

Forest management strategies to avoid high severity fire and reduce carbon emissions

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The Forest Carbon Sink

- Forests remove 3 billion tons annually
- Forest carbon sink has been increasing
 - Regrowth, fire suppression
- U.S. forests sequester 10% of human emissions

= Climate Mitigation Potential

Forest Carbon Accounting

- **Additionality:** forest practices that exceed the baseline expectation for carbon sequestration
- **Permanence:** the length of time the carbon must be sequestered

Additionality and Permanence

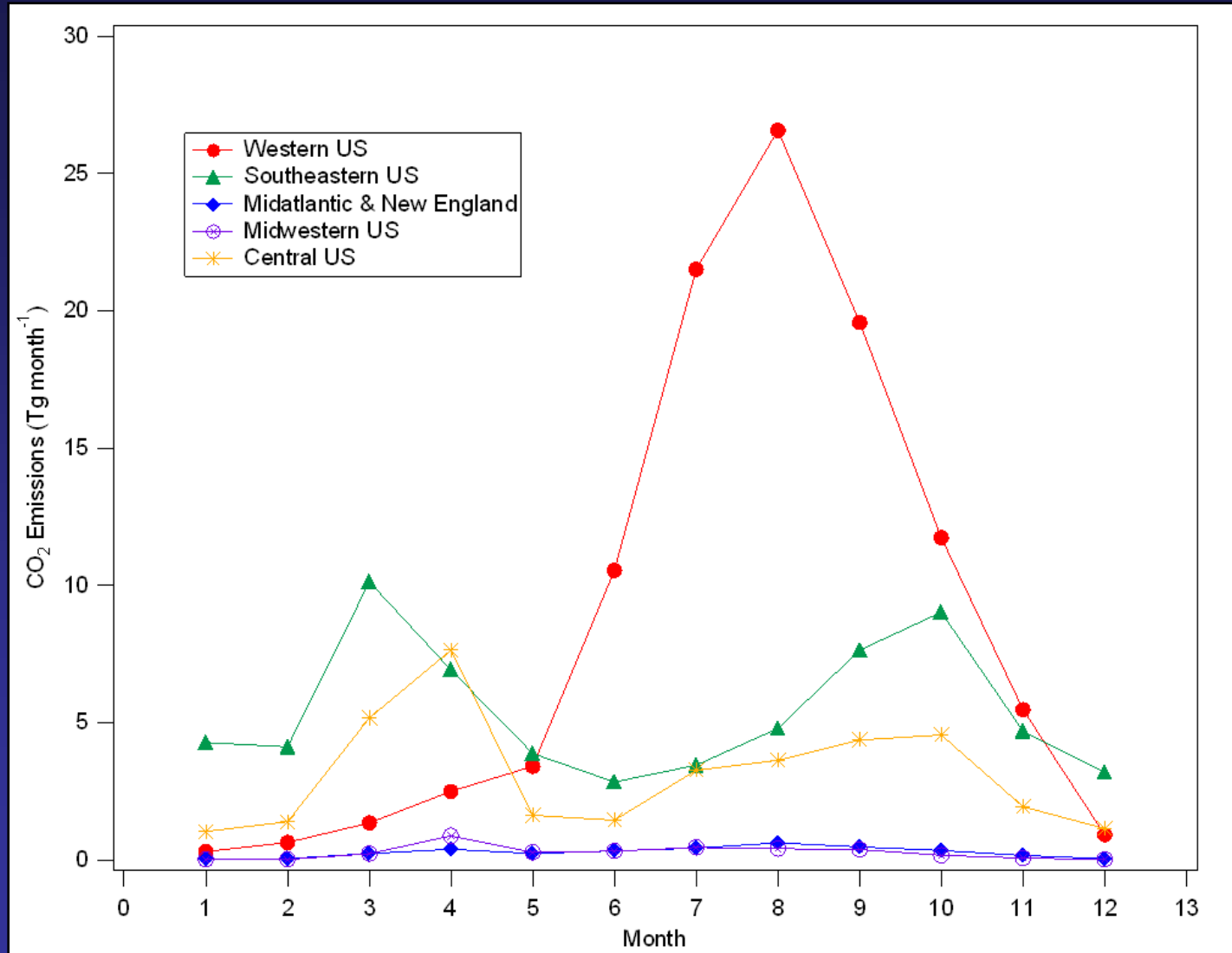


Photo: Rogue Valley IMC



Photo: U.S. Forest Service

Wildfires: A Large Source of Emissions



(Wiedinmyer and Neff 2007)

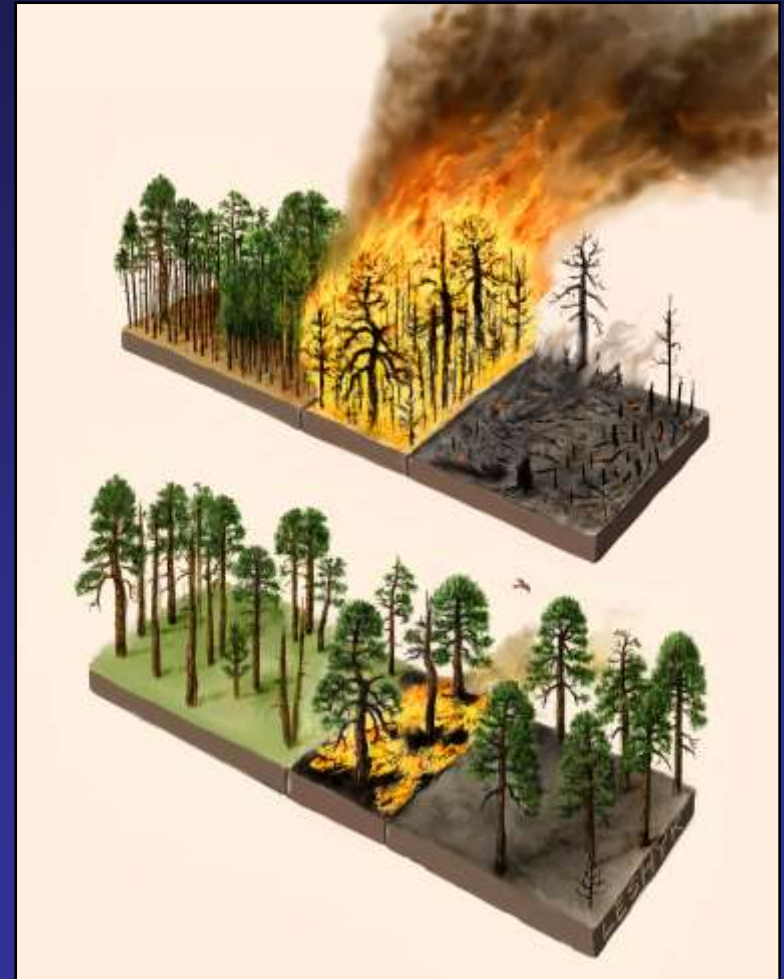
Permanence?



