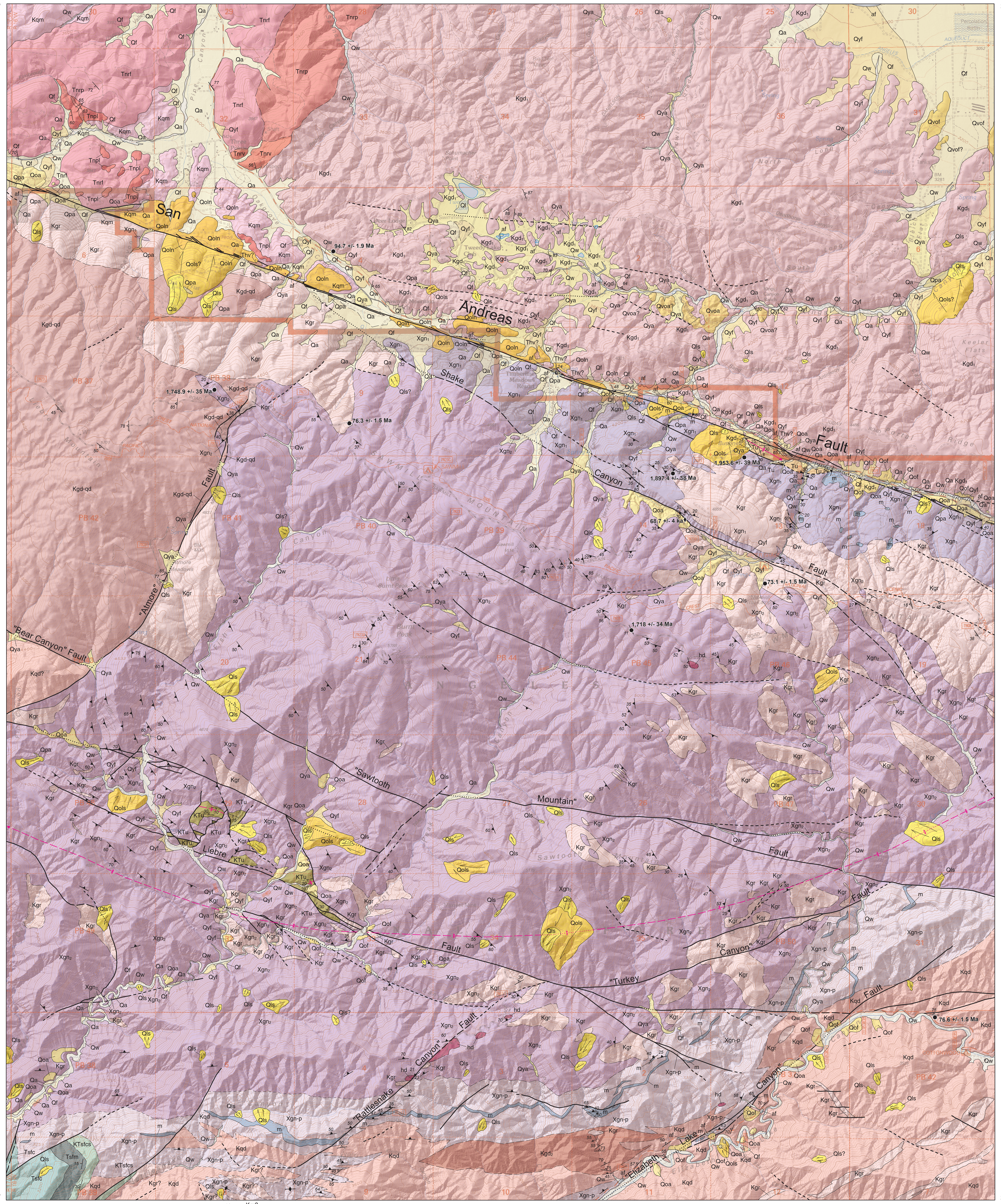

Coordinate System:
Universal Transverse Mercator, Zone 11N
North American Datum 1927

Topographic base from U.S. Geological Survey
Burnt Peak 7.5-minute Quadrangle, 1958, photo revised 1985.
Shaded relief image derived from USGS Lidar DEM, 2017

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program, Statemap Award no. G21AC10701.

Scale 1:24,000

Contour Interval 40 Feet
Dotted Lines Represent 20-Foot Contours
Contour Inverval on River Surface 5 Feet
National Geodetic Vertical Datum of 1929

Approximate Mean Declination, 2022

Professional Licenses and Certifications:
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Signature, date, and stamp of licensed individual's seal found within the accompanying document: Authorship Documentation and Product Limitations.

Publication Title: "Preliminary Geologic map of the Burnt Peak 7.5' Quadrangle, Los Angeles County, California: California Geological Survey Preliminary Geologic Map 22-06, scale 1:24,000".

PRELIMINARY GEOLOGIC MAP OF THE BURNT PEAK 7.5' QUADRANGLE LOS ANGELES COUNTY, CALIFORNIA

VERSION 1.0

By

Francesca N. Valencia, Brian J. Swanson, and Janis Hernandez

Digital preparation by
Francesca N. Valencia, Brian J. Swanson, and Deshawn A. Brown Jr.

2022

Preliminary Geologic Maps available from:
https://www.conservation.ca.gov/cgs/maps-data/rgm/preliminary

California Department of Conservation
California Geological Survey

DESCRIPTION OF MAP UNITS

SURFICIAL UNITS

af — **Artificial Fill (Holocene)**—Consists of man-made deposits of earth-fill soils derived from local sources. Mapped primarily along road alignments and at larger man-made berms.

Ql — **Lake deposits (Holocene)**—Mostly unconsolidated fine-grained sand, silt, and clay associated with Tweedy Lake and Hidden Lake; lakes filled episodically. Deposits at Tweedy Lake contain salts or other evaporites as well as interfingered alluvium deposited while lake levels are low.

Qw — **Wash deposits (late Holocene)**—Unconsolidated sand, gravel and cobbles deposited in recently active stream channels. Sediments are generally derived from local bedrock or reworked from nearby older Quaternary deposits. Sediments subject to remobilization and deposition during storm events.

