

EROS Data Center

Monthly Activity Reports

January 1, 1978 - December 31, 1979

EROS Data Center
Activity Report for
January 1978

NATIONAL PARK SERVICE DEMONSTRATION PROJECT: Support is being given to the Lake Mead National Recreation Area Resource Inventory Project, a cooperative demonstration project between the National Park Service (NPS) and the EROS Data Center (EDC). A two-week workshop was held at EDC from January 9-20, 1978, for six NPS personnel, which included: (1) manual interpretation of medium-scale black-and-white aerial photography of selected sites for vegetation mapping, (2) manual interpretation of digitally enhanced Landsat imagery for basic geologic analysis and interpretation, and (3) digital analysis of Landsat CCT data for vegetation and terrain mapping. Manual interpretation of medium-scale, black-and-white aerial photography collected over five small potential development sites within the recreation area provided detailed vegetation and terrain map overlays. Geologic efforts consisted of developing a classification scheme to be applied to an EDIES scene of the area, consisting of landform classes, drainage patterns, cover types, and lineament configurations.

NORTHERN FLORIDA IRRIGATED LANDS INVENTORYING AND MONITORING PROJECT: Two representatives from the Suwannee River Water Management District (SRWMD) and Aaron Higer (WRD/Miami) conducted a feasibility study on inventorying and monitoring irrigation practices in the Suwannee River Basin. Prior to their trip to EDC, SRWMD personnel conducted extensive field checking in Suwannee County. The analysis session at EDC consisted of an interpretation of land cover using photo-optically enhanced Landsat scenes representing four different months a year. A dot grid was used to determine acreages of the cover classes and the Image 100 was used to assess crop acreages. This preliminary study indicates that Landsat data may be an effective tool to monitor and inventory agricultural lands in northern Florida, which in turn will give insight into water use in the Suwannee River Basin area.

IRANIAN TRAINING COURSE: A representative from EDC met with officials from the Satellite Applications Project, National Iranian Radio and Television Organization of the Government of Iran in Tehran, to discuss plans for a proposed remote sensing workshop. The workshop, which would be conducted in Tehran in July and August 1978, would be modeled after the International Remote Sensing Workshops held at EDC. During the meetings, a proposed course outline, tentative schedule, and general budget for the workshop were drafted.

CY 77 TRAINING SUMMARY: EDC conducted 29 workshops and courses involving approximately 170 instruction days. Eight hundred and eighteen land managers and resource specialists attended these workshops and courses. Approximately 50 percent of the attendees were from bureaus and agencies with the Department of Interior. Courses were presented specifically for Geological Survey/WRD (one course), Bureau of Land Management (six courses), U.S. Fish and Wildlife Service (two courses), Bureau of Mines (one course), and ME3A (one course). Also, the 8th and 9th International Remote Sensing Workshops

were presented to 59 scientists from 36 countries, and a short course was presented to 24 Latin American scientists in Argentina.

EDC SECURITY SERVICE CONTRACT: A new security service contract for 1978 has been awarded to National Investigations Bureau, Inc., Maywood, Illinois, in the amount of \$96,184.80.

INTERNATIONAL EXCHANGE OF DATA BASE INFORMATION: Seven days of extensive training about the EDC data base, main image file, inquiry, order processing, and production scheduling systems were provided to personnel from the Landsat data receiving and processing facility in Brazil. Preliminary design of the Landsat International Data Base Tape format was completed and a copy given to Brazil. A copy was also delivered to the Telespazio Center in Italy by the Deputy Chief, EDC during his visit there. A copy will be sent to each member of the Landsat Ground Stations Operations Working Group in the near future for their review and comments.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): EDIPS fabrication continues on schedule and testing should begin in March. System delivery to EDC is still scheduled for early April. The High Resolution Film Recording System (HRFRS) was delivered to TRW on January 27, 1978, approximately one week behind schedule. Modifications to the Photo Lab required for EDIPS are about 90 percent complete, and new equipment that is required has been ordered and its delivery is on schedule. The EDIPS production workflow has been defined and the required documentation, including Standard Operating Procedures and specifications, are on schedule.

DATA PRODUCTION SUMMARY: Shipped reimbursable receipts are approaching the one million dollar level with Landsat imagery and digital data accounting for approximately 50 to 60 percent of the gross sales. The Photo Lab average turnaround time for imagery is 14 days with a complaint to order ratio of about 2 percent. Work in process in the Photo Lab for reimbursable imagery is within the target range of \$100,000 to \$150,000, and the product acceptance rate is approximately 85 percent. INORAC is off-line for two hours each day at noon to permit program testing (EDIPS) which is expected to continue for a number of weeks. Progress with the new Accession Aids Program continued. A complete microfiche Landsat catalog of the world is now in production and undergoing limited distribution. The aircraft portion of this program is also on schedule, with the small-scale block photography complete, and being prepared for distribution to NCIC and their state affiliates.

VISITORS: The Data Center had over 500 visitors during January, including representatives from the EROS Program; Geologic Division; Minnesota Department of Natural Resources; WRD; National Park Service; BLM; U.S. Fish and Wildlife Service; Brazil; Analytic Services, Inc.; and General Electric Co. William Wallace of the Interior Department's Audit and Investigation staff spent 4½ days reviewing data sales, projections, and actuals, as part of the USGS budget execution audit review. Sixteen high school teachers,

participating in the Dakota Wesleyan University Aerospace Workshop for Educators, spent one-half day at EDC for briefings on EROS, EDC, and Landsat.

NSTL AAF ACTIVITY: A 3½-day Land Use Workshop was conducted for 11 participants from the Louisiana State Planning Office, St. Bernard Parish Planning Office, and the New Orleans City Government. Other activities included briefings and tours for the head geologist and 12 others from the New Orleans Exploration Office of Exxon Oil, Director of NAVOCEANO, group of officers from Keesler AFB, group attending NASA/ERL Remote Sensing Workshop, and graduate students from LSU, Mississippi Southern, and Tulane University.

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BUREAU OF LAND MANAGEMENT DIGITAL IMAGE ANALYSIS WORKSHOP: An Introduction to Digital Image Analysis of Landsat Data was conducted at EDC for twenty-one BLM Resource Managers from Alaska and eight western states. Topics covered in the workshop included: image forming process, the Landsat system, digital image processing, digital analysis systems and techniques, preprocessing, enhancement, classification schemes, and sampling techniques.

NATIONAL PARK SERVICE DEMONSTRATION PROJECT: EDC personnel participated in field work with National Park Service personnel in the Lake Mead National Recreation Area, Arizona and Nevada. The field work was designed to train Park Service personnel in the use of remotely sensed data for resource planning, to test the feasibility of a resource inventory procedure in an arid region, to provide the participants with reconnaissance data of the 1.3 million acres being investigated, and to field check proposed classification maps. This information will be used in conjunction with manual interpretation of photographic products and computer classification and enhancement of digital Landsat data to produce geologic, vegetation, and land use maps of the Lake Mead National Recreation area for use by the Park Service personnel in park planning and management.

BUREAU OF LAND MANAGEMENT REMOTE SENSING WORKSHOP: EDC personnel participated in a workshop in Anchorage, Alaska for Bureau of Land Management State Office and District Office personnel. The results of the image enhancement work, geohydrologic analysis and vegetation/terrain mapping done within the Denali study site and the utility of the products derived from this work for meeting BLM resource management and planning information requirements received considerable discussion.

U.S. FISH AND WILDLIFE SERVICE REMOTE SENSING WORKSHOP: The sixth in a series of remote sensing workshops for U.S. Fish and Wildlife Service personnel was conducted at EDC. Twenty-five participants from the field and regional offices attended the workshop which focused on basic principles of manual image analysis. Workshop exercises included landform, drainage, vegetation type mapping, and habitat assessment using aerial photographs of a wildland environment. The workshop also included an overview of Landsat, and Landsat vegetation mapping exercises and an introduction to digital image analysis techniques.

STRIP-MINE MONITORING PROJECT: EDC personnel met with representatives from the Remote Sensing Division, Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency (EPA), Las Vegas, Nevada to discuss EPA strip-mine monitoring activities. EPA personnel expressed interest in cooperating with EDC in acquiring medium- and low-level aerial photography over selected strip mines and participating in EDC training programs.

SOCIETY OF EXPLORATION GEOPHYSICISTS REMOTE SENSING WORKSHOP: EDC participated in a four-day workshop sponsored by the Society of Exploration Geophysicists held in Denver, Colorado. The workshop, developed by Dr. Robert Regan, USGS-GD, comprehensively covered remote sensing techniques in exploration. EDC presented two lectures on the Landsat System and availabilities of data, services and instrumentation.

PECORA IV: A planning meeting was held at EDC for Pecora IV, which is scheduled to be held October 10-12, 1978, in Sioux Falls. Participants included Mike Burger (National Wildlife Federation), Al Marmelstein (U.S. Fish and Wildlife Service), Bill Fisher (EROS Program) and EDC personnel. The symposium agenda, potential guest speakers, publicity plans, and logistics, housing, and local support requirements were discussed and agreed upon.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): The Mark II High Resolution Film Recording System (HRFRS) completed final acceptance testing February 2, 1978, two weeks ahead of the contract schedule, and was turned over to TRW for integration into the EDIPS. EDIPS/INORAC systems interface development at EDC is on schedule and will start simulation April 1, 1978. All required software has been integrated, and a training program was started in mid-February. The current schedule reflects receiving high density tapes and film during the April-May simulation period. During this time, two complete data bases will be maintained; one for all production work, the other for simulation of EDIPS data entry and order processing. Full scale production operation of the EDIPS/INORAC interface is scheduled for June 1, 1978. Delivery of the new photo lab equipment required for EDIPS which includes a DeVere Enlarger, Klimsch Contact Printer, Microfiche Camera Display System, and a Houston Processor is on schedule except for the Houston Processor which may be 10 to 15 days late. Late delivery of this item is not expected to effect EDIPS.

GENERAL PURPOSE COMPUTER SYSTEM UPGRADE: Upgrade of the EDC Burroughs B6700 general purpose computer system has essentially been completed with implementation of the third central processor, additional core memory, and eight additional disk packs. The only remaining item is a tape drive and associated control unit that was incorrectly configured prior to shipment. Engineering modifications will be required for these components prior to installation.

DATA PRODUCTION: Shipped reimbursable orders are approaching one and one-quarter million dollars. The trend of incoming mail shows a slight increase up to 115 items received daily in Users Services (30 to 35 percent are orders). Valid customer complaints are averaging about 46 per month for this fiscal year, representing about 2% of the total orders produced. However, only about one-tenth of one percent of the individual products during this period are classified as legitimate photographic quality complaints. Customer response cards average about 400 per month, which is approximately 15% of the number disseminated. Reimbursable orders for EDIES data are at about one-quarter million dollars. Orders are no longer being accepted for EDIES products unless the CCT is in-house at EDC. This is being done due to the slow delivery of CCTs from GSFC and the EDIPS schedule, which calls for the MKI HRFR to be shipped to Goodyear Aerospace about March 25 (MKI to be configured to MKII design). Support has been given to the Corps of Engineers (COE) from the New York District in entering and ordering data at EDC. Support for the COE Dam Safety Program has begun. This involves determining CCT availability over the entire country.

ALASKAN ACTIVITY: Tom George attended the Beaufort Sea Synthesis meeting in Barrow which was sponsored by the Arctic Project Office of the Outer Continental Shelf Environmental Assessment Program (OCSEAP). This week-long meeting was attended by all the OCS investigators working in the Beaufort Sea area and by representatives of the Alaska Oil and Gas Association. The objectives of the meeting were to 1) understand the results of new information collected over the past year, 2) evaluate alternative impacts of proposed development and 3) identify data gaps that need to be filled concerning potential development. It appears that many impacts can be held to an acceptable level by time-phasing of activities to avoid important wildlife migrations, and careful design of structures to preserve circulation patterns in nearshore coastal areas. Landsat, NOAA and aircraft imagery which has been provided to many OCSEAP investigators has played a key role in the current understanding of the physical processes in the Beaufort. More and continuing data is needed in many areas to answer questions about sea ice motion, circulation patterns and other processes in the Beaufort Sea.

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INTERAMERICAN DEVELOPMENT BANK TRAINING COURSE: A four-week training course in the interpretation of Landsat imagery was conducted at the EROS Data Center, February 21 - March 7, for 20 Central American scientists under the sponsorship of the Interamerican Development Bank. Participants included representatives of Guatemala, Honduras, El Salvador, Nicaragua, and Costa Rica. The first two weeks of the course were devoted to fundamentals of remote sensing, the Landsat system, and approaches to the manual interpretation of satellite imagery for natural resource and land planning applications. During the third week each country group prepared multidisciplinary analyses of images of their country and discussed their conclusions and recommendations. An introduction to the preparation of controlled Landsat mosaics was presented during the fourth week. It is anticipated that further work will be done in Central America on the completion of thematic maps and the compilation of regional Landsat mosaics in black-and-white and color.

PNRC IDAHO FOREST INVENTORY PROJECT: An EDC representative attended a PNRC Idaho Forest Inventory Project Review meeting at NASA, Ames, March 2. The purpose of the meeting was to review the progress, current status, and future plans of each participating agency and contractor, ESL, NASA, Idaho Department of Lands, and EROS. The major discussion concerned ESL's design of the timber volume estimation procedure which will be used to estimate net volume per acre by land ownership categories over the entire 8 million acre study area. Modifications to the procedure were recommended and will be incorporated into the design. Also discussed were incorporating land ownership and land network map data into the processing system to summarize volume estimation results in the manner which Idaho Department of Lands requires.

BUREAU OF LAND MANAGEMENT/EROS TRAINING PROGRAM: Bureau of Land Management personnel visited EDC to discuss the BLM/EROS training program and follow-on project work. The BLM has a need for additional basic photo interpretation and digital analysis courses beyond what is now given by EDC personnel. It was agreed that additional basic photo interpretation courses would not be given by EDC personnel. EDC will provide assistance in preparing a questionnaire to assess future BLM remote sensing requirements. This will be coordinated through the BLM Scientific Systems Development organization in Denver. The BLM follow-on projects in Alaska and Arizona were discussed. EDC personnel will assist in defining evaluation procedures to be used by BLM Alaska personnel to evaluate Landsat digital products for the Denali area.

NATIONAL PARK SERVICE/EROS DEMONSTRATION PROJECT: Continued support for the Lake Mead National Recreation Area Resource Inventory Project included refinement of Landsat digital classification results of the 1.3 million acre recreation area based upon field reconnaissance data collected last month. The Landsat classification was spatially stratified, and the classification legend descriptions were refined in the Data Analysis Laboratory and also a statistical sampling scheme was developed for quantitative assessment of classification map accuracy.

DATA PRODUCTION: Data sales reimbursable receipts reached approximately one and one half million dollars as of the end of March. Total reimbursable receipts for Landsat data since the start of the program is approximately six million dollars - about 78% for imagery and 22% for CCTs.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): EDIPS delivery to EDC will be delayed approximately one month from April 1, to May 1, 1978. The primary reasons for the slip are late delivery of the High Resolution Film Recorder to TRW for integration into the system, and problems encountered during system testing. Final acceptance testing of the High Density Tape Copy System was successfully completed at GE/Beltsville and NASA/GSFC. The EDIPS CCT document has completed USGS review and is being prepared for GPO printing. The document is scheduled to be available for distribution May 1, 1978.

ALASKAN ACTIVITY: One of the biggest assets of the Alaskan AAF library is the extensive hard copy file of Landsat and aircraft imagery available for browse to the user community. This file has been very difficult to keep current in the last few years because of the lack of funds specifically designated for this purpose. Initially copies of data were received through NASA contracts; following their expiration data was received through the Outer Continental Shelf Environmental Assessment Program project which is limited to coastal zone imagery. Arrangements have recently been made with the Alaska Resources Library for funding to cover the acquisition of the best 1977 and 1978 summer Landsat imagery of interior Alaska. A partial listing of summer 1977 imagery has been selected and 9" negatives of a single band ordered. Prints will be made from the negatives and a set will be on file at the Alaska Resources Library in Anchorage as well as the AAF in Fairbanks.

NSTL ACTIVITY: Conducted a managers remote sensing course for EPA. Addressed the USGS Conservation Division, Offshore Operators in the applications of remotely sensed data. Consulted with various private, state, and Federal users on the following topics: mill site selection; Mississippi River channeling projects; timber typing and volume estimating; CIR mission planning; camera mounting on light aircraft; beetle damage assessment; forest logging; road planning; and selection of aerial and satellite imagery.

OFFICIAL VISITORS: Official visitors to EDC included representatives from EROS Program; LIA; Defense Mapping Agency; American Selco, Inc.; BLM; USDA; USFS; Venezuela; Panama; Argentina; Ford Aerospace; American Satellite Corp.; TRW; U.S. Dept. of State; Atlantic Richfield; Canadian Center for Remote Sensing; and Australia.

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April 1978

BUREAU OF LAND MANAGEMENT REMOTE SENSING COURSE: An introductory course in geologic remote sensing techniques was presented to 24 geoscientists from the Bureau of Land Management, Conservation Division, and EROS Program Office during the first week in April. Topics covered included basic concepts and principles of remote sensing systems applied to general geologic and specific mineral occurrence investigations.

U.S. FISH & WILDLIFE SERVICE REMOTE SENSING WORKSHOP: An introductory remote sensing training workshop was conducted for 23 Fish & Wildlife Service personnel, April 10-14, 1978. Manual image interpretation techniques for assessing habitats were presented using lectures and workshop exercises containing Landsat color composites and enlarged color infrared aircraft photography. Habitat change detection techniques were presented using two dates of color infrared photography. An introduction to digital image analysis was provided using the GE Image-100 to demonstrate image enhancement, classification and change detection.

MEXICAN TRAINING COURSE: A two-week remote sensing training course was conducted for the DETENAL organization of the Mexican Federal Government. DETENAL is responsible for the mapping of topography, land-use, soils, and geology for Mexico at a scale of 1:50,000. The objective of the training course was to show the application of Landsat data to regional mapping of resources. Principles of image analysis and interpretation were presented and workshop exercises were used to familiarize students with Landsat data and products.

MINING SAFETY AND HEALTH ADMINISTRATION TO UTILIZE LANDSAT DATA: Messrs. Kirk McCabe and John Janski from the Pittsburgh Center of the Mining Safety and Health Administration (MSHA), Department of Labor visited EDC to obtain information and digital image enhancement techniques for lineament analysis. Contrast stretch and high frequency enhancements were demonstrated. Preliminary discussions were held on cooperative projects to demonstrate digital image analysis techniques over coal mining areas in the Appalachians where considerable ground information is available. MSHA will prepare a proposed project plan and submit it to EDC for consideration.

LACIE PROJECT REVIEW: An EDC representative attended the LACIE (Large Area Crop Inventory Experiment) Project review held at NASA/JSC April 4 and 5. Fifty-six scientists were invited by NASA to participate in the two-day intensive briefing and discussion on LACIE operations and results. The invited participants were encouraged to critically review the project and to exchange views with the LACIE Project staff. The principal topics discussed included Landsat classification accuracy assessment and the future application of LACIE-derived technology.

DATA PRODUCTION: Shipped reimbursable data sales are close to the budget plan. Second quarter shipped sales were \$721,550 as compared to the first quarter of \$763,071. To date, the shipped products have exceeded \$1.7 million and incoming orders are over \$2.0 million. Total photo lab output for the first half of this fiscal year was 151,000 frames. The work in process remains relatively high due to the volume of user orders and delays in getting CCT's from GSFC. Questions are being asked about the availability of Landsat-3 data which is still not coming out of GSFC. An analysis of Landsat orders over \$100 since mid-1974 through calendar 1977, has shown that two-thirds of all data sold is over non-U.S. countries. Africa and mid-East data have the highest geographical demand followed by South America, Asia/Far East, Russia/China, Europe, Australia, Mexico/Central America, and Canada.

PECORA V PLANNING MEETING: A planning meeting was held at EDC April 4, 1978, for Pecora V which will be sponsored by the American Water Resources Association (AWRA) and held in Sioux Falls, in the June 1979 timeframe. Participants included Dana Rhoads, AWRA Manager, Thad McLaughlin, and EDC personnel. The thrust and mechanics of post-symposiums, potential topics and guest speakers, publicity plans, logistics, housing and local support requirements were discussed.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): EDIPS delivery to EDC is scheduled to occur during the week of May 8, 1978. System Verification Test (SVT) is in process and will be completed April 24, 1978. Following SVT, a five-day test will be conducted to identify and characterize any incompatibilities that may exist between EDIPS and the NASA/GSFC Master Data Processor (MDP). This test will utilize the latest available MDP-generated High Density Tape (HDT). Modifications to the B6700 INORAC software system to accommodate EDIPS have been completed and the new system has been brought on-line.

