U.S. DEPARTMENT OF INTERIOR

U.S. GEOLOGICAL SURVEY

PRELIMINARY GEOLOGIC MAP OF THE PANGUITCH QUADRANGLE, GARFIELD COUNTY, UTAH

by

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OPEN-FILE REPORT 95-9

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DESCRIPTION OF MAP UNITS

UNCONSOLIDATED SURFICIAL DEPOSITS

Qal **Flood-plain and channel alluvium of the Sevier River (Holocene)** --Sand and gravel deposits in channels, bars, and adjacent flood plains less than about 2.5 m above the main channel. Chiefly pale-yellowish-brown (10YR 6/2) to yellowish-brown (10YR 6/4) very fine to coarse sand. Sand is about 85-90 percent quartz and 5-10 percent lithic grains of andesitic to felsic volcanic rocks, pink and white limestone, calcite-cemented sandstone, chert, and chalcedony; 2-4 percent accessory minerals, olivine, pyroxene and hornblende. Locally alluvium is silty and (or) may contain abundant gravel. Unit is subject to occasional flooding. Base covered. Estimated thickness 1-4 m

Qa_1 **Alluvium (Holocene)** --Sand and gravel deposits in drainageways tributary to Sevier River. Two compositional types exist: quartzose alluvium in drainages east of the Sevier River, and west of it, alluvium rich in mafic volcanic grains. An example of quartz-rich alluvium is in Peterson Wash (4 km east of Panguitch): white (10YR 8/1) very fine to coarse-grained sand and gravelly sand; contains minor lithic grains; An example of the mafic-rich (volcanic litharenite) alluvium is in South Canyon: brown (10YR 5/3) to yellowish-brown (10YR 5/2) silty, pebbly sand, fine to coarse-grained sand, composed of 60 percent quartz, 40 percent ferromagnesian minerals and basalt or andesite. Pebbles are round to subround, chiefly mafic to intermediate volcanics, but sparse ash-flow tuff also. Base not exposed; estimated thickness 1-2 m

Qfy **Young alluvial-fan deposits (Holocene)** --Stratified gravel, sand, silt, and clay presently accumulating in fan-shaped deposits at the mouths of drainages. West of Sevier River, alluvium is derived from hills made chiefly of epiclastic volcanic fragments (units Tse and Td) and basalt (units Tb and Tbcc). Gravel is mostly round to subround pebbles, but 10-20 percent cobbles and small boulders. Gravel is hard, finely crystalline and porphyritic basalt and andesite, black (N1), medium dark gray (N4), and light bluish gray (5B 7/1). Contains sparse thin beds of gravelly mudstone, probable debris flow deposits; also sparse to common beds 5-10 cm thick of pale-brown (10YR 6/3) pebbly sand that is very fine to coarse grained. Excellent source of mineable aggregate. In the quadrangle, Panguitch is located on the largest fan deposit, deposited by sporadic floods of Panguitch Creek. Possible future flooding in parts of the town area is suggested by the large size of the deposit and its young age (less than about 10,000 years) together with the relatively large watershed of Panguitch Creek (the area downstream from the dam at Panguitch Lake) and a summer climate characterized by sporadic cloudburst storms (Butler and Mundorff, 1970). Thickness exposed in ravines is 1-3 m, but gravel pits (sec. 14, T.35 S., R.5 W. and SE¼,NE¼,NW¼ sec. 28, T.34 S., R.5 W. at northeast edge of Panguitch town) reveal that some deposits are 10-15 m thick

Qsw **Sheetwash alluvium (Holocene)**--Pale-brown (10YR 6/3) silty and clayey very fine to coarse sand; Andesitic and basaltic pebbles common locally. In places unit contains fine sandy clay and silt. Sand and gravel is composed chiefly of quartz in the Sevier Valley and chiefly volcanic lithic fragments in washes on basaltic uplands. Poorly exposed unit. Estimated thickness 2-4 m

Qc **Colluvium (Holocene)**--Mass-wasting deposits on slopes. Composed mostly of gravelly, unsorted medium to fine sand and subangular to subrounded gravel in unsorted matrix of sand to clay-sized particles. Includes talus, sheetwash alluvium, and alluvial fan deposits too small to map separately. 1-4 m thick.

