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E7.3 10557

CR-131856

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CENTRAL ATLANTIC REGIONAL ECOLOGICAL TEST SITE: A PROTOTYPE
REGIONAL ENVIRONMENTAL INFORMATION SYSTEM

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1 May 1973

Type I Progress Report for Period 1 March 1973 - 30 April 1973

Prepared for:

Goddard Space Flight Center
Greenbelt, Maryland 20771

E73-10557) CENTRAL ATLANTIC REGIONAL
ECOLOGICAL TEST SITE: A PROTOTYPE
REGIONAL ENVIRONMENTAL INFORMATION SYSTEM
Progress Report, 1 Mar. - 30 (Geological
Survey) 12 p HC \$3.00 CSCL 08F

N73-23429

Unclas
G3/13 00557

Publication authorized by the Director, U.S. Geological Survey

Type I Progress Report

ERTS-1

1 March 1973 - 30 April 1973

a. Central Atlantic Regional Ecological Test Site: A Prototype Regional Environmental Information System. (ERTS-A Experiment SR-125)

b. IN-002

c. Statement and explanation of any impedance:

The main difficulties reported in past progress reports have propagated themselves, to a certain extent, into the present reporting period, although the situation has been alleviated somewhat and a revised modus operandi has been established. These difficulties are incomplete aircraft underflight coverage and problems of obtaining color composite images, or other representations of multispectral display of ERTS imagery, in a format easily brought into registration with the geometrically-rectified land use data base which is to serve as a "training set" for ERTS land use mapping.

High altitude photography received within the past two months has left only a small portion of CARETS unphotographed -- the western portion of Fauquier County, Virginia. Steps are being taken to obtain this coverage.

While the Level I Land Use mapping for ERTS is being accomplished through the use of commercially-produced, color composite enlargements, these enlargements are expensive and not entirely satisfactory. The

limited number of frames practical to produce has thus far allowed interpretation from only a single color composite per area covered. Consequently, in addition to the 70 mm transparencies and negatives presently received, the CARETS program is requesting the receipt of 9½" (1:1,000,000) ERTS positive transparencies images. These 9½" frames can be used to produce inexpensive color composites through the diazochrome process, and the 9½" frames may also be cut into smaller frames and used in the I²S color additive viewer, where they can be enlarged to a scale of 1:384,000. While still not entirely solving the color composite problem, the large scale ERTS images are expected to help.

d. Accomplishments during the reporting period and those planned for the next period:

During this reporting period progress was made on a Level III land use classification to respond to more detailed user requirements and to exploit the fullest resolution potential of ERTS data. A small area of the Norfolk-Portsmouth SMSA test site was mapped on Level III, with the use of high altitude aerial photography, topographic maps, and other local maps. It was also decided to attempt to identify as many Level III land uses as possible during the land use mapping of CARETS from ERTS.

The principal accomplishments during the past two months have been the near-completion of ERTS 1972 Level I land use mapping of CARETS at a scale of 1:250,000. Although experimental ERTS land use mapping

was conducted in the area around Frederick County, Maryland, and ERTS change detection work was completed for the Norfolk-Portsmouth test site, this was the first full-scale attempt at using ERTS to map systematically the entire CARETS area. Numerous problems were encountered. Originally, 1:250,000 high altitude photo mosaic control base (actually a reduction of that used for the Level II mapping) had been prepared. It was determined, however, that the use of such a base introduced too much bias. Instead, CARETS is being mapped on overlays directly from unrectified ERTS 1:250,000 color composite transparencies. These overlays will later be transferred to a map base; area measurements from unrectified maps will be compared for accuracy with those from a rectified base.

Preliminary experimentation with color composite images at a scale of 1:100,000 revealed that much greater detail could be obtained at a larger scale without loss of resolution because the minimum recording size mapping rule requires greater generalization at a smaller scale. The ERTS interpreters also found that a 2 mm minimum recording size is too small for land use mapping at 1:250,000 because of complexity and scale.

The mapping of CARETS has revealed an extensive capability of ERTS as a tool for identifying land use. On Level I, water was the most easily identifiable feature, with forests, non-forested wetlands, bare land (especially beaches), agricultural and urban areas all

identifiable to some extent. There is great difficulty, however, in distinguishing suburban residential area from agricultural field patterns, wooded residential areas from forests, orchards and horticultural areas from forests, and some wetlands from forests, agriculture, and water without coverage from late spring and summer passes.

Besides mapping CARETS on Level I, the ERTS interpreters have also tried to determine how many second and third level land uses can be identified on ERTS images. Because of the nature of the CARETS region, most Level I agricultural land (category 2) falls into the cropland category (21) on Level II; most Level I non-forested wetland (6) is the Level II vegetated non-forested wetland (category 61). The ERTS color composites used for land use mapping were imaged in October and do not permit distinguishing between deciduous and evergreen forests. This distinction, however, can readily be made on ERTS frames imaged during the winter. Level II and III urban land uses are not as readily detected as other categories. Occasionally, Level II categories of residential, commercial, industrial, extractive, and transportation can be identified, but not consistently on Level III. Airfields and major highways (including interchanges and bridges) are easily identified. Railways and railway yards can be and are occasionally identified, although the black signature of railway yards can be confused with

water bodies. Areas of single family residences can be identified and delineated in some cases.

During this reporting period two user meetings and several informal discussions were held with representatives of the Northern Virginia Planning District Commission. The Commission was given copies of the CARETS experimental Level II land use sheets of their district, providing the most up-to-date land use information available. These maps will be used in the final water quality plan for the District and to obtain acreage and percentage of land uses in the Commission's Broad Run Watershed Study. In exchange for the land use information, feedback will be obtained on their use of the data and evaluation of significance of ERTS coverage of their Planning District.

