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

INTRODUCTION
In the spring of 2002, an analysis of dune stability was carried out on the 1.2 mile stretch of beach in Holgate, Long Beach Island, New Jersey. Several variables relating to dune stability were 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 or absence of dune-stabilizing vegetation. The combined influence of these variables was used to determine which sections of dunes are most susceptible to breaching. GIS was used to visually compare, analyze, and weight the importance of each variable, and to mathematically integrate the variables across "sweeping bins" along the length of the dune field.

OBJECTIVE
The purpose of this project was to determine and quantify the susceptibility of dunes to overwash and erosion. The goal was to produce a "dune susceptibility map" that indicates where residential areas, particularly beachfront homes and property, may be at risk 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 Oceanic and Atmospheric Administration (NOAA) and the New Jersey Department of Environmental Protection (NJDEP). In the field, dune profile measurements were taken perpendicular to the beach face every 100 ft. Dune measurements included (1) distance from seaward toe to crest, (2) distance from crest to landward toe, and (3) slope of fore- and backdune. Topography was used to calculate the true dune width from the slope and toe-to-crest measurements. Vegetation was field mapped within "present" or "absent." Both the dune and vegetation data were digitized from the field maps into the GIS.

RESULTS
Each of the four dune stability variables are shown as overlays on the base map image. The variables, scored according to bins, are shown below the base map image. For presentation, the bins were plotted to the width of the dunes. Red bins are the most susceptible to dune breach, and are characterized by narrow dune widths, low dune elevations, shallow foredune slopes, and absence of vegetation.

The dune susceptibility map shows the overall rank of the bins, which is based on all four variables. Red bins are very high overall susceptibility and black bins are very low. There are 12 bins that have very high susceptibility and only 4 bins with very low susceptibility.

CONCLUSION
The final map shows the vulnerability of individual dunes in this 1.2 mile stretch of beach. It is obvious by performing fieldwork that the vulnerability of some of these areas are due to anthropogenic modifications. Some dunes were leveled off to create a view of the beach, a walkway or a backyard. Dunes are natural beach features that serve as safeguards against storm activity in order to protect the island and mainland. These features need to also be protected and preserved, not manually altered for the selfish benefit of beachfront homeowners. Perhaps this project will give coastal residents new insight into how their actions affect the beachfront and the consequences they are promoting.