

Pushing the envelope - Are there downsides to extending the burn window for black oaks?

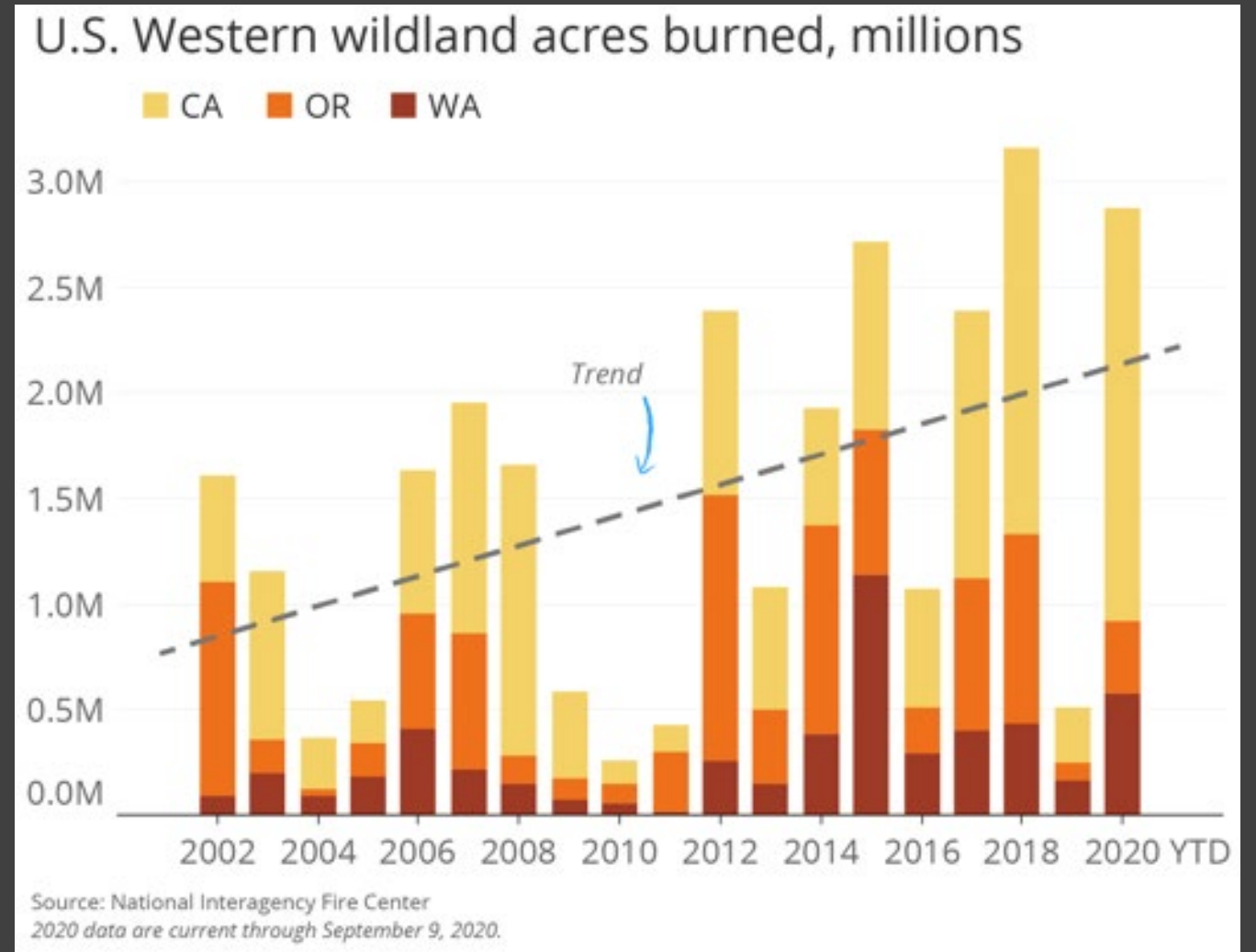
Ryan Fass,
Nicole Molinari,
Leander Anderegg



UC Santa Barbara

California and Wildfire

- Severe wildfires are off the hook



Fire Suppression Sets the Stage



Fire Suppression





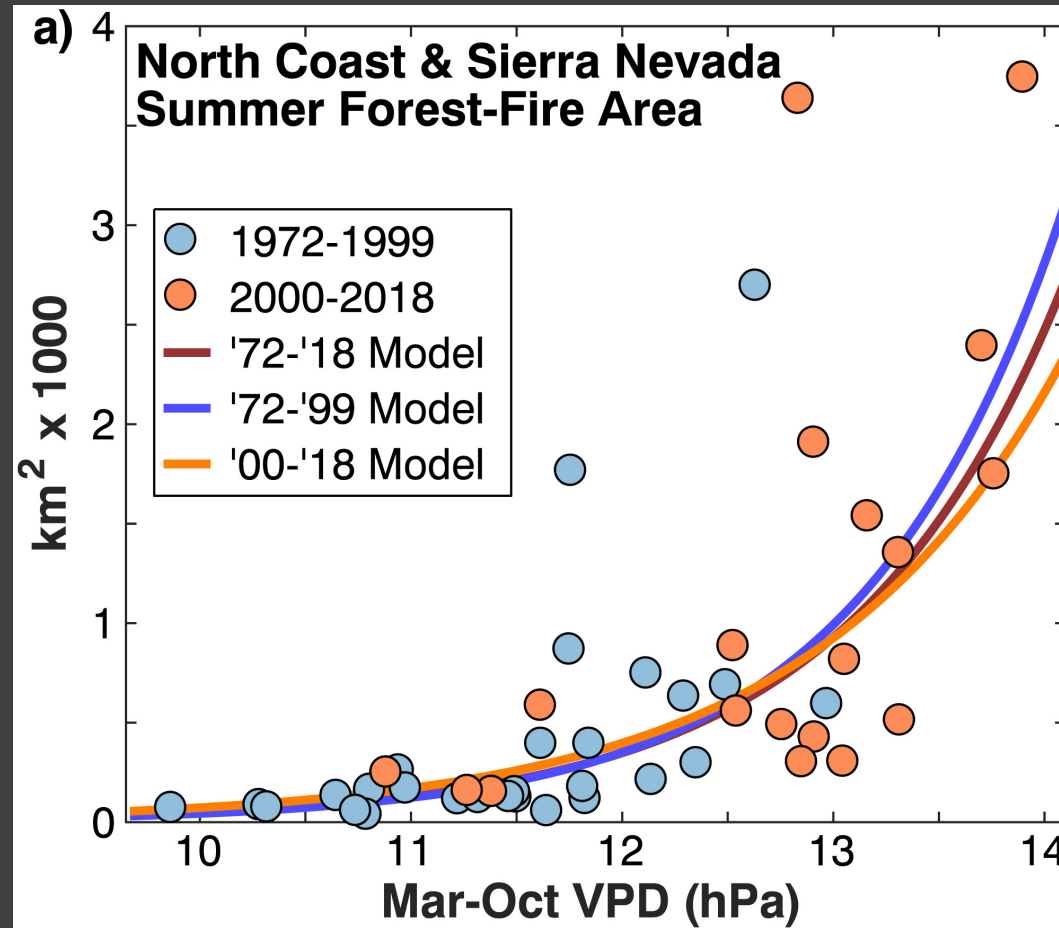
Ecologically managed Forest



Fire-suppressed Forest



Climate Change Turns Fire to 11



Ecological Consequences



Loss of biodiversity, habitat fragmentation and potential species extinction.

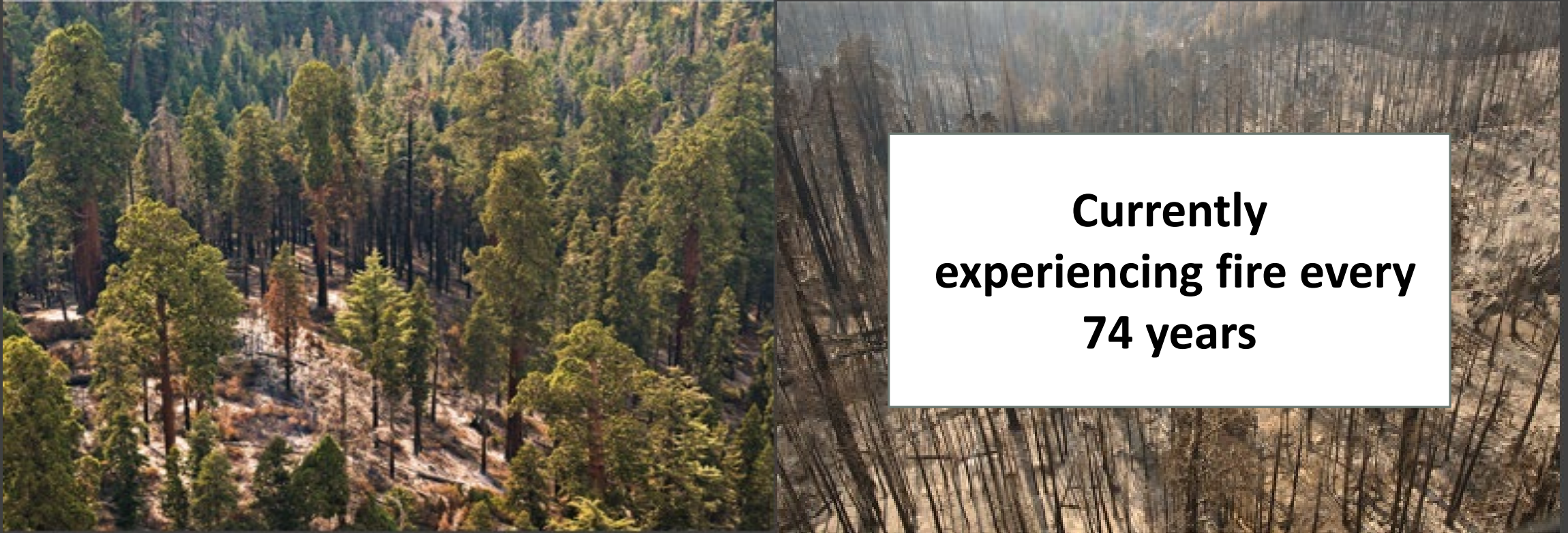
Ecological Consequences



**Historically
forests experience fire
every 10-15 years**

Loss of biodiversity, habitat fragmentation and potential species extinction.

Ecological Consequences



Loss of biodiversity, habitat fragmentation and potential species extinction.

Solution: Prescribed Fire

Goals:

- Reduce fuels and tree density
- Return forest to a more natural state
- Increase fire resiliency



Scaling Up Prescribed Fire

CA Goal: 400,000 acres
burned per year

CA Wildfire & Forest Resilience
Task Force, 2022

- 2023: 126,000 acres
burned

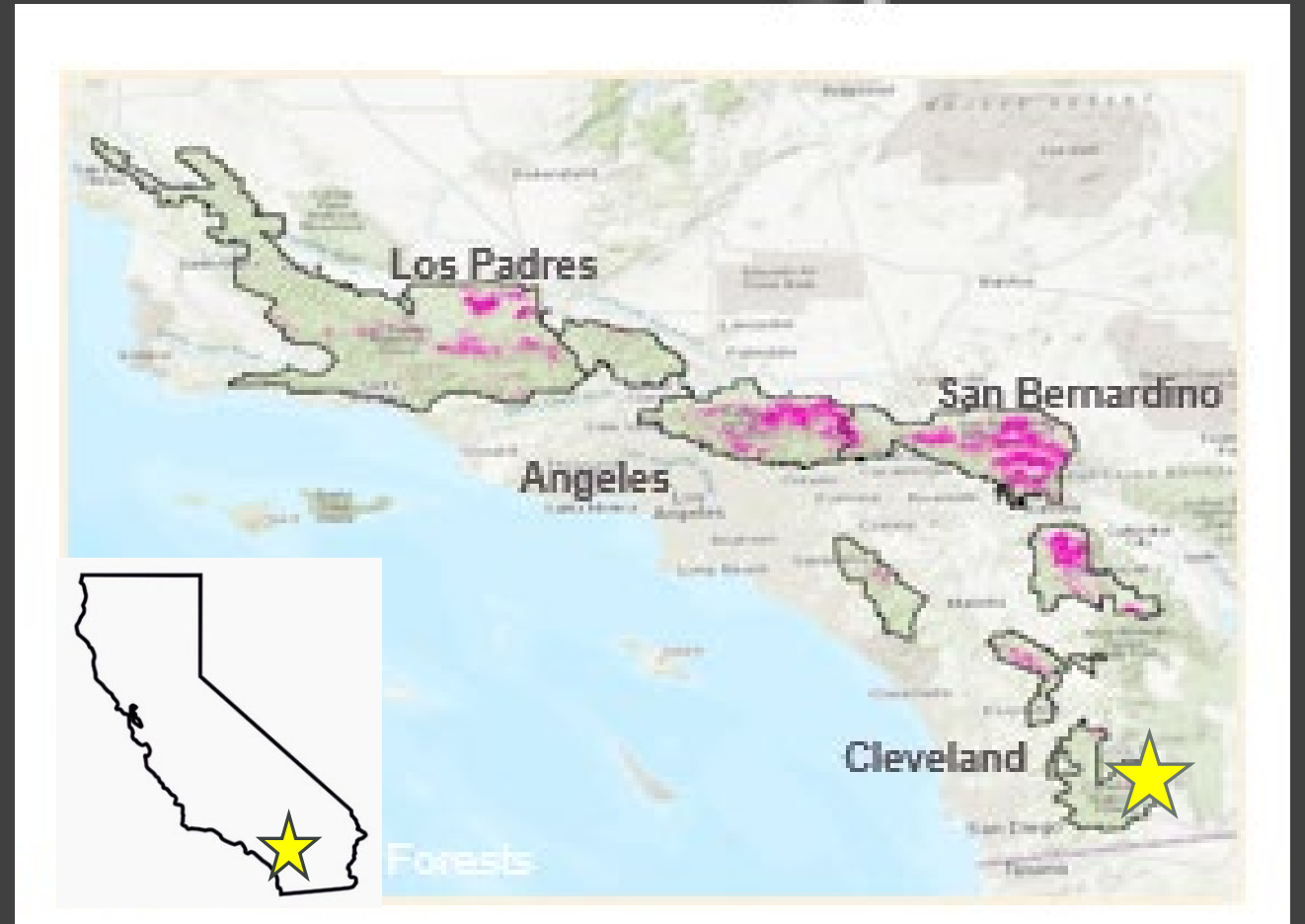


Need: more prescribed fire on the ground.

