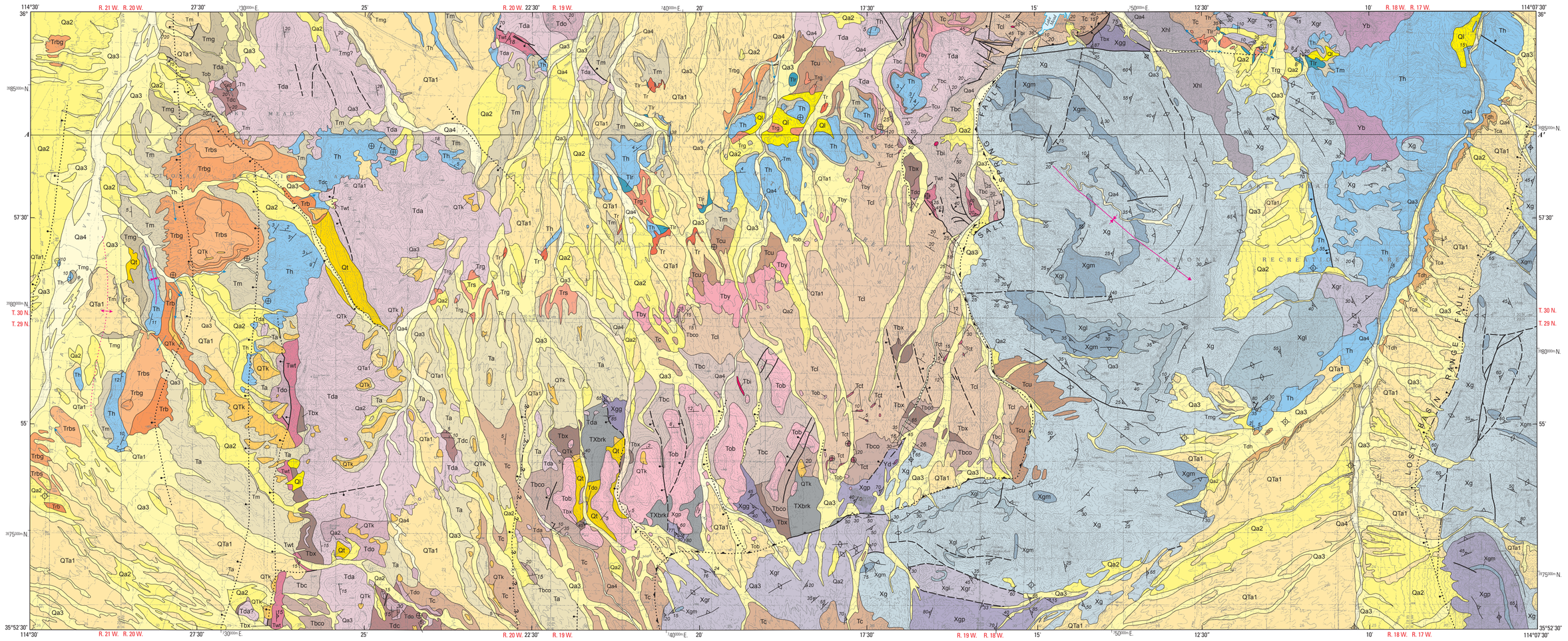
U.S. Department of the Interior
U.S. Geological Survey

Prepared in cooperation with the
National Park Service and Bureau of Land Management

Scientific Investigations Map 3372
Pamphlet accompanies map



Base from U.S. Geological Survey, Garnet Mountain NW, Senator Mountain NE, Senator Mountain NW, 1989, 1:24,000
Transverse Mercator projection; 1927 North American Datum

