Dune Breach Susceptibility in Holgate, Long Beach Island, New Jersey
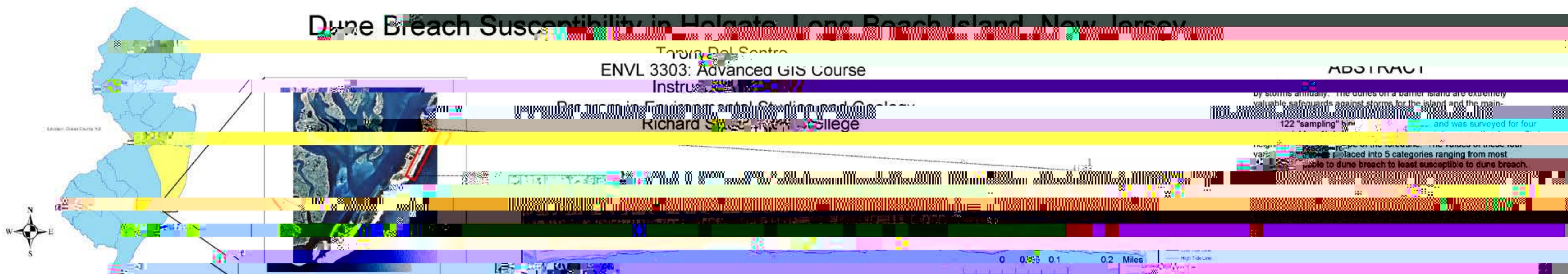
Tarun DelSontro

ENVL 3303: Advanced GIS Course
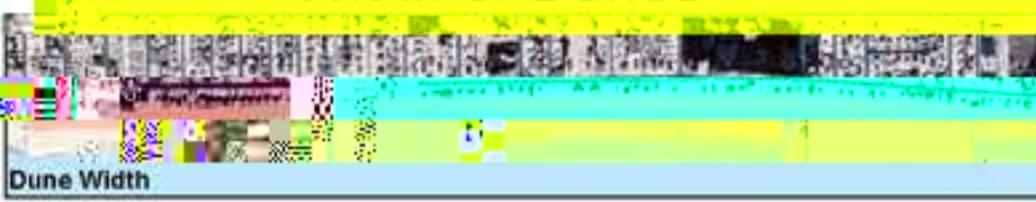
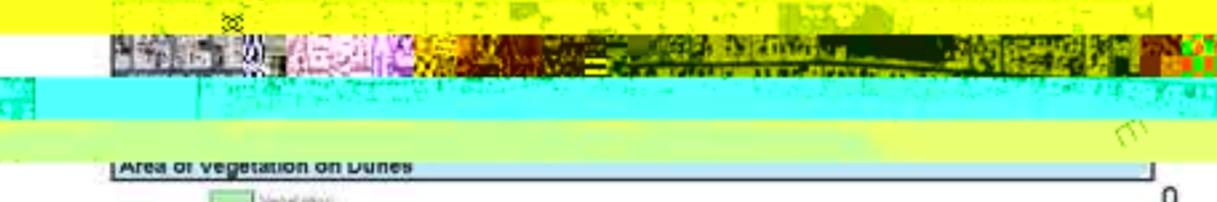Instructor: Dr. Jacqueline Environmental Studies and Geology

Richard Stockton College

ABSTRACT

by storms annually. The dunes on a barrier island are extremely valuable safeguards against storms for the island and the main-

122 "sampling" bins

and was surveyed for four

height ... slope of the foredune. The values of these four variables ... placed into 5 categories ranging from most ... ble to dune breach to least susceptible to dune breach.

0   0.05   0.1   0.2   Miles

Width of Dunes

Vegetation on Dunes

Elevation of Dunes

Slope of Foredunes

Dune Width

Dunes

Area of Vegetation on Dunes

Vegetation

0   0.15   0.3   Miles

Elevation Model (feet)

Dune Width Scoring
- 47 - 73 ft - High Susceptibility
- 75 - 92 ft
- 93 - 115 ft
- 116 - 128 ft
- 129 - 142 ft - Low Susceptibility

