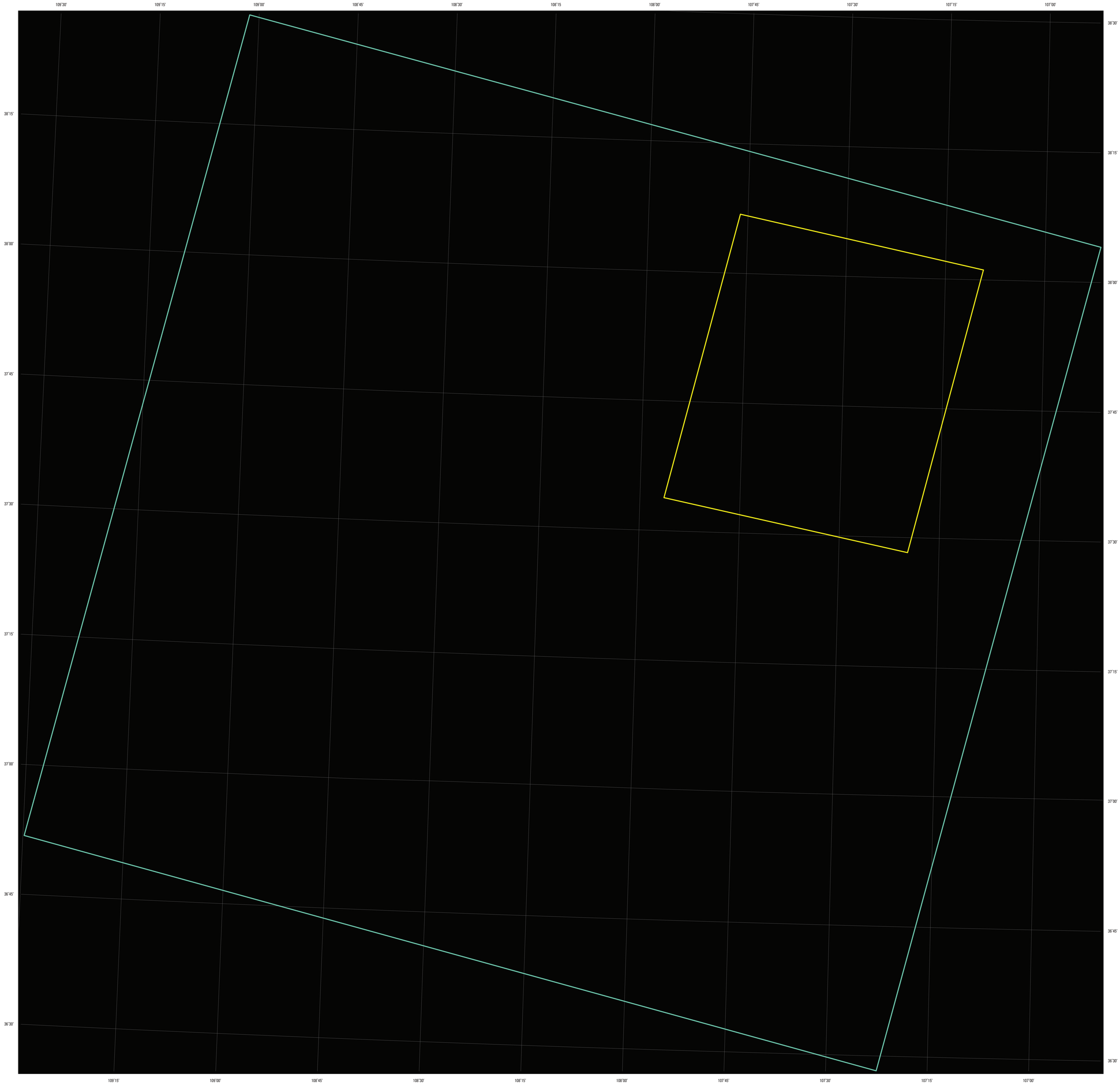
U.S. Department of the Interior
U.S. Geological Survey

Scientific Investigations Map 3466
Pamphlet accompanies map



Map projection: Universal Transverse Mercator (UTM) Zone 13 N, WGS 84 datum

Landsat 8 Scene ID: LC80350342013171LGN00
Acquired June 20, 2013

Outline of Landsat scene footprint is shown in cyan.

Outline of ASTER scene footprint described by Rockwell (2012) is shown in yellow.

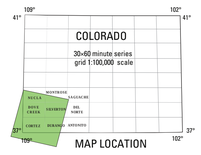
Landsat 8 L1T orthorectified data obtained from USGS Earth Resources Observation and Science Center (EROS).

