

Reforestation at Hubert Eaton Scout Reservation

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(Team 13)



Outline

- 1. Brief Introduction**
2. General Information of Hubert Eaton Scout Reservation
3. Beetle and Fire History of HESR
4. Forest Restoration History of HESR
5. Our Findings
6. Our Solutions
7. Costs



Where?

Hubert Eaton Scout Reservation at Camp
Pollack

What?

Mixed conifer-oak woodland forest
restoration after battles with beetle and
fire

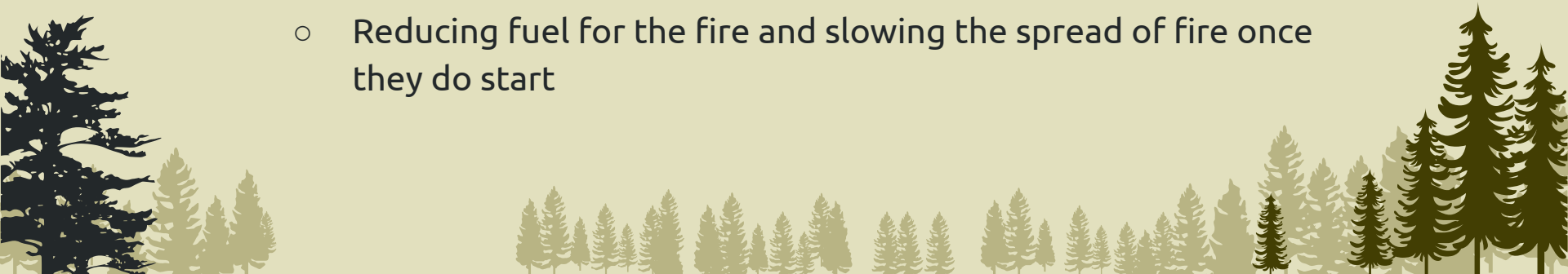
How?

Using strategies including mastication,
herbicide and controlled burns



HESR Forest Management Objectives

- Forest Health and Regrowth of Conifers
 - Returning the Forest to Pre-Fire Conditions which means reducing the number of oaks
- Mitigating Shrub Species
 - Shrub species outgrow the mixed conifer plant community after a fire
- Fire Protection
 - Reducing fuel for the fire and slowing the spread of fire once they do start

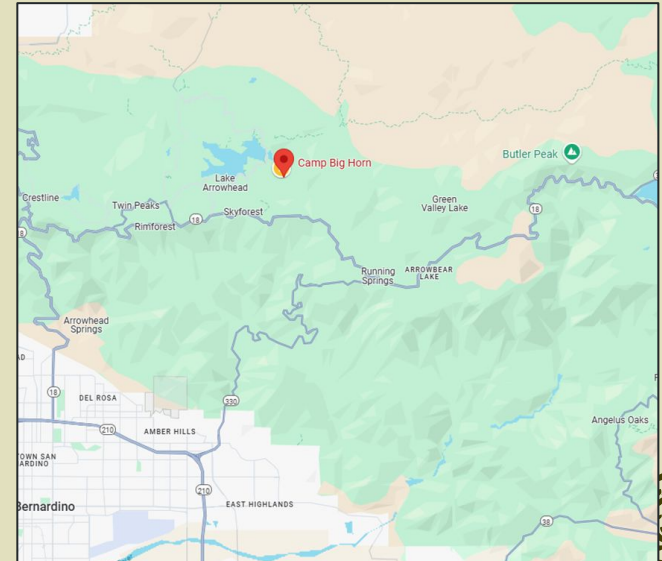


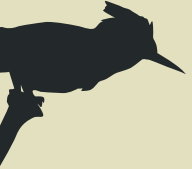
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General Information on HESR

- >2,000 acre property in San Bernardino County
- Private non industrial surrounded by federal forest
- 3 miles southeast of Lake Arrowhead
- Elevation: 5,200 feet - 6,400 feet
- Donated to LA Boy Scouts by the LA Turf Club
 - Some purchased from Utah International, Inc



