

Held in Room 423-S, at the Statehouse at 9:00 a. m./~~p.m.~~, on March 18 & 19, 1981.

All members were present except:

- Vice Chairperson Aylward - Excused
- Rep. Campbell - Excused
- Rep. Polson - Excused

The next meeting of the Committee will be held at 9:00 a. m./~~p.m.~~, on March 24, 1981.

These minutes of the meeting held on March 18 & 19, 1981 were considered, corrected and approved.



 Chairman

The conferees appearing before the Committee were:

- Professor William Barr - Kansas Applied Remote Sensing Program
- E. A. Martinko - Assistant Professor of Environmental Studies and Associate Director
Kansas Applied Remote Sensing Program
- Ms. Caron - National Conference of State Legislatures

Chairman Beezley called the meeting to order. Professor William Barr began the presentation on the Kansas Applied Remote Sensing Program. This program was started in 1972. The main function of the program is to use aircraft and satellite photo data to make better and more cost effective decisions in agencies dealing with crops, fish and game, irrigation, rangeland and urban development.

Dr. E.A. Martinko stated that this information gives a permanent record of the landscape and makes much unique information available. First would come the field data and map information, this would lead on to an analysis of information for a final action by the agency using this information. Dr. Martinko spoke at length on various phases of the program and then introduced Ms. Caron of the National Conference of State Legislatures who made several comments and passed out information to the Committee. Chairman Beezley thanked the conferees; the minutes were approved and the meeting adjourned.

MARCH 19, 1981

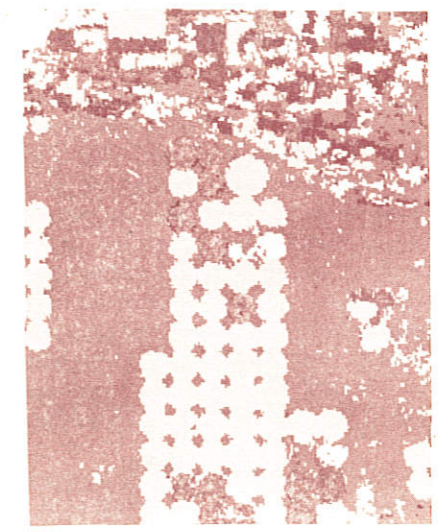
The meeting was called to order by Chairman Beezley. Raney Gilliland of the Research Department gave an overview of SB 298, the corporate farming bill. Sen. Kerr discussed what his committee had done and gave his comments and suggestions to the committee who will be taking up this bill in hearings next week. The committee discussed and commented on the various sections of the bill and gained input and information toward a better understanding of SB 298. Chairman Beezley appointed a sub committee consisting of Rep. Waggener as Chairman and Rep. Hinshaw and Rep. Hagerman to study the grandfather section with regard to the Garden City Corporation. The meeting was adjourned.

Unless specifically noted, the individual remarks recorded herein have not been transcribed verbatim. Individual remarks as reported herein have not been submitted to the individuals appearing before the committee for editing or corrections.

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KANSAS APPLIED REMOTE SENSING PROGRAM

The University of Kansas
Space Technology Center
Lawrence, Kansas 66045



Land cover/land use map of Garden City, Kansas and vicinity prepared by computer processing of digital data acquired by the Landsat satellite. Note the large, circular center-pivot irrigated cornfields in the lower portion of the map.

MAJOR KARS PROGRAM RESEARCH AND APPLICATIONS AREAS

- Land use/land cover inventory, change detection and mapping
- Irrigated lands inventories
- Wildlife habitat evaluation
- Strip mined lands assessment
- Crop and rangeland evaluation
- Integrated natural resources inventories
- Geographic information system design, construction, and application
- Thematic mapping

FACILITIES

KARS Program offices and laboratories are located in the University of Kansas Space Technology Center. The Program has complete facilities for processing and interpretation of remote sensing data in both image and digital formats, state-of-the-art cartographic production, statistical analysis, and geographic data base production. Graphic arts, photographic processing and support services are provided within the Space Technology Center.

The KARS Program's Image Interpretation Laboratory is furnished with a complete range of equipment for viewing and analyzing imagery, and for transferring image data to base maps of various scales. Included are a



Bausch and Lomb Zoom Transfer Scope, an Itek Color Additive Viewer, a Variscan Rear Projection Viewer, five Richards Light Tables with Bausch and Lomb Zoom 240 stereoscopes, a Saltzman Reducing/Enlarging Projector, a MacBeth Color Spot Densitometer, an Interpretation Systems Incorporated (ISI) VP-8 Color Video Image Analyzer, an Old Delft Scanning Stereoscope, and a complete assemblage of other manual image interpretation aids.

Analysis of digital remote sensing data, digitizing and other computer-assisted data processing operations are supported by facilities of the KARS

University of Kansas Honeywell Level 66 Computer System provide KARS staff with access to a variety of interactive digital image processing and classification, statistical analysis, and computer mapping software. Also housed in the laboratory are an Integral Data Systems Dot Matrix Printer used for production of textual, graphic, and cartographic hard copy, and an Altek AC90SM microprocessor-controlled digitizer having a 42 x 60 inch back-lighted digitizing tablet.



Aerial photography in support of KARS projects is acquired from a Cessna 180 Skywagon accessible to KARS staff. Both a multispectral cluster of four Hasselblad 500EL 70 mm format cameras and a Fairchild nine inch format cartographic camera are available for photographic missions.

Custom designed cartographic and graphic products are prepared by KARS staff using negative scribing and photo-mechanical techniques. Production of color graphics and color separations are standard procedures. Printing services are available. KARS staff also have access to Tektronix computer graphics systems, computer mapping software, and both flatbed and drum plotters.

