

Transition Team Paper on the EROS Data CenterOBJECTIVES

The purpose of this document is to:

1. Provide information on the history and programs of the EROS Data Center and on the budget and funding problems which currently threaten the future of the Center.
2. Outline a near-term legislative, administrative, and technical strategy that would lead to resolution of existing funding problems and to the long-term viability of the EROS Data Center as an important component of U.S. earth science and global change programs.

BACKGROUND INFORMATION

The Department of the Interior established the Earth Resources Observation Systems (EROS) program in 1966 and placed management responsibility for the program in the USGS. The EROS Data Center was established in Sioux Falls, South Dakota, in 1971 to archive and distribute NASA land remote sensing satellite data and for applications development and training associated with Department of the Interior use of remotely sensed data. The present facilities outside Sioux Falls were completed in 1973. Under a 20-year lease-purchase agreement, the USGS will gain full ownership of the facility in 1993. In 1983, EDC was assigned organizationally to the USGS National Mapping Division and is now a major field center of that division.

In 1979, Presidential Directive (NSC-54) assigned to NOAA the management responsibility for civil operational land remote sensing activities in addition to its ongoing atmospheric and oceanic responsibilities. In FY 1983, responsibility for the management of Landsat multispectral data handling was transferred from USGS to NOAA with the understanding that EDC would continue to provide support services with NOAA funding. Budget authority and sales revenues were also transferred to the Department of Commerce.

Under the provisions of the Land Remote Sensing Commercialization Act of 1984 (P.L. 98-365) EDC has been receiving funds from NOAA to maintain, reproduce, and distribute Landsat data for EOSAT, the commercial operator of the Landsat system. Since 1986, EOSAT has received all revenue from the sale of Landsat data.

Since the establishment of the EROS Data Center in 1971, the programs and activities have become significantly broader and have expanded beyond the initial archiving and distribution of NASA land remote sensing satellite data. Currently, about

one-third of the Center's resources are devoted to Landsat-related activities, while the remaining two-thirds are devoted to the production and distribution of earth science data, aerial photography, and other types of remotely sensed data; research in remote sensing and spatial data analysis; applications development; and user education.

EDC produces and distributes specialized image map products and conducts research to improve data processing techniques and geographic information systems (GIS), which assist land managers in making land-use planning decisions. EDC accesses, archives, and distributes aircraft and civil satellite land remote sensing data, and provides analytical services to a wide variety of data users. Scientists and technicians at EDC carry out a broad program of research and development of advanced information systems employing remote sensing, cartographic, and digital earth science data.

In 1986, the USGS and NOAA signed a Memorandum of Agreement (MOA) covering establishment at EDC of a National Satellite Land Remote Sensing Data Archive, called for by P.L. 98-365, and associated Federal research activities, and on March 16, 1988, USGS and NASA signed a Memorandum of Understanding (MOU) covering use of EDC for processing, distributing, and archiving land remote sensing data acquired by NASA's research and development and experimental activities. Implementation plans are now being developed.

CURRENT PROGRAMS AND FUNDING

U.S. Geological Survey. The EROS Data Center conducts a core program, consisting of a mix of activities, in support of the USGS mission. Such activities include aerial photography storage and reproduction, advanced digital cartographic software (Mark II) development, data digitizing, image processing research, data management software development, as well as activities that support the broader interests of the Survey, such as earth science data dissemination and geographic information systems technology development. To conduct this core program EDC annually receives approximately \$8-9 million of appropriated funds from the USGS. In addition, EDC receives approximately \$1.5 million from annual reimbursable sales of aerial and space photography, cartographic data, and earth science data.

In recent years, EDC has become increasingly vulnerable as a target for budget cuts. For example, EDC faced a \$2 million reduction in USGS funding in FY 1988 and a \$1.5 million reduction in FY 1989. These reductions were largely restored through Congressional action.

Other DOI Bureaus. During the past 15 years, EDC has cooperated closely with a number of DOI bureaus and offices, especially in conducting cooperative applications projects and in assisting DOI

organizations in developing and integrating remote sensing and GIS technology and techniques with their programs. Funds received by EDC for these activities have varied from year to year, but were approximately \$200,000 in FY 1988.

