FY25 Strategic University Research Partnership (SURP)

Scaling the remote sensing of invasive species in California (CalWeeds)

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Objectives: The objective of this study is to develop a standardized framework for detecting invasive plant species at multiple spatial scales. To do this, we will define species-level classifications of non-native plants in Southern California parklands using NASA's Airborne Visible/Infrared Imaging Spectrometer (AVIRIS; both the classic and Next Generation instruments), and upscale these measurements to determine the accuracy and precision of the detection of invasive species at the spectral and spatial resolution of NASA satellite data. The results of this proposed work will standardize invasive species mapping at different spatial scales, helping land managers pinpoint and mitigate invasive plant spread.

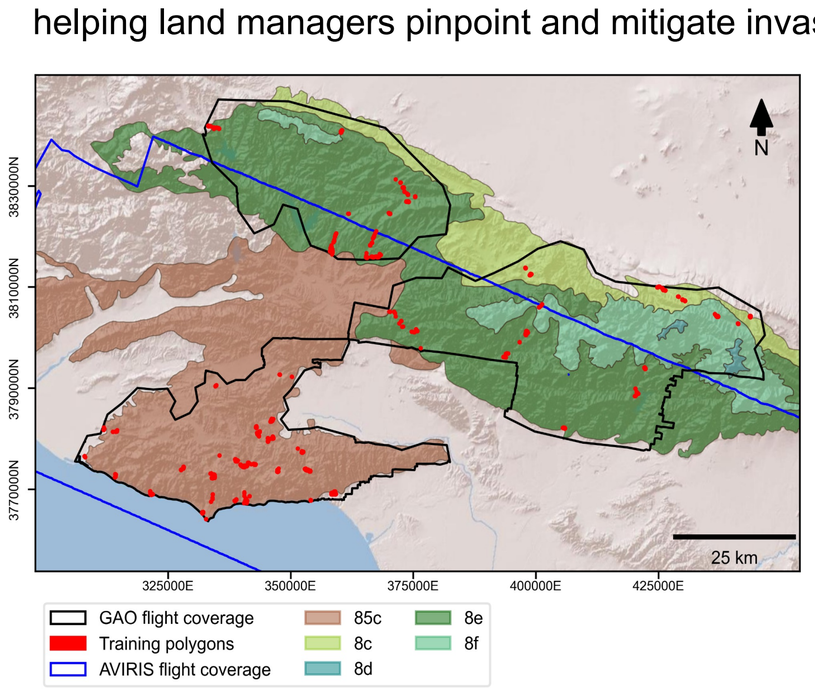

Figure 1. Map of the study area, AVIRIS flightline coverage, and locations where training data was collected.

Background: Non-native species invasions are identified as a significant driver of global biodiversity loss and are causing widespread ecosystem degradation, often with irreparable consequences. Non-native plants establish and spread naturally, while disturbance events such as wildfires accelerate invasive spread as native communities recover [A]. Effective surveillance is therefore crucial for locating emerging invasions and monitoring their spread. Spatially contiguous species distribution maps complement plot-level data by facilitating the detection across heterogeneous landscapes between sampling locations [B].

Approach and Results: A multi-class Support Vector Machine (SVM) model was developed following standard modeling procedures to map the distribution of 13 native and 13 invasive classes. The results demonstrate strong model performance. Across 10 independent models, the average overall accuracy was 89.9%.