Qf — **Modern alluvial fan deposits (late Holocene)**—Unconsolidated to weakly consolidated, poorly sorted, sand, and silt, gravel and cobble deposits with uncommon boulders, forming active, essentially undissected, alluvial fans. Includes small to large cones at the mouths of stream canyons and broad aprons of coarse debris adjacent to mountain fronts. Gravel clasts are derived from local up-slope sources and typically unweathered with little to no oxidation. Sediments subject to remobilization and deposition during storm events.

Qa — **Modern alluvium (late Holocene)**—Unconsolidated to weakly consolidated, mostly undissected, sand, silt, gravel and cobbles and uncommon boulders deposited dominantly by fluvial processes. Deposited parallel to localized stream valleys and/or underlying larger river valleys; subject to remobilization and deposition during storm events.

Qpa — **Ponded alluvium (Holocene)**—Unconsolidated to weakly consolidated, moderately sorted and bedded sand and silt with minor gravel ponded upstream of drainages offset by adjacent faults, constricted by landslide movement, or accumulated in closed depressions.

Qls — **Landslide deposits (Holocene)**—Unconsolidated to moderately well-consolidated jumbled sediment or rock debris consisting of surficial failures, debris flows, rock avalanches, and large-scale rockslides. Recognizable by topographic expression, such as hummocky terrain, closed depressions, or scarps, chaotic internal structure, pervasive fracturing, and/or out-of-sequence rock packages.

Qya — **Younger alluvium (middle Holocene to late Pleistocene)**—Unconsolidated to slightly consolidated, yellowish-brown to dark-yellowish-brown (10YR 5/4 to 10YR 4/4 moist), interlayered, thin- to thick-bedded sand, gravel silty sand, and local cobble-rich layers; clasts typically reflect upstream bedrock sources and deposits. Deposits are slightly to moderately dissected by modern streams but could be modified by runoff from large storm events.

Qyf — **Younger alluvial fan deposits (middle Holocene to late Pleistocene)**—Unconsolidated to weakly consolidated, undissected to slightly dissected, pale-brown to light-brownish-gray to dark-yellowish-brown (10YR 6/3-2 to 10YR 4/4 moist), silty and coarse- to very coarse-grained sand with pebbles, cobbles and uncommon boulders; poorly to moderately stratified.

Qoa — **Older alluvium (late Pleistocene)**—Dark-grayish-brown to yellowish-brown (10YR 4/2 to 10YR 5/4 moist) silty pebbly sand with coarse subrounded to subangular gravel and local cobbles; clasts composed of locally derived crystalline basement rock; slightly friable to well consolidated, moderately to poorly sorted; weakly stratified to locally well stratified. Surfaces are strongly dissected, leaving scattered isolated deposits. Qoa dominantly occurs in three areas: Along the San Andreas Fault (SAF); west of Upper Shake campground along the south side of a significant splay of the SAF; and in the southeastern part of the quad along Elizabeth Lake Canyon. Mapped alluvium likely reflects more than one period of deposition. Well consolidated silty Qoa cut by SAF splay west of Upper Shake Campground dated at 68.70 +/-3.89 ka (IRSL analysis in 2022 by Shannon Mahan at USGS Luminescence Lab).

Qof — **Older fan deposits (late Pleistocene)**—Light-yellowish-brown (10YR 6/4 dry; 10YR5/4 moist) fine- to coarse-grained sand with silt and pebbly sand with scattered clasts of gravel and cobbles; clasts subrounded to subangular and composed of crystalline basement rock; slightly to moderately consolidated, poorly sorted and poorly stratified. Surfaces are slightly to strongly dissected.

Qols — **Older landslide deposits (late Pleistocene)**—Weakly consolidated to well-consolidated jumbled sediment or rock debris consisting of ancient rock avalanches and large-scale rockslides. Distinctive geomorphic expression subdued due to post-failure erosion, but recognizable based on altered topographic expression, chaotic internal structure, pervasive fracturing, and/or out-of-sequence rock packages.

Qoln — **Older alluvium (late to middle Pleistocene)**—Dark-grayish-brown to brown (10YR 4/2 to 10YR 4/3 moist), unconsolidated, poorly sorted, cobbles to boulders with scattered pebbles; angular to subrounded clasts derived from both the Liebre Quartz Monzonite complex and diorite gneiss complex. (modified from Barrows and others, 1985)

Qvoa — **Very old alluvium (early Pleistocene)**—Yellowish-brown to brownish-yellow (10YR 5/6 to 10YR 6/6 moist), silt, fine- to coarse-grained sand, and gravel derived from crystalline bedrock; moderately to well-consolidated, highly dissected. Isolated unit located at the west end of Kings Canyon, at the junction with Spring Canyon.

Qvof — **Very old fan deposit (early Pleistocene)**—Moderately consolidated, reddish-brown, medium dense, fine- to medium-grained arkosic sand with fine to medium gravel. Gravels predominately fine- to medium, sub-rounded granitic clasts. Clay coatings on grains and clasts predominant. (Hernandez, 2011)

TERTIARY SEDIMENTARY AND VOLCANIC DEPOSITS

Thv? — **Hungry Valley Formation(?), undivided (Pliocene)**—Tan to light-brown to light-grayish-brown sandstone, light-yellowish-brown silty sandstone, and darker yellowish-brown conglomerate. Bedding is poorly to faintly developed with somewhat disrupted appearance. Local dark-grayish-brown irregular discontinuous clay lenses. Poorly to moderately cemented, poorly to moderately sorted, non-marine, fine- to coarse-grained arkosic sandstone and pebble to cobble conglomerate. Large clasts include subrounded to very well-rounded pebbles and cobbles of weathered granitic rocks. Rare subangular to angular granitic-rock clasts occur locally (Barrows and others, 1985). Small outcrops are exposed north of the SAF along the northern side of Pine Canyon Road, between the Tweedy Lake community access road and Bushnell Summit. Mapped as undivided Hungry Valley Formation, "Th," by Barrows and others (1985) and tentatively interpreted as a fault sliver intermediate in location relative to the type Hungry Valley Formation deposits west of the quadrangle in Ridge Basin (southwest of the SAF), and the inferred source area (on the northeast side of the SAF) displaced to the east of the quadrangle by long-term, right-lateral fault slip.

