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science for a changing world

WGISS-42

USGS Agency Report

U.S. Department of the Interior
U.S. Geological Survey

Kristi Kline
USGS EROS Center

Major Activities

- Landsat Archive/Distribution Changes
- Land Change Monitoring, Assessment, and Projection (LCMAP)
- Sentinel-2
- GloVis upgrade
- Landsat 9

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Collection Definition Progress

- **The USGS defined three basic categories of products**
  - **NRT (Near-real time) – products that are processed using ancillary data such as predicted ephemeris or bumper mode parameters that may be improved by reprocessing**
  - **Tier 1 – products that meet the criteria for the collection definition (i.e. enable time-series stacking, <12m RMSEr)**
  - **Tier 2 – products that do not meet the criteria for the collection definition and have been processed using the best known ancillary data**

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Collection Definition Study Findings Summary

- **Radiometric variability is not a factor**
  - **Operational land imager (OLI) temporal uncertainty is better than 0.3% on average**
    - **Based on on-board calibrator**
  - **ETM+ and TM are better than 2%**
    - **Based on top of atmosphere reflectance measured over pseudo-invariant calibration sites**
- **Geodetic accuracy vary by sensor, source data type, the quality of PCD, and level to which the data have been processed (L1T, L1GT, L1G)**
  - **Some data (e.g. TMA and LGAC) are of lower quality due to poor quality or missing PCD**
  - ***MSS is highly variable and will be assessed later***

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Collection Identification
Product ID / File Name Convention

- **Current Proposed Product ID:**
  - **LXSS_LLL_PPPRRR_YYYYMMDD_yyyymmdd_CC_TX**
    - **L = Landsat (constant)**
    - **X = Sensor (C = OLI/TIRS, E = ETM, T = TM, etc.)**
    - **SS = Satellite (e.g., 09 for Landsat 9, 10 for Landsat 10)**
    - **LLL = Processing level (L1T, L1G, L1S)**
    - **PPP = WRS path**
    - **RRR = WRS row**
    - **YYYYMMDD = Acquisition Year (YYYY) / Month (MM) / Day (DD)**
    - **yyyymmdd = Processing Year (yyyy) / Month (mm) / Day (dd)**
    - **CC = Collection number (e.g., 02)**
    - **TX = Tier Category - RT for Real-time, T1 for Tier-1, T2 for Tier-2**

  Example: LE07_L1T_029030_20140715_20140805_02_T1

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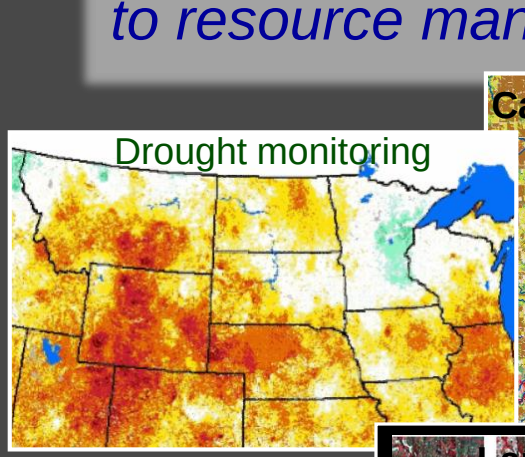
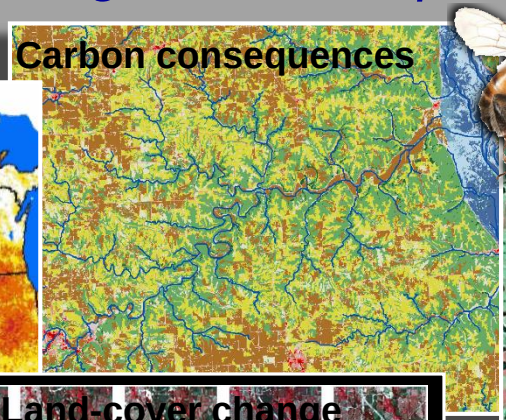
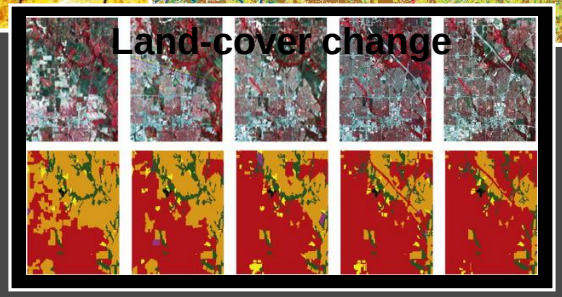
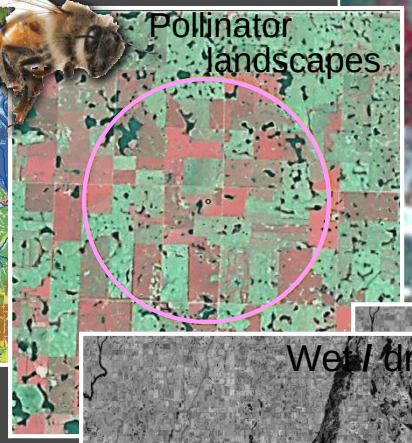
Land Change Monitoring, Assessment, and Projection (LCMAP)