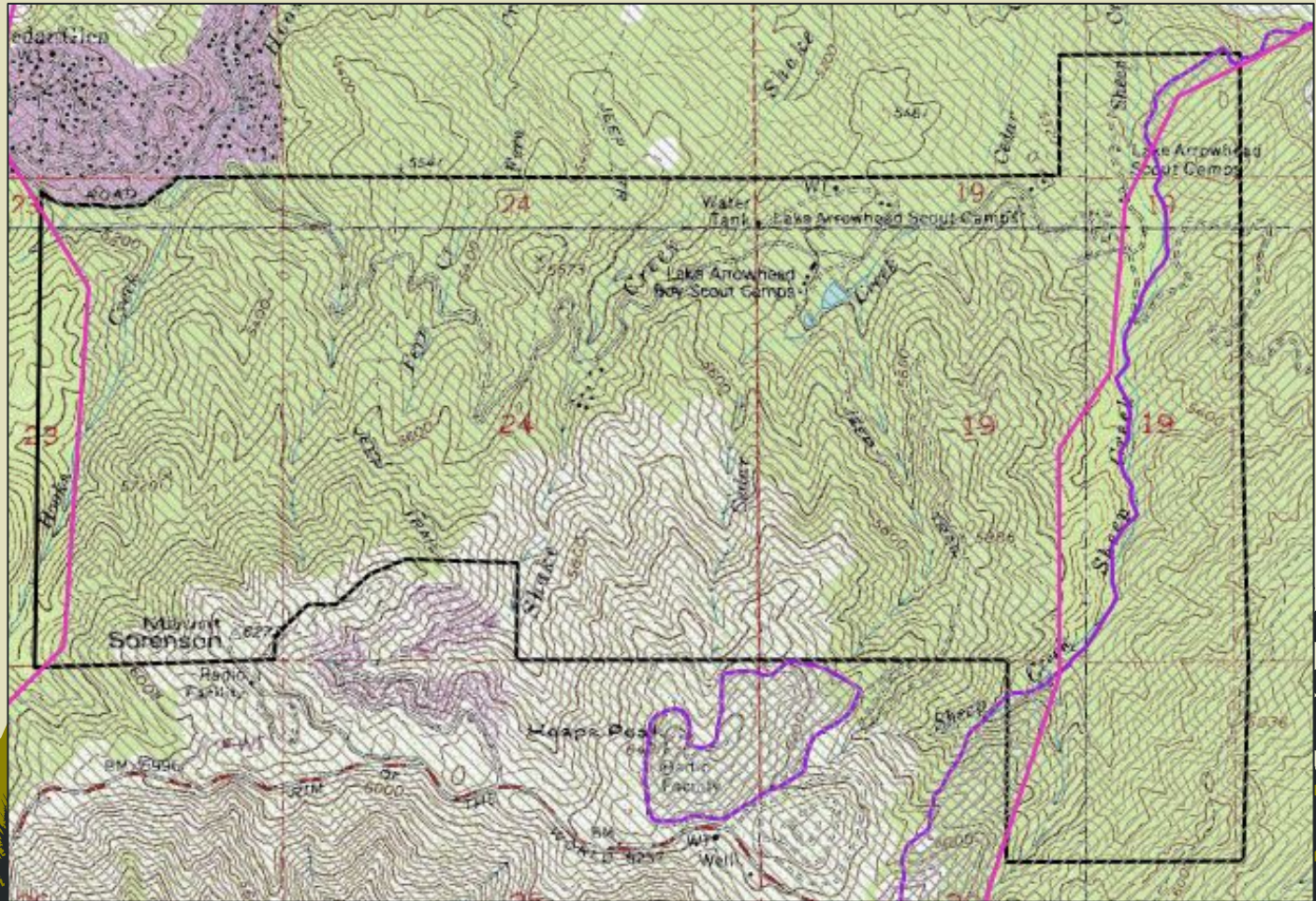


Shift in Use of HESR

- Originally used by Native Americans for food
- 1800s: Machining, logging, mining
 - Brookings Logging Company
- 1920s: Shift to recreation

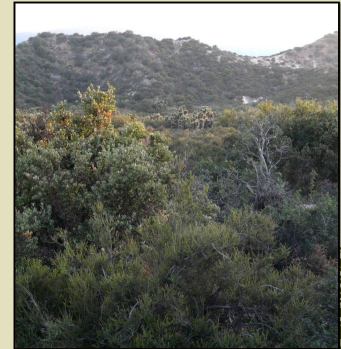


PROPERTY MAP



Forest Types

- The current property includes mixed-conifer woodland, oak woodland, riparian communities, and chaparral
 - Units 6 and 7 are mainly mixed oak woodland and chaparral
- Current forest is even-aged due to fires



Conifers vs Hardwoods

- **HESR has a combination of hardwoods and conifers**
 - Conifers: year round foliage provides shelter for species such as deer and squirrel
 - Hardwoods do not provide the same year round consistency
 - Good in moderation
- **When determining what to prioritize the differences are important**