Vegetation Scoring

Elevation Scoring

Slope Scoring
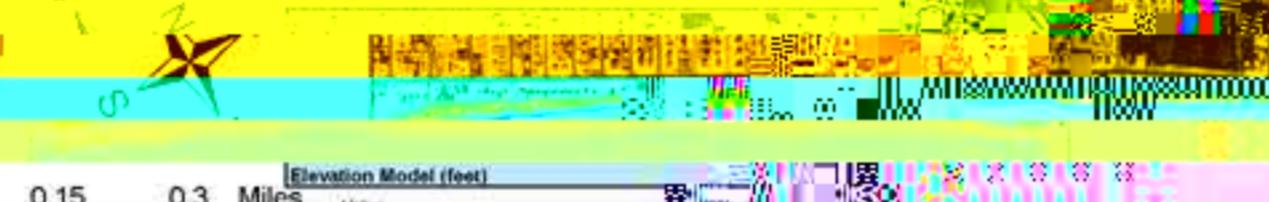
INTRODUCTION

In the spring of 2002, an analysis of dune stability was carried out ... Island, New Jersey ... collected and examined in order to ... assess the vulnerability of dunes to overwash and erosion from storm activity. These variables include: (1) dune width, (2) dune height, (3) dune slope, and (4) presence/absence of dune-stabilizing vegetation. The combined influence of these variables was used to determine which sections of dune are most susceptible to breaching. GIS was used to visually compare, analyze, and weigh the importance of each variable, and to mathematically integrate the variables across "sampling bins" along the length of the dune field

The base ... base map image data ... related data are from NJDEP. Elevation data are from NOAA LIDAR, flown in September, 2000. The LIDAR ... was used to (1) constrain the locations of the seaward and landward dune toe ... (3) create a foredune slope map.

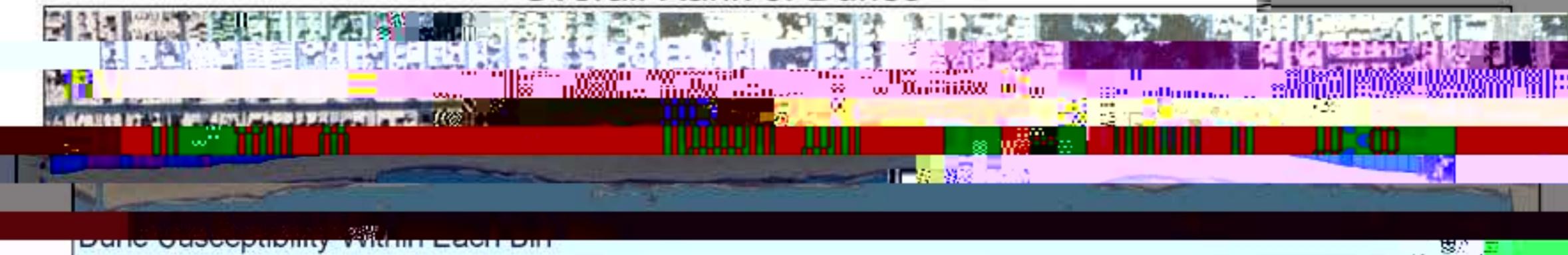In order to measure the variables in a consistent manner, the study area was subdivided into 122 uniform "sampling bins", measuring 100 ft ... For each bin, summary statistics or area ratios were calculated individually for the four dune stability variables.

Dune width and vegetation were measured as ... content within a given bin. Average dune ... height ... slopes were measured for each bin and the ... values ... determined using summary statistics. All ... accesetways were ... disrupt the maximum ...

Each variable was further grouped using a scoring system of 1 to 5, where 1 is ... susceptible to dune breach and 5 is the le... determining natural breaks in the data distribution. The overall susceptibility ... of a given bin was calculated ... variable scores using the following equation:

$$(3\ Elevation + 2\ Slope + Width + Vegetation)$$

Elevation and slope were given more weight because of their greater importance to the stabilization of dunes

OBJECTIVE

The purpose of this project was to determine and ... susceptibility of dunes to overwash and erosion. The goal was to produce a "dune susceptibility map" that ... where residential areas, particularly beach-front homes and property, may be at risk ... and exposed to dune overwash and flooding.

METHODOLOGY

Data were collected in the field as part of the larger Marine Geology (MARS-3310) class project, and acquired from several federal and state agencies, including the National ... Administration (NOAA) ... and the New Jersey Department of Environmental Protection (NJDEP). In the field, dune profile measurements were taken perpendicular ... 100ft. Dune measurements included (1) distance from seaward toe to crest, (2) distance from crest to landward toe, and (3) slope of fore- and backdune. Trigonometry was used to calculate the true dune width from the slope and toe-to-crest measurements. Vegetation was field mapped as either "present" or "absent." Both the dune and vegetation data were digitized from the field maps into the GIS.

RESULTS

clipped to the width of ...

The dune susceptibility map shows the overall rank of the bins ... have very ... susceptibility and only 4 bins ... susceptibility.

CONCLUSION

mile stretch of beach. It is obvious by performing fieldwork that the vulnerability ... dunes were le... beach, a walk-way ... backyard. ... natural beach ... of beach-front homeow... Perhaps this project will give coastal residents new insight into ... and the consequences they are promoting.

Overall Rank on Dunes

Dune Susceptibility Within Each Bin

0   0.2   0.4   0.8   Miles

- Very High Susceptibility
- High Susceptibility
- Moderate Susceptibility
- Low Susceptibility
- Very Low Susceptibility