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GEOLOGIC MAP OF THE PALA 7.5' QUADRANGLE SAN DIEGO COUNTY, CALIFORNIA: A DIGITAL DATABASE

VERSION 1.0

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Digital Database
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2000

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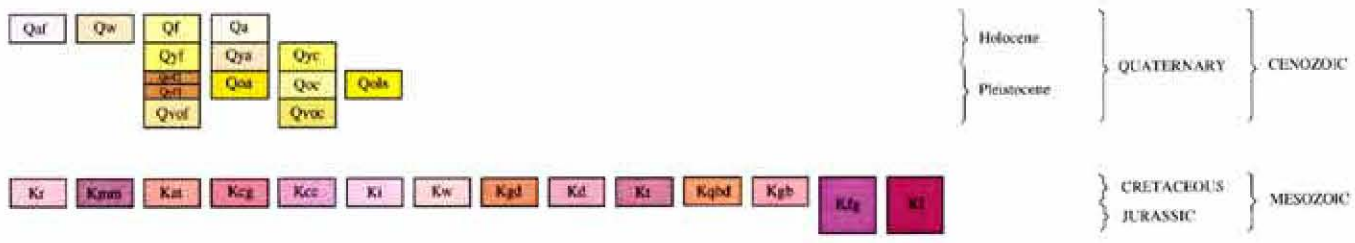
DEPARTMENT OF CONSERVATION
Division of Mines and Geology

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

MODERN SURFICIAL DEPOSITS - Sediment that has been recently transported and deposited in channels and washes, on surfaces of alluvial fans and alluvial plains, and on hillslopes and in artificial fills. Soil-profile development is non-existant. Includes:

- **Qaf** — Man made "artificial cut and fill".
- **Qw** — Active channel and wash deposits (late Holocene) - Unconsolidated to locally poorly consolidated sand and gravel deposits in active washes of streams.
- **Qf** — Active alluvial fan deposits (late Holocene) - Unconsolidated to locally poorly consolidated sand, gravel, cobble and boulder deposits in active alluvial fans.
- **Qa** — Active alluvial flood plain deposits (late Holocene) - Unconsolidated to locally poorly consolidated sand and gravel deposits in active alluvial flood plains.

YOUNG SURFICIAL DEPOSITS - Sedimentary units that are slightly consolidated to cemented and slightly to moderately dissected. Alluvial fan deposits typically have high coarse:fine clast ratios. Younger surficial units have upper surfaces that are capped by slight to moderately developed soil profiles. Includes:

- **Qya** — Young alluvial flood plain deposits (Holocene and late Pleistocene) - Mostly unconsolidated, poorly sorted, permeable flood plain sediment.
- **Qyc** — Young colluvial deposits (Holocene and late Pleistocene) - Mostly poorly consolidated and poorly sorted slope wash and stream deposits.
- **Qyf** — Young alluvial fan deposits (Holocene and late Pleistocene) - Mostly poorly consolidated and very poorly sorted sand, gravel, cobble and boulder deposits in young alluvial fans.

OLD SURFICIAL DEPOSITS - Sedimentary units that are moderately consolidated and slightly to moderately well dissected. Older surficial deposits have upper surfaces that are capped by moderately to well-developed soils. Includes:

- **Qoa** — Older alluvial flood plain deposits (Pleistocene, younger than 500,000 years) - Mostly moderately well consolidated, poorly sorted, permeable flood plain deposits.
- **Qoc** — Older colluvial deposits (Pleistocene, younger than 500,000 years) - Mostly moderately well consolidated, poorly sorted slope wash and stream deposits.
- **Qof2** — Older fan deposits (Pleistocene, younger than 500,000 years) - Mostly poorly consolidated fan, debris flow and talus deposits. Clasts possess a moderately well developed clay coating but are otherwise fresh.
- **Qof1** — Older fan deposits (Pleistocene, younger than 500,000 years but older than Qof2 deposits) - Mostly poorly consolidated fan, debris flow and talus deposits. Clasts are distinctly deeply weathered and the matrix distinctly reddish brown in color.
- **Qols** — Older landslide deposits (Holocene to Pleistocene) - Landslide slump and rock fall deposits.

