U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

GEOLOGIC INVESTIGATIONS SERIES
MAP I-2628, Version 1.0
Pamphlet accompanies map

Base from U.S. Geological Survey, 1987
Universal Transverse Mercator Projection

TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1997

SCALE 1:100 000
1 0 1 2 3 4 5 6 7 8 MILES
1 0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

CONTOUR INTERVAL 50 METERS
SUPPLEMENTARY CONTOUR INTERVALS 25 METERS

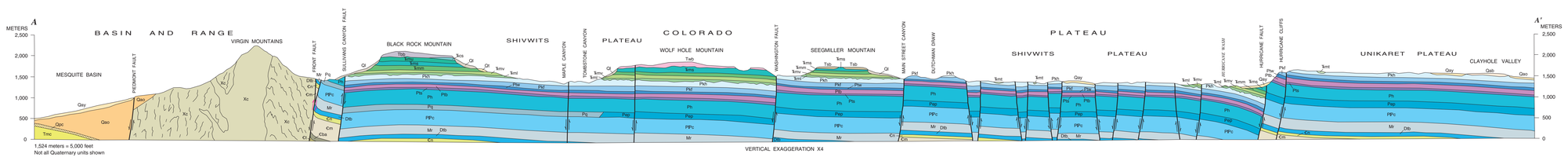
ARIZONA
MAP LOCATION

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—2000

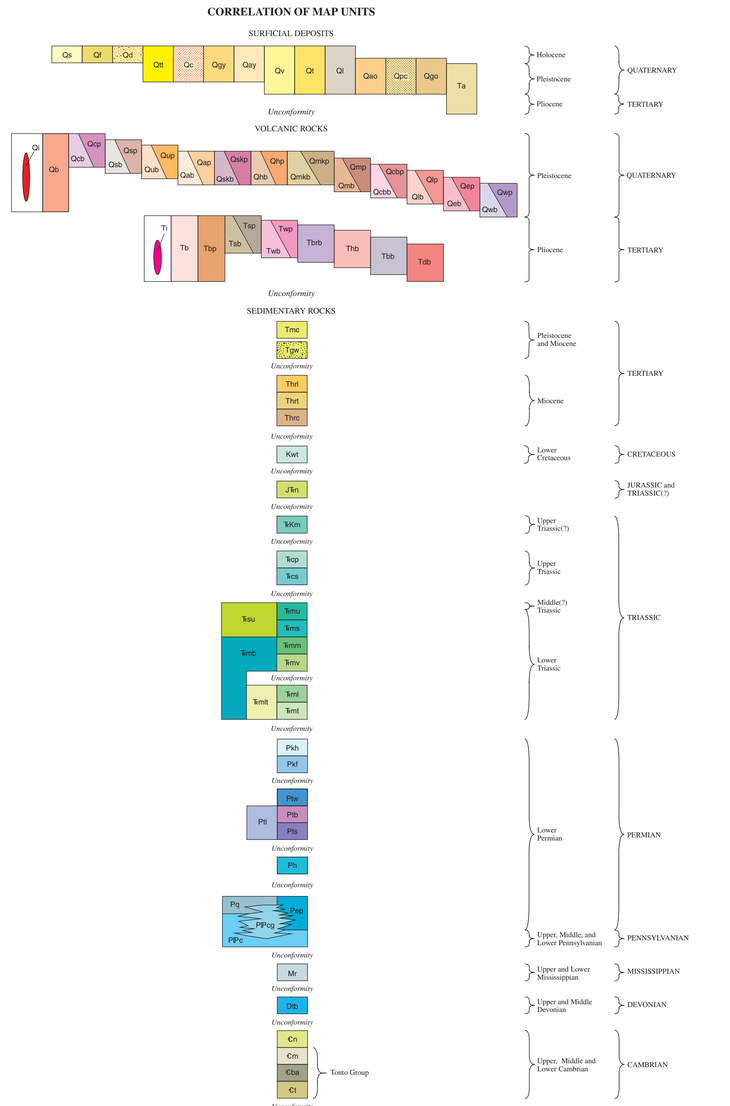
Geology mapped, 1990-1996;
GIS compilation by J.B. Workman, 1996-1997