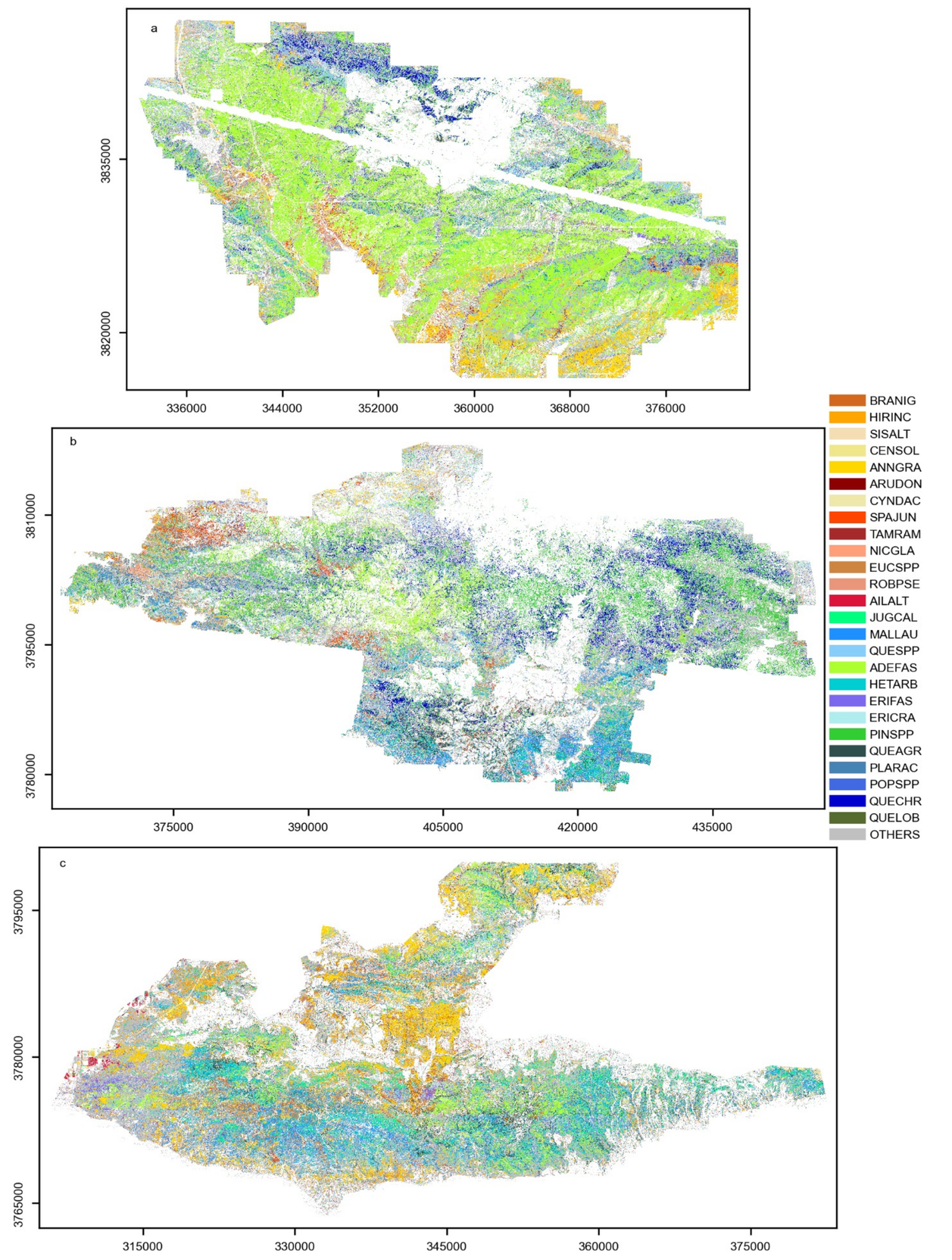

Figure 2. Class level predictions at 2 m spatial resolution across the northern region of the Angeles National Forest (a), the southern region of the Angeles National Forest (b), and the Santa Monica Mountains (c).

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Publications:

[A] Nicoletta Stork, Amy Mainzer, & Roberta Martin, "Native and non-native plant regrowth in the Santa Monica Mountains National Recreation Area after the 2018 Woolsey Fire," *Ecosphere*, 14(6), e4567 (2023) https://doi.org/10.1002/ecs2.4567

[B] Nicoletta Stork, Amy Mainzer, Brooke Carruthers, Mark Mendelsohn, Gregory Asner, & Roberta Martin. "Mapping Distribution Patterns of Invasive Alien Species in the Santa Monica Mountains Using Airborne Imaging Spectroscopy and Line-Point Transect Data." GIScience & Remote Sensing 62, no. 1 (2025): 2510869. https://doi.org/10.1080/15481603.2025.2510869

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