The KARS Program maintains an extensive collection of Landsat and aerial imagery and digital data, and a

THE UNIVERSITY OF KANSAS APPLIED REMOTE SENSING (KARS) PROGRAM

The University of Kansas Applied Remote Sensing (KARS) Program has received base funding from the National Aeronautics and Space Administration (NASA) since 1972 to conduct applied research on techniques which will enable public agencies to better utilize available satellite and airborne remote sensing systems. The KARS Program is an applied research program of the University of Kansas Space Technology Center. The Space Technology Center was established in 1972 by the National Aeronautics and Space Administration (NASA) and the State of Kansas to enhance research and education in space-related science and technology through multidisciplinary research efforts. The KARS Program is administered by Professor B.G. Barr, Director of the Space Technology Center, and Dr. Edward A. Martinko, KARS Program Associate Director. The KARS staff is comprised of specialists having backgrounds in biology, geography, engineering, cartography, computer science, environmental studies and natural resources management.

Projects undertaken by the KARS Program with local, regional, state and federal agencies are designed to demonstrate the manner in which remote sensing technology can aid agencies in decision-making, policy formulation, planning and in meeting other responsibilities. All KARS services are provided to Kansas state agencies on a demonstration basis as allowable under constraints of NASA long term funding. All KARS services are provided at large to any potential user on a contractual basis.

The KARS Program has provided assistance and services to more than forty agencies in Kansas, Missouri and other states in the Great Plains/Rocky Mountain region. Contractual applied remote sensing projects have been carried out for the U.S. Fish and Wildlife Service, U.S. Office of Surface Mining, USDA/Soil Conservation Service, U.S. Environmental Protection Agency, U.S. National Park Service, Kansas Fish and Game Commission and Mid-America Regional Council. Projects have involved land use/land cover inventory, monitoring land use change, wildlife habitat evaluation, mapping of irrigated lands, surface mined lands inventory, recreational area planning, soil conservation needs assessment, aquatic vegetation mapping, rangeland condition evaluation, urban area analysis, and education and training. In addition, KARS staff have provided remote sensing consulting

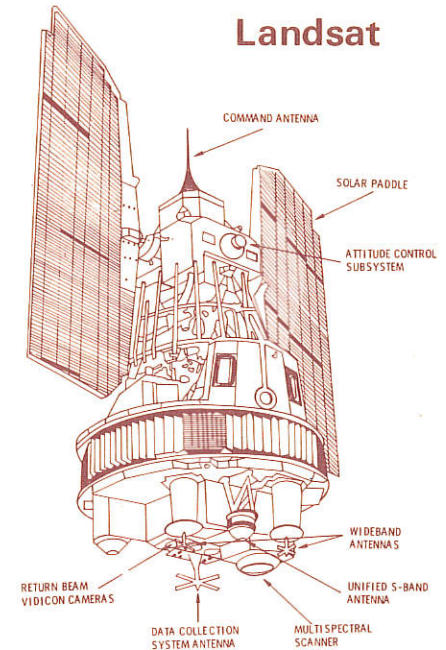
For additional information contact:

Kansas Applied Remote Sensing
(KARS) Program
University of Kansas
Space Technology Center
2291 Irving Hill Road
Lawrence, Kansas 66045

Telephone: 913/864-4775
KANS-A-N 564-4775

REMOTE SENSING

Remote Sensing is the science of acquiring information about an object or area in the absence of physical contact with the entity of interest. Remote sensing systems, such as cameras, scanners, and radars, mounted aboard aircraft and spacecraft are increasingly being used to inventory, evaluate, and monitor the extent and condition of phenomena such as land use, water resources, crop and rangeland, conservation practices, and urbanization. The Kansas Applied Remote Sensing (KARS) Program was established to assist persons and agencies concerned with natural resources management and related issues in employing remote sensing technology. Data acquired by remote sensing, especially when used in concert with information obtained in traditional ways, can often enable such persons and agencies to make better, more rapid, and/or more cost effective decisions regarding problems with which they must deal.



Landsat

KARS NEWSLETTER

The KARS Program publishes the quarterly *KARS NEWSLETTER* which is designed to foster the application of remote sensing data and to provide a forum for communication on remote sensing related matters. Current (1980) circulation is approximately 1400. Readers include employees of local, state, regional, and federal agencies, research centers, colleges and universities, and private firms. Most readers reside in the Midwest and Western U.S., but Newsletters are mailed throughout the United States, and to several other nations. Subscriptions are available upon request.

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AGENDA

COMMITTEE BRIEFING
KANSAS APPLIED REMOTE SENSING PROGRAM

Capitol Building
Topeka, Kansas
Wednesday, March 18, 1981

Presentation

Speaker

Introduction

Representative William Beezley
Chairman
House Agriculture and
Livestock Committee

Introduction to the Kansas Applied
Remote Sensing (KARS) Program

B. G. Barr
Director
KARS Program

Remote Sensing Applications in Kansas:
Wildlife habitat evaluation
Irrigated lands inventory
Crop identification
Noxious weed evaluation
Strip mined lands monitoring
Urban and prime agricultural land use
change

Edward A. Martinko
Associate Director
KARS Program

Overview of Landsat Applications
in the United States

Loyola M. Caron
Staff Associate
National Conference of
State Legislatures (NCSL)
Natural Resources Infor-
mation Systems Project

Open Discussion

Adjourn

AGENCIES WITH WHICH CONTACTS ARE MAINTAINED
BY THE KANSAS APPLIED REMOTE SENSING PROGRAM *

Municipal: CONCORDIA, KANSAS CHAMBER OF COMMERCE
KANSAS CITY, KANSAS CITY COMMISSION
KANSAS CITY, KANSAS DEPARTMENT OF PLANNING
AND DEVELOPMENT
KANSAS CITY, KANSAS MAYOR'S OFFICE