NSTL ACTIVITY: A lecture concerning "Available U.S. Geological Survey Products from EROS and NCIC Programs" was given at the Association of American Geographers Remote Sensing Workshop held in New Orleans April 8 and 9. On the 12th of April the EROS/AAF hosted 32 remote sensing professors for a tour and lecture on "What EROS and NCIC can do for You." Lt. Gen. A. Martin toured the NSTL/AAF on April 11 and reviewed the training facilities in connection with an upcoming foreign officers training course in remote sensing of shorelines, beaches and tidal marshes for NAVOCEANO's Training Center. This course will overlap with lectures being given by Louisiana State University's coastal oceanography program and University of Southern Mississippi's geographic cartography lab. These overlapping lectures will cover a nine-week period and NSTL/AAF personnel will be involved for 5 1/2 weeks of half-day lectures and exercises including field work. The NSTL/AAF held its Third Mosquito Control Workshop April 25 - 28, which concentrated on wetland detection and vegetation mapping.

ALASKA ACTIVITY: An uncontrolled mosaic of 1977 summertime Landsat imagery of interior Alaska was prepared for the fire control section of the Bureau of Land Management. This mosaic consists of thirty-seven images and covers most of the region managed by BLM's Fairbanks District Office. Last summer this region suffered the worst fire season in twenty years and by using

Landsat imagery BLM can determine the effectiveness of the methods employed in fighting the fires. BLM has ordered enlargements of two scenes to use in training sessions to demonstrate to their fire fighters the importance of being familiar with the fuel components and terrain of an area to aid in deciding which fires to let burn and which fires should be controlled. They feel Landsat imagery is an excellent tool to use in these decisions. Participated in a high-altitude photography coordination meeting in Anchorage which was attended by nineteen representatives from various State and Federal agencies. There will be two NASA U-2 aircraft in the state this summer obtaining as much coverage of Alaska as possible. Various agencies are cooperating in financing these missions and they have agreed that a common sensor package be used for all flight lines.

OFFICIAL VISITORS: Official visitors to EDC included representatives from: The Australian Department of Science; Informatics Division, Plan and Budget Organization, Iran; University of Budapest, Hungary; University of Mexico; Korea Research Institute of Geoscience; The University of Nebraska; Public Technology Inc., Washington, D.C.; WRD, Reston and St. Paul, Minnesota; South Carolina Resources Commission.

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INTERNATIONAL REMOTE SENSING WORKSHOP: The 10th International Remote Sensing Workshop was held at EDC in May. Thirty participants representing 17 countries attended. The four-week workshop, which emphasized manual interpretation of Landsat imagery, was divided in four general sessions: a) review of fundamentals of remote sensors and interpretation techniques, b) general discipline studies in geology and vegetation, c) regional analysis of and field trip to test sites in the Black Hills of South Dakota, and d) analysis of imagery of test sites selected by each student.

BLM REMOTE SENSING TRAINING COURSE: A one-week remote sensing training course was presented to Bureau of Land Management personnel in Phoenix, Arizona, May 8-12, 1978. There were 21 participants representing the States of Arizona, New Mexico, Colorado, Utah, and Nevada. The course emphasized manual interpretation of aerial photographs and Landsat imagery. A variety of workshop exercises were used to demonstrate the utility of remote sensing for natural resources inventory and analysis. A one-day field trip permitted ground verification of image interpretations. A brief introduction to digital image analysis techniques was included.

PNRC ACTIVITY: EDC continued assisting the Pacific Northwest Regional Commission's (PNRC) activities to establish in the States of Oregon, Idaho, and Washington the capability to use Landsat data operationally. As part of that assistance, an EDC representative has been assigned to temporary duty in Boise from May 1 to September 30, 1978, to provide liaison between the USGS/EROS Program and the State agencies participating in the project, assist project participants in developing analysis plans, review technical proposals prepared by project participants and/or support service organizations, and participate in technical reviews of completed work.

VEGETATION MAPPING COURSE: A field trip was conducted in Leelanau County, Michigan to prepare field exercises and final plans for the vegetation remote sensing workshop to be held June 19-23, 1978. The purpose of the course is to introduce participants to the practical uses, advantages, and limitations of aircraft and satellite imagery for vegetation resources evaluation. Approximately 30 participants are expected to attend. The site location is on the Lake Michigan shore near the Sleeping Bear Dunes National Park. This workshop is being conducted by the University of Michigan School of Natural Resources in cooperation with the EROS Data Center.

IRANIAN REMOTE SENSING WORKSHOP: The Iranian Remote Sensing Center (IRSC) was visited to make final plans for the first Iranian Remote Sensing Workshop to be held in Tehran, Iran, during July 22 - August 15, 1978. Workshop agenda, required images, syllabus and supplies were discussed. Three days were spent in the field visiting sites to be used during discipline applications exercises in geology, hydrology and agriculture/soils. Preparations for the workshop are progressing and no major problems are anticipated.

BLM/ALASKA ASVT: EDC personnel participated in the NASA/BLM ASVT Phase I project review held April 27-28 in Denver, Colorado. The project review was given by ESL, Inc. (the prime contractor), personnel from the University of California-Berkeley, and BLM personnel. The review was attended by approximately 35 individuals, mostly from BLM. The Phase I test site encompasses approximately two million acres around Denali, Alaska. The Landsat classification has been completed and large scale photography and ground observations were used to describe, with confidence boundaries, the wildland resources sampled in each computer class. Preparation of final area estimates and map overlay products is in progress. BLM personnel, with EDC's assistance, have begun to define a procedure to evaluate the project deliverables with respect to BLM's needs. The evaluation will begin when the end products are delivered to the BLM.

ISP WORKING GROUP: An EDC representative chaired a meeting of Working Group II/4, Commission II, International Society of Photogrammetry (ISP), at the Canadian Center of Remote Sensing. Working Group II/4 is developing a summary report on the current state-of-the-art of instrumentation for remote sensor data reduction. Thirty North American scientists representing NASA, U.S.G.S., Canadian Center of Remote Sensing, and Remote Sensing Equipment manufacturing firms have now participated in the last two meetings of the Working Group.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): EDIPS testing at the TRW facility has been completed. Resolution of the minor problems that occurred during Systems Verification Test (SVT) and the special compatibility test is in progress. EDIPS is scheduled to arrive at EDC before the end of May.

LANDSAT GROUND STATION OPERATORS WORKING GROUP (LGSOWG) MEETING: Al Watkins participated in the sixth LGSOWG meeting held May 9-11 in Stockholm, Sweden. Major items discussed during the meeting included: status of Landsats 2 & 3; plans for Landsat D; possible new foreign Landsat ground stations; ground station status, experience, and plans of each member country; compatibility of tape and data base formats; and applications that are achieving operational status.

NSTL ACTIVITY: A four-day LSU-MSU Logging Institute Remote Sensing Workshop was conducted for foresters from Texas, Louisiana, Mississippi, Arkansas, Florida, South Carolina, Maine and Brazil. Participated in NASA's Earth Resources Laboratory Workshop for the Navajo Nations. Preparations were completed for an Overview of Remote Sensing Workshop for a group from Costa Rica that will start May 30. Participated in the American Congress of Surveying and Mapping Coastal Mapping Convention in New Orleans and exhibited at the Federal Laboratories Consortium for Technology Transfer held in conjunction with Louisiana Office of Science, Technology and Environmental policy in Baton Rouge, Louisiana. The Consortium consists of more than 150 Federal government laboratories informally joined to advance and facilitate the transfer of technology. A presentation and tour was given to the Gulf Coast Marine Environmental Science Society.

ALASKAN ACTIVITY: Presented a paper and poster display at the 12th International Symposium on Remote Sensing of the Environment held in the Philippines in late April concerning ice jams and subsequent flooding on the Yukon River and the role Landsat could play in determining where dusting of river ice should be concentrated to alleviate spring flooding. Participated in a meeting with representatives from the Soil Conservation Service and the Department of Natural Resources to discuss reconnaissance soils mapping to help the State classify agricultural lands for future development. Assistance was provided to approximately 100 visitors during this reporting period.

OFFICIAL VISITORS: Official visitors to EDC included representatives from: the Plan and Budget Organization, Tehran, Iran; NASA/Ames; Public Technology, Inc., Washington, DC; Bangladesh; U.S. Bureau of Mines; University of British Columbia; Phoenix Corp., McLean, VA; South Africa; Brazil; and Venezuela.

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June 1978

UNIVERSITY OF MICHIGAN VEGETATION COURSE: A Vegetation Remote Sensing Workshop was presented in northern Michigan by University of Michigan and EDC personnel June 19 through 23. All administrative details and a portion of the instruction were handled by the University of Michigan School of Natural Resources, and EDC provided one person to participate in the teaching and assisted in course planning and preparation. The course, which had open enrollment and concentrated on vegetation inventory, resource evaluation, and impact assessment, represents an effort on the part of EDC to stimulate and encourage the participation of universities in remote sensing training of the user community.

WATER RESOURCES REMOTE SENSING WORKSHOP: A Water Resources Remote Sensing Workshop was given at the EROS Data Center June 13-16, 1978. The purpose of this workshop was to acquaint the participants with basic remote sensing principles and practical applications of Landsat data and other types of imagery as they relate to water resources studies. The course was designed primarily for hydrologists from U.S.G.S. Water Resources Division and their cooperating agencies, although a number of the 27 participants were associated with state-level agencies. Lectures on the feasibility and economic aspects of utilizing remotely sensed data for water resources applications supplemented the basic principles, lectures and applications examples presented. A workshop exercise was given which allowed the participants an opportunity to analyze and interpret Landsat imagery for regional hydrologic information.

BUREAU OF LAND MANAGEMENT WORKSHOP: A remote sensing training course was presented to Bureau of Land Management personnel in Boise, Idaho, May 22-26, 1978, which included 31 participants, representing the States of Idaho, Oregon, Nevada, Montana, Wyoming, and Alaska. Manual interpretation of aerial photographs and Landsat imagery was emphasized, and several image exercises were used to demonstrate the utility of remote sensing for natural resources inventory and analysis. A one-day field trip permitted ground verification of image interpretations. A brief introduction to digital image analysis techniques was included.

STRIP MINE MONITORING COURSE: Representatives from EDC met with personnel from Peter Kiewit Sons' Co. in Sheridan, Wyoming, to: a) learn about and observe the coal mining operations at the Decker Coal Mine in Southeastern Montana, and b) become familiar with the vegetation, soil, geology and hydrology in the Tongue River Watershed. The meeting and field trip provided an opportunity for EDC personnel to verify visual image interpretation made from aircraft and Landsat imagery of mine activities, hydrology, soils, geology and vegetation. The aircraft and Landsat imagery was then used in workshop exercises for the Coal Surface Mining Remote Sensing Workshop conducted at the EROS Data Center June 5-9, 1978. The course

included 28 participants from 18 states. Sixteen participants were affiliated with four Department of Interior agencies, viz U.S.G.S., Bureau of Land Management, U.S. Fish and Wildlife Service and Bureau of Mines. Eight participants were from State agencies, and four were from private industry. The objective of the workshop was to demonstrate remote sensing techniques which are practical for gathering information mandated by the Surface Mining Control and Reclamation Act, 1977. Both regional and site specific workshop exercises were introduced using Landsat color composites and color infrared aerial photographs (scales 1:120,000; 1:60,000 and 1:24,000) of the Decker Coal Mine in Southeastern Montana. Examples of coal mining in Indiana and Tennessee were also introduced during the workshop. A second Coal Surface Mining Remote Sensing Workshop is scheduled for December, 1978.

HARVARD UNIVERSITY TERRAIN ANALYSIS COURSE: During June 19-23, EDC hosted a basic remote sensing workshop on "Terrain Analysis", conducted by the Graduate School of Design of Harvard University. This was the first workshop at EDC conducted by an outside group and included 19 participants from 14 states, Italy, and Paraguay. Workshop topics and related exercises included pattern recognition principles for aerial photographic terrain analysis, rock type identification, transported soils, and soils mapping. EDC staff support consisted of a DAL demonstration, selected case study presentations, and a tour of the EDC facility.

TEXAS A & M UNIVERSITY WORKSHOP: Nine faculty members and graduate students from the Geology Department of Texas A & M University attended an introductory training course in geological remote sensing techniques at EDC from May 30 to June 2, 1978. This training program is part of an EDC effort to involve academic institutions in technology transfer commitments to both student and industrial sectors. The course was generally well received and afforded an opportunity to gain a better insight into the requirements of university faculty for implementing remote sensing technology into their curriculum.

NATIONAL COMPUTER CONFERENCE: EDC personnel participated in the 1978 National Computer Conference held in Anaheim, California, during the week of June 5-9. This conference has an extensive technical program, large exhibit area (with approximately 1,400 exhibit booths), and normally has a registered attendance of approximately 40,000 domestic and foreign computer specialists and users. One of the concurrent sessions held on Wednesday, June 7, was devoted to the subject of Image Processing and Remote Sensing. EDC personnel organized and chaired a session on Introduction and Leading Applications, and during that session a paper was presented by a staff member on work done at EDC entitled, "Image Analysis Techniques Required for Natural Resources Inventories". EDC personnel also participated in a panel session on Satellite and Other Data Characteristics.

PECORA IV: The Pecora IV Program Planning Committee comprised of personnel from National Wildlife Federation, EROS Program, U.S.G.S., and U.S. Fish and Wildlife Service met at the EROS Data Center to finalize the technical program for the Pecora Symposium to be held in Sioux Falls, October 10-12, 1978. The announcement for the symposium, which includes the technical program and registration information was prepared and will be circulated in mid-July. The technical program will include 14 invited papers, 45 poster session papers and 2 banquet presentations, all of which respond

to the theme, The Applications of Remote Sensing Data for Wildlife Management.

DEFENSE MAPPING AGENCY (DMA) DATA REQUIREMENTS: EDC has been working with DMA and NASA regarding DMA's hydrographic requirements for Landsat data. The tentative DMA requirements are for Landsat coverage at high gain of approximately 3,000 geographic scene centers of shallow sea areas around the world to be taken over the next 5 years. Most scenes will require coverage twice, with temporal separation and relatively cloud-free conditions with minimum water turbidity. DMA will require a large number of uncorrected CCT's probably 2-3 thousand and radiometrically and geometrically corrected photographic reproductions of all the scenes at a total cost of approximately \$1,000,000 for data over the next 5 years.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): The EDIPS arrived at EDC in two parts, the first part on May 24, and the second part on May 27. The system completed installation and initial system test on June 6. The Demonstration of Satisfactory Operation (DSO) test was started June 6, and completed June 11. Modification of the two High Density Tape Recorders to bring them up to the same configuration as NASA's has been completed. Start of the 30-day Performance Acceptance Test may be delayed two weeks to accomplish a modification to EDIPS to solve an IRIG timing problem that was found during the compatability test performed just prior to system delivery.

ALASKAN ACTIVITY: Created a display for an Interior Alaska Economic Development Conference held in Fairbanks. A large portion of the display featured remote-sensing and its applications in Alaska and one of our personnel was on hand to answer questions. The panels of satellite imagery and aerial photography created much interest among the viewers and several have visited the AAF since that time to better acquaint themselves with what is available for their use. Several rolls of high-altitude aerial photography of Alaska from summer 1977 were loaned to us by the Alaska Power Administration for duplication and inclusion in our files. The AAF had almost one hundred visitors seeking various information and sold approximately \$2,000 worth of data.

NSTL ACTIVITY: NSTL completed a four-day workshop for the LSU/MSU Logging Institute. Participants were from major southern forest companies that were also attending a logging institute held at the University of Southern Mississippi's facility on the Gulf Coast. Official visitors to NSTL included the Consul General of Mexico, Jorge Aguliar, and his Vice Consul, Salvador G. Largas. NSTL participated with NASA/ERL on a one-day remote sensing overview for the Soil Conservation Service of Mississippi, attended by 42 people.

OFFICIAL VISITORS: Official visitors to EDC included representatives from: Texas A&M; Rome, Italy; NASA Headquarters and NASA/GSFC; Tehran, Iran; Geological Survey of India; Indiana State University; British Embassy, Washington, DC; Deputy Under Secretary of the Air Force for Space Systems; Swedish Space Corporation; EROS Program; Chile; and Branch of Contracts, Reston, VA and Denver, CO.

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SCIENTIFIC DELEGATION FROM THE PEOPLES REPUBLIC OF CHINA: A delegation of scientists from the Peoples Republic of China visited the Data Center on July 5 and 6, 1978. The purpose of their visit was to become familiar with the EDC facilities and its mission and responsibilities. Presentations and detailed discussions covered data production and computer operations, the new EDIPS, applications assistance and training, the characteristics of Landsat data and principles of computer processing of Landsat data, and the systems and techniques used in the Data Analysis Laboratory.

LAKE MEAD NATIONAL RECREATION AREA RESOURCES ANALYSIS DEMONSTRATION PROJECT: This cooperative demonstration project between the National Park Service and the EROS Data Center was completed on July 14, 1978. Principal end products of the project, including maps, overlays, and imagery will be delivered to the NPS Denver Service Center later this summer or fall for a NPS project review. Slides of the results will be used for preparation of journal articles and symposia presentations, as well as lectures and materials for EDC remote sensing workshops.

EROS/BLM COOPERATIVE PROJECT: BLM personnel from Washington, D.C. and Denver visited EDC July 5-7 to review the project in Arizona which involves the use of digital image analysis techniques and three phase sampling with stratification to map and inventory vegetation resources over approximately 2 million acres. BLM personnel from Arizona and Denver later attended a digital analysis workshop July 17-21 at EDC to finalize the classification framework, define schedules for fall field work and additional training workshops at EDC, and to begin developing training statistics to use in the maximum likelihood classifier. Digital terrain data is being registered to the Landsat data and estimating elevation, slope, and aspect for each picture element is being estimated. EDC and BLM personnel will use these data in post-classification stratification to describe the vegetation resources associated with each computer class. The Calcomp plotter will be used to plot primary sample units onto orthophotoquads. The orthophotoquads will then be used by EDC and BLM personnel to locate subsequent photo and ground plots.

NASA REMOTE SENSING EDUCATORS CONFERENCE: EDC participated in the NASA sponsored Conference of Remote Sensing Educators (CORSE) held at Stanford University on June 26-30, 1978. The objectives of the conference were to promote and improve the teaching of remote sensing at universities and colleges in fourteen western states. One hundred seventy-five faculty and staff attended the 5-day conference. Emphasis of the conference was on teaching techniques, materials, graphics, field exercises, curricula, faculty qualifications, and support facilities, equipment and services.

U.S. FOREST SERVICE RESOURCE MANAGEMENT STUDIES: EDC personnel are working with U.S. Forest Service personnel from the California Regional Office, Range Division (San Francisco); the Lassen National Forest; and the Rocky Mountain Forest and Range Experiment Station in the analysis of large scale (1:600 and 1:2000) color and color infrared photographs of rangeland plant communities

in northeastern California. The objective of the cooperative project is to determine the feasibility of using large scale photographs as a tool for determining range condition and trend. Large scale photographs and accompanying ground measurements were acquired during the second week of July 1978 and the current aerial photos will be compared with similar photographs acquired in July 1967 and 1969 to assess changes in species composition, plant numbers and plant cover.

PACIFIC NORTHWEST PROJECT: On July 20 and 21 an EDC representative met in Boise, Idaho with the Idaho Department of Water Resources to discuss the irrigated land mapping and inventory project being conducted in the Snake River basin. Procedures and results of the Phase IIIA & B research, which has been completed, as well as plans for the future were discussed. A number of suggestions were made regarding technical problems which have been encountered, and tentative plans were made for a seminar on advanced computer analysis procedures which would be attended by selected state personnel involved in the PNRC project and EDC representatives knowledgeable in computer-assisted image processing.

INTERNATIONAL LANDSAT DATA BASE: Effort continues in the exchange of Landsat data base information between EDC and the foreign countries that receive and process Landsat data. A tape has been received from Brazil and the software generated to read the tape into the EDC data base.

CONTRACTS: Preproposal conferences were held for two major annual contracts at EDC--"Custodial Services" and "Facility Engineering and Maintenance Support". Bids and proposals have been received by the Branch of Procurement and Contracts, Denver Region, and awards are pending evaluation and negotiations.

LANDSAT DATA RELAY SYSTEM: A contract has been awarded to RCA Americom to provide the capability to relay Landsat data from the NASA receiving stations in Fairbanks, Alaska and Goldstone, California to NASA/GSFC and from NASA/GSFC to the EROS Data Center for final processing and dissemination to users. Installation of the EDC antenna should begin in the near future and the whole system is scheduled to be operational in January 1979.

NSTL ACTIVITY: Naval Oceanographic Research and Development Agency (NORDA) personnel were trained in the use of the VP-8 image analyzer for enhancement of GOES and DMS Weather Satellite images of ocean water masses. Landsat computer analysis of the Mississippi River bottom-land hardwood has been started using NORDA's I²S computers at NSTL. Mr. A. Shows, Water Resources Division District Engineer, from Louisiana, reviewed manual Landsat interpretation procedures used in the uses of AAF equipment for future projects.

LAGS ACTIVITY: One hundred sixty nine frames of Landsat imagery were received from EDC and forwarded to the National Centers. The first Chilean International Symposium on Remote Sensing was held, and included approximately 120 attendees, not only from Chile, but also from Canada, France, IAGS, Brazil, and Argentina.