Qbc **Basaltic colluvium (Holocene)**--Like colluvium (unit Qc) except mostly basaltic clasts mixed with sand, silt, and clay derived from granular disintegration and decomposition of basalt (unit Tb). Unit also contains lesser amounts of mafic and intermediate volcanic clasts derived from Tse unit. 1-3 m thick.

Qa_2 **Alluvium (Holocene and Pleistocene)**--Sand and gravel, well sorted and stratified. Upper 15 cm is dark-yellowish-brown (10YR 4/2) silty fine sand; sand in rest of unit is silty, very fine to medium grained, locally coarse grained. Contains rounded pebbles, cobbles, and few small boulders of dark colored fine-grained basalt and andesite, and some light-colored tuff. In stream valleys, deposits form narrow terrace remnants higher than Qa_1 deposits; deposits also form wide, graded, relatively smooth surfaces that slope toward Sevier River 2-8 m higher than Qa_1 deposits; locally veneered by sandy sheetwash alluvium. Source of mineable aggregate. Thickness 1-5 m

Qat **Alluvial-terrace deposit (Holocene and Pleistocene)**--Sand and gravel deposit like Qal except most terrace surfaces are about 2.5 m higher than the Sevier River (and tributary ephemeral channel in Graveyard Hollow). Includes a few small remnants 30 m higher than the Sevier River. Deposit of former channels and flood-plains of the Sevier River and its tributary in Graveyard Hollow. Unit contains chalcedony clasts from the Brian Head Formation (as defined by Anderson, 1993) and pink and white sandstone and limestone clasts from the Claron Formation. A source of aggregate, but land may be better utilized as pasture. 2-5 m thick

Qfo **Older fan alluvium (Pleistocene)**--Same as young fan alluvium (Qfy) except unit is several meters higher topographically and, in places, its surface has a 1 to 1.5- m-thick Stage I (weak soil carbonate accumulation of Gile and others, 1966) petrocalcic C horizon, implying an older age than Qfy. Well exposed in Highway 89 cut at Roller Mill Hill (south-central sec. 27, T. 34 S., R. 5 W.). In the extreme southeast corner of the quadrangle, unit appears to be cut by a degraded scarp, which is interpreted to be a fault scarp owing to its linearity, down-to-east aspect, and parallelism to the Sevier Fault (4 km east in adjoining Casto Canyon quadrangle). If so, faulting may have occurred in late Quaternary time (less than about 100,000 yrs). Thickness 2-10 m

Qap_1 **Young pediment gravel (Pleistocene)**--Sandy, subrounded pebble and cobble gravel deposit underlying uniform, broad surfaces that slope toward Sevier River. Gravelly sand, a local basal layer, unevenly bevels underlying soft bedrock (unit Tvf) in bluffs of Casto Wash (SE¼ sec. 11, T.35 S., R.5 W.). The sand is in lenses 1.5 m thick and is moderate brown (5 YR 4/4) to light brown (5 YR 5/6). Unit is crudely stratified, channel-and-fill bedding. East of the Sevier River, the composition indicates a source in the Paunsaugunt Plateau (4-5 km east of the map area); clasts are 60-70 percent mafic to intermediate volcanic rocks, apparently from the Mount Dutton Formation, about 10 percent pink and white limestone and calcareous sandstone of the Claron Formation, 5-10 percent chalcedony from the Brian Head Formation (restricted), and <5 percent quartzite and <1 percent tuff and black argillite, probably from conglomerate in the Claron Formation. West of the river the limestone, sandstone, and chalcedony are absent and volcanic rocks predominate, derived from basalt (Tb) and older valley fill (Tse unit). Surface of unit is marked by a few north-northwest-trending lineaments (old trails? or surface rupture traces?) between Peterson Wash and Panguitch airport (sect. 26, T. 34 S., R. 5 W.). Thickness 8-13 m

Qap_2 **Older pediment gravel (Pleistocene)**--Gravel and sandy gravel like unit Qap_1 but intermediate in height between it and oldest pediment gravel (Qap_3). In the uppermost 1-1.5 m of the deposit, the matrix is strongly calcareous and the bases of most pebbles are coated by thin rinds of calcium carbonate, attributed to soil processes. Thickness of unit 4-8 m

