Base from U.S. Geological Survey
7.5' Sage quadrangle, 1954
Polyconic projection

SCALE 1:24,000

CONTOUR INTERVAL 20 FEET

Geology mapped by D.M. Morton and M.P. Kennedy, 2003-04.

Preliminary Geologic Map of the Sage 7.5' Quadrangle, Riverside County, California

Version 1.0

By

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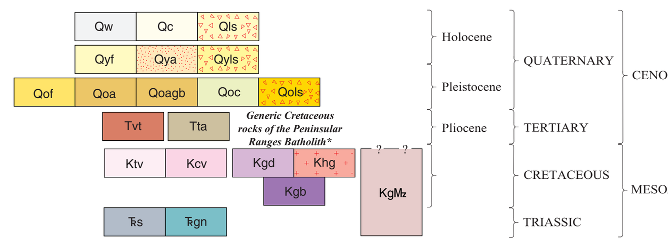
CORRELATION OF MAP UNITS



* *These units are mapped as undivided generic, because they represent common rock types associated with more than one specific pluton.*

EXPLANATION

Contact—Solid where located within ±15 meters; dashed where located within ±30 meters; no line shown for scratch contact

Fault—High angle. Solid where located within ±15 meters; dashed where located within ±30 meters; dotted where concealed

Quartz veins

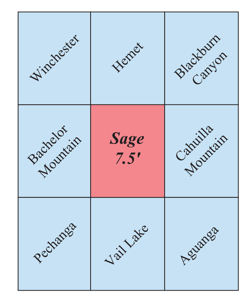
Landslide scarp—Hachures on scarp face

Landslide arrows—Arrows show direction of landslide movement

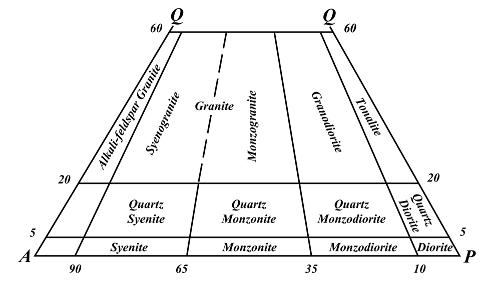
Strike and dip of metamorphic foliation

70 **Inclined**

Vertical



SURROUNDING 7.5' QUADRANGLES



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

Any use of trade, firm, or product names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Government.

This map was printed on an electronic plotter directly from digital files. Dimensional calibration may vary between electronic plotters and between X and Y directions on the same plotter, and paper may change size due to atmospheric conditions; therefore, scale and proportions may not be true on plots of this map.

Digital files available on World Wide Web at http://pubs.usgs.gov/of/2005/1285/

DESCRIPTION OF MAP UNITS

Very young surficial deposits (late Holocene)—Sediment recently transported and deposited in channels and washes, on surfaces of alluvial-fans and alluvial plains, and on hillslopes. Soil-profile development is non-existent. Includes:

Qw **Wash deposits**—Unconsolidated bouldery to sandy alluvium of active and recently active washes

Qc **Colluvial deposits**—Active and recently active rocky colluvial deposits of gabbro debris on hillside. Unconsolidated

Qls **Landslide deposits**—Highly fragmented to largely coherent active landslides. Unconsolidated to consolidated. Most mapped landslides include scarp area as well as slide deposit. Many originated in Pleistocene and all or parts were reactivated during Holocene

Young surficial deposits (Holocene and late Pleistocene)—Sedimentary units that are slightly consolidated to cemented and slightly to moderately dissected. Younger surficial units have upper surfaces that are capped by slight to moderately developed pedogenic-soil profiles (A/C to A/AC/BcambricCox profiles). Includes:

Qyf **Young alluvial fan deposits**—Unconsolidated deposits of alluvial fans and headward drainages of fans. Consists predominately of gravel, sand, and silt. Trunk drainages and proximal parts of fans contain higher percentage of coarse-grained sediment than distal parts

Qya **Young alluvial channel deposits**—Unconsolidated, gray, sandy alluvium along channels and headward part of broad channels

Qyls **Young landslide deposits**—Highly fragmented to largely coherent landslide deposits. Unconsolidated to consolidated. Most mapped landslides include scarp area as well as slide deposit. Many landslides in part reactivated during late Holocene