Photo: Arizona Division of Emergency Management

Management & C Accounting

- California AB32
- Thinning = stock loss
- Wildfire emissions are written off the books

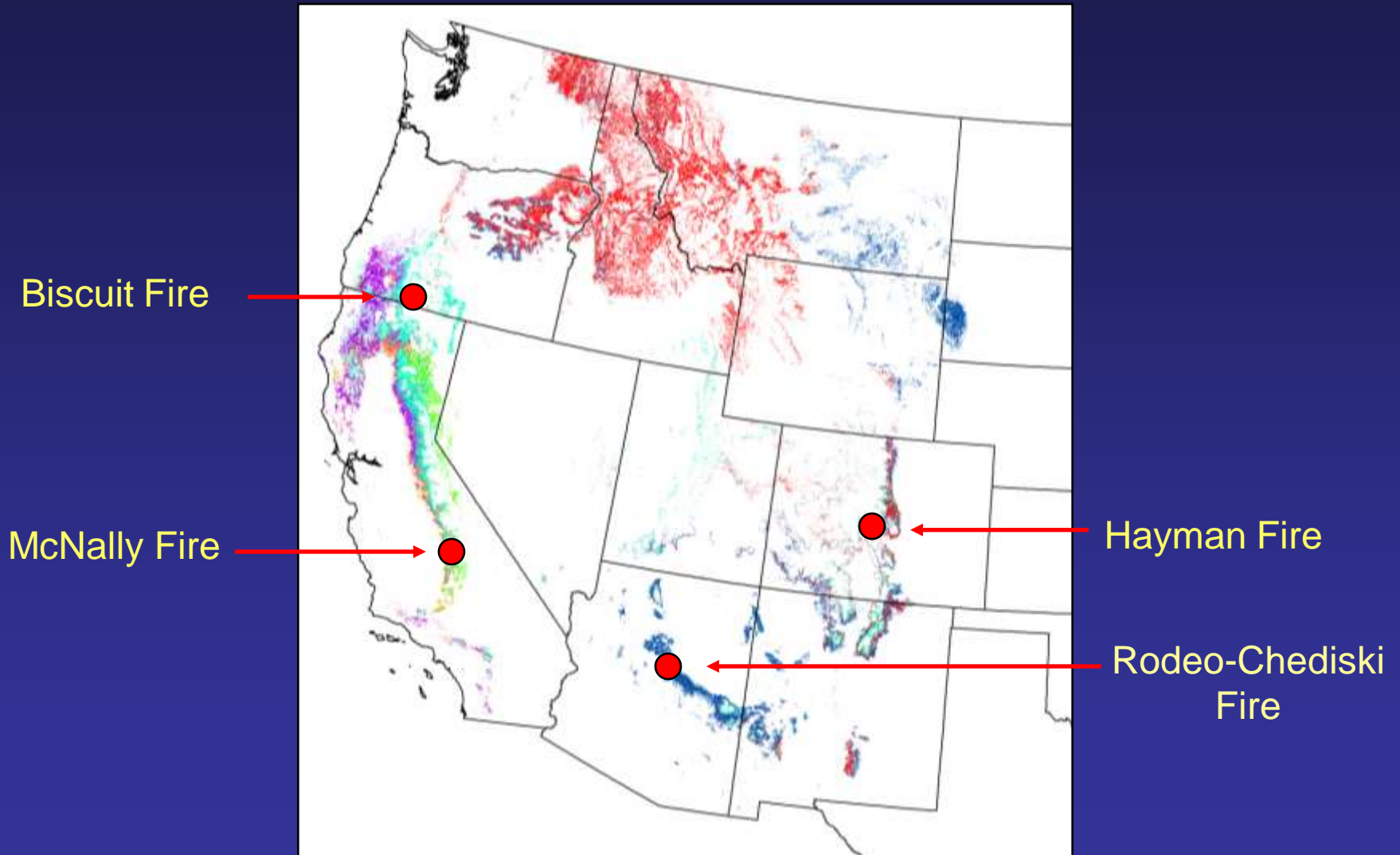


Hurteau, Koch, and Hungate (2008)

Hypothesis:

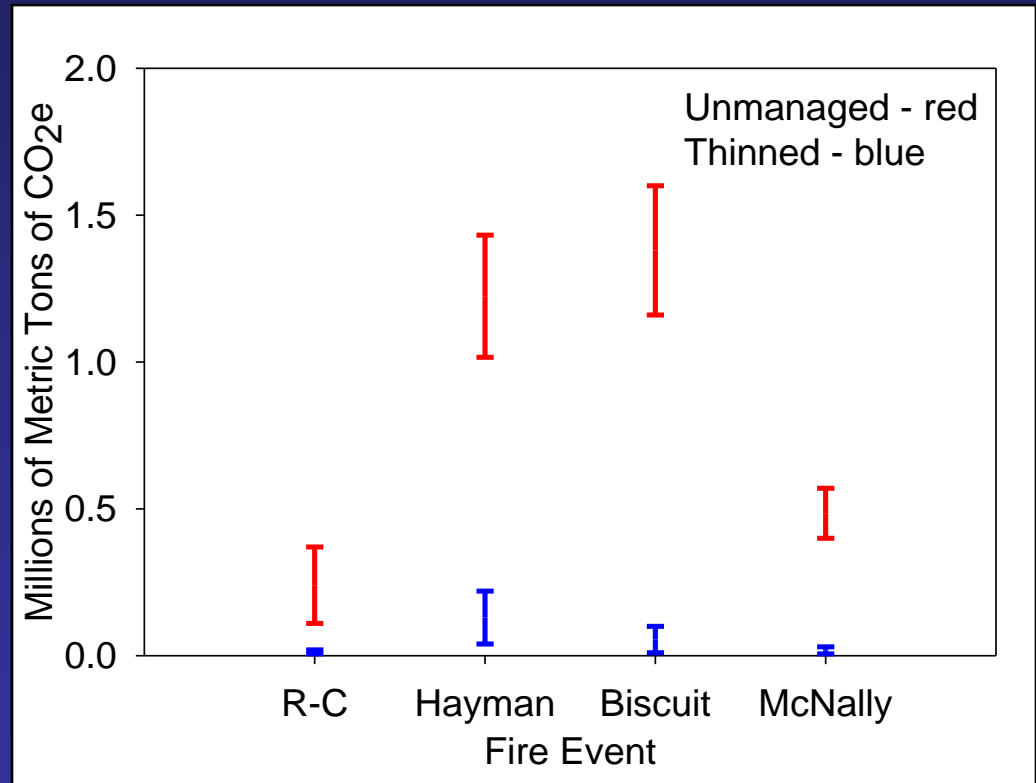
Forest thinning makes forests
more resistant to stand
replacing fire resulting in a net
carbon benefit.