Qap_3 **Oldest pediment gravel (Pleistocene)**--Chiefly rounded to subrounded clasts of andesite, basalt, and other dark-colored mafic to intermediate volcanic rocks and <0.5 percent white, pink, and yellow quartzite cobbles. Surface of deposit is veneered by pebble and cobble residuum having a dark-brown (10YR 4/3) silty, fine to coarse sand matrix. Forms gently east-sloping surfaces in southwest part of quadrangle; is the highest pediment surface. Accumulation of pedogenic calcium carbonate in the upper 2 m of deposit is evidently Stage I-II (Gile and others, 1966). Base covered. Estimated thickness 2-8 m

QTfo **Very old fan alluvium (middle or early? Pleistocene to late Pliocene?)**--Pale-brown (10YR 6/3) interbedded sand, gravel, sandy gravel and gravelly sand. Unit contains abundant subrounded cobbles and boulders in beds 0.5 m thick suggesting deposition by large floods in a proximal to mid-fan position. Few coarse-grained, martix-supported diamicton beds, 0.2 m thick, probably debris-flow deposits. Unit is thicker and more bouldery than other fan deposits (units Qfy and Qfo). Unit contains pink, white, and tan limestone and sandstone clasts of Oligocene Claron Formation and chalcedony clast of the Brian Head Formation (fig. 2).

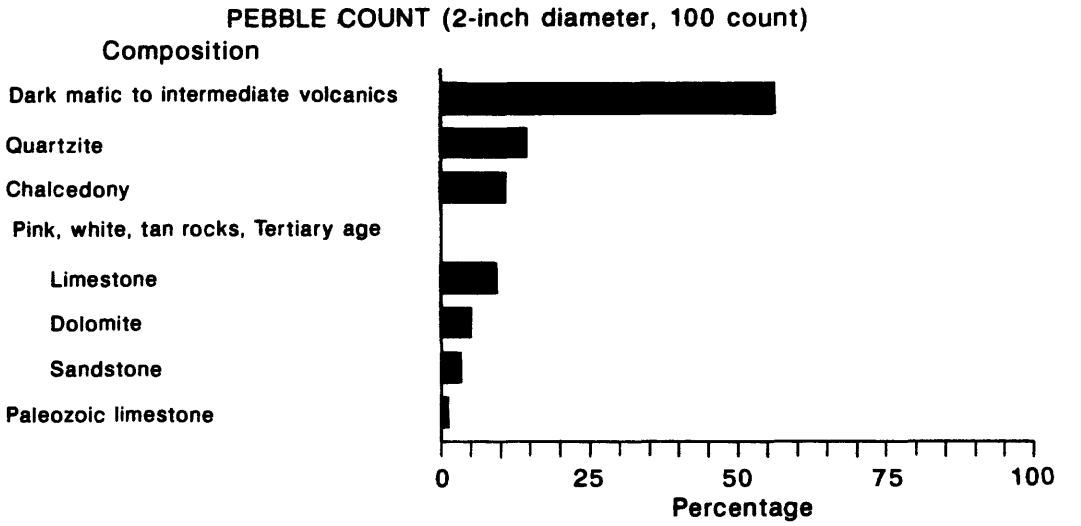


Fig. 2 Composition of pebbles in QTfo unit

Presently exposed bedrock sources for these clasts are at west edge of Paunsaugant Plateau, 5 km east. A relatively old age for the deposit is suggested by its bevelling by unit Qap_2, and by its unconformable(?) contact with unit Tvf. Exposed only in southeast corner of map area. Exposed thickness 20 m

BEDROCK UNITS

Tb **Basalt flows (Pliocene)**--Abundant medium-gray (N5), medium-dark-gray (N4) very fine to medium-grained olivine basalt and sparse olivine-clinopyroxene-plagioclase basalt; may include some basaltic andesite; olivine forms roundish phenocrysts 0.5-2 mm in diameter, singly and in clusters; less commonly rock texture is cumulophyric where rock has sparse clusters of radiating small prisms (1-2 mm long) of clinopyroxene. Rock is commonly vesicular or vuggy, but much is dense and aphanitic. Flows intertongue with Tse unit; some surficial flows southwest of Panguitch may be exhumed. Flows are cut by drainages and crop out as blocky cliffs that pinch out laterally in South Canyon, the canyon of Panguitch Creek, in DD and Graveyard Hollows, and in the hills west of Highway 89. A whole-rock potassium-argon age of 5.3 ± 0.5 Ma. is reported (Rowley and others, 1994, p. 10) for a sample 1.5 km south-southeast of Panguitch (sample AC-PANG, lat 37°48'N., long 112°25'45''W.). Exactly when basaltic volcanism began and ended is not known, but it ended before the canyons were cut, thus is older than the Holocene volcanism that formed basalt flows 30 km southwest in the Navajo Lake area (Moore and Nealey, 1993) and 20 km southwest in Mammoth Creek (Moore and others, 1994). Thickness of unit is as much as 20 m

