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E77-10074 II

NASA-CR-149440

LANDSAT APPLICATION OF REMOTE SENSING TO SHORELINE-FORM ANALYSIS

Contract No. NAS5-20999
Investigation No. 21240

Quarterly Report for Period 9/1/76 to 1/1/77

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11 January 1977

21240

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(E77-10074) LANDSAT APPLICATION OF REMOTE
SENSING TO SHORELINE-FORM ANALYSIS
Quarterly Report, 1 Sep. 1976 - 1 Jan. 1977
(Virginia Univ.) 8 P HC AQ2/RF A01 CSCI 08E

G3/43

Unclass
00074

N77-10409

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Landsat Application of Remote Sensing To Shoreline-Form Analysis		5. Report Date 1/11/77	6. Performing Organization Code
		8. Performing Organization Report No.	
7. Author(s) Robert Dolan, Principal Invest. Jeffrey Heywood, Investigator		10. Work Unit No.	
9. Performing Organization Name and Address Department of Environmental Sciences University of Virginia Charlottesville, VA 22903		11. Contract or Grant No. NAS5-20999	
		13. Type of Report and Period Covered Quarterly Report 9/1/76 to 1/1/77	
12. Sponsoring Agency Name and Address NASA/Goddard Space Flight Center Greenbelt, Maryland 20771 Edward Crump, Technical Monitor		14. Sponsoring Agency Code	
		15. Supplementary Notes	
16. Abstract Low altitude aerial photography (1:20,000) is being used to map historical coastal erosion and overwash penetration for Cape Lookout National Seashore. The data will be correlated with data on coastal orientation obtained from Landsat imagery. Field data on beach measurements and sand grain size is being processed for correlation studies with coastal erosion and orientation for Assateague Island and Cape Hatteras. There are no significant results to report during this period.			
17. Key Words (Selected by Author(s)) Coastal Erosion, Coastal Orientation, Overwash Penetration, Landsat, Coastal Processes, Aerial Photography Cape Lookout		18. Distribution Statement	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 8	22. Price*

*For sale by the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

PREFACE

Objective

Our objective is to quantify relationships between shoreline form and coastal dynamics and to predict areas vulnerable to shoreline erosion and storm-surge penetration. We are using Landsat enlargements, high-altitude aerial photography, and low-altitude aerial photography to accomplish these objectives.

Scope of Work

We have presented preliminary results of our analysis of the correlation between coastal erosion and coastal orientation for Assateague Island and Cape Hatteras in previous reports dated 27 April and 18 June, 1976. The next major phase of our study is to perform the same analysis for Cape Lookout. To this end we have measured the orientation of Cape Lookout National Seashore with Landsat imagery, and we are nearing completion of the mapping of historical erosion of this 80-kilometer section of mid-Atlantic coast.

We have begun to acquire imagery for the southern New Jersey coast in preparation for mapping historical erosion in that area. This mapping effort will run concurrently with the analysis of the Cape Lookout data.

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INTRODUCTION

Our project is concerned, in general, with the study of sedimentary-coastal processes in the mid-Atlantic region from New Jersey to North Carolina. Specifically, we are analyzing shoreline erosion data from historical aerial photography and shoreline-form data from recent Landsat imagery. We are attempting to find the natural relationship between shoreline form and historical erosion with the ultimate objective of being able to predict areas of storm vulnerability based on shoreline form or coastal orientation.

This quarterly report will be shorter than previous reports, because since 1 September, our time has been spent primarily on gathering data. We will therefore not discuss analysis or significant findings.

ACCOMPLISHMENTS

During the period from 9/1/76 to 1/1/77, we have completed nearly all of the mapping of historical coastal erosion and overwash penetration for Cape Lookout National Seashore. The area extends from Beaufort Inlet to Ocracoke Inlet, North Carolina, and includes Shackleford Banks, Core Banks, and Portsmouth Island. The source of data is low altitude (c. 1:20,000) aerial photography flown in 1943, 1954, 1958, 1962, 1969 and 1976 for Shackleford Banks, and 1940, 1955, 1962, 1969, and 1975 for Core Banks and Portsmouth.

We have acquired aerial photography of the New Jersey coast from Cape May to Beach Haven for 1930 and 1940. We have ordered photography dated 1949, 1961, 1962, and 1971 in preparation for mapping the New Jersey coast later this month.

Sand-grain size measurements have been completed on samples taken from Assateague Island during our summer field trip. Measurements are continuing for samples from Cape

Hatteras and Cape Lookout. A microscope and rapid sediment analyzer are being used for these measurements. Correlations will be made between this data and coastal erosion and orientation data already gathered.

SIGNIFICANT RESULTS

We have no significant results to report during this reporting period.

PROBLEMS

The mapping of historical coastal erosion and overwash penetration for Cape Lookout is requiring more time than we had anticipated due to a number of factors. The area is less developed and the bay shore is more unstable than the other barrier islands we have mapped. This causes more difficulty in aligning photography to our base maps. It has been more difficult to determine a consistent high water mark on the historical photography due to extensive ridge and runnel effects. This causes difficulty in locating the shoreline. Furthermore, due to the low profile of the Core Banks, the vegetation tends to be more responsive to overwash and other coastal processes. Therefore, the correct vegetation line is more difficult to interpret than on Assateague or Cape Hatteras.

PROGRAM FOR NEXT REPORTING PERIOD

The mapping of historical coastal erosion and overwash penetration on Cape Lookout National Seashore will be completed this month. This data will then be combined with the coastal orientation data for Lookout, and correlation studies will be performed as done for Assateague and Cape Hatteras. We will then be in a better position to assess the relationship between coastal erosion and coastal orientation for barrier islands along the Atlantic coast. (Quarterly report dated 18 June 1976.)

We will run correlation studies between the beach data gathered during our summer field trip and data on coastal erosion and orientation gathered from Landsat and aerial photography. We will also begin mapping historical coastal erosion and overwash penetration for the southern New Jersey coast.

Finally, we are still looking for that "big" storm which did not occur last year. With the aid of aerial photography supplied by NASA Wallops, we will then map the before-and-after response of the coast to the storm. This will allow us to test our ability to predict the location of greatest storm damage.

PUBLICATIONS

We recently received notification by the editors of Science of their desire to publish an article we wrote based on our project findings of the past year. We are currently making revisions on our first draft of the article. Most of the information contained in the article has been presented in our previous quarterly reports. An in-house publication entitled Handbook for Remote Sensing is now being printed. Funding has been provided by the National Park Service and NASA-Wallops. The main purpose of the publication is to ... describe the usefulness of remote sensing as a source of geomorphological data in the coastal zone. Much of the information is based on years of experience of the authors in coastal zone research. Ratings are given to different types and scales of imagery with regards to identifying the many different natural features in the coastal zone. Technical data on remote sensing equipment and film types were supplied by NASA-Wallops. Of special interest is a comprehensive listing of most of the aerial photography known to exist over Assateague Island, Cape Hatteras, and Cape Lookout National Sea-

shores. A case study based upon some of the findings presented in our previous NASA quarterly reports is also included.