OFFICIAL VISITORS: Official visitors to EDC included representatives from: Iowa Geological Society; Elder Associates; Batley Enterprises; Southwest Texas State University; Xerox Optical Systems; Polytechnic Institute of Conakry, Guinea; Department of Soil and Water, Nepal; Peoples Republic of China; SRI International; University of Wisconsin Geology Department; University of Arizona College of Earth Services; Geological Survey of Pakistan; Turkey; and University of Stuttgart.

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IRANIAN REMOTE SENSING WORKSHOP: Four representatives from EDC conducted a four-week remote sensing workshop in Tehran, Iran, July 22-August 15, 1978, in cooperation with the Iranian Remote Sensing Center. Forty students attended the workshop, which included one week of instruction on the fundamentals of remote sensing, one week of lectures and exercises on the applications of remote sensing, disciplinary team analysis of study areas in Iran, a field trip to the study areas and team reports of their analyses.

CIRCUM-PACIFIC REMOTE SENSING WORKSHOP: EDC staff conducted a workshop in satellite remote sensing at the CIRCUM-Pacific Energy and Mineral Resources Conference July 24-28, 1978, in Honolulu, Hawaii. Forty-four geoscientists from 11 foreign countries attended the five-day workshop. A paper was also presented at the conference on analytic and interpretive methods for the development of geological interpretations from remotely sensed data.

WASHINGTON DEPARTMENT OF NATURAL RESOURCES FOREST RESOURCES INVENTORY PROJECT: Two Washington Department of Natural Resources personnel visited EDC to work with Landsat digital data to compliment Washington's Gridded Resource Information Data System (GRIDS)--the objective being to determine what forest resource classes can be identified by processing Landsat digital data. GRIDS data, collected by interpretation of medium-scale aerial photography and digitally encoded, was successfully entered into the IDIMS image processing system and merged with corresponding Landsat data of two townships in western Washington. GRIDS data from one of the townships was used to develop statistics to train the maximum likelihood classification algorithm as well as statistics to perform canonical analysis. Comparison of classification results from both maximum likelihood and the canonical analysis efforts to the GRIDS data will continue next month. Analysis efforts on the second township composed of different forest stand conditions will also continue.

DEFENSE MAPPING AGENCY SHALLOW SEAS MAPPING PROJECT: EDC assisted Defense Mapping Agency Hydrographic personnel in differentiating between Landsat high-gain and low-gain data. It was determined that high-gain data saturates over areas such as beaches and urban areas and in cloudy situations. More analysis will be done to determine the best enhancements for the "Shallow Seas" mapping project. In addition, a progress report on the resampling study for geometric transformation being done cooperatively by Purdue University (LARS) and EDC was reviewed. Images of the Bimini area with different resamplings and classifiers applied were discussed.

NORTHERN FLORIDA IRRIGATED LANDS STUDY: The Suwanee River Water Management District (SWRMD) in cooperation with USGS-WRD and EDC, has used Landsat data to estimate acreages of irrigated and non-irrigated crops in northern Florida. Two papers have been prepared which document the development of an operational methodology for the collection, storage, and retrieval of water use data for monitoring irrigated crop land. An EDC applications scientist visited the SWRMD to discuss the significance of the completed research phase, refinements in methodology for future research, and continued cooperation.

EDC AND USGS-FLAGSTAFF REMOTE SENSING TRAINING PROGRAMS: EDC representatives visited Flagstaff, Arizona, to meet with personnel of the USGS field center in regard to coordination of remote sensing training activities of EDC and the Flagstaff center. Among items discussed were the curricula of the various courses taught at each facility, exchange of training materials, cooperation in publicizing courses and referral of potential students, and an exchange of ideas and procedures regarding professional training.

TEXAS A & M UNIVERSITY FACULTY MEMBERS COMPLETE SUMMER INTERNSHIP AT EDC: Two members of the Geology Department, Texas A & M University, worked with EDC staff for two months this summer on the development of training materials for use in university training programs. Emphasis was on the utilization of Landsat data to geologic applications.

LANDSAT DATA TO BE UTILIZED IN LOCATING BURIED ALLUVIAL VALLEYS IN THE MIDWEST: An EDC representative visited the Kansas Geological Survey (KGS) Groundwater Section to assess research being done on locating buried alluvial valleys through pattern analysis of Landsat imagery. A short field trip was taken near the Lawrence, Kansas area to become familiar with general landscape characteristics. Future work in northeastern Kansas is planned by KGS to determine the ground water significance of delineated linear and curvilinear patterns.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): The Performance Acceptance Test (PAT) for the EDIPS was conducted at EDC from July 31 through August 25, 1978. During this period of time, the system was run on a five-day per week schedule for a total scheduled use time of 237 hours and 22 minutes. Of this time, the system was down for 59 minutes resulting in an effectiveness level of the system of 99.5% during the test period, which is well above the required effectiveness level of 85%. The MKII Laser Beam Recording system should complete final acceptance testing at Goodyear and be shipped to EDC in early September.

DATA PRODUCTION AND SALES: Data sales (shipped reimbursable receipts) are at \$3.0 million as of the end of August. New computer derived information is being used by Photo Lab management to improve production scheduling and flow of data products through the Photo Lab. This effort has resulted in a reduction of the work in process in the Photo Lab, i.e., from \$313K at the end of July to \$212K on August 22, and has reduced turnaround time for data products.

NSTL ACTIVITY: Ground data collection for U.S. Fish and Wildlife Service demonstration project was completed this month and final manual interpretation overlays have been drafted. Work continues on computer analysis of this same area using the I²S 101. An amendment to the original agreement with U.S. Fish and Wildlife Service has been made at their request to prepare sufficient documentation of this project to enable NSTL personnel to co-author a paper for future presentation. Contact was made with BLM-New Orleans regarding the latest training products and equipment currently available at the EROS/AAF. A presentation and tour was given to 40 German Exchange students who were hosted by Rotary International. A full day of orientation regarding EDC products and services was again presented in support of ERL's southern training program. Participants were from University of Oklahoma and University of California.

Two training courses are scheduled for the next reporting period, August 29-September 1, Overview of Remote Sensing, and September 11-15, EPA Managers Workshop in Denver. In addition to this, Frank Beatty and Pat O'Neil will begin teaching a course on remote sensing applications and resource management in conjunction with Mississippi State University.

ALASKAN ACTIVITY: Paula Krebs has been appointed as representative to the Temporary Task Force on Remote Sensing. This group, consisting of representatives from the Department of Interior, Department of Agriculture, Office of the Governor, Department of Natural Resources, Federal/State Land Use Planning Commission and the Geophysical Institute was formed to work out policy, plans and coordination for use of remote sensing in Alaska to minimize duplication of activities and gain greater benefits by sharing results obtained by various agencies. A statewide remote sensing technology and transfer conceptual plan and policy recommendations will be developed soon and be presented to all interested state and federal agencies for review. The Geophysical Institute is assisting the State of Alaska to evaluate the utility of satellite remote sensing data. We will study satellite data available from existing sources as well as make recommendations for various formats and potential sources in the future. Also included in the State-funded project is training of state personnel in the basic techniques of interpretation of remote sensing data at workshops to be conducted in Fairbanks in the fall or winter. John Miller and Paula Krebs attended a NASA-sponsored conference on Remote Sensing for Educators held at Stanford University June 26-30. Faculty and staff from various universities attended the conference to learn how to promote remote sensing courses within their universities and improve those remote sensing courses already being taught.

OFFICIAL VISITORS: Official visitors to EDC included representatives from: Inter-American Development Bank; Resource Inventory, DNR, Olympia, Washington; Ruhr University, Germany; University of Alberta; Executive Secretary, Remote Sensing Society of the United Kingdom; DNR, University of Michigan; COMSAT General Corporation; Research Office, Portugal; Civil Engineering Laboratory, Electric Power Industry, Chiba, Japan; University of Wisconsin; University of Utah; EROS Program; Australia; NASA GSFC and JSC; Rocky Mountain Mapping Center; LIA; NCIC Headquarters; DMA Hydrographic Center; Topographic Division, USGS; USGS Flagstaff; University of Arizona; Deputy Minister of Agriculture, Director of Meteorology, and AID Agriculture Officer, Damascus, Syria.

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ELEVENTH INTERNATIONAL REMOTE SENSING WORKSHOP: The Eleventh International Remote Sensing Workshop began September 21, at EDC. In attendance were 32 foreign scientists representing Canada, Trinidad and Tobago, Holland, Poland, Switzerland, Italy, Turkey, Algeria, Tunisia, Ghana, Nigeria, the Republic of the Congo, Swaziland, Malawi, Saudi Arabia, India, Indonesia, Australia, the Republic of China, and Japan. The four-week course includes one week of instruction on the fundamentals of remote sensing, one week on applications to resource assessment, a field trip to the Black Hills of South Dakota, and one week of interpretation of imagery of the participants' country or area of interest. The emphasis is on visual interpretation of Landsat images.

BLM FUTURE TRAINING AGREEMENTS: Two representatives from EDC met with the BLM Office of Scientific Systems Development in Denver, Colorado, on September 18, to discuss future EROS Data Center/BLM cooperation in remote sensing training. During FY 1979, EDC will present four basic photo interpretation courses for BLM in Reno, Denver, Phoenix, and Boise, as well as an advanced geology course and a digital analysis course, both to be taught at EDC. In FY 1980, it was agreed that EDC will teach two intermediate/advanced photo interpretation courses and two digital analysis courses. The basic photo interpretation courses will be case-study/project oriented, and the digital analysis courses will stress applications and operational considerations of digital analysis. It was further agreed that the EDC commitment to BLM training in FY 1981 and FY 1982, would continue at a level similar to that planned for FY 1980.

OFFICE OF SURFACE MINING REMOTE SENSING PROGRAMS: Four personnel from the Office of Surface Mining, Division of Abandoned Mines, accompanied by the Chief, EROS Program, visited the EROS Data Center September 12-13, 1978. EDC conducted a remote-sensing orientation session emphasizing uses of remotely sensed data in assessment of coal mining activity and abandoned mine land including a demonstration of the utilization of digital image analysis equipment in monitoring reclamation of surface mining areas. Office of Surface Mining personnel provided information regarding their data and information needs and also critiqued the Coal Surface Mining Remote Sensing Workshop that was conducted in June 1978. At the conclusion of the meeting, there appeared to be several areas of mutual interest, including a course designed to locate abandoned mine lands tentatively scheduled for April 1979, and the possibility of future cooperative demonstration projects.

WASHINGTON DNR/EDC COOPERATIVE ACTIVITIES: Personnel from the Washington Department of Natural Resources worked with the EDC personnel in the Data Analysis Lab (DAL) to determine what forest classes are definable using Landsat data. The results of an unsupervised classification were compared to DNR's Gridded Resource Information System (GRIDS) which had been previously merged with Landsat data. Plans were made to use topographic information for stratification to improve classification results. Evaluation of raw data versus canonical transformed data for use in classification continues. The accuracy assessment scheme was redefined and priorities established for completion of the project in late fall.

NATIONAL FORESTRY APPLICATIONS PROJECT REVIEW: Two EDC representatives attended the Nationwide Forestry Applications Project (NFAP) final review at the NASA/JSC, September 20, 1978. The NFAP focused on nine test sites within the United States; each site representing a different forest ecosystem. The objective was to determine the extent to which Landsat could be used to map Level II and III land cover types and with what accuracy area proportions could be estimated. The Landsat digital analysis was conducted on a GE-Image 100 system with a parallelepiped classification decision rule. The percent correct classification of Level II categories varied with the ecosystem and ranged from approximately $70\% \pm 5\%$ to $93\% \pm 4\%$ at an estimated operational cost of \$.03 to \$.06 per acre. The project team is now soliciting user evaluations of the map products, proportion estimates, and costs. It was generally recognized that analysis techniques used in the NFAP were about two years old, and many advances have been made since. Another study will be conducted on a tenth test site after consideration of other techniques such as controlled clustering for deriving training statistics, image stratification, and use of digital terrain data.

UN/FAO DESERT LOCUST PROJECT: Mr. Jelle U. Heilkema, Technical Officer for Remote Sensing, UN/FAO (Rome), worked for two weeks with EDC personnel in the DAL on a study of ephemeral desert vegetation as part of a desert locust breeding-site monitoring project. He used principal components analysis as an image enhancement technique and as a multitemporal data correction technique for Landsat analysis.

DATA PRODUCTION AND SALES: Data sales (shipped reimbursable receipts) slightly exceeded the goal of \$3.2 million for FY 1978.

INTERNATIONAL LANDSAT DATA BASE: Effort continues in the exchange of Landsat data base information between EDC and the foreign countries that receive and process Landsat data. A tape of Brazilian data coverage has been received and read into the EDC data base. Brazil will update their holdings quarterly. A tape is scheduled to be received from Canada by the end of this year.

NSTL ACTIVITY: The AAF, at the request of the Environmental Protection Agency, held a four-day workshop for EPA members at the USGS Federal Training Center in Denver. The 15 attendees included personnel from EPA Water Resource Division Offices in Albuquerque, New Mexico, and Lawrence, Kansas. During the workshop, Mr. O'Neil took aerial photographs of Denver's primary reservoir and of a recent forest fire as part of the demonstration of DPA's Enviro-Pod reconnaissance system. In addition, the AAF was visited by the chief of the scientific staff of DMA in Washington, DC, and a group of 12 DMA personnel. They received a presentation on what the EROS Program has to offer. Fifty-one students from Louisiana State University School of Environmental Design visited the AAF and were given a lecture and tour. There was also a visit by the French Consul General and 40 military engineers, and they received a Landsat presentation.

ALASKAN ACTIVITY: Continued assisting the State of Alaska in evaluating the utility of satellite remote-sensing data. Many meetings have taken place this month with various State agency personnel to determine how to best serve them with knowledge gained from the variety of real-time data that is being received. Currently Defense Meteorological Satellite Program (DMSP) imagery, both thermal and visual, and NOAA imagery is being received daily. Arrangements have also been made with the Integrated Satellite Information Services (ISIS) Inc. of Canada to obtain Landsat Quick-Look imagery of Alaska with 40% or less cloud cover on a temporary basis. As the imagery is received, it is scanned for possible use to appropriate agencies, enlargements or copies are made immediately and sent off to that agency within a few hours of acquisition. This is an experimental program only but it is hoped to get State agencies involved in the use of remote-sensing for their programs where useful to them. Mike McCormick, liaison between user agencies and the NASA/Western Regional Applications Program, visited the Geophysical Institute and met with the remote-sensing group. He was given a brief description of various projects, both completed and in-process, by those personnel involved and a tour of all facilities used by this group. Eighty-four visitors used the browse facility this month.

OFFICIAL VISITORS: Official visitors to EDC included representatives from: Iowa Geological Survey; International Rice Institute, Sri Lanka; Australia; USGS Flagstaff, AZ; USAID; USGS Data Base Administrator; EROS Program; BLM, and NASA GSFC.

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FOURTH WILLIAM T. PECORA SYMPOSIUM: The Fourth Pecora Symposium, sponsored by the National Wildlife Federation, was held in Sioux Falls, SD, October 10-12, 1978. The theme was "Remote Sensing Applications for Wildlife Management". EDC personnel participated in the Symposium by: a) planning the technical program, b) conducting a half-day review of remote sensing fundamentals, c) presenting three poster session papers, d) conducting tours of the EROS Data Center, and e) demonstrating capabilities of the Data Analysis Laboratory. During the three-day session, 12 invited technical papers and 48 poster session papers were presented. Opening remarks were presented by Tom Kimball, Executive Vice President, National Wildlife Federation, and Dr. Menard, Director of the Survey. Keynote addresses were presented by Dr. W. Leslie Pengelly, President, Wildlife Society; Russell W. Peterson, Director, Office of Technology Assessment, U.S. Congress; Bob Cook, Deputy Director, U.S. Fish/Wildlife Service; and Dr. Noel Hinners, Associate Administrator, Office of Space Science, NASA. Approximately 250 persons primarily from the U.S. and Canada attended the Symposium. David Johnson, NOAA, was the recipient of this year's Pecora Award. Co-sponsoring agencies with the National Wildlife Federation include: U.S. Geological Survey, Canadian Wildlife Service, International Association of Fish and Wildlife Agencies, and National Aeronautics and Space Administration.

MINE SAFETY AND HEALTH ADMINISTRATION REMOTE SENSING WORKSHOP: A four-day remote sensing workshop was given at EDC in cooperation with the Mine Safety and Health Administration on September 26-29, 1978. The topic of mine safety and ground stability was developed through a series of exercises designed to emphasize analysis and interpretation of lineaments as related to potential mine hazard areas in underground operations. The 24 participants represented industrial and federal organizations involved with mine safety engineering and hazard monitoring.

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY "MINERALS EXPLORATION" WORKSHOP: The South Dakota School of Mines and Technology hosted a five-day short course in Remote Sensing for Minerals and Mineral Fuels (October 16-20, 1978) as part of their continuing education program for the mining industry. The workshop is part of a multiphase effort by EDC to transfer remote sensing technology to academic institutions for industrial training support. This course, attended by 23 industrial participants, represents the second phase of EDC involvement with SDSMT; future courses will be conducted entirely by SDSMT faculty.

VISIT BY BLM ASSOCIATE STATE DIRECTORS: A remote sensing orientation session was conducted September 27, 1978, for 19 Bureau of Land Management Associate State Directors or their representatives. The objective was to familiarize the BLM personnel with the EDC facilities and activities and include a briefing on the cooperative BLM/EROS project and a demonstration of digital image analysis for resource inventories. Considerable discussion followed the presentations to explore near-term and long-term applications of Landsat

technology to BLM resource inventory programs. It was decided that Landsat data should be used in the pre-planning phases of the BLM's inventories that use the Soil-Vegetation Inventory Method (SVIM). A proposal to demonstrate how Landsat could be used in the pre-planning phases was presented by several BLM personnel and discussed.

NAS, SPACE APPLICATIONS BOARD MEETING: EDC personnel participated in a meeting on October 4, 1978, at the National Academy of Sciences, Space Science Board, on remote sensing technology transfer programs in government and industry. Presentations were made on the EDC applications program, the NASA regional applications activities and several industry programs. A sub-committee of the Space Science Board is in the process of preparing a report which the National Academy of Sciences will submit to NASA regarding recommendations on NASA's involvement in the transfer of remote sensing technology to user agencies, with particular emphasis on NASA's interface with the private sector.

WASHINGTON DNR/EDC COOPERATIVE ACTIVITIES: Digital analysis efforts on two forest test sites in western Washington continued with the visit of Department of Natural Resources personnel to work with EDC scientists in the Data Analysis Laboratory. Digital topographic data was successfully applied to stratify Landsat classification results for the Western Hemlock test site. This procedure allowed two size classes of second growth timber to be distinguished. Classification on a second (Douglas-fir) test site composed of different stand conditions was initiated. Stratification with digital topographic data proved to be useful on this test site as well. Plans for a project review session in Olympia, and field accuracy assessment checks during the final two months of the cooperative project were discussed.

PACIFIC NORTHWEST REGIONAL COMMISSION PROJECT: After six months of operation in the Landsat Applications Program, all the PNRC funds for applications and education training projects have been allocated. These funds were matched on a 50/50 basis by state agencies within the three states. There are a total of 11 applications projects and 6 education training projects for a total program cost of \$760,000. The most noteworthy efforts within the applications projects are the installation of digital analysis and information system packages on state-owned computers in Idaho and Washington.

CHEMICAL MANAGEMENT SEMINAR: A seminar on chemical and effluent management in photographic laboratories was held in Sioux Falls, SD, October 24-26, 1978. The seminar was sponsored by the Society of Photographic Scientists and Engineers in cooperation with the U.S.G.S. EROS Data Center. The purpose of the Seminar was to identify the problems and solutions in meeting State and Federal Environmental Protection Agency standards and to present information on the latest methods, equipment and techniques for photographic chemical management. Approximately 150 individuals attended the Seminar.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Two major simulations of the EDIPS production system were conducted this month to prepare for an anticipated full workload of MSS data starting in mid-November. Simulation data were used to develop statistical time lines, turn around times and throughput capability to assure no system problems and to improve procedural interfaces. The effectiveness of simulation has been somewhat limited because of certain problems with the input digital data available for processing.

LANDSAT DATA RELAY SYSTEM: Preparations continue for implementation of the Landsat data relay system between EDC and NASA/GSFC. A Federal Communications Commission (FCC) approval has been granted and antenna installation at EDC should begin during the second week in November. The technical specifications for the two high density tape recorders required for recording data received over the system has been received from GSFC. The spec has been updated and will be delivered to Denver for procurement action. Operation of the system is scheduled for early 1979.

NSTL ACTIVITY: Pat O'Neil attended the Pecora IV Symposium and presented a paper entitled, "Trend Analysis of Vegetation in Louisiana's Atchafalaya River Basin." A full exhibit was presented at the Gulf Coast American Geological Society. A table exhibit and EROS handouts were displayed at the American Institute of Planners Convention at New Orleans and at the ACSM/ASP fall meeting in Albuquerque, New Mexico. Education activities for the month consisted of a full day of lectures and orientation for geology students from Nicholls State University and from the NASA/ERL Regional Workshop. Pat O'Neil gave a lecture on services of the EROS Program to the attendees of the American Pulp Wood Association.

