# TYPE 1 PROGRESS REPORT

For Period Ending 1 August 1972





A. Title of Investigation:

Evaluation of the Application of ERTS-A Data to the Regional Land Use Planning Process, Proposal #058

B. GSFC Identification Number of Principal Investigator:

James L. Clapp, UN 040

C. Statement of Any Problems Impeding Progress of Investigation:

1. Awaiting the arrival of RB-57 imagery (Mission 205 - ERTS 058 Project - Green Bay-Milwaukee-Madison) flown on 4 June 1972 as part of this ERTS contract.

2. Awaiting the arrival of ERTS imagery.

3. The contract makes reference (p.8) to "exhibit C" to be used by the investigators in preparing information for the NDPF System. We are unable to find any "exhibit C" and request that copies be sent to us for later progress reports.



D. Discussion of Accomplishments During Reporting Period and Those Planned for Next Reporting Period:

(1) Period Ending 1 August 1972:

Through a series of participant seminars, an organizational structure was developed for this project. This organizational chart (see Enclosure #1) delineates the presently perceived major responsibilities of: Administration & Project Coordination; Interpretation; Data Processing; Applications & Documentation; and Policy

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Formulation. Individuals that are assigned to these responsibilities are identified in Enclosure #2.

Enclosure #2 also documents those individuals on the Steering Committee of the University of Wisconsin Environmental Monitoring and Data Acquisition Group, which helps direct operations.

Also shown is a preliminary "advisory council" listing which we are forming. Since only a few individuals have been personally contacted to date, this list primarily indicates organizations which will be represented. The members of this council will represent a cross section of land use concerns for the state of Wisconsin. They will provide real inputs to a total analysis of the application of ERTS data to the regional land use planning process.

In addition to these organizational matters, work has progressed in developing a preparedness for the arrival of ERTS data. This included a partial updating of the "data banks" detailed in our original proposal. Specifically, the soils and transportation information has been updated. Concurrently, interpretation has begun of selected information from the RB-57 mission of August/October 1971 (Mission 176 - Green Bay-Milwaukee) for the eventual purpose of correlation with the ERTS interpretations. In keeping up with this preparedness, Monday meetings have been scheduled with the Principal Investigator and Co-

Investigators, and Thursday meetings with all staff on the project, including Research Assistants and part-time help.

(2) Proposed for Period Ending 1 October 1972:

During this period the final members of the advisory council are to be selected and initial meetings developed to document concerns of different land use interests.

A certain amount of time is to be spent in increasing our preparedness during the next weeks. This includes final development of interpretation and extraction techniques for the imagery and preparing USGS maps for comparison. We also intend to develop programs during this time whose function is a statistical comparison between extracted data from ERTS and the data presently stored in the existing data banks.

During this period the interpretation, extraction and data storage of ERTS-A data will be initiated.

We intend to contact NASA-Houston to reconfirm the scheduled RB-57 flight for October 1972 as part of this contract.

Much of this initial research will be developed into a paper which has been accepted for presentation and publication at the Eighth International Symposium on Remote Sensing at Ann Arbor, Michigan (2-8 October 1972). A copy of the pre-print summary (Enclosure #3) is included with this report. Mr. Richard Stonesifer, Technical Officer, and Mr. R. D. Phillips,

Contracting Officer, have already been contacted about this in a previous letter and notified of our desire to make this presentation and also to meet the requirements of Article IX (Data Use and Release Restrictions) of our contract.