LAWRENCE, KANSAS CITY ENGINEER
LAWRENCE, KANSAS CITY COMMISSION
LAWRENCE, KANSAS PLANNING DEPARTMENT
Salina, Kansas Planning Department
OTTAWA, KANSAS PLANNING DEPARTMENT

County: ATCHISON COUNTY, KANSAS COMMISSIONERS
CHEROKEE, KANSAS BOARD OF COMMISSIONERS
CLOUD COUNTY, KANSAS COMMISSIONERS
DOUGLAS COUNTY, KANSAS EXTENSION AGENT
DOUGLAS COUNTY, KANSAS PLANNING DEPARTMENT

FRANKLIN COUNTY, KANSAS PLANNING COMMISSIONERS
JACKSON COUNTY, KANSAS DISTRICT CONSERVATIONIST
NEMAHA COUNTY, KANSAS DISTRICT CONSERVATIONIST
RILEY COUNTY, KANSAS ENGINEER
SALINE COUNTY, KANSAS PLANNING DEPARTMENT
SUMNER COUNTY COMMISSIONERS

State: Kansas Agricultural Extension Service
KANSAS ATTORNEY GENERAL'S OFFICE
KANSAS CORPORATION COMMISSION
KANSAS STATE BOARD OF AGRICULTURE
KANSAS DEPARTMENT OF ECONOMIC DEVELOPMENT
KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT
KANSAS DEPARTMENT OF REVENUE
Kansas Department of Transportation
Kansas Department of Energy
KANSAS ADJUTANT GENERAL, Division
EMERGENCY PREPAREDNESS
Kansas State Biological Survey

KANSAS BUREAU OF AIR QUALITY AND OCCUPATIONAL HEALTH
KANSAS STATE HISTORICAL SOCIETY
KANSAS STATE CONSERVATION COMMISSION
KANSAS FISH AND GAME COMMISSION
Kansas Geological Survey
KANSAS GOVERNOR'S OFFICE
KANSAS LEGISLATIVE RESEARCH DEPARTMENT
Kansas Mined Land Conservation & Reclamation Board
KANSAS PARKS AND RESOURCES AUTHORITY
KANSAS WATER RESOURCES BOARD
MISSOURI WATER RESOURCES BOARD
MISSOURI DEPARTMENT OF NATURAL RESOURCES
MISSOURI GOVERNOR'S OFFICE

Regional: Big Lakes Regional Planning Commission
(Pottawatomie, Riley, Geary)
CHIKASKIA-INDIAN HILLS REGIONAL PLANNING
COMMISSION (SUMNER, HARPER, KINGMAN)
Flint Hills Resource Conservation and Develop-
ment Project (Morris, Chase, Marion and
Lyon Counties, Kansas)
FOUR RIVERS RESOURCE CONSERVATION AND
DEVELOPMENT DISTRICT (JEWELL, REPUBLIC,
MITCHELL, CLOUD, OTTAWA, LINCOLN,
ELLSWORTH AND SALINE COUNTIES, KANSAS)

MID-AMERICA REGIONAL COUNCIL
Northwest Kansas Planning and Development
Commission (Cheyenne, Sherman, Wallace,
Rawlins, Thomas, Logan, Decatur,
Sheridan, Gove, Norton, Graham, Trego,
Phillips, Rooks, Ellis, Smith, Osborne,
and Russell Counties, Kansas)
Ozark Regional Commission
SOLDIER CREEK WATERSHED BOARD OF DIRECTORS
SUNFLOWER RESOURCE CONSERVATION AND DEVELOPMENT
DISTRICT (SUMNER, HARPER, KINGMAN, BARBER,
COMANCHE AND KIOWA COUNTIES, KANSAS)

Regional: GREATER SOUTHWEST REGIONAL PLANNING COMMISSION
(cont'd.) Groundwater Management Districts

TAUY CREEK WATERSHED PLANNING DISTRICT BOARD
OF DIRECTORS
Missouri River Basin Commission

Federal: U.S. ARMY CORPS OF ENGINEERS, KANSAS CITY
AND ALBUQUERQUE OFFICES
U.S. DEPARTMENT OF AGRICULTURE, SOIL
CONSERVATION SERVICE (SCS)
U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL
STABILIZATION AND CONSERVATION SERVICE (ASCS)
U.S. GEOLOGICAL SURVEY WATER RESOURCES DIVISION -
LAWRENCE/GARDEN CITY, KANSAS
U.S. Bureau of Reclamation, Denver and Topeka
Offices

U.S. ENVIRONMENTAL PROTECTION AGENCY, KANSAS CITY
AND WASHINGTON, D. C. OFFICES
U.S. FISH AND WILDLIFE SERVICE, KANSAS CITY, DENVER,
AND WASHINGTON, D. C. OFFICES
U.S. BUREAU OF INDIAN AFFAIRS, HORTON, KANSAS AGENCY
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
U.S. DEPARTMENT OF THE INTERIOR, OFFICE OF SURFACE
MINING, KANSAS CITY REGIONAL OFFICE

* All agencies that are capitalized represent demonstration projects that have been completed or are being developed.

