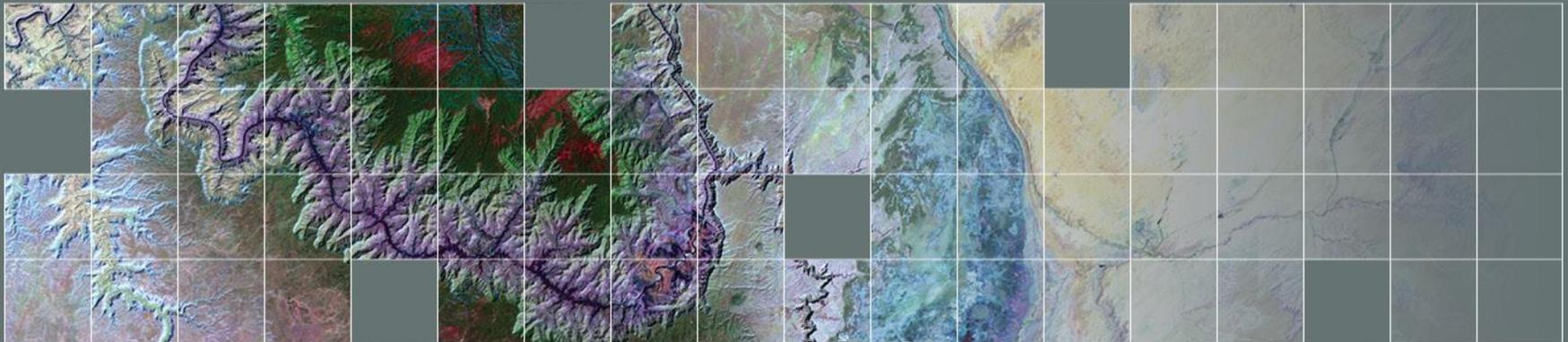




Climate and Land Use Change
Earth Resources Observation and Science (EROS) Center

USGS Analysis Ready Data



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U.S. Geological Survey

Analysis Ready Data (ARD)

- Analysis-ready data (ARD) are consistently processed to the highest scientific standards and level of processing required for direct use in applications.
- A key goal for ARD is to 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

Scope of Implementation

- Early phases will focus on U.S. coverage for Landsat TM, ETM+, and OLI-TIRS data
- Future phases may extend further back in time through the MSS record, increase future temporal density by integrating Sentinel-2 data, and ultimately expand the scope to global coverage
- Landsat 4-7 TM and ETM+ Product User Guide:
http://landsat.usgs.gov/documents/cdr_sr_product_guide.pdf
- Landsat 8 OLI/TIRS product User Guide:
http://landsat.usgs.gov/documents/provisional_l8sr_product_guide.pdf
- User-defined format for data/information delivery (flat binary, Geotiff, NetCDF, ASCII – will solicit community input, starting with the LST

U.S. ARD Projection Parameters

USGS Product Projection Parameters			
Projection: Albers Equal Area Conic			
Datum: World Geodetic System 84 (WGS84)			
	Conterminous U.S.	Alaska	Hawaii
First standard parallel	29.5°	55.0°	8.0
Second standard parallel	45.5°	65.0°	18.0
Longitude of central meridian	-96.0°	-154.0°	-157.0
Latitude of projection origin	23.0°	50.0°	3.0
False Easting	0.0	0.0	0.0
False Northing	0.0	0.0	0.0

U.S. Grid Specifications – 30m GSD

	Upper Left Tile				Lower Right Tile			
	(h)	(v)	ulX (m)	ulY (m)	(h)	(v)	lrX (m)	lrY (m)
CONUS	0	0	-2565585	3314805	32	21	2234415	164805
Alaska	0	0	-851715	2474325	16	13	1698285	374325
Hawaii	0	0	-444325	2168895	4	2	305655	1718895

Impacts and Benefits

- **Product User Guides will need to be updated to reflect changes to science data and metadata changes associated with Landsat Level-1 product collections (e.g. QA band attributes, metadata traceability, filename conventions)**
- **QA band attributes and ordering will be changed as a consequence of Level-1 product updates**
- **Longer latency due to ETM+ definitive ephemeris and bumper mode correction, TIRS line of sight model refinement**
- **Options for use of TOA reflectance or surface reflectance**
- **Data and information access through a new API**
- **Leverage increased temporal density of side-lap from adjacent paths**
- **Improved traceability with Level-1 products**

Proposed OLI QA Band Attributes

Bit	Value	Cumulative Sum	Description - OLI
0	1	1	Designated Fill
1	2	3	Terrain Occlusion
2	4	7	Radiometric Saturation
3	8	15	
4	16	31	Cloud
5	32	63	Cloud Confidence
6	64	127	
7	128	255	Cloud Shadow
8	256	511	
9	512	1023	Snow/Ice
10	1024	2047	
11	2048	4095	Cirrus
12	4096	8191	
13	8192	16383	
14	16384	32767	
15	32786	65553	