Rx Fire Case Study:

Cleveland
National Forest

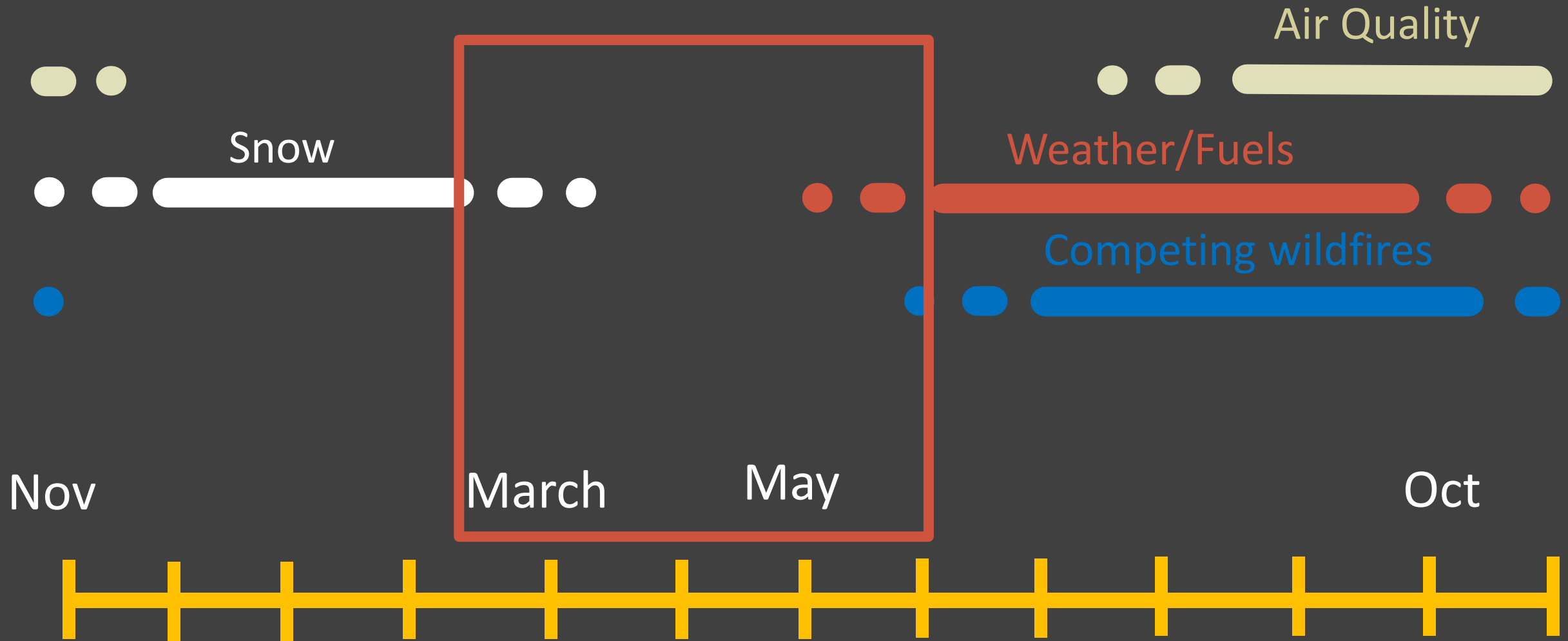
Laguna Mtn.
5,700 ft elevation





Ancestral lands of the Indigenous Kumeyaay people

Cleveland NF 'burn window'



Jeffrey Pine/Black Oak Forests

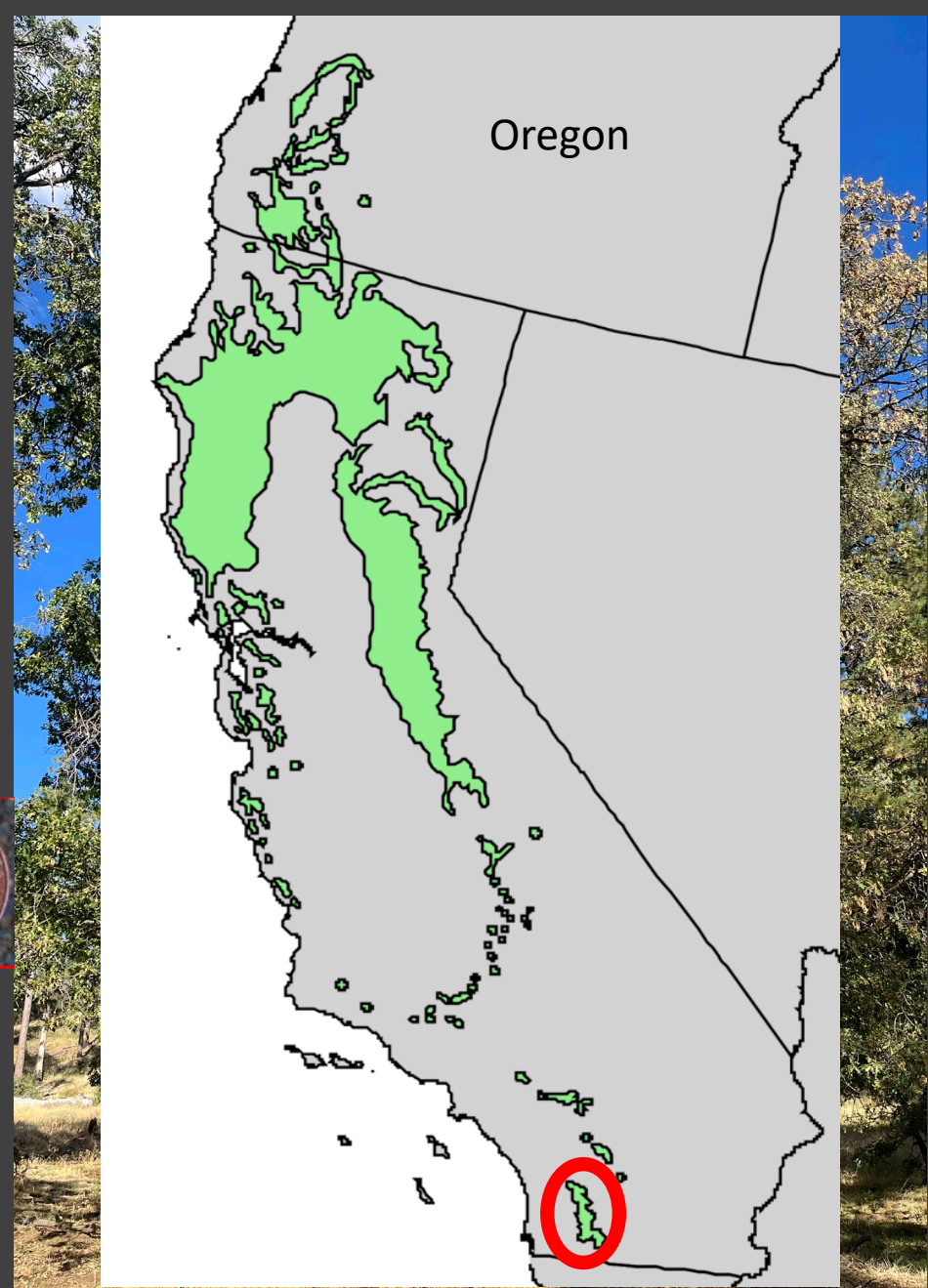
Black Oak *Quercus kelloggii*

- Cultural Keystone species
- Critical for habitat and wildlife
- Less studied than conifers



Jeffrey Pine/Black Oak Forests

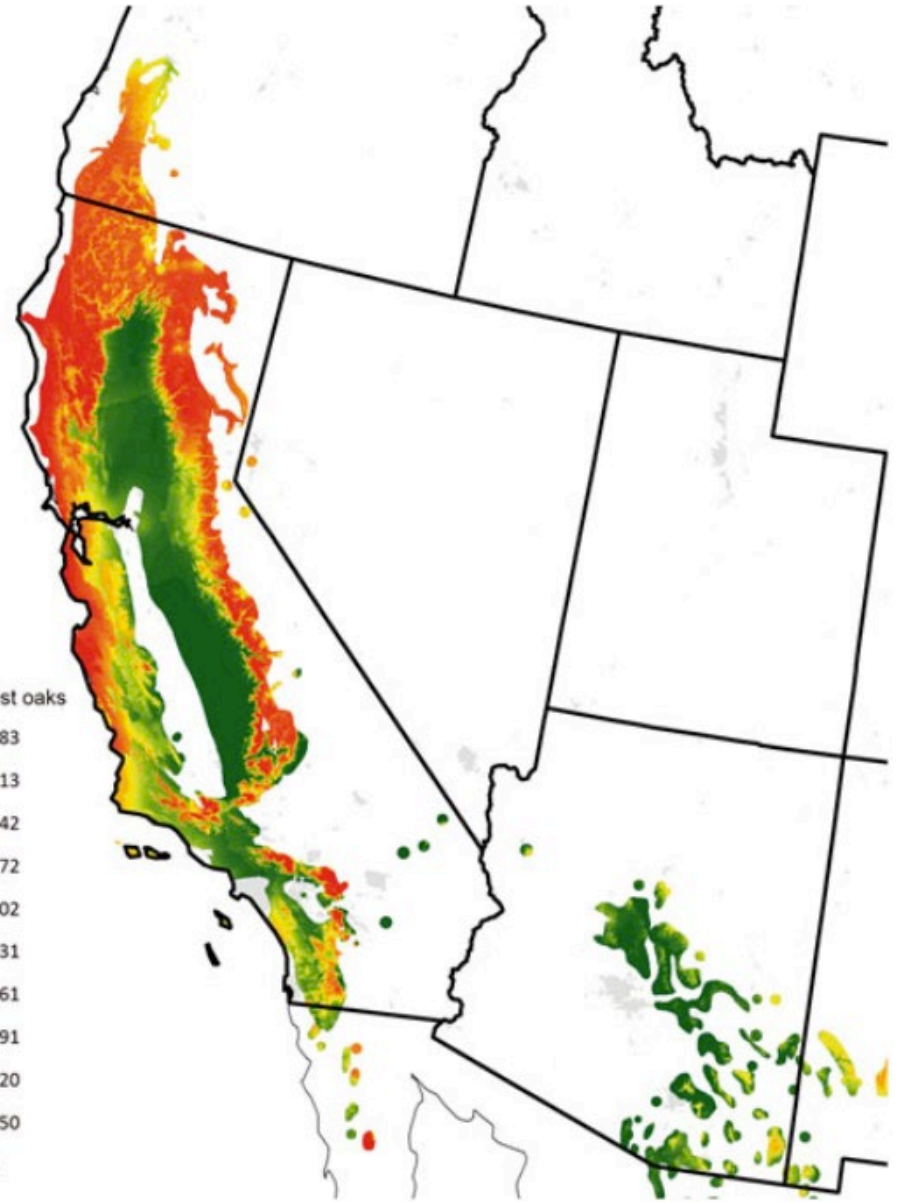
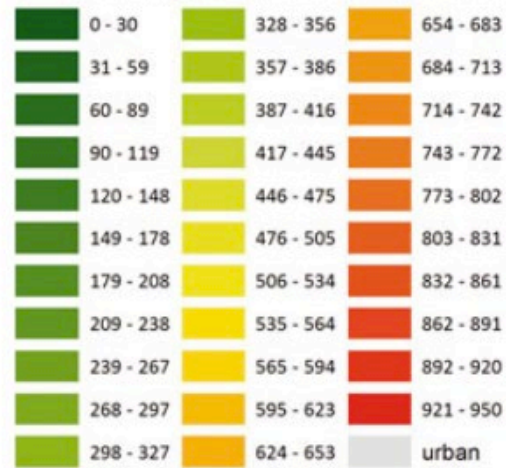
- One of the most southern distributions of black oak
- Already under threat due to goldspotted oak borer (GSOB)



