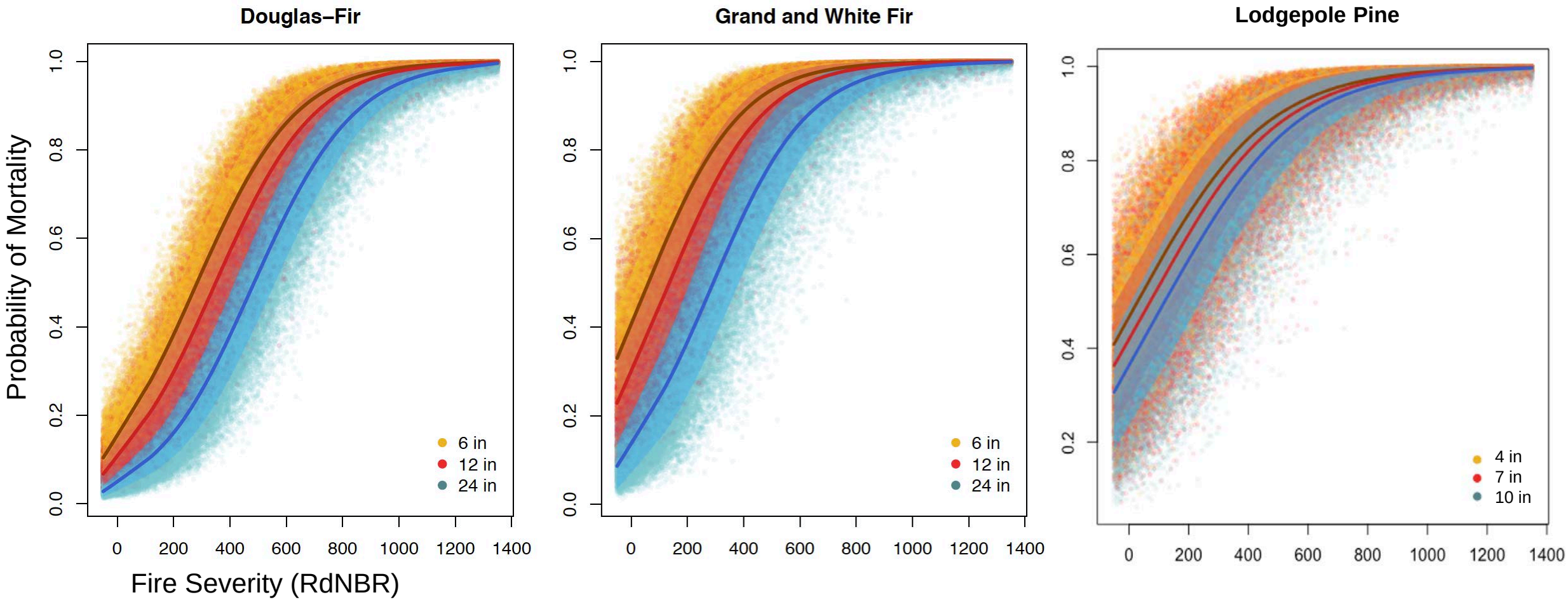


12 inch Ponderosa