Processing of the data from the 1972 Baltimore aircraft mission (University of Michigan aircraft), to develop techniques for measuring net radiation, was initiated in late April at the Environmental Research Institute of Michigan. After conversion of the tapes from analog to digital format, experiments are being conducted to determine the best methods of obtaining a surface temperature map from the computer. Formerly in the climatological investigations, such maps were prepared by a laborious and somewhat subjective process involving photometric integration by grid cells of a photographic print of the scanner image. This work is preparatory to a Skylab experiment and to comparison with, and interpretation of ERTS-derived land use data in terms of the probable climatological impact of land use changes.

Accomplishments planned for the next reporting period include:

- a) Completion of ERTS Level I base mapping of CARETS
- b) Initiation of the comparison of the accuracy of ERTS and high altitude aerial photography land use mapping for selected test sites.
- c) Preparation of digital file for one or two of CARETS subregions
- d) Initiation of user contact with the Metropolitan Washington Council of Governments, obtaining a detailed user evaluation.
- e. Scientific results and practical applications:

A practical application of ERTS images, namely determining the extent to which regional plans for a metropolitan area are being carried out, was brought to the attention of the CARETS staff by a representative of one of the user agencies, the Northern Virginia Planning District Commission. The "radial corridor" planning concept for the Washington Metropolitan area was first established in the Year 2000 Plan in the early 1960's. Under this plan, concentrated development would extend outward from Washington along wide radial arterial corridors, while the wedges in between the corridors would remain primarily open space areas. Although this plan never had had a legal status, it was approved by almost all planning commissions within the Washington Metropolitan area. The extent to which planning has failed to maintain these open spaces -- the degree of wedge violation -- can be readily seen on ERTS images. ERTS thus can be used by planners to demonstrate present conditions of urbanization within metropolitan areas.

f. Published reports or talks:

The CARETS project presented three papers at the NASA/Goddard Space Center Symposium of Significant Results Obtained from ERTS, March 5-9, 1973. In "Land Use Classification and Change Analysis Using ERTS-1 Imagery," Robert Alexander discussed the analysis of the Norfolk-Portsmouth Standard Metropolitan Statistical Area for discrimination of land use classes and change analyses, concluding that land use detail obtainable from ERTS exceeded the expectation of both the Interagency Steering Committee and the USGS proposed standardized land use classification. In a second paper, "ERTS Regional-Scale Overview Linking Land Use and Environmental Processes in CARETS," Alexander hypothesizes that ERTS-derived zones of similarity--photomorphic regions--are sub-regions of similar land use characteristics. In a third paper, "Evaluation of Land Use Mapping from ERTS in the Shore Zone of CARETS," Robert Dolan and Linwood Vincent concluded that not only could ERTS imagery be used to map Level I land use distribution on the CARETS region's barrier islands, but also that it appears that vulnerability and sensitivity of the land cover classes can be estimated from the investigation of ERTS imagery with some supplementing underflights and field work.

In addition to their ERTS-1 symposium paper, Dolan and Vincent also published an article entitled "Coastal Processes" in the March 1973 (volume 34, number 2) issue of Photogrammetric Engineering, describing the value of high altitude photography as the "only method currently

available for investigating the aerial and temporal distributions of crescentic coastal features...."

On April 5 William Mitchell presented a talk, "The Central Atlantic Regional Ecological Test Site," before a group of planners attending a workshop of the Metropolitan Washington Council of Governments. He discussed the accomplishments of the CARETS project during fiscal year 1973 and its prospects for fiscal year 1974.

g. Recommendations for improvement:

None.

h. Changes in standing order forms:

None.

i. ERTS image description forms:

See attached.

j. Data request forms submitted:

None.

k. Status of data collection platforms (if applicable):

N.A.

ERTS IMAGE DESCRIPTOR FORM

USER NAME Robert H. Alexander
USER ID IN-002
AGENCY U.S. Geological Survey

DATE 1 May 1973

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS *				DESCRIPTORS
E-1133 15150-7 3 December 1973 Bulk Process					back bay, barrier beach, barrier island, barrier lagoon, bay, bridge, canal, coastal marsh, coastal plain, continental shelf, cropland, estuary, floodplain, forest, highway, inlet, island, lake, marsh, peninsula, plain, river, rural area, salt marsh, stream, tributary, urban area, valley, vegetation.
E-1205 15135-4,5,6,7 13 February 1973 Bulk Process					airfield, back bay, barrier bar, barrier beach, barrier island, bridge, coast, coastal marsh, coastal plain, coast line, continental shelf, cropland, estuary, floodplain, forest, gap, harbor, highway, island, lake, marsh, meander-metropolitan area, mountain, park, peninsula, piedmont, plain, railroad, ridge, river, rural area, salt marsh, sea, stream, suburban area, tributary, urban area, valley, vegetation.

* FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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E-1205 15141-4,5,6,7 13 February 1973 Bulk Process					airfield, back bay, barrier beach, barrier island, bay, bridge, canal, cape, coast, coastal marsh, coastal plain, coast line, continental shelf, cropland, estuary, floodplain, forest, harbor, highway, island, lake, marsh, meander, metropolitan area, peninsula, plain, river, rural area, salt marsh, sea, stream, tributary, urban area, valley, vegetation.
E-1205 15144, 4,5,6,7 13 February 1973 Bulk Process					airfield, barrier beach, barrier island, bridge, bay, canal, cape, coast, coastal marsh, coastal plain, coast line, continental shelf, cropland, estuary, floodplain, forest, harbor, highway, inlet, island, lake, marsh, meander, metropolitan area, peninsula, plain, railroad, river, rural area, salt marsh, sea, stream, tributary, urban area, valley, vegetation.

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