Use of Historical Reconnaissance Data in the Long-Term Ecological Research (LTER) Network Program: The Global Fiducial Library.

John Vande Castle, LTER Network Office, updated March 22, 2003

Background:

The Global Fiducial Program, or Library (GFL) resulted from a National Research Council panel which recommended there be a global network of fiducial sites as a tool to address global issues to include, but not limited to sea-level change, tectonic plate motion and other global change issues. The complete findings are summarized in the National Research Council committee report: "International Network of Global Fiducial Stations: Science and Implementation Issues" published in 1991. The committee recommended the "fiducial sites" be located where other geodetic, geophysical and related observations are made.

An initial presentation was made to LTER principal investigators at the 1996 LTER Coordinating Committee meeting regarding potential use of classified data for research purposes. The Committee agreed to participate in the activity by unanimous vote. Since current work requires clearances that few LTER scientists posses, John Vande Castle of the LTER Network Office has worked with the individual sites to coordinate locations for data acquisition and access to historical reconnaissance data and access to more recently acquired data for LTER sites.

On 20 Sept. 2002 at the "Historical Imagery Declassification Conference" the raw imagery from the KH-7 and KH-9 intelligence satellites was officially declassified and the rolls of film transferred to the National Archives and EROS Data Center. These satellites provided high-resolution imagery (in some cases greater than 1 meter) during the period from 1963 to 1980 for U.S. intelligence uses. As part of the celebration of the release staged by the National Imagery and Mapping Agency (NIMA), LTER investigator Bruce P. Hayden addressed more than 150 people attending the conference. In a half-hour presentation on scientific uses of declassified imagery, Bruce presented LTER uses of declassified imagery at the Sevilleta, Jornada, McMurdo and Virginia Coast LTER sites. Satellite-derived scientific products provided by the sites and John Vande Castle at the LTER Network Office focused on the use of imagery for tracking changes in land use, tracking the spread of invasive species, and integrating satellite data with other data resources

Current and future GFL data of LTER sites:

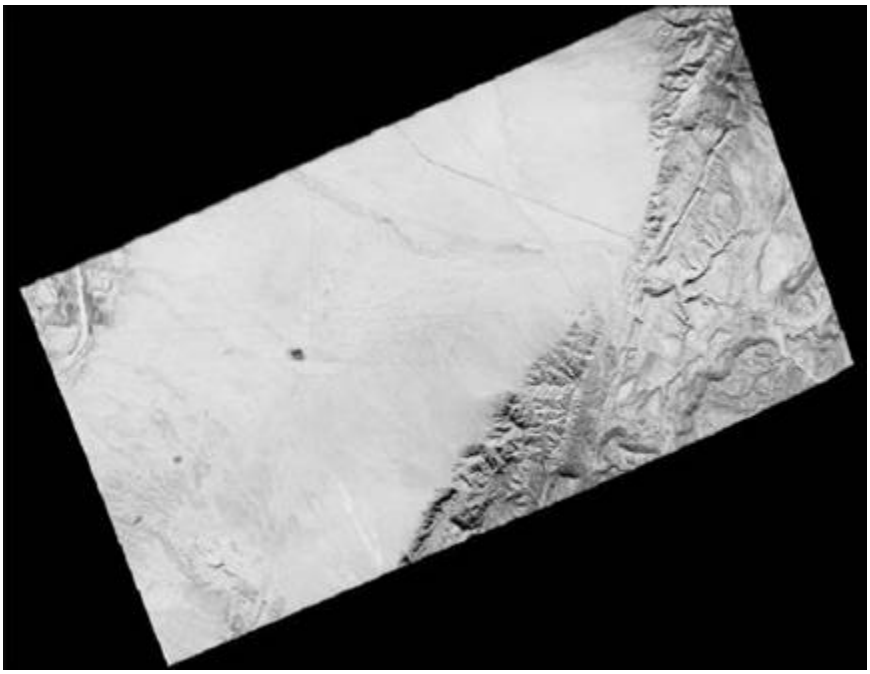
The LTER Network Office has worked to coordinate data access to historical reconnaissance data and access to more recently acquired data for LTER sites. During 2002 and 2003, John Vande Castle has reviewed site surveys for the remaining LTER sites with USGS personnel. Final coordination and plans were confirmed with LTER site personnel as to what characteristics are to be monitored, data acquisition times, area covered and resolution needed for the research. In spring of 2003, John Vande Castle met with USGS personal to review the results of the initial acquisition of current imagery based on the location parameters defined by the LTER sites.