GSOB

- Currently in SoCal
- But major threat EVERYWHERE

Climate suitability (0-1000) within distribution of host oaks

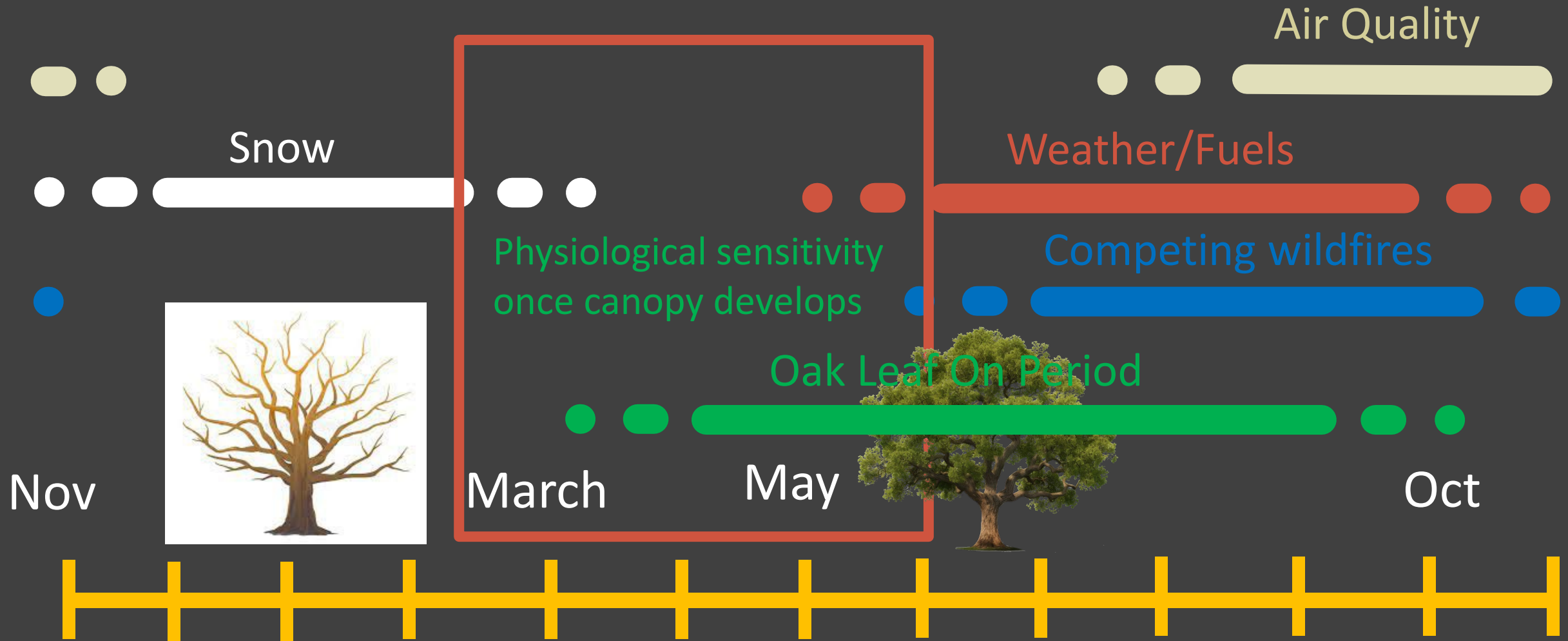


Jeffrey Pine/Black Oak Forests

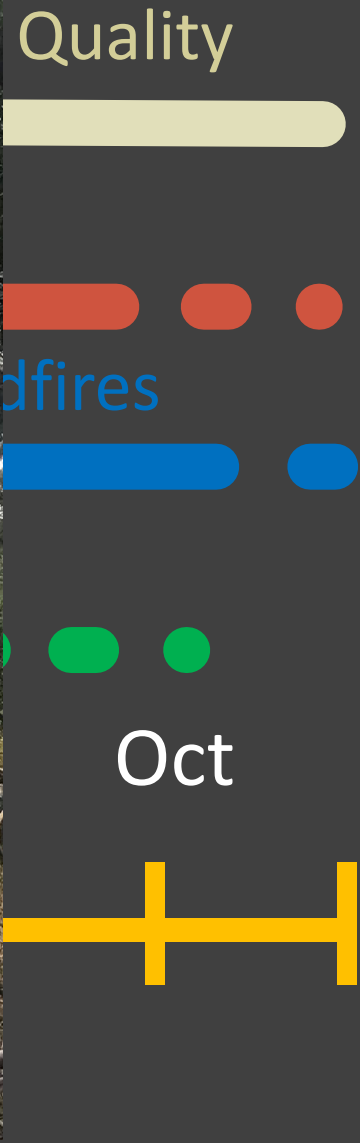
- Strong desire to preserve large, high value, 'legacy' oaks on the landscape



Cleveland NF 'burn window'



Cleveland NF 'burn window'



Experimental Design

Dormant Burn

Late November –
Early March

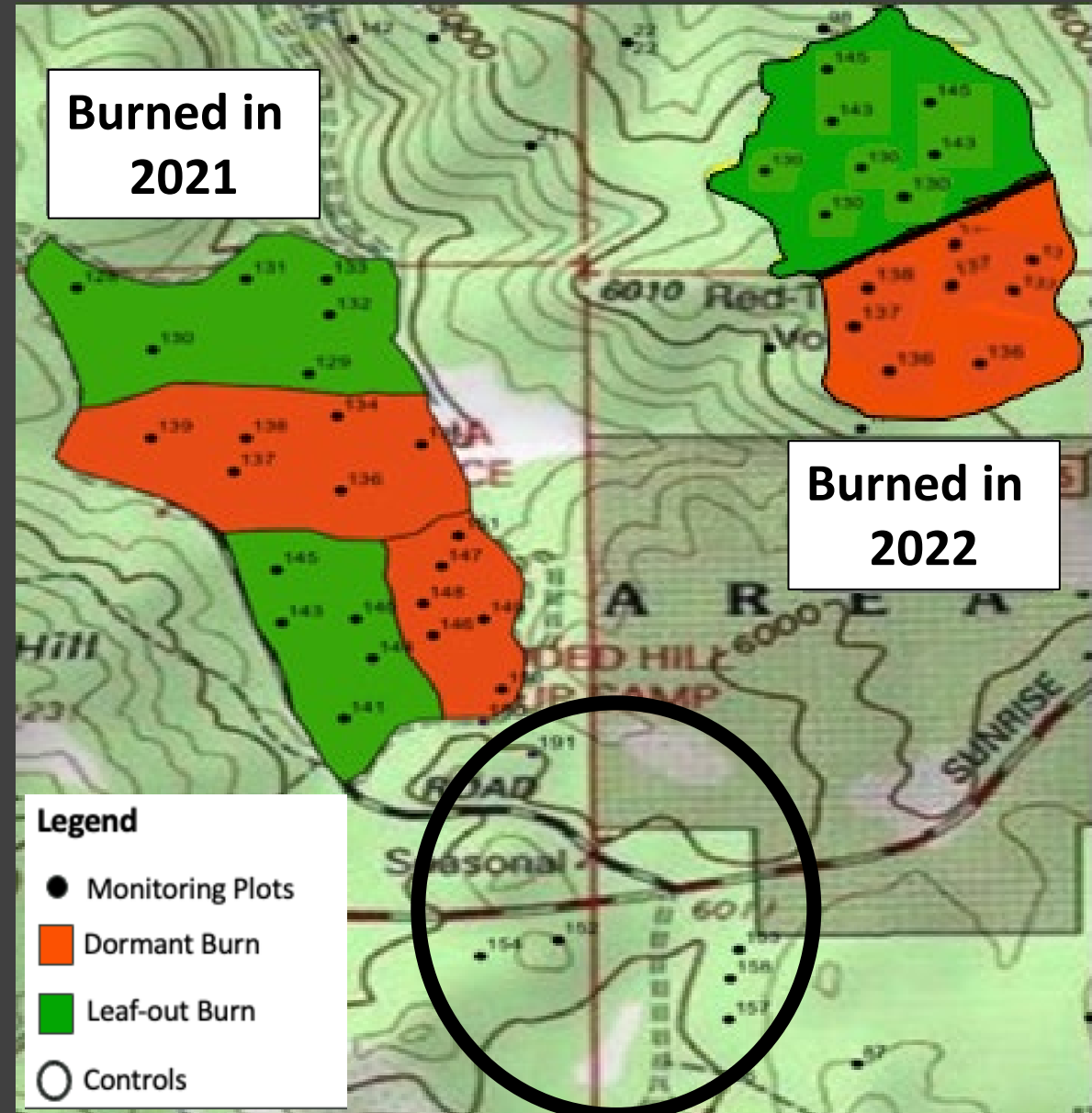
Leaf-out Burn

Late March –
May

Control (No Burn)



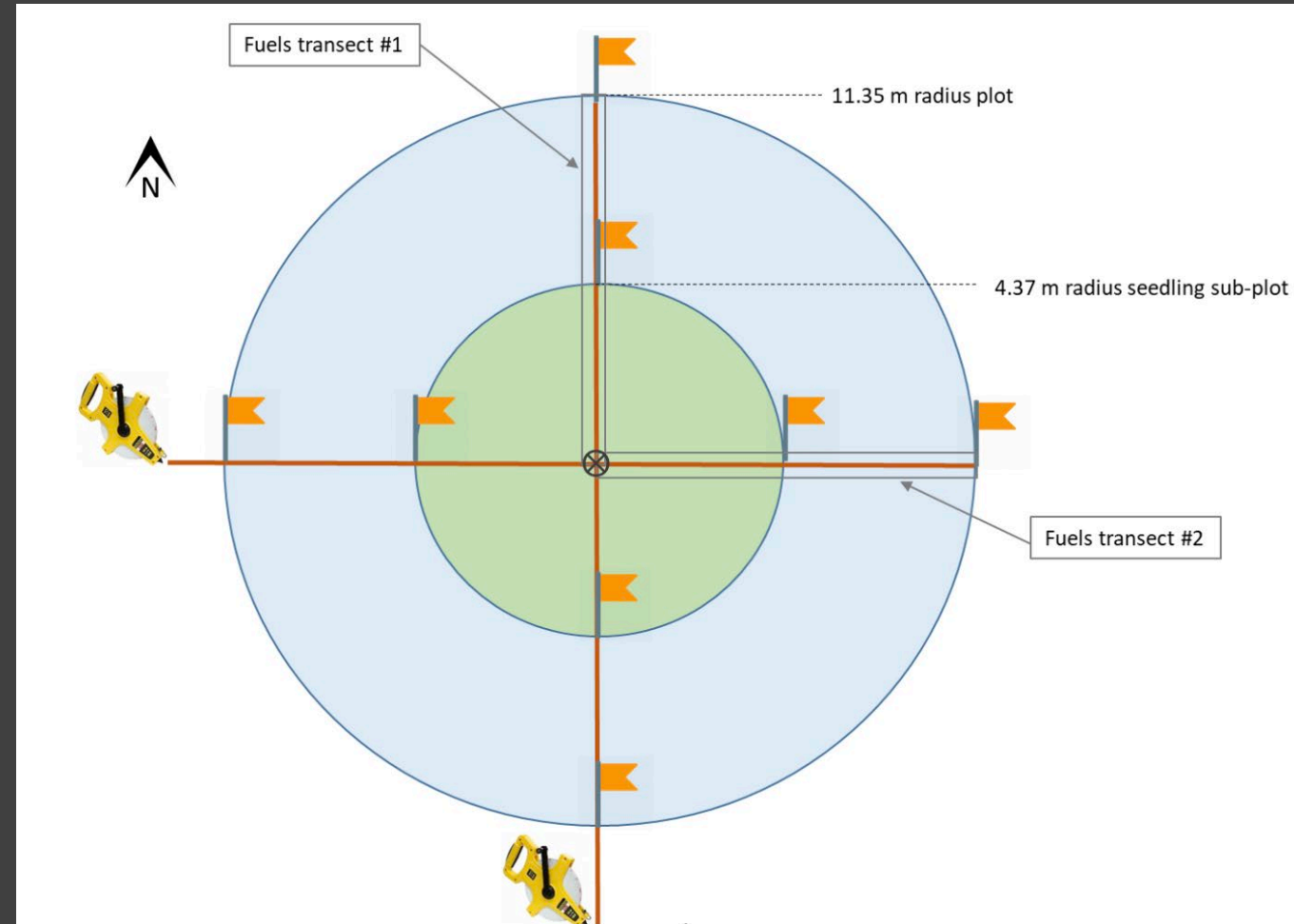
- **Total acres burned ~120**
- **Total Plots = 48**



Common Stand Exam- Plots (1/10th acre)