ALASKAN ACTIVITY: A meeting of the Alaska Remote Sensing Task Force was held in Anchorage. At this meeting it was decided that the task force should include representatives from the local borough-municipalities and also the Alaska Federation of Natives. The group also formalized the statement of goals and objectives of the Task Force. Discussion was held on conducting a needs assessment survey, i.e., type of information needed, which agencies to contact, method of survey - questionnaire or interview. It was decided that personal interviews would be the preferable method and discussion will continue as to content of the survey. The Geophysical Institute is participating with the State of Alaska Department of Natural Resources and the USDA Soil Conservation Service in a cooperative project to use Landsat imagery for reconnaissance-level soils mapping. Information on soils is needed by the state to aid in the selection of lands to be classified for agricultural uses.

IAGS ACTIVITY: Lands and Surveys Department of the Government of Guyana is seeking assistance to utilize Landsat data for wet land and urban studies for the northern half of the country. They also want to conduct studies in their southern plateau region utilizing satellite data.

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BLM TRAINING COURSE: EDC Applications scientists conducted remote sensing training courses for BLM personnel in Cannon City, Colorado, October 30 - November 3, 1978, and Reno, Nevada, November 13-17, 1978. The first course included 23 BLM representatives from the Cannon City District and the Denver Service Center. The second course included 18 BLM representatives from California, Colorado, Oregon, Utah, and Wyoming. The courses combined lectures and exercises, supported by one field day to verify interpretations. Exercises included drainage and landform delineation, vegetation mapping, change detection, large scale aerial photo interpretation, and Landsat cover type mapping. Lecture topics included characteristics of film-filters, principles of image interpretation, photo geometry, Landsat and computer-assisted image analysis, and acquisition of remote sensing data.

SEG SHORT COURSE: A short course in remote sensing for exploration geophysicists was conducted by EDC staff at the Society of Exploration Geophysicists Annual Meeting in San Francisco. Sixty persons attended the one-day session.

NASA GEOLOGY AND GEOPHYSICS PLAN: EDC personnel participated in a review of the NASA five-year plan for geology and geophysics by the Space and Terrestrial Applications Advisory Committee (STAAC) at NASA Headquarters. The committee will meet again in March 1979 to evaluate a more complete plan.

SCIENTISTS FROM THE PEOPLES REPUBLIC OF CHINA VISIT TO EDC. EDC conducted a three-day briefing for geologists from the Scientific Research Institute for Petroleum Exploration and Development, Peoples Republic of China. The Chinese explained the detailed petroleum geology and stratigraphy of the Tsaidam and Kwangsi Basins, for the first time for foreigners. The Chinese would like to embark on a cooperative petroleum exploration project which would involve exchange of information and staff.

EROS/BLM COOPERATIVE PROJECT CONTINUES: During the week of October 23-27, BLM and EDC personnel worked together collecting field data for the third phase of the project which involves the use of digital image analysis techniques and three phase sampling with stratification to map and inventory vegetation resources over approximately two million acres in northwestern Arizona.

WASHINGTON DNR/EDC COOPERATIVE ACTIVITIES CONTINUE: Two EDC scientists visited study sites in western Washington to compare forest stand classification results obtained from digital analysis of Landsat data to actual stand conditions. Possible reasons for classification discrepancies were noted when the Landsat analysis and actual conditions did not correspond. In some areas it appeared that topographic influences on spectral response accounted for classification discrepancies. A project review session was held in Olympia where Washington DNR supervisory personnel were briefed on the status and future plans for the DNR project. The accuracy assessment procedure was discussed as were plans for publishing the results of the study.

ABANDONED COAL MINE PROJECT: An EDC representative met with personnel from the Division of Mineral Land Reclamation, State of Virginia. Ground information was gathered on abandoned coal mines and will be used with recently acquired CIR aircraft photography in upcoming coal surface mine workshops. The 1:24,000 CIR aircraft photography was flown by the Environmental Protection Agency and will be used in a cooperative project between the Division of Mineral Land Reclamation and the Office of Surface Mining for abandoned mine reclamation.

PACIFIC NORTHWEST REGIONAL COMMISSION: Final reports have been completed for the Idaho Department of Water Resources "Irrigated Lands Project" and the Oregon Department of Agriculture "Noxious Weeds Project." Both reports indicate a high degree of success. The respective agencies are in the process of integrating Landsat derived information into their operational management procedures. Resource managers of Idaho and Washington state government have installed VICAR/IBIS digital analysis software systems on their respective state computer systems. The Jet Propulsion Laboratory will host a training course in utilization of these systems for Idaho and Washington State Agency personnel December 13-16, 1978. Initial use of this system in Idaho has shown that computer operation costs are less expensive than anticipated due to efficiency of the VICAR/IBIS system in job stringing. Oregon has proposed hiring a state Landsat program leader to coordinate state efforts to introduce an operational regional analysis center concept.

SOLAR ENERGY SYSTEM: A contract was awarded by the Sioux Falls Development Foundation and construction begun on the solar energy water preheating system to be implemented at EDC. The solar energy system, when operational in late summer 1979, will contribute approximately 58.5% of the energy required to preheat water used in the photographic processes. The contract was awarded to Wentz Plumbing and Heating of Lincoln, Nebraska, in the amount of \$646,600. Design studies show an economic pay-back in approximately 10 years.

NSTL ACTIVITY: A land use workshop was held November 14-17, which included professors from three southern universities and personnel from city and state (Louisiana and Missouri) planning agencies. The evening remote sensing graduate course was highlighted by a full day ground truth trip to Cat Island in the Gulf of Mexico. The island is being studied environmentally and physiographically by the students as a term project. Discussions were held in Atlanta, Georgia, regarding an interagency coordinating study to determine historical, present and projected environmental conditions of the Santee-Cooper Watersheds. A joint EROS/NCIC team presentation was given at Tulane University.

ALASKAN ACTIVITY: John Miller attended a meeting in Anchorage which up-dated the status of the statewide high-altitude aerial photography program. Approximately twenty-five thousand flight line miles were obtained this summer and cataloguing is now underway. It now appears that we will be archiving a complete set of this data which will be of great interest to users in this area and a tremendous addition to our assistance facility files. Sixty-five people visited the facility this month, many spending several hours there working on specific projects.

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ADVANCED GEOLOGIC REMOTE SENSING TECHNIQUES COURSE: An advanced course in geologic remote sensing techniques was given at EDC to 26 participants from BLM during the week of November 27th. The course was the second in a series of courses directed toward the remote sensing requirements of BLM geologists. Principal topics covered included contrast enhancement techniques, spatial filtering and edge enhancement techniques, MSS band ratios, principal components analysis, simulated natural color generation, and classification procedures. All lectures and exercises stressed both data processing mechanics and utility of output products in terms of geologic analyses and interpretations. A similar course will be given during the third week in October 1979 which will be open to all Federal and State agencies interested in advanced geologic remote sensing techniques.

INSTRUCTIONAL ASSISTANCE GIVEN AT GEORGE WASHINGTON UNIVERSITY REMOTE SENSING COURSE: EDC personnel gave the first two days of instruction for the George Washington University course in Remote Sensing and Digital Information Extraction. Approximately 15 persons from industry and government agencies attended the five-day course.

WORKSHOP ON INTEGRATION OF GEOPHYSICAL DATA WITH LANDSAT DATA: A workshop on integration of geophysical data with Landsat data for geological analysis was conducted at EDC by the Phoenix Corporation, McLean, Virginia. The two-and-one-half-day course was attended by 25 persons from the EROS Data Center and other government agencies. The course covered principles of magnetic and gravity surveys, reduction of aircraft and spacecraft potential field data, and development of geophysical/geological models in the analysis of geophysical data. An interactive analysis program was implemented on the IDIMS computer for two dimensional analysis and display of magnetic and gravity data.

PECORA V PLANNING SESSIONS: EDC participated in a Pecora V Technical Program committee planning session held during the American Water Resources Association's annual meeting in Orlando, Florida, December 7, 1978. During this planning session, many topics were discussed including the announcement for the call for papers, advertisement of the symposium, identification of session chairman, poster session requirements, and details of a field trip.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): The EDIPS system has been completely checked out in preparation for scheduling simulation activity in early January 1979. Paperwork for the procurement of two high density tape recorders for the Domsat link are in the Denver Branch of Contracts Office. Contract award is expected mid-January with delivery August 1979. Domsat antenna and electronics are scheduled for system checkout in January.

NSTL ACTIVITY: (1) Work was conducted over a 3-day period in the Santee-Cooper River Basin area in connection with the Corps of Engineers redirection project. Aircraft and ground reconnaissances were made and discussions regarding the establishment of an interagency environmental monitoring system were held. A meeting involving 11 different agencies is scheduled for mid-January in South Carolina to further develop this concept. (2) The U.S. Navy invited a member of the staff to participate in a demonstration of a bottom mapping sonar system. Both bottom profiling and side-looking sonar systems were demonstrated over a point 50 miles off shore in the Gulf of Mexico. The platform was the USNS Kane. (3) The Mississippi State University Graduate Course in Remote Sensing Applications was completed this month. (4) Six professors from the University of Florida at Gainesville toured the AAF in conjunction with an ERL Regional Training Program.

ALASKA ACTIVITY: Participated in field work and mapping for the Water Resources Level B study of Southcentral Alaska. Their portion of the study has now been completed and the finished maps and descriptions have been given to the Water Resources Council. The primary goal of the Southcentral Alaska Water Resources Level B Study is to formulate long-range regional plans for the years 1985, 2000 and 2025 and alternatives based on water and related land resources in the southcentral region of Alaska. The detail of classifications and of map scales (1:63,360 and 1:25,000) prepared for this study provides a data base which did not exist prior to June 1978. Approximately 10 million acres were mapped in six months using Landsat MSS data, aerial photography and field work. The reconnaissance level maps include land cover, landforms and surficial deposits, and geologic hazards. The remote-sensing data sources were analyzed by computer-aided analysis and/or manual interpretation techniques. Tabular data of acreage estimates of land cover were generated on a quadrangle by quadrangle basis for those areas completed by computer-aided analysis techniques. A user's guide to the reconnaissance maps of natural resources of Southcentral Alaska contains the essential information for meaningful interpretation of map content for planning purposes. This includes complete descriptions of the categories used in the classifications. A cooperative agreement between the Geophysical Institute and the Alaska Department of Natural Resources has been made under which we will serve as the State of Alaska repository for high altitude aerial photography. This photography is being acquired under a joint federal and state agency agreement to obtain high altitude aerial photography of the whole state during a three-year period, 1978 through 1980. Documentation of the film has been almost completed by BLM and will be in our files shortly. A vegetative-index map of a portion of the Fairbanks North Star Borough was prepared from Landsat data by means of ratioing bands 5 and 7. The goal is to delineate hardwood forests from softwood, brush and wetland categories to support land selection decisions by the Borough. Tentative maps in line-printer format are being evaluated by the Planning and Zoning Department to decide whether to extend this rather inexpensive technique to cover a major part of the Borough's lands.

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COAL SURFACE MINING REMOTE SENSING WORKSHOP: A Coal Surface Mining Remote Sensing Workshop was held at EDC January 8-12, 1979. The workshop was attended by 18 participants from 12 states. Eight participants were affiliated with four Department of Interior agencies: USGS, Office of Surface Mining, U.S. Fish and Wildlife Service, and the Bureau of Mines. Nine participants were from state agencies, and one was from private industry. Regional and site specific exercises were introduced using Landsat and aerial photography of the Decker Coal Mine in southeastern Montana. In addition, examples of coal mining activities in Virginia and Tennessee were utilized.

BLM/ASP WORKSHOP: EDC personnel participated in the Bureau of Land Management/American Society of Photogrammetry annual workshop entitled "Practical Applications and Uses of Color Infrared and Color Imagery" held in Denver, Colorado, January 9 and 10, 1979. Approximately 100 scientists and resource managers from Federal and state agencies and industrial organizations attended the workshop.

COLORADO LANDSAT CONFERENCE: An EDC representative presented a paper "Remote Sensing Applications for Monitoring Strip Mines" at the Colorado Landsat Conference in Denver, Colorado, on January 15, 1979. The workshop was sponsored by the Colorado Mapping Advisory Committee and the National Conference of State Legislatures.

JOINT NASA/GEOSAT COMMITTEE MEETING: EDC participated in a meeting on January 10, 1979, in Denver, Colorado, of the Joint NASA/Geosat Test Case Program's Porphyry Copper Subpanel. The meeting was held to review progress made to date, establish formal site study teams, and plan specific activities for 1979. The porphyry copper test sites are Helvetia, Stafford, and Silver Bell--all located in Arizona.

DATA PRODUCTION: Shipped reimbursable receipts from data sales for the month of January were \$355,437. Total shipped reimbursables for the fiscal year are \$1,041,940--this is about 7.0% below the budget plan. However, based on a detailed analysis of the sales for the last five quarters and other factors such as DMA, CIA, Work In Process (WIP) trends, and EDIPS, the \$3,400,000 sales budget should be reached this fiscal year.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): A final simulation of the new EDIPS was completed the third week in January. The simulation consisted of seven continuous days of processing, taking all Landsat acquisitions and completing the necessary processing through the NASA/GSFC system and EDIPS to obtain a master reproducible film chip. Each processing step through the system received a thorough checkout, thereby providing the confidence required to declare the system operational for processing MSS corrected data. RBV data processing will be delayed until the NASA/GSFC system can routinely process RBV data.

DOMSAT SYSTEM: The EDC Domsat antenna was installed January 25, 1979. System testing is scheduled to begin February 9, and run for approximately 60 days. The leased line and associated software needed for transmission of inventory data is in the final testing stage. The contract for two additional high density tape recorders has been awarded. The recorders are scheduled for delivery by August 1979.

NSTL ACTIVITY: The Remote Sensing Course for the Navy Foreign Officer Program began January 24, and will continue until the end of February. A Louisiana State University/Mississippi State University Forestry Workshop was held January 9-12. Mr. Beatty participated in a two-day conference on environmental monitoring of the South Carolina coastal region and has been designated Remote Sensing Coordinator for six scientific interagency monitoring teams. The AAF assisted NASA/ERL regional applications training effort. Mr. Beatty participated in a briefing in Baton Rouge for Louisiana tax assessors who are attempting to establish a uniform tax mapping program for the state. Mr. Beatty joined with Mr. Borgerding of the Mid-Continent Mapping Center and his staff in presenting products and training capabilities of the USGS.

ALASKA ACTIVITY: At the request of the Bureau of Land Management, a data search was conducted to identify Landsat imagery of the Denali Highway area through the winter season. Data products at 1:1,000,000 and 1:250,000 were ordered and will be examined by a team of resource specialists at BLM and taken into the field later this winter for evaluation to determine their utility for resource planning and management. A physical oceanographer working with the Outer Continental Shelf Environmental Assessment Program discovered an abrupt decrease in salinity in Simpson Lagoon this spring which is believed to correspond to the surge of fresh water that builds up from snow melt on the North Slope. A data search was performed which yielded NOAA satellite coverage of the entire North Slope on a daily basis and several Landsat scenes at key periods between mid May and early June. Custom enlargements of the NOAA images were produced inhouse and Landsat scenes ordered from EDC. Landsat on June 8 passed west of the study area but imaged a large overflow occurring at the mouth of the Colville River. The images will be used with other data to document the event. A meeting was held between personnel working on the satellite Quick-Look project, state legislators, consultants to the legislature, and a representative of the Office of the Governor to discuss results to date and to plan the up-coming report to the legislature concerning the first six months' operation of the Quick-Look demonstration. It was generally felt that NASA has yet to match the State of Alaska's initiative toward acquiring and utilizing Landsat data on a quick-look basis. The University of Alaska team was asked to seek further areas of cooperation from NASA as well as Canadian sources of quick-look data because operational applications of Landsat in Alaska would require prompt availability of data.

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COORDINATION OF EDC TRAINING PROGRAM: On January 23-24, a representative visited Washington, D.C. to confer with several groups in regard to the EDC training program. A meeting was held with Dr. Charles Paul of the Office of Science and Technology, U.S. AID, to discuss the role of both the EROS Program and AID in international training in remote sensing and to investigate ways in which the two programs can work together to complement each other and to optimize training opportunities for foreign scientists. Discussion was held with Mr. Joe Vitale, NASA University Affairs Officer, to solicit his advice on dealing with universities to provide remote sensing training to the user. Mr. Vitale has been involved for years with government grants and contracts to universities and provided much information that will be of value if EDC undertakes the proposed cooperative university training program. The summary meeting of the Central American remote sensing program, presented by the Interamerican Development Bank, was attended. Bank personnel presented the results of the project, in which the USGS and the EROS Program played a large role, and future programs of both remote sensing training and technology development projects were discussed and recommendations made.

U.S. FISH AND WILDLIFE SERVICE WORKSHOP: The eighth remote sensing workshop for U.S. Fish and Wildlife Service personnel was presented to 21 participants on February 12-16. The focus of the course was the interpretation of vegetation cover and assessment of wildlife habitat using a variety of aircraft and Landsat imagery. The course included an overview of remote sensing principles, methods of analysis, stereoscopy, and photogeometry. Emphasis was placed on a thorough overview and comparison of remote sensing data types and characteristics. The course concluded with an introduction of digital image analysis concepts and a demonstration of digital image display, enhancement, classification, and change detection using one of the interactive digital analysis systems in the Data Analysis Laboratory.

LANDSAT RBV CARTOGRAPHIC APPLICATION: A representative from EDC visited the USGS National Center to brief a joint meeting of the Aerospace Information Working Group and the EROS Program Office on work being done with digital RBV imagery from Landsat 3. Examples were shown comparing RBV imagery to published USGS topographic maps demonstrating cartographic possibilities of RBV imagery. Other examples were presented showing how data from the RBV could be merged with MSS data into color composite images. These types of color composites would have the spatial resolution qualities of the RBV image combined with the spectral characteristics of the MSS.

STEREOSAT USERS WORKING GROUP MEETING: An EDC representative attended a meeting at NASA Headquarters of the Stereosat Users Working Group. The purpose of the meeting was to help define user needs and requirements for a Stereosat program and to build support for the mission within the various agencies and industrial groups represented. First round, baseline requirements for the mission as defined by the JPL Project team were presented. Detailed discussions were held to enumerate, in detail, specific user needs so refinement of mission requirements can be made.

GEOSAT MEETING AT EDC: The Geosat Data Management Subcommittee visited EDC and was briefed by Center Management on a number of subjects pertinent to the interests of Geosat member companies. Subjects discussed included the plans for availability (nonavailability) of pre-November 1976 CCT data, the planned system for Landsat D data, the processing capacity to handle retrospective data, and the possibility of establishing a government/industry advisory board on data handling.

ANNUAL MEETING OF THE IRRIGATION ASSOCIATION: EDC representation was invited to the Annual Technical Meeting of the Irrigation Association held in San Francisco. The present and potential role of remote sensing for irrigation planning, inventory, monitoring, and management was discussed. The audience consisted of over 700 irrigation engineers, planners, and related manufacturers. Because of the great deal of interest generated by the presentation, the possibility of a short course on the subject is being discussed to help meet their requests for additional information and assistance in applying remote sensing technology in irrigation endeavors.

DATA PRODUCTION: The year-to-date shipped reimbursable data sales exceeded \$1,300,000, which is about 4% to 5% below the projected level for this time period. User inquiries for data show an increase. The photographic products Work-in-Process (WIP) is running at \$100-\$125 thousand range with about 50% being in a shipping status. Production turnaround times have been significantly reduced, and the production rework rate is down considerably. Landsat photographic products and CCT's represent 53% and 13% respectively, of data sales thus far this fiscal year.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Production processing of Landsats 2 and 3 MSS data began with data acquired after February 1, 1979. Approximately 300 scenes were received and processed. The limited quantity of data processed was due primarily to production delays in the Master Data Processor at Goddard Space Flight Center. The EDIPS system has functioned without problem. Implementation of RBV processing is scheduled for March 1979, but will probably slip one month, and processing of historical, non-standard data is scheduled to begin June 1, 1979.

DOMSAT IMPLEMENTATION: RCA is conducting final acceptance testing of the communications link. Due to a combination of hardware and scheduling problems and bad weather on the east coast, system acceptance has been delayed by approximately one month and is now anticipated by early March. A 30 to 60-day procedural test period is planned to allow for overlap with air shipments and development of appropriate quality control procedures, resulting in production use in late April or early May. The existing HDT recorders on EDIPS will be used for Domsat until two new recorders are delivered in August 1979.

MANUSCRIPTS APPROVED: The following reports prepared by EDC personnel have been recently approved by the Director's office:

Lucas, J. R., Taranik, J. V., and Billingsley, F. C., 1978, Land classification of south-central Iowa for computer enhanced images: NASA Type III final report, Goddard Space Flight Center, Greenbelt, Maryland, National Technical Information Service, 256 p.