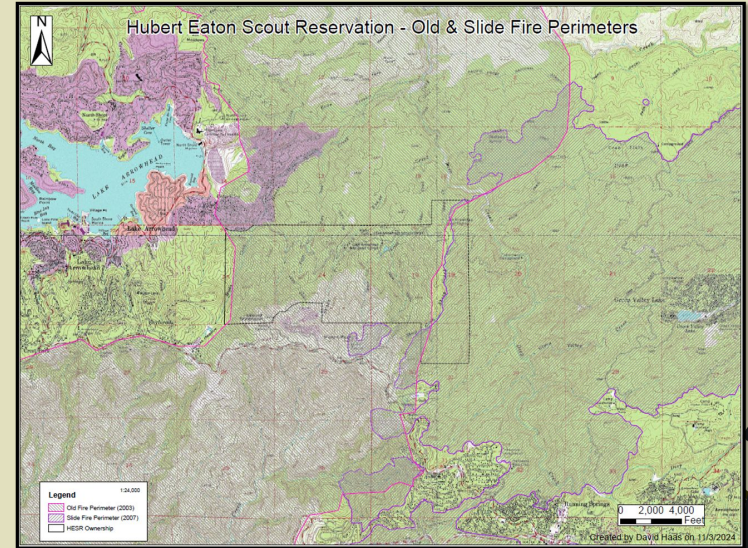


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Fire History

- Old Fire (2003) and Slide Fire (2007)
 - Destroyed large portions of the property
- Other fires in 1922, 1930, 1956, and 1991
- Restoration efforts must account for frequent fires





Fire Consequences

- Loss of timber and regeneration
- Increase in shrubs
- Decrease in canopy cover
 - Decrease in soil moisture
- Increase runoff
- Increased stress to remaining trees
 - Susceptible to insects and disease



Bark Beetles Infestation

- First reports approximately 60 miles away from HESR in 2000
- At first in Coulter pines
- Eventually made its way to HESR and peaked in 2002-2003
- Infesting pines, spruce, firs, and cedars
- Population began to decline in 2004
 - Due to drought and low amounts of hosts



Bark Beetles Effects

- The biggest killer of pines in the early 2000s
- 78% mortality in >17 DBH Coulter pines
- 73.5% mortality in >17 DBH Ponderosa pines
- Giant gaps in forest canopy
- Oaks mostly unaffected, letting them dominate HESR

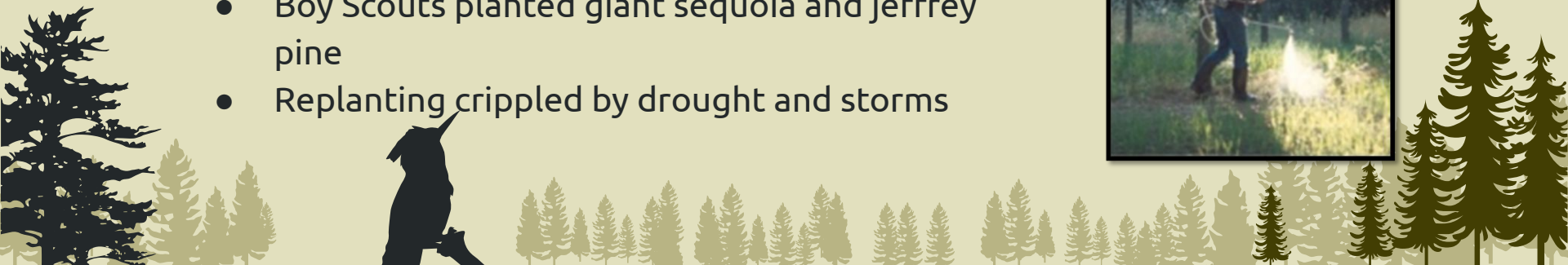


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Forest Restoration History

- Primary objectives: Fuel management and forest restoration
 - Removal of dead trees
 - Mastication
 - Herbicides
 - Planting mixed conifers (150-200 trees/acre)
- Boy Scouts planted giant sequoia and jeffrey pine
- Replanting crippled by drought and storms



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Plot Maps

- Elevation of over 5000 feet
- Warmer than optimal
- Some steep “gnarly” terrain



Our Plot

- **Conditions**
 - Steep—huge machinery will not be effective
 - Hot, dry, little moisture
- **Brush hazard**
 - Dense, high, unrestricted growth
 - Incredibly dry and flammable
 - Tons of logs/snags
- **Oaks**
 - Very dominant black oak population
 - Little pines/conifers



Soil

- After further research using Satellite/GIS data our plot seems to have an abnormally low soil moisture content
- Likely due to limited canopy cover due to burned pines
- Not ideal for growing new pines