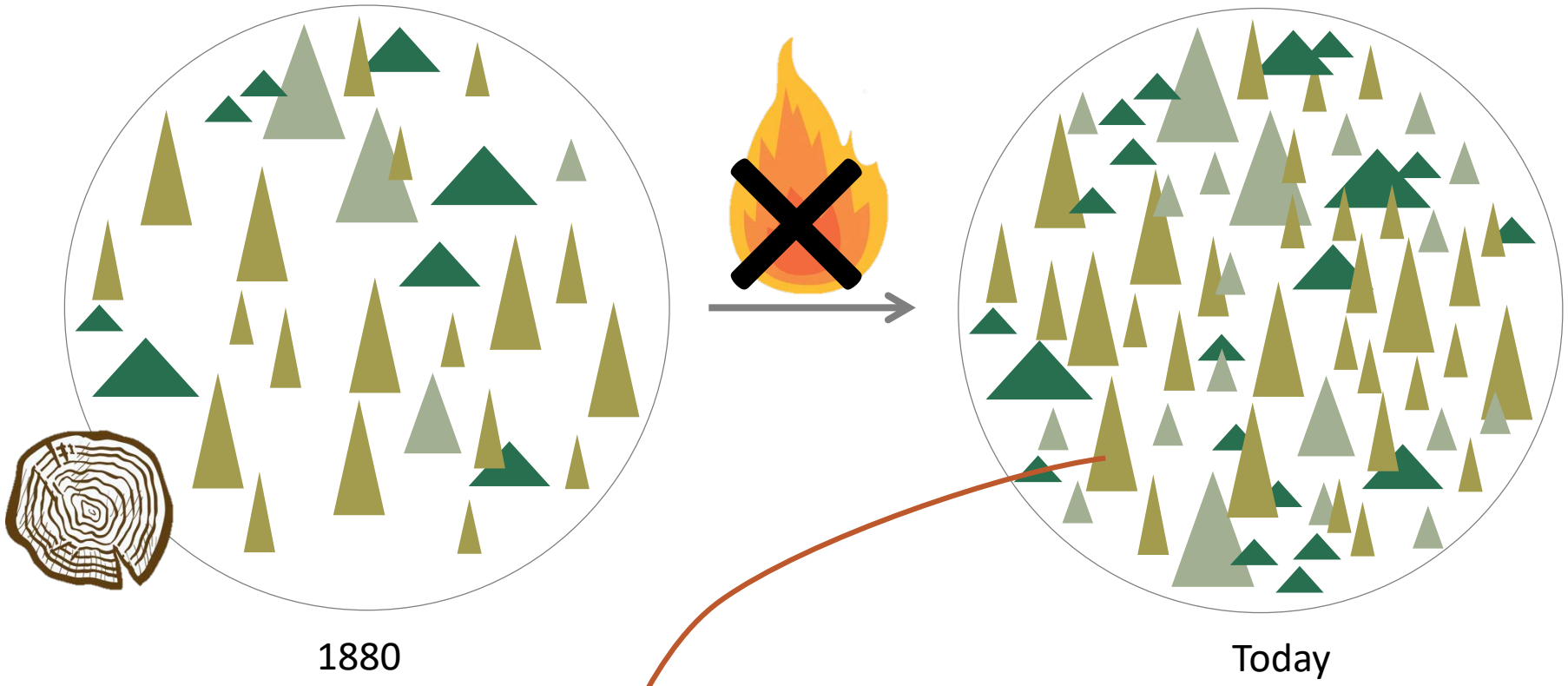
Fire Severity 200 (RdNBR)