Study Locations



Reduced Fire Severity = Fewer Emissions

- Thinning requires a C stock reduction (3.9 MMTCO₂)
- Avoided emissions (5.7 MMTCO₂)
- Avg US 20 tCO₂/yr



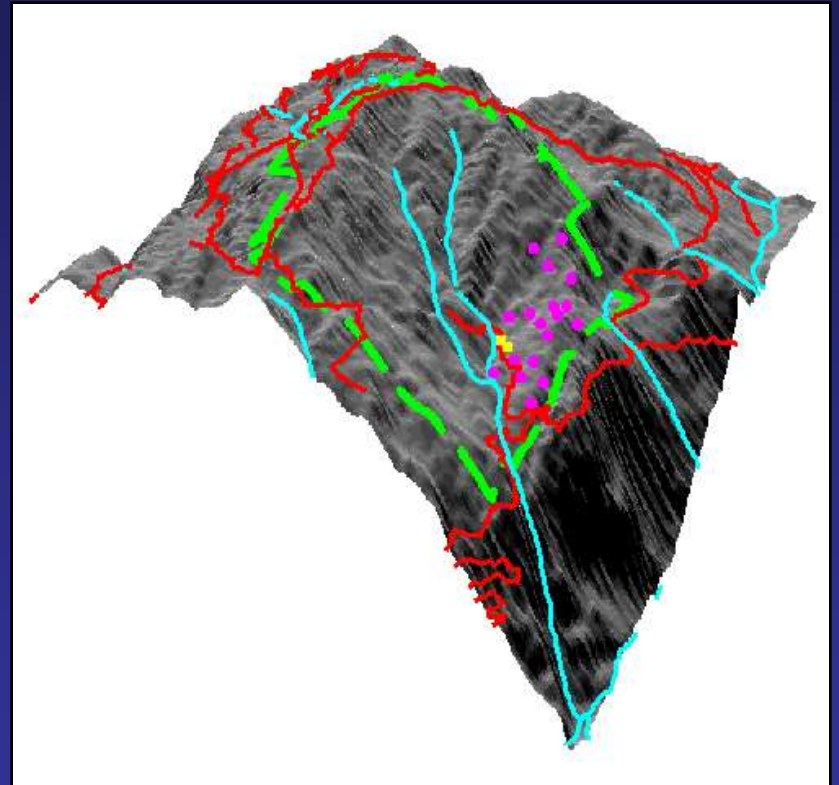
Hurteau, Koch, and Hungate (2008)

Hypothesis:

A forest structure that approximates the pre-suppression structure will be most resistant to wildfire and have the greatest carbon benefit

Forests, Wildfire, & Carbon

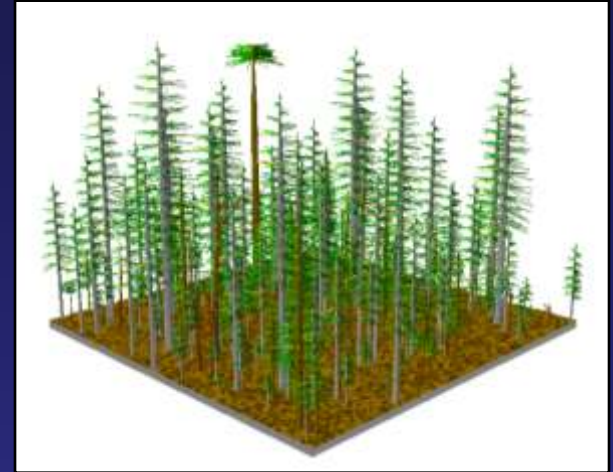
- Fire suppressed forest structure
- Modeled structural treatments
- Modeled 97th percentile fire weather
- Baseline post-treatment



Treatments

- 1865 Forest Structure
- Restoration thin
- Thin from below
- No thin

All treatments crossed with
prescribed fire

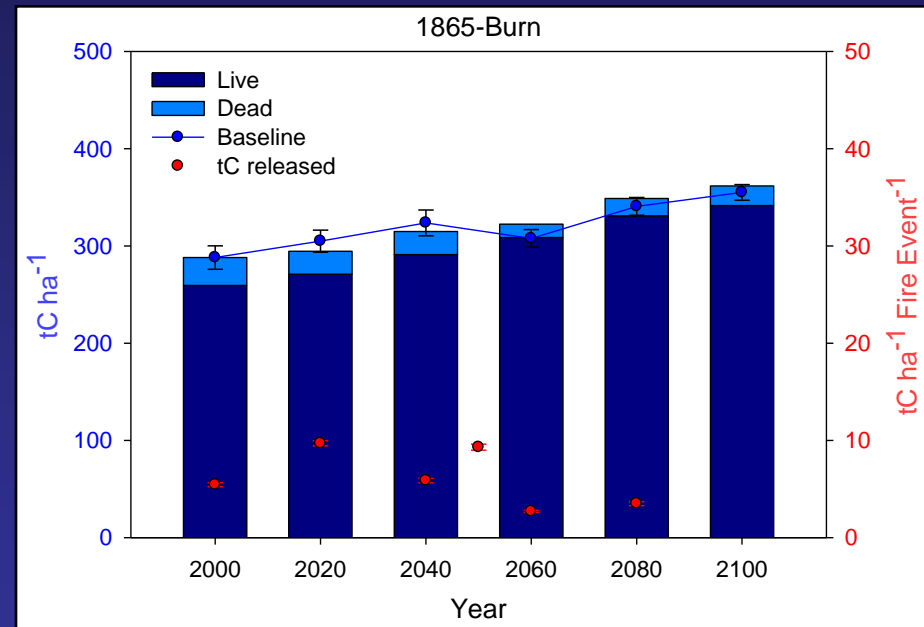
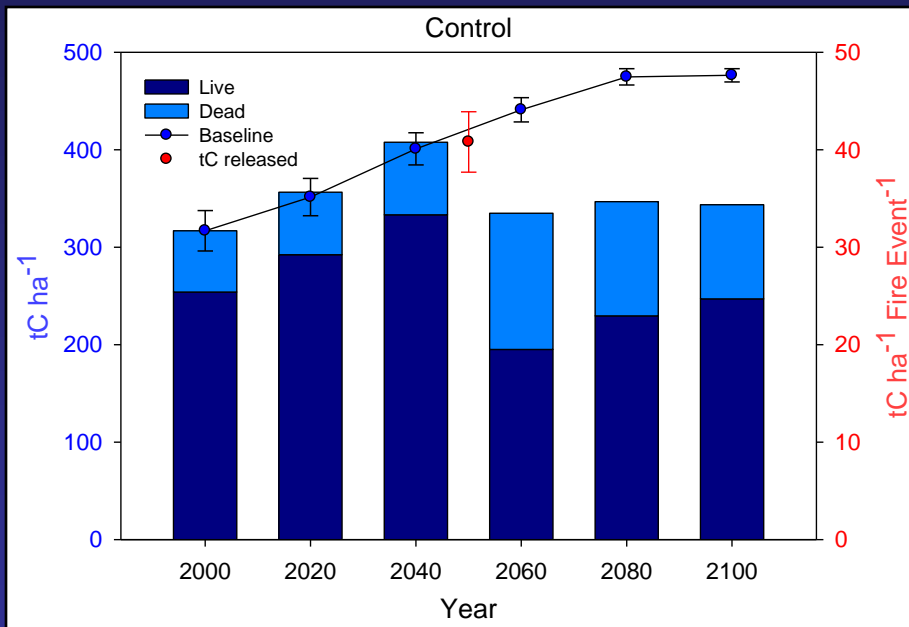


