

**Climate and Land Use Change**  
**Land Remote Sensing Program**



*Requirements Capabilities & Analysis  
for Earth Observations*

# HyspIRI Science Symposium

**June 3, 2015**

# Topics



*Requirements Capabilities & Analysis  
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- Landsat 7/8 operational update
- Overview of Requirements Capabilities and Analysis for Earth Observations (RCA-EO)
- RCA-EO use examples

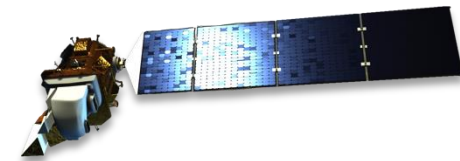
# Landsat Operational Satellite Status



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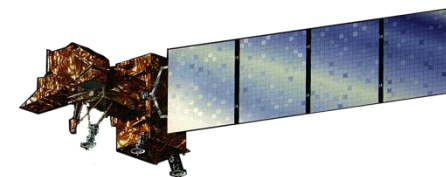
## ***Landsat 8***

- ~ 725 new scenes per day; 8-day revisit
- Operational Land imager (OLI) continues normal operation.
- Actions completed to restore processing of the thermal Infrared Sensor (TIRS) data. Data collected during TIRS anomaly have been successfully reprocessed and placed in Archive.



## ***Landsat 7***

- ~ 475 new scenes per day; ~ 22% of pixels missing per scene (faulty scan-line corrector)
- L7 collection strategy - continental coverage (L8 capturing islands and reefs)
- Sufficient fuel for additional years of operation



# Landsat-based Information Product Status



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- Standard orthorectified L1T calibrated radiance Landsat scenes (10M in 2014)
- LandsatLook (full-resolution JPEGs browse/print images)
- TM/ETM+ surface reflectance CDR product released in EE May 2013
- Global 30m Land Cover Forest Gain/Loss product available through Google Earth Engine
- Landsat 8 OLI “provisional” surface reflectance product released Dec. 2014
- Coming soon:
  - Burned Area Extent and Dynamic Surface Water Extent ECVs available in “provisional” status
  - Global 30m Land Cover Percent Tree Cover 2010 and validation data available for evaluation via USGS Visualization tool
  - Landsat TM/ETM+ “provisional” surface temperature expected June 2015
- Further out:
  - Fractional Snow Covered Area ECV available in “provisional” status Q4 FY15
  - Biomass ECV in early stages of development (modeling and estimation)

# What is RCA-EO



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- RCA-EO provides decision support for optimizing Earth Observation (EO) investments
- Traceable, solution-agnostic process for decision making
- RCA-EO will help:
  - Assess the value of EO capabilities to USGS and other agencies
  - Evaluate user satisfaction with EO systems, products, services
  - Inform the development of future EO products and systems
  - Match requirements with potential EO options
  - Support program and budget justifications – current and future
- Partnerships with NOAA and OSTP's National Earth Observation Assessment (EOA) 2016
- Complements ongoing coordination relationships:
  - Interagency, Landsat Science Team, science symposia, etc.