Old surficial deposits (late to middle Pleistocene)—Sedimentary units that are moderately consolidated and slightly to moderately dissected. Older surficial deposits have upper surfaces that are capped by moderately to well-developed pedogenic soils (A/AB/B/Cox profiles and Bt horizons as much as 1 to 2 m thick and maximum hues in the range of 10YR 5/4 and 6/4 through 7.5YR 6/4 to 4/4 and mature Bt horizons reaching 5YR 5/6). Includes:

Qof **Old alluvial fan deposits**—Reddish brown, gravel and sand alluvial-fan deposits; indurated, commonly slightly dissected. In places includes discontinuous thin alluvial-fan deposits of Holocene age

Qoa **Old axial channel deposits**—Fluvial sediments deposited on canyon floors. Consists of moderately indurated, commonly slightly dissected gravel, sand, silt, and clay-bearing alluvium. Locally capped by thin, discontinuous alluvial deposits of Holocene age

Qoagb **Old axial channel deposits containing gabbro clasts**—Red brown fluvial sediments deposited on sloping surface. Consists of moderately indurated, slightly dissected cobbly, gravel, sand, silt, and clay-bearing alluvium derived largely from gabbro. Red color is product of high iron content of the gabbro. Locally expansive. Locally capped by thin, discontinuous alluvial deposits of Holocene age

Qoc **Old colluvial deposits**—Colluvial deposits on hillsides and at the base of slopes. Ranges in grain size from rubble to sand. Unconsolidated to slightly indurated

Qols **Old landslide deposits**—Oak Mountain landslide; partly reactivated. Consists of fragmented gabbro debris. Landslide morphology moderately modified

Tvt **Basalt of Temecula area (Miocene)**—Forms scattered exposures of basalt north and east of Temecula (Mann, 1955; Kennedy, 1977; Hull, 1990), about 15 miles southwest of quadrangle. In southwest corner of Sage quadrangle is an occurrence of vesicular basalt

Tta **Temecula Arkose (Pliocene)**—Mainly pale greenish-yellow, medium- to coarse-grained, indurated sandstone along southern margin of quadrangle. Includes thin discontinuous beds of tuffaceous sandstone, siltstone, and claystone, and some pebble and conglomerate beds having locally derived clasts. Named by Mann (1955) for exposures of nonmarine fluvial sandstone exposed southeast of Temecula, about 15 miles southwest of quadrangle. Kennedy (1977) assigned unit late Pliocene Blancan IV-V mammal age (2.2 to 2.8 My) based on vertebrate assemblages. Assemblages include *Nannippus*, *Hypolagus*, *Tetrameryx*, *Equus*, and *Odocoileus* (Golz, and others, 1977). Later work documents occurrence of *Tetrameryx* and establishes age as Irvingtonian I rather than late Blancan (Woodburne, 1987). Places Temecula Arkose age nearer 1.9 Ma (late Pliocene) than 2.2 Ma. Microtine fauna from unit in Radec area, about ten miles south of quadrangle, is considered to have age of 4.6 Ma (Blancan I) (Repenning, 1987). Thickness of Temecula Arkose ranges from 90 to over 550 m (Kennedy, 1977)

Plutonic rocks of the Peninsular Ranges Batholith

Ktv **Tonalite of the Tucalota Valley pluton (Cretaceous)**—Here informally named for exposures in the Tucalota Valley area near center of pluton. Relatively homogeneous, medium-grained, biotite-hornblende tonalite. Most of tonalite is massive and contains sparse ellipsoidal mafic inclusions

Kcv **Tonalite of the Coahuila Valley pluton of Sharp 1967 (Cretaceous)**—Relatively homogeneous hornblende-biotite tonalite and minor granodiorite. Gray, medium grained, hypidiomorphic granular. Most tonalite is massive and contains sparse ellipsoidal mafic inclusions. Contains subequal amounts of biotite and hornblende. Typically consists of 40 to 50 percent, compositionally zoned, subhedral andesine, 20 to 35 percent quartz, and 0 to 8 percent potassium feldspar. Color index ranges from 10 to 30. Sphene is conspicuous accessory mineral in much of unit, occurring as large euhedral crystals. Other accessory minerals are epidote (pistacite and allanite), zircon, apatite, tourmaline, and opaque minerals. Contains sparse, ellipsoidal, mafic inclusions consisting essentially of biotite, hornblende, and plagioclase. Weathers to form large boulder outcrops. Emplacement age based on zircon U-Pb analysis is 96.7 Ma by isotope dilution and 99.7 Ma by ion probe; sphene U-Pb age is 95.7 Ma by isotope dilution. $^{40}Ar/^{39}Ar$ age of hornblende is 94 Ma, biotite 92 Ma, and K-feldspar 81.5 Ma (W.R. Premo, per. commun., 1999)