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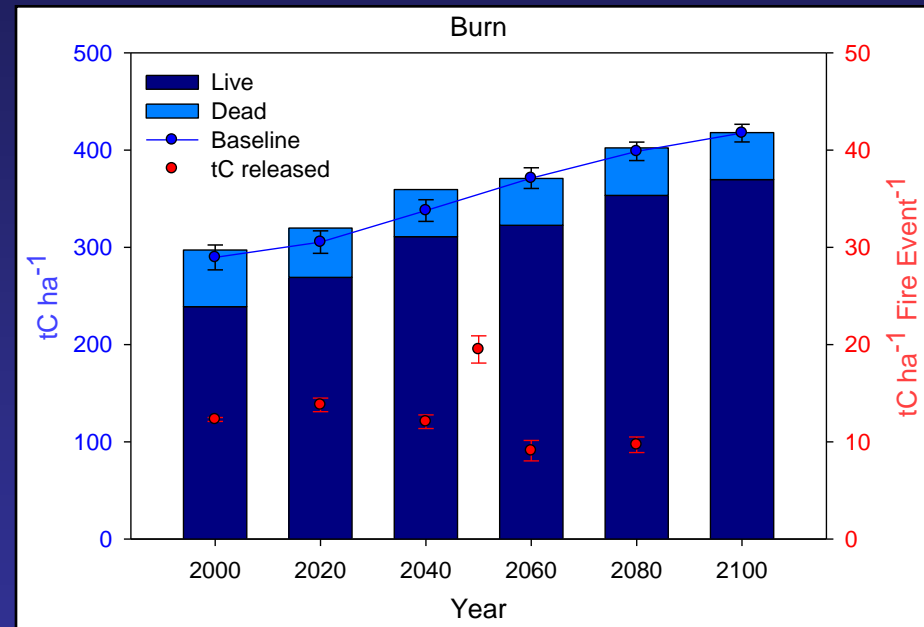
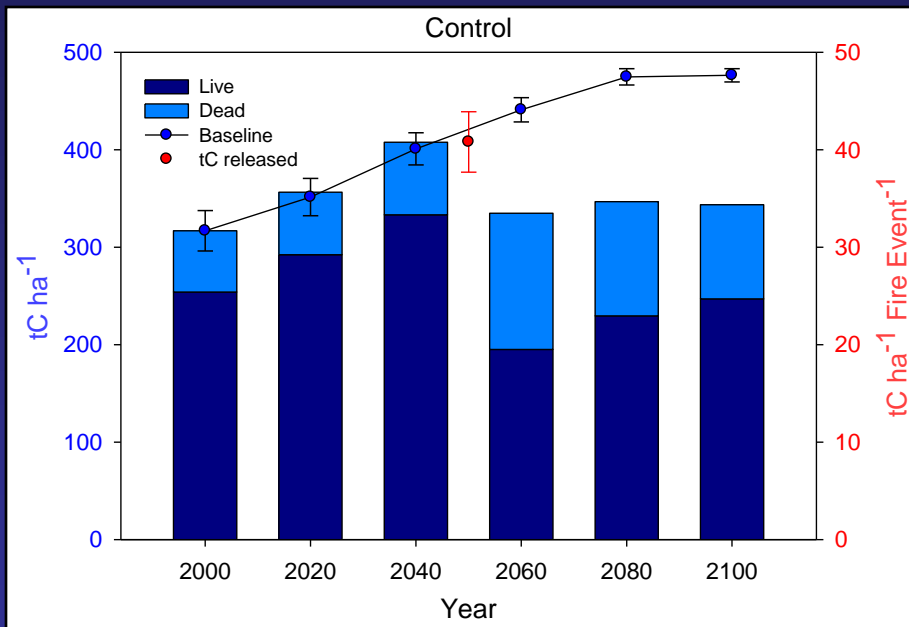


1865

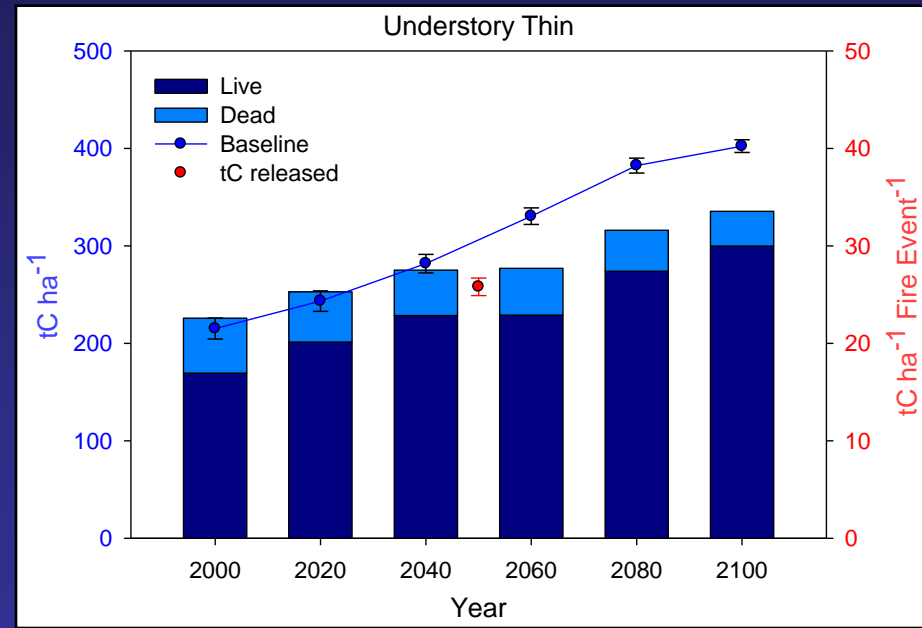
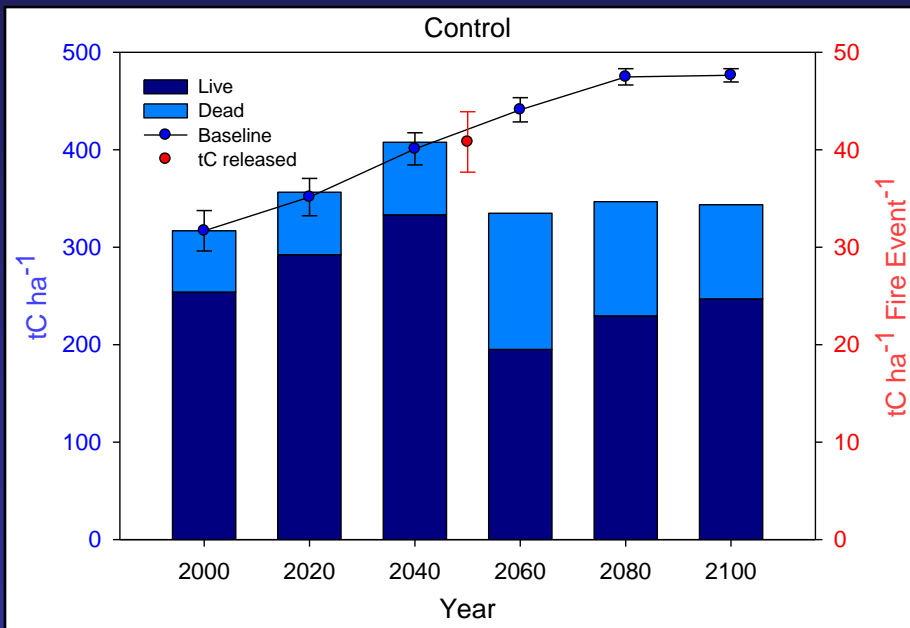
Current vs. Historic