- Pettinger, L. R., Farmer, A., and Schamberger, M., 1978, Quantitative wildlife habitat evaluation using high-altitude color infrared aerial photographs: in Pecora IV Symposium, Application of Remote Sensing Data to Wildlife Management, Sioux Falls, South Dakota, 1978, Proceedings.
- Carneggie, D. M. and Marmelstein, A., 1979, A perspective on remote sensing for wildlife management: the Pecora Symposium: in Pecora IV Symposium, Application of Remote Sensing Data to Wildlife Management, Sioux Falls, South Dakota, 1978, Proceedings.
- Jenson, S. K. and Waltz, F. A., 1979, Canonical analysis and principal components analysis in remote sensing: to be presented at the American Society of Photogrammetry Annual Meeting, March 19-23, 1979, 12 p.
- Klaas, E. E., Anderson, W. H., and Frederick, R. B., 1979, The use of Landsat imagery for estimating the food available to refuging lesser snow geese: in Pecora IV Symposium, Application of Remote Sensing Data to Wildlife Management, Sioux Falls, South Dakota, 1978, Proceedings.
- Lauer, D. T. and Nyquist, M. O., 1979, Lake Mead National Recreation Area resource analysis project: to be presented at the American Society of Photogrammetry Annual Meeting, March 19-23, 1979, 18 p.
- Todd, W. J., Gehring, D. G., and Haman, J. F., 1979, Landsat wildland mapping accuracy: to be submitted for publication in Photogrammetric Engineering and Remote Sensing.

NSTL ACTIVITY: (1) The Foreign Naval Officers Training Program was successfully completed. (2) Discussions were held with personnel from the U.S. Fish & Wildlife Service regarding the Santee Cooper long-term environmental mapping project. Plans were formulated for a followup meeting discussing base mapping and vegetation trend analysis for the immediate future. (3) We assisted the Earth Resources Laboratory with a workshop presentation and tour. (4) A presentation was made to the Mississippi Society of Petroleum Landmen in Jackson, Mississippi. (5) The Louisiana State University Geography Department Advanced Remote Sensing class spent a day using the equipment at the facility. (6) The EROS facility exhibited at the State of Louisiana Police-Jurymen Association at Baton Rouge, Louisiana. (7) NSTL will participate at the Louisiana State University Workshop at Baton Rouge, Louisiana for the Corps of Engineers Workshop. (8) A total of 3,225 people attended our lectures and exhibits this month.

ALASKA ACTIVITY: At the request of USDA/Forest Service, a training session was conducted for 10 of their employees at a meeting in Anchorage. The session included an introduction to satellite remote sensing, an informative discussion of the AAF at the Geophysical Institute and remote sensing activities by university personnel, and a discussion and brief workshop of Landsat applications to geology, particularly landforms and surficial deposits. The geologic discussion was centered on the Denali project. The workshop activities were centered on the Susitna and Level B projects and the Chugach

National Forest. The attendees were very receptive to the applications of Landsat for vegetation and geologic analysis. On behalf of the State Legislature, John Miller visited Prince Albert, Saskatchewan to learn more about the Canadian Landsat quick-look system and the feasibility of using a similar system in Alaska or the alternatives to a State-owned system, including transmission by telefacsimile of Landsat images in near real-time. Further development awaits action by the legislature. Two groups were given tours of the assistance facility this month. In mid-January, 12 Alaskan librarians toured the Geophysical Institute and were given a presentation on various data and assistance available to the user community through the office. Nineteen students and their teachers from Mountain Village, a very small village on the Yukon River in southwestern Alaska, also toured the Institute and were given a presentation by personnel. It was very interesting to note that these students, from a very remote village, had no problem identifying Landsat imagery of their area and could easily locate well-known rivers and fishing sites.

IAGS ACTIVITY: Seventy-two (72) frames of Landsat imagery and two hundred and forty (240) Sea Surface Temperature sheets were received and forwarded to national centers. IAGS technicians continue to assist Colombia in the construction of Landsat mosaics. DMA IAGS is assisting the IGM, Argentina in a 1:250,000 mapping program. Landsat products are being utilized to assist in delineating field classifications and supplemental control data. Preparations are well underway for the first Technology Exchange Week for Latin America. The Technology Exchange Week seminar, hosted by DMA IAGS, is scheduled for May 14-18, 1979, in Panama City, Panama.

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RENEWABLE RESOURCES INVENTORY METHODS WORKSHOP: EDC cooperated with the University of California, Berkeley, in presenting a workshop entitled "Introduction to Renewable Resources" on the Berkeley Campus March 5-9. The 35 participants in the course included forest and range managers, and inventory specialists from both the public and private sectors in the Western United States and Canada. The emphasis of the course was on the development of sampling and measurements systems and the integration of aerial photographs, satellite data, and ground data into these systems. Forest and rangeland inventory examples and case studies were used to illustrate principles and techniques discussed during lecture sessions. Workshop exercises dealt with 1) use of sampling techniques, 2) aerial photographs and satellite imagery for stratification, and 3) measurement techniques applicable to large and medium-scale photographs. Based on the solicitation for attendance and reaction to the course from the participants, the course will likely be offered again in the future.

1979 ASP-ACSM ANNUAL MEETING: EDC representatives participated in the annual meeting of the American Society of Photogrammetry and presented technical papers entitled "Canonical Analysis and Principal Components Analysis in Remote Sensing" and "Lake Mead National Recreation Area Resource Analysis Project."

PROPOSED COOPERATIVE DEMONSTRATION PROJECT IN THE WRANGELL-ST. ELIAS NATIONAL PARK IN S.E. ALASKA: EDC personnel attended a planning meeting with National Park Service (NPS) personnel in Denver. The objective of the meeting was to discuss a cooperative remote sensing project in the proposed Wrangell-St. Elias National Park in S. E. Alaska. A preliminary project plan was developed which identified remote sensing tasks to provide information for management and planning within the Park. The tasks include: (a) prepare vegetation cover map, based upon manual interpretation of U-2 photographs, for wildlife habitat assessment; (b) prepare maps of existing and potential hazards; (c) monitor time of ice formation and thaw, advance/retreat of glaciers and change in river channels; (d) investigate use of composite mapping techniques in combination with digital analysis of cover types to define habitat suitable for sheep and goats; and (e) prepare digital Landsat mosaic of proposed park area.

IDAHO VEGETATION RESOURCES INVENTORY (IVRI) PROJECT STATUS: Individuals from the Bureau of Land Management, Denver Service Center, visited EDC March 12-19, 1979, to work on the BLM/EROS cooperative Idaho Vegetation Resources Inventory (IVRI) Project. Their work was primarily done in the Data Analysis Laboratory, with the assistance of Data Analysis and Applications personnel. The successfully selected and digitized ground control points, digitized IVRI project boundaries, and digitized selected pastures represented all Intensive Mapping Areas. A day was also spent clustering the digital Landsat data and analyzing the results.

WORKSHOP FOR LAND-USE ANALYSIS USING AIRBORNE MULTISPECTRAL SCANNER DATA:

EDC participated in a Cooperators' Workshop for Land Use Analysis Using Airborne Multispectral Scanner Data in Denver on March 15 and 16. The Bureau of Reclamation is sponsoring the research project to determine the usefulness of airborne multispectral data for environmental monitoring on the lower Colorado River. In addition to EDC, the Environmental Protection Agency and Colorado State University are cooperating on the project.

WATER RESOURCES DIVISION MIDWEST REGIONAL AQUIFER ASSESSMENT: An EDC representative attended a USGS, Water Resources Division Northern Midwest Regional Aquifer Assessment meeting in Madison, Wisconsin on March 13-14, 1979. The principal purpose of the meeting was to discuss work products, priorities and schedules of the Aquifer project. Remote sensing applications were also discussed in relation to water-use inventory, detection of structural elements, and detection of potential recharge sites in the project area.

PANEL REVIEW FOR ASSESSING THE USE OF REMOTE SENSING OF IRRIGATED LANDS:

EDC participated in a panel review of work plans at NASA/Ames for an Applications Pilot Test (APT) concerning the use of remote sensing for irrigated lands assessment for water management, to be conducted during the next four years by the University of California (Berkeley and Santa Barbara campuses). The APT is sponsored by NASA and the California Department of Water Resources. The purpose of the review was to offer suggestions regarding techniques and procedures early in the project so that changes deemed desirable could be implemented in the course of the study. A secondary function was to bring together a number of experienced researchers and educators in an exchange of information and ideas regarding the state-of-the-art in remote sensing in agriculture and irrigation surveys. The APT consists of four tasks as follows: Task I - Operational demonstration of manual analysis of Landsat and low-altitude aircraft data in a multiphase inventory of irrigated lands for the entire state. Task II - Irrigated land inventory using digital analysis. Task III - Manual analysis for crop inventory. Task IV - Digital analysis for crop inventory.

DATA PRODUCTION: Year-to-date shipped reimbursable data sales are at approximately \$1,570,000 which is about 5% below the FY 79 sales projection. Of this total, Landsat imagery and CCT's represent 52% and 14% respectively. The first quarter of this fiscal year yielded \$686,000 and the second quarter should close out at nearly \$885,000. The incoming order trend is up and running about 3% behind the fiscal year plan. Some 75% of all orders are being turned around in under two weeks. A new "Type C" color print processor (Kreonite) has been installed in the photographic production line operations.

LANDSAT-D CONCEPTUAL DESIGN REVIEWS: EDC participated in two Landsat-D conceptual design reviews held at NASA/GSFC, one was on the Landsat-D system, and the other on the hardware and functional operation of the ground processing and operational control of the satellite. A software review of the ground processing system is scheduled in May 1979.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Production processing of Landsat 2 and 3 MSS data continued through the month of March. Approximately 1,000 scenes of MSS data were received from NASA GSFC on High Density Tapes, which is approximately 30% of the data acquired by the satellite during March. Implementation of RBV digital processing at GSFC has slipped to June 1, 1979. The Domsat data relay system is in test. Image data has been transmitted over the link and processed through EDIPS with good results. Operational use of the link is scheduled to occur in late April.

TERMINAL ACCESS TO EDC DATA BASE: Authorization has been granted by the Director to allow non-Federal organizations terminal access to the EDC computerized data base. In the past, access to the EDC data base has been restricted to a limited number of U.S. Government users.

WASTE WATER RECYCLING SYSTEM: An award in the amount of \$382,676.00 was made to the Swift Brothers Construction Company, Sioux Falls, South Dakota, for the construction of the Waste Water Recycling System. Completion of the project is scheduled for November of next year.

NSTL ACTIVITY: (1) A briefing on EROS products and a tour of the Applications Assistance Facility was given to members of the Association for Educational Communication and Technology, S.E. Mississippi High School students, and attendees to a NASA Earth Resources Laboratory Workshop. (2) An EDC representative visited the facility to monitor present conditions and discuss future activities. (3) An exhibit of EROS products was presented at the University of Mississippi career day and at the Louisiana Assessment Mapping Convention.

IAGS ACTIVITY: Almost 300 frames of Landsat imagery were received and forwarded on to National Centers. Columbia is preparing the printing of Landsat mosaics and the Panamanian government has expressed an interest in the printing of Landsat mosaics.

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WATER RESOURCES REMOTE SENSING WORKSHOP: A Water Resources Remote Sensing Workshop was given at the EROS Data Center on April 3-6, 1979, for 19 hydrologists from USGS Water Resources Division and their cooperating agencies. The course was designed to acquaint participants with practical applications of Landsat imagery and high altitude aerial photography for water resources. Two workshop exercises were presented to demonstrate how image analysis and interpretation could provide hydrologic information.

ARIZONA VEGETATION RESOURCES INVENTORY (AVRI) PROJECT: BLM personnel from Arizona and Denver Service Center were at EDC April 9-11, 1979, to evaluate final reclassification results of the AVRI Test Site. The Arizona people worked with the I-100 analysis system to determine the elevational cutoff points for each resource class within each computer class. This information will be used to produce the final reclassification image for the BLM/EROS cooperative project. The BLM personnel also looked at possible management applications of the digital data. They were able to locate potential pinyon/juniper treatment areas by determining the decision criteria for resource class, elevating slope and aspect. For example, they found all areas that were pinyon/juniper with elevations greater than 5000 feet and on slopes less than 10%.

IDAHO VEGETATION RESOURCES INVENTORY (IVRI) PROJECT: Effort continued on the Bureau of Land Management/EROS Idaho Vegetation Resources Inventory (IVRI) cooperative demonstration project. BLM personnel from the Denver Service Center and the Boise District Office spent three weeks at EDC working in the Data Analysis Laboratory and conferring with EDC applications scientists in an attempt to classify the areas under investigation.

U.S.G.S./DIGITAL APPLICATIONS TEAM: Members of the Topographic Division's Digital Applications Team (DAT), which is headed by Dr. Robert McEwen, visited EDC on March 28-29, to discuss the subject of computerization of topographic and planimetric data. The DAT people presented detailed information on how digital line graph files and elevation models are being made. The DAT approach(es) being used and the DAT equipment and facilities were discussed. EDC discussed how these types of digital data are being used for classification refinement, composite mapping, correction of terrain illumination differences and applications decisionmaking.

TECHNICAL SESSION ON REMOTE SENSING PRESENTED AT AAPG CONFERENCE: EDC staff presented a four-hour technical session on current remote sensing technology, analysis techniques, and data availability for geologic applications at the Annual Convention of the American Association of Petroleum Geologists held at Houston, Texas, during April 1-4, 1979. The convention was well attended (7,000-8,000) and consisted of concurrent technical sessions (6-8), poster sessions, and numerous exhibits. Several hundred attended the technical session on remote sensing technology. A few other papers included remote sensing techniques (principally poster papers) and several exhibitors displayed examples of Landsat and aircraft images.

12TH INTERNATIONAL WORKSHOP FIELD TRIP PREVIEWED: EDC personnel visited the Black Hills of South Dakota to preview field sites that will be used during the May International Remote Sensing Workshop. Several new workshop exercises have been developed especially for geologic, hydrologic, forestry, and land use applications in the limestone terrains of the southern Black Hills. Twelve workshop exercises have now been developed for the Black Hills area, identifying remote sensing techniques applicable to the solution of various resource management problems.

DATA PRODUCTION: Shipped reimbursable receipts to date for FY 1979 exceed \$1,800,000 for imagery and CCT's. This is about 7.5% below the budget plan for this time period. The incoming order trend is holding within 3% to 4% of the fiscal year plan. The second quarter shipped reimbursable receipts were \$884,567 as compared to the first quarter of \$686,413. During the first six-month period, Landsat imagery was 52% and CCT's 14% of the total shipped products.

VISITORS FROM PEOPLE'S REPUBLIC OF CHINA (PRC): Two groups from the PRC visited EDC during this reporting period. The first group, a twelve-member delegation from the State Geological Bureau visited EDC on April 16, and was accompanied by personnel from the USGS Office of International Geology. The second group, which consisted of a seven-member remote sensing delegation, visited EDC April 27 and 30, and May 1, and was accompanied by a Washington representative from the Committee on Scholarly Communication with the People's Republic of China. Both groups were briefed on the various aspects of the Data Center, its function and activities. Applications-related presentations addressed the groups' intense interest in natural resource exploration. The current petroleum exploration studies being carried out jointly by the People's Republic of China and the USGS were discussed as were some applications relating to porphyry copper exploration. An EDC applications scientist accompanied the first group during their visit to two porphyry copper mines in Arizona. Discussions about EDC operations and activities were more detailed with the second group because they will be involved with setting up a remote sensing center in the PRC.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Approximately 2400 scenes of Landsat 2 and 3 data were received at EDC during April. As of April 30, a total of 4100 scenes had been processed through EDIPS and placed in the archives. Operational use of the Domsat system began on April 27. Acquisition by Landsat 3 was suspended for several days due to MSS sensor problems. The decision has been made to add a geometric correction capability to EDIPS. This upgrade of EDIPS will allow an HDT-A (partially processed data) interface between NASA/GSFC and EDC which will add much more processing flexibility at EDC and preclude the need for going back to GSFC for retrospective data. The necessary procurement package is being generated and system modification is expected to be completed by October or November 1980.

NSTL ACTIVITY: (1) A member of the NSTL/AAF staff traveled to Blacksburg, VA, to assist in a remote sensing workshop for the Southeastern Division of the Geological Society of America. In addition to participating in the workshop, briefings on the Santee-Cooper project were made to USGS personnel in Reston, VA, to USF&WS personnel in Charleston, SC, and to WRD personnel in Columbia, SC. (2) A Forestry Remote Sensing Workshop was held on

April 24 to 27, in conjunction with the Louisiana State University/ Mississippi State University Logging and Forestry Operations Center. This was the first workshop to be held at NSTL in the new AAF. (3) The move into the new AAF was completed. Some difficulties are being experienced with circuit wiring, but work is underway to correct this problem. (4) A meeting was held with representatives from USF&WS and BLM concerning a proposed Coastal Mapping Workshop in the Gulf Coast Region.

ALASKAN ACTIVITY: Forty-nine rolls of color infrared and black-and-white aerial photography acquired in summer 1978 under a joint Federal and State agency agreement to obtain high altitude aerial photography of the whole state during a three-year period, 1978 through 1980, were received. The almost nine thousand frames of color-infrared photography were cut into individual frames, put in plastic envelopes for protection, and filed by flight line numbers. The interest in this photography has been very high and, judging by inquiries, will continue to be high in the future. The first of two training sessions in remote sensing was held at the Geophysical Institute. These sessions are sponsored by the Geophysical Institute under a State-funded project and were geared toward State employees to acquaint them with remote sensing and its applications to their work. Tom George attended a short course entitled "Introduction to Resource Inventory Methods" at Berkeley, California in early March. While in California, he also did project work for the Soil Conservation Service on a 1979 reindeer range inventory. Bill Stringer and John Miller traveled to Juneau to make a report to the legislature on our assistance to the State of Alaska in evaluating the utility of near real-time satellite data. This Quick-Look Project acquires DMSP, NOAA, and Landsat real-time satellite imagery, and is used to produce sea-surface temperature maps for the fishing industry, and analyses of sea-ice conditions for personnel working offshore on the ice in the Beaufort Sea. Current Landsat coverage was obtained over the Beaufort Sea northeast of Prudhoe Bay on behalf of Ken Holden of USGS in Anchorage. The images were received within 24 hours of acquisition, and they provided information on ice-leads which was a key factor in evacuating a drill-rig on the ice engaged in core sampling of ocean floor. The project of applying near real-time Landsat data to crucial environmental problems is funded by the State of Alaska.

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12th INTERNATIONAL REMOTE SENSING WORKSHOP: Seventeen non-U.S. scientists, one U.S.G.S. representative from Reston, and two EROS Data Center employees participated in the 12th International Remote Sensing Workshop. The workshop, which dealt with manual interpretation of Landsat data, was similar to previous International Remote Sensing Workshops held at EDC. Sessions were offered in which fundamentals were reviewed and remote sensing systems used in discipline studies were examined. A four and one-half day field trip to the Black Hills of South Dakota allowed students to verify analysis work to physical situations. Finally, the participants applied their developed approaches to Landsat imagery of their own countries.

REMOTE SENSING WORKSHOP FOR BLM SCIENTISTS: A one-week introductory remote sensing workshop was presented in Phoenix, Arizona to 13 Bureau of Land Management participants from Arizona, New Mexico, Utah, California, Oregon, Colorado, Wyoming, Maryland, and Alabama. The course included principles of image formation, characteristics of films and filters, stereoscopy, and image geometry. Image interpretation exercises centered on the resource mapping process, and a one-day field trip to the study area north of Phoenix permitted verification of interpretations. The course concluded with an introduction to the Landsat system and imagery and digital image analysis.

EROS/BLM TRAINING PROGRAM: EDC has successfully concluded a three-year cooperative training program with the Bureau of Land Management which has increased the awareness and use of remote sensing techniques by Bureau personnel. Approximately 25 percent of the Bureau's resource managers and other specialists have attended a BLM/EROS-sponsored course. Fourteen introductory manual image analysis courses were offered in eight diverse locations, including Anchorage, Boise, Phoenix, Albuquerque, and Denver. Each course included a one-day trip to a nearby field site to confirm interpretations. Two geologic applications courses (one introductory and one advanced) were presented at EDC. Four courses in digital analysis systems in the Data Analysis Laboratory to demonstrate applications of machine processing of Landsat data to resource management problems. In FY 80, EDC will develop and offer specialized training courses in response to specific BLM needs, while BLM will use private contractors to continue offering introductory remote sensing courses.

IDAHO VEGETATION RESOURCES INVENTORY PROJECT: Bureau of Land Management (BLM) personnel from Denver spent two weeks at EDC working on the Idaho Vegetation Resources Inventory (IVRI) Project. EDC personnel worked with the BLM people in stratification of the classified IVRI Landsat image, development of a sampling procedure, and allocation of primary sample units (p.s.u.'s) to the strata. CalComp plots of USGS topographic map overlays showing the precise location of each of the selected p.s.u.'s were generated. The p.s.u.'s

were then manually transferred by BLM and EDC personnel to the USGS topo maps, which were then sent to a private contractor acquiring the large scale aerial photos over each of the p.s.u.'s. This completes EDC's processing involvement in the IVRI project.