National Oceanic and Atmospheric Administration (NOAA). In FY 1988, EDC received \$5.2 million from NOAA to archive, reproduce, and distribute Landsat data for EOSAT. That amount was down from the \$6.7 million received in FY 1987. EDC will receive only \$0.75 million to perform Landsat operations support functions for the first 6 months of FY 1989. An additional \$0.75 million may be provided by NOAA in the second half of FY 1989 if the Landsat satellites continue to operate and if NOAA receives additional funding for Landsat 4/5 operations.

As a result of a Congressionally initiated reprogramming, NOAA will receive, and provide to EDC, \$3.0 million in FY 1989 to be used to meet responsibilities given to NOAA by P.L. 98-365 for the historical preservation (archiving) of Landsat data. Under a 1986 Memorandum of Agreement, NOAA and the USGS established the National Satellite Land Remote Sensing Data Archive at EDC to meet P.L. 98-365 requirements for data preservation. The FY 1989 reprogramming was a one-time opportunity. NOAA has clearly indicated that it will provide no funds beyond FY 1989 to operate the Archive.

In summary then, EDC will receive \$3.75 million (and possibly \$4.5 million) in FY 1989 from NOAA for Landsat-related activities, including EOSAT support and data archiving. However, in FY 1990 that number may go to zero.

National Aeronautics and Space Administration (NASA). EDC has a history of cooperation with NASA that dates back to 1971 when the Center was established to archive and distribute NASA satellite and aircraft data. In the intervening years, the two organizations have cooperated in many areas including image processing and analysis software development, computer networking, preservation of historical data, remote sensing research activities, and others. With the exception of support for EDC scientists participating in formal NASA research programs, NASA has provided little direct funding for EDC programs in recent years. With the recent signing of the USGS/NASA MOU for Experimental Land Remotely Sensed Data Processing, Distribution, Archiving, and Related Science Support that situation may change.

Consistent with that agreement, NASA has proposed a near-term role in which EDC would archive NASA aircraft and shuttle data, including Airborne Visible and Infrared Imaging Spectrometer (AVIRIS), Thermal Infrared Multispectral Scanner (TIMS), and Synthetic Aperture Radar (SAR) aircraft data. Such activities would provide beneficial interaction and experience in preparation for handling similar data later in the mid-1990's.

The MOU specifies the USGS and EDC role in the planned Earth Observing System (EOS), which is scheduled to be flown in conjunction with the NASA Earth Orbiting Space Station. Current discussions indicate that EDC activities could double in size by FY 1995 because of EOS-related efforts, including equipment to support EOS operations. The EOS sensors will work at very high data rates, and the resulting large volumes of land remote sensing data will require extensive processing and archiving capabilities. The USGS will have a significant role in assisting NASA in the design of the sensors needed for gathering the basic earth-science data sets. In addition to the equipment, potential exists for significant funding to support EOS operations at EDC. NASA funding support of EDC activities would start in FY 1991.

Agency for International Development/Department of State (AID/DOS). In 1987, EDC initiated an International Activities Program in cooperation with AID to provide technical assistance in remote sensing and GIS applications for resource assessment and monitoring in less developed regions and countries of the world. This highly successful and expanding program provides developing countries with timely and accurate geographic and cartographic information describing the location, condition, and extent of resource assets, so that problems such as food shortages, drought, deforestation, and others can be rapidly assessed and appropriately addressed. The program's goal is to make the tools and techniques useful to the nations involved and to transfer them to those nations for independent use.

Activities of this program are fully reimbursed by AID, who provided more than \$230,000 in FY 1987 and approximately \$800,000 in FY 1988. AID funds to the Center in FY 1989 are expected to exceed \$1 million.

Department of Defense and Intelligence Community. EDC cooperates with and otherwise assists DOD and the intelligence community in their exploitation of civil land remote sensing satellite data and GIS technology for military and intelligence purposes. Assistance includes data acquisition, data cataloging and indexing, data processing, software development, product generation, data analysis, applications development, research and development, and training and technology transfer. Reimbursable funding received by EDC for these activities was approximately \$325,000 in FY 1988.

Other Federal Agencies. EDC has a history of cooperation and assistance in support of programs of other Federal agencies, most notably within the Department of Agriculture. Such support includes providing custom products, software services, satellite data ordering services through blanket USGS procurement contracts with EOSAT and SPOT Image Corporation for Landsat and SPOT data, and other general support of remote sensing and GIS applications. In recent years, EDC has received something over \$300,000 per year from other Federal agencies for these support services.

