TEXAS A&M UNIVERSITY
REMOTE SENSING CENTER
COLLEGE STATION TEXAS 77843

College of Agriculture
College of Engineering
College of Geosciences
College of Science

TYPE I PROGRESS REPORT-NUMBER 2

Period: November 28, 1972 to January 27, 1973

TITLE: MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION (MMC 667) (Contract No. NAS5-21857)

PRINCIPAL INVESTIGATOR: Dr. J. W. Rouse, Jr. (UN220)
Remote Sensing Center
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College Station, Texas 77843

PROJECT DESCRIPTION:

This regional study monitors the vernal advancement and retrogradation of natural vegetation (green wave effect) using ERTS observations throughout the Great Plains Corridor. The green wave effect is charted by using the relatively homogeneous rangeland vegetation systems of the Mixed Prairie region in the central United States as phenological indicators. ERTS multispectral scanner data and ground observations collected from the network of ten test sites are used to measure vegetation changes during the life-time of ERTS-1. Attention is given to observing seasonal drought and other bioclimatic influences which impact upon management and production in agriculture. The overall objective of this investigation is to determine the effectiveness of ERTS-type data in monitoring the vegetation conditions of direct concern to rangeland management and agri-business decisions in this region.

ACCOMPLISHMENTS:

During the period covered by this report the following tasks were accomplished:

a) A computer program was developed to accumulatively assimilate specific vegetation data obtained from ground sampling at the ten network test sites. The ground data is routinely entered into the accumulated data set when received from the test sites. Calculations are made and mean data and calculated values are computer tabulated and plotted graphically. The automated summary provides a important reference of temporal fluctuations of the important vegetation parameters for each test site.

b) An evaluation of ground truth data was made to determine the magnitude of temporal vegetation changes experienced during the autumnal phase of the ERTS-1 investigations at the ten test sites.

c) All ten network test sites were located on ERTS-1 black and white imagery, and overlays made to aid in locating the exact position of test sites on future imagery. Procedures were developed for routine cloud cover

determinations, and cloud cover estimates were made for each of the test site areas for all imagery received.

d) Estimates of ERTS-1 data quality were completed for the ten test sites. Retrospective product orders for magnetic tapes and color composites for selected dates, based on data quality standards were completed and sent to NDPF.

e) A detailed manual interpretation and data evaluation was initiated for vegetation features and temporal changes observable on ERTS-1 black and white imagery and the complementary grey-scale computer printouts. Two selected dates for one network test site (College Station) are being analyzed in the preliminary investigation utilizing ground data and aerial photography for evaluating vegetation conditions on the selected dates.

f) Computer analysis of the MSS digital data was initiated by analyzing the data for the College Station test site on two dates.

g) Image descriptors were assigned for all ERTS-1 imagery containing good quality Great Plains Corridor network test site data (Appendix).

h) Cataloging and indexing procedures for ERTS products were refined and made operationally routine.

SUMMARY OF SIGNIFICANT FINDINGS:

Preliminary evaluation of autumnal phase ground truth data suggests that the sampling procedures at the Great Plains Corridor network test sites are adequate to show relatively small temporal changes in aboveground vegetation biomass and vegetation condition. Vegetation changes measured August through December, reflect grazing intensity and environmental conditions at the test sites.

Preliminary analysis of black and white imagery suggests that detail in vegetation patterns is much greater than originally anticipated. A "first look" analysis of single band imagery and digital data at two locations in the vicinity of the College Station test site shows that woodland, grassland, and cropland areas are easily delineated. Computer derived grey-scale maps from MSS digital data were shown to be useful in identifying the location of small fields and features of the natural and cultivated lands. Single band imagery and digital data are believed to have important application for synoptic land use mapping and inventory.

Preliminary statistical evaluation of MSS digital data from the two locations suggest that the coefficient of variation (CV) for Band 5 mean reflectance data is useful in determining the homogeneity of a vegetative scene. CV's ranged from about 5% for uniform grassland to more than 20% for woodland-grassland areas with variable ground cover. The relatively low CV value for a uniform scene appears also to be indicative of a desirable signal to noise ratio, enhancing the potential usefulness of the data for quantative "signature" analysis.

Initial ratio analysis, using Band 5 and 7 data, suggests the applicability of these data to the detection of temporal changes in the "greenness" of a vegetative scene. Significant shifts in total reflectance from August 30 to October 23, as an apparent result of a decreased solar angle, indicate the necessity of data normalization for this factor.

DATA PRODUCT SUMMARY:

The ERTS-1 Imagery and Tape Receipts and Orders "quick-look" chart on the following page shows the status of the ERTS data inventory and data requests at the end of this reporting period. Two retrospective data requests were placed during the period covered by this report. These were sent on December 21, 1972, and January 5, 1973.