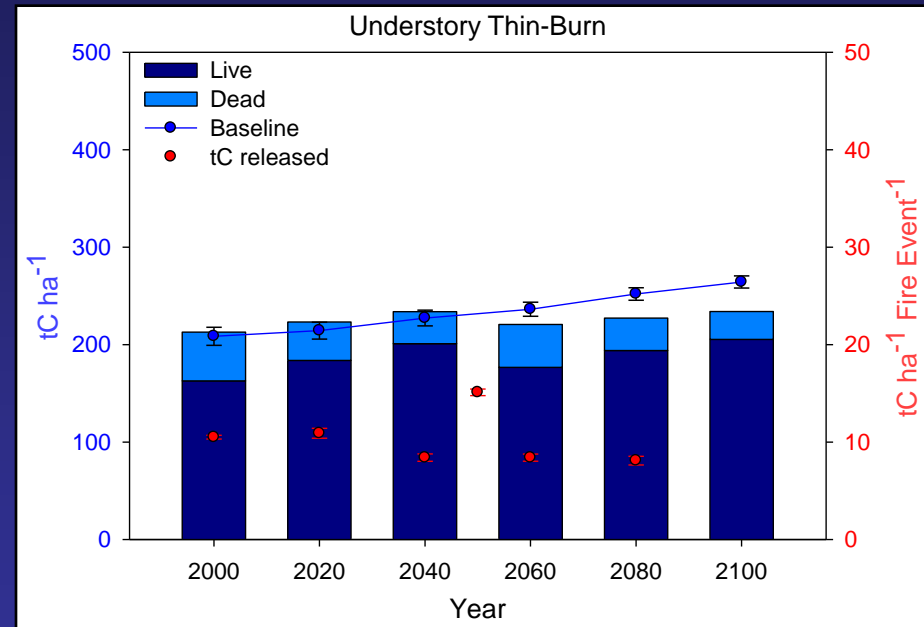
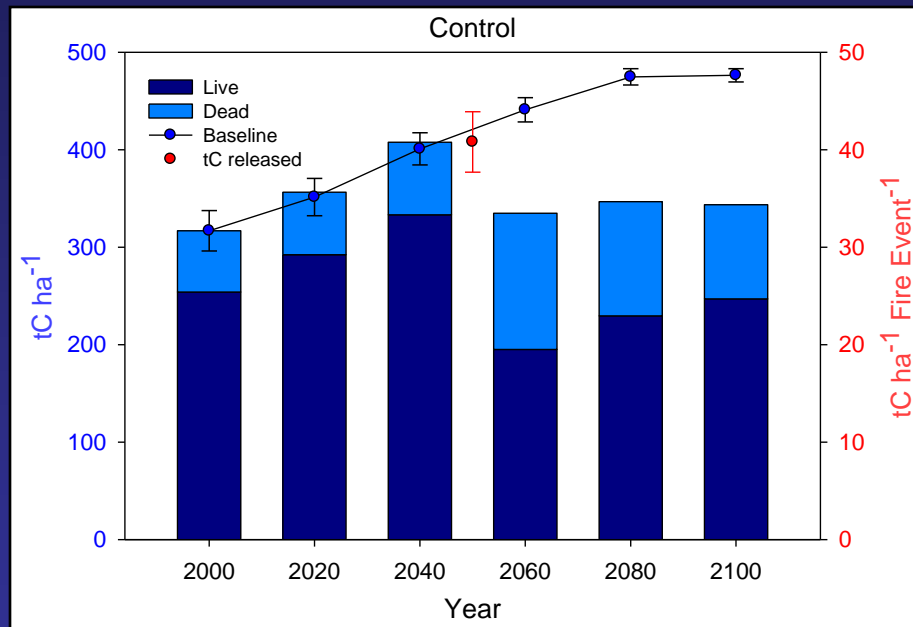
Control vs. Burn Only