Project Number	Project Title	Cooperating Agency	Type of Governmental Organization					Data Source					
			Federal	State	Regional	County	Municipal	Private	Landsat	Skylab	High Altitude	Medium Altitude	Low Altitude
13.	Republican River Canoe Trail and Campsite Planning	Cloud County Commissioners Concordia, Kansas, Champter of Commerce Four Rivers Resource Conservation and Development District Kansas State Park and Resources Authority U. S. Department of Agriculture - Soil Conservation Service	X	X	X	X	X						X
14.	County Line Lake, Missouri, Project	Governor's Office - State of Missouri Missouri Department of Natural Resources		X									X
15.	Mapping Aquatic Vegetation at Douglas County State Lake	Kansas Fish & Game Commission		X									X
16.	Delineation of Drainage Patterson in Strip Mined Areas of Southeast Kasnas	Kansas Fish & Game Commission Kansas Department of Health & Environment Kansas Attorney General's Office		X						X			
17.	Converstion of Prime Agricultural Land to Urbanized Land Use	Mid-America Regional Council			X					X			
18.	Barber County Sage and Cedar Infestations	U. S. Department of Agriculture - Soil Conservation Service Barber County Sunflower Resource, Conservation and Development District	X		X			X	X				X
19.	Mapping and Monitoring Musk Thistle Infestations of Kansas Rangeland	Kansas Department of Agriculture - Weed and Pesticide Division U. S. Environmental Protection Agency		X				X	X				X
20.	Assessment of Distributional Change in Eastern Redcedar	Kansas Department of Agriculture - Weed and Pesticide Division		X				X	X	X			X
21.	Development of Wildlife Habitat Areas in Southeast Kansas Strip-Mined Region	Kansas Fish & Game Commission		X									X
22.	Land Use Mapping for Planning and Zoning in Sumner County	Chikaskia, Golden Belt and Indian Hills Regional Planning Commission Sumner County Commission			X	X				X			
23.	Law Enforcement Planning for the Republican National Convention	Kansas City, Kansas, Police Department Johnson, Wyandotte and Leavenworth County Law Officials				X	X			X			
24.	Using LANDSAT to Select a Pronghorn Antelope Release Site in Kansas	Kansas Fish & Game Commission		X				X					

Projects of the Kansas Applied Remote Sensing Program
April, 1972 to March, 1980

Project Number	Project Title	Cooperating Agency	Type of Governmental Organization						Data Source					
			Federal	State	Regional	County	Municipal	Private	Landsat	Skylab	High Altitude	Medium Altitude	Low Altitude	
1.	Developmental Planning on Clinton Dam and Reservoir	Lawrence/Douglas County Planning Department				X	X							X
2.	Decision on Completion of I-35 and Pattonsburg Reservoir	Governor's Office - State of Missouri Missouri Department of Natural Resources		X					X					X
3.	Kansas City, Kansas, Flooding Disaster	Mayor's Office, Kansas City, Kansas Civil Defense Office, Kansas City, Kansas					X							X
4.	Using Remote Sensing for Wildlife Habitat Inventory in Kansas	Kansas Fish & Game Commission		X					X	X				
5.	Regional Land Use Map for the Four Rivers Resource Conservation and Development Project	Four Rivers Resource Conservation and Development District U. S. Department of Agriculture - Soil Conservation Service	X		X				X					
6.	Land Use Map of Cherokee County, Kansas	Cherokee County Commissioners Kansas Department of Economic Development Kansas Geological Survey		X		X				X				
7.	Sanitation Route Allocation in Kansas City, Kansas	Kansas City, Kansas, Department of Planning and Development					X			X				
8.	Evaluating Environmental Impact on Road Construction in Kansas City, Kansas	Kansas Department of Transportation Kansas City, Kansas, Planning and Development Department		X			X							X
9.	Census Tract Division: Mid-America Regional Council	Mid-America Regional Council					X			X				
10.	Mapping Center Pivot Irrigation in Southwest Kansas	Kansas Fish & Game Commission		X					X					
11.	Habitat and Stream Order Mapping of the Chikaskia River Basin	Kansas Fish & Game Commission U. S. Fish & Wildlife Service Kansas City Area Office Sunflower Resource Conservation and Development District	X	X	X				X	X				
12.	Mapping and Monitoring of Vegetation in Cheyenne Bottoms Waterfowl Management Area	Kansas Fish & Game Commission		X					X	X				X

Project Number	Project Title	Cooperating Agency	Type of Governmental Organization						Data Source					
			Federal	State	Regional	County	Municipal	Private	Landsat	Skylab	High Altitude	Medium Altitude	Low Altitude	
41.	Arkansas River Irrigation Moratorium	U. S. Geological Survey-Water Resources Division	X	X					X					X
42.	Roy's Creek & Pony Creek Watershed	Kansas State Board Agriculture-Water Resources Division U. S. Department of Agriculture-Soil Conservation Service	X									X		X
43.	Sandsage Prairie	Kansas Fish & Game Commission			X				X					
44.	Tall Grass Prairie National Park	Save the Tall Grass Prairie, Inc.						X		X				
45.	Pine Ford Lake, Missouri	U. S. Fish & Wildlife Service	X							X				X
46.	Abandoned Mine Land Inventory	U. S. Department of Interior - Office of Surface Mining Kansas Mined Land Board	X	X						X				X
47.	Short Courses in Kansas	NASA Earth Resources Laboratory	X	X	X	X	X	X	X	X	X	X	X	X
Total			12	30	9	10	8	4	19	5	18	2	28	

