Using Airborne Remote Sensing to Map Sweet Fennel on Santa Cruz Island

Kyla Dahlin¹, Greg Asner², Chris Field², Rebecca Shaw³.
¹Stanford University, Department of Biology
²Carnegie Institution for Science, Department of Global Ecology
³The Nature Conservancy
Outline

• Background information
• Data products
• The project, phase 1
• Field validation
• The project, phase 2
• Acknowledgements
What is airborne remote sensing?

- High spatial resolution
- High spectral resolution
- Combined sensors
- The Carnegie Airborne Observatory (CAO) combines NASA JPL’s Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) with a lidar system and an integrated navigational system.
AVIRIS
Airborne Visible/Infrared Imaging Spectrometer
Sweet Fennel *(Foeniculum vulgare)*

- Native to the Mediterranean region
- Cultivated for food/seasoning
- Grows very well on dry, disturbed soils
Mapping Fennel

1) Remove everything from the image that is **not** fennel – bare ground, clouds, water, things that are more than 3 m tall.

2) Identify spectra that are fennel.

3) Identify spectra that might be misclassified as fennel.

4) Use spectral angle mapping (SAM) to classify pixels that are nearest to the averaged fennel spectrum.

5) Incorporate previous mapping efforts.

6) Field validate the map.

7) Iterate.
Results & Field Validation
Conclusions so far

• We successfully identified 77% of the dense patches of fennel with the SAM classification.

• However, we had a very high number of “false positives” (96% of points visited)

• More sophisticated/complicated tools may be necessary to differentiate fennel from *Baccharis* spp.
Next Steps

• Address image processing issues.
• Try different classification tools (Minimum Noise Fraction Transform, Mixture-Tuned Matched Filtering, Spectral Unmixing, etc.)
• Develop ways to incorporate the ProHunt data into analysis.
• Look at other species, vegetation types, etc.
Thanks!

The interns: Chris Fedor & Sara Maatta

The Nature Conservancy: Rebecca Shaw & colleagues

Carnegie Institution Department of Global Ecology: Greg Asner, Chris Field, and the CAO crew

Stanford University, School of Earth Sciences & Jasper Ridge Biological Preserve

NASA Jet Propulsion Laboratory

Questions?