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# Landsat Update - Volume 1, Issue 4, 2007

## Landsat Science Team Spotlight

**Prasad S. Thenkabail**
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Prasad S. Thenkabail, an American National, has 23 years' experience working as an international expert in Remote Sensing and Geographic Information Systems (RS/GIS) and its applications to natural resources management, sustainable development, and environmental studies. He has visited and worked in over 25 countries in Africa, Asia, the Middle East, and North America.

During the last 4 years, Thenkabail has worked for IWMI as a principal researcher of the Global Research Division. Currently, he is the head of the RS/GIS & Natural Resource Management Group. In this position he works globally, mostly in economically developing countries, providing leadership for various projects and in spatial data applications for thematic research. Projects he has led include global irrigated area mapping (GIAM), droughts (remote sensing component), wetland mapping, knowledge base systems for Sri Lanka (KBS-Lanka), and water productivity studies. All of the projects involve heavy use of spatial datasets, especially satellite sensor data. Thenkabail has led the development and launch of the following Web portals: IWMI Data Storehouse Pathway (http://www.iwmidsp.org), Global Irrigated Area Mapping (http://www.iwmigiam.org), and KBS-Lanka (http://www.iwmikbs.org). He has contributed significantly to the IWMI Drought Monitoring System (http://dms.iwmi.org) and Tsunami Satellite sensor Data Catalogue (http://tsdc.iwmi.org).

Thenkabail is an editor for the Remote Sensing of Environment journal. He is also one of the associate editors-in-chief of the Journal of Spatial Hydrology (JoSH). In June 2007, Thenkabail's team was recognized by the Environmental Systems Research Institute (ESRI) for "Special Achievement in GIS" (SAG award) for their Tsunami-related work and for their innovative spatial data portal (http://www.iwmidsp.org) and science applications (http://www.iwmigiam.org).

## Did you know...

**Can you determine which spectral bands would be best to use?**

This question is asked by all users of remotely sensed data. The level of detail (spatial resolution) is often the most considered aspect of using a satellite image. Less appreciated is how land surfaces reflect irradiative energy differently and how to use this information to identify features of interest.

Scientists at the U.S. Geolocial Survey (USGS) Center for Earth Resources Observation and Science (EROS) developed an interactive tool that helps visualize how the bands on different satellite sensors measure the intensity (relative spectral response -RSR) of wavelengths (colors) of light By overlaying the spectral curves from different features (spectra), you can determine which bands of the selected sensor will work for your application.

Check out the Spectral Characteristics Viewer! http://ldcm.usgs.gov/viewer.php

## Shoemaker Awards for External Communications

The Shoemaker Awards for External Communications recognize USGS products that demonstrate extraordinary effectiveness in communicating and translating complex scientific concepts and discoveries into words and pictures that capture the interest and imagination of the American public. The judges are communicators, designers, and scientists from the public and private sector.

This year USGS and SAIC employees located at EROS were recipients of this prestigious award for their work on the EarthNow! Landsat Image Viewer (http://earthnow.usgs.gov) and the Smithsonian Institution's Earth from Space traveling exhibit (http://www.earthfromspace.si.edu/).