# RCA-EO Components



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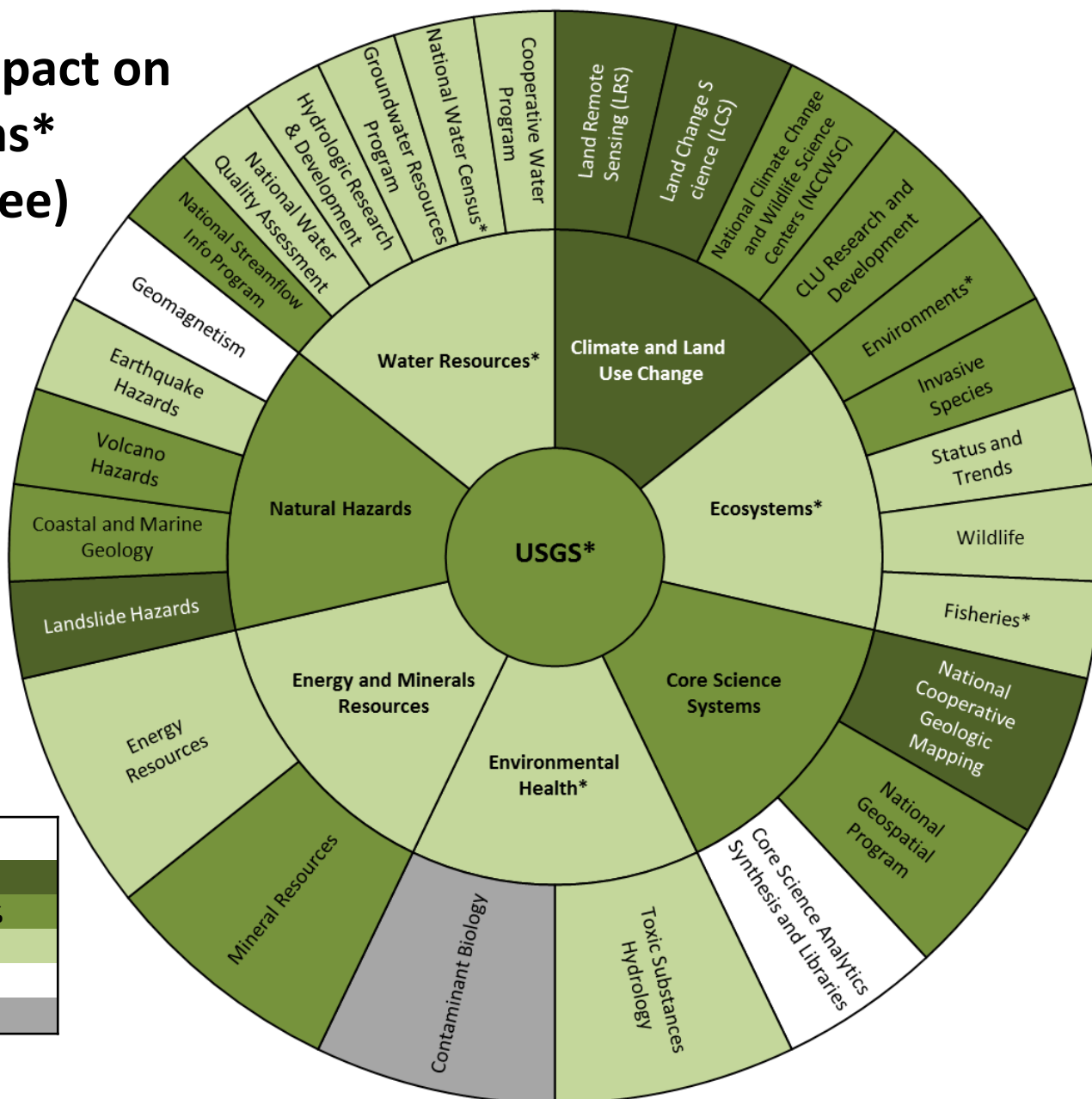
- Value Tree Information
  - Provides organizational context by describing an organization's mission, goals, and the products and services that support them
  - Describes how EO systems are currently used in producing the products and services
- User Requirements Information
  - System independent EO requirements and associated attributes needed by users to do their job
- Capabilities:
  - Information about the measurement capabilities of current and future Earth observing systems
  - Initial focus has been on those most relevant to USGS/DOI
    - Over 100 satellite systems detailed to date
  - Mature database will contain the full range of platforms and sensors (current, planned, concepts)

# Remote Sensing Impact on USGS Programs\* (From Value Tree)

## Organizations Areas Evaluated

- USGS (Center)
- USGS Mission Areas (Inner Ring)
- USGS Programs (Outer Ring)

\*Incomplete data, though impact assessment is likely to be close to the final value. Impacts based on example set of Satellite and Airborne systems.



