PROGRESS REPORT GEOLOGIC MAP OF THE SOUTH HALF OF THE BEAVER 30' x 60' QUADRANGLE, BEAVER, PIUTE, IRON, AND GARFIELD COUNTIES, UTAH

by

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DESCRIPTION OF GEOLOGIC UNITS

Qf Artificial-fill deposits—Emplaced deposits of artificial fill for dams.

Qal_1, Qal_2 Alluvium—Sand, silt, and clay with lenses of gravel in channels, floodplains, and adjacent low river terraces of rivers and major streams; subscript denotes relative age, with Qal_1 younger and Qal_2 older; maximum thickness about 30 feet (10 m).

Qat_1 Younger stream-terrace deposits—Sand and gravel that form dissected surfaces as much as 15 feet (5 m) above the level of adjacent modern streams; maximum thickness about10 feet (3 m).

Qat_2 Older stream-terrace deposits—Sand and gravel that form well dissected surfaces 15 to 30 feet (5-10 m) above the level of adjacent modern streams; maximum thickness about 10 feet (3 m).

Qaf_1 Young alluvial-fan deposits—Poorly to moderately sorted silt, sand, and gravel deposited by streams, sheetwash, debris flows, and flash floods on alluvial fans; surface is modern and generally undissected; thickness at least 30 feet (10 m).

Qaf_2 Middle alluvial-fan deposits—Poorly to moderately sorted silt, sand, and gravel deposited by streams, sheetwash, debris flows, and flash floods on alluvial fans; surface is moderately dissected by modern streams;

mapped only in the Minersville Reservoir area; thickness at least 30 feet (10 m).

Qaf_3 Old alluvial-fan deposits—Poorly to moderately sorted silt, sand, and gravel deposited by streams, sheetwash, debris flows, and flash floods on alluvial fans; surface is well dissected by modern streams; mapped only in the southwestern Tushar Mountains; thickness at least 50 feet (15 m).

Qap_1 Young piedmont-slope alluvium—Poorly to moderately sorted silt, sand, and gravel deposited by streams, sheetwash, debris flows, and flash floods on coalesced alluvial fans and pediments; surface is modern and generally undissected; thickness at least 30 feet (10 m).

Qap_2, Qap_3, Qap_4 Middle piedmont-slope alluvium—Poorly to moderately sorted silt, sand, and gravel deposited by streams, sheetwash, debris flows, and flash floods on coalesced alluvial fans and pediments; surface is moderately dissected by modern streams; subscript denotes relative age, with Qap_2 youngest and Qap_4 oldest; thickness at least 50 feet (15 m).

$QTap_5$ Old piedmont-slope alluvium—Poorly to moderately sorted silt, sand, and gravel deposited by streams, sheetwash, debris flows, and flash floods on coalesced alluvial fans and pediments; surface is deeply dissected by modern and older streams; mapped only in the Circleville Canyon – Dog Valley area (Anderson, 1987); maximum thickness about 30 feet (10 m).

Qms Landslide deposits—Unsorted, mostly angular, unstratified rock debris moved by gravity from nearby bedrock cliffs; maximum thickness about 100 feet (30 m).

Qmr Rock-glacier deposits—Unsorted, angular, unstratified rock debris in lobate masses in cirques east of the crest of the Tushar Mountains; maximum thickness about 30 feet (10 m).

QTs Basin-fill sedimentary rocks—Poorly to moderately consolidated, tan and gray, tuffaceous sandstone and subordinate mudstone, siltstone, and conglomerate deposited in basins of different ages (Pliocene to late Miocene) and origins; basins were formed by normal, oblique, and strike-slip faults related to basin-range extension and responsible for the present topography; includes deposits studied in detail in the Beaver basin (Machette and others, 1984; Machette, 1985), where Evans and Steven (1982) dated rhyolites of about 9 Ma that are synchronous with the beginning of basin-range faulting that formed the basin; the main phase of basin-range faulting took place between 7.6 and 5.4 Ma in the Kingston Canyon area (Rowley and others, 1981); thickness of QTs at least 2,000 feet (600 m).

