

National Satellite Land Remote Sensing Data Archive

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BACKGROUND

For over three decades, satellite sensors have collected data of the Earth's land surface, providing information for monitoring global, regional, and local changes in our natural resources and environment. Only with satellites, which can cover large areas of the globe at regular intervals, is it practical to quickly understand such developments as deforestation, desertification, environmental contamination, and natural hazards. Temporal comparisons of satellite images can make these phenomena quite clear. Aside from the larger question of change at the global scale, these data provide information to scientists studying water, energy, and mineral resources problems, to help protect environmental quality, and to contribute to prudent, orderly management and development of our Nation's natural resources. These data have accumulated, constituting historical records that should be archived and made available to a broad user community. Recognizing the importance of preserving these data, Congress directed the Department of Interior to create the *National Satellite Land Remote Sensing Data Archive* (Public Law 102-555), a permanent government archive of land satellite data. Formally established in 1992, the archive is housed in, and managed by, the U.S. Geological Survey (USGS) EROS Data Center (EDC) near Sioux Falls, South Dakota.

ARCHIVE HOLDINGS

EDC has archived, managed, and distributed land remote sensing data and other Earth surface data since 1972. A large collection of data, including Landsat TM and MSS and NOAA's Advanced Very High Resolution Radiometer (AVHRR), were already archived at the Center before Congress ensured its longevity by establishing the *National Satellite Land Remote Sensing Data Archive*. Over the past three decades the Nation has invested more than \$3 billion to acquire and distribute data worldwide from the Landsat series of satellites, more than 120,000 gigabytes of which are held at the EROS Data Center. This collection from Landsats 1 through 5 forms the core of the national archive. The archive also includes more than 12,000 gigabytes of AVHRR data, and more than 880,000 declassified intelligence satellite photographs. By 2001, holdings will include data from: Landsat 7; NASA's MODIS instrument; ASTER, a cooperative effort between NASA and Japan's Ministry of International Trade and Industry; the Shuttle Radar Topography Mission (SRTM), a joint venture of NASA and the National Imagery and Mapping Agency; LightSAR, a NASA synthetic-aperture radar instrument; and, NASA's Small Spacecraft Technology Initiative (SSTI), including both the *Lewis* and *Clark* small satellites. By 2005, the collection will grow to approximately 2,400,000 gigabytes of data.

CHALLENGE

Managing the exponential growth of these holdings is a daunting task, but is only the beginning of the challenge emerging over the next decade. The challenge is compounded by the archive's primary objective to distribute data on demand to a global community of scientific users.

EDC is a world leader not only in archiving techniques for remotely sensed data, but also in delivering data to end users quickly, in forms they can use, at costs they can bear. Every advance in online distribution, in storage media, in applications research, or in cost saving delivery technologies equates to more users. As demand increases and user expectations about delivery times and efficiency rise, the challenge is to meet these demands and expectations. An important element in addressing these challenges is to establish partnerships with other government agencies, the private sector, and international organizations.

DATA MIGRATION

Public Law 102-555 requires the U.S. Department of Interior, specifically USGS-EDC, to maintain Landsat and other land remote sensing data for long-term scientific analysis and study. To ensure these data are available in the future, EDC embarked on a major program in 1990 to transfer all U.S. Landsat data to a new storage medium. After evaluating several types of archival media, the Digital Cassette Recording System-incremental (DCRSi) technology was selected for its reliability, low cost, high data density (48 gigabytes/cassette) and high transfer rates (107 megabits/second).

The TM/MSS Archive Conversion System (TMACS) began converting the 1979 to 1992 MSS data in December 1992, followed by the 1982 to 1992 TM data in November 1993. A major milestone was recently achieved when all Landsat data acquired by the U.S. between 1979 and 1992 (352,733 MSS scenes and 320,499 TM scenes) were successfully transferred to digital cassette tape. Over 120,000 scenes previously unprocessed and uncatalogued, were processed, inspected, and catalogued during the conversion. These new TM scenes are now referenced in the Global Land Information System (GLIS) and are available from USGS-EDC. Throughout the conversion process, data on aging tapes suffering from a hydrolysis problem were recovered using a baking process at 55°C for 24 hours. So far, EDC has a 100% success rate in recovering data from affected tapes.

ACCESSING THE ARCHIVE

Information on data in the archive can be obtained online by using GLIS. Users can search for, and access metadata, and place orders for images interactively. Released in 1991, GLIS is an interactive source of information for land remote sensing and other Earth surface data. In its World Wide Web version, it includes some browse, search, and order capabilities for various data sets. The GLIS web address is <http://edcwww.cr.usgs.gov/webglis/>.

CONCLUSION

The archive is a national resource for environmental research, land management, natural hazard analysis, and resource development, with applications that extend well beyond America's borders. The worldwide community of archive users includes personnel in federal, state, and local governments, academia, and private enterprise. All have an acute interest in the assured availability of data. No other national resource provides as much global, repetitive, multispectral, calibrated digital data from a single archive. The *National Satellite Land Remote Sensing Data Archive* resources compose a baseline chronology of change, both natural and human-induced, that make it invaluable for scientific assessment and prediction.