Tbcc **Basaltic cinder cone remnant (Pliocene)**--Medium-gray (N5) to dark-gray (N) olivine basalt, blocky and scoriaceous basalt of near-vent flows, interbedded with weathered moderate-brown (5YR 4/4) to moderate-reddish-brown (10R 4/6) cinders; Two high areas of Dickinson Hill are eroded vents that fed the surrounding flows. Exposed unit is only 1-3 m thick, but may be much thicker where underlain by one or more basaltic dikes or near-vertical conduits.

Tse **Coarse-grained valley fill (Pliocene)**--Sandy conglomerate and volcanic mudflow breccia, moderately consolidated. Light-brownish-gray (5YR 6/1) gravel and very pale reddish-purple (5RP 7/2) to light-brownish-gray (5YR 6/1) sand. Grain size ranges from clay to small boulders; poorly sorted, texturally and compositionally immature (Folk, 1951). Mafic to intermediate volcanic clasts. Formed as braided-stream and mudflow deposits of alluvial fans that prograded southward or eastward into a young Sevier Valley from upfaulted volcanic terrain north and west. Unit may be equivalent to Sevier River Formation of Callaghan (1938) and the Sevier River Formation of Anderson and Rowley (1987); equivalent to valley-fill deposits of Kurlich and Anderson (1991) and high-level volcanic gravels of Moore and others (1994). Poorly exposed, but outcrops 200 m west of Highway 89, NW¼ NW¼ sec. 14, T. 35 N., R. 5 W., expose repetitive planar beds 0.2-0.5 m thick, of sandy clast-supported subround gravel interbedded with matrix-supported subangular to angular gravel. Source was prodigious, coarsely fragmented mafic to intermediate volcanic rock (Mount Dutton Formation? and volcanoes north of the area). Imbricated cobbles suggest southward flow of depositing streams. Colors of clasts are: medium gray (N5), medium dark gray (N4), light brownish gray (5YR 6/1), greenish black (5G 2/1); weathered colors: moderate yellowish brown (10YR 5/4), dusky red (5R 3/4), grayish red (5R 4/2), very pale purple (5P 8/2). Poorly sorted pebbly sandstone interbeds 0.2-0.5 m thick are very pale brown (10YR 7/3). In Graveyard Hollow (sec. 9, T. 35 S., R. 5 W.), unit is unconsolidated, sandy, subround gravel in lensic channel-and-fill braided stream deposits, 1.5-2 m thick. The unit may overlie on or grade laterally into the Td unit. Poor exposures in the northwest corner of the map obscure stratigraphic relations. Reasoning from geologic age however, unit Tse (Pliocene) should unconformably overlie unit Td (Oligocene to Miocene). Unit Tse intertongues with discontinuous basalt flows (unit Tb), of which one is about 5 Ma (see unit Tb). The Tse unit exhibits variable grain size, sorting, and textures; sediment varys from pebbly sand to poorly sorted and crossbedded point-bar deposits filling channels that cut out planar beds. In the west part of the quadrangle, are more clasts of a pale-red (10R 6/2), very pale red purple (5RP 7/2) to grayish-orange-pink (5YR 7/2) dacitic(?) biotite-rich (10-15 percent), quartz-poor (3-5 percent) ash-flow tuff. Paul Willians and Peter Rowley (U.S. Geological Survey, oral commun., 1994) identified the sample as the Narrows Tuff Member of the Leach Canyon Formation, although it petrographically resembles the crystal-rich tuff member of the Mount Belknap Volcanics described by Budding and others (1987). The former is more likely, as it, or the Haycock Mountain Tuff, is part of the source rock (Markagunt Megabreccia, Anderson, 1993) exposed 10-15 km west. The rounded tuff clasts were probably carried east by streams into the evolving Sevier Valley. In the southeast part of quadrangle the contact with unit Tvf in the valley is obscure. Tvf may be inset or a lateral interfingering, eastward-fining, coeval lithofacies relation, based on scant exposures 4 km southeast of Panguitch in sec. 35, T. 34 S., R. 5 W. Exposed thickness of Tse unit 300 m, but probably thicker