APPROXIMATE MEAN DECLINATION, 2017

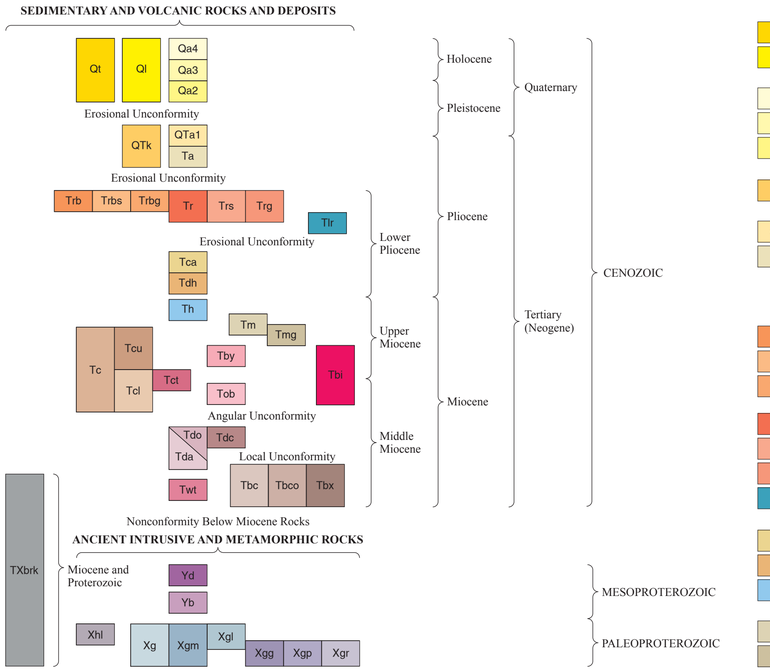
SCALE 1:50 000
1 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 .5 0 1 2 3 4 5 KILOMETERS
CONTOUR INTERVAL 40 FEET

ARIZONA
MAP LOCATION

Geology mapped by K.A. Howard, 1997–2009, and S.C. Lundstrom, 1997. Assisted by Zach Anderson, 2009. Includes selected structural data from Lucchitta (1966), Blacet (1975), Laney (1979a,b), Cascadden (1991), Duebendorfer and Sharp (1998), Blythe and others (2010), and Anderson and others (2013)
GIS database and digital cartography by S.S. Priest and Debra L. Block
Edited by Taryn A. Lindquist; digital cartographic production by Kathryn Nimz
Manuscript approved for publication November 21, 2016

CORRELATION OF MAP UNITS

[See Description of Map Units (in pamphlet) for precise unit ages]



LIST OF MAP UNITS

[See Description of Map units (in pamphlet) for complete unit descriptions]

SEDIMENTARY AND VOLCANIC ROCKS AND DEPOSITS

- Qt — **Talus deposits (Quaternary)**
- Ql — **Landslide and colluvium deposits (Quaternary)**

Piedmont alluvium

- Qa4 — **Youngest alluvium (Holocene)**
- Qa3 — **Younger alluvium (Holocene)**
- Qa2 — **Intermediate-age alluvium (Pleistocene)**

Erosional Unconformity

- QTk — **Calcrete (Pleistocene and Pliocene)**

Old piedmont alluvial deposits

- QTal — **Old alluvium (Pleistocene and Pliocene)**
- Ta — **Older alluvium (Pliocene)**

Erosional Unconformity

Ancestral Colorado River deposits (lower Pliocene)

Bullhead Alluvium

- Trb — **Bullhead Alluvium, undivided**
- Trbs — **Sand**
- Trbg — **Gravel**

River deposits of uncertain stratigraphic position

- Tr — **River deposits, undivided**
- Trs — **Sand**
- Trg — **Gravel**
- Tlr — **Limestone-block rubble (lower Pliocene)**

Erosional Unconformity

- Tca — **Cemented alluvial conglomerate of White Elephant Wash (lower Pliocene)**
- Tdh — **Deposits of Hualapai Wash (lower Pliocene)**
- Th — **Hualapai Limestone (upper Miocene)**

Muddy Creek Formation(?) (upper Miocene)

- Tm — **Mudstone**
- Tmg — **Gypsum**
- Tc — **Conglomerate, undivided (upper and middle Miocene)**
- Tcu — **Upper conglomerate (upper Miocene)**
- Tcl — **Lower conglomerate (upper and middle Miocene)**
- Tct — **Tephra bed(s) (Miocene)**
- Tby — **Young olivine basalt (upper Miocene)**
- Tob — **Olivine basalt (middle Miocene)**
- Tbi — **Intrusive basalt (Miocene)**