Historical GFL Data:

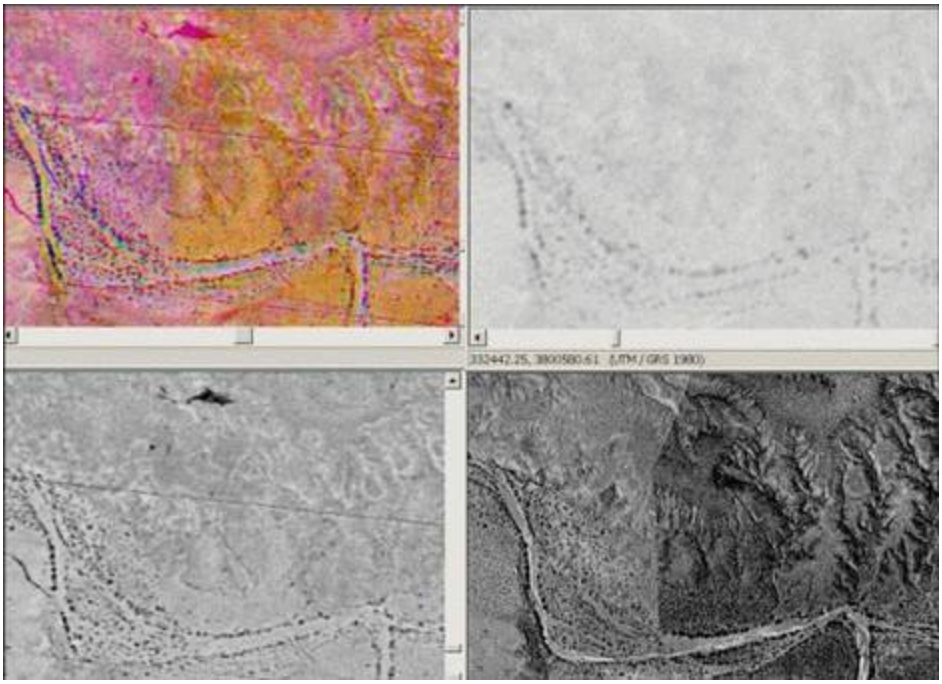
To estimate what type of reconnaissance data are available for LTER sites, a search of historical and current Global Fiducial Library data was made. During 2000 and early 2001, the LTER Network Office worked with members of the individual LTER sites to prepare standardized GFL site surveys – see: (http://www.lternet.edu/technology/gfl/index.html). Using this information, a review of available reconnaissance data was made with staff of Earth Satellite Corporation (Earthsat) by John Vande Castle of the LTER Network Office early in 2001. A historical time series of data was selected for the Virginia Coast and Sevilleta LTER sites. The data was processed by Earthsat and made available to the LTER sites in late August of 2001. The raw data was read at the LTER Network Office and placed on-line for use by LTER researchers.

The data are currently being incorporated into the LTER "Spatial Data Workbench" (see http://www.lternet.edu/technology/sdw) so these "hyperspatial" datasets can be more easily accessed and compared to the other remote sensing datasets acquired within the LTER program. A web page has been developed to support the initial formulation and use of the GFL data within the LTER program (http://www.lternet.edu/technology/). An alternative access is also available for the "mcm", "sev" and "vcr" sites by ftp at:
ftp://ftp.lternet.edu/archive/lter. An overview presentation has been developed which shows specific examples of the GFL data for the Sevilleta LTER site, as well as earlier data acquired for the McMurdo – Taylor Dry Valley site (http://www.lternet.edu/technology/gfl/).

For the Sevilleta LTER site, the data has been reviewed and assessed for general content. The high resolution and historical aspects of the data are important, and plans are being made on how to best extract useful information and compare them to other, more current datasets. Examples, shown below include important views of the region of the Sevilleta LTER site, long before it became an NSF LTER program site. The second image demonstrates changes over time in the general land use and vegetation of just a small plot of land on the Sevilleta LTER site. The third image shows the region surrounding the Sevilleta LTER headquarters. NOTE that these images are SUBSTANTIALY Reduced in resolution from the raw data maintained in the on-line archive.



Full resolution images of an overlap region from 1964, 1971 and 1994. Note the clear definition from vegetation changes once the Sevilleta became established as a wildlife reserved and grazing was reduced inside the Sevilleta. Note the clear fence line boundary in the 1994 image – not present in earlier data.



Full resolution images of an overlap region from 1964, 1971 and 1994. Note the clear definition from vegetation changes once the Sevilleta became established as a wildlife reserve, and grazing was reduced inside the Sevilleta. Note the clear fence line boundary in the 1994 image.

The UNM Sevilleta Field station and USDA Fish and Wildlife headquarters (to the bottom/south). This infrastructure was, of course absent in 1964 and has even changed significantly since 1994 with the addition of a visitor center and other buildings.