# How fast do Landsat users need their data?

## More results from the USGS non-Federal customer satisfaction survey

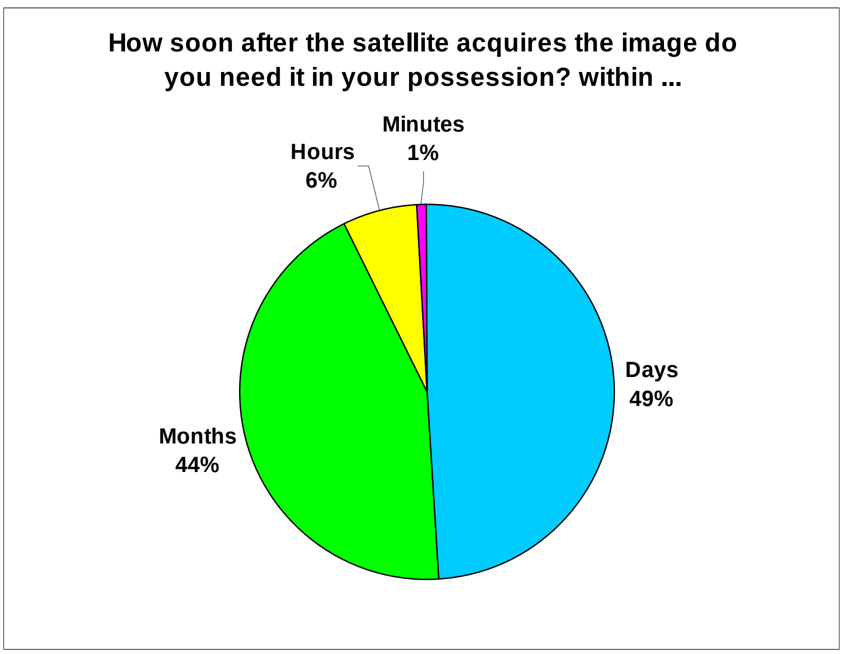
The article on the "Landsat Non-Federal Customer Satisfaction Survey" in the last issue focused on users' satisfaction with the accuracy of Landsat data. In that same survey, we also asked users how quickly they need the data, how satisfied they are with delivery times, and what are the impacts if the data are not received in the time frame they require.

We asked data users about two different time factors of concern to Landsat Data Continuity Mission (LDCM) mission planners:

1. How soon after the satellite acquires the image do you need it in your possession?
2. How soon after you place the order do you need it in your possession?

For both questions, no preset values were given—we allowed users to write in a value and indicate the units (minutes, hours, days, or months). Most users did not write in a number, but they did select the unit of time, which gives a general indication of how quickly they need the image/data.

The response to the first question is shown in the chart below. Of the 225 non-Federal users who responded to this question, 93 percent indicated they need the data within days or months after the satellite acquires the data. Only 6 percent of the users indicated they need it within hours, and 1 percent requested data within minutes.




Another timeline of concern—once users have ordered the data, how quickly do they expect delivery? The respondents' answer to this question is shown in the chart below. A similar color scheme is used to compare customer expectations for the two timelines.


From these two charts, the following points are evident:

▪ It appears that, for most of these users, it is acceptable to take days (48 hours or more) after image acquisition to process the data and make it available for ordering.

▪ Users expect a more rapid response to their requests; however, it is still acceptable to most of these users to take days (over 24 hours) to fulfill an order request.

▪ A small percentage of users need the data quickly after acquisition, and failure to meet that need can have a big impact. We asked survey respondents, "What is the impact if the data does not arrive within your required time?" Some of the more time-sensitive responses we received were:

o "After a hurricane [I would] have problems, in other time[s] [it] is not much [of a] problem"

o "Because I work with irrigation areas [it] is very important to obtain the images as soon as possible. This [is] in order to provide support in farm management in near real time."

o "…based on a TM image taken on a Monday, we may make decisions regarding recreation, livestock grazing, fire threats, etc., on a Wednesday afternoon 2 days later. So time would be critical in that instance."

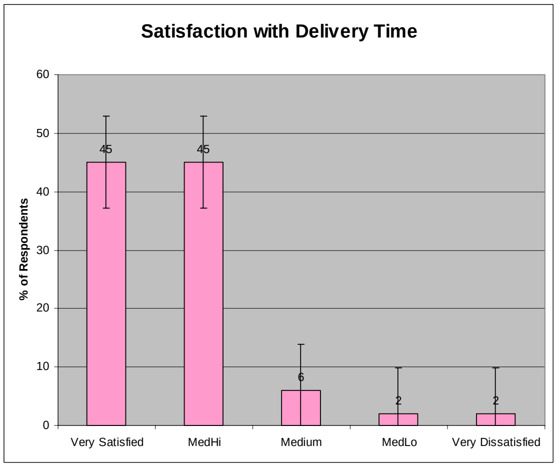
o "For my primary project, delivery impacts time for analysis and timely dissemination of results that have potential economic and legal ramifications."