Key measurements

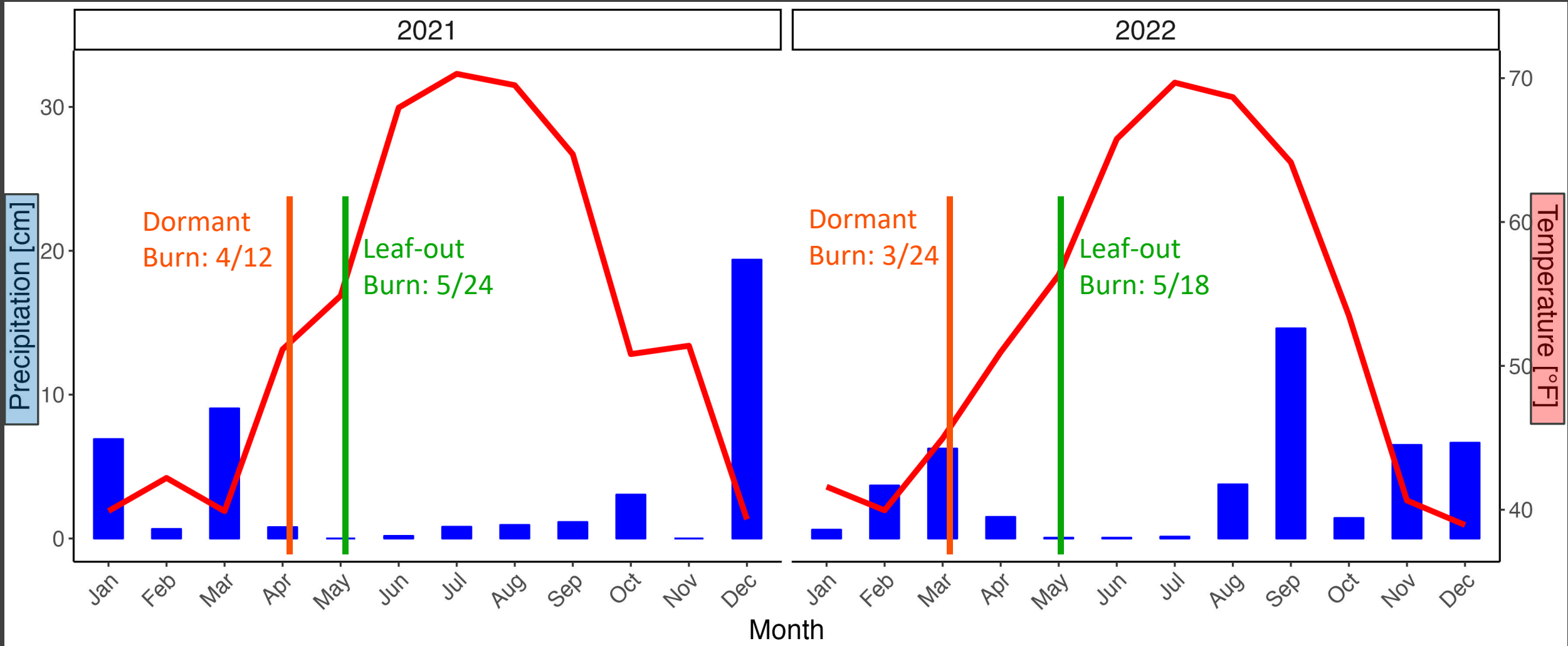
- Tag and measure all adult trees (≥ 3 " dbh) and saplings (< 3 " dbh)
- Seedling counts
- Species cover
- Brown's Fuel transects



Climographs for burn years

Total Precipitation for year = 42.9cm (16.89in)

Total Precipitation for year = 45.2cm (17.8in)



Prescribed Fire!



Video: Shane Dewees

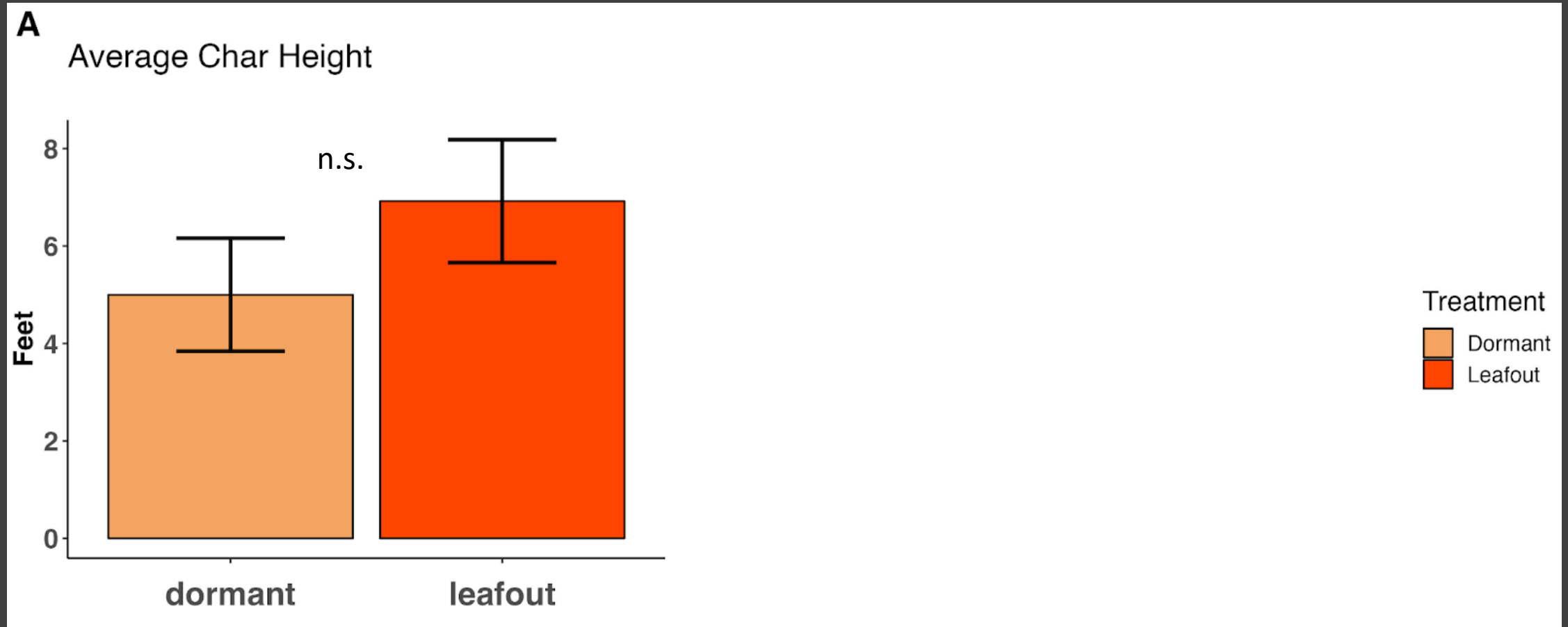
Fire Intensity

Char Height- Height of continuous char (black) on the bole

Scorch Percent- percent of canopy damaged by fire (brown leaves)



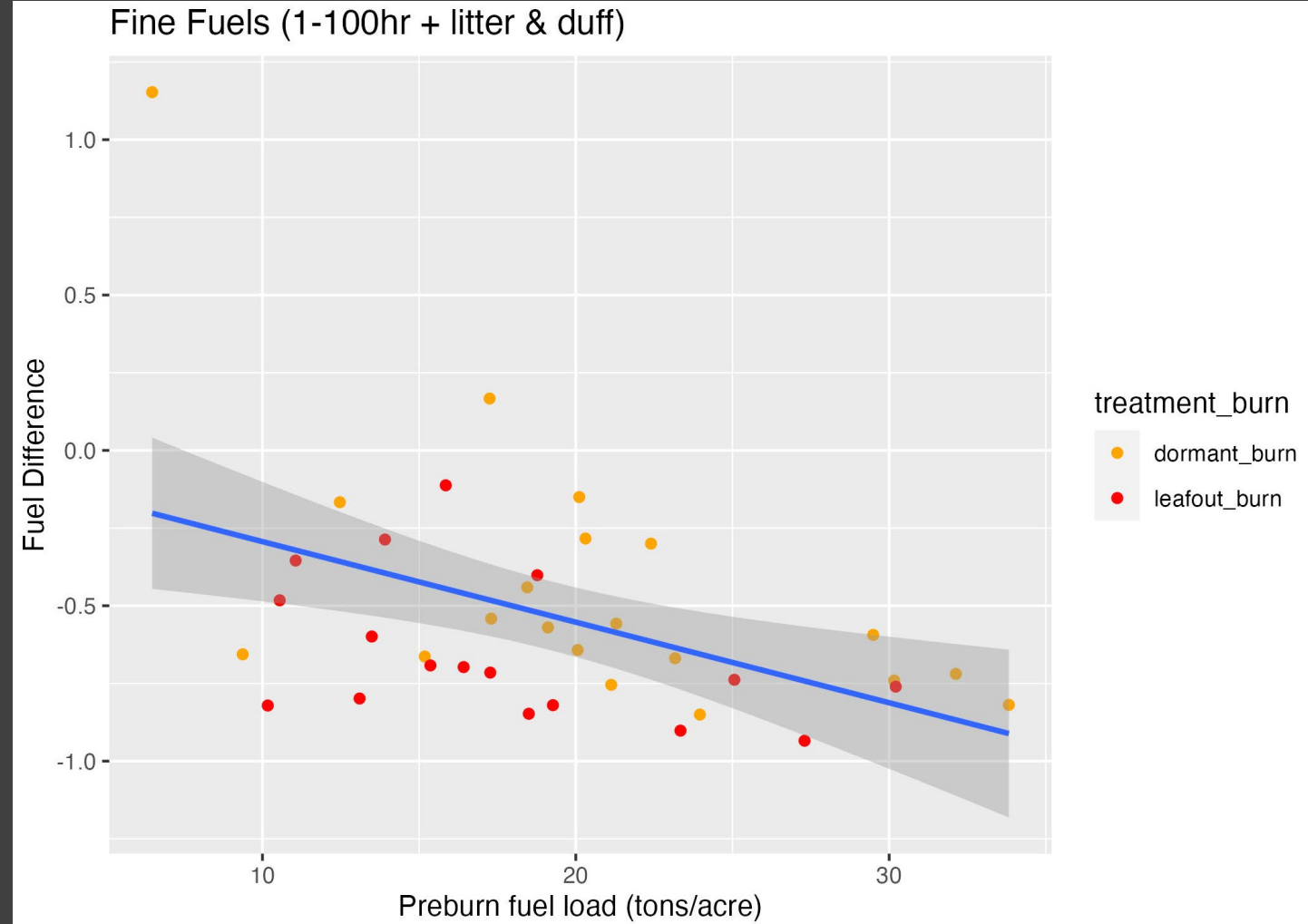
Fire Intensity





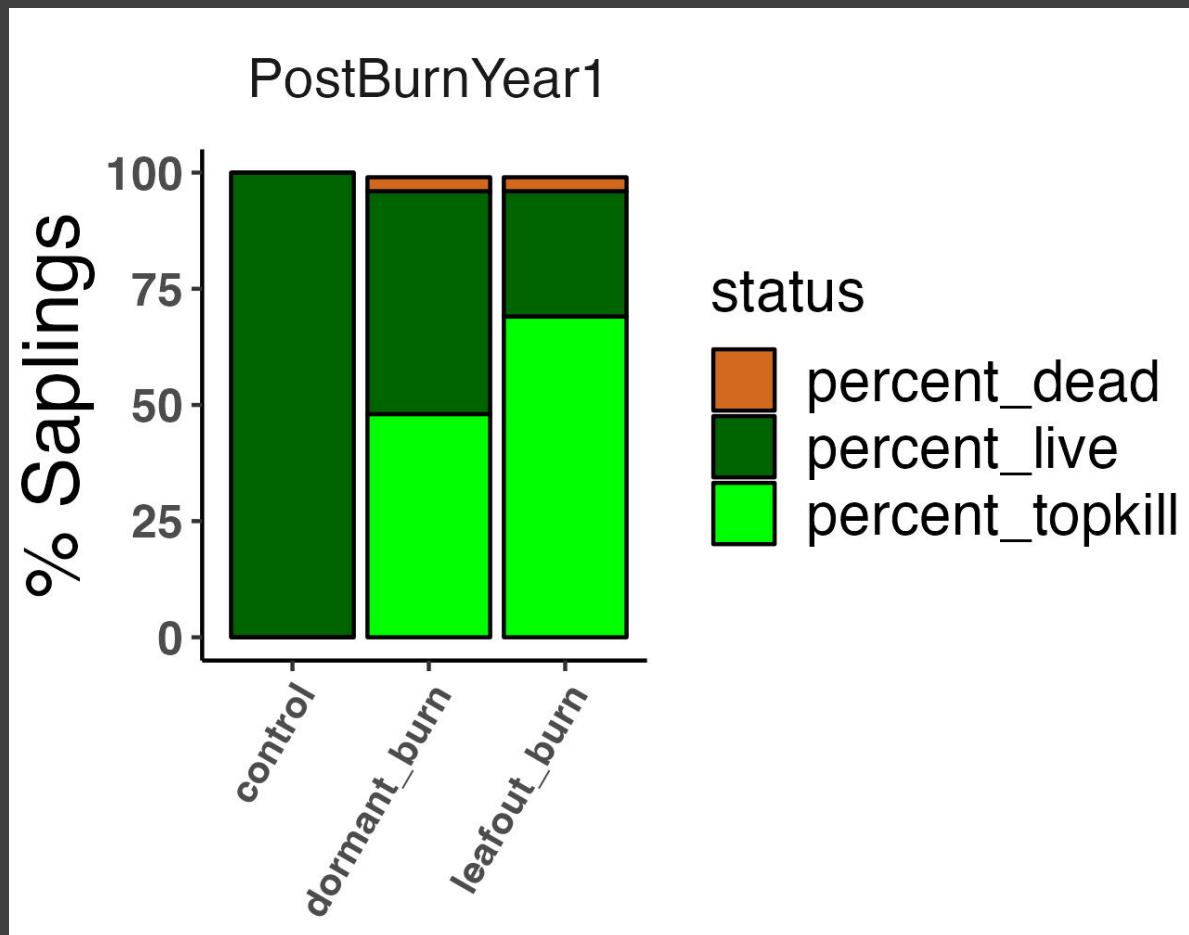
Burning after leafout when conditions are typically drier resulted in a slightly more intense fire