Influence of burn severity and tree size on mortality



Restorative burn severity



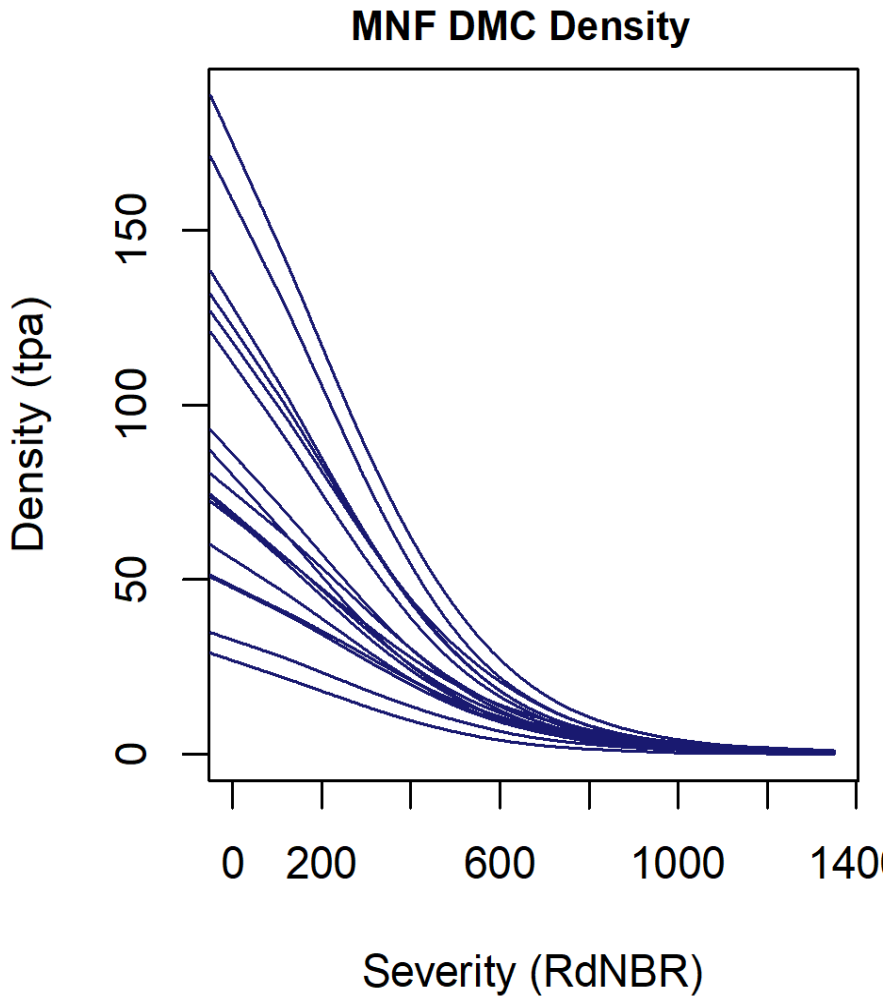
Probability

or

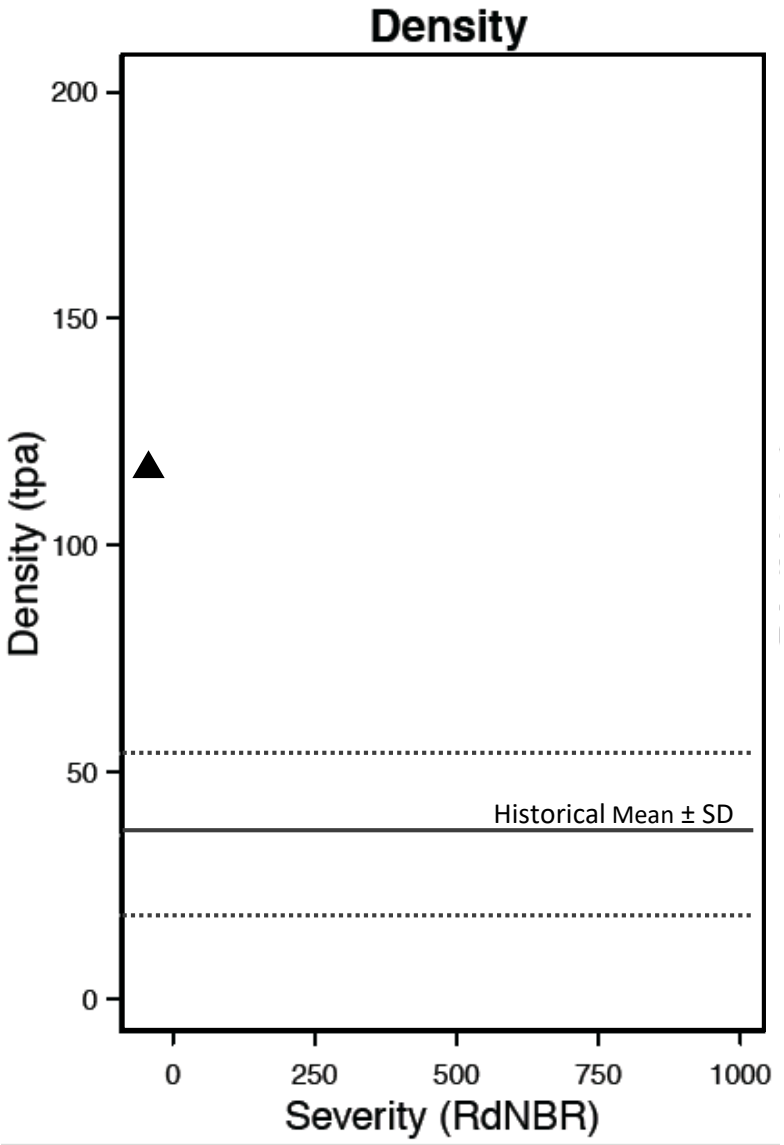
= *tree size + burn severity + years post-fire*

