SJSU | WILDFIRE INTERDISCIPLINARY RESEARCH CENTER

Deciduous Plants are More Hazardous than Previously Found in Home Ignition Zone

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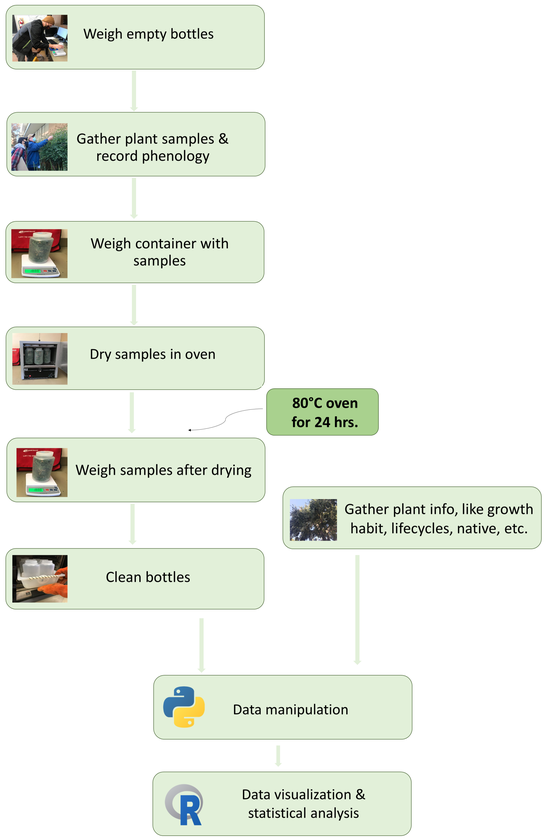
Introduction

Defensible spaces around homes are a key component to mitigate their wildfire hazards. However, a lack of studies on the plant hazards has led to a limited amount of information available for residents, especially in California. Although plant fire behaviors are complex, the simplest measure for plant fuel hazards is live fuel moisture: the percentage of moisture in each plant (fresh plant weight- dried plant weight/dried plant weight x 100). In this study, we measured the live fuel moisture of plants at SJSU and explored characteristics that affect live fuel moisture.

Characteristics investigated are:
- Growth Habit
- Native vs. Non-native
- Irrigation
- Deciduous vs Evergreen
- Herbs vs Non-Herbs
- Conifers vs Non-Conifers
- Resin

Wildfire in Healdsburg, California[1]

Method



Results

These results are raw data. We had few data points and thus lacked enough power to detect significance with mixed effect models.

1. Deciduous vs Evergreen

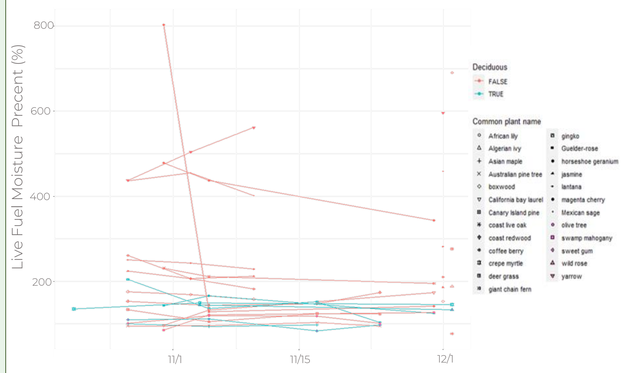


Figure 1a. Live fuel moisture percent of plants from late October through early December. The shape indicates a common name, and the color indicates deciduous or evergreen.

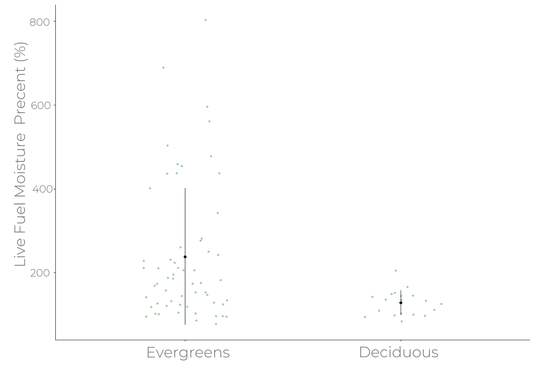
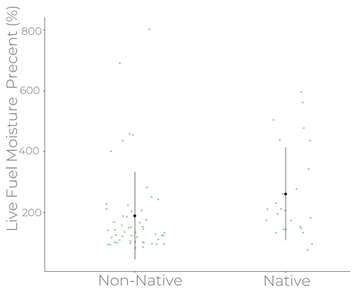


Figure 1b. Live fuel moisture percent for deciduous and evergreen plants. Black dots are the average, black lines are the standard deviation, and green dots are the weekly live fuel moisture for individual plants.

