

# Mangrove Monitoring



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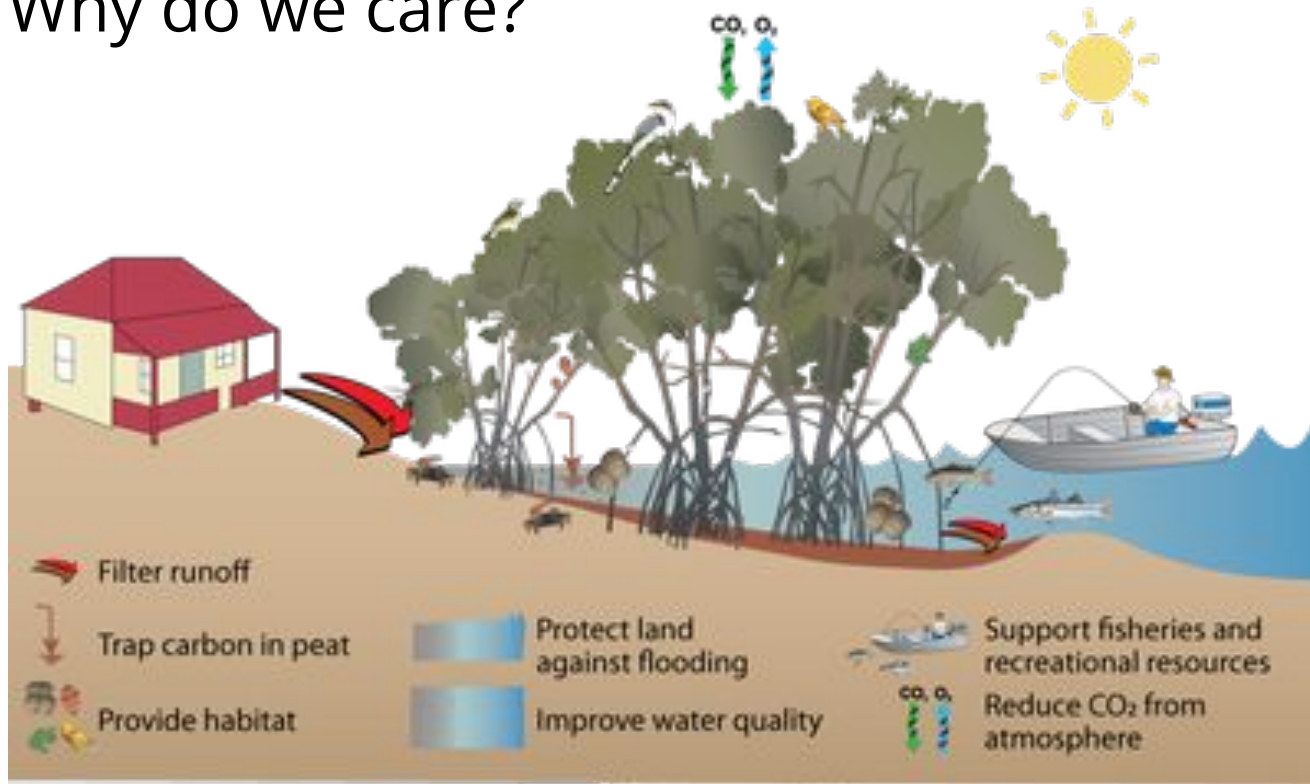
**Brynn Hall**

**Julien Bloch**

**Lysny Woodahl**

**Leif Grosswiler**

# Why do we care?



Conceptual diagram illustrating the important ecological functions that mangroves provide to the marine environment.  
Diagram courtesy of the Integration and Application Network ([ian.umces.edu](http://ian.umces.edu)), University of Maryland Center for Environmental Science. Source: Kruczynski, W.L., and P.J. Fletcher (eds.). 2012. Tropical Connections: South Florida's marine environment. IAN Press, University of Maryland Center for Environmental Science, Cambridge, Maryland. 492 pp.