Edited by Jan Zigler; digital cartography by Kathryn Nimz

Manuscript approved for publication January 26, 1998



CORRELATION OF MAP UNITS



LIST OF MAP UNITS

(See Description of Map Units (in pamphlet) for complete unit descriptions)

- Qs — **Stream-channel alluvium (Holocene)**
- Qf — **Floodplain deposits (Holocene)**
- Qd — **Dune sand and sand sheet deposits (Holocene)**
- Qtt — **Travertine deposits (Holocene and Pleistocene?)**
- Qc — **Colluvial deposits (Holocene and Pleistocene?)**
- Qgy — **Young alluvial terrace deposits (Holocene and Pleistocene?)**
- Qay — **Young alluvial fan deposits (Holocene and Pleistocene?)**
- Qv — **Valley-fill alluvial deposits (Holocene and Pleistocene)**
- Qt — **Talus deposits (Holocene and Pleistocene)**
- Ql — **Landslide deposits (Holocene and Pleistocene)**
- Qao — **Older alluvial fan deposits (Holocene(?) and Pleistocene)**
- Qpc — **Pediment calcrete (Holocene(?) and Pleistocene)**
- Qgo — **Older alluvial terrace deposits (Holocene(?) and Pleistocene)**
- Ta — **Old alluvium (Pleistocene and Pliocene)**

VOLCANIC ROCKS

- Ql — **Young basalts, undivided (Pleistocene)**
- Qi — **Intrusive dikes (Pleistocene)**
- Qb — **Basalt flows (Pleistocene)**

Cave Basalt (Pleistocene)
- Qcp — **Pyroclastic deposits**
- Qcb — **Basalt flows**

Sage Basalt (Pleistocene)
- Qsp — **Pyroclastic deposits**
- Qsb — **Basalt flows**

Undivided basalt (Pleistocene)
- Qup — **Pyroclastic deposits**
- Qub — **Basalt flows**

Antelope Knoll Basalt (Pleistocene)
- Qap — **Pyroclastic deposits**
- Qab — **Basalt flows**

Basalt of Seven Knolls (Pleistocene)
- Qskp — **Pyroclastic deposits**
- Qskb — **Basalt flows**

Basalt of Hat Knoll (Pleistocene)
- Qhp — **Pyroclastic deposits**
- Qhb — **Basalt flows**

Basalt of Maryland Knoll (Pleistocene)
- Qmkp — **Pyroclastic deposits**
- Qmkb — **Basalt flows**

Basalt of Moriah Knoll (Pleistocene)
- Qmp — **Pyroclastic deposits**
- Qmb — **Basalt flow**

Craigs Knoll/Berry Knoll basalt (Pleistocene)
- Qcbp — **Pyroclastic deposits**
- Qcbb — **Basalt flows**

Little Tanks Basalt (Pleistocene)
- Qlp — **Pyroclastic deposits**
- Qlb — **Basalt flow**

East Mesa Basalt (Pleistocene)
- Qep — **Pyroclastic deposits**
- Qeb — **Basalt flows**

West Mesa Basalt (Pleistocene)
- Qwp — **Pyroclastic deposits**
- Qwb — **Basalt flows**

Older basalts, undivided (Pliocene)
- Ti — **Intrusive dikes**
- Tb — **Basalt flows**
- Tbp — **Pyroclastic deposits**

Seegmiller Mountain Basalt (Pliocene)
- Tsp — **Pyroclastic deposits**
- Tsb — **Basalt flow**

Wolf Hole Mountain Basalt (Pliocene)
- Twp — **Pyroclastic deposits**
- Twb — **Basalt flows**

Black Rock Canyon Basalt (Pliocene)
- Tbrb — **Basalt flow(s)**

Hobble basalt (Pliocene)
- Thb — **Basalt flow**

Black Rock Mountain Basalt (Pliocene)
- Tbb — **Basalt flows**

Basalt of Diamond Butte (Pliocene)
- Tdb — **Basalt flow**

SEDIMENTARY ROCKS

Sedimentary rocks of the Grand Wash Trough and Mesquite Basin (Pleistocene and Miocene)
- Tmc — **Muddy Creek Formation**
- Tgw — **Rocks of the Grand Wash Trough (informal name)**

