

# POST-FIRE REFORESTATION CONSIDERATIONS FOR SIERRA MIXED CONIFER FORESTS ON FEDERAL LANDS



Photo credit: L. Smith

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# Restoration & Reforestation Challenges

- Increasing proportions in stand-replacing (high severity) fire in the Sierra Nevada Mixed Conifer (Miller & Safford 2012)
- Increasing patch size of stand-replacing fire (Miller et al 2009)
- Notable lack of natural regeneration, particularly of pine species, in large high severity fire patches (Collins and Roller 2013)
- Inherent susceptibility of early seral stages to high severity fire (Thompson, Spies, & Ganio 2007)
- Climate changes trends suggest:
  - ▣ Potential increases in active fire regimes
  - ▣ Decreased suitability of natural regeneration

# Themes I intend to touch on:

- Reforestation for Restoration
- The post-fire restoration portfolio – Managing for Risk and Return
- Reforestation Strategy - One size does not fit all
  - Spatial, proportional, and temporal variability
  - Heterogeneity and uniqueness of place
- Post-fire landscapes are dynamic
  - The Natural Regeneration Gamble
  - The safety card
  - Fuels Dynamics and Site prep – an extended warranty worth the purchase
  - Planting windows are like burn windows – timing is imperative
- How can we promote heterogeneity?
- Managing investment performance – and competing vegetation
  - Is time on our side?
- The Devil in the details

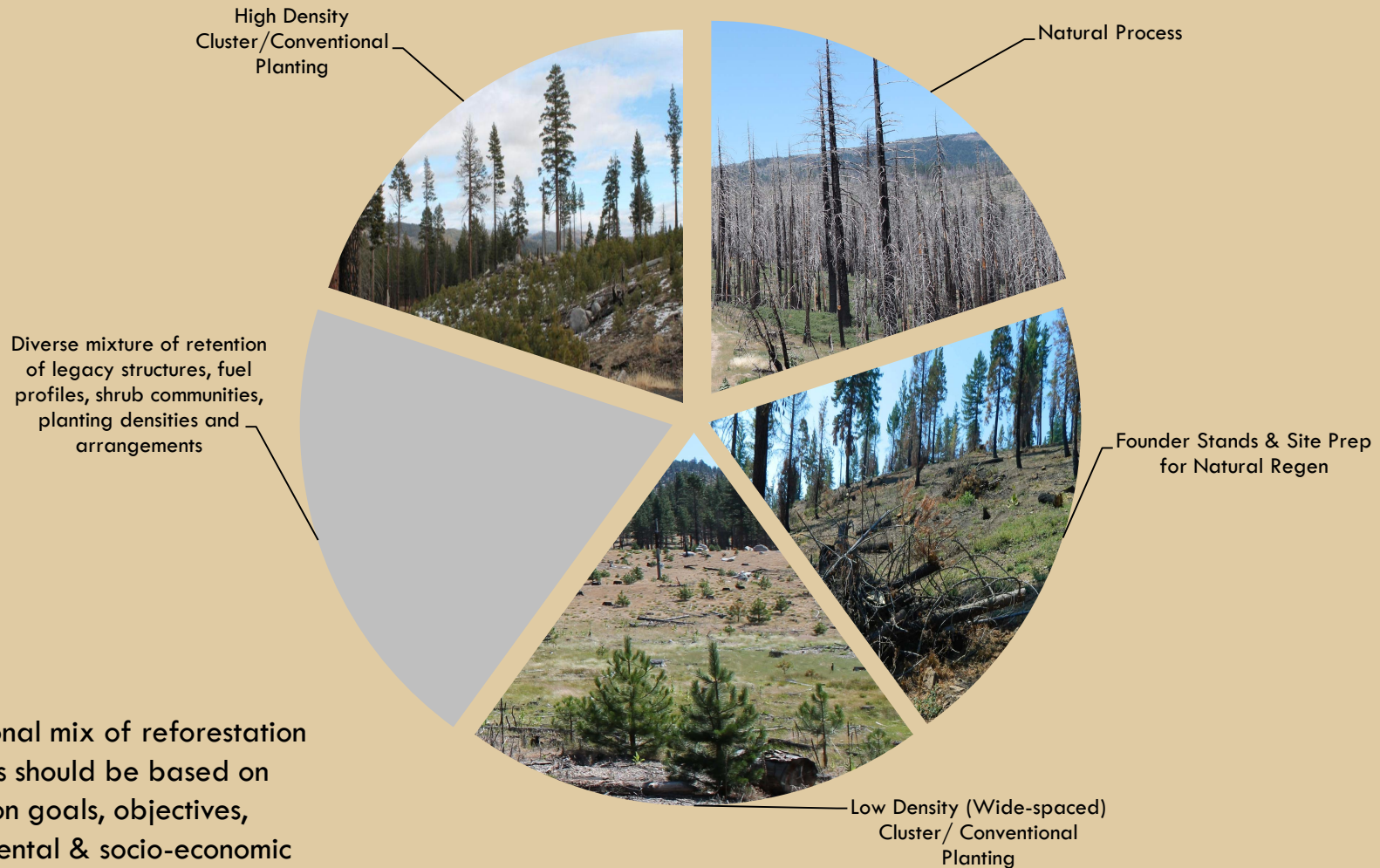
# Reforestation for Restoration: Given recent trends of uncharacteristically large areas of high severity, how do we transform post-fire environments into the desired future conditions?