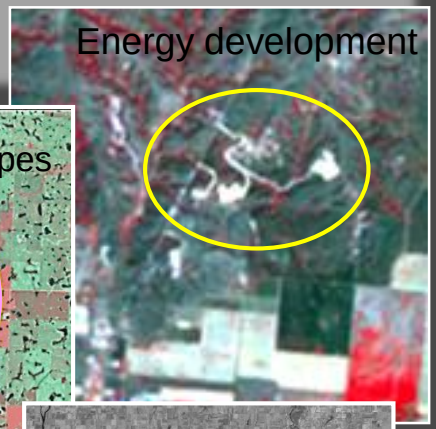
A capability to continuously track and characterize changes in land cover, use, and condition and translate such information into assessments of current and historical processes of change that can serve as the science foundation that supports evaluations and decisions relevant to resource management and policy.

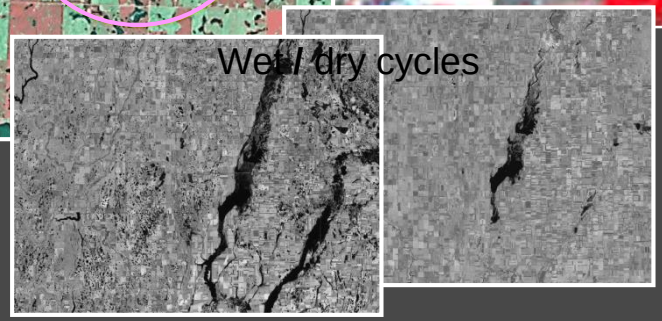












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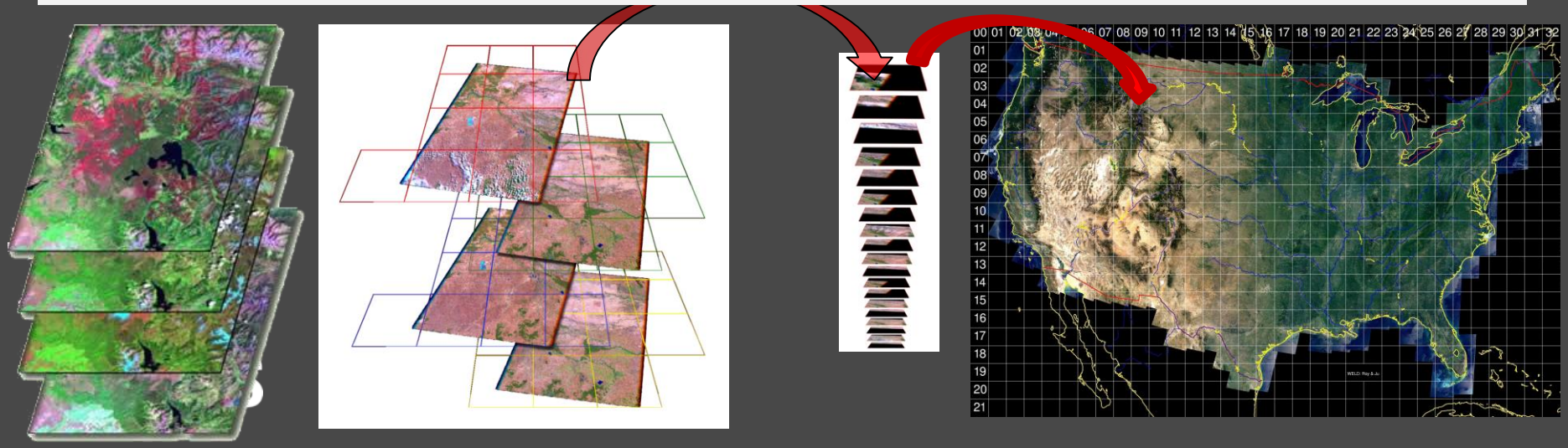
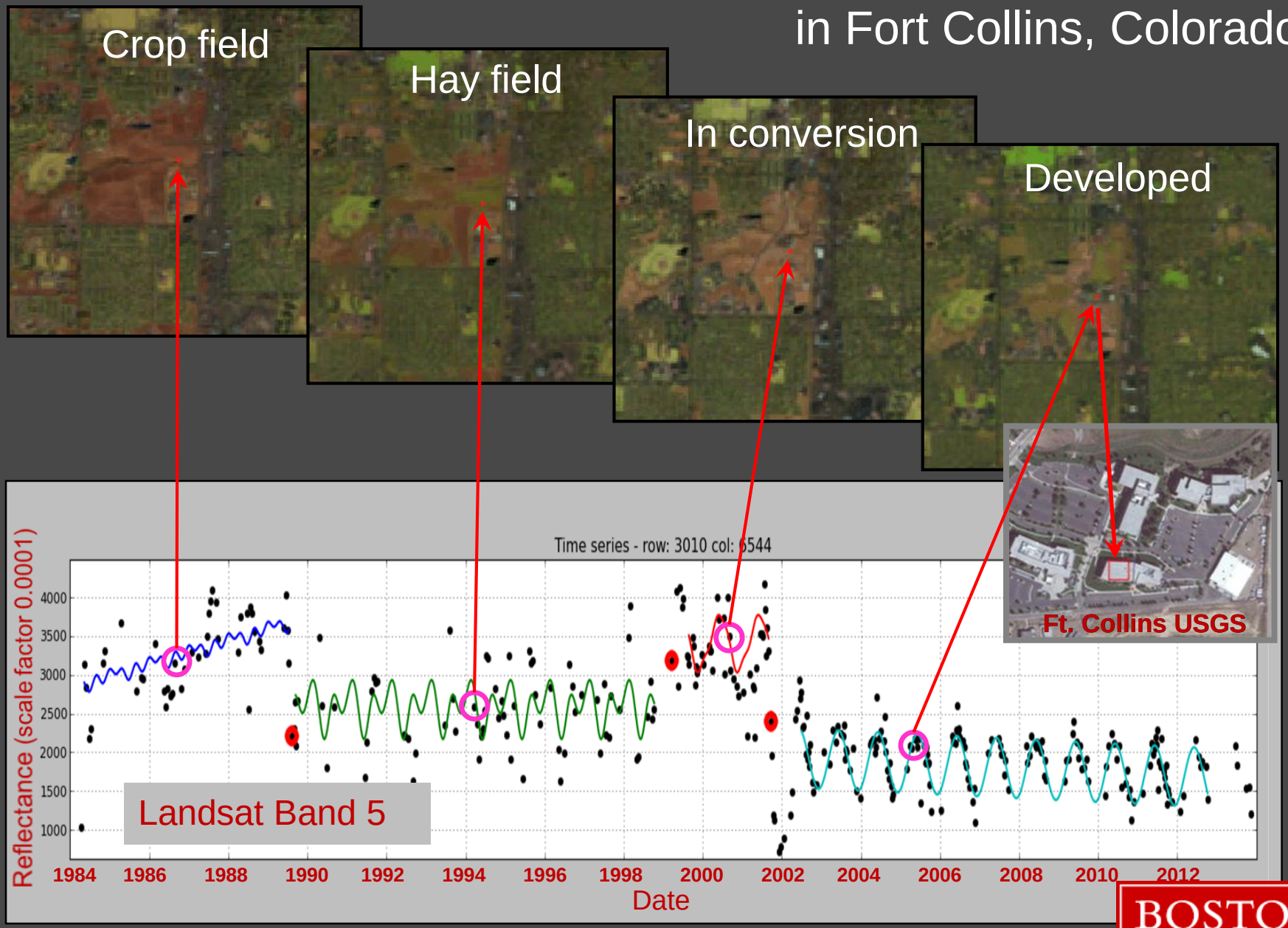
Analysis Ready Data (ARD)

