UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

PRELIMINARY GEOLOGIC MAP OF CENOZOIC DEPOSITS OF COPPEROPOLIS QUADRANGLE, CALIFORNIA

by

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INTRODUCTION

This is one of a series of preliminary geologic maps showing Cenozoic deposits of the San Joaquin Valley. Our efforts have been concentrated on refining and further subdividing the late Cenozoic stratigraphic units proposed by earlier workers (Arkley, 1964; Davis and Hall, 1959) to allow for more precise dating of depositional and tectonic events. The interested reader should consult Marchand and Allwardt (1981) for a more complete discussion of late Cenozoic stratigraphy.

Geologic, pedologic, and physiographic evidence was used to separate the Cenozoic deposits within the map area into nine principal stratigraphic units—the Ione and Valley Springs Formations, the Table Mountain Latite, the Mehrten and Laguna Formations, the North Merced Gravel, the Turlock Lake, Riverbank (three units) and Modesto (lower and upper members) Formations. Useful criteria for differentiating these units include superposition, lithology, degree of consolidation, degree of soil profile development, degree of erosional modification, and position within a sequence of geomorphic surfaces.

Mapping was carried out through the use of soil survey maps, old and modern topographic maps, available exposures, aerial photographs and pre-existing geologic maps. The map boundaries of late Cenozoic units (Laguna Formation and younger) largely approximate the boundaries of soil units as mapped by Arkley (1964) and Retzer and others (1951). An earlier map of the Copperopolis quadrangle (Taliaferro and Solari, 1948) was used in the early stages of field work, but their contacts and Cenozoic stratigraphy have been considerably revised. Cenozoic normal faults offsetting the Table Mountain Latite, as well as associated bedrock shear zones of the Bear Mountain fault zone were mapped by Woodward-Clyde Consultants (1977).

Mapping and correlation of Cenozoic deposits in Stanislaus County has been greatly facilitated by consultation with R. J. Arkley of the University of California, Berkeley. R. L. Blum of the Pacific Gas and Electric Co. generously provided a preliminary copy of a map showing the results of some of the geological investigations that were carried out on the Copperopolis quadrangle by Woodward-Clyde Consultants for P. G. and E.'s Stanislaus Nuclear Project. The authors, however, remain responsible for any inaccuracies in the mapping. C. A. Price provided invaluable assistance by drafting the map and compiling data for the explanation after the death of Denis Marchand in January 1981.

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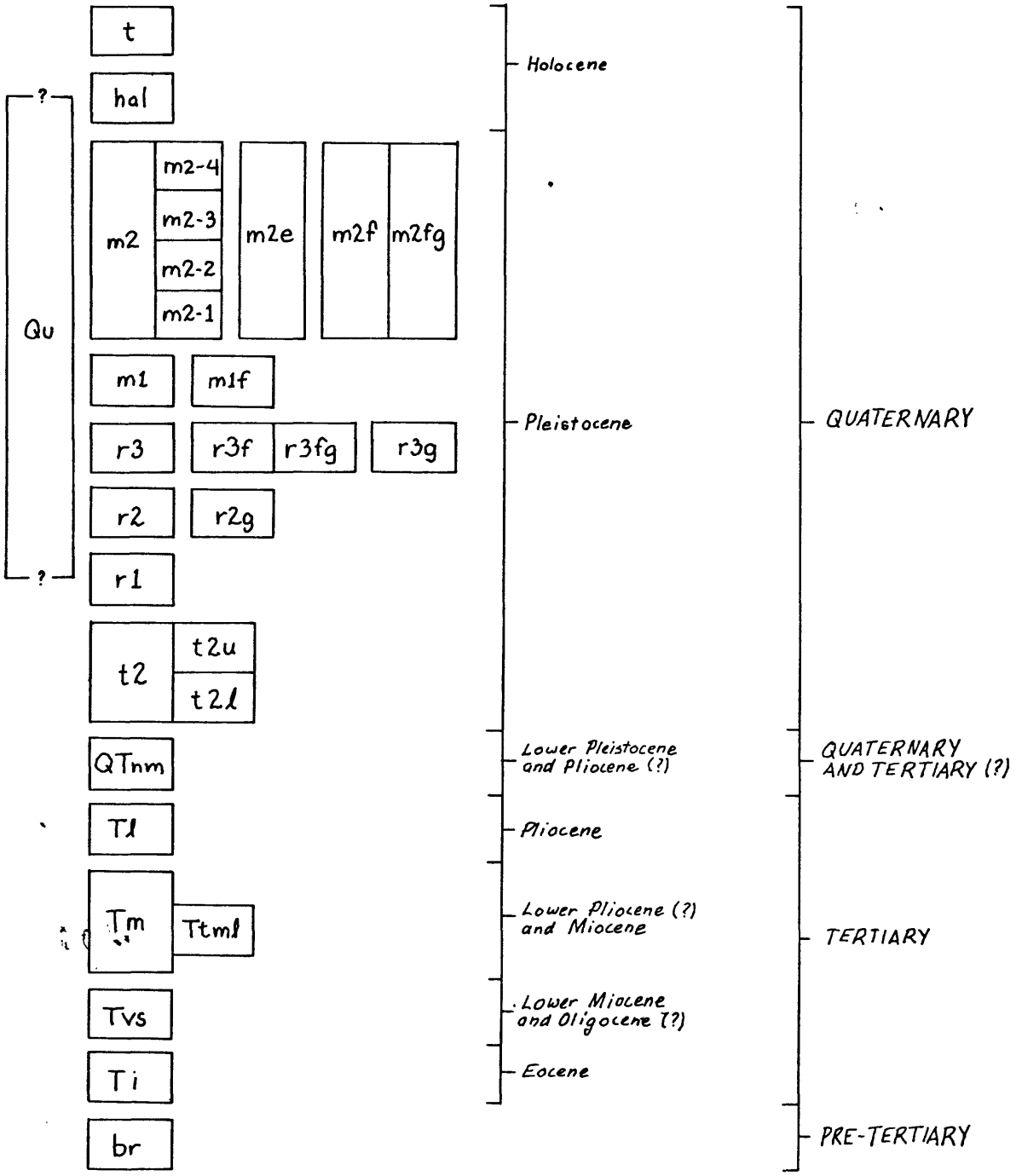
CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS[1]/