# 2015 NASA Senior Review



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## RCA-EO Value Tree used to evaluate USGS use of NASA Senior Review missions

- Review included Aqua, Aquarius, Aura, CALIPSO, CloudSat, GRACE, Jason-2/OSTM, QuikSCAT, SORCE, and Terra)
- USGS Value tree information measured impact of these missions for USGS products and services
  - Identified 95 individual use cases for USGS products and services by 30 USGS scientists
  - MODIS and ASTER most used sensors out of 8 total
  - Volcano hazards, minerals, agriculture were dominant applications

# Sample USGS Hyperspectral Uses



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- **Ecosystem Function\***

## AQUATIC/WATER

- Oil Detection and Coastal Wetland Response
- Color of Dissolved Organic Matter (CDOM)
- Aquatic Community Ecological Flows
- San Francisco Bay Research (Marsh Equilibrium Monitoring)
- Carbon Cycling in Salt Marshes
- Salt Pond Restoration
- River Corridor Habitat Dynamics
- Algal Bloom Research
- Coral Reef Research

## FIRE/VEGETATION

- Post Fire Research
- Sagebrush Mapping
- Hyperspectral Invasive Species Mapping
- Vegetation condition assessment

\*Use of USGS Value Tree data to identify a sample of USGS projects that currently or would like to use hyperspectral data (satellite and/or airborne)

# Sample USGS Hyperspectral Use (continued)



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- **Surface Composition and Thermal Properties\***

## MINERALS

- Minerals Mapping
- Coastal Inundation and Oil Detection and Extent
- Geologic Mapping Applications
- Geothermal Resource Assessment
- Volcanoes

## ENVIRONMENTAL

- Environmental/Contaminant Studies
- Hydrofracking Applications
- Environmental Health

\*Use of USGS Value Tree data to identify a sample of USGS projects that currently or would like to use hyperspectral data (satellite and/or airborne)

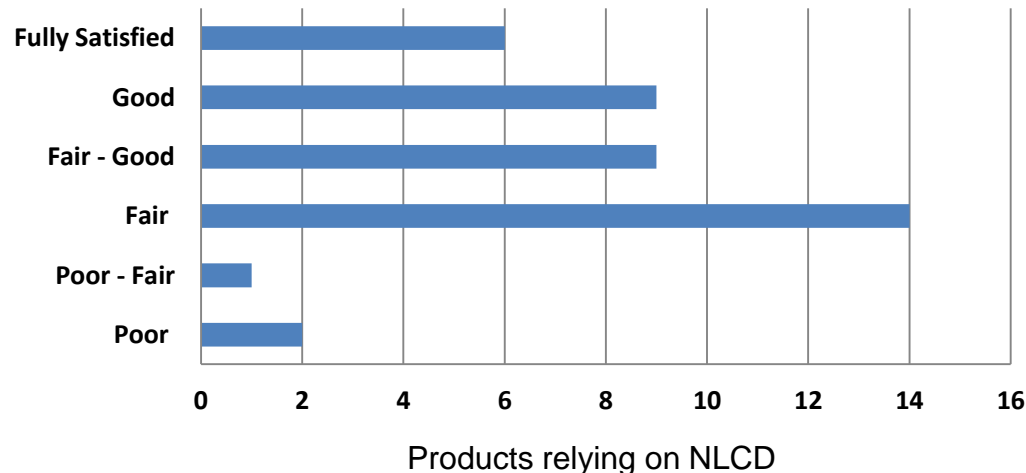
# Product Evaluation National Land Cover Database (NLCD)



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- NLCD users (63%) identified NLCD limitations (rated below “good”) in meeting their needs:
  - Higher temporal resolution (annual)
  - Quicker product turnaround (2 year lag product release)
  - Finer spatial resolution
  - More land cover categories
  - Inconsistencies in methodology between product releases