Fuel Loading

- The biggest driver of fuel consumption is what's on the ground not burn timing



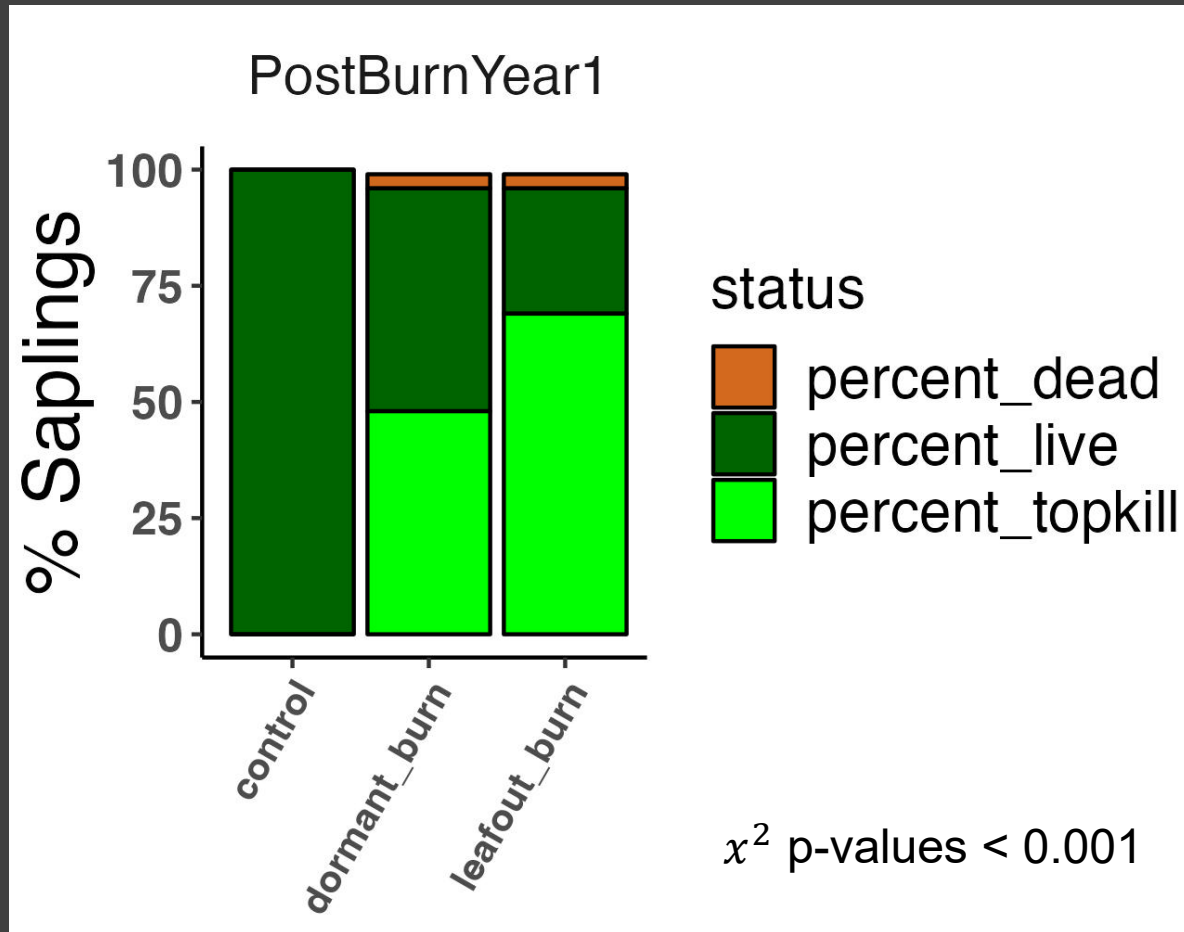
Acres Treated	
Fire Intensity	 Slightly higher Scorch, Similar fuels reduction



Greater than 1.37m height and a dbh < 7.62cm

Saplings

- Very little mortality after fire
- Substantial topkill
- More topkill in the leafout burn



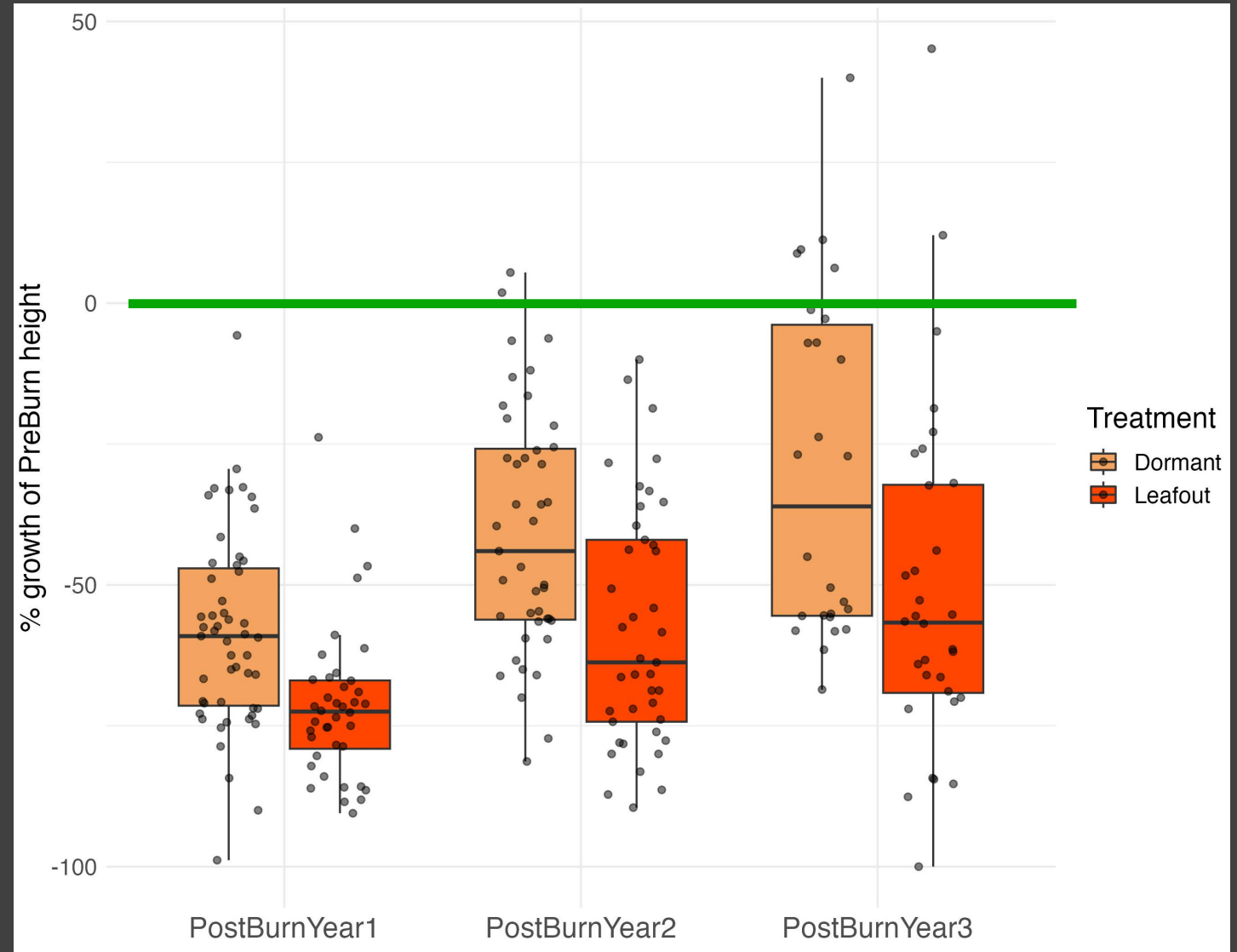
Sapling Recovery

Q: Does a sapling's ability to recover differ depending on whether it was burned during dormancy or leafout?

Hypothesis: Saplings that were burned with their leaves on would experience a larger negative physiological effect causing them to recover slower.

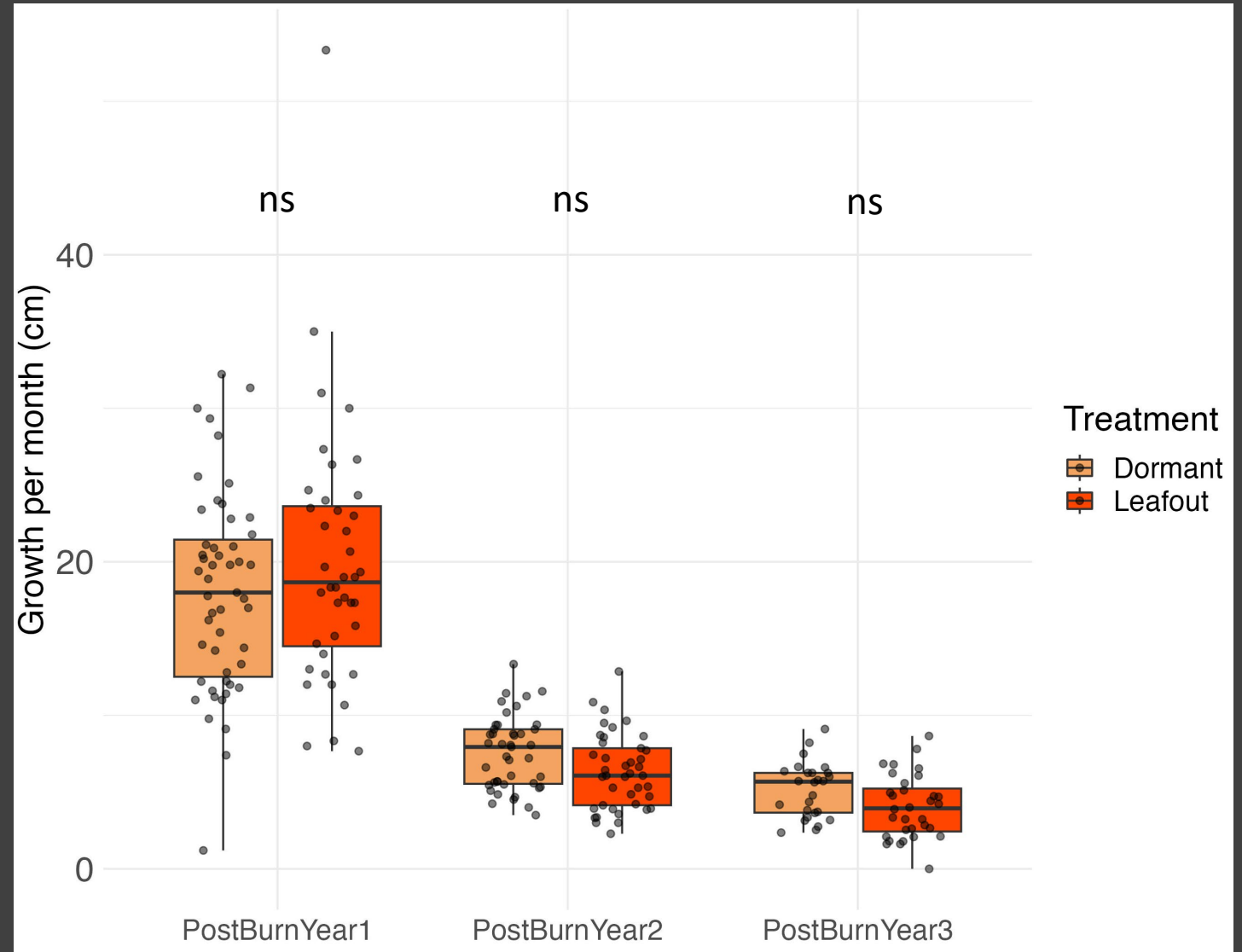
Sapling Recovery

- 3 years post-burn saplings are more than 50% of their pre-burn height
- Expected full recovery in 5 years