Decisions of what to treat, what not to treat, and how to treat should be rooted in:

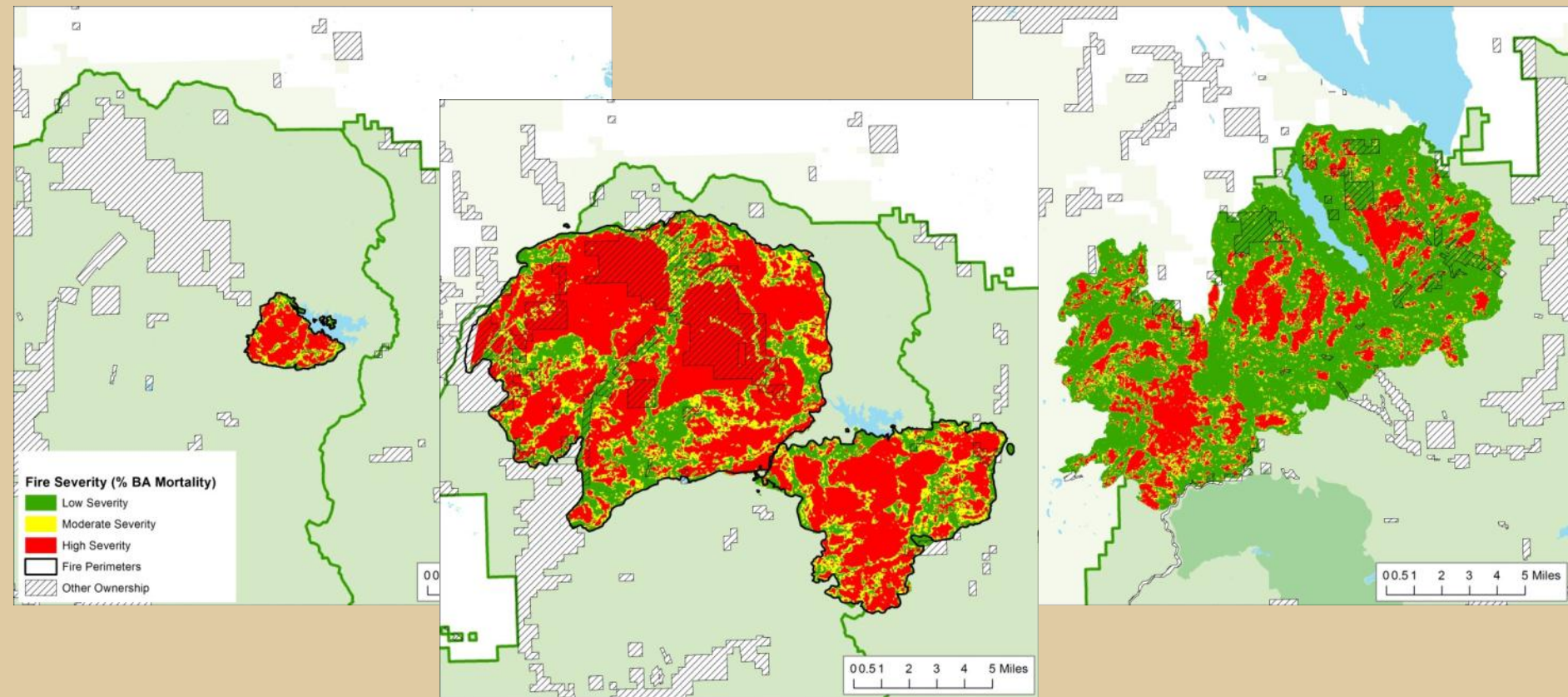
- Clear and measureable site specific goals and objectives!
- Acknowledgement of stand trajectories and potential for future disturbance
- Balanced by scale, timing, and organizational capacity.

