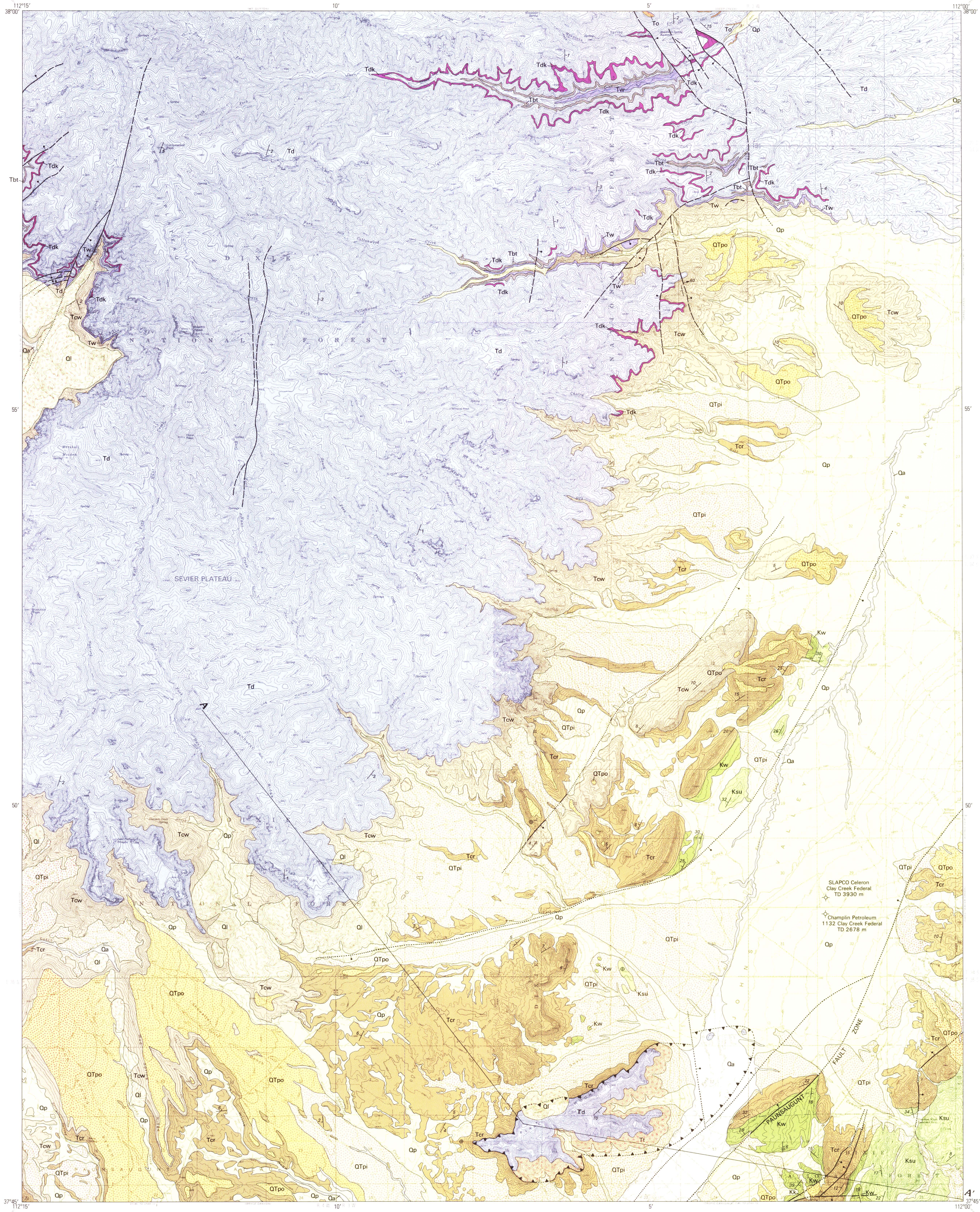
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I-1798