LANDSAT DATA BEING UTILIZED TO IMPROVE WATERSHED RUN-OFF ESTIMATES: An EROS/WRD project has been initiated to improve the regression equations that are used to estimate run-off and streamflow statistics in the Tennessee Appalachian Plateau by the addition of land cover classification from Landsat data. Portions of the Landsat data were clustered using an unsupervised algorithm technique to derive thirty-nine spectrally separate cover types. The classified portions were then geometrically corrected and output on a lineprinter as 1:24,000 scale map overlays. These map overlays are being field-checked to determine hydrologically significant categories. Parts of two Landsat scenes are being mosaicked together and this new scene which covers the complete watershed area will be classified.

PROPOSED EROS ALASKAN FIELD OFFICE: Plans have been initiated to open and operate an EROS Alaskan Field Office in Anchorage, Alaska. The proposed office would increase access to training, analysis equipment, and technical assistance in remote sensing for DOI and cooperating agency personnel in Alaska. The office would be located in USGS space, be staffed with about six scientists and technicians from EDC, be equipped with both manual and digital analysis equipment, and would provide interagency personnel access to the equipment for use on their operational projects. The office will open with a start-up staff in August 1979, pending final administrative approval.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Approximately 2,200 scenes of Landsat MSS data were received via the Domsat link, processed thru EDIPS and placed in the archives during this reporting period. Transmission of RBV digital data from GSFC to EDC has slipped from the first of June to around the end of June. Landsat 3 has resumed acquiring MSS data even though the sensor scan line start problem has not been resolved. A draft technical specification for the EDIPS upgrade has been completed and delivered to Branch of Contracts for inclusion in the procurement package.

CONSTRUCTION ACTIVITIES: A contract was awarded to Maguire Iron & Steel, Sioux Falls, SD, for refinishing and cleaning interior of 250,000 gallon water tower. A by-pass system has been installed to provide continuity of water supply to maintain operations and fire protection while the refinishing work is accomplished. Construction work began on the water reclamation and recycling project. This project involves recycling the water from the EDC "lake" for use in the photographic processes and will reduce the amount of water required to be purchased from the city of Sioux Falls.

LANDSAT GROUND STATION OPERATIONS WORKING GROUP (LGSOWG) MEETING: EDC participated in the eighth LGSOWG meeting held May 15-17 in Slidell, Louisiana, which included representatives from NASA, European Space Agency, Italy, Argentina, Australia, India, Brazil, Canada, Japan, and Zaire. Major items discussed during the meeting included: status of Landsats 2 & 3; plans for Landsat D; Landsat D follow-on; possible new foreign Landsat ground stations; ground station status, experience, and plans of each member country; compatibility of digital data tapes and data base formats; and applications that are achieving operational status. A meeting of senior user services and data management personnel from certain foreign Landsat data receiving and processing facilities was held at EDC the week before the LGSOWG meeting in Slidell. The intent of the meeting at EDC was to: exchange information on methods and techniques used or planned to be used by each station; discuss exchange of information on data available from each station; and establish closer communication between each station at the working level.

NSTL ACTIVITY: (1) A remote sensing exercise was presented to 45 students at a Forest Road Planning Workshop sponsored by the Louisiana State University/ Mississippi State University Logging and Forestry Operation Center. (2) A visit was made to Columbia and Charleston, South Carolina to discuss with participants of the Santee Cooper River Project the use of remote sensing for vegetation mapping. Also a ground-truth trip was made to the Lower Santee River to check preliminary color infrared analysis. (3) A remote sensing presentation was made to 65 members of the Society of American Forestry Regional Meeting held in Mobile, Alabama. (4) The capabilities of the EROS Applications Assistance Facility were presented to 16 timber company executives at the Louisiana State University/ Mississippi State University Logging and Forestry Operations Center. (5) NSTL had 80 visitors during the month of May and had one Remote Sensing Workshop with 12 attendees.

ALASKAN ACTIVITY: Almost 200 people made use of the facility during this reporting period. Twenty-seven participants attended the second training session in remote sensing held at the Geophysical Institute April 2-6, 1979. These training sessions are sponsored by the Geophysical Institute under a State-funded project and are geared toward State employees to acquaint them with remote sensing and its applications to their work. The response to these sessions has been excellent and post-contact with the attendees has shown that they are putting their newly gained knowledge in this field to good use. Numerous elementary and secondary school groups toured the facility during this reporting period, including students from a broad section of the state, two groups from Circle City on the Upper Yukon, a group from Emmonak on the Lower Yukon, students from Mountain Village, also on the Yukon and twenty-five students from Koliganek, which is in southwestern Alaska. Some of these villages are very remote and over six hundred air miles from Fairbanks and in many instances we have gained knowledge from the youths as well as their gaining knowledge from us.

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FIFTH ANNUAL WILLIAM T. PECORA SYMPOSIUM: The American Water Resources Association sponsored the Fifth Annual William T. Pecora Memorial Symposium in Sioux Falls, South Dakota, June 11-15, 1979. Satellite Hydrology was the theme of the Symposium. The EROS Data Center acted as host for the week-long hydrological remote sensing program. The Symposium focused attention on satellites and remote sensing as a powerful new way of observing the hydrosphere, as new tools in preparing against future water shortages, and as a practical means of water management. Applications of satellite data in the fields of meteorology, snow and ice, surface water, soil moisture, ground water, water quality and environmental change, wetlands, coastal zone hydrology, and water use management were explored. Approximately 300 attendees participated in the Symposium.

TECHNICAL ASSISTANCE IN REMOTE SENSING GIVEN TO PEOPLE'S REPUBLIC OF CHINA (PRC): Geologists from EDC traveled to the People's Republic of China to conduct a training workshop in geologic applications of remote sensing data and to participate in a cooperative demonstration project regarding the use of Landsat images for petroleum exploration. Both activities were conducted in cooperation with China's Scientific Research Institute for Petroleum Exploration and Development.

HARVARD TERRAIN ANALYSIS WORKSHOP HELD AT EROS DATA CENTER: EDC hosted a workshop in Terrain Analysis--Interpretation of Aerial Photographs and Images, presented by the Harvard Graduate School of Design the week of June 18-22 to twenty-nine scientists. In addition to providing facilities and logistical support, several EDC scientists presented lectures on recent project work.

GEOLOGIC REMOTE SENSING TECHNIQUES WORKSHOP: Thirteen D.O.I., State, and domestic and foreign industrial geologists participated in an introductory course in geologic remote sensing techniques at EDC during the week of June 4. The workshop addressed basic remote sensing concepts and principles, logic of manual geologic analysis and interpretation techniques, and applications to several types of exploration-oriented geologic investigations.

REMOTE SENSING TECHNIQUES TO BE UTILIZED IN NATIONAL INVENTORY OF ABANDONED MINE LANDS: Two EDC scientists visited Oak Ridge National Laboratory on June 5 and 6 for an overview of the proposed national inventory of abandoned mine lands. Oak Ridge National Laboratory, under auspices of a Memorandum of Understanding with the Office of Surface Mining, is developing a geo-based information system for use with the national inventory. Remote Sensing techniques are proposed for use in the context of the national inventory and five county-wide study areas, one in each region of the Office of Surface Mining, and will be selected as pilot areas later this year.

STATUS OF TEXAS A&M - USGS COOPERATIVE EDUCATION PROJECT: On June 11, EDC representatives met with Dr. David Parrish of the College of Geosciences, Texas A&M University, to discuss the progress of the program for incorporating satellite remote-sensing into the teaching of Geology at the University. This program is funded by a grant from the U.S. Geological Survey to Texas A&M. To date a number of "Teaching Modules" (i.e., units of teaching materials, outlines, etc. that when aggregated comprise an entire college course) have been prepared and will be used in Geology courses during the '79-'80 school year, and a faculty-student seminar in remote sensing has been completed during the past spring semester. Following the testing of the modules next year a final report will be submitted in June of 1980 which will detail their activities results, and evaluations.

APPLICATIONS BRANCH SCIENTIST PARTICIPATES IN THE FIRST NORTH ATLANTIC REGIONAL WORKSHOP ON REMOTE SENSING: EDC participated in the First U.S. North Atlantic Regional Workshop on Remote Sensing in the Coastal and Marine Environment. The workshop, held at the University of Rhode Island, was sponsored jointly by the Center for Ocean Management Studies (University of Rhode Island) and the Marine Policy and Ocean Management Program (Woods Hole Oceanographic Institution) and was designed to provide for an exchange of information between the developers of remote sensing technology, suppliers of remote sensing data, and users of coastal and marine information. In addition to EDC, NASA and NOAA personnel provided relevant information to the user audience. The workshop was well received and according to those who came to learn about remote sensing, highly useful.

INTERNATIONAL HYDROLOGIC MEETING HELD IN SIOUX FALLS: The U.S. and Canadian International Committee for Scientific Hydrology met in Sioux Falls during the week of June 4th. About 30 of the visiting scientists spent an afternoon at EDC and were briefed on Applications Branch training, hydrologic applications, and data analysis capabilities. In addition, the group toured the facility and had time to browse in the Visitor Assistance Area and talk to Applications Branch scientists.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Approximately 1800 scenes of Landsat MSS data were processed and archived this month, with an end-of-month backlog of approximately 100 scenes. The Domsat link is experiencing some retransmission of HDTs, with no serious impact on production. Implementation of RBV processing is expected to begin in mid-July, based on recent status of the Master Data Processor at GSFC. A draft technical specification for the EDIPS upgrade was reviewed by Branch of Contracts and returned to EDC for final copy preparation. That copy was then completed and mailed to contracts on June 29, 1979. This modification will be implemented via a change order to the existing EDIPS contract with TRW. Approval has been received from the ADP and Telecommunications Management Office to proceed with the procurement.

MAJOR SOFTWARE PROJECTS: Production management systems for controlling and monitoring photo lab production are proceeding. Recent improvements allow work orders to be scheduled and generated at any time during the day. Further design efforts are proceeding to address the use of distributed processing capabilities to further optimize photo lab performance. This project will continue into 1980 before completion is realized. Major software changes are being implemented to revise the INORAC general ledger to more optimally satisfy EDC reporting requirements, as well as those of the Branch of Financial Management.

NSTL ACTIVITY: (1) A presentation was given to the Regional Planning Commission personnel at the USGS Mapping Center at Rolla, MO with 21 people attending. (2) The Alabama Regional Coastal Mapping Workshop at Wrightsville Beach, NC was attended. The workshop was for the USGS and the National Ocean Survey and Office of Coastal Zone Management of the National Oceanic and Atmospheric Administration. A Gulf of Mexico Regional Coastal Mapping Workshop will be coordinated by the EROS Applications Assistance Facility along with the National Oceanic and Atmospheric Administration in August. (3) A Forestry Remote Sensing Workshop was given for the Louisiana State University/Mississippi State University Forestry and Harvesting Training Center, and 11 people from the International Paper Company attended the workshop. (4) The EROS Applications Assistance Facility participated in the Landsat training course at NASA's Earth Resource Laboratory. The capabilities of the Laboratory, EROS Program, and the National Cartographic Information Center were demonstrated. Ten people attended the course from various State agencies. (5) Five forestry graduate students were given a demonstration on some of the various equipment in the User Assistance Center. This visit by the students was for partial fulfillment of requirements for their Master's Degree. (6) A Land Use Workshop is planned for July 10-13, 1979.

ALASKAN ACTIVITY: Approximately 200 people made use of the facility during this reporting period. With the commencement of the summer forest fire season we have been called upon several times by the Bureau of Land Management to help them obtain current imagery of burning areas. We try to supply reproductions of U-2 or Landsat imagery to them in a timely manner, usually less than a day. We also have been monitoring fire activity using Landsat images from the Canadian ground station transmitted to us in near-real-time by facsimile. Our facsimile recorder is now working well and the imagery has sufficient resolution and contrast for many surveillance applications relating to natural events such as floods and forest fires. Tom George attended a short course at LARS - Purdue on Advanced Topics in the Analysis of Remote Sensing Data. Following his week of study there he went to California and did preliminary digital analysis work for a project he is involved in with the Soil Conservation Service mapping reindeer habitat on the Seward Peninsula. While in California he also visited with personnel with the Western Regional Applications Program.

IAGS ACTIVITY: The Technology Exchange Week for Latin America was held in Panama City, Panama. This conference was sponsored by the Defense Mapping Agency (DMA) and its component, the Inter American Geodetic Survey (IAGS). Over 500 attendees participated in this event. Sessions on Image and Data Collection Systems, Computer Sciences, Photogrammetry, Cartography, Photography and Lithography, Geodesy and Surveying, Remote Sensing, Information Systems, and Hydrography and Oceanography were conducted during the week's activities. A Remote Sensing Workshop has been tentatively scheduled in November 1979 for Latin American participants. The IAGS Cartographic School will sponsor this meeting. Officials of the Paraguay government requested assistance in obtaining Landsat coverage over the Paraguay River Basin which was at its highest level in over 100 years. The IAGS with the cooperation of NASA and the Brazilian Space Institute (INPE) is providing data which will cover before, during, and after stages of flooding. This data will be analyzed to aid in disaster relief and future flood control methods.

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EROS SCIENTISTS PARTICIPATE IN TECHNICAL VISIT TO THE PEOPLE'S REPUBLIC

OF CHINA: Three scientists from EDC traveled to the People's Republic of China as part of a 13-member USGS delegation invited to and hosted in China by the Scientific Research Institute for Petroleum Exploration and Development of the Ministry of Petroleum. While in China, the delegation carried on discussions of scientific and technological exchange with the Chinese on subjects relating to the occurrence, origin, exploration, and development of petroleum resources in China. The group also had the opportunity to visit a number of petroleum producing areas in China. The EROS delegation was particularly involved in discussions and studies relating to the applications of Landsat data in the exploration for petroleum in China. Image analyses and interpretations made by both groups as part of an informal joint project which was initiated in November 1978 were reviewed and discussed in Peking. One of the areas of study, the Tsaidam Basin in western China, was visited for the purpose of substantiating interpretations and acquiring ground truth data. Finally, the EROS team conducted a three-day workshop in Peking on the applications of remote sensing in petroleum exploration for 50 members of the Ministry of Petroleum.

ABANDONED MINE LANDS REMOTE SENSING WORKSHOP: EDC conducted an Abandoned Mine Lands Remote Sensing Workshop which was attended by 13 participants. Eleven of the participants were affiliated with the following Department of Interior agencies: The U.S. Geological Survey, the Office of Surface Mining, and the Bureau of Land Management. The remaining two participants were from the Environmental Protection Agency and West Virginia University. Regional and site specific exercises were introduced using Landsat and aerial photography of the mined lands of Georges Creek Watershed in Maryland. In addition, examples of mined lands in Virginia and Indiana were introduced.

U.S. FOREST SERVICE PROJECT: Two scientists from the U.S. Forest Service's Northern Forest Fire Laboratory visited EDC to map forest fire fuels. The project is attempting to use digital Landsat and digital terrain data to identify forest vegetation classes which can be associated with forest fire fuels and thus permit the mapping of fuels over large areas. The most significant task completed during their week visit was the alignment of Landsat, NCIC elevation data, and USGS Digital Elevation Models (DEM's) to a UTM grid for the study site near Missoula, Montana. USGS DEM's provided higher quality elevation but were not available for the complete area. Consequently the NCIC data were used to provide elevation data for areas where USGS data were not available. Subsequently, slope and slope aspect were computed and combined with the elevation data to complete the terrain file for the study area. Continuation of this project will include a field trip in August to collect data for determining the relations between vegetation classes and digital terrain and spectral data.

EROS/U.S. FISH AND WILDLIFE SERVICE HABITAT EVALUATION DEMONSTRATION

PROJECT: Effort continued on the cooperative demonstration project with the Oklahoma Cooperative Wildlife Research Unit (U.S. Fish and Wildlife Service). The project goal is to assess factors causing a decline in the population of prairie chickens, an endangered species in Oklahoma. Three FWS personnel worked for two weeks at EDC to produce a Landsat digital vegetation/land cover classification of 11 of 13 study areas in eastern and western Oklahoma. When the two remaining areas are completed, follow-on analysis will focus on correlating cover type diversity and interspersion with bird population data. Trends resulting from the correlations will be interpreted in terms of patterns of population decline.

NASA ASVT REVIEW: EDC participated in a review of current and proposed NASA Application Systems Verification and Transfer (ASVT) projects. Six current projects and eleven proposed projects were discussed, and the review panel was asked to evaluate the proposed projects on a number of criteria including:

- user needs and justification
- user commitment and operational intent
- probability of success
- defined end point for NASA involvement
- soundness of technical and managerial plan
- industry and/or university involvement
- plans for benefits evaluation and project documentation

IDAHO VEGETATION RESOURCES INVENTORY (IVRI) PROJECT: EDC assisted Denver BLM personnel in transferring data for the Idaho Vegetation Resources Inventory Project from EDC to the Bureau of Reclamation's digital image processing system. All subsequent processing of the Idaho data will be done in Denver by BLM personnel. EDC will continue to provide technical assistance in completing the analysis. Further activities are planned to assist BLM in entering digital terrain and soils data and registering these data to Landsat for use in post-classification processing and composite mapping tasks.

WORKSHOP AT GEORGE WASHINGTON UNIVERSITY: EDC participated in a training course, "Remote Sensing and Digital Information Extraction," held at the George Washington University. The objectives of the course were to provide the participants with an understanding of the principles of advanced sensors, errors in sensor data, processing and analysis techniques, and their application to geology, agriculture, forestry, and land use. A similar course will be offered again in October 1979.

DATA PRODUCTION AND SALES: Shipped reimbursable receipts for the first three quarters of FY79 were \$2,421,000. July sales should close at about \$285,000 for a year-to-date total of \$2,706,000. Incoming reimbursable receipts are at \$2,802,000 as of July 27. It is anticipated that year-end reimbursable sales will yield about \$3,337,000. The main reason for this estimate being below the plan of \$3,400,000 is that a number of relatively high sales volume special projects anticipated to happen this year have been delayed.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Approximately 1,850 scenes of Landsat MSS data were processed through EDIPS and placed in the archives during July. Incoming data are processed daily as received, with a backlog remaining of less than one day's processing. The technical specification for modification of the EDIPS system was completed and forwarded to TRW on July 17, and a meeting was held with TRW technical personnel on July 26. This procurement is proceeding on schedule and contract award should be made by the end of the fiscal year.

NSTL ACTIVITY: (1) Hurricane Bob nearly closed out the Land Use Workshop as participants had to return home to "batten down the hatches." Only three participants returned and the workshop was completed making up for lost time through evening sessions. During the workshop, NASA's Earth Resources Laboratory personnel gave a half-day demonstration of unsupervised urban area classification procedures on one of their initial processors. The state-of-the-art techniques proved to be the high interest point of the workshop. (2) NASA Earth Resources Laboratory's current Landsat image processing class toured the Applications Assistance Facility and were lectured on data product services of EDC. Participants included State planners from North Carolina. (3) A Keesler Air Force Base administrative officer group toured the facility as part of an orientation day regarding Gulf Coast federal services. (4) The Mississippi Southcentral Planning and Development Commission has been using the digital planimeter in the facility, and archeologists from Tulane University have been using the light table and rear view projectors. (5) The Corps of Engineers, New Orleans District, has discussed techniques and equipment necessary for determining quantitative measures of shoreline dynamics for the entire state of Louisiana. Feasibility tests will be run in late August or early September in the facility using our equipment. (6) The AAF is cohosting a Gulf Coast Mapping Conference at Diamond Head, August 7-9.

ALASKAN ACTIVITY: Approximately 70 visitors made use of the facility during this reporting period. A meeting was held in Anchorage to finalize plans for this summer's high altitude aerial photography program. The U-2 will arrive July 10 and the WE-57 will arrive on July 18 to again acquire as much cloud-free imagery as possible. Priority will be given to Interior Alaska and additional areas may be flown (Kenai Peninsula and Southeastern Alaska) if funds permit. Assistance and aerial photography were provided to BLM and the State Division of Lands to plan a "burn-out" of a large fire in the Delta barley project area. Additionally, an enlargement of a facsimile quick-look Landsat image of the Delta area taken June 1 was made and provided to the fire control team. This facsimile copy was extremely useful as it was the most current Landsat image of the area of interest. Tom George attended the Rural Development Council meeting in Palmer in mid-June and gave a talk on remote sensing applications related to rural Alaska. He also visited BLM at the new Federal Center in Anchorage and discussed their data retrieval system.

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FUELS MAPPING PROJECT: EDC scientists visited the fuel mapping project study site west of Missoula, Montana to collect field data. Existing aerial photographs for twenty cluster blocks were acquired and delineated into homogenous forest stands. Data collected while visiting cluster blocks included overstory species composition and density, ground cover conditions, and the applicable fuel model within the National Fire Danger Rating System (NFDRS) for individual stands. The field data will be used to establish vegetation/spectral/terrain relationships fundamental for the mapping of forest vegetation and forest fire fuels with Landsat and digital terrain data. Verification of terrain calculations for slope and aspect was also conducted while visiting cluster blocks. Slopes and aspects calculated from USGS Digital Elevation Models described the true terrain conditions very well.