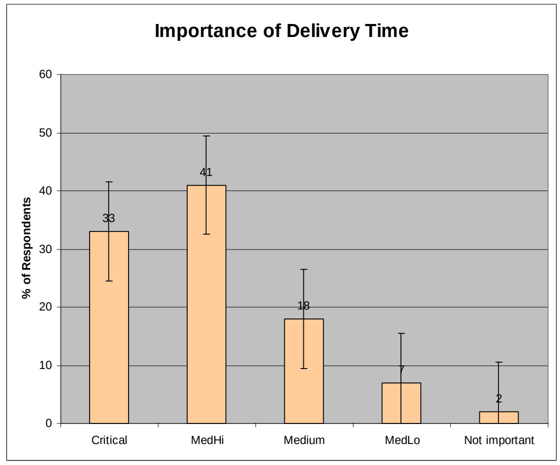
o "We are also experimenting with using Landsat in part of rapid federal assessments of forest damage due to catastrophic storms. This type of application requires imagery within about a day of acquisition."

We also asked users to rate their satisfaction and the importance of current Landsat data delivery times on a scale of 1 to 5, where 1 is high and 5 is low. Results are shown in the charts below.

▪ The mean satisfaction rating was 1.69, with a standard deviation of 0.8.

▪ The mean importance rating was 2.08, with a standard deviation of 0.97.






While users appear to be satisfied with current data delivery times, the mean importance rating seems to be larger than the satisfaction rating. From many of the comments users gave when asked about the impact of delivery times, it appears that users would certainly benefit from and appreciate faster turnaround times from image collection through data processing, production request, and delivery. We also need to take into account the more time-critical applications of the data, such as disaster response and operational land management.

## What is USGS doing to improve delivery times?

The Landsat Data Continuity Mission (LDCM) is formulating requirements for a system that will process and make LDCM data available for users to download within 24 hours of acquisition. This system will improve upon the delivery time users experience today and support time-critical applications in a more automated way.

In the meantime, efforts are under way at USGS EROS to make all newly acquired Landsat 7 cloud-free data available within 12 hours of reception.

# Tambora, Sumbawa, Indonesia

**Article reference from online source: VolcanoWorld**
http://volcano.und.edu/vwdocs/volc_images/southeast_asia/indonesia/tambora.html