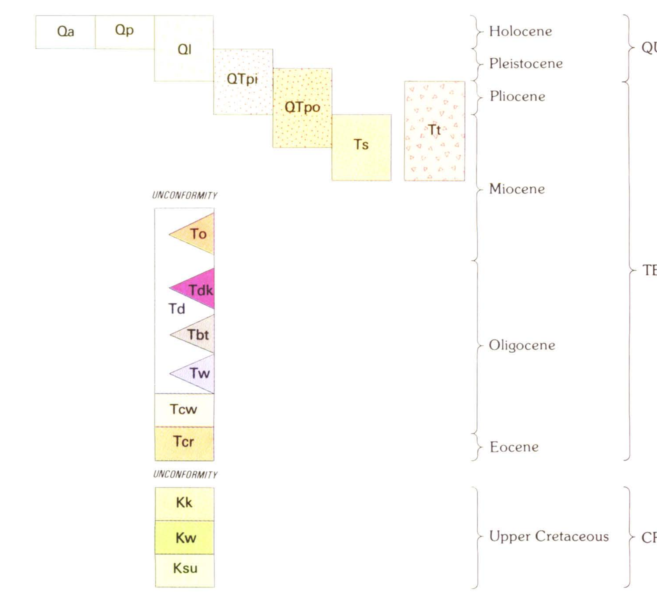
Base from U.S. Geological Survey, Adams Head, Cow Creek, Flake Mountain East, and Flake Mountain West, 1971, 1:24,000

SCALE 1:50 000

CONTOUR INTERVALS 20 AND 40 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology mapped in 1964–66, 1983

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qa **Alluvium (Holocene)**—Gravel, sand, and silt, locally cobbly and bouldery, of the East Fork of the Sevier River and its tributaries. Mostly flood plain and channel deposits. Includes minor alluvial-fan and talus deposits, alluvial slope wash, and colluvium. In the southeastern part of the quadrangle, includes flood-plain deposits probably mostly of Pleistocene age, now undergoing local wind deflation. Maximum thickness about 10 m

Qp **Piedmont-slope deposits (Holocene)**—Poorly sorted, alluvial silty sand and subordinate gravel occurring as thin mantles on pediments and as thicker accumulations in alluvial fans. May include deposits of Pleistocene age. Thickness locally exceeds 100 m

Ql **Landslide debris (Holocene and Pleistocene)**—Mostly angular, poorly sorted rock debris that moved downslope by gravity from nearby bedrock areas. Includes talus and sheetwash colluvium. Thickness locally as much as 50 m

QTpi **Intermediate-age piedmont-slope deposits (Pleistocene and Pliocene)**—Poorly sorted, unconsolidated, alluvial gravel and silty sand occurring as mostly thin mantles on pediments and as thicker accumulations in alluvial fans. Deposits occur on surfaces of many levels that have been dissected by Holocene and modern streams. Lower part may be correlative with the Sevier River Formation (Ts), which has been shown by drilling to be more than 50 m thick beneath Johns Valley (Doelling and Davis, 1978). Contact locally gradational with piedmont-slope deposits (Qp). Thickness locally exceeds 50 m

QTpo **Older piedmont-slope deposits (Pleistocene, Pliocene, and Miocene)**—Poorly to moderately consolidated, light-gray and tan pebble conglomerate and subordinate sandstone. Occurs as dissected patches, probably remnants of piedmont-slope deposits, located well above present stream levels. Lower part may be correlative with the Sevier River Formation (Ts). Contact gradational with intermediate-age piedmont-slope deposits (QTpi). Thickness about 30 m

Tt **Tectonic breccia of Flake Mountain (Pliocene or Miocene)**—Poorly to moderately consolidated, light- to medium-gray and tan breccia formed above a Pliocene or late Miocene, or conceivably early Pleistocene, low-angle normal fault in the Flake Mountain area. Consists of fractured and brecciated angular fragments and blocks of Mount Dutton Formation (Td) and the white member of the Claron Formation (Tcw). Blocks are as much as 50 m long. Thickness as much as 100 m

Ts **Sevier River Formation (Pliocene? and Miocene)**—Shown only on cross section. Fluvial conglomerate, sandstone, and siltstone, the upper part of which may be of Pliocene or even Pleistocene age

Td **Mount Dutton Formation (Miocene and Oligocene)**—Stratovolcano sequence of soft to resistant, gray, tan, and green, mostly dacitic, massive to well-bedded volcanic mudflow breccia, subordinate fluvial sandstone and conglomerate, and minor flow breccia and lava flows. Lithologies of lava flows and clasts are similar and generally consist of aphanitic rocks; some rocks, however, contain sparse or moderately abundant, mostly small phenocrysts of plagioclase, pyroxene, hornblende, and Fe-Ti (iron-titanium) oxides. In accordance with the definitions of Parsons (1965, 1969) and Smedes and Prostka (1972), we use the term alluvial facies for these rocks. They form a large apron mostly on the southern side of thick sequences of lava flows and autoclastic flow breccia of the vent facies, the nearest rocks of which are about 10 km northwest of the mapped area (Rowley, 1968; Anderson and Rowley, 1975; Rowley and others, 1979). The basal contact is gradational with the white member of the Claron Formation (Tcw); it is drawn where volcanic mudflow breccia predominates over sandstone and conglomerate. The abundance of volcanic mudflow breccia increases upward from this contact. K-Ar (potassium-argon) ages of beds within the formation from outside the mapped area range in age from 27 to 21 Ma (Fleck and others, 1975; ages corrected for new decay constants from Steiger and Jäger, 1977). In the mapped area, however, basal parts of the formation probably are older than 29 Ma, and upper parts of the formation probably are not much younger than the 23-Ma Osiris Tuff. Maximum thickness of the formation is about 600 m, increasing north of the mapped area.

