# Visualizing Dune Volume Change Across the Pea Island National Wildlife Refuge

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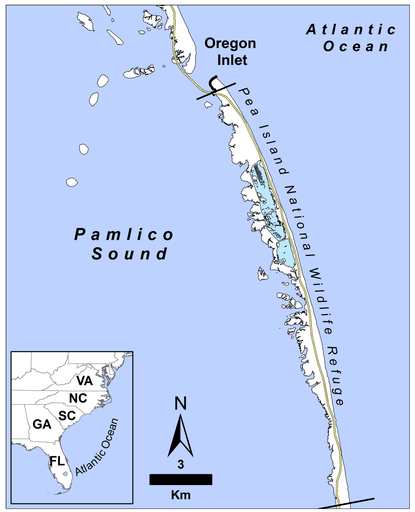
## Introduction

The Pea Island National Wildlife Refuge is located on a dynamic coastal barrier island system that experiences severe storms multiple times per year. These storms can damage the coastal roadway that serves as a critical link to communities south of the Refuge. The North Carolina Department of Transportation funds an ongoing Coastal Monitoring Program to inform future planning to maintain the transportation corridor. As part of this effort, NCDOT has developed digital terrain models of the barrier island, four times per year since 2012. These terrain models were used to extract beach and dune profiles across the PINWR study area. Navigating the large dune profile dataset is a daunting task yet is essential in planning for management of the Refuge and the coastal highway.

PINWR Study Area




Photos showing coastal roadway damage on Sept. 7, 2019

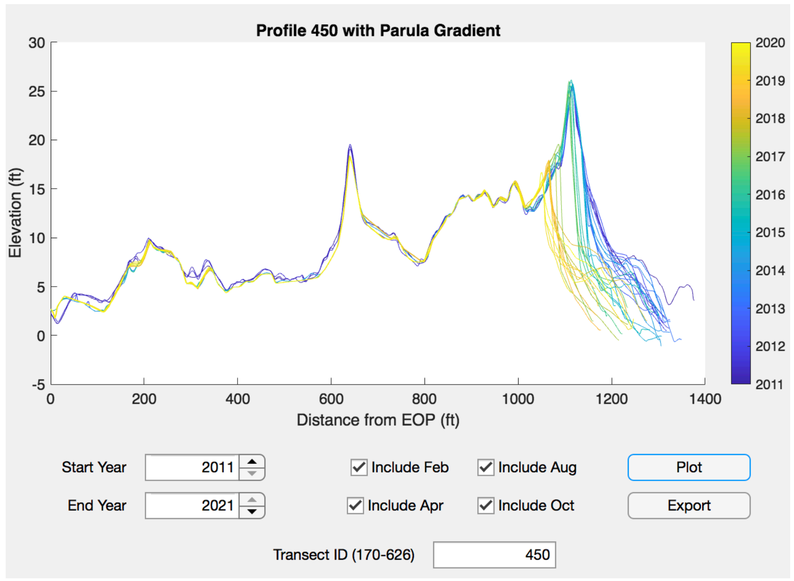
## Objectives

- Maximize the inherent value of this dataset
- Improve the format of dune visualization figures
- Make it easy to traverse, visualize, and under-
- stand this dataset

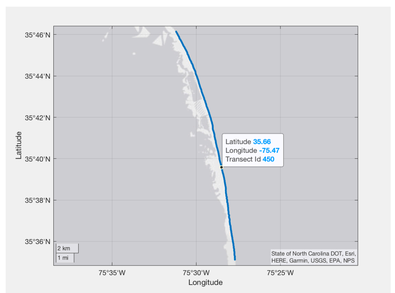
## Methods

- Matlab's App Designer was utilized to make a user-friendly graphical user interface (GUI)
- Included the option of choosing a specific transect of interest, selecting specific date ranges, and including or excluding seasonal terrain models
- Utilized a color gradient to highlight the dune profile change through time

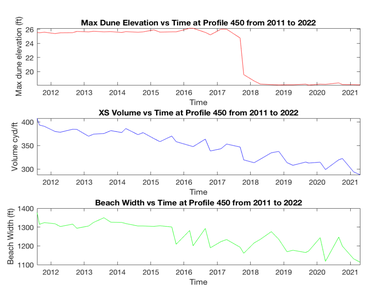
## User's View of GUI




Output Figure 1 – Geographic Context




Output Figure 2 – Transect Parameters



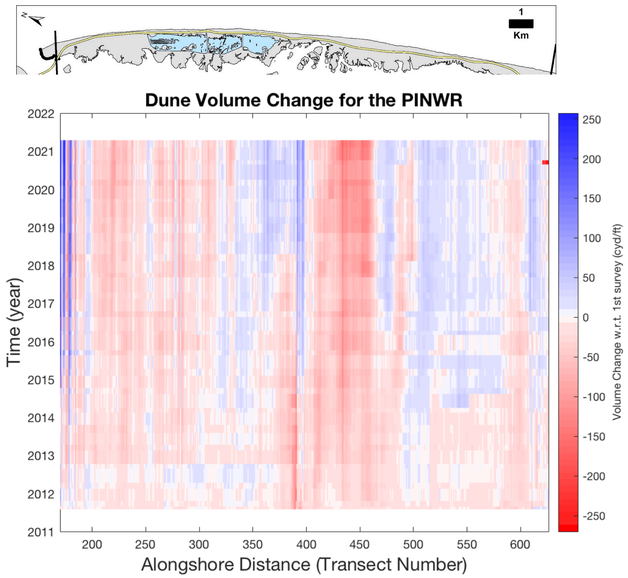

## GUI Output

The output of the functionally dynamic graphical user interface includes:

- A figure visualizing dune profile change through time with user-entered specifics
- A figure, like Output Figure 1, highlighting where the chosen transect is located geographically
- A figure, like Output Figure 2, showing max dune elevation, volume, and beach width through time
- Two tables of summarized and formatted data that the user can export

## Long Term Trends

Currently, the drivers of dune volume change on the PINWR are being investigated. Dunes are the primary barrier between the ocean and NC12, the only highway in and out of Hatteras. To protect vulnerable coastal infrastructure, it is important to monitor dune volume change.




## Findings

- This tool helps our research team provide accessible information in the annual Coastal Monitoring Program report
- Found that long term accretion of sediment has occurred at either end of the PINWR
- Found that accretion and erosion of dunes alternates across the research area

## Future Research

- Correlate dune volume change with wave parameters such as wave height, period, and direction
- Investigate the link between hurricane events and dune volume change
- Explore how long shore sediment transport affects dune volume change

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