Using Remote Sensing to Assess the Influence of Thermal Properties and Vegetation Structure on Arthropod Biodiversity in Agricultural Landscapes

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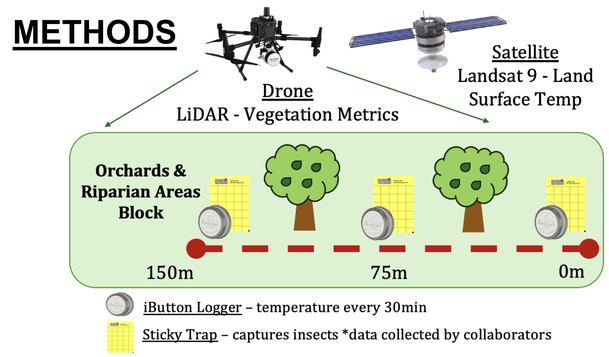
INTRODUCTION

- Vegetation structure influences the thermal properties and microclimates of an environment.
- Temperature and thermal properties drive species distribution and abundance.
- Land use change, agricultural intensification, and crop type can alter thermal habitat availability.
- Microclimate availability is a key driver of beneficial and pest insect species abundance in agricultural landscapes.

Hypothesis: Vegetation structural metrics and thermal characteristics vary across orchard type and distance to riparian habitat, influencing arthropod biodiversity.

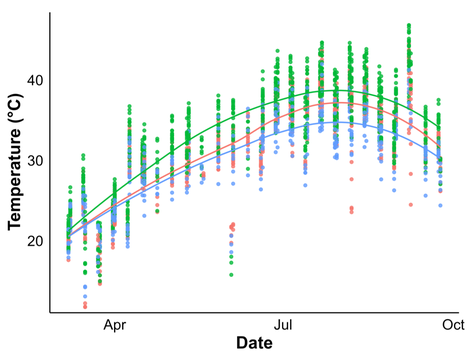
METHODS



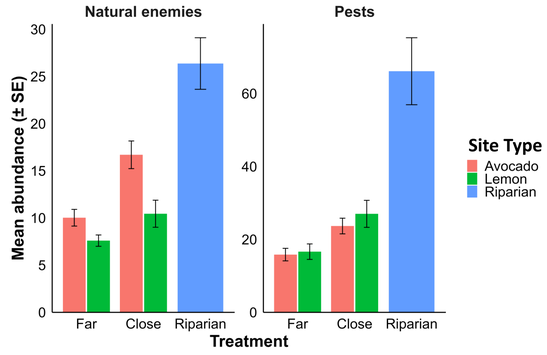
- Microclimate and insect data are being collected across orchard and riparian gradients using Landsat 9 thermal imagery, iButton loggers and sticky traps, placed along main transects at 0, 75, and 150 m.
- Drone flights collected high-resolution LiDAR for measuring canopy structure.

Figure 1: (A) iButton housing placed at 0, 75, 150m from edge of Riparian or Crop block. **(B)** Sticky traps placed at the same intervals in the canopy. Both sticky traps and loggers were placed in the same location.

PRELIMINARY RESULTS



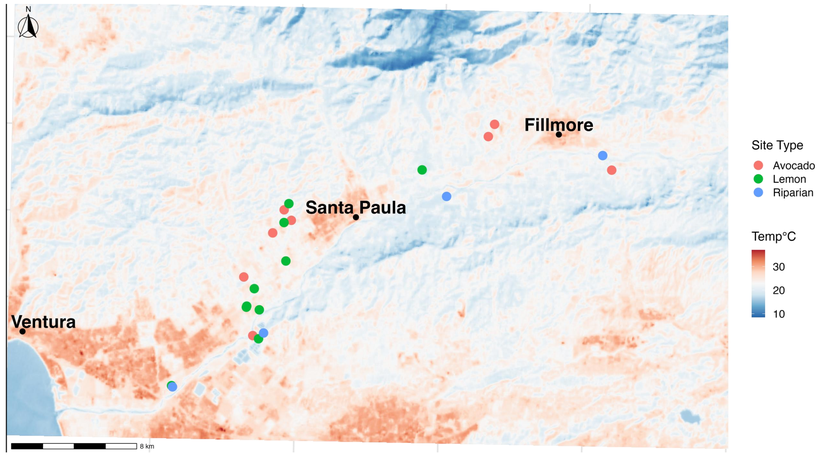
Landsat Surface Temp differs by Crop Type, with Riparian sites coolest over March – October 2025.



Mean natural enemy and pest abundance is significantly different across crop type ($F = 8.75$, $p < 0.0002$).

Santa Clara River Valley

- The SCRV is a matrix of agricultural lands and riparian and upland habitats.
- Restoration in the SCRV has primarily focused on removal of *Arundo donax* from the riparian corridor.
- Riparian and hillsides are cooler than urban and agricultural areas via satellite imagery.



Aerial View of Point Cloud – Left is a Lemon Orchard, and Right is Riparian Vegetation leading to the Santa Clara River

PRELIMINARY FINDINGS

- Macro-scale surface temperature varies with land use type.
- More pests and natural enemies in and close to riparian areas.
- Riparian and orchard lidar stands exhibit substantial differences in density and height across the 0 to 150m transects.

FUTURE WORK

- Continue to monitor temperature via Landsat 9.
- Finish processing the collected Lidar.
- Quantify the relationship between temperature, vegetation, site factors, and arthropods.
- Look at other metrics of arthropod biodiversity.

ACKNOWLEDGEMENTS

Thank you to my Lab Members, Collaborators, and my PI. Thank you to my funding sources: Air Force Research Laboratory, Utom Conservation Fellowship Fund, California Native Plant Society - San Gabriel Mountains Chapter Student Grant, and the CPP Rachel Carson Scholarship. This project was supported by the California State University Agricultural Research Institute grant number 23-99-106 and USDA NIFA NextGen grant to the California State University Agricultural Research Institute, award number 2023-70440-40177