**Location:** 8.3S, 118.0E;  **Path** 115, **Row** 66
**Elevation:** 9,348 feet (2,850 m)

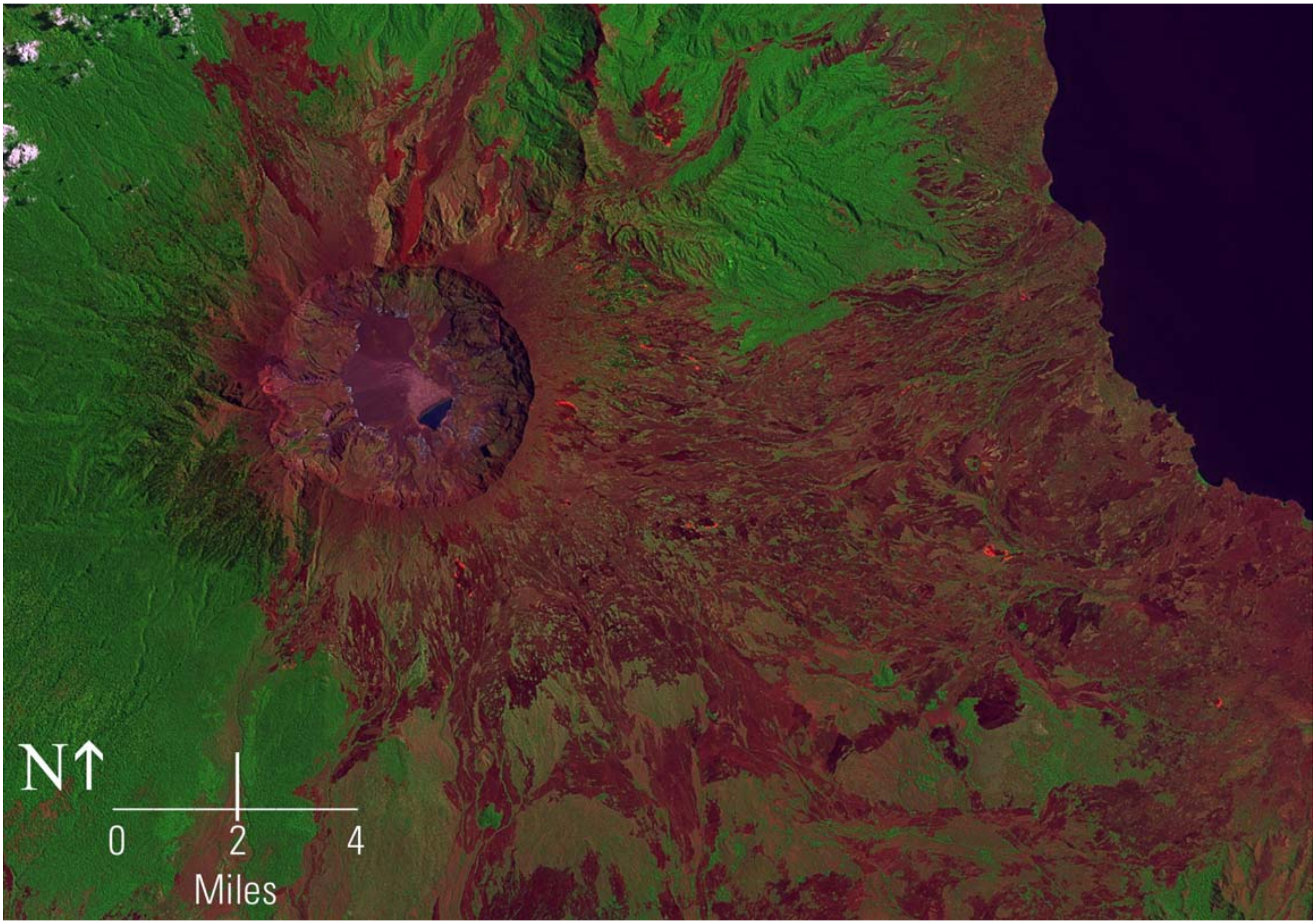


**fig. 1.  Mt. Tambora.  Landsat 7 SLC-on; September 13, 2000**

**Mount Tambora** (or **Tomboro**) is an active strata volcano on Sumbawa Island, Indonesia. Sumbawa Island is part of the Lesser Sunda Islands, which is a segment of the Sunda Arc, a string of volcanic islands that form the southern chain of the Indonesian archipelago.