In the lower part of the formation, generally below the level of the Kingston Canyon Tuff Member (Tdk), and in some places below the Three Creeks Tuff Member of the Bullion Canyon Volcanics (Tbt), beds of volcanic mudflow breccia contain abundant clasts of distinctive light-gray, light-green, and light-purple porphyritic plutonic rock similar to the Spry intrusion (Anderson and Rowley, 1975; Grant, 1979; Grant and Anderson, 1979), exposed in the Sevier Valley about 6 km northwest of the mapped area. These clasts make up most or all of the clasts in the breccia locally in the northern part of the mapped area; some or all of these beds may be of ash-flow origin and although they may correlate with the Buckskin Breccia of Anderson and Rowley (1975), are here mapped with the Mount Dutton Formation

Tdk **Kingston Canyon Tuff Member (Oligocene)**—Mostly resistant, reddish-brown, pink, salmon, brown, and purplish-pink, densely welded, dacitic ash-flow tuff. Forms a simple cooling unit. Contains sparse phenocrysts of plagioclase and minor pyroxene, Fe-Ti oxides, and biotite. Also contains drawn-out pumice lenticules, sparse to moderately abundant volcanic rock fragments, and abundant vesicles. Locally includes a black vitrophyre, as much as 2 m thick, at the base. Member pinched out against preexisting topography. Member defined by Anderson and Rowley (1975). K-Ar age is 26 Ma (Fleck and others, 1975; age corrected for new decay constants from Steiger and Jäger, 1977). Maximum thickness about 10 m

To **Osiris Tuff (Miocene)**—Resistant, pink, orange, red, reddish-brown, and light-gray, densely welded, rhyodacitic ash-flow tuff. Forms a simple cooling unit, which in some places includes an upper, light-gray vapor-phase zone. Contains moderately abundant phenocrysts of plagioclase, subordinate sanidine, and minor biotite, pyroxene, and Fe-Ti oxides. Also contains drawn-out pumice lenticules. Locally includes a black vitrophyre, as much as 3 m thick, at the base. The Osiris Tuff was first recognized by Williams and Hackman (1971), and later named and defined by Anderson and Rowley (1975). Source is the Monroe Peak caldera in the Monroe, Marysvale, and Koosharem areas about 50 km north of the quadrangle (Rowley, Cunningham, and Kaplan, 1981; Rowley, Williams, and others, 1981; Cunningham and others, 1983; Steven and others, 1984; Rowley and others, 1986a, b; Rowley and others, 1987a, b). Occurs in the uppermost part of the Mount Dutton Formation only in the northern part of the mapped area, where it is near its southern limit of exposure (Rowley, 1968). K-Ar age is 23 Ma (Fleck and others, 1975; age corrected for new decay constants from Steiger and Jäger, 1977). Maximum thickness about 10 m

Tbt **Three Creeks Tuff Member of Bullion Canyon Volcanics (Oligocene)**—Moderately resistant, light-gray, tan, and pink, moderately welded, dacitic ash-flow tuff. Locally forms two cooling units that in many places pinched out against preexisting topography. Contains abundant phenocrysts of plagioclase, subordinate hornblende and biotite, and minor quartz, Fe-Ti oxides, and sanidine. Contains moderately abundant ash-flow pumice and sparse volcanic rock fragments. In most places the member consists of an autoclastic breccia in which pebble- to boulder-size clasts of tuff are enclosed in a matrix of the same lithology as the clasts. Autobrecciated rocks such as this are unusual in the formation outside the mapped area; they are probably due to late-stage flowage near the southern distal margin of the tuff (Rowley, 1968). This interpretation is supported by paleomagnetic and petrographic studies in the Cottonwood Creek area (Caskey, 1975), which indicated that brecciation took place below the Curie temperature (600° C) but before most compaction and welding of shards occurred. The tuff erupted from an obscure caldera discovered by Steven (1981; Steven and others, 1984) in the Clear Creek area about 65 km north-northwest of the mapped area. The member was defined by Steven and others (1979), who determined K-Ar and fission-track ages of about 27 Ma for it. Maximum thickness about 30 m