Restorative burn severity

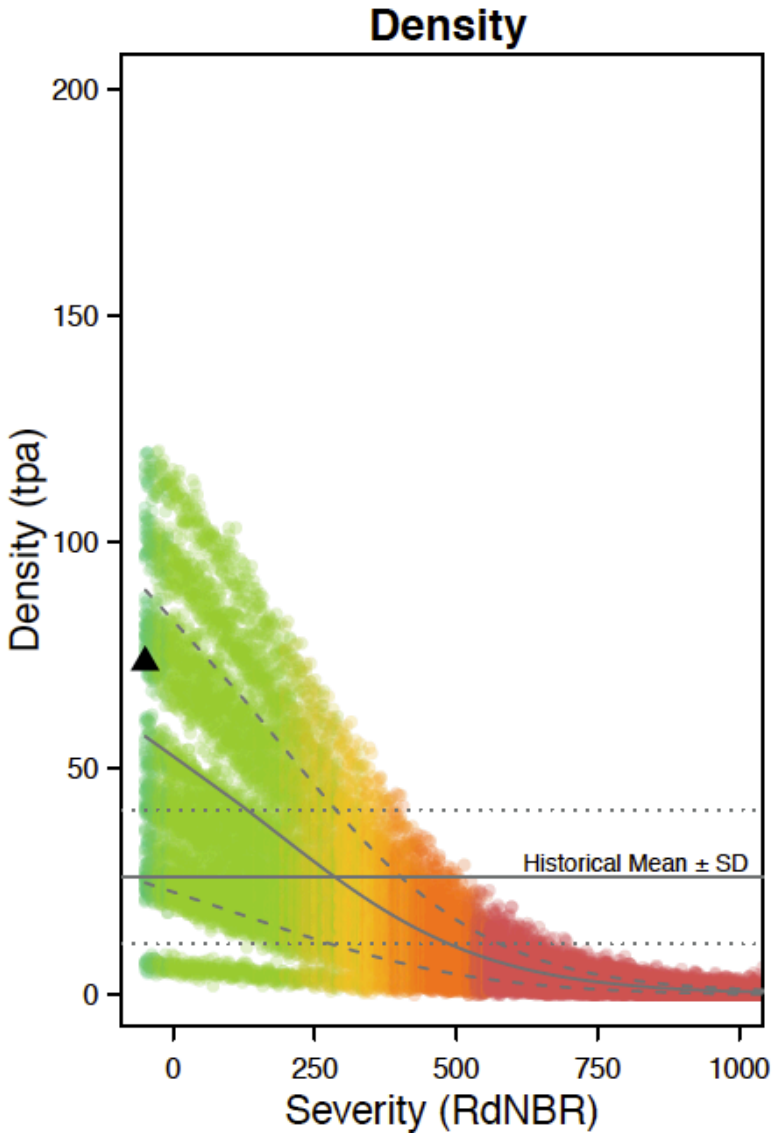
- 25 current stands on the Malheur within inventoried roadless areas
  - Ponderosa pine and dry mixed conifer biophysical groups
- At every fire severity value for each stand
  - Calculate mortality probability for each tree (>6 in.)
  - Calculate basal area and density
- Repeat 5 times for each stand
  - Drawing from range of possibilities not mean
- Compare to known historical conditions