Tb Basalt—Resistant, dark-gray and black, locally vesicular or amygdaloidal, crystal-poor (olivine and pyroxene phenocrysts) olivine basalt lava flows and cinder cones; synchronous with basin-range extension (Christiansen and Lipman, 1972; Rowley and Dixon, 2001); includes basalt near Minersville Reservoir that has a K-Ar date of 7.6 Ma, another south of it in the Black Mountains that has a K-Ar date of 6.4 Ma (Best and others, 1980), basalt in Kingston Canyon that has a K-Ar date of 7.8 Ma (Rowley and others, 1981), and basalt southeast of Otter Creek Reservoir that has a K-Ar date of 5.0 Ma (Best and others, 1980); maximum thickness of lava flows about 200 feet (60 m).

Tsr Sevier River Formation—Poorly to moderately indurated, gray, tan, yellow, white, pink, and light-green, tuffaceous sandstone, pebbly to bouldery conglomerate, mudstone, and siltstone of fluvial and locally lacustrine origin; deposited in basins that formed generally prior to the main episode of basin-range faulting (Rowley and others, 1981, 1998, 2002; Rowley, 1998); airfall tuff beds and basalts within the formation near the town of Sevier north of the mapped area have K-Ar dates between 14 and 5.6 Ma (Best and others, 1980; Steven and others, 1979; Rowley and others, 1994); mapped only south of Junction; thickness at least 500 feet (150 m).

Try Young rhyolite lava flows—Resistant, mostly gray, flow banded, crystal-poor, high-silica rhyolite volcanic domes, lava flows, and pyroclastic material; sources define an east-trending belt in the Blue Ribbon transverse zone (Rowley and others, 1978; Rowley, 1998), including a dome near Beaver airport that has a K-Ar date of 8.3 Ma (Anderson and others, 1990b), two domes in the Black Mountains that have K-Ar dates of 7.9 Ma (Anderson and others, 1990b) and 7.6 Ma (Mehnert and others, 1978; Rowley and others, 1978), flows capping the Sevier Plateau north of Kingston Canyon that have K-Ar dates of 7.6 Ma (Rowley and others, 1981), a dome south of Minersville Reservoir that has a K-Ar date of 7.5 Ma (Evans and Steven, 1982; Anderson and others, 1990b), and the rhyolite of Phonolite Hill in Kingston Canyon with K-Ar dates of 5.4 and 4.8 Ma (Rowley and others, 1981); although the dome in Kingston Canyon has a relief of more than 1,000 feet (300 m), in most other places the maximum thickness of the rhyolites is less than 200 feet (60 m).

Thv Horse Valley Formation—Mostly soft, gray and pink, crystal-poor, dacitic lava flows and volcanic mudflow breccia of a probable stratovolcano complex west of the map area (Anderson and Rowley, 1975; Rowley, 1978); about 22-19 Ma (Fleck and others, 1975); maximum thickness about 1,000 feet (300 m), thickening westward.

Tml Potassium-rich mafic lava flows—Resistant, black and dark-gray, locally vesicular and amygdaloidal, crystal-poor lava flows and scoria that resemble basalt but chemical analyses show to be high in K_20 (Best and others, 1980; Cunningham and others, 1983; Rowley and others, 1994, 2002); considered to represent the oldest product of bimodal (extension-related) volcanism (Cunningham and others, 1998), with K-Ar dates of 25-21 Ma; maximum thickness about 500 feet (150 m).

Tmg Mafic gravels of Gunsight Flat—Moderately resistant, black and dark-gray fluvial conglomerate made up of clasts of Tml, locally intercalated with Tml and interpreted to represent fanglomerates shed northward from Miocene fault scarps (Anderson and others, 1990a); exposed only in the southern Tushar Mountains; maximum thickness 1,000 feet (300 m).

Tlf Tuff of Lion Flat—Soft, pink, white, tan, and gray, unwelded, crystal-poor, rhyolite ash-flow tuff and minor airfall and water-laid tuff (Wickstrom, 1982; Lanigan and Anderson, 1987); probably tuff-ring deposits (Rowley and others, 2002); age between 23 and 22 Ma; exposed only in the east Black Mountains; maximum thickness about 300 feet (100 m).