- Data processed to a level that enables direct use in applications
  - Allows geospatial, multi-spectral, and multi-temporal manipulations for the purposes of data reduction, analysis, and interpretation
  - Consistent radiometric processing scaled to TOA and surface reflectance
  - Consistent geometry including spatial coverage and cartographic projection – e.g., pixels align through time
  - Metadata of sufficient detail on data provenance, geographic extent, scaling coefficients, and data type

Initial ARD production is focused on the TM through OLI record (1982 – present) for the U.S., but to eventually back through MSS (1972) and global scale



Spectral history of a location in Fort Collins, Colorado



Zhu, Z. and C.E. Woodcock. 2014. Continuous change detection and classification of land cover using all available Landsat data. Remote Sensing of Environment 144:152–171.

BOSTON UNIVERSITY

LCMAP Near-term (2017) Goals

For all United States (CONUS, Alaska, and Hawaii)

- A transformative Landsat science data archive that is “analysis ready” and capable of supporting near real-time science and applications
- Validated 1985-2015 annual land cover and land change products
- Statistical estimates of land change and land cover for 1985-2015
- Scientific and geographic evidence of the value of high frequency land change monitoring for improving the understanding of US land change dynamics

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Why is the USGS implementing LCMAP?

- Modernize access to the Landsat archive
  - Set the foundation for a Federal land monitoring system
  - Continue long-standing USGS land cover commitment
- Meet USGS land change science needs:
  - Landsat and the land change science mission
  - Geographic research on understanding the connections between human activity and natural systems
  - Improve understanding of the combined impacts of climate and land use change