Project Number	Project Title	Cooperating Agency	Type of Governmental Organization						Data Sources					
			Federal	State	Regional	County	Municipal	Private	Landsat	Skylab	High Altitude	Medium Altitude	Low Altitude	
25.	Lawrence-Douglas County Zoning Decisions	Lawrence-Douglas Planning Commission				X	X							X
26.	Planning for the Sand Hills State Park, Kansas	Kansas Park and Resources Authority		X										X
27.	Irrigated Lands Mapping for Corporate Farming Lands Study	Legislative Research Department		X					X					
28.	Tauy Creek Watershed Planning	Tauy Creek Watershed Board of Directors U. S. Department of Agriculture - Soil Conservation Districts	X			X								X
29.	Kansas Land Use Patterns Map	Kansas Department of Economic Development		X					X					
30.	Soldier Creek Watershed 208 Planning	U. S. Department of Agriculture - Soil Conservation Service Soldier Creek Watershed Steering Committee Kansas Department of Health and Environment NASA Earth Resources Laboratory	X	X	X				X					X
31.	Fugitive Dust Source Analysis	Kansas Department of Health and Environment		X										X
32.	St. Jacob's Well National Landmark	Kansas Fish & Game Commission U. S. National Park Service	X	X					X					
33.	Bald Eagle Habitat	Kansas Audubon Society Kansas Fish & Game Commission		X			X							X
34.	Riley County Landfill	Riley County Engineer				X								X
35.	Natural Disaster Response and Analysis	Kansas Department of Emergency Preparedness Planning		X						X				X
36.	Irrigated Land Mapping	Legislative Research Department		X					X					X
37.	Clinton Park	Kansas State Park and Resources Authority		X						X				X
38.	Mine Creek Battlefield	State Historical Society		X										X
39.	Louisburg Health Care Facility	Miami County Health Care Consultant						X		X				
40.	Saline County Prime Agricultural Land	Saline County Department of Planning & Farming				X			X	X				

Kansas Applied Remote Sensing



Newsletter

The University of Kansas

January 1981

Volume 10, Number 1

KARS PROGRAM TO OFFER REMOTE SENSING SHORT COURSES

During the Spring and Summer of 1981 the University of Kansas Applied Remote Sensing (KARS) Program will offer a series of short courses covering the fundamentals of remote sensing and the interpretation and application of information derived through remote sensing. The courses are made possible through a grant from the National Aeronautics and Space Administration (NASA).

"Remote Sensing" refers to the gathering of data regarding the extent and condition of features on the Earth's surface (land use, crops, woodland, residential development, etc.) with cameras, scanners and other sensors mounted aboard aircraft and satellites. Such data may be utilized in land use planning, water resources management, conservation needs assessment, crop and range-land inventories and numerous other analyses of the physical and cultural environment. The courses will be of particular interest to state, local, regional and federal agency personnel and college faculty. None of the courses presuppose any prior knowledge of remote sensing.

Two different courses will be offered. During March and April an introductory one day course, "Remote Sensing: An Overview", will be offered in four cities across Kansas. There will be no charge for the one-day course. These courses will be held from 9:30 A.M. - 3:30 P.M. in the following cities:

Kansas City	- March 31 (Tuesday)
Topeka	- April 2 (Thursday)
Salina	- April 7 (Tuesday)
Pratt	- April 8 (Wednesday)

Course participants will be introduced to the principles and concepts of remote sensing and to a wide range of potential applications.

(continued on page 3)

DIGITIZER ENHANCES KARS DATA ANALYSIS CAPABILITIES

The KARS Program has acquired a new Altek AC90SM micro-processor controlled digitizer. The digitizer significantly increases KARS capabilities in the areas of geographic data base construction, automated cartography and computer graphics, and in routine applications such as area measurements.



Jim Rosacker, KARS staff member, enters information into the BIA woodland management data base on the newly-acquired KARS digitizer.

The digitizer unit has a 42 by 60-inch "active" area for digitizing. It is backlit and has height and tilt adjustments for operator convenience. It is controlled by a Zilog Z-80 microprocessor that allows it to transmit X, Y and Z coordinates, point labels and other information in the precise spatial coordinates desired by the user. Thus, spatial data may be obtained in the units of a map or image, rather than the units of the tablet. Both translation and rotation of the coordinate system may be performed by the microprocessor.

The microprocessor may also impose a user-defined grid on the product being digitized, and it may be programmed to transmit a new X-Y coordinate every time the cursor moves a user-specified fraction of the grid.

(continued on page 5)

NEW KARS PROGRAM BROCHURE

The KARS Program has recently published a brochure describing its facilities, services and major research and applications areas. The brochure can be obtained free of charge from Anne Kahle, KARS Program, KU Space Technology Center, Lawrence, KS 66045 (Telephone 913-864-4775, KANS-A-N 564-4775).

MINED LAND PROTOTYPE STUDY

Under the Surface Mining Control and Reclamation Act of 1977, the U.S. Department of Interior's Office of Surface Mining (OSM) has responsibility for the identification and reclamation of abandoned coal mines and lands or waters affected by coal mining processes. Areas mined since the law was enacted are now reclaimed by the coal operator. Areas mined prior to the Act were rarely reclaimed and hence large areas of these abandoned or "orphan" mines exist, presenting potential hazards as well as loss of productive agricultural lands.

To assist in identification, selection and reclamation of these areas, OSM is developing, through cooperative agreements with agencies in each of the coal-mining states, a national inventory of abandoned coal mine lands (AML) and associated problems. The KARS Program and the University of Kansas Center for Public Affairs (CPA) are currently conducting the AML Inventory for Kansas (KARS Newsletter, April 1980).

Concurrent with the National Inventory, OSM is funding several prototype studies which are designed to evaluate the inventory, to identify data needs not currently addressed in the inventory, to develop more efficient and cost-effective data collection techniques, and to make recommendations for the next phase of the National Inventory.

KARS and CPA have been awarded the prototype study for Region IV, an area covering the states of Arkansas, Iowa, Kansas, Missouri, Oklahoma and Texas. An interdisciplinary team of researchers from KARS, CF., the KU Department of Geography, the Kansas Geological Survey, U.S. Geological Survey and the KU Division of Biological Sciences is addressing questions relating to the physical and chemical characteristics of mine spoils, water and spoil sampling techniques, revegetation problems, erosion and sedimentation, and strip-pit lake water quality. Remote sensing is being used in the vegetation, water quality and site morphometry aspects of the prototype study. The remote sensing component of the study will include an evaluation of aerial photography for mapping vegetation, determining water quality and analyzing site morphometry.