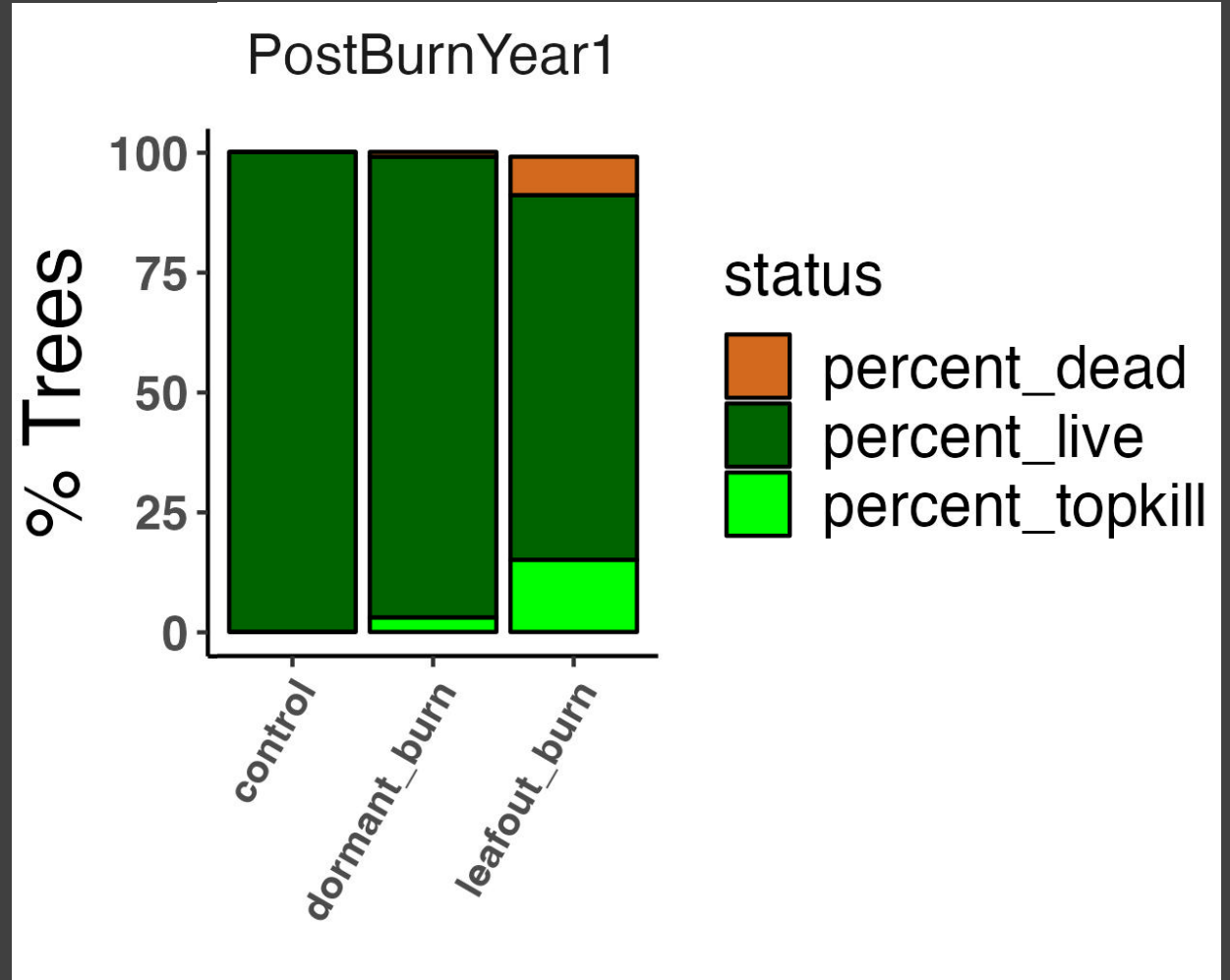


Sapling Recovery

- No difference in recovery rate between treatments
- 1st year growth is aggressive



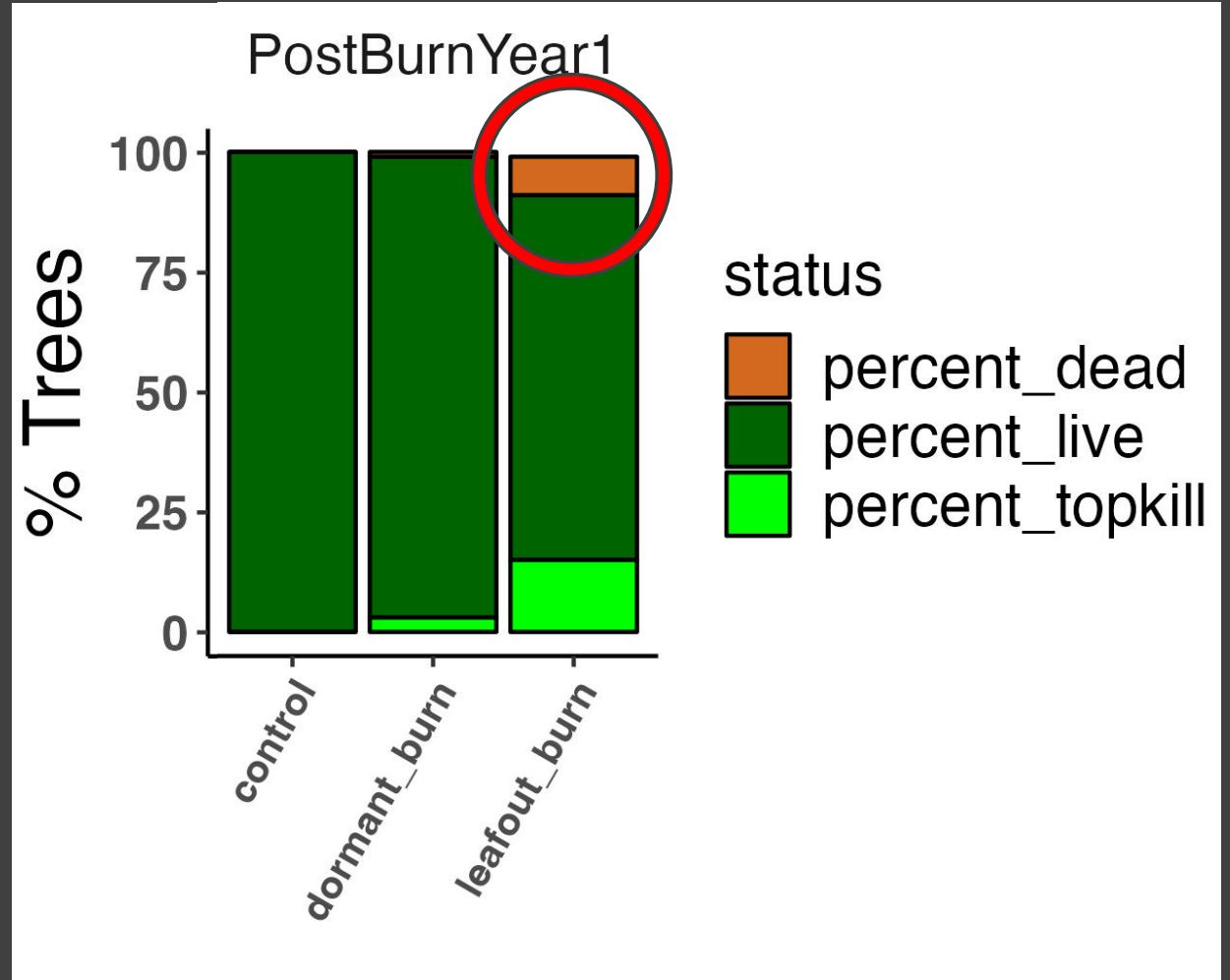
Adult Black Oaks



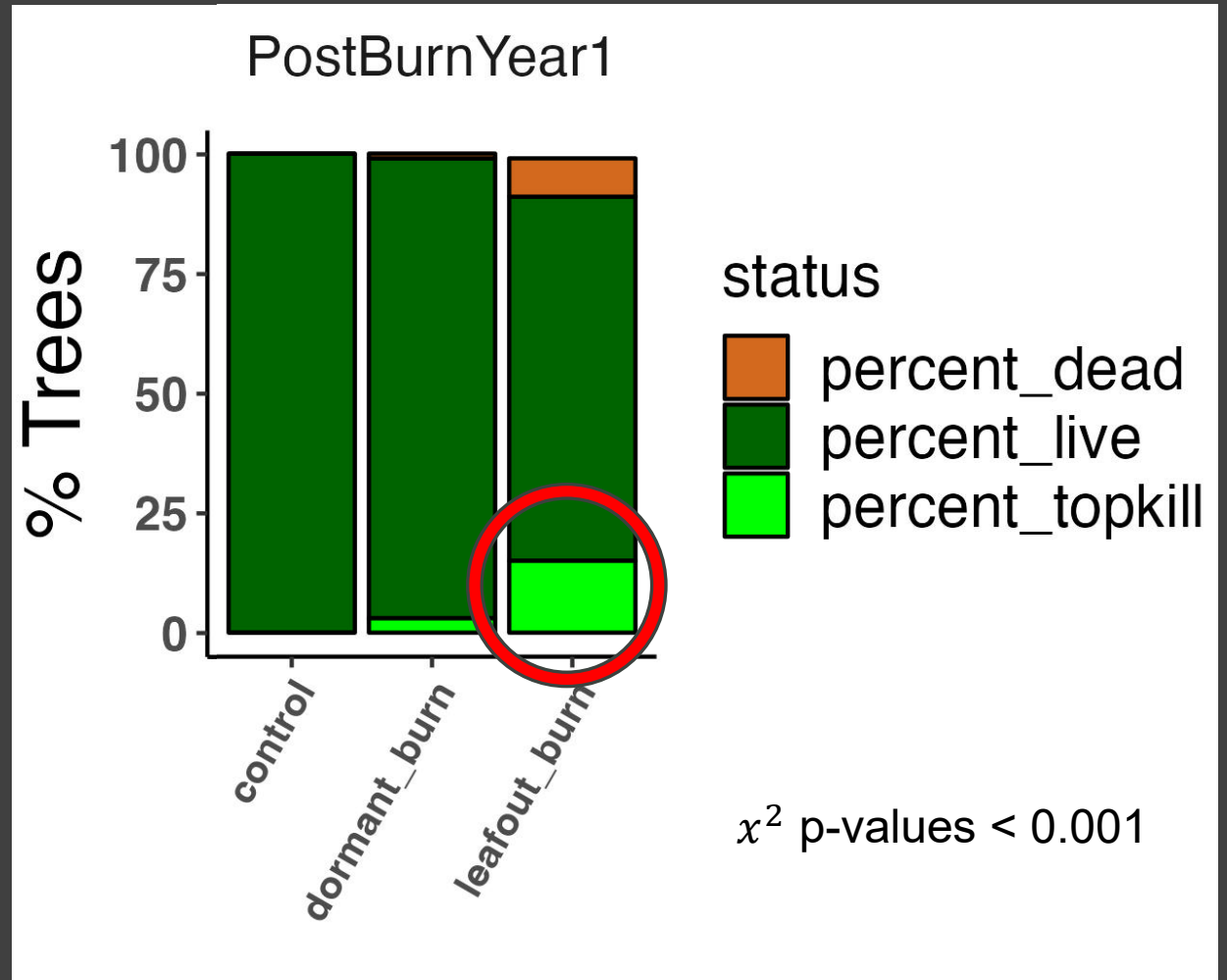
Dbh > 7.62cm

Adult Black Oaks

- Timing has little affect on adult survivorship
- Leafout burn results in higher topkill.