- Deciduous plants had a lower average live fuel moisture content than evergreens.
- 83% (5/6 species) of deciduous plants had decreased live fuel moisture levels from October whereas evergreen species had mixed results.
- Magenta cherry (evergreen) had a dramatic decline in live fuel moisture within just one month.

2. Native vs Non-Native



- Native plants had higher average live fuel moisture than non-native plants.
- Natives were mostly non-conifer evergreens.

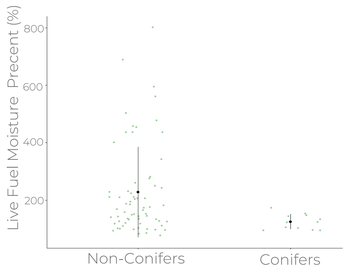
Figure 2. Live fuel moisture percent for native and non-native plants. Black dots are the average, black lines are the standard deviation, and green dots are the weekly live fuel moisture for individual plants.

3. Herbs vs Shrubs & Trees

- Herbs had higher average live fuel moisture than non-herb species.

Figure 3. Live fuel moisture percent for herb and non-herb plants (shrubs and trees). Black dots are the average, black lines are the standard deviation, and green dots are the weekly live fuel moisture for individual plants.

4. Conifers vs Non-Conifers



- Conifers had lower average fuel moisture than non-conifers.

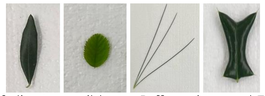
Figure 4. Live fuel moisture percent for conifers and non-conifers plants from late October through early December. Black dots are the average, black lines are the standard deviation, and green dots are the weekly live fuel moisture for individual plants.

5. Irrigation, Resin, and Growth States

- Irrigation status and resin did not influence live fuel moisture.
- Dead and diseased plants had lower average live fuel moisture content than new growth.

Implications

- Previous studies[3] suggest that deciduous plants are less hazardous. However, we show that deciduous plants have lower live fuel moisture during the fall fire-season and are thus more hazardous than previously thought. Additionally, fallen leaves (dead fuel) from deciduous plants may be ember-beds and lead to ignitions.
- Evergreens generally have higher live fuel moisture than deciduous plants. Although conifers are evergreens, they have lower live fuel moisture than other non-conifers.
- Our preliminary results suggest that non-conifer evergreens, such as common native horticultural plants, are the least hazardous. However, additional research is needed. Experiments, especially combustion experiments, are necessary. Mixed-effects analyses are also needed to control for factors.



Leaves of olive tree, wild rose, Jeffery pine , and English holly[2]

Errors

- **Wet weather**: Fuel should not be collected if wet.
- **Data collection inconsistencies**: Data was collected during protocol development and training. >20% of data collected could not be used in analysis, especially in the early stage of sampling.
- **Outliers**: Due to data collection during training, there is concern about the accuracy of some outliers.

Future Work

- Expand this study to a fire-season-long timeline with additional plants, and test for statistical significance of plant characteristics.
- Collect additional plant features, such as leaf area and perimeter (in progress), overall plant biomass, branching pattern, and combustion characteristics (funded for 22-23 SJSU RSCA Seed Grant) to better understand the relationships between plant characteristics and hazards.

References & Acknowledgement

1: Sullivan, Justin. The California Wildfires in Pictures. The New York Times, www.nytimes.com/2020/08/19/us/california-wildfires-photos.html
2: Kato, Kanako, et al. 2022, Fire Management and Ecology Lab, San Jose Sate University.
3: Doran, Douglas J, et al. "Fire in the Wildland-Urban Interface: Selecting and Maintaining Firewise Plants for Landscaping." University of Florida, Florida.

Special thank you to Skyla Dennis, Jordan Reding, Sky Biblin, Spenser Klinefelter, Atharv Keskar, David Benterou, Elyes Essanaa Rachel Wong, Charlotte Ward, David Wang, and Jessica Lee for data collection and protocol development.