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

Geologic map of the Lost Spring Mountain East quadrangle, northern Mohave County, Arizona

by
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Open-File Report OF93-565

1993

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INTRODUCTION

The Lost Spring Mountain East 7.5′ quadrangle (96 sq km) is located in northern Mohave County, Arizona, along the Arizona/Utah state line. The quadrangle is about one kilometer west of Colorado City, Arizona, the nearest settlement (fig. 1). Altitudes range from about 1,415 m at Short Creek (north-central edge of quadrangle) to 1,634 m, at Lost Spring Mountain (west-central edge of quadrangle). Access to the quadrangle is by improved dirt road, locally referred to as the Navajo Trail, from Colorado City, Arizona (fig. 1). Several unimproved dirt roads lead from the Navajo Trail to various locations within the quadrangle area. For travel on these roads, four wheel drive vehicles are recommended because of loose soil or sandy conditions.

The area is managed entirely by the U.S. Bureau of Land Management, including about five and a half sections that belong to the state of Arizona and about fourteen sections of private land in the vicinity of Short Creek, northeastern quarter of the quadrangle. The area supports thick to moderate growths of sagebrush, cactus, various grasses, and a moderate cover of pinyon pine and juniper trees is common in rocky areas on Lost Spring Mountain.

PREVIOUS WORK

The first geologic map of this quadrangle was a photogeologic map made by C.H. Marshall (1956) for the U.S. Atomic Energy Commission that was compiled onto two Arizona state geologic maps, one at a scale of 1:500,000 (Wilson and others, 1969) and the other at a scale of 1:1,000,000 (Reynolds, 1988). The Short Creek NW quadrangle (now the Colorado City quadrangle) bordering this quadrangle on the east has been mapped photogeologically by Marshall and Pillmore (1956).

MAPPING METHODS

A preliminary geologic map was made from 1:24,000-scale aerial photographs. Detailed mapping at 1:24,000 was supplemented by photogeologic methods. In particular, many of the Quaternary alluvial units having similar lithologies were mapped using photogeologic methods. Detailed field investigations were then conducted to insure accuracy and consistency of all map units for descriptive purposes.

GEOLOGIC SETTING

The map area lies within the Uinkaret Plateau, a subplateau of the southwestern part of the Colorado Plateaus physiographic province (fig. 1). This part of the Uinkaret Plateau is characterized by relatively flat lying Triassic bedrock strata that have an average regional dip of about 2° northeast.

There is one small fault at the north edge of the quadrangle. Thickness of the Triassic strata is based on exposures about 5 km west of this quadrangle where the entire Triassic sequence is well exposed. Cenozoic deposits are widely distributed in the map area consisting of surficial fluvial deposits, sand dunes, and minor landslide deposits. The distribution of Quaternary alluvial and dune deposits are an important factor in future environmental, land, and range management planning projects in this area by federal, state, and private organizations. The surficial units are useful in the study of local geomorphology and have intertonguing and gradational contacts.

