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

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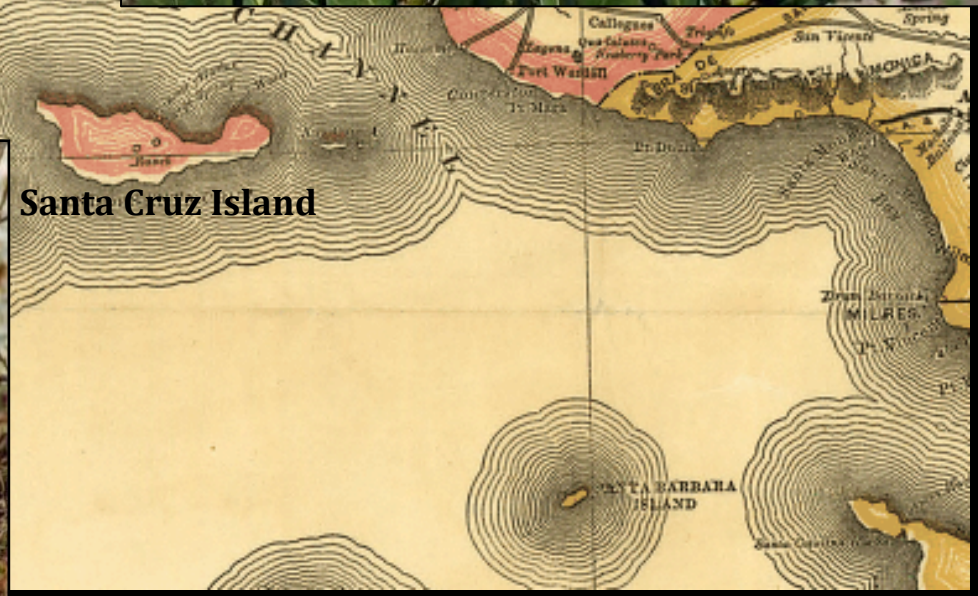
Outline

- Background information
- Data products
- The project, phase 1
- Field validation
- The project, phase 2
- Acknowledgements