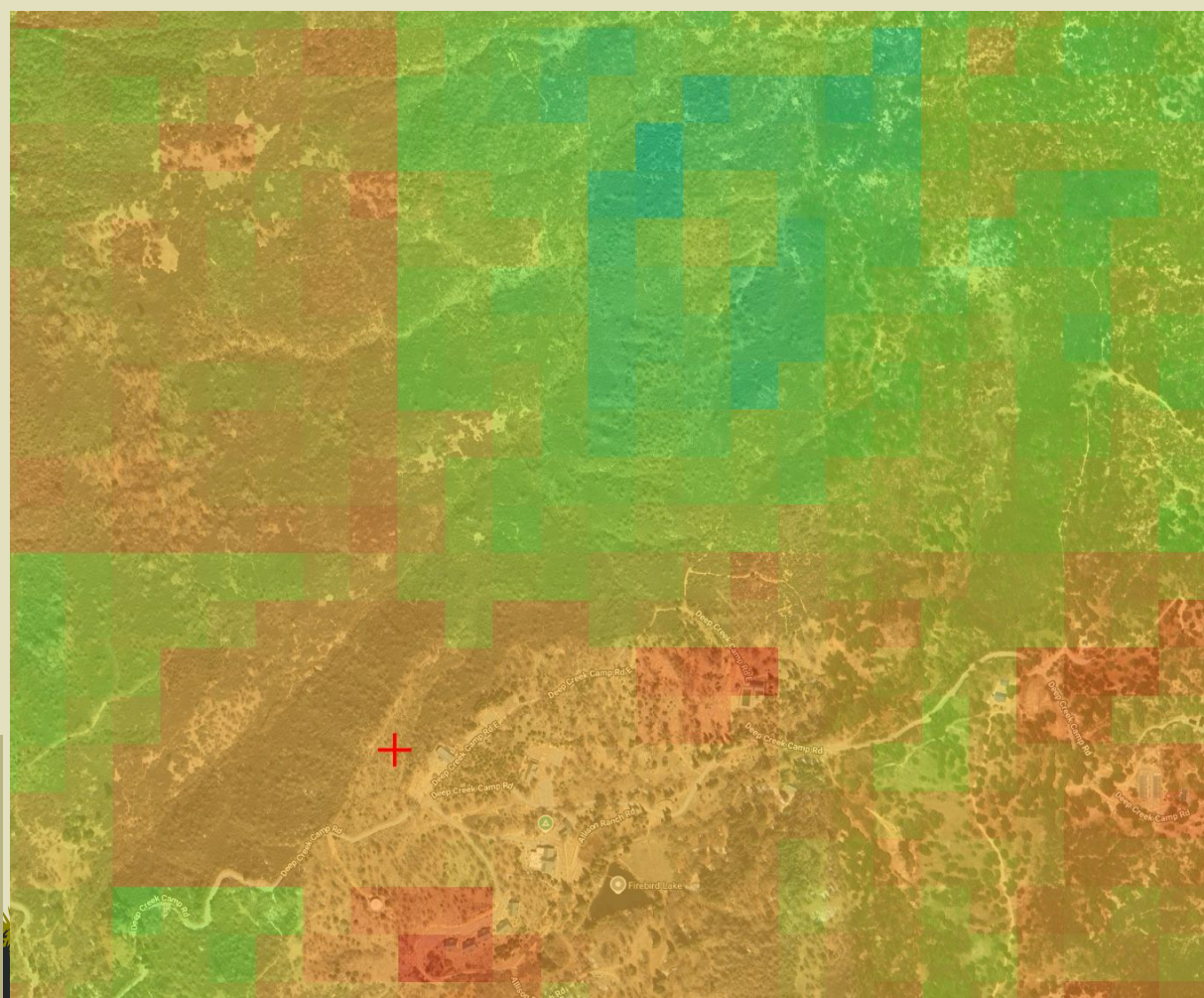
KEY

Green— High moisture

Orange— Low moisture

Red— Dry (roads/infrastructure)

+ — Our plot



Data Collection Techniques

- Group were assigned a circle plot of radius 37.2 feet
- Students were tasked with measuring:
 - Number of trees and their species and age cohort
 - Before old fire, after old fire, natural regeneration, and planted in '21
 - Number of stumps diameter ≥ 10 inches
 - Canopy cover
 - Using densitometer