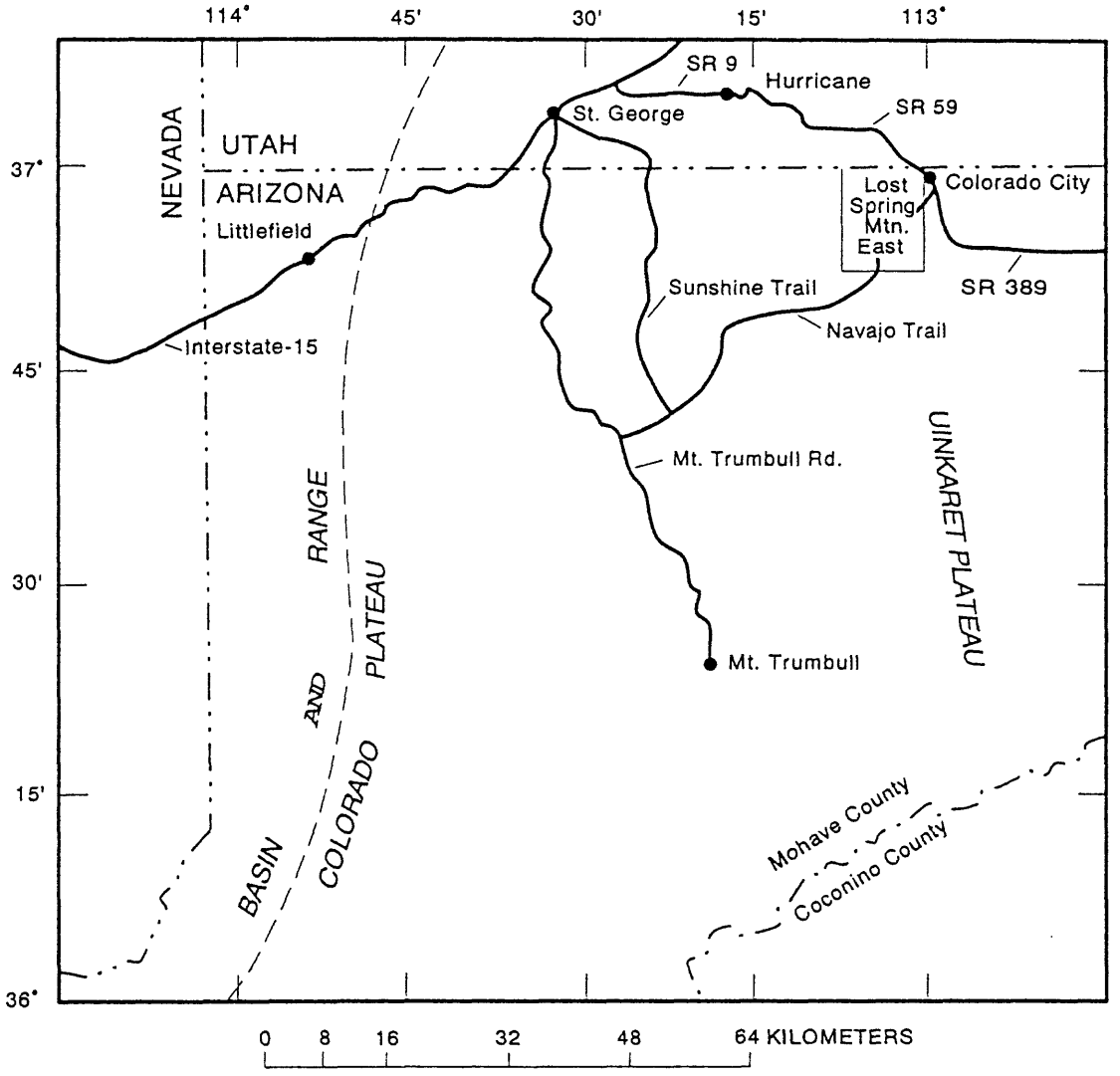

Figure 1. Index map of northern Mohave County, northwestern Arizona, showing the Lost Spring Mountain East, AZ 7.5′ quadrangle. SR = State Route.

STRATIGRAPHY

The sedimentary bedrock strata include members of the Moenkopi (Middle? and Lower Triassic) and Chinle Formations (Upper Triassic). A small portion of the Petrified Forest Member of the Chinle Formation, crops out in the northeast quarter of the quadrangle in the Short Creek area (fig. 1). The conglomeratic sandstone of the Shinarump Member of the Chinle Formation forms a resistant tan-brown cliff above red beds of the Moenkopi Formation which forms Lost Spring Mountain. Red siltstone and sandstone of the upper red member of the Moenkopi Formation are exposed in slopes below the conglomeratic sandstone of the Shinarump. Pale red and gray surficial pediment and other alluvial deposits cover about half of the quadrangle surface area.

The predominantly Quaternary age assigned to the alluvial deposits in the map area are based mainly on field relationships of these deposits with similar deposits 26 km west of this quadrangle and their relation to Pleistocene and Pliocene basalt flows (Billingsley, 1992a,b,c). Details of the stratigraphic sequence of alluvial deposits are given in the description of map units.

STRUCTURAL GEOLOGY

Structural features are almost non-existent in the quadrangle area. A small unnamed fault is present at the north-central edge of the quadrangle. The fault has a northwest strike, displacing strata down to the northeast about 25 m with strata dipping gently east on the both sides of the fault. Geologic mapping west of the quadrangle area (Billingsley, 1992a,b,c), indicates that the fault activity is late Pliocene or Pleistocene in age.

Other then a 2° regional dip of strata to the northeast, the only other structural features are vertical and near vertical joints. Most joints in the bedrock strata strike northwesterly; a few strike northeasterly. The joints are especially prominent in the Shinarump Member of the Chinle Formation on Lost Spring Mountain where erosion along them has formed spectacular pinnacles.