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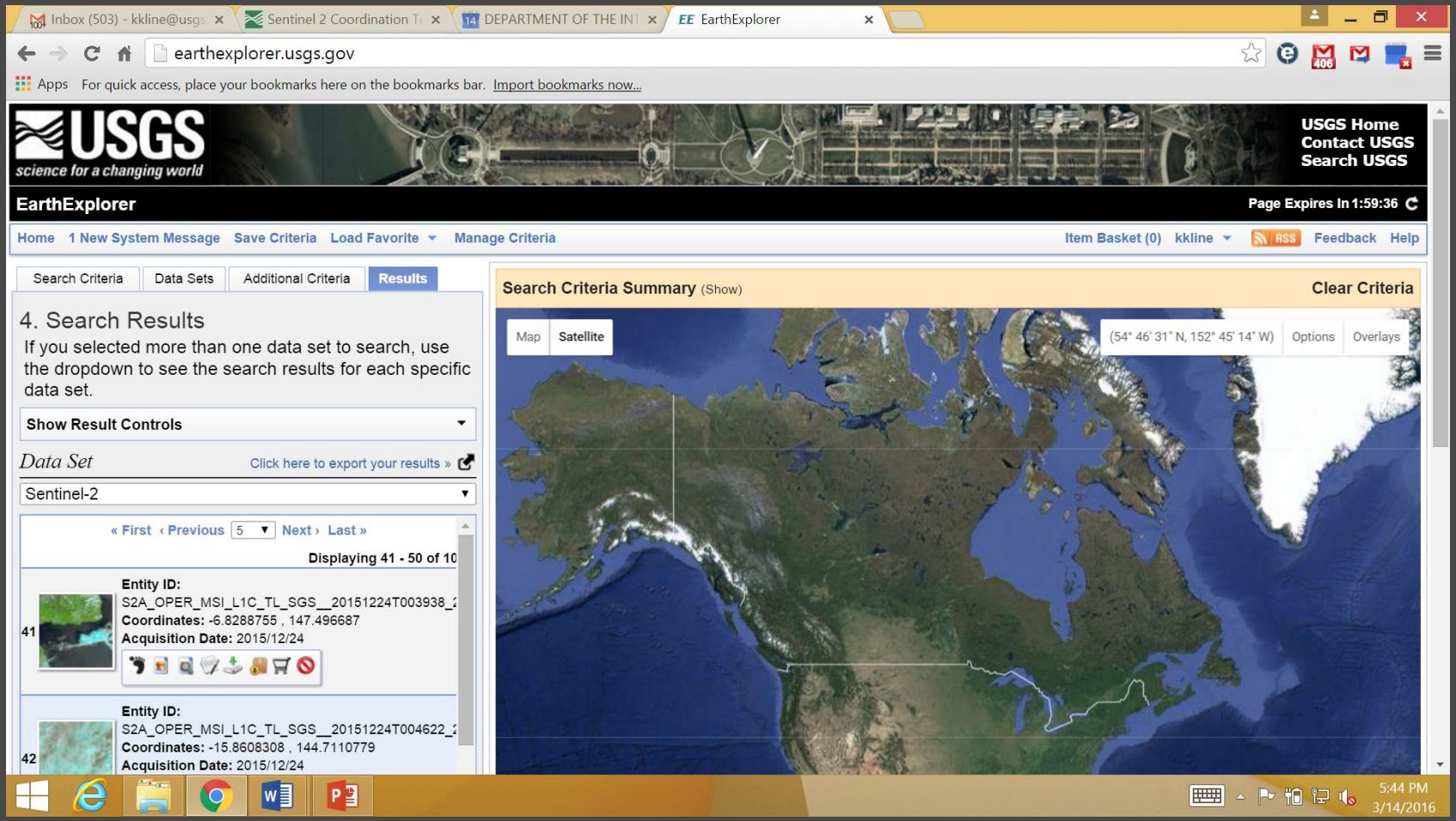
Sentinel-2 Available



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Sentinel-2

- US providing individual tiles (SAFE format)
- 3-band full resolution browse also available
- Interfaces:
  - EarthExplorer – available now
  - GloVis – available now
  - LandsatLook (“SentinelLook”) – coming soon (~6 months)

