The Impact of Development on Shoreline Movement in Stone Harbor and Avalon, New Jersey
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ABSTRACT
A study area of 70 blocks was utilized in Stone Harbor and Avalon, N.J. To determine the effect that development has on the movement of a shoreline. A forested area of 30 blocks was compared to a slightly larger length of developed shoreline. The shoreline was measured in both the purpose of analyzing each segment of shore movement more closely. The distance between a given historical shoreline and the western boundary of the block was measured for every 100 feet and survey data were calculated using various distances measured. By color-coding a standard deviation of the block, it is apparent which blocks sustained the greatest shoreline migration. The forested shoreline was found to have the greatest deviation from a theoretical average shoreline while the developed shoreline showed the least deviation from the average. The results of this study support the idea that development of a barrier island has a stabilizing effect on the migration of the shoreline. The forested area allowed for greater movement of the shoreline, similar to the type of movement that would be seen on a completely natural barrier island.

INTRODUCTION
Coastal management professionals as well as coastal zone property owners need to be aware of the potential hazards that are associated with living in close proximity to the shoreline. The movement of the shoreline is a constant for those who make their homes and livelihoods close to the ocean. The degree of movement directly impacts the degree of risk to coastal properties. Barrier islands stretch from New Jersey's main land and coast. In New Jersey, as well as along most of the eastern shore of the United States, the barrier islands have become highly developed vacation towns that bring in most of the income for coastal counties in the summer season. Increased development of these island towns brings in additional income to the town in the form of property taxes, summer rent income, and more people to shop and eat in the town's tourist centers. This project explores the effect that development has had on shoreline movement from 1936 to 2002. By studying the historical shorelines in two main sites along Stone Harbor Island, it is possible to see changes in the developed shoreline when compared to an equal length of forested shoreline.

OBJECTIVES
The objective of this study was to determine which areas of the study site sustained the greatest shoreline change over time. The effect of development on New Jersey's barrier islands is a very real influence on the behavior of the island; this study seeks to quantify that change by comparing a forested shoreline to a developed shoreline on the same barrier island.

REFERENCES

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METHODOLOGY
Sevens Mile Island, which contains the towns of Stone Harbor and Avalon in Cape May County, was examined using 13 historical shorelines spanning the years 1936-2002. The study site was composed of 70 blocks spanning from Avalon into the Stone Harbor. The forested region was to the north of the developed region. The forested shorelines were obtained from the Shoreline Survey, ODSP data file using ArcView 3.3 software. Sevens Mile Island was extracted from the data file to the approximate boundary. Fieldwork was done to verify the coordinates used in collecting data over so many years, the shorelines may vary as much as 100 feet relative to each other, but are assumed to be accurate for the purpose of this study. The most recent data was exported from the 1998, 2000, and 2002 to complete the history of the shorelines.

RESULTS AND CONCLUSIONS
Figure 1 shows the yearly change in average movement between the developed and forested shorelines. It is clear that the forested shoreline has a far greater width of movement than the developed shoreline displays. A similar trend is observed in Figure 2, where trends of shoreline movement can be seen over greater periods of time. The break point years are determined by visual shifts in the data. Figure 3 shows differences in range that each year experienced relative to the conditions of the previous year. Over time, the shoreline has developed or developed. Again, the forested shoreline showed greater width of movement. The results of the shoreline change standard deviation analysis are shown in Figure 4. The bars have been shifted to highlight the spatial range over which the shorelines changed. The colors represent the degree of shoreline position variability within each block area. The color of a block indicates the same color represents the smallest standard deviation from the theoretical average shoreline position. As the colors show very clearly, the warmest colors are located furthest to the right on the visualization. The warmest colors represent the largest deviation from a theoretical average shoreline position and this large deviation is present only on the forested shoreline. The cold and medium colors are distributed to the south the forest, this area is highly developed and represents the least amount of shoreline deviation from a mean.

Risky coastal areas that have undergone beach nourishment projects and which have been permitted to behave radically without interference. It is therefore impossible to determine whether the beach has naturally accreted or eroded but only when the beach has been advanced seaward or retreated landward, as compared to the initial 1936 shoreline.