Santa Cruz Island

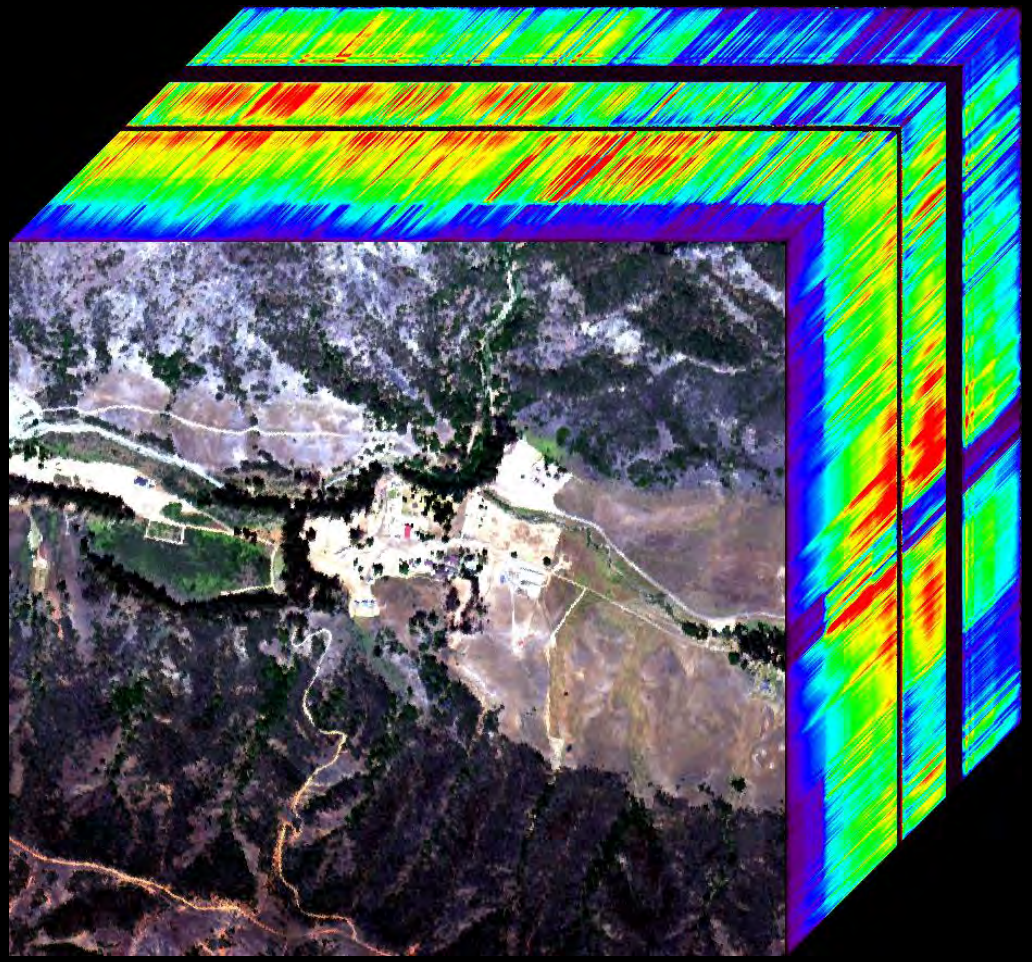


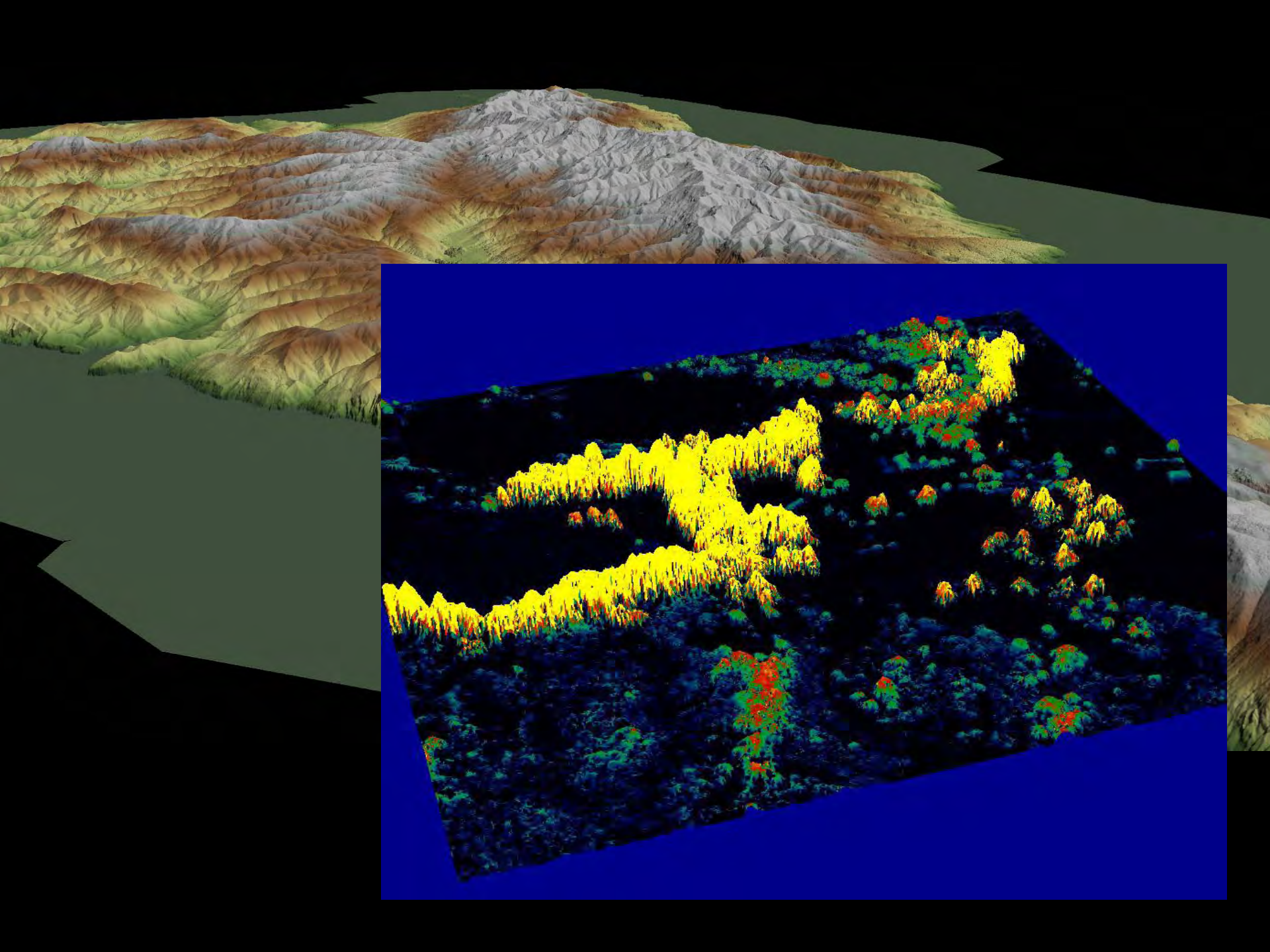
What is airborne remote sensing?