Tvf **Fine-grained valley fill (Pliocene)**--Clay, silt, and fine sand; light-brownish-gray (2.5Y 6/2), white (N9), light-pinkish-gray (5YR 9/1), pinkish-gray (7.5YR 6/2), brown (7.5 YR 5/4, wet) slightly silty clay and silty fine to very fine sand. Low density, flocculated clay, tuffaceous(?) and zeolitic in places. Soft to friable, firm to brittle; blocky structure; thinly laminated and even beds 10-20 cm thick to massive beds >1 m thick. Contains some beds of yellowish-gray (5Y 8/1) peloidal micritic limestone 0.5-3 cm thick; sparse ostracodes (0.2 mm diameter). Very fine fibrous (0.1 mm diameter), white calcified plant stems or roots?. Contains fragile, white snails, both flat whorls and high spired. Fine-grained sediment of marsh, ponds or small lake, and stream floodplain. Exposed thickness about 30 m

Td **Mount Dutton Formation, alluvial facies (Oligocene and Miocene)** --Interbedded mudflow breccia, sandy conglomerate, and pebbly sand. Exposed as light-brownish-gray (5YR 6/1) beds; residuum of weathered lag gravel, sand and grus is moderate brown (5YR 4/4), grayish red (10YR 4/2), medium gray (N5), and very pale reddish purple (5RP 7/2). Mafic to intermediate volcanic clasts mainly angular to round pebbles and cobbles but some boulders 1-3 m across, are supported in a clayey, poorly sorted sand matrix. Bedding is 0.3-2 m thick, planar and rather continuous, but channel-and-fill structures commonly cut some beds. Unit forms rounded, ravined high hill in northwest corner of quadrangle; rare cliffy outcrops along Threemile Creek reveal beds of clayey matrix-supported breccia interbedded with clast-supported sandy conglomerate and breccia and pebbly sand. Probably equivalent to the distal clastic alluvial facies of Mount Dutton Formation on the south flank of the Marysvale volcanic field, a complex assemblage of stratovolcano deposits (Anderson and Rowley, 1975; Anderson and Rowley, 1987; Rowley and others, 1994, p. 12). Unit resembles Tse unit except Td unit has more boulders. Exposed thickness 60-90 m, but probably much thicker

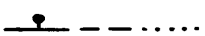
Tbv **Bear Valley Formation (Oligocene and Miocene)** --Sandstone; distinctive light color and is crossbedded. Unit named by Anderson (1971). White (N9) to very light gray (N8) volcanic arenite; very fine to fine sand grains of about 60 percent quartz, and the remainder mainly feldspar, biotite, hornblende, augite, and relict pumice grains replaced by zeolite; grains are cemented by clinoptilolite that is 10-40 percent of the volume of the rock (Anderson, 1971, p. 1202). Trough and wedge cross-laminations occur in sets 0.2-1.5 m thick; laminae are 0.1-1 cm thick. Abundant joints intersect bedding. Sandstone is a moderately hard, low-density rock. Exposed in canyons at the west edge of the quadrangle; in the west half of the quadrangle it may unconformably underlie unit Tse.

At the exposure in Threemile Creek (northwest corner of map), a gradational vertical change in rock type raises a stratigraphic question. White crossbedded sandstone grades upward into beds of mudflow breccia. Is this the contact of the Tbv unit with the overlying unit Td (Mount Dutton Formation)? Or, is the mudflow breccia a different rock type *within* the mostly sandstone Tbv unit? It could be either; sandstone of the Tbv unit contains some mudflow breccia (Anderson, 1971, fig. 3), and the overlying Mount Dutton (unit Td) is chiefly mudflow breccia. At the contact in question, a gradational pebbly sandstone, 3-5 m thick separates the white sandstone (Tbv unit) from overlying darker diamicton layers (Td?). The gradational sandstone is medium thick bedded, very pale orange (10YR 8/2) to grayish orange pink (5YR 7/2), very fine to very coarse grained, representing texturally immature (Folk, 1951) pebbly volcanic arenite. The sandstone becomes more pebbly upward and grades into mudflow breccia. Small dikes of white sandstone (resembles unit Tbv) project into the basal layers of the mudflow above (unit Td?), suggesting that unlithified sand of unit Tbv was forced upward massively by the sudden loading caused by rapid emplacement of the mudflow. Exposed thickness of Tbv unit 30 m