Tib Biotite-sanidine porphyry rhyolite dikes—Moderately resistant, gray and tan rhyolite dikes; have K-Ar dates of 22.5 and 22.3 Ma (Rowley and others, 1994), perhaps related to emplacement of the Lincoln stock, just north of the map area and with a preliminary U/Pb date of about 23 Ma (Coleman and others, 1997; D.S. Coleman, written commun., 2004); exposed only in the southeastern Mineral Mountains; maximum thickness about 200 feet (60 m).

Tic Concordant intrusions—Resistant, gray, quartz monzonite intrusions in the Markagunt Plateau (Anderson and Rowley, 1975; Anderson and others, 1990a, b); probably laccoliths that intrude into Tc; one, the Spry Intrusion in Circleville Canyon, is of batholith size in outcrop (Grant and Anderson, 1979) and extends well to the south in the subsurface (Blank and Kucks, 1989; Bankey and others, 1998), has an age of 25 Ma (Anderson and others, 1990a), and erupted Tbb and Tbr.

Mount Dutton Formation—Mostly soft, brown, tan, pink, and gray, volcanic mudflow breccia made up of angular clasts of crystal-poor andesitic rock, subordinate resistant lava flows and flow breccia of the same lithology, and minor fluvial and eolian sandstone and conglomerate whose clasts are the same lithology (Anderson and Rowley, 1975); deposits from clustered stratovolcanoes that form most of the southern Marysvale volcanic field (e.g., Callaghan, 1939; Anderson and Rowley, 1975; Steven and others, 1979, 1990; Cunningham and others, 1983; Rowley and others, 1998, 2002,

Campbell and others, 1999), where they are dated at 26 to 21 Ma (Fleck and others, 1975); thickness in the area at least 6,000 feet (2,000 m).

Tdv Vent facies—Volcanic mudflow breccia, flow breccia, and lava flows interpreted to represent near-source eruptions (Anderson and Rowley, 1975); many of the source stratovolcanoes are aligned east-west along the east-striking Blue Ribbon transverse zone (Rowley and others, 1978, 1998; Rowley, 1998), which passes from Kingston Canyon, along the break in slope between the Tushar Mountains and Markagunt Plateau, along the northern side of the Black Mountains, and on across the entire Great Basin.

Tda Alluvial facies—Primarily volcanic mudflow breccia in which lithologies are more heterogeneous than in the vent facies, representing deposits interpreted to have traveled farther from the source, down the flank of individual stratovolcanoes (Anderson and Rowley, 1975), passing into conglomerate still farther from the source; the unit is by far the most voluminous component of the formation.

Tdp Plugs and dikes—Small source magma bodies (vents) of the formation (e.g., Blackman, 1985); the crystal-poor (poorly differentiated) nature of the rock coupled with the low volume of its source plutons indicate that the intrusive sources of the volcanic rocks of the formation are deep.

Tdan Antimony Tuff Member—Resistant, mostly red, densely welded, crystal-poor trachytic ash-flow tuff intertongued within the upper part of the formation (Anderson and Rowley, 1975); source vent may underlie Sevier Valley near the town of Sevier; K-Ar age is 25 Ma (Rowley and others, 1994); exposed mostly in the Sevier Plateau; maximum thickness 50 ft (15 m).

Tdb Beaver Member—Resistant, gray, pink, tan, green, and reddish-brown, dense, thick-bedded, crystal-rich, andesite porphyry lava flows and flow breccia of several volcanic domes, and local tuffaceous sandstone, volcanic mudflow breccia, and tuff (Anderson and Rowley, 1975); K-Ar dates of 26.2 and 25.0 Ma (Fleck and others, 1975); exposed only south of Beaver; maximum thickness about 600 feet (200 m).

Tdl Local tuffs—Several, mostly resistant, reddish-brown and tan, densely welded, crystal-poor, trachytic ash-flow tuffs intertongued within the formation; maximum thickness of any one unit is about 200 feet (60 m).

Tdk Kingston Canyon Tuff Member—Resistant, mostly purple, densely welded, crystal-poor, trachytic ash-flow tuff intertongued within the lower part of the formation (Anderson and Rowley, 1975); perhaps derived from the same source area as Tdan; K-Ar date of 26 Ma (Fleck

and others, 1975); exposed mostly in the Sevier Plateau; maximum thickness about 50 feet (15 m).