# Threats to mangroves

- Construction
- Agriculture
- Aquaculture



# Boots on the ground



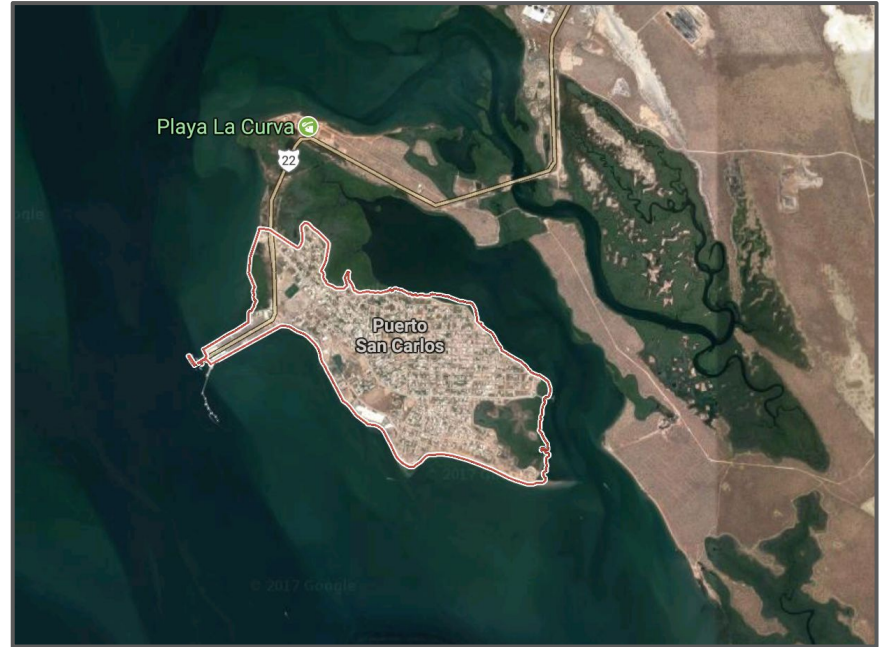
# Goals

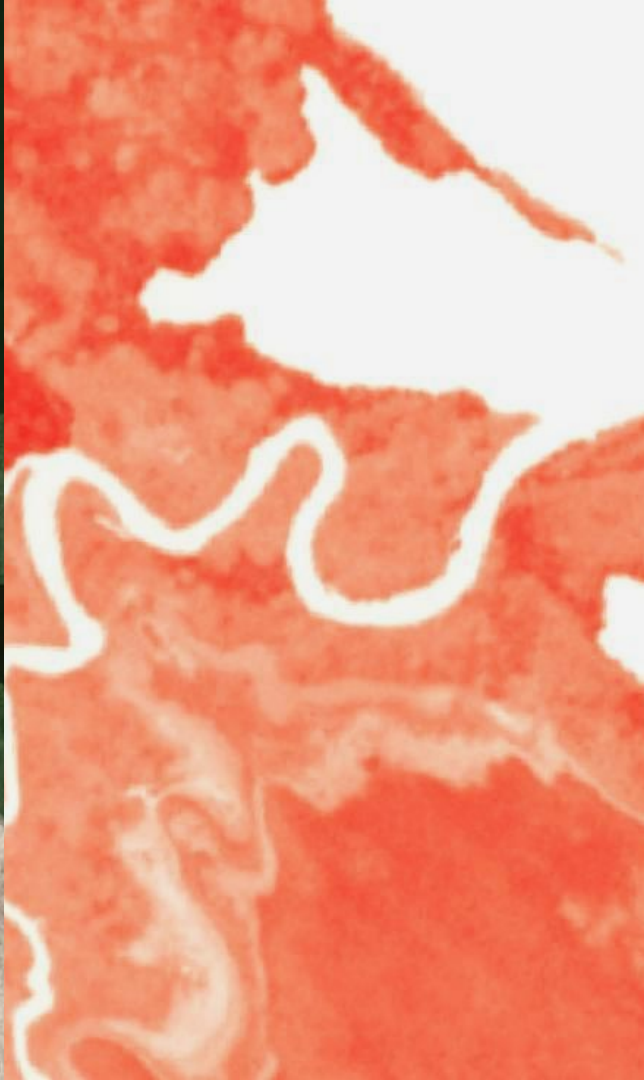
- Large scale spatial and temporal monitoring
  - Detect change in Ecosystems
  - Species Classification
  - Measure Biomass