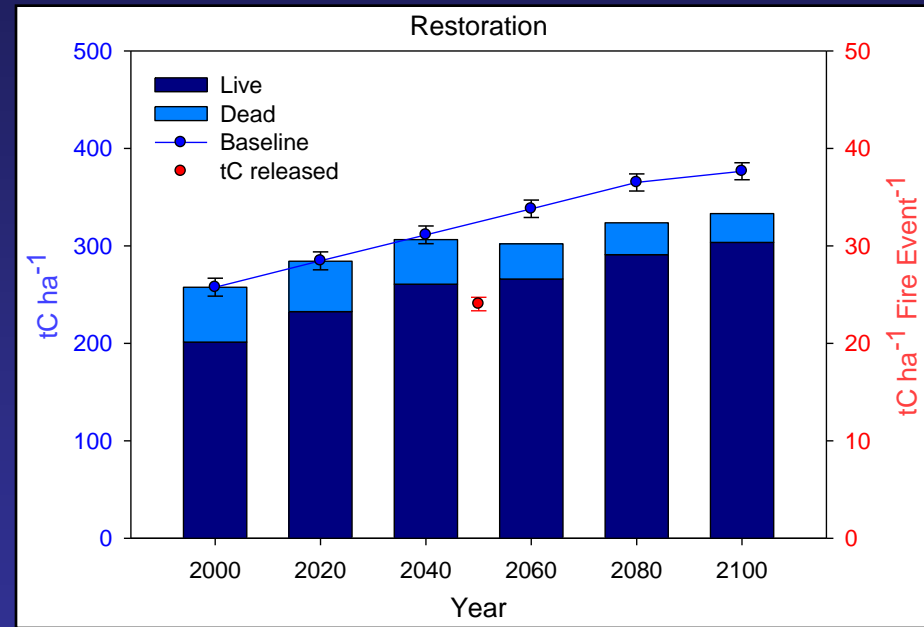
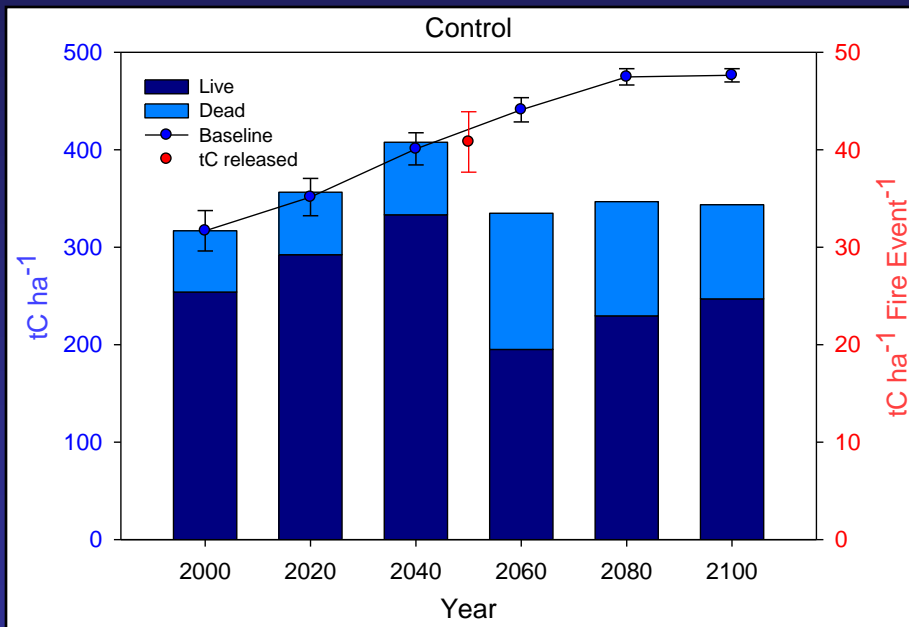
Control vs. Understory Thin



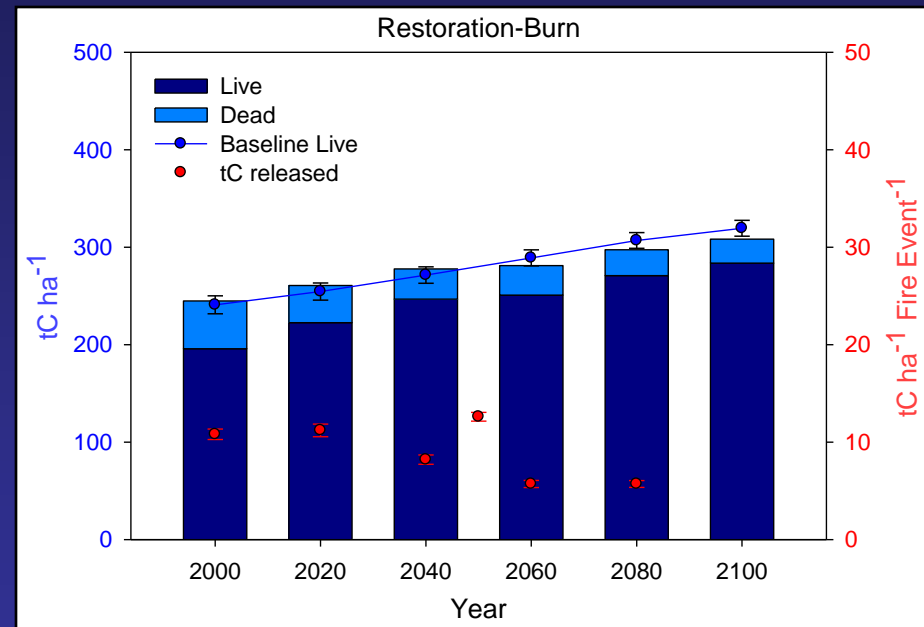
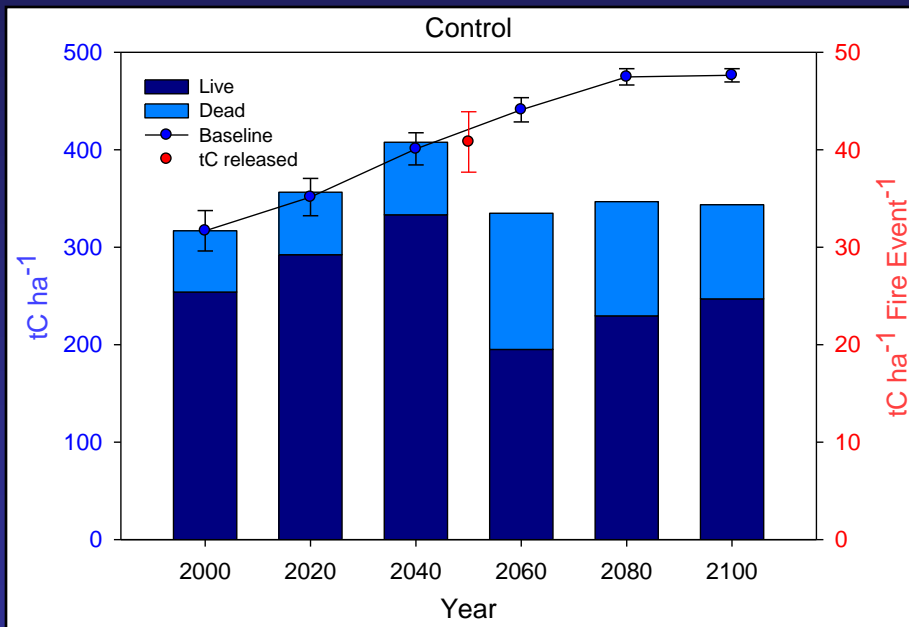
Control vs. Understory Thin+Burn



