UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF CALIFORNIA
EDMUND G. BROWN, GOVERNOR
HARVEY O. BANKS, DIRECTOR OF WATER RESOURCES

SONORA PASS QUADRANGLE
CALIFORNIA
15 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey

Control by USC&S and USC&GS

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1953 and 1955.
Advance field check 1954 and 1956

Polyconic projection. 1927 North American datum
10,000-foot grids based on California coordinate system, zones 3 and 2
1000-meter Universal Transverse Mercator grid ticks, zone 11, shown in blue

Indefinite portion of Alpine-Tuolumne county boundary cannot be fully reconciled with description in the statutes

Dashed land lines indicate approximate locations
Land lines unsurveyed in T. 6 N.–R. 20 and 21 E., T. 7 and 8 N.–R. 20 E., and parts of T. 5 and 7 N.–R. 21 E.
Unchecked elevations are shown in brown

APPROXIMATE MEAN DECLINATION, 1956

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER 25, COLORADO OR WASHINGTON 25, D. C.
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

The east half of this area is also covered by 1:24 000 scale maps of Lost Cannon Peak and Pickel Meadow 7.5 minute quadrangles, surveyed 1954

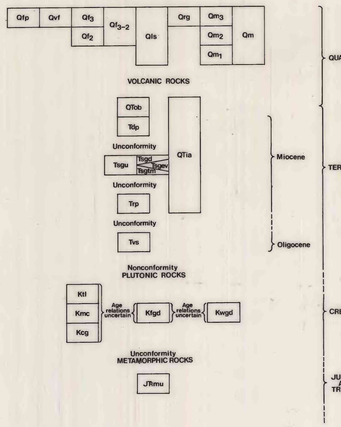
PRELIMINARY GEOLOGIC MAP OF THE SONORA PASS 15 MINUTE QUADRANGLE, CALIFORNIA

BY

JAMES R. GIUSSO

1981

CORRELATION OF MAP UNITS



UNIT DESCRIPTIONS

SURFICIAL DEPOSITS

Qfp FLOOD-PLAIN ALLUVIUM--Moderately to poorly sorted gravelly to silty sand and sandy to clayey silt. Limited to low-relief flood-plain topography

Qvf VALLEY-FILL DEPOSITS, UNDIVIDED--Alluvium underlying low-gradient floors of alpine valleys. Includes stream-channel and flood-plain alluvium, low-gradient alluvial-fan deposits, glacial outwash deposits, and lacustrine deposits. Often associated with glacial drift

Qf_3 YOUNG ALLUVIAL FAN DEPOSITS--Poorly sorted bouldery sand and gravel. Includes some valley-fill deposits in low-gradient valleys where distal fan limits are gradational and poorly defined. Fan surfaces are undissected to slightly dissected, with few, if any, well-defined drainage channels. Fan drainage is distributary, radiation from the apex. Generally unweathered with weak, if any, soil profile development

Qf_{3-2} UNDIVIDED YOUNG AND INTERMEDIATE ALLUVIAL FANS--Mapped in areas where young and intermediate fan surfaces are too complexly interrelated to be mapped separately. Limited to the valley of Lost Cannon Creek

Qf_2 INTERMEDIATE ALLUVIAL FAN DEPOSITS--Similar lithologically and sedimentologically to young alluvial fan deposits. Contacts between young and intermediate alluvial fan deposits are gradational and poorly defined. Intermediate alluvial fan surfaces are slightly to moderately dissected, with numerous well-defined drainages. Drainage is predominantly distributary. Relief due to dissection is generally less than 5 m. Limited to the valley of Lost Cannon Creek

Qls LANDSLIDE DEPOSITS--Unsorted angular boulder- to clay-size debris. Occurs generally as lobate masses in steep mountainous areas. Includes talus and colluvium overlapping and intermixed with the landslide debris. Ten major landslides occur in the quadrangle, all but one of these involve Tertiary volcanic rocks. The largest landslide is less than 1 km^2

Qrg ROCK-GLACIER DEPOSITS--Highly angular bouldery gravel, unweathered. Including and closely associated with blocky talus. Characterized by distinctive lobate morphology. Generally limited to north- and northeast-facing cirques and ridges at elevations about 9,500 ft