Tu — **Undifferentiated Sedimentary Unit (Miocene? to Pliocene)**—Undifferentiated interbedded light- to medium-gray silty medium-grained sandstone, pebbly sandstone and pebble conglomerate with local cobbles and small boulders exposed south of the San Andreas Fault along Pine Canyon Road near Bushnell Summit. Moderately hard, poorly sorted, and poorly to moderately well bedded. Beds are deformed into a southeast-plunging, asymmetrical synclinal fold. Clasts are subangular to subrounded and composed dominantly of gneiss, schist and granitoids. Unit could be related to the Hungry Valley Formation in Ridge Basin to the west, which would suggest possible large-scale right-lateral separation on one or more splay faults mapped to the south.

Neenach Volcanics Formation (Late Oligocene to early Miocene)—Series of calc-alkaline andesitic, dacitic, and rhyolitic flows interbedded with pyroclastic and volcaniclastic sediments, which were deposited unconformably on the Cretaceous quartz monzonite (Kqm). Subdivided by Matthews (1973b) into six distinct members. The volcanic flows vary in age from about 18 to 24 Ma (Turner, 1970; Weigand and Swisher, 1991; Sims, 1993). Previously interpreted as correlative with the Pinnacles Volcanic Formation to the northwest based on striking chemical, petrographic, and stratigraphic similarities, and used as the basis to interpret approximate 315 km of long-term, right-lateral slip on the San Andreas Fault (Matthews, 1973a; 1973b; 1976).

Tnpl — **Pumice lapilli tuff member**—White to grayish-beige, and yellowish-green to grayish-green where altered, pumice lapilli tuff and tuff. Pumice fragments are up to 3 cm in maximum dimension, averaging 2 to 3 mm in diameter, and decreasing in diameter down-section. Angular fragments of flow-banded rhyolite from 1 to 3 mm in diameter are rare to abundant (Matthews, 1973b). Vaguely bedded with most beds less than 2 meters thick. Crystal fragments from granitic rocks are abundant in the lower portion (modified from Olson and Swanson, 2019). Locally vesicular, with vesicles up to 1 mm in diameter. Texture varies from massive to chaotic, with brecciated lensoidal lapilli locally altered. Brecciated zones consist of green welded tuff clasts in a pink to purple matrix with local micro-brecciated lapilli. Unaltered zones of Tnpl are buff colored with yellowish residue on weathered minerals that give a speckled look in outcrop. Small anhedral garnets up to 1 mm or less in size are disseminated in unaltered zones and are clustered adjacent to local quartz veins.

Tnrp — **Rhyolite member, perlite unit**—Varying colors of black- to brown-black, grayish-white to dusky greenish-gray, and tan to brown (where weathered) flow-banded perlite with alternating bands of clear and cloudy glass from 1 mm to 1.5 cm thick. Perlite is non-porphyritic with vitreous to waxy to resinous luster and inclusions of red, devitrified rhyolite (Matthews, 1976). Outcrops are jagged and visible in aerial imagery. Weathering occurs along foliation, jointing, and along quartz veins. Fractures conchoidally with sharp thin edges. Gradational lower contact with map unit Tnrf. Unit is cut by many white to smoky quartz veins that display a range of translucent, semi-transparent to opaque properties. Characteristic outcrops for this map unit are exposed near the southwest corner of the quadrangle, off Pine Canyon Road.

Tnrf — **Rhyolite member, flow-banded unit**—White- to pale yellowish-orange (weathered) and pale-red, yellowish-gray, and grayish-purple (fresh) aphanitic flow-banded rhyolite; banding is continuous over a distance of several meters and defined by color variations, planar to locally undulatory or warped banding ranging from <1 mm to >1 cm in thickness. Outcrops can appear massive at a distance where bands are thin and pale. Bands of subrounded- to subangular-microbrecciated aphanitic rhyolite with fine-grained reddish-purple matrix are common. Soils on Tnrf slopes have abundant granule to pebble sized angular clasts and "popcorn" soil texture is common where outcrops are intensely weathered. Local alteration observed in outcrops along Sacombre Road.

Tnrv — **Rhyolite member, vitric lapilli-tuff unit**—Black to gray to bluish-gray pumiceous tuff containing completely devitrified round-bubble pumice fragments floating in a matrix of fine ash. Clasts of glassy and devitrified rhyolite and perlitic fractures characterized as glassy zones (Matthews, 1976). Abundant chaotic quartz veins 1 mm to 6 cm thick cut unit. Local scoria texture with vesicles up to 1 cm in diameter. One unnamed mine adit is located within this unit northeast of Pine Canyon Road, but the ore rock may have been in the underlying granodiorite.

KTu — **Sedimentary rock of upper Fish Canyon**—Sedimentary rock is preserved in several isolated exposures within a northwest-trending fault block in upper Fish Canyon, north of Lions Camp. Dibblee (2002) mapped a short section of this rock across Burnt Peak Canyon as sandstone and conglomerate of the San Francsiquito Formation divided by a fault but lying in depositional contact with basement rocks to the northeast and southwest. Szatai (1961) mapped a narrow but much longer sliver of sedimentary rock extending from the northwest side of Burnt Peak Canyon almost to Fish Canyon but assigned this section to the Ridge Route Formation. The subject rocks are remote from any road access, but review of imagery, particularly of April 2017 Google Earth imagery, suggests that the sedimentary rock occurs as several exposures isolated by complex faulting and folding. Owing to uncertainty in correlation with named formations, the unit is mapped as undifferentiated Cretaceous/Tertiary sedimentary rock of upper Fish Canyon.

*The matrix color of surficial materials amd their pedogenic soils is classified according to the Munsell soil-color chart (Munsell, 2019).