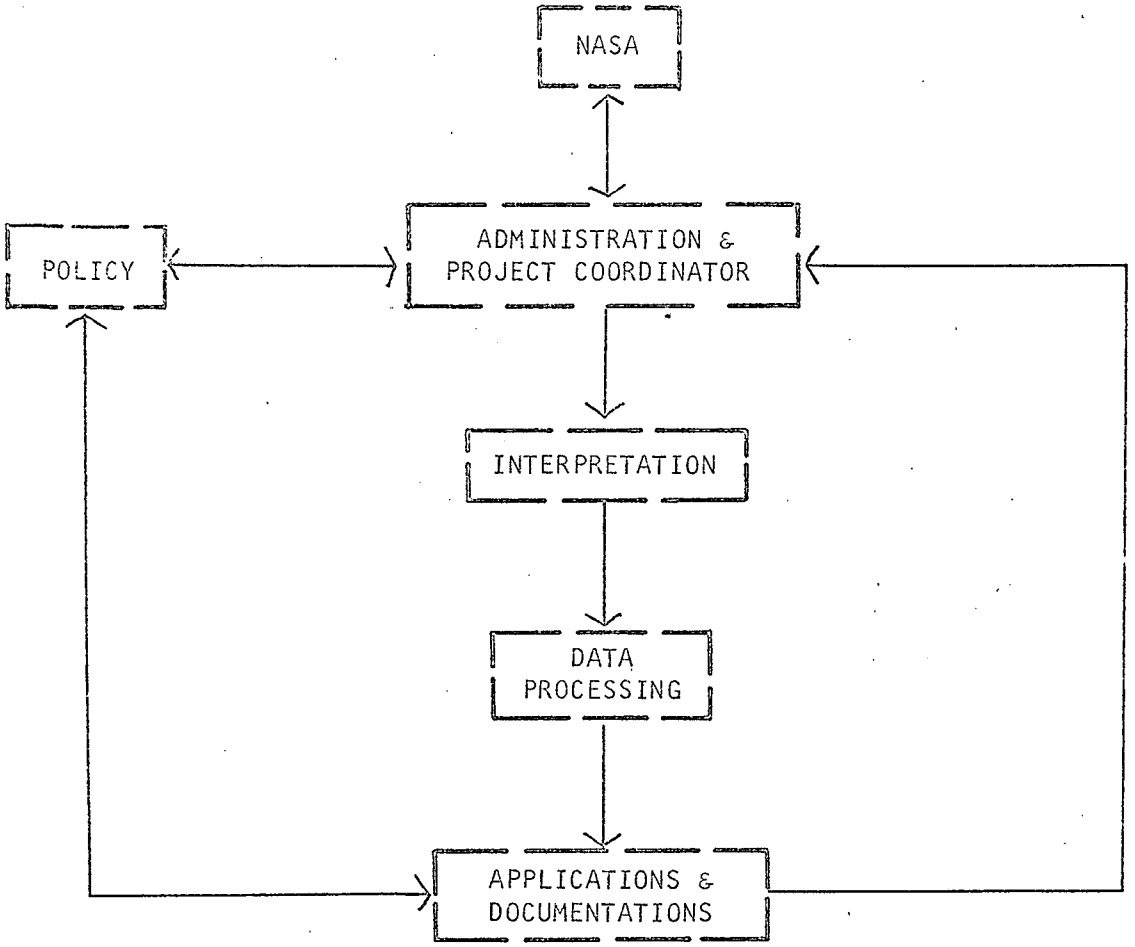
E. Discussion of Significant Results:

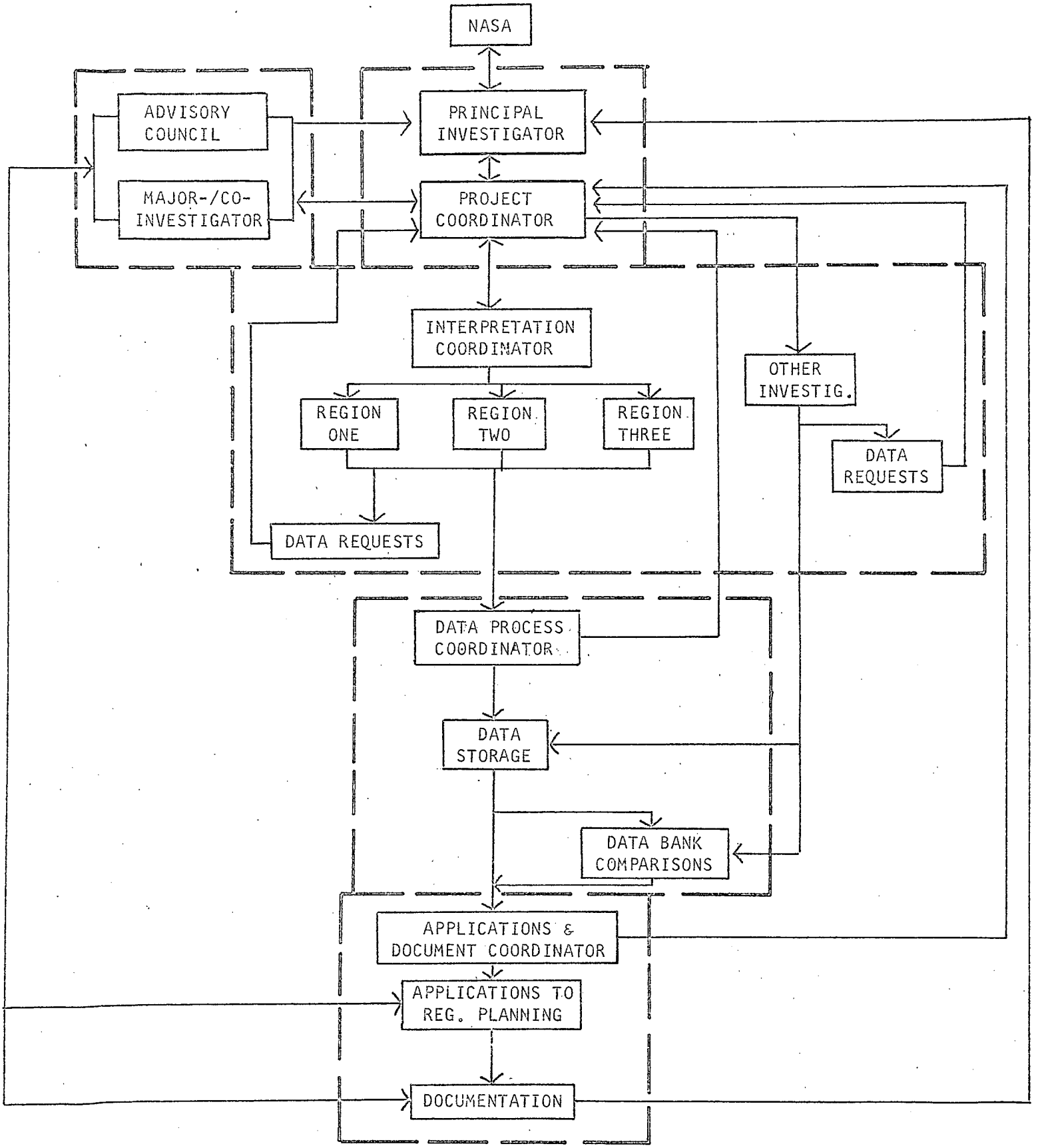
None at this time.