Qm_3 YOUNG GLACIAL MORAINE DEPOSITS--Generally unweathered, unsorted bouldery to clayey gravel. Associated with undissected moraines. Little to no soil profile development or vegetation. Includes some talus and alluvial fan deposits which are intimately associated with the glacial drift. Generally limited to north- and northeast-facing cirques at elevations above 9,500 ft

Qm_2 INTERMEDIATE GLACIAL MORAINE DEPOSITS--Unsorted to very poorly sorted bouldery to clayey gravel that is slightly compacted. Associated with undissected to slightly dissected sharp-crested lateral moraines and slightly to moderately dissected terminal moraines. Granitic boulders on the surface are slightly to moderately weathered and soil profiles generally are weakly developed. Includes some talus, valley fill, and alluvial fan deposits which are intimately associated with the glacial drift. Limited to elevations above 9,000 ft except in the West Walker drainage. Unit is of Tioga and Tahoe age

Qm_1 OLD GLACIAL MORAINE DEPOSITS--Deeply weathered, unsorted bouldery to clayey gravel. Generally associated with hummocky topography. Buried granitic clasts are decomposed to grus. Moderately to strongly developed soil profiles. Occurs peripheral to intermediate glacial moraine deposits. Mapped only in the drainage of the West Walker River. Unit is of pre-Tahoe age

Qm UNDIVIDED GLACIAL MORAINE DEPOSITS--Unsorted to very poorly sorted bouldery to clayey gravel. Lacks diagnostic constructional form

VOLCANIC ROCKS

Qtob OLIVINE BASALT FLOWS OF ARNOT PEAK--Light gray porphyritic olivine-augite basalt. Olivine and augite phenocrysts up to 4 mm in diameter. Outcrops are massive with sporadic vesiculation. Microscopically the matrix contains abundant altered and fresh primary(?) pyrite. The olivine basalt of Arnot Peak conformably overlies the Disaster Peak Formation

QTia INTRUSIVE ANDESITE--Black to gray-green basalt and andesite dikes, plugs, necks, and other intrusive bodies. Includes dense aphanitic basalts, hornblende andesite porphyries with phenocrysts of hornblende up to 8 mm x 2 mm, and a dacite intrusion located in the northwest corner of map area, approximately 1 km due west of sec. 31. Most observed intrusions exhibit one or more of the following: horizontal columnar jointing, little or no vesiculation, chilled margins, and steep contacts. The large intrusive bodies along the western side of the southern border of the map area are strongly propylitized (Clyde Wahrhaftig, oral commun., 1980). Six plugs and necks have intruded only plutonic basement rocks so a restricted age range cannot be determined by relative stratigraphy. Most intrusions occur near Red and Disaster Peaks. Some of these intrusions cut the Disaster Peak Formation (<8.8 m.y.; Slemmons, 1966, p. 205) and have minor small associated flow rocks. The large intrusion approximately 2.5 km due north of Disaster Peak sits in the center of a glaciated valley without evidence of glaciation and alteration is therefore possibly Quaternary

Tdp DISASTER PEAK FORMATION OF SLEMMONS (1966)--Thin volcanic sequence of gray to brown to black hornblende-rich andesite flows and intrusions, light-gray to pink andesite lahars, and minor amounts of brown moderately sorted volcanoclastic sediments. The andesite flows typically contain euhedral hornblende phenocrysts up to 6 mm long in a fine-grained gray groundmass. Locally andesite dikes are present that characteristically have hornblende phenocrysts up to 2.5 cm in length and may contain hornblende clots 6 to 8 cm in diameter. Lahar flows are light gray to pink with unsorted subrounded to subangular clasts of hornblende-rich andesite. Lahar matrix is composed of poorly cemented andesitic sand, silt, and clay. Local propylitic alteration is associated with intrusive bodies but no regional propylitic alteration or silicification was observed. The Disaster Peak Formation unconformably overlies the Stanislaus Group