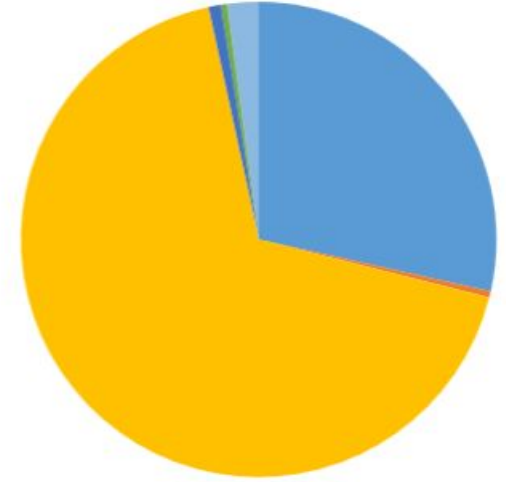


Data Findings



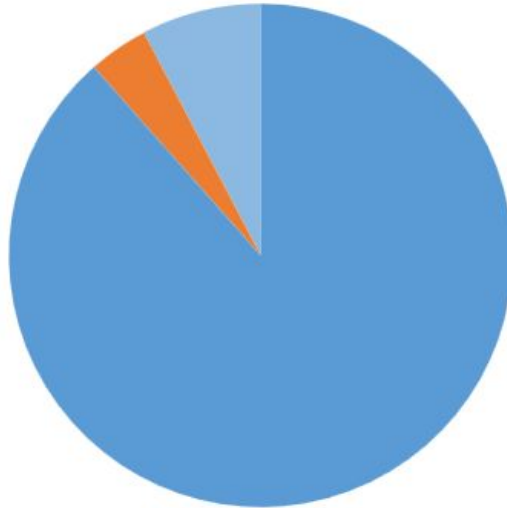
Total Species Comp

- Ponderosa/Coulter/Jeffrey Pine
- Sugar Pine
- Black Oak
- Live Oak
- Incense-cedar
- Giant Sequoia



Species Comp Planted After 21

- Ponderosa/Coulter/Jeffrey Pine
- Sugar Pine
- Giant Sequoia



Data Findings

Plots Collected	33	
Total Acreage collected	3.3	
Trees Collected	239	
Trees/Acre	72.4	
Average Number of Stumps/;	17.0	
Average Live Brush Cover	29%	
Average Dead Brush Cover	37%	
Average Canopy Cover	37%	

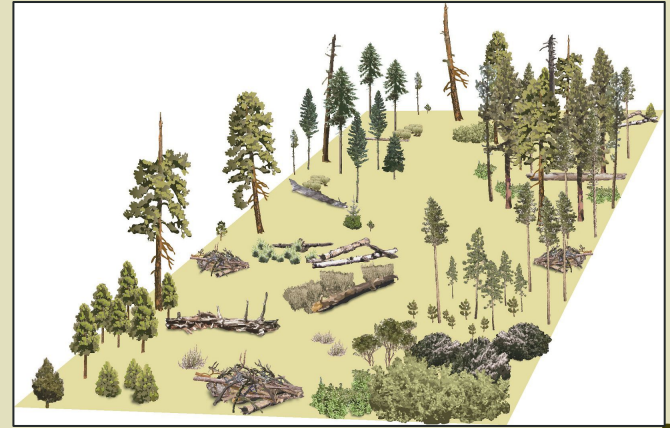


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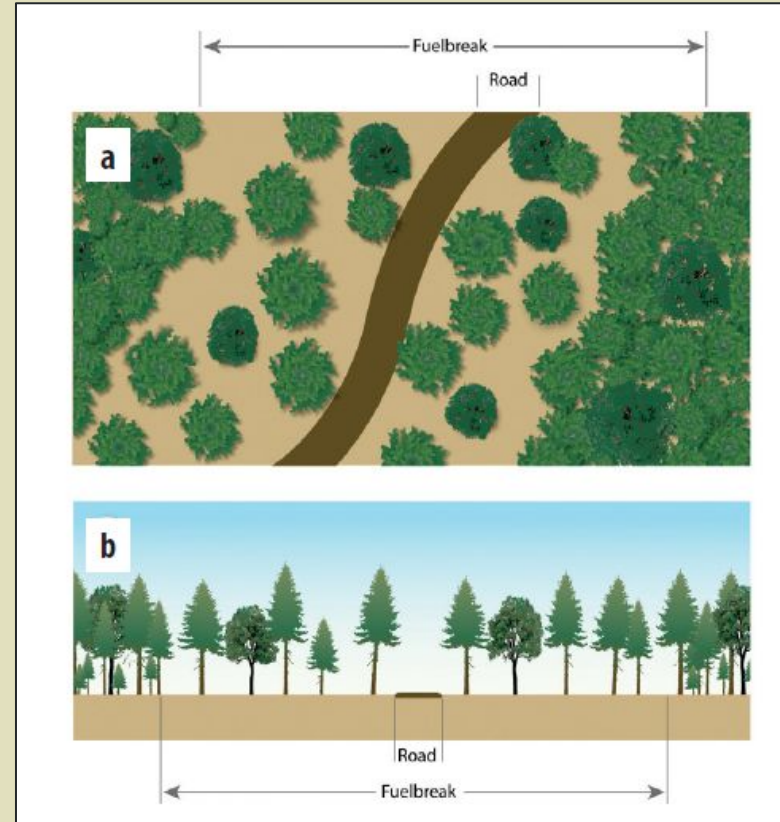
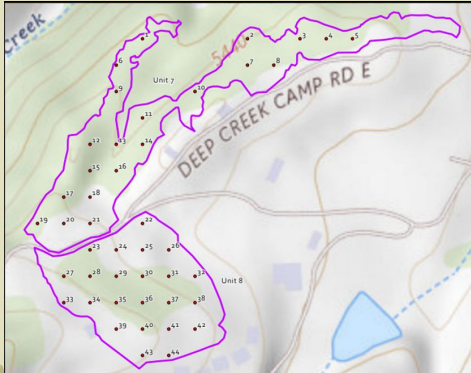
ICO Planting