Background is imagery derived from multiple 2012 sources and served by ESRI (http://goto.arcgisonline.com/maps/World_Imagery): DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

SCALE 1:325 000

0 5 10 20 30 40 MILES

0 5 10 20 30 40 KILOMETERS



The satellite imagery was processed and assessed by B.W. Rockwell during 2013–2014. The digital topographic base map, digital compilation, and GIS database of the geologic map was also prepared by B.W. Rockwell

EXPLANATION

MODELED MINERAL AND VEGETATION GROUPS

[Layer names: ASTER—Mineralogy+vegetation, Landsat 7—Mineralogy+vegetation, and Landsat 8 OLI—Mineralogy+vegetation. Numbers indicate digital value of specified class in associated raster GIS file. The text "not in L7" appears where Landsat 7 (L7) does not have a modeled group]

Inferred acid-producing potential in non-sedimentary rocks

High

Low

- 14 — Clay, sulfate, mica, and(or) marble with possible oxidizing sulfides and minor iron sulfate, or amorphous iron in playa surfaces and other high-albedo soils (not in L7)
- 12 — Clay, sulfate, mica, and(or) marble + major ferric iron with possible oxidizing sulfides and major iron sulfate
- 17 — Clay, sulfate, mica, and(or) marble + major ferric iron with possible major iron sulfate and hydroxide (commonly proximal zones of weathered, highly pyritic rocks and mine waste) (not in L7)
- 18 — Clay, sulfate, mica, and(or) marble + major ferric iron with possible moderate to major iron sulfate and hydroxide (commonly distal zones of weathered, highly pyritic rocks and mine waste) (not in L7)
- 9 — Clay, sulfate, mica, and(or) marble + major ferric iron with possible iron sulfate and hydroxide (commonly in argillically-altered rocks) (not in L7)
- 19 — Clay, sulfate, mica, and(or) marble + ferrous or coarse-grained ferric iron with possible minor iron sulfate (not in L7)
- 8 — Clay, sulfate, mica, and(or) marble + major ferric iron (not in L7)
- 7 — Clay, sulfate, mica, and(or) marble + moderate to major ferric iron
- 6 — Clay, sulfate, mica, and(or) marble + minor ferric iron
- 2 — Major ferric iron
- 1 — Minor ferric iron (high redness, often includes hematite)
- 13 — Sparse, green vegetation + ferric iron (not in L7)
- 3 — Ferric ± ferrous iron
- 5 — Clay, sulfate, mica, and(or) marble
- 10 — Clay, sulfate, mica, and(or) marble + ferrous or coarse-grained ferric iron
- 4 — Ferrous or coarse-grained ferric iron (may include oxidized basalts, fire ash, some moist soils, and any blue/green rocks) (not in L7)
- 11 — Dense, green vegetation
- 15 — No data—Smoke, clouds, and(or) cloud shadow
- Outline of ASTER scene footprint from Rockwell (2012)
- Outline of Landsat 8 OLI scene footprint

GEOLOGIC UNITS

[Layer name: Geolgic_units. Polygon shading according to age. Geology and linework are from Horton and others (2017)]

- **Quaternary units**
- **Tertiary units**
- **Tertiary–Cretaceous units**
- **Cretaceous units**
- **Cretaceous–Jurassic units**
- **Jurassic units**
- **Jurassic–Triassic units**
- **Triassic units**
- **Triassic–Permian units**
- **Permian units**
- **Carboniferous units**
- **Pennsylvanian units**
- **Mississippian–Devonian–Carboniferous units**
- **Mississippian–Devonian units**
- **Mesoproterozoic units**
- **Mesoproterozoic–Paleoproterozoic units**
- **Paleoproterozoic units**
- **Water**

GEOLOGIC STRUCTURES

[Layer names: Geologic_structure_orient, Geolgic_structure, and Geology_units]

- **Contacts**
- **Normal fault**—Dashed where approximate, dotted where concealed
- **Syncline**—Dotted where concealed
- **Anticline**—Dotted where concealed
- **Dike or sill**

HYDROLOGIC FEATURES

[Layer names: Principal_rivers and Water_bodies]

- **Rivers**—Primary rivers are solid lines, secondary rivers are dashed
- **Bodies of water**

POLITICAL FEATURES

[Layer names: State_boundaries, NatParkForest_boundaries, County_boundaries, City_limits, City_centers, and Roads]

- **City centers**
- **City limits**—Incorporated and unincorporated communities
- **National Park and National Forest boundaries**
- **State boundaries**
- **County boundaries**
- **Roads primary** (160)
- **Roads secondary** (140)

COMPILED MAP LAYERS

[The following map layouts can be selected and may also be selected from the bookmark and the layer lists]

- **Satellite Footprints**
- **Geologic Map**
- **ASTER**—Mineralogy + vegetation
- **Landsat 7**—Mineralogy + vegetation
- **Landsat 8 OLI**—Mineralogy + vegetation
- **Landsat 8 OLI**—Bands 431
- **Landsat 8 OLI**—Bands 541
- **Landsat 8 OLI**—Bands 651
- **Landsat 8 OLI**—Bands 671
- **Base Maps**

Improved Automated Identification and Mapping of Iron Sulfate Minerals, Other Mineral Groups, and Vegetation using Landsat 8 Operational Land Imager Data, San Juan Mountains, Colorado, and Four Corners Region

By

Barnaby W. Rockwell,[1] William R. Gnesda,[2] and Albert H. Hofstra[2]

2021

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[2]U.S. Geological Survey

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