F. Listing of Published/Proposed Articles:

Clapp, J.L., R. W. Kiefer, M.M. McCarthy, and B.J. Niemann, 1972. Interdisciplinary Research on the Application of ERTS-A Data to the Regional Land Use Planning Process. (Accepted for publication in the Proceedings of the Eighth International Symposium on Remote Sensing of the Environment, University of Michigan, Ann Arbor.)

#1


NASA
ADMINISTRATION &
PROJECT COORDINATOR
POLICY
INTERPRETATION
DATA
PROCESSING
APPLICATIONS &
DOCUMENTATIONS


NASA
ADVISORY COUNCIL
PRINCIPAL INVESTIGATOR
MAJOR-/CO-INVESTIGATOR
PROJECT COORDINATOR
INTERPRETATION COORDINATOR
OTHER INVESTIG.
REGION ONE
REGION TWO
REGION THREE
DATA REQUESTS
DATA REQUESTS
DATA PROCESS COORDINATOR
DATA STORAGE
DATA BANK COMPARISONS
APPLICATIONS & DOCUMENT COORDINATOR
APPLICATIONS TO REG. PLANNING
DOCUMENTATION

#2

ERTS

ENVIRONMENTAL MONITORING AND DATA ACQUISITION GROUP (EMDAG)
INSTITUTE FOR ENVIRONMENTAL STUDIES (IES), and
ENVIRONMENTAL AWARENESS CENTER (EAC)
UNIVERSITY OF WISCONSIN-MADISON

PERSONNEL:

Principal Investigator:

J.L. Clapp - Professor, Civil and Environmental Engineering, and Director, Environmental Monitoring and Data Acquisition Group

Co-Investigators/Coordinators:

R.W. Kiefer - Interpretation Coordinator; Professor, Civil and Environmental Engineering

M.M. McCarthy - Project Coordinator; Project Associate, Environmental Monitoring and Data Acquisition Croup

B.J. Niemann, Jr. - Data Processing and Documentation Coordinator; Associate Professor, and Chairman, Department of Landscape Architecture/Environmental Awareness Center

Co-Investigators:

T. Green III - Associate Professor, Civil and Environmental Engineering, and Department of Meteorology

M. Ostrom - Director, Wisconsin Geological and Natural History Survey

Advisory Council:

State Planning
Regional Planning
County Planning
State Department of Natural Resources
State Transportation Planning
Utilities Planning
University Extension
Geology and Hydrology
Agriculture
Forestry (Public & Private Sectors)
Recreation
Conservation and Preservation

Steering Committee/EMDAG:

Representatives of:

Department of Natural Resources - C.D. Besadny

Environmental Awareness Center - P.H. Lewis, Jr.