DESCRIPTION OF MAP UNITS

Surficial deposits

Qaf **Artificial fill and quarry pits (Holocene)**--Alluvial and bedrock material removed from pits and trenches to build stock tanks and drainage diversion dams. Includes spoil from sandstone rock quarries in the Shinarump Member of the Chinle Formation on Lost Spring Mountain

Qs **Stream-channel alluvium (Holocene)**--Unconsolidated and poorly sorted, interlensing silt, sand, and pebble gravel. Intertongues or inset to alluvial fan (Qa_1), terrace-gravel (Qg_1), upper part of valley-fill (Qv), and dune (Qd) deposits. Stream channels subject to high-energy flows and flash floods and support little or no vegetation. Contacts approximate. Estimated thickness 1 to 5 m

Qd **Dune sand (Holocene)**--Light red and tan, fine-grained, quartz sand. Locally forms small dunes and sandsheets covering alluvial pediment (Qpd) deposits and natural sand dune levees along banks of Short Creek. Eolian sand originates from Jurassic sediments of the Navajo Sandstone and Kayenta Formation northeast of quadrangle, transported down pediment drainages, mostly derived locally from stream-channel alluvium (Qs) of Short Creek drainage. Dominant wind direction is from the southwest. Supports grassy vegetation. As much as 8 m thick

Qf **Flood-plain deposits (Holocene)**--Chiefly red or gray silt and fine-grained sand and clay; locally cemented by clay and calcite. Accumulates in low-gradient drainages. Subject to frequent temporary ponding. Sparse or no vegetation. Estimated thickness 3 to 10 m

Qg_1 **Young terrace-gravel deposits (Holocene)**--Unconsolidated, light-brown to pale-red siltstone, sandstone, and lenses of gravel containing pebbles of well rounded black, red, yellow, gray, and white quartzite. Locally contains minor amounts of petrified wood fragments. Includes reworked materials from alluvial fan (Qa_1, and Qa_2), pediment (Qpd), and talus (Qt) deposits. Forms terrace bench about .5 to 2 m above local stream beds. Sustains moderate growth of salt cedar trees. Averages about 1 m thick

Qa_1 **Young alluvial fan deposits (Holocene)**--Unconsolidated silt and sand. Includes lenses of coarse gravel composed of multicolored, rounded pebbles of chert and quartzite and few cobbles of light red sandstone. Partly cemented by calcite and clay. Intertongues with stream-channel alluvium (Qs), upper part of valley-fill (Qv), young terrace-gravel (Qg_1), and talus (Qt) deposits. Alluvial fan subject to erosion by sheet wash and flash floods. Supports sparse vegetation composed of sagebrush, cactus, and grass. As much as 6 m thick

Qv **Valley-fill deposits (Holocene and Pleistocene)**--Partly consolidated silt, sand, and lenses of pebble to cobble gravel. Intertongues with talus (Qt), low terrace-gravel (Qg_1), and alluvial fan (Qa_1) deposits. Valleys subject to sheetwash flooding and temporary ponding; cut by arroyos in some larger valleys. Supports thick vegetation composed of sagebrush, grass, and cactus. As much as 9 m thick

Qg_2 **Higher terrace-gravel deposits (Holocene and Pleistocene)**--Similar to young terrace-gravel (Qg_1) deposits. Consists mainly of light-red, fine-grained sand and gray silt and clay cement. Intertongues with young alluvial fan (Qa_1), pediment (Qpd), and talus (Qt) deposits. Forms flat benches about 3 to 7 m above local stream beds. Sustains moderate to thick growth of sagebrush. Averages about 5 m thick

Qt **Talus deposits (Holocene and Pleistocene)**--Unsorted debris consists of breccia and large angular blocks of local bedrock as much as 1 m in diameter. Includes silt, sand, and gravel; partly cemented by calcite and gypsum. Intertongues with alluvial fan (Qa_1 and Qa_2), valley-fill (Qv), and terrace-gravel (Qg_1) deposits. Supports sparse to moderate growths of sagebrush, cactus, and grass. Only relatively extensive deposits shown. As much as 4 m thick

Ql **Landslide deposits (Holocene and Pleistocene)**--Unconsolidated masses of unsorted rock debris. Including detached blocks of strata that have rotated backward and slid downslope as loose, incoherent masses of broken rock and deformed strata, often partly surrounded by talus. Unstable when wet. Only large masses are shown. Thickness probably as much as 20 m