# Post-fire Restoration Portfolio: Managing for Diverse Interests, Risks and Returns



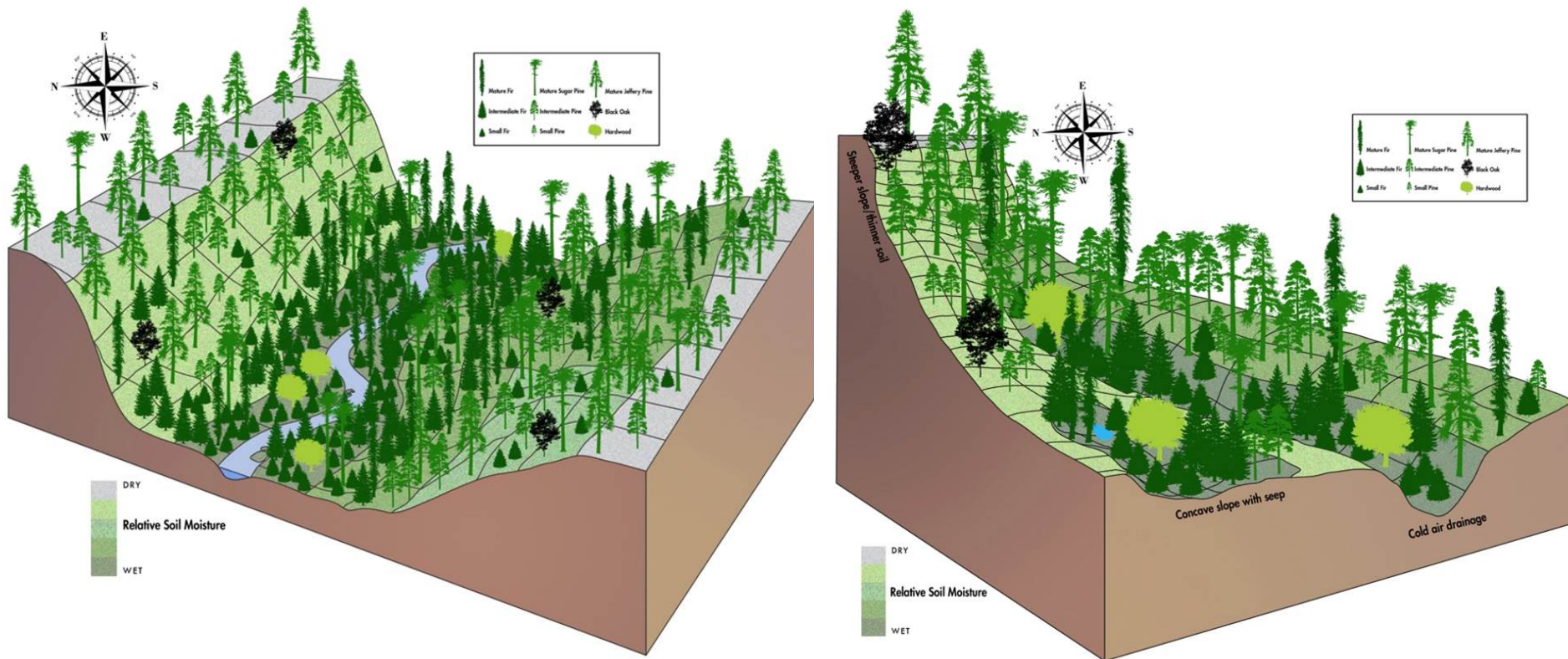
Proportional mix of reforestation strategies should be based on restoration goals, objectives, environmental & socio-economic attributes

# One size does not fit all: Spatial, proportional, and temporal variability



# One size does not fit all:

Heterogeneity driven by topography & site specificity



From North, Stine, O'Hara, Zielinski, & Stephens. 2009. An ecosystem management strategy for Sierran mixed-conifer forests. Gen. Tech. Rep. PSW-GTR-220

# Post-fire landscapes are dynamic:

## Natural Regeneration in the 2000 Storrie Fire



As seen in 2011



# Post-fire landscapes are dynamic: 2012 Chips Fire Re-burn of 2000 Storrie Fire



As seen in 2012

# Post-fire landscapes are dynamic: What grows up eventually comes down - SAFETY

Photo credits: Plumas NF staff



Safety considerations and plans need to be as dynamic as these post-fire environments are and need to consider long term trajectories.

