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Bi-Monthly Progress Report

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Period: September 1, to October 31, 1972

- A. Title of Investigation: "A Study of the Utilization of ERTS-A
Data from the Wabash River Basin".
ERTS-A Proposal Number SR#049
- B. Principal Investigator: D. A. Landgrebe
GSFC Number UN127
- C. Data gathered over the Wabash River Basin by the ERTS-1 satellite
continues to occur when the region is under a cloud cover. Al-
though this has impeded the progress of analyzing data from the
Wabash River Basin, substitute data from other areas has allowed
the development of analysis techniques to proceed on schedule.
- D. Crop Species Identification and Acreage Estimation: Planning
continued for the evaluation of ERTS-1 data from crop, identifi-
cation and acreage determination. It is anticipated that the
statistical reporting service of the U. S. Department of Agri-
culture will join LARS in this effort and negotiations toward
this end are now in progress. Initial work on the development
of the statistical sampling model utilizing ERTS and ground
truth data was completed.

E72-10208
CR-128479

During the next period, the sampling model will be completed,
and classification of ERTS data will be started. Since no ERTS
data would be available during the 1972 growing season for corn
and soybeans in Indiana, data from other areas will be considered
for initial work on developing analysis procedures for the
identification of crops.

Urban Land Use: Aircraft multispectral scanner data was obtained
from the White River, Marion County, Indiana, area in September
at 5000 and 2000 feet. This data was digitized and reformatted
and analysis of separable spectral classes was begun. Conferences
were held with the Division of Planning of the Indiana Department
of Commerce to draft a working agreement between Purdue/LARS and
that agency. The purpose of such an agreement is to enable a
working relationship with personnel from the Division of Planning
to determine the detail of land use separation desired for state
wide planning.

(E72-10208) A STUDY OF THE UTILIZATION OF
ERTS-A DATA FROM THE WABASH RIVER BASIN. N73-12331
AN EARLY ANALYSIS OF ERTS-1 DATA Bimonthly
Progress D.A. Landgrebe, et al (Purdue Univ.) 31 Oct. 1972 29 p CACL 08H G3/13 00208
Unclas

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Mapping of Soil Associations: Preliminary results of soil association mapping were obtained from Collin County, Texas. Further delineation of soil associations will be studied using the same procedure as reported herein. Additionally, training samples will be selected from the various types and a compatibility for recognizing soil types will be evaluated. If ERTS-1 data over bare soils in the Wabash River Basin become available, it will be used in preference to the "Texoma Frame".

Earth Surface Feature Identification: A small section of the study area was cloud-free on August 8, 1972. This area was analyzed and preliminary results of forest and agriculture cover types are reported. Similar activities to those reported above are being pursued with the Indiana Department of Natural Resources. These contacts are important to generating useful analysis results.

Atmospheric Modeling: Activity during this reporting period consisted of modification of several programs required to compute aerosol scattering to allow their usage on the LARSYS programs. This work is progressing satisfactorily and will continue during the next reporting period.

E. A classification (using the LARSYS software) of a portion of frame E-1016-16050 CCT was completed. The categories: row crops (corn or soybeans), forest and woodland areas, diverted acres - pastureland - or nonproductive grassland areas, water (rivers), clouds, and cloud shadows, were represented by one or more spectral classes. The results of this classification are significant in that they show potential for accurate identification and delineation of forested and agricultural areas using automatic data handling techniques.

- F. LARS Information Note 092972 entitled "An Early Analysis of ERTS-1 Data" by D. A. Landgrebe, R. M. Hoffer, F. E. Goodrick, and staff, was published on September 29, 1972. The results contained in this report were also reported at the Goddard meeting September 29, 1972.

Two reports are attached which contain results in the sub-disciplines of land use analysis and soil survey and classification. The first was submitted to the NASA Scientific and Technical Information Center on October 3, 1972. The second is in the process of being submitted.

- G. No operational changes are recommended.
- H. There are no changes in the standing order form requested.
- I. No ERTS image description forms were completed during the period.
- J. Frame E-1003-16334 was requested on August 10, 1972, as a test of the retrospective ordering system. The data was received late due to incorrect addressing of the tapes.

5-12

"Preliminary Results on Automatic Identification of Forest and Agricultural Cover Types Utilizing ERTS-1 Data Over the Wabash River Basin" *

ERTS Frame No.: E-1016-16050; obtained on 8 August 1972
Run Number: 72008600 Classification Serial Number: 092633301

Introduction

ERTS-1 Frame No. E-1016-16050 CCT data arrived at Purdue University on September 22. Although 60% or more of the frame was cloud covered, an area of approximately 300 square miles which was cloud-free was selected for analysis. This area is located approximately 20 miles west of Evansville, Indiana and includes the junction of the Wabash and Ohio Rivers.

Procedure

After the data from the designated study areas were reformatted, a preliminary classification was produced, using the clustering algorithm. This automatic classification result was completed on September 23, within 18 hours after the data tapes had arrived. Study of these results indicated some misclassifications, particularly those between water and cloud shadows present in the data. A second iteration was then carried out, utilizing 15 different spectral classes plus a hand-selected class for clouds and another for cloud shadow areas. This revision and classification work was completed on September 26.

Results

The second classification shows well defined field boundaries and an accurate delineation of the forested areas. The classification includes the following categories, each of which are represented by one or more spectral classes:

- row crops (corn or soybeans)
- forest and woodland areas
- diverted acres, pastureland, or nonproductive grassland areas
- water (primarily Wabash and Ohio Rivers)
- clouds
- cloud shadows

A number of agricultural fields appeared bright blue on the color infrared composite prepared using Channels 4, 5, and 7. The cause of this spectral response has not been determined, although it is thought that it is related to very high rainfall just prior to the collection of this ERTS data. The results of this classification are significant in that they show the potential for accurate identification and delineation of forested and agricultural areas, using automatic data handling techniques. Additionally, these results indicate the potential for rapid analysis of data collected over relatively large geographical areas.

* 2A. Land Use Classification

6.0

"Preliminary Results on Machine Classification of Soil Associations in Collin County, Texas"

ERTS Frame Number: Subframe of the Texoma frame collected July 25, 1972.

Run Number: 72001403 Classification Serial Number: 1107215005

Introduction

An area of about 50 square miles adjacent to and west of Lavon Reservoir in Collin County, Texas was chosen from the Texoma frame collected by the ERTS-1 satellite on July 25, 1972. The area is dissected by several creeks, including Muddy Creek, White Rock Creek, and Ticky Creek. Direct ground observations were not available, but the area was mostly covered with cotton and pasture vegetation.

Procedure

After the data from the designated study areas were reformatted, a cluster analysis (unsupervised classification in the LARSYS programs) was performed on the bands 4, 5, 6, and 7 (MSS) data from this area. Five distinct spectral categories were found. Soil boundaries from the 1969 soil survey were manually superimposed onto the resulting spectral map for the purpose of evaluating the results.

Results

Boundaries between Houston clay and Houston Black clay were generally apparent in the spectral analysis. Houston clay is more steeply sloping than the Houston Black clay and is less suitable for cultivated agriculture. Cotton is frequently grown on the Houston Black soils, whereas Houston soils are more often used as pasture.