Generic Cretaceous granitic rocks of the Peninsular Ranges batholith

Kgd **Granodiorite (Cretaceous)**—Medium- to coarse-grained, equigranular to porphyritic, heterogeneous biotite granodiorite and lesser amounts of monzogranite and tonalite. Contains locally abundant inclusions and schist septa

Khg **Heterogeneous granitic rocks (Cretaceous)**—Wide variety of heterogeneous granitic rocks includes a mixture of monzogranite, granodiorite, tonalite, and gabbro. Some heterogeneous assemblages include large proportions of schist and gneiss. Tonalite is most abundant rock composition

Kgb **Gabbro (Cretaceous)**—Mainly coarse-grained to locally pegmatitic black hornblende gabbro

End rocks of Peninsular Ranges batholith

KgMz **Intermixed schist and granitic rocks (Mesozoic)**—Wide variety of Mesozoic schist and related metamorphic rocks mixed with Cretaceous granitic rocks ranging in composition from monzogranite to quartz diorite. Most granitic rocks are tonalite composition

Trs **Schist (Triassic)**—Biotite schist. Includes cordierite biotite schist, and in highest metamorphic-grade rocks sillimanite schist, and less commonly garnet bearing schist. Locally meta lithic greywacke, quartzite and quartz-rich metasandstone

Trgn **Biotite gneiss and schist (Triassic)**—Medium- to dark-gray, coarse-grained biotite gneiss and schist, and biotite-quartz-feldspar gneiss and schist. Locally contains sillimanite and garnet. Commonly includes metaquartzite and minor amounts of calc-silicate hornfels. Anatectic stringers of granitic material are common

GEOLOGIC SUMMARY

The Sage 7.5' quadrangle is located at the southern part of the Perris block of the Peninsular Ranges batholith, a relatively stable area located between the Elsinore and San Jacinto Fault Zones (Woodford and others, 1971). The geology of the quadrangle is dominated by parts of two large tonalite plutons, the tonalite of the Coahuila Valley pluton of Sharp (1967), and the tonalite of the Tucalota Valley pluton. Most of the tonalite in both plutons is massive or very slightly foliated and contains scattered ellipsoidal mafic inclusions. In the northwestern corner of the quadrangle is an intimate mixture of schist, gneiss and heterogeneous granitic rocks. Some of the granitic rocks are white mica-bearing monzogranite. In most of the area the Tucalota Valley pluton is separated from the Coahuila Valley pluton by a broad septum of gneiss and schist. The metamorphic rocks consist of foliated biotite schist, biotite gneiss, and impure quartzite. Antatectic gneiss is common. Hornblende gabbro invaded by a variety of heterogeneous grantitic rocks occurs in the southern part of the quadrangle.

The Temecula Arkose (Mann, 1955) is mainly pale greenish-yellow, medium- to coarse-grained, indurated sandstone. It includes thin discontinuous beds of tuffaceous sandstone, siltstone, and claystone, and some pebble and conglomerate beds having locally derived clasts. Kennedy (1977) assigned the unit a late Pliocene Blancan IV-V mammal age (2.2 to 2.8 Ma) based on vertebrate assemblages collected east of quadrangle. Assemblages include *Nannippus*, *Hypolagus*, *Tetrameryx*, *Equus*, and *Odocoileus* (Golz and others, 1977). Later work established the first occurrence of *Tetrameryx* as Irvingtonian I rather than late Blancan (Woodburne, 1987), placing the Temecula Arkose age nearer 1.9 Ma (late Pliocene) than 2.2 Ma. A microtine fauna from this unit in the Radec area, about five miles east of Santa Ana quadrangle, is considered to have an age of 4.6 Ma (Blancan I) (Repenning, 1987). Thickness of the Temecula Arkose ranges from 90 to over 550 m (Kennedy, 1977). A thin, narrow outcrop of vesicular basalt, the Miocene basalt of Temecula area (Morton, 2004), occurs in the southwest corner of the quadrangle. A large landslide, the Oak Mountain landslide (Hart, 1991) consists of gabbro fragments largely resting on the Pliocene Temecula Arkose.

