GEOLOGIC MAP OF THE BURNS KNOLL QUADRANGLE
BEAVER AND IRON COUNTIES, UTAH

by

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on the contents of this report.
DESCRIPTION OF MAP UNITS

Qal  Alluvial deposits of intermittent stream channels and floodplains (Holocene)--
    Unconsolidated, poorly sorted sand, gravel, and boulder deposits whose clast
    composition reflects local geologic units upstream. Thickness up to 30 feet.

Qaf$_1$ Alluvial fan deposits of the latest generation (Holocene)--Unconsolidated mud, sand,
    gravel, and boulder deposits; 80 percent sand and grit size, 20 percent larger
    clasts up to a foot. Mostly developed where stream channel gradients flatten as
    they enter the Escalante Desert lowland. These fans cut the late Quaternary
    fault scarps.

Qaf$_2$ Alluvial fan deposits of intermediate age (Holocene to Pleistocene)--Unconsolidated
    mud, sand, gravel and boulder deposits along the west side of the Escalante
    Desert along the east flank of Blue Mountain. The Lake Bonneville shoreline is
    so indistinct south of Moonshine Well that the age of Qaf$_2$ relative to the 15,000-
    year-old Bonneville Shoreline was not determined. Surface of these fans is cut by
    small rills.

Qaf$_3$ Older alluvial fan deposits (Pleistocene?)--Poorly consolidated deposits of silt, sand,
    gravel, and boulders that form the steep upper part of the alluvial apron along
    the east side of Blue Mountain.

Qap  Alluvial deposits on pediment (Quaternary)--Silt- to boulder-size deposits on southward
    sloping pediment surface that covers the northern two-thirds of this quadrangle.
    Islands of Tertiary volcanic rock remain above the pediment surface in its upper
reaches. The pediment is cut by shallow drainage courses. Pediment deposits are interlaced with eolian sand and silt which was deposited concurrently with alluvial materials on the pediment surface.

Qe  Eolian deposits, undivided (Quaternary)--Mostly silt to fine sand deposits that have been blown across the Escalante Desert floor in a northeasterly direction. Mostly formed into low, poorly organized longitudinal dunes. Eolian material constitutes a fair portion of all deposits in the Escalante Desert having accumulated concurrently with alluvial and lacustrine deposits throughout late Quaternary time, activated by persistent winds blowing out of the Mojave Desert in California and Nevada.

Qea  Eolian and alluvial deposits (Quaternary)--Eolian sand and silt with a significant component of admixed alluvial fan material.

Qeb  Blowouts (Quaternary)--Small eolian deflation depressions in the floor of the Escalante Desert intimately associated with adjacent dune deposits.

Qlu  Undifferentiated lacustrine deposits (Quaternary)--This unit is mapped only below the elevation of 5090 feet, the likely highstand of Lake Bonneville in the Lund area (Currey, 1982) between 16,000-14,500 years ago. They are mostly reddish-orange clayey silt with an admixture of eolian sand. Lake Bonneville deposits are poorly known in this quadrangle because they are partially covered by later eolian and playa deposits.
Qla  Lacustrine and alluvial deposits (Quaternary)--Deposits of mixed origins: Lake Bonneville bottom sediments, playa-lake floor deposits, eolian sand and silt, and fine-grained alluvial materials at the toe of fans and pediments. Mostly fine-grained sandy silt.

QTa  Alluvium (Quaternary-Pliocene?)--Alluvial pea-gravel, sand, and silt on the Escalante Desert floor. This material may have come from the west or north within the quadrangle, but a large part of it may also have come from the High Plateaus east of Cedar City and been brought across the desert by Pleistocene streams that are no longer so active. Some may also have been brought from the southwest from Pleistocene drainages off the Bull Valley Mountains near Enterprise. QTa is now largely covered with Holocene eolian deposits. Its thickness is unknown, but may be hundreds of feet.

Tbm  Blawn Formation, mafic lava flow member (Miocene)--Brown to gray porphyritic trachyandesite lava flows that weather reddish-brown with liesegang bands. Contains plagioclase and pyroxene phenocrysts. Best et al. (1987) showed that Blawn rocks are 23-18 m.y. old. Less than 100 feet thick where exposed along the north edge of the map, but more extensively exposed and thicker in the Frisco quadrangle to the north (Best, Lemmon, and Morris, 1989).

Ti   Isom Formation (Oligocene)--Marginally rhyolite to trachyte, densely welded, reddish-brown to purplish-gray ash-flow tuff. Contains less than 12 percent phenocrysts of plagioclase, and minor pyroxene and magnetite. Age, adjusted to new decay constants, is 26 m.y. Exposed only along southwest edge of map.
Tsh  Andesite of Shauntle Hills (Oligocene)—Heterogeneous reddish-brown lava flows containing phenocrysts of plagioclase and combinations of biotite, hornblende, and pyroxene in an aphanitic matrix. Exposed along north edge of this quadrangle but more extensively exposed in the adjacent Frisco quadrangle where it attains a thickness of nearly 2000 feet (Best, Lemmon, and Morris, 1989).

Jt  Temple Cap Formation (Jurassic)—Interbedded red siltstone and sandstone in basal 200 feet; silty red sandstone and fine grained tan flaggy sandstone in the middle 500 feet; upper 575 feet is medium-grained, cliff-forming, tan sandstone with small-scale, water-laid crossbeds. The top of the formation is truncated by the Blue Mountain thrust.