# Post-fire landscapes are dynamic: Need for restoring fuel loads and managing for long term tree survival and safety



Photo credit: Bobette Jones

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# Site Preparation: A tool in restoring long term fuel profiles and enhancing resistance to re-burn



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# Post-fire landscapes are dynamic: Planting windows are like burn windows – Timing is Imperative



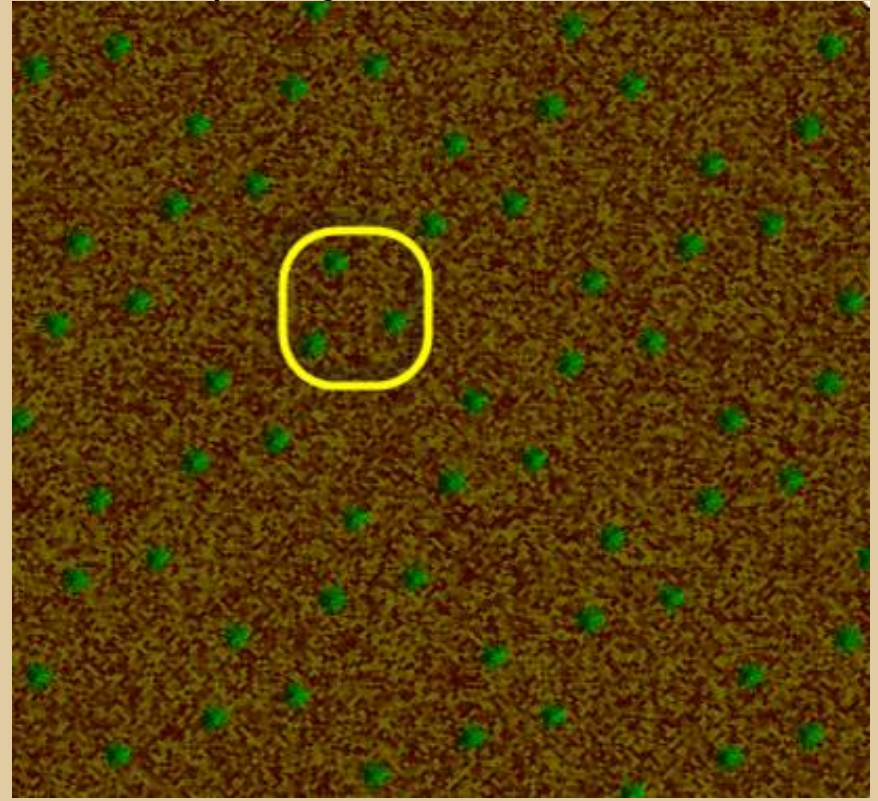
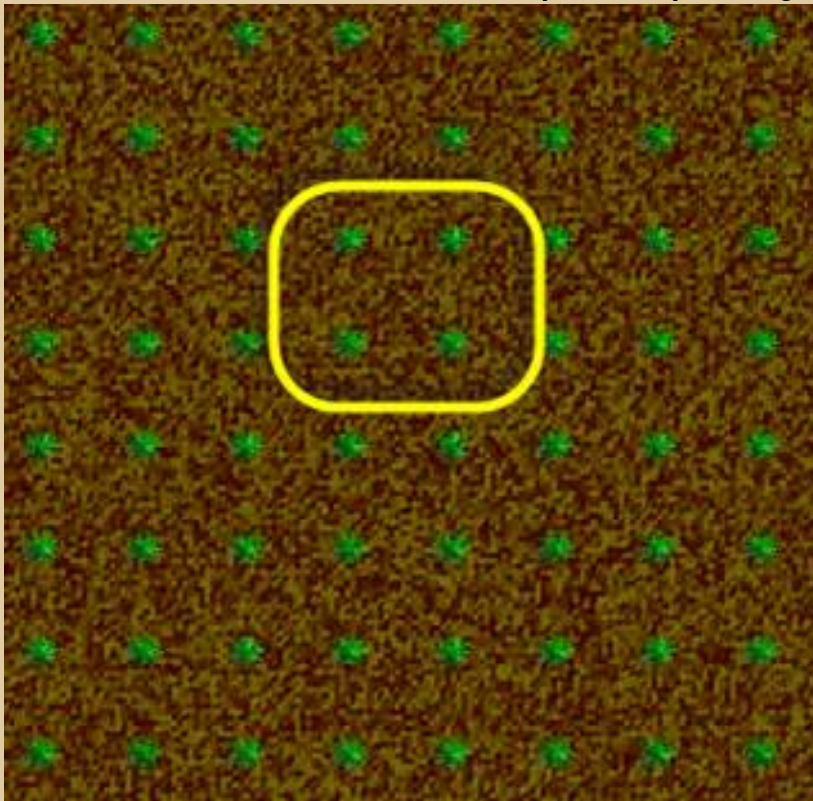