Rainbow Gardens Member of the Horse Spring Formation (Miocene)
- Thrl — **Limestone unit**
- Thrt — **Tuffaceous limestone and sandstone unit**
- Thrc — **Conglomerate unit**
- Kwt — **Willow Tank Formation (Lower Cretaceous)**
- JTRn — **Navajo Sandstone (Jurassic and Triassic?)**
- TRKm — **Kayenta and Moenave Formations, undivided (Upper Triassic?)**

Chinle Formation (Upper Triassic)
- Trcp — **Petrified Forest Member**
- Trcs — **Shinarump Member**

Moenkopi Formation (Middle? and Lower Triassic)
- Trmu — **Upper red member (Middle? and Lower Triassic)**
- Trms — **Shnabkaib Member (Lower Triassic)**
- Trmm — **Middle red member (Lower Triassic)**
- Trsu — **Upper red member, Shnabkaib Member, and middle red member, undivided (Middle? and Lower Triassic)**
- Trmv — **Virgin Limestone Member (Lower Triassic)**
- Trml — **Lower red member (Lower Triassic)**
- Trmt — **Timpoweap Member (Lower Triassic)**
- Trmb — **Basal members, Virgin Limestone Member and lower red member, undivided (Lower Triassic)**
- Trmlt — **Lower red member and Timpoweap Member, undivided (Lower Triassic)**

Kaibab Formation (Lower Permian)
- Pkh — **Harrisburg Member**
- Pkf — **Fossil Mountain Member**

Toroweap Formation (Lower Permian)
- Ptw — **Woods Ranch Member**
- Ptb — **Brady Canyon Member**
- Pts — **Seligman Member**
- Ptl — **Toroweap Formation, lower part undivided**
- Ph — **Hermit Formation (Lower Permian)**
- Pep — **Esplanade Sandstone and Pakoon Limestone (Lower Permian)**
- Pq — **Queantoweap Sandstone (Lower Permian)**

Callville Limestone (Lower Permian; Upper, Middle, and Lower Pennsylvanian)
- PIPc — **Limestone, cherty limestone, arenaceous limestone, and calcareous sandstone**
- PIPcg — **Gypsiferous facies**
- Mr — **Redwall Limestone (Upper and Lower Mississippian)**
- Dtb — **Temple Butte Formation (Upper and Middle Devonian)**
- Cn — **Nopah Formation (Upper Cambrian)**

Tonto Group (Upper, Middle, and Lower Cambrian)
- Cm — **Muav Limestone (Upper and Middle Cambrian)**
- Cba — **Bright Angel Shale (Middle Cambrian)**
- Ct — **Tapeats Sandstone (Lower Cambrian)**
- Xc — **Crystalline rocks, undivided (Early Proterozoic)**

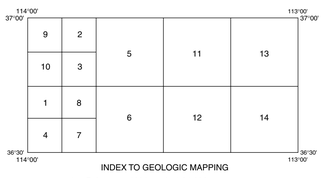
Contact—Approximately located

Fault—Dashed where inferred or approximately located; dotted where concealed; bar and ball on downthrown side; R indicates reverse fault. Number is estimated displacement in meters. Arrows in cross section indicate direction of relative movement; red arrows indicate direction of Proterozoic movement

Low angle fault—Dashed where approximately located, dotted where concealed. Sawteeth on hanging wall

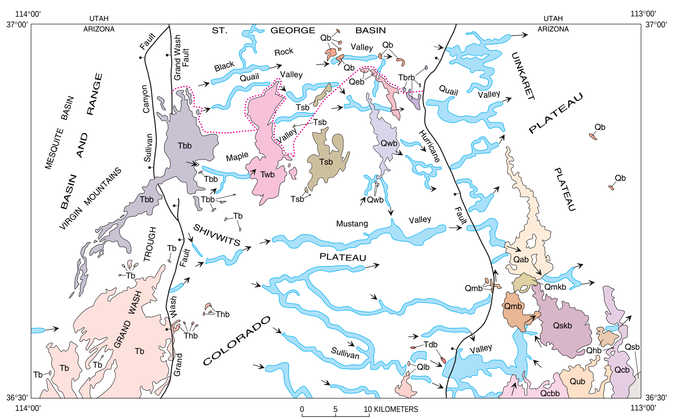
Folds—Showing trace of axial surface and direction of plunge; dashed where approximately located; dotted where concealed

