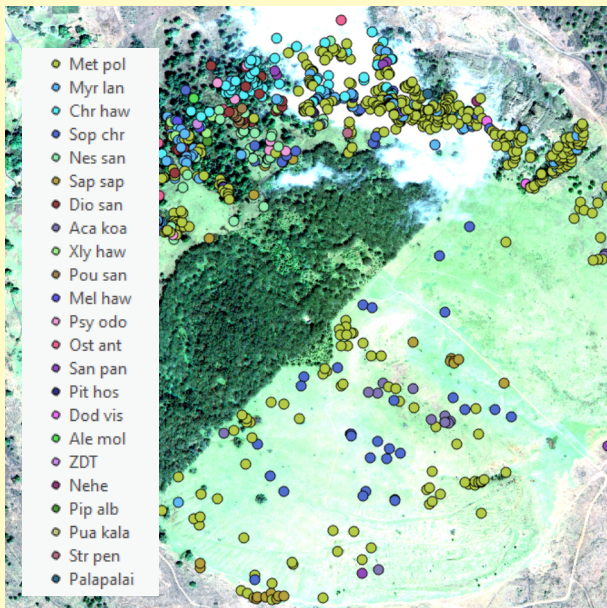


## Introduction

- The goal is to detect tree canopy in satellite image by species in the Pu'u Wa'awa'a Aupua'a.
- This is achieved by using ENVI and ArcGIS Pro to train Machine Learning (ML) models to classify each pixel of a satellite image.

## Data

- Initial tree species data was provided by David Russell. He collected GPS points of species on Pu'u Wa'awa'a in 2017 as part of his master thesis.
- Eight band, 32 cm resolution World View 3 satellite imagery was used as the basis for classification.



Sample trees at Pu'u Wa'awa'a

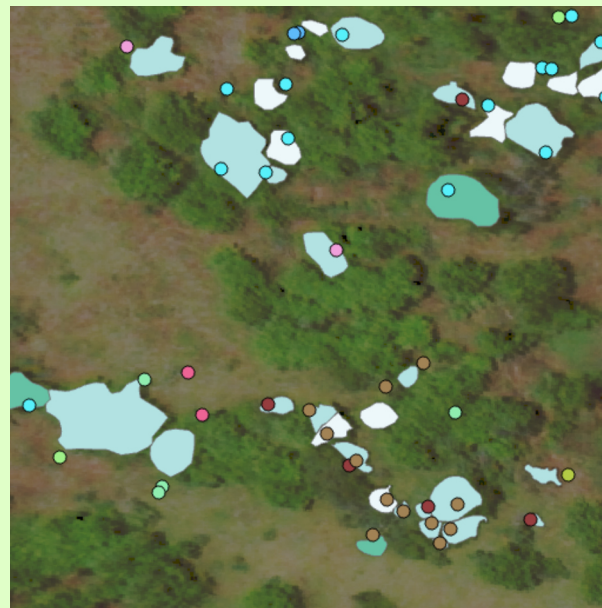
## Methods

### Imagery to Train On

- The satellite imagery was atmospherically corrected which removes the influence of the sun's spectrum in the imagery. The imagery was then pansharpened which transfers the resolution from the higher greyscale image to the lower multispectral image.
- Two additional bands were derived which were Normalized Difference Vegetation Index (NDVI) and Variance to help trees stand out from the background.

### Polygons from Tree Species Points

- The outline of each tree was manually created from the point indicating its species.



Outline of sample trees

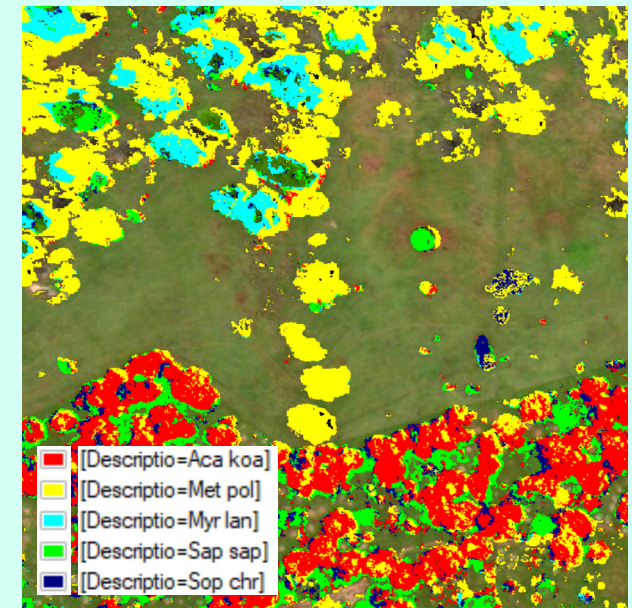
## Classifying Image using ML Model

- Training, classification, and validation was done with multiple model types, different parameters, and different image bands. This involves lots of trial and error to determine which combination is the best. Random Forest was determined to be the best.

## Discussion

### Future Goals

- The current model has a 73% accuracy for the Pu'u.
- Collecting more tree species data is the next step to increase the accuracy of the model. Cluster sampling the whole Aupua'a will solve bias in the model and help achieve the goal of above 80% accuracy.



Classified image with RF