Toa Antimony Tuff Member of the Mount Dutton Formation and Osiris Tuff, undivided.

Tkcn Kingston Canyon Tuff Member of the Mount Dutton Formation, Buckskin Breccia, Three Creeks Tuff Member of the Bullion Canyon Volcanics, and Needles Range Group, undivided.

To Osiris Tuff—Resistant, brown, tan, and gray, densely welded, moderately crystal-rich, rhyodacitic ash-flow tuff (Williams and Hackman, 1971) characterized by drawn out pumiceous lenticules and, at its top, local flow foliation caused by secondary flowage; derived from the largest caldera in the Marysvale field, the Monroe Peak caldera east of Marysvale, which is controlled by the east-striking Cove Fort transverse zone (Steven and others, 1984, 1990; Rowley, 1998; Rowley and others, 2002); K-Ar age about 23 Ma (Fleck and others, 1975; L.W. Snee, U.S. Geological Survey, written commun, 1998); maximum thickness about 200 feet (60 m).

Tlm Volcanic rocks of Langdon Mountain—Soft to resistant, pink, tan, gray, and red dacitic lava flows, flow breccia, volcanic mudflow breccia, and minor fluvial conglomerate and sandstone; mostly alluvial-facies deposits derived from clustered stratovolcanoes in the central Sevier Plateau; maximum thickness in the map area about 500 feet (150 m), thickening northward.

Ttm Tuff of Minersville—Small-volume, moderately resistant, tan, gray, and pink, poorly welded, crystal-poor (conspicuous sanidine and subordinate plagioclase and biotite), rhyolite ash-flow tuff and apparent source dikes; most exposures east of Minersville; maximum thickness of tuff about 100 feet (30 m).

Tql Leach Canyon Formation of the Quichapa Group--Moderately resistant, tan and gray, crystal-poor, poorly welded, low-silica rhyolite ash-flow tuff; part of a series of regional ash-flow tuffs (Quichapa Group; Mackin, 1960; Williams, 1967) derived from the Great Basin; source probably the Caliente caldera complex of eastern Nevada, as suggested by isopachs (Williams, 1967; Rowley and others, 1995); Ar/Ar age about 23.8 Ma (Best and others, 1993); exposed only west of Parowan Valley; maximum thickness about 150 feet (50 m), thickening southwestward.

Tbv Bear Valley Formation—Generally soft, characteristically light-green but locally gray and yellow, moderately to well sorted, commonly cross

bedded, fine- to medium-grained, tuffaceous sandstone of mostly eolian but locally fluvial origin, interbedded volcanic mudflow breccia, airfall tuff, and poorly and highly welded ash-flow tuff (Anderson, 1971); has K-Ar dates of about 25 Ma (Fleck and others, 1975); maximum thickness about 1,000 feet (300 m).

Tbr Volcanic rocks of Bull Rush Creek—Soft to moderately resistant, tan, gray, pink, and greenish-yellow, dacitic volcanic mudflow breccia, conglomerate, sandstone, lava flows, poorly welded ash-flow tuff, dikes, and flow breccia (Anderson and others, 1990a); lava flows and clasts have an identical, distinctive lithology of crystal-rich quartz monzonite porphyry similar to the Spry Intrusion (Tic); stratovolcano deposits on the roof of, and derived from the Spry Intrusion, which subsequently domed up Tbr; K-Ar date of 26.4 Ma; base not exposed but about 800 feet thick (250 m).

Tbb Buckskin Breccia—Moderately resistant, gray and pink, poorly to moderately welded, crystal poor, dacitic ash-flow tuff, flow breccia, volcanic mudflow breccia, conglomerate, and sandstone (Anderson and Rowley, 1975; Yannacci, 1986); characterized by as much as 50 percent rock volume of crystal-rich lithic clasts identical to Tbr and the Spry Intrusion (Tic), from which it was derived; intertongues with the Isom Formation (Tin) and considered about 26 Ma; exposed between Buckskin Valley and Circleville Canyon (Markagunt Plateau); maximum thickness about 250 feet (80 m).