Angular Unconformity

Mount Davis Volcanics (middle Miocene)

- Tda — **Basaltic andesite**
- Tdo — **Olivine-pyroxene basalt**
- Tdc — **Volcanic-clast conglomerate**

Local Angular Unconformity

- Tbc — **Sedimentary breccia and conglomerate, undivided (middle Miocene)**
- Tbco — **Old conglomerate**
- Tbx — **Megabreccia**
- Twt — **Welded tuff (middle Miocene)**
- TXbrk — **Breccia, conglomerate, granite, and gneiss, undivided (Miocene and Proterozoic)**

Nonconformity Below Miocene Rocks

ANCIENT INTRUSIVE AND METAMORPHIC ROCKS

- Yd — **Diabase (Mesoproterozoic)**
- Yb — **Granite of Burro Spring (Mesoproterozoic)**
- Xhl — **Leucogranite of Greggs Hideout (Paleoproterozoic)**
- Xg — **Gneiss, undivided (Paleoproterozoic)**
- Xgm — **Mafic and quartz-poor gneiss**
- Xgl — **Leucogranitic gneiss**
- Xgg — **Paragneiss, garnet fresh**
- Xgp — **Paragneiss, garnet partly retrograded**
- Xgr — **Paragneiss, garnet retrograded**

EXPLANATION OF MAP SYMBOLS

[Faults and folds are solid where location is certain; dashed where location is inferred; dotted where location is concealed. Queries added where identity or existence may be questionable]

- **Contact**—Solid where location is certain

Faults

- **Normal fault**—Bar and ball on downthrown side. Showing dip where known
- **Low-angle normal fault**—Half-circles on upper plate

Folds—Showing trace of axial surface and direction of plunge where appropriate

- **Anticline**
- **Syncline**
- **Synform**

Strike and dip of bedding and volcanic layering

- **Inclined**—Showing dip where known
- **Horizontal**

Strike and dip of foliation—Metamorphic or tectonic foliation in gneiss; compaction foliation in welded tuff

- **Inclined**—Showing dip where known
- **Horizontal**
- **Vertical**

Slickenlines—Showing trend and plunge

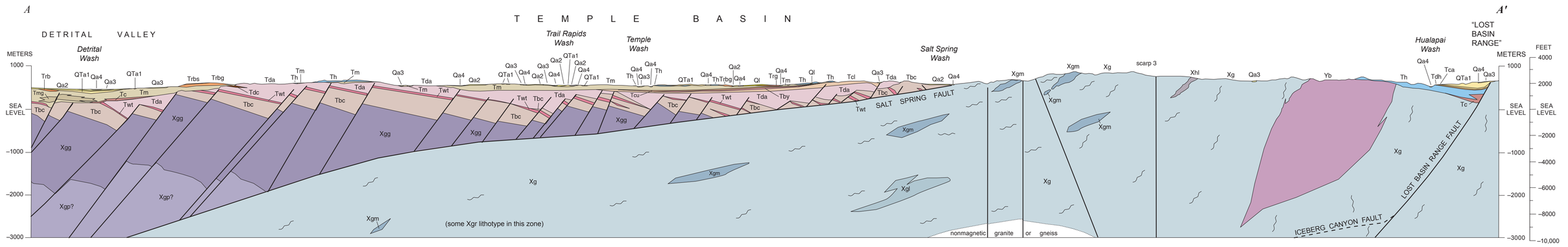
Form lines on lithologic layering—Showing dip direction or verticality as interpreted from aerial imagery

- **Inclined**
- **Vertical**

Form line showing general orientation of metamorphic or tectonic foliation in cross section

Drill hole—Approximate location (see table 1)

Fluvial current direction—From imbrication and crossbedding in ancestral Colorado River deposits



Geologic Map of the Northern White Hills, Mohave County, Arizona

By
Keith A. Howard, Susan S. Priest, Scott C. Lundstrom, and Debra L. Block

2017

This map was printed on an electronic plotter directly from digital files. Dimensional calibration may vary between electronic plotters and between X and Y directions on the same plotter, and paper may change size due to atmospheric conditions; therefore, scale and proportions may not be true on plots of this map.

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