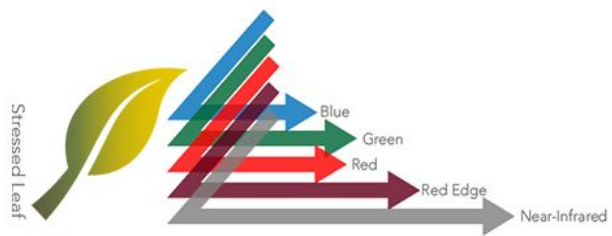
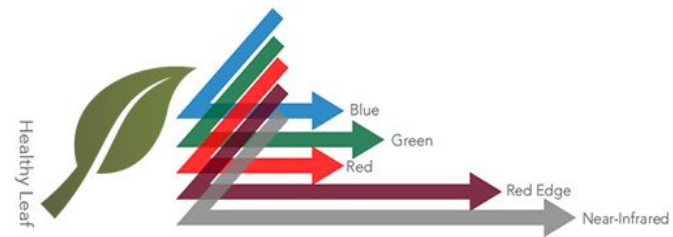
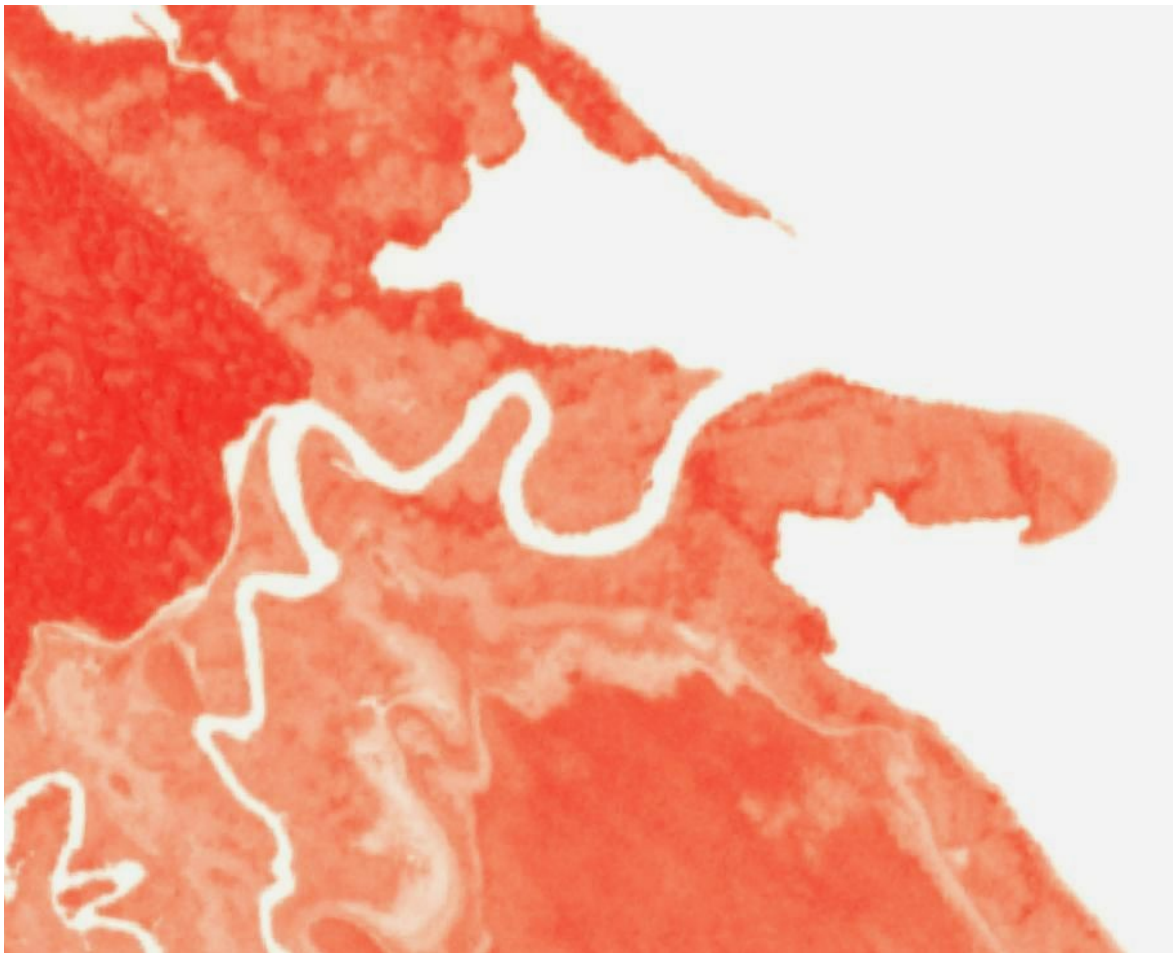


# Benefits of Satellite Imagery

- Daily imagery
- Cover Large Areas
- MultiSpectral Imagery
- Track Change







# Satellite Imagery

## Goals:

- Vegetation detection
- Mangrove detection

## Explored Methods:

- Unsupervised
  - Thresholded NDVI
  - K-Means
- Supervised
  - SVM
  - Adaboost
  - Random Forest



1 km

Truth



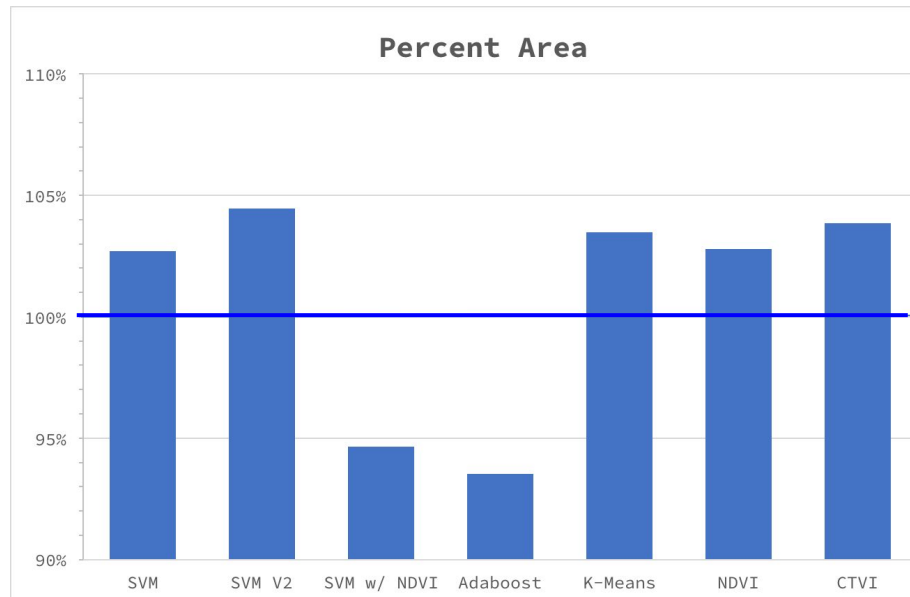
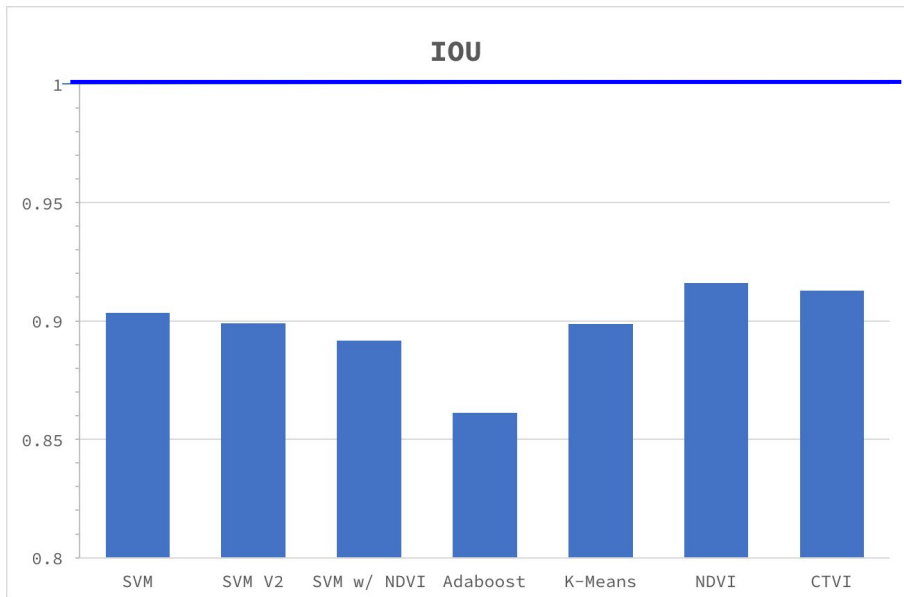
NDVI