VERY OLD SURFICIAL DEPOSITS - Sediments that are slightly to well consolidated to indurated, and moderately to well dissected. Upper surfaces are capped by moderate to well developed pedogenic soils. Includes:

- **Qvoc** — Very old colluvial deposits (early Pleistocene) - Mostly well-indurated, clay and sand deposits that mantle early Pleistocene uplifted depressions.
- **Qvof** — Very old alluvial fan deposits (early Pleistocene) - Mostly very well-indurated, reddish-brown, sand and cobble, early Pleistocene alluvial fan deposits.

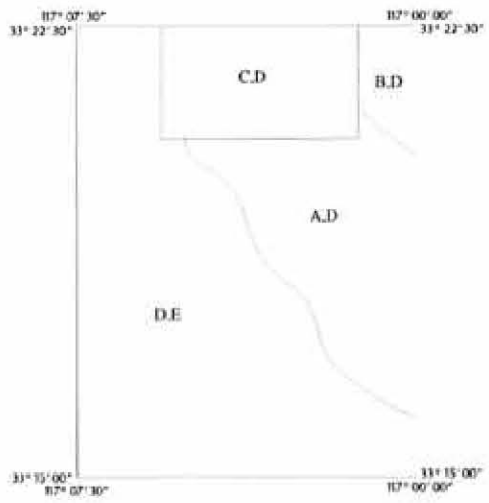
BEDROCK UNITS

- **Kr** — Granodiorite of Rainbow (Cretaceous) - Leucocratic hornblende-biotite granodiorite; medium to coarse grained, massive.
- **Kmm** — Monzogranite of Merriam Mountain (Cretaceous) - Leucocratic hornblende-biotite monzogranite; medium to coarse grained, massive.
- **Kat** — Gabbro of the Agua Tibia Mountains (Cretaceous) - Hornblende gabbro; medium to coarse grained, massive to foliate. This gabbro often contains minor biotite and quartz (quartz bearing gabbro).
- **Kcg** — Tonalite of Cole Grade (Cretaceous) - Hornblende-biotite tonalite; coarse grained and massive.
- **Kco** — Tonalite of Cosner Canyon (Cretaceous) - Hornblende-biotite tonalite; coarse grained and massive. Contains some granodiorite and is characterized by an abundance of pegmatitic dikes.
- **Ki** — Granodiorite of Indian Mountain (Cretaceous) - Biotite leucocratic granodiorite; white, fine to medium grained and massive.
- **Kw** — Gabbro of Weaver Mountain (Cretaceous) - Hornblende gabbro; coarse grained and massive.
- **Kgd** — Granodiorite undivided (Cretaceous) - Mostly hornblende-biotite granodiorite; coarse to medium grained.
- **Kd** — Diorite undivided (Cretaceous) - Mostly hornblende diorite; medium to coarse grained, dark gray, massive.
- **Kt** — Tonalite undivided (Cretaceous) - Mostly hornblende-biotite tonalite; coarse grained, light gray.
- **Kqbd** — Quartz bearing diorite undivided (Cretaceous) - Mostly biotite-hornblende quartz bearing diorite; medium grained, dark gray, massive.
- **Kgb** — Gabbro undivided (Cretaceous) - Mostly biotite-hornblende-hypersthene gabbro; coarse grained, dark gray, massive.
- **KJg** — Metagranitic rocks (Cretaceous and Jurassic) - Mostly gneiss; very light gray to white, massive.
- **KJ** — Metavolcanic and metasedimentary rocks undivided (Cretaceous and Jurassic) - Low grade (greenschist facies) rocks that are in part coeval with and in part older than the Cretaceous plutonic rocks they lie in contact with.