Major drainages, such as Tucalota Creek, Lewis Valley, and Weber Valley, contain both dissected Pleistocene alluvial deposits and essentially undissected Holocene alluvial deposits. Some of the drainages, such as Glenoak Valley, contain mainly Holocene alluvial deposits.

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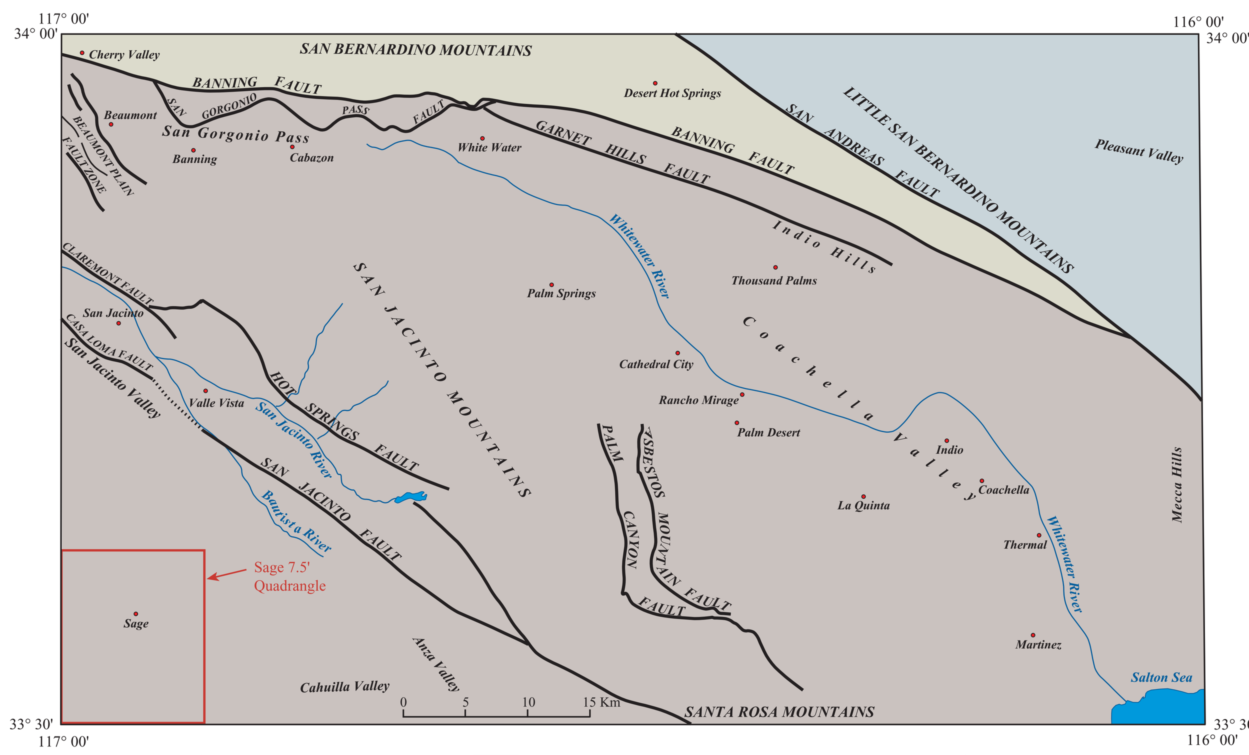

Rocks of the Peninsular Ranges assemblage.

Rocks of the San Gabriel Mountains assemblage. Includes basement (mostly concealed by Quaternary deposits) that is offset by the San Jacinto Fault

Rocks of the San Bernardino Mountains assemblage. Includes basement (mostly concealed by Quaternary deposits) of the Mojave Desert, which is similar to San Bernardino Mountains basement

Map of Palm Springs 30' X 60' quadrangle showing the location of the Sage 7.5' quadrangle. Colored areas define structural assemblages. Approximate locations of most faults having large displacements or extent are shown. •Town or geographic feature.