- **Syncline**
- **Doubly plunging syncline**
- **Anticline**
- **Doubly plunging anticline**
- **Monocline**—Axial trace located approximately midway between top and bottom hinges of fold; dashed where approximately located; dotted where concealed
- **Stratigraphic dome**
- 15 **Strike and dip of beds**—Measured in the field
- **Strike of vertical and subvertical joints**—Interpreted from aerial photographs
- 35 **Strike and dip of metamorphic foliation**—From Moore (1972)
- **Strike of vertical metamorphic foliation**
- C **Collapse structure**—Circular collapse structure characterized by strata dipping inward toward central point. May reflect collapse of deep-seated breccia pipe that originated in Redwall Limestone
- **Sinkhole**—Enclosed depression or cave; partially filled by alluvium
- **Flow direction of basalt**
- **Gypsum mine (Gy), natural stone quarry (Ns), copper mine (Cu)**
- **Pyroclastic cone or vent area**



INDEX TO GEOLOGIC MAPPING

1. Bohannon, 1991, scale 1:24,000
2. Bohannon and Lucchitta, 1991, scale 1:24,000
3. Bohannon and others, 1991, scale 1:24,000
4. Bohannon, 1992, scale 1:24,000
5. Billingsley, 1993g, scale 1:31,680
6. Billingsley, 1994g, scale 1:31,680
7. Lucchitta and others, 1995a, scale 1:24,000
8. Lucchitta and others, 1995b, scale 1:24,000
9. Billingsley, 1995, scale 1:24,000
10. Billingsley and Bohannon, 1995, 1:24,000
11. Billingsley, unpub. data a, scale 1:31,680
12. Billingsley, unpub. data b, scale 1:31,680
13. Billingsley, unpub. data c, scale 1:31,680
14. Billingsley, unpub. data d, scale 1:31,680



EXPLANATION

- Qb — Young basalts undivided
- Qcb — Cave Basalt
- Qsb — Sage Basalt
- Qub — Undivided basalt
- Qab — Antelope Knoll Basalt
- Qskb — Basalt of Seven Knolls
- Qhb — Basalt of Hat Knoll
- Qmkb — Basalt of Maryland Knoll
- Qmb — Basalt of Moriah Knoll
- Qcbb — Craigs Knoll/Berry Knoll Basalt
- Qlb — Little Tanks Basalt
- Qeb — East Mesa Basalt
- Qwb — West Mesa Basalt
- Tb — Older basalts undivided
- Tsb — Seegmiller Mountain Basalt
- Twb — Wolfe Hole Mountain Basalt
- Tbrb — Black Rock Canyon Basalt
- Thb — Hobble Basalt
- Tbb — Black Rock Mountain Basalt
- Tdb — Basalt of Diamond Butte
- Paleovalley (Triassic)—Arrow indicates direction of paleoflow
- Fault—Bar and bar on downthrown side
- Boundary between Shivwits Plateau and St. George Basin

Figure 1. The Littlefield 30' x 60' quadrangle, northern Mohave County, northwestern Arizona, showing geographic features, distribution of volcanic rocks, and Triassic paleovalley systems.

GEOLOGIC MAP OF THE LITTLEFIELD 30' x 60' QUADRANGLE, MOHAVE COUNTY, NORTHWESTERN ARIZONA

By
George H. Billingsley and Jeremiah B. Workman

2000

For sale by U.S. Geological Survey, Map Distribution, Box 25286, Federal Center, Denver, CO 80225
1–888–ASK–USGS

Available on World Wide Web at http://geopubs.wr.usgs.gov/data.html