- Prefire conditions contained mostly conifers
- Species composition has shifted
- ICO (Individuals, clumps, and openings)
 - Clumps- Regulate weather and storm
 - Individuals- Shade intolerant species
 - Openings- Creates discontinuity



Shaded Fuel Breaks

- Plots are generally flat with some valleys North
- These are ideal for fuel Break
 - These will create fuel discontinuity



Mastication

- Getting rid of oak creates extra wood which can be turned into mulch
- This is useful for
 - Preventing soil erosion
 - Water conservation
 - Growing intended species
- Conifers need more water than black oaks
- Brush suppression
 - Covering brush negates some of the rapid growth advantage over conifers



Kindling and Mulch

- Mulch piles over 3 inches kill microorganisms in soil
- Areas with many oaks may need to be given to scouts for projects
 - This further serves the land owners intentions



Planting Pines

- Prefire conditions contained mostly conifers
- Species composition has shifted
 - Oaks grow back quicker
- Replanting pines remediates this advantage
 - Bringing back ideal range



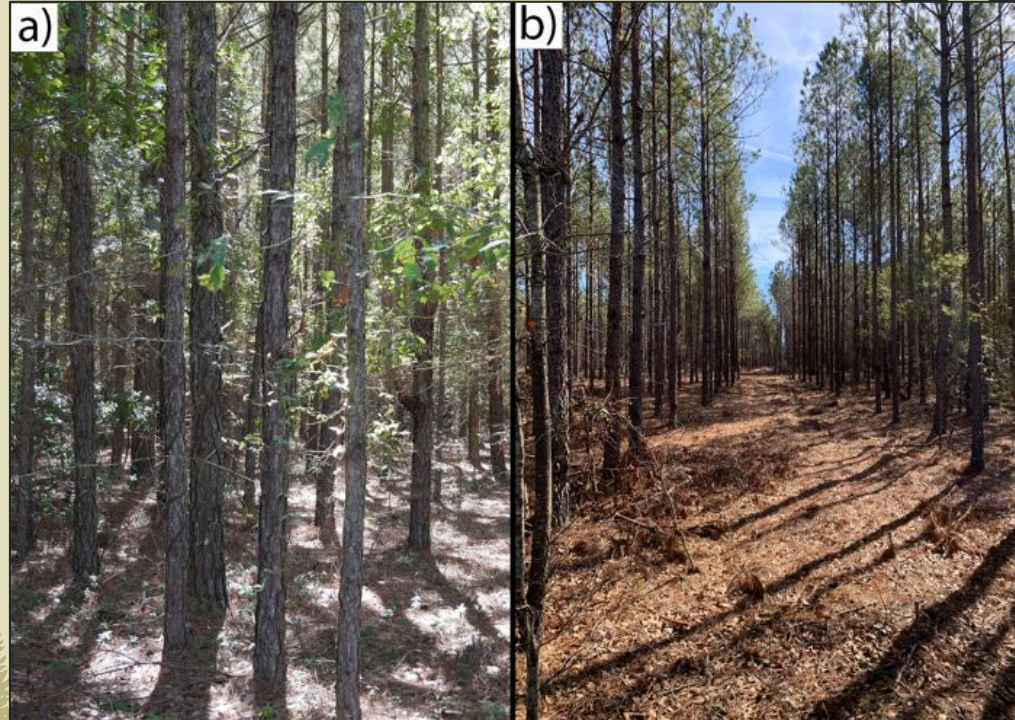
Managing existing oak populations

- Oaks are living hydras—you cut down one trunk and another will spring up eventually
- So we are proposing to use herbicides after hand felling



Challenges

- Drought/low soil moisture
 - Woods chips from recently masticated oaks
 - Traps moisture
 - Prevents drying
 - Suppress weeds/competition