Tin Isom Formation and the Needles Range Group, undivided
Isom Formation—Resistant, brown and reddish-brown, crystal-poor, densely welded, trachydacitic ash-flow tuff (Mackin, 1960; Fryman, 1987) derived perhaps from the Indian Peak caldera complex at the Utah-Nevada border (Best and others, 1989a, b); age about 27-26 Ma on the basis of many Ar/Ar and K-Ar dates (Best and others, 1989b; Rowley and others, 1994); maximum thickness about 30 feet (10 m).
Needles Range Group—Resistant, gray, tan, pink, and light-purple, crystal-rich, moderately welded, dacite ash-flow tuff (Mackin, 1960) derived from the Indian Peak caldera complex (Best and others, 1989a, b); near Minersville, consists of both the Lund Formation (27.9 Ma; Best and others, 1989a) and the Wah Wah Springs Formation (30.5 Ma; Best and others, 1989a) of the Needles Range Group; in the Markagunt Plateau, consists of the Wah Wah Springs Formation; maximum thickness about 100 feet (30 m).

Tbct Three Creeks Tuff Member of the Bullion Canyon Volcanics—Resistant, gray and tan, moderately welded, crystal-rich, dacitic ash-flow tuff (Steven and others, 1979) derived from the Three Creeks caldera in the southern Pahvant Range (Steven, 1981; Steven and others, 1984, 1990),

which is controlled by the Cove Fort transverse zone (Rowley, 1998; Rowley and others, 2002); K-Ar age about 27 Ma (Steven and others, 1979); maximum thickness about 600 feet (200 m).

Tvl Local volcanic and sedimentary rocks—Heterogeneous assemblage, predating Tn, of mostly resistant lava flows, ash-flow tuff, flow breccia, volcanic mudflow breccia, and tuffaceous sandstone (Anderson and Rowley, 1975); a K-Ar date of 31.9 Ma was determined on an ash-flow tuff (Fleck and others, 1975); exposed only between Buckskin Valley and Circleville Canyon; maximum thickness about 450 feet (140 m).

Tcg Conglomerate of the Mineral Mountains—Moderately resistant, white and light-gray, fluvial conglomerate and sandstone characterized by pebbles of quartzite and carbonates as much as 3 feet (1 m) in diameter, resting unconformably on Mesozoic sedimentary rocks; exposed only in the southern Mineral Mountains and Minersville area; maximum thickness about 120 feet (40 m).

Tc Claron Formation—Soft to resistant, mostly red (lower part) and white and gray (upper part), lacustrine and fluvial limestone, calcrete, sandstone, siltstone, mudstone, and conglomerate; maximum thickness about 1,000 feet (300 m).

Jn Navajo Sandstone—Resistant, red, yellow, and gray, spectacularly cross bedded, fine- to coarse-grained, eolian sandstone (Earll, 1957; Price, 1998); exposed only northeast of Minersville; maximum exposed thickness about 200 feet (60 m).

TRm Moenkopi Formation—Soft and locally resistant, red, pink, light- and dark-gray, and greenish-gray, thin-bedded siltstone, shale, and subordinate limestone (Earll, 1957; Price, 1998); exposed only east and northeast of Minersville; maximum thickness about 1,000 feet (300 m).

Ppk Plympton and Kaibab Formations, undivided—Exposed only east and northeast of Minersville.

Plympton Formation—Moderately resistant, gray and tan, thin bedded, ledgy, chert-bearing, dolomite and limestone (J.E. Welsh and B.R. Wardlaw, unpublished data, 1978); maximum thickness about 200 feet (60 m).

Kaibab Formation—Resistant, light- to dark-gray, medium-grained, thin- to thick-bedded, fossiliferous limestone characterized by cliffs and ledges and by abundant dark-brown chert concretions and beds (Earll, 1957; J.E. Welsh and B.R. Wardlaw, unpublished data, 1978; Corbett, 1984; Price, 1998); maximum thickness about 400 feet (120 m).

Pt Toroweap Formation—Generally resistant, light- to dark-gray, black, and tan, fine-grained, mostly thin-bedded, ledgy, locally cherty and fossiliferous limestone and subordinate sandstone (J.E. Welsh and B.R. Wardlaw, unpublished data, 1978; Corbett, 1984); exposed only northeast of Minersville; maximum thickness about 250 feet (75 m).