TERTIARY SEDIMENTARY AND VOLCANIC DEPOSITS (CONTINUED)

San Francisquito Formation (Late Cretaceous to early Paleocene)—The San Francisquito Formation consists of almost 4,000 m of sediments deposited primarily in a deep-sea submarine fan system. Initially described and named by Dibblee (1967), this formation was studied in more detail by Kooser (1980, 1982), including the exposures surrounding lower Fish Canyon in the southwest corner of the Burnt Peak quad. In the Late Cretaceous, the western Cordilleran margin was the site of a several 1,000-km-long subduction zone where the Farallon plate was subducted beneath the western edge of the North American plate. The San Francisquito Formation was deposited in a local basin formed by rapid subsidence of the igneous and metamorphic basement as the forearc basin expanded and developed. Marine transgression into this basin began in the late Maastrichtian Stage with the oldest sediments found just to the southeast on Warm Springs Mountain (Kooser, 1982). Sedimentation in the central Transverse Ranges continued relatively uninterrupted from the Late Cretaceous into the Paleocene. The oldest sediments were deposited in shallow water (KTsfcs); as subsidence continued, sediments accumulated at the base of the continental slope (Tsfm) and in an adjacent submarine fan valley (Tsfc). Basal conglomerate clasts (KTsfcs) are dominantly composed of local granite and gneiss and poorly rounded suggesting a local crystalline basement source terrain, whereas overlying deep water conglomerates are well rounded and polished and contain abundant volcanic clasts, suggesting a more distal source with active silicic volcanism (Kooser, 1982; Olson and Valencia, 2021).

Tsfc — **San Francisquito Formation, conglomerate**—Dark-gray to brown cobbly to bouldery conglomerate with scattered thick-bedded sandstone and rare mudstone, well-cemented. Conglomerates are commonly disorganized, clast-supported, beds up to 5 m thick. Clasts are typically polished, subrounded to well-rounded; clast types include: quartz diorite, quartz monzonite, biotite-chlorite gneiss, quartzite, trachyandesite, porphyritic dacite and rhyodacite, devitrified crystal and lithic tuff, and sandstone intraclasts (Kooser, 1980; 1982). Sandstone beds are commonly medium-grained, lithic to arkosic, massive to parallel-laminated, and range in thickness from 10 to 50 cm. Equivalent to unit "KTsb" of Kooser (1980; 1982), which she infers was deposited in a deep-sea canyon near the apex of a submarine fan (Olson and Valencia, 2021). Kooser (1982) indicates the Tsfc is time transgressive from Late Cretaceous to early Paleocene time, and in the Fish Creek area was not deposited until the early Paleocene; Tsfc interfingers with the mudstone member (Tsfm), such that the Tsfc overlies the Tsfm in the Burnt Peak Quadrangle.

Tsfm — **San Francisquito Formation, mudstone**—Very dark-gray to dark-olive-brown silty mudstone, massive to thinly laminated, fissile, finely disseminated carbonaceous debris, fossiliferous pebbly mudstone intervals and thin sandstone interbeds are common (Kooser, 1982). Fossils include Macrocallista furlong, Tornatellaea pinguis, and Turritella pachecoensis suggesting an early Paleocene age (Kooser, 1980). Interfingers laterally with Tsfc conglomerate, such that it underlies Tsfc in the Burnt Peak Quadrangle. Isolated rounded boulders of gneiss, granitoids, and volcanics up to 3 m in diameter occur within the mudstone associated with convoluted laminae and large slump folds. Equivalent to unit "KTsc" of Kooser (1980; 1982), which she infers was deposited at the base of the continental slope (Olson and Valencia, 2021)

KTsfcs — **San Francisquito Formation, conglomerate and sandstone**—A mixture of numerous shallow-water marine and perhaps some nonmarine facies. At maximum the unit is less than 100 m thick and in places pinches out entirely. Lithofacies include breccia, interstratified conglomerate and arenite, coal stringers, sandy-grainstone, biotite-wacke, and sandy-packstone to limy-arkosic wacke. Breccia facies is a laterally discontinuous accumulation of unsorted, angular cobbles, boulders, and coarse arkosic sand. The interstratified conglomerate and arenite facies consists of lenses of sandy, gritty conglomerate and poorly to moderately sorted, conglomeratic arenite. Clasts are composed of poorly rounded to angular granitic and gneissic cobbles and boulders. Marine shell material is common above the basal few meters. Shelly fauna consists largely of fragments of robust bivalves but also includes large turrid gastropods. Unconformably overlies the gneissic and plutonic basement in the southwest corner of the Burnt Peak quadrangle. Equivalent to "KTsa" unit of Kooser (1980; 1982) and considered to possibly include deposition in the Burnt Peak area during Late Cretaceous time.

MESOZOIC INTRUSIVE ROCKS

Granite, Granodiorite, Quartz Diorite and Quartz Monzonite (Cretaceous)—Mesozoic intrusive rocks in the Burnt Peak Quadrangle are separated into two groups by the San Andreas Fault (SAF). Granodiorite, quartz monzonite and granite mapped north of the fault are thought to be related to the Sierra Nevada Batholith and are generally older than the intrusive rocks south of the SAF (Nourse and others, 2020). Intrusive rocks south of the fault consist dominantly of granodiorite, quartz diorite and granite, which are part of the Liebre Block of pre-SAF rocks as defined by Powell (1993) in the central Transverse Ranges.

Kgr — **Granite (Late Cretaceous)**—Dominantly very-light-gray to white, fine- to medium-grained, equigranular, massive to weakly foliated granite exposed south of the SAF; locally ranges to medium- to coarse-grained and inequigranular in northeastern exposures along Maxwell Road; contains minor (<5%) fine-grained biotite. Mapped localities vary from small fine-grained pods and bodies complexly intruded into gneissic rock to the south, and larger bodies closer to the SAF to the north. Exposures occur in sparse small natural outcrops, road cuts, channel banks and deeply incised canyon slopes. New U-Pb dating of the granite at two localities (see map) produced Late Cretaceous ages of 76.3 +/-1.0 [1.5] Ma (MSWD = 6.0) and 73.1 +/-0.5 [1.5] Ma (MSWD = 4.8) (age +/-internal 2SE uncertainty; [total 2% uncertainty]). Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2022).