MAP SYMBOLS

- Contact between map units.
- Fault - dashed where inferred, dotted where concealed.
- Strike and dip of foliation.
- Landslide - arrows indicate principal direction of movement.
- Air photo lineament - Mostly joints and minor folds.
- Pegmatite dike.
- Location of samples collected for thin section analysis.

REFERENCES



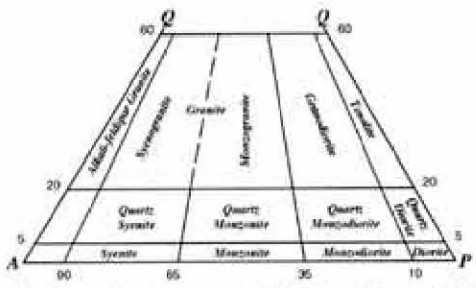
A. Hanley, J.B. and Jahns, R.H., 1950, unpublished geological maps of the Pala and Rincon pegmatite districts, San Diego County California: Unpublished U.S. Geological Survey mapping (scale 1:24,000). This mapping was used with slight modification for the basement rock geology in the north- and east-central part of the quadrangle.

B. Irwin, W.P. and Greene, R.C., 1970, Studies related to wilderness primitive areas, Agua Tibia, California: U.S. Geological Survey Bulletin 1319-A, 19p., map scale 1:48,000. This mapping was used with slight modification for the basement rock geology in the northwestern corner of the quadrangle.

C. Jahns, R.H. and Wright, L.A., 1951, Gem- and lithium-bearing pegmatites of the Pala district, San Diego County, California: California Division of Mines and Geology Special Report 7-A, 72p., map scale 1:18,000. This mapping was used with slight modification for the pegmatites and adjacent bedrock geology in the northern quarter of the quadrangle.

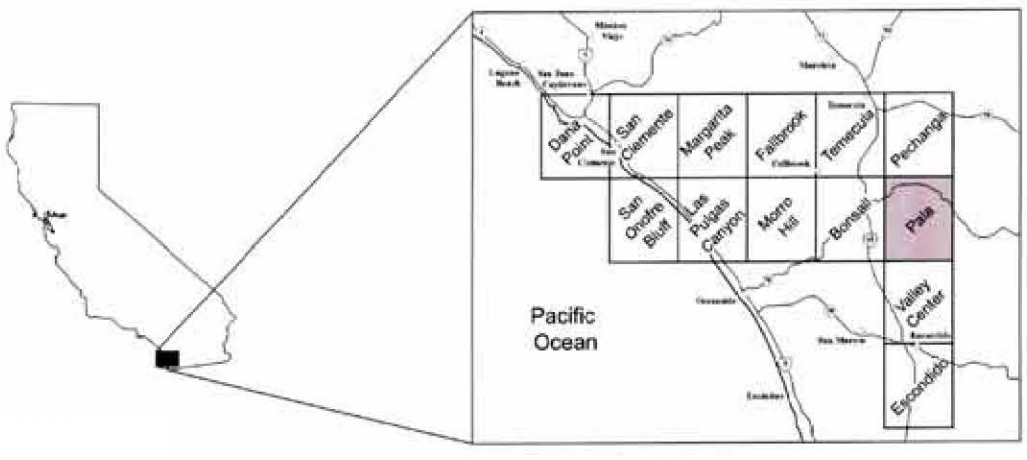
D. Kennedy, M.P., 2000, New 1:24,000-scale geologic mapping completed between July 1999, and June 2000.

E. Larsen, E.S. Jr., 1948, Batholith and associated rocks of Corona, Elsinore and San Luis Rey quadrangles, southern California: Geological Society of America Memoir 29, 182 p., map scale 1:125,000. This mapping was useful in depicting regional contacts between major plutons but the very small scale does not allow direct use of these contacts at 1:24,000.



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

*Streckeisen, A.L., 1973, Plutonic rocks—Classification and nomenclature recommended by the IUGA subcommission on Systematics of Igneous Rocks: Geotimes, v.18, pp.26-30.



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GEOLOGIC MAP LEGEND
PALA QUADRANGLE

FIGURE 6.3-3