Qpd **Pediment deposits (Holocene and Pleistocene)**--Includes extensive local deposits, south part and northeast part of quadrangle. South part consists of pale red, tan, and brown, fine-grained sandstone and siltstone; partly cemented with calcite, gypsum, and clay. Includes surficial lag gravel composed of black, brown, gray, white, red, and yellow, well-rounded quartzite pebbles averaging less than 2.5 cm in diameter and rare, rounded, petrified wood fragments derived from erosion of Shinarump Member of Chinle Formation. Northeast part consists of light red and gray siltstone and sandstone and no lag gravel in northeast part of quadrangle. Includes integrated, poorly defined sand dunes and sand sheet deposits. Almost all material locally derived from Jurassic and Triassic sedimentary strata. Intertongues with younger alluvial fan (Qa_1), dune sand (Qd), and flood-plain (Qf) deposits. Commonly adjacent to or overlapped by younger alluvial fan (Qa_1), and dune (Qd) deposits. Approximately 3 to 12 m thick

Sedimentary Rocks

Chinle Formation (Upper Triassic)--Includes, in descending order, Petrified Forest and Shinarump Members as used by Stewart and others (1972)

Trcp **Petrified Forest Member**--White, blue-gray, green-gray, pale-red, and purple-red mudstone, siltstone, and coarse-grained sandstone. Contains bentonitic clays derived from volcanic ash. Only lower part exposed, mostly covered by stream-channel (Qs), dune sand (Qd), and pediment (Qpd) deposits, northeast quarter of quadrangle. Gradational and sharp erosional contacts with underlying cliff-forming Shinarump Member; locally fills channels cut into Shinarump. Forms slope. Estimated incomplete thickness about 60 m

Trcs **Shinarump Member**--Orange-brown, black, tan, and white, coarse-grained, cross-bedded to flat-bedded, conglomeratic sandstone. Weathers brown and black. Includes stream-channel deposits largely composed of well-rounded, black, brown, red, gray, white, and yellow quartzite pebbles and gravel; about 30% of clasts are black. Contains silicified petrified logs and wood fragments. Includes multicolored sandstone beds quarried for artistic stone sculptures on Lost Spring Mountain. Fills erosion channels cut into upper red member of Moenkopi Formation as much as 4 m deep. Forms cliff. As much as 55 m thick

Moenkopi Formation (Middle? and Lower Triassic)--Includes, in descending order, upper red member and Shnabkaib Member as used by Stewart and others (1972). The Middle-Lower Triassic boundary probably lies in the upper red member (Morales, 1987)

Trmu **Upper red member**--Heterogeneous sequence of red sandstone, siltstone, mudstone, conglomerate, and minor gray gypsum. Includes cliffs of thin-bedded sandstone in upper and lower part. Erosional contact with underlying Shnabkaib Member at base of lowest red sandstone cliff, difficult to find. Basal contact placed arbitrarily near top of highest thick white siltstone and dolomite bed of Shnabkaib. Forms slope and ledge sequence about 70 m thick

Trms **Shnabkaib Member**--Interbedded, white, laminated, aphanitic dolomite and silty gypsum. Includes light-red, thin-bedded mudstone, siltstone, and sandstone in upper and lower part. Contact with middle red member not exposed in this quadrangle. Forms steep slope with ledges. Incomplete, about 26 m thick

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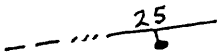
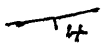
Wilson, E.D., Moore, R.T., and Cooper, J.R., 1969, Geologic map of the State of Arizona: Arizona Bureau of Mines, University of Arizona, scale 1:500,000.

Contact--Dashed where approximately located



Fault--Dashed where approximately located or inferred; dotted where concealed; bar and ball on downthrown side. Number is estimated displacement in meters.

Strike and dip of beds

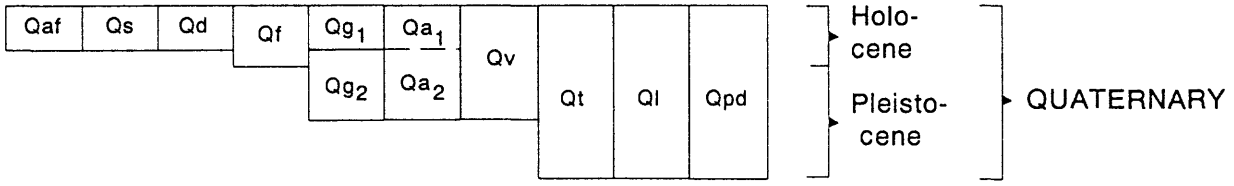


Inclined

Strike of vertical and near-vertical joints--Determined photogeologically

CORRELATION OF MAP UNITS

SURFICIAL DEPOSITS



SEDIMENTARY ROCKS