Challenges

- Topography limits use of feller bunchers.
 - Instead use hand felling
 - Due to challenge of very steep terrain
 - Reduced soil disturbance for new pines
 - Expensive but necessary
 - Grants will help manage costs

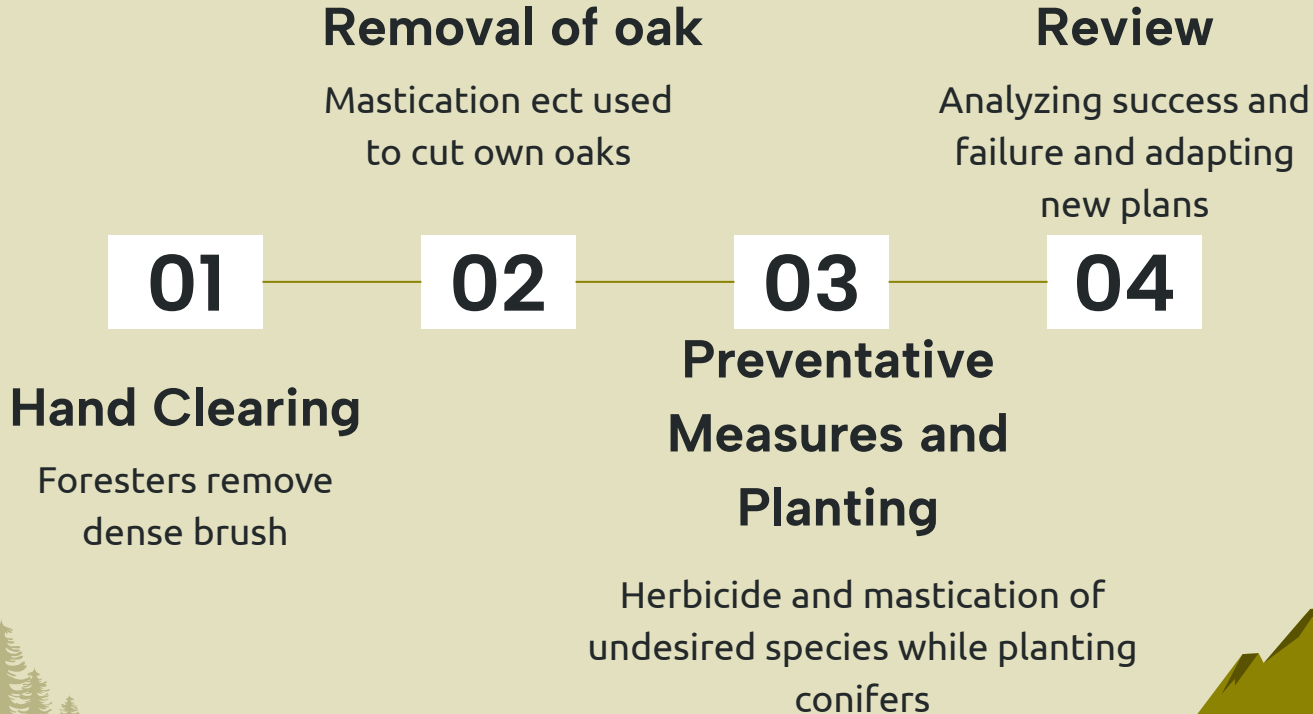


Challenges

- Low access due to dense and high brush
 - Hand clearing using chainsaws in hard to reach areas
 - It is expensive however it is one of the only options due to terrain and controlled burn practices
 - Mulchers in flat areas



Reforestation Timeline



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CFIP

- California Forest Improvement Program
- Willing to pay portion of various treatments per acre
- Assume consumer costs to be about 40% of CFIP cap rates
 - According to Jeremy Zagarella, registered forester with California - RPF #3229