Restorative burn severity: Dry mixed conifer



Restorative burn severity: Ponderosa pine

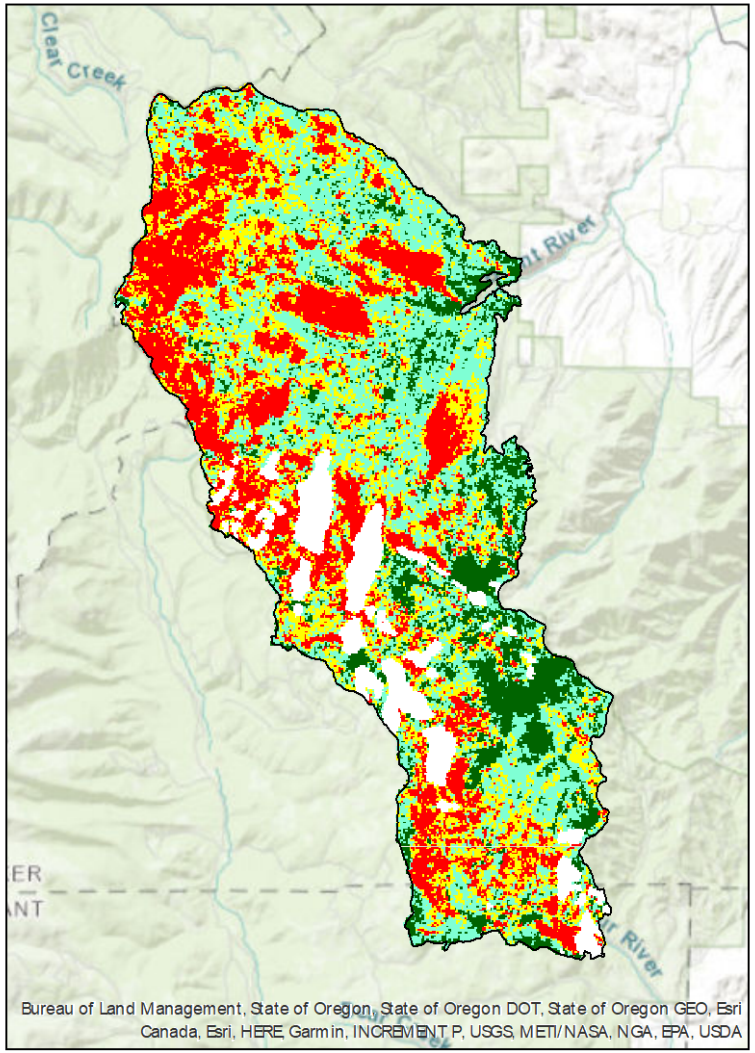


Looking forward

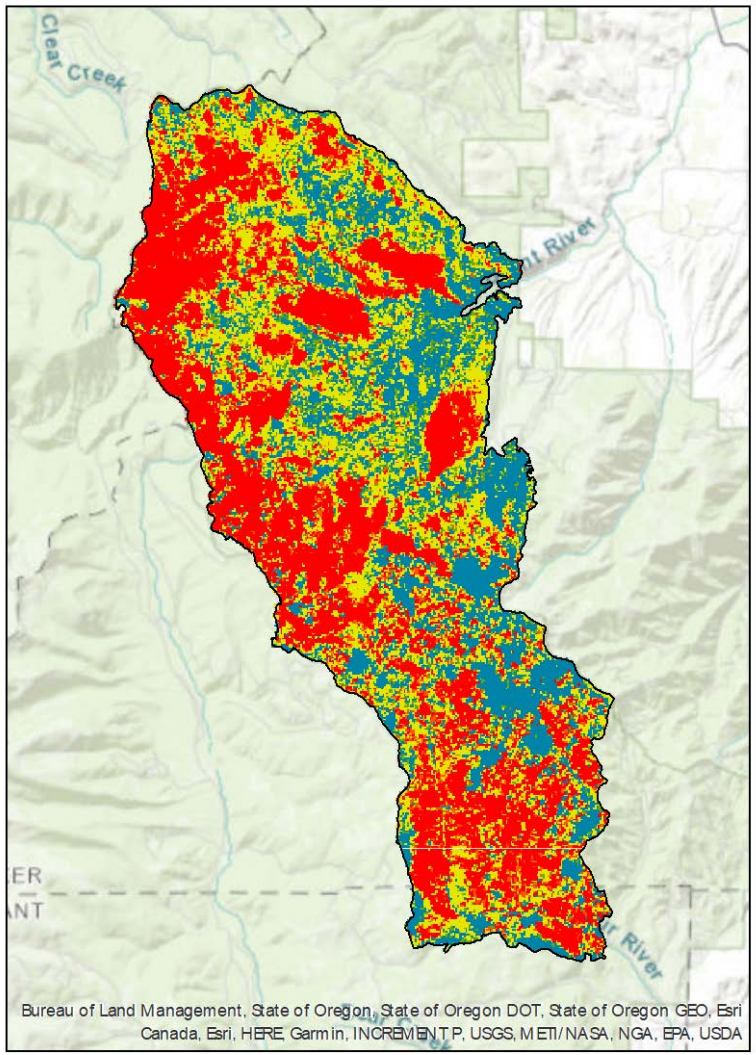
- Expand across National Forests in eastern Oregon
- Incorporate more intensively managed stands
- Assess how/when prescribed fires are falling within restorative windows
- Web app for managers to model specific stands
- Create wildfire burn severity maps based on where fires were likely restorative