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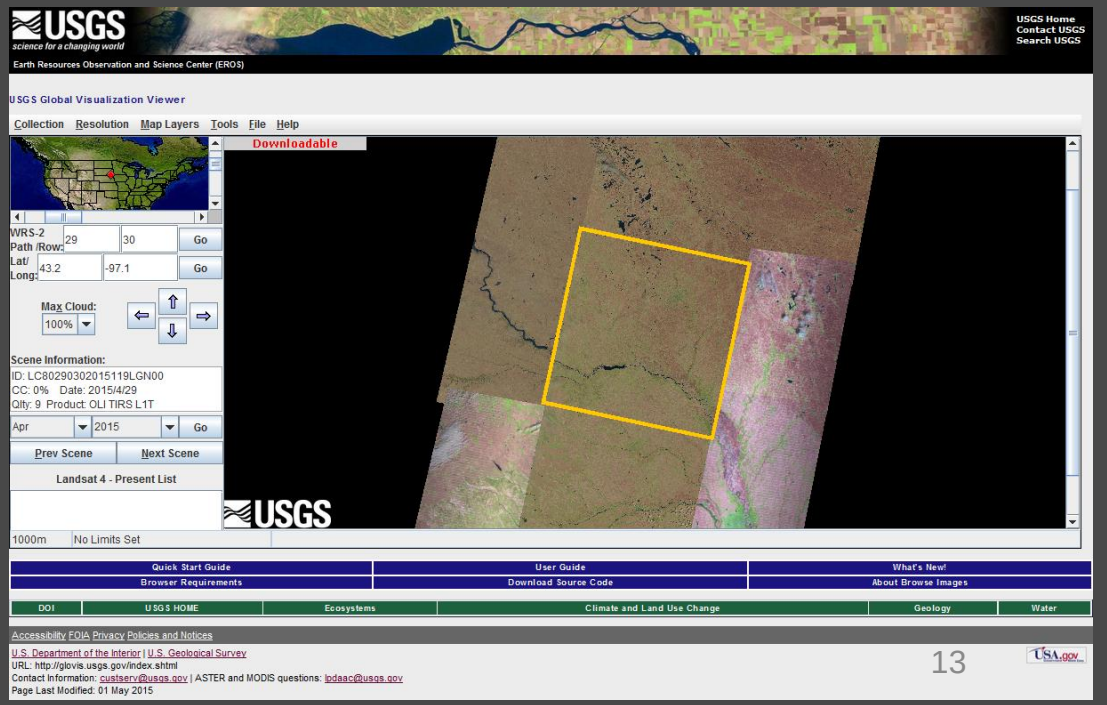
What is GloVis…

The USGS Global Visualization Viewer (GloVis) is a quick and easy online search and order tool for selected satellite and aerial data, developed in 2001. The GloVis has been a popular visualization viewer for searching massive quantities of imagery stored in the EROS data holdings. Through a graphic map display, the user can select any area of interest and immediately view all available browse images within the USGS inventory for the specified location and download or order on-demand products through the interface.



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Redesign

- **GloVis redesign uses modern languages and image processing tools -- enables GloVis to:**
  - **Eliminate dependence on Java for main display**
  - **Use HTML5, newer JavaScript libraries and CSS3 features**
  - **Newer technologies such as map services, Open Geospatial Consortium (OGC) web services, and/or Open-source Project for a Network Data Access Protocol (OPeNDAP)**
  - **Restructure display of non-WRS datasets such as ASTER, using a map-based display rather than a WRS-2-based display**

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Redesign

- **GloVis redesign uses modern languages and image processing tools -- enables GloVis to:**
  - **Improve interface for downloading and for requesting on-demand products**
  - **Work seamlessly with current EROS systems for retrieving data and for user downloads**
  - **Improve code architecture to accommodate future imagery evaluation concepts**

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- The EROS Landsat archive: more than **6 million images (171 billion sq. km) from 1972 to the present** – and spanning the globe.
- All Landsat images are **available to anyone at no cost.**
- **Each year millions images are distributed** to users in over 180 nations and territories.