Jn  Navajo Sandstone (Lower Jurassic)—Red to light brownish gray, fine-grained eolian sandstone that forms cliffs and ledges. Tertiary silicification has converted most of the Navajo on Blue Mountain into quartzite. Thickness about 1900 feet.

Trc  Chinle Formation (Upper Triassic)—The Chinle Formation consists of the basal Shinarump Conglomerate Member, mapped as Trcs, and the upper member mapped as Trc. The upper member includes variegated mudstone, siltstone and sandstone, and locally contains limestone nodules. In the Beaver Dam Mountains sixty miles south of Blue Mountain this unit has been assigned to the Petrified Forest Member of the Chinle Formation (Hintze, 1986). Alteration to hornfels has changed the appearance of these strata on Blue Mountain, but the alteration effects are not as great in the upper Chinle as in the Moenkopi Formation. Some shales in the upper member of the Chinle are phyllicitic, and locally the unit is
mottled; but it is less indurated than the Moenkopi. The upper Chinle member is about 280 feet thick.

**Trcs**  **Shinarump Member of Chinle Formation (Upper Triassic)**--This member forms ledges and cliffs of light colored sandstone, making it a conspicuous and easily recognizable unit. At the base a quartzite pebble conglomerate ranges from zero to 10 feet in thickness; the remainder of the member consists of medium coarse, greenish gray to light brownish gray sandstone, with channel cross bedding prominent in the upper part of the unit. Locally, the unit contains petrified wood. The Shinarump Member is about 120 feet thick.

**Trm**  **Moenkopi Formation (Lower Triassic)**--Hornfels, indurated siliceous siltstone and mudstone, yellowish green, brown, and greenish black. Base of unit not exposed; thickness about 300 feet.

**Cs**  **Swasey Limestone (Middle Cambrian)**--Medium gray, massive crystalline dolomitized limestone that characteristically forms cliffs and ledges. Thickness on Blue Mountain is 670 feet (Weaver, 1980, p. 129-130).

**STRUCTURE**

**Blue Mountain thrust fault**--In the adjacent Blue Mountain quadrangle to the west the Mesozoic Blue Mountain thrust soles on the Chisholm Formation, except at the easternmost side where it ramps up into the Swasey Limestone as shown on this map. The steep eastward dip of the thrust surface on this map is a result of post-thrust folding.
This folding is dome-like beneath Blue Mountain and probably was caused by an unroofed Tertiary laccolithic intrusion beneath Blue Mountain. Presence of an igneous body beneath Blue Mountain is suggested by a 200 gamma aeromagnetic high centered on the Blue Mountain topographic high.

**High-angle faults that cut Mesozoic rocks**--North-trending faults are probably related to the major basin-range fault concealed by valley-fill on the east side of Blue Mountain. They show small displacement, generally down to the east. Faults that trend northeastward or southeastward may be tear faults related to Mesozoic movement on the Blue Mountain thrust.

**Concealed basin-range fault east of Blue Mountain**--No geophysical data are available to help estimate the total displacement on this range-bounding fault but it likely has several thousand feet of Late Miocene to Holocene vertical offset, by analogy with similar known basin-range faults.

**Normal fault that cuts Quaternary deposits**--In the southwest corner of the quadrangle a fault shown by hachured line cuts Qac deposits. This fault indicates Quaternary movement on the concealed basin-range fault described above. Offset of the Quaternary deposits is about 20 feet. The scarp is so much modified by post-faulting erosion that the faulting probably occurred several thousand years ago. This quadrangle lies on the west edge of the Intermountain Seismic Belt and has shown almost no historic earthquake activity (Stover et al. (1986)).
ECONOMIC GEOLOGY

No commercial mineral production has been reported for this quadrangle. Weaver (1980, p. 128) reported that he had collected limonite and hematite pseudomorphs after pyrite from the Shinarump Member of the Chinle Formation on the east side of Blue Mountain. This same area shows some prospector's trails and shallow excavations. No systematic geochemical surveys of the area have been reported.

Sand and gravel could be obtained from alluvial fans on the west side of the quadrangle, but the materials are poorly sorted and better deposits of construction materials are available in adjacent areas to the south.

GEOLOGIC HAZARDS

Because there are no permanent human inhabitants in this quadrangle, nor any works of man other than the gravel roads and railroad, the potential for significant damage is very limited. The chief hazard is flooding which occurs most often after late summer cloudbursts. Damages to the county-maintained gravel roads is not likely to be serious and can be quickly and inexpensively repaired. Railroad maintenance is done by railroad crews stationed at Lund, 12 miles to the southwest.

Earthquakes are a possible but extremely infrequent hazard. The basin-range fault on the west side of Escalante Valley could possibly generate a magnitude 7 earthquake, and there could possibly be surface rupture at the west base of Blue Mountain. But because of the remoteness of the area and the lack of human inhabitants or structures not much loss would likely occur within the quadrangle even in a severe earthquake.
Wind is perennial in the Escalante Desert area. On hot days in the Mojave Desert of California and Nevada the air expands northeastward generating stiff afternoon winds across the Escalante Desert flats. Silt and fine sand blows northeastward across the desert floor and is occasionally a nuisance to transportation.

REFERENCES CITED


Mower, R.W., 1982, Hydrology of the Beryl-Enterprise area, Escalante Desert, Utah, with emphasis on ground water: Utah Department of Natural Resources Technical Publication 73, 56 p.