SVM

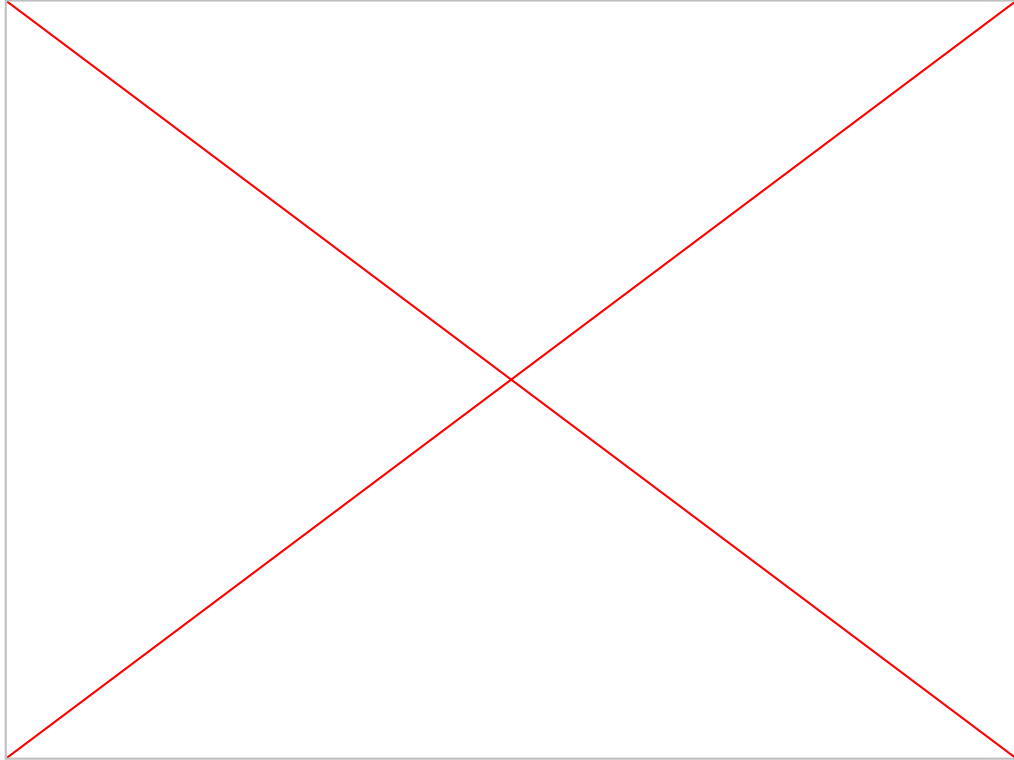


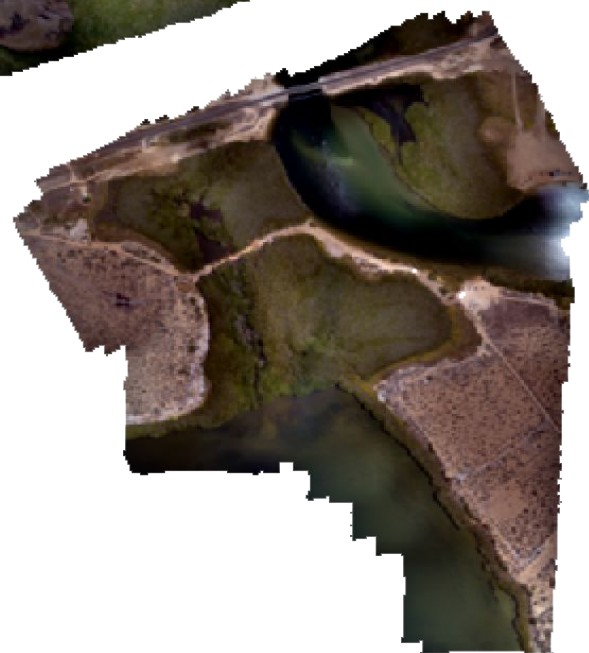
# Evaluation Metrics





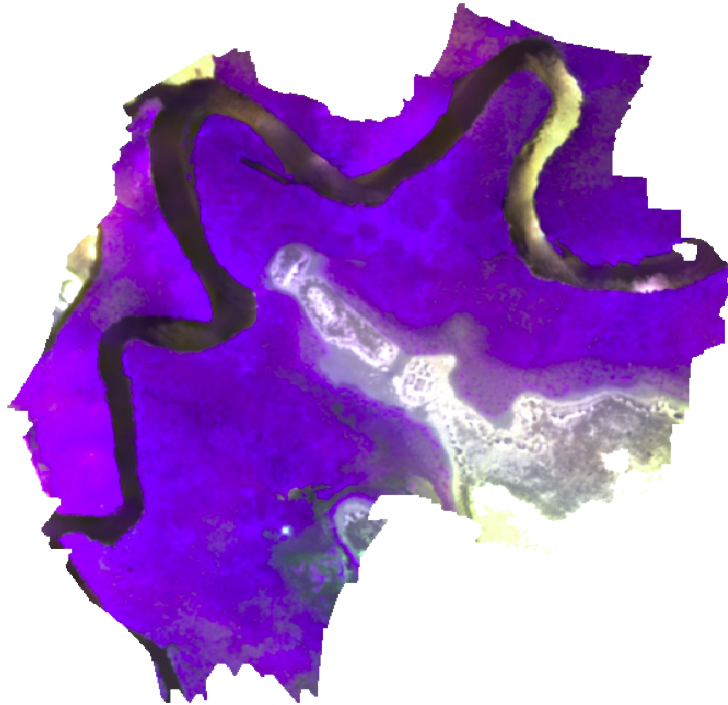
# High Resolution Drone Imagery





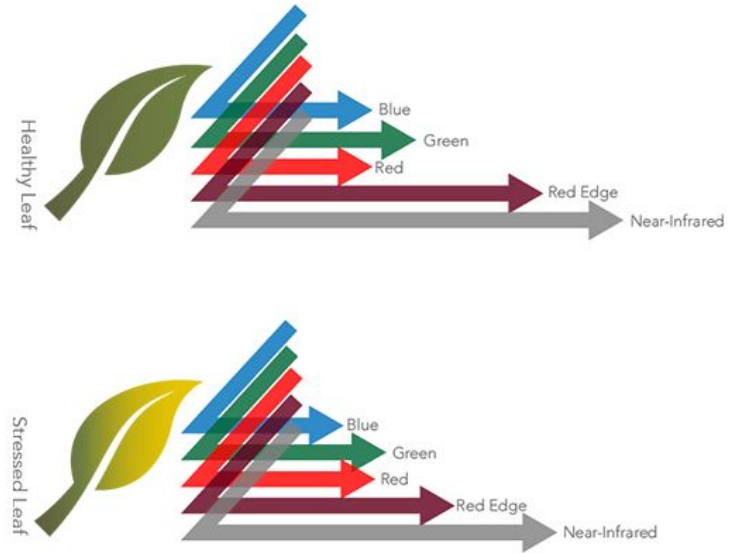
## MultiSpectral Imagery:

- RGB (390 ~ 700nm)
- Red Edge (730 - 740nm)
- Near IR (770 - 810nm)

