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LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE-FORM ANALYSIS

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21240

Quarterly Report

LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE-FORM ANALYSIS

Introduction

Work is proceeding on schedule with our study of application of remote sensing to shoreline-form analysis. With the aid of a National Park Service grant we have completed an historical inventory of shoreline change along Assateague Island and Cape Hatteras National Seashores. We are now comparing this data with imagery acquired through the current NASA project. Our initial analysis leads us to believe that areas of the coastline which have historically shown to be highly vulnerable to storm damage can be independently identified by coastline angularity and overwash flats on small scale imagery and by coastal cusping on large scale imagery.

Problems

Our major problem has been with the acquisition of imagery and in determining the most useful format for analyzing Landsat images. Low altitude aerial photography was flown for our project by NASA-Wallops in September. However, most of the frames were of little or no use due

to cloud cover and double exposure. Negotiations to date for another pre-storm flight have been fruitless. Without large scale pre-storm and post-storm photography, we will be unable to fulfill all of our project objectives. Specifically, we will not be able to adequately test our method of predicting the location of storm damage along the sedimentary east coast of the United States.

The second problem of Landsat image format was expected, but we are making progress in finding the solution. We have experimented with and have rejected two methods of utilizing Landsat. The first was to study 9" x 9" prints enlarged on our KARGL reflecting projector. This proved inadequate. The second was to project negatives onto a screen at a scale of 1:80,000 and draw appropriate base maps. This method has proven to be less accurate than expected. We are now experimenting with a third method of photographically enlarging a negative and producing a print as close as possible to 1:80,000 scale. This print will then become the base on which all our measurements will be made.

Accomplishments

Historical data on shoreline migration (erosion and accretion) and vegetation migration has been collected at

100 meter intervals along nearly 200 kilometers of Assateague Island and Cape Hatteras National Seashores. Low altitude aerial photography for as many as seven different time periods from 1934 to 1974 was used as the data source. The data has been computerized to provide statistical output and graphical representation of geomorphological change. The graphical output has been condensed for comparative analysis.

Mosaics of high altitude aerial photography flown by NASA in May, 1975 are being used for comparative analysis with the historical data in an attempt to predict the location of storm damage. Landsat imagery is being used for the same purpose.

Base maps of Assateague Island have been drawn from Landsat images. Coastal angularity has been plotted for two different time periods in an effort to determine if change in shoreline form can be detected with this type of imagery.

Significant Results

The large volume of historical data allows us to analyze the historical changes in shoreline form to an extent never before possible. We have combined the mean rate of change in shoreline with periodic variations to

give us a measure of change that includes both the long-term trend and the short term extreme events caused by storms. With this measure we have been able to select areas of the coast which have historically shown to be most vulnerable to storm damage.

On Assateague there are six such areas: the western tip of Fishing Point; the southern National Park Service parking lot; Smith Hammocks; Fox Hill Level; Little Fox Hill Level; and the northern five kilometers of the island. Comparative analysis of these areas with other data and with large and small scale aerial photographs shows them to be associated with large overwash fans and shoreline cusping. Initial analysis of Landsat imagery and high altitude photography indicates that the areas of high vulnerability are also associated with the angular orientation of the shoreline.

Continuing Research

Although we are well into the analysis stage of our project, we feel we have only scratched the surface of possible conclusions that can be derived from our data and imagery. Furthermore, we have not yet received the before-storm and after-storm imagery that will be so

important in supporting or refuting our theories. Therefore, for the duration of the project we will be concentrating on comparative analysis of historical imagery and data, and of new imagery as it is received, in an effort to answer the questions stated in our September quarterly report.

Publications

We foresee as many as 2 distinct papers resulting from this research. To this end, we are compiling a set of notes relating to the fields of coastal zone management, coastal geomorphology, and the application of multi-level remote sensing to shoreline-form analysis.

Landsat and Aircraft Data

We have found historical low altitude aerial photography essential to our project due to the need for high resolution in data collection. An excellent set of low altitude photography flown by NASA Wallops in June, 1974, under the auspices of a National Park Service grant was also essential. The only set of low altitude photography provided by the current NASA grant has proven to be inadequate.

A set of high altitude photography provided by this grant has proven to be invaluable. It is hoped that another

set following the storm season will prove to be more valuable in our comparison analysis.

It is too early to assess the usefulness of the Landsat imagery. Through further experimentation, we will be able to assess whether or not it can replace high altitude photography in providing the unique infor-ation required for our research.