THE EFFECTS OF FIRE INTENSITY ON SOIL MICROBIAL COMMUNITIES AND ECTOMYCORRHIZAL FUNGI IN BLUE OAK WOODLANDS

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INTRODUCTION

California is experiencing more frequent and destructive wildfires due to climate change and human-caused environmental disturbances (Williams et al., 2023). The 2024 Park Fire, the fourth-largest fire in state history, burned 429,603 acres across Butte and Tehama Counties (CAL FIRE, 2024). Within this area, the Big Chico Creek Ecological Reserve, home to vital blue oak woodlands, experienced significant damage across 7,000 acres, impacting both flora and fauna (Big Chico Creek Ecological Reserve, 2024). While fire is a natural process in many California ecosystems, the impact of varying fire intensities on soil health, microbial communities, and plant-fungal interactions is poorly understood (Hewitt et al., 2023). One key interaction is the symbiotic relationship between *Quercus douglasii* (blue oak) and ectomycorrhizal fungi, which support nutrient and water exchange, plant defense, and soil erosion control (Matthew et al., 2007; Yi Dong et al., 2018). Given the essential role of these fungi, this study aims to investigate the effects of fire intensity on soil fungal communities and the survivability of ectomycorrhizal fungi in blue oak woodlands impacted by the Park Fire. By analyzing soil cores from high, medium, low, and no-fire intensity zones, as well as conducting greenhouse experiments with blue oak seedlings, this research will provide insights into fungal resilience and its role in ecosystem recovery.

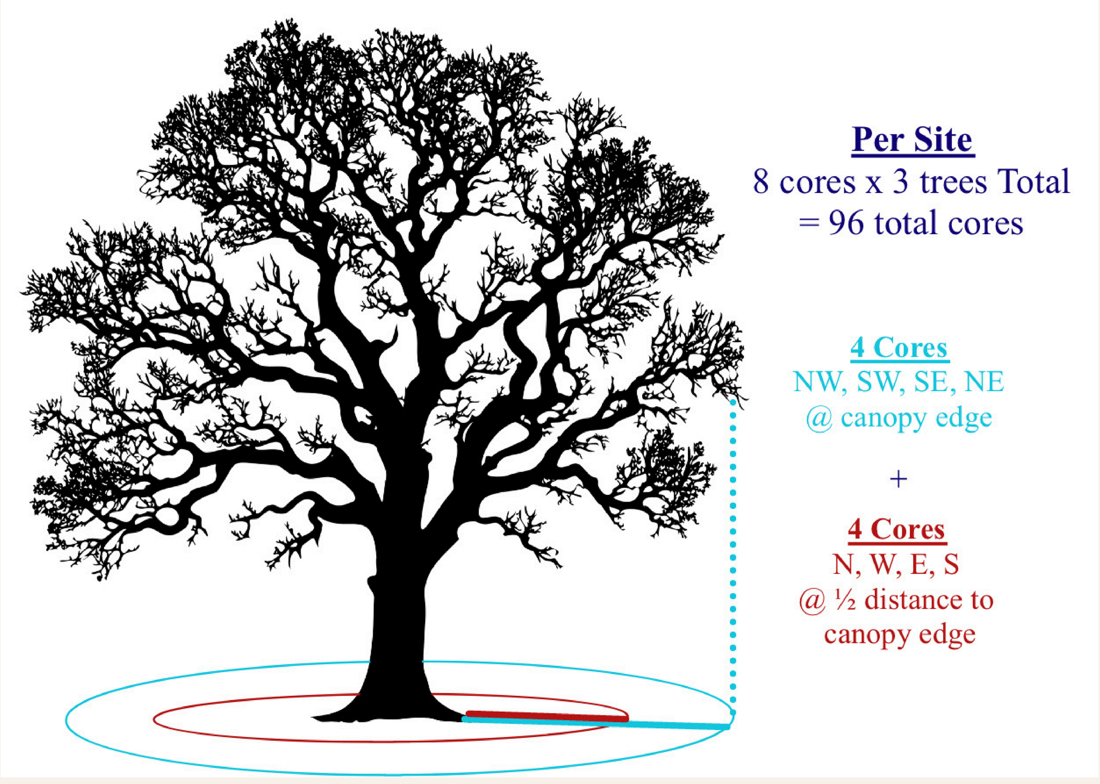
HYPOTHESES

- Q1: How does fire intensity influence soil fungal community composition post-fire?
    - H1: Soil fungal community composition will correlate with fire intensity; higher fire intensity will be associated with reduced fungal diversity.
- Q2: How does burn intensity impact ectomycorrhizal recruitment in blue oak seedlings post-fire?
    - H2: Blue oak seedlings grown in soil from low and medium-fire-intensity zones will exhibit higher ectomycorrhizal recruitment than seedlings grown in soil from high-intensity zones.