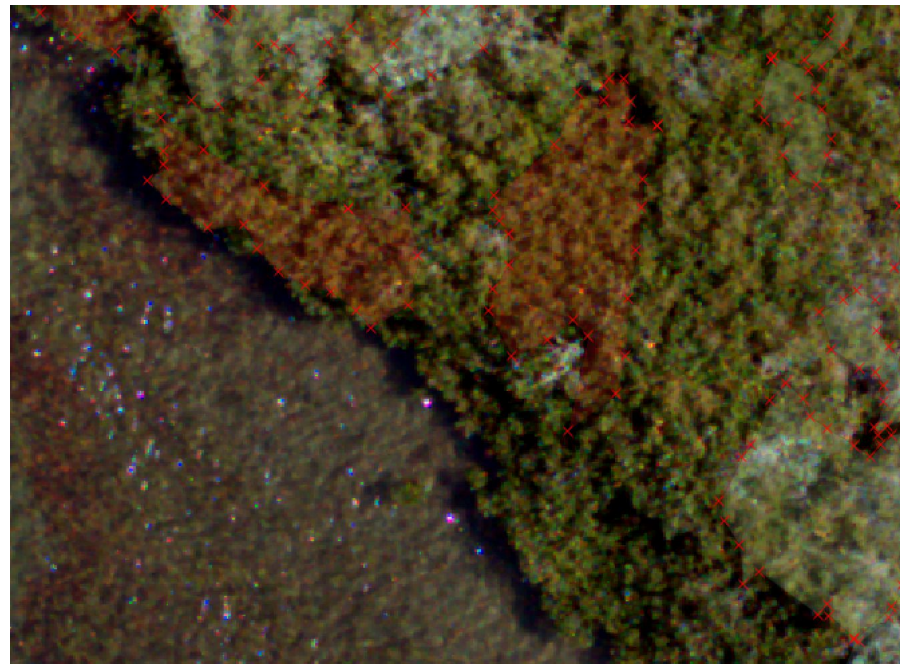
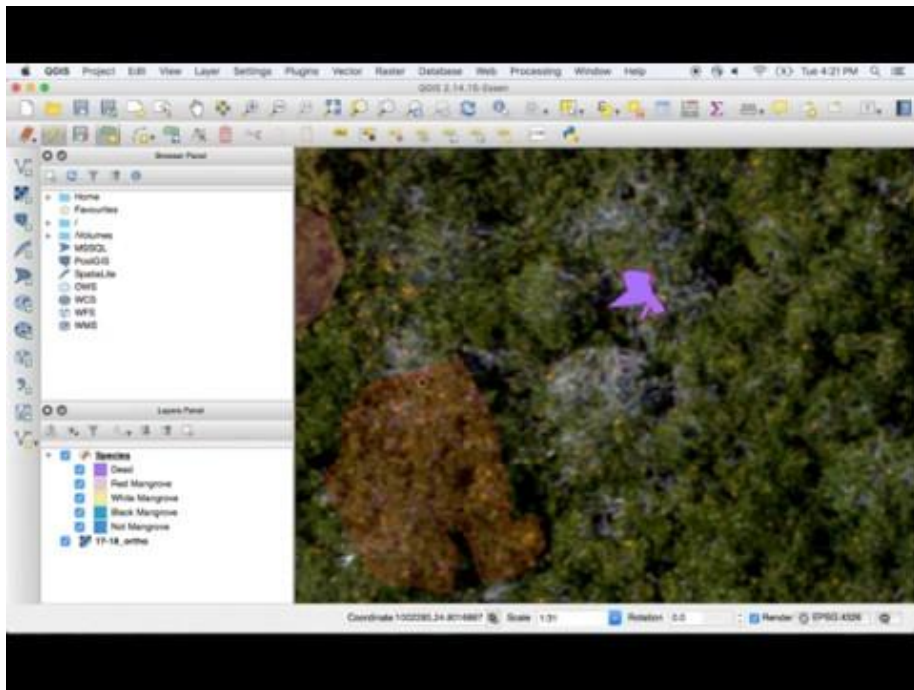


## Benefits:

- Species Distribution
- Population Health



# Manual Classification





# Explored Methods

## Drone Imagery:

- Mangrove detection
- Mangrove species classification
- Training satellite imagery classifiers