Kqd — **Quartz diorite (Late Cretaceous)**—Speckled, white and dark-gray to black, fine- to medium-grained, subequigranular biotite- and hornblende-bearing quartz diorite; biotite and hornblende commonly occur as small clots that are locally aligned to form a weak to moderate foliation; plagioclase is dominantly andesine in composition. Unit occurs south of the SAF primarily along Lake Hughes Road and along the southern portion of the quadrangle, where it complexly intrudes Xgn-p gneiss forming interlayered contacts and common xenoliths of gneiss and older intrusive rock; foliation in the quartz diorite is generally parallel to foliation in the Xgn-p gneiss and may be related to intrusion and melting along the older foliation; Szatai (1961) suggested that the quartz diorite formed by in place granitization of the gneiss. Unit is typically weathered and moderately coherent where exposed; commonly forms sandy grus at the surface. This quartz diorite was informally named the Warm Spring diorite by Szatai (1961) and correlated by Dibblee (2002) with the Wilson diorite of Miller (1934) in the southwestern San Gabriel Mountains; unpublished U-Pb dating of tonalitic rock of the Wilson diorite (LA-SF-ICPMS on zircons) indicates ages of 67 Ma and 73 Ma (Josh Schwartz, CSUN Laser Lab, pers. commun., 2022). New U-Pb dating of a sample collected along Lake Hughes Road (see map) produced an age of 76.6 +/-0.4 [1.5] Ma (MSWD = 2.9) (age +/-internal 2SE uncertainty [total 2% uncertainty]). Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2022).

Kgd-qd — **Granodiorite and Quartz Diorite (Late Cretaceous)**— Speckled light-gray to black, medium-grained, subequigranular hornblende biotite granodiorite, quartz diorite, and local tonalite exposed south of the SAF on the east side of Liebre Mountain (Ross, 1972); massive to weakly foliated as defined by small aligned clusters of medium-grained hornblende and biotite; may be a genetically related to the Liebre Granodiorite originally defined by Crowell (1952) in the Lebec quadrangle; quartz diorite facies could also be related to the quartz diorite mapped along Lake Hughes Road. Preliminary U-Pb dating of granodiorite on the Liebre Mountain Quadrangle to the west have produced ages between 80 and 84 Ma. Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2022).

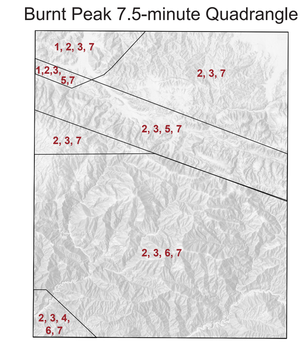
Kqm — **Quartz monzonite (Late Cretaceous)**—Black and light-gray to white speckled, medium-grained to locally coarse-grained, massive to very weakly foliated quartz monzonite. Weathers to grus, forming rounded hills with rare natural exposures. Unit mapped extensively along the north side of the SAF eastward from the La Liebre Ranch Quadrangle and west of Pine Canyon Road. New U-Pb dating of quartz monzonite on the La Liebre Ranch Quadrangle to the northwest produced a preliminary early Late Cretaceous age of about 92 Ma. Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2019).

Kgd_1 — **Granodiorite and Granite (Late Cretaceous)**—Dominantly composed of medium- to coarse-grained, biotite granodiorite and granite exposed north of the SAF; previously mapped as quartz monzonite by Dibblee (1967; 2002). Granodiorite composition grades to granite as orthoclase content increases from eastern edge of the quadrangle (from Lake Hughes area) towards Pine Canyon Road to the west. Increase in orthoclase content is gradual, and pink color varies in saturation and transparency across the unit. Crystals of orthoclase and plagioclase range up to 1 cm in maximum dimension. Biotite crystals are disseminated to concentrated as medium to coarse crystal books; commonly aligned along weakly to moderate primary foliation. Isolated zones with mafic inclusions ranging from 4 to 10 cm. Inclusions are oriented suparallel to parallel with the mineral foliation; cut by few leucocratic aplite and pegmatite dikes. Local large intensely weathered mafic diorite enclaves cut by pegmatite dikes and quartz veins are exposed along the Los Angeles County Aqueduct in the southeast portion of the quadrangle. Several small mines and prospects have pursued gold from the granodiorite within the Burnt Peak Quadrangle. In the Neenach School Quadrangle to the north, gold mines and prospects have been associated with metasedimentary xenoliths within the granodiorite (Valencia and others, 2022). A zone of heavily sheared and pulverized rock up to about 40 m wide is exposed in road cuts for Pine Canyon Road along the north side of the SAF, across from Shake Canyon and east of Bushnell Summit. New U-Pb dating of the granodiorite produced an early Late Cretaceous age of 94.7 +/-0.5 [1.9] Ma (age +/-internal 2SE uncertainty; [total 2% uncertainty]); MSWD = 5.1. Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2022).

Kgd_2 — **Granodiorite (Cretaceous?)**—Light- to medium-gray, foliated granodiorite speckled with black hornblende and biotite grains exposed northwest of Lake Hughes Canyon near Prospect Canyon. Medium-grained to porphyritic with locally common pink K-feldspar phenocrysts up to 2.5 cm in maximum dimension; weak to moderately strong foliation defined by aligned biotite grains and preferred orientation of phenocrysts. Appears to be intruded by quartz diorite (Kqd); age uncertain but tentatively assumed to be Cretaceous.

hd — **Hornblende diorite and gabbro (Mesozoic?)**—Medium-gray, fine- to medium-grained hornblende diorite and local medium- to coarse-grained dark-gray to dark greenish-gray gabbro with white plagioclase phenocrysts. Generally weathered and poorly exposed except in road cuts; forms local small pods and lenses. Age uncertain but may represent more than one phase of intrusion.

