LAND USE OF NORTHERN MEGALOPOLIS FROM ERTS-1 IMAGERY

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16. Abstract

During the first six months of this contract, a Significant Scientific Result which has proven of interest to state and interstate planning agencies has been accomplished, namely the compilation of an eight-category, color-coded, land use map of the state of Rhode Island.

However, the continuing failure to receive any imagery in form suitable for final-type mapping endangers the timely completion of the project.

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Preface

The objective of the investigation reported herein is to determine the utility of ERTS-1 for compiling land use maps and computer data banks suitable for use in large-area regional planning studies. The test area includes all of New England except northern Maine, but priority is given to the densely populated southern states Massachusetts, Connecticut and Rhode Island.

The report concludes that although a Significant Scientific Result already has been attained during the first six months of this contract, the continuing failure to receive any imagery in form suitable for large-area, final-type thematic mapping endangers timely completion of the project. There is a single recommendation, and it doubtless is redundant: that NASA take every possible step to get essential ERTS images into the hands of its investigators.

Illustration

LAND USE MAP OF NORTHERN MEGALOPOLIS FROM ERTS-1 IMAGERY

1. Introduction.

This interim report is submitted to inform GSFC authorities of the scientific and technological status of the subject investigation at the end of the first six months. A Significant Scientific Result has been attained. Nevertheless the report is brief, since no imagery in suitable form for final-type large-area mapping has yet been received.

2. Work done during the Six-Month Reporting Period.

From initiation of the contract in June 1972 until launch on 23 July, this research group was very active with:

(1) collecting, evaluating and studying ground truth in the form of maps, aerial photos, textual materials, and conferences with planners

(2) determining format for the mapping effort (scale, land use categories, locational tolerances, etc.)

(3) experimenting with methods for converting the anticipated color-coded land use map product into a digital computer data bank

(4) developing appropriate computer software and investigating statistical methods, and

(5) reviewing background literature.

After launch, these preparatory actions were continued, with the addition of some hardware review, until the receipt at Hanover of the first ERTS imagery in mid-September 1972. At that time a crash program was begun, to prepare for a presentation at the ERTS Preliminary Findings Seminar held at Goddard on 29 September. That program

Figure 1

resulted in the compilation of a preliminary map of the land use of the State of Rhode Island (Fig. 1), by David T. Lindgren and David J. Ruml, and a paper.[1]

From the time of the September symposium until the end of the reporting period (30 November 1972), only b/w paper prints of possible useful imagery have been received. Due to prolonged cloudiness over northern United States, as well as backlogs in the photo lab, the first of these b/w prints to indicate fully useful mapping coverage arrived in mid-November. By the end of the reporting period b/w paper prints of four potentially useful images had been received. Together they cover about 2/3 of the total test site.

Stremuous efforts to get multiband transparencies of these four scenes from the GSFC photo lab, for mapping, have as yet been unsuccessful.

3. Significant Scientific Results.

The preliminary map of land use of Rhode Island (Fig. 1) is believed to be the first urban-type land use map ever made from satellite imagery, and its preparation a Significant Scientific Result for ERTS-1. Eight categories of land use were differentiated at a scale of 1:250,000 including 3 categories of residential area: single family and multiple/mixed urban types, plus a "residential and open space" rural one. This compares favorably with RB-57 mapping experience in which, mapping at 1:120,000 from photography taken from 60,000 feet, 11 basic categories of land use were discriminated. From ERTS, the urban cores of cities down to 7,000 population, and commercial and industrial sites down to 800 feet square, were consistently discriminated. For further technical details, see the paper cited in the footnote below.

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[1] Simpson, Robert B., Urban-Field Land Use of Southern New England: A First Look. To be published in January 1973 by GSFC in a volume on proceedings of the seminar.

Fig. 1. Preliminary ERTS-Derived Land Use Map of the State of Rhode Island.

The first map of its kind. Drawn from a 1:250,000 enlargement of an MSS color composite (Scene No. 1005-15005, dated 28 July 1972). Legend adapted from one developed by Dartmouth College Project in Remote Sensing for metropolitan area land use studies of Boston and New Haven from NASA-MSC RB-57 photography, under USGS Geographic Applications Program contract, 1970-72.

LEGEND

SINGLE-FAMILY RESIDENTIAL	yellow
MIXED SINGLE- & MULTI-FAMILY RESIDENTIAL	orange
COMMERCIAL & MANUFACTURING	red
TRANSPORTATION & UTILITIES	black
RURAL RESIDENTIAL & OPEN SPACE	light green
WOODLAND	dark green
AGRICULTURAL (ROW CROPS)	brown
WATER	blue
OBSCURED BY CLOUDS	white

Scale of this color print is 1:375,000 (5.9 miles per inch)
Scale of the original map is 1:250,000 (3.9 miles per inch)

Representatives of one interstate planning agency (the New England River Basins Commission) and 6 state planning agencies (Alabama, Connecticut, Massachusetts, New Hampshire, Ohio and Rhode Island) have visited, telephone or written the Dartmouth College Project on Remote Sensing for further information about the Rhode Island map. In addition it is believed that other state-level agencies have expressed interest to representatives of the USGS EROS program. Cost benefits have not been estimated, but it seems apparent that if ERTS can provide useful land use data, they will be economical. More information on this subject will be developed during the next six months.

4. Program for the Next Six Months.

In the light of the experience of the last six months it would be premature to attempt to revise schedules for the next six months until suitable mapping imagery is received and active mapping begun. Arrangements have been made with the General Electric commercial photo laboratory in Beltsville, Maryland to convert the four images cited in paragraph 2 above to a 1:250,000 map base on a priority basis as soon as they are released by the GSFC laboratory. And as soon as the Beltsville enlargements reach Hanover full-scale mapping will begin. Hopefully this will be by 1 January 1973.

5. Conclusions.

The first six months of this contract have provided a Significant Scientific Result in the form of a land use map of an entire state, compiled by two men in two days. Theoretically the prospects are bright for the successful completion of this contract. But nothing will be done, nor can be done, until suitable imagery is received.

6. Recommendation.

That essential ERTS imagery be gotten out to Investigators in useable form more rapidly, even if this requires additional subcontracting to commercial photo processors.