Tw **Wah Wah Springs Formation of Needles Range Group (Oligocene)**—Mostly resistant, light-gray, tan, pink, and light-green, moderately welded, dacitic ash-flow tuff. Locally pinched out against preexisting topography; locally autobrecciated, perhaps related to late-stage flowage during pinching out. Paleomagnetic studies (Shuey and others, 1976) suggest that the unit belongs to the Wah Wah Springs Formation of Mackin (1960) and of Best and Grant (1983, 1987), derived from a caldera source at the Nevada-Utah State line. Contains abundant phenocrysts of plagioclase, subordinate hornblende, biotite, and quartz, and minor Fe-Ti oxides, pyroxene, and sanidine; petrographically similar to rocks of the Three Creeks Tuff Member (Tbt) except that the Wah Wah Springs contains smaller and less abundant phenocrysts of plagioclase. Contains sparse ash-flow pumice and volcanic rock fragments. K-Ar age is 31–30 Ma (Fleck and others, 1975; age corrected for new decay constants from Steiger and Jäger, 1977). Maximum thickness about 40 m

Claron Formation (Oligocene and Eocene)—Thin- to thick-bedded, fluvial and lacustrine sedimentary rocks, mostly white in the upper part (white member) and mostly red in the lower part (red member). Contact between members generally is placed at the base of the lowest white limestone bed but locally is gradational; where gradational, it is placed above where rocks are mostly red and below where rocks are mostly white. All or part of these rocks near the mapped area have been called the Wasatch Formation by some workers (for example, Gregory, 1951; Hackman and Wyant, 1973; Sargent and Hansen, 1982), but Spieker (1946) showed that the type Wasatch of northern Utah and southern Wyoming does not extend farther south than central Utah. Thus we prefer the term Claron Formation because it answers the need for a locally defined name. Claron Formation was defined by Leith and Harder (1908) in the Iron Springs mining district west of Cedar City, Utah, and was extended into other parts of Utah by Mackin (1960) and subsequent workers (for example, Doelling, 1975; Rowley and others, 1979). On the basis of a detailed stratigraphic and paleontologic study of the rocks of the Cretaceous-Tertiary boundary in the Table Cliff Plateau about 25 km east of the mapped area, Bowers (1972, 1981) named two new formations, the Paleocene(?) and Upper Cretaceous Canaan Peak Formation, and the Paleocene(?) Pine Hollow Formation, for rocks that may correlate with basal parts of the Claron; and he used informal names for rocks that are generally correlative with the main part of the Claron. More detailed work is needed to establish how these formal and informal units correlate with the Claron assemblage. Bowers' variegated sandstone member and underlying white limestone member of the Wasatch Formation probably are equivalent to the white member of the Claron Formation, and his pink limestone member of the Wasatch Formation is equivalent to most of the red member of the Claron Formation in this area

Tcw **White member (Oligocene)**—Mostly soft, white, light- to medium-gray, and minor yellow and red sandstone, limestone, shale, and minor conglomerate, air-fall tuff, and volcanic mudflow breccia. Amount of volcanic material increases upward. Sandstone is locally crossbedded. The member is especially well exposed at Casto Bluff, in the southwestern part of the mapped area (Rowley, 1968). Maximum thickness about 330 m

Tcr **Red member (Oligocene and Eocene)**—Resistant to soft, red, pink, purplish-gray, and minor yellow, orange, and gray limestone, shale, sandstone, and conglomerate. Locally contains a moderately resistant, light-gray sandstone bed at its base. Limestone locally replaced by silica. Some clastic beds contain volcanic detritus, but most clasts in the member consist of fragments of quartzite, chert, and sparse limestone derived from pre-Cenozoic rocks. Sandstone and conglomerate beds locally are crossbedded and may occur as shoestring channel deposits. Limestone beds locally contain fossil algae as rounded heads as much as 0.3 m in diameter and as small fragments. Lower part may include rocks of Paleocene or Late Cretaceous age, including thin local patches of a tan and orange, ledgy conglomerate and sandstone that may correlate with the Canaan Peak Formation and of a soft reddish-brown and light-gray shale that may correlate with the Pine Hollow Formation (Bowers, 1972). Overlies folded Cretaceous and older rocks in angular unconformity (Sargent and Hansen, 1982). Forms the photogenic, deep-red beds of Bryce Canyon National Park and Red Canyon south and southwest of the mapped area. Maximum exposed thickness about 300 m