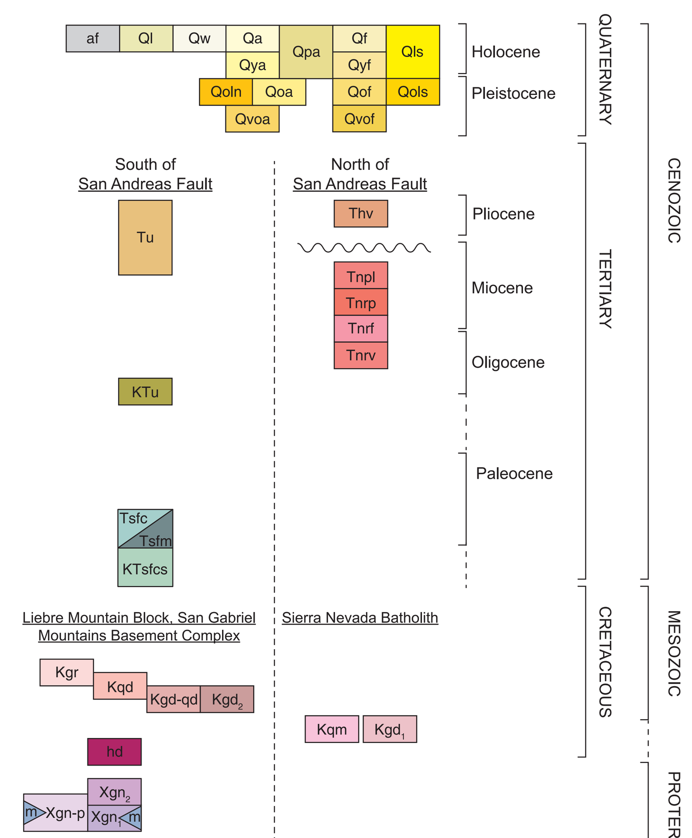
Burnt Peak 7.5-minute Quadrangle

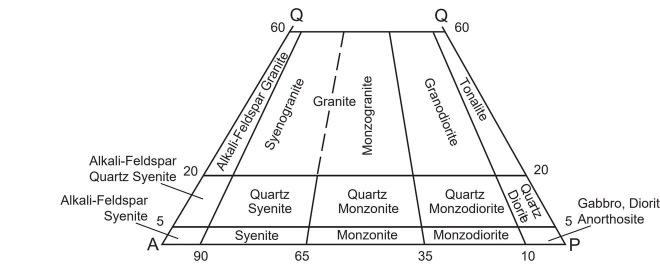


SOURCES OF MAP DATA
1. Matthew, 1973
2. Dibblee, 2002*
3. Lancaster and others, 2012*
4. Kooser, 1980
5. Barrows and others, 1985
6. Szatai, 1961
7. Valencia, Swanson, and Hernandez, 2022*

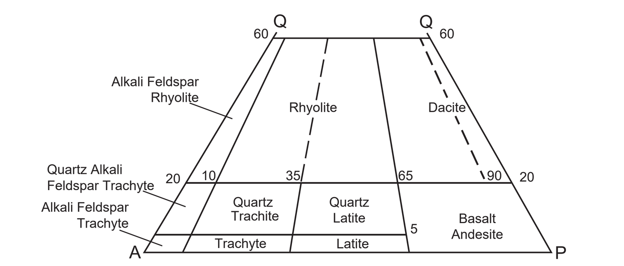
*Data source covers entire quadrangle

CORRELATION OF MAP UNITS





Classification of plutonic rock types (from Streckeisen, 1973; 1976).
A, alkali feldspar; P, plagioclase feldspar; Q, quartz.



QAPF modal classification of plutonic rock types (based on Le Maitre, 2002).
This diagram must not be used for rocks in which the mafic mineral content, M, is greater than 90%.
A, alkali feldspar; P, plagioclase feldspar; Q, quartz

PALEOPROTEROZOIC ROCK

Paragneiss and Orthogneiss (Paleoproterozoic)—Much of the basement rock south of the San Andreas Fault (SAF) is composed of various gneissic lithologies and associated marble and quartzite located within the Liebre Mountain block of Powell (1993). The basement rocks of this block are separated from the Mendenhall gneiss and other basement rocks of the southwestern San Gabriel Mountains by the Pelona Schist and related Vincent Thrust Fault. Szatai assigned the gneissic rock package to the informally named "Sawtooth Gneiss". Dibblee also lumps all of this rock into one unit; however, field observations reveal that much of what Dibblee mapped as quartz diorite in the mountainous areas northwest of Lake Hughes Road is actually quartzofeldspathic gneiss, which is complexly intruded along foliation by the quartz diorite to the southeast. Based on updated mapping and new U-Pb dating, we differentiate three gneissic rock units: Xgn_1 is distinguished along the south side of the SAF for K-feldspar-poor biotite paragneiss with local marble pods and granitic orthogneiss because U-Pb dating indicates ages of 1.9 to 1.95 Ga, which are significantly older than gneisses dated elsewhere on the quad; Xgn_2 is distinguished for younger gneiss with a mix of quartzofeldspathic gneiss and secondary biotite and hornblende gneiss that lacks known marble layers and is dated between 1.7 and 1.75 Ga. Xgn-p is distinguished for banded quartzofeldspathic paragneiss generally lacking biotite-rich bands but including a prominent band of marble layers. Xgn-p may be equivalent to Xgn_1 based on the presence of marble and may form a regional-scale west-plunging synform, but the age of Xgn-p has not yet been verified. Map relationships between the three units is obscured by poor exposure near the SAF and by inaccessibility to exposures in the Fish Canyon area.