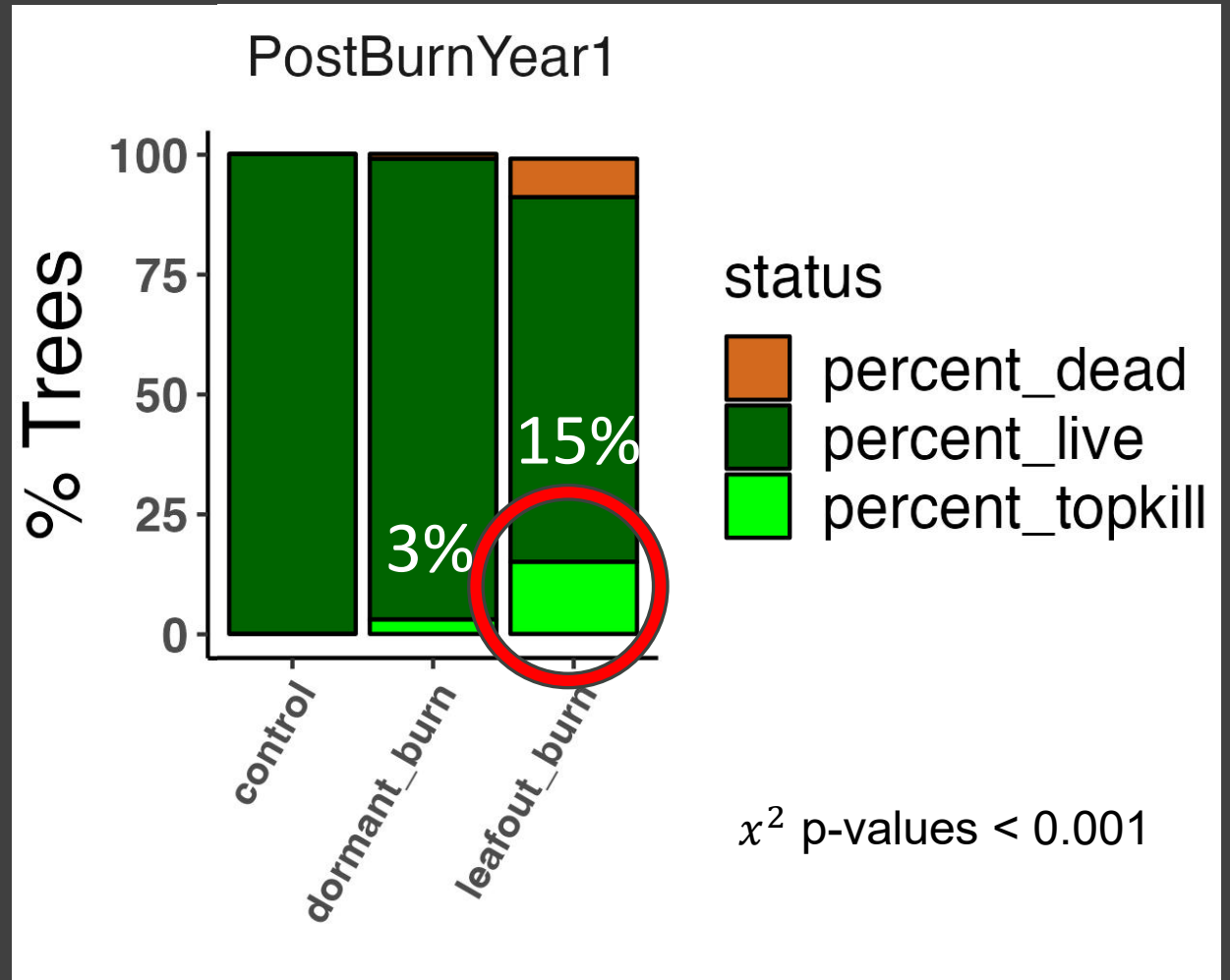






Adult Black Oaks







Adult Black Oaks

- Is this increase in topkill significant from a management perspective?



Acres Treated	
Fire Intensity	 Higher Scorch, Similar fuels reduction
Adult Oaks	 Low mortality. Slightly higher top-kill in Leafout burn.
Sapling Oaks	 Low mortality. Slightly higher top-kill in Leafout burn.

Trade-offs: Effects of Late Season Burn (Leafout)

Acres Treated	
Fire Intensity	 Higher Scorch, Similar fuels reduction
Adult Oaks	 Low mortality. Slightly higher top-kill in Leafout burn.
Sapling Oaks	 Low mortality. Slightly higher top-kill in Leafout burn.

Adaptive Management

Are there mitigation measures we can take to reduce topkill in adult oaks?

Methods- Adaptive Burn 2023



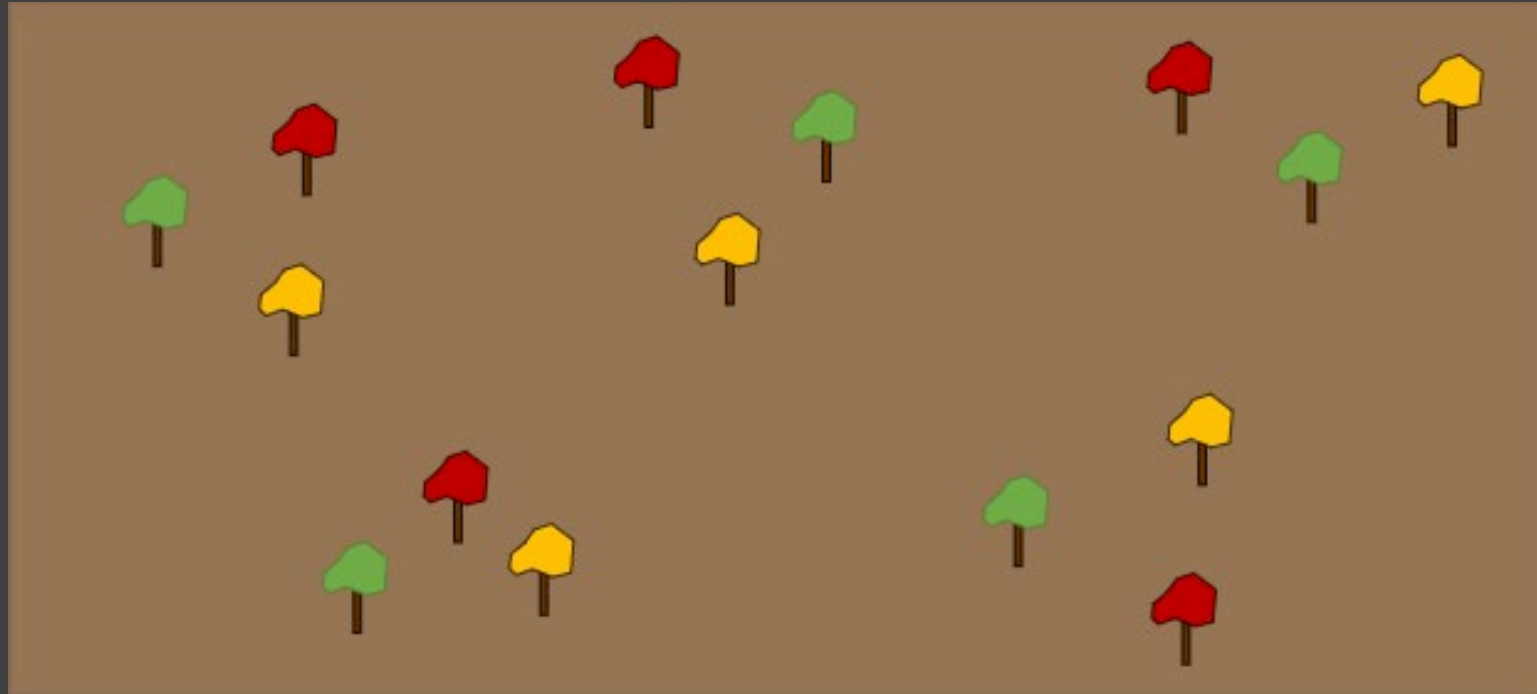
= fire ring around tree, 15 trees



= prefire limbing, raking, woody veg removal,
15 trees



= control, no treatment, 15 trees

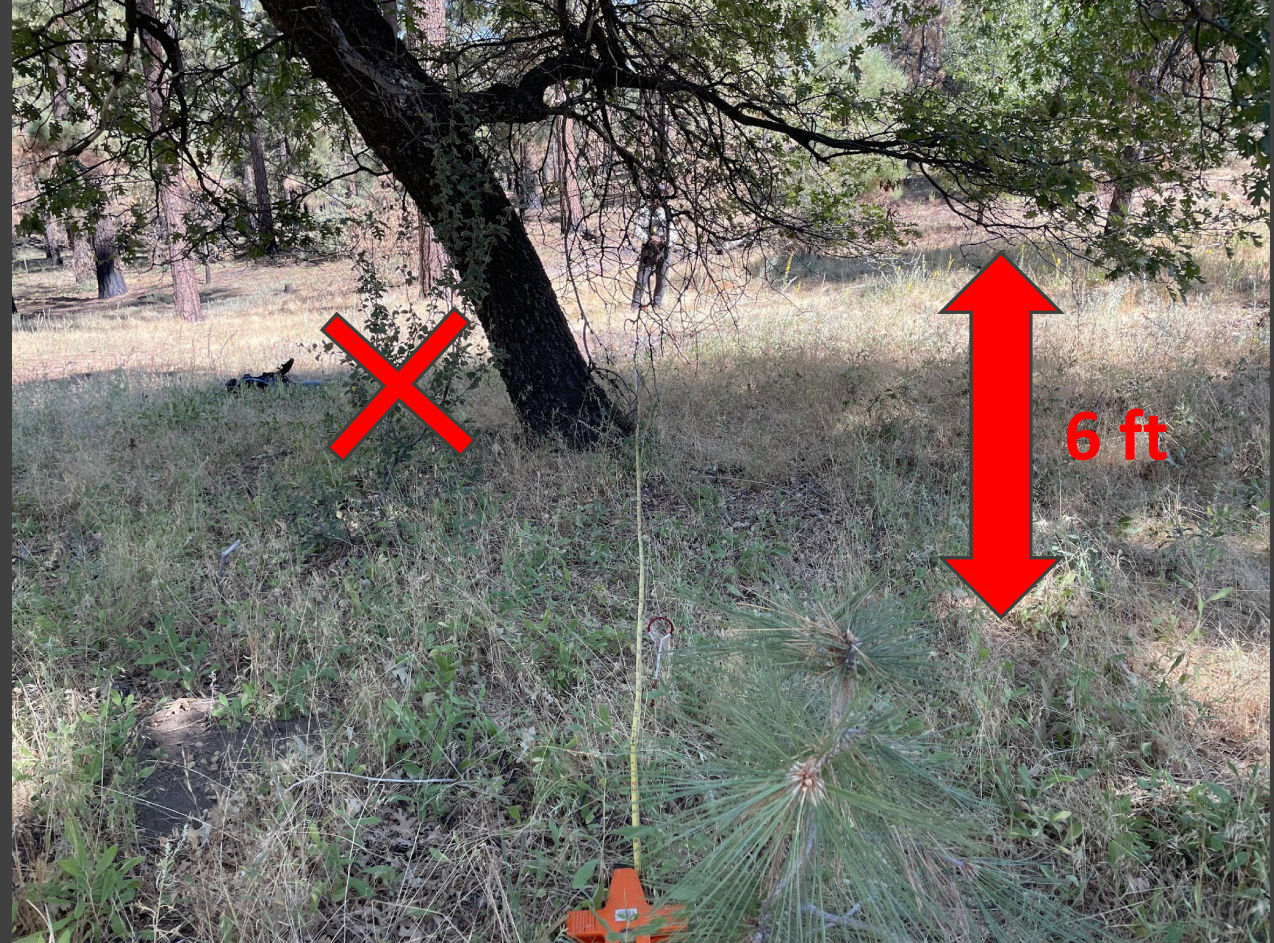


Methods- Treatments

Fire Ringing



Manual Removal- raking at base, limbing to 6ft, removal of woody understory



More Prescribed Fire!