Pq Queantoweap Sandstone—Generally resistant, tan and pink, thin-bedded, ledgy, fine-grained sandstone (J.E. Welsh and B.R. Wardlaw, unpublished data, 1978); exposed only in the Minersville area; maximum thickness about 500 feet (150 m).

Pp Pakoon Dolomite—Soft to resistant, gray and pink, ledgy, medium-grained, thick-bedded, locally chert-bearing dolomite and minor sandstone (J.E. Welsh and B.R. Wardlaw, unpublished data, 1978; Corbett, 1984; Price, 1998); exposed only southeast of Minersville; maximum thickness 800 feet (240 m).

Pc Calville Limestone—Generally resistant, white and gray, fine-grained, fine- to medium-bedded, ledgy, locally fossiliferous, locally cherty limestone and minor gray, purple, and brown siltstone and fine-grained sandstone capped by an upper cliff (J.E. Welsh and B.R. Wardlaw, unpublished data, 1978; Wardlaw, 1980; Corbett, 1984; Price, 1998); exposed only southeast of Minersville; maximum thickness 400 feet (120 m).

Mr Redwall Limestone—Resistant, light-gray to black, medium-grained, thick-bedded, highly fossiliferous, rarely cherty, spar-rich limestone and, in the lower part, dolomite (J.E. Welsh and B.R. Wardlaw, unpublished data, 1978); forms massive cliffs; exposed only southeast of Minersville; maximum thickness in incomplete section about 1,000 feet (300 m).

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SOURCE LIST FOR GEOLOGIC MAPPING
(Numbers correspond to those on index map)

1. Anderson, J.J., 1965, Geology of northern Markagunt Plateau, Utah: Austin, University of Texas, unpublished Ph.D. dissertation, 194 p.

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GEOLOGIC SYMBOLS

CONTACT

NORMAL FAULT

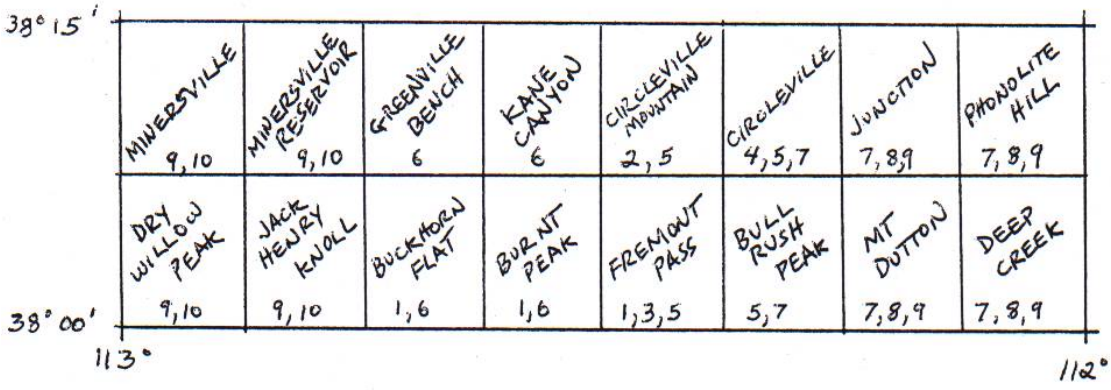
Dashed where location inferred; dotted where concealed; bar and ball on downthrown side