Tsgu STANISLAUS GROUP, UNDIVIDED--Composed of three formations (Noble and others, 1974), from oldest to youngest, Table Mountain Latite, Eureka Valley Tuff, and Dardenelles Formation. These rocks were first mapped in reconnaissance by Ransome (1898), and later in detail by Slemmons (1953, 1966). The Table Mountain Latite, Eureka Valley Tuff, and the Dardenelles Formation have been seperated out locally but in general, have been mapped as Stanislaus Group, undivided. The Stanislaus Group reaches a maximum thickness of more than 457 m near Sonora Pass (Slemmons, 1966, p. 204) and ranges in age from 8.8 to 10.7 m.y. (Noble and others, 1974)

Tsgd DARDENELLES FORMATION (NOBLE AND OTHERS, 1974; AS DESCRIBED BY SLEMMONS, 1953, 1966)--Dark-gray to black porphyritic augite-olivine basalt,olivine basalt, augite basalt, and aphanitic basalt. Plagioclase phenocrysts are seen megascopically as small laths. The Dardenelles Formation conformably overlies the Eureka Valley Tuff (Slemmons, 1966, p. 204)

Tsgev EUREKA VALLEY TUFF (NOBLE AND OTHERS, 1974)--The Eureka Valley Tuff is comprised of three formal members, from oldest to youngest: Tollhouse Flat member, By-day member, and an unnamed upper member. Consists of a series of black to white, usually moderately welded, plagioclase-bearing biotite-augite lithic tuffs with angular lithic and crystal fragments. Abundant flattened, partially devitrified glassy streaks up to 5 cm long are present in the darker tuffs. The pink to white tuffs are usually poorly welded, poorly sorted, and hornblende bearing with no glassy streaks and large (2 cm) sometimes rounded lithic fragments that appear to be bedded locally. The Eureka Valley Tuff occurs both conformably on top of the Table Mountain Latite and in paleochannels cut into the lower strata

Tsgtm TABLE MOUNTAIN LATITE (SLEMMONS, 1953)--Black to red, usually vesicular, coarsely porphyritic latite flows, breccias, and minor intrusions. Characterized by weathered platy sieve-texture plagioclase phenocrysts up to 1 cm long; dark-green glassy clinopyroxene phenocrysts are also present in most flows. Also includes minor interbedded basalt and andesite flows that contain small laths of plagioclase. Minor hornblende has also been observed. Table Mountain Latite breccias are heterogeneous dark red, poorly to moderately sorted with subrounded clasts. Microscopically, the matrix is tuffaceous with partially devitrified glass. This formation is a cliff former with the breccia member being most resilient. The Table Mountain Latite unconformably overlies the Relief Peak Formation

Trp RELIEF PEAK FORMATION OF SLEMMONS (1966)--Red to brown to black pyroxene andesite lahars, hypersthene-augite andesite flows, hornblende-hypersthene andesite flows, minor olivine basalt flows, biotite-hornblende andesite flows, and minor volcaniclastic sandstone and conglomerate. Lahars have a majority of andesitic clasts but include minor clasts of plutonic basement rocks and metamorphic roof pendant rocks toward the base of the formation. Matrix in the lahars consists of smaller lithic fragments. Autobrecciated flows are homogeneous mafic to intermediate rocks that have undergone flow brecciation (Curtis, 1954). The majority of fluvial deposits are toward the base of the formation. Sedimentary units are moderately sorted, thin-bedded lithic sandstone-siltstone, and lithic wacke to poorly sorted massive conglomerate beds with clasts of andesite, granite, rhyodacite, and metamorphic rocks. Some of the fluvial beds have abundant disseminated carbonaceous matter that possibly contains uranium mineralization (Rapp, 1981). The Relief Peak Formation is regionally moderately to weakly propylitized and locally strongly propylitized and silicified (Wilshire, 1957). It lies unconformably between the Stanislaus Group 8.8 to 10.7 m.y. (Noble and others, 1974) and Valley Springs Formation (16-33.4 m.y.; Slemmons, 1966, p. 201). Whole-rock K-Ar dates of 19.2±0.8 and 20.0±0.8 are reported by Morton and others (1977) at the base of the Relief Peak Formation south of the map area