MAP SYMBOLS

CONTACT

STRIKE AND DIP OF BEDS



FAULT--Bar and ball on downthrown side; dotted where concealed; dashed where approximately located or inferred

LINEAR FEATURE OBSERVED ON AERIAL PHOTOGRAPHS--may be fault or joint trace

SAND AND GRAVEL PIT

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ARTIFICIAL FILL

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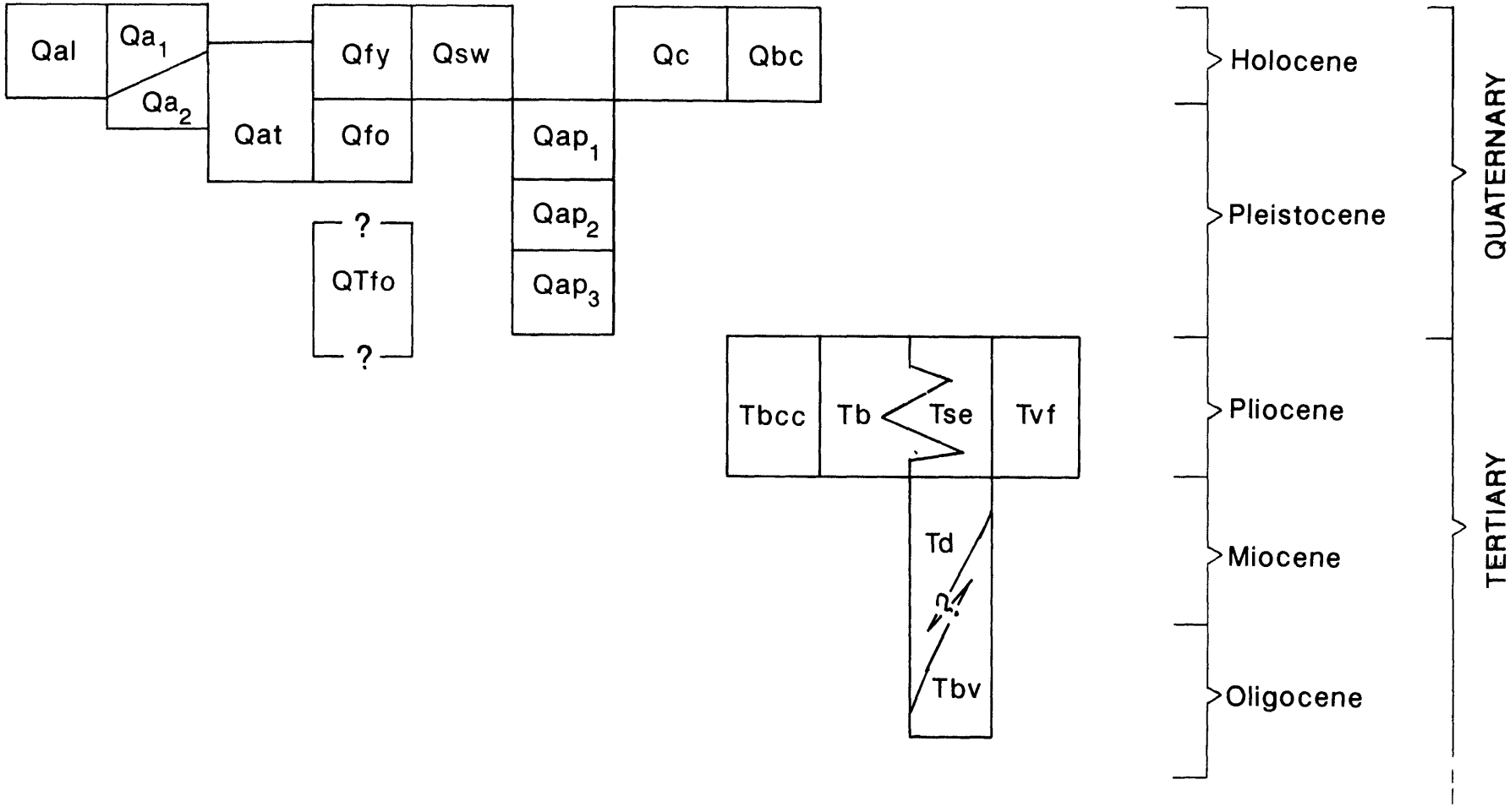
CORRELATION OF MAP UNITS