**User Satisfaction with the NLCD**

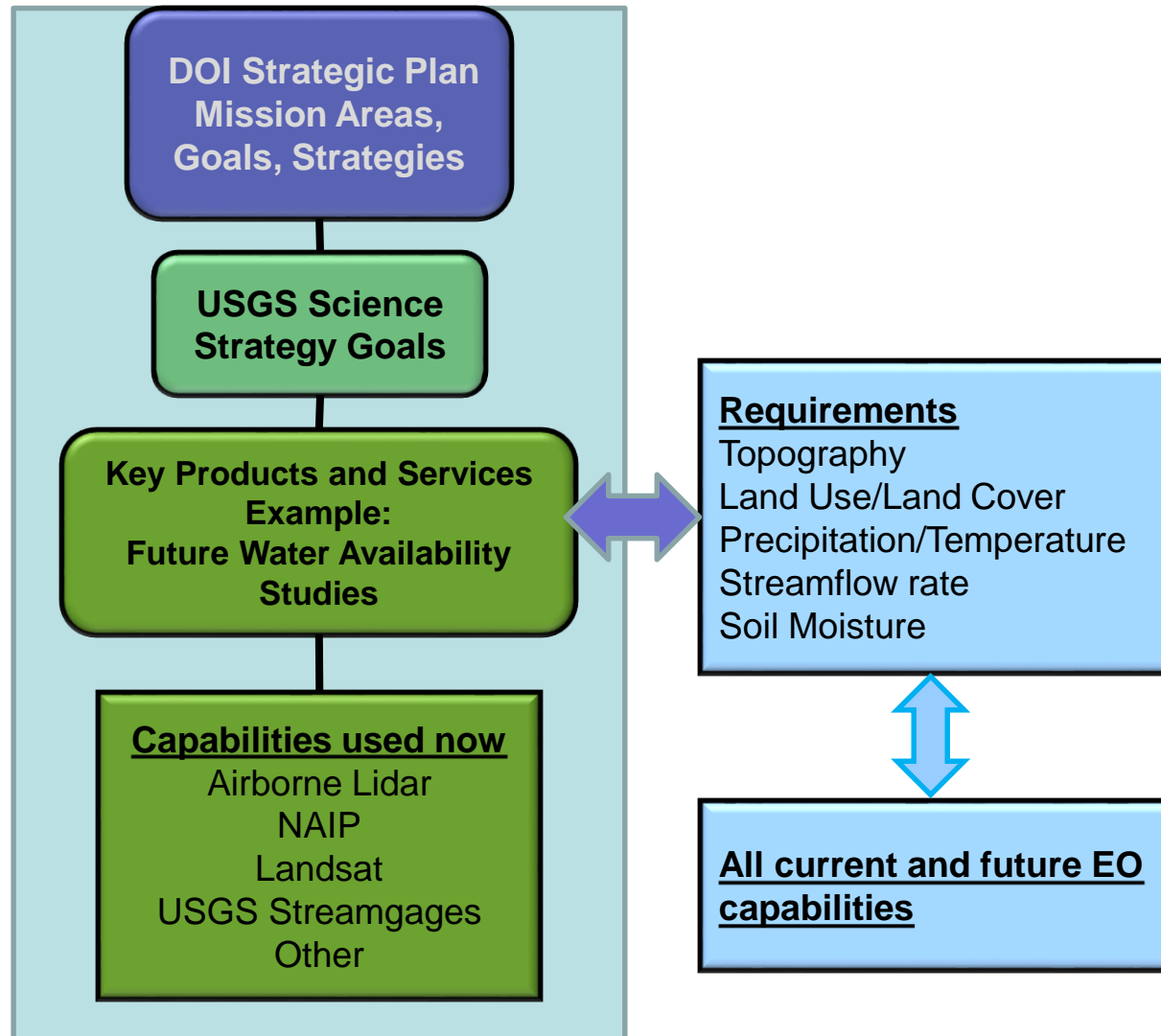


# Value Tree to User Requirements



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## Value Tree



# Short and Near-term Plans



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- Develop requirements for USGS
  - Expand to other DOI agencies and eventually beyond
- Develop value tree for Department of the Interior (DOI) and other civil agencies
- Expand capabilities database
- Integrate RCA-EO into USGS business decision and budget planning process
- Perform analysis and trades for existing and new products, sensors and concepts (portfolio management)

# Presentation Topics



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- Questions?

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