Restoration maps: Rail Fire

MTBS Burn Severity Classes



Restoration Potential Classes

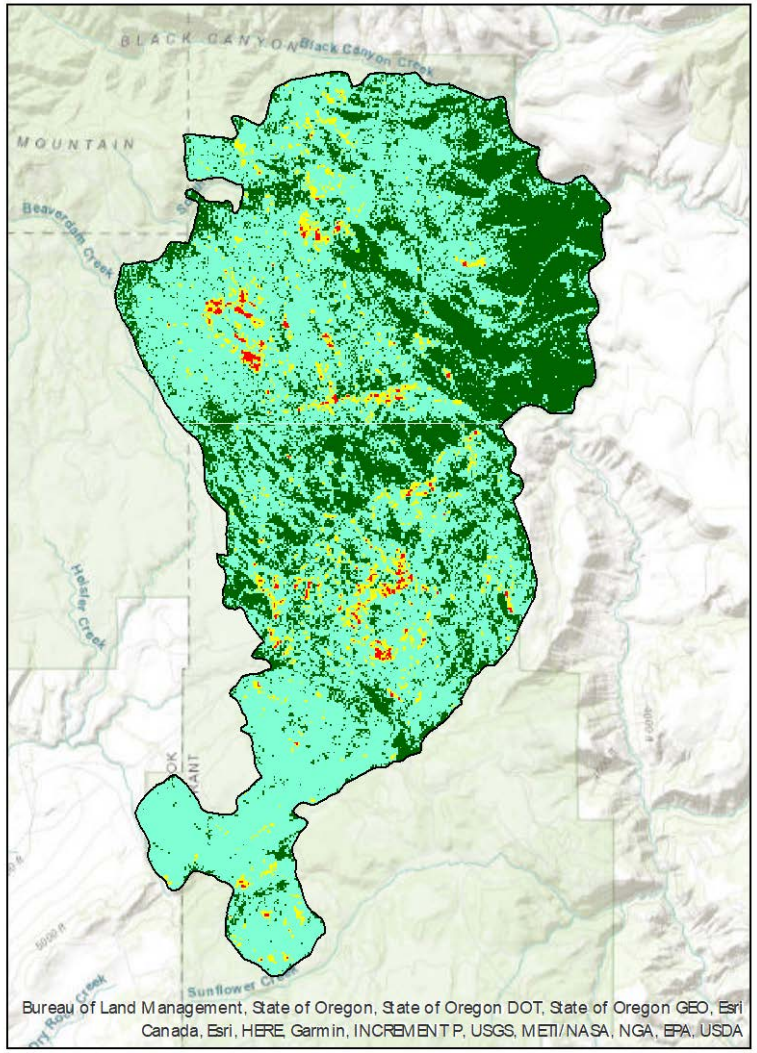


Probability restorative fire

Blue = <0.5
Green = 0.5-0.75
Yellow = >0.75
Orange = 0.5-0.75
Red = <0.5

Restoration maps: Corner Creek Fire

MTBS Burn Severity Classes



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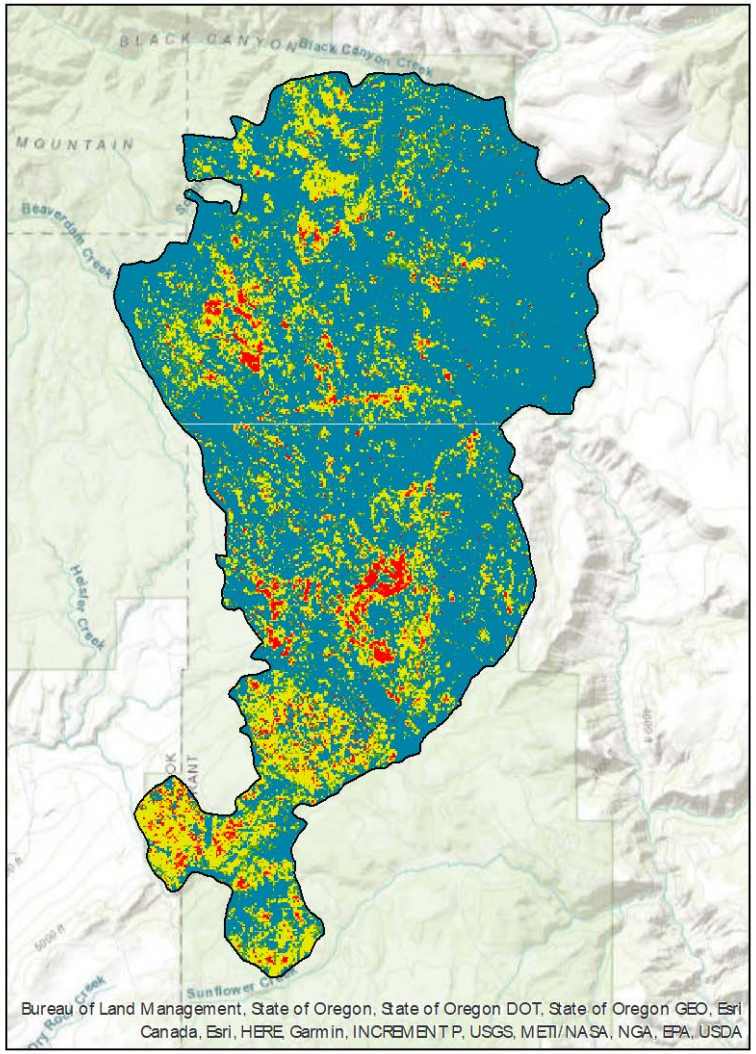

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Final thoughts

Wildfires will continue and some will produce undesirable effects

Begin to understand where and when fire was restorative, optimize our pre- and post-fire management to capitalize on fire as a restoration tool

Acknowledge in most places fire alone will not restore both historical density and composition

- 100+ years of fire suppression cannot be easily ‘undone’
- Trade-offs
- Further mechanical treatments or repeated burning

Thanks!

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