Major Landsat Science Team Impacts Discussion – 2012 to Present

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Discussion Purpose

• Review the activities of the Landsat Science Team members of the past four years and identify accomplishments that have had an impact on the success of the overall Landsat program.

• The impacts summarized in the following slides are based on the input of the LST members.
Impacts of the LST include:

• Defined Landsat continuity and the role of international imaging systems; science statements were successfully used by the USGS to shape the U.S. Sustainable Land Imaging (SLI) agenda and advocate for Landsat 9 capabilities and the need for a Landsat 10.

• Research documenting the Landsat 8 science and product vision for terrestrial global change (published in 2014 special issue of Remote Sensing of Environment, cited >300 times to date).

• Evaluated impacts of TIRS instrument anomalies on Landsat thermal data users.

• Research on algorithms dealing with cloud/shadow detection, data tiling, and land cover change mapping have been incorporated into USGS Landsat operational systems.

• Contributed technical capabilities and provided guidance and insights for a new generation of USGS EROS land change products.

• Provided concepts that are resulting in a major transformation of the Landsat archive into an “analysis-ready” structure.
Impacts of the LST include (continued):

- Offered rationale, insight, and advice supporting Landsat Collections, to provide users with access to the most up-to-date and traceable Analysis Ready Data
- Provided science justification for revision of Landsat-7 and -8 acquisition schedule (resulting in ~1200 / day vs ~650 / day). Reduced emphasis on cloud avoidance, use full sunlit imaging.
- Articulated novel science offering new insights on cryospheric systems; improved coverage of the South Pole.
- Quantified Landsat-5 reflectance orbit drift variability; used to inform Landsat-7 end-of-life scenarios
- Ensured an understanding of the value of Landsat to promote and maintain institutional support, of the Landsat program and role of Landsat Science Team; resulting in science informed information products and policy development.
Impacts of the LST include (continued):

- Established the importance of the Landsat Global Archive Consolidation for the production of new terrestrial Essential Climate Variables that make full use of the program’s spatial and temporal coverage, multidecadal continuity, metadata, instrument calibration (and cross-calibration) and data access. Recognition of Landsat Climate Data Records (CDR) as integral element of Global Climate Observing System (GCOS) enabling robust and transparent generation of ECVs.

- Support of Landsat-9 Architecture Study Team, provision of science rational for particular sensing features, exemplified by articulation of science value of 12 bit radiometric resolution.

- Articulated the science motivation for bringing MSS data in line with TM and later Landsat instruments and offering options to produce reliable, continuous, measures across all Landsats.

- Improved capacity for integration of Landsat into Federal and private sector programs, including agricultural mapping such as yield predictions and compliance monitoring and increasingly systematic and institutionalized forest monitoring systems.
Impacts of the LST include (continued):

- Enhanced and improved ability to use concurrent thermal and reflected Landsat data to derive evapotranspiration, surface energy, water, and water use. Thermal informed application advancements have been demonstrated to improve mapping of vegetation phenology and stress over large areas, as well as increasing the accuracy of required cloud and shadow detection and screening algorithms.

- Articulated and demonstration the information content in Landsat time series. Applications and science leadership regarding use of time series data to characterize land cover and dynamics.

- Science and applications examples of large area and dense time series science and map products, including global and regional gridded composited products, and derived products such as vegetation indices, burned areas, forest change (harvesting and regeneration), agricultural field sizes, among others. Illustrating the strength of temporal data to improve algorithm outcomes.

- Demonstrated the use of Landsat-8 and archival data for monitoring and mapping of fresh and coastal water. Science and applications to enable global mapping of surface water with high level of detail in a systematic, transparent, and repeatable fashion.
Impacts of the LST include (continued):

• Empowered and enabled the global applications community in the use of Landsat data through provision of science, enhanced understanding, and examples to support an increasingly large user base undertaking sophisticated, integrated, and often unprecedented analyses.