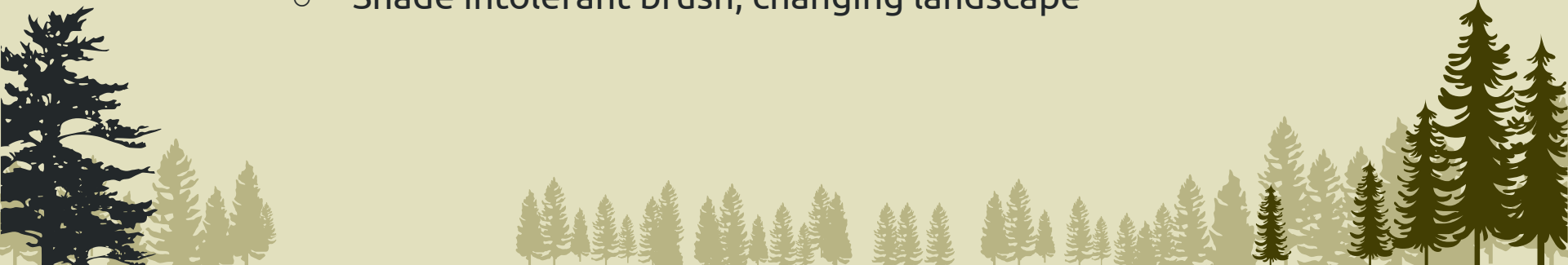
Short Term Treatments

- Site Preparation Mechanical – Heavy: \$1,340
 - Heavy cover of brush and some oak trees to be removed
- Trees & Planting – Light: \$338
 - Mixed conifers to be planted
- Release: Mechanical – Light: \$670
 - Decrease competition for young crop trees



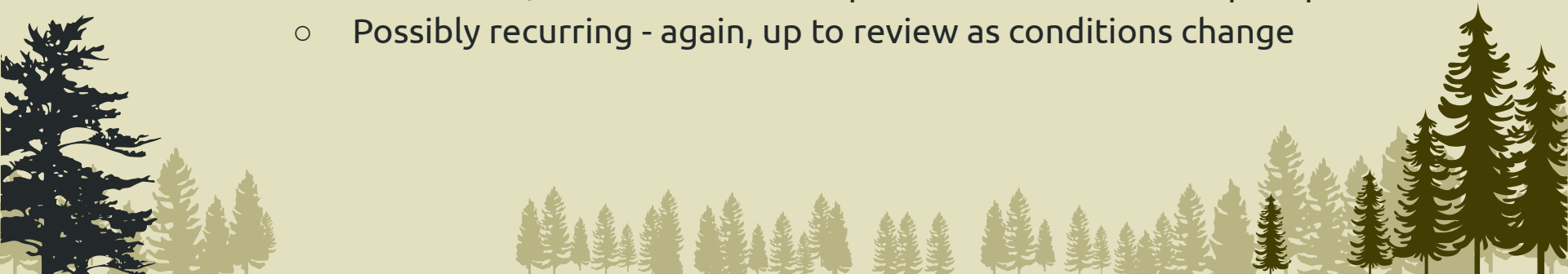
Long Term Treatment

- Tree Shelters: \$416
 - Shade cards, manual watering, etc.
- Follow-Up Herbicide – Moderate: \$644
 - Limit oaks and brush from regrowing and outcompeting conifers
- Review after conifers grow tall enough
 - Shade intolerant brush, changing landscape



Implementation Cost

- Short term:
 - Site Prep + Release + Planting = \$2,348 covered by CFIP
 - $2348 * .4 = \$939.2$ estimated cost per acre to prepare and plant trees
- Long term:
 - Shelters + Follow-up= \$1,060 covered by CFIP
 - $1060 * .4 = \$424$ estimated cost per acre for continued upkeep
 - Possibly recurring - again, up to review as conditions change





Funding

- CFIP covers the majority of cost
- Bordering a National Forest
 - National Government would be inclined to help prevent fires
 - Possible collaboration and aid in management



Grants

- California Rises 2025 Grant for Disaster Relief & Recovery
 - Apply under the focus topic of fire mitigation
 - In the past, they diverted 38% of the annual fund to fire prevention



The Cost of Doing Nothing

- Potential for Fire (Headwater Economics)
 - Property loss
 - Further worsening of shrubs and oaks



Resources

Jeremy Zagarella, registered forester with California RPF #3229

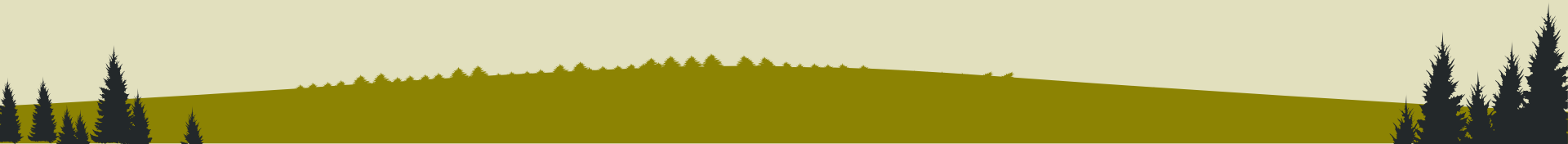
Kaylee Burr, forestry major at Reedley College

Fransisco De La Torre-Allen, Natural Resources/Natural Science Student at Shasta College

Socioecological Impacts of the Western Pine Beetle Outbreak in Southern California: Lessons for The Future, Christopher J. Fettig

Head Water Economics- Kelly Pohl

CFIP Cap Rates for Practices (REV. 06/2025)



**Thank
You!**



Fire Spread