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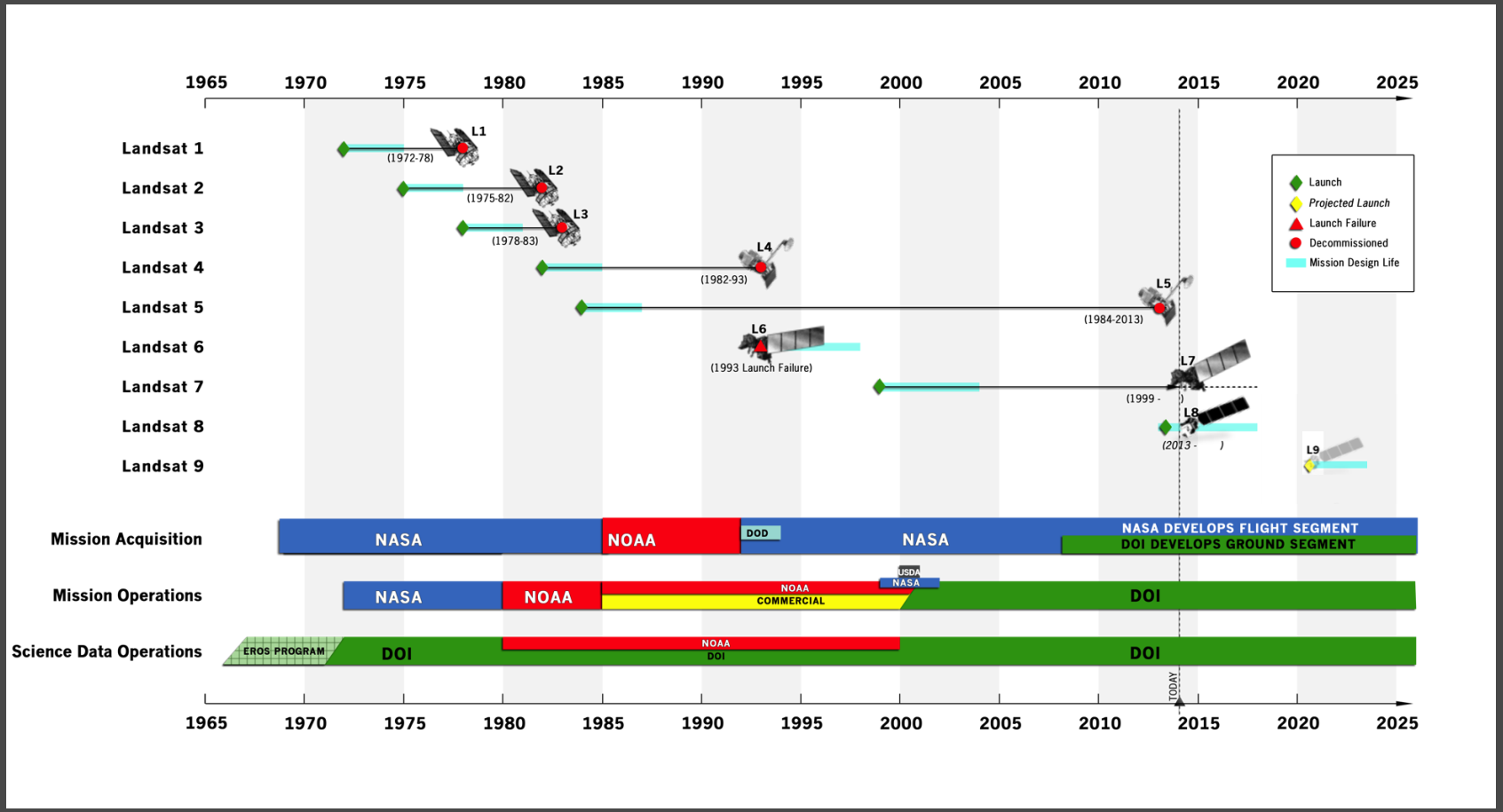
Landsat Missions Timeline



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Landsat 9 Status

- **August 17:** Key Decision Point B (KDP-B)
  - KDP-B – entry into “Phase B”: preliminary design for all mission segments is completed
  - Landsat 9 relies heavily on Landsat 8 heritage: much of this design work has already been accomplished, putting Landsat 9 “ahead of the curve” at this stage
  - Landsat 9 remains on-track for a December 2020 launch

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Questions

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