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MONITORING RANGELAND VEGETATION IN THE KANSAS FLINT HILLS USING LANDSAT MSS DATA

Traditional techniques for estimating the productivity of rangelands, based on detailed field data collection, can be time consuming and are not well suited to inventory of large geographical areas. One promising alternative involves the use of data collected by Landsat. Landsat's multispectral scanner (MSS) measures the reflectance of environmental phenomena in four wavelength "bands" in the visible and near-infrared portions of the electromagnetic spectrum. These spectral measurements may be related to various properties of vegetation cover and soil. Various techniques are available for correlating spectral reflectance recorded by the Landsat MSS with measurements of percent vegetation cover and biomass.

KARS research assistant Gray Tappan has recently completed a Master of Arts thesis in Geography in which he studied nine such measures known as vegetation index models. The research was conducted under the supervision of Dr. T. H. Lee Williams, Assistant Professor of Geography and KARS Research Investigator. The models were tested throughout the 1980 growing season for a rangeland site in the northern Flint Hills region of Kansas. Spectral reflectance measurements of the study site were obtained on six different dates of Landsat MSS imagery in 1980, and from four images obtained in previous years. A densitometer was used to measure the optical density of the study site on the multi-band imagery. The density measurements were converted to digital reflectance values which were then normalized for variations in sun angle, and were used to derive the vegetation index model values.

Correlations between field-derived measurements of green vegetation cover and most of the vegetation index models were found to be very strong. The model employing the ratio of Landsat bands 6/5 showed the strongest correlation ($r = .989$) followed by the Transformed Vegetation Index model using band 6 ($r = .963$). Although strong correlations were established between most of the models and field-derived measurements, the small number of data sets limited the degree to which the models could be evaluated on a more universal scale.

The KARS Program is currently engaged in a cooperative project with the U.S. Forest Service to test computer processed LANDSAT MSS data for assessing the nature and condition of vegetation on the Cimarron National Grassland in southwest Kansas. Vegetation index models such as those used by Tappan are being evaluated. Further information regarding the Cimarron National Grassland project may be obtained from Jim Merchant (KARS Program).

Contributors to this issue of the KARS Newsletter include Lee Williams, Jim Merchant, Kit Gunn, Emily Roth, Joe Poracsky, Gray Tappan and Liz Kipp. Liz Kipp and Jim Merchant served as co-editors for this issue.

...SHORT COURSES (Contd)

Among the questions to be answered during the course are:

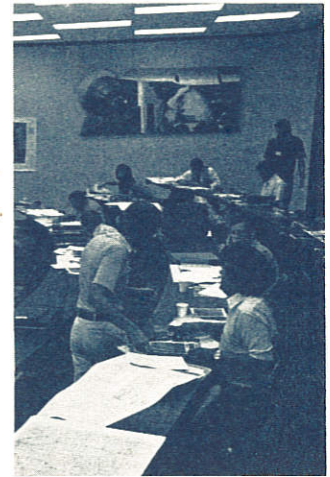
- What is Remote Sensing?
- In what forms are Remote Sensing data available?
- What information can the user derive through Remote Sensing?
- What are the advantages and disadvantages of using Remote Sensing?
- How has Remote Sensing been applied in various disciplines?
- How does a user acquire Remote Sensing data?

The second course is designed specifically for state, local, regional and federal agency personnel working in Kansas who wish to acquire more detailed training and hands-on experience in image interpretation and particularly in digital processing of LANDSAT data. Others may be admitted on a space available basis. This five-day course on "Fundamentals of Applied Remote Sensing" will be offered twice, June 1-5 and July 13-17, 1981 at the University of Kansas Space Technology Center in Lawrence. The course will include training in a variety of applications of remote sensing but will stress the application of LANDSAT data to the special interests of those attending (for example, vegetation inventory, regional planning, land use mapping).

Topics to be covered during the course will include:

- Introduction to Remote Sensing
- Physical Principles of Remote Sensing
- Remote Sensing Systems and Platforms
- Landsat

- Manual Image Interpretation
- Interpretation of Aerial Photography
- Analysis of Landsat Imagery



Numerical Analysis of Landsat Data
 Supervised Classification
 Unsupervised Classification

Field Data Collection in Support of
 Remote Sensing

Applications of Remote Sensing

Geographic Data Bases

Acquisition of Remote Sensing Data

Lectures, discussions, laboratory exercises and field trips will focus upon developing an understanding of how remote sensing may be employed by course participants in their own professional work.

A \$25.00 advance registration fee will be charged to cover the cost of materials to be retained by the participants. There will be a limited enrollment for each five day course.

Further details on the courses may be obtained from Anne Kahle, KARS Program, KU Space Technology Center, Lawrence, Kansas 66045 (Telephone 913-864-4775, KANS-A-N, 564-4775).

KANSAS APPLIED REMOTE SENSING PROGRAM

Short Courses

I am interested in obtaining further details concerning the following short courses(s):

One day short courses

- Kansas City - March 31 (Tues) _____
- Topeka - April 2 (Thurs) _____
- Salina - April 7 (Tues) _____
- Pratt - April 8 (Wed) _____

Five day short course

- Lawrence STC - June 1-5, 1981 _____
- Lawrence STC - July 13-17, 1981 _____

Name: _____

Affiliation: _____

Address: _____

Telephone: _____

...MINED LANDS (Contd)

In October of 1980, an intensive program of aerial photography and on-site measurements was conducted over fifty selected test sites in Cherokee and Crawford counties in southeastern Kansas. The KU Space Technology Center's four-Hasselblad camera cluster was used to acquire color, color infrared and multiband blue and green aerial photography over the sites at various scales between 1:5000 and 1:40,000. Fifty strip pit lakes were visited by the field crews concurrently with the aerial photography and measurements were made of water temperature, pH, specific conductivity, dissolved oxygen and turbidity. In addition, water samples were taken for chemical analysis and for determination of algal biomass. Several of the measurements were duplicated above and below the thermocline. Transects were also made across the test sites to determine vegetation cover and composition.