The funding history for EDC's recent past, as well as projections for the current fiscal year are summarized in the following table. The funding outlook for FY 1990 is still uncertain, however, total revenues to EDC may be nearly \$4 million less than in FY 1989, primarily due to termination of NOAA funding.

(in \$ millions)

	<u>FY 1987</u>	<u>FY 1988</u>	<u>FY 1989</u>
USGS	8.9	8.1	8.6
Data Sales (non-Landsat)	1.5	1.6	1.7
NOAA	6.7	5.2	3.7
NASA	0.1	0.1	0.1
AID	0.2	0.8	1.0
Other Agencies (including DOD)	<u>0.8</u>	<u>0.9</u>	<u>1.6</u>
	18.2	16.7	16.7

GOALS FOR THE FUTURE

The attributes which characterize the EROS Data Center, especially the Center's scientific and technical expertise, its broad interdisciplinary and interagency programmatic experience, and its technical facilities, represent capabilities in land remote sensing, earth science data handling, and the interdisciplinary study of the Earth that are unique. These attributes represent capabilities from which many Federal agencies and programs could derive substantial, cost-effective benefit. Consequently, the principal recommendation of the recent "Report to Congress on Program Alternatives for the EROS Data Center" was that EDC should become the integral core participant of a well-defined multi-agency activity in remote sensing and earth science data archiving, data management, research, and data analysis. Therefore, one major goal for the future is to establish and implement such a multiagency program that will support and enhance the wide-ranging programs of organizations involved in remote sensing and earth science activities.

The attributes which characterize EDC also represent capabilities that are critical to successful implementation of the emerging large-scale cooperative global change programs of NASA, NOAA, USGS, NSF, and others. These programs will address global climate and environmental changes which are not yet well understood, but which have strong implications for mankind's long-term survival on this planet.

In a recent letter to Dr. Dallas L. Peck, Chairman of the Committee on Earth Sciences, Dr. Thomas N. Pyke, Jr., Chairman of the Interagency Working Group on Data Management for Global Change, makes the following statements:

"Understanding global change will require application of long-term, global observations for a number of variables. Current applicable data need to be preserved, new data requirements identified and provided for, and the availability of these data assured to all scientists in an easily accessible and operationally useful format if the program is to be successful.... Of particular concern to the Interagency Working Group and the earth science community is the identification of a capability to preserve, maintain, and make available land-related data needed for global change activities. As you know, that expertise and capability currently exists in the U.S. Geological Survey's (USGS) EROS Data Center (EDC) in Sioux Falls, South Dakota. EDC has served as one of the Nation's largest earth science data archiving, processing, and distribution facilities for over 15 years, providing the scientific community with global earth-observation data and information from the Landsat program and other aerial photographic and digital cartographic data.... Consistent with Interagency Working Group plans to build on existing capabilities where possible, the Group recommends that the USGS EROS Data Center be assigned the responsibility for managing, developing, implementing, and operating a Land Data and Information Management System in support of the U.S. Global Change Program."

Therefore, a second important future goal for EDC is to maintain and enhance existing and develop and implement new data acquisition, data processing, data analysis and interpretation, and data management capabilities that will lead to the establishment and operation of a National Land Data and Information Management System at EDC for the support of U.S. global change programs.

STRATEGY FOR ACHIEVING FUTURE GOALS

Realization of the two major goals described in the previous section will lead to the long-term viability of the EROS Data Center as an important component of U.S. remote sensing and earth science programs. However, without resolution of existing funding problems, the future of the Center remains in jeopardy, as are the many programmatic benefits that a strong EROS Data Center would help achieve. Specific actions need to be taken during the next several months in order to preserve the EROS Data Center and enhance its value to a wide range of important programs and activities. Listed and briefly discussed below are

several tangible actions that are proposed as the basis of a near-term strategy to help achieve the future goals identified for EDC in this paper.