# How can we promote heterogeneity?

What kind of tree “neighborhood” do we want to promote?

What are kind of neighborhood are we trying to achieve, through what kind of trajectories and manipulations, and how soon?

Square-spacing vs. Clustered Spacing



Diagrams Courtesy of Joe Sherlock, R5 Silviculturist

# Examples:

2001 Stream Fire Plantation – Square 10x10 foot spacing.



# Examples:

2006 Boulder Fire Cluster Planting - Clump creation with legacy structure retention at variable scales.



Photo credit: Bobette Jones

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2006 Boulder Fire Cluster Planting - Clump creation with legacy structure retention at variable scales.



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# Need to manage for long term performance of the investment: Competition, the early years.... for Soil Moisture



# Managing investment performance: Means managing competing vegetation

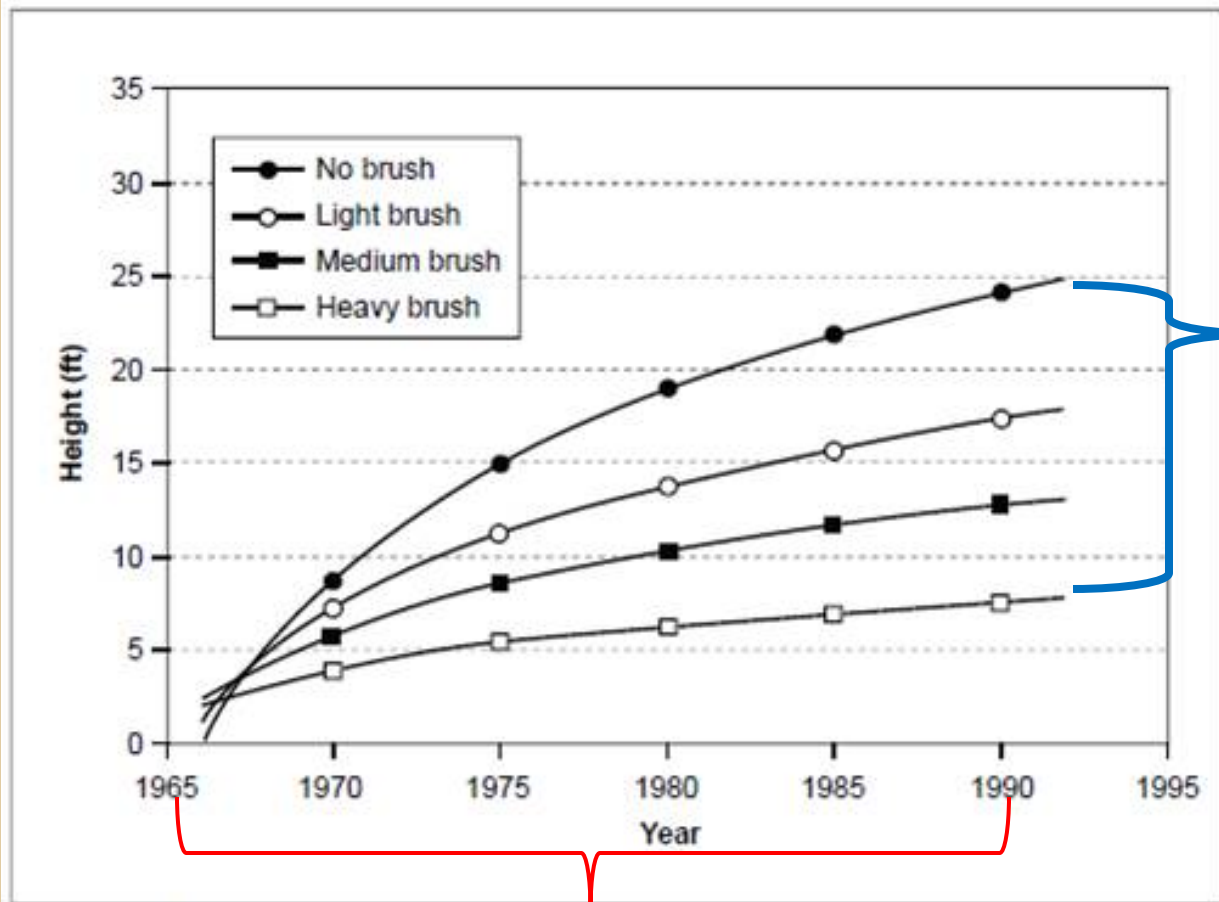




# Managing investment performance: Means managing competing vegetation



# Need to manage for long term performance of the investment : “Ti-i-i-i-me, is on my side” or is it?



> 15 ft height difference over 25 years



Figure 9—Relationship of ponderosa pine height and brushfields, 1966–1992.

**What's the probability the site may re-burn in 25 years?**

# Need to manage for long term performance of investment:

Trees will grow out of vulnerable seedling/sapling stages sooner if we manage competing vegetation.

3 year old versus 4 year old trees



40 year old versus the same (now 7 year old) trees