The various data collected during the prototype study are being analyzed to determine interrelationships and to develop operational recommendations for field survey and remote sensing in AML inventory and reclamation programs. For further information on the study, contact Dr. T. H. Lee Williams at KARS, or Rolfe Mandel at CPA (tel. 913-864-3700).

PURDUE TO HOST REMOTE SENSING EDUCATORS' CONFERENCE

CORSE-81, Conference on Remote Sensing Education, will be held May 19-21, 1981, at Purdue University. Co-sponsored by NASA and NOAA, the conference is being organized and conducted by the Laboratory for Applications of Remote Sensing (LARS).

The goal of the conference is to bring together remote sensing educators from across the country to exchange information on establishing and improving remote sensing curricula in institutions of higher education. Several tutorial workshops will be held in conjunction with the conference. These workshops, on the days preceding and following the conference, will serve to acquaint relative newcomers with the basics of remote sensing and will be a means for others to keep abreast of new technological developments. Whenever possible, educational materials used in these workshops will be distributed so that those attending may adapt them for use in their own classes.

Attendance at CORSE-81 is limited to approximately 200 educators, with room and meals provided for many who attend. Registration information will be available in early February. For additional information contact Shirley Davis, Laboratory for Applications of Remote Sensing, Purdue University, 1220 Potter Drive, West Lafayette, Indiana 47906.

NASA/NOAA SPONSOR REGIONAL CONFERENCES

The National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA) have scheduled a series of conferences on remote sensing. Beginning in March, NASA will sponsor four 3-day conferences, while NOAA's National Earth Satellite Service will conduct five meetings on the operational land remote sensing program it is developing based on Landsat technology.

The locations and dates for the conferences are: Danvers, Mass., March 9-11 (NASA) and March 12 (NOAA); Monterey, Calif., March 30-April 1 (NASA) and April 2 (NOAA); Purdue University, Lafayette, Ind., May 18-20 (NASA) and May 21 (NOAA); Biloxi, Miss., June 29-July 1 (NASA). Additional NOAA conferences will be in Atlanta, Ga., March 23, and Austin, Tex., April 28-29. The latter conference is being co-sponsored by the Texas Natural Resources Information System.

Three NASA regional conferences - at Danvers, Mass., Monterey, Calif., and Biloxi, Miss. - will report the results of current state and local government use of data from Landsat for natural resource and environmental management. The NASA conference at Purdue University will provide an opportunity for university educators to discuss techniques, approaches and curriculum materials for teaching remote sensing as both a technology and a tool in natural resource curricula. The goal of the conference is to enable universities and private industry to broaden their capabilities to provide such training.

The NOAA conferences are part of an expanding dialogue taking place between NOAA and non-Federal users of remotely sensed land data. At its conferences, NOAA will report on the status of system activities underway or planned, and will describe some product line and service function options possible under the operational Landsat system. The main purpose of the conference series is to obtain opinions and reactions from data users.

Registration information for the NOAA conferences can be obtained from Bill Spann or Nancy Hooper, Metrics, Inc., 290 Interstate North, Suite 116, Atlanta, GA 30339; (404) 955-1975.

Contacts for the NASA conferences are:
EASTERN REGIONAL - Ms. Lucretia Latta, Systems and Applied Science Corp., 6811 Kennelworth Ave., Riverdale, MD 20840 (800) 638-0925.
WESTERN REGIONAL - Gene Zaitseff, Bendix Field Engineering Corp., 155-A Moffett Park Drive, Sunnyvale, CA. 94086; (415) 965-6152.
LANDSAT/GEOBASED - Mrs. Marjorie Smith, NSTL/-Earth Resources Laboratory, NSTL Station, Biloxi, MS 39529; (601) 688-3326.
PURDUE EDUCATIONAL (CORSE '81) - Ms. Shirley M. Davis, Laboratory for Application of Remote Sensing (LARS), Purdue University, 1220 Potter Dr., West Lafayette, IN 47906; (317) 749-2052.

... DIGITIZER (Con'd)
tion of an inch. This allows the operator to adjust the volume of data produced to the intrinsic accuracy of the material being digitized. During the first 60 days of operational use the digitizer has been employed for:

1. computing the areal extent of potentially minable oil shale deposits in southeast Kansas from maps prepared under a joint project of the KU Center for Research, Inc. and Department of Geology;
2. preparing a computer-based geographic information system for the Walnut Creek watershed in West-central Kansas, including data regarding crop type, acreage, location and irrigation status; the data base will be used

by the Kansas Geological Survey to model water demand and groundwater hydrology in the watershed; and

3. constructing, for the U.S. Bureau of Indian Affairs (BIA), a woodland management information system for Indian reservation lands in Kansas; the system, which will incorporate data on land cover and land use for a thirty year time period, land ownership and soils, will be used by BIA to make more effective management decisions regarding utilization of renewable resources.