- 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

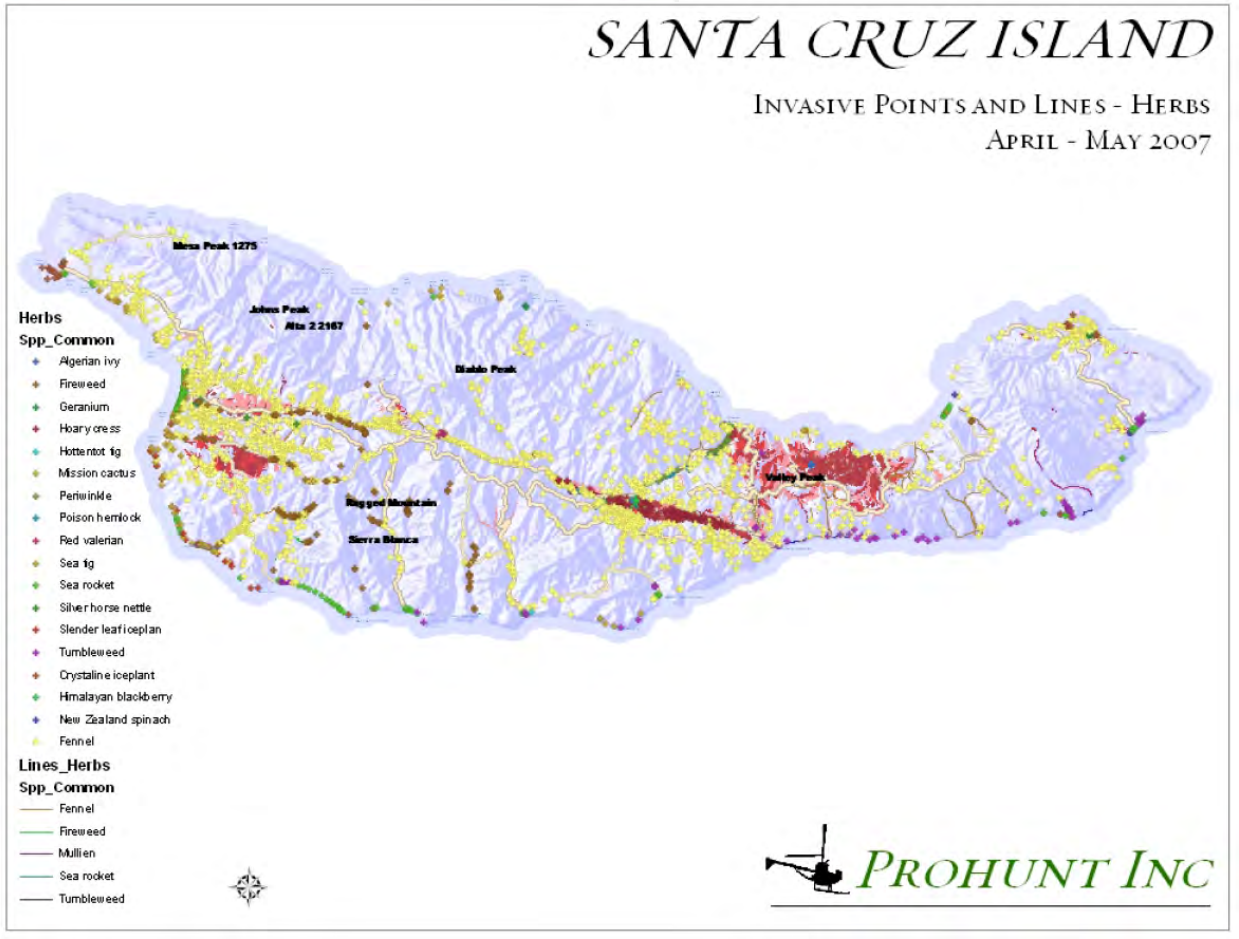




Sweet Fennel (*Foeniculum vulgare*)