## Drone Imagery:

- SVM
- Gradient Boosted Trees
- Random Forest
- Convolutional Neural Networks

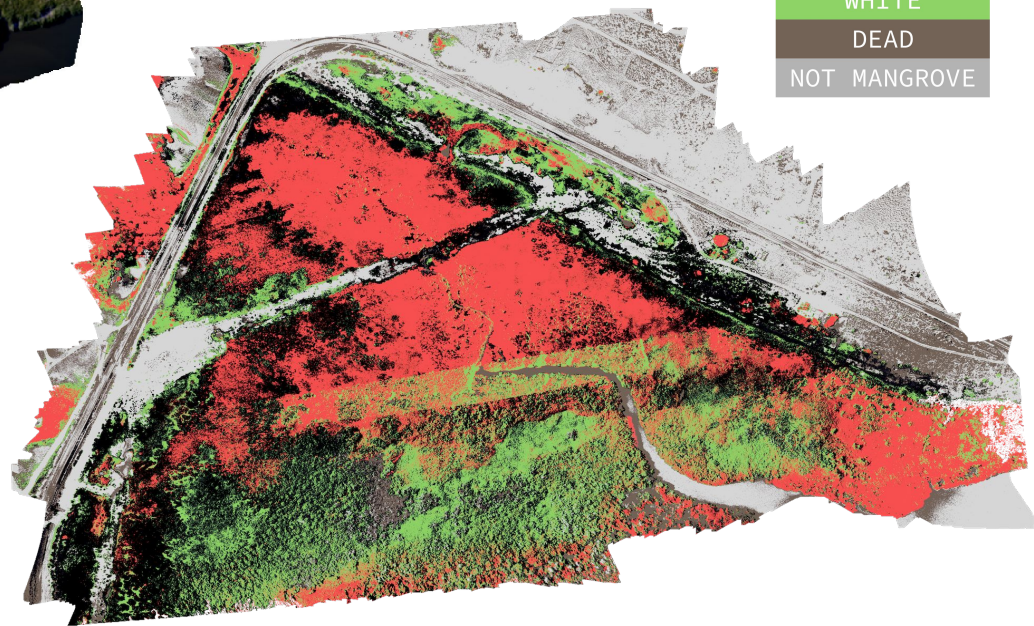


0.1 km

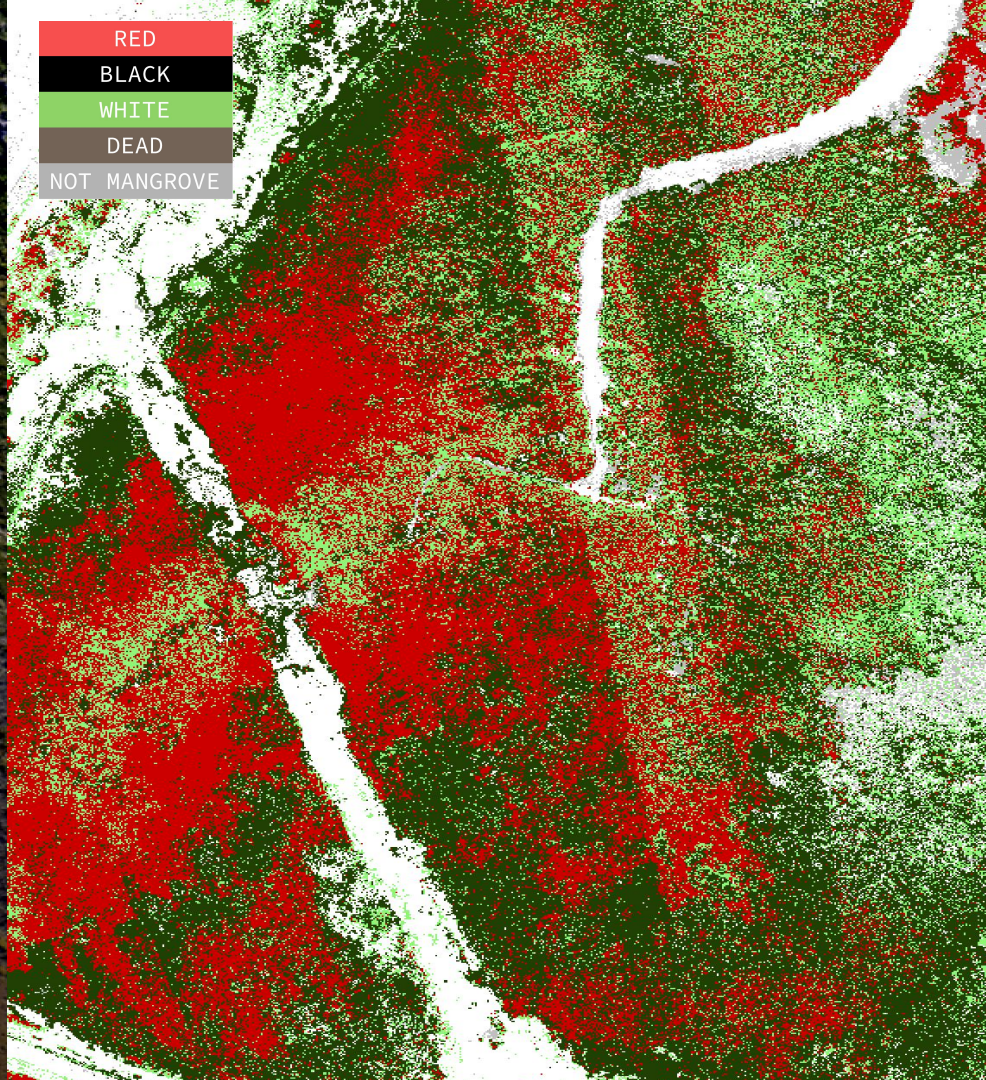
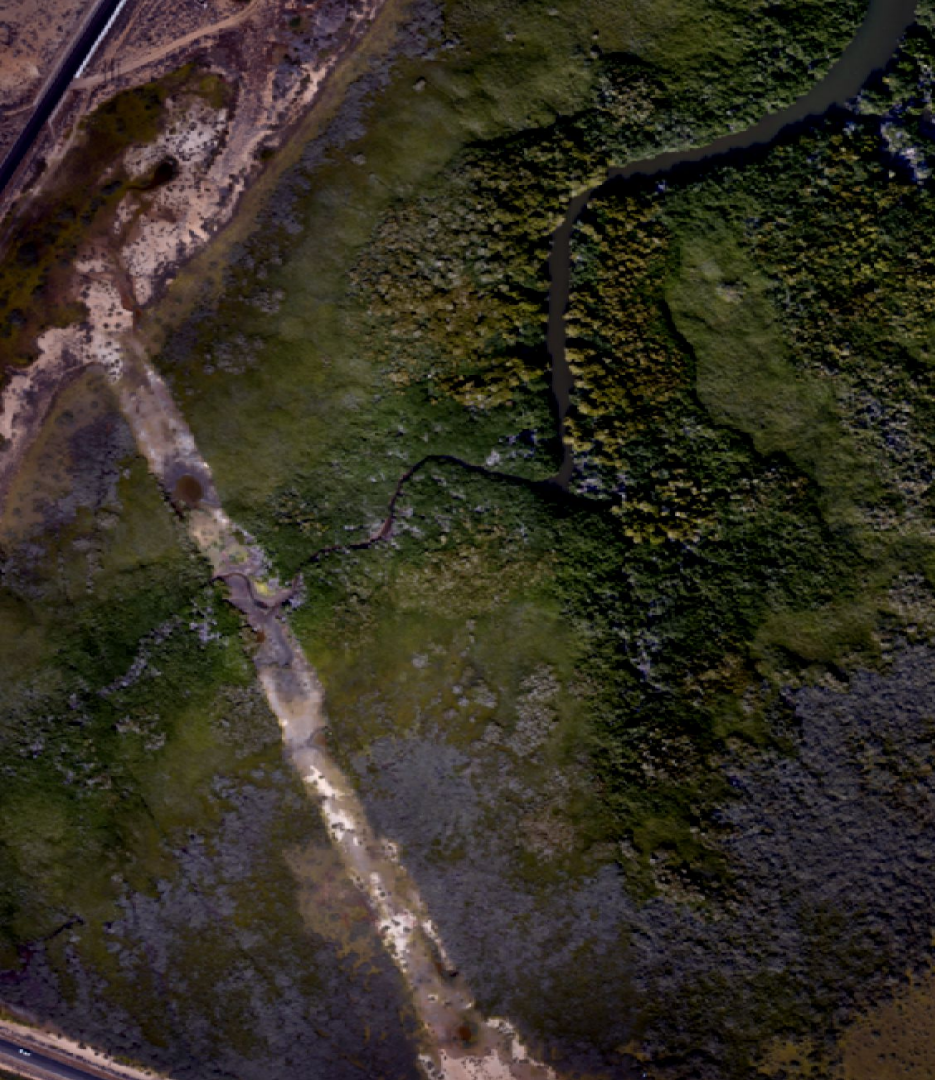