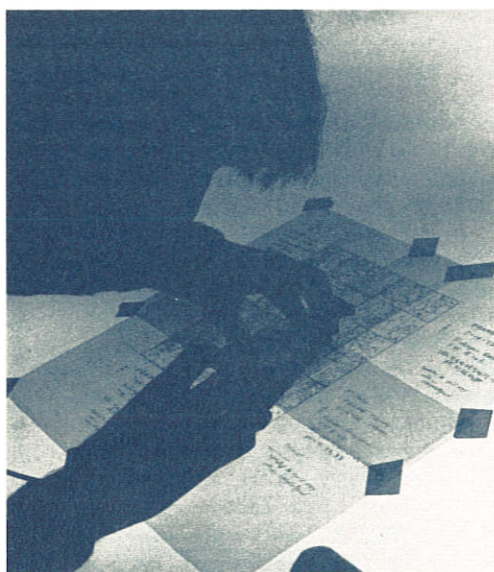
KARS Program digitizing services are available on a contractual basis. Additional information can be obtained from either Jim Merchant or Kit Gunn.

WHAT IS A GEOGRAPHIC INFORMATION SYSTEM?

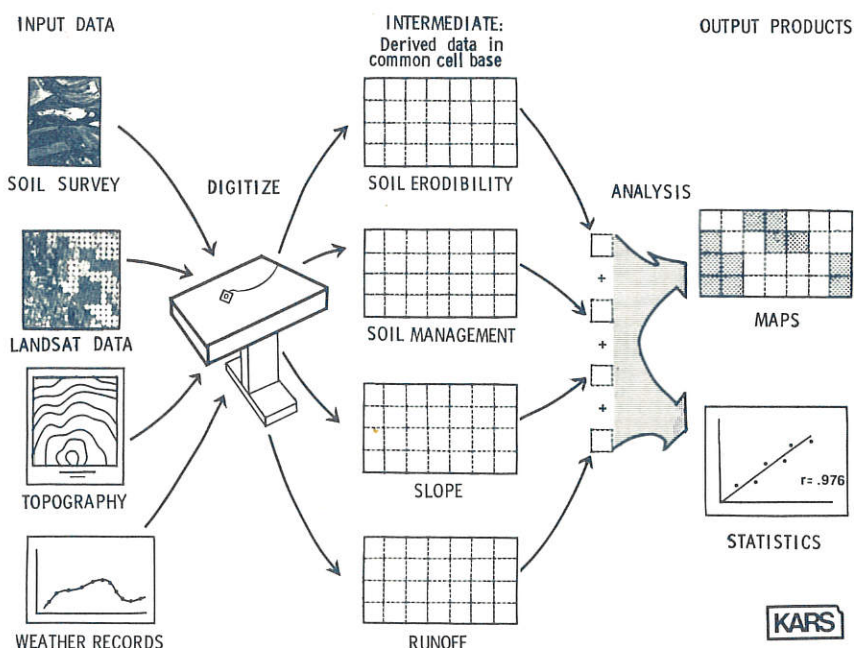
Information acquired through remote sensing is usually most valuable when employed in combination with ancillary data such as that contained in soils surveys, census records, topographic and thematic maps and similar resources. A very effective tool for combining and utilizing data from such disparate sources is the *geographic information system* (GIS). Usually computer based, such systems are constructed by coding and referencing all data to a location on the earth's surface. For example, in a GIS based on the U.S. Land Survey, data might be coded by section, township and range. In such a case, land use, vegetation, soils, population, geology, relief, elevation, slopes, climatic characteristics, water quality, stream discharge, socio-economic condition, political/administrative jurisdictions or any of a multitude of other phenomena found in each section could be entered into the system. Some of these data could be acquired through remote sensing and some would come from other sources.

A *digitizer* is an instrument used to enter data into a GIS computer file. The digitizer converts data from its original format (e.g., map) to a numerical ("digital") format which can be used in computer processing. Digitizing may include procedures such as tracing, with the instrument's cursor, land use, soils, or political boundaries from an existing map. As the tracing is accomplished, the location and other attributes of the area are coded into the computer file.

Once a GIS has been constructed, the data base can be utilized in many ways. If, for example, a resource manager wished to determine the potential for soil erosion in a large watershed, he could request that the system evaluate the relevant data coded for each section within the area of interest. The data evaluated for this application might include factors such as land cover, slopes, rainfall, soils characteristics, and conservation practices utilized. (continued on page 6)



A cursor is used to trace area boundaries in the process of digitizing.



... GIS (Con'd)

lized. Very quickly the manager would be able to view a map and statistical report in which each section was classified according to its soil erosion hazard. Geographic information systems provide planners, resources managers and others with an ability to analyze complex spatial interrelationships in a cost effective manner. Further information on geographic information systems can be obtained from the KARS Program.

INVITATION TO SUBMIT NEWS ITEMS

The KARS Newsletter welcomes contributions of an applied remote sensing nature and encourages newsletter readers to submit research findings, announcements of meetings, publications, and information pertinent to remote sensing applications in Kansas or the Midwest/Great Plains region. All contributions will be acknowledged.

KARS STAFF CHANGES

Gray Tappan, a KARS staff member for two years, has completed the Master of Arts degree in Geography. Gray has been appointed a Remote Sensing Analyst with Lockheed Aerospace Corporation and will work in the Agristars Program foreign commodity production and forecasting project, Earth Observation Division at the Lyndon B. Johnson Space Center in Houston, Texas. Primarily interested in land use change and rangeland mapping, Gray conducted projects for the KARS Program involving land use inventory, wildlife habitat assessment and geo-data base development for woodland management.

Mike Hogben, affiliated with the KARS Program through the Abandoned Mined Lands Inventory Project shared by the University of Kansas Center for Public Affairs and the KARS Program, began work recently as a Technical Systems Analyst for the Cities Service Company in Tulsa, Oklahoma. Mike, whose interests focus on the cartographic aspects of remote sensing, was engaged in photo-interpretation and land use mapping. He will be developing software in the areas of computer cartography and remote sensing for Cities Service.

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