Kk **Kaiparowits Formation (Upper Cretaceous)**—Soft, mostly light gray, mostly thin-bedded, locally crossbedded, fine- to medium-grained sandstone, mudstone, siltstone, and shale. Originated as alluvial-plain deposits (Peterson and Kirk, 1977). Poorly exposed in one place in the southeastern part of the quadrangle, where it occurs on the western flank of the Cretaceous Johns Valley anticline, the axis of which lies just east of the mapped area (Robison, 1966; Hackman and Wyant, 1973; Doelling and Davis, 1978; Sargent and Hansen, 1982). The formation was largely removed by erosion before deposition of the Claron Formation (Tcr). Maximum thickness about 15 m

Kw **Wahweap Formation (Upper Cretaceous)**—Ledgy, tan, buff, yellowish-brown, light-gray, and red, lenticular, crossbedded, thin- to medium-bedded, fine- to medium-grained sandstone interbedded with soft, light-gray and bluish-gray mudstone, shale, and siltstone. Locally contains ironstone concretions. Formation is fluvial and alluvial-plain in origin (Peterson and Kirk, 1977). Occurs on the western flank of the Johns Valley anticline and was partly removed by erosion before deposition of the Claron Formation (Tcr). Individual sandstone beds rarely greater than 4 m thick; maximum exposed thickness of the formation about 150 m

Ksu **Straight Cliffs Formation, upper part (Upper Cretaceous)**—Ledgy, light- to medium-gray, white, and buff, thin- to thick-bedded, crossbedded, lenticular, conglomeratic, medium- to coarse-grained sandstone interbedded with soft gray mudstone, siltstone, shale, carbonaceous shale, and coal. Formation resembles the Wahweap Formation (Kw) but resistant sandstone beds are more abundant, thicker, coarser grained, and mostly gray, and soft shale beds are more carbonaceous. Includes the Drip Tank and John Henry Members (Peterson, 1969). Formation is fluvial, alluvial plain, paludal, and marine in origin (Peterson, 1969; Peterson and Kirk, 1977). In the southeastern corner of the mapped area, the formation forms the western flank of the Johns Valley anticline (Robison, 1966; Hackman and Wyant, 1973; Doelling and Davis, 1978; Sargent and Hansen, 1982), which is overlain in angular unconformity by the Claron Formation (Tcr). Coal beds as thick as 6 m, located by shallow drilling beneath Johns Valley, were formerly assigned to the Cretaceous Dakota Sandstone (Doelling and Davis, 1978), but deeper drilling for oil in the quadrangle (SLAPCO Celeron and Champlin Petroleum wells) suggests that the coal beds belong to the Straight Cliffs Formation (Sargent, 1984). Thickness in partial sections is about 360 m, thicker east of the mapped area (Sargent and Hansen, 1982)

Contact

High-angle fault—Showing dip of fault plane; most are normal faults. Dashed where approximately located; dotted where concealed. Bar and ball on downthrown side, where relative offset is known

Low-angle fault—Probably represents the eroded lower part of a listric-type normal fault or perhaps a denudation-type normal fault. Approximately located; dotted where concealed. Sawteeth on upper plate. Occurs in the southeastern part of the map

Strike and dip of beds

Inclined

Horizontal

Dry hole—Drilled for oil and gas. Showing lease names, operator, and total depth (TD) in meters

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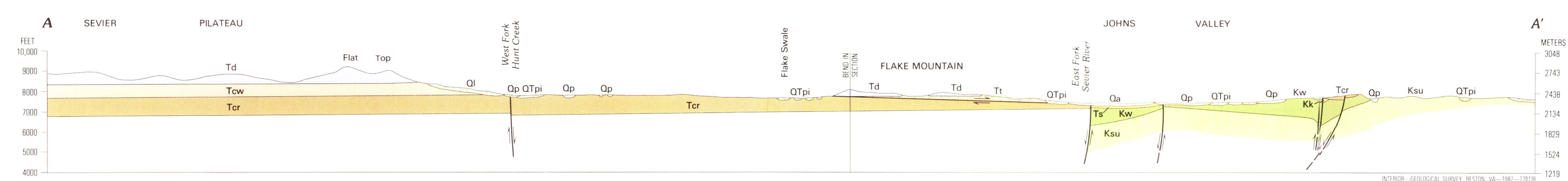

GEOLOGIC MAP OF THE ADAMS HEAD-JOHNS VALLEY AREA, SOUTHERN SEVIER PLATEAU, GARFIELD COUNTY, UTAH

By
Peter D. Rowley, Richard Hereford, and Van S. Williams

1987

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