United States Department of Agriculture
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Salt Marsh UAS Study

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Salt Marsh UAS Project Background

Unoccupied aerial systems (UAS) are effective at surveying and monitoring sensitive salt marsh landscapes because they're unobtrusive, efficient, and provide high-resolution and accurately georeferenced details of the landscape in multiple spectral bands. This project uses drone technology to survey salt marshes in Massachusetts and the remotely collected data - along with ground truthing data - trains automatic classification models. In short, the model learns to classify various vegetation, water and bare ground features. The goal of this project is to provide stakeholders, such as coastal land managers or environmental policy makers, with more accurate tools and information regarding the ecological health of salt marshes over time. This summer I helped collect aerial imagery, process imagery into digital elevation models (DEMs) and orthomosaics, and then compared classification model outputs with current landscape conditions.

Collecting data at Peggotty Beach using Trimble.

Matrice 600 Drone

Classification Model and Future Implications

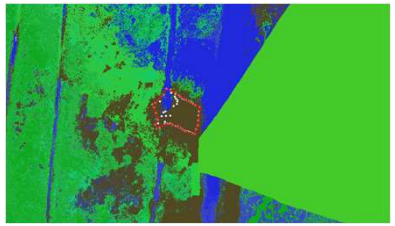
Our remote sensing specialist, Dr. Kate Fickas, creates and trains our salt marsh classification model. The model uses orthomosaics and DEMs to classify the vegetation, water features and bare ground of a specific site. With data going back to 2018, we can see how a specific site changes throughout a season and across years. This research is the future of surveying since more information is gained from multispectral cameras than with traditional ground assessment.

Results of Individual Project:

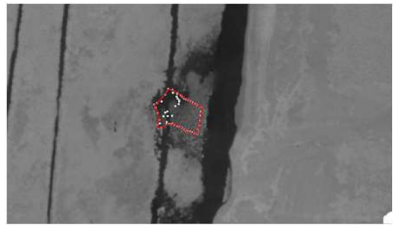
I found from my data collection and analysis that the classification model accurately classified the bare ground areas I delineated as a bare ground feature. Comparing the model classifications with the RBG images and SWIR, I found that the bare ground area has recovered greatly since 2019. Vegetation such as salicornia and limonium has grown in, covering the area significantly than in 2019. In the SWIR images, I observed inundation of the bare ground area which means that there is less reflectance from vegetation and more light absorption.

2019 RBG Bare Ground

2021 RGB Bare Ground



2021 Model Classifications featuring Bare Ground



2021 SWIR Bare Ground

Individual Project: Validating Classification Model Outputs

Introduction:

We can use UAS data to create models that will effectively classify landscape cover, but bare areas can be an issue because they can grow in a small amount of time. Therefore, it is important to use visual observation to understand what could cause bare areas.

Methods:

I chose Peggotty Beach in Scituate, MA to conduct my research because it is an area that is recovering from historic storm surges. Spectral data was collected during summer 2021 using a Matrice 600 drone, a Micasense RedEdge sensor, and a short-wave infrared sensor (SWIR). Imagery was reviewed, spectrally calibrated, and processed in Agisoft Metashape to create DEMs and orthomosaics. Our remote sensing specialist, Dr. Kate Fickas, created and trained a classification model using the DEMs and ground truthing points that were collected in 2018.

Prior to receiving the model outputs, we visually observed the Peggotty Beach land cover in person to identify and delineate bare areas with a Trimble RTK unit and post processed the data points in QGIS. I used visual observation and the model outputs to determine the changes in the landscape cover from vegetation to bare ground and vice versa as well as considering the role of water retention in these areas.

Discussion:

This way of data collection is very important to the future of surveying and conservation because we can harness much more data with UAS and multispectral cameras than with traditional ground surveying techniques. With this method of data collection and analysis, we can create higher resolution pictures of areas of interest at any given time. This in turn will allow stakeholders to have a greater understanding of what is happening in these areas which is even more important given salt marshes are vulnerable to sea level rise and climate change impacts.

The Center for Agriculture, Food and the Environment