BLM VEGETATION COVER MAPPING IN ALASKA: EDC representatives worked with Alaska Bureau of Land Management personnel in evaluating the accuracy of a 2 1/2 million acres vegetation cover map that was derived from Landsat digital data. Approximately 75 ground plots, each representing a cluster of 25 pixels, were looked at on the ground and detailed vegetation data were recorded. All ground data were collected over a two-week period by four three-person crews ferried to each plot by a helicopter. BLM personnel will travel to EDC in September to work with Applications Branch personnel to analyze the data. Final results are expected by late October-early November.

COLUMBIA RIVER AND TRIBUTARIES IRRIGATION WITHDRAWALS ANALYSIS PROJECT: EDC representatives met with Portland district U.S. Corps of Engineers personnel to finalize plans for the Columbia River and Tributaries Irrigation Withdrawals Analysis Project. Discussions concentrated on developing a project timetable, assigning responsibilities, and arranging an aerial photography mission. Following the Portland meeting, two days were spent visiting the Yakima Basin, Washington and Umatilla Basin, Oregon study areas for the purposes of field familiarization and ground data acquisition.

U.S. FISH AND WILDLIFE SERVICE PRAIRIE CHICKEN HABITAT MAPPING PROJECT: Personnel from the Oklahoma Cooperative Wildlife Research Unit (U.S. Fish and Wildlife Service) worked in the Data Analysis Laboratory with EDC personnel to complete Landsat digital analysis of their last three Prairie Chicken habitat study areas. Summary statistics of land cover in all study areas resulting from the analysis will now be correlated with Prairie Chicken population data to determine what land cover characteristics are most highly correlated with high Prairie Chicken population figures.

USGS - LIA GROUND WATER PROJECT: EDC personnel provided technical assistance to the LIA - Earth Sciences Applications Section in utilizing remotely sensed imagery for ground water exploration in the Culpeper Basin, Virginia. The

Culpeper Basin consists of triassic tilted sedimentary beds intruded by diabase sills. Ground water movement is almost entirely along fractures. Landsat imagery and 1:80,000 aerial photography is being utilized to map possible fracture zones through analysis of lineaments and fracture traces. Specific sites were chosen for test drilling to evaluate the hydrologic characteristics of several key beds and to test the usefulness of this remote sensing technique in a complex geohydrologic area. It is anticipated that major development will be taking place in this area in the near future. Conventional geohydrologic studies to date suggest that ground water will be scarce.

CLASSIFICATION OF PERENNIAL SNOW/ICE AND GLACIERS: EDC personnel worked with Dr. Robert Rudd, University of Denver, in the data analysis lab. Dr. Rudd is on a work assignment for the Geography Program (USGS) investigating capabilities for the classification of perennial snow/ice and glaciers. Parallelepiped classification and principal components analysis were performed using the Image 100 analysis system on a Landsat subscene covering the Wrangell-St. Elias National Monument in Southeastern Alaska, an area containing large amounts of perennial snow and many glaciers. Preliminary results indicate that these cover classes are generally spectrally distinct.

SCRIPPS INSTITUTE OF OCEANOGRAPHY DATA ANALYSIS SYSTEM: At the invitation of the Scripps Institution of Oceanography EDC personnel participated in testing their new Interactive Digital Image Manipulation System (IDIMS). This system has the new Deanza display subsystem and a 3 meter-disk antenna with peripherals for real-time reception of satellite (TIROS, NIMBUS) data. The utility of Landsat data was shown on subscenes of LaJolla and San Diego. The IDIMS functions for enhancement, clustering, and maximum likelihood were tested and gave the same results as the EDC-IDIMS.

VISIT OF CONGRESSIONAL STAFF MEMBERS: On August 8 and 9, Jim Gehrig and John Stewart, staff members of the Senate Committee on Commerce, Science, and Transportation visited the EROS Data Center to better understand its role in the Landsat program. Principal areas of discussion included: USDI through EDC has been the principal interface with users of Landsat data; EDC training programs and technology demonstration projects have been a major contributor to the acceptance and use of Landsat data in the general fields of Earth science; there have been, and are, a number of interface problems between NASA/GSFC and EDC resulting from the NASA perception of Landsat as an extended experiment and the EROS concept of getting data to the users; NASA plans for processing and distribution of Landsat D TM data are retrogressive and will result in poor quality and delayed delivery of data to users; the marketability of Landsat 1, 2, and 3 data is inadequate to make the program anywhere near self-supporting. Program benefits should be evaluated on "public good" rather than dollar out - dollar in basis; marketability of Landsat D TM data is even more tenuous; and USDI is making a strong pitch in the IRS³ Committee to assume responsibility for the post Landsat D operational Earth observation satellite system, and has a plan for moving ahead if that responsibility is assigned.

DATA PRODUCTION AND SALES: Shipped reimbursable receipts are close to 3 million as of the end of August. Based on increased CCT production at NASA/GSFC and expected customer year-end billing close-outs, data sales for FY 79 should be very close to the projected \$3,400,000 mark.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Approximately 2,170 scenes of MSS data were processed through EDIPS and placed in the archives during August. Backlog continues to stay below one day's processing of MSS data. A total of 11,596 scenes have been archived in HDT format since February 1, 1979. EDC is still awaiting routine delivery of RBV data from NASA/GSFC. The TRW proposal for the EDIPS modification was received on August 24, 1979, and is currently under evaluation. A technical evaluation report will be submitted to Branch of Contracts the week of September 4. The schedule identified in the proposal specifies installation and acceptance to be completed by mid-February 1981, assuming issuance of a notice to proceed to TRW by the end of September 1979.

IMAGE PROCESSING SYSTEM: A Generalized Image Processing System (GIPS) has been developed at EDC. Most of the software operates on the B6700 general purpose computer and interfaces with EDIPS for generation of film products. Current capabilities include destriping, edge enhancement, contrast stretch, haze removal, conversion of CCT formats (both foreign and the GSFC "X" format), and film generation. Capabilities to be added in the near future include ground control point entry, geometric correction, MSS/RBV correlation, mosaicking of multiple scenes, and entry/processing of non-Landsat digital data. Many of these concepts/capabilities have resulted through a continuing cooperative effort with the Flagstaff Computer Branch.

NSTL ACTIVITY: (1) The three-day conference on Coastal Mapping for Decision-makers was very successful. Approximately 85 attendees from industry, State and Federal agencies represented map users and map makers such as State and regional planners and planning consultants, oil companies, U.S. Fish and Wildlife, Federal and State emergency management teams, USGS Mid-Continent Mapping Center team, State Marine Councils, NOAA-National Ocean Survey, private mapping companies, State Highway Departments, universities, State Geological Surveys, DOI-BLM, natural gas pipeline companies, etc. The purpose of the convention which was accomplished, was to establish a dialog between these groups. (2) The EROS NSTL/AAF was featured on Louisiana public television. The program was viewed four consecutive days throughout the state. (3) An exhibit was provided at the city of Slidell Science Day and was seen by over 1,200 persons. (4) The capabilities of the photo optical laboratory was demonstrated to Vernon Knight, Vice-President of Kimberly Clark/Timberland Division. (5) Preliminary planning was completed for the Second Annual Foreign Naval Officers' Coastal Processes Remote Sensing Workshop scheduled for 1980. (6) Future objectives of the Forestry Industry Remote Sensing Workshop were discussed with Bob McDermitt, LSU/MSU Logging and Forestry Operations Center. (7) Two gentlemen representing the Water and Power Authority of Bombay, India spent a day at the Applications Assistance Facility where they were instructed in the applications of thermography for power plant output plume analysis and general hydrologic inventory for springs, seeps and leachate location. (8) Two people from the AAF will travel to the Data Center for instruction of the Silent 700 terminal used with IDIMS.

ALASKAN ACTIVITY: The Landsat imagery files have been modified to the Path-Row reference system. This was accomplished with few difficulties and all imagery is now filed in chronological order within the path-row file. This should make it much more convenient for users to search for available imagery for a given location. A meeting was held with Kathy Sullivan, a NASA geologist-astronaut and Olav Smistad, manager of aircraft operations planning, NASA/JSC, to discuss testing and evaluation of various sensors on fixed-wing aircraft platforms over Alaska, primarily for geologic purposes. Ms. Sullivan will be on board the NASA/JSC aircraft during its photographic missions over Alaska. Approximately five thousand flight line miles of aerial photography have been obtained to date during this summer's segment of the Alaskan high-altitude aerial photography coverage. Color-infrared and monochrome photography from these missions will be archived here for statewide use. The program will continue through August and hopefully skies will clear and enable NASA to obtain many more miles of coverage. The Quick-Look program continued to serve fire-suppression agencies with daily Landsat coverage, cloud cover permitting. About fifteen major fires have burned 237,000 acres in interior Alaska. Another significant achievement was prediction of the outburst of glacier-dammed Strandline Lake located west of Anchorage and Cook Inlet. High water conditions were noted on a July 1 image, and the outburst from the glacier flooded the entire Beluga River valley approximately ten days later.

IAGS ACTIVITY: IAGS technicians conducted a course on the use of Landsat mosaics in Columbia. The course was attended by 10 Colombian students. The Project Chief of Paraguay accompanied Ambassador White to the Ministry of Defense, Paraguay, where the Ambassador presented the Minister with the Landsat imagery of the Paraguay River flood. DMA-IAGS received credit and thanks for providing this support.

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13TH INTERNATIONAL REMOTE SENSING WORKSHOP: Twenty non-U.S. scientists participated in the 13th International Remote Sensing Workshop held at the EROS Data Center. The workshop dealt primarily with manual interpretation of Landsat data but did include an introduction to remote sensing systems used in machine-assisted analysis. A 4 1/2 day field trip to the Black Hills of South Dakota allowed students to verify analysis work in physical situations. Finally, the participants applied analysis procedures to Landsat imagery of their areas of interest.

EAST-WEST CENTER REMOTE SENSING WORKSHOPS: EDC representatives presented orientation workshops in Honolulu in cooperation with the Resource Systems Institute, East-West Center. The workshops were designed to serve as an introduction to the use of remote sensing technology for agricultural-related investigations. The 35 participants in the first workshop session, August 25-26, 1979, included the Director General, Geological Survey of Bangladesh; Director General, Geological Survey of Pakistan; Senior Geologist, Malaysia Geological Survey, in addition to other professionals from Sri Lanka, India, Phillipines, Australia, Guam, Taiwan, Nepal, and The People's Republic of China. The 18 participants in the second session, August 27-28, were primarily University of Hawaii faculty and graduate students. Two of the students were from the Office of the Chief Geologist, USGS. Follow-up discussion revealed an interest on the part of East-West Center personnel in future activities between EDC and their organization, including future training activities and potential project work dealing with the remote sensing technology for agricultural assessment and development in Asian-Pacific countries.

DENALI, ALASKA ANALYSIS PROJECT: Two scientists from EDC assisted Bureau of Land Management personnel in field verification of the geology portion of the Denali ASVT Project. The study consisted of an analysis of the drainage, lineaments, bedrock, geomorphology and geologic hazards present in the Denali area based on Landsat imagery and two scales of aerial photography. EDC and BLM personnel selected approximately 60 sites for field verification. Two helicopters supported field crews and visited these sites to collect rock, landform and soil descriptions, and ground and/or low altitude oblique photographs. Information gathered during the one-week field period and accompanying discussion sessions will be used by BLM in writing up the final project evaluation due in December.

LANDSAT DATA UTILIZED IN MONITORING GULF OF MEXICO OIL SPILL: Several Landsat scenes of the Gulf of Mexico oil spill were examined to determine the spectral characteristics of the oil slick. Various image enhancements were used to determine the best oil versus water display. Image classification techniques were also applied to determine area estimates of the slick size. Participants in the Mexico oil-slick monitoring project included the EROS Program Office, NASA, USGS-Conservation Division, and the U.S. Coast Guard.

IDAHO SYMPOSIUM: EDC personnel participated in the symposium entitled Remote Sensing for Natural Resources held at Moscow, Idaho on September 10-14, 1979. The symposium was sponsored by the International Union of Forest Research Organizations, American Society of Foresters, American Society of Photogrammetry, and University of Idaho. Approximately 100 scientists from the USA and abroad attended the symposium. EDC personnel presented papers entitled "Data Availability and Technology Transfer Activities at the EROS Data Center" and "Integration of Digital Landsat and Terrain Data for Mapping Wildland Resources."

ASP/ACSM 1979 FALL CONVENTION: The ASP/ACSM 1979 Fall convention was held in Sioux Falls, September 17-20, 1979. The meeting, whose theme was Observing and Measuring the Planet Earth, included over seven hundred attendees and seventy exhibits. Approximately 400 of the attendees toured the EROS Data Center during the week. All in all, the convention was considered a big success.

DATA PRODUCTION AND SALES: FY 1979 shipped reimbursable data sales were \$3,344,000, which is within two percent of the projected sales of \$3,400,000. A final closeout of this year's shipped sales will be tabulated and reconciled during the first week of October. Both turnaround times and the work-in-process have been reduced in recent weeks.

EDIPS PRODUCTION STATUS: Approximately 1500 scenes of MSS data were processed through EDIPS and added to the data base in September. No production RBV data have been received. Current projections indicate that the RBV processing system at GSFC will be operational around November 1, 1979. The RBV digital data collected since February 1, 1979 will be converted to film and shipped to EDC to allow startup of the RBV digital system with little or no backlog.

EDIPS "A" MODIFICATION: Notification to proceed with the EDIPS modification to accept partially corrected data has been issued to TRW. This modification will be completed during the fourth quarter of 1980 at a cost of approximately \$950,000. At that time the primary data transfer from GSFC will consist of data that have been radiometrically corrected with no geometric corrections applied. These HDT-A's will then become the archival format for Landsat MSS data through the Landsat D time frame. Processing of all special orders will then be performed at EDC with no requirement for submitting retrospective orders to GSFC.

NSTL ACTIVITY: (1) A status review of the proposed Santee-Cooper Rediversion Monitoring Program was held at the Office of the Special Assistant to the Secretary, Southeast Region in Atlanta, September 14. Clarification of the prime objectives and a review of the proposed monitoring effort were accomplished. Dr. H. C. Mattraw, USGS leader on the Appalachacola River Project, aided the interagency group in this planning. A concise statement of objectives and funding requirements is scheduled for presentation to the Interagency Steering Committee in approximately 30 days. (2) The Chief of

the EDC Applications Branch visited NSTL and attended the quarterly review of the NASA Regional Applications Program meeting where he presented a status report on the Applications Assistance and Training Program at the EROS Data Center. The Chief of the AAF also attended. (3) Four graduate school night classes are currently underway by the University of Southern Mississippi using the AAF training area. One of these is a remote sensing course. (4) The following university and Federal agencies have received a full one-day orientation at the facility this month. The orientation consists of a tour of the facility, applications training lectures oriented to the discipline group, product displays and browse file use: (a) Corps of Engineers (12); (b) Louisiana State University School of Architecture (16); and (c) Louisiana State University Department of Geography (20). (5) Mr. C. P. O'Neil attended the American Society of Photogrammetry Symposium at Sioux Falls and then participated in IDIMS training (image processing). (6) Ms. M. Rotunda visited the EROS Data Center for briefing by branch personnel on administrative procedures and also participated in IDIMS training. (7) A remote sensing workshop for the U.S. Fish and Wildlife Service is slated for October 15-19. A remote sensing workshop for EPA managers is tentatively scheduled for October 22-26 in Kansas City, Missouri.

ALASKA ACTIVITY: Approximately 60 users visited the facility during this reporting period. John Miller made a presentation on Landsat applications to the BLM Outer Continental Shelf office staff in Anchorage. A question and answer session followed the briefing which helped to clarify just what Landsat applications might be useful to this group's needs. The first roll of color-infrared aerial photography from the 1979 segment of the Alaskan high-altitude aerial photography program has been received from NASA ARC and has been cut and filed. John Miller made a presentation to the Planning and Zoning Commission of the North Star Borough and explained the implications of a vegetative index map that was prepared for a portion of the Borough from digital Landsat data. A simple Band 7 to Band 5 ratio was used to delineate nine categories of cover types which reflected the relative strengths of the chlorophyll signature. In this part of Alaska's interior, such a vegetative index has a close relation to types of soils and can be used to infer suitability of land for development. It is expected that the Borough will base its selection of 112,000 acres of public land in part upon the Landsat results.

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Advanced Geological Remote Sensing Techniques Workshop: An Advanced Geological Remote Sensing Techniques Workshop was presented October 15-19, at EDC to 20 geologists representing Federal and State governments and the private sector. The course emphasized the uses of digitally-processed images in mineral exploration and general geologic analysis work.

National Park Service/EROS Data Center Cooperative Project: A hydrologist from the National Park Service - Everglades National Park worked with EDC personnel on Landsat digital analysis of a project site in the Everglades. Satellite remote sensing techniques were successfully merged with hydrologic data to generate information on areal extent, depth, and quantity of water within the Shark River Slough during both wet and dry seasons. Results of this temporal study will allow Everglades National Park personnel to more effectively manage the ecologically critical water budget of the Park.

Water Resources Workshop: A four day Water Resources Remote Sensing Workshop was conducted at the EROS Data Center October 22-25, 1979. The purpose was to familiarize the participants with basic remote sensing principles and practical applications of Landsat data and other types of imagery as they apply to water resources investigations. The workshop was designed primarily for hydrologists from USGS Water Resources Division and their cooperating agencies, although a number of the 33 participants were associated with State level agencies. Lectures on the feasibility of utilizing remotely sensed data in Water Resources studies supplemented the basic principles lectures and application examples presented. Five workshop exercises were given which allowed the participants an opportunity to analyze and interpret Landsat imagery to provide hydrologic information.

Basic Geology/USGS Conservation Division Workshop: Two representatives from EDC conducted a five-day workshop on the principles and applications of geologic remote sensing for a group of 23 Conservation Division geologists. The workshop was held at the Conservation Division offices in Menlo Park, California from October 1 through October 5. Geologists from Alaska, Idaho, and California were in attendance.

Workshop at the University of North Dakota: An EDC scientist participated as instructor in a Remote Sensing Workshop entitled "Digital Analysis of Landsat Data" held at the University of North Dakota October 12 and 13. He presented illustrated lectures on "An Introduction to Landsat" and "The EROS Data Center Mission" in addition to conducting a local area field exercise with U-2 imagery of the Grand Forks area and environs. The workshop was sponsored by the University of North Dakota Institute for Remote Sensing and the Association of American Geographers, Great Plains - Rocky Mountain Division, in conjunction with the NASA/Ames Research Center.

Short Course at South Dakota School of Mines: An EDC geologist participated in the short course "Geologic Remote Sensing for Minerals and Mineral Fuels" offered at South Dakota School of Mines in Rapid City, October 22 through 26. The course was designed to familiarize geologists in the mineral industry with the basic types of remotely sensed data, their interpretation, and availability. This Data Center participation was the last phase of a 2-year effort to enable the School of Mines faculty to establish and maintain a program of remote sensing training for industry users.

Course at George Washington University: An EDC representative participated in a training course, "Remote Sensing and Digital Information Extraction," held at the George Washington University October 22 through 26. Approximately 18 persons from various Federal agencies participated in the course. The course provided an overview of the electromagnetic spectrum, energy flow profile, and the fundamentals of digital image analysis. These lectures were followed by discussions of applications to agriculture, land use, forestry and range, water resources, geology, and cartography.

Terrain Analysis Workshop: On October 9 through 13, a training course in terrain analysis using remotely sensed data was conducted at EDC by Professor Douglas Way of the Harvard Graduate School of Design. The course was offered in cooperation with the Data Center, and several EDC scientists participated as instructors. The course concentrated on terrain analysis, geology, soil characteristics and geomorphology, and particular emphasis was placed on actual interpretation of information on the images directed toward planning applications such as highway construction, sources of construction material, and subdivision planning. This was the third time that the workshop has been conducted at the Data Center. This permits the participants to become familiar with the products and services available at the Center, and facilitates the participation of Center staff in the instruction.

NASA Users Conference: EROS Data Center personnel participated in NASA's Western Regional Remote Sensing Conference held in Monterey, California on October 17 through 19. The bulk of the technical program was devoted to papers on applications of remote sensing in State resource management programs. EDC organized and chaired a session entitled "Federal Programs in Remote Sensing." In this session, three technical papers were presented on the role of remote sensing in the Departments of Interior, Agriculture, and Commerce; EDC represented Interior. Approximately 250 Federal, State, and local personnel from the 14 western states attended the conference.

Office of Space and Terrestrial Applications Workshop: EDC participated in a NASA Office of Space and Terrestrial Applications (OSTA) workshop whose basic goal was to identify and evaluate data systems concepts which could provide users with more readily usable data. The underlying reason for this meeting was the OSTA concern about its inability to get quality data out to users in a timely and effective manner. As a result, individuals representing both discipline areas and data systems were called together at Wallops Island to make recommendations to OSTA regarding the development of an applications data service.