**Original**

## **Classification**

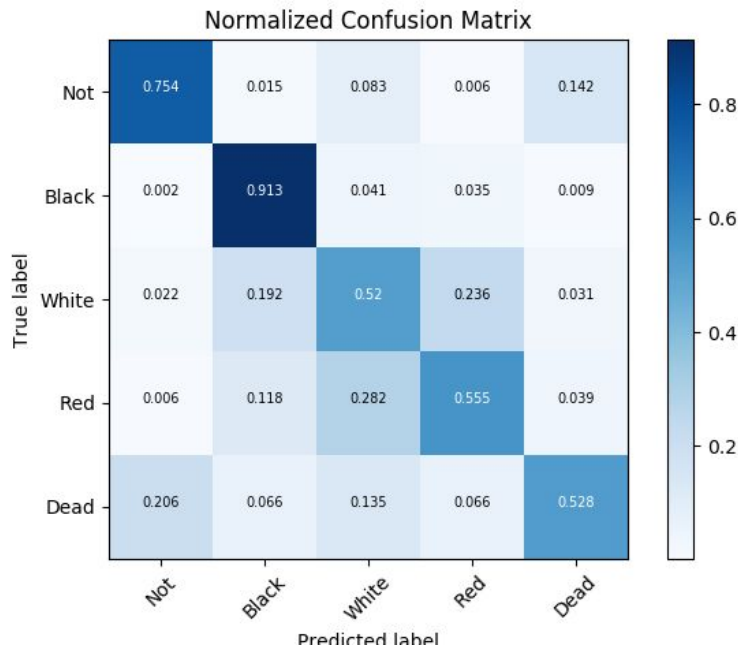


|              |
|--------------|
| RED          |
| BLACK        |
| WHITE        |
| DEAD         |
| NOT MANGROVE |

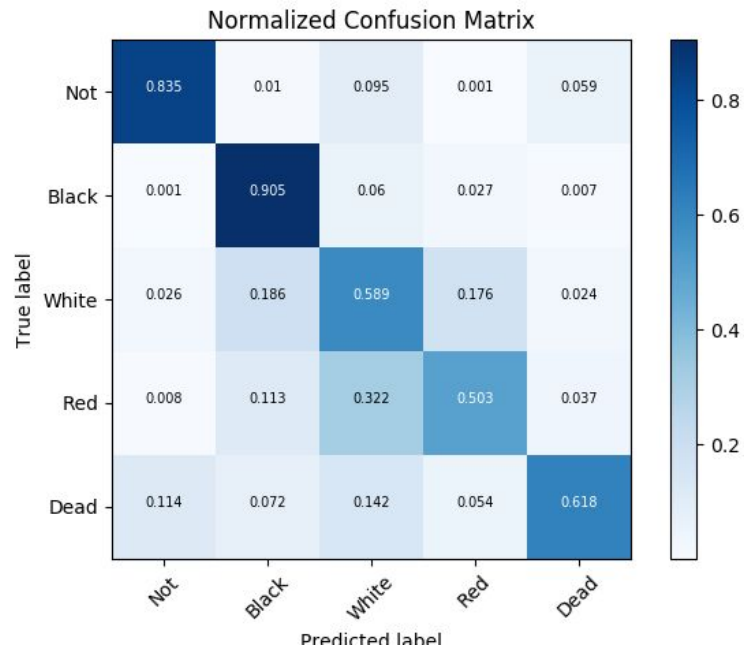


# Drone Image Classification

## Preliminary Results



**Method:** Support Vector Machine with 24000 samples, linear kernel



**Method:** Gradient Boosted Tree with 24000 samples, tree width of 250, tree depth of 4

# Payload Engineering

## Parrot Sequoia

- Multi Spectral
- Light weight system
- Testing Flight Times