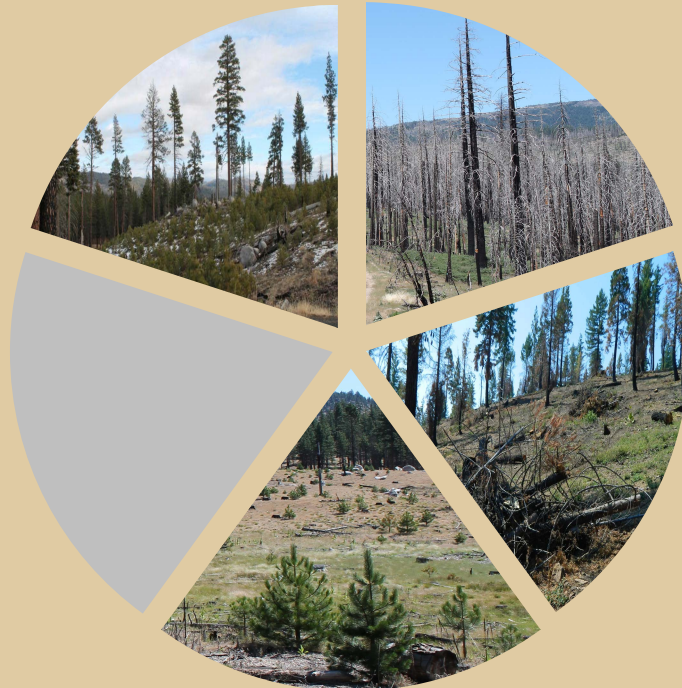
The sooner we can grow trees out of vulnerable stages, the sooner we can introduce processes like fire without adversely affecting the regeneration investment.

# Last Pitch: the devil in the details

- Post-fire environments are so dynamic in so many different ways
  - Natural Regen, future disturbance, fuel profile trajectories, competing vegetation
- Timing is everything
  - Post-disturbance “land rush” for growing space
  - Planting windows are like burn windows
  - Cost and need for more assertive treatments increase with time
- Need to manage scale appropriately with objectives, funding, and capacity
  - Balance scale with timing
  - Cost and need for more assertive treatments increase with time
  - Need to frontload adaptive management and build in implementation plan flexibility commensurate with post-fire dynamics
- Details, Details, Details – It is much more complex than many think
  - Ecological, Economic, Social, and Organizational factors

## Ending Thoughts:

The legacy we leave the next generation of resource managers should be diverse and balance interests, risks, and returns



Whether its pre-fire or post-fire management, a strategy that employs a diverse spectrum of tactics across the landscape appropriate with site specific goals, objectives, & ecological relevance may best promote resilience.

# Thanks!

- Thanks for your time and participation today
- Thanks to folks who've graciously shared photos, feedback, lively discussions, etc.
- Thanks to our Plumas Reforestation Folks and Regional Silviculture & Nursery Folks!