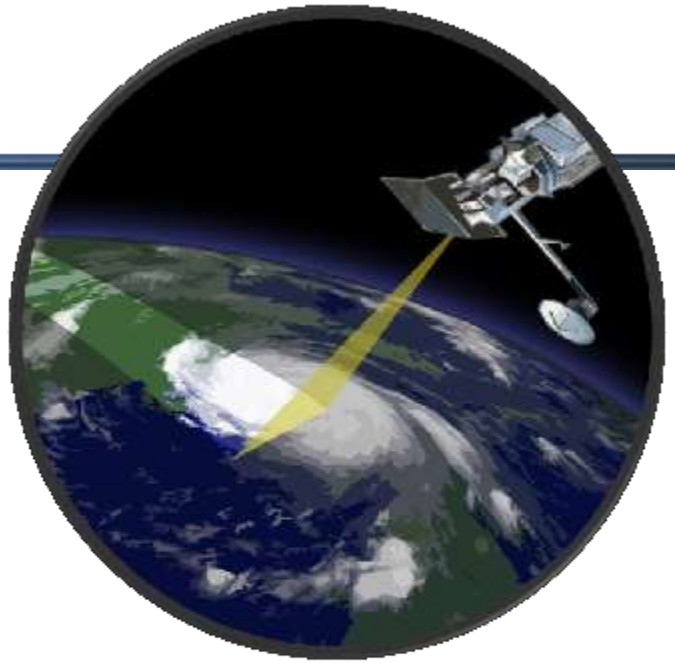
USGS
Land Remote Sensing Program
Status update for NGAC/LAG



Tim Newman

Program Coordinator

Land Remote Sensing

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Land Remote Sensing Program

U.S. Geological Survey

Department of the Interior

Sep 28, 2016

Challenges

- **Sustainable Land Imaging (SLI) Program—**
  joint NASA-USGS mission vision
- **Requirements & capabilities assessment—**
  across USGS, DOI and the Federal Civil Community
  - communicate value of Landsat
  - anticipate future user needs
- **Climate change and national security—**

  defining Landsat/LCMAP role in this arena
- **Public versus private partnering—**
  what is the right mix

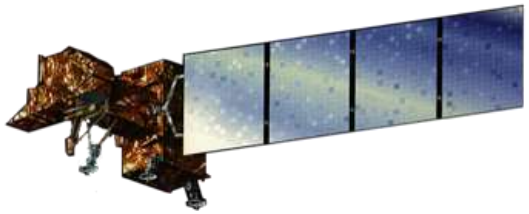
Landsat operational satellite status

Landsat 8 (2013)

- Collecting up to 725 new scenes per day; supports 16-day revisit.

- Thermal Infrared Sensor (TIRS) continues to operate on B-side subsystems with observatory engineers closely tracking hardware performance.

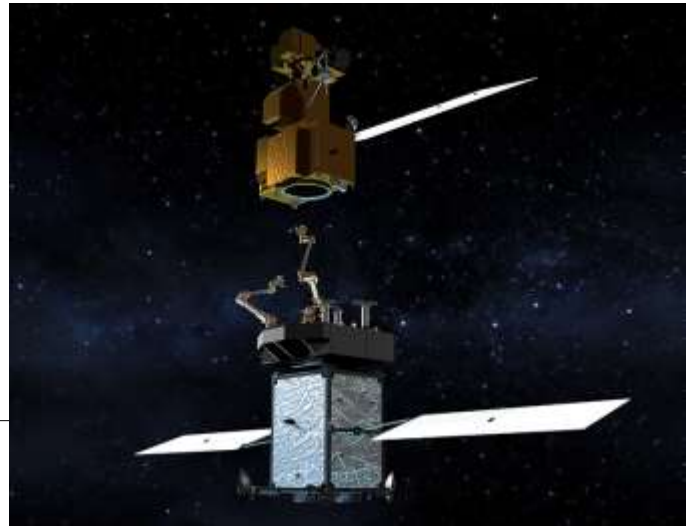
Landsat 7 (1999)



- Collecting about 475 new scenes per day; about 22% of pixels missing per scene (faulty scan-line corrector)

- The latest fuel estimate projects L7 operating into 2020/2021 (depending upon lowering strategy)

- Restore-L (http://ssco.gsfc.nasa.gov/)



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Sustainable Land Imaging (SLI)

SLI NASA/USGS Inter-Agency Agreement (IAA) (2016)

Landsat 9 (launch in late 2020)

- Upgraded Thermal Infrared Sensor (TIRS-2) design—from risk class C to B redundancy upgrades
- Going to 14 (from 12) bit depth resolution for OLI-2

Landsat 10 (launch ~mid-2020s)

- EVERYTHING IS ON THE TABLE at this point (e.g., small sat, hyperspectral, etc.)
- Measurements that enable **backward and forward assessments**
- Technology and requirements studies underway to support a 2018 decision point

Climate change and national security & Landsat's role

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

By the authority vested in me as President by the Constitution and the laws of the United States of America, I hereby direct the following:

Section 1. Purpose. This memorandum establishes a framework and directs Federal departments and agencies (agencies) to perform certain functions to ensure that climate change-related impacts are fully considered in the development of national security doctrine, policies, and plans.

-- Landsat has provided "unparalleled witness" to vast changes occurring on the Earth since 1972, and has supported undisputed evidence of:

- Rates and consequences of land and water change from local to global scales.
- Changes in the condition of land and water resources.
- Impacts of historical and contemporary weather and climate events.
- The impacts of land policy and management decisions.

LCMAP – Land Change Monitoring, Assessment, and Projection

- Generation of science-quality land change products from current and near-real time Earth observations (e.g., Landsat).
- Land change detection system that:
  - Characterizes historical land change at any point across the full Landsat record.
  - Detects land change as it occurs.
- Includes an information delivery capability that (eventually) provides global, seamless, multi-temporal land change (cover and condition) products via the Internet.

USGS

Change analysis based on Zhu and Woodcock (2014) Continuous Change Detection and Classification (CCDC) methods.

BOSTON UNIVERSITY

Analysis Ready Data (ARD)

- Significantly reduce the burden of processing on applications scientists
- Standard Level-1T products serve as the input used for generating ARD
- The ARD product consists of Landsat top of atmosphere reflectance, ***surface reflectance***, and brightness temperature data that are consistently processed, gridded to a common cartographic projection, and accompanied by appropriate metadata to enable further processing while retaining traceability of data provenance.
- Products derived from the ARD include, but are not limited to: maps of land cover and land-cover change, spectral indices, temporal composites, and other geophysical and biophysical parameters

USGS

Summary: 2016 Landsat Advisory Group Tasks

Task 1 - Revisit of the small sat investigation from the FY15 task (Sustainable Land Imaging challenge-- communication)

Task 2 – Study the feasibility and utility of implementing temporal data cubes to support projection or 'forecast' models of land change trends (Climate Change, LCMAP, ARD, and RCA challenges)

Task 3 – Study data continuity mission enhancements (Sustainable Land Imaging and RCA challenges)