Tvs VALLEY SPRINGS FORMATION (PIPER AND OTHERS, 1939)--Thin sequence of pink to buff interbedded tuffaceous sedimentary rocks, welded tuffs, and lava flows, all of which are rhyodacitic to rhyolitic in composition. Mineralogically, these rocks consist of crystals of plagioclase, biotite, and sanidine; matrix of sedimentary rocks includes rock fragments as well as crystal fragments. Tuffs are usually densely welded and contain abundant glass shards. Volcanic flows are usually aphanitic with a glassy groundmass. Formation is only partly preserved in map area, occurring in a few small areas. The Valley Springs Formation has been dated by 25 K-Ar determinations in the range of 16.1 to 33.4 m.y. (Slemmons, 1966, p. 201). Unconformably overlies plutonic basement rocks unit. First described and named by Piper and others (1939)

PLUTONIC ROCKS[1]

Ktl GRANODIORITE OF TOPAZ LAKE--Light-gray to white medium-grained porphyritic biotite granite to granodiorite characteristically containing 5 to 35 percent, 2- to 10-cm pink microcline perthite megacrysts and 0 to 5 percent fine-grained ragged biotite crystals. Includes minor pegmatitic and medium-grained alaskitic border phases. Seven samples dated in Sonora Pass quadrangle by Evernden and Kistler (1970) give an age range from 81.6 to 84.8 m.y. Unit was first described by Curtis (1951)

Kmc GRANODIORITE OF MILL CREEK--Homogeneous gray to white medium-grained porphyritic biotite granodiorite containing potassium feldspar megacrysts up to 5 cm long and rounded quartz phenocrysts up to 1.5 cm diameter. Mill Creek granodiorite is very similar to Topaz Lake pluton both texturally and modally and has a Rb/Sr isochron age of 83.2±3 m.y. (R. W. Kistler, oral commun., 1981). The nature of the western contact of the Mill Creek pluton with the Topaz Lake pluton is not known

Kcg GRANODIORITE OF CHINA GARDEN--Pinkish-gray to white medium-grained seriate, hornblende-biotite granite to granodiorite containing approximately 2 percent anhedral hornblende and 5 percent anhedral biotite. Includes porphyritic, granophyric, and foliated border phases. R. W. Kistler (oral commun., 1980) reports a whole-rock Rb-Sr isochron age of 92.1±2.7 m.y.

Kfgd GRANODIORITE OF FREMONT LAKE--Medium-dark-gray medium- to fine-grained equigranular hornblende-biotite granodiorite. Small (<3 mm) euhedral books of biotite with lesser amounts of euhedral hornblende and minor amounts of sphene. Contains abundant lenticular or elongate mafic inclusions, commonly uniformly distributed through the rock but locally in clusters. Unit was first described by Clyde Wahrhaftig (written commun., 1980) near Fremont Lake in the Tower Peak quadrangle to the south. Occurs mainly as 2 masses separated and intruded by Granodiorite of Topaz Lake

Kwgd GRANODIORITE OF WHITE PEAK--Light-gray medium-grained subporphyritic hornblende biotite granodiorite. Contains phenocrysts of pink to white potassium feldspar up to 1.5 cm but commonly 5 mm. Biotite is less than 2 mm and is anhedral.. Hornblende crystals up to 4 mm are usually altered. Unit was named and described by Clark (1967). No dates are available and relative age is unknown

OPEN-FILE REPORT 81-1170

METAMORPHIC ROCKS

JTR mu METAMORPHIC ROCKS, UNDIFFERENTIATED--Includes intermediate to acid lava flows and tuffs, poorly sorted subangular crossbedded volcanic sands, argillaceous phyllite and slate, marble and skarn, schist, and quartzite conglomerate. Metavolcanic rock types dominate although there are thick metasedimentary rock sections in some places. Metamorphosed to greenschist facies with biotite hornfels locally present near plutonic contacts. The metamorphic rocks are cut by plutonic rocks of late Cretaceous age. Lack of fossil evidence makes exact age unknown but Schweikert (1972, 1976) suggests a lower Jurassic age

[1]Plutonic rock classification after Streckheisen (1976).