Inclined

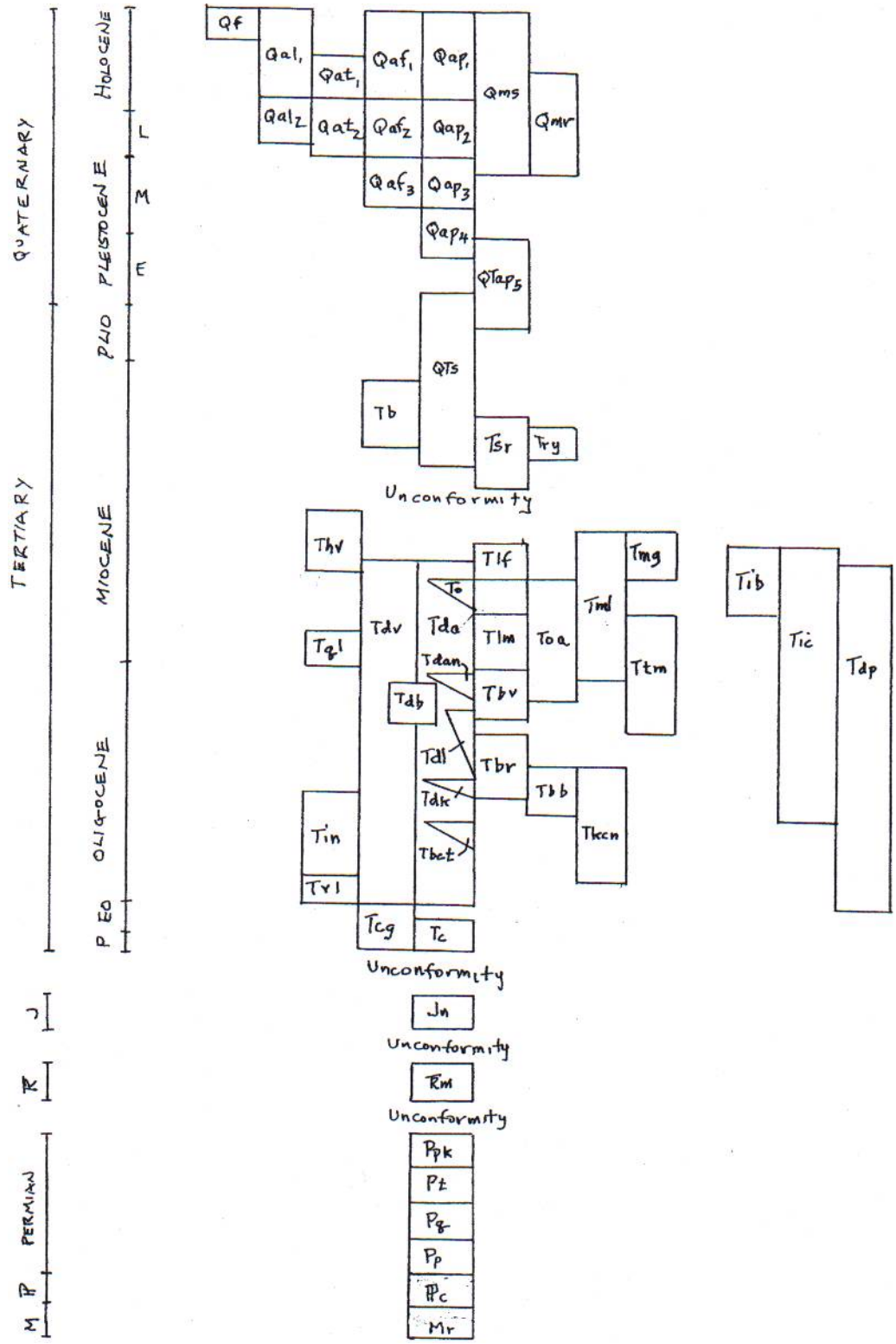
STRIKE AND DIP OF BEDDING

VOLCANIC VENT

SOUTH HALF OF BEAVER 1:100K



Index map showing sources of geologic mapping and 7.5-minute quadrangles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Utah Geological Survey
a division of
Utah Department of Natural Resources
in cooperation with
U.S. Geological Survey

Plate 1
Utah Geological Survey Open-File Report 435
Progress Report Geologic Map of the South Half of the Beaver 30'x 60' Quadrangle

Scale 1:100,000

0 0.5 1 2 3 4 5 6 7 8 9 Miles

This open-file release is a progress report that provides the public with the results of the first year of mapping of a multi-year project. The map is incomplete and inconsistencies, errors, and omissions have not been resolved. The map may not conform to UGS policy and editorial standards and it may be premature for an individual or group to take action based on its contents.

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Progress Report Geologic Map of the South Half of the Beaver 30' x 60' Quadrangle, Beaver, Piute, Iron, and Garfield Counties, Utah

by
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2004

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