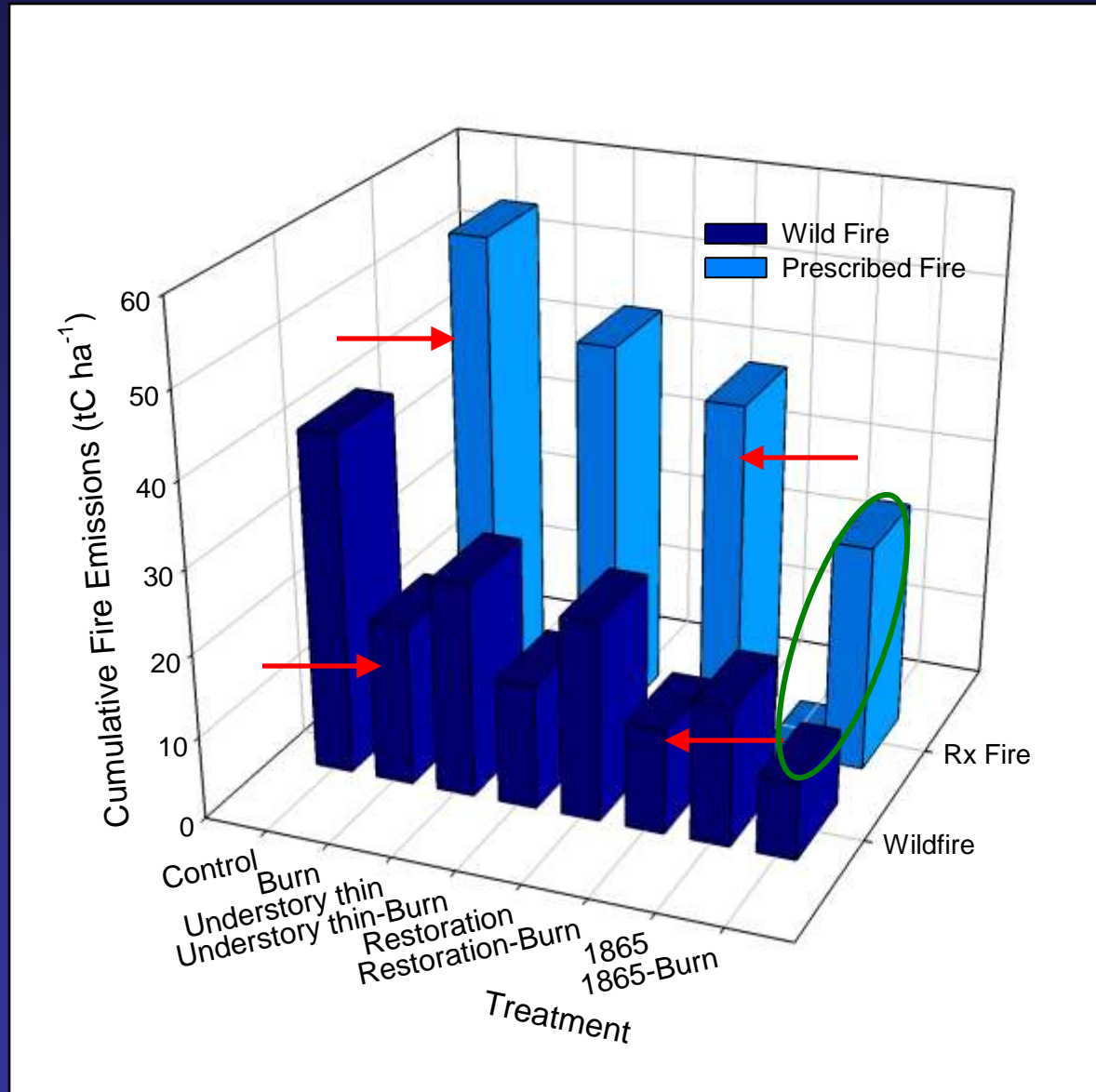
Control vs. Restoration



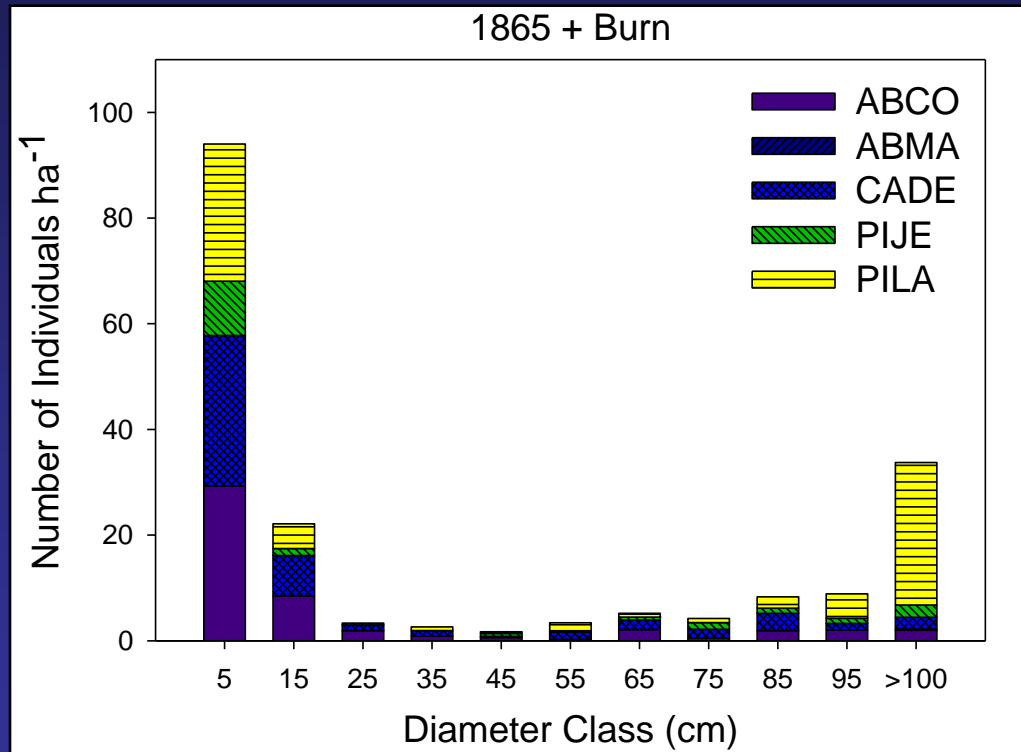
Control vs. Restoration+Burn



Restoration = Lower Emissions

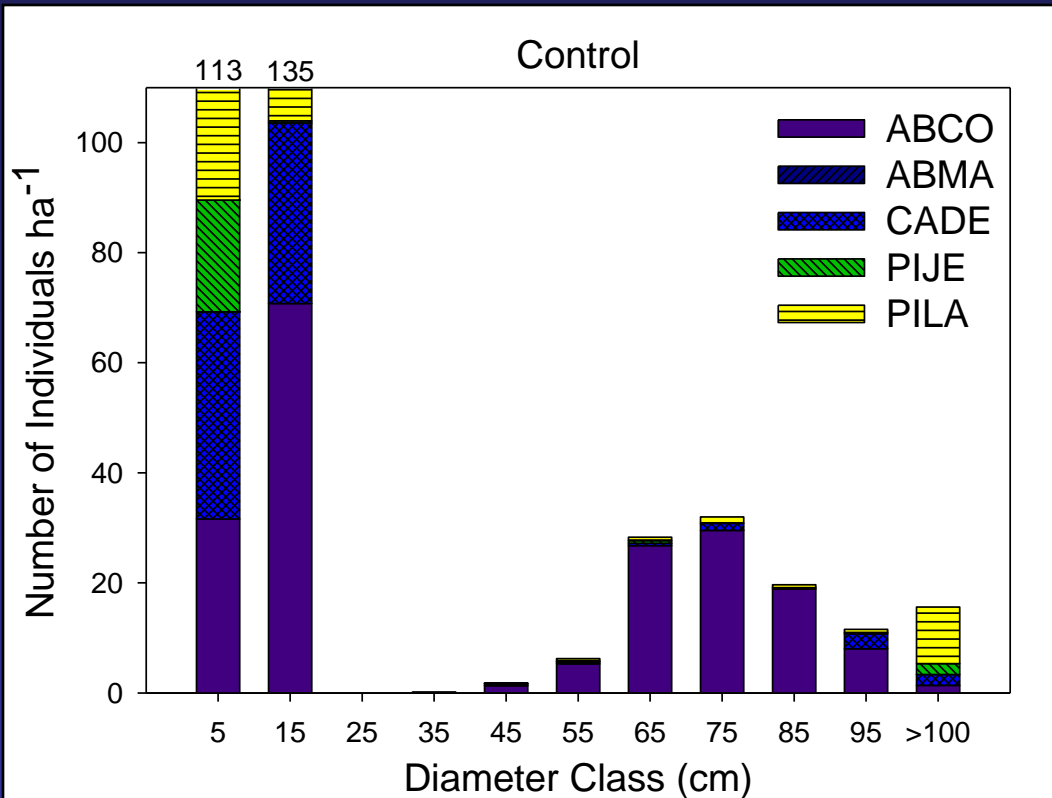


Historic Forest Structure



- Low density
- Large individuals
- Fire tolerant species

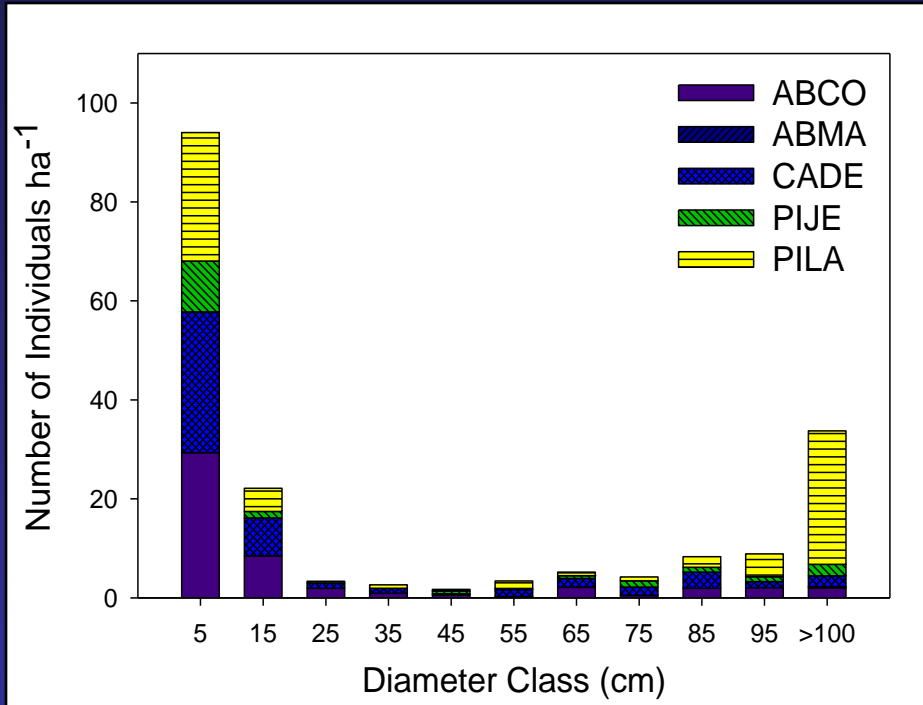
Current Forest Structure



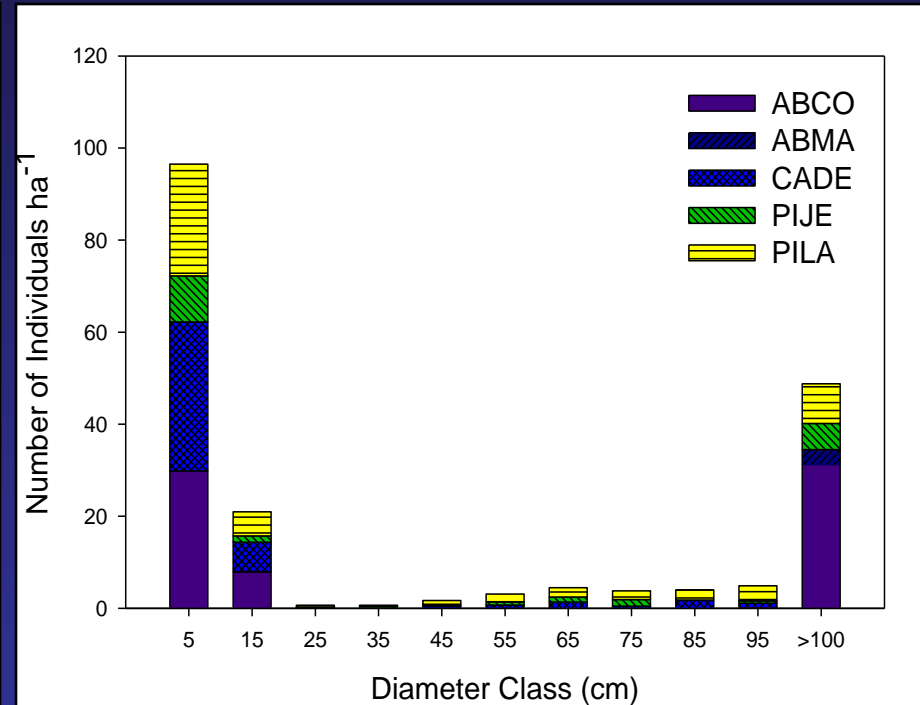
- High density
- Smaller individuals
- Fire intolerant species

Forest Structure

1865+Burn



Restoration+Burn



Take Home Message

- Fuels reduction treatments have carbon costs
- Management can influence:
 - Emissions
 - Post-fire C stocks
 - Restoration+Burn = best approximation

An aerial photograph of a forest with patches of snow on the ground. The trees are mostly evergreens, and the snow is scattered across the landscape, creating a high-contrast scene. The overall tone is bright due to the white snow.

Acknowledgements

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