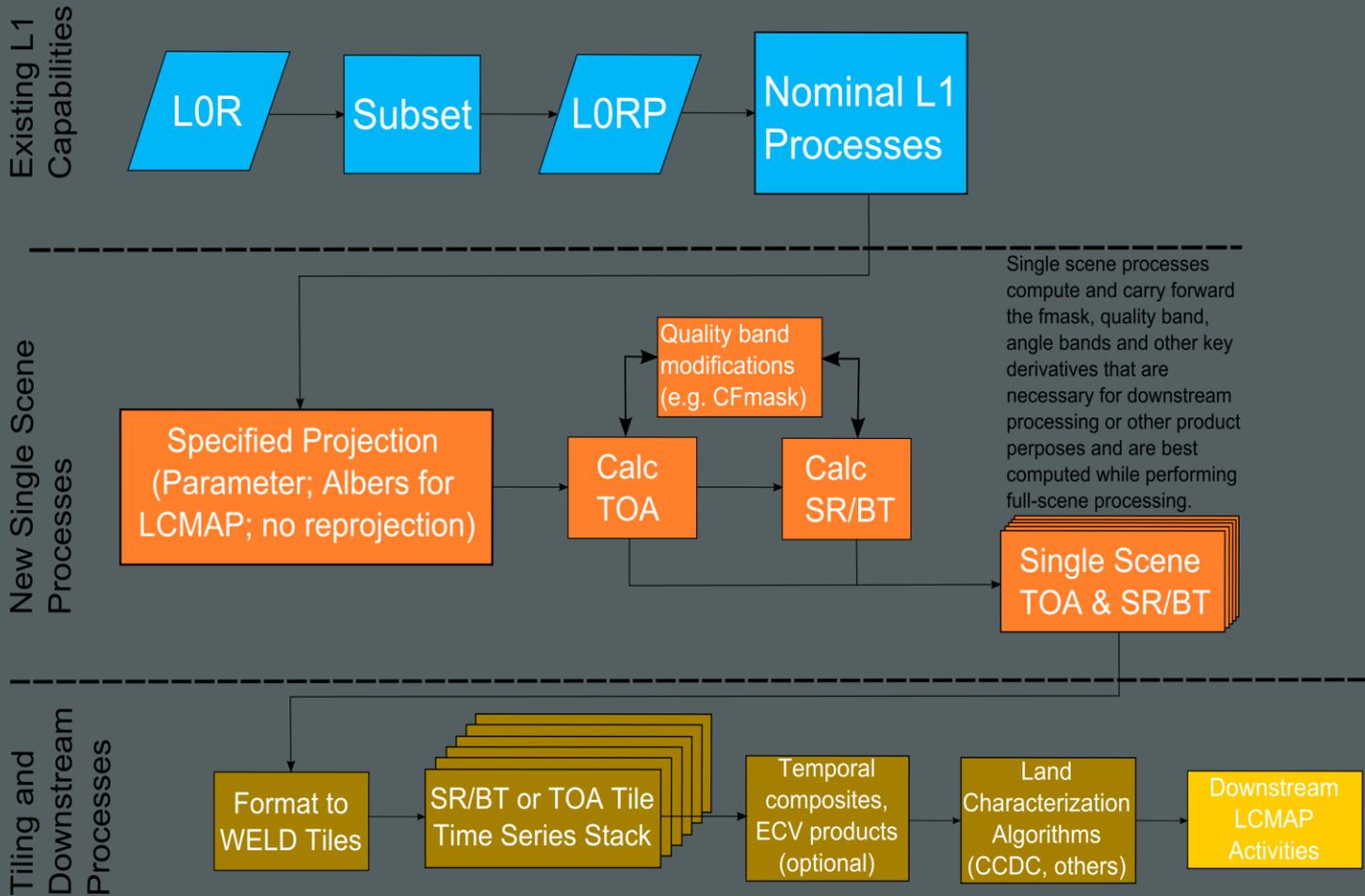
Proposed TM/ETM+ QA Attributes

Bit	Value	Cumulative Sum	Description – TM/ETM+
0	1	1	Designated Fill
1	2	3	Dropped Pixel
2	4	7	Radiometric Saturation
3	8	15	
4	16	31	Cloud
5	32	63	Cloud Confidence
6	64	127	
7	128	255	Cloud Shadow
8	256	511	
9	512	1023	Snow/Ice
10	1024	2047	
11	2048	4095	
12	4096	8191	
13	8192	16383	
14	16384	32767	
15	32786	65553	

Proposed MSS QA Attributes

Bit	Value	Cumulative Sum	Description - MSS
0	1	1	Designated Fill
1	2	3	Dropped Pixel
2	4	7	Radiometric Saturation
3	8	15	
4	16	31	Cloud
5	32	63	Cloud Confidence
6	64	127	
7	128	255	
8	256	511	
9	512	1023	
10	1024	2047	
11	2048	4095	
12	4096	8191	
13	8192	16383	
14	16384	32767	
15	32786	65553	

Notional ARD Data Flow



Questions and Comments?