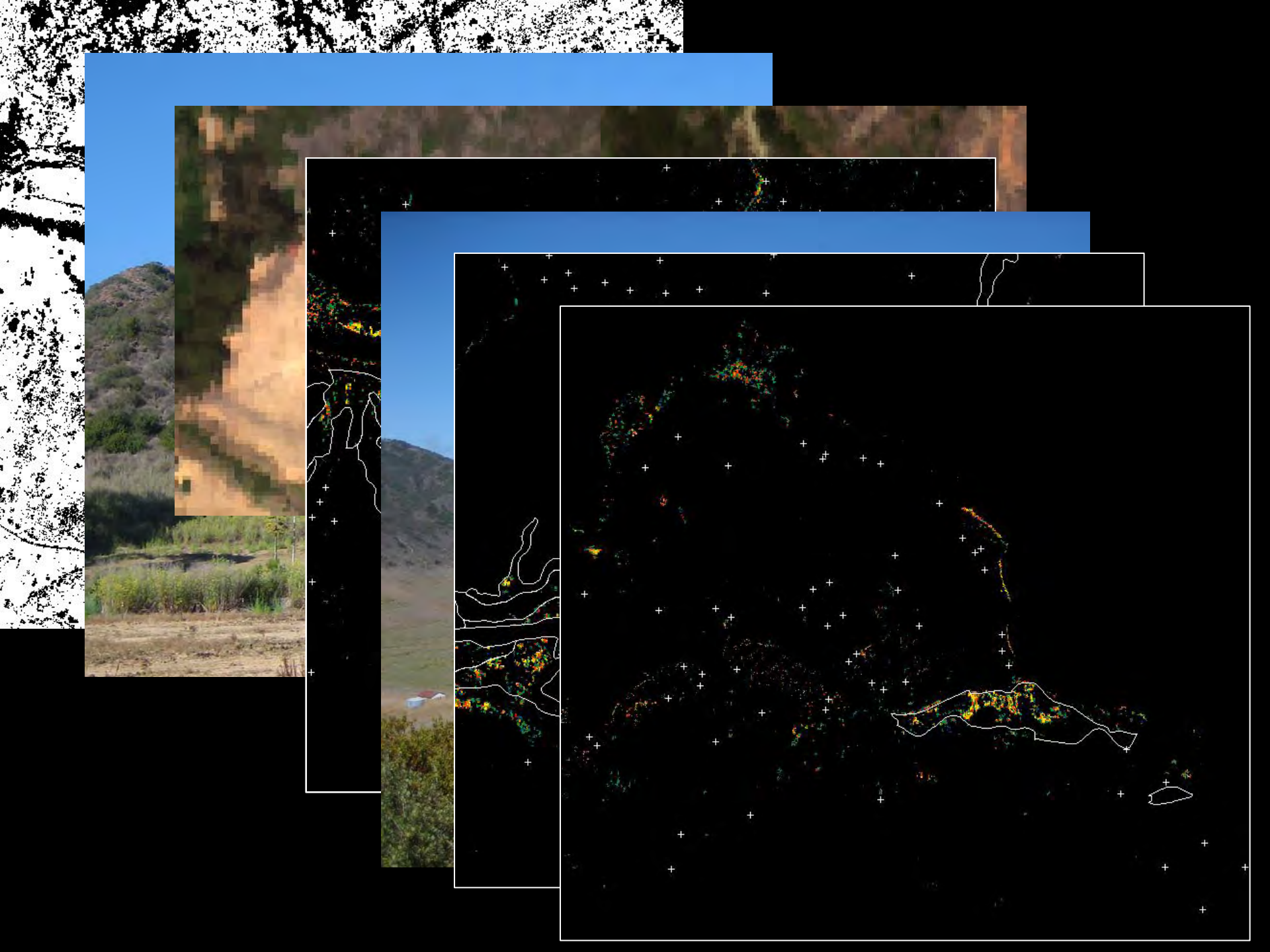
- Native to the Mediterranean region
- Cultivated for food/seasoning
- Grows very well on dry, disturbed soils


SANTA CRUZ ISLAND
Vegetation
The Nature Conservancy


SANTA CRUZ ISLAND
INVASIVE POINTS AND LINES - HERBS
APRIL - MAY 2007
Mesa Peak 1275
Johns Peak
Alto 2.2167
Diablo Peak
Rugged Mountain
Sierra Blanca
Valley Peak
Herbs
Spp_Common
Algerian ivy
Fireweed
Geranium
Hoary cress
Hottentot fig
Mission cactus
Periwinkle
Poison hemlock
Red valerian
Sea fig
Sea rocket
Silver horse nettle
Slender leaf iceplan
Tumbleweed
Crystaline iceplant
Himalayan blackberry
New Zealand spinach
Fennel
Lines_Herbs
Spp_Common
Fennel
Fireweed
Mullien
Sea rocket
Tumbleweed
PROHUNT INC

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!