Xgn_2 — **Quartzofeldspathic, biotite and hornblende gneiss (Paleoproterozoic)**—Undifferentiated unit consisting of two dominant gneissic rock types; pinkish-gray to light-gray quartzofeldspathic gneiss and secondary well foliated medium- to dark-gray biotite gneiss and inter-layered hornblende gneiss and hornfels, and local lenses of amphibolite of uncertain age; gneiss subunits are not differentiated on map due to poor lateral exposure of contacts observed away from road cuts. The gneisses are generally fine-grained, with porphyroclasts locally ranging up to 1 cm; foliation in biotite and hornblende gneisses defined by alternating light and dark bands and is dominantly planar, but locally contorted with small-scale folds; compositional banding ranges from less than 1 mm to several cm thick and is less distinct and more discontinuous in quartzofeldspathic packages; locally migmatitic with leucocratic melt bands and boudins; moderately fissile and locally schistose where biotite-rich bands are abundant; generally fractured overall; best exposed in road cuts, channel banks and deeply incised canyon slopes in the Fish Creek and Burnt Peak Canyon watersheds. Intruded by Cretaceous granite bodies and locally intruded by undated gray diorite or gabbro, and by thin aplite or pegmatite dikes. Biotite gneiss is likely a paragneiss, although no marble or distinctive quartzite units were observed. Quartzofeldspathic gneiss may be orthogneiss in part; cross-cutting relationships with Xgn-p are not well exposed and the units may be juxtaposed in part by faulting; presence of hornblende suggests amphibolite grade metamorphism. New U-Pb dating produced ages of 1,748.9 +/-12.2 [35] Ma (MSWD = 1.9) for the biotite gneiss (see map) and 1,718.0+/-13.6 [34] Ma (MSWD = 2.6) for the hornblende gneiss (upper intercept age +/-internal 2SE uncertainty [total 2% uncertainty]). Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2022).

Xgn-p — **Quartzofeldspathic paragneiss with marble (Paleoproterozoic)**—Light-brown weathering quartz- and feldspar-rich gneiss with small, oxidized biotite or hornblende grains, which locally encloses discontinuous bands of light-gray to white marble ranging up to 6 m in thickness (larger marble bands distinguished on map as "m") and rare, thin, light-gray quartzite beds, which substantiates the paragneiss interpretation; marble is generally fine-grained with mm- to cm-scale banding, but is locally coarsely recrystallized and locally contains abundant pale-greenish-yellow to dark-green olivine crystals; graphite is also commonly present; locally contains well-rounded quartz grains, pebbles, cobbles, and sandy layers exhibiting primary bedding (Szatai, 1961). The gneiss is moderately foliated, defined by mm- to cm-scale bands of varying grain size and quartz content; foliation is generally planar with few observed small-scale folds; weakly fissile but generally fractured and weathered, forming few exposures except in road cuts and channel banks. Complexly intruded by quartz diorite and foliated granodiorite to the southeast, resulting in zones of with pervasive seams of quartz diorite intruded along foliation and isolated enclaves of Xgn-p enclosed by quartz diorite. Also intruded by Late Cretaceous granite and gray hornblende diorite/gabbro of uncertain age. Age of paragneiss not quantified; the presence of interleaved marble suggests it may be genetically related to Xgn_1, with exposures occurring on the limbs of a broad, faulted, northwest-plunging synformal fold.

Xgn_1 — **Biotite gneiss and granitic orthogneiss (Paleoproterozoic)**—Biotite gneiss with interlayered dark-gray biotite and light-gray felsic bands typically a few mm to a few cm thick; well-foliated and slightly fissile where biotite is abundant; includes discontinuous lenses and pods of white marble (m) that are highly brecciated near fault zones; presumed to be a paragneiss based on thin banding and interleaved marble. Locally cut by light- to medium-gray, weakly foliated granitic orthogneiss with minor biotite and muscovite; orthogneiss is locally overprinted by ductile shear fabric. The gneiss is generally fractured, and in-place exposures are sparse except in active channel banks and road cuts. New U-Pb dating produced ages of 1,953.6 +/-21.2 [39] Ma (MSWD = 10) for the biotite gneiss (see map) and 1,897.4 +/-6.9 [38] Ma (MSWD = 9.9) for the orthogneiss (upper intercept age +/-internal 2SE uncertainty [total 2% uncertainty]). Analyses were conducted on zircons using laser ablation ICPMS analyses at the CSUN Laser Lab (2022). These relative dates and map distribution support that the orthogneiss intruded the paragneiss 150 to 200 million earlier than previous ages reported for the Mendenhall gneiss to the south (Barth and others, 2001), related rocks southwest of the San Gabriel Fault near Frazier Mountain (Nourse and others, 2020), and younger gneisses dated elsewhere on the Burnt Peak 7.5' Quadrangle. This older gneissic package is therefore distinguished on the map along the south side of the San Andreas Fault. The southern boundary is not well constrained but is tentatively delineated along the splay of the fault mapped through Upper Shake Campground.

SELECTED REFERENCES

Barrows, A.G., Kahle, J.E., and Beeby, D.J., 1985, Earthquake hazards and tectonic history of the San Andreas Fault Zone, Los Angeles County, California: California Division of Mines and Geology, Open File Report 85-10LA, 139 p, Plates 1a and 1b, map scale 1:12,000.

Barth, A.P., Wooden, J.L., and Coleman, D.S., 2001, SHRIMP-RG U-Pb zircon geochronology of Mesoproterozoic metamorphism and plutonism in the southwestern United States: Journal of Geology.

Crowell, J.C., 1952, Geology of the Lebec quadrangle, California: California Division of Mines Special Report.

Dibblee, T.W., Jr., 1967, Areal geology of the western Mojave Desert, California: U.S. Geological Survey Professional Paper 522.

Dibblee, T.W., Jr., 2002, Geologic map of the Burnt Peak quadrangle, Los Angeles County, California: Dibblee Geological Foundation Map, scale 1:24,000.

Hernandez, J., 2011, Preliminary geologic map of the Lake Hughes 7.5-Minute Quadrangle, Los Angeles County, California: California Department of Conservation, California Geological Survey, map scale 1:24,000.

Kooser, M.A., 1980, Stratigraphy and sedimentology of the San Francisquito Formation, Transverse Ranges, California: Unpublished doctoral dissertation, University of California, Riverside.

Kooser, M.A., 1982, Stratigraphy and sedimentology of the type San Francisquito Formation, southern California.