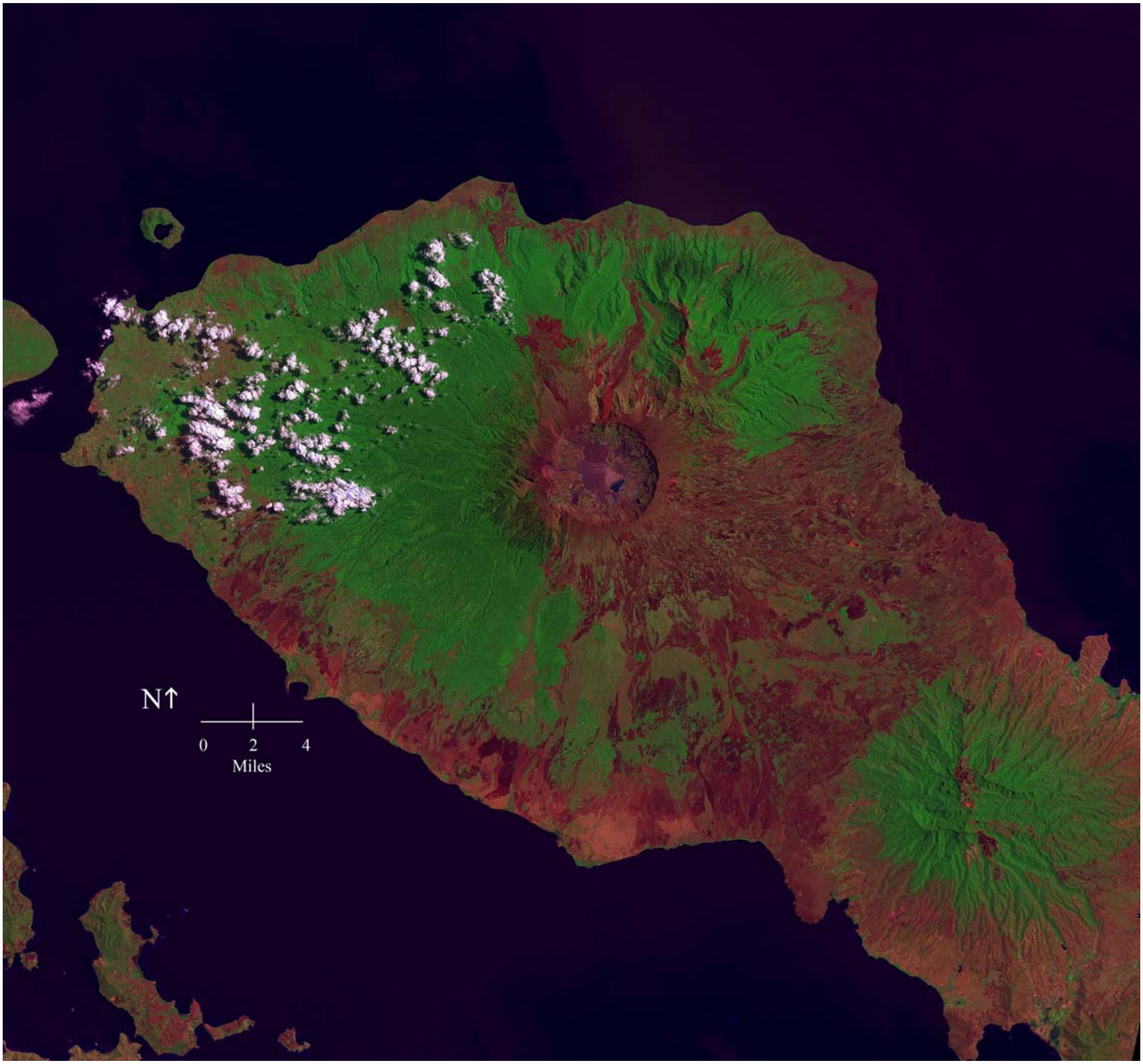


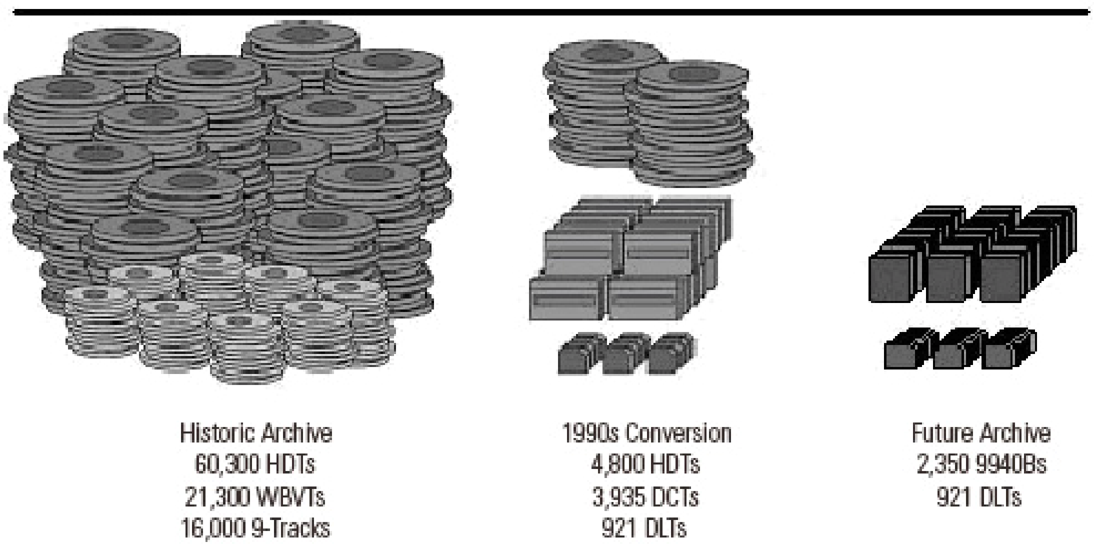
**fig. 2. Sanggar Peninsula. Landsat 7 SLC-on; September 13, 2000**

Tambora erupted in 1815 with a rating of seven on the Volcanic Explosivity Index. The explosion was heard on Sumatra Island more than 2,000 km (1,200 mi) away. Heavy volcanic ash falls were observed as far away as Borneo, Sulawesi, Java, and the Maluku islands.