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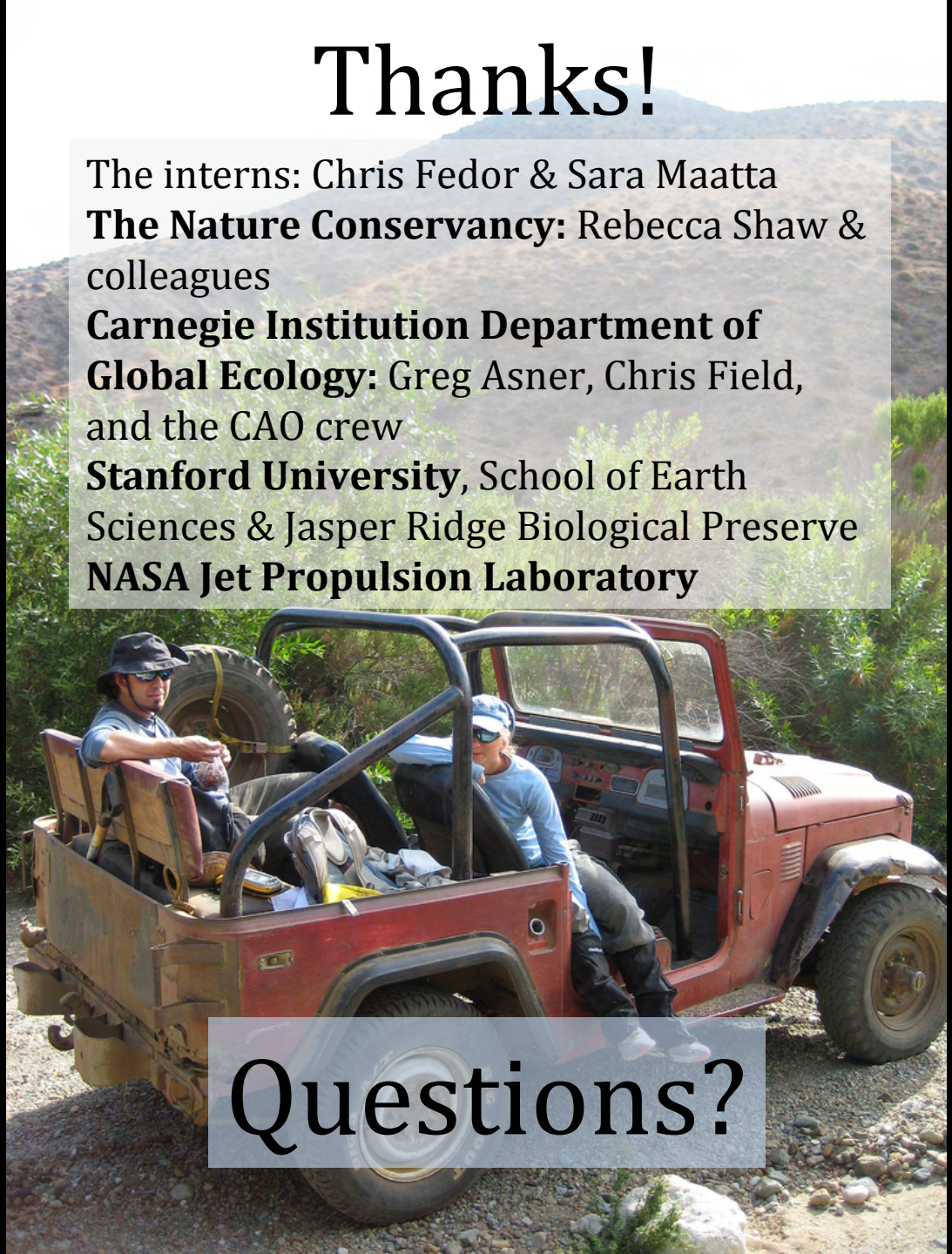
Stanford University, School of Earth Sciences & Jasper Ridge Biological Preserve
NASA Jet Propulsion Laboratory



Questions?