



## Sustainable Land Imaging

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(slides courtesy of NASA HQ/David Jarrett)*

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Chesapeake Bay  
Landsat 8 surface reflectance mosaic, 2014

“Surface reflectance” is a new USGS Landsat product that corrects for the effects of haze, aerosol, water vapor, and ozone on Landsat data. This processing provides a sharper view of the Earth’s surface, as if there were no atmosphere interrupting the view between the satellite and ground.

# Landsat Overview



Successful NASA/DOI partnership for over 40 years

- NASA builds and launches satellites
- USGS assesses user needs; operates satellites; archives and provides data

Longest continuous remotely sensed record of global land change (1972 –)

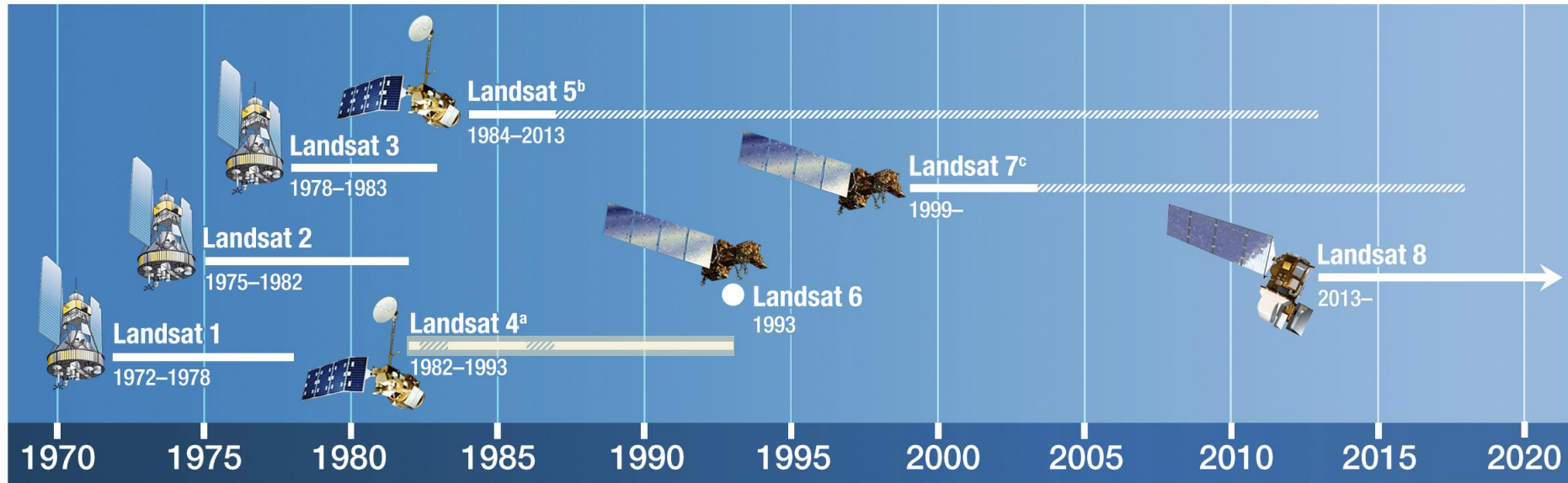
- Multiple spectral bands (visible, near-, shortwave- and thermal-infrared)
- Supports analysis of weekly to decadal phenomena

Ranked 3<sup>rd</sup> “most critical” Earth observing system (of 362 systems examined) in OSTP-led National Plan for Civil Earth Observations (2014)

- 2<sup>nd</sup> most critical satellite system, after GPS

Recent progress: Administration’s 20-year commitment to Sustainable Land Imaging Program

# Landsat History



<sup>a</sup>Limited data due to transmitter failure soon after launch. Only 45,172 Landsat 4 Thematic Mapper scenes from 1982–1993 available for science users—~10 scenes/day (vs 725 scenes/day from L8)

<sup>b</sup>Data coverage limited to Continental US (CONUS) and International Ground Station sites after a transmitter failure in 1987; Multispectral Scanner turned off in August 1995

<sup>c</sup>Degraded Performance due to Scan Line Corrector failure in May 2003

- The Landsat program began as the Earth Resources Technology Satellites Program in 1966, with Landsat 1 (ERTS) launched in July 1972
- NASA built and launched Landsats 1-5 and Landsats 7-8
- Thermal band added for Landsats 3 and beyond
- After launch, Landsat operations are transferred from NASA to USGS, and USGS collects, archives, processes, and distributes the image data via the internet at no cost to users
- Landsat 8 began as a data purchase and became known as the Landsat Data Continuity Mission (LDCM)
  - Although the thermal bands were originally not incorporated in the mission, they were added back into the Observatory's capabilities following strong support from a variety of stakeholders

# Landsat On-Orbit Status



- Landsat 7
  - Launched in 1999
  - Scan Line Corrector instrument hardware failure in 2003 resulted in a loss of 22% of each Landsat 7 scene
  - Expected to be decommissioned in 2019
- Landsat 8
  - Launched in 2013
  - Operational Land Imager (OLI; the 30m resolution, multi-spectral instrument) operating superbly
  - Thermal Infrared Sensor (TIRS) experiencing a stray light problem in one of two channels; also now operating on redundant hardware
  - Currently collecting 725 scenes/day (exceeding the requirement of 400 scenes/day)
  - Launched with at least 10 years of fuel; fuel could last nearly 20 years based on operational consumption to date

# SLI in FY16 President's Budget Submit



✧ A multi-component program, with the essential investments in technology and observational innovation to ensure a world class, sustainable, and responsible land imaging program through 2035:

1. TIR-FF (Class D Thermal Infrared Free Flyer) to launch ASAP (no later than 2019) and to fly in constellation with a reflective band imager like OLI on L-8
  - Low-cost mitigation against an early loss of the Landsat 8 Class C TIRS, while demonstrating feasibility of constellation flying for land imaging
2. Landsat 9 (Class B upgraded rebuild of Landsat 8) to launch in 2023
  - Low programmatic risk implementation of a proven system with upgrades to bring the whole system to Class B
3. **Land Imaging Technology and Systems Innovation**
  - **Hardware, operations and data management/processing investments to reduce risk in next generation missions.**
4. Landsat 10
  - Mission definition to be informed by the Technology investments, leading to key mission configuration/architecture decisions by the end of the decade

# Landsat Future



## Sustainable Land Imaging (SLI) Architecture