Geologic contact dashed where approximate; Queried where uncertain.

Faults and air photo lineaments dashed where approximate; bar and ball on down thrown side.

REFERENCES CITED

Clark, M. M., 1967, Pleistocene glaciation of the drainage of the West Walker River, Sierra Nevada, California: Stanford, Calif., Stanford University, Ph. D. thesis, 130 p.

Curtis, G. H., 1951, The geology of the Topaz Lake quadrangle and the eastern half of Ebbetts Pass quadrangle: Berkeley, University of California, Ph. D. thesis, 310 p.

_____1954, Mode of origin of pyroclastic debris in the Mehrten Formation of the Sierra Nevada: Berkeley, University of California Publications in Geological Sciences, v. 29, no. 9, p. 453-502.

Evernden, J. F., and Kistler, R. W., 1970, Chronology of emplacement of Mesozoic batholithic complexes in California and western Nevada: U.S. Geological Survey Professional Paper 623, 42 p.

Morton, J. L., Silberman, M. L., Bonham, H. F., Jr., Garside, L. J., and Noble, D. C., 1977, K-Ar ages of volcanic rocks, plutonic rocks, and ore deposits in Nevada and eastern California--Determinations run under the U.S.G.S.-NBMG Cooperative Program: Isochron/West, v. 20, p. 19-29.

Noble, D. C., Slemmons, D. B., Korringa, M. K., Dickinson, W. R., Al-Rawi, Y., and McKee, E. H., 1974, Eureka Valley Tuff, east-central California and adjacent Nevada: Geology, v. 2, p. 139-142.

Piper, A. M., Gale, H. S., Thomas, H. E., and Robinson, T. W., 1939, Geology and groundwater hydrology of the Mokelumne area, California: U.S. Geological Survey Water-Supply Paper 780, 230 p.

Ransome, F. L., 1898, Some lava flows of the western slope of the Sierra Nevada, California: U.S. Geological Survey Bulletin 89, 74 p.

Rapp, J., 1981, Uranium mineralization of the Sonora Pass region, Tuolumne County, California: California Geology, March 1981, p. 43-52.

Schweikert, R. A., 1972, Shallow level intrusions in the eastern Sierra Nevada, California: Stanford, Calif., Stanford University, Ph. D. thesis, 85 p.

_____1976, Shallow-level plutonic complexes in the eastern Sierra Nevada, California, and their tectonic implications: Geological Society of America Special Paper 176, 58 p.

Slemmons, D. B., 1953, Geology of the Sonora Pass region: Berkeley, University of California, Ph. D. thesis, 201 p.
_____1966, Cenozoic volcanism of the central Sierra Nevada, California: California Division of Mines and Geology Bulletin 190, p. 199-208.

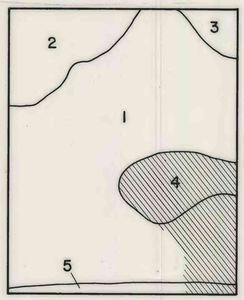
Streckeisen, A., 1976, To each plutonic rock its proper name: Earth Science Reviews, v. 12, p. 1-33.

Wilshire, H. G., 1957, Propylitization of Tertiary volcanic rocks near Ebbetts Pass Alpine County, California: University of California, Publications in Geological Sciences, v. 32, p. 243-272.

INDEX TO MAPPING

1. Giusso, J.R., 1980, Unpublished air photo interpretation, with information from Slemmons (1953)
2. Bergantz, G.W., Giusso, J.R., and Keith, W., 1980, unpublished reconnaissance geologic mapping.
3. Schweikert, R. (1972).
4. Giusso, J.R., 1980, unpublished air photo interpretation, with information from Slemmons (1953) and Clark (1967).
5. Wahrhaftig, Clyde, 1980, unpublished geologic mapping.

1-5 Quaternary geology by J.C. Dohrenwend (1979, 1980), unpublished geologic mapping. Patterned area modified after Clark (1967).



NOTE: Air photo interpretation not field checked.

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.