t	DREDGE TAILINGS Gravelly debris from placer mining
hal	UNDIFFERENTIATED HOLOCENE ALLUVIUM
Qu	UNDIFFERENTIATED QUATERNARY DEPOSITS Alluvial and colluvium in small isolated valleys
	MODESTO FORMATION Upper member includes:
m2	Arkosic alluvial sand and silt not differentiated as to terrace level; represents glacial outwash from core of Sierra Nevada (Hanford soil)
m2-4	Phase four - arkosic alluvium forming low terraces along the Stanislaus River (Hanford soil)
m2-3	Phase three - arkosic alluvium forming terraces between phase 2 and phase 4 surfaces (Hanford soil)
m2-2	Phase two - fill in channels cut into phase 1 terraces
m2-1	Phase one - arkosic alluvium forming the highest of the upper member terraces (Hanford and Meikle soils)
m2e	Arkosic eolian sand
m2f	Locally (Sierra Nevada foothills) derived alluvial silt, sand, and gravel forming low terraces along small drainages; contains abundant volcanic and metamorphic detrius (Wyman and Paulsell soils)
m2fg	Locally (foothills) derived gravelly alluvium (Anderson soil)
	Lower member includes:
m1	Arkosic alluvial sand associated with terraces at or slightly above the highest m2 level (Greenfield soil)
m1f	Locally (foothills) derived alluvial silt, sand and gravel forming terraces slightly above the m2f surfaces (Ryer soil)
	RIVERBANK FORMATION Upper unit includes:
r3	Arkosic sand forming terraces at or above m2 level (San Joaquin and Madera soils)
r3f	Locally (foothills) derived alluvial silt and sand (Bear Creek and Yokohl soils)
r3fg	Locally (foothills) derived alluvium graded to r3 levels
r3g	Gravelly alluvium derived from older gravels (Redding and Reyes soils)

r2 — Middle Unit includes:
Arkosic glacial outwash sand forming terraces along the Stanislaus River (Snelling and San Joaquin soils)

r2g — Alluvial gravel (Redding soil)

r1 — Lower uit includes:
Arkosic glacial outwash forming terrace remnat above r2 levels (Cometa soil)

TURLOCK LAKE FORMATION

t2 — Upper unit includes:
Undifferentiated arkosic glacial outwash underlying rolling hllly topography (Cometa soil)

t2u — Arkosic coarse sand and gravel forming upper part of the upper unit; represents coarse glacial outwash (Montpelier soils)

t2l — Arkosic fine sand, silt, and clay forming lower part of the upper unit; crops out on lower hillslopes below t2u; represents fine glacial outwash and rock flour (Whitney soil)

QTnm — NORTH MERCED GRAVEL
Thin locally derived gravel veneer overlying a pediment surface cut across Tertiary strata (Redding and Keyes soils)

Tl — LAGUNA FORMATION
Thick gravel with subordinate sand and silt; derived from mixed metamorphic, volcanic, and granitic sources

Tm — MEHRTEN FORMATION
Andesitic sandstone, conglomerate, mudstone, and resistant debris flow beds; includes andesitic debris flow beds, sandstone, and siltstone below Table Mountain Latite called Relief Peak (?) Formation by Slemmons (1966)

Ttml — TABLE MOUNTAIN LATITE
Dark gray to black porphyritic augite latite flow; dated by K/Ar method at 9.0 m.y. (Dalrymple, 1964).

Tvs — VALLEY SPRINGS FORMATION
Claystone, tuffaceous claystone, vitric tuff, siltstone, and minor clayey sandstone and conglomerate

Ti — IONE FORMATION
White or brown, quartzose kaolinitic sandstone, conglomerate, and claystone; remnants of lateritic paleosol found locally at top

br — BASEMENT ROCKS
Mostly metavolcanic and metasedimentary rocks, and serpentinite