Receipt of ERTS-1 MSS standing order black and white products indicates a lag time of about four

ERTS-1 IMAGERY AND TAPE

b

RECEIPTS AND ORDERS

GREAT PLAINS CORRIDOR TEST SITES

CYCLE	DATES	COLLEGE STATION	SONORA	THROCK-MORTON	WOOD-WARD	HAYS	SAND-HILLS	COTTON-WOOD	MANDAN	WES-LACO	CHICK-ASHA
0	7/25 - 7/30										
1	8/1 - 8/17										
2	8/19 - 9/4										
3	9/6 - 9/22										
4	9/24 - 10/10										
5	10/12 - 10/28										
6	10/30 - 11/15										
7	11/17 - 12/3										
8	12/5 - 12/21										
9	12/23 - 1/8										
10	1/10 - 1/26										

SYMBOLS:

- NO DATA PRODUCTS RECEIVED
- 9" B&W POSITIVE TRANSPARENCIES RECVD. (STANDING ORDER)
- B&W PRODUCTS ORDERED (NOT RECEIVED FROM STANDING ORDER)
- BULK PROCESSED DIGITAL TAPES ORDERED
- MAGNETIC TAPES RECEIVED
- NO FURTHER PRODUCT ORDERS ANTICIPATED
- BULK COLOR COMPOSITE PRINT ORDERED — RECEIVED
- BULK COLOR COMP. TR. ORDERED — RECEIVED
- PRECISION COLOR COMP. ORDERED — RECEIVED
- PRECISION COLOR COMP. TR. ORDERED — RECEIVED

to six weeks from the date the satellite acquired the data. No MSS color products have been received through the end of this reporting period. Consequently, photo interpretation that relies on color tone for delineating vegetation condition and characterizing soil vegetation interrelationships has been delayed. Further computer analysis of data will also be delayed until ordered tapes are received.

SCHEDULED ACTIVITIES:

The following activities are scheduled for the next reporting period:

a) The Data Analysis Plan will be completed.

b) A computer derived grey-scale printout will be obtained for each network test site. The actual study areas will be located, and computer analysis will be made from test site MSS data for all dates for which digital tapes have been received.

c) A detailed study of temporal vegetation changes, characteristic "signatures" for specific vegetation classes, and reflectance shifts during the 1972 autumnal phase will be conducted for selected locations. This study will be an extension of the preliminary investigation reported herein.

d) Network test site characterization procedures

will be formalized and test site characterization will be initiated.

e) Minor revisions in the ground data collection format will be made based on the experience of the fall sampling and will constitute a refinement of technique.

f) Necessary preparation will be made and ground data collection will be initiated for monitoring the vernal advancement of vegetation at the network test sites.

g) A summary will be written that lists the aerial photography received and describes the manner in which this type of data is being used.

h) Routine data handling, imagery evaluation, and assignment of descriptors, product ordering, and other project activities will continue.

APPENDIX

ERTS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

NDPF USE ONLY
D
N
ID

DATE Jaunary 31, 1973

PRINCIPAL INVESTIGATOR Dr. J. W. Rouse, Jr.

GSFC UN220

ORGANIZATION Remote Sensing Center

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	River	Pasture	Range-land	
111016311M	X	X	X	City, Cropland, Forest
112816311M	X	X	X	Dormant Vegetation
114616311M	X	X	X	Dormant Vegetation
105916474M	X	X	X	Lake, Scrub
107716475M	X	X	X	Lake, Scrub
111316482M	X	X	X	Lake, Dormant Vegetation
113016424M	X	X	X	Lake, Dormant Vegetation
113116483M	X	X	X	Lake, Dormant Vegetation
105816410M	X	X	X	Brush, Grassland
107616411M	X	X	X	Brush, Grassland
107716470M	X	X	X	Brush, Grassland
111316473M	X	X	X	Brush, Dormant Vegetation
113016415M	X	X	X	Brush, Dormant Vegetation
113116474M	X	X	X	Brush, Dormant 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 PRODUCT ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

MAIL TO NDPF USER SERVICES
CODE 563
BLDG 23 ROOM E413
NASA GSFC
GREENBELT, MD. 20771
301-982-5406

GSFC 37-2 (7/72)

ERTS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

NDPF USE ONLY
D _____
N _____
ID _____

DATE January 31, 1973 (Continued)

PRINCIPAL INVESTIGATOR _____

GSFC _____

ORGANIZATION _____

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	River	Pasture	Range-land	
107716461M	X	X	X	Brush, Dormant Vegetation
113116465M	X	X	X	Brush, Dormant Vegetation
102316451M	X	X	X	Grassland, Cropland
106016505M	X	X	X	Grassland, Cropland
109516454M	X	X	X	Grassland, Cropland
113116460M	X	X	X	Grassland, Dormant Vegetation
113216514M	X	X	X	Fallow Field, Dormant Vegetation
104316552M	X	X	X	Dune, Irrigation
106116552M	X	X	X	Dune, Irrigation
104517063M	X	X	X	Badland
106317062M	X	X	X	Badland
108117064M	X	X	X	Badland
113517072M	X	X	X	Snow, Badland, Ice
104517054M	X	X	X	Meander
106317053M	X	X	X	Meander

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GSFC _____

ORGANIZATION _____

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	River	Pasture	Range-Land	
108117055M	X	X	X	Meander
113517063M	X	X	X	Snow, Frozen Lake
107516373M	X	X	X	Scrub, Lake
105816404M	X	X	X	Grassland
107616405M	X	X	X	Grassland
109416411M	X	X	X	Dormant Vegetation
113016413M	X	X	X	Dormant Vegetation

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