Institute for Environmental Studies - J.E. Ross

International Biological Program - O. Loucks

Marins Studies Center - R.A. Ragotzkie

Space Science and Engineering Center - T.Haig

Wisconsin Geological and Natural History Survey - M. Ostrom

#3

# INTERDISCIPLINARY RESEARCH ON THE EVALUATION OF ERTS-A DATA TO THE REGIONAL LAND USE PLANNING PROCESS

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Michael M. McCarthy**, and Bernard J. Niemann, Jr.**
Environmental Awareness Center
and
Environmental Monitoring and Data Acquisition Group
Institute for Environmental Studies
University of Wisconsin
Madison, Wisconsin

## SUMMARY

This paper is concerned with the application of ERTS-A satellite data to the regional land use planning process. The fundamental problem is to determine which significant natural and cultural data can be identified and evaluated using ERTS-A data. In the identification and evaluation process the focus is placed upon: 1) scale effects, 2) spectral effects, 3) temporal effects, and 4) pattern effects, and how each contributes to the reliability of the acquired data. Efforts are made to determine the efficiency of ERTS-A acquisition in comparison with resources inventories conducted by conventional methods. Objectives of the research are:

1) Compare ERTS-A imagery to specific natural and cultural data at varying scales and over time.
2) Determine and document usefulness of ERTS-A data for environmentally based regional land use planning in Wisconsin.
3) Assist various state and university groups in obtaining interagency and interdisciplinary involvement in data analysis and

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interpretation of ERTS-A data for application to current land use allocation problems.

The interdisciplinary nature of this study was enhanced by the formation of a policy group. This group, which functions as an advisory committee, represents the various land use interests in the state of Wisconsin. Specifically, representation exists for: county/urban planning, regional planning, state planning, private recreational development, government recreational and conservation development, private conservation leagues, agricultural uses, forestry uses, geologic uses, utility systems, and transportation systems.

The investigation and documentation of the application of ERTS-A imagery to the regional planning process consists of utilizing three representative geographical regions within the state of Wisconsin. The three locations represent: 1) a variety of natural and cultural resource data, 2) different regional planning problems facing Wisconsin, and 3) varying scales of data.

A critical reason for selecting the geographical regions is the manner in which the data are stored. Because of the need to describe and depict regional resource complexity in an interrelatable state, the data within two of the geographical units have been inventoried and stored in a two-dimensional computer-based map form. Computer oriented processes (entitled REMAP I, REMAP II, and EDAP) were developed to provide for the economical storage, analysis and spatial display of natural and cultural data for regional planning purposes. The third geographical region was selected to provide area context for the entire Wisconsin region and as a base for later studies.

Geographical Region One - Southcentral and Southwestern Wisconsin.

This region includes parts of Columbia, Dane, Iowa and Rock Counties. Two watershed studies were funded by NASA to investigate applications of remote sensing to watershed management. Remote

sensing techniques were extensively used to obtain information for these watersheds. These two studies collectively contain over 70 different variables using spatial computer data bases. A third data bank was developed for parts of three of the counties to determine optimum electric energy transmission systems location. This spatial data base (EDAP) contains over 196 natural and cultural variables. The four-county data base consists of information necessary for urban aspects of regional planning and a variety of land uses representing a continuum of impacts.

Geographical Region Two - Southeast to Northeast Wisconsin.

The data bank for this region was developed to assist the Wisconsin Division of Highways locate Interstate 57 between Green Bay and Milwaukee. The data base has been completed and highway corridors selected and recommended. The area represents a variety of urban, agricultural, water and recreational resources within a major population growth region in Wisconsin. The data base for this region has 330 manipulatable variables for the REMAP II program and 132 variables for the REMAP I system. The study spatially relates data requiring computer storage for 1,228,128 separate bits of data.

Geographical Region Three - State of Wisconsin and Contiguous Lakes.

The Wisconsin Geological and Natural History Survey has collected geological and soils data for the entire state. The University of Wisconsin Marine Studies Center has investigated the current patterns in Lake Michigan and Lake Superior, as well as near-shore circulation characteristics.

This paper describes attempts to investigate the correlations between the stored data bank information and the interpreted ERTS-A data. With regard to the natural and cultural data items under investigation, the

study is concerned with: 1) which data are discernible from ERTS-A imagery; 2) to what quantitative extent can these data be inventoried from ERTS-A imagery; and 3) at what times of year can the data be most efficiently interpreted and inventoried.

Although the degree to which ERTS imagery can satisfy regional land use planning data needs is not known, it appears to offer means by which the data acquisition process can be immeasurably improved. This paper documents the initial experiences of an interdisciplinary group using ERTS-A imagery as a base for environmental monitoring and the resolution of regional land allocation problems.