- * USGS appropriated baseline funding at the level of \$8-10 million per year must be maintained. Such appropriated funds are the cornerstone upon which a multiagency program, including reimbursable income activities, can be built. These funds are required to maintain the facilities, capabilities, and expertise that support the USGS core program and that will support increasing numbers of multiagency program activities.
- * Bilateral programs should be continued and expanded. The multiagency program will benefit ultimately from all technological and scientific advancements that are achieved through cooperative programs like those EDC has conducted in the past with various agencies. Consequently, cooperative activities such as those with AID and DOD, that show strong potential for substantial funding growth as well as for scientific and technical success, should be expanded in the short term. Specifically, a strategy must be developed to expand the cooperative activities between EDC and DOD/Intelligence community agencies to utilize the extensive resources and capabilities at EDC to meet their civil satellite data requirements.
- * An organizational and management environment that encourages growth of the multiagency program must be provided. Reimbursable funding strategies that are acceptable and attractive to cooperative agencies must be implemented.
- * Amend P.L. 98-365 to transfer responsibility for long-term preservation of land remote sensing data from NOAA to the USGS. NOAA is unwilling or unable to provide funds to meet their responsibilities to operate and populate the National Satellite Land Remote Sensing Data Archive, and the USGS has no legal authority to do so even if it were so inclined. Furthermore, without FY 1990 funding, 16 years of irreplaceable historical Landsat data are in danger of being destroyed. The public must be fully informed of and educated on this pending action to generate a ground swell of support to do whatever is required to ensure preservation of these data. Action taken to transfer responsibility for the Archive to the USGS must include identifying funds to operate the Archive and acquire data to be placed in it.
- * In 1986, the USGS and NOAA established Cooperative Federal Land Remote Sensing Research Program at the EROS Data Center to conduct research, development, and other

activities that will enhance the application and utilization of remotely sensed data and advance the capabilities of remote sensing as a cost effective tool that can be usefully applied in multidisciplinary research and operational investigations. Consistent with P.L. 98-365, DOI should seek to broaden its active participation in the Cooperative Research Program and seek opportunities for cooperative studies with other agencies that have interest in global earth science studies. The opportunities of this program need to be made known more widely, and the possibility of using the program as a mechanism to help implement the multiagency activity should be fully investigated.

- * The implementation plan called for in the USGS/NASA MOU for Experimental Land Remotely Sensed Data Processing, Distribution, Archiving, and Related Science Support should be prepared in full awareness of EDC's short-term funding problems. A broad and meaningful role for EDC in the EOS timeframe should be defined by that document. However, of equal importance will be definition of tangible activities, such as AVIRIS data processing and distribution, that have the potential for carrying with them funds to ease the Center's short-term budget problems. NASA must recognize that in order to preserve critical capabilities for FY 1991 and beyond, funding is required to cover the potential FY 1990 shortfall.
- * Establish an appropriate mechanism to identify and address technical and budgetary requirements for establishing and operating a Land Data and Information Management System. A possible mechanism would be an interagency committee with members from NASA, NOAA, USGS, NSF, and others with major global change programs who would be specifically charged with developing an implementation plan for the Data and Information Management System. Of highest priority would be development of a strategy, which might include an OMB "cross-cut" exercise, whereby FY 1990 funds could be made available from the participating agencies for initial development and implementation work at EDC.

SUMMARY AND CONCLUSIONS

The EROS Data Center is a unique facility whose expertise and capabilities make it a potentially important resource to a wide range of Federal agencies and programs that deal with earth science and earth resource issues. It is a potentially important resource as an earth science data and information center designed to meet basic needs of emerging programs on global change. However, the Center's future and its potential value to other agencies and programs is jeopardized by an uncertain funding future.

The USGS has identified EDC goals for the future that will enhance the Center's value to many Federal agencies, to important earth resource programs, and especially to emerging global change programs. Realization of these goals will require additional funds and the implementation of certain key steps. These include maintaining USGS baseline funding of \$8-10 million for key activities and capabilities; expansion of cooperative activities between EDC and other Federal agencies to enhance long-term multiagency support capabilities; transfer of the responsibility for long-term preservation of historical land remote sensing data from NOAA to the USGS, and identification of sufficient funds to meet that responsibility; definition and implementation of substantial short- and long-term roles for EDC in processing, archiving, and distributing land data from EOS and other NASA experimental sensors; and generation of interagency funding support for establishing a Land Data and Information Management System to support multiagency global change programs.