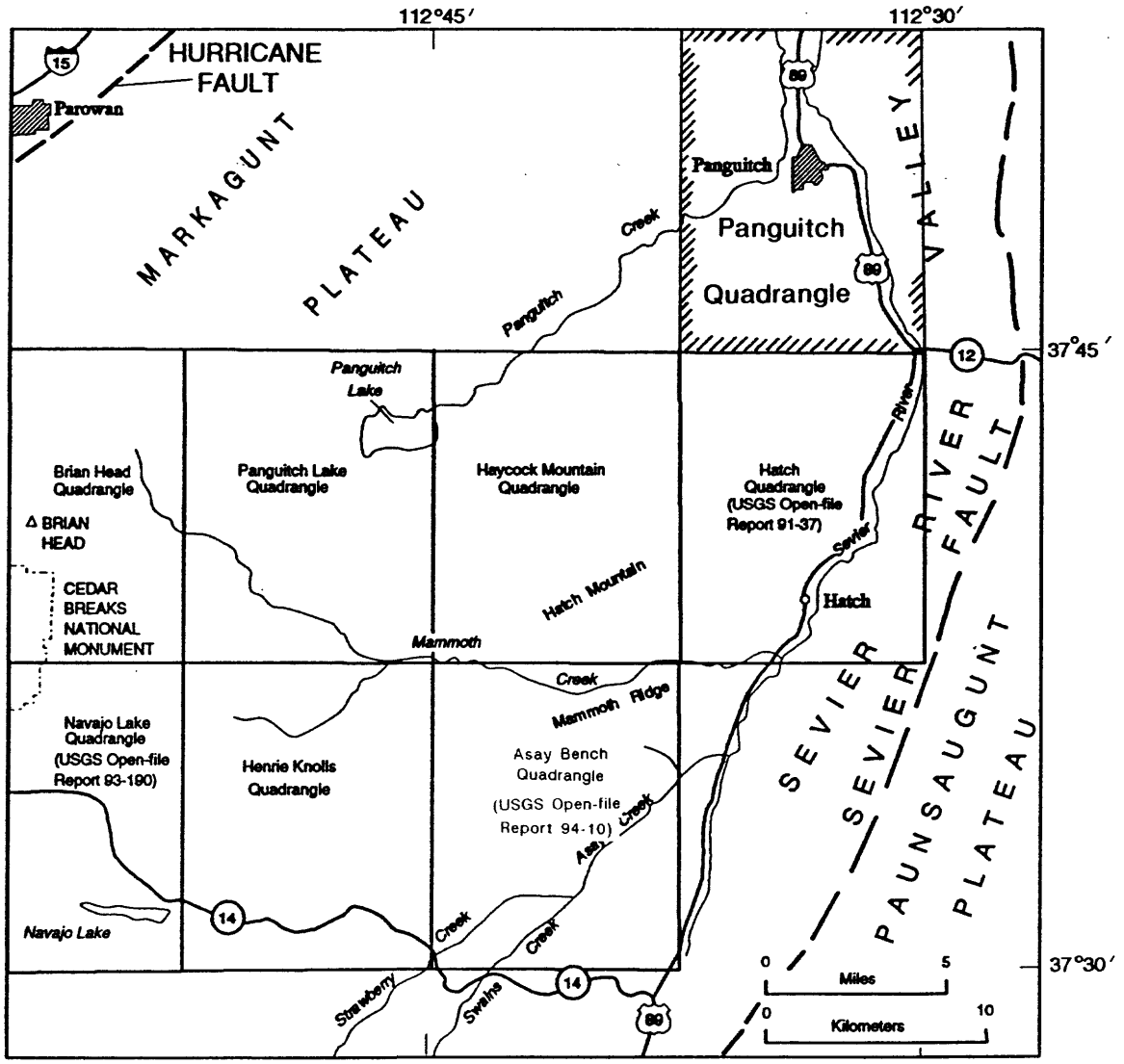


Figure 1. Location of Panguitch quadrangle