The death toll was at least 71,000 people, of which 11,000–12,000 were killed directly by the eruption. The eruption created global climate anomalies; 1816 became known as the "Year without a Summer" because of the effect on North American and European weather. Agricultural crops failed and livestock died in much of the Northern Hemisphere, resulting in the worst famine of the 19th century.

## The Evolution of Digital Data Technology

Throughout the years, advances in technology have created opportunities for archives to store more data, while taking less space and resources.




At EROS, the archive began with film…rolls and rolls of film. When the digital revolution hit EROS in 1974, we were at the forefront of technology, using a 9-track tape called the 3420 (fig. 3). The 3420 had a capacity of 150 MB of data, or about half of one Landsat Thematic Mapper (TM) scene. This remarkable piece of technology was in use for 14 years until data was transferred to more updated storage units.

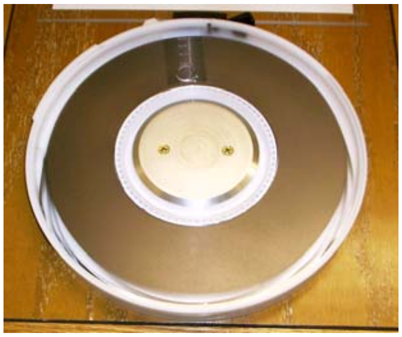


**fig. 3. 3420 9-track tape**

The progression from reel tapes to a pure digital format is an ongoing process. As new technology becomes available, EROS must meet the demands of storing ever-increasing bits of newly acquired data. At the same time, it is vital that the data stored on older forms of equipment get transferred to whatever new technology is being used at the time. Another challenge is to be certain that we retain equipment that can read the older media and successfully interface with the new technology.

| Type | Capacity | Capacity (in scenes) | In Use: |
|---|---|---|---|
| **1)** 3480 Cartridge Tape | 300 MB | 1 TM Scene | 5/1/1990 – Present |
| **2)** 3490 Cartridge Tape | 800 MB | 2.5 TM Scenes | 1/20/1985 – Present |
| **3)** Digital Linear Tape | 35 GB | 116 TM Scenes | 1/31/1996 – Present |
| **4)** High Density Tape | 2 GB | 6 TM Scenes | 11/1/1965 – 11/3/1996 |
| **5)** Digital Cassette Tape | 48 GB | 160 TM Scenes | 3/13/1991 – Present |
| **6)** T9940 Cartridge Tape | 200 GB | 6650 TM Scenes | 3/01/2004 – Present |
| **7)** Compact Disk | 650 MB | 2 TM Scenes | 7/13/1992 – Present |
| **8)** Linear Tape-Open (LTO) | 400/200 MB<br>Compressed/Uncompressed | 12,000/6,000<br>TM Scenes | 6/01/2003 – Present |
| **9)** 8mm Tape | 5.06/2.5 GB<br>High/Low Density | 16/8 TM Scenes | 6/01/1990 – Present |


**1)**


**2)**


**3)**

**4)**

**5)**


**6)**


**7)**


**8)**


**9)**

# Conference Information

## Conferences Attended

*The 2007 IEEE International Geoscience and Remote Sensing Symposium:* July 23–27, 2007

*32nd International Symposium on Remote Sensing of Environment:* June 25–29, 2007

*Society of American Foresters National Convention:* October 23–27, 2007

*American Society for Photogrammetry & Remote Sensing (ASPRS)*
*& the Canadian Remote Sensing Society (CRSS):* October 28–November 1, 2007

*Geological Society of America (GSA):* October 28–31, 2007

## Conferences Scheduled to Attend this Calendar Year

American Geophysical Union
December 10–14, 2007
San Francisco, CA
In support of the USGS exhibit.