Late May

Video: Michaela Dietzel

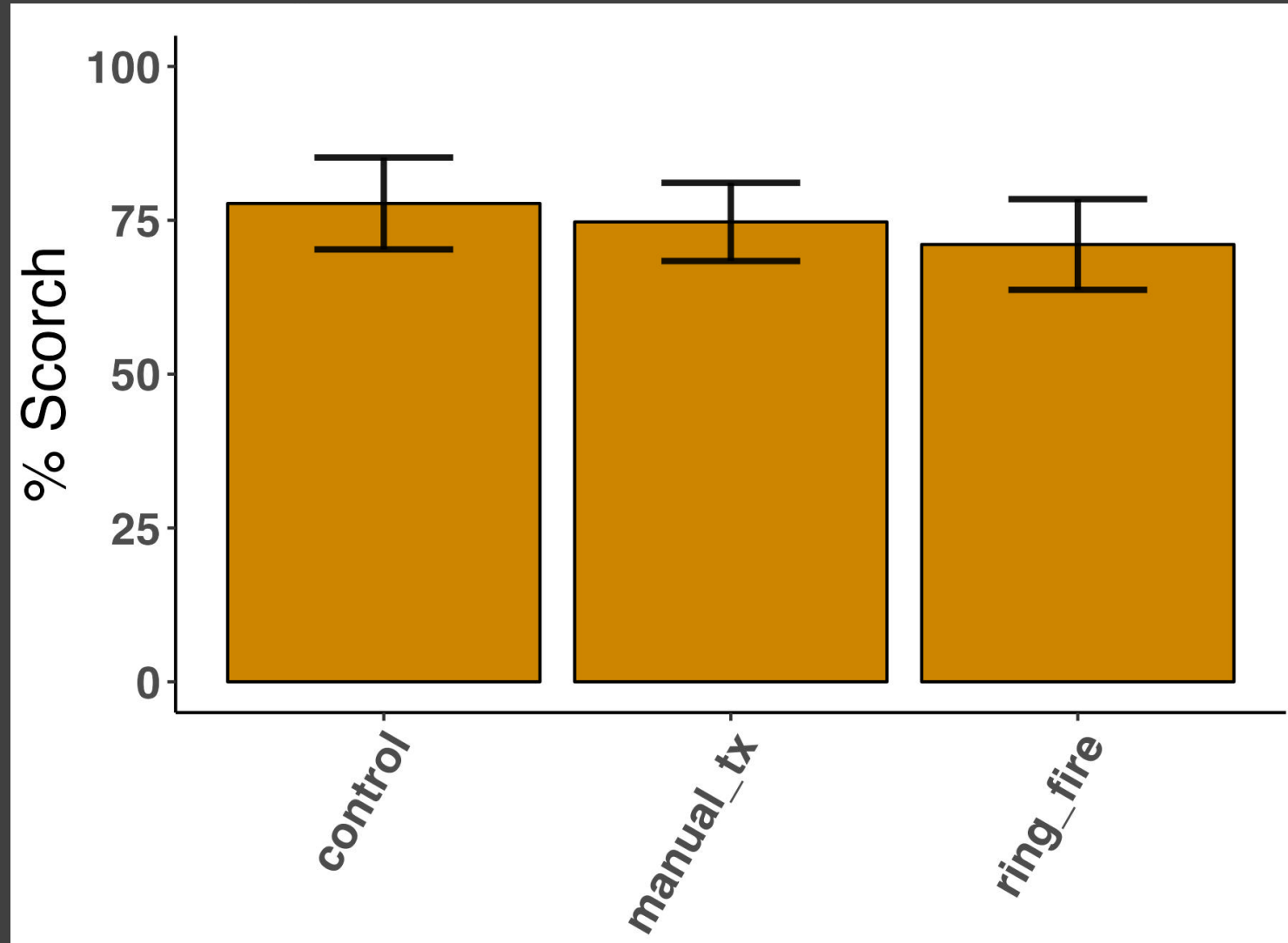


Scorch Percent of Trees

- Scorch percent is the same across treatments
- Scorch percent is high

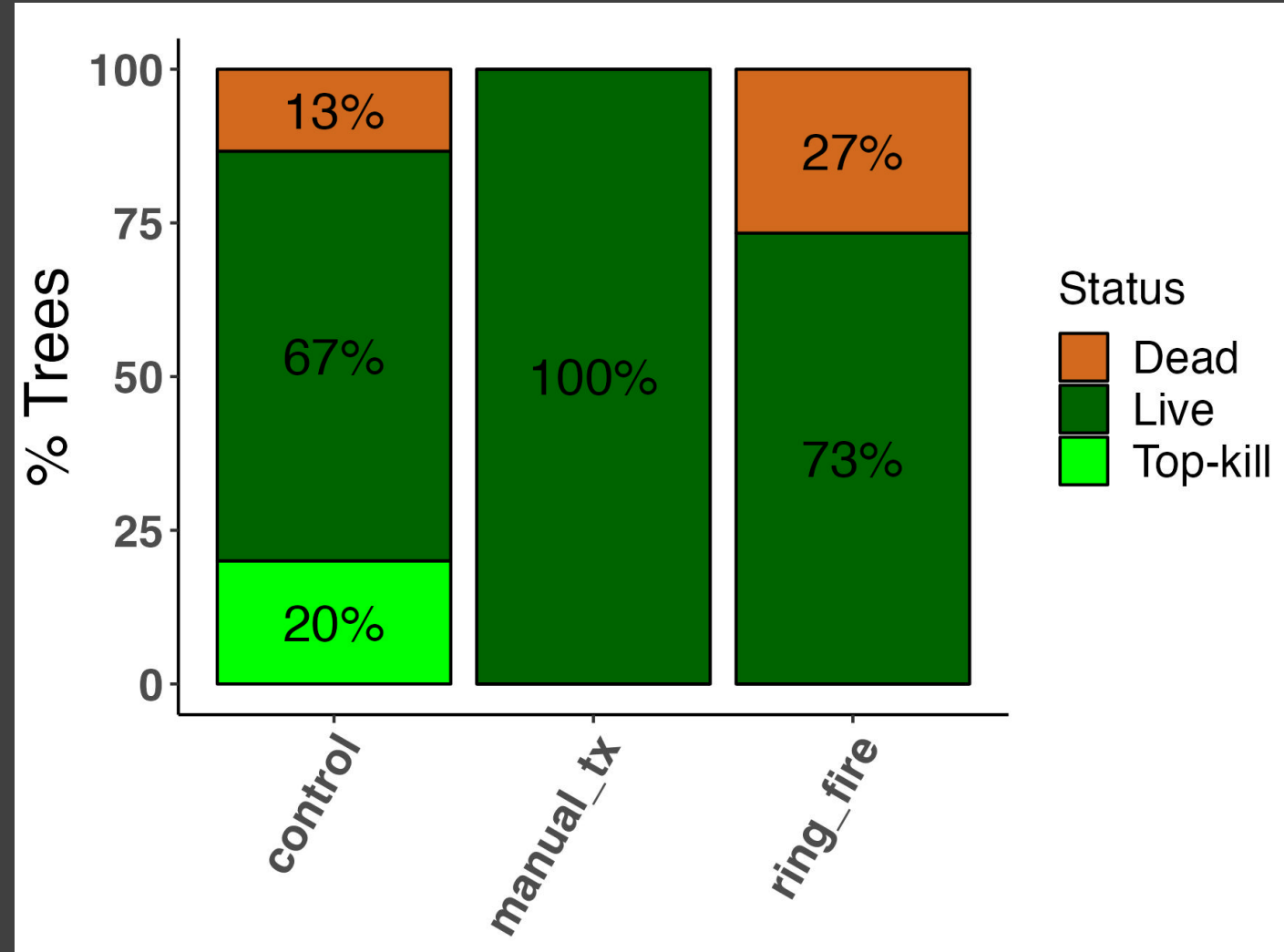
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HOT BURN



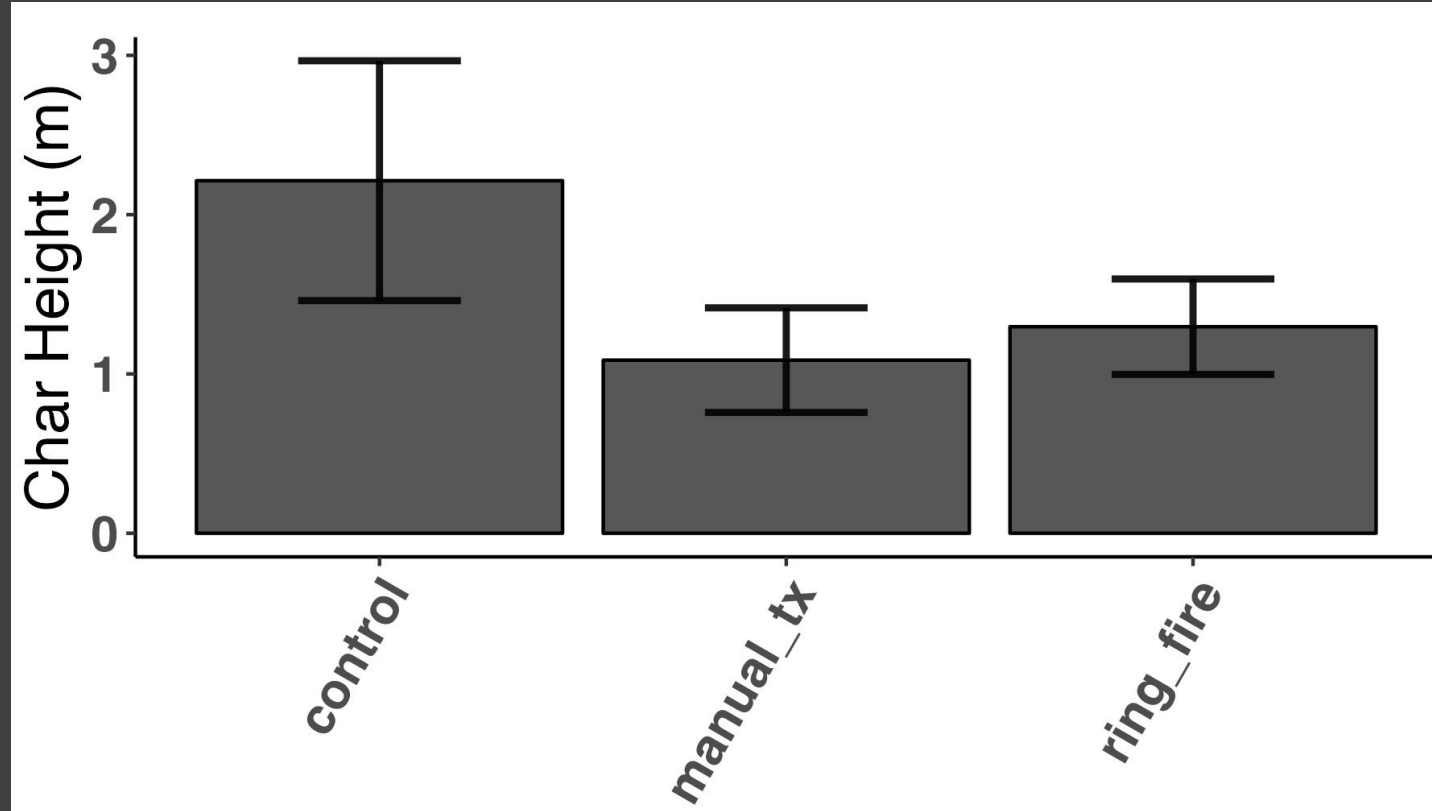
Tree Status Post-burn

- Control- only treatment with topkill
- Manual Removal- most effective
- Fire Ringing- no topkill but substantial death



Char Height of Trees

- Reduced char height in manual and fire ringing treatments



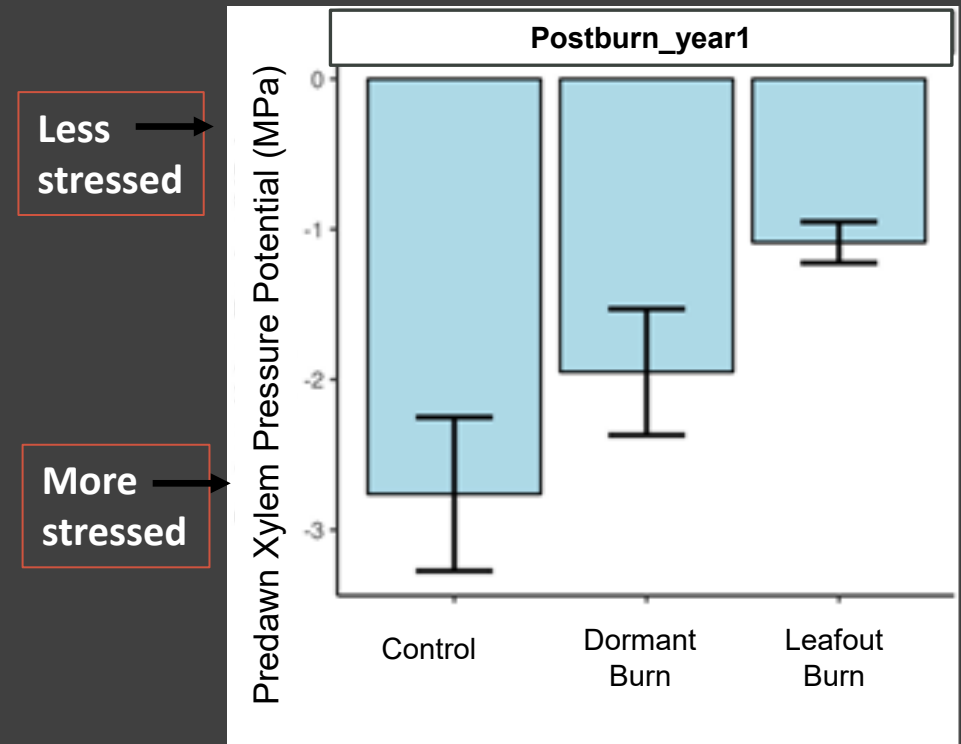
Summary, Saplings

- Prone to topkill regardless of timing
- Management objectives:
 - Reduce young oaks: Alternative strategy recommended.
 - Maintain young oaks: Rx fire effective with recovery < 5 years.



Summary, Saplings

- Prone to topkill regardless of timing
- Management objectives:
 - Reduce young oaks: Alternative strategy recommended.
 - Maintain young oaks: reduce water stress through late season burning



Summary, Adults

- Topkill most common later in the season
- Local context and project goals dictate acceptable levels of topkill
 - Warming, drought and high severity fire → oaks key players in future forests
 - Sensitivities due to Goldspotted Oak Borer

→ Management goals in southern CA often focus on retaining legacy oaks



Summary, Trade-offs

- Looking for a win:win
- Utilized partnerships to find answers:
 - CNF, UC Santa Barbara & USFS Ecology Program
 - Integrate findings into *Mount Laguna & Pine Valley Community Protection and Healthy Forest Restoration Project NEPA*
- Incredible framework for finding solutions to land management problems



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UC Santa Barbara



Questions