Lancaster, J.T., Hernandez, J.L., Hayden, W.D., and others, 2012, Geologic map of the Quaternary surficial deposits in southern California, Lancaster 30' x 60' Quadrangle: California Geological Survey Special Report 217, map scale 1:100,000.

Le Maitre, R.W., 2002, Igneous Rocks: A classification and glossary of terms: Recommendations of the International Union of Geological Sciences Subcommission on the Systematics of Igneous Rocks.

Matthews, V., III, 1973a, Pinnacles-Neenach correlation: A restriction for models of the origin of the Transverse Ranges and the Big Bend in the San Andreas Fault: Geological Society of America, Bulletin.

Matthews, V., III, 1973b, Geology of the Pinnacles Volcanic Formation and Neenach Volcanic Formation and their bearing on the San Andreas Fault problem: Unpublished Doctoral Thesis, University of California, Santa Cruz.

Matthews, V., III, 1976, Correlation of Pinnacles and Neenach Volcanic Formations and their bearing on San Andreas Fault problem: American Association of Petroleum Geologists, Bulletin.

Miller, W.J., 1934, Geology of the western San Gabriel Mountains of California: University of California Publications in Mathematics and Physical Sciences.

Munsell Color Co., Inc., 2019, Munsell soil-color charts (2009 revised ed.): Grand Rapids, Michigan.

Nourse, J.A., Swanson, B.J., and others, 2020, Recent advancements in geochronology, geologic mapping, and landslide characterization in basement rocks of the San Gabriel Mountains block.

Olson, B.P.E., Swanson, B.J., 2019, Preliminary geologic map of the La Liebre Ranch Quadrangle, Kern and Los Angeles Counties, California: California Department of Conservation, California Geological Survey, map scale 1:24,000.

Olson, B.P.E., Valencia, F.N., 2021, Preliminary geologic map of the Whitaker Peak Quadrangle, Kern and Los Angeles Counties, California: California Department of Conservation, California Geological Survey, map scale 1:24,000.

Powell, R.E., 1993, Balanced palinspastic reconstruction of pre-late Cenozoic paleogeology, southern California: Geological Society of America Memoir 178.

Streckeisen, A.L., 1973, Plutonic rocks—Classification and nomenclature recommended by the IUGS Subcommission on the Systematics of Igneous Rocks: Geotimes.

Streckeisen, A.L., 1976, To each plutonic rock a proper name: Earth Science Reviews.

Sims, J.D., 1993, Chronology of displacement on the San Andreas Fault in central California: Geological Society of America Memoir 178.

Szatai, J.E., 1961, The geology of parts of the Redrock Mountain, Warm Spring, Violin Canyon, and Red Mountain Quadrangles, Los Angeles County, California: Unpublished doctoral dissertation, University of Southern California.

Turner, D.L., 1970, Potassium-argon dating of Pacific Coast Miocene foraminiferal stages.

Valencia, F.N., Olson, B.P.E., and Hernandez, J.L., 2022, Preliminary geologic map of the Neenach School Quadrangle, Kern and Los Angeles Counties, California: California Department of Conservation, California Geological Survey, map scale 1:24,000.

Weigand, P.W., and Swisher, C.C., III, 1991, Are the Neenach and Pinnacles Volcanic Formations miscorrelated?

IMAGERY

DWR, 2016, Lidar-based 0.25m DEM and Ortho Imagery, for State Water Project Aqueduct area.

Google Earth Pro, 2021, Color and Black & White imagery dated between April 2015 and April 2017.

U.S. Department of Agriculture, Farm Service Agency–Aerial Photography Field Office, National Agriculture Imagery Program (NAIP).

MAP SYMBOLS

Contact between map units—Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain.

Fault—Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where location is uncertain. Arrow and number indicate direction and angle of dip of fault plane.

Thrust Fault—Barbs on lower plate; solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where existence is uncertain. Arrow and number indicate direction and angle of dip of fault plane.

Syncline (sedimentary rock) or synform (gneiss)—Solid where accurately located, long dash where approximately located, dotted where concealed, arrow showing plunge direction

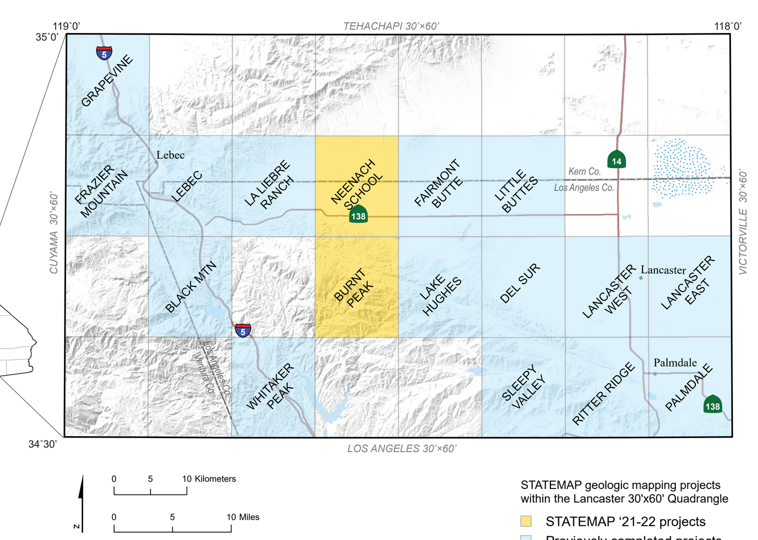
Landslide—Arrows indicate principal direction of movement

U-Pb Geochronology point (8 samples)

IRSL Geochronology point (one sample)

Strike and dip of geologic structure; number indicates dip angle in degrees.
Bedding
Approximate bedding
Overturned bedding
Photo-interpreted bedding
Primary foliation
Secondary foliation
Secondary vertical foliation
Inclined joint
Shear

Map Location



STATEMAP geologic mapping projects within the Lancaster 30'x60' Quadrangle
STATEMAP '21-22 projects
Previously completed projects

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