Cooperative Demonstration Project with USACOE: Two EDC personnel visited Pendleton, Oregon, September 30 through October 5, for field work in conjunction with the Columbia River and Tributaries Irrigation Withdrawals Analysis Project. The EDC team was joined in the field by two scientists from the North Pacific Division, Corps of Engineers, Portland, Oregon. Sample sites in the Umatilla River Basin (Oregon) were visited along with three 36 square mile sites in the Yakima River Basin (Washington). Recently acquired 1:24,000 scale color-infrared aerial photographs were annotated for subsequent use in the computer classification and accuracy assessment phases of the project.

Data Production and Sales: Data sales for FY'80 are projected to be \$3,500,000. Shipped reimbursable receipts for the first month of FY'80 are close to \$300,000. Actual data sales for the past two years have been within 1% or 2% of the projected sales which are usually made one and one-half years prior to the end of the fiscal year. Based on the trends of certain firm and pending orders, foreign Landsat sales should be higher than usual in FY'80 compared to the last two years.

EROS Digital Image Processing System (EDIPS): Approximately 2,100 scenes of Landsat MSS data were processed through EDIPS and added to the Main Image File this month. The EDIPS backlog consistently remains below one day's processing. Earlier projections of digital RBV data availability from NASA have not been fulfilled, and a new production date has not been specified. Two HDT's of uncorrected ("A") data were received late this month. CCT's of these scenes will be shipped to TRW for use in the EDIPS modification. Retrospective orders for data are now being accepted and transferred to GSFC for production, but expected turnaround times for these products are still uncertain. Two high density tape recorders were delivered this month. These units will supplement the two existing recorders, allowing two units to be assigned full-time to the Domsat and tape copy functions and two to EDIPS. Acceptance tests will be conducted the week of November 5.

NSTL Activity: (1) The EROS/NCIC AAF was given coverage in a full page article featured in the Times-Picayune newspaper with a circulation of 60,000. (2) The capabilities of the facility were demonstrated this month through an orientation consisting of a tour and lecture to the following agencies: Louisiana State University, Department of Architecture; South Central Bell in conjunction with NASA ERL; Louisiana Department of Transportation and Development; Mississippi Civil Engineers; University of Florida; Louisiana State University, Remote Sensing Class. (3) The U.S. Fish and Wildlife Workshop planned for October 15 through 19 at NSTL was canceled and rescheduled for January and May of FY'80. (4) The EROS facility was invaded by 35 enthusiastic fourth and fifth graders on October 18 from Mandeville Middle School, Mandeville, Louisiana. The students were given a lecture and tour in addition to literature for their science class. (5) Two members of the EROS/AAF will participate in a remote sensing workshop in Kansas City, Kansas for the EPA on October 29. (6) Total visitors for October were 120.

Alaska Activity: (1) The 30th Alaska Science Conference, sponsored by the Alaska Division, American Association for the Advancement of Science and the Alaska Section, American Chemical Society, was held in Fairbanks. The theme this year was "Science for Alaska" covering a broad range of disciplines. A large segment of the conference was devoted to poster sessions and AAF personnel assisted in the preparation of several of these. The geology session of the Science Conference was dedicated to the U.S. Geological Survey in recognition of its 100th anniversary and the great contribution it has made in the study of Alaska's resources. AAF personnel assembled the USGS exhibit featuring remote sensing that was displayed at the last Pecora Symposium and supplemented the exhibit with three panels featuring our own conference and even attracted favorable comments in the local press. Literature featuring USGS, EROS Program, and the Applications Assistance Facility was also prominently available as handouts. Total attendance was over 450 persons throughout the three days. At the conclusion of the conference the exhibit was disassembled and shipped to Anchorage for a two-week display in the new Federal Building. (2) Over half of the aerial photography obtained in summer 1979 by NASA/ARC and NASA/JSC for the Alaskan high-altitude aerial photography program has been received, cut and filed. Complete coverage of southeastern Alaska was obtained this year and the quality of this film is excellent. (3) It has become evident that our own accessions of cloud-free Landsat images for browse purposes should be catalogued in a computer-retrievable data base. We now have over ten thousand images of Alaska on file organized in files by path and row numbers of the World Reference System. Formerly our catalog of cloud-free Landsat scenes of Alaska was ordered chronologically (by scene ID number), but this made it awkward to cross reference with the locations of the files. The task of creating a computer-based catalog file of all our Landsat data is now about 90% complete. It will soon be possible for any person with access to the statewide University computer network to generate a list of Landsat scenes either by specifying a range of path and row numbers, scene I.D.'s, dates or a combination thereof. The user will have the assurance that the listed scenes are available locally for viewing at 1:1-million scale black-and-white prints. It will also provide a convenient cross-reference between scene I.D., path/row, and date, as well as specify the cloud cover and which scenes are available in color or in digital tape formats in our archives.

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DATA PRODUCTION AND SALES: Shipped reimbursable sales for the first two months of FY 80 are \$550,453. While shipped sales are on the FY 80 projection, incoming sales are seasonally down for this time of the year. The Work-In-Process is in the \$100,000 range and turnaround times are under two weeks for all orders. There are some 500 CCT's on retrospective order from the Goddard Space Flight Center (GSFC) - the turnaround time for retrospective CCT's is currently averaging 47 days.

MEXICO REMOTE SENSING WORKSHOP: An EDC scientist participated as a member of the instructional staff in a remote sensing workshop entitled "Remote Sensing of Agriculture and Rural Land Use" in Mexico City on October 29 and 30. The workshop was jointly sponsored by the Remote Sensing Committee of the National Council for Geographic Education (NCGE) and the Direccion General de Estudios del Territorio Nacional (DENTENAL) of Mexico. The workshop was attended by 27 students from Mexico, the United States, and Canada. Most participants were academic geographers with university level teaching responsibilities in remote sensing. However, several students were affiliated with geological and cartographic agencies of the Mexican government.

ARGENTINA REMOTE SENSING WORKSHOP: EDC supported, on special invitation, a United Nations - C.N.I.E. cosponsored Remote Sensing Training Course in Buenos Aires, Argentina during November. The three-week course, November 5-23, 1979, was attended by 25 South and Central American participants and addressed multidisciplinary applications of remotely sensed data, particularly Landsat data. Both manual and digital analysis techniques were covered through lecture and exercise programs. A two-day field trip to the Parana River Delta and Buenos Aires demonstrated the applicability of Landsat data to geology, soils, vegetation, and both urban and rural landuse related problems.

SHORT COURSE ON PETROLEUM EXPLORATION: EDC hosted a two-day short course on Petroleum Exploration presented by William Ramsey-Palmer and Charles Hynneck of Spectra Associates, Odessa and Dallas, Texas. The short course, which was attended by about twenty EDC staff members, consisted of a review of the origin and occurrence of petroleum and discussed exploration philosophy and techniques utilized in the search for hydrocarbons. The applications of remote sensing to petroleum exploration was highlighted.

EVERGLADES NATIONAL PARK COOPERATIVE PROJECT: An EDC hydrologist traveled to the Everglades National Park to work with National Park Service personnel in evaluating the results of Landsat temporal analysis of hydrologic conditions within the Shark River Slough study site. Hydrologic parameters, including distribution of hydrobiological zones, water depths, and water distribution were assessed by helicopter and airboat. Satellite data collection platforms, staff gauges, and continuous hydrologic recording devices were visited along several transects within the project area. Technical report preparation followed field evaluations. Final results are expected by January.

MINNESOTA STATE PLANNING AGENCY COOPERATIVE PROJECT: Minnesota State Planning Agency personnel, Doug Meisner and Bob Smekofski, visited EDC to review the work that had been completed on the cooperative project. They also grouped the spectral classes into information classes using their knowledge of the area. A new training technique, entering training areas by digitizing polygons from aerial photographs, was tested. It appears to be a workable technique.

U.S. CORPS OF ENGINEERS SYMPOSIUM: EROS Data Center personnel presented an invited paper on the mission and responsibilities of the Center at a U.S. Army Corps of Engineers Symposium on Remote Sensing held in Reston, Virginia, during October 29-31, 1979. Sixteen technical papers and over 40 poster papers were presented by representatives from the federal agencies (USGS, NOAA, NASA, COE), academic institutions and commercial companies. The keynote address was given by Dr. A. C. Morrissey, Office of Scientific and Technology Policy. The banquet speaker was the Senator Harrison H. Schmitt of New Mexico. The Director of Civil Works, MG E. R. Heiberg and his deputy, BG H. G. Robinson gave talks on the importance of remote sensing technology to the Corps of Engineers. Most of the poster papers were given by Corps of Engineers personnel representing virtually all of the districts throughout the United States. High interest in remote sensing technology was demonstrated by the attendees (over 200) through their questions and participation in technical sessions.

MISSOURI RIVER BASIN COMMISSION SYMPOSIUM: On November 15 and 16 a symposium on the use of remotely sensed data in the inventory of irrigated lands was held in Sioux Falls in cooperation with EDC. The symposium, which included about 70 attendees, consisted of a number of presentations on recent projects conducted at various research facilities across the country, which have dealt with irrigated land inventory and monitoring. EDC scientists presented several papers at the symposium and hosted a tour of the Data Center.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Approximately 2527 scenes of Landsat MSS data were processed through EDIPS and added to the Main Image File in November. The EDIPS end-of-month backlog included 19 scenes. No additional RBV imagery has been received. Processing timelines have improved in the Image Processing Facility (IPF) at GSFC. Although approximately 35 percent of the MSS data acquired are rejected during processing, the remaining data for the month of October had been completely processed to the EDC data base by mid-November. Continuing IPF efforts will attempt to close out successively earlier months of data until all processible backlog is cleared. The average time required from scene acquisition to data base entry for 2,178 scenes of data acquired in October was 13 days. Two additional high density tape recorders completed acceptance test and were integrated into the EDIPS/Domsat system in November. Systems design is proceeding for the modifications to EDIPS and INORAC required to provide high density tape products to the AgRISTARS program. Systems Requirements Documents (SRD's) for the EDIPS "A" Modification were received from the contractor, and review comments are being prepared.

NSTL ACTIVITY: (1) Mr. Dave Dooling, Scientist Editor of the Huntsville Times, Huntsville, Alabama, visited the Applications Assistance Facility (AAF) and interviewed a member of the staff. He was given a briefing on the services and capabilities of the AAF. (2) Two members of the AAF traveled to Kansas City, Kansas, to conduct a remote sensing workshop for the Environmental Protection Agency held October 29-November 2. (3) A lecture on the EROS AAF/NCIC was given at the 79th Annual Meeting of the American Society of Landscape Architects held in New Orleans on November 1. One hundred fifty people attended the session. (4) A Forestry Remote Sensing Workshop was held on November 6-9 in conjunction with the Louisiana State University/Mississippi State University Logging and Forestry Operations Center. There were twelve participants. (5) On November 13-14 a Geology Workshop addressing only Landsat imagery was held with twelve student participants. (6) A Landsat Symposium, sponsored by NASA/ERL was held at Biloxi, MS, on November 14-15. The EROS AAF, in cooperation with the National Cartographic Information Center, prepared an exhibit for the convention. (7) Tours and demonstrations were given to the following organizations: Louisiana State University, Baton Rouge Department of Geography, Botany, and Marine Science; Lockheed Electronics in conjunction with the Tennessee Valley Authority; Tulane University School of Architecture, New Orleans. (8) On November 19-20 one-day workshops were conducted for six students from Mississippi State University and 10 students from Nickols State University.

ALASKAN ACTIVITY: Several groups were given tours of the facility during the last month. One such group consisted of a dozen men from Ft. Wainwright currently working in the MIDAS (airborne remote-sensing) unit there. Twenty-eight sixth graders from a local elementary school were very impressed with the operation. They especially enjoyed viewing aerial photographs stereoptically. This age group often pose some very thought-provoking questions which tend to keep the staff "on their toes" when speaking to them. All of the high altitude aerial photography obtained in Summer 1979 has now been received, cut and filed. Previously users had left their names asking to be notified when the imagery arrived and they have been notified. Calls are received daily from various locales, both inside and outside Alaska, asking for information on imagery for a specific site and our hard copy files make it much easier to answer these requests in detail. The computer-based catalog file for our Alaskan Landsat accessions have been completed. The user has the option of obtaining complete lists of all our Landsat scenes by path and row, by date, available in color or digital magnetic tapes. Searches based upon geographic locations can be accommodated by specifying the path, path and row, path and row plus dates, or only dates. Our browse file is particularly useful because it emphasizes Alaskan data of high quality, and hard copies are immediately available for inspection or rapid duplication if needed. The catalog service is available not only in our own library, but throughout Alaska via the statewide University computer network. A catalog of the hard copies of remote sensing data available in the Alaskan AAF was prepared and sent to EDC. Information was also provided on the sources of remote sensing data used by the AAF and on the equipment available at the AAF for processing these data.

EROS Data Center
Monthly Activity Report
December 1979

CHINA DELEGATION VISITS, EDC: Four scientists from the Scientific Research Institute for Petroleum Exploration and Development, Peking, China, arrived at EDC on December 3, 1979, for a 6-week visit. The purpose of the visit is to select computer compatible tapes (CCT's) of Landsat data covering all of China (535 scenes) and to become familiar with digital image processing, Photo Lab operations, and geologic applications. Criteria for CCT selection include 20 percent or less cloud cover and acquisition during October to March with low sun angle conditions. Snow cover in parts of China has presented some problems in find acceptable scenes. Briefings and discussions on the Photo Lab, EDIPS, B-6700, and Data Analysis Laboratory capabilities have been held. The China delegation plans to depart EDC on January 11, 1980, and travel to California to discuss contractual arrangements for procuring a System 101 digital image analysis system for International Imaging Systems, Inc.

MINNESOTA STATE LAND CLASSIFICATION PROJECT: The Minnesota State Land Classification Project continued in the Data Analysis Laboratory. Agency cooperators recently supplied the geographic information system (MLMIS) variables of township, minor civil division, land use, water orientation, highway orientation, soils, geomorphic regions, forest cover, major and minor watershed, public ownership, and school districts, which were entered into the IDIMS system. A reference image of photo-interpreted data was created and digitized. This will be used for comparison and verification of the Landsat computer classified (interpreted) data.

COOPERATIVE BLM/EDC VEGETATION MAPPING PROJECT: Two EDC representatives met with BLM personnel in St. George, Utah, and Phoenix, Arizona, to present the final output products from the cooperative BLM/EDC vegetation mapping project. This was accomplished by summarizing the project objectives, methodologies, and results. The most useful output projects were overlays derived from the integration of digital terrain data and Landsat classification results. Specific overlays included: potential pinyon/juniper chaining areas, potential sagebrush treatment areas, potential desert bighorn sheep habitat, potential antelope habitat, potential mule deer winter and summer range and potential grazing suitability by slope. These output products were considered to have immediate utility in their planning process. Continued studies will be conducted to evaluate other uses of the digital data set when combined with other ancillary data (e.g., access zones, precipitation zones, soils data, and hydrology). Based on the very positive reaction of the BLM personnel, this project and its output products have led to increased user acceptance of Landsat data within the BLM. It illustrates that such data when input to a geobased information system can be useful to other land managing agencies.

REMOTE SENSING TRAINING COURSE, NAIROBI, KENYA: EDC personnel participated in a 3-week remote sensing training course conducted in Nairobi, Kenya. The course provided an introduction to remote sensing and emphasized applications to forest and range management problems. The course was sponsored by the Agency for International Development (AID) and the Kenya Regional Ecological Monitoring Unit (KREMU). There were 20 students in the course, representing 8 African countries (Kenya, Tanzania, Sudan, Rwanda, Swaziland, Botswana, Somalia, and Uganda). AID operates a Regional Remote Sensing Facility and in addition to offering training courses, maintains a browse file which contains representative Landsat scene locations in East Africa. East African resource managers can order black-and-white Landsat images directly from the Regional Remote Sensing Facility.

AUSTRALIAN LANDSAT ACTIVITIES: An EDC representative visited remote sensing scientists and facilities in Western Australia and New South Wales, in order to learn how the Australians are utilizing Landsat imagery for rangeland assessment and other applications. Agencies and personnel visited in Western Australia include: Department of Agriculture, Department of Lands and Surveys (point of contact for all remote sensing activities in Western Australia), and the Commonwealth Scientific and Industrial Research Organization (CSIRO), Land Resources Management Division. The latter is using digital analysis equipment for rangeland classification and change detection monitoring. A visit was also made to the remote sensing facility operated by Division of Mineral Physics (CSIRO) in Sydney. At the present time, the Australian Landsat receiving station is acquiring digital data and they expect their processing facility to be operating in March 1980. The Australians are presently using Photowrite equipment to generate their own film masters, often at a scale of 1:500,000 from which they are printing hardcopy images at scales up to 1:100,000. The Australians are planning to produce contrast enhanced images as their standard product once their processing facility is operational.

COSTA RICA NATIONAL WILDLIFE REFUGE: A representative from the U.S. Fish and Wildlife Service visited EDC in preparation for his trip to Costa Rica. The U.S. will be advising the Costa Rican Government in the development of their first national wildlife refuge. Digitally enhanced and enlarged Landsat imagery of Costa Rica was purchased for manual interpretation of wildlife habitat and refuge planning.

GEOSAT/NASA TEST CASE PROGRAM: At the request of NASA management, a day-long activity and progress review meeting for the Joint Geosat/NASA Test Case Program was held at NASA Headquarters on December 4. The meeting was organized and chaired by EDC Geoscience personnel. The meeting included: (1) a review of the history and objectives of the Test Case Program; (2) a discussion by the chairman of the prophyry copper, uranium, and oil and gas subpanels on the occurrence and economic significance of these commodities selected for the Test Case Program study; and (3) detailed reviews by site team representatives of the activities and progress of the studies being carried out at the 8 test sites. The meeting was attended by more than 50 representatives from NASA, the Department of Interior, private industry, and foreign government agencies.

NASA/EROS LANDSAT PROGRAM REVIEW WORKING GROUP MEETING: EDC personnel participated in the Eighth NASA/EROS Landsat Program Review Working Group meeting held December 11, 1979, at the USGS National Center. Subjects discussed during the meeting included Landsat 2 and 3 status; status of the GSFC Image Processing Facility (IPF); MSS, RBV, and CCT backlog at GSFC and plans for backlog workoff; EDC EDIPS status; problems with Landsat data converted to film via the EBR but not processed through the GSFC digital system; HOM vs. SOM map projection; plan for converting Landsat historical data to CCT's; etc. The next meeting will be held at NASA Headquarters March 19, 1980.

EROS DIGITAL IMAGE PROCESSING SYSTEM (EDIPS): Approximately 2,540 scenes of Landsat MSS data were processed through EDIPS and added to the Main Image File in December. The EDIPS end-of-month backlog consisted of 317 scenes. GSFC is currently planning to start digitally processing RBV data in February 1980. In lieu of digitally processing RBV data in the meantime, GSFC is converting the RBV backlog to film. Modification for the EDIPS upgrade continues on schedule. A review of the software requirements for the upgrade was held at TRW during this reporting period.

DATA PRODUCTION AND SALES: Shipped reimbursable sales for October through December were \$846,640, with December closing out at \$228,350. The Work-In-Process is currently at \$207,856, of which \$105,300 represents backlogged CCT orders. Turnaround time for retrospective CCT's from NASA/GSFC is presently averaging about 64 days (due to Goddard's throughput capability of the IPF). Average turnaround time for imagery production has been running about 12 days at EDC.

ALASKAN ACTIVITY: Ninety-four visitors made use of the facility during this month. Data ordered from EDC amounted to \$5,266. Worked with the Office of the Governor regarding enlargements of U-2 photography of the Delta area to aid the Department of Transportation in planning road construction in newly developed areas there. Participated in a meeting in Anchorage of a subcommittee of the Committee on Natural Resources Information Management (CONRIM) to discuss various remote sensing projects within the state and the problem of funding for new and existing projects. Another meeting will be held in December. Twenty-one fifth graders from Ft. Wainwright and 19 eighth graders from Immaculate Conception School (ICS) toured the facility this month. The teacher from ICS asked for assistance later in the year when she plans an extensive study of satellite remote sensing for her students.

NSTL ACTIVITY: Approximately 100 individuals visited the facility this month, including: Twenty-six high school students from a private military school in Covington, Louisiana; three members of the COE District Office at Vicksburg, MS, regarding manual interpretation of Mississippi River flood plains and manual quantification of small land parcels. A comparison of manual vs. machine compilation with field data indicated a considerable improvement in accuracy using manual techniques originally developed by this facility for use by the U.S. Fish and Wildlife Service; Prof. Romans, LSU Geology Department, three State geologists, and Mr. Ray Wallace of the

Gulf Coast Hydrosience Center regarding the utility of Landsat unenhanced data products for petroleum exploration; and Mr. Lee Jennings and a lawyer for the State of Louisiana reviewed imagery availability for a "wetland" site in Louisiana which will be used as a test case to determine a Federal legal definition of wetlands in order to effect more equitable administration of these laws. Addressed 18 Corps of Engineers personnel who were participating in a remote sensing workshop at LSU. Discussed EROS/AAF and NCIC services available at NSTL and various applications of Landsat data using manual image analysis techniques during a NASA-sponsored workshop.

