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Padilla Bay Research Assistant

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COLLEGE OF THE ENVIRONMENT

Internship Title: Graduate Student Padilla Bay Research Assistant

Student Name: Lucas Lane

Internship Dates: June 2022 – August 2022

Advisor Name: Leo Bodensteiner

STUDENT SIGNATURE: Lucas Lane

DATE: August 15th, 2022

Figure 1: A photo of native and non-native eelgrass entangled together in Padilla Bay.

Lucas Lane

Padilla Bay Research Assistant Internship Report

August 14th, 2022

Department of Environmental Sciences, Western Washington University

Introduction

Background

During the Summer of 2022, I was able to accompany graduate student Jacqui Bergner under the advisement of Dr. David Wallin for her field research in Padilla Bay National Estuary and Reserve. Her thesis work focuses on the characteristics of climate change on the two eelgrass species in the bay: *Zostera Marina* (Native eelgrass) and *Zostera Japonica (*non-native eelgrass*).* This was done by creating distribution models of the two species, with the data being created from multiple measurements. I assisted Jacqui with collecting these data and measurements for 2-3 days during low tide during each month. These data included imagery captured by Unoccupied Aerial Systems (UAS), otherwise known as drones, and in-situ elevation measurements of the sediment along with vegetative landcover surveys. The study area (an area already defined by Padilla Bay's Research Reserve) was divided into three "transects" that ran lengthwise, with five zones being divided among them. Along each transect was rows of pvc pipes that ran the entire length of the study area, which were placed by Padilla Bay's research team. These were used as biomonitoring sites, and in order to not disturb their project we always walked along the south side of the poles.

Figure 2: A photo of the study area during low tide in April 2022.

Goals

My goals for the internship included a few different field techniques. I intended to learn basic GPS navigation skills in the field alongside measuring elevation data in the x,y, and z coordinates. Vegetative ecological surveys helped to introduce how to determine percent cover of different organisms in several given plots, as well as basic species identification. GPS navigation also helped to navigate to each pre-determined survey point. I also placed ground control points to assist in catching drone imagery that will be used as a raster dataset to physically view land cover over the study area, an

application of remote sensing. Many of these goals were based on the idea of taking field data and gaining a better understanding of how GIS vector and raster datasets can be created in the field, as well as understanding the species distribution patterns of the two eelgrass species.

Duties and Tasks

Elevation measurements

My tasks while working for Jacqui involved three different types of data collection/assistance. The first type of task was elevation measurements of the sediment. This was done using an Emlid Reach R2 Unit attached to a pole that measured elevation in the x,y and z directions. Elevation measurements were taken every fifty feet along the entire length of each transects, with random nested samples being taking at random points in the form of twenty points in an "x" shape. Later on during the summer, certain areas had been noted by Jacqui as "points of interest" that we later came back to to take even more elevation measurements of. These "points" were areas that would stand out topographically: areas such as deep stream channels or large mounds of sediment. These points were measured randomly while at the site, with the purpose of them being used to strengthen the accuracy of the Digital Elevation Mode. The longitude and latitude were measured in the NAD 1983 UTM Zone 10 coordinate system, while the vertical data was measured in the NAVD 88 datum. Each point that was measured was averaged over a period of one minute as a form of data quality assurance. Jacqui will bring these data into ArcGIS Pro and create a DEM (Digital Elevation Model) of the study area. These were the days that I assisted Jacqui the most on, and certainly gave me a good insight on how to collect elevation data and ensure that was accurate and precise.

Figure 3: Photo of the pole in which an Emlid Reach (not shown) was attached to for elevation measurements. The pink plate was used to help stabilize the pole.

Land cover surveys

The next type of task was taking vegetative land cover surveys, where predetermined random points on a GPS were located. Once at the correct location, the GPS would emit a beep, and the nearest pvc pole in the ground was the correct point to begin the survey at. Once these points were navigated to, the 5x5 survey plot was measured four times in a row over a one-meter length, starting four meter south of the nearest PVC pipe to the GPS coordinates. For each of the four section that were measured, the 5x5 grid created 25 intercepts at which the type of landcover was recorded. Having the 25 intercepts measured along the four sections of the survey resulted in a clean 100 data points recorded at each survey point. Types of categories for each section of the section of the survey plot included native eelgrass, non-native eelgrass, algae, detritus, and bare ground. These data will be used to calculate percent cover of each category. This data will then be used alongside the elevation measurements to show the correlation between specific eelgrass species at different elevation sites.

Figure 4: Photo of me measuring four meters south of the corresponding pvc pole to begin the survey.

Ground Control Points

The third and final task was to place ground control points at predetermined GPS locations along two of the transects. For these days, Dr. Wallin would join us at the study area and fly a drone out and back two times over each transect (for a total of six drone flights). In the first and third transects, the ground control markers being placed would show up in the drone captured imagery, and will be used as georeferencing points in ArcGIS Pro to a georeferenced map in order to ensure that the imagery is properly projected and placed. Jacqui will use this data to create raster images of the study area,

showing areas of high/low elevation, and where specific types of eelgrasses are present. The elevation and vegetative survey data will be used in conjunction with these rasters to increase the validity of the aerial imagery.

Conclusion

I was able to meet all the goals that I had set before beginning this internship. I gained valuable understanding of how data is collected and how those data can be used using tools that I learned about in my advanced GIS courses. Alongside this I was able to improve my GPS navigation skills and learn how to navigate to predetermined points that were randomly selected. II also was able to gain understanding on how land cover classification surveys are conducted, although I am not apart of the analysis of the data and deeming the percent cover for each lane cover type. For drone flight days, the work didn't personally give me experience in capturing remotely sensed data, but I was able to get a better understanding of how drones can used to capture imagery over and over each month, to eventually create multiple datasets that can compared to each other with data analysis. Overall, I gained a great understanding of how field data is collected, how to remain safe while working in an environment such as the ocean, and got to learn many processes that determine how estuary ecosystems function and how the physical environment affects specific organisms. This project has also helped inspire my desire to attend graduate school and complete a thesis of my own, hopefully utilizing some of the skills I learned here.

Acknowledgments

I would like to thank Jacqui for allowing me the opportunity to assist her with her field research this summer. She was a fantastic mentor and was extremely helpful when answering questions or explaining how to perform tasks. She always made sure to keep us safe in the field and make sure that we were physically and mentally okay due to the physical demand that walking for long distances for long amounts of time had on our bodies. I am extremely grateful for this opportunity to learn field science and have fun doing it!

Figure 5: A photo I took of a crab sitting atop a mound of eelgrass