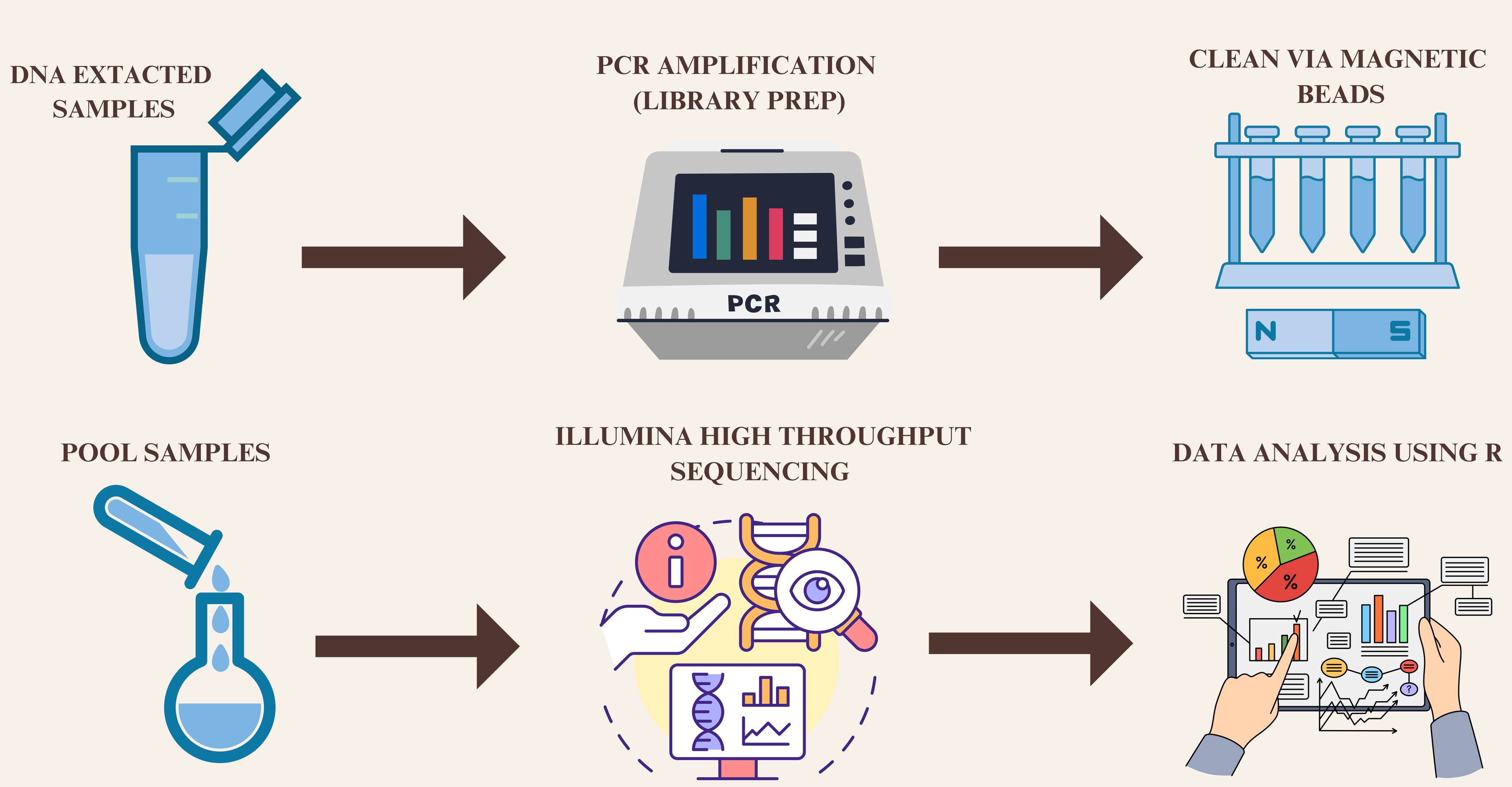
METHODS

Field Sampling

- 4 sites: Low Fire Intensity, Medium Fire Intensity, High Fire Intensity, No Burn
- 3 trees per site were chosen at random
- Soil cores were taken using a 9 in. Stainless Steel Bulb Planter



Community Composition



Fungal Baiting

- Blue oak seedlings grown in soil samples from each fire intensity zone.
- Fungal recruitment will be assessed by monitoring ectomycorrhizal colonization on the blue oak roots.
- Root samples will be examined for fungal colonization; ectomycorrhizal establishment across different fire-intensity soils

SIGNIFICANCE

- Understanding blue oak symbiotic relationships post-fire is crucial for maintaining these woodlands amid increasing wildfires.
- As wildfires increase in intensity and frequency due to climate change, understanding their effects on soil and microbial communities is essential for ecosystem management and restoration
- Ectomycorrhizal fungi play an important role in nutrient and water exchange for blue oaks. For ecosystems, blue oaks offer and support biodiversity and prevent soil erosion.
- Even though fire is a natural process in many ecosystems, the specific effects of fire intensity on soil fungal communities and ectomycorrhizal fungi in blue oak woodlands remain unclear.
- Findings could guide post-fire restoration practices not only for the Big Chico Creek Ecological Reserve but for other blue oak woodlands throughout California. It can tell us where to focus replanting efforts or whether soil modifications might enhance fungal recovery.

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